Volume II: Appendices

Draft

Environmental Impact Statement

LAND ACQUISITION AND AIRSPACE ESTABLISHMENT

to

Support Large-Scale Marine Air Ground Task Force Live Fire and Maneuver Training

Marine Corps Air Ground Combat Center
Twentynine Palms, CA

February 2011

Volume II:

APPENDICES

LIST OF APPENDICES

APPENDIX A
AGENCY CORRESPONDENCE

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DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
2 NAVY ANNEX
WASHINGTON, DC 20380-1775

5000
MROC

FEB 07 2003

MROC DECISION MEMORANDUM 11-2003

Subj: 10 DECEMBER 2002 MARINE REQUIREMENTS OVERSIGHT COUNCIL (MROC) MEETING: JOINT NATIONAL TRAINING CENTER

1. At 1345 on 10 December 2002, the MROC convened. Attendees were:

Members	Organization
Gen Nyland	ACMC
LtGen Parks	M&RA
LtGen Bedard	PP&O
LtGen Hanlon	MCCDC
LtGen Magnus	P&R
LtGen Kelly	I&L
LtGen Hough	AVN
Also in Attendance	
BGen Paxton	P&R

2. Purpose. The Commanding General of Training and Education Command, MajGen Thomas S. Jones presented a decision brief to obtain MROC approval for a Marine Corps Joint National Training Center (JNTC) resource strategy proposal and to identify Marine Corps JNTC decision points.

3. Presentation Summary.

a. Background information. Defense Planning Guidance 2004 (DPG-04) directed that all DoD Components transition to a transformed training regimen by the end of FY05, with the goal of at least 25% of major training exercises being joint. OSD, Joint Forces Command (JFCOM), and Service efforts were directed towards establishing a JNTC that supports Service, interoperability, and joint level training no later than 1 October 2004. Subsequently, OSD directed that the initial JNTC event would take place during May 2003.

b. JNTC Thrusts. OSD, JFCOM, and the Services developed four "Thrusts" to further training transformation and JNTC implementation.

(1) Thrust 1: Improved horizontal training, which will build on existing Service interoperability training.

(2) Thrust 2: Improved vertical training, which will link component/joint command and staff planning and execution.

Subj: 10 DECEMBER 2002 MARINE REQUIREMENTS OVERSIGHT COUNCIL (MROC) MEETING: JOINT NATIONAL TRAINING CENTER

(3) Thrust 3: Integration exercises, which will enhance existing joint exercises to address joint interoperability training in a joint context.

(4) Thrust 4: Functional training, which will provide a dedicated joint training environment for functional warfighting and complex joint tasks.

c. The initial "Thrust 1" JNTC exercise will be held at the National Training Center, Ft. Irwin, California, the MAGTFTC, 29 Palms, California, and Nellis Air Force Base, Nevada during May 2003. This exercise supports the regional approach as presented by the Marine Corps. The initial "Thrust 3" JNTC exercise will be an enhanced Roving Sands Exercise during June 2003.

d. The May 2003 JNTC exercise will set the precedent for future JNTC exercises and is an opportunity to showcase Marine Corps capabilities and requirements. Competing visions between OSD/JFCOM and the Services make the success of the May 2003 exercise crucial to current and future Marine Corps interests. To capitalize on resource and training opportunities provided by OSD, MROC support is critical. TECOM has been successful in championing the May 2003 JNTC exercise as a regional exercise and the Marine Corps should use it as an opportunity to showcase capabilities and requirements.

e. Marine Corps JNTC Resource Strategy. The following training and resource initiatives are needed to enhance Marine Corps training. They will enable the Marine Corps to meet OSD's training transformation guidance and serve to enhance both the near-term and long-term participation in the JNTC. Four components of the strategy are designated as key Marine Corps JNTC decision points.

(1) Decision Point #1: Deployable Virtual Training Environment (DVTE). DVTE provides MOS specific simulators/weapons systems. Although it is characterized as a training system, its deployability makes it suitable for use during actual operational rehearsals. OSD is committing $2M to support a CACCTUS/DVTE demonstration during the May 2003 JNTC event. The estimated cost, which is not currently programmed, for fielding DVTE to the FSSGs, MEUs, Battalions, Squadrons, and schools is $23.4M over the FYDP.

(2) Decision Point #2: Range Instrumentation System (RIS), which includes Position Location Instrumentation (PLI), Multiple Integrated Laser Engagement System (MILES), targetry, and the overall systems integration architecture. Only MILES is currently funded. The proposed PLI capability includes the Integrated GPS Radio System (IGRS) and Blue Force Tracking (BFT). IGRS is a training system that provides locations information with playback capabilities. BFT is an operational system that provides only location information. OSD plans to provide $750K for MAGTFTC IGRS instrumentation in support of the May 2003 JNTC Event. Marine Corps funding needed to support May 2003

2

Subj: **10 DECEMBER 2002 MARINE REQUIREMENTS OVERSIGHT COUNCIL (MROC) MEETING: JOINT NATIONAL TRAINING CENTER**

Event RIS requirements consists of $450K for BFT and $4.6M for targetry. TECOM proposes to analyze the training value of BFT and IGRS, and use that analysis to develop a recommendation for Marine Corps training PLI.

(3) Decision Point #3: Simulation center upgrades (Note: The MAGTF Training Command (MAGTFTC) Simulation Center upgrade is designated Decision Point 3). $250K is needed for MAGTFTC Simulation Center upgrades for the May 2003 JNTC Event. OSD may be willing to fund half of the requirement. An additional $330K would be required to upgrade the remaining Marine Corps simulation centers.

(4) Decision Point #4: Land expansion to support MOUT and MEB-training. MajGen Jones indicated that the MOUT and MEB-Training Universal Needs Statements have been completed and are being forwarded to MCCDC.

(5) Combined Arms Command and Control Tactical Upgrade System (CACCTUS). CACCTUS provides the technology required to simultaneously link live, virtual, and constructive training. $60M is currently programmed over the FYDP to provide CACCTUS to all three MEFs, Quantico, and MAGTFTC.

(6) Military Operations in Urban Terrain (MOUT) facility.

(7) MEB training.

(8) CAX enhancements.

(9) Combined Arms Staff Trainer (CAST) upgrades.

f. The following table summarizes Marine Corps mid/long-term unfunded JNTC requirements:

ITEM	FY04	FY05	FY06	FY07	FY08	FY09
DVTE	$8.3M	$4.4M	$1.9M	$2.9M	$4.4M	$1.9M
FLI(BFT)	TBD	TBD	TBD	TBD	TBD	TBD
Simulation Center Upgrades	$300K	$150K	$150K	$150K	$150K	$150K
JNTC Targets[1]	$4.3M	$4.2M	$8.5M			
Total JNTC	[illegible]	$8.8M	[illegible]	$3.1M	[illegible]	[illegible]
Other Targets[2]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TOTAL	$42.5M	$19.8M	$45.6M	$21.6M	$26.7M	$33.2M

[1] JNTC Targets are targets specifically for the CAX/JNTC at MAGTFTC.

[2] Other Targets are requirements for targets at ranges at remaining Marine Corps bases.

3

Subj: 10 DECEMBER 2002 MARINE REQUIREMENTS OVERSIGHT COUNCIL (MROC) MEETING: JOINT NATIONAL TRAINING CENTER

g. Recommendation. That the MROC support TECOM's comprehensive JNTC resource strategy by:

(1) Funding near-term TECOM initiatives needed for the May 2003 JNTC exercise.

(2) Authorizing and supporting mid and long-term unfunded JNTC initiatives to compete during PR-05.

4. MROC Discussion.

a. The presentation actually combines Three topics: A Commandant-directed review of the status of training initiatives; the MAGTFTC MOUT Facility and MEB Training initiatives, which were last discussed by the MROC on 13 August 2002 (MROCDM 43-2002 refers); and, the OSD JNTC initiative.

b. JNTC Thrusts 1 through 3 will be implemented concurrently. Therefore, the Marine Corps may be simultaneously resourcing requirements to achieve all three.

c. Training initiatives (e.g., range upgrades and modernization) have not generally faired well in the POM process. They affect all Advocates, but are not owned by an individual Advocate. The MROC agreed that a failure to invest in needed training initiatives will result in the Marine Corps falling further behind the other Services in terms of training. To rectify this problem, range investment must become a focus for PR-05. Senior leaders must provide guidance to their PEG/PWG members to prioritize range investment.

d. Failure to showcase our training initiatives at the May 2003 Event and shape the JNTC debate could place our training facilities (e.g., MAGTFTC) at risk. TECOM will coordinate with P&R to identify an affordable FY 03 funding level and timeline to support the May 2003 JNTC Event that will allow us to showcase our training initiatives, shape the JNTC debate, and leverage OSD funding.

e. The MROC deferred discussion on the MOUT Facility and MEB Training initiatives until the Commandant's conceptual approval is obtained. MCCDC will obtain the Commandant's approval as soon as practical, now that the UNS's have been completed (MROCDM 43-2002 of 6 September 2002 contains the original tasking). I&L will discuss project management-related issues (e.g., HQMC/MARFOR/MAGTFTC roles and responsibilities, management team composition and location, etc.) with MARFORPAC/MAGTFTC. As soon thereafter as practical, I&L will brief the MROC on the proposed management team and Environmental Impact Statement (EIS) funding requirements (e.g., the minimum funding needed to begin the EIS, total funding required by FY, etc.). The presentation will also summarize the major elements of the initiatives and MROC decisions to date.

4

Subj: 10 DECEMBER 2002 MARINE REQUIREMENTS OVERSIGHT COUNCIL (MROC) MEETING: JOINT NATIONAL TRAINING CENTER

5. MROC Decisions.

a. The MROC supports TECOM's JNTC resource strategy and authorized the unfunded mid/long term training initiatives identified in the brief to compete as PR-05 initiatives.

b. The MROC urged those involved in the upcoming PR-05 process to provide guidance to their representatives to prioritize range investment initiatives during the deliberations.

c. To satisfy short-term May 2003 JNTC Event requirements, TECOM will identify a timeline and coordinate with P&R to determine an affordable FY-03 funding level that will allow us to showcase our training initiatives, shape the JNTC debate, and leverage OSD funding. TECOM, supported by P&R, will obtain the Commandant's approval for the May 2003 JNTC Event strategy after consulting with ACMC.

d. The MROC deferred discussion on the MOUT Facility and MEB Training initiatives pending resolution of the short-term May 2003 JNTC Event funding issues and the following actions:

(1) MCCDC will obtain the Commandant's conceptual approval for the MOUT Facility and MEB Training initiatives as soon as practical.

(2) I&L will discuss project management-related issues (e.g., HQMC/MARFOR/MAGTFTC roles and responsibilities, management team composition and location, etc.) with MARFORPAC/MAGTFTC. As soon thereafter as practical, I&L will brief the MROC on the proposed management team and Environmental Impact Statement (EIS) funding requirements (e.g., the minimum funding needed to begin the EIS, total funding required by FY, etc.). The presentation will also summarize the major elements of the initiatives and MROC decisions to date.

W. L. NYLAND

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INTERAGENCY AGREEMENT
BETWEEN
MARINE CORPS INSTALLATIONS - WEST
AND
CALIFORNIA STATE OFFICE BUREAU OF LAND MANAGEMENT
GOVERNING COORDINATION OF
MARINE CORPS MILITARY TRAINING ACTIVITIES ON
BUREAU OF LAND MANAGEMENT LAND IN CALIFORNIA

I. PARTIES TO THE AGREEMENT

This Interagency Agreement (herein Agreement) is made by and between the United States Marine Corps (herein USMC) and the California State Office, Bureau of Land Management (herein BLM) to provide for the coordination of Marine Corps training activities on land under the management and control of the BLM in the State of California.

II. PREAMBLE

WHEREAS USMC trains military personnel in the State of California to maintain mission ready status in their assigned units;

WHEREAS USMC has evolving training needs that require the use or acquisition of non-Department of Defense land within the State of California for the foreseeable future;

WHEREAS USMC preference is for the use or acquisition of other Federal public lands within the State of California to meet its training needs;

WHEREAS BLM is responsible for and has jurisdiction over the use and management of certain public lands within the State of California;

WHEREAS BLM is responsible for processing public land withdrawal applications from other Federal agencies and is responsible for submitting preliminary findings and recommendations on such applications to the Secretary of the Interior per 43 C.F.R. Part 2300;

WHEREAS BLM has unique knowledge of the public lands under its control and has the expertise essential to USMC for evaluating appropriate parcels of land to meet USMC training needs;

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WHEREAS USMC and BLM recognize the importance of government-to-government relations with American Indians and the participation of American Indians in any consideration of USMC use or acquisition of BLM controlled land in the State of California;

WHEREAS the Economy Act (31 USC 1535, as amended) allows a Federal agency to enter into an agreement with another Federal agency for services;

WHEREAS USMC will require the cooperation, coordination, and assistance of BLM in any use or acquisition of BLM land for USMC military training, including compliance with the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4370f, for environmental analyses and the Engle Act, 43 U.S.C. §§ 155-158, for public land withdrawals;

NOW, THEREFORE, the parties agree to work cooperatively in the following manner:

III. AUTHORITY FOR ENTERING INTO THIS AGREEMENT

The parties enter into this Agreement in accordance with Sections 155-158 of the Engle Act of 1958 (43 USC §§ 155-158), 10 USC § 5013, and the Economy Act (31 USC § 1535).

IV. PURPOSE

The purpose of this Agreement is to facilitate the use or acquisition of BLM controlled land in the State of California by USMC for military training purposes while meeting the requirements of the National Environmental Policy Act, the Federal Land Policy and Management Act, and the Engle Act.

V. RESPONSIBILITIES

1. USMC and BLM together will:

a. Cooperate on any environmental analysis of a proposed use or acquisition of BLM controlled land by USMC for military training in compliance with NEPA;

b. When applicable, follow procedures necessary to withdraw public land for military purposes per the Engle Act and compliance with NEPA.

2

c. Establish separate interagency agreements covering specific individual projects relating to USMC use or acquisition of BLM controlled land in the State of California.

d. Exchange relevant unclassified information in an open, timely, and cooperative manner.

2. USMC will:

a. Communicate the execution of this Agreement to those elements throughout its chain of command working to complete tasks associated with any project involving the use or acquisition of BLM controlled land within the State of California for military training purposes.

b. Designate a point of contact for the implementation of this Agreement.

c. Act as the Lead Agency for any NEPA documents produced in support of USMC proposed use or acquisition of BLM controlled land in the State of California.

3. BLM will:

a. Communicate execution of this Agreement to the appropriate district, state and headquarters offices of the Department of the Interior.

b. Designate a point of contact for the implementation of this Agreement.

c. Act as a Cooperating Agency for any NEPA documents produced in support of USMC proposed use or acquisition of BLM controlled land in the State of California.

VI. FINANCIAL ADMINISTRATION

1. Subject to availability of funds, USMC agrees to reimburse BLM for all costs incurred in furtherance of the bona fide needs of the USMC, including the prevailing indirect cost rate under this Agreement or any subsequent agreement, for analyses associated with any use or acquisition of BLM administered land in the State of California by USMC for military training purposes. BLM shall remain responsible for all costs associated with the mission funded activities of the BLM. BLM will provide an initial cost estimate within 30 days of the execution of any project specific agreement entered into by the Parties to this

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Agreement; this cost estimate will itemize the types of expenses (e.g., personnel, travel, etc.).

2. USMC shall prepare a Statement of Work to describe the assistance needed and use a Military Interdepartmental Purchase Requests (MIPR) to authorize the expenditure of a fixed amount of funds by BLM on a reimbursable basis. The USMC financial point of contact will be specified on each MIPR. BLM shall sign and return acceptance forms to confirm their ability to provide the services requested. BLM will notify USMC on a quarterly basis when expenditures occur and provide expenditure records when requested by USMC.

3. BLM will base salary expenditures for governmental employees according to General Schedule plus fringe benefits and leave surcharge. Travel expenses will comply with Federal Travel Regulations.

VII. DISPUTE RESOLUTION

1. Either Party to this Agreement may provide the other Party written notice of a dispute concerning the implementation of this Agreement. The Parties will attempt to resolve any such dispute informally.

2. If disputes cannot be informally resolved after 15 days following written notice of a dispute, either signatory of this Agreement may request elevation of the matter to their higher headquarters for resolution by issuing a written statement of dispute.

VIII. CONDITIONS - Both parties understand and mutually agree:

1. Implementation of this Agreement is of mutual benefit;

2. BLM will not undertake any activities at the expense of USMC in advance of the complete execution of necessary funding documents;

3. This Agreement does not constitute a commitment of funds, and that performance under this agreement by either party is dependant upon lawful appropriation, availability, and allocation of funds by proper authorities;

4. This Agreement may be modified or amended only by mutual agreement of the parties in writing and signed by each of the parties hereto;

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5. USMC and BLM shall execute separate sub-agreements for any services beyond the scope of this Agreement;

6. Any documents or data exchange between the Parties to the Agreement will not be released to a third party unless the designated representative of the party that generated the document or data approves the release;

7. Nothing herein contained shall be construed as limiting or affecting in any way the vested or delegated authority of the USMC and BLM;

8. This agreement becomes effective when signed by all parties and shall remain in full force and effect until terminated by either party upon 45 days notice, in writing, given to the other party.

MICHAEL R. LEHNERT
Major General, USMC
Commanding General
Marine Corps Installations – West

15 Sep 08
Date

MICHAEL POOL
Director
California State Office
Bureau of Land Management

9/12/08
Date

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UNITED STATES MARINE CORPS
MARINE AIR GROUND TASK FORCE TRAINING COMMAND
MARINE CORPS AIR GROUND COMBAT CENTER
BOX 788100
TWENTYNINE PALMS, CALIFORNIA 92278-8100

5000
CG
OCT 0 8 2008

Ms. Nancy B. Kalinowski
Director, Office of System Operations Airspace and Aeronautical Information Management (AIM)
Federal Aviation Administration
800 Independence Ave., SW
Washington, DC 20591

Dear Ms. Kalinowski:

SUBJECT: COOPERATING AGENCY INVITATION

Pursuant to the National Environmental Policy Act (NEPA), the Department of the Navy (DON) is preparing an Environmental Impact Statement (EIS) to study proposed land acquisition and airspace establishment alternatives to meet Marine Corps Marine Expeditionary Brigade (MEB) sustained, combined arms, live-fire and maneuver training requirements. I invite the Federal Aviation Administration (FAA) to actively participate with the DON as a federal cooperating agency in the preparation of analyses and documentation required by NEPA. With FAA's cooperation and expertise, DON's goal is to prepare an EIS that is fully sufficient, in both scope and content, for decision-making relative to Special Use Airspace.

The Marine Corps is the nation's expeditionary force in readiness and must train as it fights to successfully deploy Marines immediatel anywhere in the world to meet United States national defense requirements. Based upon the capabilities of our adversaries, the increased ranges of new weapons and battlefield transportation systems, and continuously-improved warfighting doctrine, the Marine Corps created MEB training requirements to ensure our Marines deploy with the realistic training they require to win in combat.

Currently, no Department of Defense facility is large and capable enough to provide MEB sustained, combined arms, live-fire and maneuve training. The Marine Corps Air Ground Combat Center at Twentynine Palms, California, would best provide the training. However, it currently has insufficient military range land and associated airspac to meet MEB training requirements. This is why the DON's EIS is studying alternatives to meet MEB training requirements.

The DON requested the Bureau of Land Management to withdraw approximately 421,270 acres of land, known as the Western, Southern, and Eastern expansion areas from the Public Domain on behalf of the DON, United States Marine Corps for use as a military training range by the United States Marine Corps. The enclosure depicts the study area locations.

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CG
OCT 0 8 2008

If the FAA accepts this invitation to participate as a cooperating agency in the EIS, I would appreciate your office designating an FAA point of contact to, among other things, work with staff and stakeholders to disclose relevant information early in the analytical process, apply available technical expertise and staff support, avoid duplication of effort, and address intergovernmental issues.

I appreciate your consideration of this request and look forward to your response. Should you have questions or need additional information, please contact Mr. Joseph Ross, Land Acquisition Program Manager, Marine Corps Air Ground Combat Center/Marine Air Ground Task Force Training Command, at: (760)830-7683 or by e-mail at: joseph.ross@usmc.mil.

Sincerely,

R. J. ABBLITT
Chief of Staff
U.S. Marine Corps

Enclosure: 1. Study Area Map

cc.:
LtCol D.K. Switzer
Federal Aviation Administration
ANM-903
1601 Lind Ave SW
Renton, WA 98057

U.S. Department
of Transportation
Federal Aviation
Administration

DEC 04 2008

Mr. R. J. Abblitt
Chief of Staff
U. S. Marine Corps
Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center
P.O. Box 788100
Twentynine Palms, CA 92278-8100

Dear Mr. Abblitt:

Thank you for your letter of October 8, 2008 requesting the Federal Aviation Administration participate as a Cooperating Agency in the Environmental Impact Statement (EIS) for the proposed land acquisition and airspace establishment to meet Marine Corps Marine Expeditionary Brigade (MEB) sustained, combined arms, live-fire and maneuver training requirements.

The FAA is pleased to participate in the EIS process in accordance with the National Environmental Policy Act of 1969 as amended, and it's implementing regulations. Since the proposal contemplates Special Use Airspace (SUA), the FAA will cooperate following the guidelines described in the Memorandum of Understanding between the FAA and the Department of Defense Concerning SUA Environmental Actions, dated October 4, 2005.

Modification of the SUA in the State of California resides under the jurisdiction of the Western Service Area, Operations Support Group, in Renton, Washington; therefore the Western Service Area will be the primary focal point for matters related to both airspace and environmental matters. Mr. Clark Desing is the Manager of the Operations Support Group. FAA Order 7400.2, Chapter 32 indicates these processes should be conducted in tandem as much as possible; however, they are separate processes. Approval of either the aeronautical process or the environmental process does not automatically indicate approval of the entire proposal.

A copy of the incoming correspondence and this response is being forwarded to Mr. Desing. At your earliest convenience, please contact the Western Service Area at (425) 203-4500 to be assigned airspace and environmental points of contact for further processing of your proposal.

Sincerely,

Rodger A. Dean
Acting Director, System Operations Airspace & Aeronautical Information Management
Air Traffic Organization

UNITED STATES MARINE CORPS
COMMANDER, U.S. MARINE CORPS BASES, PACIFIC
CAMP H. M. SMITH, HI 96861-5001

IN REPLY REFER TO:
11000
G-4/0958
20 OCT 2009

From: Commander, U.S. Marine Corps Bases, Pacific
To: Deputy Commandant, Installations and Logistics (LF)

Subj: 29 PALMS LAND ACQUISITION/AIRSPACE ESTABLISHMENT IN SUPPORT OF LARGE-SCALE MAGTF LIVE FIRE AND MANEUVER TRAINING SPACE

Ref: (a) MCATS Tasker G4.9261.2 dtd 18 Sep 09
(b) Description of Proposed Action and Alternatives v3 dtd 16 Sep 2009

1. Reference (a) requested review, comment and concurrence on reference (b). I concur with the Description of Proposed Action and Alternatives and fully support continued planning and preparation of the Draft Environmental Impact Statement.

2. My POC is Mr. Bob Pedigo, Facilities Director, at (808) 477-8778 or robert.pedigo@usmc.mil.

K. J. STALDER

Copy to:
DC, CDI
CG, MCI West
CG, MCAGCC 29 Palms

UNITED STATES MARINE CORPS
MARINE CORPS INSTALLATIONS WEST
BOX 555200
CAMP PENDLETON, CALIFORNIA 92055-5200

IN REPLY REFER TO:
1000
MGN/afp
20 Feb 10

Mr. Mark Kuck
Suport Manager, Airspace and Procedures
Los Angeles Air Route Traffic Control Center
2555 E. Ave P
Palmdale, CA, 93550

Dear Mr. Kuck,

As you know, the United States Marine Corps is presently conducting feasibility studies for the possible land and airspace expansion of the Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms. In accordance with standard procedures the Federal Aviation Administration (FAA) is a cooperating agency in this effort. In order to facilitate planning and minimize the effects on the existing airspace structure, a Special Use Airspace (SUA) Feasibility and Alternatives Assessment is being developed for the areas surrounding the MCAGCC Twentynine Palms range complex. This feasibility and alternatives assessment is intended to improve our ability to provide a high quality SUA proposal to the FAA for its review and ultimate decision. It will also allow us to shape our proposal to minimize potential impacts to non-participating aircraft and to the environment.

To facilitate the assessment, I request that the airspace operations and related data identified in the attachment be provided to Marine Corps Installations West (Attn G-3/RAC) at the above letterhead address. The data is essential for developing a comprehensive assessment and will be used in various models and analysis tools. In areas where the requested data is not available, please note such in your response. If in your opinion any of the requested data would require your staff to conduct data analysis which you deem inappropriate at this juncture, please so note and provide the raw data with your response.

Your response by 20 March, 2010 will be most appreciated and will ensure that we complete the assessment in a timely manner. Please contact our Regional Airspace Coordinator, LtCol Aaron Potter at 760.763.6403 if you have questions or need additional information regarding this request. Thank you in advance for your assistance.

Sincerely,

M. G. Naylor
M. G. NAYLOR

DATA REQUIREMENTS
FOR
FEASIBILITY ASSESSMENT FOR THE ESTABLISHMENT OF
SPECIAL USE AIRSPACE

1.Radar track data/hourly aircraft operations data for the average day from the surface to FL400 within a 3 nautical mile (nm) distance outward from the area formed by the following latitude-longitude data. (Proposed Johnson Valley Air 1& 2)

Boundaries - (perimeter) - Beginning at 34 38 30 North 116 45 10 West;
thence direct 34 43 00 North 116 26 23 West;
thence direct 34 40 30 North 116 29 43 West;
thence direct 34 30 00 North 116 26 23 West;
thence direct 34 14 00 North 116 17 03 West;
thence direct 34 14 00 North 116 36 15 West;
thence direct 34 27 48 North 116 45 12 West;
to the point of beginning.

Beginning at 34 38 30 North 116 36 10 West;
thence direct 34 43 00 North 116 26 23 West;
thence direct 34 40 30 North 116 29 43 West;
thence direct 34 30 00 North 116 26 23 West;
thence direct 34 14 00 North 116 17 03 West;
thence direct 34 14 00 North 116 36 15 West;
thence direct 34 27 48 North 116 36 12 West;
to the point of beginning.

2.Radar track data/hourly aircraft operations data for the average day from 1500 to FL400 within a 3 nautical mile (nm) distance outward from the area formed by the following latitude-longitude data. (Proposed Sundance MOA Extention.)

Boundaries - (perimeter) – Beginning at 34 14 00 North 116 36 15 West;
thence direct 34 14 00 North 115 30 03 West;
thence direct 34 06 00 North 115 32 00 West;
thence direct 34 06 00 North 116 33 00 West;
to the point of beginning.

3.Radar track data/hourly aircraft operations data for the average day from 5000 to FL400 within a 3 nautical mile (nm) distance outward from the area formed by the following latitude-longitude data. (Bristol MOA/ATCAA)

Boundaries - (perimeter) - Beginning at 34 43 00 North 116 17 03 West;
thence direct 34 42 50 North 115 26 33 West;
thence direct 34 22 00 North 115 35 23 West;
thence direct 34 17 00 North 115 41 13 West;
thence direct 34 17 00 North 115 44 03 West;
thence direct 34 25 00 North 115 44 03 West;
thence direct 34 25 00 North 115 47 03 West;
thence direct 34 33 00 North 115 47 03 West;
thence direct 34 34 40 North 115 54 58 West;
thence direct 34 35 30 North 115 58 03 West;
thence direct 34 41 00 North 116 03 03 West;
thence direct 34 41 15 North 116 04 33 West;
thence direct to beginning point.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Barstow Field Office
2601 Barstow Road
Barstow, CA 92311
www.ca.blm.gov/barstow

OCT 0 3 2010

In Reply Refer To:
1791(P)
CA-680.21

Chris Proudfoot
Project Manager
Twenty Nine Palms MCAGCC
Bldg 1554, Box 788106
Twenty Nine Palms, CA 92278-8106

Re: Assumptions for Twenty-Nine Palms Marine Corps Air Ground Combat Center Land Acquisition EIS Analysis

Sir:

Per your request, enclosed are the assumptions BLM has agreed to utilize for the MCAGCC Land Acquisition Draft EIS analysis, based on discussions between BLM and MCAGCC staff and the EIS technical consultants, and our follow-up meeting of September 21-22, 2010.

Contact Mickey Quillman of my management staff at (760) 252-6020 if you have any further questions or need clarification of these assumptions.

Sincerely,

Roxie C. Trost

Roxie C. Trost
Field Manager

Enclosures:
Summary of Assumptions

c.c: Craig Bloxham, Principal
TEC Inc.
1819 Cliff Drive, Ste F
Santa Barbara, CA 93109

Baseline Assumptions and/or Variables Held Constant for All Alternatives:

- **Baseline Visitors - West:** In the west area, all analyses will assume an *average* total of 300,000 visitor-days per year (all recreation, not just OHV) as a baseline. As described in the PDEISv1, this is an estimate provided in 2010 by BLM, based on RMIS statistics for organized events and estimates of casual use. Projected changes through 2015 are provided in the Table on p.6.
- **Baseline Visitors – East and South:** For purposes of this analysis, 800 visitor-days per year (all recreation, not just OHV) was assumed for the south study area and 500 visitor-days per year was assumed for the east area: all visits to the south area assumed to be single-day visits and all by local area residents only; 10% of visitor-days to the east area assumed to be multi-day use, also by local area residents.
- **Purpose of Visits - West:** For west area, assume 17% of the visitor-days/year are directly linked to organized race events ("event-related") and would not occur if race events were not held 83% of visitor-days are "dispersed-use" (including casual use unrelated to race events plus would-be race spectators that would still recreate in the area even if races were displaced.
- **Day Use vs. Overnight – West:**
  - For both dispersed-use and event-related groups, assume 20% of visitor-days/year are by single-day users (arrive and depart same day) and the other 80% of visitor-days/year are multi-day visits.
  - Assume an *average* of 2.5 days/2 nights duration for all multi-day visits.
- **Average Group Size:** Assume the *average* group size is 3 people for both dispersed-use and event-related trips. This means that there is an average of one main transport vehicle for each 3 visitors to and from the recreational area.
- **Origin of Visitors within the County:**
  - For day-use visits, assume the origin of users is 50% from "local" area (within 50 miles of JV); 30% from elsewhere in San Bernardino County; and 20% from outside the County.
  - For multi-day trips, assume the origin of visitors is 20% from "local" area; 20% from elsewhere in San Bernardino County; and 60% from outside the County.
- **Visitor Spending Patterns:**
  - "Local" visitors spend 100% of the cost of the trip "locally" (within 50 miles of JV).
  - Visitors from elsewhere in San Bernardino County spend 60% "locally" and 40% elsewhere in the County.
  - Visitors from outside the County spend 30% "locally," 10% in the rest of San Bernardino County, and 60% outside of San Bernardino County.

Alternative 1 Assumptions:

- **Displacement of Event-Related Visits:** Based on input from the BLM Recreation Branch Chief, the analysis assumes that 100% of organized races (and race-related visits as defined above) would be eliminated from JV under Alt 1 and none of these displaced events would be accommodated at other venues in the County (in reality some race events may be able to proceed in a reduced or truncated form, or be held elsewhere, but for the sake of a conservative analysis, it is assumed that no current JV race events would be held anywhere in the County).
- **Displacement of Dispersed-Use Visits:**
    - Assume that 75% of the baseline dispersed-use visitor-days in JV (as defined above) would be displaced by Alt 1. The other 25% of dispersed-use visitor-days would continue in JV because some popular areas within the OHV Area (on the remaining 17,628 acres or roughly 9% of the OHV Area) would remain available to the public.
    - Assume that 90% of the dispersed-use that would be displaced by Alternative 1 (i.e., 90% of the 75% displaced) would shift to other recreational resources in San Bernardino County. The other 10% of the displaced JV dispersed-users would stay outside the County.
    - For AQ – assume 90% of the displaced visitors that would shift elsewhere in the County (90% of the 90% of the 75%) would stay within the Ozone non-attainment area (the other 10% could go to areas such as Dumont or Spangler, but these are more remote from local areas and the LA Basin.
- **Origin of Displaced Visitors within the County:**
    - For day-use visits remaining in the county under Alt 1, assume the origin of users is 65% from the "local" area (within 50 miles of JV); 25% from elsewhere in San Bernardino County; and 15% from outside the County.
    - For multi-day trips remaining in the county, assume the origin of visitors is 20% from "local" area (within 50 miles of JV); 20% from elsewhere in San Bernardino County; and 60% from outside the County.

Alternative 2 Assumptions:

- **Displacement of Event-Related Visits:** assume that 60% of the organized races in JV (including "King of the Hammers" in its current form) would be eliminated under Alt 2, along with 60% of the strictly "event-related" visits. The displaced race events would not be absorbed at other County venues.
- **Displacement of Dispersed-Use Visits:**
  - Assume that 25% of the baseline dispersed-use visitor-days in JV (as defined above) would be displaced by Alt 2. The other 75% of dispersed-use visitor-days would continue in JV. Approximately 78,470 acres or roughly 41% of the existing JV OHV area would remain available for public recreation year-round.
  - Assume that 90% of the dispersed-use that would be displaced by Alternative 2 (i.e., 90% of the 25% displaced) would shift to other recreational resources in San Bernardino County. The other 10% of the displaced JV dispersed-users would stay outside the County.
  - For AQ – assume 90% of the displaced visitors that would shift elsewhere in the County (90% of the 90% of the 25%) would stay within the Ozone non-attainment area (the other 10% could go to areas such as Dumont or Spangler, but these are more remote from local areas and the LA Basin).
- **Origin of Displaced Visitors within the County:** (same as baseline)
  - For day-use visits remaining in the county under Alt 2, assume the origin of users is 50% from "local" area (within 50 miles of JV); 30% from elsewhere in San Bernardino County; and 20% from outside the County.
  - For multi-day trips remaining in the county, assume the origin of visitors is 20% from "local" area (within 50 miles of JV); 20% from elsewhere in San Bernardino County; and 60% from outside the County.

Alternative 4 & 5 Assumptions: *(assumes no restrictions on alcohol in the RPAA in considering visitation changes).*

- **Displacement of Event-Related Visits:** Assume that 15% of the organized races in JV (not the"King of the Hammers" event) would be eliminated under Alt 4 or 5, along with 15% of the strictly "event-related" visits. The displaced race events would not be absorbed at other County venues.

- **Displacement of Dispersed-Use Visits:**

    - Assume that 15% of the multi-day dispersed-use and 30% of the single-day dispersed-use in JV would be displaced by Alt 4 or 5. The other 85% of multi-day and 70% of single-day dispersed-use would continue in JV during the 10 months of restricted public access each year.

    - Assume that 90% of the dispersed-use that would be displaced by Alt 4 or 5 (i.e., 90% of the 15% or 30% displaced) would shift to other recreational resources in San Bernardino County. The other 10% of the displaced JV dispersed-users would stay outside the County.

    - For AQ – Assume 90% of the displaced visitors that would shift elsewhere in the County (90% of the 90% of the 15 or 30%) would stay within the Ozone non-attainment area (the other 10% could go to areas such as Dumont or Spangler, but these are more remote from local areas and the LA Basin).

- **Origin of Displaced Visitors within the County:** (same as baseline)

    - For day-use visits remaining in the County under Alt 4 or 5, assume the origin of users is 50% from "local" area (within 50 miles of JV); 30% from elsewhere in San Bernardino County; and 20% from outside the County.

o For multi-day trips remaining in the County, assume the origin of visitors is 20% from "local" area (within 50 miles of JV); 20% from elsewhere in San Bernardino County; and 60% from outside the County.

Alternative 6 Assumptions: *(assumes no restrictions on alcohol in the RPAA in considering visitation changes).*

- **Displacement of Event-Related Visits:** assume that 60% of the organized races in JV (not including some modified form of "King of the Hammers") would be eliminated under Alt 6, along with 60% of the strictly "event-related" visits. The displaced race events would not be absorbed at other County venues.
- **Displacement of Dispersed-Use Visits:**
    - Assume that 30% of the dispersed-use (both multi- and single-day) in JV would be displaced by Alt 6. The other 70% of dispersed-use would continue in JV during the 10 months of restricted public access each year.
    - Assume that 90% of the dispersed-use that would be displaced by Alternative 6 (i.e., 90% of the 30% displaced) would shift to other recreational resources in San Bernardino County. The other 10% of the displaced JV dispersed-users would stay outside the County.
    - For AQ – Assume 90% of the displaced visitors that would shift elsewhere in the County (90% of the 90% of the 30%) would stay within the Ozone non-attainment area (the other 10% could go to areas such as Dumont or Spangler, but these are more remote from local areas and the LA Basin).
- **Origin of Displaced Visitors within the County:** (same as baseline)
    - For day-use visits remaining in the county under Alt 6, assume the origin of users is 50% from "local" area (within 50 miles of JV); 30% from elsewhere in San Bernardino County; and 20% from outside the County.
    - For multi-day trips remaining in the County, assume the origin of visitors is 20% from "local" area (within 50 miles of JV); 20% from elsewhere in San Bernardino County; and 60% from outside the County.

Baseline JV Visitor-Days per Year - 2015 Projection

Year	Dispersed-Use		Organized Race Events		Total Use	
	#visitor-days	% Annual Increase	Other than King of Hammers	King of Hammers	Visitor-Days	% Annual Increase
2008	127,000		80,763	720	208,483	
2009	142,000	11.8%	80,763	30,270	253,033	21.4%
2010	165,147	16.3%	80,763	45,438	291,348[1]	15.1%
2011	173,404	5.0%	80,763	45,438	299,605	2.8%
2012	182,075	5.0%	80,763	45,438	308,276	2.9%
2013	191,178	5.0%	80,763	45,438	317,379	3.0%
2014	200,737	5.0%	80,763	45,438	326,938	3.0%
2015	210,774	5.0%	80,763	45,438	336,975	3.1%

[1]Rounded up to 300,000 for the analysis.

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APPENDIX B
CURRENT TRAINING AREAS AND FIXED RANGES

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Table B-1. Combat Center Training Areas

Training Area	Acres	Description
Acorn	17,463	The Acorn Training Area is located in the southwestern area of Marine Corps Air Ground Combat Center at Twentynine Palms, CA (Combat Center) and is used as a non-live-fire maneuver area. A Special Use Area #1 is located at the southeastern portion of the Acorn Training Area, while a Special Use Area #2 is located at the southwestern portion and extends into the Sand Hill Training Area to the south. A second Special Use Area #2 is located at the northwestern portion of the Acorn Training Area and extends into the Emerson Lake Training Area.
America Mine	20,910	The America Mine Training Area is located on the eastern boundary of the Combat Center and is used for patrolling, mortar firing, infantry training, and light armored vehicle training. America Mine is composed of both mountainous (37%) and rolling terrain.
Black Top	50,848	The Black Top Training Area is located on the northern boundary of the Combat Center and is used for tank gunnery, artillery and small arms training, and major exercises. Black Top Training Area is mostly gently sloping and only 13% of this area is mountainous or rough.
Bullion	28,860	The Bullion Training Area is located to the west of America Mine Training Area and is used for aviation bombing and strafing, gunnery practice, artillery, and infantry maneuvers. Range is contained within the Bullion Training Area. Approximately 44% of the Bullion Training Area is mountainous. A Special Use Area #2 is located at the southern portion of the Bullion Training Area.
Cleghorn Pass	36,301	The Cleghorn Pass Training Area is located in the southeastern area of the Combat Center and is used for small arms, tank gunnery, light armored vehicle live-fire, and maneuvers. Cleghorn Pass contains several Fixed Ranges: Range 400, Range 410, Range 410A, Range 500, and a Battle Site Zero (BZO) Range. The Armor Multi-Purpose Range Complex, used for tank exercises, is located within Range 500. About 40% of the area within the Cleghorn Pass Training Area is mountainous or rough.
Delta	29,748	The Delta Training Area is located in the central area of the Combat Center and is used for live-fire maneuvers and major exercises. Live fire is limited due to safety considerations. Heavy use occurs during pre-Combined Arms Exercise (CAX) and by tenant commands. About 48% of the Delta Training Area is gently sloping and 52% is mountainous. A Special Use Area #1 is located at the southern boundary of the Delta Training Area. This Special Use Area extends into the Prospect Training Area.
East	6,890	The East Training Area is located in the southern area of the Combat Center, east of Mainside, and is used for non-live-fire activities, live-fire activities that impact in Prospect and Delta Training Areas, and as a staging area for major exercises. The majority of the East Training Area is gently sloping and only 12% is mountainous.
Emerson Lake	32,141	The Emerson Lake Training Area is located at the western boundary of Combat Center and is used for tank maneuvers, aviation bombardment, and aerial targetry. Principal use occurs during pre-CAX and Final Exercises. Approximately 70% of the land is gently sloping and the remaining is composed of low rolling terrain (only 13% is mountainous or rough). A Special Use Area #1 and a Special Use Area #2 are located at the western and southwestern portion of the Emerson Lake Training Area, respectively. The Special Use Area #2 extends into the Acorn Training Area to the south.

Table B-1. Combat Center Training Areas

Training Area	Acres	Description
Gays Pass	18,307	Gays Pass Training Area is located in the northwestern area of the Combat Center and is used for ground-based, live-fire exercises and artillery. Principal use occurs during pre-CAX and Final Exercises. Gays Pass is characterized by gently sloping land and mountains on either side (approximately 44% is mountainous).
Gypsum Ridge	17,546	The Gypsum Ridge Training Area is located in the southwestern area of the Combat Center and is used for bivouac and wheeled vehicle maneuvers and, on special occasion, live-fire demonstrations. This area is used as a staging area for CAX Final Exercises. Gypsum Ridge consists of low rolling terrain and includes the northern section of Deadman Lake (a dry lake bed). The Gypsum Ridge Training Area has a Special Use Area #1 in its southeastern section.
Lava	22,775	The Lava Training Area is located in the center of the Combat Center, to the north of the Cleghorn Pass Training Area, and is used primarily for battalion tactical training (including both ground-based and combined ground/air live-fire) and artillery. Principal use occurs during Pre-CAX and Final Exercises. The Lava Training Area has exposed lava rock and consists of 26% mountainous or rough terrain. A Special Use Area #1 exists within the southwestern section of the Lava Training Area, while a second Special Use Area #1 is located at the southeastern edge and extends into the Lead Mountain Training Area.
Lavic Lake	54,761	The Lavic Lake Training Area is located in the northwestern portion of the Combat Center and is used for aviation training exercises and live-fire maneuvers with major exercises. Principal use occurs during CAX Final Exercises. Most of the area is gently sloping and made up of lava rock. About 17% of the terrain is mountainous or rough. A Special Use Area #1 is located at the northern portion and a Special Use Area #2 is located at the northwestern portion of the Lavic Lake Training Area. A Special Use Area #2 extends into the Sunshine Peak Training Area to the west.
Lead Mountain	53,548	Located at the far northeastern boundary of the Combat Center, Lead Mountain Training Area is used for aviation, artillery, and ground-based live-fire. A dummy airfield is located in the southern portion of the Training Area. Principal use occurs during CAX Final Exercises. Lead Mountain Training Area is composed mostly of gently sloping land and only 8% of the terrain is rough. Three Special Use Area #1 exist within the Lead Mountain Training Area. The first is located at the southwestern edge and is shared with the Lava Training Area, the second is located at the northern section, and the third is at the western section where a radio repeater station is located. Two Special Use Area #2 also exist within the Lead Mountain Training Area; one is located at the western section and the other borders the eastern boundary of Dry lake.
Main Side	3,942	Mainside is located at the southern boundary of the Combat Center and includes administration, housing, maintenance, supply and support, and community facilities. Live fire is limited due to safety considerations. Mainside is periodically used for Military Operations on Urban Terrain (MOUT) training.
Maumee Mine	16,103	The Maumee Mine Training Area is located at the northwestern boundary of the Combat Center and is used for artillery and maneuver training exercises. Principal uses of this area occur during CAX Final Exercises. This area is 19% mountainous.

Table B-1. Combat Center Training Areas

Training Area	Acres	Description
Noble Pass	24,029	The Noble Pass Training Area is located in the center of the Combat Center and is used for aviation and/or ground-based live-fire, tank maneuvers, infantry training, and CAX's with some artillery use. This area is approximately 59% mountainous.
Prospect	13,146	The Prospect Training Area is located just north of the East Training Area in the southern portion of Combat Center and is used for battalion and company level training. Principal use of this area occurs during Pre-CAX and by tenant commands. Approximately 22% of the Prospect Training Area is mountainous. A Special Use Area #1 is located at the northwestern section of the Prospect Training Area, extending into the Delta Training Area.
Quackenbush Lake	42,415	The Quackenbush Training Area is located east of the Emerson Lake Training Area, at the western section of the Combat Center. This area is used for ground-based live-fire, artillery, aviation training, and maneuvers. Heavy use occurs during Pre-CAX, Final Exercises, and by tenant units. Approximately 13% of the terrain is mountainous. A Special Use Area #2 is located at the eastern border of the Quackenbush Lake Training Area. This Special Use Area extends slightly into the northwestern portion of the Range Training Area.
Rainbow Canyon	25,567	The Rainbow Canyon Training Area is located to the west of the Black Top Training Area in the northwestern section of the Combat Center. It is used as a live-fire and maneuver area. Principal use occurs during pre-CAX and Final Exercises. Range 601 (Sensitive Fuse Impact Area), an abandoned air-to-ground range, is located within the Rainbow Canyon Training Area.
Range	21,739	The Range Training Area is located in the central part of the Combat Center and is used for training using fixed ranges and Sensitive Fuse Areas. Approximately 19% of the Range Training Area is mountainous or consists of rough terrain. A Special Use Area #2 is located at the northwestern portion of the Range Training Area, extending into the Quackenbush Lake Training Area.
Sand Hill	16,786	The Sand Hill Training Area is located at the far southwestern border of the Combat Center and is used for maneuvers. Portions of the Exercise Support Base and Expeditionary Airfield (EAF), as well as Assault Landing Zone (ALZ) Sand Hill, are located within the Sand Hill Training Area. Portions of three Special Use Area #1 occupy the northeastern end and a Special Use Area #2 occupies the majority of the western and southern parts of the Training Area. Live-fire is not conducted due to proximity to Mainside which is located to the east.
Sunshine Peak	22,892	The Sunshine Peak Training Area is located at the far northwestern area of the Combat Center. This area is seldom used. When used, its primary use is an ordnance drop zone (DZ). Approximately 38% of the Sunshine Peak Training Area is mountainous. A Special Use Area #1 is located at the southeastern portion, while a Special Use Area #2 occupies the northern portion of the Sunshine Peak Training Area, extending into the Lavic Lake Training Area.
West	10,621	The West Training Area is located in the southern area of the Combat Center, northwest of Mainside. Portions of DZ Sand Hill, the EAF, and Exercise Support base, as well as the ALZ are located within the West Training Area. No live-fire maneuvers occur at the West Training Area. This area is used as a staging area for major exercises. Most of the West Training Area consists of gently sloping terrain. A Special Use Area #1 occupies the northern section, while a Special Use Area #2 occupies the southern edge of the West Training Area.

Source: MAGTF Training Command 2003.

Table B-2. MCAGCC Fixed Ranges

Range	Training Area	Description
051	Range	Explosive Ordnance Disposal (EOD) special use range for testing of equipment.
100	TA East	Squad Maneuver Range; this range is a land navigation training course.
101	Range	Tank Main Gun Training Range (miniaturized scale). This live-fire range is designed for armor units to fire subcaliber training devices at scaled targets. Range 101 is also used as a small arms and pistol range.
102	Range	Squad Maneuver Range. The Compass Course is also a non-live-fire land navigation course.
103	Range	Squad Defensive Firing Range. This live-fire range is designed to improve defensive tactics by incorporating changing deployment requirements and scenarios.
104	Range	Anti-Mechanized/Grenade Range. Range 104 is designed to develop the confidence of unit members in their abilities to use grenades and special weapons.
105	Range	Gas chamber training occurs within Range 105.
105A	Range	BZO Range. A BZO range is a 200 foot (50 meter) course for calibrating weapons.
106	Range	Range 106 is a Mortar Range. Units practice firing live mortars.
107	Range	Infantry Squad Battle Course; this live-fire range features quick-reaction scenarios such as ambushes, raids, and reconnaissance.
108	Range	Infantry Squad Assault Range; this range is designed to improve offensive tactics during changing deployment requirements and scenarios.
109	Range	Anti-Armor Live-Fire Tracking Range. Range 109 is designed primarily for use by DRAGON or TOW weapons systems.
110	Range	MK-19 Range; this live-fire range is used for firing of the MK-19 machine gun.
111	Range	Military Operations on Urban Terrain (MOUT) Assault Course. Used to train units for MOUT operations and features automated stationary and moving targets.
112	Range	EOD Demolition Range. Range 112 is restricted to Marine Corps Air Ground Combat Center at Twentynine Palms, CA (Combat Center) EOD units for destroying dud and Grade III ordnance, as well as training with and testing special EOD tools and equipment.
113	Range	Multi-Purpose Machine Gun Range. This live fire range is designed for offensive and defensive machine gun practice.
113A	Range	BZO Range. A BZO range is a 200 foot (50 meter) course for calibrating weapons.
114	Range	Combat Engineer Demolition Range. This range is designed for company training in most types of mine training.
210	Bullion	Helicopter Door Gunnery Range. This range is used by aircraft crews to train in the firing of machine guns and rockets.
225	Range	Urban complex
400	Cleghorn Pass	Company Live Fire and Maneuver Range. Range 400 is designed for company sized live-fire attacks on enemy strongholds.
401	Range	Company Live Fire and Maneuver Range
410	Cleghorn Pass	Rifle Platoon Attack Range. Range 410 is designed for rifle platoons to attack enemy positions and practice wire breaching and trench clearing procedures.
410A	Cleghorn Pass	Rifle Platoon Attack Range. This range is designed to provide a rifle platoon the opportunity to conduct a minefield breach and a dismounted, live attack against an enemy squad.

Table B-2. MCAGCC Fixed Ranges

Range	Training Area	Description
500	Cleghorn Pass	Armor Live Fire and Maneuver Range. Provides the sites and supporting facilities for armor and anti-armor training.
601	Rainbow Canyon	Super Sensitive Fuse Impact Range. This range is restricted to critical fuse and ordnance that can be delivered by indirect fire weapons or aircraft. *Note: This range has been closed to sensitive fuses since 1995.*
620	Unknown	No information at this time.
630	Unknown	No information at this time.
800	Range	Improvised Explosive Device Lane

Source: MAGTF Training Command 2003.

Range Protocols

- Safety Briefs. The following briefs related to ordnance, hazardous materials, and scrappers are required to be given by personnel designated by the Marine Air Ground Task Force (MAGTF) Training Command, G-3 prior to entering the range and training areas at the Combat Center (MAGTF Training Command 2007):
  - Explosive Ordnance Disposal (EOD) Unexploded Ordnance (UXO);
  - Hazardous Materials (Natural and Cultural Resources); and
  - Scrappers.
- Training. Standard Operating Procedure (SOP) Range/Training Areas and Airspace (RTAA) 1017, Scrappers, is followed if someone is seen or suspected of scrapping in the training areas.
- Requiring that battalion task forces fire only non-dud producing munitions until they cross into the current Combat Center property so that any land acquired in Johnson Valley would be available for civilian use following a sweep of the range to remove military munitions and debris. Table 2-15 lists various types of non-dud producing munitions that would be used.
- Designing a west-to-east direction of maneuver (opposite of Alternative 1), with three battalion task forces assembling near the center of any land acquired within the west study area and maneuvering eastward through commonly used corridors on the installation. Two of the battalions would converge at the Marine Expeditionary Brigade (MEB) objective near the eastern edge of the current installation, while the southern battalion would terminate the exercise on any land acquired within the south study area.
- The Combat Center requires that it be kept informed of any accident or incident that constitutes a serious or significant event that may require notification to higher headquarters Reportable Incidents. Examples of accidents or incidents requiring a report to the Range Control Officer are listed in SOP RTAA 1011, Training Accidents and Incident Reporting; 1. General; 4. Reportable Incidents (MAGTF Training Command 2007), and also in incident-specific SOPs:
  a. Aircraft or motorized vehicle accidents (also 1012. Aircraft Accidents).
  b. Unintentional jettison of any material from an aircraft.
  c. Actual medical evacuations (MEDEVACs) (1013. MEDEVAC Procedures).
  d. Ordnance released or dropped in the wrong area.

e. Accidental/negligent discharges.

f. Missing, lost, or stolen munitions.

g. Serious injury or death.

h. Anything that is liable to create interest or inquiries from the local civilian community.

- Training. SOP RTAA 2001, Environmental Constraints Applicable To All Training Activities: 1) General. Training areas and land use restrictions must be considered in operational staff planning, while hazardous material and waste management must be considered as a basic logistical requirement. As a rule, material taken into a training area must be removed from the training area. 2) Spill Prevention, Containment, and Clean Up.
- Training. SOP RTAA 2003, Police of Training Areas; General – what it is, how it can be recovered, where to take it. Disposal – of garbage, recyclables, hazardous materials, food waste, and unused ammo.
- Training. SOP RTAA Chapter 5 Exercises and Key Events.
- Training. SOP RTAA 5001 Exercise, 6. 6. Exercise Clean Up:

  a. A minimum period of three days per exercise dedicated to range police is required from all exercise forces. A one day mid-exercise cleanup will typically occur during the exercise. A minimum of two additional days of cleanup will then occur following the end of the exercise.

  b. A post-exercise inspection of the training area will be conducted following completion of an exercise by the exercise force representatives and Range Training Area Maintenance Section. The exercise force shall not depart the Combat Center until the RTAA is in a proper state of police. This includes any numbered ranges and observation posts that were used by the exercise force.

  c. All exercise force EOD personnel will conduct ordnance residue cleanup and UXO clearance sweeps with Combat Center EOD personnel during post exercise cleanup as required.

- SOP RTAA 6023 Police of Tank/Amphibious Assault Vehicle/Light Assault Vehicle, and Other Vehicle Crossings.
- SOP RTAA Chapter 7 Ammunition and Explosives.

APPENDIX C
PUBLIC INVOLVEMENT

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64604 Federal Register / Vol. 73, No. 211 / Thursday, October 30, 2008 / Notices

mailed to the USPTO, for a total postage cost of approximately $107,453 per year.

The recordkeeping costs for this collection are associated with submitting maintenance fee payments, forms, and petitions online through the USPTO Web site. It is recommended that customers who submit fee payments and documents online print and retain a copy of the acknowledgment receipt as evidence of the successful transaction. The USPTO estimates that it will take 5 seconds (0.001 hours) to print a copy of the acknowledgment receipt and that approximately 214,556 maintenance fee payments, forms, and petitions will be submitted online, for a total of 215 hours per year for printing this receipt. Using the paraprofessional rate of $100 per hour, the USPTO estimates that the recordkeeping cost associated with this collection will be approximately $21,500 per year.

The total non-hour respondent cost burden for this collection in the form of filing fees, postage costs, and recordkeeping costs is estimated to be $614,571,323 per year.

IV. Request for Comments

Comments are invited on: (a) Whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; (b) the accuracy of the agency's estimate of the burden (including hours and cost) of the proposed collection of information; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the collection of information on respondents, *e.g.*, the use of automated collection techniques or other forms of information technology.

Comments submitted in response to this notice will be summarized or included in the request for OMB approval of this information collection; they also will become a matter of public record.

Dated: October 24, 2008.

Susan K. Fawcett,

Records Officer, USPTO, Office of the Chief Information Officer, Customer Information Services Group, Public Information Services Division.

[FR Doc. E8–25886 Filed 10–29–08; 8:45 am]

BILLING CODE 3510–16–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Acquisition of Lands and Establishment of Airspace Contiguous to the Marine Corps Air Ground Combat Center, Twentynine Palms, CA

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section (102)(2)(c) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(c)), as implemented by the Council on Environmental Quality Regulations (40 CFR parts 1500–1508), the Department of the Navy announces its intent to prepare an Environmental Impact Statement (EIS) to study alternatives for meeting Marine Corps Marine Expeditionary Brigade (MEB) sustained, combined arms, live-fire and maneuver training requirements. The proposed action is to request the withdrawal of federal public lands, acquire state and privately owned lands, and to seek the establishment of Special Use Airspace with the effect of expanding the Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. The Department of the Navy will prepare the EIS in cooperation with the Bureau of Land Management and Federal Aviation Administration.

DATES: All written, oral, or telephonic comments regarding the scope of issues that the Department of the Navy should consider during EIS preparation must be received before January 31, 2009. Three public scoping meetings have been scheduled and the meeting locations are as follows:

1. December 3, 2009, 5 p.m. to 9 p.m., Twentynine Palms, CA;
2. December 4, 2009, 5 p.m. to 9 p.m., Victorville, CA;
3. December 5, 2009, 5 p.m. to 9 p.m., Ontario, CA.

ADDRESSES: Written comments or requests for inclusion on the EIS mailing list may be submitted to Project Manager (*Attn:* Mr. Joseph Ross), Box 788104, Bldg 1554, Rm 138, MAGTFTC/MCAGCC, Twentynine Palms, CA 92278–8104. Public meeting locations are as follows:

1. Twentynine Palms Junior High School, Hay's Gym, 5798 Utah Trail, Twentynine Palms, CA;
2. Hilton Garden Inn Victorville, 12603 Mariposa Road, Victorville, CA;
3. Convention Center, 2000 E. Convention Center Way, Ontario, CA.

FOR FURTHER INFORMATION CONTACT: Project Manager (*Attn:* Mr. Joseph Ross), Box 788104, Bldg 1554, Rm 138, MAGTFTC/MCAGCC, Twentynine Palms, CA 92278–8104; *phone:* 760–830–3764; *e-mail: SMBPLMSWEBPAO@usmc.mil.*

SUPPLEMENTARY INFORMATION: Each of the three scoping meetings will consist of an informal, open house session with information stations staffed by Marine Corps representatives. Public comment forms will be available and gathered at the information stations, and a stenographer will be available to take oral comments for inclusion in the record. Details of the meeting locations will be announced in local newspapers. Additional information concerning meeting times and the proposed alternatives will be available on the EIS Web site located at *http://www.29palms.usmc.mil/las.*

The meetings are designed to solicit input from agencies and the affected public regarding issues or interests that should be studied or the reasonable alternatives that should be considered for study to meet Marine Corps Marine Expeditionary Brigade (MEB) sustained, combined arms, live-fire and maneuver training requirements. The public is welcome to comment orally or by written comment forms at the meeting; or, by sending a letter to Mr. Joe Ross, Project Manager, 29Palms Proposed Training Land/Airspace Acquisition Project, MAGTFTC/MCAGCC, Bldg 1554, Box 788104, Twentynine Palms, CA 92278–8104; by an e-mail to *SMBPLMSWEBPAO@usmc.mil;* or by voice mail at 760–830–3764.

The EIS will consider alternatives for the proposed acquisition of training land and accompanying Special Use Airspace sufficient to meet the training requirements for three MEB battalions, as a Ground Combat Element, and a correspondingly sized Air Combat Element to simultaneously maneuver for 48–72 hours, using combined-arms and live fire with their supporting Logistics Combat Element and Command Element. To meet MEB training requirements which utilize weapons systems and platforms currently and foreseeable in the Marine Corps inventory, more contiguous military range land and airspace than is now available for training anywhere in the United States would be required.

The requirement for MEB training reflects a shift in doctrine that emerged in the 1990s that placed the MEB as the premier fighting force that would be deployed to world crises in the foreseeable future. The Marine Corps studied locations nationwide that might meet the training requirements and concluded that the Southwest Region

Federal Register / Vol. 73, No. 211 / Thursday, October 30, 2008 / Notices 64605

range complex is the best location to meet them. This study further determined that expansion at MCAGCC would be necessary to meet the sustained MEB training requirement for a three battalion Ground Combat Element to maneuver to a single objective. MCAGCC is the Marine Corps' service-level training facility for Marine Air Ground Task Force training, the place through which nearly all Marine Corps units rotate for training before deployment.

The Marine Corps is studying various alternatives to meet MEB training requirements at MCAGCC Twentynine Palms, CA. At this time, it is anticipated that the EIS will evaluate five action alternatives and the No Action Alternative. The EIS will also consider any other reasonable alternatives that are subsequently identified during scoping or the preparation of the document. The Marine Corps will also evaluate opportunities for co-use of the land, as part of the evaluation of alternatives. The following is a summary of the alternatives that are currently proposed to be studied in the Environmental Impact Statement.

Alternative 1 would add approximately 188,000 acres to the West of the base and approximately 22,000 acres to the South of the base, and accompanying Special Use Airspace. During a MEB training exercise, three battalions would begin movement in a westerly direction from different starting positions in the current MCAGCC range complex area and converge on a single objective in the western part of what is called "Johnson Valley," conducting live-fire from ground- and air-based combat elements throughout the training exercise. During non-MEB training periods, any newly acquired installation lands would be used for live-fire, combined arms training and other military training of smaller units. With regard to any Special Use Airspace, this alternative would establish Restricted Airspace over the Western Area to accommodate live-fire from aviation and surface units. Special Use Airspace over the proposed Southern expansion area would need to be converted from Military Operational Airspace to Restricted Airspace.

Alternative 2 would add approximately 112,000 acres to the West of the base, the same 22,000 acres to the South as in Alternative 1, and accompanying Special Use Airspace. During a MEB training exercise, three battalions would begin movement in a westerly direction from different starting positions in the current MCAGCC range complex area and converge on a single objective in the center of what is called "Johnson Valley," conducting live-fire from ground- and air-based combat elements throughout the training exercise. During non-MEB training periods, any newly acquired installation lands would be used for live-fire, combined arms training and other military training of smaller units. With regard to Special Use Airspace, this alternative would establish Restricted Airspace over the Western Area to accommodate combined arms live-fire from aircraft in support of the Ground Combat Element and would determine whether the current Special Use Airspace over the proposed Southern expansion area would need to be converted from Military Operational Airspace to Restricted Airspace.

Alternative 3 would add the same 22,000 acres of land in the South as would be added in Alternatives 1 and 2 and would add approximately 228,000 acres to the East of the base. During a MEB training exercise, two battalions would begin movement from starting positions to the east of the MCAGCC current range complex and travel together in a westerly direction before separating for individual movement once aboard the current MCAGCC. The third battalion would begin movement in a westerly direction from a starting position in the southern portion of the current range complex. All three battalions would maneuver toward a single objective in the northwest portion of the current range complex. The two battalions that would start in the proposed new areas to the east would conduct live-fire from ground- and air-based combat elements once aboard the current MCAGCC range complex, and the third battalion would be able to conduct live fire from ground- and air-based combat elements throughout the training exercise. During non-MEB training periods, any newly acquired installation lands to the east would be used for live small arms fire and other military training of smaller units, and any newly acquired installation lands in the south would be used for live-fire, combined arms training and other military training of smaller units. In this alternative, it is possible that no additional Special Use Airspace would need to be established, or that any current Special Use Airspace would need to be modified.

Alternative 4 would add the same 188,000 acres to the west of the current installation and approximately 22,000 acres to the south of the installation as are contained in Alternative 1. During a MEB training exercise, three battalions would begin movement in an easterly direction from different starting positions in what is called "Johnson Valley" and assault different objectives in the eastern portion of the current range complex and in the proposed southern expansion area. Live-fire training in the western expansion area would be limited to non-dud producing ordnance, with dud-producing ordnance only targeted within the current range boundary. Non-MEB training events would be subject to the same restrictions. With respect to Special Use Airspace, this alternative would establish Restricted Airspace over the Western and Southern Areas to accommodate combined arms live-fire from aviation and surface units.

Alternative 5 would add the same 188,000 acres of land to the west of the base as in Alternatives 1 and 4. During a MEB training exercise, three battalions would begin movement in an easterly direction from separate starting positions in "Johnson Valley." Two battalions would attack separate objectives in the current range complex, and the third battalion would attack the Combined Arms Military Operations in Urban Terrain (CA MOUT) facility in the current range complex. Live-fire training in the western expansion area would be limited to non-dud producing ordnance, with dud-producing ordnance only targeted within the current range boundary. Non-MEB training events would be subject to the same restrictions. With respect to Special Use Airspace, this alternative would establish Restricted Airspace over the Western Area to accommodate combined arms live-fire from aviation and surface units.

The No Action Alternative would seek no additional lands and no additional or changes to Special Use Airspace associated with MCAGCC's current range complex. During a MEB exercise, the three battalions of the ground combat element would commence their operations aboard the current MCAGCC range complex in the eastern and central areas of the base, moving towards a single objective in the northwest corner of the current MCAGCC, undertaking live-fire and combined arms actions throughout, except as restrained by on-base administrative controls.

The Department of the Navy is initiating the scoping process to identify community interests and local issues to be addressed in the EIS. Federal, state and local agencies, Native American Indian Tribes and interested individuals are encouraged to provide oral and/or written comments regarding the scope of the EIS to develop reasonable alternatives and/or to identify specific issues or topics of environmental

64606 Federal Register / Vol. 73, No. 211 / Thursday, October 30, 2008 / Notices

concern that the commenter believes should be considered.

The EIS will evaluate potential environmental effects associated with action alternatives and the No Action Alternative. Potential issues include, but are not limited to: Land use, recreation, energy development, air quality, airspace/air traffic, biological resources, cultural resources, mining/minerals, socioeconomics and noise.

A mailing list has been assembled to facilitate preparation of the EIS. Those on this list will receive notices and documents related to EIS preparation. This list includes local, state, and federal agencies with jurisdiction or other interests in the alternatives. In addition, the mailing list includes adjacent property owners, affected municipalities, and other interested parties such as conservation and off-highway vehicle organizations. Anyone wishing to be added to the mailing list may request to be added by contacting the EIS project manager at the address provided above.

Dated: October 24, 2008.

T.M. Cruz,

Lieutenant Commander, Judge Advocate Generals Corps, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E8–25845 Filed 10–29–08; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF EDUCATION

Notice of Proposed Information Collection Requests

AGENCY: Department of Education.

SUMMARY: The IC Clearance Official, Regulatory Information Management Services, Office of Management, invites comments on the proposed information collection requests as required by the Paperwork Reduction Act of 1995.

DATES: Interested persons are invited to submit comments on or before December 29, 2008.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires that the Office of Management and Budget (OMB) provide interested Federal agencies and the public an early opportunity to comment on information collection requests. OMB may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The IC Clearance Official, Regulatory Information Management Services, Office of Management, publishes that notice containing proposed information collection requests prior to submission of these requests to OMB. Each proposed information collection, grouped by office, contains the following: (1) Type of review requested, e.g. new, revision, extension, existing or reinstatement; (2) Title; (3) Summary of the collection; (4) Description of the need for, and proposed use of, the information; (5) Respondents and frequency of collection; and (6) Reporting and/or Recordkeeping burden. OMB invites public comment.

The Department of Education is especially interested in public comment addressing the following issues: (1) Is this collection necessary to the proper functions of the Department; (2) will this information be processed and used in a timely manner; (3) is the estimate of burden accurate; (4) how might the Department enhance the quality, utility, and clarity of the information to be collected; and (5) how might the Department minimize the burden of this collection on the respondents, including through the use of information technology.

Dated: October 24, 2008.

Angela C. Arrington,

IC Clearance Official, Regulatory Information Management Services, Office of Management.

Office of Elementary and Secondary Education

Type of Review: New.

Title: Reading First Expenditure Study.

Frequency: Annually.

Affected Public: Not-for-profit institutions; State, Local, or Tribal Gov't, SEAs or LEAs.

Reporting and Recordkeeping Hour Burden:

Responses: 4,420.

Burden Hours: 13,260.

Abstract: The U.S. Department of Education Reading First program has no formal mechanism for grantees to report on specific uses of grant funds. The proposed surveys will collect data on the use and allocation of Reading First grants from current State educational agencies (SEA) grantees and their local educational agencies (LEA) subgrantees. Collecting such information will help satisfy the informational needs of key stakeholders, and inform future grant-making efforts.

Requests for copies of the proposed information collection request may be accessed from *http://edicsweb.ed.gov*, by selecting the "Browse Pending Collections" link and by clicking on link number 3844. When you access the information collection, click on "Download Attachments" to view. Written requests for information should be addressed to U.S. Department of Education, 400 Maryland Avenue, SW., LBJ, Washington, DC 20202–4537. Requests may also be electronically mailed to *ICDocketMgr@ed.gov* or faxed to 202–401–0920. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be electronically mailed to *ICDocketMgr@ed.gov*. Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339.

[FR Doc. E8–25894 Filed 10–29–08; 8:45 am]

BILLING CODE 4000–01–P

DEPARTMENT OF EDUCATION

National Assessment Governing Board; Meeting

AGENCY: Department of Education, National Assessment Governing Board.

ACTION: Notice of open meeting and partially closed meetings.

SUMMARY: The notice sets forth the schedule and proposed agenda of a forthcoming meeting of the National Assessment Governing Board. This notice also describes the functions of the Board. Notice of this meeting is required under Section 10(a)(2) of the Federal Advisory Committee Act. This document is intended to notify members of the general public of their opportunity to attend. Individuals who will need special accommodations in order to attend the meeting (i.e., interpreting services, assistive listening devices, materials in alternative format) should notify Munira Mwalimu at 202–357–6938 or at *Munira.Mwalimu@ed.gov* no later than November 10, 2008. We will attempt to meet requests after this date, but cannot guarantee availability of the requested accommodation. The meeting site is accessible to individuals with disabilities.

DATES: November 20–22, 2008.

Times

November 20

Committee Meetings:

Ad Hoc Committee on NAEP Testing and Reporting on Students with Disabilities and English Language Learners: Open Session—2 p.m. to 4 p.m.

Executive Committee: Open Session—4:30 p.m. to 5 p.m.; Closed

70626 Federal Register / Vol. 73, No. 226 / Friday, November 21, 2008 / Notices

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Acquisition of Lands and Establishment of Airspace Contiguous to the Marine Corps Air Ground Combat Center, Twentynine Palms, CA; Correction

AGENCY: Department of the Navy, DoD.

ACTION: Notice; correction.

SUMMARY: The Department of the Navy published a document in the **Federal Register** on October 30, 2008, announcing its intent to prepare an Environmental Impact Statement for the Proposed Acquisition of Lands and Establishment of Airspace Contiguous to the Marine Corps Air Ground Combat Center, Twentynine Palms, California. The original publication contained incorrect dates.

FOR FURTHER INFORMATION CONTACT: Project Manager (Attn: Mr. Joseph Ross), Box 788104, Bldg. 1554, Rm. 138, MAGTFTC/MCAGCC, Twentynine Palms, CA 92278–8104; phone: 760–830–3764; e-mail: *SMBPLMSWEBPAO@usmc.mil.*

Correction

1. In the **Federal Register** of October 30, 2008, in FR Doc. E8–25845, on page 64604, in the second column, correct the **DATES** caption to read as follows:

DATES: All written, oral, or telephonic comments regarding the scope of issues that the Department of the Navy should consider during EIS preparation must be received before January 31, 2009. Three public scoping meetings have been scheduled and the meeting locations are as follows:

1. December 3, 2008, 5 p.m. to 9 p.m., Twentynine Palms, CA;

2. December 4, 2008, 5 p.m. to 9 p.m., Victorville, CA;

3. December 5, 2008, 5 p.m. to 9 p.m., Ontario, CA.

Dated: November 14, 2008.

T.M. Cruz,

Lieutenant Commander, Judge Advocate General's Corps, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E8–27693 Filed 11–20–08; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Closed Meeting of the Chief of Naval Operations (CNO) Executive Panel

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: The CNO Executive Panel will report on the findings and recommendations of the Subcommittee "The Navy & The Nation" to the Chief of Naval Operations. The matters to be discussed during the meeting are: Campbell-Ewald Advertising contract, Branding project, and marketing & recruiting methods; CNO's Engagement and long-range schedule. Each topic under each of these headings relates solely to the internal personnel rules and practices of the agency; discloses privileged/confidential trade secrets, commercial, and financial information; pertains to the CNO's classified "SECRET" long-range schedule, and discusses information the premature disclosure of which would be likely to significantly frustrate the fair bidding process for a major DON contract which makes this information exempt from open meeting disclosure pursuant to 5 U.S.C. sections 552b(c)(1) and (4).

DATES: The meeting will be held on December 15, 2008, from 9 a.m. to 11 a.m.

ADDRESSES: The meeting will be held at Center for Naval Analyses (CNA), Room 1A01, 4825 Mark Center Drive, Alexandria, VA 22311.

FOR FURTHER INFORMATION CONTACT: LCDR Eric Taylor, CNO Executive Panel, 4825 Mark Center Drive, Alexandria, VA 22311, telephone: 703–681–4909.

SUPPLEMENTARY INFORMATION: Pursuant to the provisions of the Federal Advisory Committee Act, as amended (5 U.S.C. App.), these matters constitute classified information that is specifically authorized by Executive Order to be kept secret in the interest of national defense and is, in fact, properly classified pursuant to such Executive Order.

Accordingly, the Secretary of the Navy has determined in writing that the public interest requires that all sessions of this meeting be closed to the public because they will be concerned with matters listed in sections 552b(c)(1) and (4) of title 5, United States Code.

Individuals or interested groups may submit written statements for consideration by the Chief of Naval Operations Executive Panel at any time or in response to the agenda of a scheduled meeting. All requests must be submitted to the Designated Federal Officer at the address detailed below. If the written statement is in response to the agenda mentioned in this meeting notice then the statement, if it is to be considered by the Panel for this meeting, must be received at least five days prior to the meeting in question.

The Designated Federal Officer will review all timely submissions with the Chief of Naval Operations Executive Panel Chairperson, and ensure they are provided to members of the Chief of Naval Operations Executive Panel before the meeting that is the subject of this notice. To contact the Designated Federal Officer, write to Executive Director, CNO Executive Panel (N00K), 4825 Mark Center Drive, 2nd Floor, Alexandria, VA 22311–1846.

Dated: November 14, 2008.

T.M. Cruz,

Lieutenant Commander, Office of the Judge Advocate General, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E8–27694 Filed 11–20–08; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF EDUCATION

Arbitration Panel Decision Under the Randolph-Sheppard Act

AGENCY: Department of Education.

ACTION: Notice of arbitration panel decision under the Randolph-Sheppard Act.

SUMMARY: The Department of Education (Department) gives notice that, on August 26, 2008, an arbitration panel rendered a decision in the matter of *Teresa Alcorn* v. *Kentucky Office for the Blind, Case no. R-S/07-3.* This panel was convened by the Department under 20 U.S.C. 107d-1(a), after the Department received a complaint filed by the petitioner, Teresa Alcorn.

FOR FURTHER INFORMATION CONTACT: You may obtain a copy of the full text of the arbitration panel decision from Suzette E. Haynes, U.S. Department of Education, 400 Maryland Avenue, SW., room 5022, Potomac Center Plaza, Washington, DC 20202–2800. *Telephone:* (202) 245–7374. If you use a telecommunications device for the deaf (TDD), you may call the Federal Relay Service (FRS) at 1–800–877–8339.

Individuals with disabilities may obtain this document in an alternative format (e.g., Braille, large print, audiotape, or computer diskette) on request to the contact person listed under **FOR FURTHER INFORMATION CONTACT.**

PRESS ADVISORY

United States Marine Corps

Division of Public Affairs

Date:	Nov. 25, 2008
Contact:	HQMC Media Branch, POC: Capt Amy Malugani
Telephone:	(703) 614-4309

USMC HOSTS OPEN HOUSES FOR PROPOSED LAND EXPANSION

HEADQUARTERS MARINE CORPS (Nov. 25, 2008) – The Department of the Navy is in the initial stages of preparing an Environmental Impact Statement (EIS) to study potential environmental effects associated with a range of reasonable alternatives (including 'no action' alternative) for the proposed acquisition of lands and establishment of special-use airspace bordering the Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, Calif.

As part of the National Environmental Policy Act (NEPA) process, the Marine Corps will host three scoping meetings in Southern California. Meetings will be in open house format allowing interested parties to view information boards and handouts, speak with project representatives and submit written and oral comments on issues and alternatives for consideration in the Draft EIS (by Jan. 31, 2009). For additional information please reference the project website www.29palms.usmc.mil/las.

Open-house meeting locations, times and dates are as follows:

Wednesday, Dec. 3, 2008, 5 to 9 p.m.
Twentynine Palms Junior High School
5798 Utah Trail
Twentynine Palms, CA 92277

Thursday, Dec. 4, 2008, 5 to 9 p.m.
Hilton Garden Inn
12603 Mariposa Road
Victorville, CA 92395

Friday, Dec. 5, 2008, 5 to 9 p.m.
Ontario Convention Center
2000 E. Convention Center Way
Ontario, CA 91764

Comment Mailing Address:
MAGTFTC, MCAGCC
ATTN: Land Acquisition Program
Box 788104, Bldg 1554, Rm 138
Twentynine Palms, CA 92278-8104
E-mail: SMBPLMSWEBPAO@usmc.mil

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Barstow Field Office
2601 Barstow Road
Barstow, CA 92311
www.ca.blm.gov/barstow

In Reply Refer To:
CACA 50194
CA-680. 20

MAY 2 9 2009

MAGTFTC, MCAGCC
ATTN: Land Expansion Program Manager
Box 788104, Building 1554, Room 138
Twenty-nine Palms, CA 92278-8104

APPLICATION SUMMARY OF PROPOSED EXPANSION OF MARINE COPRS AIR TO GROUND COMBAT CENTER AT 29 PLAMS, CALIFORNIA

Dear Joe:

The following is a summary of the actions that have taken place as part of the BLM's Segregation Process for the Proposed Expansion of Marine Corps Air to Ground Combat Center (MCAGCC) at 29 Palms, California.

SEGREGATION APPLICATION RECEIVED

The Department of the Navy, U.S. Marine Corps Air to Ground Combat Center at 29 Palms, California submitted an application to the Barstow Field Office of the Bureau of Land Management (BLM) on August 4, 2008 for a proposed expansion of the installation. The application was to withdraw 365,906 acres of Public Lands, and approximately 507 acres of Federal subsurface mineral estate from all forms of appropriation under the public land laws, including surface entry, mining, mineral leasing under the Mineral Act of 1947.

This withdrawal would provide the USMC at MCAGCC at 219 Palms, California the opportunity to evaluate the best alternative that meets both the needs of MCAGCC, and is the least intrusive on the environment and the Off Highway Vehicle Community in the 29 Palms area. Appendix A

FEDEREAL REGISTER NOTICE

The BLM published a Notice of Proposed Legislative Withdrawal and Opportunity for Public Meeting: California. This notice was published in the *Federal Register, Volume 73, No. 179* on Monday, September 15, 2008. This Notice provided a ninety day comment period from September 15 through December 15, 2008 for stakeholders to express their views about the impacts of the proposed expansion.

The U.S. Navy, MCAGCC published a Notice of Intent to Prepare an Environmental Impact Statement (EIS) in the *Federal Register, Volume 73, No. 211 on Thursday, October 30, 2008.* The publication of this document started the Official Segregation Date for the project. The segregation is for two years, and expires on October 30, 2010. The Segregation may be renewed upon request by the USMC. Appendix B

SEGREGATION DATES:

The Segregation is effective from September 15, 2008 through September 15, 2010. The Segregation may be renewed at the request of MCAGCC

PUBLIC MEETINGS:

The BLM held two Segregation meetings to inform the public of the BLM's responsibility related to the segregation request. The meeting dates were announced in the Federal Register, and local newspapers. The first meeting was held on September 23, 2008 at the Twenty-nine Palms Junior High School, Hays Gym, 5798 Utah Trail, Twenty-nine Palms, CA. The second meeting was held on September 24, 2008 at the Hilton Garden Inn, 12603 Mariposa Road, Victorville, CA.

The meetings were held in an Open House Format with posters describing the National Environmental Policy Act (NEPA) process; BLM's requirements with on the Segregation Process; and MCAGCC's proposed expansion alternatives and maps of these alternatives. Attendance of interested parties at each meeting ranged from 50 to 150 people. Interested parties were provided the opportunity submit written comments at each location and were provided a physical address and e-mail addresses to submit comments at a later date. Appendix D

SUMMARY OF COMMENTS:

The BLM Segregation Comment Period ran from September 15, 2008 through December 15, 2008. The BLM received over 500 written comments, 898 e-mail comments, and a few faxed comments.

OHV Community Opposed to Expansion: 898 e-mails and approximately 500 written comments opposed to the expansion.

Mining Interests: Five comments concerned about their leases. There are over 75 mining leases in the segregation area, but most are held by one or two individuals.

Residential Property Owners: Approximately 10 residents were concerned about noise and dust associated with the expansion. They were also concerned with loss of property values.

Local Communities: Two local communities, Apple Valley, and Yucca Valley, passed resolutions against the proposed expansion.

Alternative Energy Issues: Three alternative energy companies; FPL, Sterling Energy, and Opti-solar have submitted comments about the potential impacts to their pending energy projects.

Small Business Concerns: There were several comments from small business owners from the communities around Johnson Valley who sell to the OHV community. They are very concerned about the loss of income if the proposed expansion is successful.

Miscellaneous comments: One stakeholder was concerned with the loss of use of a dirt runway in the Johnson Valley Expansion Area.

Should you require any further information on this project, please contact Mickey Quillman, BLM, Barstow Field Office, Resource Manager at (760) 252-6020.

Sincerely,

Mickey Quillman

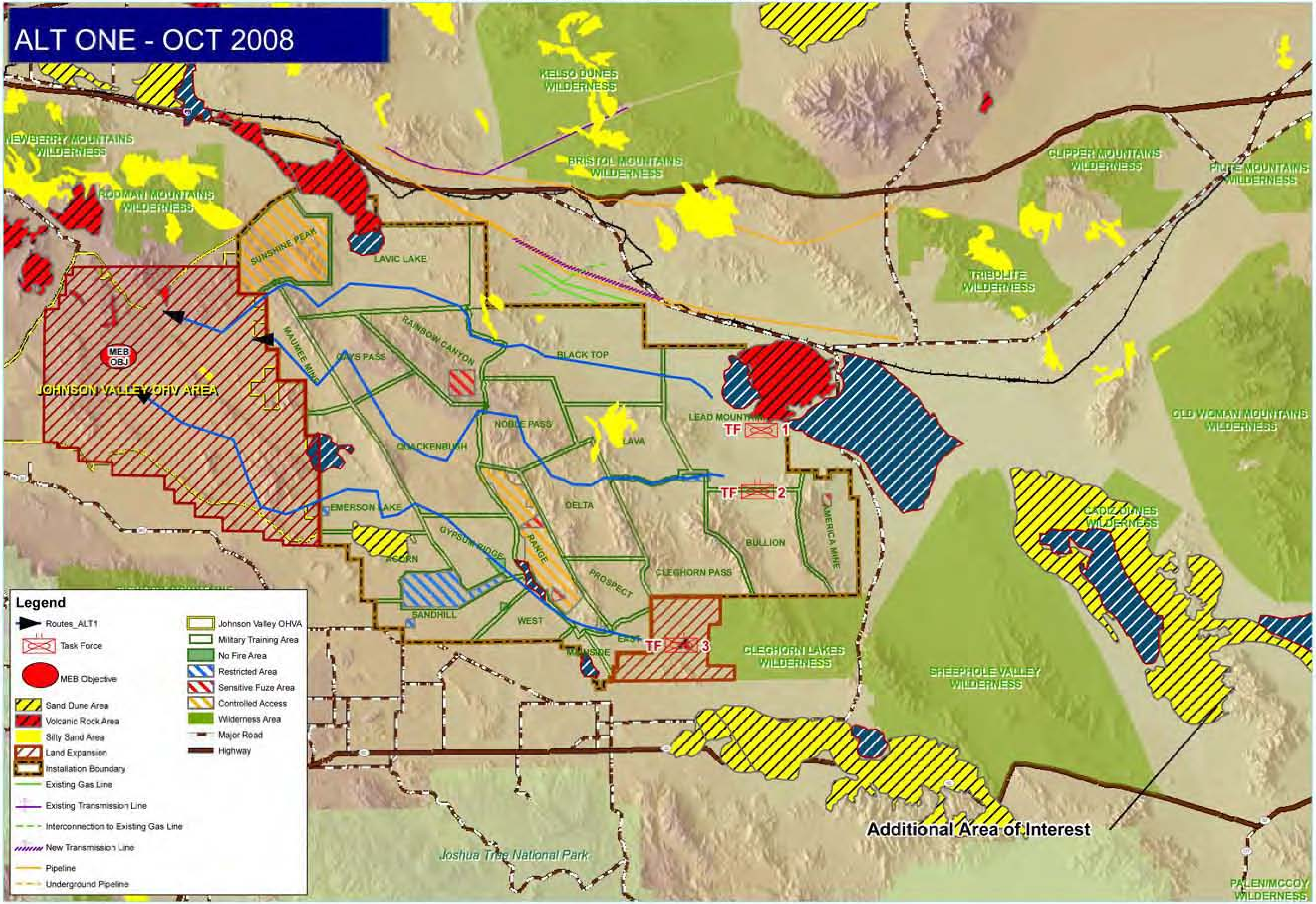
for Roxie C. Trost
Field Manager

Enclosures:
Appendix A, B, C and D
Third Party List

This summary filed in Withdrawal Case file: CACA50194, 29 January, 2009.
This summary and all information in appendix forwarded to Military for inclusion in administrative record for EIS on 29 January, 2009 along with copy of transmittal letter.

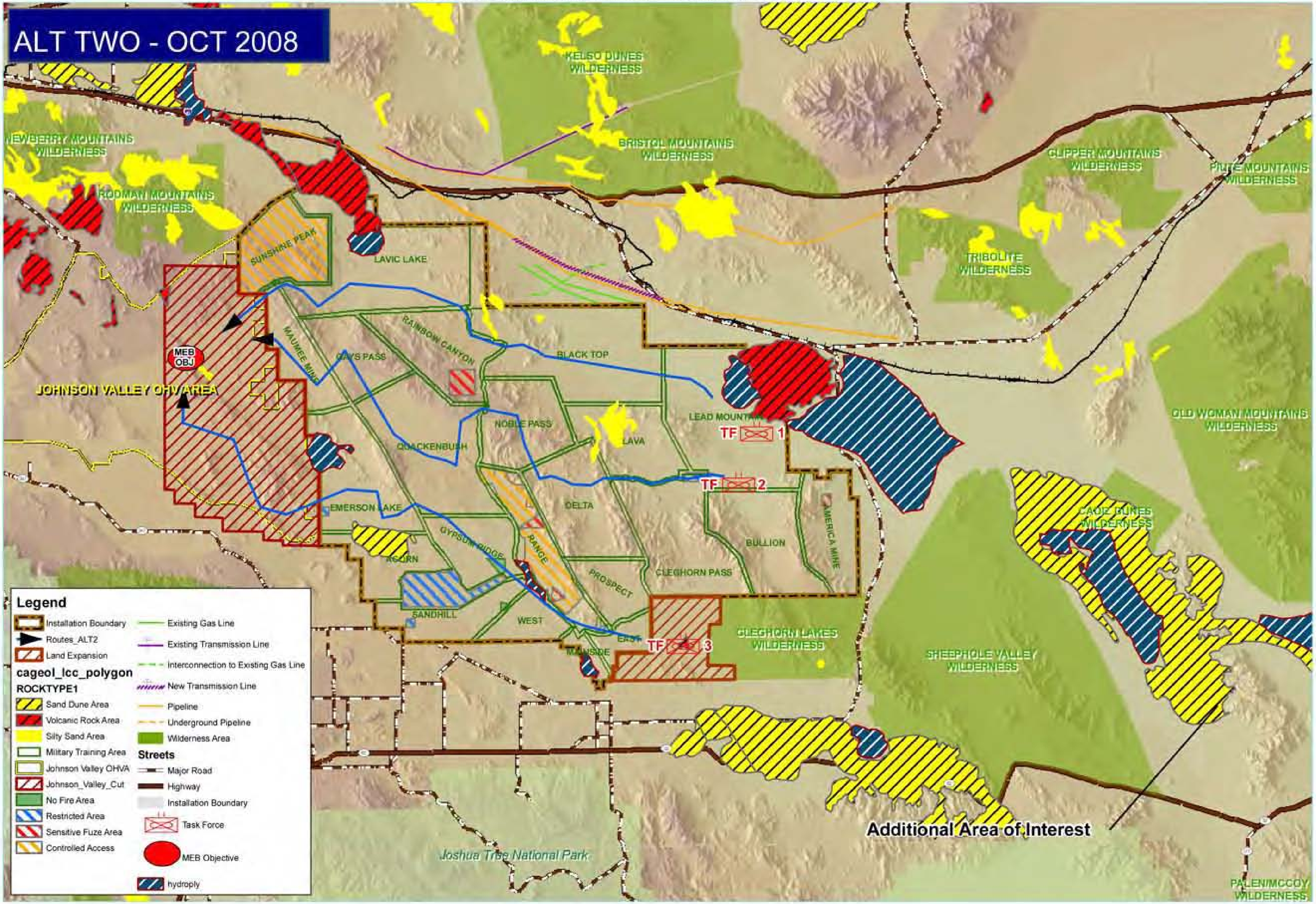
SAN BERNADINO COUNTY

PROPOSED MCAGCC LAND EXPANSION



SAN BERNADINO COUNTY

PROPOSED MCAGCC LAND EXPANSION

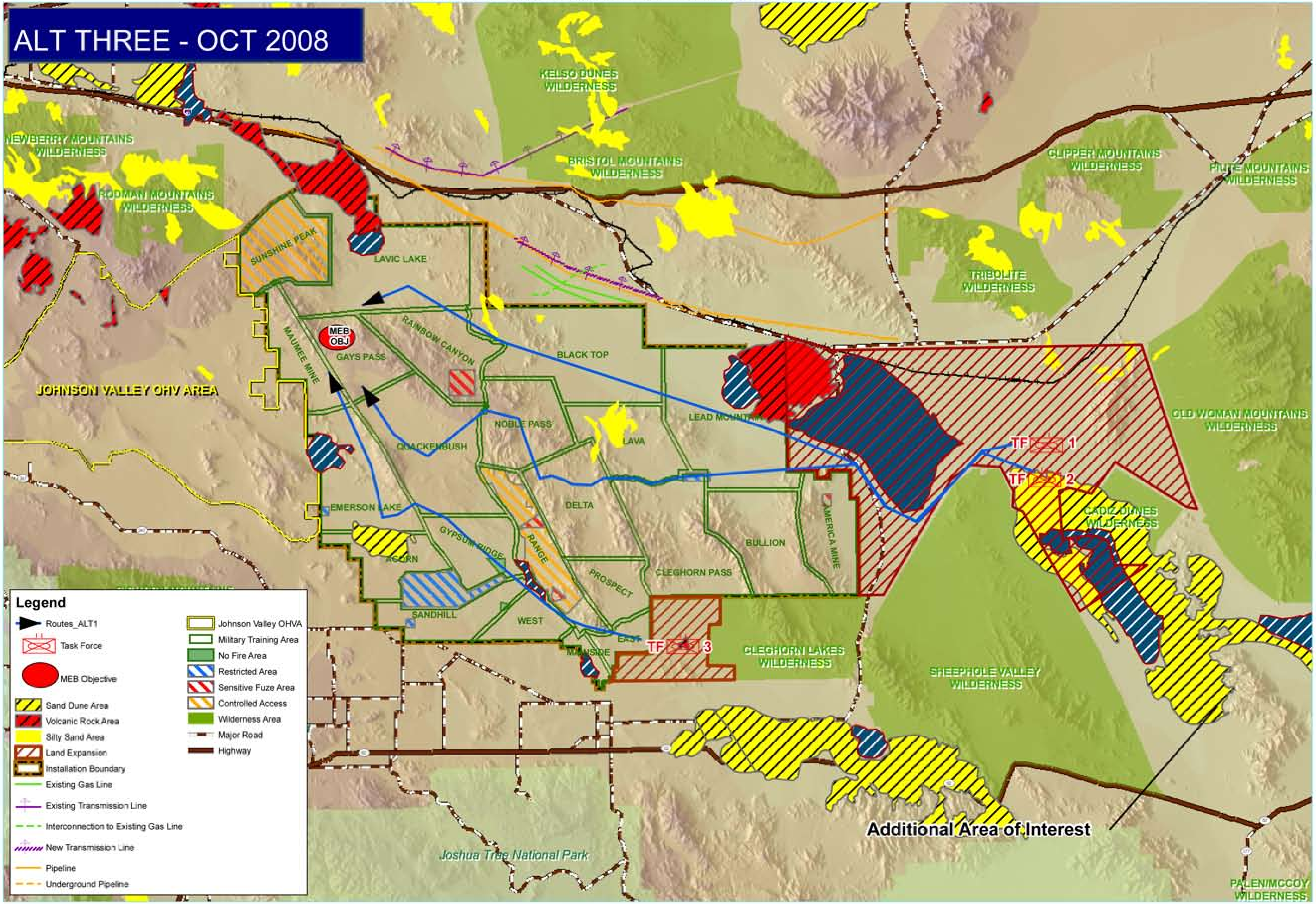


MARINE CORPS AIR GROUND COMBAT CENTER, TWENTYNINE PALMS, CALIFORNIA

FOR OFFICIAL USE ONLY (FOUO)
LIMITED DISTRIBUTION - UNCLASSIFIED

SAN BERNADINO COUNTY

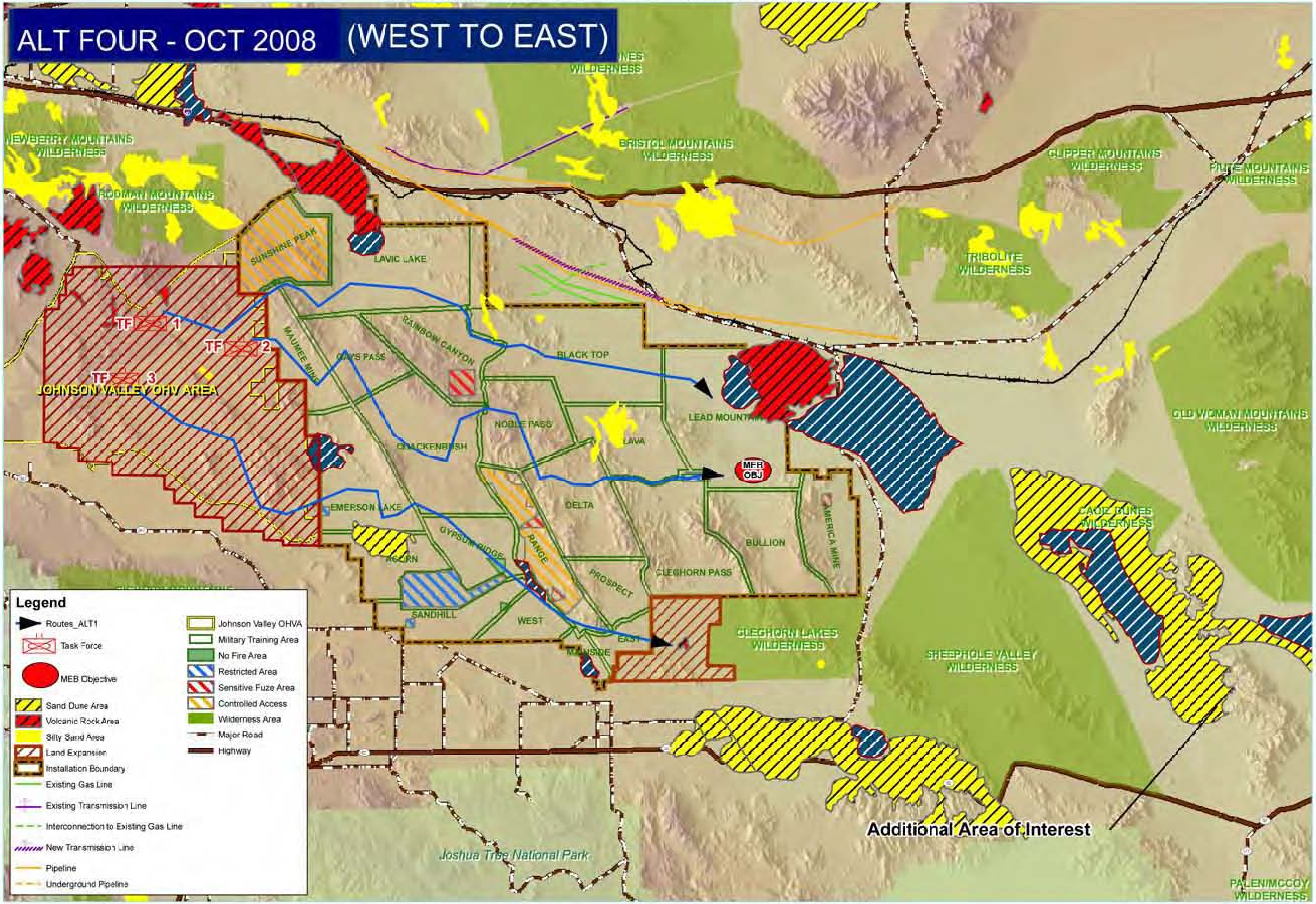
PROPOSED MCAGCC LAND EXPANSION



MARINE CORPS AIR GROUND COMBAT CENTER, TWENTYNINE PALMS, CALIFORNIA

SAN BERNADINO COUNTY

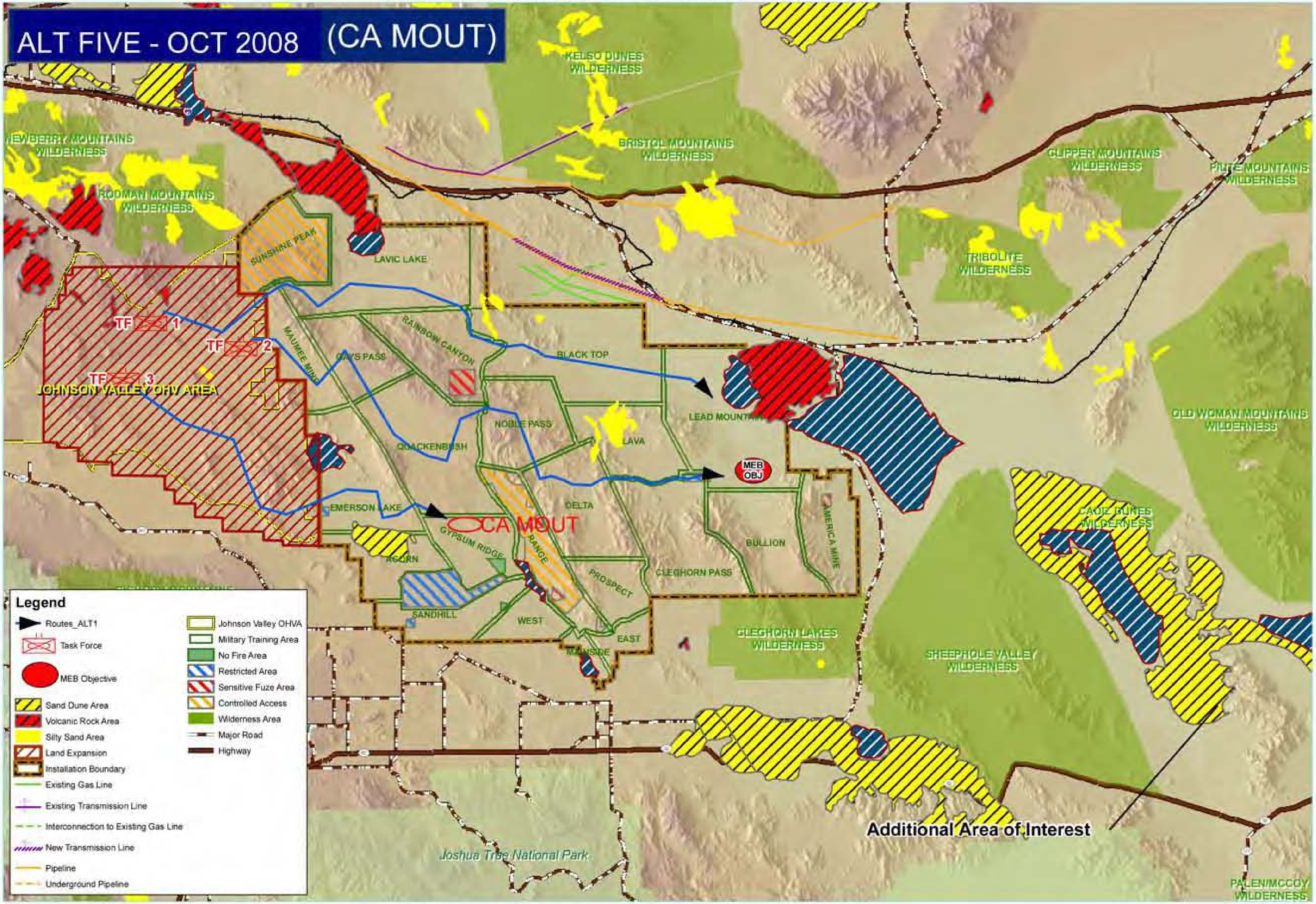
PROPOSED MCAGCC LAND EXPANSION



MARINE CORPS AIR GROUND COMBAT CENTER, TWENTYNINE PALMS, CALIFORNIA

SAN BERNADINO COUNTY

PROPOSED MCAGCC LAND EXPANSION

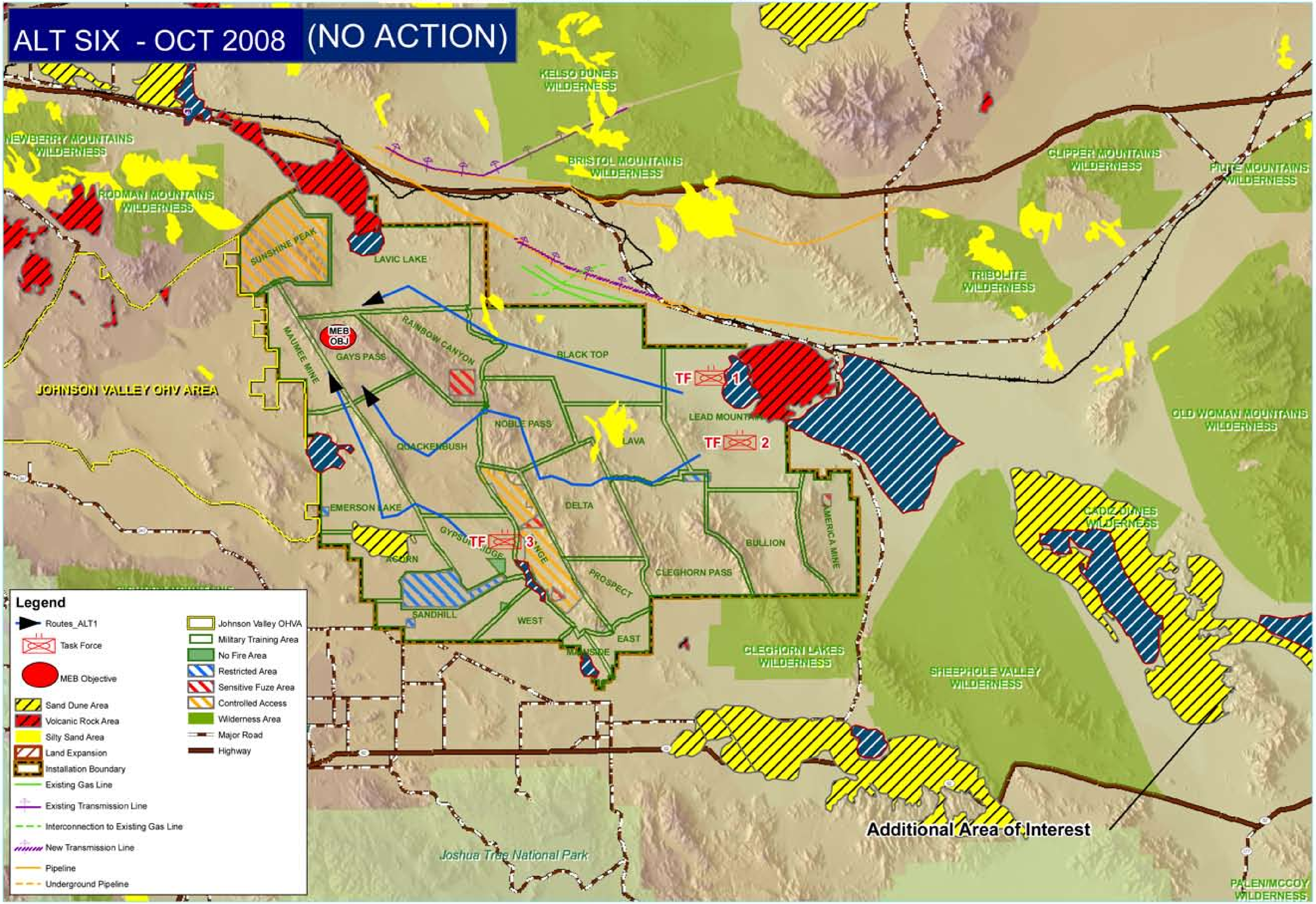


MARINE CORPS AIR GROUND COMBAT CENTER, TWENTYNINE PALMS, CALIFORNIA

FOR OFFICIAL USE ONLY (FOUO)
LIMITED DISTRIBUTION - UNCLASSIFIED

SAN BERNADINO COUNTY

PROPOSED MCAGCC LAND EXPANSION

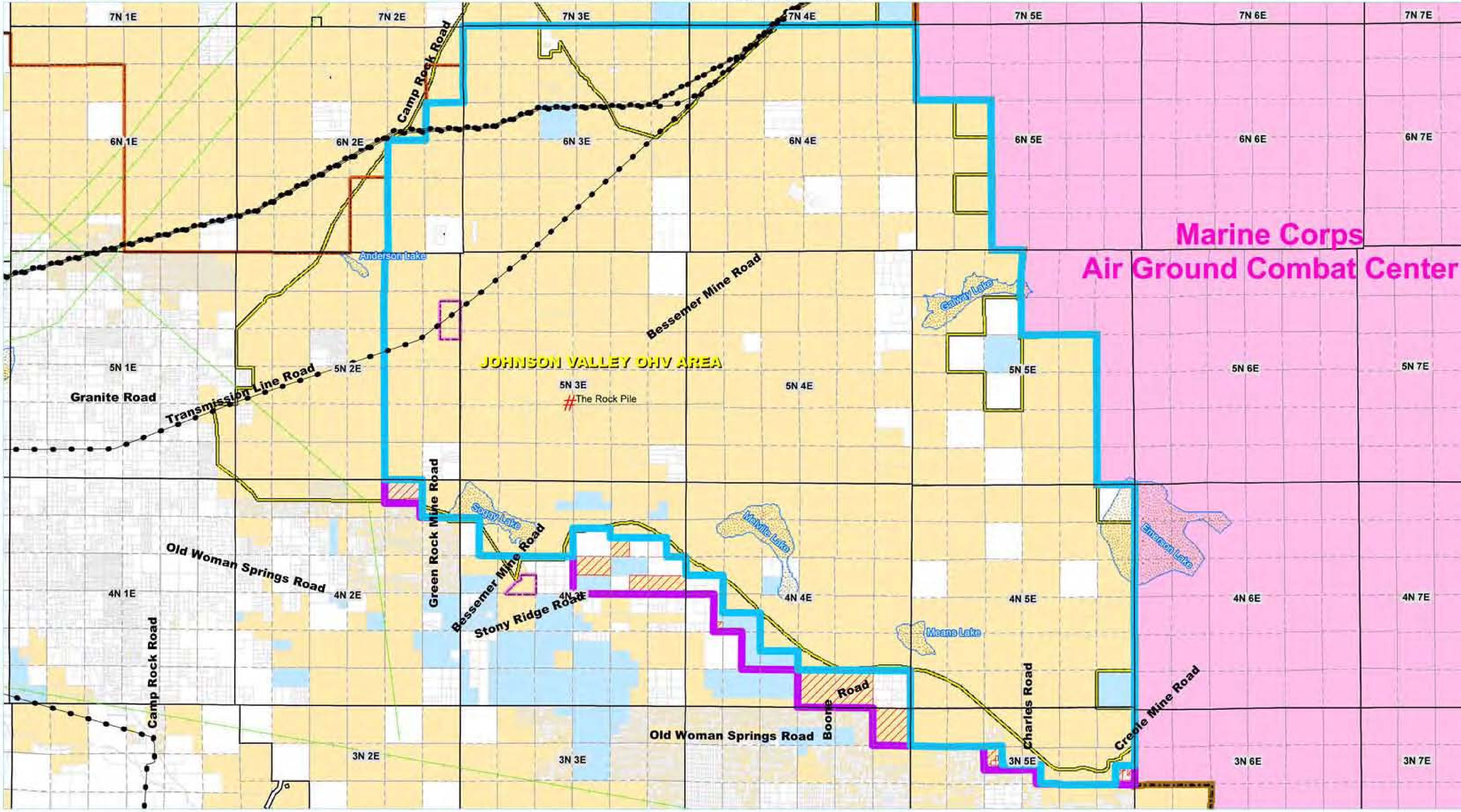


MARINE CORPS AIR GROUND COMBAT CENTER, TWENTYNINE PALMS, CALIFORNIA

APPROVED FOR PUBLIC RELEASE
MAGTFC / MCAGCC Public Affairs Office

Handout -- West Study Area Comparison

UNCLASSIFIED



For Further Information
Please Contact:
Training Land/Airspace Study Office
http://www.29palms.usmc.mil/las/
760-830-3764
SMBPLMSWEBPAO@usmc.mil
MAGTFC, MCAGCC
Bldg. 1554, Box 788106
Twentynine Palms, CA 92278-8106

Ownership derived from
San Bernardino County
Tax Parcel Information, 2006

LEGEND

- West Study Area (Revised)
- West Study Area (Original)
- Returned Public Lands
- Military Reservation Boundary (NGA)
- Desert Tortoise Critical Habitat Area (BLM)
- Area of Critical Environmental Concern (BLM)
- Johnson Valley OHVA (BLM)
- Township/Range Sections (San Bernardino County)
- Private/Unclassified Lands
- State Lands
- Federal Lands
- Local Road (ESRI)
- Major Road (ESRI)
- Existing Power Lines (GeoFiWest)
- LADWP Greenpath (GeoFiWest)

SCALE 1:150,000

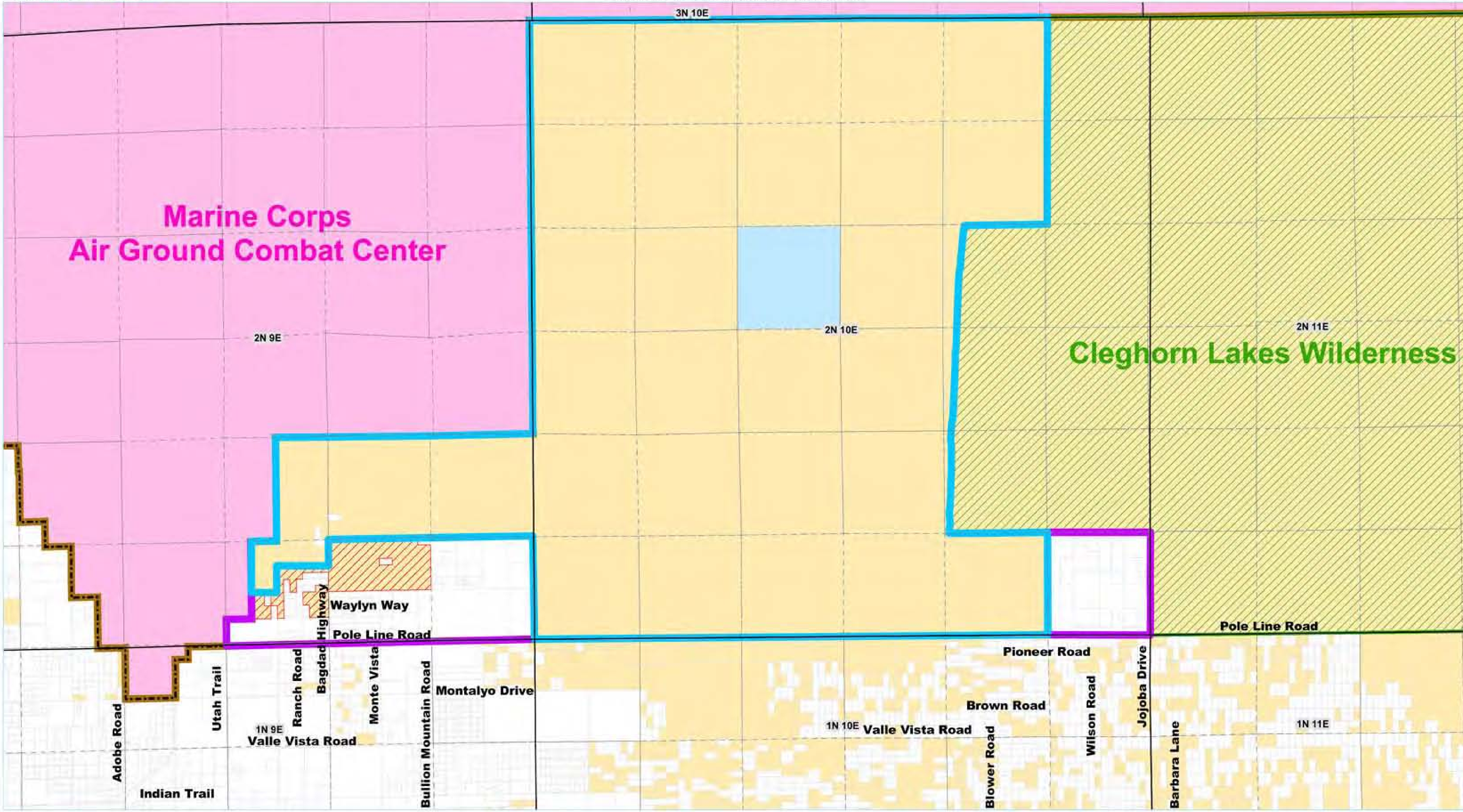
0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

Projection:
WGS 1984 UTM Zone 11N

Although every effort has been made to ensure the accuracy of the information, errors and conditions originating from physical sources to develop the database may be reflected in the data supplied. The user must be aware of data conditions and ultimately bear responsibility for the appropriate use of the information with respect to possible errors, original map scale, collection methodology, currency of the data, and other conditions specific to certain data. This information does not depict all possible resources. Field verification of all data is required for site-specific projects. This information is deemed reliable but not guaranteed.

MARINE CORPS AIR GROUND COMBAT CENTER, TWENTYNINE PALMS, CALIFORNIA



For Further Information
Please Contact:
Training Land/Airspace Study Office
http://www.29palms.usmc.mil/las/
760-830-3764
SMBPLMSWEBPAO@usmc.mil
MAGTFC, MCAGCC
Bldg. 1554, Box 788106
Twentynine Palms, CA 92278-8106

Ownership derived from
San Bernardino County
Tax Parcel Information, 2006

LEGEND

- South Study Area (Revised)
- South Study Area (Original)
- Military Reservation Boundary (NGA)
- Wilderness Area (BLM)
- Township/Range Sections (San Bernardino County)
- Private/Unclassified Lands
- State Lands
- Federal Lands
- Returned Public Lands

SCALE 1:55,000

0 0.25 0.5 1 1.5 2 Miles

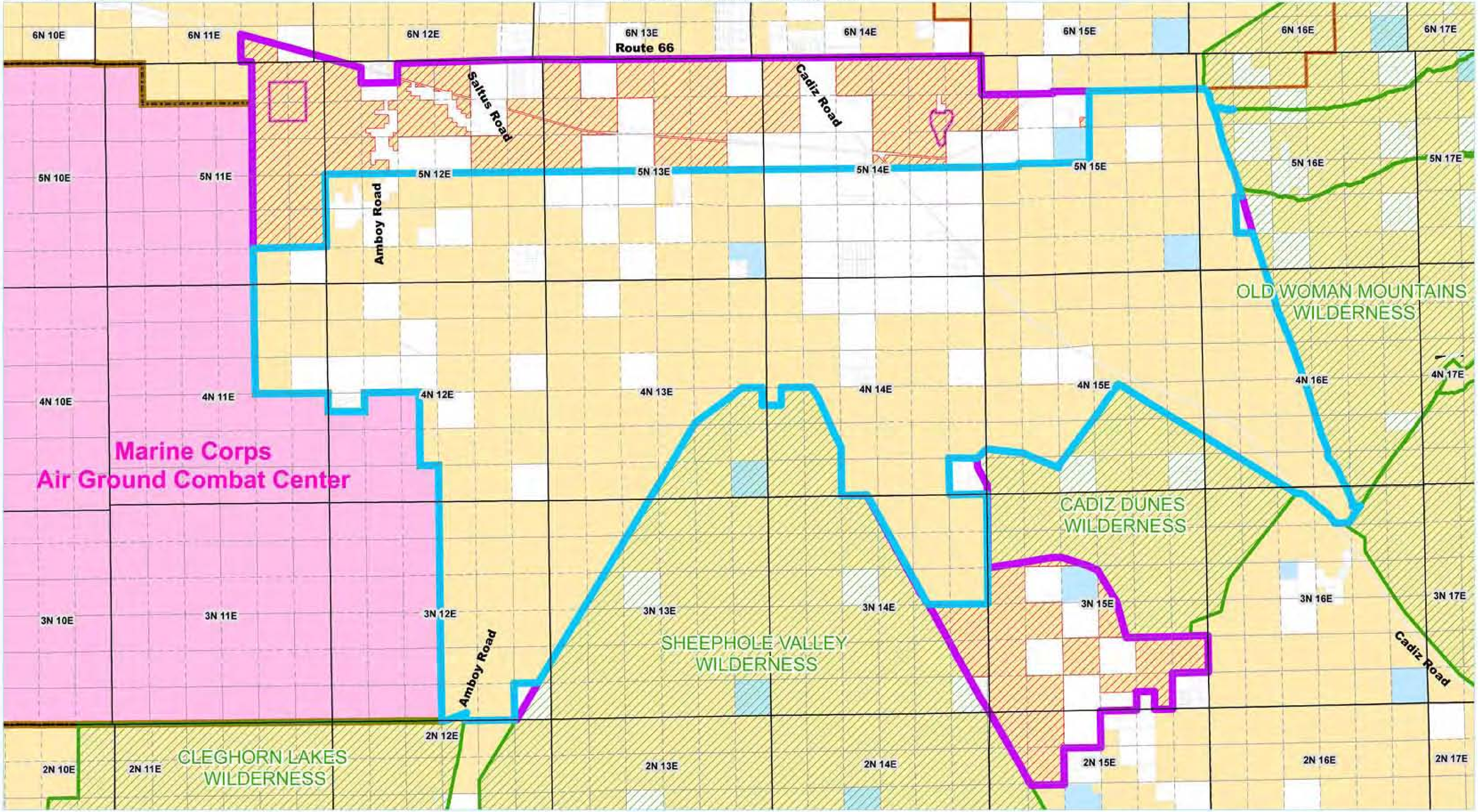
0 0.375 0.75 1.5 2.25 3 Kilometers

Projection:
WGS 1984 UTM Zone 11N

Although every effort has been made to ensure the accuracy of the information, errors and conditions originating from physical sources to develop the database may be reflected in the data supplied. The user must be aware of data conditions and ultimately bear responsibility for the appropriate use of the information with respect to possible errors, original map scale, collection methodology, currency of the data, and other conditions specific to certain data. This information does not depict all possible resources. Field verification of all data is required for site-specific projects. This information is deemed reliable, but not guaranteed.

Handout – East Study Area Comparison

UNCLASSIFIED



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Twentynine Palms, CA 92278-8106

Ownership derived from
San Bernardino County
Tax Parcel Information, 2006

LEGEND

- East Study Area (Revised)
- East Study Area (Original)
- Returned Public Lands
- Military Reservation Boundary (NGA)
- Wilderness Area (BLM)
- Desert Tortoise Critical Habitat Area (BLM)
- Area of Critical Environmental Concern (BLM)
- Township/Range Sections (San Bernardino County)
- Private/Unclassified Lands
- State Lands
- Federal Lands
- Local Road (ESRI)
- Major Road (ESRI)

SCALE 1:155,000

0 0.45 0.9 1.8 2.7 3.6 Miles

0 1 2 4 6 8 Kilometers

Projection:
WGS 1984 UTM Zone 11N

Although every effort has been made to ensure the accuracy of the information, errors and conditions originating from physical sources to develop the database may be reflected in the data supplied. The user must be aware of data conditions and ultimately bear responsibility for the appropriate use of the information with respect to possible errors, original map scale, collection methodology, currency of the data, and other conditions specific to certain data. This information does not depict all possible resources. Field verification of all data is required for site-specific projects. This information is deemed reliable, but not guaranteed

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09-250_East_SA_Tax_Parcel_Comparison_Handout_Revised_1to160K_11x17_20090609-TJW

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APPENDIX D
AIRSPACE MANAGEMENT

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This Airspace Management Appendix (1) describes the National Airspace System classifications and defines common aeronautical terms associated with airspace use; (2) provides a comparison of the current and proposed airspace configurations; (3) describes the representative baseline use of the Combat Center region Special Use Airspace (SUA); and (4) describes the projected SUA use under the proposed action and alternatives. The appendix data provides the basis for summary information provided in the Airspace Management sections, such as Sections 3.6 and 4.6.

D.1 National Airspace System Description

Navigable airspace over the U.S. is categorized as either controlled or uncontrolled. Controlled airspace is that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements outlined in the Federal Aviation Administration's (FAA's) "General Operating and Flight Rules" (14 Code of Federal Regulations [CFR] Part 91). By contrast, uncontrolled airspace is outside the parameters of controlled airspace where aircraft are not subject to those operating and flight rules.

Controlled airspace is defined in FAA Order 7400.2 as being "airspace of defined dimensions within which Air Traffic Control (ATC) service is provided to Instrument Flight Rules (IFR) flights and to Visual Flight Rules (VFR) flights in accordance with the airspace classification." For IFR operations in controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance.

Controlled airspace is designated as Class A, B, C, D, and E, while uncontrolled airspace is designated as Class G, as described below.

Class A airspace, generally, is that airspace from 18,000 feet above mean sea level (MSL) up to and including 60,000 feet or Flight Level (FL) 600. Flight levels are altitudes MSL based on the use of a directed barometric altimeter setting, and are expressed in hundreds-of-feet. Therefore, FL600 is equal to approximately 60,000 feet MSL. Class A airspace includes the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous States and Alaska (U.S. Department of Transportation FAA 2008).

Class B airspace, generally, is that airspace from the surface to 10,000 feet MSL around the nation's busiest airports. The primary purpose of this class is to reduce the potential for midair collisions in the airspace surrounding those airports with high density air traffic operations. The actual configuration of Class B airspace is individually tailored but essentially resembles an inverted wedding cake consisting of a surface area and two or more layers, and is designed to contain all published instrument procedures for the runway environment (U.S. Department of Transportation FAA 2008).

Class C airspace, generally, is that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area with a 5 NM radius, and an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation (U.S. Department of Transportation FAA 2008). The primary purpose of Class C airspace is to improve aviation safety by reducing the risk of midair collisions in the terminal area and enhancing the management of air traffic operations therein.

Class D airspace, generally, is that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be designated as Class D or Class E airspace (U.S. Department of Transportation FAA 2008).

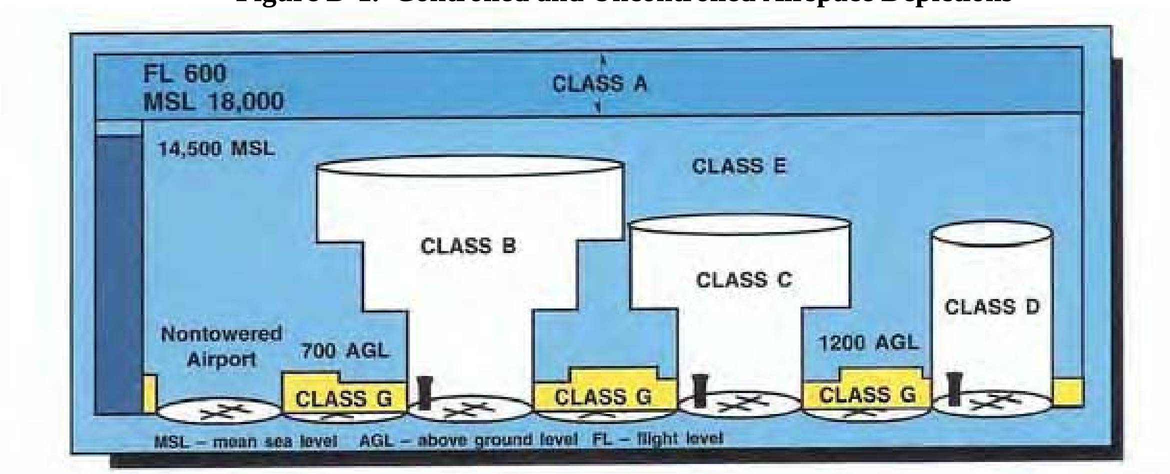
Class E airspace consists of the following seven types of airspace that are not considered to be A, B, C, or D classes as defined above.

- **Surface Area Designated for an Airport.** When so designated, the airspace will be configured to contain all instrument procedures.
- **Extension to a Surface Area.** These airspace areas serve as extensions to Class B, C, and D surface areas designated for an airport. This airspace provides controlled airspace to contain standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR.
- **Airspace Used for Transition.** These areas begin at either 700 or 1,200 feet above ground level (AGL) for use in transitioning aircraft to/from the terminal or enroute environment.
- **En Route Domestic Airspace Areas.** These areas extend upward from a specified altitude to provide controlled airspace where there is a requirement for IFR enroute ATC services, but where the Federal airway system is inadequate.
- **Federal Airways.** Federal Airways (Victor Routes) are Class E airspace areas, and, unless otherwise specified, extend upward from 1,200 feet to, but not including, 18,000 feet MSL.
- **Other.** Unless designated at a lower altitude, Class E airspace begins at 14,500 feet MSL up to, but not including, 18,000 feet MSL overlying: a) the 48 contiguous States, including the waters within 12 miles from the coast of the 48 contiguous States; b) the District of Columbia; c) Alaska, including the waters within 12 miles from the coast of Alaska, and that airspace above FL600; d) excluding the Alaska peninsula west of 160^{o}00'00" west longitude, and the airspace below 1,500 feet above the surface of the earth unless specifically so designated.
- **Offshore/Control Airspace Areas.** This includes airspace areas beyond 12 NM from the coast of the U.S., wherein ATC services are provided (U.S. Department of Transportation FAA 2008).

Class G is airspace that has not been designated as Class A, B, C, D, or E airspace. This is considered uncontrolled airspace in which ATC does not have authority over aircraft operations. This airspace follows the contours of the earth's surface with vertical altitude limits up to 700 feet AGL, 1,200 feet AGL, or 14,500 feet MSL, as applicable. VFR general aviation pilots are the primary users of this airspace (U.S. Department of Transportation 2008).

Figure D-1 provides graphic representation of the different airspace classifications.

Figure D-1. Controlled and Uncontrolled Airspace Depictions



Airspace and Aeronautical Terms

Special Use Airspace (SUA) is airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed on aircraft operations that are not part of those activities. Types of SUA include Alert Areas, Controlled Firing Areas, Military Operations Areas (MOAs), Prohibited Areas, Restricted Areas, and Warning Areas.

Military Operations Area (MOA) is airspace of defined vertical and lateral limits established outside Class A airspace to separate and segregate certain non-hazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted (Pilot/Controller Glossary 2008). Class A airspace covers the continental U.S. and limited parts of Alaska, including the airspace overlying the water within 12 NM of the U.S. coast. It extends from 18,000 feet MSL up to, and including, 60,000 feet MSL (Pilot/Controller Glossary 2008). MOAs are considered "joint use" airspace. Non-participating aircraft operating under VFR are permitted to enter a MOA, even when the MOA is active for military use. Aircraft operating under IFR must remain clear of an active MOA unless approved by the responsible Air Route Traffic Control Center (ARTCC). Flight by both participating and VFR non-participating aircraft is conducted under the "see-and-avoid" concept, which stipulates that "when weather conditions permit, pilots operating IFR or VFR are required to observe and maneuver to avoid other aircraft. Right-of-way rules are contained in CFR Part 91" (Pilot/Controller Glossary 2008). The responsible ARTCC provides separation service for aircraft operating under IFR and MOA participants. The "see-and-avoid" procedures mean that if a MOA were active during inclement weather, the general aviation pilot could not safely access the MOA airspace.

Air Traffic Control Assigned Airspace (ATCAA) is airspace of defined vertical and lateral limits, assigned by ATC, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic (Pilot/Controller Glossary 2008). This airspace, if not required for other purposes, may be made available for military use. ATCAAs are frequently structured and used to extend the horizontal and/or vertical boundaries of MOAs.

Restricted Area is designated airspace that supports ground or flight activities that could be hazardous to non-participating aircraft. A Restricted Area is airspace designated under 14 CFR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated "joint-use" and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency (Pilot/Controller Glossary 2008).

Military Training Routes (MTRs) are flight corridors developed and used by the Department of Defense (DoD) to practice high-speed, low-altitude flight, generally below 10,000 feet MSL. Specifically, MTRs are airspace of defined vertical and lateral dimensions established for the conduct of military flight training at airspeeds in excess of 250 knots indicated airspeed (Pilot/Controller Glossary 2008). MTRs are developed in accordance with criteria specified in FAA Order 7610.4. They are described by a centerline (often with defined horizontal limits on either side of the centerline) and vertical limits expressed as minimum and maximum altitudes along the flight track. MTRs are identified as Visual Routes (VR) or Instrument Routes (IR).

Air Refueling Routes (ARs) are high-altitude flight paths within which air refueling operations are conducted. Air refueling operations are assigned specific flight paths and altitudes where potential conflicts with nonparticipating aircraft are very unlikely. ARs are not shown on civilian aeronautical charts.

Airspace for Special Use (ASU) is used to collectively identify airspace that is not classified as SUA but is of defined dimensions wherein activities must be confined because of their nature, and/or wherein limitations may be imposed on aircraft operations that are not a part of those activities. ASU includes MTRs, ATCAAs, aerial refueling track/anchors (AR), slow routes (SR), and low-altitude tactical navigation areas (LATNs).

Flight Level (FL). Manner in which altitudes at 18,000 feet MSL and above are expressed, as measured by a standard altimeter setting of 29.92 inches of mercury.

References for Airspace System Definitions

Pilot/Controller Glossary. 2008. Federal Aviation Administration Pilot/Controller Glossary, February 14, 2008.

U.S. Department of Transportation, Federal Aviation Administration (FAA). 2008. Aeronautical Information Manual, February 14, 2008.

U.S. Department of Transportation, Federal Aviation Administration (FAA). 2008. FAA Order 7400.2G, Procedures For Handling Airspace Matters. April 10, 2008.

U.S. Department of Transportation, Federal Aviation Administration (FAA). 2009. FAAH-8083-25, Pilot's Handbook of Aeronautical Knowledge.

U.S. Department of Transportation, Federal Aviation Administration (FAA). 2009. Order JO 7400.8R, Special Use Airspace, February 5, 2009.

D.2 Current and Proposed Special Use Airspace Configuration Descriptions

Table D.2-1 notes the published times of use and controlling agency for the existing SUA. Table D.2-2 describes the existing Combat Center SUA, as published in *FAA Order JO 7400.8R, Special Use Airspace*, and, for comparison, the SUA additions and modifications proposed in Chapter 2 to support MEB Exercise operations under each alternative.

Table D.2-1. Special Use Airspace Times of Use and Controlling Agency

Airspace	Designated Times of Use	Controlling or Scheduling Agency
R-2501	Continuous	Los Angeles ARTCC
Sundance MOA	Intermittent by NOTAM	Los Angeles ARTCC
Bristol MOA	0700-1500 Mon-Fri; other times by NOTAM	Los Angeles ARTCC
Turtle MOA	0600-1600 Mon-Fri; other times by NOTAM	Los Angeles ARTCC

Notes: ARTCC = Air Route Traffic Control Center; MOA = Military Operations Area; NOTAM = Notice to Airmen

Table D.2-2. Existing and Proposed Alternative Special Use Airspace Configurations

<table>
<tr><th>Airspace</th><th>Existing</th><th>Alternative 1 Proposed</th><th>Alternative 2 Proposed</th><th>Alternative 3 Proposed</th><th>Alternatives 4, 5, and 6 Proposed</th></tr>
<tr><td>**R-2501 N/S/E/W**</td><td>• Surface to unlimited</td><td>No Change</td><td>No Change</td><td>No Change</td><td>No Change</td></tr>
<tr><td>**Proposed Restricted Area R-XXXX**</td><td>Non-existent</td><td>• West of R-2501
• Surface (over controlled lands) to FL400</td><td>• Lateral boundaries reduced from Alternative 1
• Surface to FL400</td><td>Not proposed</td><td rowspan="4">Identical to Alternative 1</td></tr>
<tr><td>**Proposed Johnson Valley MOA/ATCAA**</td><td>Non-existent</td><td>• South of proposed Restricted Area
• 1,500 feet AGL up to, but not including, FL180
• Establish ATCAA from FL180 to FL400</td><td>• Lateral boundaries reduced from Alternative 1
• MOA 1,500 feet AGL up to, but not including, FL180
• Establish ATCAA from FL180 to FL400</td><td>Not proposed</td></tr>
<tr><td>**Sundance MOA**</td><td>• 500 feet AGL up to, and including, 10,000 feet MSL
• No overlying ATCAA
• Excludes 1 mile radius of Airpark surface to 1,500 feet AGL and 1 mile corridor from airport center south to MOA edge.</td><td>• Extend existing lateral boundaries
• Raise floor to 1,500 feet AGL
• Raise ceiling up to, but not including, FL180
• Establish ATCAA from FL180 to FL270</td><td>Same as Alternative 1</td><td>Same as Alternative 1</td></tr>
<tr><td>**Bristol MOA/ATCAA**</td><td>• 5,000 feet MSL up to, but not including, FL180
• ATCAA from FL180 to FL220</td><td>• 1,500 feet AGL up to, but not including, FL180
• Raise ATCAA ceiling from FL220 to FL400</td><td>Same as Alternative 1</td><td>• Reclassify MOA/ ATCAA as Restricted Area
• 5,000 feet MSL to FL400</td></tr>
</table>

Table D.2-2. Existing and Proposed Alternative Special Use Airspace Configurations

Airspace	Existing	Alternative 1 Proposed	Alternative 2 Proposed	Alternative 3 Proposed	Alternatives 4, 5, and 6 Proposed
Proposed CAX MOA/ATCAA	• Not designated – occasional use between FL190 and FL220 per LOA with FAA	• Establish MOA from 1,500 feet AGL up to, but not including, FL 180 • Establish ATCAA from FL180 to FL400	Same as Alternative 1	• Establish as Restricted Area • 5,000 feet MSL to FL400	Identical to Alternative 1
Turtle MOA/ATCAA	• MOA 11,000 feet MSL up to, but not including, FL180 • ATCAA from FL180 to FL220	• Lower floor to 1,500 feet AGL up to, but not including, FL 180 • Raise ATCAA from FL220 to FL400	Same as Alternative 1	Same as Alternative 1	

Notes: CAX = Combined Arms Exercise; MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; FL = Flight Level; AGL = above ground level; MSL = mean sea level; LOA = Letter of Agreement

D.3 Representative Baseline Airspace Use

This section describes the representative baseline use of the existing Combat Center Expeditionary Airfield (EAF) and the Center SUA, to include the Turtle MOA/ATCAA. This baseline reflects the representative annual number of aircraft operations typically conducted by the different aircraft types at the EAF and within R-2501, and the Bristol MOA/ATCAA, Sundance MOA, and Turtle MOA/ATCAA.

The EAF operations consist of the takeoffs and landings, touch and go landings, and low approaches that are typically conducted in an airfield environment, to include Camp Wilson and Drop Zone (DZ) Sandhill, whereas each are counted as two operations. These operations are shown in Table D.3-1.

Table D.3-1. Representative Annual Baseline Airfield Operations

Aircraft	EAF[1]			Camp Wilson			Drop Zone Sandhill			Total			
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Total
FA-18A/C	10	6	10	0	0	0	0	0	0	10	6	0	16
F-18E/F	10	6	0	0	0	0	0	0	0	10	6	0	16
AV-8B	23	12	0	0	0	0	0	0	0	23	12	0	35
UC-35	21	22	0	0	0	0	0	0	0	21	22	0	43
C-20	21	22	0	0	0	0	0	0	0	21	22	0	43
C-17	6	6	0	0	0	0	0	0	0	6	6	0	12
C-12	167	171	3	0	0	0	0	0	0	167	171	3	341
UAV	0	0	0	0	0	0	88	132	0	88	132	0	220
E-2/C-2	10	0	0	0	0	0	0	0	0	10	0	0	10
C-130	5	5	0	0	0	0	0	0	0	5	5	0	10
CH-53E	211	217	4	10	7	0	8	12	0	229	236	4	469
MV-22B	991	597	152	0	0	0	54	34	11	1045	631	163	1839
AH-1	190	198	4	0	0	0	0	0	0	190	198	4	392
UH-1	190	198	4	0	0	0	0	0	0	190	198	4	392
SAR	128	131	3	0	0	0	0	0	0	128	131	3	262
H-60	22	22	0	0	0	0	0	0	0	22	22	0	44
Total	2005	1613	180	10	7	0	150	178	11	2165	1798	181	4144

Notes: [1]Includes aircraft arrival, departure, and touch and go operations. Eve = Evening.
Source: U.S. Department of the Navy (DoN) 2009 with MV-22 operations prorated.

SUA operations are expressed in terms of a sortie operation which is a one flight training mission conducted by a single aircraft from takeoff to landing. In quantifying airspace use, each sortie operation is normally accounted for in each SUA area in which it operates during the course of that single sortie mission. This baseline serves as a benchmark for comparison with the projected operations and assessing any potential impacts that may result from the proposed alternatives.

Tables D.3-2 and D.3-3 reflect the annual cumulative sorties by aircraft type for the R-2501 North, South, East, and West subsections; the Bristol MOA/ATCAA; and Sundance MOA. Baseline sortie data is not available for the Turtle MOA/ATCAA. More specific details on aircraft performance for current and projected sortie operations are provided in Appendix H, Noise Modeling.

Table D.3-2. Representative Annual Baseline Aircraft Sortie-Operations for R-2501 N/S/E/W

Aircraft Type	R-2501 N				R-2501S				R-2501 E				R-2501 W			
	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
F/A-18 C/D	1,075	18	-	1093	1,371	23	-	1,394	1,062	17	-	1,079	1,016	17	-	1,033
F-5E	36	-	-	36	44	-	-	44	35	-	-	35	3	-	-	3
KC-130	340	18	-	358	433	23	-	456	335	17	-	352	322	17	-	339
AV-8B	645	250	-	895	821	319	-	1,140	636	247	-	883	611	237	-	848
AH-1	876	214	54	1,144	1,119	275	69	1,463	867	212	53	1,132	829	203	51	1,083
UH-1	359	-	-	359	458	-	-	458	354	-	-	354	339	-	-	339
CH-53E	537	18	-	555	684	23	-	707	530	17	-	547	508	17	-	525
MV-22 [1]	22	12	4	38	4	1		5	30	11		41	48	23	4	75
UAS	161	18	107	286	206	23	137	366	159	17	105	282	152	17	101	270
Total	4,066	575	187	4,790	5,142	688	206	6,036	4,028	546	159	4,733	3,891	547	158	4,596

Note: [1] MV-22 sorties are flown on perimeter routes to landing and assault zones located within the SUA and do not typically include other mission activities. Eve = Evening
Source: DoN2009.

Table D.3-3. Representative Annual Baseline Sortie-Operations for the Sundance, Bristol, and Turtle MOAs

Aircraft Type	Sundance MOA				Bristol MOA/ATCAA				Total R-2501 and MOA Sortie				Turtle MOA/ATCAA No data available – see text			
	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
F/A-18 C/D	100	2	-	102	232	5	-	237	4,856	82	-	4938				
F-5E	3	-	-	3	7	-	-	7	158	-	-	158				
KC-130	32	2	-	34	75	5	-	80	1,537	82	-	1,619				
AV-8B	60	23	-	83	140	54	-	194	2,913	1,130	-	4,043				
AH-1	83	20	5	108	192	47	12	251	3,966	971	244	5,181				
UH-1	34	-	-	34	79	-	-	79	1,623	-	-	1,623				
CH-53E	50	2	-	52	116	5	0	121	2,425	82	-	2,507				
MV-22[1]	6	1		7	6	1		7	4	1		5				
UAS	15	2	10	27	35	5	23	63	728	82	484	1,294				
Total	387	53	15	455	888	123	35	1,044	18,412	2,518	740	21,670				

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; Eve = Evening
Source: DoN 2009.

D.4 Projected Special Use Airspace Use

Projected annual use of the Combat Center airspace is based on the estimated number of sorties that would be conducted by the different participating aircraft types for Marine Expeditionary Brigade (MEB) and Enhanced Mojave Viper (EMV) Exercises and tenant/transient activities. These projections are based on a Marine Air Ground Task Force (MAGTF) G3 analysis of the flight training requirements for each of these mission activities over a typical 12-month period. Aircraft flight profiles and sortie operations within each SUA area would vary somewhat based on the land acquisitions and ground-based activities proposed under each alternative.

Aircraft types shown in the projected data differ somewhat from the baseline due to newer generation aircraft that will be fully operational within the timeframe of the proposed MEB Exercise operations. For example, it was estimated that the F-35 will represent approximately 10 percent of F-18 sorties and 25 percent of AV-8 sorties. The MAGTF G3 data was adjusted accordingly to account for F-35 sorties.

Table D.4-1 provides a summary of the estimated total sorties that would be conducted by participating aircraft during the single and annual MEB Exercise events. Also included are EMV and tenant/transient operations that typically would be conducted in the Combat Center airspace throughout the year when an MEB Exercise is not scheduled. These sortie estimates would be generally the same for all airspace configurations proposed under the different alternatives.

Table D.4-1. Estimated Annual Sorties for all Combat Center Exercise and Training Activities

Aircraft Type	MEB Exercise		EMV Exercise		Tenant/Transient and Other Military Training	Cumulative Annual Total
	Single Exercise	Total Twice Annual	Single Exercise	Total Eight Annual		
AV-8B	150	300	90	720	603	1,623
FA-18	242	484	150	1,200	996	2,680
F-35	76	152	46	368	308	828
Joint FW	2	4	16	128	0	132
AH/UH-1	546	1,092	336	2,688	2,236	6,016
CH-53	116	232	114	912	677	1,821
MV-22	134	268	100	800	632	1,700
Joint RW	160	320	84	672	0	992
EA-6B	37	74	19	152	134	360
KC-130	68	136	40	320	270	726
Joint AR	18	36	4	32	0	68
UAS	120	240	46	368	460	1,068
Total	**1,669**	**3,338**	**1,046**	**8,368**	**6,351**	**18,057**

Notes: MEB = Marine Expeditionary Brigade; EMV = Enhanced Mojave Viper

Sortie Estimate Assumptions

Sortie estimates for the Combat Center SUA are based on the following data and assumptions that were derived from the MAGTF G3 operational analyses of the proposed and ongoing Combat Center operations.

1. MAGTF G3 analyses identified MEB Exercise Work-up and Final sortie projections for each daily activity and airspace use based on anticipated aircraft participants and training mission requirements. These analyses also identified daily flight windows (hours of use) for the existing and proposed airspace and altitude blocks that would typically be utilized during the Work-up and Final flight activities. Airspace use tables are based on the sortie totals and airspace to be utilized (as indicated by flight windows) for the MEB Exercise Work-up and Final phases.

2. Mission activities would occur over a 24-hour period that is divided into day, evening, and night timeframes for noise modeling purposes. The average distribution (percentage) of aircraft sorties conducted within time periods during the Work-up and Final phases is assumed to be as follows:

Work-up: Day (70%) Evening (25%) Night (5%)
Final: Day (50% Evening (12%) Night (38%)

3. The nature of the MEB Exercise mission activities would generally require most aircraft types to maneuver, to some extent, throughout all Combat Center airspace during the course of an exercise flight operation. For that reason, the same number of sorties is shown in multiple areas for each aircraft, where appropriate, for all alternatives and associated airspace configurations. The time spent, altitudes used, and profiles flown within each SUA area would differ somewhat, depending on the air and ground mission scenarios performed each day.

4. Table D.4-2 presents a general estimate of the percentage of sortie duration time an aircraft would typically operate within each SUA area for the alternative airspace proposals. These percentages are based on the above assumptions and the annual total hours of use shown in the MAGTF G3 analysis summary for each airspace area.

5. These assumptions were used uniformly for the MEB, EMV, and tenant/transient estimates since it is anticipated that all Combat Center activities would make full use of the proposed land acquisition and airspace capabilities.

Table D.4-2. Sortie Duration Distribution in Existing/Proposed Airspace

Existing/Proposed Airspace	Percentage of Sortie Duration in SUA	
Alternatives 1, 2, 4, 5, and 6		
	Work-up	**Final**
R-2501	40	27
Proposed Restricted Area R-XXXX	19	24
Proposed Johnson Valley MOA/ATCAA	19	24
Bristol MOA/ATCAA	22	15
Proposed Expanded Sundance MOA/ATCAA	Not used	4
Proposed CAX MOA/ATCAA	Not used	3
Turtle MOA/ATCAA	Not used	3
Total	100	100
Alternative 3		
R-2501	25	25
Bristol Restricted Area	23	23
CAX Restricted Area	17	17
Proposed Expanded Sundance MOA/ATCAA	19	19
Turtle MOA/ATCAA	16	16
Total	100	100

Note: SUA = Special Use Airspace; MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise

MEB Exercise Estimates

Tables D.4-3 through D.4-6 reflect the estimated number of aircraft sortie-operations that would be conducted during the MEB Exercise Work-up and Final phases under the different alternatives for the day, evening, and night time periods. Throughout all tables, Joint FW refers to other Service fighter type aircraft such as F-16s; Joint RW refers to other Service helicopters such as an H-60; and Joint AR refers to other Service Aerial Refueling aircraft such as a KC-135 or K-10.

Table D.4-3. Estimated MEB Exercise Sortie-Operations for Single Work-up Period - Alternatives 1, 2, 4, 5, and 6

Aircraft Type	• R-2501 • Proposed RA R-XXXX and Johnson Valley MOA/ATCAA				Proposed Bristol MOA/ATCAA Modification				Proposed Modifications • Sundance MOA/ATCAA • CAX Corridor MOA/ATCAA • Turtle MOA/ATCAA			
	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
AV-8B	80	29	6	114	80	28	6	114	-	-	-	-
FA-18	109	39	8	155	109	38	8	155	-	-	-	-
F-35	39	14	3	55	39	13	3	55	-	-	-	-
Joint FW	1	1	0	2	1	1	0	2	-	-	-	-
AH/UH-1	298	107	21	426	-	-	-	-	-	-	-	-
CH-53	73	26	5	104	-	-	-	-	-	-	-	-
MV-22	81	29	6	116	-	-	-	-	-	-	-	-
Joint RW	95	34	7	136	-	-	-	-	-	-	-	-
EA-6B	20	7	1	28	20	7	1	28	-	-	-	-
KC-130	35	13	3	50	35	12	3	50	-	-	-	-
Joint AR	0	0	0	0	-	-	-	-	-	-	-	-
UAS	59	21	4	84	59	21	4	84	-	-	-	-
Total	890	320	64	1270	343	120	25	488	-	-	-	-

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise

Table D.4-4. Estimated MEB Exercise Sortie-Operations for Single Final Period - Alternatives 1, 2, 4, 5, and 6

Aircraft Type	• R-2501 • Proposed RA R-XXXX and Johnson Valley MOA/ATCAA • Sundance MOA/ATCAA Modification • Bristol MOA/ATCAA Modification				New CAX Corridor MOA/ATCAA				Turtle MOA/ATCAA Modification			
	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
AV-8B	18	9	9	36	18	9	9	36	18	9	9	36
FA-18	43	22	21	86	43	22	21	86	43	22	21	86
F-35	11	6	5	22	11	6	5	22	11	6	5	22
Joint FW	9	2	7	18	9	2	7	18	-	-	-	-
AH/UH-1	60	30	30	120	60	30	30	120	-	-	-	-
CH-53	6	3	3	12	6	3	3	12	-	-	-	-
MV-22	9	5	4	18	9	5	4	18	-	-	-	-
Joint RW	12	6	6	24	12	6	6	24	-	-	-	-
EA-6B	5	2	2	9	5	2	2	9	5	2	2	9
KC-130	10	4	4	18	10	4	4	18	9	4	8	18
Joint AR	9	5	4	18	9	5	4	18	9	5	4	18
UAS	18	9	9	36	18	9	9	36	18	9	9	36
Total	201	101	97	399	201	101	97	399	113	57	58	225

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise

Table D.4-5. Estimated MEB Exercise Sortie-Operations for Single Work-Up Period - Alternative 3

Aircraft Type	R-2501				Sundance MOA/ATCAA Modification				New Bristol Restricted Area				New CAX Corridor Restricted Area				Turtle MOA/ATCAA Modification			
	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
AV-8B	80	28	6	114	80	28	6	114	80	28	6	114	80	28	6	114	80	28	6	114
FA-18	109	38	8	155	109	38	8	155	109	38	8	155	109	38	8	155	109	38	8	155
F-35	39	13	3	55	39	13	3	55	39	13	3	55	39	13	3	55	39	13	3	55
Joint FW	1	1	0	2	1	1	0	2	1	1	0	2	1	1	0	2	1	1	0	2
AH/UH-1	298	107	21	426	298	107	21	426	298	107	21	426	298	107	21	426	298	107	21	426
CH-53	73	26	5	104	73	26	5	104	73	26	5	104	73	26	5	104	73	26	5	104
MV-22	81	29	6	116	81	29	6	116	81	29	6	116	81	29	6	116	81	29	6	116
Joint RW	95	34	7	136	95	34	7	136	95	34	7	136	95	34	7	136	95	34	7	136
EA-6B	20	7	1	28	20	7	1	28	20	7	1	28	20	7	1	28	20	7	1	28
KC-130	35	12	3	50	35	12	3	50	35	12	3	50	35	12	3	50	35	12	3	50
Joint AR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UAS	59	21	4	84	59	21	4	84	59	21	4	84	59	21	4	84	59	21	4	84
Total	890	316	64	1270	890	316	64	1270	890	316	64	1270	890	316	64	1270	890	316	64	1270

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise

Table D.4-6. Estimated MEB Exercise Sortie-Operations for Single Final Period - Alternative 3

Aircraft Type	R-2501				Sundance MOA/ATCAA Modification				New Bristol Restricted Area				New CAX Corridor Restricted Area				Turtle MOA/ATCAA Modification			
	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
AV-8B	18	9	9	36	18	9	9	36	18	9	9	36	18	9	9	36	18	9	9	36
FA-18	43	22	21	86	43	22	21	86	43	22	21	86	43	22	21	86	43	22	21	86
F-35	11	6	5	22	11	6	5	22	11	6	5	22	11	6	5	22	11	6	5	22
Joint FW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AH/UH-1	60	30	30	120	60	30	30	120	60	30	30	120	60	30	30	120	-	-	-	-
CH-53	6	3	3	12	6	3	3	12	6	3	3	12	6	3	3	12	-	-	-	-
MV-22	9	5	4	18	9	5	4	18	9	5	4	18	9	5	4	18	-	-	-	-
Joint RW	12	6	6	24	12	6	6	24	12	6	6	24	12	6	6	24	-	-	-	-
EA-6B	5	2	2	9	5	2	2	9	5	2	2	9	5	2	2	9	5	2	2	9
KC-130	10	4	4	18	10	4	4	18	10	4	4	18	10	4	4	18	9	4	8	18
Joint AR	9	5	4	18	9	5	4	18	9	5	4	18	9	5	4	18	9	5	4	18
UAS	18	9	9	36	18	9	9	36	18	9	9	36	18	9	9	36	18	9	9	36
Total	201	101	97	399	201	101	97	399	201	101	97	399	201	101	97	399	113	57	58	225

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise

Table D.4-7 reflects MAGTF G3 estimates of the percentage of time each aircraft type typically operates within the indicated altitude strata described in Chapter 2. Table D.4-8 includes a further estimate of the percentage of time at which aircraft operate within the lower altitudes.

Table D.4-7. Typical Altitude Distributions for Aircraft Types

Aircraft Type	Surface up To, but not including, 8,000 feet MSL	8,000 feet MSL up to, but not including, 14,000 feet MSL	14,000 feet MSL up to, but not including, 18,000 feet MSL	18,000 feet MSL up to, but not including, FL270	FL270 up to FL400
F/A18	5-10%	30%	60%		5%
F-35	5-10%	30%	60%		5%
AV-8	5-10%	30%	60%		5%
EA-6B	0	0	0	100%	0
KC-130	10%	0	95%	0	0
Joint FW	5-10%	30%	60%		5%
AH-1	100%	0	0	0	0
UH-1	100%	0	0	0	0
CH-46	100%	0	0	0	0
CH-53	100%	0	0	0	0
MV-22	60%	40%	0	0	0
Joint RW	100%	0	0	0	0
Joint AR	0	0	0	100%	0
UAS	80%	20%		0	0

Notes: MSL = mean seal level; FL = Flight Level

Table D.4-8. Typical Lower Altitude Distributions for Aircraft Types

Aircraft Type	Typical Altitude Distribution by Percentage within Altitude Range (feet AGL with average ground elevation of 4,000 feet MSL)									
	Average Sortie Duration (minutes)	Surface - 500 feet	500 - 1,000	1,000 - 3,000’	3,000 – 4,000	Surface – 4,000	4,000 - 10,000	10,000 - 14,000	14,000 - 24,000	24,000 - 36,000
AV-8B	78	5	1	1	2		29	57		5
F/A-18C/D	90	5	1	1	2		29	57		5
F-35B*	90	5	1	1	2		29	57		5
Joint FW	90	5	1	1	2		29	57		5
AH-1/ UH-1	90	70	20	9	1					
CH-53	90	70	20	9	1					
MV-22	120	49	14	6	1		30			
Joint RW	120	70	20	9	1					
EA-6B	120								100	
KC-130	180					2.5	2.5	95		
Joint AR	240								100	
UAS	600					80	20			

Notes: AGL = above ground level; MSL = mean sea level

Tables D.4-9 and D.4-10 show the aircraft sortie altitude distributions for the MEB Exercise Work-up and Final periods based on Table D.4-7 estimates for each aircraft type. Tables D.4-11 through D.4-20 provide similar estimates for future EMV exercises and tenant/transient sortie-operations.

Table D.4-9. Estimated Single MEB Exercise Sortie-Operations by Airspace/Altitude Distribution - Alternatives 1, 2, 4, 5, and 6

Aircraft	Existing and Proposed Special Use Airspace by Altitude Stratifications																
	R-2501		Proposed Restricted Area R-XXXX/ Johnson Valley MOA/ATCAA				Proposed Sundance MOA/ATCAA Modification		Bristol MOA/ATCAA Modification			New CAX Corridor MOA/ATCAA			Turtle MOA/ATCAA Modification		
	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 8,000	8,000 to not incl. 14,000	14,000 to not incl. FL270	FL270-FL400	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	5,000 to not incl. 11,000	11,000-FL180	FL180-FL400
MEB Exercise Work-up Period (training days 1-19; no flight activity on days 10 and 18)																	
AV-8B	114	114	114	114	114	0	0	0	0	114	0	0	0	0	0	0	0
FA-18	155	155	155	155	155	0	0	0	0	155	0	0	0	0	0	0	0
F-35	55	55	55	55	55	0	0	0	0	55	0	0	0	0	0	0	0
Joint FW	2	2	2	2	2	0	0	0	0	2	0	0	0	0	0	0	0
AH/UH-1	426	0	426	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH-53	104	0	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MV-22	116	0	116	116	0	0	0	0	0	0	0	0	0	0	0	0	0
Joint RW	136	0	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EA-6B	0	28	0	0	28	0	0	0	0	28	0	0	0	0	0	0	0
KC-130	3	47	3	0	47	0	0	0	0	47	0	0	0	0	0	0	0
Joint AR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UAS	84	84	84	84	84	0	0	0	0	84	0	0	0	0	0	0	0
Total	1195	485	1195	526	485	0	0	0	0	485	0	0	0	0	0	0	0
MEB Exercise Final Period (flight training days 20-22)																	
AV-8B	36	36	36	36	36	36	36	36	36	36	36	36	36	36	0	36	0
FA-18	86	86	86	86	86	86	86	86	86	86	86	86	86	86	0	86	0
F-35	22	22	22	22	22	22	22	22	22	22	22	22	22	22	0	22	0
Joint FW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AH/UH-1	120	0	120	0	0	0	120	0	120	0	0	120	0	0	0	0	0
CH-53	12	0	12	0	0	0	12	0	12	0	0	12	0	0	0	0	0
MV-22	18	18	18	18	0	0	18	0	18	0	0	18	0	0	0	0	0
Joint RW	24	0	24	0	0	0	24	0	24	0	0	24	0	0	0	0	0
EA-6B	0	9	0	0	9	0	0	9	0	9	0	0	9	0	0	9	0
KC-130	1	17	1	0	17	0	1	17	1	17	0	1	17	0	0	17	0
Joint AR	0	18	0	0	18	0	0	18	0	18	0	0	18	0	0	18	0
UAS	36	36	36	36	36	0	36	36	36	36	0	0	36	0	0	36	0
Total	355	242	355	198	224	144	355	224	355	224	144	319	224	144	0	224	0

Note: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; FL = Flight Level; MEB = Marine Expeditionary Brigade

Table D.4-10. Estimated Single MEB Exercise Sortie-Operations by Airspace/Altitude Distribution - Alternative 3

Aircraft	Mission Altitude Distribution within Existing and Proposed Special Use Airspace												
	R-2501		Sundance MOA/ATCAA Modification		New Bristol RA Modification			New CAX RA			Turtle MOA/ATCAA Modification		
	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	5,000 to not incl. 11,000	11,000 to not incl. FL180	FL180 - FL400
MEB Exercise Work-up Period (training days 1-19; no flight activity on days 10 and 18)													
AV-8B	114	114	114	114	114	114	0	114	114	0	114	114	0
FA-18	155	155	155	155	155	155	0	155	155	0	155	155	0
F-35	55	55	55	55	55	55	0	55	55	0	55	55	0
Joint FW	2	2	2	2	2	2	0	2	2	0	2	2	0
AH/UH-1	426	0	426	0	426	0	0	426	0	0	426	0	0
CH-53	104	0	104	0	104	0	0	104	0	0	104	0	0
MV-22	116	0	116	0	116	0	0	116	0	0	116	116	0
Joint RW	136	0	136	0	136	0	0	136	0	0	136	0	0
EA-6B	0	28	0	28	0	28	0	0	28	0	0	28	0
KC-130	3	47	3	47	3	47	0	3	47	0	3	0	0
Joint AR	0	0	0	0	0	0	0	0	0	0	0	0	0
UAS	28	28	28	28	28	28	0	28	28	0	28	28	0
Total	1,139	429	1,139	429	1,139	429	0	1,139	429	0	1,139	498	0
MEB Exercise Final Period (flight training days 20-22)													
AV-8B	36	36	36	36	36	36	36	36	36	0	36	36	0
FA-18	86	86	86	86	86	86	86	86	86	0	86	86	0
F-35	22	22	22	22	22	22	22	22	22	0	22	22	0
Joint FW	0	0	0	0	0	0	0	0	0	0	0	0	0
AH/UH-1	120	0	120	0	120	0	0	120	0	0	120	0	0
CH-53	12	0	12	0	12	0	0	12	0	0	12	0	0
MV-22	18	0	18	0	18	0	0	18	0	0	18	18	0
Joint RW	24	0	24	0	24	0	0	24	0	0	24	0	0
EA-6B	0	9	0	9	0	9	0	0	9	0	0	0	0
KC-130	1	17	1	17	1	17	0	1	17	0	1	17	0
Joint AR	0	18	0	18	0	18	0	0	18	0	0	18	0
UAS	36	36	36	36	36	36	0	36	36	0	36	36	0
Total	355	224	355	224	335	224	144	355	224	0	355	233	0

Note: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; FL = Flight Level; MEB = Marine Expeditionary Brigade

Table D.4-11. Estimated Single EMV Sortie-Operations for Work-Up Period - Alternatives 1, 2, 4, 5, and 6

Aircraft Type	• R-2501 • Proposed Restricted Area R-XXXX and Johnson Valley MOA/ATCAA • Sundance MOA/ATCAA Modification • Bristol MOA/ATCAA Modification				• New CAX MOA/ATCAA • Turtle MOA/ATCAA Modification NOT USED			
	Day	**Eve**	**Night**	**Total**	**Day**	**Eve**	**Night**	**Total**
AV-8B	51	18	4	73	-	-	-	-
FA-18	85	30	6	121	-	-	-	-
F-35	26	10	2	38	-	-	-	-
Joint FW	5	2	1	8	-	-	-	-
AH/UH-1	193	69	14	276	-	-	-	-
CH-53	71	26	5	102	-	-	-	-
MV-22	59	21	4	84	-	-	-	-
Joint RW	48	17	3	68	-	-	-	-
EA-6B	12	4	1	17	-	-	-	-
KC-130	1	1	0	2	-	-	-	-
Joint AR	0	0	0	0	-	-	-	-
UAS	29	10	3	42	-	-	-	-
Total	575	205	41	823	-	-	-	-

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; Eve = Evening

Table D.4-12. Estimated Single EMV Sortie-Operations for Final Period - Alternatives 1, 2, 4, 5, and 6

Aircraft Type	• R-2501 • Proposed Western Restricted Area and MOA/ATCAA • Sundance MOA/ATCAA Modification • Bristol MOA/ATCAA Modification • Proposed CAX MOA/ATCAA				Turtle MOA/ATCAA Modification			
	Day	**Eve**	**Night**	**Total**	**Day**	**Eve**	**Night**	**Total**
AV-8B	9	2	6	17	9	2	6	17
FA-18	15	3	11	29	15	3	11	29
F-35	4	1	3	8	4	1	3	8
Joint FW	4	1	3	8	4	1	3	8
AH/UH-1	30	7	23	60	-	-	-	-
CH-53	6	1	5	12	-	-	-	-
MV-22	8	2	6	16	-	-	-	-
Joint RW	8	2	6	16	-	-	-	-
EA-6B	1	0	1	2	-	-	-	-
KC-130	4	1	3	8	4	1	3	8
Joint AR	2	1	1	4	-	-	-	-
UAS	6	2	4	12	6	2	4	12
Total	97	23	72	192	42	10	30	82

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; Eve = Evening

Table D.4-13. Estimated Single EMV Sortie-Operations for Work-up Period - Alternative 3

Aircraft Type	• R-2501 • Sundance MOA/ATCAA Modification • New Bristol Restricted Area • New CAX Restricted Area				Turtle MOA/ATCAA Modification			
	Day	Eve	Night	Total	Day	Eve	Night	Total
AV-8B	51	18	4	73	51	18	4	73
FA-18	85	30	6	121	85	30	6	121
F-35	26	10	2	38	26	10	2	38
Joint FW	5	2	1	8	5	2	1	8
AH/UH-1	193	69	14	276	-	-	-	-
CH-53	71	25	4	102	-	-	-	-
MV-22	59	21	4	84	-	-	-	-
Joint RW	48	17	3	68	-	-	-	-
EA-6B	12	4	1	17	12	4	1	17
KC-130	1	1	0	2	-	-	-	-
Joint AR	0	0	0	0	-	-	-	-
UAS	29	10	3	42	24	8	2	34
Total	575	205	41	823	203	72	16	291

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; Eve = Evening

Table D.4-14. Estimated Single EMV Sortie-Operations for Final Period - Alternative 3

Aircraft Type	• R-2501 • Sundance MOA/ATCAA Modification • New Bristol Restricted Area • New CAX Restricted Area				Turtle MOA/ATCAA Modification			
	Day	Eve	Night	Total	Day	Eve	Night	Total
AV-8B	9	2	6	17	9	2	6	17
FA-18	15	3	11	29	15	3	11	29
F-35	4	1	3	8	4	1	3	8
Joint FW	4	1	3	8	4	1	3	8
AH/UH-1	30	7	23	60	-	-	-	-
CH-53	6	1	5	12	-	-	-	-
MV-22	8	2	6	16	-	-	-	-
Joint RW	8	2	6	16	-	-	-	-
EA-6B	1	0	1	2	1	0	1	2
KC-130	4	1	3	8	4	1	3	8
Joint AR	2	1	1	4	2	1	1	4
UAS	6	2	4	12	6	2	4	12
Total	97	23	72	192	33	9	22	64

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; Eve = Evening

Table D.4-15. Estimated Single EMV Exercise Sortie-Operations by Airspace/Altitude Distribution - Alternatives 1, 2, 4, 5, and 6

Aircraft	Existing and Estimated Special Use Airspace by Altitude Stratifications																
	R-2501		Proposed Restricted Area R-XXXX/ Johnson Valley MOA/ATCAA				Proposed Sundance MOA/ATCAA Modification		Bristol MOA/ATCAA Modification			New CAX Corridor MOA/ATCAA			Turtle MOA/ATCAA Modification		
	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 8,000	8,000 to not incl. 14,000	14,000 to not incl. FL270	FL270-FL400	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	5,000 to not incl. 11,000	11,000-FL180	FL180-FL400
EMV Work Up Period (training days 1-19; no flight activity on days 13 and 19)																	
AV-8B	73	73	73	73	73	0	73	73	73	73	0	0	0	0	0	0	0
FA-18	121	121	121	121	121	0	121	121	121	121	0	0	0	0	0	0	0
F-35	38	38	38	38	38	0	38	38	38	38	0	0	0	0	0	0	0
Joint FW	8	8	8	8	8	0	8	8	8	8	0	0	0	0	0	0	0
AH/UH-1	276	0	276	0	0	0	276	0	276	0	0	0	0	0	0	0	0
CH-53	102	0	102	0	0	0	102	0	102	0	0	0	0	0	0	0	0
MV-22	84	0	84	84	0	0	84	0	84	0	0	0	0	0	0	0	0
Joint RW	68	0	68	0	0	0	68	0	68	0	0	0	0	0	0	0	0
EA-6B	0	17	0	0	17	0	0	17	0	17	0	0	0	0	0	0	0
KC-130	2	0	2	0	30	0	30	30	0	30	0	0	0	0	0	0	0
Joint AR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UAS	34	34	34	34	34	0	34	34	34	34	0	0	0	0	0	0	0
Total	806	291	806	358	321	0	834	321	804	321	0	0	0	0	0	0	0
EMV Final Period (flight training days 20 and 21)																	
AV-8B	17	17	17	17	17	17	17	17	17	17	17	17	17	17	0	17	0
FA-18	29	29	29	29	29	29	29	29	29	29	29	29	29	29	0	29	0
F-35	8	8	8	8	8	8	8	8	8	8	8	8	8	8	0	8	0
Joint FW	8	8	8	8	8	8	8	8	8	8	8	8	8	8	0	8	0
AH/UH-1	60	0	60	0	0	0	60	0	60	0	0	60	0	0	0	0	0
CH-53	12	0	12	0	0	0	12	0	12	0	0	12	0	0	0	0	0
MV-22	16	0	16	16	0	0	16	0	16	0	0	16	0	0	0	0	0
Joint RW	16	0	16	0	0	0	16	0	16	0	0	16	0	0	0	0	0
EA-6B	0	2	0	0	2	0	0	2	0	2	0	0	2	0	0	0	0
KC-130	8	8	2	0	8	0	2	8	2	8	0	2	8	0	0	8	0
Joint AR	0	0	0	0	4	0	0	4	0	4	0	0	4	0	0	0	0
UAS	12	12	12	12	12	0	12	12	12	12	0	12	12	0	0	12	0
Total	186	84	180	90	88	62	180	88	180	88	62	180	88	62	0	82	0

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; FL = Flight Level; EMV = Enhanced Mojave Viper

Table D.4-16. Estimated Single EMV Period Sortie-Operations by Airspace/Altitude Distribution - Alternative 3

Aircraft (Total Sorties)	Current and Estimated Future Special Use Airspace by Altitude Stratifications												
	R-2501		Sundance MOA/ATCAA Modification		New Bristol Restricted Area Modification			New CAX Restricted Area			Turtle MOA/ATCAA Modification		
	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	5,000 to not incl. 11,000	11,000 to not incl. FL180	FL180 - FL400
EMV Work Up Period (training days 1-19; no flight activity on days 13 and 18)													
AV-8B	73	73	73	73	73	73	0	73	73	0	0	73	0
FA-18	121	121	121	121	121	121	0	121	121	0	0	121	0
F-35	38	38	38	38	38	38	0	38	38	0	0	38	0
Joint FW	8	8	8	8	8	8	0	8	8	0	0	8	0
AH/UH-1	276	0	276	0	276	0	0	276	0	0	0	0	0
CH-53	102	0	102	0	102	0	0	102	0	0	0	0	0
MV-22	84	0	84	0	84	0	0	84	0	0	0	0	0
Joint RW	68	0	68	0	68	0	0	68	0	0	0	0	0
EA-6B	0	17	0	17	0	17	0	0	17	0	0	17	0
KC-130	2	0	2	0	0	30	0	2	0	0	0	0	0
Joint AR	0	0	0	0	0	0	0	0	0	0	0	0	0
UAS	42	42	42	42	42	42	0	42	42	0	0	42	0
Total	814	299	814	299	812	329	0	814	299	0	0	299	0
EMV Final Period (flight training days 20-21)													
AV-8B	17	17	17	17	17	17	0	17	17	17	17	17	17
FA-18	29	29	29	29	29	29	0	29	29	29	29	29	29
F-35	8	8	8	8	8	8	0	8	8	8	8	8	8
Joint FW	8	8	8	8	8	8	0	8	8	8	8	8	8
AH/UH-1	60	0	60	0	60	0	0	60	0	0	0	0	0
CH-53	12	0	12	0	12	0	0	12	0	0	0	0	0
MV-22	16	0	16	0	16	0	0	16	0	0	0	0	0
Joint RW	16	0	16	0	16	0	0	16	0	0	0	0	0
EA-6B	0	2	0	2	0	2	0	0	2	0	2	0	2
KC-130	2	8	2	8	2	8	0	2	8	0	8	8	8
Joint AR	0	0	0	4	0	4	0	0	4	0	0	0	4
UAS	12	12	12	12	12	12	0	12	12	0	12	12	12
Total	180	84	180	88	180	88	0	180	88	62	84	82	88

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; FL = Flight Level; EMV = Enhanced Mojave Viper

Table D.4-17. Estimated Annual Tenant/Transient Sortie-Operations - Alternatives 1, 2, 4, 5, and 6

Aircraft Type	• R-2501 • Proposed Restricted Area R-XXXX and Johnson Valley MOA/ATCAA				Bristol MOA/ATCAA Modification				• Sundance MOA/ATCAA Modification • Proposed CAX MOA/ATCAA • Turtle MOA/ATCAA Modification			
	Day	**Eve**	**Night**	**Total**	**Day**	**Eve**	**Night**	**Total**	**Day**	**Eve**	**Night**	**Total**
AV-8	426	152	30	608	426	152	30	608	-	-	-	-
F-18	700	250	51	1,001	700	250	51	1,001	-	-	-	-
F-35	225	80	16	321	225	80	16	321	-	-	-	-
AH/UH-1	1,569	560	112	2,241	-	-	-	-	-	-	-	-
CH-53	477	170	35	682	-	-	-	-	-	-	-	-
MV-22	446	154	37	637	-	-	-	-	-	-	-	-
EA-6B	94	34	6	134	94	34	6	134				
KC-130	189	68	13	270	189	68	13	270	-	-	-	-
UAS	281	100	20	401	281	100	20	401	-	-	-	-
Total	4,407	1,568	320	6,295	1,915	684	136	2,735	-	-	-	-

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; Eve = Evening

Table D.4-18. Estimated Annual Tenant/Transient Sortie-Operations - Alternative 3

Aircraft Type	• R-2501 • Sundance MOA/ATCAA Modification • New Bristol Restricted Area • New CAX Restricted Area • Turtle MOA/ATCAA Modification			
	Day	**Eve**	**Night**	**Total**
AV-8	426	152	30	608
F-18	700	250	51	1,001
F-35	225	80	16	321
AH/UH-1	1,569	560	112	2,241
CH-53	477	170	35	682
MV-22	446	154	37	637
EA-6B	94	34	6	134
KC-130	189	68	13	270
UAS	281	100	20	401
Total	4,407	1,568	320	6,295

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; Eve = Evening

Table D.4-19. Estimated Annual Tenant/Transient Sortie-Operations by Aircraft/Airspace/Altitude Block - Alternatives 1, 2, 4, 5, and 6

Aircraft	Current and Estimated Future Airspace Use by Altitude Strata																
	R-2501		Proposed Restricted Area R-XXXX/ Johnson Valley MOA/ATCAA				Proposed Sundance MOA/ATCAA Modification		Bristol MOA/ATCAA Modification			New CAX Corridor MOA/ATCAA			Turtle MOA/ATCAA Modification		
	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 8,000	8,000 to not incl. 14,000	14,000 to not incl. FL270	FL270-FL400	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	5,000 to not incl. 11,000	11,000-FL180	FL180-FL400
AV-8	608	608	608	608	608	0	0	0	0	608	0	0	0	0	0	0	0
F-18	1001	1001	1001	1001	1001	0	0	0	0	1001	0	0	0	0	0	0	0
F-35	321	321	321	321	321	0	0	0	0	7	0	0	0	0	0	0	0
AH/UH-1	2241	0	2241	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH-53	682	0	682	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MV-22	637	0	637	637	0	0	0	0	0	0	0	0	0	0	0	0	0
EA-6B	0	134	0	0	134	0	0	0	0	0	0	0	0	0	0	0	0
KC-130	14	256	14	0	256	0	0	0	0	256	0	0	0	0	0	0	0
UAS	401	401	401	401	401	0	0	0	0	401	0	0	0	0	0	0	0
Total	5905	2721	5905	2968	2721	0	0	0	0	2273	0	0	0	0	0	0	0

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; FL = Flight Level

Table D.4-20. Estimated Annual Tenant/Transient Sortie-Operations by Aircraft Type/Airspace/Altitude Block - Alternative 3

Aircraft	Current and Estimated Future Airspace Use by Altitude Strata												
	R-2501		Sundance MOA/ATCAA Modification		New Bristol Restricted Area Modification			New CAX Restricted Area			Turtle MOA/ATCAA Modification		
	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 - FL270	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	Surface to not incl. 14,000	14,000 to not incl. FL270	FL270 - FL400	5,000 to not incl. 11,000	11,000 to not incl. FL180	FL180 - FL400
AV-8	608	608	608	608	15	15	0	608	608	0	608	608	0
FA-18	1001	1001	1001	1001	18	18	0	1001	1001	0	1001	1001	0
F-35	321	321	321	321	7	7	0	321	321	0	321	321	0
AH/UH-1	2241	0	2241	0	2241	0	0	2241	0	0	2241	0	0
CH-53	682	0	682	0	682	0	0	682	0	0	682	0	0
MV-22	637	0	637	0	637	0	0	637	0	0	637	637	0
EA-6B	0	134	0	134	0	134	0	0	134	0	0	134	0
KC-130	14	256	14	256	14	256	0	14	256	0	14	256	0
UAS	401	401	401	401	401	401	0	401	401	0	401	401	0
Total	5905	2721	5905	2721	4015	831	0	5905	2721	0	5905	3358	0

Notes: MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; FL = Flight Level

Tables D.4-21 and D.4-22 provide a summary of the daily average sorties and flight windows for the MEB Exercise Work-up and Final activities under all alternatives. Again, flight profiles may differ somewhat with the proposed airspace SUA and modifications proposed for each alternative. These tables also include, for comparison, the daily average sorties and flight windows for Non-MEB tenant/transient training and other ongoing military flight activities that would also utilize the existing and proposed airspace throughout the year when MEB exercises are not scheduled.

Table D.4-21. Average Daily Airspace Use for MEB Exercises and Other Non-MEB Military Flight Activities - Alternatives 1, 2, 4, 5, and 6

Airspace Use	Airspace Unit						
	Existing R-2501	Proposed Restricted Area R-XXXX	Proposed Johnson Valley MOA/ ATCAA	Proposed Sundance MOA/ ATCAA	Proposed Bristol MOA/ ATCAA	Proposed CAX MOA/ ATCAA	Proposed Turtle MOA/ ATCAA
MEB Exercise Scenario (48 days/year)							
Average Daily Sorties							
[1]MEB Work Up	74	74	74	0	74	0	0
[2]MEBFinal	133	133	133	133	133	133	133
[3]Average Daily Flight Window (hours day/night)							
MEB Work Up	9/3	9/3	9/3	0	4/0	0	0
MEB Final	12/12	12/12	12/12	12/12	12/12	12/12	12/12
Non-MEB Tenant/Transient (160 days/year)							
Average Daily Sorties							
All Days	14/7	14/7	14/7	0	14/7	0	0
[3]Average Daily Flight Window (hours day/night)							
All Days	10/1	10/1	10/1	0	10/1	0	0
[4]Other Military Flight Activities (270 days/year)							
Average Daily Sorties							
All Days	49	49	49	7	25	7	7
[3]Average Daily Flight Window (hours day/night)							
All Days	8/3	8/3	8/3	2/1	4/2	1/1	1/1

Notes:

1. The Work-up phase of the MEB Exercise includes training days 1-19; however, flight activity would not occur during training days 10 and 18. The average daily sorties calculation does not include those two training days.
2. The Final phase of the MEB Exercise includes training days 20-22; flight activity would occur during all three of these training days.
3. The daily flight window is the continuous span of time (hours) each day during which flight operations would typically occur from start to finish. This is the duration of time the airspace would be scheduled to accommodate these operations. Where indicated, this flight window may be divided between day (0700-2200 hrs) and night (2200-0700 hrs) operations to fulfill night time training requirements.
4. Other military flight activities may include major training exercises and basic proficiency training and would be conducted within the designated airspace during those periods when the twice annual MEB exercises would not be scheduled (approximately 270 days each year).

MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; MEB = Marine Expeditionary Brigade

Table D.4-22. Average Daily Airspace Use for MEB Exercises, Non-MEB Tenant/Transient Training, and Other Military Flight Activities - Alternative 3

Airspace Use	Airspace Unit				
	Existing R-2501	**Proposed Sundance MOA/ATCAA**	**Proposed Bristol Restricted Area**	**Proposed CAX Restricted Area**	**Proposed Turtle MOA/ATCAA**
MEB Exercise Scenario (48 days/year)					
Average Daily Sorties					
[1]MEB Work Up	74	74	74	74	74
[2]MEB Final	133	133	133	133	133
[3]Average Daily Flight Window (hours day/night)					
MEB Work Up	9/3	9/3	9/3	9/3	9/3
MEB Final	12/12	12/12	12/12	12/12	12/12
Non-MEB Tenant/Transient (160 days/year)					
Average Daily Sorties					
All Days	14/7	14/7	14/7	14/7	14/7
[3]Average Daily Flight Window (hours day/night)					
All Days	10/1	10/1	10/1	10/1	10/1
[4]Other Military Flight Activities (270 days/year)					
Average Daily Sorties					
All Days	49	49	49	49	49
[3]Average Daily Flight Window (hours day/night)					
All Days	8/3	5/2	7/2	6/2	5/2

Notes:

1. The Work-up phase of the MEB Exercise includes training days 1-19; however, flight activity would not occur during training days 10 and 18. The average daily sorties calculation does not include those two training days.

2. The Final phase of the MEB Exercise includes training days 20-22; flight activity would occur during all three of these training days.

3. The daily flight window is the continuous span of time (hours) each day during which flight operations would typically occur from start to finish. This is the duration of time the airspace would be scheduled to accommodate these operations. Where indicated, this flight window may be divided between day (0700-2200 hrs) and night (2200-0700 hrs) operations to fulfill night time training requirements.

4. Other military flight activities may include major training exercises and basic proficiency training and would be conducted within the designated airspace during those periods when the twice annual MEB exercises would not be scheduled (approximately 270 days each year).

MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; MEB = Marine Expeditionary Brigade

D.5 Projected Airspace Use (Flight Windows – Estimated Hours of Use)

The MAGTF G-3 Western and Eastern Analyses provide an estimate of the daily and annual flight windows for each of the airspace areas and altitude blocks that would be used for the MEB, EMV and other military training activities throughout the year. Each daily flight window is considered to be the period of time that airspace is in use from the start until completion of all flight activities conducted within that airspace. The duration of the flight windows will vary on a daily basis, depending on the nature of the exercise and associated flight activities and number of aircraft participating in those daily activities. Flight windows would typically range between 8-15 hours daily during the Exercise Work-up phase and would extend over a 24 hour period during the final exercise (Final) phase such as occurs during the last three days of the MEB Exercise.

Tables D.5-1 and D.5-2 summarize the annual cumulative hours of airspace use for the two annual MEB and eight annual EMV exercises, and all other tenant/transient training and other military activities that are conducted throughout a one year period. The total for the other military training activities is based on the difference between the total MEB Exercise and EMV hours and the overall Combat Center total annual hours.

D.5-1. Cumulative Flight Windows (Hours of Use) for Alternatives 1,2, 4, 5, and 6

Airspace Unit	Altitude Block	MEB Exercise Total Annual Hours	EMV Total Annual Hours	Tenant/Transient and other Military Training Total Annual Hours	Total Annual Hours
R-2501	Surface -13,000 MSL	552	2,016	811	4,110
	14,000 - FL270	552	2,016	811	4,110
Restricted Area R-XXXX (Alt 2 Partial Restricted Area)	Surface – 7,000 MSL	456	2,016	1,295	3,767
	8,000 -13,000 MSL	456	1,632	743	3,618
	14,000 - FL270	456	1,632	644	3,450
	FL270 – 400	24	64	8	96
Johnson Valley MOA/ATCAA (Alt 2 Partial MOA/ATCAA)	Surface – 7,000 MSL	456	2,016	1,295	3,767
	8,000 -13,000 MSL	456	1,632	743	3,618
	14,000 - FL270	456	1,632	644	3,450
	FL270 – 400	24	64	8	96
Extended Sundance MOA/ATCAA	1,500 AGL – 13,000 MSL	144	320	0	464
	14,000 - FL270	144	416	8	568
Expanded Bristol MOA/ATCAA	Surface – 13,000 MSL	144	576	0	720
	14,000 - FL270	240	1,168	635	2,235
	FL270 – FL400	24	64	0	88
CAX Corridor MOA/ATCAA	Surface – 13,000 MSL	144	192	0	336
	14,000 – FL270	144	384	0	528
	FL270 – FL400	24	64	0	88
Turtle MOA/ATCAA	3,000 AGL – 10,000 MSL	0	0	0	0
	11,000 MSL - FL180	144	384	0	528
	FL180 - FL270	0	0	0	0
Total		**5,040**	**18,288**	**7,645**	**35,638**

Notes: MEB = Marine Expeditionary Brigade; EMV = Enhanced Mojave Viper; MSL = mean sea level; FL = Flight Level; MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise; AGL = above ground level

Table D.5-2. Cumulative Flight Windows (Hours of Use) for Alternatives 3

Airspace Unit	Altitude Block	MEB Exercise Total Annual Hours	EMV Total Annual Hours	Tenant/Transient and other Military Training Total Annual Hours	Total Annual Hours
R-2501	Surface -13,000 MSL	552	2,016	1,552	4,120
	14,000 - FL270	552	2,016	1,499	4,067
Partial Expanded Sundance MOA/ATCAA	1,500 AGL – 13,000 MSL	412	1,088	1,216	2,716
	14,000 - FL270	332	896	1,112	2,340
Expanded Bristol MOA/ATCAA	Surface – 13,000 MSL	552	1,344	1,512	3,408
	14,000 - FL270	552	1,680	1,491	3,723
	FL270 – FL400	24	0	8	32
CAX Corridor MOA/ATCAA	Surface – 13,000 MSL	536	960	1,546	3,042
	14,000 – FL270	536	960	1,665	3,161
	FL270 – FL400	16	32	8	56
Turtle MOA/ATCAA	3,000 AGL – 10,000 MSL	440	384	1,610	2,434
	11,000 MSL - FL180	252	736	1,530	2,518
	FL180 - FL270	8	32	0	40
Total		4,764	12,144	14,749	31,657

Notes: MEB = Marine Expeditionary Brigade; EMV = Enhanced Mojave Viper; MSL = mean sea level; FL = Flight Level; AGL = above ground level; MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; CAX = Combined Arms Exercise

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APPENDIX E
MEB EXERCISE VEHICLES, AIRCRAFT, AND WEAPONS

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Combat Vehicles

Medium Tactical Vehicle Replacement (MTVR)

- Six-wheel drive all-terrain vehicles
- Engine: Turbocharged 6-cylinder diesel, 425 horsepower
- Maximum Speed: 65 miles per hour
- Maximum Range: 300 miles
- Dimensions: Length 26.2 feet, Width 8.2 feet
- Combat Weight: 32,500 pounds

High Mobility Multipurpose Wheeled Vehicle (HMMWV)

- Light military truck
- Engine: Diesel, 8-cylinder, 6.5 liter, Naturally Aspirated, 150 horsepower at 3600 revolutions per minute
- Maximum Speed: 55 miles per hour (Governed at gross weight)
- Range: 275 - 337 miles
- Dimensions: Length 15 to 17 feet, Width 7 feet
- Weight: 7,700 to 9,280 pounds

Logistics Vehicle System (LVS)

- Modular assortment of eight-wheel drive all-terrain vehicles
- Engine: Turbocharged Detroit Diesel V8 (8V92TA)
- Maximum Speed: 57 miles per hour
- Maximum Range: 300 miles
- Dimensions: Length 38 feet, Width 8 feet
- Curb Weight: 40,300 pounds
- Payload Capacity: 20,000 to 46,000 pounds

Internally Transportable Vehicle (ITV)

- 4-wheeled vehicle designed to fit inside and be transported by the MV-22 Osprey
- Engine: 4-cylinder gasoline; 71 horsepower at 2,500 revolutions per minute
- Maximum Speed: 60 miles per hour
- Dimensions: Length 11 feet, Width 5.3 feet
- Weight: 4,000 pounds (plus 2,000-pound payload capacity)

Source: www.marinecorpstimes.com 2009.

M60A1 Bridge Vehicle

- Armored vehicle used for launching and retrieving a 60-foot scissors-type bridge
- Engine: 12-cylinder diesel AVOS-1790-20
- Maximum Speed: 30 miles per hour
- Maximum Range: 290 miles
- Dimensions: Length 32 feet, Width 13.1 feet
- Combat Weight: 56.6 tons

Amphibious Assault Vehicle (AAV)

- Fully tracked amphibious landing vehicle
- Engine: Cummings VT400, 4 Cycle, 8-cylinder, 90'Vee, Water Cooled, Turbocharged, Multifuel
- Maximum Speed: Land 45 miles per hour, Water 8.2 miles per hour
- Maximum Range: 300 miles
- Dimensions: Length 26.7 feet, Width 10.7 feet
- Combat Weight: 60,758 pounds

Light Armored Vehicle (LAV)

- Eight-wheeled amphibious armored personnel carrier
- Variants: LAV with TOW system; LAV-C2/L/R; LAV-25; LAV-M
- Engine: 275 horsepower Detroit Diesel 6V53T
- Maximum Speed: 62 miles per hour
- Maximum Range: 410 miles
- Dimensions: Length 21.2 feet, Width 8.2 feet
- Combat Weight: 28,200 pounds

M88A2 HERCULES Recovery Vehicle

- Recovery vehicle for main battle tanks
- Engine: 12-cylinder diesel 750 horsepower at 2400 revolutions per minute
- Maximum Speed: 30 miles per hour
- Maximum Range: 300 miles
- Dimensions: Length 29.3 feet, Width 11.3 feet
- Combat Weight: 70 tons

High Mobility Artillery Rocket System (HIMARS)

- Mobile launcher attached to a 5-ton medium tactical vehicles (FMTV) truck chassis
- Engine: 6-cylinder diesel 280 horsepower at 2600 revolutions per minute
- Maximum Speed: 53 miles per hour
- Maximum Range: 300 miles
- Dimensions: Length 23 feet, Width 8 feet
- Weight: 24,000 pounds

Source: www.globalsecurity.org 2009.

<u>Abrams M1A1 Main Battle Tank</u>

- Well armed, heavily armored, and highly mobile tank designed for modern armored ground warfare
- Engine: AGT-1500 turbine engine, 1500 horsepower
- Maximum Speed: 42 miles per hour (Governed)
- Maximum Range: 275 miles
- Dimensions: Length (Gun Forward) 32 feet, Width 12 feet
- Combat Weight: 68 tons

Aircraft

<u>AV-8B Harrier</u>

- Subsonic attack aircraft
- Engine: single Pegasus turbofan engine with two intakes and four vectorable nozzles
- Maximum Speed: .89 Mach (662 miles per hour) at sea level
- Range: 1,200 nautical miles
- Dimensions: Wingspan 30 feet 4 inches, Length: 46 feet 4 inches
- Loaded Weight: 22,950 pounds

<u>F/A-18 Hornet</u>

- Carrier-capable multi-role fighter jet
- Engine: Two General Electric F404-GE-400 (or 402) turbofans
- Maximum Speed: Mach 1.8 (1,190 miles per hour) at 40,000 feet
- Combat Radius: 290 nautical miles on hi-lo-lo-hi mission
- Dimensions: Wingspan 40 feet, Length 56 feet
- Loaded Weight: 37,150 pounds

MV-22

- Vertical takeoff and landing tiltrotor aircraft
- Engine: Two AE1107C Rolls-Royce Allison, 6,150 shaft horsepower (4,586 kilowatts)
- Maximum Speed: 305 knots
- Maximum Range: 879 nautical miles
- Dimensions: Length 57 feet 4 inches, Width with rotors 84 feet 7 inches
- Maximum Takeoff Weight: 60,500 pounds

KC-130

- In-flight refueling and tactical transport aircraft
- Engine: Four Allison T56-A-16; 4,910 shaft horsepower per engine
- Maximum Speed: 315 knots
- Maximum Range: 1,000 nautical mile radius with 45,000 pounds of fuel; 2,875 nautical miles with 38,258 pounds of cargo
- Dimensions: Wingspan 132 feet 7 inches, length 97 feet 9 inches
- Operating Weight: 83,300 pounds

RQ-4 Global Hawk (Tier II)

- Unmanned aerial vehicle
- Engine: One Allison Rolls-Royce AE3007h turbofan engine
- Cruise Speed: 404 miles per hour
- Endurance: 36 hours
- Dimensions: Wingspan 116 feet 2 inches, Length 44 feet 5 inches
- Weight: 22,900 pounds

Source: www.globalsecurity.org 2009.

<u>EA-6B Prowler</u>

- Electronic Warfare Aircraft
- Engine: Two Pratt & Whitney J52-P408 turbofan engines
- Maximum Speed: .99 mach
- Maximum Range: 850 nautical miles (combat configuration)
- Dimensions: Wingspan 53 feet, Length 59 feet
- Maximum Weight: 61,500 pounds

Source: www.globalsecurity.org 2009.

<u>AH-1 Cobra</u>

- Attack helicopter
- Engine: Two General Electric T700-GE-401 Turboshaft engines (1,690 horsepower each)
- Maximum Speed: 170 knots (195 miles per hour)
- Range: 317 nautical miles
- Dimensions: Rotor diameter 48 feet, Length overall (rotors turning) 58 feet
- Maximum Takeoff Weight: 14,700 pounds

<u>UH-1 Huey</u>

- Utility helicopter
- Engine: Pratt and Whitney T400-CP-400
- Speed: 121 knots at sea level
- Range: 172 nautical miles
- Dimensions: Rotor Diameter 48 feet, Length 57.3 feet
- Maximum Takeoff Weight: 10,500 pounds

CH-53E

- Heavy-lift transport helicopter
- Engine: Three T64-GE-416 turboshaft engines, 4,380 shaft horsepower (3,270 kilowatts) each
- Maximum Speed: 170 knots
- Maximum Range: 540 nautical miles
- Dimensions: Rotor Diameter 79 feet, Length 99 feet 5 inches
- Maximum Takeoff Weight: 73,500 pounds

Combat Engineer Support Vehicles

Medium Crawler Tractor (MCT)

- Used in combat and combat support
- Engine: 200 horsepower, turbocharged 6-cylinder diesel
- Weight: 40,000 pounds
- 128- to 168-inch blade

Source: John Deere (www.deere.com) 2009.

Assault Breacher Vehicle

- A tracked, armored engineer vehicle (M1A1 chassis) specifically designed for conducting in-stride breaching of minefields and complex obstacles
- Engine: AGT-1500 turbine engine, 1500 horsepower
- Maximum Speed: 42 miles per hour (Governed)
- Maximum Range: 275 miles
- Dimensions: Length (Gun Forward) 32 feet Width 12 feet
- Combat Weight: 63 tons

Combat Excavator (John Deere 200LC)

- Engine: John Deere 6068 H; 159 horsepower, 6-cylinder diesel
- Transport Length: 31.25 feet
- Transport width: 10.5 feet
- Weight: 49,940 pounds
- Bucket Capacity: 0.52 to 1.43 cubic yards

Grader (CAT 120H)

- Engine: CAT 3126B; 125 to 140 net horsepower 6-cylinder diesel
- Weight: 27,880 pounds
- Blade width: 12 feet

Tractor, Rubber Tired, Articulated Steering, Multipurpose Vehicles (TRAM)

- 4-wheel drive loader
- Engine: John Deere 6076A; 185 horsepower at 2,200 revolutions per minute, 6-cylinder diesel
- Maximum Speed: 26 miles per hour
- Dimensions: Length 27 feet, Width 9 feet
- Weight: 35,000 pounds

<u>D7 Bulldozer</u>

- Primary earthmover for construction of survivability positions and antitank ditches
- Engine: 200 horsepower Cat 3306T diesel
- Speed: 6 miles per hour
- Dimensions: Length 22 feet 9 inches, Width 12 feet
- Weight: 50,000 pounds

<u>Armored Backhoe</u>

- Specifications not found

<u>Extended Boom Forklift</u>

- Four-wheel drive, rubber-tired forklift
- Optimal lifting range of 4,000 to 11,000 pounds
- Maximum Speed: 35 miles per hour
- Maximum Range: 425 miles

Light Capacity Rough Terrain Truck Forklift (LRTF)

- Telescopic boom, 4-wheel drive, crab and circle steering modes
- Engine: B2566 diesel
- Dimensions: Length 19 feet, Width 6.7 feet, Height 7.4 feet
- Weight: 13,450 pounds
- Loads up to 50,070 pounds

Weapons

155-millimeter Howitzer

- Towed artillery piece
- Weight: 15,760 pounds (M-198)
- 4 rounds per minute.
- Firing Range: The maximum range is 18,100 meters when firing standard 95-pound M107 HE and M864 DPICM projectiles, and 30,000 meters when firing 97-pound M549 RAP rounds.

M58 Linear Demolition Charge (LDC)

- System includes the MK 155 MOD 0/1 hydraulically elevated launch rail and container frame mounted to a M353 trailer chassis
- Provides responsive, explosive minefield/obstacle clearing capability
- Clears an 8 meter x 100 meter lane when detonated

Javelin

- "Fire and forget" shoulder fired, antitank missile.
- Disposable launch tube
- Range: 2,000 meters (maximum); 75 meters (minimum)
- Weight: 45.5 pounds (launcher and missile)
- Length: 3.5 feet

Source: www.army.mil 2009.

Rocket Launcher

- Shoulder-Launched Multipurpose Assault Weapon (SMAW)
- Functions to destroy bunkers and other fortifications during assault operations.
- Range: 500 meters (tank sized target); 250 meters (1x2 meter target)
- Weight: 30.5 pounds (ready-to-fire); 16.6 pounds (launcher)
- Length: 54 inches (ready-to-fire); 29.9 inches (launcher)t

TOW Launcher

- Tube-launched, Optically-tracked, Wire command-link guided (TOW)
- Can be mounted on several types of vehicles or tri-pod mounted.
- Disposable launch tube
- Range: 3,750 meters (maximum); 65 meters (minimum)
- Weight: 47.1 pounds (missile); 204.6 pounds (launcher)
- Length: 3.8 feet

Notes: TOW mounted on LAV.

.50 Caliber Machine Gun

- Heavy machine gun
- Can be mounted on several types of vehicles or tri-pod mounted.
- Belt-fed ammunition
- Weight: 83.8 pounds (gun); 127.9 pounds (with tripod)
- Length: 65 inches

M240B Machine Gun

- Medium machine gun
- Can be used by ground forces or mounted on several types of vehicles.
- Fed from disintegrating belts; uses 7.62 millimeter cartridge.
- Weight: 27.6 pounds
- Length: 49 inches

MK-19 Grenade Launcher

- Belt-fed automatic 40 millimeter grenade launcher
- Vehicle or tripod mounted.
- Weight: 72.5 pounds
- Length: 43.1 inches

60 millimeter Mortar (M224)

- Lightweight Mortar
- Smooth bore, muzzle loading, high-angle-of-fire weapon.
- Weight: 46.5 pounds
- Length: 40 inches
- Range: 3,500 meters (maximum effective); 70 meters (minimum)

81 millimeter Mortar (M252)

- Medium weight Mortar
- Smooth bore, muzzle loading, high-angle-of-fire weapon.
- Weight: 91 pounds
- Length: 50 inches
- Range: 5,935 meters (maximum effective); 83 meters (minimum)

120 millimeter Mortar (M120)

- Medium weight Mortar
- Smooth bore, muzzle loading, high-angle-of-fire weapon.
- Weight: 91 pounds
- Length: 50 inches
- Range: 5,935 meters (maximum effective); 83 meters (minimum)

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APPENDIX F
REPRESENTATIVE AMMUNITION IDENTIFICATION AND HAZARD INFORMATION

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This appendix provides representative ammunition identification and hazard information for munitions used for training at Marine Corps Air Ground Combat Center at Twentynine Palms, CA (Combat Center). The exact type, platform, nomenclature (e.g., Cartridges 75 millimeter [mm], 81mm Mortar, 81mm High Explosive [HE] M821), whether the device is dud-producing (yes/no), photograph, description of use, and hazards are listed for each. When an item of ammunition is "fired" and fails to function properly, it is referred to as a "dud." It usually remains on the range where it may be found. A "non-dud producing" item of ammunition, a "No" in the column, either presents no residual explosive hazard – such as a solid rifle projectile, or the procedures for its use cause the operator to resolve any "dud" condition and remove or eliminate any hazard that may be presented. Procedures for use of explosive demolition charges, Bangalore torpedoes, hand grenades, etc., prescribe a process to eliminate the hazard if they fail to function. Live-fire training allows for dud and non-dud producing munitions use in any exclusive military use area. Only non-dud producing munitions would be fired in the Restricted Public Access Areas.

Hazard Information is defined as follows:

Anti-disturbance – Fuze may detonate the item if it detects vibration, movement, etc.

Clockwork/Mechanical Time – Item is functioned by a clock mechanism. If a dud, the clockwork may be jammed. Jarring, striking, or moving the item may start the clock and cause the item to function.

Cocked striker – The item contains a spring loaded firing pin. If a dud, the firing pin may be jammed. Jarring, striking, or moving the item may cause it to function.

Ejection – The item contains a charge that, when functioned, ejects various smaller components from the item case that may cause injury if they strike a person.

Electrical – Item contains a source of electricity.

Electromagnetic Radiation (EMR) – Radio waves, lightning, etc. may cause the item to function.

Fire – Exposure to flame or high heat may cause the propellant or explosive to burn or detonate.

Fragmentation – Functioning of the item produces pieces of metal moving away from the item location at extremely high velocity in all directions, just as fast or "faster than a speeding bullet."

High Explosive (HE) – Item contains a material that may detonate and produce blast overpressure, secondary results of a detonation include intense heat and fragmentation.

High Pressure (Accumulator) – Item contains a pressure vessel that may contain liquid or gas under high pressure.

Impact – Striking the item on or in the vicinity of the primer may cause it to function.

Incendiary – Item contains a material that, if ignited, burns with intense heat and bright flame.

Intense Light – Item is an illumination round, the light from which may cause temporary or permanent eye damage.

Jet – Item contains a shaped charge that forms a "jet" of molten metal when it functions that can travel a significant distance.

Lucky (Piezoelectric) – Fuze of the item contains a crystal that when struck generates an electric charge that functions the item. Jarring, striking, or moving the item may cause the item to function. Changes in temperature can also cause the item to function.

Magnetic – Fuze may detonate the item if movement of magnetic material in the vicinity of the item is detected.

Mechanical – Item contains springs, etc., that are designed to move part of the item. Functioning may result in injury to personnel in close proximity.

Missile – Item contains a "rocket" motor that, if ignited, may project it forward at high velocity.

Movement – Physically moving or striking the item may cause it to function.

Projection – Item contains a motor that, if functioned, may cause it to become a projectile.

Proximity (Variable Time [VT]) – Item fuze includes a sensor designed to detect the ground and detonate the munition a distance above it. In a dud, if the fuze is still functioning, it could detect an approaching animal or person as the ground and detonate the item.

Shock – Dropping or striking the item may cause it to function.

Smoke – Item produces a thick smoke, that may be white or colored, that may result in respiratory issues if inhaled for long periods. It also reduces visibility in the area.

Static – The discharge of static electricity may cause the item to function.

Red Phosphorus (RP) - Item contains white phosphorus that burns with intense heat and bright light when exposed to air (oxygen).

Wait Time – Item remains active for a period of time after it is functioned, usually due to the presence of a battery. Item may function until battery power is interrupted or drained down.

White Phosphorus (WP) – Item contains white phosphorus that burns with intense heat and bright light when exposed to air (oxygen).

Cartridge, 5.56mm

Representative Weapon Platform, Department of Defense Identification Code (DODIC), and Nomenclature:

Platform	*DODIC*	*Nomenclature*
M16A2 Rifle	A059	Cartridge, 5.56mm Ball M855 Clipped
M16A2 Rifle	A063	Cartridge, 5.56mm Tracer M856
SAW	A064	Cartridge, 5.56mm 4 Ball M855/1 Tracer M856 Linked

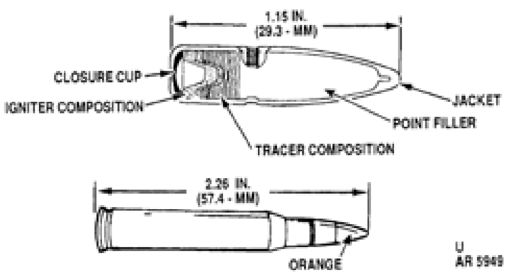
Appearance:

M855 and M856 cartridges linked for use with Squad Automatic Weapon (SAW)

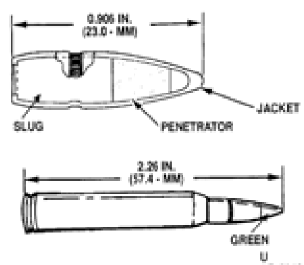
Description:

M855 North Atlantic Treaty Organization (NATO) 5.56mm ball cartridge: While the cartridge was designed to be fired from the newer, heavy barreled M-16A2 assault rifle and M-4 carbine, it may be fired out of older M-16 models without severe degradation of accuracy. The M855 can be identified by its green painted tip.

M856 NATO 5.56mm tracer cartridge: Introduced with the M855, the M856 is the tracer variant of the M855. The M856 can be identified by its orange painted tip.



CARTRIDGE, 5.56MM, TRACER



CARTRIDGE, 5.56MM, BALL, M855

Hazards:

Cartridge, 5.56mm
Fire

Cartridge, 7.62mm

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
M240G Machine Gun	A131	Cartridge, 7.62mm 4 Ball M80/1 Tracer M62 Linked
GAU 2B/A Mini-gun	A165	Cartridge, 7.62mm 4 Ball M80/1 Tracer M62 Linked

Appearance:

M80 7.62MM Ball cartridge

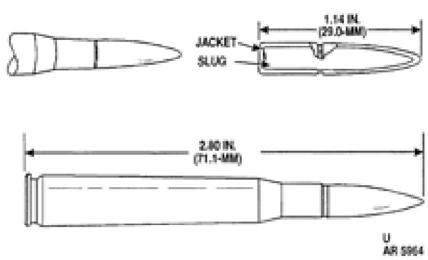
M80 and M62 cartridges linked for use with M240G

Description:

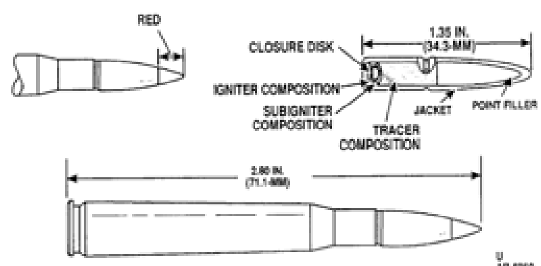
M80 NATO 7.62mm ball cartridge: The M80 is the standard 7.62mm ball cartridge. The M80 can be identified by its unpainted (copper) tip.

M62 NATO 7.62mm ball/tracer cartridge: The M62 is the tracer variant of the M80. It is, in all respects, identical to the M80. The M62 can be identified by its orange painted tip.

The standard ammunition mix for machine gun use (M-60) is four ball (M80) cartridges followed by one tracer (M62). Some mini-gun ammunition is loaded with low light level tracer ammunition.



CARTRIDGE, 7.62MM, BALL, M80



CARTRIDGE, 7.62MM, TRACER, M62

Hazards:

Cartridge, 7.62mm
Fire

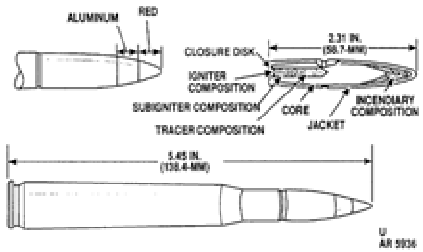
Cartridge, Caliber .50

Representative Weapon Platform, DODIC, and Nomenclature

Platform	*DODIC*	*Nomenclature*
Cal .50 Machine Gun	A557	Cartridge, Caliber .50 4 Ball M2/1 Tracer M10
OH-58 Helicopter	A576	Cartridge, Caliber .50 4 Armor Piercing Incendiary (API)/1 Armor Piercing Incendiary Tracer (API-T) Cartridge Linked

Appearance:

Various .50 Caliber cartridges



Cartridge, Caliber .50 4 Armor Piercing Incendiary

Description:

The caliber .50 cartridge consists of a cartridge case, primer, propelling charge, and the bullet. The term bullet refers only to the small-arms projectile. There are eight types of ammunition issued for use in the caliber .50 machine gun. The tips of the various rounds are color-coded to indicate their type. The ammunition is linked with the M2 or M9 metallic links for use in the machine gun.

Hazards:

Cartridge, Caliber 0.50
Fire

Cartridge, 20mm Aircraft Linked

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft		Cartridge, 20mm Aircraft Linked

Appearance:

Description:

M55A2 ***Target-practice.*** The M55A2 TP ammunition is used for gunnery training and test firing in lieu of the service round. It has a hollow cavity projectile body without a fuze (inert). The nose of the round is constructed of aluminum and is swaged to the projectile body.

M220 ***Target-practice.*** Except for the addition of a tracer element, the M220 TP-T is very similar physically and ballistically to the M55A2. Tracer burnout usually occurs at a range of approximately 1,500 meters (± 100 meters).

M56A3/A4 ***High-explosive incendiary (HEI).*** Functioning with both explosive and incendiary effect, the M56A3/A4 HEI is intended for use against ground targets, including lightly armored vehicles. This thin-walled steel projectile can produce casualties to exposed personnel within a ± 2 meter radius. It has a base plate which prevents ignition of the incendiary mixture by propellant gases. The M56A3/A4 is assembled with a single-action M503A3 point-detonating fuze. The explosive charge is 165 grains (.37 ounces); the incendiary charge is 20 grains. The HE mix and the incendiary mix are combined into one pellet in the A3 HEI. To improve the fire-start capability of the A4, the incendiary pellet is inserted into the projectile and then the HE pellet is added.

M242/M242A1 ***HEI-tracer.*** Except for the addition of a tracer element, the M242/M242A1 HEI-T is basically the same structurally and functionally as the M56A3/A4.

M53 ***Armor-piercing incendiary.*** The M53 API is intended for use against lightly armored targets. It functions with a combined incendiary and has a penetrating effect. The body of the projectile is constructed of solid steel; the nose is constructed of an aluminum alloy. The explosive charge is 65 grains (.14 ounce).

M246/M246A1 ***HEI with tracer and self-destruct feature.*** The M246/M246A1 HEI-T-SD is intended for use against aerial targets. It has an HEI charge, a self-destruct relay charge, and a tracer element. It is assembled with an M503A3 point detonating fuze. The tracer burns for about 5 seconds whereupon the relay charge ignites and detonates the HEI charge low order. If impact with the target occurs before self-destructing, the PD fuze causes the HEI charge to detonate high order. The M246 has the HE and incendiary mix combined as one pellet; the M264A1 has the HE and incendiary charge loaded as separate pellets.

M51A2/XM254 ***Dummy.*** The M51A2 is an inert round of solid metal construction and is used for non-firing system loading and system checkout. The XM254 is constructed of plastic, which reduces wear on gun components

Hazards:

Cartridge, 20mm Aircraft Linked
High Explosive (HE)
Incendiary
Fragmentation
Fire

Cartridge, 25mm Aircraft Linked

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft		Cartridge, 25mm Aircraft Linked

Appearance:

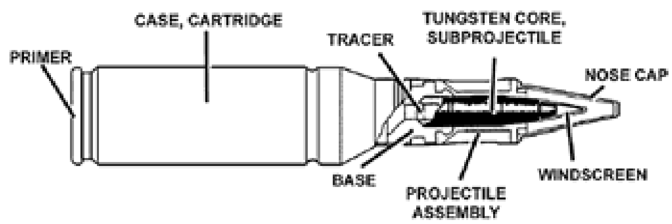


Figure 2-8. M791 APDS-T.

Description:

The 25x137mm caliber/.98425 inch is one of the standard sizes of cannon and autocannon ammunition for NATO forces. The round itself has a length of approximately 223 mm (8.6 inches). The 25mm round can be used in both an anti-materiel and anti-personnel fashion. When operating in an infantry mode, a 25mm weapon armed with HE rounds can effectively kill large numbers of opposing troops either in the open or in light fortifications. When operating in an anti-materiel mode, a 25mm weapon armed with AP rounds can disable many aircraft and vehicles, including some main battle tanks.

The United States (U.S.) military uses 25mm weapons in their AV-8B Harrier, AC-130 gunship, M2 Bradley, LAV-25, F-35 Lightning II, and as a standard ship-based munition in the MK-38 autocannon.

Hazards:

Cartridge, 25mm Aircraft Linked
High Explosive (HE)
Incendiary
Fragmentation
Fire

Cartridge, 25mm

Representative Weapon Platform, DODIC, and Nomenclature:

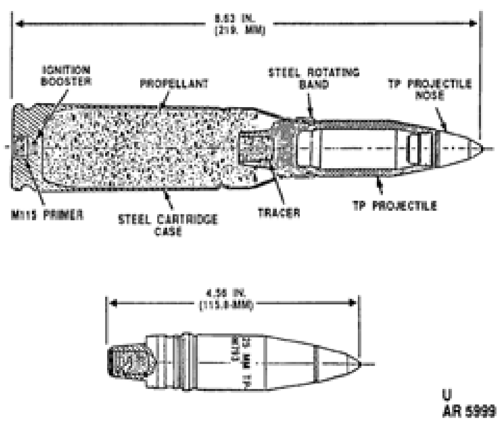
Platform	*DODIC*	*Nomenclature*
Bushmaster Cannon	A976	Cartridge, 25mm Target Practice Tracer (TPT) M793 Linked

Appearance:

CARTRIDGE, 25MM, TARGET PRACTICE-TRACER, M793

Description:

The cartridge case contains an M115 primer. The 25-MM, TP-T, M793 is a spin stabilized target practice round with a tracer. The projectile is blue with white markings. The cartridge case is olive drab with black markings.



Hazards:

Cartridge, 25mm, M793
Smoke/Incendiary
Fire

Cartridge, 40mm

Representative Weapon Platforms, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
M203 Grenade Launcher	B519	Cartridge, 40mm Target Practice (TP) M781
M203 Grenade Launcher	B535	Cartridge, 40mm Illumination White Star Parachute M583
MK-19 Grenade Launcher	B576	Cartridge, 40mm Target Practice (TP) M385A1 Linked

Appearance:

40MM TP M781 and M385A1

Various 40MM Signal and Illumination Cartridges

40MM TP M781 Dud

40MM TP M385 Dud

Description:

The M203 grenade launcher uses several fixed-type, low-velocity 40mm rounds. The M203 fires HE, illuminating, signaling, CS, and training ammunition. All M203 grenade launcher rounds are fixed rounds.

The M781 TP round is blue zinc or aluminum with white markings. It is used for practice and produces a yellow or orange signature on impact.

The M583 illumination round is white with black markings. It is used for illumination and signals and is lighter and more accurate than comparable hand-held signal rounds. The parachute attached to the round deploys upon ejection to lower the candle at 7 feet per second. The candle burns for about 40 seconds.

The MK-19 fires six types of cartridges: M430I/M430A1 HE dual-purpose grenades, M383 HE grenade, M385A1/M918 training practice, and M922/M922A1 dummy rounds. The M385A1 is an inert round with a propellant charge.

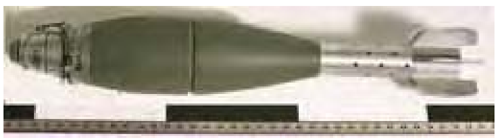
Hazards:

M781 Hazard	*M583 Hazards*	*M385 Hazard*
None	Ejection	None
	Explosive (HE)	
	Fire	
	Smoke/Incendiary	

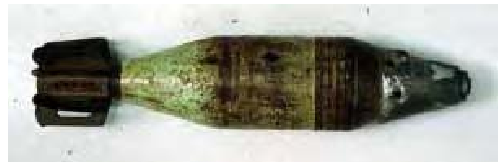
Cartridge, 60mm

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
60mm Mortar	B630	Cartridge, 60mm Smoke WP M302/E1/A1/A2
60mm Mortar	B643	Cartridge, 60mm HE M888
60mm Mortar	B647	Cartridge, 60mm Illumination M721



60MM M888



60MM M302 Dud Round

Expended 60MM M721

Description:

Mortar ammunition is considered semi-fixed because the propelling charge is adjustable. On 60mm rounds, bags of granular or horseshoe-shaped propellant are attached to the fins or boom. All 60mm mortar rounds, except training rounds, have three major components - a fuze, body, and tail fin with propulsion system assembly.

The M302 projectile contains a WP filler to produce screening or spotting smoke. Currently, manufactured projectiles have a light-green body with one yellow band below the gas-check bands; identification markings appear in light red. Projectiles of earlier manufacture have a gray body, with one yellow band and yellow markings. The fins are unpainted aluminum.

The M888 projectile contains a HE charge; the body is painted olive drab green with yellow markings.

The M721 projectile contains a base-ejected, parachute-suspended illuminant charge. The cartridge is painted white, except for the fin assembly which is unpainted aluminum. Nomenclature and manufacturing data are stenciled in black.

Hazards

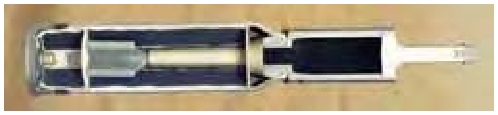
M302 White Phosphorous	*M888 High Explosive*	*M721 Illumination*
Explosive (HE)	EMR	Cocked-Striker
Fragmentation	Explosive (HE)	Ejection
Movement	Fragmentation	Explosive (HE)
White Phosphorus (WP)	Movement	Fire
	Proximity (VT)	Fragmentation
	Static	Smoke/Incendiary

Cartridge, 120mm

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Tank, M1A1 Abrams	C784	Cartridge, 120mm Target Practice Tracer (TPT) M831.A1/E2
Tank, M1A1 Abrams	C785	Cartridge, 120mm Target Practice Cone Stabilized Discarding SABOT (TPCSDS) M865

Appearance:



M831 TP-T

M865 TPCSDS

Description:

The M831A1 is an Army TP-T projectile fired from smoothbore guns. The M831A1 projectile is similar in appearance to the M831 projectile except for the fins being replaced by a stabilizer. The M831 and M831A1 are electrically-primed cartridges containing TP-T projectiles. The fin and boom on the M831 have been replaced by a stabilizer with six equally spaced slots on the M831A1, which spins the projectile in flight. The TP-T projectiles do not contain main charge explosives or fuzing. The projectile is painted blue with nomenclature markings in white. The M831A1 has three forward-pointing arrows stamped 120 degrees apart in the spike and four forward-pointing arrows stenciled 90 degrees apart on the white obturator band. The M831A1 bourrelet is not segmented.

The 120mm M865 Target Practice, Cone Stabilized, Discarding Sabot - Tracer (TPCSDS-T) cartridge may be found in the field with either the cone with holes or slotted cone. This is a gun fired, target practice projectile. The projectile is painted blue with white markings. The cone is unpainted. The sabot is aluminum and the core (penetrator) is steel.

Hazards:

M831 TP-T	*M865 TPCSDS-T*
Smoke/Incendiary	Smoke/Incendiary

Cartridge, 81mm

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
81mm Mortar	C868	Cartridge, 81mm HE M821
81mm Mortar	C870	Cartridge, 81mm Smoke RP M819
81mm Mortar	C871	Cartridge, 81mm Illumination M853/A1

Appearance:

81MM HE Dud Round

M821 HE

M819 RP

M853 Illum

Description:

The M821A2 and M821A1 HE Cartridges are designed for use with the M252 81mm Mortar System and are used against personnel, bunker, and light materiel targets. The high fragmentation steel projectile is loaded with Composition B explosive. The bodies are painted olive drab with yellow markings.

The M819 is a fin-stabilized, base-ejecting, mortar-fired projectile used to provide screening smoke. The body and tail cone are painted light green. The body has a stenciled brown band and black markings. The boom and fins are unpainted aluminum.

The M853 is a fin-stabilized projectile containing a base-ejected, parachute-suspended illuminating charge. The body and tail cone are painted white. The ignition cartridge housing and fins are unpainted aluminum. Nomenclature, lot number, and date of manufacture are stenciled in black. A warning notice appears in red on the body of the projectile.

Hazards:

M819 Smoke RP	*M821 HE*	*M853 Illumination*
Cocked-Striker	Electromagnetic Radiation (EMR)	Cocked-Striker
Ejection	Explosive (HE)	Ejection
Explosive (HE)	Fragmentation	Explosive (HE)
Fragmentation	Movement	Fire
Smoke/Incendiary	Proximity (VT)	Fragmentation
	Static Electricity	Smoke/Incendiary

Cartridge and Launcher, 84mm M136 AT4

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Marine	C995	Cartridge and Launcher, 84mm M136 AT4

Appearance:

84MM M136 Rocket

Description:

The M136 AT4 is a recoilless rifle used primarily by Infantry Forces for engagement and defeat of light armor. The recoilless rifle design permits accurate delivery of an 84mm HE Anti-Armor (HEAA) warhead, with negligible recoil. The M136 AT4 is a lightweight, self-contained, anti-armor weapon consisting of a free-flight, fin-stabilized, rocket-type cartridge packed in an expendable, one-piece, fiberglass-wrapped tube. The M136 AT4 is man-portable and is fired from the right shoulder only.

Hazards:

M136 AT4
Explosive (HE)
Fragmentation
Jet (HEAT or Shaped Charge)
Lucky (Piezoelectric)
Movement

Projectile, 155 mm

Representative Weapon Platform, DODIC, and Nomenclature:

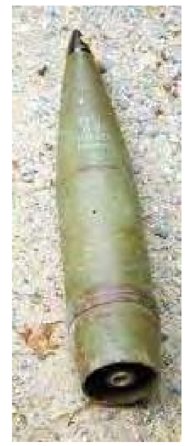
Platform	*DODIC*	*Nomenclature*
155mm Howitzer	D505	Projectile, 155mm Illumination M485 Illumination
155mm Howitzer	D528	Projectile, 155mm Smoke WP M825 Series
155mm Howitzer	D544	Projectile, 155mm HE M107 (Composition B))
155mm Howitzer	D579	Projectile, 155mm High-Explosive Rocket-Assisted (HERA) M549A1 (trinitrotoluene [TNT])

Appearance:

Projectile, Illum M485


Projectile, WP M825

Projectile, HE M107


Projectile, HERA M549A1

Description:

The 155mm diameter projectiles offer a wide range of options for battlefield usage. Separate loading ammunition is used in 155mm howitzers. Separate loading ammunition has four separate components: primer, propellant, projectile, and fuze. The four components are issued separately. Upon preparation for firing, the fuze is threaded into the projectile, and the projectile and propellant are loaded into the howitzer in two separate operations.

The M485 projectile contains a parachute-suspended illuminating candle. The projectiles are painted olive drab with white markings. They may have one white band depending upon when they were manufactured.

The M825 series consists of WP smoke projectiles. The projectile and canister are painted light green with markings stenciled in red. The projectile has a yellow band around the ogive.

The M107 is a HE projectile painted olive drab with yellow markings.

The M549A1 is a high-explosive rocket-assisted (HERA) projectile used in howitzers to provide extended-range artillery fire. The projectile is painted olive drab with yellow stenciling. The rotating band and white plastic obturator are unpainted.

Hazards:

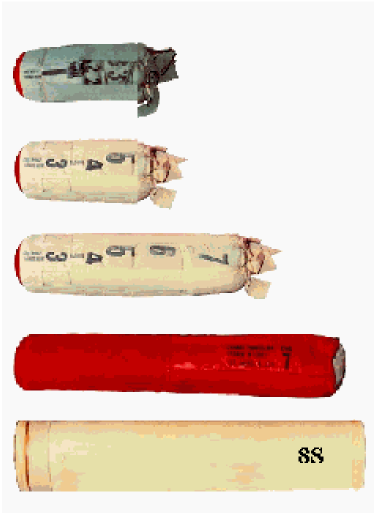
M485 Illumination	*M825 WP*	*M107 HE*	*M549A1 HERA*
Cocked-Striker	Clockwork/Mechanical Time	Cocked-Striker	Cocked-Striker
Ejection	Cocked-Striker	EMR	EMR
Explosive (HE)	Explosive (HE)	Explosive (HE)	Explosive (HE)
Fire	Fragmentation	Fragmentation	Fragmentation
Fragmentation	Movement	Movement	Movement
Intense Light	White Phosphorus (WP)	Static	Proximity (VT)
Smoke/Incendiary			Static

Charge, Propellant 155 mm

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
155mm Howitzer	D540	Charge, Propelling 155mm Green Bag M3A1
155mm Howitzer	D532	Charge, Propelling 155mm Red Bag M203 Series
155mm Howitzer	D533	Charge, Propelling 155mm White Bag M119 w/o Primer
155mm Howitzer	D541	Charge, Propelling 155mm White Bag M4 Series

Appearance:



Green Bag, M3A1 (Top Two)

White Bag, M4A2 (Third from Top)

Charge 7RB, M119A2 Red Bag (Fourth from Top)

M203 (Bottom)

Description:

Separate loading ammunition is used in 155mm howitzers. Separate loading ammunition has four separate components: primer, propellant, projectile, and fuze. The four components are issued separately. Upon preparation for firing, the projectile and propellant are loaded into the howitzer in two separate operations. Separate loading ammunition propellants are issued as a separate unit of issue in sealed canisters to protect the propellant. The amount of propellant to be fired with artillery ammunition is varied by the number of propellant increments. The charge selected is based on the range to the target and the tactical situation.

Green Bag, M3A1, propellant is designed for firing charges 1 through 5. The propellant is fastened together with four cloth straps sewn to the base and hand tied on top of increment 5. The igniter pad (3.5 ounce CBI) is located on the base increment. The entire M3A1 propellant contains approximately 5.5 pounds of single perforated neutral burning powder. There are flash reducers containing potassium sulfate or potassium nitrate sewn forward of charges 1 (2 ounce pad), 4 and 5 (1 ounce pad each). The flash reducers limit breech flare back, muzzle flash, and blast over-pressure.

White Bag, M4A2 propellant is designed for charges 3 through 7. Their basic configuration is the same as Green Bag propellant. The M4A2 contains approximately 13 pounds of multi-perforated (Progressive burn) propellant. A flash reducer pad containing 1 ounce of potassium nitrate or potassium sulfate is sewn to the base increment.

Charge 8WB, M119 - This single increment, multi-perforated, white bag charge with a perforated igniter core tube extending through the center of the propellant with a flash reducer sewn to the forward end. It can only be used in the long tube 155mm howitzers (M19 series and the M198). Store horizontally due to the central, perforated igniter core tube. Cannot fire rocket-assisted projectiles using M119 due to the design of the flash reducer.

Charge 8WB, M119A1, is exactly the same as the M119 except for the donut-shaped flash reducer sewn to the forward end. This design of the flash reducer precludes ignition of the rocket motor for Rocket Assisted Projectile (RAP).

Charge 7RB, M119A2, is a single increment 7 red bag charge for firing in 155mm howitzers that have the M185 and M199 cannon tubes. The forward end of the charge has a 3-ounce lead foil liner and four pockets sewn longitudinally to the circumference. Each of the four pockets contains 4 ounces of potassium sulfate to act as a flash reducer. Charge 7RB can be used interchangeably with charge 8WB with a minor difference in muzzle velocity. The M119A2 was created to correspond with existing North American Treaty Organization (NATO) firing tables.

M203 propellant is a zone 8S charge designed to provide extended range for the M198, M19A5/A6 howitzers. The M203 propellant charge is a single increment, red bag charge with a central igniter core extending through its entire length and a donut-shaped flash reducer at the forward end of the charge. The M203 is used only with the M549A1 (TNT loaded) RAP, the M825 felt wedge, and the M864 base bleed projectiles.

M203A1 Propellant also a single increment base ignited charge. The outer casing is a solid combustible material. There is still an igniter pad at the base of the propellant, and it contains .7 ounces of black powder and 1 ounce of CBI. The propellant is not made up of granules; it consists of 28 pounds of slotted, stick propellant. The M203A1 charge is fired only with the M549A1 (TNT loaded), RAP, M825 felt wedge, and M864 projectiles in the M198 and M109A5/6 howitzers. The reasons for design of the M203A1 propelling charge are: 1) cooler burning, less flash, blast, and tube wear. 2) Casing form is more durable causing for less igniter core damage. 3) For automatic loading systems, it allows fewer mechanical problems.

Hazards:

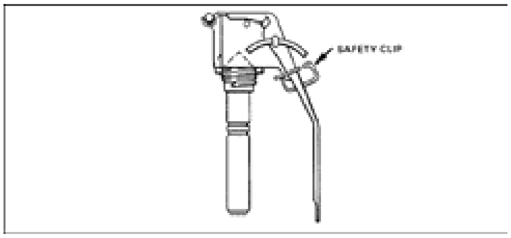
M3A1 Green Bag	*M203 Red Bag*	*M119 White Bag*	*M4 White Bag*
Static Electricity	Static Electricity	Static Electricity	Static Electricity
Fire	Fire	Fire	Fire

Fuze, Hand Grenade

Representative Weapon Platform, DODIC, and Nomenclature

Platform	*DODIC*	*Nomenclature*
Individual Marine	G878	Fuze, Hand Grenade M228

Appearance:



Description:

Detonating fuzes explode within the grenade body to initiate the main explosion of the filler substance. Detonating fuzes include the M213 and M228.

Hazards:

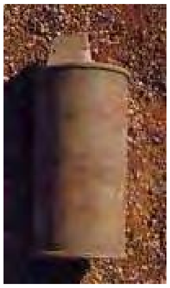
Fuze, Hand Grenade
Cocked Striker
Explosive (HE)
Fragmentation
Fire

Grenades, Smoke

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Individual Marine	G930	Grenade, Hand Smoke HC AN-M8
Individual Marine	G940	Grenade, Hand Smoke Green M18
Individual Marine	G945	Grenade, Hand Smoke Yellow M18

Appearance:



AN-M8 HC Smoke M18 Green/Yellow Smoke

Description:

The AN-M8 is a hand-thrown, burning, HC-smoke grenade which may also be launched by ground or airborne grenade launchers.

The M18 is a hand-thrown, smoke grenade which emits red, yellow, or violet smoke for 50 to 90 seconds. The M18 may also emit green smoke. These grenades use a pyrotechnic, delay-igniting fuze which provides an approximate 2-second delay.

Hazards:

AN-M8 HC Smoke	*M18 colored Smoke*
Cocked-Striker	Cocked-Striker
Explosive (HE)	Explosive (HE)
Fire	Fragmentation
Fragmentation	Smoke/Incendiary
Smoke/Incendiary	Fire

Shoulder Launched Multi-Purpose Assault Weapon (SMAW)

Representative Weapon Platforms, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Individual Marine	HX05	Rocket, Assault 83mm MK-1 High Explosive SMAW
Individual Marine	HX07	Rocket, Assault 83mm MK-8 HEAA SMAW

Appearance

MK-1 HE SMAW

MK-8 HEAA SMAW Dud

Description:

This is a folding-fin HEAA surface-to-surface rocket and launcher. The tactical rocket uses an MK-259 Mod 0 impact fuze. The tactical rocket has a black rocket motor with an off-white fiberglass exhaust cone, a black warhead with markings stenciled in yellow, a gold-colored target sensor, and unpainted aluminum fins. The practice rocket has a black rocket motor with an off-white fiberglass exhaust cone, a light-blue plastic warhead, and unpainted aluminum fins. The rocket case is olive drab with manufacturing data and other markings stenciled in yellow. The encased tactical round, the MK-6 Mod 0, is encircled by three 38-millimeter (1.50-inch) bands, one black and one yellow at the front of the case, and a brown one at the rear.

There are two training configurations, a practice rocket, and a trainer. The practice rocket is identical to the tactical rocket, except for an inert warhead. The rocket is black; the rocket case, olive drab with yellow markings and manufacturing data, and a 38-millimeter (1.50-inch) yellow band.

Hazards:

MK-1	*MK-8*
Explosive (HE)	Explosive (HE)
Fragmentation	Fragmentation
Missile	Jet (HEAT or Shaped Charge)

Mine Clearing Line Charge (MICLIC) Rocket Motor and Line Charge

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
MICLIC	J143	Rocket Motor, 5 inch MK22-2/3/4
MICLIC	M913	Charge, Demolition, HE Linear M58

Appearance:

MK22 Rocket Motor and M58 Line Charge on Launch Platform

Charge, Demolition, HE Linear M58 Showing Blocks of C4 Explosive

Rocket Motor, 5 inch MK22-2/3/4 for Linear Demolition Charge

Description:

MK-22 Rocket Motor: Major internal components for both rocket motors include a star-perforation propellant grain, a salt sleeve, an igniter, and a nose plug. The rocket motors main features consist of the rocket motor tube, cable guide, front closure, nose plug, lockpin, towing bridle assembly, and two button-lug bands. The MK-22-series rocket motors are painted gray and have a brown band around the forward end. Markings are stenciled in black.

M58 Line Charge: These are rocket-projected explosive line charges used to breach anti-tank and/or anti-personnel minefields or other obstacles to provide a path for tanks, vehicles, and personnel. The service line charges use the M1134-series fuzes. The rocket motors and line charges are electrically initiated.

Hazards:

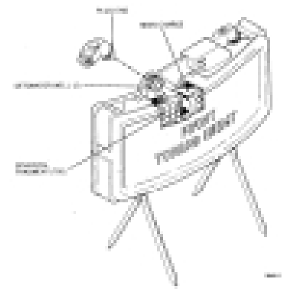
MK-22 Rocket Motor	*M58 Line Charge*
Ejection	Explosive (HE)
EMR	
Explosive (HE)	

M18A1 Claymore Mine

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Individual Marine	K143	Mine, Anti-personnel M18A1 w/ Firing Device (Claymore)

Appearance:



Description:

The M18A1 is a directional fragmentation mine, widely copied by other nations. The inert practice version of the mine is designated M68. The plastic body encloses 700 steel ball bearings embedded in a plastic matrix; these fragments are backed by plastic explosive. The fragmentation face is convex horizontally to direct the fragments and concave vertically to control vertical dispersion. The M18A1 mine is olive drab with raised lettering on the front and black markings on the rear.

Hazards:

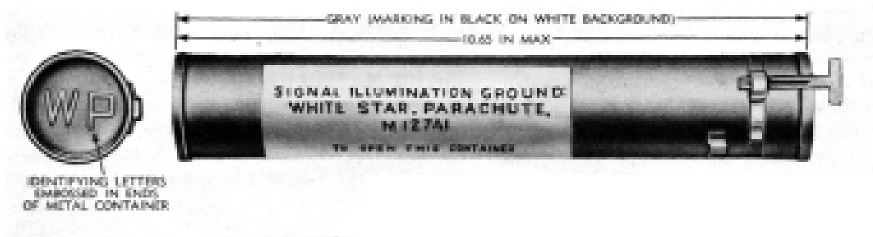
M18A1 Claymore Mine
Explosive (HE)
Frag

Signal Flares and Smoke

Representative Weapon Platforms, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Individual Marine	L312	Signal Illumination White Star Parachute M127/A1
Individual Marine	L314	Signal Illumination Green Star Cluster M125/A1/E1
Individual Marine	L324	Signal, Smoke Green Parachute M128A1

Appearance:



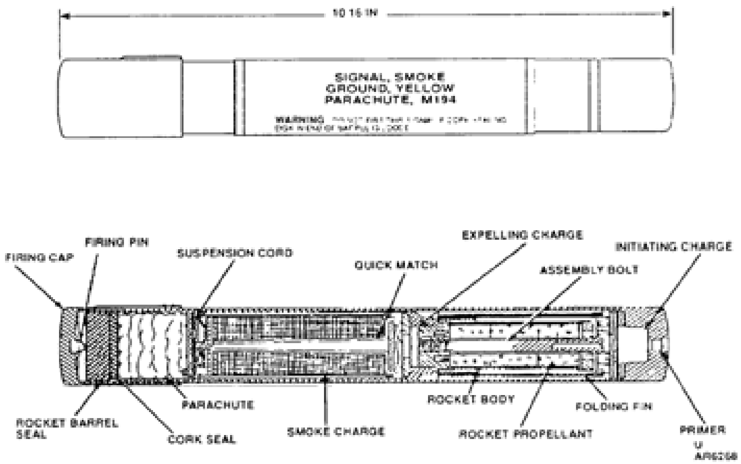
M127 Series Signal Flare

Description:

The M127 signal is rocket propelled and fin stabilized. The expendable type launcher is integral with the signal and hence for firing does not require a grenade launcher attached to a rifle firing a special cartridge. It produces a white or red star.

The M125 series signals are made of cardboard and contain a small black powder charge to eject the star cluster flare.

The M128 series parachute smoke signal consists of a parachute suspended smoke composition element and a rocket motor propulsion assembly enclosed in a hand-held aluminum launching tube. The base of the tube contains a primer and an initiating charge.



Typical Signal, Smoke Ground, Parachute Diagram

Hazards:

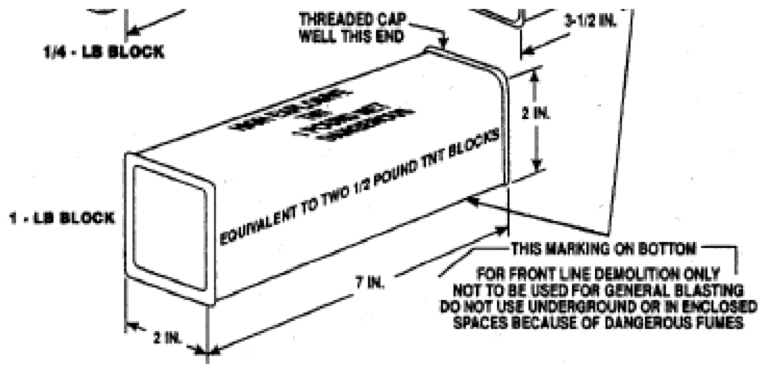
M127 Series	*M125 Series*	*M128 Series*
Fire	Ejection	Fire
Smoke/Incendiary	Smoke/Incendiary	Smoke/Incendiary

Demolition Charges

Representative Weapon Platform, DODIC, and Nomenclature:

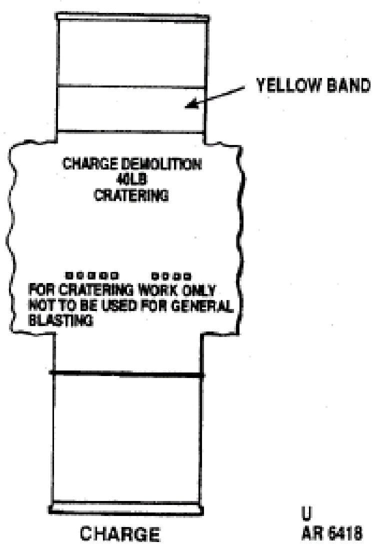
Platform	*DODIC*	*Nomenclature*
Individual Marine	M032	Charge, Demolition Charge 1 pound TNT
Individual Marine	M039	Charge, Demolition Cratering 40 pound
Individual Marine	M421	Charge, Demolition Shaped M3 Series 40 pound
Individual Marine	ML25	Charge, Demolition Flex Linear M59 Series c-4

Appearance:

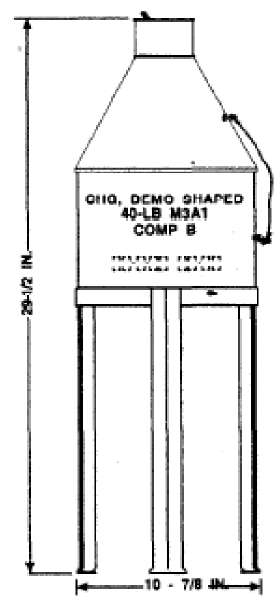


TNT 1 pound Charge

TNT Block Demolition Charges



40 pound Cratering Charge



40 pound Shaped Charge

Flexible Linear Shape Charge Samples

Description:

TNT block demolition charges are issued in three sizes. The 1/4-pound block demolition charge is in a cylindrical waterproof cardboard container, and the 1/2-pound and 1-pound block demolition charges are in rectangular waterproof cardboard containers. All three have metal ends with a threaded cap well in one end.

The 40-pound cratering demolition charges are watertight cylindrical metal containers with approximately 39 pounds of H-6 explosive. A semicircular angle is located on the top of the container for handling the charge or lowering it into a hole.

Shaped demolition charges used in military demolition operations are tapered top cylindrical blocks of HEs having a lined, conical cavity in one end which directs the cone liner material into a narrow jet for penetrating metal, concrete, earth, or other materials. A carrying handle is attached to each charge.

Hazards:

1 pound Charge Hazards	*40 pound Cratering Charge Hazards*	*40 pound Shaped Charge Hazards*	*Flex Linear Shaped Charges*
Explosive (HE)	Explosive (HE)	Explosive (HE)	Explosive (HE)
		Jet (Shaped Charge)	

MK7 Anti-Personnel Obstacle Breaching Systems (APOBS)

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Individual Marine	MN79	Demolition Kit, Breaching System, Anti-Personnel Obstacle Breaching System (APOBS)

Appearance:

Description:

The APOBS is an explosive line charge system that allows safe breaching through complex anti-personnel obstacles. The APOBS is used to conduct deliberate or hasty breaches through enemy anti-personnel minefields and multi-strand wire obstacles. It is light enough to be carried by two soldiers with backpacks and can be deployed within 30 to 120 seconds.

The APOBS is made up of a front and rear backpack subsystem containing grenade-filled, line-charge segments; a detonation cord to ignite the grenades; a drogue parachute that provides stability during flight; and two quick connectors. Additionally, a rocket-motor assembly provides Marines the option to initiate the APOBS in delay or command modes.

Once set in place, the APOBS rocket is fired from a 35-meter standoff position, sending the line charge with fragmentation grenades over the minefield and/or wire obstacle. The grenades neutralize or clear the mines and sever the wire, effectively clearing a footpath for troops up to 45 meters in length.

As a certified insensitive munition, APOBS is safe to employ and transport.

Hazards:

MK7 APOBS
Explosive (HE)
Fragmentation
Projection

Demolition Kits and Assemblies

Representative Weapon Platform, DODIC, and Nomenclature:

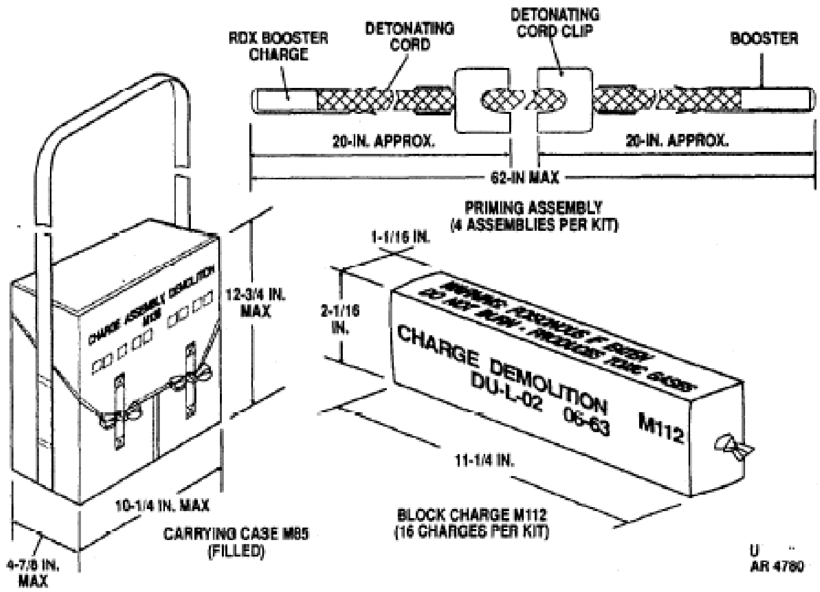
Platform	*DODIC*	*Nomenclature*
Individual Marine	M028	Demolition Kit, Bangalore Torpedo M1A2
Individual Marine	M757	Charge, Assembly Demolition Kit M183 C-4 16 x 1 1/4 pound

Appearance:

Bangalore Torpedo

Bangalore Torpedo Sections

Bangalore Torpedo Being Emplaced



Charge, Demolition Assembly M183

Description

The M1A1 Bangalore Torpedo is an anti-personnel mine clearing charge dating back to World War II. It clears a footpath 0.6 meters wide. Each Bangalore section weighs 13 pounds, including 9 pounds of explosive. The Bangalore kit consists of ten 5-foot sections.

The M183 demolition kit consists of 16 block demolition charges M112, four priming assemblies, and carrying case M85. The demolition charge M112 is a rectangular block of Comp C4 approximately 2 inches by 1-1/2 inches and 11 inches long, weighing 1-1/4 pounds.

Hazards:

M1A1 Bangalore Torpedo	*M183 Charge, Demolition Assembly*
Explosive (HE)	Explosive (HE)
Fragmentation	

Initiating and Priming Devices

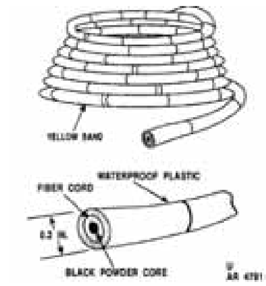
Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Marine	M130	Cap, Blasting Electric Special M6
Marine	M131	Cap, Blasting Non-Electric Special M7
Marine	M670	Fuse, Blasting Time M700
Marine	M766	Igniter, Time Blasting Fuse M2/M60
Marine	M456	Cord, Detonating Pentaerythritol tetranitrate (PETN)

Appearance:

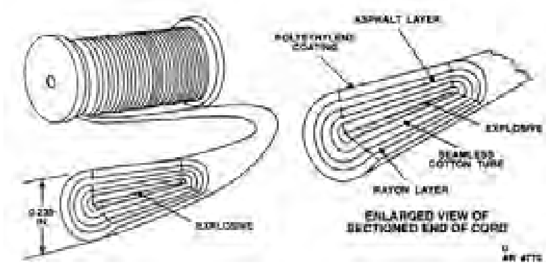
M6 Electric Blasting Cap

Non-Electric Blasting Caps



Time Fuse

Igniter, Time Fuse



Detonating Cord

Description:

Blasting Cap M6 consists of a base charge of Cyclotrimethylenetrinitramine (RDX). Two 12-foot lead wires, connected by a bridge wire in the ignition charge, extend through a rubber (or rubber and sulfur) plug assembly in the open end of the cup. Two circumferential crimps secure the plug assembly in the cup.

The non-electric blasting cap consists of an aluminum alloy cup containing an ignition charge of lead styphnate and a base charge of RDX. The flared end facilitates insertion of time-blasting fuse or detonating cord.

Time fuse is olive drab with a yellow single band 1/4 inches wide every 18 inches and a double yellow band every 90 inches.

The igniter consists of three major assemblies: a firing mechanism, a fuse holder, and a primer base.

Detonating cord generally consists of a core of high velocity explosive in a seamless textile tube. The tube is covered with a thin layer of asphalt and sheathed in an outer cover of plastic coated textile. The plastic outer cover is smooth and colored olive drab.

Hazards:

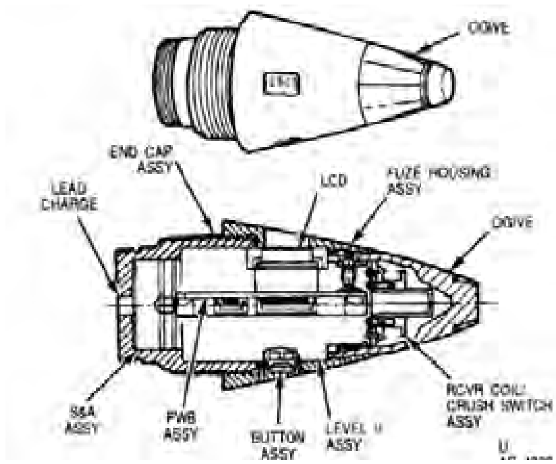
M6 Hazards	*M7 Hazards*	*M700 Hazard*	*M60 Hazard*	*Detonating Cord Hazards*
Shock	EMR	None	None	Shock
Fragmentation	Fragmentation			Explosive (HE)
Explosive (HE)	Explosive (HE)			

Fuzes and Primers

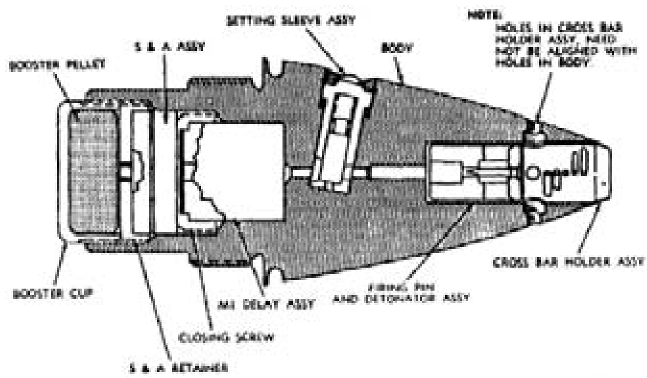
Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
155mm Howitzer	N289	Fuze, Electronic Time M762
155mm Howitzer	N340	Fuze, Point Detonating M739/A1
155mm Howitzer	N523	Primer, Percussion M82

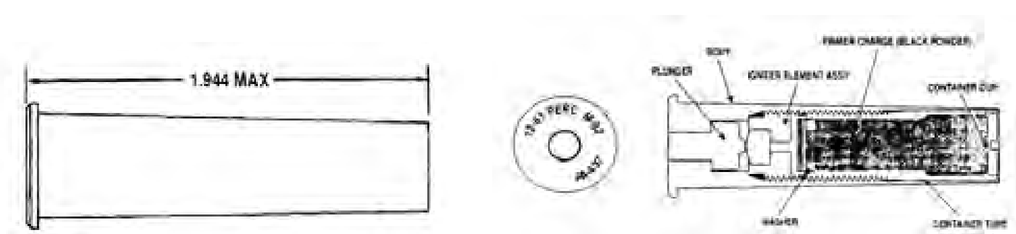
Appearance:



M762 Electrical Time Fuze



M739 Point Detonating Fuze



Primer, Percussion M82

Description:

If the M762 fuze fails in the time mode or impacts before a time setting expires, there is no true PD back-up; however, the round may or may not function on ground impact.

The M739 series fuzes are the latest improved version of the selective impact fuzes. The fuze body is a one-piece design of solid aluminum and has a standard 2-inch threaded base to match projectile nose and fuze cavity.

The primer consists of a cylindrical brass case with an extraction flange which contains a plunger in the base, an ignition element, and a container loaded with 22 grains of black powder

Hazards:

M762 Electronic Time Fuze	*M739 Point Detonating Fuze*	*M82 Percussion Primer*
High Explosive (HE)	High Explosive (HE)	Low Explosive
Fragmentation	Fragmentation	Fragmentation
		Impact
		Fire

Guided Missiles

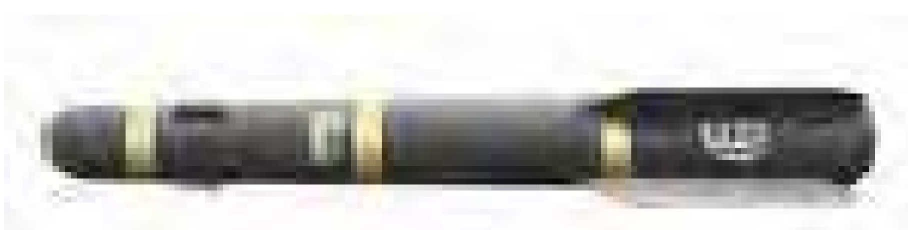
Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
TOW Launcher	PB99	Guided Missile, Practice BTM-71A-3 Basic Extended Tube-launched, Optically tracked, Wire-guided (TOW)
Aircraft TOW Launcher	WF10	Guided Missile, Surface Attack Ballistic Guided Missile (BGM)-71D-5 TOW
Aircraft	PB69	Guided Missile, Surface Attack Air-to-Ground Guided Missile (AGM)-65D Maverick
Aircraft	PA79	Guided Missile, Surface Attack AGM-114A Hellfire

Appearance:

TOW Missile

Maverick Missile



Hellfire Missile

Hellfire Missile

Description:

TOW tactical missiles are unpainted and have a silver-anodized electronics section, a black-anodized ogive, a black anodized warhead section, a black flight rocket motor section, and a gold anodized aft body section. Markings on all missiles are black or yellow. The ogive and warhead section of the practice missile are painted blue.

Except for an unpainted seeker window and nose dome cover, the Maverick missile is painted olive drab. A black band, with COMP B stenciled in yellow, encircles the forward body section, and a brown band encircles the aft body section. Other markings are stenciled in black.

The AGM-114 Hellfire is a multi-platform, multi-target United States designed modular missile system. The name comes from its original intention as a helicopter-launched fire-and-forget weapon (*HELicopter Launched FIRE-and-forget*). Initial problems with the TV-based guidance system forced designers to consider a laser guidance system. The Hellfire today is a comprehensive weapon system, one that can be deployed from rotary- and fixed-wing aircraft, naval assets, and land-based systems against a variety of targets.

Hazards:

TOW	*Maverick*	*Hellfire*
EMR	Explosive (HE)	EMR
Explosive (HE)	Frag	Explosive (HE)
Frag	Jet (HEAT or Shaped Charge)	Frag
High Pressure (Accumulator)		
Mechanical		
Movement		

Bombs, General Purpose and Practice

Representative Weapon Platform, DODIC, and Nomenclature:

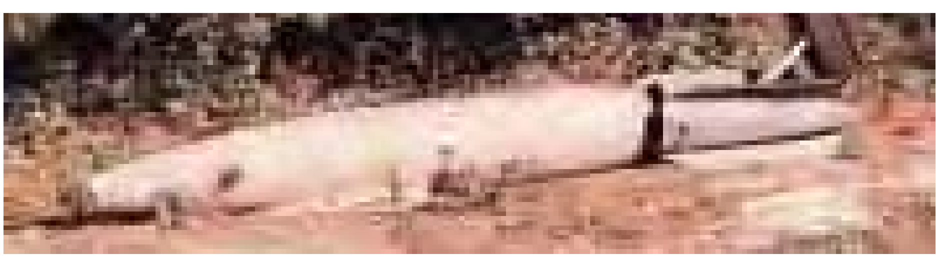
Platform	*DODIC*	*Nomenclature*
Air		Bomb, General Purpose MK-76 25 pound Inert
Air		Bomb, General Purpose MK-82 500 pound HE
Air		Bomb, General Purpose MK-83 1,000 pound Inert
Air		Bomb, General Purpose MK-84 2,000 l pound HE

Appearance:

MK-76 Practice Bomb

MK-82 500 pound General Purpose Bomb

MK-83 1,000 pound General Purpose Bomb



MK-84 2,000 pound General Purpose Bomb

Description:

The MK-76-series bombs are painted black or blue. The MK-76 Mods 1, 2, 3, 4, and some Mod 5 bombs have a 0.25-inch (6-millimeter) white stripe over the index holes.

The MK-82, MK-83 and MK-84 bombs are painted olive drab and have a yellow band 3 inches wide around the nose and tail or around the nose only. Thermally insulated bombs have two yellow bands each 3 inches wide around the nose. Yellow lettering is stenciled around the body near the nose. The MK-82 is just over 5 feet long, the MK-83 is just over 6 feet long, and the MK-84 is just over 8 feet long.

Hazards:

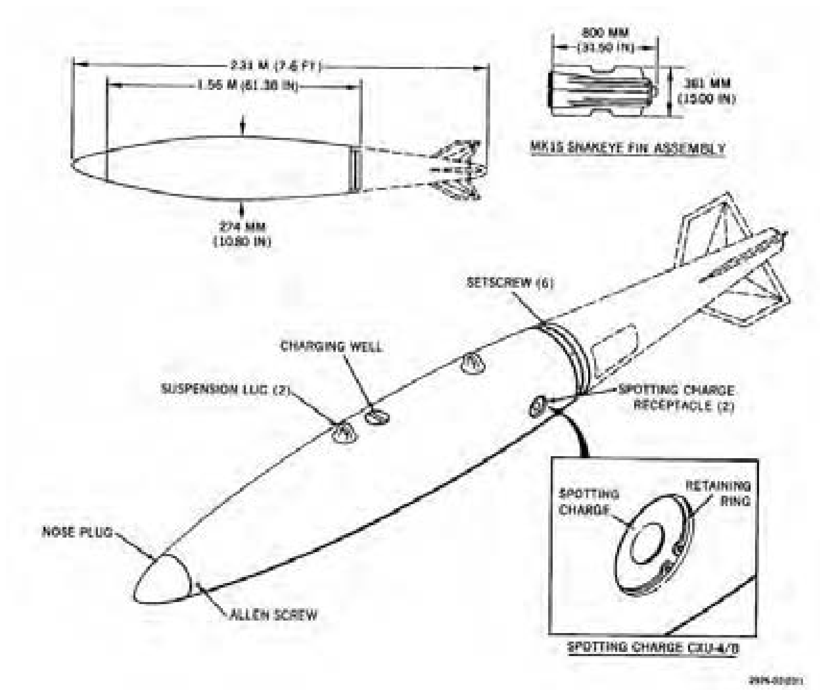
MK-76 Practice	*MK-82 500 pound*	*MK-83 1,000 pound Bomb*	*MK-84 2,000 pound Bomb*
Red Phosphorus (RP)	Antidisturbance	Antidisturbance	Antidisturbance
Smoke/Incendiary	Clockwork/Mechanical Time	Clockwork/Mechanical Time	Clockwork/Mechanical Time
	Cocked-Striker	Cocked-Striker	Cocked-Striker
	Ejection	Ejection	Ejection
	EMR	EMR	EMR
	Explosive (HE)	Explosive (HE)	Explosive (HE)
	Fragmentation	Fragmentation	Fragmentation
	Magnetic	Magnetic	Magnetic
	Movement	Movement	Movement
	Proximity (VT)	Proximity (VT)	Proximity (VT)

Bomb, Practice Inert Bomb Dummy Unit (BDU)-45

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft		Bomb, Practice Inert BDU-45

Appearance:



Description:

The BDU-45 is a 500 pound Navy practice bomb.

Hazards:

BDU-45 Practice Bomb
Low Explosive
Fragmentation
Fire

2.75-inch Aerial Rockets

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	HA12	Rocket, 2.75 inch HE M151
Aircraft	H116	Rocket, 2.75 inch WP M259
Aircraft	H184	Rocket, 2.75 in RP M264

Appearance:

Dud 2.75-inch Rocket Warhead

2.75-inch HE Rocket Complete

Description"

The HE warhead is olive drab with yellow markings. Designation and other information are stenciled in yellow.

The nose of both the M259 and M264 is light brown, and the body is light green with a yellow color band. The designation and other information are stenciled in red. The canister is unpainted, pre-scored aluminum, with nomenclature and lot number stenciled in red.

Hazards:

M151	*M259*	*M264*
Explosive (HE)	Cocked-Striker	Clockwork/Mechanical
Frag	Ejection	Time
Movement	Explosive (HE)	Ejection
	Frag	Electrical
	Smoke/Incendiary	Explosive (HE)
	White Phosphorus (WP)	Red Phosphorus (RP)
		Smoke/Incendiary
		Wait Time

Rocket, 5-inch ZUNI

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft		Rocket, 5 inch Zuni High Explosive (HE)
Aircraft		Rocket, 5 inch Zuni WP
Air		Rocket, 5 inch Zuni Illumination

Appearance:

Zuni MK-16

LAU-10C/B or -10D/B (exact model unknown)

Description:

MK-16 Zuni Folding-Fin Aircraft Rocket (FFAR)

The Zuni 5-inch FFAR was designed as a modular system, and allows the use of different types of warhead and fuze. Options included general-purpose and shaped-charged warheads, point-detonation, delayed-action and proximity fuzes. The latter option was intended for air-to-air application, but Zuni was almost exclusively used as an air-to-ground weapon. For a list of current warheads, see section on the MK-71 motor below. The rocket is deployed primarily in four-tube pods of the LAU-10/A series. The exact length and weight of the Zuni depends on the warhead, but typical values are 2.79 meters (110 inches) and 48.5 kilograms (107 pounds), respectively.

Designation Note: No formal designations are allocated to all-up 5-inch Zuni rockets. Instead, the rocket type is generally identified by the designation of the motor assembly, which is the main body of the rocket and includes nozzle and fins. The original production Zuni motor is designated MK-16, and the ultimate variant is the MK-16 MOD 3. The various warheads are typically usable with all available motors, and are presumably often fitted to the rockets in the field only briefly before actual use. Therefore, it was apparently deemed unnecessary to assign MK/MOD designations to every specific combination of rocket and payload. In fact, the original edition of the current designation system for rockets and missiles explicitly excluded unguided line-of-sight rockets from the system.

MK-71 Zuni

The current 5-inch Zuni rockets use the MK-71 motor. It uses a smokeless propellant and has a completely new nozzle/fin assembly. The latter has four wrap-around type fins, and therefore the MK-71 is sometimes called a Wrap-Around Fin Aerial Rocket (WAFAR) instead of an FFAR. The actual diameter of the MK-71 is quoted as 130 millimeters (5.12 inches). The MK-71 MOD 0 began to replace the MK-16 in June 1971, but was soon superseded by the MK-71 MOD 1, which entered full production in September 1973. The MK-71 MOD 1 is the only Zuni motor currently in use, and is a Hazards of Electromagnetic Radiation to Ordnance (HERO) safe modification of the MOD 0. The MK-71 rockets are fired from LAU-10C/A and LAU-10D/A 4-tube pods, the earlier launcher versions (through LAU-10B/A) being incompatible with the new motor. The LAU-10C/A is for shore-based use only because it lacks the thermal protection coating of the -10D/A.

A wide variety of warheads is available for the MK-71 rocket. The following table lists the basic characteristics (length, weight) of MK-71 Zuni rockets with the warhead/fuze combinations currently used by the U.S. Navy:

Warhead	*Warhead Type*	*Fuze*	*Length*	*Weight*
MK-24 MOD 0/1	General Purpose	MK-93 MOD 0	249.4 centimeters (98.18 inches)	56.8 kilograms (125.2 pounds)
		MK-188 MOD 0	240.0 centimeters (94.48 in)	
		MK-352 MOD 2		
		FMU-90/B		
MK-32 MOD 0	Anti-Tank/Anti-Personnel	MK-93 MOD 0	277.9 centimeters (109.41 inches)	56.3 kilograms (124.13 pounds)
		MK-188 MOD 0	268.5 centimeters (105.71 inches)	
		MK-352 MOD 2		
		FMU-90/B		

Warhead	*Warhead Type*	*Fuze*	*Length*	*Weight*
MK-33 MOD 1	Illumination Flare	MK-193 MOD 0	274.6 centimeters (108.12 inches)	56.9 kilograms (125.4 pounds)
MK-34 MOD 0	Smoke (White Phosphorus)	MK-93 MOD 0	247.1 centimeters (97.28 inches)	58.2 kilograms (128.33 pounds)
		MK-188 MOD 0	237.7 centimeters (93.58 inches)	
		MK-352 MOD 2		
		FMU-90/B		
MK-34 MOD 2	Smoke (Red Phosphorus)	MK-188 MOD 0		
		MK-352 MOD 2		
MK-63 MOD 0	Fragmentation	MK-93 MOD 0	287.5 centimeters (113.19 inches)	62.7 kilograms (138.3 pounds)
		MK-352 MOD 2	278.1 centimeters (109.49 inches)	
		FMU-90/B		
MK-84 MOD 4	Chaff/Countermeasures	FMU-136/B	240.0 centimeters (94.48 inches)	56.8 kilograms (125.2 pounds)
RR-182/AL				
MK-6 MOD 7	Practice	n/a (nose plug)	237.7 centimeters (93.58 inches)	58.2 kilograms (128.33 pounds)
MK-24 MOD 0		n/a (ogive)	241.9 centimeters (95.25 inches)	58.0 kilograms (127.84 pounds)
WTU-11/B		inert MK-93 MOD 0	268.5 centimeters (105.71 inches)	56.3 kilograms (124.13 pounds)

Specifications

Note: Data given by several sources show slight variations. Figures given below may therefore be inaccurate!

Data for 5-inch FFAR, 5-inch HVAR, Zuni MK-16, Zuni MK-71:

	5-inch FFAR	*5-inch HVAR*	*Zuni MK-16*	*Zuni MK-71*
Length	1.65 meters (5 feet 5 inches)	1.83 meters (6 feet)	1.95 meters (77 inches) (motor only)[1]	1.94 meters (76.3 inches) (motor only)[1]
Weight	36 kilograms (80 pounds)	64 kilograms (140 pounds)	26.7 kilograms (58.9 pounds) (motor only)[1]	36.1 kilograms (79.5 pounds) (motor only)[1]
Diameter	Warhead: 12.7 centimeters (5 inches) Motor: 8.9 centimeters (3.5 inches)	12.7 centimeters (5 inches)	12.7 centimeters (5 inches)	13 centimeters (5.12 inches)
Speed	780 kilometers per hour (485 miles per hour)	1,530 kilometers per hour (950 miles per hour)	2,600 kilometers per hour (1,615 miles per hour)	
Range	< 1.6 kilometers (1 mile)	5 kilometers (3 miles)	8 kilometers (5 miles)	
Propulsion	Caltech 3.5-inch rocket	Solid-fueled rocket	Solid-fueled rocket; 3.6 Knots (800 pounds) for 1.3 seconds	Solid-fueled rocket
Warhead	20 kilograms (45 pounds) HE warhead (& others)		(various)	

Note: 1. Total length and weight depend on warhead; see main section for data on all-up rounds

Hazards:

5-inch Zuni Rocket
High Explosive (HE)
Fragmentation
Shaped Charge
Incendiary
Red Phosphorus (RP)
White Phosphorus (WP)
Ejection

Bombs, Laser Guided

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft		Bomb, Laser Guided Bomb Unit (GBU)-12 500 pounds
Aircraft		Bomb, Laser GBU-16 1,000 pound
Aircraft		Bomb, Laser GBU-10 2,000 pound

Appearance:

GBU-12 500 pound Bomb

GBU-16 1,000 pound Bomb

Description:

The GBU-12, GBU-16 and GBU-10 guidance kits are painted olive drab. Component parts, designations, loading data, serial number, and date of manufacture are stenciled in black or white. The GBU-12 is about 10.5 feet long, the GBU-16 is about 12 feet long, and the GBU-10 is just over 14 feet long.

Hazards:

GBU 12	*GBU-16*	*GBU-10*
Ejection	Ejection	Ejection
EMR	EMR	EMR
Explosive (HE)	Explosive (HE)	Explosive (HE)
Fragmentation	Fragmentation	Fragmentation
Movement	Movement	Movement
Proximity (VT)	Proximity (VT)	Proximity (VT)
	Mechanical	Mechanical

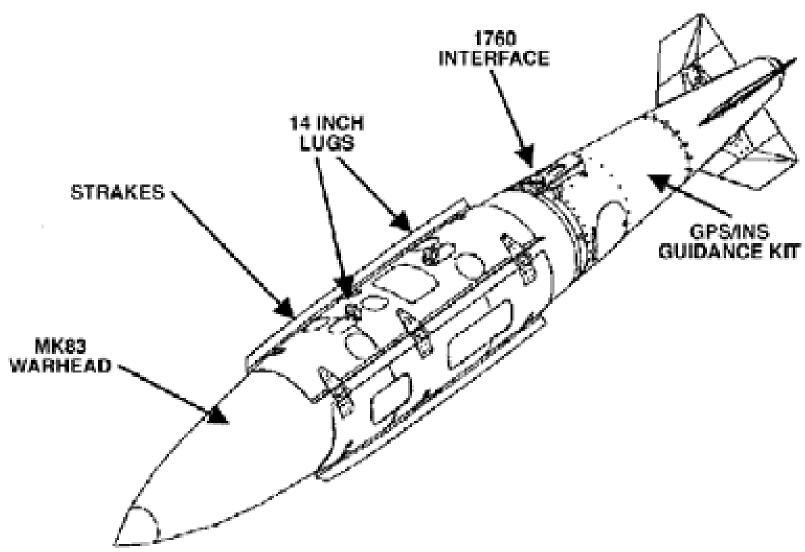
Joint Direct Attack Munition (JDAM)

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	JDAM GBU-38 Ver. 4 250 pound
Aircraft	NA	JDAM GBU-38 500 pound
Aircraft	NA	JDAM GBU-54 500 pound
Aircraft	NA	JDAM GBU-32 1,000 pound
Aircraft	NA	JDAM GBU-31 2,000 pound

Appearance:

GBU-32 JDAM
Joint Direct Attack Munition



Description:

The JDAM GBU-31 is a tailkit meeting both United States Air Force (USAF) and Navy needs, with the USAF as the lead service. It is a weapon with high accuracy, all-weather, autonomous, conventional bombing capability. JDAM upgrades the existing inventory of general purpose and penetrator unitary bombs, and a product improvement may add a terminal seeker to improve accuracy.

Once released, the bomb's Inertial Navigation System (INS)/Global Positioning System (GPS) takes over and guides the bomb to its target regardless of weather. Guidance is accomplished via the tight coupling of an accurate GPS with a 3-axis INS. The Guidance Control Unit (GCU) provides accurate guidance in both GPS-aided INS modes of operation (13 meter Circular Error Probable [CEP]) and INS-only modes of operation (30 meter CEP). INS only is defined as GPS quality hand-off from the aircraft with GPS unavailable to the weapon (e.g., GPS jammed). In the event JDAM is unable to receive GPS signals after launch for any reason, jamming or otherwise, the INS will provide rate and acceleration measurements which the weapon software will develop into a navigation solution. The GCU provides accurate guidance in both GPS-aided INS modes of operation and INS-only modes of operation. This inherent JDAM capability will counter the threat from near-term technological advances in GPS jamming.

JDAM is not intended to replace any existing weapon system; rather, it is to provide accurate delivery of general purpose bombs in adverse weather conditions. The JDAM upgrades the existing inventory of MK-83 1,000- and MK-84 2,000-pound general purpose unitary bombs and the 2,000-pound hard target penetrator bomb by integrating a guidance kit consisting of an INS/GPS guidance kit.

There is some confusion over the precise designations of the JDAM family. The 1,000-pound variant of JDAM is designated the GBU-32, and the 2,000-pound version of the JDAM is designated the GBU-31. JDAM variants for the MK-82 500-pound bombs are reportedly designated GBU-30 and GBU-38 according to various sources, though there is no indication as to what, if any, difference exists between these variants (indeed, it is possible that the association of the GBU-30 designation with the 500-pound MK-82 is erroneous). The JDAM kit for the MK-81 250-pound bomb is reportedly designated GBU-29. Hard Target penetrators being changed into low-cost JDAMs included the 2,000 pound Bomb Live Unit (BLU)-109 (GBU-31) and 1,000 pound BLU-110 (GBU-35).

Hazards:

GBU 38/54/32/31
Explosive (HE)
Fragmentation

BLU-116 Advanced Unitary Penetrator [AUP] GBU-24 D/B (Navy)

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	Advanced Unitary Penetrator (AUP) BLU-116, GBU-24D/B

Appearance:

Description:

The AUP is the next-generation, hard target penetrator munition that provides a lethal capability to penetrate and defeat extremely hard multi-layer underground facilities. Sharing an external appearance and flight characteristics with the 2000-pound BLU-109, the AUP has an advanced heavy steel penetrator warhead filled with high-energy explosives that can penetrate more than twice as much reinforced concrete as the BLU-109. Performance is enhanced by a void-sensing Hard Target Smart Fuze that detonates the AUP at the optimum point in a target to inflict maximum damage.

The AUP can make use of the BLU-109 proven family of guidance kits for precision delivery, including the GBU-10, GBU-15, GBU-24, GBU-27, JDAM, and AGM-130 kits. The shroud also replicates BLU-109 surfaces for attachment of hardbacks, air foil groups, guidance systems, propulsion units, and ground handling equipment.

Hazards:

GBU 24
Explosive (HE)
Fragmentation

Small Diameter Bomb (SDB) GBU-39

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	Small Diameter Bomb GBU-39

Appearance:

Description:

The GBU-39 SDB is a 250 pound (113 kg) guided bomb that is intended to provide aircraft with the ability to carry a higher number of bombs. Most USAF aircraft will be able to carry (using the BRU-61/A rack) a pack of four SDBs in place of a single 2,000 lb bomb.

Two variants are being developed. One version of the SDB is equipped with a GPS-aided INS to attack fixed/stationary targets such as fuel depots, bunkers, etc. The second variant (GBU-40) (or SDB II) will include a thermal seeker with automatic target recognition features for striking mobile targets such as tanks, vehicles, and mobile command posts. The GBU-39 has a circular error probable (CEP) of only 5-8 meters, which means it has a 50% probability of hitting within 5-8 meters its intended target, which should minimize collateral damage. The small size of the bomb allows a single strike aircraft to carry more of the munitions than is possible utilizing currently available bomb units. The SDB carries approximately 38 pounds (17 kilograms) of AFX-757 high explosive, yet because of its design it has the same penetration capabilities as the 2,000 pound BLU-109. During demonstrations, the SDB has successfully penetrated more than 8 feet (2.4 meter) thick reinforced concrete. It also has integrated “DiamondBack” type wings which deploy after release, increasing the glide time and therefore the maximum range.

Hazards:

GBU 39
Explosive (HE)
Fragmentation

Laser Guided Training Round

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	Enhanced Laser Guided Training Round (E-LGTR)

Appearance:

Description:

The Paveway II E-LGTR provides realistic Paveway II Laser Guided Bomb (LGB) (GBU-10/12/16) tactical employment training as an alternative to expending operational Paveway II LGB assets.

The E-LGTR accurately emulates the LGB envelope, flight characteristics, and guidance system of the Paveway II system. Live-fire training permits aircrews to practice delivery tactics in a real-mission environment and experience actual weapon characteristics with today's range limitations. The E-LGTR provides significantly improved CEP (within 3 meters) and CE90 performance against challenging airborne lased tactical target environments.

Hazards:

E-LGTR

Bomb, Penetrator, 550 pound BLU-111

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	Enhanced Laser Guided Training Round

Appearance:

Description:

The BLU-111/B penetrator is forged steel casing warheads, which is a more accurately toleranced variant of the MK-82, 500-pound general purpose bomb. The Joint Standoff Weapon AGM-154C (Unitary Variant) will use a combination of an Imaging Infrared (IIR) terminal seeker and a two-way data link to achieve point target accuracy through aimpoint refinement and man-in-the-loop guidance. The AGM-154C will carry the BLU-111/B equipped with the FMU-152 Joint Programmable Fuze (JPF) and is designed to attack point targets.

The BLU-110A/B and BLU-111A/B thermally protected bombs are identical to the MK-83 and MK-84 thermally protected bombs, respectively, with the exception of the explosive filler. The BLU series bomb bodies use PBNX-109 as explosive filler. The MK-82 and MK-83 series Low Drag General Purpose bombs underwent a Product Improvement Initiative (PII) which entailed filling the bomb cases with a less sensitive explosive. When so filled, the MK-82 and MK-83 bombs are redesignated BLU-111/B and BLU-110/B, respectively.

The BLU-111 is a 500-pound class steel casing warhead designed to fit into low-cost JDAM bombs. The main purpose of the BLU-111 is to penetrate hardened targets, bunkers or concrete walls while minimizing collateral damage because it carries only 500-pound of high explosive. The BLU-111 warhead has been provided to the GBU-30 JDAM bomb and AGM-154C Joint Standoff Weapon (JSOW) (BLU-111/B). The BLU-111/B provided to the U.S. Navy JSOW-Cs will be fitted with the FMU-152 Joint Programmable Fuze (JPF).

Hazards:

BLU-111
Explosive (HE)
Fragmentation

Chaff

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	RR-129/AL Chaff Countermeasures
Aircraft	NA	RR-124 Chaff Countermeasures

Appearance:

Modern U.S. Navy RR-129 and RR-124 chaff countermeasures and containers. Note how the RR-129 chaff, bottom, is different lengths, and the RR-124, top, is all the same length. The RR-124 is designed to prevent interference with civil Air Traffic Control radar systems.

Description:

Chaff, originally called Window by the British, and *Düppel* by the Second World War era German Luftwaffe, is a radar countermeasure in which aircraft or other targets spread a cloud of small, thin pieces of aluminum, metallised glass fiber, or plastic, which either appears as a cluster of secondary targets on radar screens or swamps the screen with multiple returns.

Modern armed forces use chaff (in naval applications, for instance, using short-range Super Rapid Blooming Off-Board Chaff rockets) to distract radar-guided missiles from their targets. Most military aircraft and warships have chaff dispensing systems for self-defense. An intercontinental ballistic missile may release, in its midcourse phase, several independent warheads, a large number of decoys, and chaff.

Hazards:

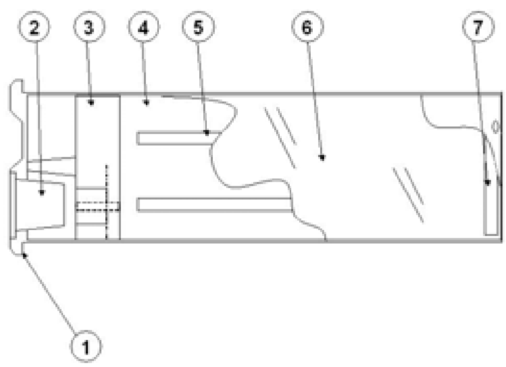
Countermeasures Chaff
None

Flares

Representative Weapon Platform, DODIC, and Nomenclature:

Platform	*DODIC*	*Nomenclature*
Aircraft	NA	

Appearance:



Typical Flare Construction

Flares In Use

Schematic view of a MJU-7A/B decoy flare cartridge: anodized aluminum cartridge (1); an electrical impulse cartridge (2), providing both expulsion and, in some cases, direct ignition of the payload; a pusher plate acting as a safe & arm device (3); the payload (4) with first fire layer (5); the wrapping self-adhesive polyester reinforced aluminum foil (6); and a front washer (7).

Description:

A (decoy) flare is an aerial infrared countermeasure to counter an infrared homing ("heat seeking") surface-to-air missile or air-to-air missile. Flares are commonly composed of a pyrotechnic composition based on magnesium or another hot-burning metal, with burning temperature equal to or hotter than engine exhaust. The aim is to make the infrared-guided missile seek out the heat signature from the flare rather than the aircraft's engines.

There is a wide variety of calibers and shapes available for aerial decoy flares. Due to volume storage restrictions on board platforms, many aircraft of American origin use square decoy flare cartridges. Nevertheless, cylindrical cartridges are also available on-board American aircraft, such as MJU-23/B on the B-1 Lancer or MJU-8A/B on the F/A-18 Hornet; however, these are used mainly on-board French aircraft and those of Russian origin, e.g., PPI-26 IW on the MiG 29.

Square calibers and typical decoy flares:

- 1x1x8 inch, e.g., M-206, MJU-61, (MTV based) M-211, M-212 (spectral flares)
- 2x1x8 inch, e.g., MJU-7A/B (MTV based), MJU-59/B (spectral flare)
- 2x2,5x8 inch, e.g., MJU-10/B (MTV based)

Cylindrical calibers and typical decoy flares:

- 2.5 inch, e.g., MJU-23/B (MTV based)
- 1.5 inch, e.g., MJU 8 A/B (MTV based)
- 1 inch, e.g., PPI 26 IW

Hazards:

Flares
Electromagnetic Radiation (EMR)
Expulsion
Incendiary

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APPENDIX G
AIR QUALITY CALCULATIONS AND CONFORMITY DETERMINATION

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Appendix G - Air Emission Calculations - 29 Palms LAAE EIS Project Alternatives

Table G-1. Emission Source Data for Road Construction - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

Activity/Equipment Type	*Hp Rating*	*Average Daily % of Full Throttle*	*Number Active*	*Hours/ Day*	*Total Work Days*	*Total Hp-Hrs*
3000 Gal Water Truck	400	0.60	2	8	30	115,200
Motor Grader - 14 Foot Blade	275	0.80	1	8	30	52,800
Rubber Wheeled Compactor	400	0.80	1	8	30	76,800
Fugitive Dust	NA	NA	1	NA	30	30
On-Road Trucks						
Activity/Equipment Type	*Vehicle Weight*	*Miles per Round Trip*	*Daily Trips*		*Total Work Days*	*Total Miles*
Equipment Delivery Truck		200	1		2	400

Table G-2. Emission Source Data for Construction of Communications Towers - 29 Palms LAS EIS Proposed Alternatives 1, 2, a

Activity/Equipment Type	*Hp Rating*	*Average Daily % of Full Throttle*	*Number Active*	*Hours/ Day*	*Total Work Days*	*Total Hours*
Forklift	67	0.40	1	4	5	536
Helicopters						
Activity/Equipment Type			*Number Active*	*Cruising (Hrs)*	*# of LTOs*	*# of Rock and Blocks (1)*
Helicopter - Skycrane			1	5	12	120
Helicopter - Huey (1)			1	2	10	50
On-Road Trucks						
Activity/Equipment Type	*Vehicle Wt. (Tons)*	*Miles per Round Trip*			*Total Trips*	*Total Miles*
Heavy Duty Truck (2)		100			10	1,000

Notes: (1) For Huey, # of Rock and Blocks = # of TGOs.

(2) Assume 10% of total VMT would occur on unpaved road.

Table G-3. Offroad Construction Equipment Emission Factors - 29 Palms LAS EIS Project Alternatives

Project Year 2010/Source Type	Fuel Type	Emission Factors (Grams/Horsepower-Hour) VOC	CO	NOx	SOx	PM	PM10	PM2.5	CO2	CH4	N2O	References
Off-Road Equipment - <15 Hp	D	0.45	2.14	2.87	0.01	0.15	0.15	0.14	568	0.084	0.006	(1)
Off-Road Equipment - 16-24 Hp	D	0.49	1.52	2.76	0.00	0.16	0.16	0.14	568	0.084	0.006	(1)
Off-Road Equipment - 25-50 Hp	D	1.49	3.87	3.44	0.00	0.35	0.45	0.33	568	0.084	0.006	(1)
Off-Road Equipment - 51-120 Hp	D	0.66	2.36	4.05	0.00	0.36	0.30	0.33	568	0.084	0.006	(1)
Off-Road Equipment - 121-175 Hp	D	0.47	2.02	3.75	0.00	0.21	0.22	0.19	568	0.084	0.006	(1)
Off-Road Equipment - 176-250 Hp	D	0.34	0.97	3.60	0.00	0.13	0.15	0.12	568	0.084	0.006	(1)
Off-Road Equipment - 251-500 Hp	D	0.29	1.08	3.03	0.00	0.11	0.15	0.10	568	0.084	0.006	(1)
Off-Road Equipment - 501-750 Hp	D	0.31	1.18	3.25	0.00	0.12	0.15	0.11	568	0.084	0.006	(1)
Off-Road Equipment - >750 Hp	D	0.37	1.45	4.28	0.00	0.13	0.13	0.12	568	0.084	0.006	(1)
On-road Truck - Idle (Gms/Hr)	D	13.69	48.45	104.13	0.06	1.76	1.58	1.20	6,994	0.500	0.250	(2)
On-road Truck - 5 mph (Gms/Mi)	D	12.10	25.26	37.29	0.04	2.31	2.08	1.57	3,845	0.100	0.050	(2)
On-road Truck - 25 mph (Gms/Mi)	D	1.50	7.95	15.51	0.02	0.65	0.59	0.44	2,043	0.100	0.050	(2)
On-road Truck - 55 mph (Gms/Mi)	D	0.81	4.66	14.53	0.02	0.58	0.52	0.39	1,662	0.100	0.050	(2)
On-Road Trucks - Composite (Gms/Mi)	D	9.42	20.77	31.79	0.04	1.89	1.70	1.29	1,847	0.100	0.050	(2)
On-Road Trucks - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	8.89	2.57	0.39	- - -	- - -	- - -	(3)
Disturbed Ground - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	55.00	27.50	2.75	- - -	- - -	- - -	(4)
Helicopter - Skycrane - Cruise		3.84	22.11	4.41	0.45	1.99						(5)
Helicopter - Skycrane - LTO		6.81	21.37	1.07	0.15	1.36						(5)
Helicopter - Skycrane - Rocks and Blocks		0.41	3.01	0.91	0.08	0.38						(5)
Helicopter - Skycrane - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	123.22	61.61	24.64	- - -	- - -	- - -	(6)
Helicopter - Huey - Cruise		0.37	4.41	4.15	0.35	0.65						(7)
Helicopter - Huey - LTO		2.17	1.90	1.02	0.10	0.19						(7)
Helicopter - Huey - TGO		0.06	0.76	0.96	0.08	0.15						(7)
Helicopter - Huey - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	11.28	5.64	2.26	- - -	- - -	- - -	(6)

Notes: (1) Composites developed from Offroad emission factors obtained from URBEMIS 2007 for project year 2010.

(2) Heavy duty diesel truck running emission factors developed from EMFAC2007 (CARB 2006b). Units in gms/mile calculated for project year 2010.
Composite emission factors based on a round trip of 75% at 55 mph, 20% at 25 mph, and 5% at 5 mph. Units in grams/mile.
Although not shown in these calculations, emissions from 15 minutes of idling mode included for each truck round trip.

(3) See Table G-7. Units in Lb/VMT.

(4) Units in lbs/acre-day from section 11.2.3 of AP-42 (USEPA 1995). Emissions reduced by 50% from uncontrolled levels to simulate implementation of best management practices (BMPs) for fugitive dust control

(5) AESO 2000a and b for a CH-46E. Cruise units in lb/hr and LTO/Rocks and Blocks/TGO units in lb/event.

(6) See Table G-17, R-2501 Section. Units in Lb/LTO.

(7) EPA 1992. Cruise units in lb/hr and LTO/Rocks and Blocks units in lb.

Table G-4. Total Road Construction Emissions - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Total Pounds									
Activity/Equipment Type	*VOC*	*CO*	*NOx*	*SOx*	*PM*	*PM10*	*PM2.5*	*CO2*	*CH4*	*N2O*
3000 Gal Water Truck	73.85	274.97	770.26	0.82	28.19	38.10	25.94	144,254	21.32	1.42
Motor Grader - 14 Foot Blade	33.85	126.03	353.04	0.37	12.92	17.46	11.89	66,116	9.77	0.65
Rubber Wheeled Compactor	49.23	183.31	513.51	0.54	18.79	25.40	17.29	96,169	14.21	0.95
Fugitive Dust	--	--	--	--	1,650	825	83			
Subtotal	*157*	*584*	*1,637*	*2*	*1,710*	*906*	*138*	*306,540*	*45*	*3*
On-Road Vehicles										
Equipment Delivery Truck	8.30	18.31	28.04	0.03	1.67	1.50	1.13	1,629	0.09	0.04
On-Road Vehicles -Subtotal	*8.30*	*18.31*	*28.04*	*0.03*	*1.67*	*1.50*	*1.13*	*1,629*	*0.09*	*0.04*
Total Emissions (Pounds)	165	603	1,665	2	1,712	907	139	308,169	45	3

Calculation of Annual Emissions for Off-Road Equipment

Emission Factor (g/hp-hr) x Total Horsepower-hours (hp-hr/yr) x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for On-Road Vehicles

Emission Factor (g/mile) x Number of daily truck trips x Round-trip distance (mile) x Number of working days x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for PM fugitive dust - ground disturbance

Emission Factor (lb/acre-day) x Acreage Disturbed (acres) x Annual number of working days (day/yr) = Annual Emissions (lb/yr)

Table G-5. Emissions for Construction of Communications Towers - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Total Pounds									
Activity/Equipment Type	*VOC*	*CO*	*NOx*	*SOx*	*PM*	*PM10*	*PM2.5*	*CO2*	*CH4*	*N2O*
Forklift	0.8	2.8	4.8	0.0	0.4	0.4	0.4	671.2	0.1	0.0
Subtotal	*0.8*	*2.8*	*4.8*	*0.0*	*0.4*	*0.4*	*0.4*	*671.2*	*0.1*	*0.0*
Helicopters										
Helicopter - Skycrane - Cruise	19.2	110.6	22.1	2.3	10.0	-	-	-	-	-
Helicopter - Skycrane - LTO	81.7	256.4	12.8	1.8	16.3	-	-	-	-	-
Helicopter - Skycrane - Rocks and Blocks	49.2	361.2	109.2	9.6	45.6	-	-	-	-	-
Helicopter - Skycrane - Fugitive Dust	-	-	-	-	1,478.6	739.3	295.7	-	-	-
Helicopter - Huey - Cruise	0.7	8.8	8.3	0.7	1.3	-	-	-	-	-
Helicopter - Huey - LTO	21.7	19.0	10.2	1.0	1.9	-	-	-	-	-
Helicopter - Huey - TGO	3.1	37.9	48.1	4.1	7.5	-	-	-	-	-
Helicopter - Huey - Fugitive Dust	-	-	-	-	112.8	56.4	22.6	-	-	-
Subtotal	*175.7*	*794.0*	*210.7*	*19.4*	*1,674.0*	*795.7*	*318.3*	-	-	-
On-Road Vehicles										
Equipment Delivery Truck	2.2	12.1	32.6	0.0	1.3	1.2	0.9	3,874.0	0.2	0.1
Equipment Delivery Truck - Fugitive Dust	-	-	-	-	889.3	257.0	39.4	-	-	-
On-Road Vehicles -Subtotal	*2.2*	*12.1*	*32.6*	*0.0*	*890.6*	*258.2*	*40.3*	*3,874.0*	*0.2*	*0.1*
Total Emissions (Pounds)	178.6	808.8	248.1	19.5	2,565.0	1,054.3	359.0	4,545.2	0.3	0.1

Calculation of Annual Emissions for Off-Road Equipment

Emission Factor (g/hp-hr) x Total Horsepower-hours (hp-hr/yr) x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for Helicopters - LTOs

Emission Factor (lb/LTO) x Number of LTOs = Annual Emissions (lb/yr)

Calculation of Annual Emissions for On-Road Vehicles

Emission Factor (g/mile) x Number of daily truck trips x Round-trip distance (mile) x Number of working days x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for PM fugitive dust - ground disturbance

Emission Factor (lb/acre-day) x Acreage Disturbed (acres) x Annual number of working days (day/yr) = Annual Emissions (lb/yr)

Table G-6. Emission Source Data for Tactical Vehicles/Support Equipment - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

Activity/Equipment Type	*Number of Vehicles*	*Annual VMT*	*Miles per Gallon*	*Total Gallons*	*Hp*	*Total Hp-Hr (1)*
Tactical Vehicles						
Medium Tactical Vehicle Replacement	348	228,814	3.85	59,432	250	1,188,644
High-Mobility Multipurpose Wheeled Vehicle	785	393,386	14.00	28,099	150	561,980
Logistics Vehicle System	198	75,094	2.00	37,547	445	750,940
Internally Transportable Vehicle	50	18,156	14.00	1,297	71	25,937
M60A1 Bridge Vehicle	4	2,580	0.33	7,818		
Amphibious Assault Vehicle	187	87,550	0.75	116,733	425	2,334,667
(Variants)	87	34,694	5.17	6,711	275	134,213
M88A2 Hercules Recovery Vehicle	12	1,290	0.33	3,909		
High-Mobility Artillery Rocket System	6	70	3.85	18	330	364
Abrams M1A1 Main Battle Tank	44	16,354	0.33	49,558		
Joint Assault Bridge	5	1,858	0.33	5,632		
Assault Breacher Vehicle	5	3,000	0.36	8,333		
Tactical Support Equipment (2)						
	Number of Vehicles	*Hp*	*Hours per Year*	*Total Hp-Hr*		
Medium Crawler Tractor	5	118	120	70,800		
Excavator, Combat	12	295	120	424,800		
Grader	2	150	120	36,000		
Armored Tractor	3	118	120	42,480		
D7 Bulldozer	5	200	120	120,000		
Armored Backhoe	12	295	120	424,800		
Extended Boom Forklift	4	150	120	72,000		
Light Capacity Rough Terrain Truck Forklift	2	110	120	26,400		
Tractor, Rubber Tired, Articulated Steering	10	185	120	222,000		

Notes: (1) Based upon a fuel usage rate of 0.051 gallons per Hp-Hr.

(2) Horsepower ratings from 2007 CEIP Appendix D.11.

Table G-7. Tactical Vehicles/Support Equipment Emission Factors - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Emission Factors (Pounds/1000 Gallons)										
Source Type	*ROG*	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*Reference*
Tank Vehicles and ABV											
Abrams Tank/Bridge Vehicles	0.06	0.45	118.80	0.51	1.56	1.56	1.52	21,054	0.68	0.60	(1)
Assault Breacher Vehicle	14.10	101.60	170.88	13.96	1.71	1.71	1.57	21,054	0.68	0.60	(2)
Other Tactical Vehicles/TSE											
	Emission Factors (Grams/Horsepower-Hour)										
121-250 Hp	0.94	4.40	10.84	1.32	0.44	0.43	0.43	568	0.08	0.01	(3)
>250 Hp	0.95	4.20	10.84	1.32	0.42	0.41	0.41	568	0.08	0.01	(3)

Notes: (1) From 2007 CEIP Appendix D.11, page 6.

(2) FEA for Proposed ABV Action at MCAGCC (2003).

(3) From 2007 CEIP Appendix D.11, page 7.

(4) GHG Emission Factors for (a) Tank Vehicles and ABVs from General Reporting Protocol, Tables C.3 and C.6 jet fuel (California Climate Action Registry 2009) and (b) other TV/TSE from OFFROAD2007 Model.

Table G-8. Total Tactical Vehicles/Support Equipment Emissions - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Pounds per Year										
Activity/Equipment Type	*ROG*	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tactical Vehicles											
Medium Tactical Vehicle Replacement	2,489	11,006	28,406	3,459	1,101	1,074	1,074	33,757,494	99,776	6,652	37,914,821
High-Mobility Multipurpose Wheeled Vehicle	1,165	5,451	13,430	1,635	545	533	533	15,960,232	47,173	3,145	17,925,778
Logistics Vehicle System	1,573	6,953	17,946	2,185	695	679	679	21,326,696	63,035	4,202	23,953,136
Internally Transportable Vehicle	54	252	620	75	25	25	25	32,479	5	0	32,679
M60A1 Bridge Vehicle	0	4	929	4	12	12	12	164,604	5	5	166,159
Amphibious Assault Vehicle	4,890	21,617	55,793	6,794	2,162	2,110	2,110	66,304,533	195,974	13,065	74,470,116
Light Armored Vehicle (Variants)	281	1,302	3,207	391	130	127	127	168,062	25	2	169,097
M88A2 Hercules Recovery Vehicle	0	2	464	2	6	6	6	82,302	3	2	83,079
High-Mobility Artillery Rocket System	1	3	9	1	0	0	0	10,327	31	2	11,599
Abrams M1A1 Main Battle Tank	3	22	5,887	25	77	77	75	1,043,385	34	29	1,053,241
Joint Assault Bridge	0	3	669	3	9	9	9	118,567	4	3	119,686
Assault Breacher Vehicle	118	847	1,424	116	14	14	13	175,450	6	5	177,107
Subtotal - Pounds	10,574	47,461	128,784	14,691	4,777	4,667	4,663	139,144,131	406,069	27,113	156,076,499
Tactical Support Equipment											
Medium Crawler Tractor	147	147	147	147	147	147	147	147	147	147	147
Excavator, Combat	890	3,933	10,152	1,236	393	384	384	531,937	79	5	535,212
Grader	75	333	860	105	33	33	33	45,079	7	0	45,357
Armored Tractor	89	393	1,015	124	39	38	38	53,194	8	1	53,521
D7 Bulldozer	251	1,111	2,868	349	111	108	108	150,265	22	1	151,190
Armored Backhoe	890	3,933	10,152	1,236	393	384	384	531,937	79	5	535,212
Extended Boom Forklift	149	698	1,721	210	70	68	68	90,159	13	1	90,714
Light Capacity Rough Terrain Truck Forklift	55	256	631	77	26	25	25	33,058	5	0	33,262
Multipurpose Vehicles	460	2,153	5,305	646	215	210	210	277,989	41	3	279,701
Subtotal - Pounds	3,006	12,959	32,850	4,129	1,428	1,398	1,398	1,713,764	400	164	1,724,315
Total Emissions (Pounds)	13,579	60,420	161,635	18,820	6,205	6,065	6,061	140,857,894	406,469	27,276	157,800,814
Total Emissions (Tons) [1]	6.79	30.21	80.82	9.41	3.10	3.03	3.03	63,892.14	184.37	12.37	71,599.36

Calculation of Annual Emissions for Tactical and Support Equipment

Emission Factor (g/hp-hr) x total Hp-hrs x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Abrams Tank/Bridge Vehicles and Assault Breacher Vehicle

Emission Factor (lbs/1000 gals) x Total Gals x 1 /1000 = Annual Emissions (lb/yr)

Table G-9. On-Road Vehicle Data for Personnel/Equipment Transport - 29 Palms LAS EIS Project Alternatives

Activity/Equipment Type	*Annual # of Vehicle Round Trips*	*Miles/Round Trip (1)*	*Total Annual Miles*
On-Road Transport			
Buses	800	90	72,000
Tractor-Trailer/Convoyed Vehicles	200	90	18,000

Notes: (1) Equal to distance travelled within the MDAB - all trips would originate from March Air Reserve Base and Camp Pendleton.

(2) Horsepower ratings from 2007 CEIP Appendix D.11.

Table G-10. On-Road Vehicle Transport Emission Factors - 29 Palms LAS EIS Project Alternatives

Source Type/Activity	Emission Factors (Grams/Mile)										Reference
	ROG	*CO*	NO_X	SO_X	*PM*	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	
Urban Bus											
25 MPH	0.94	8.43	15.78	0.02		0.26	0.24	2,177			(1)
55 MPH	0.46	6.01	21.96	0.02		0.16	0.14	2,133			(1)
Composite Trip (1)	0.56	6.49	20.72	0.02	-	0.18	0.16	2,142	-	-	(1)
Heavy Diesel Truck											
25 MPH	0.80	5.63	10.33	0.02		0.41	0.37	1,768			(1)
55 MPH	0.45	3.67	10.00	0.01		0.37	0.34	1,500			(1)
Composite Trip (1)	0.52	4.06	10.07	0.01	-	0.38	0.35	1,554	-	-	(1)

Notes: (1) Assumes statewide average fleets for year 2013. Obtained from ARB EMFAC2007 Model (ARB 2006). PM inlcudes combustive and tire and brake wear.

(2) Composite factors based on a trip of 80% 25 mph and 20% 55 mph.

Table G-11. Total On-Road Vehicle Personnel/Equipment Transport Emissions - 29 Palms LAS EIS Project Alternatives

	Pounds per Year										
Equipment Type	*ROG*	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tactical Vehicles											
Buses	88	1,031	3,290	3	-	28	26	340,020	-	-	-
Tractor-Trailer/Convoyed Vehicles	21	161	399	0	-	15	14	61,650	-	-	-
Total Emissions (Pounds)	109	1,192	3,689	4	-	43	40	401,670	-	-	-
Total Emissions (Tons)	0.05	0.60	1.84	0.00	-	0.02	0.02	182.19	-	-	182.19

Table G-12. Emission Source Data for Tactical Vehicles/Support Equipment - Unpaved Road Dust - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Weight	*Unpaved Emission Factor (Lb/VMT)*			*Annual*	*% Unpaved*	
Equipment Type	*(Tons)*	*PM*	PM_{10}	$PM_{2.5}$	*VMT*	*Travel (1)*	*Unpaved VMT*
Tactical Vehicles							
Medium Tactical Vehicle Replacement	10.0	6.51	1.88	0.29	228,814	90%	205,933
High-Mobility Multipurpose Wheeled Vehicle	3.0	3.79	1.09	0.17	393,386	50%	196,693
Logistics Vehicle System	20.0	8.89	2.57	0.39	75,094	50%	37,547
Internally Transportable Vehicle	3.5	4.06	1.17	0.18	18,156	50%	9,078
M60A1 Bridge Vehicle	70.0	15.63	4.52	0.69	2,580	90%	2,322
Amphibious Assault Vehicle	30.6	10.77	3.11	0.48	87,550	90%	78,795
Light Armored Vehicle (Variants)	14.1	7.60	2.20	0.34	34,694	90%	31,225
M88A2 HERCULES Recovery Vehicle	70.0	15.63	4.52	0.69	1,290	90%	1,161
High-Mobility Artillery Rocket System	12.0	7.07	2.04	0.31	70	50%	35
Abrams M1A1 Main Battle Tank	70.0	15.63	4.52	0.69	16,354	90%	14,719
Joint Assault Bridge	70.0	15.63	4.52	0.69	1,858	90%	1,673
Assault Breacher Vehicle	55.0	14.02	4.05	0.62	3,000	90%	2,700
Tactical Support Equipment							
Ground Disturbance (2)	1	110.0	55.0	5.5	48		

Notes: (1) Percentage of unpaved roads from 2007 CEIP Appendix D.13.

(2) Weight = daily disturbed acreage and Annual VMT = total annual days of disturbance. Emission factors in lb/acre-day.

Table G-13. Emission Source Data for Tactical Vehicles/Support Equipment - Paved Road Dust - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Weight	*Paved Emission Factor (Lb/VMT)*			*Annual*	*% Paved Travel (1)*	*Paved VMT*
Equipment Type	*(Tons)*	*PM*	PM_{10}	$PM_{2.5}$	*VMT*		
Tactical Vehicles							
Medium Tactical Vehicle Replacement	10.0	0.07	0.01	0.002	228,814	10%	22,881
High-Mobility Multipurpose Wheeled Vehicle	3.0	0.01	0.00	-	393,386	50%	196,693
Logistics Vehicle System	20.0	0.20	0.04	0.006	75,094	50%	37,547
Internally Transportable Vehicle	3.5	0.01	0.00	0.000	18,156	50%	9,078
M60A1 Bridge Vehicle	70.0	1.32	0.26	0.038	2,580	10%	258
Amphibious Assault Vehicle	30.6	0.38	0.07	0.011	87,550	10%	8,755
Light Armored Vehicle (Variants)	14.1	0.12	0.02	0.003	34,694	10%	3,469
M88A2 HERCULES Recovery Vehicle	70.0	1.32	0.26	0.038	1,290	10%	129
High-Mobility Artillery Rocket System	12.0	0.09	0.02	0.002	70	50%	35
Abrams M1A1 Main Battle Tank	70.0	1.32	0.26	0.038	16,354	10%	1,635
Joint Assault Bridge	70.0	1.32	0.26	0.038	1,858	10%	186
Assault Breacher Vehicle	55.0	0.92	0.18	0.027	3,000	10%	300

Notes: (1) Percentage of paved roads from 2007 CEIP Appendix D.13.

(2) US EPA 42 13.2.1, sL - 0.1, k(PM10) - 0.016, k(PM2.5) - 0.0024, C(PM10) - 0.00047, C(PM2.5) - 0.00036

Table G-14. Annual Fugitive Dust Emissions for Tactical Vehicles - Unpaved Roads - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Annual Emissions - Tons		
Equipment Type	*PM*	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles			
Medium Tactical Vehicle Replacement	670.28	193.71	29.70
High-Mobility Multipurpose Wheeled Vehicle	372.41	107.63	16.50
Logistics Vehicle System	166.94	48.25	7.40
Internally Transportable Vehicle	18.42	5.32	0.82
M60A1 Bridge Vehicle	18.14	5.24	0.80
Amphibious Assault Vehicle	424.23	122.61	18.80
Light Armored Vehicle (Variants)	118.62	34.28	5.26
M88A2 HERCULES Recovery Vehicle	9.07	2.62	0.40
High-Mobility Artillery Rocket System	0.12	0.04	0.01
Abrams M1A1 Main Battle Tank	115.00	33.24	5.10
Joint Assault Bridge	13.07	3.78	0.58
Assault Breacher Vehicle	18.93	5.47	0.84
Subtotal	**1,945.24**	**562.19**	**86.20**
Tactical Support Equipment			
Ground Disturbance	2.64	1.32	0.13
Subtotal	**2.64**	**1.32**	**0.13**
Total Emissions	**1,947.88**	**563.51**	**86.33**

Table G-15. Annual Fugitive Dust Emissions for Tactical Vehicles - Paved Roads - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

	Annual Emissions - Tons		
Equipment Type	*PM*	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles			
Medium Tactical Vehicle Replacement	0.81	0.15	0.02
High-Mobility Multipurpose Wheeled Vehicle	1.10	0.18	-
Logistics Vehicle System	3.77	0.73	0.10
Internally Transportable Vehicle	0.06	0.01	0.00
M60A1 Bridge Vehicle	0.17	0.03	0.00
Amphibious Assault Vehicle	1.67	0.32	0.05
Light Armored Vehicle (Variants)	0.21	0.04	0.01
M88A2 HERCULES Recovery Vehicle	0.09	0.02	0.00
High-Mobility Artillery Rocket System	0.00	0.00	0.00
Abrams M1A1 Main Battle Tank	1.08	0.21	0.03
Joint Assault Bridge	0.12	0.02	0.00
Assault Breacher Vehicle	0.14	0.03	0.00
Total Emissions	**9.22**	**1.75**	**0.22**
Total Emissions - Paved and Unpaved Roads	**1,957.10**	**565.25**	**86.56**

Table G-16. Proposed MCAGCC Aircraft Operations and Emissions - Airspaces - 29 Palms LAS EIS Project Alternatives

	Sorties				Tons per Year									
Aircraft Type	*Annual*	*Fraction Below 3,000 AGL*	*Total Duration (Min.)*	*Duration Below 3,000 AGL (Min.)*	*ROG/HC*	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*	*CH4*	*N2O*	*CO_2e[1]*
F/A-18 C/D	484	0.07	90	6.3	0.07	0.41	1.14	0.07	1.07	1.07	522	0.02	0.01	527
F-35	152	0.07	90	6.3	0.02	0.13	0.36	0.02	0.34	0.34	164	0.01	0.00	166
Joint FW (1)	4	0.07	90	6.3	0.00	0.00	0.05	0.00	0.00	0.01	5	0.00	0.00	5
KC-130	136	0.07	180	12.6	0.03	0.12	0.65	0.03	0.29	0.29	230	0.01	0.01	232
AV-8B	300	0.07	78	5.5	0.37	4.28	4.18	0.03	0.52	0.52	261	0.01	0.01	264
AH-1	546	0.99	90	89.1	0.19	3.63	1.91	0.14	1.45	1.45	1,067	0.03	0.03	1,077
UH-1	546	0.99	90	89.1	0.04	0.26	1.77	0.12	1.24	1.24	912	0.03	0.03	921
CH-53E	232	0.99	90	89.1	0.12	1.64	6.21	0.31	1.70	1.70	2,381	0.08	0.07	2,403
MV-22	268	0.69	120	82.8	0.01	0.45	6.59	0.23	0.89	0.89	1,752	0.06	0.05	1,769
Joint RW (2)	320	0.99	12	11.9	0.02	0.28	0.15	0.01	0.11	0.11	83	0.00	0.00	84
EA-6B	74	-	120	-	-	-	-	-	-	-	-	-	-	-
Joint AR (3)	36	-	240	-	-	-	-	-	-	-	-	-	-	-
UAS	240	-	600	-										
Total	3,338		1,890		0.86	11.20	23.01	0.95	7.62	7.63	7,378	0.24	0.21	7,447

Notes: (1) Assumes F-16 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

Table G-17. Proposed Aircraft Emissions - Landing and Take-Offs - 29 Palms LAS EIS Project Alternatives

Location/Aircraft Type	*Annual Sorties*	*Tons per Year*									
		ROG/HC	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*	*CH4*	*N2O*	*CO_2e*
EAF											
F/A-18 C/D	484	13.17	34.61	3.86	0.22	4.02	4.02	1,672	0.05	0.05	1,688
F-35	152	4.14	10.87	1.21	0.07	1.26	1.26	525	0.02	0.01	530
Joint FW (1)	4	0.01	0.05	0.02	0.00	0.00	0.00	7	0.00	0.00	8
KC-130	136	0.52	1.01	1.18	0.06	0.61	0.61	498	0.02	0.01	503
AV-8B	300	2.62	2.93	1.72	0.13	0.23	0.23	528	0.02	0.01	533
AH-1	546	0.09	1.93	0.57	0.05	0.49	0.49	362	0.01	0.01	365
UH-1	546	0.18	0.91	0.35	0.03	0.32	0.32	237	0.01	0.01	239
CH-53E	232	1.30	2.65	1.03	0.08	0.44	0.44	627	0.02	0.02	633
MV-22	268	1.54	0.73	1.54	0.01	0.27	0.27	607	0.02	0.02	613
Joint RW (2)	320	0.05	1.13	0.33	0.03	0.29	0.29	212	0.01	0.01	214
EA-6B	74	0.83	1.70	0.45	0.04	0.07	0.07	208	0.01	0.01	210
Joint AR (3)	36	0.06	1.86	0.59	0.09	0.62	0.62	301	0.01	0.01	304
UAS	240	-	-	-	-	-	-	-	-	-	-
Subtotal	**3,338**	**24.53**	**60.38**	**12.86**	**0.80**	**8.63**	**8.63**	**5,786**	**0.19**	**0.16**	**5,840**
R-2507											
AH-1	1,092	0.02	0.38	0.17	0.01	0.14	0.14	101	0.00	0.00	102
UH-1	1,092	0.01	0.16	0.31	0.03	0.25	0.25	269	0.01	0.01	271
CH-53E	464	0.12	0.45	0.93	0.05	0.28	0.28	388	0.01	0.01	392
MV-22	536	0.00	0.08	2.38	0.06	0.25	0.25	491	0.02	0.01	496
Joint RW (2)	640	0.01	0.22	0.10	0.01	0.08	0.08	59	0.00	0.00	
Subtotal	**3,184**	**0.16**	**1.29**	**3.90**	**0.16**	**1.00**	**1.00**	**1,309**	**0.04**	**0.04**	**1,261**
Total - LTOs	**6,522**	**24.69**	**61.67**	**16.76**	**0.96**	**9.62**	**9.62**	**7,094**	**0.23**	**0.20**	**7,101**

Notes: (1) Assumes F-18 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

Table G-18. Proposed Fugitive Emissions - Landing and Take-Offs - 29 Palms LAS EIS Project Alternatives

Aircraft Type/Location	*Annual Sorties*	*Tons per Year*	
		PM10	*PM2.5*
EAF			
AH-1	546	0.35	0.14
UH-1	546	0.08	0.03
CH-53E	232	1.59	0.64
MV-22	268	0.26	0.10
Joint RW (2)	320	0.21	0.08
Subtotal	**1,912**	**2.50**	**1.00**
R-2507			
AH-1	1,092	12.71	5.08
UH-1	1,092	3.08	1.23
CH-53E	464	14.29	5.72
MV-22	536	2.33	0.93
Joint RW (2)	640	7.45	2.98
Subtotal	**3,824**	**39.86**	**15.94**
Total	**5,736**	**42.36**	**16.94**

Table G-19. Aircraft Emission Factors - Airspace Modes of Operation - 29 Palms LAS EIS Project Alternatives

Aircraft	Engine Type	# Engines	Engine Power Setting	Fuel Flow/ Engine (Lb/Hr)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Source of EF
					Pounds/1000 Pounds Fuel									
F/A-18 C/D	F404-GE-402	2	85% N	3,318	0.44	2.44	6.74	0.40	6.36	6.36	3,096	0.10	0.09	AESO Memo Rpt 9815E, 11/02
F-35	F404-GE-402	2	85% N	3,318	0.44	2.44	6.74	0.40	6.36	6.36	3,096	0.10	0.09	F-18 as a surrogate
Joint FW (1)	F100-PW-100	1	Intermediate	7,617	0.14	0.91	30.89	0.96	2.06	6.36	3,096	0.10	0.09	F-16 as a surrogate
KC-130	T56-A-16	4	8,000 Q	1,300	0.36	1.58	8.75	0.40	3.97	3.97	3,096	0.10	0.09	AESO Memo Rpt 2000-09B, 1/01
AV-8B	F-402-RR-404	1	Intermediate	6,186	4.33	50.73	49.49	0.40	6.19	6.19	3,096	0.10	0.09	EPA (1992), p. 187
AH-1	T700-GE-401C	2	38% Q - Cruise	425	0.56	10.54	5.55	0.40	4.20	4.20	3,096	0.10	0.09	AESO Memo Rpt 9824a, 1/00
UH-1	T53-L-13B	2	58% Q - Climbout	363	0.13	0.88	6.02	0.40	4.20	4.20	3,096	0.10	0.09	AESO Memo Rpt 9904A, 1/00
CH-53E	T64-GE-416 and -416A	3	70% Q - Cruise	1,488	0.15	2.13	8.08	0.40	2.21	2.21	3,096	0.10	0.09	AESO Memo Rpt 9822C, 2/00
MV-22	T406-AD-400	2	Helo (16°) Cruise	1,530	0.01	0.79	11.64	0.40	1.58	1.58	3,096	0.10	0.09	AESO Memo Rpt 9946E, 1/01
Joint RW (2)	T700-GE-401C	2	38% Q - Cruise	425	0.56	10.54	5.55	0.40	4.20	4.20	3,096	0.10	0.09	AH-1 as a surrogate
EA-6B	J52-P408	2	Intermediate	5,752	3.85	18.29	48.20	0.96	5.75	5.75	3,096	0.10	0.09	EPA (1992), p. 186
Joint AR (3)	F108-CF-100	4	Intermediate	5,650	0.03	1.61	13.53	0.96	0.65	0.65	3,096	0.10	0.09	IERA 2002

Notes: (1) Assumes F-16 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

(4) GHG Emission Factors from General Reporting Protocol, Tables C.3 and C.6 jet fuel (California Climate Action Registry 2009).

Table G-20. Aircraft Emission Factors - Landing/Take-off Modes of Operation - 29 Palms LAS EIS Project Alternatives

Aircraft	Engine Type	# Engines	Fuel Usage (Pounds per LTO)	Pounds/LTO									Source of EF
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	
F/A-18 C/D	F404-GE-402	2	2,232	54.43	143.03	15.95	0.89	16.61	16.61	6,911	0.22	0.20	AESO Memo Rpt 9815E, 11/02
F-35	F404-GE-402	2	2,232	54.43	143.03	15.95	0.89	16.61	16.61	6,911	0.22	0.20	F-18 as a surrogate
Joint FW (1)	F100-PW-100	1	1,207	4.74	23.33	9.89	1.12	2.17	2.17	3,737	0.12	0.11	USAF IERA 2002
KC-130	T56-A-16	4	2,367	7.65	14.79	17.35	0.95	9.03	9.03	7,329	0.24	0.21	AESO Memo Rpt 2000-09B, 1/01
AV-8B	F-402-RR-404	1	1,137	17.49	19.55	11.48	0.84	1.55	1.55	3,520	0.11	0.10	EPA (1992), p. 187
AH-1	T700-GE-401C	2	428	0.33	7.08	2.09	0.17	1.80	1.80	1,325	0.04	0.04	AESO Memo Rpt 9824a, 1/00
UH-1	T53-L-13B	1	280	0.67	3.32	1.28	0.11	1.18	1.18	867	0.03	0.02	AESO Memo Rpt 9904A, 1/00
CH-53E	T64-GE-416 and -416A	3	1,746	11.24	22.86	8.86	0.70	3.76	3.76	5,406	0.18	0.15	AESO Memo Rpt 9822C, 2/00
MV-22	T406-AD-400	2	1,464	11.51	5.44	11.51	0.08	2.01	2.01	4,533	0.15	0.13	AESO Memo Rpt 9946E, 1/01
Joint RW (2)	T700-GE-401C	2	428	0.33	7.08	2.09	0.17	1.80	1.80	1,325	0.04	0.04	AH-1 as a surrogate
EA-6B	J52-P408	2	1,819	22.55	45.91	12.10	0.98	1.82	1.82	5,632	0.18	0.16	EPA (1992), p. 186
Joint AR (3)	F108-CF-100	4	5,399	3.33	103.38	32.90	5.13	34.49	34.49	16,716	0.54	0.47	IERA 2002

Notes: (1) Assumes F-16 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

(4) GHG Emission Factors from General Reporting Protocol, Tables C.3 and C.6 (California Climate Action Registry 2009).

Table G-21. Aircraft Emission Factors - Pad Landings - 29 Palms LAS EIS Project Alternatives

Aircraft	Engine Type	# Engines	Fuel Usage (Pounds per Landing)	Pounds/Landing									Source of EF
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	
AH-1	T700-GE-401C	2	60	0.03	0.69	0.32	0.02	0.25	0.25	185.8	0.01	0.01	AESO Memo Rpt 9961, 7/99
UH-1 (4)	T53-L-13B	1	159	0.02	0.30	0.57	0.05	0.46	0.46	492.3	0.02	0.01	AESO Memo Rpt 9904A, 1/00
CH-53E	T64-GE-416 and -416A	3	540	0.52	1.94	4.03	0.22	1.19	1.19	1,671.9	0.05	0.05	AESO Memo Rpt 9960, Revision B, 4/00
MV-22	T406-AD-400	2	592	0.01	0.29	8.87	0.24	0.94	0.94	1,832.9	0.06	0.05	AESO Memo Rpt 2000-09B, 1/01
Joint RW (2)	T700-GE-401C	2	60	0.03	0.69	0.32	0.02	0.25	0.25	185.8	0.01	0.01	AH-1 as a surrogate

Notes: (1) Equal to hover, climbout, descent, and approach modes.

Table G-22. Aircraft Fugitive Dust Emission Factors - Landing/Take-off Modes of Operation - 29 Palms LAS EIS Project Alternatives

Aircraft	Soil Silt Content (%)	Rain Days per Year	% of Time Wind Speed > 12 Knots	Exposed Area (Acres)	PM10	PM2.5	Location of EF	Source of EF
					Pounds/Landing or Take-o			
EAF								
AH-1	9.1	8	0.17	0.04	1.30	0.52	2007 CEIP -	MDAQMD Mine Operations
UH-1	9.1	8	0.04	0.04	0.30	0.12	2007 CEIP -	MDAQMD Mine Operations
CH-53E	9.1	8	0.16	0.45	13.72	5.49	2007 CEIP -	MDAQMD Mine Operations
MV-22	9.1	8	0.02	0.51	1.94	0.78	2007 CEIP -	MDAQMD Mine Operations
Joint RW (1)	9.1	8	0.17	0.04	1.30	0.52	2007 CEIP -	MDAQMD Mine Operations
R-2501								
AH-1	9.1	8	0.33	0.37	23.27	9.31	2007 CEIP -	MDAQMD Mine Operations
UH-1	9.1	8	0.08	0.37	5.64	2.26	2007 CEIP -	MDAQMD Mine Operations
CH-53E	9.1	8	0.32	1.01	61.61	24.64	2007 CEIP -	MDAQMD Mine Operations
MV-22	9.1	8	0.04	1.14	8.69	3.48	2007 CEIP -	MDAQMD Mine Operations
Joint RW (1)	9.1	8	0.33	0.37	23.27	9.31	2007 CEIP -	MDAQMD Mine Operations

Table G-23. Total Proposed Aircraft Emissions within all MCAGCC Airspaces - 29 Palms LAS EIS Project Alternatives

Airspace	*Tons per Year*									
	ROG/HC	*CO*	*NOx*	*SO_2*	*PM10*	*PM2.5*	*CO_2*	*CH4*	*N2O*	*CO_2e*
Airspaces	0.86	11.20	23.01	0.95	7.62	7.63	7,378	0.24	0.21	7,447
EAF LTOs	24.53	60.38	12.86	0.80	8.63	8.63	5,786	0.19	0.16	5,840
Range LTOs	0.16	1.29	3.90	0.16	1.00	1.00	1,309	0.04	0.04	1,261
Prop Wash - Fugitive Dust					42.36	16.94				
Total	**25.55**	**72.87**	**39.77**	**1.91**	**59.60**	**34.20**	**14,472**	**0.47**	**0.41**	**7,447**

Table G-24. Proposed Ground Forces Annual Ordnances - 29 Palms LAS EIS Project Alternatives

Ordnance Type/Activity	*Item #*	Usage	Units	Weight/Unit (Lb)	Total Explosive Weight (Tons)
Ground Forces Munitions					
Cartridges Smaller than 30 mm	A059, A063, A064, A131, A576, A976	936,270	EA		
Cartridges 30-75 mm	B519, B535, B576, B630, B643, B647	24,242	EA		
Cartridges 75 mm and Larger	C784, C785, C868, C870, C871, C995	11,468	EA	3.06	17.52
Projectiles, Canisters, and Chargers	D505, D528, D532, D533, D541, D544, D579	38,332	EA	4.96	95.00
Grenades	G878, G930, G940, G945	666	EA		
Rockets, Rocket Motors, and Igniters	HX05, HX07, J143	144	EA	0.11	0.01
Mines and Smoke Pots	K143	144	EA	0.22	0.02
Signals and Simulators	L312, L314, L324	360	EA		
Blasting Caps, Demo. Charges, and Detonators	M Series - Detonating cord	8,829	Ft	0.01	0.02
Blasting Caps, Demo. Charges, and Detonators	M Series - Other explosives	8,829	EA		
Fuses and Primers	N289, N340, N523	24,642	EA	0.003	0.04
Guided Missiles	PB99, WF10	144	EA	1.59	0.11
Total		1,057,160			

Table G-25. Air-Delivered Munitions Used During MEB Exercises - 29 Palms LAS EIS Project Alternatives

	Identification Code	Usage	Units	Weight/Unit	Total Explosive Weight (Tons)
Unguided Munitions					
General Purpose Bomb (25 Lb) - Inert	MK-76 (Inert)	1,950	EA		
General Purpose Bomb (500 Lb)	MK-82	1,020	EA	154.00	78.54
General Purpose Bomb (1,000 Lb) Inert	MK-83 (Inert)	156	EA		
General Purpose Bomb (1,000 Lb)	MK-83	132	EA	165.50	10.92
General Purpose Bomb (2,000 Lb)	MK-84	36	EA	331.00	5.96
Inert Practice Bomb	BDU-45 (Inert)	360	EA		
2.75-inch Rocket	HE/WP/RP Rocket	8,400	EA	0.91	3.84
5-inch Zuni Rocket	HE/WP/ILLUM Rocket	792	EA	4.95	1.96
Guided Munitions [1]					
Hellfire missile	MK-114	72	EA	17.60	0.63
Laser Guided Bomb (500 lb)	GBU-12	432	EA	154.00	33.26
Laser Guided Bomb (1000 lb)	GBU-16	54	EA	165.50	4.47
Laser Guided Bomb (2000 lb)	GBU-10	4	EA	331.00	0.66
Joint Direct Attack Munitions (250 lb)	GB-38 version 4	252	EA	77.00	9.70
Joint Direct Attack Munitions (500 lb)	GBU-38, GBU-54	576	EA	154.00	44.35
Joint Direct Attack Munitions (1000 lb)	GBU-32	24	EA	165.50	1.99
Joint Direct Attack Munitions (2000 lb)	GBU-31	64	EA	331.00	10.59
Hard Target Penetrator	GBU-24	4	EA	331.00	0.66
Small Diameter Missile	GBU-39	24	EA	38.00	0.46
TOW Missile	BGM-71	84	EA	7.92	0.33
Laser Guided Training Round	-	432	EA	0.0066	0.001
Penetrator (500 lb)	BLU-111	384	EA	154.00	29.57
Aircraft Gun Systems Munitions					
20 mm	-	198,000	EA		
25 mm	-	181,000	EA		
7.62 mm	-	336,000	EA	0.002	0.32
.50 Cal	-	790,000	EA	0.01	4.29
Chaff and Flares					
Chaff (Assorted)	-	6,400	EA	0.01	0.04
Flares (Assorted)	-	20,862	EA	0.001	0.01

Table G-26. Ordnance Combustive Emission Factors - 29 Palms LAS EIS Project Alternatives

Ordnance Type	Pounds per Item or (lb/ton of Explosive)						
	ROG	*CO*	*NOx*	*SO_2*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Ground Forces Munitions							
Cartridges Smaller than 30 mm	7.95E-06	1.60E-03	8.50E-05	--	1.08E-06	5.60E-07	3.23E-08
Cartridges 30-75 mm	2.99E-06	3.50E-04	3.59E-05	--	8.22E-07	4.27E-07	2.47E-08
Cartridges 75 mm and Larger	0.85	82.0	9.25	--	4.10E-03	2.13E-03	1.23E-04
Projectiles, Canisters, and Chargers	11.44	777	0.57	--	5.12E-02	2.66E-02	1.54E-03
Grenades	2.39E-05	1.75E-04	4.15E-05	--	3.29E-06	1.71E-06	9.86E-08
Rockets, Rocket Motors, and Igniters	3.26	309	7.28	--	1.74E-02	9.05E-03	5.22E-04
Mines and Smoke Pots	0.58	223.61	0.00	--	2.06E-02	1.07E-02	6.18E-04
Signals and Simulators	0.00	0.01	0.01	--	5.66E-05	2.94E-05	1.70E-06
M Series - Detonating cord	1.21	252.47	0.00	--	4.00E-05	2.08E-05	1.20E-06
M Series - Other explosives	-	0.01	0.01	--	3.44E-03	1.79E-03	1.03E-04
Fuses and Primers	3.44	170.00	-	--	5.70E-06	2.96E-06	1.71E-07
Guided Missiles (3)	3.48	263.66	53.00	--	0.0137	0.0071	0.0004

Notes: (1) Data are averages of emission factors for munitions categories found in 2007 CEIP Appendix D.9.

(2) PM emission factors are for a per blast unit

(3) Used PA45 Surface Attack MGM-51C, from Appendix D.9 of the 2007 CEIP

Table G-27. Air Delivered Munitions Combustive Emission Factors - 29 Palms LAS EIS Project Alternatives

Ordnance Type/Pollutant	*Pounds per Item or (lb/ton of Explosive)*						
	ROG	*CO*	*NOx*	*SO_2*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Unguided Munitions							
General Purpose Bomb (25 Lb) - Inert							
General Purpose Bomb (500 Lb)	11.73	796.00	0.00	--	0.53	0.27	0.02
General Purpose Bomb (1,000 Lb) Inert							
General Purpose Bomb (1,000 Lb)	7.01	554.89	0.00	--	1.36	0.71	0.04
General Purpose Bomb (2,000 Lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Inert Practice Bomb							
2.75-inch Rocket	11.73	796.00	0.00	--	0.010	0.005	0.0003
5-inch Zuni Rocket	3.91	429.67	0.00	--	0.067	0.035	0.002
Guided Munitions							
Hellfire missile	3.91	429.67	0.00	--	0.01	0.01	0.0004
Laser Guided Bomb (500 lb)	11.73	796.00	0.00	--	0.53	0.27	0.02
Laser Guided Bomb (1000 lb)	7.01	554.89	0.00	--	1.36	0.71	0.04
Laser Guided Bomb (2000 lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Joint Direct Attack Munitions (250 lb)	11.73	796.00	0.00	--	0.26	0.14	0.01
Joint Direct Attack Munitions (500 lb)	11.73	796.00	0.00	--	0.53	0.27	0.02
Joint Direct Attack Munitions (1000 lb)	7.01	554.89	0.00	--	1.36	0.71	0.04
Joint Direct Attack Munitions (2000 lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Hard Target Penetrator	7.01	554.89	0.00	--	2.72	1.41	0.08
Small Diameter Missile	3.91	429.67	0.00	--	0.01	0.01	0.0004
TOW Missile	3.91	429.67	0.00	--	0.01	0.01	0.0004
Laser Guided Training Round	0.90	77.00	0.00	--	0.26	0.14	0.01
Penetrator (500 lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Aircraft Gun Systems Munitions							
20 mm	0.0002	0.03	0.0004	--	2.00E-05	1.04E-05	6.01E-07
25 mm		0.06		--	5.48E-05	2.85E-05	1.64E-06
7.62 mm	86.44	125.82	5.97	--	1.77E-06	9.19E-07	5.30E-08
.50 Cal	- 0.55	92.38	- 19.88	--	8.70E-06	4.52E-06	2.61E-07
Chaff and Flares							
Chaff (Smokeless Powder)	0.49	159.33	17.67	--	3.28E-05	1.71E-05	9.84E-07
Flares	1.64	117.00	17.67	--	2.89E-06	1.50E-06	8.68E-08

Notes: (1) Data are averages of emission factors for munitions categories found in 2007 CEIP Appendix D.9.

(2) PM emission factors are for a per blast unit

(3) TOG Emission factors were converted from ROG by multiplying by 0.82

Table G-28. Proposed Ground Forces Combustive Emissions - 29 Palms LAS EIS Project Alternatives

Ordnance Type	*Annual Emissions (Pounds/Year)*						
	ROG	CO	NO_X	SO_2	PM	PM_{10}	$PM_{2.5}$
Ground Forces Munitions							
Cartridges Smaller than 30 mm	7.4	1,498.0	79.6	--	1.0	0.5	0.0
Cartridges 30-75 mm	0.1	8.5	0.9	--	0.0	0.0	0.0
Cartridges 75 mm and Larger	14.9	1,437.1	162.1	--	47.1	24.5	1.4
Projectiles, Canisters, and Chargers	1,086.6	73,846.4	54.2	--	1,962.6	1,019.6	59.0
Grenades	0.0	0.1	0.0	--	0.0	0.0	0.0
Rockets, Rocket Motors, and Igniters	0.0	2.5	0.1	--	2.5	1.3	0.1
Mines and Smoke Pots	0.0	3.5	-	--	3.0	1.5	0.1
Signals and Simulators	-	3.6	3.6	--	0.0	0.0	0.0
M Series - Detonating cord	0.0	6.1	-	--	0.4	0.2	0.0
M Series - Other explosives	-	88.3	88.3	--	30.4	15.8	0.9
Fuses and Primers	0.1	6.3	-	--	0.1	0.1	0.0
Guided Missiles [1]	0.4	30.2	6.1	--	2.0	1.0	0.1
Total Ground Forces Emissions - Pounds	1,110	76,931	395	-	2,049	1,065	62
Total Ground Forces Emissions - Tons	0.55	38.47	0.20	-	1.02	0.53	0.03

Table G-29. Air Delivered Munitions Combustive Emissions - 29 Palms LAS EIS Project Alternatives

Ordnance Type	Pounds/Year						
	ROG	CO	NOx	SO2	PM	PM_{10}	$PM_{2.5}$
Unguided Munitions							
General Purpose Bomb (25 Lb) - Inert							
General Purpose Bomb (500 Lb)	921.0	62,517.8	-	--	538.6	279.5	16.1
General Purpose Bomb (1,000 Lb) Inert							
General Purpose Bomb (1,000 Lb)	76.6	6,061.1	-	--	179.5	93.3	5.4
General Purpose Bomb (2,000 Lb)	41.8	3,306.1	-	--			
Inert Practice Bomb							
2.75-inch Rocket	45.0	3,055.7	-	--	86.5	45.1	2.5
5-inch Zuni Rocket	7.7	842.7	-	--	52.7	27.4	1.6
Guided Munitions							
Hellfire missile	2.5	272.2	-	--	1.0	0.5	0.0
Laser Guided Bomb (500 lb)	390.1	26,478.1	-	--	228.1	118.4	6.8
Laser Guided Bomb (1000 lb)	31.3	2,479.5	-	--	73.4	38.2	2.2
Laser Guided Bomb (2000 lb)	4.6	367.3	-	--	10.9	5.7	0.3
Joint Direct Attack Munitions (250 lb)	113.8	7,722.8	-	--	66.5	34.5	2.0
Joint Direct Attack Munitions (500 lb)	520.1	35,304.2	-	--	304.1	157.8	9.1
Joint Direct Attack Munitions (1000 lb)	13.9	1,102.0	-	--	32.6	17.0	1.0
Joint Direct Attack Munitions (2000 lb)	74.3	5,877.4	-	--	174.1	90.5	5.2
Hard Target Penetrator	4.6	367.3	-	--	10.9	5.7	0.3
Small Diameter Missile	1.8	195.9	-	--	0.3	0.2	0.0
TOW Missile	1.3	142.9	-	--	1.2	0.6	0.0
Laser Guided Training Round	0.0	0.1	-	--	114.0	59.2	3.4
Penetrator (500 lb)	207.4	16,407.1	-	--	1,044.5	543.0	31.3
Aircraft Gun Systems Munitions							
20 mm	40.6	5,940.0	85.1	--	4.0	2.1	0.1
25 mm	-	9,955.0	-	--	9.9	5.2	0.3
7.62 mm	27.7	40.3	1.9	--	0.6	0.3	0.0
.50 Cal	2.4	396.2	85.2	--	6.9	3.6	0.2
Chaff and Flares							
Chaff (Smokeless Powder)	0.0	6.7	0.7	--	0.2	0.1	0.0
Flares	0.0	0.7	0.1	--	0.1	0.0	0.0
Total Air-Delivered Emissions - Pounds	2,528	188,839	173	-	2,941	1,528	88
Total Air-Delivered Emissions - Tons	1.26	94.42	0.09	-	1.47	0.76	0.04
Total Combustive Ordnance Emissions - Pounds	3,638	265,770	568	-	4,990	2,592	150
Total Combustive Ordnance Emissions - Tons	1.82	132.88	0.28	-	2.49	1.30	0.07

Table G-30. Annual Construction and Operational Emissions - 29 Palms LAS EIS - Alternative 1

Activity/Source	Annual Emissions (Tons per Year)										
	VOC	CO	NO_x	SO_x	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Road Construction											
Mobile Equipment	0.08	0.30	0.83	0.00		0.04	0.03	154	0.02	0.00	155
Fugitive Dust						0.41	0.04				
Subtotal	**0.08**	**0.30**	**0.83**	**0.00**		**0.45**	**0.07**	**154**	**0.02**	**0.00**	**155**
Communication Tower Construction											
Mobile Equipment	0.00	0.00	0.00	0.00		0.00	0.00	0.34	0.00	0.00	-
Helicopters	0.09	0.40	0.11	0.01		0.40	0.16	-	-	-	-
On-road Trucks	0.00	0.01	0.02	0.00		0.13	0.02	1.94	0.00	0.00	-
Subtotal	**0.09**	**0.40**	**0.12**	**0.01**		**0.53**	**0.18**	**2.27**	**0.00**	**0.00**	-
Total Construction	**0.17**	**0.71**	**0.96**	**0.01**		**0.98**	**0.25**	**156**	**0.02**	**0.00**	**155**
MEB Exercises											
Tactical Vehicles	5.29	23.73	64.39	7.35		2.33	2.33	69,572	203.03	13.56	78,038
Tactical Support Equipment	1.50	6.48	16.43	2.06		0.70	0.70	857	0.20	0.08	862
Fugitive Dust						565.25	86.56				
Subtotal	**6.79**	**30.21**	**80.82**	**9.41**		**568.29**	**89.59**	**70,429**	**203.23**	**13.64**	**78,900**
Aircraft Operations											
Airspaces	0.86	11.20	23.01	0.95		7.62	7.63	7,378	0.24	0.21	7,447
EAF LTOs	24.53	60.38	12.86	0.80		8.63	8.63	5,786	0.19	0.16	5,840
Range LTOs	0.16	1.29	3.90	0.16		1.00	1.00	1,309	0.04	0.04	1,261
Fugitive Dust						42.36	16.94				
Subtotal	**25.55**	**72.87**	**39.77**	**1.91**		**59.60**	**34.20**	**14,472**	**0.47**	**0.41**	**14,549**
Ordnance Activities											
Combustive	1.82	132.88	0.28								
Fugitive						2.49	1.30				
Subtotal	**1.82**	**132.88**	**0.28**			**2.49**	**1.30**	-	-	-	-
Personnel Commutes											
On-road Vehicles	0.05	0.60	1.84	0.00	-	0.02	0.02	182	-	-	182
Total Operations - Tons per Year (1)	**34.21**	**236.56**	**122.71**	**11.33**	-	**630.40**	**125.10**	**85,083**	**203.70**	**14.05**	**93,632**
Reduction of West Area Emissions - Tons per Year (2)	**(2.95)**	**(24.27)**	**(1.45)**	**(0.03)**		**(258.47)**	**(26.87)**	**(455)**	**(0.67)**	**(0.00)**	
Reduction of South Area Emissions - Tons per Year (3)	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**		**(0.36)**	**(0.04)**	**(1)**	**(0.00)**	-	
Total Operations Net Change - Tons per Year (1)	**31.25**	**212.27**	**121.26**	**11.30**		**371.57**	**98.19**	**84,628**	**203.04**	**14.05**	**93,632**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---				
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**NA**	**Y**	**NA**				

Notes: (1) Excludes construction, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Alternative 1 would eliminate 23% of year 2015 emissions from Johnson Valley

(3) Alternative 1 would eliminate 10% of year 2015 emissions from the South Area

Table G-31. Annual Construction and Operational Emissions - 29 Palms LAS EIS - Alternative 2

Activity/Source	*Annual Emissions (Tons per Year)*										
	VOC	*CO*	*NO_x*	*SO_x*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Road Construction											
Mobile Equipment	0.08	0.30	0.83	0.00		0.04	0.03	154	0.02	0.00	155
Fugitive Dust						0.41	0.04				
Subtotal	**0.08**	**0.30**	**0.83**	**0.00**		**0.45**	**0.07**	**154**	**0.02**	**0.00**	**155**
Communication Tower Construction											
Mobile Equipment	0.00	0.00	0.00	0.00		0.00	0.00	0.34	0.00	0.00	-
Fugitive Dust	0.09	0.40	0.11	0.01		0.40	0.16	-	-	-	-
Mobile Equipment	0.00	0.01	0.02	0.00		0.13	0.02	1.94	0.00	0.00	-
Subtotal	**0.09**	**0.40**	**0.12**	**0.01**		**0.53**	**0.18**	**2.27**	**0.00**	**0.00**	**-**
Total Construction	**0.17**	**0.71**	**0.96**	**0.01**		**0.98**	**0.25**	**156**	**0.02**	**0.00**	**155**
MEB Exercises											
Tactical Equipment	5.29	23.73	64.39	7.36		2.33	2.33	69,572	203.03	13.56	78,038
Tactical Support Equipment	1.50	6.48	16.43	2.06		0.70	0.70	857	0.20	0.08	862
Fugitive Dust						565.25	86.56				
Subtotal	**6.79**	**30.21**	**80.82**	**9.41**		**568.29**	**89.59**	**70,429**	**203.23**	**13.64**	**78,900**
Aircraft Operations											
Airspaces	0.86	11.20	23.01	0.95		7.62	7.63	7,378	0.24	0.21	7,447
EAF LTOs	24.53	60.38	12.86	0.80		8.63	8.63	5,786	0.19	0.16	5,840
Range LTOs	0.16	1.29	3.90	0.16		1.00	1.00	1,309	0.04	0.04	1,261
Fugitive Dust						42.36	16.94				
Subtotal	**25.55**	**72.87**	**39.77**	**1.91**		**59.60**	**34.20**	**14,472**	**0.47**	**0.41**	**14,549**
Ordnance Activities											
Combustive	1.82	132.88	0.28								
Fugitive						2.49	1.30				
Subtotal	**1.82**	**132.88**	**0.28**			**2.49**	**1.30**	**-**	**-**	**-**	**-**
Personnel Commutes											
On-road Vehicles	0.05	0.60	1.84	0.00	-	0.02	0.02	182	-	-	182
Total Operations - Tons per Year (1)	**34.21**	**236.56**	**122.71**	**11.33**	**-**	**630.40**	**125.10**	**85,083**	**203.70**	**14.05**	**93,632**
Reduction of West Area Emissions - Tons per Year (2)	**(1.56)**	**(12.83)**	**(0.77)**	**(0.01)**		**(136.61)**	**(14.20)**	**(240.26)**	**(0.35)**	**(0.00)**	
Reduction of South Area Emissions - Tons per Year (3)	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**		**(0.36)**	**(0.04)**	**(0.66)**	**(0.00)**	**-**	
Total Operations Net Change - Tons per Year (1)	**32.65**	**223.71**	**121.94**	**11.31**		**493.43**	**110.86**	**84,842**	**203.35**	**14.05**	**93,632**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---				
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**NA**	**Y**	**NA**				

Notes: (1) Excludes construction, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Alternative 2 would eliminate 12% of year 2015 emissions from Johnson Valley

(3) Alternative 2 would eliminate 10% of year 2015 emissions from the South Area.

Table G-32. Annual Construction and Operational Emissions - 29 Palms LAS EIS - Alternative 4

	Annual Emissions (Tons per Year)										
Activity/Source	*VOC*	*CO*	*NO_x*	*SO_x*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Road Construction											
Mobile Equipment	0.08	0.30	0.83	0.00		0.04	0.03	154	0.02	0.00	155
Fugitive Dust						0.41	0.04				
Subtotal	**0.08**	**0.30**	**0.83**	**0.00**		**0.45**	**0.07**	**154**	**0.02**	**0.00**	**155**
Communication Tower Construction											
Mobile Equipment	0.00	0.00	0.00	0.00		0.00	0.00	0.34	0.00	0.00	-
Fugitive Dust	0.09	0.40	0.11	0.01		0.40	0.16	-	-	-	-
Mobile Equipment	0.00	0.01	0.02	0.00		0.13	0.02	1.94	0.00	0.00	-
Subtotal	**0.09**	**0.40**	**0.12**	**0.01**		**0.53**	**0.18**	**2.27**	**0.00**	**0.00**	**-**
Total Construction	**0.17**	**0.71**	**0.96**	**0.01**		**0.98**	**0.25**	**156**	**0.02**	**0.00**	**155**
MEB Exercises											
Tactical Equipment	5.29	23.73	64.39	7.36		2.33	2.33	69,572	203.03	13.56	78,038
Tactical Support Equipment	1.50	6.48	16.43	2.06		0.70	0.70	857	0.20	0.08	862
Fugitive Dust						565.25	86.56				
Subtotal	**6.79**	**30.21**	**80.82**	**9.41**		**568.29**	**89.59**	**70,429**	**203.23**	**13.64**	**78,900**
Aircraft Operations											
Airspaces	0.86	11.20	23.01	0.95		7.62	7.63	7,378	0.24	0.21	7,447
EAF LTOs	24.53	60.38	12.86	0.80		8.63	8.63	5,786	0.19	0.16	5,840
Range LTOs	0.16	1.29	3.90	0.16		1.00	1.00	1,309	0.04	0.04	1,261
Fugitive Dust						42.36	16.94				
Subtotal	**25.55**	**72.87**	**39.77**	**1.91**		**59.60**	**34.20**	**14,472**	**0.47**	**0.41**	**14,549**
Ordnance Activities											
Combustive	1.82	132.88	0.28								
Fugitive						2.49	1.30				
Subtotal	**1.82**	**132.88**	**0.28**			**2.49**	**1.30**	-	-	-	-
Personnel Commutes											
On-road Vehicles	0.05	0.60	1.84	0.00	-	0.02	0.02	182	-	-	182
Total Operations - Tons per Year (1)	**34.21**	**236.56**	**122.71**	**11.33**	**-**	**630.40**	**125.10**	**85,083**	**203.70**	**14.05**	**93,632**
Reduction of West Area Emissions - Tons per Year (2)	**(0.51)**	**(4.23)**	**(0.25)**	**(0.00)**		**(45.01)**	**(4.68)**	**(79.15)**	**(0.12)**	**(0.00)**	
Reduction of South Area Emissions - Tons per Year (3)	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**		**(0.36)**	**(0.04)**	**(0.66)**	**(0.00)**	**-**	
Total Operations Net Change - Tons per Year (1)	**33.69**	**232.32**	**122.46**	**11.32**		**585.04**	**120.38**	**85,004**	**203.59**	**14.05**	**93,632**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---				
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**NA**	**Y**	**NA**				

Notes: (1) Excludes construction, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Alternative 2 would eliminate 4% of year 2015 emissions from Johnson Valley.

(3) Alternative 2 would eliminate 10% of year 2015 emissions from the South Area.

Table G-33. Annual Construction and Operational Emissions - 29 Palms LAS EIS - Alternative 5

Activity/Source	Annual Emissions (Tons per Year)										
	VOC	CO	NO_x	SO_x	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Road Construction											
Mobile Equipment	0.08	0.30	0.83	0.00		0.04	0.03	154	0.02	0.00	155
Fugitive Dust						0.41	0.04				
Subtotal	**0.08**	**0.30**	**0.83**	**0.00**		**0.45**	**0.07**	**154**	**0.02**	**0.00**	**155**
Communication Tower Construction											
Mobile Equipment	0.00	0.00	0.00	0.00		0.00	0.00	0.34	0.00	0.00	-
Fugitive Dust	0.09	0.40	0.11	0.01		0.40	0.16	-	-	-	-
Mobile Equipment	0.00	0.01	0.02	0.00		0.13	0.02	1.94	0.00	0.00	-
Subtotal	**0.09**	**0.40**	**0.12**	**0.01**		**0.53**	**0.18**	**2.27**	**0.00**	**0.00**	-
Total Construction	**0.17**	**0.71**	**0.96**	**0.01**		**0.98**	**0.25**	**156**	**0.02**	**0.00**	**155**
MEB Exercises											
Tactical Equipment	5.29	23.73	64.39	7.35		2.33	2.33	69,572	203.03	13.56	78,038
Tactical Support Equipment	1.50	6.48	16.43	2.06		0.70	0.70	857	0.20	0.08	862
Fugitive Dust						565.25	86.56				
Subtotal	**6.79**	**30.21**	**80.82**	**9.41**		**568.29**	**89.59**	**70,429**	**203.23**	**13.64**	**78,900**
Aircraft Operations											
Airspaces	0.86	11.20	23.01	0.95		7.62	7.63	7,378	0.24	0.21	7,447
EAF LTOs	24.53	60.38	12.86	0.80		8.63	8.63	5,786	0.19	0.16	5,840
Range LTOs	0.16	1.29	3.90	0.16		1.00	1.00	1,309	0.04	0.04	1,261
Fugitive Dust						42.36	16.94				
Subtotal	**25.55**	**72.87**	**39.77**	**1.91**		**59.60**	**34.20**	**14,472**	**0.47**	**0.41**	**14,549**
Ordnance Activities											
Combustive	1.82	132.88	0.28								
Fugitive						2.49	1.30				
Subtotal	**1.82**	**132.88**	**0.28**			**2.49**	**1.30**	-	-	-	-
Personnel Commutes											
On-road Vehicles	0.05	0.60	1.84	0.00	-	0.02	0.02	182	-	-	182
Total Operations - Tons per Year (1)	**34.21**	**236.56**	**122.71**	**11.33**	-	**630.40**	**125.10**	**85,083**	**203.70**	**14.05**	**93,632**
Reduction of West Area Emissions - Tons per Year (2)	**(0.51)**	**(4.23)**	**(0.25)**	**(0.00)**		**(45.01)**	**(4.68)**	**(79)**	**(0.12)**	**(0.00)**	
Total Operations Net Change - Tons per Year (1)	**33.70**	**232.34**	**122.46**	**11.32**	-	**585.40**	**120.42**	**85,004**	**203.59**	**14.05**	**93,632**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---				
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**NA**	**Y**	**NA**				

Notes: (1) Excludes construction, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Alternative 2 would eliminate 4% of year 2015 emissions from Johnson Valley.

Table G-34. Annual Construction and Operational Emissions - 29 Palms LAS EIS - Alternative 6

Activity/Source	*Annual Emissions (Tons per Year)*						
	VOC	***CO***	***NO_X***	***SO_X***	***PM***	***PM_{10}***	***$PM_{2.5}$***
Road Construction							
Mobile Equipment	0.08	0.30	0.83	0.00		0.04	0.03
Fugitive Dust						0.41	0.04
Subtotal	**0.08**	**0.30**	**0.83**	**0.00**		**0.45**	**0.07**
Communication Tower Construction							
Mobile Equipment	0.00	0.00	0.00	0.00		0.00	0.00
Fugitive Dust	0.09	0.40	0.11	0.01		0.40	0.16
Mobile Equipment	0.00	0.01	0.02	0.00		0.13	0.02
Subtotal	**0.09**	**0.40**	**0.12**	**0.01**		**0.53**	**0.18**
Total Construction	**0.17**	**0.71**	**0.96**	**0.01**		**0.98**	**0.25**
MEB Exercises							
Tactical Equipment	5.29	23.73	64.39	7.35		2.33	2.33
Tactical Support Equipment	1.50	6.48	16.43	2.06		0.70	0.70
Fugitive Dust						565.25	86.56
Subtotal	**6.79**	**30.21**	**80.82**	**9.41**		**568.29**	**89.59**
Aircraft Operations							
Airspaces	0.86	11.20	23.01	0.95		7.62	7.63
EAF LTOs	24.53	60.38	12.86	0.80		8.63	8.63
Range LTOs	0.16	1.29	3.90	0.16		1.00	1.00
Fugitive Dust						42.36	16.94
Subtotal	**25.55**	**72.87**	**39.77**	**1.91**		**59.60**	**34.20**
Ordnance Activities							
Combustive	1.82	132.88	0.28				
Fugitive						2.49	1.30
Subtotal	**1.82**	**132.88**	**0.28**			**2.49**	**1.30**
Personnel/Vehicle Transport							
On-Road Transport	0.05	0.60	1.84	0.00	-	0.02	0.02
Total Operations - Tons per Year (1)	**34.21**	**236.56**	**122.71**	**11.33**		**630.40**	**125.10**
Reduction of West Area Emissions - Tons per Year (2)	**(1.61)**	**(13.26)**	**(0.79)**	**(0.01)**		**(141.23)**	**(14.68)**
Reduction of South Area Emissions - Tons per Year (3)	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**		**(0.36)**	**(0.04)**
Total Operations Net Change - Tons per Year (1)	**32.59**	**223.28**	**121.92**	**11.31**		**488.81**	**110.38**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**NA**	**Y**	**NA**

Notes: (1) Excludes construction, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Alternative 6 would eliminate 13% of year 2015 emissions from Johnson Valley.

(3) Alternative 6 would eliminate 10% of year 2015 emissions from the South Area.

Table G-35. Emission Source Data for Tactical Vehicles/Support Equipment - 29 Palms LAS EIS - Alternative 3

Activity/Equipment Type	*Number of Vehicles*	*Annual VMT*	*Miles per Gallon*	*Total Gallons*	*Hp*	*Total Hp-Hr (1)*
Tactical Vehicles						
Medium Tactical Vehicle Replacement	348	264,470	3.85	68,694	250	1,373,870
High-Mobility Multipurpose Wheeled Vehicle	785	468,192	14.00	33,442	150	668,846
Logistics Vehicle System	198	92,318	2.00	46,159	445	923,180
Internally Transportable Vehicle	50	22,506	14.00	1,608	71	32,151
M60A1 Bridge Vehicle	4	2,982	0.33	9,036		
Amphibious Assault Vehicle	187	105,092	0.75	140,123	425	2,802,453
(Variants)	87	42,404	5.17	8,202	275	164,039
M88A2 Hercules Recovery Vehicle	12	1,464	0.33	4,436		
High-Mobility Artillery Rocket System	6	70	3.85	18	330	364
Abrams M1A1 Main Battle Tank	44	20,324	0.33	61,588		
Joint Assault Bridge	5	2,310	0.33	6,999		
Assault Breacher Vehicle	5	3,000	0.36	8,333		
Tactical Support Equipment (2)						
	Number of Vehicles	*Hp*	*Hours per Year*	*Total Hp-Hr*		
Medium Crawler Tractor	5	118	120	70,800		
Excavator, Combat	12	295	120	424,800		
Grader	2	150	120	36,000		
Armored Tractor	3	118	120	42,480		
D7 Bulldozer	5	200	120	120,000		
Armored Backhoe	12	295	120	424,800		
Extended Boom Forklift	4	150	120	72,000		
Light Capacity Rough Terrain Truck Forklift	2	110	120	26,400		
Tractor, Rubber Tired, Articulated Steering	10	185	120	222,000		

Notes: (1) Based upon a fuel usage rate of 0.051 gallons per Hp-Hr

(2) Horsepower from CEIP page 7 of 18

Table F-36. Total Tactical Vehicles/Support Equipment Emissions - 29 Palms LAS EIS - Alternative 3

	Pounds per Year										
Activity/Equipment Type	*ROG*	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tactical Vehicles											
Medium Tactical Vehicle Replacement	2,877.37	12,721.02	32,832.35	3,998.03	1,272.10	1,241.81	1,241.81	39,017,912	115,324	7,688	43,823,073
High-Mobility Multipurpose Wheeled Vehicle	1,386.06	6,487.92	15,983.88	1,946.38	648.79	634.05	634.05	18,995,218	56,144	3,743	21,334,531
Logistics Vehicle System	1,933.47	8,547.96	22,061.89	2,686.50	854.80	834.44	834.44	26,218,312	77,493	5,166	29,447,168
Internally Transportable Vehicle	66.63	311.87	768.35	93.56	31.19	30.48	30.48	40,260.17	5.95	0.40	40,508
M60A1 Bridge Vehicle	0.54	4.07	1,073.52	4.61	14.10	14.10	13.74	190,251.60	6.18	5.38	192,049
Amphibious Assault Vehicle	5,869.34	25,948.64	66,972.21	8,155.29	2,594.86	2,533.08	2,533.08	79,589,675	235,240	15,683	89,391,359
Light Armored Vehicle (Variants)	343.56	1,591.20	3,920.15	477.36	159.12	155.50	155.50	205,409.99	30.36	2.02	206,675
M88A2 Hercules Recovery Vehicle	0.27	2.00	527.04	2.26	6.92	6.92	6.74	93,403.20	3.03	2.64	94,285
High-Mobility Artillery Rocket System	0.76	3.37	8.69	1.06	0.34	0.33	0.33	10,327	31	2	11,599
Abrams M1A1 Main Battle Tank	3.70	27.71	7,316.64	31.41	96.08	96.08	93.61	1,296,671.20	42.09	36.66	1,308,920
Joint Assault Bridge	0.42	3.15	831.44	3.57	10.92	10.92	10.64	147,349.00	4.78	4.17	148,741
Assault Breacher Vehicle	117.50	846.67	1,424.00	116.33	14.25	14.25	13.11	175,450.00	5.70	4.96	177,107
Subtotal - Pounds	12,600	56,496	153,720	17,516	5,703	5,572	5,568	165,980,239	484,329	32,338	186,176,015
Tactical Support Equipment											
Medium Crawler Tractor	146.72	146.72	146.72	146.72	146.72	146.72	146.72	146.72	146.72	146.72	146.72
Excavator, Combat	889.68	3,933.33	10,151.75	1,236.19	393.33	383.97	383.97	531,936.51	78.61	5.24	535,212
Grader	75.40	333.33	860.32	104.76	33.33	32.54	32.54	45,079.37	6.66	0.44	45,357
Armored Tractor	88.97	393.33	1,015.17	123.62	39.33	38.40	38.40	53,193.65	7.86	0.52	53,521
D7 Bulldozer	251.32	1,111.11	2,867.72	349.21	111.11	108.47	108.47	150,264.55	22.21	1.48	151,190
Armored Backhoe	889.68	3,933.33	10,151.75	1,236.19	393.33	383.97	383.97	531,936.51	78.61	5.24	535,212
Extended Boom Forklift	149.21	698.41	1,720.63	209.52	69.84	68.25	68.25	90,158.73	13.32	0.89	90,714
Light Capacity Rough Terrain Truck Forklift	54.71	256.08	630.90	76.83	25.61	25.03	25.03	33,058.20	4.89	0.33	33,262
Multipurpose Vehicles	460.05	2,153.44	5,305.29	646.03	215.34	210.45	210.45	277,989.42	41.08	2.74	279,701
Subtotal - Pounds	3,006	12,959	32,850	4,129	1,428	1,398	1,398	1,713,764	400	164	1,724,315
Total Emissions (Pounds)	15,605	69,455	186,570	21,645	7,131	6,970	6,965	167,694,003	484,729	32,502	187,900,330
Total Emissions (Tons) [1]	7.80	34.73	93.29	10.82	3.57	3.48	3.48	76,064.81	219.87	14.74	85,252.29

Calculation of Annual Emissions for Tactical and Support Equipment

Emission Factor (g/hp-hr) x HP-hr x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Abrams Tank/Bridge Vehicles and Assault Breacher Vehicle

Emission Factor (lbs/1000 gals) x Gals x 1 /1000 = Annual Emissions (lb/yr)

Table G-37. Emission Source Data for Tactical Vehicles/Support Equipment - Unpaved Road Dust - 29 Palms LAS EIS - Alternative 3

Equipment Type	*Weight (Tons)*	*Unpaved Emission Factor (Lb/VMT)*			*Annual VMT*	*% Unpaved Travel (1)*	*Unpaved VMT*
		PM	*PM_{10}*	*$PM_{2.5}$*			
Tactical Vehicles							
Medium Tactical Vehicle Replacement	10.0	6.51	1.88	0.29	264,470	90%	238,023
High-Mobility Multipurpose Wheeled Vehicle	3.0	3.79	1.09	0.17	468,192	50%	234,096
Logistics Vehicle System	20.0	8.89	2.57	0.39	92,318	50%	46,159
Internally Transportable Vehicle	3.5	4.06	1.17	0.18	22,506	50%	11,253
M60A1 Bridge Vehicle	70.0	15.63	4.52	0.69	2,982	90%	2,684
Amphibious Assault Vehicle	30.6	10.77	3.11	0.48	105,092	90%	94,583
Light Armored Vehicle (Variants)	14.1	7.60	2.20	0.34	42,404	90%	38,164
M88A2 HERCULES Recovery Vehicle	70.0	15.63	4.52	0.69	1,464	90%	1,318
High-Mobility Artillery Rocket System	12.0	7.07	2.04	0.31	70	50%	35
Abrams M1A1 Main Battle Tank	70.0	15.63	4.52	0.69	20,324	90%	18,292
Joint Assault Bridge	70.0	15.63	4.52	0.69	2,310	90%	2,079
Assault Breacher Vehicle	55.0	14.02	4.05	0.62	3,000	90%	2,700
Tactical Support Equipment							
Ground Disturbance (2)	1	110.0	55.0	5.5	48		

Notes: (1) Percentage of unpaved roads from CY2007 CEIP Appendix D.11 page 220 of 220

(2) Weight = daily disturbed acerage and Annual VMT = total annual days of disburbance. Emission factors in lb/acre-day.

Table G-38. Emission Source Data for Tactical Vehicles/Support Equipment - Paved Road Dust - 29 Palms LAS EIS - Alternative 3

Equipment Type	*Weight (Tons)*	*Paved Emission Factor (Lb/VMT)*			*Annual VMT*	*% Paved Travel (1)*	*Paved VMT*
		PM	*PM_{10}*	*$PM_{2.5}$*			
Tactical Vehicles							
Medium Tactical Vehicle Replacement	10.0	0.07	0.01	0.002	264,470	10%	26,447
High-Mobility Multipurpose Wheeled Vehicle	3.0	0.01	0.00	-	468,192	50%	234,096
Logistics Vehicle System	20.0	0.20	0.04	0.006	92,318	50%	46,159
Internally Transportable Vehicle	3.5	0.01	0.00	0.000	22,506	50%	11,253
M60A1 Bridge Vehicle	70.0	1.32	0.26	0.038	2,982	10%	298
Amphibious Assault Vehicle	30.6	0.38	0.07	0.011	105,092	10%	10,509
Light Armored Vehicle (Variants)	14.1	0.12	0.02	0.003	42,404	10%	4,240
M88A2 HERCULES Recovery Vehicle	70.0	1.32	0.26	0.038	1,464	10%	146
High-Mobility Artillery Rocket System	12.0	0.09	0.02	0.002	70	50%	35
Abrams M1A1 Main Battle Tank	70.0	1.32	0.26	0.038	20,324	10%	2,032
Joint Assault Bridge	70.0	1.32	0.26	0.038	2,310	10%	231
Assault Breacher Vehicle	55.0	0.92	0.18	0.027	3,000	10%	300

Notes: (1) Percentage of unpaved roads from CY2007 CEIP Appendix D.11 page 220 of 220

(2) US EPA 42 13.2.1, sL - 0.1, k(PM10) - 0.016, k(PM2.5) - 0.0024, C(PM10) - 0.00047, C(PM2.5) - 0.00036

Table G-39. Annual Fugitive Dust Emisssions for Tactical Vehciles - Unpaved Roads - 29 Palms LAS EIS - .

Equipment Type	*Annual Emissions - Tons*		
	PM	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles			
Medium Tactical Vehicle Replacement	774.7	223.9	34.3
High-Mobility Multipurpose Wheeled Vehicle	443.2	128.1	19.6
Logistics Vehicle System	205.2	59.3	9.1
Internally Transportable Vehicle	22.8	6.6	1.0
M60A1 Bridge Vehicle	21.0	6.1	0.9
Amphibious Assault Vehicle	509.2	147.2	22.6
Light Armored Vehicle (Variants)	145.0	41.9	6.4
M88A2 HERCULES Recovery Vehicle	10.3	3.0	0.5
High-Mobility Artillery Rocket System	0.1	0.0	0.0
Abrams M1A1 Main Battle Tank	142.9	41.3	6.3
Joint Assault Bridge	16.2	4.7	0.7
Assault Breacher Vehicle	18.9	5.5	0.8
Subtotal	**2,309.7**	**667.5**	**102.4**
Tactical Support Equipment			
Ground Disturbance	2.6	1.3	0.1
Subtotal	**2.6**	**1.3**	**0.1**
Total Emissions	**2,312.4**	**668.8**	**102.5**

Table G-40. Annual Fugitive Dust Emisssions for Tactical Vehciles - Paved Roads - 29 Palms LAS EIS - Alt

Equipment Type	*Annual Emissions - Tons*		
	PM	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles			
Medium Tactical Vehicle Replacement	0.9	0.2	0.0
High-Mobility Multipurpose Wheeled Vehicle	1.3	0.2	-
Logistics Vehicle System	4.6	0.9	0.1
Internally Transportable Vehicle	0.1	0.01	0.00
M60A1 Bridge Vehicle	0.2	0.04	0.01
Amphibious Assault Vehicle	2.0	0.39	0.06
Light Armored Vehicle (Variants)	0.3	0.05	0.01
M88A2 HERCULES Recovery Vehicle	0.1	0.02	0.00
High-Mobility Artillery Rocket System	0.0	0.00	0.00
Abrams M1A1 Main Battle Tank	1.3	0.26	0.04
Joint Assault Bridge	0.2	0.03	0.00
Assault Breacher Vehicle	0.1	0.03	0.00
Total Emissions	**11.1**	**2.1**	**0.3**
Total Emissions - Paved and Unpaved Roads	**2,323.5**	**671.0**	**102.8**

Table G-41. Annual Air Emissions Summary - 29 Palms LAS EIS - Alternative 3

	Annual Emissions (Pounds per Year)										
Activity/Source	*ROG*	*CO*	*NO_x*	*SO_x*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Road Construction											
Mobile Equipment	165	603	1,665	2	1,712	82	139	308,169	45	3	310,072
Fugitive Dust					1	825	83				
Subtotal	**165**	**603**	**1,665**	**2**	**1,712**	**907**	**221**	**308,169**	**45**	**3**	**310,072**
MEB Excersises											
Tactical Equipment	12,600	56,496	153,720	17,516	5,703	5,572	5,568	165,980,239	484,329	32,338	186,176,015
Tactical Support Equipment	3,006	12,959	32,850	4,129	1,428	1,398	1,398	1,713,764	400	164	1,724,315
Fugitive Dust					2,324	1,341,908	205,511				
Subtotal	**15,605**	**69,455**	**186,570**	**21,645**	**9,455**	**1,348,878**	**212,477**	**167,694,003**	**484,729**	**32,502**	**187,900,330**
Aircraft Operations											
Airspaces	1,715	22,408	46,014	1,908		15,243	15,257	14,755,580	479	417	14,894,961
EAF LTOs	49,058	120,761	25,718	1,600		17,257	17,257	11,571,378	376	327	11,680,681
Range LTOs	320	2,578	7,801	320		1,991	1,991	2,617,570	85	74	2,522,279
Fugitive Dust						84,713	33,885				
Subtotal	**51,093**	**145,748**	**79,532**	**3,828**		**119,204**	**68,390**	**28,944,528**	**940**	**818**	**29,097,921**
Ordnance Activities											
Combustive	3,638	265,770	568								
Fugitive						4,990	2,592				
Subtotal	**3,638**	**265,770**	**568**	-		**4,990**	**2,592**	-	-	-	-
Personnel Commutes											
On-road Vehicles	0.05	0.60	1.84	0.00		0.02	0.02	182	-	-	182
Total - Pounds per Year (1)	**70,337**	**480,973**	**266,673**	**25,473**		**1,473,072**	**283,459**	**196,638,713**	**485,668**	**33,320**	**216,998,434**
Total - Tons per Year (1) (2)	**35.17**	**240.49**	**133.34**	**12.74**		**736.54**	**141.73**	**87,785**	**217**	**15**	**96,874**
Reduction of BLM East Area Emissions - Tons per Year (2)	**(0.00)**	**(0.01)**	**(0.00)**	**(0.00)**		**(0.23)**	**(0.02)**	**(0.40)**	**(0.00)**	**(0.00)**	**(0.40)**
Reduction of BLM South Area Emissions - Tons per Year (3)	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**		**(0.36)**	**(0.04)**	**(0.66)**	**(0.00)**	**-**	**(0.66)**
Total Operations Net Change - Tons per Year (1)	**35.16**	**240.45**	**133.33**	**12.74**		**735.94**	**141.67**	**87,784**	**216.82**	**14.88**	**96,873**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---				
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**N**	**Y**	**NA**				

Notes: (1) Excludes construciton, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Equal to 10% of total West Area emissions.

(3) Equal to 10% of total South Area emissions.

(4) CO2e units are in metric tonnes.

Table G-42. Year 2010 Visitation Activities for Acquired Lands - 29 Palms LAS EIS

Area	Total Annual Visitor-Days	Total Annual Visitor Days			Days per Overnight Use	Total Annual Visitors		
		OHV Day Use	Overnight	Non-OHV Day Use		OHV Day Use	Overnight	Non-OHV Day Use
Johnson Valley	291,348	49,945	233,078	8,324	2.5	49,945	93,231	8,324
East	500	450	50		2.5	450	20	-
South	800	800			-	800	-	-

Table G-43. Emission Source Data for Existing Activities in Johnson Valley OHV Area.

Trip Type/Vehicle or Source	Annual Vehicle Trips	VMT/ Trip	Annual VMT	Vehicle Weight (Tons)
OHV Day Use				
Transport vehicle	24,973	20	499,454	1
OHVs	6,243	24	146,715	0.50
Motorcycles	18,730	24	440,144	0.05
Overnight				
Transport vehicle	31,077	30	932,314	2
OHV	11,654	44	513,501	0.50
Motorcycle	34,962	44	1,540,503	0.05
Generator - Gasoline (1) (2)	31,077	3	93,231	
Propane Stoves (1) (3)	31,077	2	62,154	
Fire (4)	31,077	20	621,542	
Non-OHV Day Use				
Transport vehicle	4,162	20	83,242	1

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table G-44. Emission Source Data for Existing Activities in the East Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	225	20	4,500	1
OHVs	56	24	1,322	0.50
Motorcycles	169	24	3,966	0.05
Overnight				
Transport vehicle	7	30	200	2
OHV	3	44	110	0.50
Motorcycle	8	44	330	0.05
Generator - Gasoline (1) (2)	7	3	20	
Propane Stoves (1) (3)	7	2	13	
Fire (4)	7	20	133	

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table G-45. Emission Source Data for Existing Activities in the South Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/ Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	400	20	8,000	1
OHVs	100	24	2,350	0.50
Motorcycles	300	24	7,050	0.05

Assumptions:

(1) Source: (BLM 2010).

(2) 17/80/3% of visitor use days = OHV day/overnight/non-OHV day uses.

(3) The average length of stay for overnight use is 2.5 days.

(4) Rider occupancy of transport vehicle for day/overnight uses is 2/3 visitors.

(5) 50% of day and overnight visitors would operate an OHV. OHV fleet mix = 75/25% motorcycle/4 wheel vehicle.

(6) Vehile miles travelled (VMT) based upon 20% of visitors drive 10 VMT, 70% drive 25 VMT, and 10% drive 40 VMT per day.

Table G-46. Existing Emissions within Acquired Lands - 29 Palms LAS EIS (Pounds/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
OHV Day Use										
Transport vehicle	159	4,371	515	6	-	53	49	530,725	46	-
Transport vehicle - dust						335,039	33,504			
OHVs	47	1,284	151	2	-	16	14	155,900	14	-
OHVs - dust						72,046	7,205			
Motorcycles	2,436	21,250	1,184	2	-	38	35	136,817	199	-
Motorcycles - dust						76,689	7,669			
Overnight										
Transport vehicle	296	8,160	962	10	-	99	91	990,686	86	-
Transport vehicle - dust						854,331	85,433			
OHVs	163	4,494	530	6	-	54	50	545,651	48	-
OHVs - dust						252,161	25,216			
Motorcycles	8,524	74,376	4,143	7	-	132	122	478,860	696	-
Motorcycles - dust						268,411	26,841			
Generator - Gasoline	6,039	1,947	3,077	165	-	202	186	302,070	-	-
Propane Stoves	12	93	162	1	9	9	9	155,386	2	11
Fire	4,289	64,019	-	-	14,295	9,323	8,080	-	3,854	-
Non-OHV Day Use										
Transport vehicle	26	729	86	1	-	9	8	88,454	8	-
Transport vehicle - dust						55,840	5,584			
Total - Johnson Valley	*21,990*	*180,723*	*10,810*	*199*	*14,304*	*1,924,451*	*200,094*	*3,384,549*	*4,953*	*11*
East Area										
OHV Day Use										
Transport vehicle	1	39	5	0	-	0	0	4,782	0	-
Transport vehicle - dust						3,019	302			
OHVs	0	12	1	0	-	0	0	1,405	0	-
OHVs - dust						649	65			
Motorcycles	22	191	11	0	-	0	0	1,233	2	-
Motorcycles - dust						691	69			
Overnight										
Transport vehicle	0	2	0	0	-	0	0	213	0	-
Transport vehicle - dust						183	18			
OHVs	0	1	0	0	-	0	0	117	0	-
OHVs - dust						54	5			
Motorcycles	2	16	1	0	-	0	0	103	0	-
Motorcycles - dust						58	6			
Generator - Gasoline	1	0	1	0	-	0	0	65	-	-
Propane Stoves	0	0	0	0	0	0	0	33	0	0
Fire	1	14	-	-	3	2	2	-	1	-
Total - East Area	*28*	*275*	*19*	*0*	*3*	*4,657*	*468*	*7,950*	*3*	*0*
South Area										
OHV Day Use										
Transport vehicle	3	70	8	0	-	1	1	8,501	1	-
Transport vehicle - dust						5,366	537			
OHVs	1	21	2	0	-	0	0	2,497	0	-
OHVs - dust						649	65			
Motorcycles	39	340	19	0	-	1	1	2,191	3	-
Motorcycles - dust						1,228	123			
Total - South Area	*42*	*431*	*30*	*0*	*-*	*7,246*	*726*	*13,189*	*4*	*-*
Total Emissions - Pounds	*22,061*	*181,429*	*10,858*	*200*	*14,307*	*1,936,353*	*201,288*	*3,405,688*	*4,960*	*11*

Table G-47. Existing Emissions within Acquired Lands - 29 Palms LAS EIS (Tons/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
					Johnson Valley					
OHV Day Use										
Transport vehicle	0.08	2.19	0.26	0.00	-	0.03	0.02	265.36	0.02	-
Transport vehicle - dust	-	-	-	-	-	167.52	16.75	-	-	-
OHVs	0.02	0.64	0.08	0.00	-	0.01	0.01	77.95	0.01	-
OHVs - dust	-	-	-	-	-	36.02	3.60	-	-	-
Motorcycles	1.22	10.63	0.59	0.00	-	0.02	0.02	68.41	0.10	-
Motorcycles - dust	-	-	-	-	-	38.34	3.83	-	-	-
Overnight										
Transport vehicle	0.15	4.08	0.48	0.01	-	0.05	0.05	495.34	0.04	-
Transport vehicle - dust	-	-	-	-	-	427.17	42.72	-	-	-
OHVs	0.08	2.25	0.26	0.00	-	0.03	0.02	272.83	0.02	-
OHVs - dust	-	-	-	-	-	126.08	12.61	-	-	-
Motorcycles	4.26	37.19	2.07	0.00	-	0.07	0.06	239.43	0.35	-
Motorcycles - dust	-	-	-	-	-	134.21	13.42	-	-	-
Generator - Gasoline	3.02	0.97	1.54	0.08	-	0.10	0.09	151.03	-	-
Propane Stoves	0.01	0.05	0.08	0.00	0.00	0.00	0.00	77.69	0.00	0.01
Fire	2.14	32.01	-	-	7.15	4.66	4.04	-	1.93	-
Non-OHV Day Use										
Transport vehicle	0.01	0.36	0.04	0.00	-	0.00	0.00	44.23	0.00	-
Transport vehicle - dust						27.92	2.79			
Total - Johnson Valley	*11.00*	*90.36*	*5.40*	*0.10*	*7.15*	*962.23*	*100.05*	*1,692.27*	*2.48*	*0.01*
					East Area					
OHV Day Use										
Transport vehicle	0.00	0.02	0.00	0.00	-	0.00	0.00	2.39	0.00	-
Transport vehicle - dust	-	-	-	-	-	1.51	0.15	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	0.70	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.01	0.10	0.01	0.00	-	0.00	0.00	0.62	0.00	-
Motorcycles - dust	-	-	-	-	-	0.35	0.03	-	-	-
Overnight										
Transport vehicle	0.00	0.00	0.00	0.00	-	0.00	0.00	0.11	0.00	-
Transport vehicle - dust	-	-	-	-	-	0.09	0.01	-	-	-
OHVs	0.00	0.00	0.00	0.00	-	0.00	0.00	0.06	0.00	-
OHVs - dust	-	-	-	-	-	0.03	0.00	-	-	-
Motorcycles	0.00	0.01	0.00	0.00	-	0.00	0.00	0.05	0.00	-
Motorcycles - dust	-	-	-	-	-	0.03	0.00	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Fire	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Total - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
					South Area					
OHV Day Use										
Transport vehicle	0.00	0.04	0.00	0.00	-	0.00	0.00	4.25	0.00	-
Transport vehicle - dust	-	-	-	-	-	2.68	0.27	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	1.25	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.02	0.17	0.01	0.00	-	0.00	0.00	1.10	0.00	-
Motorcycles - dust	-	-	-	-	-	0.61	0.06	-	-	-
Total - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*11.03*	*90.71*	*5.43*	*0.10*	*7.15*	*968.18*	*100.64*	*1,703*	*2.48*	*0.01*

Table G-48. Existing Emissions within Acquired Lands by Source Category - 29 Palms LAS EIS (Tons/Year)

Area/Source Category	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
Vehicles - Combustive	5.83	57.33	3.79	0.02	-	0.20	0.18	1,463.55	0.55	-
Vehicles - Dust	-	-	-	-	-	957.26	95.73	-	-	-
Generator - Gasoline	3.02	0.97	1.54	0.08	-	0.10	0.09	151.03	-	-
Propane Stoves	0.01	0.05	0.08	0.00	0.00	0.00	0.00	77.69	0.00	0.01
Camp Fires	2.14	32.01	-	-	7.15	4.66	4.04	-	1.93	-
Subtotal - Johnson Valley	*11.00*	*90.36*	*5.40*	*0.10*	*7.15*	*962.23*	*100.05*	*1,692.27*	*2.48*	*0.01*
East Area										
Vehicles - Combustive	0.01	0.13	0.01	0.00	-	0.00	0.00	3.93	0.00	-
Vehicles - Dust	-	-	-	-	-	2.33	0.23	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Camp Fires	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Subtotal - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
South Area										
Vehicles - Combustive	0.02	0.22	0.01	0.00	-	0.00	0.00	6.59	0.00	-
Vehicles - Dust	-	-	-	-	-	3.62	0.36	-	-	-
Subtotal - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*11.03*	*90.71*	*5.43*	*0.10*	*7.15*	*968.18*	*100.64*	*1,703*	*2.48*	*0.01*

Table G-49. Emission Factors for Existing Sources within Acquired Lands - 29 Palms LAS EIS.

	Emission Factors										
Source	*VOC*	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	*Notes*
Liquid Propane Gas Combustion	1.00	7.50	13.00	0.11	0.70	0.70	0.70	12,500	0.20	0.90	(1)
Camp Fires	13.80	206.00			46.00	30.00	26.00		12.40		(2)
Generator - Gasoline	0.02	0.01	0.01	0.00		0.00	0.00	1.08			(3)
Light Duty Truck - 2010	0.14	3.97	0.47	0.01		0.05	0.04	482	0.04		(4)
Motorcycle - 2010	2.51	21.90	1.22	0.00		0.04	0.04	141	0.21		(5)
Light Duty Truck - 2015	0.08	2.68	0.30	0.01		0.05	0.05	483	0.04		(6)
Motorcycle - 2015	2.24	17.76	1.17	0.00		0.03	0.03	149	0.20		(7)
Vehicle Dust - 4WD						0.49	0.05				(8)
Vehicle Dust - Day Use Transport Vehicle						0.67	0.07				(9)
Vehicle Dust - Motorcycle						0.17	0.02				(10)
Vehicle Dust - Overnight Transport Vehicle						0.92	0.09				(11)

Notes:

(1) U.S. EPA AP-42 Section 1.5 - Liquefied Petroleum Gas Combustion (lb/1,000 gal)

(2) U.S. EPA AP-42 Section 13.1-3 - Wildfires and Prescribed Burning (lb/ton)

(3) U.S. EPA AP-42 Section 3.3 - Gasoline and Diesel Industrial Engines (lb/hp-hr)

(4) Statewide average for light duty truck, 25 mph, year 2010 (g/mile). From EMFAC2007 (ARB 2007).

(5) Statewide average for motorcycle, 25 mph, year 2010 (g/mile). From EMFAC2007 (ARB 2007).

(6) Statewide average for light duty truck, 25 mph, year 2015 (g/mile). From EMFAC2007 (ARB 2007).

(7) Statewide average for motorcycle, 25 mph, year 2015 (g/mile). From EMFAC2007 (ARB 2007).

(8) Fugitive Dust from Unpaved Roads Emission Factors for OHV (lb/VMT) EPA AP-42, Section 13.2.2.

(9) Fugitive Dust from Unpaved Roads Emission Factors for Transport Vehicles (lb/VMT) EPA AP-42, Section 13.2.2.

(10) Fugitive Dust from Unpaved Roads Emission Factors for motorcycles (lb/VMT) EPA AP-42, Section 13.2.2.

(11) Fugitive Dust from Unpaved Roads Emission Factors for Overnight Transport Vehicles (lb/VMT) EPA AP-42, Section 13.2.2.

Vehicle Travel Unpaved = ((k(s/12)^a)*((W/3)^b)

k (PM_{10})		1.50	k ($PM_{2.5}$)	0.15
	s	8.50	surface material silt content (%)	
	a	0.90		
	b	0.45		
	W_O	0.50	average weight OHV (tons)	
	W_{TV}	1.00	average weight Transport Vehicles (tons)	
	W_M	0.05	average weight Motorcycles (tons)	
	W_{TV2}	2.00	average weight Overnight Transport Vehicles (tons)	

Table G-50. Year 2015 Visitation Activities for Acquired Lands - 29 Palms LAS EIS

	Total Annual	*Total Annual Visitor Days*			*Days per*	*Total Annual Visitors*		
Area	*Visitor-Days*	*OHV Day Use*	*Overnight*	*Non-OHV Day Use*	*Overnight Use*	*OHV Day Use*	*Overnight*	*Non-OHV Day Use*
Johnson Valley	336,975	57,767	269,580	9,628	2.5	57,767	107,832	9,628
East	500	450	50		2.5	450	20	-
South	800	800			-	800	-	-

Table G-51. Emission Source Data for Year 2015 Activities in Johnson Valley OHV Area.

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/ Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	28,884	20	577,671	1
OHVs	7,221	24	169,691	0.50
Motorcycles	21,663	24	509,073	0.05
Overnight				
Transport vehicle	35,944	30	1,078,320	2
OHV	13,479	44	593,918	0.50
Motorcycle	40,437	44	1,781,755	0.05
Generator - Gasoline (1) (2)	35,944	3	107,832	
Propane Stoves (1) (3)	35,944	2	71,888	
Fire (4)	35,944	20	718,880	
Non-OHV Day Use				
Transport vehicle	4,814	20	96,279	1

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table G-52. Emission Source Data for Year 2015 Activities in the East Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	225	20	4,500	1
OHVs	56	24	1,322	0.50
Motorcycles	169	24	3,966	0.05
Overnight				
Transport vehicle	7	30	200	2
OHV	3	44	110	0.50
Motorcycle	8	44	330	0.05
Generator - Gasoline (1) (2)	7	3	20	
Propane Stoves (1) (3)	7	2	13	
Fire (4)	7	20	133	

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table G-53. Emission Source Data for Year 2015 Activities in the South Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/ Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	400	20	8,000	1
OHVs	100	24	2,350	0.50
Motorcycles	300	24	7,050	0.05

<u>Assumptions:</u>

(1) Source: (BLM 2010).

(2) 17/80/3% of visitor use days = OHV day/overnight/non-OHV day uses.

(3) The average length of stay for overnight use is 2.5 days.

(4) Rider occupancy of transport vehicle for day/overnight uses is 2/3 visitors.

(5) 50% of day and overnight visitors would operate an OHV. OHV fleet mix = 75/25% motorcycle/4 wheel vehicle.

(6) Vehile miles travelled (VMT) based upon 20% of visitors drive 10 VMT, 70% drive 25 VMT, and 10% drive 40 VMT per day.

Table G-54. Year 2015 Emissions within Acquired Lands - 29 Palms LAS EIS (Pounds/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
					Johnson Valley					
OHV Day Use										
Transport vehicle	183	5,056	596	6	-	61	56	613,840	53	-
Transport vehicle - dust						387,509	38,751			
OHVs	54	1,485	175	2	-	18	17	180,315	16	-
OHVs - dust						83,329	8,333			
Motorcycles	2,817	24,578	1,369	2	-	44	40	158,244	230	-
Motorcycles - dust						88,699	8,870			
Overnight										
Transport vehicle	342	9,438	1,113	12	-	114	105	1,145,834	100	-
Transport vehicle - dust						988,125	98,812			
OHVs	189	5,198	613	7	-	63	58	631,104	55	-
OHVs - dust						291,651	29,165			
Motorcycles	9,859	86,024	4,792	8	-	153	141	553,853	805	-
Motorcycles - dust						310,445	31,045			
Generator - Gasoline	6,985	2,252	3,558	191	-	233	215	349,376	-	-
Propane Stoves	14	108	187	2	10	10	10	179,720	3	13
Fire	4,960	74,045	-	-	16,534	10,783	9,345	-	4,457	-
Non-OHV Day Use										
Transport vehicle	31	843	99	1	-	10	9	102,307	9	-
Transport vehicle - dust						64,585	6,458			
Total - Johnson Valley	*25,434*	*209,026*	*12,503*	*231*	*16,544*	*2,225,832*	*231,430*	*3,914,591*	*5,728*	*13*
					East Area					
OHV Day Use										
Transport vehicle	1	39	5	0	-	0	0	4,782	0	-
Transport vehicle - dust						3,019	302			
OHVs	0	12	1	0	-	0	0	1,405	0	-
OHVs - dust						649	65			
Motorcycles	22	191	11	0	-	0	0	1,233	2	-
Motorcycles - dust						691	69			
Overnight										
Transport vehicle	0	2	0	0	-	0	0	213	0	-
Transport vehicle - dust						183	18			
OHVs	0	1	0	0	-	0	0	117	0	-
OHVs - dust						54	5			
Motorcycles	2	16	1	0	-	0	0	103	0	-
Motorcycles - dust						58	6			
Generator - Gasoline	1	0	1	0	-	0	0	65	-	-
Propane Stoves	0	0	0	0	0	0	0	33	0	0
Fire	1	14	-	-	3	2	2	-	1	-
Total - East Area	*28*	*275*	*19*	*0*	*3*	*4,657*	*468*	*7,950*	*3*	*0*
					South Area					
OHV Day Use										
Transport vehicle	3	70	8	0	-	1	1	8,501	1	-
Transport vehicle - dust						5,366	537			
OHVs	1	21	2	0	-	0	0	2,497	0	-
OHVs - dust						649	65			
Motorcycles	39	340	19	0	-	1	1	2,191	3	-
Motorcycles - dust						1,228	123			
Total - South Area	*42*	*431*	*30*	*0*	*-*	*7,246*	*726*	*13,189*	*4*	*-*
Total Emissions - Pounds	*25,504*	*209,732*	*12,551*	*231*	*16,547*	*2,237,735*	*232,625*	*3,935,730*	*5,736*	*13*

Table G-55. Year 2015 Emissions within Acquired Lands - 29 Palms LAS EIS (Tons/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
OHV Day Use										
Transport vehicle	0.09	2.53	0.30	0.00	-	0.03	0.03	306.92	0.03	-
Transport vehicle - dust	-	-	-	-	-	193.75	19.38	-	-	-
OHVs	0.03	0.74	0.09	0.00	-	0.01	0.01	90.16	0.01	-
OHVs - dust	-	-	-	-	-	41.66	4.17	-	-	-
Motorcycles	1.41	12.29	0.68	0.00	-	0.02	0.02	79.12	0.12	-
Motorcycles - dust	-	-	-	-	-	44.35	4.43	-	-	-
Overnight										
Transport vehicle	0.17	4.72	0.56	0.01	-	0.06	0.05	572.92	0.05	-
Transport vehicle - dust	-	-	-	-	-	494.06	49.41	-	-	-
OHVs	0.09	2.60	0.31	0.00	-	0.03	0.03	315.55	0.03	-
OHVs - dust	-	-	-	-	-	145.83	14.58	-	-	-
Motorcycles	4.93	43.01	2.40	0.00	-	0.08	0.07	276.93	0.40	-
Motorcycles - dust	-	-	-	-	-	155.22	15.52	-	-	-
Generator - Gasoline	3.49	1.13	1.78	0.10	-	0.12	0.11	174.69	-	-
Propane Stoves	0.01	0.05	0.09	0.00	0.01	0.01	0.01	89.86	0.00	0.01
Fire	2.48	37.02	-	-	8.27	5.39	4.67	-	2.23	-
Non-OHV Day Use										
Transport vehicle	0.02	0.42	0.05	0.00	-	0.01	0.00	51.15	0.00	-
Transport vehicle - dust						32.29	3.23			
Total - Johnson Valley	*12.72*	*104.51*	*6.25*	*0.12*	*8.27*	*1,112.92*	*115.72*	*1,957.30*	*2.86*	*0.01*
East Area										
OHV Day Use										
Transport vehicle	0.00	0.02	0.00	0.00	-	0.00	0.00	2.39	0.00	-
Transport vehicle - dust	-	-	-	-	-	1.51	0.15	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	0.70	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.01	0.10	0.01	0.00	-	0.00	0.00	0.62	0.00	-
Motorcycles - dust	-	-	-	-	-	0.35	0.03	-	-	-
Overnight										
Transport vehicle	0.00	0.00	0.00	0.00	-	0.00	0.00	0.11	0.00	-
Transport vehicle - dust	-	-	-	-	-	0.09	0.01	-	-	-
OHVs	0.00	0.00	0.00	0.00	-	0.00	0.00	0.06	0.00	-
OHVs - dust	-	-	-	-	-	0.03	0.00	-	-	-
Motorcycles	0.00	0.01	0.00	0.00	-	0.00	0.00	0.05	0.00	-
Motorcycles - dust	-	-	-	-	-	0.03	0.00	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Fire	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Total - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
South Area										
OHV Day Use										
Transport vehicle	0.00	0.04	0.00	0.00	-	0.00	0.00	4.25	0.00	-
Transport vehicle - dust	-	-	-	-	-	2.68	0.27	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	1.25	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.02	0.17	0.01	0.00	-	0.00	0.00	1.10	0.00	-
Motorcycles - dust	-	-	-	-	-	0.61	0.06	-	-	-
Total - South Area	*0.02*	*0.22*	*0.01*	*0.00*	*-*	*3.62*	*0.36*	*6.59*	*0.00*	*-*
Total Emissions - Tons	*12.75*	*104.87*	*6.28*	*0.12*	*8.27*	*1,118.87*	*116.31*	*1,968*	*2.87*	*0.01*

Table G-56. Year 2015 Emissions within Acquired Lands by Source Category - 29 Palms LAS EIS (Tons/Year)

Area/Source Category	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
Vehicles - Combustive	6.74	66.31	4.38	0.02	-	0.23	0.21	1,692.75	0.63	-
Vehicles - Dust	-	-	-	-	-	1,107.17	110.72	-	-	-
Generator - Gasoline	3.49	1.13	1.78	0.10	-	0.12	0.11	174.69	-	-
Propane Stoves	0.01	0.05	0.09	0.00	0.01	0.01	0.01	89.86	0.00	0.01
Camp Fires	2.48	37.02	-	-	8.27	5.39	4.67	-	2.23	-
Subtotal - Johnson Valley	*12.72*	*104.51*	*6.25*	*0.12*	*8.27*	*1,112.92*	*115.72*	*1,957.30*	*2.86*	*0.01*
East Area										
Vehicles - Combustive	0.01	0.13	0.01	0.00	-	0.00	0.00	3.93	0.00	-
Vehicles - Dust	-	-	-	-	-	2.33	0.23	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Camp Fires	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Subtotal - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
South Area										
Vehicles - Combustive	0.02	0.22	0.01	0.00	-	0.00	0.00	6.59	0.00	-
Vehicles - Dust	-	-	-	-	-	3.62	0.36	-	-	-
Subtotal - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*12.75*	*104.87*	*6.28*	*0.12*	*8.27*	*1,118.87*	*116.31*	*1,968*	*2.87*	*0.01*

Table G-57. Fraction of Events Visitors in Johnson Valley OHV Area Displaced by Each Project Alternative

Alternative	*Displaced from JV*	*Remain in County (1)*	*Displaced from County*	*% of Total JV out of C*	*Remain in O3 NA (1)*	*Displaced from O3 NA*	*% of Total JV out of NA*
1	1.00	-	1.00	0.17	-	1.00	0.17
2	0.60	-	1.00	0.10	-	1.00	0.10
4	0.15	-	1.00	0.03	-	1.00	0.03
5	0.15	-	1.00	0.03	-	1.00	0.03
6	0.60	-	1.00	0.10	-	1.00	0.10

Note: 17 percent of the annual visitor usage occurs from events.

Note: (1) = Total visitors that remain

Table G-58. Fraction of Dispersed-Use Visitors in Johnson Valley OHV Area Displaced by Each Project Alternative

Alternative	*Displaced from JV*	*Remain in County (1)*	*Displaced from County*	*% of Total JV out of C*	*Remain in O3 NA (1)*	*Displaced from O3 NA*	*% of Total JV out of NA*
1	0.75	0.90	0.10	0.06	0.81	0.19	0.12
2	0.25	0.90	0.10	0.02	0.81	0.19	0.04
4 - MDU	0.15	0.90	0.10	0.01	0.81	0.19	0.02
4 - SDU	0.30	0.90	0.10	0.005	0.81	0.19	0.01
4 - Total				0.015			0.028
5 - MDU	0.15	0.90	0.10	0.01	0.81	0.19	0.02
5 - SDU	0.30	0.90	0.10	0.005	0.81	0.19	0.01
5 - Total				0.015			0.028
6	0.30	0.90	0.10	0.02	0.81	0.19	0.05

Note: 83 percent of the annual visitor usage occurs from dispersed-use.

Note: (1) = Total visitors that remain

??? ???

Table G-59. Fraction of All Visitors in Johnson Valley OHV Area Displaced by Each Project Alternative

Alternative	*Displaced from JV*	*Remain in County*		*% of Total JV out of C*			*% of Total JV out of NA*
1	0.79			0.23			0.29
2	0.31			0.12			0.14
4 - Total	0.17			0.04			0.05
5 - Total	0.17			0.04			0.05
6	0.35			0.13			0.15

Note: 17/83 percent of the annual visitor usage occurs from events/dispersed-use.

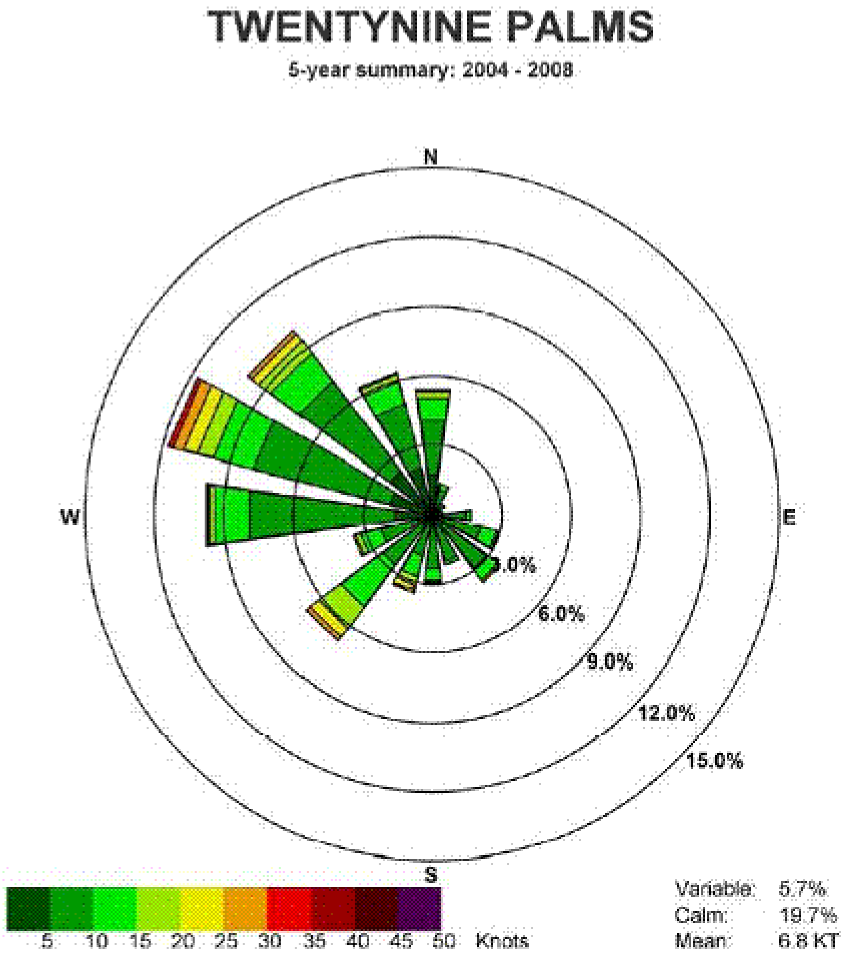
Note: (1) = Total visitors that remain

Table G-60. Year 2015 Future Baseline Emissions Relocated from Johnson Valley - 29 Palms LAS EIS Project Alternatives (Tons/Year)

Area/Source Category	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	*CO_2*	*CH_4*	*N_2O*
Johnson Valley										
Vehicles - Combustive	6.74	66.31	4.38	0.02	-	0.23	0.21	1,693	0.63	-
Vehicles - Dust	-	-	-	-	-	1,107.17	110.72	-	-	-
Gasoline-powered Generator	3.49	1.13	1.78	0.10	-	0.12	0.11	175	-	-
Propane Stoves	0.01	0.05	0.09	0.00	0.01	0.01	0.01	90	0.00	0.01
Camp Fires	2.48	37.02	-	-	8.27	5.39	4.67	-	2.23	-
Total Johnson Valley Emissions - Year 2015	12.72	104.51	6.25	0.12	8.27	1,112.92	115.72	1,957	2.86	0.01
Total Eliminated from MDAB - Alternative 1 (1)	2.95	24.27	1.45	0.03	1.92	258.47	26.87	454.58	0.67	0.00
Total Eliminated from MDAB - Alternative 2 (1)	1.56	12.83	0.77	0.01	1.02	136.61	14.20	240.26	0.35	0.00
Total Eliminated from MDAB - Alternative 4 (1)	0.51	4.23	0.25	0.00	0.33	45.01	4.68	79.15	0.12	0.00
Total Eliminated from MDAB - Alternative 5 (1)	0.51	4.23	0.25	0.00	0.33	45.01	4.68	79.15	0.12	0.00
Total Eliminated from MDAB - Alternative 6 (1)	1.61	13.26	0.79	0.01	1.05	141.23	14.68	248.38	0.36	0.00
Total Eliminated from MDAB O3 NA - Alternative 6 (1)	1.90	15.60	0.93	0.02	1.24	166.17	17.28	292.24	0.43	0.00

Note: (1) = These emissions deducted from the increase in emissions from each project alternative to produce net change in emissions.

Figure G-1. Windrose for 29 Palms MCAGCC Mainside Monitoring Station



APPENDIX G.1

LAS Project Conformity Evaluations

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UNITED STATES MARINE CORPS
MARINE AIR GROUND TASK FORCE TRAINING COMMAND
MARINE CORPS AIR GROUND COMBAT CENTER
BOX 788100
TWENTYNINE PALMS, CALIFORNIA 92278-8106

5090
4F/c-10-0868

19 OCT 2010

Mr. Alan De Salvio
Mojave Desert Air Quality Management District
14306 Park Avenue
Victorville, California 92392-2383

Dear Mr. De Salvio:

SUBJECT: REQUEST FOR CONFORMITY ANALYSIS REVIEW AND DETERMINATION

The United States Marine Corps is currently analyzing an expansion of the existing training range facility at the Marine Corps Air Ground Combat Center at Twentynine Palms, California. In support of this proposed action, the Marine Corps has prepared a Conformity Analysis of air emissions associated with the proposed expansion to satisfy the Clean Air Act (CAA) Conformity Rule requirements. We believe these emissions are in conformity with your agency's plan to attain National Ambient Air Quality Standards on schedule for Ozone and Particulate Matter 10.

Therefore, we respectfully request that you review our enclosed Conformity Analysis and provide comments regarding whether it is of adequate content to demonstrate compliance with District Rule 2002. If you agree with these findings, please provide a letter to that effect per District Rules 2002(H)(1)(e)(i)(B) and 2002(H)(1)(d)(i). This documentation is necessary for us to satisfy both our CAA and National Environmental Policy Act (NEPA) requirements.

We also ask that you forward the letter and project Conformity Analysis to the California Air Resources Board for their concurrence in accordance with 40 C.F.R. § 93.158(a)(5)(i)(B) and 40 C.F.R. § 93.158(a)(4)(i).

Each individual federal action which, by itself, exceeds de *minimus* thresholds for one or more regulated emissions, must demonstrate conformity. This request for an attainment plan revision applies specifically to the Combat Center expansion analysis and is not meant to be a comprehensive inventory of potential future military growth in the Western Mojave Desert.

5090
4F/c-10-0868

If you have any questions, please feel free to contact Mrs. Erin Adams, Natural Resources and Environmental Affairs, at (760)830-7726.

Sincerely,

(for)

MAJOR W. M. Rowley
Director, NREA
Acting

Enclosures: 1. Conformity Application Analysis
2. LAAE Emissions Calculations
3. Dispersion Modeling Analysis

Copy to: Central File
AC/S, G-4
NREA Files/Air
Land Acquisition

CONFORMITY EVALUATION
LAND ACQUISITION AND AIRSPACE ESTABLISHMENT PROPOSED ACTION
MARINE CORPS COMBAT CENTER TWENTYNINE PALMS

1.0 INTRODUCTION

The following presents a Clean Air Act (CAA) general conformity evaluation for the Land Acquisition and Airspace Establishment (LAS) action at Marine Corps Combat Center Twentynine Palms (Combat Center), as proposed by the Department of Navy (Navy). Included in this evaluation are the conformity applicability analysis for the proposed action and the methods used to demonstrate this action's conformity with the CAA and specifically with the California State Implementation Plan (SIP).

This evaluation presents conformity determinations for emissions of ozone precursors and particulate matter less than 10 microns in diameter (PM_{10}). The area where the proposed project will occur lies in areas of the Mojave Desert Air Basin (MDAB) which have been designated by the U.S. Environmental Protection Agency (EPA) as nonattainment for ozone and PM_{10}. This fact triggers the General Conformity Rule found in Section 176(c) of the CAA (42 U.S.C. § 7506(c)) (40 C.F.R. 93.153(b); MDAQMD Rule 2002(A)(3)(v)).

As part of the LAS action, the Navy proposes to establish a large-scale training range facility at the Combat Center that would accommodate sustained, combined-arms, live-fire, and maneuver training exercises for all elements of a Marine Expeditionary Brigade (MEB). To accomplish this goal, the Marine Corps would acquire additional lands adjacent to the existing Combat Center. The LAS action proposes two MEB exercises per year that would last 24 days each. The Navy published the Notice of Intent to prepare an Environmental Impact Statement (EIS) for the LAS on October 30, 2008 in the Federal Register and the Navy plans to release the Draft EIS to the public in December 2010. This conformity evaluation focuses on Alternative 6 in the Draft EIS, which would acquire lands to the west and southeast of the existing Combat Center.

2.0 CLEAN AIR ACT CONFORMITY REQUIREMENTS

"No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an (approved SIP)" 42 U.S.C. 7506(c). "Conformity" means *inter alia* conformity to the applicable SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards (NAAQS) and achieving expeditious attainment of such standards, and the proposed action will not cause or contribute to any new violation of any standard in any area. *Id.*

To implement this mandate, the EPA promulgated the conformity rule for general federal actions. These Federal General Conformity Rules are found at 40 C.F.R. §§ 150-165. California's SIP responsibilities in the area of the proposed action are delegated to the Mojave Desert Air Quality Management District (MDAQMD). The portion of the California SIP implementing Section 176(c) of the CAA is MDAQMD Rule 2002.

When EPA approves a SIP, or portion of a SIP, a conformity evaluation is governed by the approved SIP criteria and procedures. The Federal conformity regulations apply only for the portions, if any, of the part 93 requirements not contained in the SIP conformity provisions approved by EPA. In addition, any previously applicable implementation plan conformity requirements remain enforceable until the EPA approves the revision to the applicable SIP to specifically include the revised requirements or remove requirements.

2.1 Purpose and Applicability of the General Conformity Rule

Both Federal and State General Conformity Rules require the Navy to analyze this proposed action according to standardized procedures. General conformity rules apply to federal actions affecting areas that are in nonattainment of a NAAQS and to designated maintenance areas (attainment areas that have been reclassified from a previous nonattainment status and which are required to prepare an air quality maintenance plan). Conformity requirements apply specifically to the emissions for which a given area has been designated nonattainment.

Conformity analysis focuses on the net increase in emissions from a proposed action compared to existing, historical baseline conditions. Conformity analysis is limited to those direct and indirect emissions over which the federal agency has responsibility and control. Lastly, conformity analysis is not required to address emissions that are not reasonably foreseeable or quantifiable.

Conformity determinations are required when the annual direct and indirect emissions from a proposed federal action exceed an applicable *de minimis* threshold. The conformity *de minimis* thresholds vary by emission and by the severity of nonattainment conditions in the region affected by the proposed action. The EPA has designated the area which this proposed action will affect as a severe nonattainment area for ozone and its precursors and a moderate nonattainment area for PM_{10}. As a result, MDAQMD Rule 2002(A)(3)(a)(ii)(A) sets the *de minimus* thresholds applicable to this action at 25 tons per year of an ozone precursor and 100 tons per year of PM_{10}.

The general conformity rule identifies several categories of actions that are presumed to result in no net emissions increase or in an emissions increase that will clearly be less than any applicable *de minimis* level. MDAQMD Rule 2002(D). These types of activities are exempt from the requirements of the general conformity rule and are primarily routine administrative, planning, financial, and property disposal or maintenance actions.

Air emissions produced from construction and operation of the proposed action would occur within the existing and proposed boundaries of the Combat Center. This area lies within the MDAB, which includes all but the southwest corner of San Bernardino County and the eastern portions of Riverside, Los Angeles, and Kern Counties. Presently, the MDAB attains the NAAQS for all criteria pollutants except ozone and PM_{10}.

3.0 PROJECT CONFORMITY APPLICABILITY ANALYSIS

The LAS proposed action would produce emissions within the MDAB project region due to both construction and operational activities. The following presents emissions estimates and the conformity applicability analysis for the proposed action, which is Project Alternative 6 in the LAS EIS. Attachment 1 of this conformity evaluation documents the calculations of emissions for this proposed action.

Construction

Construction activities associated with the proposed action would include (1) construction of about 30 miles of unpaved roads and (2) installation of three communication towers in the west study area. Air quality impacts due to proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) due to the operation of equipment on exposed soil. Construction activity data developed by Combat Center staff were used to estimate proposed combustive and fugitive dust emissions (MAGTF Training Command 2010). This conformity analysis assumes that all construction activities would occur in year 2013, prior to initiation of the proposed training exercises in 2015.

Factors needed to derive construction source emission rates were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Volume I* (EPA 1995 and 2006), the *OFFROAD2007 Model* for off-road construction equipment (ARB 2006a), the *EMFAC2007 Model* for on-road vehicles (ARB 2006b), and the Navy Aircraft Environmental Support Office (AESO) for helicopter emission rates (AESO 2000a and 2000b).

The analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of best management practices (BMPs) for fugitive dust control. These BMPs include the following:

1. Use water trucks to keep areas of vehicle movement damp enough to minimize the generation of fugitive dust.

2. Minimize the amount of disturbed ground area at any given time.

3. Suspend all soil disturbance activities when winds exceed 25 miles per hour (mph) or when visible dust plumes emanate from the site and then stabilize all disturbed areas with water application.

4. Designate personnel to monitor the dust control program and to increase watering, as necessary, to minimize the generation of dust.

Table 1 presents a summary of the conformity-related emissions that would occur from construction of the proposed action within the MDAB. These data show that annual VOC, NO_x, and PM_{10} emissions from proposed construction activities would be well below the conformity *de minimis* thresholds. Consequently, construction emissions are not expected to cause or contribute to any delay of attainment or any new NAAQS exceedance.

Table 1. Annual Conformity-Related Emissions due to Construction of the LAS Proposed Action within the MDAB.

CONSTRUCTION ACTIVITY	*ANNUAL EMISSIONS (TONS)* (1)		
	VOC	***NO_x***	***PM_{10}***
Development of Unpaved Roads	0.08	0.83	0.45
Installation of Communication Towers	0.09	0.12	0.53
Total Annual Emissions (1)	**0.17**	**0.96**	**0.98**
MDAB Conformity *de minimis* Level	**25**	**25**	**100**
Exceeds *de minimis* Level?	No	No	No

Note: (1) All emissions are assumed to occur in calendar year 2013.

Operations

Air quality impacts associated with proposed operations would occur from (1) combustive emissions due to the use of fossil fuel-powered mobile sources and ordnance and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) due to disturbances on exposed soils. Combustive emission sources associated with proposed operations would include (1) aircraft during landing and take-off (LTOs) and cruising modes below 3,000 feet AGL, (2) tactical vehicles (TVs), (3) tactical support equipment (TSE), (4) use of ordnance, and (5) personnel on-road commutes. Proposed aircraft LTOs, operations of TVs/TSE on exposed soils, and use of ordnance would generate fugitive dust emissions. The proposed training exercises would begin in year 2015 and would produce the same level of emissions for each future year of operation.

Operational data used to calculate proposed operational emissions were obtained from the Marine Corps (as presented in EIS Section 2.4) and the project airspace and noise analyses. Factors used to calculate combustive emissions for proposed sources were obtained from the AESO (AESO 1999, 2000a, 2000c, 2001a, 2001b, and 2002); the Air Force Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) (IERA 2002); the *OFFROAD2007* Model, the *EMFAC2007 Model* for on-road vehicles; the *Calendar Year 2007 Comprehensive Emissions Inventory Plan for Marine Corps Air Ground Combat Center Twentynine Palms* (United States Army Corps of Engineers Sacramento District and Combat Center 2008); and the *Compilation of Air Pollution Emission Factors, AP-42, Volume I* (EPA 2006).

Lands proposed for acquisition currently generate emissions from recreational activities and the use of off-highway vehicles (OHV). The proposed action would displace some of these existing recreational activities and their associated emissions from the MDAB. Therefore, to estimate the net change in emissions due to the proposed action, the analysis subtracted portions of existing emissions displaced from these areas from the emission increases associated with the proposed action. Sources of air emissions that occur in these areas include (1) combustive emissions due to vehicular usage, camp fires, propane stoves, and portable diesel- and gasoline-powered generators and (2) fugitive dust emissions generated from the use of vehicles on unpaved surfaces. The Johnson Valley OHV Area within the west study area has the highest recreational usage and therefore generates the highest amount of emissions within any of the lands proposed for acquisition. Activity data used to estimate emissions from these activities were developed from visitor usage data obtained from the BLM, as presented in EIS Section 3.2 (BLM and The

Environmental Company [TEC] 2010). Table 2 presents a summary of the existing emissions that occur within the west and south study areas.

To determine the amount of existing recreational activities that the proposed action would displace from the west study area, the analysis considered the following factors: (1) the type of visitor usage (events vs. dispersed), (2) the amount of area affected by the proposed action, and (3) the amount of time per year that the proposed action would close this area to the public. These factors determined that (1) 85 percent of the existing activities and associated emissions would re-locate elsewhere within the MDAB ozone nonattainment area and (2) 87 percent of the existing activities and associated emissions would re-locate elsewhere within the MDAB PM_{10} nonattainment area. Therefore, the analysis subtracted (1) 15 percent of the VOC and NO_x emissions and (2) 13 percent of the PM_{10} emissions generated in the west area from the emission increases associated with the proposed action to estimate the net change in emissions due to the proposed action. Since the proposed training exercises would not occur until year 2015, the analysis took into consideration the

Table 2. Existing Emissions within Lands Acquired by the Proposed LAS

AREA/ACTIVITY	*ANNUAL EMISSIONS (TONS)*		
	VOC	***NO_x***	***PM_{10}***
West Study Area			
Vehicles – Combustive	5.83	3.79	0.20
Vehicles – Dust	---	---	957.26
Gasoline-powered Generator	3.02	1.54	0.10
Propane Stoves	0.01	0.08	0.00
Camp Fires	2.14	---	4.66
Total – West Area	**11.00**	**5.40**	**962.23**
South Study Area			
Vehicles – Combustive	0.02	0.01	0.00
Vehicles – Dust	---	---	3.62
Total - South Area	**0.02**	**0.01**	**3.62**

Notes: Developed from visitor usage data source (BLM and TEC 2010).

usages expected for Johnson Valley at this time (BLM and TEC 2010). This future baseline equates to a 16 percent increase in usage and associated emissions for the west area in 2015, compared to 2010 levels.

In the south study area, the proposed action would displace all of the existing recreational activities and their associated emissions from this area, but 90 percent of these activities and emissions would re-locate elsewhere within the MDAB ozone and PM_{10} nonattainment areas (BLM and TEC 2010). Therefore, the analysis subtracted 10 percent of the existing emissions from this area from the emission increases associated with the proposed action to estimate the net change in emissions due to the proposed action.

Table 3 presents a summary of annual emissions that would occur from operations of the proposed action within the MDAB PM_{10} and ozone nonattainment areas. These data show that operations of the proposed action would result in a net increase in VOC, NO_x, and PM_{10} emissions within the MDAB that would exceed their applicability conformity *de minimis* thresholds. Therefore, pursuant to MDAQMD Rule 2002, the Navy is required to perform a conformity determination to demonstrate how emissions of ozone precursors and PM_{10} from operations of the LAS proposed action will conform to the CAA and the California SIP.

Table 3. Net Annual Emissions due to Operations of the LAS Proposed Action within the MDAB

ACTIVITY	*ANNUAL EMISSIONS (TONS)* (1)		
	VOC	***NO_x***	***PM_{10}***
Aircraft Operations	25.55	39.77	17.25
Tactical Vehicles (TV)	5.29	64.39	2.33
Tactical Support Equipment (TSE)	1.50	16.43	0.70
Ordnance	1.82	0.28	-
Fugitive Dust – Aircraft	-	-	42.36
Fugitive Dust – TV/TSE	-	-	565.25
Fugitive Dust – Ordnance	-	-	2.49
Personnel On-road Commutes	0.05	1.84	0.02
Annual Emissions	**34.21**	**122.71**	**630.40**
Reduction of West Area Emissions (2)	**(1.90)**	**(0.93)**	**(141.23)**
Reduction of South Area Emissions (3)	**(0.00)**	**(0.00)**	**(0.36)**
Total Net Change - Tons per Year	**32.31**	**121.78**	**488.81**
Conformity *De Minimis* Level	**25**	**25**	**100**
Exceeds Conformity *de minimis* Level?	**Yes**	**Yes**	**Yes**

Note: (1) Proposed emissions would be the same for each year of operation.
(2) Equal to 13/15% of total West Area year 2015 PM_{10}/VOC and NO_x emissions.
(3) Equal to 10% of total South Area existing emissions.

4.0 PROJECT CONFORMITY DEMONSTRATION

4.1 Conformity Methods Defined in the General Conformity Rule

MDAQMD Rule 2002(H) identifies several criteria that can be used to demonstrate conformity. Among them include the following:

- Where the MDAQMD determines that an areawide air quality modeling analysis is not needed, local air quality modeling analysis establishes that the total direct and indirect emissions from the proposed action meet the following requirements: (a) adhere to the Procedures for Conformity Determinations of General Federal Actions contained in MDAQMD Rule 2002(I) and (b) the action does not cause or contribute to any new violation of any standard in any area or increase the frequency or severity of any existing violation (MDAQMD Rule 2002(H)(1)(d)(i)).Where the EPA has approved a revision to an area's attainment or maintenance demonstration after 1990, the proposed action may be determined to conform when MDAQMD makes a written commitment to revise its SIP attainment plan. The MDAQMD commitment must include the following (MDAQMD Rule 2002(H)(1)(e)(i)):

    1. A specific schedule for adoption and submittal of a revision to the applicable implementation plan which would achieve the needed emission reductions prior to the time emissions from the Federal action would occur;

2. Identification of specific measures for incorporation into the applicable implementation plan which would result in a level of emissions which, together with all other emissions in the nonattainment or maintenance area, would not exceed any emissions budget specified in the applicable implementation plan;

3. A demonstration that all existing applicable implementation plan requirements are being implemented in the area for the pollutants affected by the Federal action, and that local authority to implement additional requirements has been fully pursued;

4. A determination that the responsible Federal agencies have required all reasonable mitigation measures associated with their action; and

5. Written documentation including all air quality analyses supporting the conformity determination.

4.2 Conformity of Proposed Action with Respect to Ozone Precursor Emissions

The following summarizes the conformity demonstration for ozone precursor emissions associated with the LAS proposed action. This analysis is based upon (1) a review of historical emissions estimated for the Combat Center, (2) a review of recent MDAQMD ozone attainment plans, and (3) consultation with MDAQMD staff.

In 2008, the MDAQMD completed its *Federal 8-Hour Ozone Attainment Plan (Western Mojave Desert Non-attainment Area*) (*2008 Plan*), which maps a pathway to attainment of the 8-hour ozone NAAQS of 0.084 parts per million (ppm) (MDAQMD 2008). Emissions from the LAS proposed action are not specifically accounted for in this or any earlier MDAQMD attainment plan. However, the planning assumptions and principles applied in this plan are a useful tool to justify the conclusion that ozone precursor emissions will not cause or contribute to any new NAAQS violations, to any increase in severity of current conditions or delay reasonable further progress of the air basin toward attainment of the ozone NAAQS.

To satisfy the requirements of MDAQMD Rule 2002(H)(1)(e)(i)(B) and the Federal General Conformity Rules (40 C.F.R. §§ 93.150-165), the Navy formally requests the MDAQMD to provide a written commitment to include the ozone precursor emissions from the proposed LAS action into a revision of its ozone attainment plan in the California SIP revision. Because the Federal General Conformity Rules specifically require the approval of "the State agency responsible for the applicable SIP" and because recent MDAQMD attainment plans have not been approved by the EPA, the Navy respectfully asks the MDAQMD to forward its commitment to the California Air Resources Board (CARB) for their concurrence. This conformity evaluation and the emission calculations presented in Attachment 1 form the basis of project emissions data that are needed for this process. Once the MDAQMD and CARB commit to revising the California SIP according to the requirements in MDAQMD Rule 2002 and the General Federal Conformity Rules, the proposed action would conform to the SIP.

4.3 Conformity of Proposed Action with Respect to PM_{10} Emissions

The following summarizes the conformity demonstration of PM_{10} emissions for the LAS proposed action. This analysis is based upon (1) a review of historical emissions estimated for the Combat Center, (2) a review of MDAQMD PM_{10} attainment plans, and (3) consultation with the MDAQMD.

To satisfy the requirements of MDAQMD Rule 2002(H)(1)(d)(i), a dispersion modeling analysis was performed which demonstrates that PM_{10} emissions from the LAS proposed action would not contribute to an exceedance of the PM_{10} NAAQS. The following summarizes the methods and results of this analysis.

Project PM_{10} Dispersion Modeling Analysis

An air dispersion analysis was performed with the use of the EPA American Meteorological Society/EPA Regulatory Model (AERMOD) to estimate the ambient impact of PM_{10} emissions that would occur from the LAS proposed action. The AERMOD is a guideline model required by the EPA for use in regulatory air quality impact evaluations (EPA 2010). The AERMOD has the ability to simulate the various physical characteristics of stationary and mobile sources of emissions associated with the proposed LAS MEB exercises. The modeling methodologies are consistent with the guidelines of the EPA, ARB, and generally approved practices to assess proposed air pollutant concentrations. Regulatory default options appropriate for rural conditions were utilized for the modeling simulations. Attachment 2 of this conformity evaluation documents the details of this analysis.

The AERMOD analysis was performed in two steps. First, the analysis estimated PM_{10} impacts along the entire length of the proposed Combat Center boundary. Secondly, at the location of maximum impact along this boundary, a refined analysis was performed to evaluate off-site PM_{10} impacts.

<u>Source Emission Rates</u>

The analysis evaluated a scenario of peak daily PM_{10} emissions that would reasonably occur from the MEB exercises. This scenario would correspond to the final day of the 24-day MEB exercise (the FINEX). The FINEX would converge on a single objective point in the proposed West Area and therefore would produce the densest amount of PM_{10} emissions during the entire MEB exercise. The FINEX also would occur in close proximity to the boundary of the Combat Center. For these reasons, the FINEX would produce the highest off-site ambient PM_{10} impacts from the MEB exercises. Figure 2-10d in Attachment 2 shows the operational locations of the MEB exercise within the Combat Center.

The analysis assumed that peak daily PM_{10} emissions from the FINEX would occur from the following activity: (1) five percent of the annual aircraft operations, (2) seven percent of the annual TV/TSE operations, and (3) eight percent of the annual ordnance usages. In addition, the analysis assumed that 50 percent of the peak daily PM_{10} emissions during the FINEX would occur in the West Area and 25 percent each would occur in the central and east portions of the Combat Center. Tables A2-1 through A2-9 in Attachment 2 present estimations of the peak hourly PM_{10} emission rates for each source used in the AERMOD analysis.

<u>Physical Simulations of Emission Sources</u>

Due to the mobile nature of emission sources that would take part in the proposed MEB exercises, the analysis simulated both combustive and fugitive dust emissions from these sources as a series of volume sources. Figure A-1 in Attachment 2 shows the center points of the locations of these sources within the proposed Combat Center boundary. Each volume source has a side length of 2.5 kilometers (km) and a vertical height of 100 meters (m).

Source/Receptor Locations

Source base elevations were determined from USGS Digital Elevation Model (DEM) data. The horizontal locations of each source were defined in terms of Universal Transverse Mercator (UTM) coordinates.

The initial AERMOD analysis evaluated PM_{10} impacts along the proposed boundary of the Combat Center with the use of receptor points spaced about every 250 m. The analysis of maximum off-site PM_{10} impacts used a receptor spacing of 500 meters that extended approximately 10 km away from the Combat Center boundary. Figures A-1 and A-2 in Attachment 2 illustrate the receptor fields used in the AERMOD analysis.

Meteorological Data

Surface meteorological data needed for use in the modeling analysis were obtained from site-specific conditions recorded at the Combat Center Mainside ambient air monitoring station. Upper air meteorological data needed for use in the modeling analysis were obtained from conditions recorded at Desert Rock, Nevada, about 140 miles north of the Combat Center. Due to interruptions in the operations of these meteorological stations, the most recent calendar year that contained contiguous matching surface and upper air data with at least a 90 percent annual data recovery rate was 2004. The AERMET routine was used to process these meteorological data into a form suitable for use in the modeling analysis. Figure A-3 in Attachment 2 presents a wind rose generated for the Mainside station surface winds used in the analysis.

Background PM_{10} Values

The maximum PM_{10} concentration predicted by AERMOD was added to a background PM_{10} concentration to produce a total project impact for use in comparison to the 24-hour PM_{10} NAAQS. The Combat Center operated a PM_{10} sampling network from 1996 through 2005 and restarted this program in 2008. Data collected from the Emerson station, just northwest of Emerson Dry Lake and along the western boundary of the Combat Center, were used to define the background PM_{10} concentration for the PM_{10} impact analysis. This station was chosen over other stations operated at the Combat Center, as it is the closest station to the maximum PM_{10} impact location predicted by AERMOD for the proposed action.

To determine compliance with the NAAQS, EPA guidance recommends use of the highest value monitored in the area of analysis during the most recent 3-year period to define the background pollutant level (EPA 2003). The most recent 3-year period of monitoring at the Emerson station occurred from 2002 through 2005. The maximum 24-hour PM_{10} value recorded during this period was 52 ug/m^3, excluding any PM_{10} samples recorded when winds exceeded 15 miles per hour (mph) averaged over an hour, or instantaneous gusts of 25 mph, per MDAQMD Rule 403 guidelines.

The background 24-hour PM_{10} value of 52 *u*g/m3 defined for the analysis domain is deemed to be overly conservative. This is the case for the following reasons:

1. PM_{10} concentrations collected at the Emerson air monitoring station often contain PM_{10} emissions generated from existing activities within the (1) Johnson Valley OHV Area and (2) Combat Center. Operation of the proposed MEB exercises would eliminate any concurrent activities and associated PM_{10} emissions from these areas.

2. The top 10 project PM_{10} impacts predicted by AERMOD occurred during days of relatively low wind speeds. The maximum daily average wind speed for any of these days was 5.2 mph recorded at the Mainside monitoring station. The maximum 24-hour PM_{10} value recorded at the Mainside continuous PM_{10} sampler on these 10 days was 23 *u*g/m^3. In addition, analysis of PM_{10} values recorded at the Emerson station from 2002 through 2005 determined that no 24-hour PM_{10} concentration exceeded 23 *u*g/m^3 when the average daily wind speed was 5.2 mph or less.

Therefore, use of a 24-hour PM_{10} background value that is lower than 52 *ug/m*^{3} is deemed reasonable for this impact analysis.

Analysis Results

The AERMOD analysis predicted that operation of Alternative 6 would produce a maximum 24-hour PM_{10} impact of 97 *u*g/m^3 on the boundary line of the proposed Combat Center West Area. Addition of the background PM_{10} value of 52 *u*g/m^3 would produce a total project PM_{10} impact of 149 *u*g/m^3. This impact would not exceed the 24-hour PM_{10} NAAQS of 150 *u*g/m^3, as shown in Table A-2.1.

Figure A-1 shows the results of the initial PM_{10} impact analysis for locations along the entire Combat Center boundary proposed under Alternative 6. These data show that the area of maximum PM_{10} impact would occur along the southwest boundary of the proposed Combat Center West Area. Figure A-2 shows the refined analysis of off-site PM_{10} impacts. These data show that PM_{10} impact values quickly decrease with distance from the Combat Center boundary. In addition, the impact value of 90 *u*g/m^3 extends only slightly beyond the Combat Center boundary and covers roughly 0.5 square km. Taking this into consideration and the fact that the analysis uses an overly conservative PM_{10} background value, it is reasonable to conclude that Alternative 6 would produce a total project 24-hour PM_{10} impact on public lands of no more than 140 *u*g/m^3. Based upon these results, it is concluded that the proposed LAS MEB exercises would comply with the PM_{10} NAAQS.

Table A-2.1. Maximum PM_{10} Impact Predicted for the LAS Alternative 6

Pollutant	*Averaging Period*	*Maximum Impact ($\mu g/m^3$)*	*Background Concentration ($\mu g/m^3$)*	*Total Impact ($\mu g/m^3$)*	*NAAQS*
PM_{10}	24-hour	97	52	149	150

Conservative Factors in Analysis

The following lists the factors that make the total project 24-hour PM_{10} impact of 149 *u*g/m^3 a conservative prediction:

1. The FINEX emissions scenario evaluated in the analysis is based upon activity levels for equipment, aircraft, and ordnance usage and areas of operation that are maximized to produce overly conservative ambient PM_{10} impacts to public lands. In addition, this peak day scenario would occur only 2 days per year.

2. The background PM_{10} concentration of 52 *u*g/m^3 obtained from the Emerson air monitoring station may contain PM_{10} emissions generated from existing activities within the Johnson Valley OHV Area and Combat Center. Therefore, use of a background value of 52 *u*g/m^3 may double count ambient PM_{10} that would not be present during operation of the proposed MEB exercises.

3. The top 10 project PM_{10} impacts predicted by AERMOD occurred during days of relatively low wind speeds. Data collected at the Combat Center show a trend of decreasing ambient PM_{10} concentrations with decreasing wind speed. For these 10 days, the maximum 24-hour PM_{10} value recorded at the Mainside station was 23 *u*g/m^3. In addition, PM_{10} concentrations recorded at the Emerson station during wind conditions that occurred on these 10 days also did not exceed 23 *u*g/m^3. Therefore, use of a background PM_{10} value of 52 *u*g/m^3 in the analysis for conditions of low winds speeds is overly conservative.

Therefore, it is reasoned that the proposed MEB exercises would produce a 24-hour PM_{10} impact to public lands that would be less than 149 *u*g/m^3.

4.4 Conclusions

MDAQMD Rule 2002(H)(3) requires that, notwithstanding any other requirements of this section, no proposed action subject to this rule can be determined to conform if it is inconsistent with any requirement or milestone contained in the applicable implementation plan, with the achievement of "reasonable further progress" schedule, or with assumptions specified in attainment or maintenance demonstrations. Our analysis shows the emissions associated with the proposed action conform to the specific requirements of the rules pertaining to PM_{10} and ozone precursors. These emissions also conform to the general requirements in MDAQMD Rule 2002(H)(3). For these reasons, we conclude the proposed action conforms to the MDAQMD and California air quality plans.

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ATTACHMENT A

29 Palms LAS Conformity Evaluation

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ATTACHMENT A-1

Conformity Emission Calculations

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Attachment A1 - Conformity Emission Calculations - 29 Palms LAS EIS Proposed Action Alternative 6

Table A1-1. Year 2010 Visitation Activities for Acquired Lands - 29 Palms LAS EIS

	Total Annual	*Total Annual Visitor Days*			*Days per*	*Total Annual Visitors*		
Area	*Visitor-Days*	*OHV Day Use*	*Overnight*	*Non-OHV Day Use*	*Overnight Use*	*OHV Day Use*	*Overnight*	*Non-OHV Day Use*
Johnson Valley	291,348	49,945	233,078	8,324	2.5	49,945	93,231	8,324
East	500	450	50		2.5	450	20	-
South	800	800			-	800	-	-

Table A1-2. Emission Source Data for Existing Activities in Johnson Valley OHV Area.

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/ Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	24,973	20	499,454	1
OHVs	6,243	24	146,715	0.50
Motorcycles	18,730	24	440,144	0.05
Overnight				
Transport vehicle	31,077	30	932,314	2
OHV	11,654	44	513,501	0.50
Motorcycle	34,962	44	1,540,503	0.05
Generator - Gasoline (1) (2)	31,077	3	93,231	
Propane Stoves (1) (3)	31,077	2	62,154	
Fire (4)	31,077	20	621,542	
Non-OHV Day Use				
Transport vehicle	4,162	20	83,242	1

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table A1-3. Emission Source Data for Existing Activities in the East Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	225	20	4,500	1
OHVs	56	24	1,322	0.50
Motorcycles	169	24	3,966	0.05
Overnight				
Transport vehicle	7	30	200	2
OHV	3	44	110	0.50
Motorcycle	8	44	330	0.05
Generator - Gasoline (1) (2)	7	3	20	
Propane Stoves (1) (3)	7	2	13	
Fire (4)	7	20	133	

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table A1-4. Emission Source Data for Existing Activities in the South Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/ Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	400	20	8,000	1
OHVs	100	24	2,350	0.50
Motorcycles	300	24	7,050	0.05

Assumptions:

(1) Source: (BLM 2010).

(2) 17/80/3% of visitor use days = OHV day/overnight/non-OHV day uses.

(3) The average length of stay for overnight use is 2.5 days.

(4) Rider occupancy of transport vehicle for day/overnight uses is 2/3 visitors.

(5) 50% of day and overnight visitors would operate an OHV. OHV fleet mix = 75/25% motorcycle/4 wheel vehicle.

(6) Vehile miles travelled (VMT) based upon 20% of visitors drive 10 VMT, 70% drive 25 VMT, and 10% drive 40 VMT per day.

Table A1-5. Existing Emissions within Acquired Lands - 29 Palms LAS EIS (Pounds/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
OHV Day Use										
Transport vehicle	159	4,371	515	6	-	53	49	530,725	46	-
Transport vehicle - dust						335,039	33,504			
OHVs	47	1,284	151	2	-	16	14	155,900	14	-
OHVs - dust						72,046	7,205			
Motorcycles	2,436	21,250	1,184	2	-	38	35	136,817	199	-
Motorcycles - dust						76,689	7,669			
Overnight										
Transport vehicle	296	8,160	962	10	-	99	91	990,686	86	-
Transport vehicle - dust						854,331	85,433			
OHVs	163	4,494	530	6	-	54	50	545,651	48	-
OHVs - dust						252,161	25,216			
Motorcycles	8,524	74,376	4,143	7	-	132	122	478,860	696	-
Motorcycles - dust						268,411	26,841			
Generator - Gasoline	6,039	1,947	3,077	165	-	202	186	302,070	-	-
Propane Stoves	12	93	162	1	9	9	9	155,386	2	11
Fire	4,289	64,019	-	-	14,295	9,323	8,080	-	3,854	-
Non-OHV Day Use										
Transport vehicle	26	729	86	1	-	9	8	88,454	8	-
Transport vehicle - dust						55,840	5,584			
Total - Johnson Valley	*21,990*	*180,723*	*10,810*	*199*	*14,304*	*1,924,451*	*200,094*	*3,384,549*	*4,953*	*11*
East Area										
OHV Day Use										
Transport vehicle	1	39	5	0	-	0	0	4,782	0	-
Transport vehicle - dust						3,019	302			
OHVs	0	12	1	0	-	0	0	1,405	0	-
OHVs - dust						649	65			
Motorcycles	22	191	11	0	-	0	0	1,233	2	-
Motorcycles - dust						691	69			
Overnight										
Transport vehicle	0	2	0	0	-	0	0	213	0	-
Transport vehicle - dust						183	18			
OHVs	0	1	0	0	-	0	0	117	0	-
OHVs - dust						54	5			
Motorcycles	2	16	1	0	-	0	0	103	0	-
Motorcycles - dust						58	6			
Generator - Gasoline	1	0	1	0	-	0	0	65	-	-
Propane Stoves	0	0	0	0	0	0	0	33	0	0
Fire	1	14	-	-	3	2	2	-	1	-
Total - East Area	*28*	*275*	*19*	*0*	*3*	*4,657*	*468*	*7,950*	*3*	*0*
South Area										
OHV Day Use										
Transport vehicle	3	70	8	0	-	1	1	8,501	1	-
Transport vehicle - dust						5,366	537			
OHVs	1	21	2	0	-	0	0	2,497	0	-
OHVs - dust						649	65			
Motorcycles	39	340	19	0	-	1	1	2,191	3	-
Motorcycles - dust						1,228	123			
Total - South Area	*42*	*431*	*30*	*0*	*-*	*7,246*	*726*	*13,189*	*4*	*-*
Total Emissions - Pounds	*22,061*	*181,429*	*10,858*	*200*	*14,307*	*1,936,353*	*201,288*	*3,405,688*	*4,960*	*11*

Table A1-6. Existing Emissions within Acquired Lands - 29 Palms LAS EIS (Tons/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
					Johnson Valley					
OHV Day Use										
Transport vehicle	0.08	2.19	0.26	0.00	-	0.03	0.02	265.36	0.02	-
Transport vehicle - dust	-	-	-	-	-	167.52	16.75	-	-	-
OHVs	0.02	0.64	0.08	0.00	-	0.01	0.01	77.95	0.01	-
OHVs - dust	-	-	-	-	-	36.02	3.60	-	-	-
Motorcycles	1.22	10.63	0.59	0.00	-	0.02	0.02	68.41	0.10	-
Motorcycles - dust	-	-	-	-	-	38.34	3.83	-	-	-
Overnight										
Transport vehicle	0.15	4.08	0.48	0.01	-	0.05	0.05	495.34	0.04	-
Transport vehicle - dust	-	-	-	-	-	427.17	42.72	-	-	-
OHVs	0.08	2.25	0.26	0.00	-	0.03	0.02	272.83	0.02	-
OHVs - dust	-	-	-	-	-	126.08	12.61	-	-	-
Motorcycles	4.26	37.19	2.07	0.00	-	0.07	0.06	239.43	0.35	-
Motorcycles - dust	-	-	-	-	-	134.21	13.42	-	-	-
Generator - Gasoline	3.02	0.97	1.54	0.08	-	0.10	0.09	151.03	-	-
Propane Stoves	0.01	0.05	0.08	0.00	0.00	0.00	0.00	77.69	0.00	0.01
Fire	2.14	32.01	-	-	7.15	4.66	4.04	-	1.93	-
Non-OHV Day Use										
Transport vehicle	0.01	0.36	0.04	0.00	-	0.00	0.00	44.23	0.00	-
Transport vehicle - dust						27.92	2.79			
Total - Johnson Valley	*11.00*	*90.36*	*5.40*	*0.10*	*7.15*	*962.23*	*100.05*	*1,692.27*	*2.48*	*0.01*
					East Area					
OHV Day Use										
Transport vehicle	0.00	0.02	0.00	0.00	-	0.00	0.00	2.39	0.00	-
Transport vehicle - dust	-	-	-	-	-	1.51	0.15	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	0.70	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.01	0.10	0.01	0.00	-	0.00	0.00	0.62	0.00	-
Motorcycles - dust	-	-	-	-	-	0.35	0.03	-	-	-
Overnight										
Transport vehicle	0.00	0.00	0.00	0.00	-	0.00	0.00	0.11	0.00	-
Transport vehicle - dust	-	-	-	-	-	0.09	0.01	-	-	-
OHVs	0.00	0.00	0.00	0.00	-	0.00	0.00	0.06	0.00	-
OHVs - dust	-	-	-	-	-	0.03	0.00	-	-	-
Motorcycles	0.00	0.01	0.00	0.00	-	0.00	0.00	0.05	0.00	-
Motorcycles - dust	-	-	-	-	-	0.03	0.00	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Fire	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Total - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
					South Area					
OHV Day Use										
Transport vehicle	0.00	0.04	0.00	0.00	-	0.00	0.00	4.25	0.00	-
Transport vehicle - dust	-	-	-	-	-	2.68	0.27	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	1.25	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.02	0.17	0.01	0.00	-	0.00	0.00	1.10	0.00	-
Motorcycles - dust	-	-	-	-	-	0.61	0.06	-	-	-
Total - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*11.03*	*90.71*	*5.43*	*0.10*	*7.15*	*968.18*	*100.64*	*1,703*	*2.48*	*0.01*

Table A1-7. Existing Emissions within Acquired Lands by Source Category - 29 Palms LAS EIS (Tons/Year)

Area/Source Category	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
					Johnson Valley					
Vehicles - Combustive	5.83	57.33	3.79	0.02	-	0.20	0.18	1,463.55	0.55	-
Vehicles - Dust	-	-	-	-	-	957.26	95.73	-	-	-
Generator - Gasoline	3.02	0.97	1.54	0.08	-	0.10	0.09	151.03	-	-
Propane Stoves	0.01	0.05	0.08	0.00	0.00	0.00	0.00	77.69	0.00	0.01
Camp Fires	2.14	32.01	-	-	7.15	4.66	4.04	-	1.93	-
Subtotal - Johnson Valley	*11.00*	*90.36*	*5.40*	*0.10*	*7.15*	*962.23*	*100.05*	*1,692.27*	*2.48*	*0.01*
					East Area					
Vehicles - Combustive	0.01	0.13	0.01	0.00	-	0.00	0.00	3.93	0.00	-
Vehicles - Dust	-	-	-	-	-	2.33	0.23	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Camp Fires	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Subtotal - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
					South Area					
Vehicles - Combustive	0.02	0.22	0.01	0.00	-	0.00	0.00	6.59	0.00	-
Vehicles - Dust	-	-	-	-	-	3.62	0.36	-	-	-
Subtotal - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*11.03*	*90.71*	*5.43*	*0.10*	*7.15*	*968.18*	*100.64*	*1,703*	*2.48*	*0.01*

Table A1-8. Emission Factors for Existing Sources within Acquired Lands - 29 Palms LAS EIS.

Source	*Emission Factors*										*Notes*
	VOC	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	*CO_2*	*CH_4*	*N_2O*	
Liquid Propane Gas Combustion	1.00	7.50	13.00	0.11	0.70	0.70	0.70	12,500	0.20	0.90	(1)
Camp Fires	13.80	206.00			46.00	30.00	26.00		12.40		(2)
Generator - Gasoline	0.02	0.01	0.01	0.00		0.00	0.00	1.08			(3)
Light Duty Truck - 2010	0.14	3.97	0.47	0.01		0.05	0.04	482	0.04		(4)
Motorcycle - 2010	2.51	21.90	1.22	0.00		0.04	0.04	141	0.21		(5)
Light Duty Truck - 2015	0.08	2.68	0.30	0.01		0.05	0.05	483	0.04		(6)
Motorcycle - 2015	2.24	17.76	1.17	0.00		0.03	0.03	149	0.20		(7)
Vehicle Dust - 4WD						0.49	0.05				(8)
Vehicle Dust - Day Use Transport Vehicle						0.67	0.07				(9)
Vehicle Dust - Motorcycle						0.17	0.02				(10)
Vehicle Dust - Overnight Transport Vehicle						0.92	0.09				(11)

Notes:

(1) U.S. EPA AP-42 Section 1.5 - Liquefied Petroleum Gas Combustion (lb/1,000 gal)

(2) U.S. EPA AP-42 Section 13.1-3 - Wildfires and Prescribed Burning (lb/ton)

(3) U.S. EPA AP-42 Section 3.3 - Gasoline and Diesel Industrial Engines (lb/hp-hr)

(4) Statewide average for light duty truck, 25 mph, year 2010 (g/mile). From EMFAC2007 (ARB 2007).

(5) Statewide average for motorcycle, 25 mph, year 2010 (g/mile). From EMFAC2007 (ARB 2007).

(6) Statewide average for light duty truck, 25 mph, year 2015 (g/mile). From EMFAC2007 (ARB 2007).

(7) Statewide average for motorcycle, 25 mph, year 2015 (g/mile). From EMFAC2007 (ARB 2007).

(8) Fugitive Dust from Unpaved Roads Emission Factors for OHV (lb/VMT) EPA AP-42, Section 13.2.2.

(9) Fugitive Dust from Unpaved Roads Emission Factors for Transport Vehicles (lb/VMT) EPA AP-42, Section 13.2.2.

(10) Fugitive Dust from Unpaved Roads Emission Factors for motorcycles (lb/VMT) EPA AP-42, Section 13.2.2.

(11) Fugitive Dust from Unpaved Roads Emission Factors for Overnight Transport Vehicles (lb/VMT) EPA AP-42, Section 13.2.2.

Vehicle Travel Unpaved = ((k(s/12)^a)*((W/3)^b)

k (PM_{10})	1.50	k ($PM_{2.5}$) 0.15
s	8.50	surface material silt content (%)
a	0.90	
b	0.45	
W_O	0.50	average weight OHV (tons)
W_{TV}	1.00	average weight Transport Vehicles (tons)
W_M	0.05	average weight Motorcycles (tons)
W_{TV2}	2.00	average weight Overnight Transport Vehicles (tons)

Table A1-9. Year 2015 Visitation Activities for Acquired Lands - 29 Palms LAS EIS

Area	Total Annual Visitor-Days	Total Annual Visitor Days			Days per Overnight Use	Total Annual Visitors		
		OHV Day Use	Overnight	Non-OHV Day Use		OHV Day Use	Overnight	Non-OHV Day Use
Johnson Valley	336,975	57,767	269,580	9,628	2.5	57,767	107,832	9,628
East	500	450	50		2.5	450	20	-
South	800	800			-	800	-	-

Table A1-10. Emission Source Data for Year 2015 Activities in Johnson Valley OHV Area.

Trip Type/Vehicle or Source	Annual Vehicle Trips	VMT/ Trip	Annual VMT	Vehicle Weight (Tons)
OHV Day Use				
Transport vehicle	28,884	20	577,671	1
OHVs	7,221	24	169,691	0.50
Motorcycles	21,663	24	509,073	0.05
Overnight				
Transport vehicle	35,944	30	1,078,320	2
OHV	13,479	44	593,918	0.50
Motorcycle	40,437	44	1,781,755	0.05
Generator - Gasoline (1) (2)	35,944	3	107,832	
Propane Stoves (1) (3)	35,944	2	71,888	
Fire (4)	35,944	20	718,880	
Non-OHV Day Use				
Transport vehicle	4,814	20	96,279	1

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table A1-11. Emission Source Data for Year 2015 Activities in the East Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	225	20	4,500	1
OHVs	56	24	1,322	0.50
Motorcycles	169	24	3,966	0.05
Overnight				
Transport vehicle	7	30	200	2
OHV	3	44	110	0.50
Motorcycle	8	44	330	0.05
Generator - Gasoline (1) (2)	7	3	20	
Propane Stoves (1) (3)	7	2	13	
Fire (4)	7	20	133	

Notes: (1) Annual Vehicle Trips = annual # of units, VMT/Trip = hours/trip, and Annual VMT = annual hours of operation.

(2) HP = 5 at 60% Load

(3) Assumed 0.2 gallons/hours of LPG usage

(4) Annual Vehicle Trips = annual # of fires, VMT/Trip = pounds of wood burned/trip, and Annual VMT = annual pounds of wood burned.

Table A1-12. Emission Source Data for Year 2015 Activities in the South Study Area - 29 Palms LAS EIS

Trip Type/Vehicle or Source	*Annual Vehicle Trips*	*VMT/ Trip*	*Annual VMT*	*Vehicle Weight (Tons)*
OHV Day Use				
Transport vehicle	400	20	8,000	1
OHVs	100	24	2,350	0.50
Motorcycles	300	24	7,050	0.05

Assumptions:

(1) Source: (BLM 2010).

(2) 17/80/3% of visitor use days = OHV day/overnight/non-OHV day uses.

(3) The average length of stay for overnight use is 2.5 days.

(4) Rider occupancy of transport vehicle for day/overnight uses is 2/3 visitors.

(5) 50% of day and overnight visitors would operate an OHV. OHV fleet mix = 75/25% motorcycle/4 wheel vehicle.

(6) Vehile miles travelled (VMT) based upon 20% of visitors drive 10 VMT, 70% drive 25 VMT, and 10% drive 40 VMT per day.

Table A1-13. Year 2015 Emissions within Acquired Lands - 29 Palms LAS EIS (Pounds/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
OHV Day Use										
Transport vehicle	183	5,056	596	6	-	61	56	613,840	53	-
Transport vehicle - dust						387,509	38,751			
OHVs	54	1,485	175	2	-	18	17	180,315	16	-
OHVs - dust						83,329	8,333			
Motorcycles	2,817	24,578	1,369	2	-	44	40	158,244	230	-
Motorcycles - dust						88,699	8,870			
Overnight										
Transport vehicle	342	9,438	1,113	12	-	114	105	1,145,834	100	-
Transport vehicle - dust						988,125	98,812			
OHVs	189	5,198	613	7	-	63	58	631,104	55	-
OHVs - dust						291,651	29,165			
Motorcycles	9,859	86,024	4,792	8	-	153	141	553,853	805	-
Motorcycles - dust						310,445	31,045			
Generator - Gasoline	6,985	2,252	3,558	191	-	233	215	349,376	-	-
Propane Stoves	14	108	187	2	10	10	10	179,720	3	13
Fire	4,960	74,045	-	-	16,534	10,783	9,345	-	4,457	-
Non-OHV Day Use										
Transport vehicle	31	843	99	1	-	10	9	102,307	9	-
Transport vehicle - dust						64,585	6,458			
Total - Johnson Valley	*25,434*	*209,026*	*12,503*	*231*	*16,544*	*2,225,832*	*231,430*	*3,914,591*	*5,728*	*13*
East Area										
OHV Day Use										
Transport vehicle	1	39	5	0	-	0	0	4,782	0	-
Transport vehicle - dust						3,019	302			
OHVs	0	12	1	0	-	0	0	1,405	0	-
OHVs - dust						649	65			
Motorcycles	22	191	11	0	-	0	0	1,233	2	-
Motorcycles - dust						691	69			
Overnight										
Transport vehicle	0	2	0	0	-	0	0	213	0	-
Transport vehicle - dust						183	18			
OHVs	0	1	0	0	-	0	0	117	0	-
OHVs - dust						54	5			
Motorcycles	2	16	1	0	-	0	0	103	0	-
Motorcycles - dust						58	6			
Generator - Gasoline	1	0	1	0	-	0	0	65	-	-
Propane Stoves	0	0	0	0	0	0	0	33	0	0
Fire	1	14	-	-	3	2	2	-	1	-
Total - East Area	*28*	*275*	*19*	*0*	*3*	*4,657*	*468*	*7,950*	*3*	*0*
South Area										
OHV Day Use										
Transport vehicle	3	70	8	0	-	1	1	8,501	1	-
Transport vehicle - dust						5,366	537			
OHVs	1	21	2	0	-	0	0	2,497	0	-
OHVs - dust						649	65			
Motorcycles	39	340	19	0	-	1	1	2,191	3	-
Motorcycles - dust						1,228	123			
Total - South Area	*42*	*431*	*30*	*0*	-	*7,246*	*726*	*13,189*	*4*	-
Total Emissions - Pounds	*25,504*	*209,732*	*12,551*	*231*	*16,547*	*2,237,735*	*232,625*	*3,935,730*	*5,736*	*13*

Table A1-14. Year 2015 Emissions within Acquired Lands - 29 Palms LAS EIS (Tons/Year)

Area/User Type/Source	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
					Johnson Valley					
OHV Day Use										
Transport vehicle	0.09	2.53	0.30	0.00	-	0.03	0.03	306.92	0.03	-
Transport vehicle - dust	-	-	-	-	-	193.75	19.38	-	-	-
OHVs	0.03	0.74	0.09	0.00	-	0.01	0.01	90.16	0.01	-
OHVs - dust	-	-	-	-	-	41.66	4.17	-	-	-
Motorcycles	1.41	12.29	0.68	0.00	-	0.02	0.02	79.12	0.12	-
Motorcycles - dust	-	-	-	-	-	44.35	4.43	-	-	-
Overnight										
Transport vehicle	0.17	4.72	0.56	0.01	-	0.06	0.05	572.92	0.05	-
Transport vehicle - dust	-	-	-	-	-	494.06	49.41	-	-	-
OHVs	0.09	2.60	0.31	0.00	-	0.03	0.03	315.55	0.03	-
OHVs - dust	-	-	-	-	-	145.83	14.58	-	-	-
Motorcycles	4.93	43.01	2.40	0.00	-	0.08	0.07	276.93	0.40	-
Motorcycles - dust	-	-	-	-	-	155.22	15.52	-	-	-
Generator - Gasoline	3.49	1.13	1.78	0.10	-	0.12	0.11	174.69	-	-
Propane Stoves	0.01	0.05	0.09	0.00	0.01	0.01	0.01	89.86	0.00	0.01
Fire	2.48	37.02	-	-	8.27	5.39	4.67	-	2.23	-
Non-OHV Day Use										
Transport vehicle	0.02	0.42	0.05	0.00	-	0.01	0.00	51.15	0.00	-
Transport vehicle - dust						32.29	3.23			
Total - Johnson Valley	*12.72*	*104.51*	*6.25*	*0.12*	*8.27*	*1,112.92*	*115.72*	*1,957.30*	*2.86*	*0.01*
					East Area					
OHV Day Use										
Transport vehicle	0.00	0.02	0.00	0.00	-	0.00	0.00	2.39	0.00	-
Transport vehicle - dust	-	-	-	-	-	1.51	0.15	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	0.70	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.01	0.10	0.01	0.00	-	0.00	0.00	0.62	0.00	-
Motorcycles - dust	-	-	-	-	-	0.35	0.03	-	-	-
Overnight										
Transport vehicle	0.00	0.00	0.00	0.00	-	0.00	0.00	0.11	0.00	-
Transport vehicle - dust	-	-	-	-	-	0.09	0.01	-	-	-
OHVs	0.00	0.00	0.00	0.00	-	0.00	0.00	0.06	0.00	-
OHVs - dust	-	-	-	-	-	0.03	0.00	-	-	-
Motorcycles	0.00	0.01	0.00	0.00	-	0.00	0.00	0.05	0.00	-
Motorcycles - dust	-	-	-	-	-	0.03	0.00	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Fire	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Total - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
					South Area					
OHV Day Use										
Transport vehicle	0.00	0.04	0.00	0.00	-	0.00	0.00	4.25	0.00	-
Transport vehicle - dust	-	-	-	-	-	2.68	0.27	-	-	-
OHVs	0.00	0.01	0.00	0.00	-	0.00	0.00	1.25	0.00	-
OHVs - dust	-	-	-	-	-	0.32	0.03	-	-	-
Motorcycles	0.02	0.17	0.01	0.00	-	0.00	0.00	1.10	0.00	-
Motorcycles - dust	-	-	-	-	-	0.61	0.06	-	-	-
Total - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*12.75*	*104.87*	*6.28*	*0.12*	*8.27*	*1,118.87*	*116.31*	*1,968*	*2.87*	*0.01*

Table A1-15. Year 2015 Emissions within Acquired Lands by Source Category - 29 Palms LAS EIS (Tons/Year)

Area/Source Category	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Johnson Valley										
Vehicles - Combustive	6.74	66.31	4.38	0.02	-	0.23	0.21	1,692.75	0.63	-
Vehicles - Dust	-	-	-	-	-	1,107.17	110.72	-	-	-
Generator - Gasoline	3.49	1.13	1.78	0.10	-	0.12	0.11	174.69	-	-
Propane Stoves	0.01	0.05	0.09	0.00	0.01	0.01	0.01	89.86	0.00	0.01
Camp Fires	2.48	37.02	-	-	8.27	5.39	4.67	-	2.23	-
Subtotal - Johnson Valley	*12.72*	*104.51*	*6.25*	*0.12*	*8.27*	*1,112.92*	*115.72*	*1,957.30*	*2.86*	*0.01*
East Area										
Vehicles - Combustive	0.01	0.13	0.01	0.00	-	0.00	0.00	3.93	0.00	-
Vehicles - Dust	-	-	-	-	-	2.33	0.23	-	-	-
Generator - Gasoline	0.00	0.00	0.00	0.00	-	0.00	0.00	0.03	-	-
Propane Stoves	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Camp Fires	0.00	0.01	-	-	0.00	0.00	0.00	-	0.00	-
Subtotal - East Area	*0.01*	*0.14*	*0.01*	*0.00*	*0.00*	*2.33*	*0.23*	*3.97*	*0.00*	*0.00*
South Area										
Vehicles - Combustive	0.02	0.22	0.01	0.00	-	0.00	0.00	6.59	0.00	-
Vehicles - Dust	-	-	-	-	-	3.62	0.36	-	-	-
Subtotal - South Area	*0.02*	*0.22*	*0.01*	*0.00*	-	*3.62*	*0.36*	*6.59*	*0.00*	-
Total Emissions - Tons	*12.75*	*104.87*	*6.28*	*0.12*	*8.27*	*1,118.87*	*116.31*	*1,968*	*2.87*	*0.01*

Table A1-16. Fraction of Events Visitors in Johnson Valley OHV Area Displaced by Each Project Alternative

Alternative	Displaced from JV	Remain in County (1)	Displaced from County	% of Total JV out of C	Remain in O3 NA (1)	Displaced from O3 NA	% of Total JV out of NA
1	1.00	-	1.00	0.17	-	1.00	0.17
2	0.60	-	1.00	0.10	-	1.00	0.10
4	0.15	-	1.00	0.03	-	1.00	0.03
5	0.15	-	1.00	0.03	-	1.00	0.03
6	0.60	-	1.00	0.10	-	1.00	0.10

Note: 17 percent of the annual visitor usage occurs from events.

Note: (1) = Total visitors that remain

Table A1-17. Fraction of Dispersed-Use Visitors in Johnson Valley OHV Area Displaced by Each Project Alternative

Alternative	Displaced from JV	Remain in County (1)	Displaced from County	% of Total JV out of C	Remain in O3 NA (1)	Displaced from O3 NA	% of Total JV out of NA
1	0.75	0.90	0.10	0.06	0.81	0.19	0.12
2	0.25	0.90	0.10	0.02	0.81	0.19	0.04
4 - MDU	0.15	0.90	0.10	0.01	0.81	0.19	0.02
4 - SDU	0.30	0.90	0.10	0.005	0.81	0.19	0.01
4 - Total				0.015			0.028
5 - MDU	0.15	0.90	0.10	0.01	0.81	0.19	0.02
5 - SDU	0.30	0.90	0.10	0.005	0.81	0.19	0.01
5 - Total				0.015			0.028
6	0.30	0.90	0.10	0.02	0.81	0.19	0.05

Note: 83 percent of the annual visitor usage occurs from dispersed-use.

Note: (1) = Total visitors that remain

??? ???

Table A1-18. Fraction of All Visitors in Johnson Valley OHV Area Displaced by Each Project Alternative

Alternative	Displaced from JV	Remain in County		% of Total JV out of C			% of Total JV out of NA
1	0.79			0.23			0.29
2	0.31			0.12			0.14
4 - Total	0.17			0.04			0.05
5 - Total	0.17			0.04			0.05
6	0.25			0.13			0.15

Note: 17/83 percent of the annual visitor usage occurs from events/dispersed-use.

Note: (1) = Total visitors that remain

Table A1-19. Year 2015 Future Baseline Emissions Relocated from Johnson Valley - 29 Palms LAS EIS Project Alternatives (Tons/Year)

Area/Source Category	VOC	CO	NO_X	SO_X	PM	PM_{10}	$PM_{2.5}$	*CO_2*	*CH_4*	*N_2O*
					Johnson Valley					
Vehicles - Combustive	6.74	66.31	4.38	0.02	-	0.23	0.21	1,693	0.63	-
Vehicles - Dust	-	-	-	-	-	1,107.17	110.72	-	-	-
Gasoline-powered Generator	3.49	1.13	1.78	0.10	-	0.12	0.11	175	-	-
Propane Stoves	0.01	0.05	0.09	0.00	0.01	0.01	0.01	90	0.00	0.01
Camp Fires	2.48	37.02	-	-	8.27	5.39	4.67	-	2.23	-
Total Johnson Valley Emissions - Year 2015	12.72	104.51	6.25	0.12	8.27	1,112.92	115.72	1,957	2.86	0.01
Total Eliminated from MDAB - Alternative 1 (1)	2.95	24.27	1.45	0.03	1.92	258.47	26.87	454.58	0.67	0.00
Total Eliminated from MDAB - Alternative 2 (1)	1.56	12.83	0.77	0.01	1.02	136.61	14.20	240.26	0.35	0.00
Total Eliminated from MDAB - Alternative 4 (1)	0.51	4.23	0.25	0.00	0.33	45.01	4.68	79.15	0.12	0.00
Total Eliminated from MDAB - Alternative 5 (1)	0.51	4.23	0.25	0.00	0.33	45.01	4.68	79.15	0.12	0.00
Total Eliminated from MDAB - Alternative 6 (1)	1.61	13.26	0.79	0.01	1.05	141.23	14.68	248.38	0.36	0.00
Total Eliminated from MDAB O3 NA - Alternative 6 (1)	1.90	15.60	0.93	0.02	1.24	166.17	17.28	292.24	0.43	0.00

Note: (1) = These emissions deducted from the increase in emissions from each project alternative to produce net change in emissions.

Table A1-20. Emission Source Data for Road Construction - 29 Palms LAS EIS Proposed Alternative 6

Activity/Equipment Type	Hp Rating	Average Daily % of Full Throttle	Number Active	Hours/ Day	Total Work Days	Total Hp-Hrs
3000 Gal Water Truck	400	0.60	2	8	30	115,200
Motor Grader - 14 Foot Blade	275	0.80	1	8	30	52,800
Rubber Wheeled Compactor	400	0.80	1	8	30	76,800
Fugitive Dust	NA	NA	1	NA	30	30
On-Road Trucks						
Activity/Equipment Type	*Vehicle Weight*	*Miles per Round Trip*	*Daily Trips*		*Total Work Days*	*Total Miles*
Equipment Delivery Truck		200	1		2	400

Table A1-21. Emission Source Data for Construction of Communications Towers - 29 Palms LAS EIS Proposed Alternative 6

Activity/Equipment Type	Hp Rating	Average Daily % of Full Throttle	Number Active	Hours/ Day	Total Work Days	Total Hours
Forklift	67	0.40	1	4	5	536
Helicopters						
Activity/Equipment Type			*Number Active*	*Cruising (Hrs)*	*# of LTOs*	*# of Rock and Blocks (1)*
Helicopter - Skycrane			1	5	12	120
Helicopter - Huey (1)			1	2	10	50
On-Road Trucks						
Activity/Equipment Type	*Vehicle Wt. (Tons)*	*Miles per Round Trip*			*Total Trips*	*Total Miles*
Heavy Duty Truck (2)		100			10	1,000

Notes: (1) For Huey, # of Rock and Blocks = # of TGOs.

(2) Assume 10% of total VMT would occur on unpaved road.

Table A1-22. Offroad Construction Equipment Emission Factors - 29 Palms LAS EIS Project Alternatives

Project Year 2010/Source Type	*Fuel Type*	*Emission Factors (Grams/Horsepower-Hour)* VOC	CO	NOx	SOx	PM	PM10	PM2.5	*References*
Off-Road Equipment - <15 Hp	D	0.45	2.14	2.87	0.01	0.15	0.15	0.14	(1)
Off-Road Equipment - 16-24 Hp	D	0.49	1.52	2.76	0.00	0.16	0.16	0.14	(1)
Off-Road Equipment - 25-50 Hp	D	1.49	3.87	3.44	0.00	0.35	0.45	0.33	(1)
Off-Road Equipment - 51-120 Hp	D	0.66	2.36	4.05	0.00	0.36	0.30	0.33	(1)
Off-Road Equipment - 121-175 Hp	D	0.47	2.02	3.75	0.00	0.21	0.22	0.19	(1)
Off-Road Equipment - 176-250 Hp	D	0.34	0.97	3.60	0.00	0.13	0.15	0.12	(1)
Off-Road Equipment - 251-500 Hp	D	0.29	1.08	3.03	0.00	0.11	0.15	0.10	(1)
Off-Road Equipment - 501-750 Hp	D	0.31	1.18	3.25	0.00	0.12	0.15	0.11	(1)
Off-Road Equipment - >750 Hp	D	0.37	1.45	4.28	0.00	0.13	0.13	0.12	(1)
On-road Truck - Idle (Gms/Hr)	D	13.69	48.45	104.13	0.06	1.76	1.58	1.20	(2)
On-road Truck - 5 mph (Gms/Mi)	D	12.10	25.26	37.29	0.04	2.31	2.08	1.57	(2)
On-road Truck - 25 mph (Gms/Mi)	D	1.50	7.95	15.51	0.02	0.65	0.59	0.44	(2)
On-road Truck - 55 mph (Gms/Mi)	D	0.81	4.66	14.53	0.02	0.58	0.52	0.39	(2)
On-Road Trucks - Composite (Gms/Mi)	D	9.42	20.77	31.79	0.04	1.89	1.70	1.29	(2)
On-Road Trucks - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	8.89	2.57	0.39	(3)
Disturbed Ground - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	55.00	27.50	2.75	(4)
Helicopter - Skycrane - Cruise		3.84	22.11	4.41	0.45	1.99			(5)
Helicopter - Skycrane - LTO		6.81	21.37	1.07	0.15	1.36			(5)
Helicopter - Skycrane - Rocks and Blocks		0.41	3.01	0.91	0.08	0.38			(5)
Helicopter - Skycrane - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	123.22	61.61	24.64	(6)
Helicopter - Huey - Cruise		0.37	4.41	4.15	0.35	0.65			(7)
Helicopter - Huey - LTO		2.17	1.90	1.02	0.10	0.19			(7)
Helicopter - Huey - TGO		0.06	0.76	0.96	0.08	0.15			(7)
Helicopter - Huey - Fugitive Dust	- - -	- - -	- - -	- - -	- - -	11.28	5.64	2.26	(6)

Notes: (1) Composites developed from Offroad emission factors obtained from URBEMIS 2007 for project year 2010.

(2) Heavy duty diesel truck running emission factors developed from EMFAC2007 (CARB 2006b). Units in gms/mile calculated for project year 2010. Composite emission factors based on a round trip of 75% at 55 mph, 20% at 25 mph, and 5% at 5 mph. Units in grams/mile. Although not shown in these calculations, emissions from 15 minutes of idling mode included for each truck round trip.

(3) See Table A1-7. Units in Lb/VMT.

(4) Units in lbs/acre-day from section 11.2.3 of AP-42 (USEPA 1995). Emissions reduced by 50% from uncontrolled levels to simulate implementation of best management practices (BMPs) for fugitive dust control

(5) AESO 2000a and b for a CH-46E. Cruise units in lb/hr and LTO/Rocks and Blocks/TGO units in lb/event.

(6) See Table A1-17, R-2501 Section. Units in Lb/LTO.

(7) EPA 1992. Cruise units in lb/hr and LTO/Rocks and Blocks units in lb.

Table A1-23. Total Road Construction Emissions - 29 Palms LAS EIS Proposed Alternative 6

	Total Pounds						
Activity/Equipment Type	*VOC*	*CO*	*NOx*	*SOx*	*PM*	*PM10*	*PM2.5*
3000 Gal Water Truck	73.85	274.97	770.26	0.82	28.19	38.10	25.94
Motor Grader - 14 Foot Blade	33.85	126.03	353.04	0.37	12.92	17.46	11.89
Rubber Wheeled Compactor	49.23	183.31	513.51	0.54	18.79	25.40	17.29
Fugitive Dust	--	--	--	--	1,650	825	83
Subtotal	*157*	*584*	*1,637*	*2*	*1,710*	*906*	*138*
On-Road Vehicles							
Equipment Delivery Truck	8.30	18.31	28.04	0.03	1.67	1.50	1.13
On-Road Vehicles -Subtotal	*8.30*	*18.31*	*28.04*	*0.03*	*1.67*	*1.50*	*1.13*
Total Emissions (Pounds)	165	603	1,665	2	1,712	907	139

Calculation of Annual Emissions for Off-Road Equipment

Emission Factor (g/hp-hr) x Total Horsepower-hours (hp-hr/yr) x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for On-Road Vehicles

Emission Factor (g/mile) x Number of daily truck trips x Round-trip distance (mile) x Number of working days x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for PM fugitive dust - ground disturbance

Emission Factor (lb/acre-day) x Acreage Disturbed (acres) x Annual number of working days (day/yr) = Annual Emissions (lb/yr)

Table A1-24. Emissions for Construction of Communications Towers - 29 Palms LAS EIS Proposed Alternative 6

	Total Pounds						
Activity/Equipment Type	*VOC*	*CO*	*NOx*	*SOx*	*PM*	*PM10*	*PM2.5*
Forklift	0.8	2.8	4.8	0.0	0.4	0.4	0.4
Subtotal	*0.8*	*2.8*	*4.8*	*0.0*	*0.4*	*0.4*	*0.4*
Helicopters							
Helicopter - Skycrane - Cruise	19.2	110.6	22.1	2.3	10.0	-	-
Helicopter - Skycrane - LTO	81.7	256.4	12.8	1.8	16.3	-	-
Helicopter - Skycrane - Rocks and Blocks	49.2	361.2	109.2	9.6	45.6	-	-
Helicopter - Skycrane - Fugitive Dust	-	-	-	-	1,478.6	739.3	295.7
Helicopter - Huey - Cruise	0.7	8.8	8.3	0.7	1.3	-	-
Helicopter - Huey - LTO	21.7	19.0	10.2	1.0	1.9	-	-
Helicopter - Huey - TGO	3.1	37.9	48.1	4.1	7.5	-	-
Helicopter - Huey - Fugitive Dust	-	-	-	-	112.8	56.4	22.6
Subtotal	*175.7*	*794.0*	*210.7*	*19.4*	*1,674.0*	*795.7*	*318.3*
On-Road Vehicles							
Equipment Delivery Truck	2.2	12.1	32.6	0.0	1.3	1.2	0.9
Equipment Delivery Truck - Fugitive Dust	-	-	-	-	889.3	257.0	39.4
On-Road Vehicles -Subtotal	*2.2*	*12.1*	*32.6*	*0.0*	*890.6*	*258.2*	*40.3*
Total Emissions (Pounds)	178.6	808.8	248.1	19.5	2,565.0	1,054.3	359.0

Calculation of Annual Emissions for Off-Road Equipment

Emission Factor (g/hp-hr) x Total Horsepower-hours (hp-hr/yr) x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for Helicopters - LTOs

Emission Factor (lb/LTO) x Number of LTOs = Annual Emissions (lb/yr)

Calculation of Annual Emissions for On-Road Vehicles

Emission Factor (g/mile) x Number of daily truck trips x Round-trip distance (mile) x Number of working days x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Annual Emissions for PM fugitive dust - ground disturbance

Emission Factor (lb/acre-day) x Acreage Disturbed (acres) x Annual number of working days (day/yr) = Annual Emissions (lb/yr)

Table A1-25. Emission Source Data for Tactical Vehicles/Support Equipment - 29 Palms LAS EIS Proposed Alternatives 1, 2, and 4-6

Activity/Equipment Type	*Number of Vehicles*	*Annual VMT*	*Miles per Gallon*	*Total Gallons*	*Hp*	*Total Hp-Hr (1)*
Tactical Vehicles						
Medium Tactical Vehicle Replacement	348	228,814	3.85	59,432	250	1,188,644
High-Mobility Multipurpose Wheeled Vehicle	785	393,386	14.00	28,099	150	561,980
Logistics Vehicle System	198	75,094	2.00	37,547	445	750,940
Internally Transportable Vehicle	50	18,156	14.00	1,297	71	25,937
M60A1 Bridge Vehicle	4	2,580	0.33	7,818		
Amphibious Assault Vehicle	187	87,550	0.75	116,733	425	2,334,667
(Variants)	87	34,694	5.17	6,711	275	134,213
M88A2 Hercules Recovery Vehicle	12	1,290	0.33	3,909		
High-Mobility Artillery Rocket System	6	70	3.85	18	330	364
Abrams M1A1 Main Battle Tank	44	16,354	0.33	49,558		
Joint Assault Bridge	5	1,858	0.33	5,632		
Assault Breacher Vehicle	5	3,000	0.36	8,333		
Tactical Support Equipment (2)						
	Number of Vehicles	*Hp*	*Hours per Year*	*Total Hp-Hr*		
Medium Crawler Tractor	5	118	120	70,800		
Excavator, Combat	12	295	120	424,800		
Grader	2	150	120	36,000		
Armored Tractor	3	118	120	42,480		
D7 Bulldozer	5	200	120	120,000		
Armored Backhoe	12	295	120	424,800		
Extended Boom Forklift	4	150	120	72,000		
Light Capacity Rough Terrain Truck Forklift	2	110	120	26,400		
Tractor, Rubber Tired, Articulated Steering	10	185	120	222,000		

Notes: (1) Based upon a fuel usage rate of 0.051 gallons per Hp-Hr.

(2) Horsepower ratings from 2007 CEIP Appendix D.11.

Table A1-26. Tactical Vehicles/Support Equipment Emission Factors - 29 Palms LAS EIS Proposed Alternative 6

Source Type	*Emission Factors (Pounds/1000 Gallons)*							Reference
	ROG	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	
Tank Vehicles and ABV								
Abrams Tank/Bridge Vehicles	0.06	0.45	118.80	0.51	1.56	1.56	1.52	(1)
Assault Breacher Vehicle	14.10	101.60	170.88	13.96	1.71	1.71	1.57	(2)
Other Tactical Vehicles/TSE								
	Emission Factors (Grams/Horsepower-Hour)							
121-250 Hp	0.94	4.40	10.84	1.32	0.44	0.43	0.43	(3)
>250 Hp	0.95	4.20	10.84	1.32	0.42	0.41	0.41	(3)

Notes: (1) From 2007 CEIP Appendix D.11, page 6.

(2) FEA for Proposed ABV Action at MCAGCC (2003).

(3) From 2007 CEIP Appendix D.11, page 7.

(4) GHG Emission Factors for (a) Tank Vehicles and ABVs from General Reporting Protocol, Tables C.3 and C.6 jet fuel (California Climate and (b) other TV/TSE from OFFROAD2007 Model.

Table A1-27. Total Tactical Vehicles/Support Equipment Emissions - 29 Palms LAS EIS Proposed Alternative 6

	Pounds per Year						
Activity/Equipment Type	*ROG*	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles							
Medium Tactical Vehicle Replacement	2,489	11,006	28,406	3,459	1,101	1,074	1,074
High-Mobility Multipurpose Wheeled Vehicle	1,165	5,451	13,430	1,635	545	533	533
Logistics Vehicle System	1,573	6,953	17,946	2,185	695	679	679
Internally Transportable Vehicle	54	252	620	75	25	25	25
M60A1 Bridge Vehicle	0	4	929	4	12	12	12
Amphibious Assault Vehicle	4,890	21,617	55,793	6,794	2,162	2,110	2,110
Light Armored Vehicle (Variants)	281	1,302	3,207	391	130	127	127
M88A2 Hercules Recovery Vehicle	0	2	464	2	6	6	6
High-Mobility Artillery Rocket System	1	3	9	1	0	0	0
Abrams M1A1 Main Battle Tank	3	22	5,887	25	77	77	75
Joint Assault Bridge	0	3	669	3	9	9	9
Assault Breacher Vehicle	118	847	1,424	116	14	14	13
Subtotal - Pounds	10,574	47,461	128,784	14,691	4,777	4,667	4,663
Tactical Support Equipment							
Medium Crawler Tractor	147	147	147	147	147	147	147
Excavator, Combat	890	3,933	10,152	1,236	393	384	384
Grader	75	333	860	105	33	33	33
Armored Tractor	89	393	1,015	124	39	38	38
D7 Bulldozer	251	1,111	2,868	349	111	108	108
Armored Backhoe	890	3,933	10,152	1,236	393	384	384
Extended Boom Forklift	149	698	1,721	210	70	68	68
Light Capacity Rough Terrain Truck Forklift	55	256	631	77	26	25	25
Multipurpose Vehicles	460	2,153	5,305	646	215	210	210
Subtotal - Pounds	3,006	12,959	32,850	4,129	1,428	1,398	1,398
Total Emissions (Pounds)	13,579	60,420	161,635	18,820	6,205	6,065	6,061
Total Emissions (Tons) [1]	6.79	30.21	80.82	9.41	3.10	3.03	3.03

Calculation of Annual Emissions for Tactical and Support Equipment

Emission Factor (g/hp-hr) x total Hp-hrs x 1 lb/453.6 g = Annual Emissions (lb/yr)

Calculation of Abrams Tank/Bridge Vehicles and Assault Breacher Vehicle

Emission Factor (lbs/1000 gals) x Total Gals x 1 /1000 = Annual Emissions (lb/yr)

Table A1-28. On-Road Vehicle Data for Personnel/Equipment Transport - 29 Palms LAS EIS Project Alternatives

Activity/Equipment Type	*Annual # of Vehicle Round Trips*	*Miles/Round Trip (1)*	*Total Annual Miles*
On-Road Transport			
Buses	800	90	72,000
Tractor-Trailer/Convoyed Vehicles	200	90	18,000

Notes: (1) Equal to distance travelled within the MDAB - all trips would originate from March Air Reserve Base and Camp Pendleton.

(2) Horsepower ratings from 2007 CEIP Appendix D.11.

Table A1-29. On-Road Vehicle Transport Emission Factors - 29 Palms LAS EIS Project Alternatives

Source Type/Activity	Emission Factors (Grams/Mile)							Reference
	ROG	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*	
Urban Bus								
25 MPH	0.94	8.43	15.78	0.02		0.26	0.24	(1)
55 MPH	0.46	6.01	21.96	0.02		0.16	0.14	(1)
Composite Trip (1)	0.56	6.49	20.72	0.02	-	0.18	0.16	(1)
Heavy Diesel Truck								
25 MPH	0.80	5.63	10.33	0.02		0.41	0.37	(1)
55 MPH	0.45	3.67	10.00	0.01		0.37	0.34	(1)
Composite Trip (1)	0.52	4.06	10.07	0.01	-	0.38	0.35	(1)

Notes: (1) Assumes statewide average fleets for year 2013. Obtained from ARB EMFAC2007 Model (ARB 2006). PM inlcudes comb

(2) Composite factors based on a trip of 80% 25 mph and 20% 55 mph.

Table A1-30. Total On-Road Vehicle Personnel/Equipment Transport Emissions - 29 Palms LAS EIS Project Alternative

Equipment Type	*Pounds per Year*						
	ROG	*CO*	*NO_X*	*SO_X*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles							
Buses	88	1,031	3,290	3	-	28	26
Tractor-Trailer/Convoyed Vehicles	21	161	399	0	-	15	14
Total Emissions (Pounds)	109	1,192	3,689	4	-	43	40
Total Emissions (Tons)	0.05	0.60	1.84	0.00	-	0.02	0.02

Table A1-31. Emission Source Data for Tactical Vehicles/Support Equipment - Unpaved Road Dust - 29 Palms LAS EIS Proposed Alternative 6

Equipment Type	*Weight (Tons)*	*Unpaved Emission Factor (Lb/VMT)*			*Annual VMT*	*% Unpaved Travel (1)*	*Unpaved VMT*
		PM	PM_{10}	$PM_{2.5}$			
Tactical Vehicles							
Medium Tactical Vehicle Replacement	10.0	6.51	1.88	0.29	228,814	90%	205,933
High-Mobility Multipurpose Wheeled Vehicle	3.0	3.79	1.09	0.17	393,386	50%	196,693
Logistics Vehicle System	20.0	8.89	2.57	0.39	75,094	50%	37,547
Internally Transportable Vehicle	3.5	4.06	1.17	0.18	18,156	50%	9,078
M60A1 Bridge Vehicle	70.0	15.63	4.52	0.69	2,580	90%	2,322
Amphibious Assault Vehicle	30.6	10.77	3.11	0.48	87,550	90%	78,795
Light Armored Vehicle (Variants)	14.1	7.60	2.20	0.34	34,694	90%	31,225
M88A2 HERCULES Recovery Vehicle	70.0	15.63	4.52	0.69	1,290	90%	1,161
High-Mobility Artillery Rocket System	12.0	7.07	2.04	0.31	70	50%	35
Abrams M1A1 Main Battle Tank	70.0	15.63	4.52	0.69	16,354	90%	14,719
Joint Assault Bridge	70.0	15.63	4.52	0.69	1,858	90%	1,673
Assault Breacher Vehicle	55.0	14.02	4.05	0.62	3,000	90%	2,700
Tactical Support Equipment							
Ground Disturbance (2)	1	110.0	55.0	5.5	48		

Notes: (1) Percentage of unpaved roads from 2007 CEIP Appendix D.13.

(2) Weight = daily disturbed acreage and Annual VMT = total annual days of disturbance. Emission factors in lb/acre-day.

Table A1-32. Emission Source Data for Tactical Vehicles/Support Equipment - Paved Road Dust - 29 Palms LAS EIS Proposed Alternative 6

Equipment Type	*Weight (Tons)*	*Paved Emission Factor (Lb/VMT)*			*Annual VMT*	*% Paved Travel (1)*	*Paved VMT*
		PM	PM_{10}	$PM_{2.5}$			
Tactical Vehicles							
Medium Tactical Vehicle Replacement	10.0	0.07	0.01	0.002	228,814	10%	22,881
High-Mobility Multipurpose Wheeled Vehicle	3.0	0.01	0.00	-	393,386	50%	196,693
Logistics Vehicle System	20.0	0.20	0.04	0.006	75,094	50%	37,547
Internally Transportable Vehicle	3.5	0.01	0.00	0.000	18,156	50%	9,078
M60A1 Bridge Vehicle	70.0	1.32	0.26	0.038	2,580	10%	258
Amphibious Assault Vehicle	30.6	0.38	0.07	0.011	87,550	10%	8,755
Light Armored Vehicle (Variants)	14.1	0.12	0.02	0.003	34,694	10%	3,469
M88A2 HERCULES Recovery Vehicle	70.0	1.32	0.26	0.038	1,290	10%	129
High-Mobility Artillery Rocket System	12.0	0.09	0.02	0.002	70	50%	35
Abrams M1A1 Main Battle Tank	70.0	1.32	0.26	0.038	16,354	10%	1,635
Joint Assault Bridge	70.0	1.32	0.26	0.038	1,858	10%	186
Assault Breacher Vehicle	55.0	0.92	0.18	0.027	3,000	10%	300

Notes: (1) Percentage of paved roads from 2007 CEIP Appendix D.13.

(2) US EPA 42 13.2.1, sL - 0.1, k(PM10) - 0.016, k(PM2.5) - 0.0024, C(PM10) - 0.00047, C(PM2.5) - 0.00036

Table A1-33. Annual Fugitive Dust Emissions for Tactical Vehicles - Unpaved Roads - 29 Palms LAS EIS Proposed Alternative 6

	Annual Emissions - Tons		
Equipment Type	*PM*	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles			
Medium Tactical Vehicle Replacement	670.28	193.71	29.70
High-Mobility Multipurpose Wheeled Vehicle	372.41	107.63	16.50
Logistics Vehicle System	166.94	48.25	7.40
Internally Transportable Vehicle	18.42	5.32	0.82
M60A1 Bridge Vehicle	18.14	5.24	0.80
Amphibious Assault Vehicle	424.23	122.61	18.80
Light Armored Vehicle (Variants)	118.62	34.28	5.26
M88A2 HERCULES Recovery Vehicle	9.07	2.62	0.40
High-Mobility Artillery Rocket System	0.12	0.04	0.01
Abrams M1A1 Main Battle Tank	115.00	33.24	5.10
Joint Assault Bridge	13.07	3.78	0.58
Assault Breacher Vehicle	18.93	5.47	0.84
Subtotal	1,945.24	562.19	86.20
Tactical Support Equipment			
Ground Disturbance	2.64	1.32	0.13
Subtotal	2.64	1.32	0.13
Total Emissions	1,947.88	563.51	86.33

Table A1-34. Annual Fugitive Dust Emissions for Tactical Vehicles - Paved Roads - 29 Palms LAS EIS Proposed Alternative 6

	Annual Emissions - Tons		
Equipment Type	*PM*	*PM_{10}*	*$PM_{2.5}$*
Tactical Vehicles			
Medium Tactical Vehicle Replacement	0.81	0.15	0.02
High-Mobility Multipurpose Wheeled Vehicle	1.10	0.18	-
Logistics Vehicle System	3.77	0.73	0.10
Internally Transportable Vehicle	0.06	0.01	0.00
M60A1 Bridge Vehicle	0.17	0.03	0.00
Amphibious Assault Vehicle	1.67	0.32	0.05
Light Armored Vehicle (Variants)	0.21	0.04	0.01
M88A2 HERCULES Recovery Vehicle	0.09	0.02	0.00
High-Mobility Artillery Rocket System	0.00	0.00	0.00
Abrams M1A1 Main Battle Tank	1.08	0.21	0.03
Joint Assault Bridge	0.12	0.02	0.00
Assault Breacher Vehicle	0.14	0.03	0.00
Total Emissions	9.22	1.75	0.22
Total Emissions - Paved and Unpaved Roads	1,957.10	565.25	86.56

Table A1-35. Proposed MCAGCC Aircraft Operations and Emissions - Airspaces - 29 Palms LAS EIS Project Alternatives

	Sorties				Tons per Year					
Aircraft Type	*Annual*	*Fraction Below 3,000 AGL*	*Total Duration (Min.)*	*Duration Below 3,000 AGL (Min.)*	*ROG/HC*	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*
F/A-18 C/D	484	0.07	90	6.3	0.07	0.41	1.14	0.07	1.07	1.07
F-35	152	0.07	90	6.3	0.02	0.13	0.36	0.02	0.34	0.34
Joint FW (1)	4	0.07	90	6.3	0.00	0.00	0.05	0.00	0.00	0.01
KC-130	136	0.07	180	12.6	0.03	0.12	0.65	0.03	0.29	0.29
AV-8B	300	0.07	78	5.5	0.37	4.28	4.18	0.03	0.52	0.52
AH-1	546	0.99	90	89.1	0.19	3.63	1.91	0.14	1.45	1.45
UH-1	546	0.99	90	89.1	0.04	0.26	1.77	0.12	1.24	1.24
CH-53E	232	0.99	90	89.1	0.12	1.64	6.21	0.31	1.70	1.70
MV-22	268	0.69	120	82.8	0.01	0.45	6.59	0.23	0.89	0.89
Joint RW (2)	320	0.99	12	11.9	0.02	0.28	0.15	0.01	0.11	0.11
EA-6B	74	-	120	-	-	-	-	-	-	-
Joint AR (3)	36	-	240	-	-	-	-	-	-	-
UAS	240	-	600	-						
Total	3,338		1,890		**0.86**	**11.20**	**23.01**	**0.95**	**7.62**	**7.63**

Notes: (1) Assumes F-16 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

Table A1-36. Proposed Aircraft Emissions - Landing and Take-Offs - 29 Palms LAS EIS Project Alternatives

Location/Aircraft Type	*Annual Sorties*	*Tons per Year*					
		ROG/HC	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*
EAF							
F/A-18 C/D	484	13.17	34.51	3.86	0.22	4.02	4.02
F-35	152	4.14	10.87	1.21	0.07	1.26	1.26
Joint FW (1)	4	0.01	0.05	0.02	0.00	0.00	0.00
KC-130	136	0.52	1.01	1.18	0.06	0.61	0.61
AV-8B	300	2.62	2.93	1.72	0.13	0.23	0.23
AH-1	546	0.09	1.93	0.57	0.05	0.49	0.49
UH-1	546	0.18	0.91	0.35	0.03	0.32	0.32
CH-53E	232	1.30	2.65	1.03	0.08	0.44	0.44
MV-22	268	1.54	0.73	1.54	0.01	0.27	0.27
Joint RW (2)	320	0.05	1.13	0.33	0.03	0.29	0.29
EA-6B	74	0.83	1.70	0.45	0.04	0.07	0.07
Joint AR (3)	36	0.06	1.86	0.59	0.09	0.62	0.62
UAS	240	-	-	-	-	-	-
Subtotal	**3,338**	**24.53**	**60.38**	**12.86**	**0.80**	**8.63**	**8.63**
R-2501							
AH-1	1,092	0.02	0.38	0.17	0.01	0.14	0.14
UH-1	1,092	0.01	0.16	0.31	0.03	0.25	0.25
CH-53E	464	0.12	0.45	0.93	0.05	0.28	0.28
MV-22	536	0.00	0.08	2.38	0.06	0.25	0.25
Joint RW (2)	640	0.01	0.22	0.10	0.01	0.08	0.08
Subtotal	**3,184**	**0.16**	**1.29**	**3.90**	**0.16**	**1.00**	**1.00**
Total - LTOs	**6,522**	**24.69**	**61.67**	**16.76**	**0.96**	**9.62**	**9.62**

Notes: (1) Assumes F-16 aircraft.
(2) Assumes AH-1 helicopter.
(3) Assumes KC-135 aircraft.

Table A1-37. Proposed Fugitive Emissions - Landing and Take-Offs - 29 Palms LAS EIS Project Alternatives

Aircraft Type/Location	*Annual Sorties*	*Tons per Year*	
		PM10	*PM2.5*
EAF			
AH-1	546	0.35	0.14
UH-1	546	0.08	0.03
CH-53E	232	1.59	0.64
MV-22	268	0.26	0.10
Joint RW (2)	320	0.21	0.08
Subtotal	**1,912**	**2.50**	**1.00**
R-2501			
AH-1	1,092	12.71	5.08
UH-1	1,092	3.08	1.23
CH-53E	464	14.29	5.72
MV-22	536	2.33	0.93
Joint RW (2)	640	7.45	2.98
Subtotal	**3,824**	**39.86**	**15.94**
Total	**5,736**	**42.36**	**16.94**

Table A1-38. Aircraft Emission Factors - Airspace Modes of Operation - 29 Palms LAS EIS Project Alternatives

Aircraft	Engine Type	# Engines	Engine Power Setting	Fuel Flow/ Engine (Lb/hr)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Source of EF
					Pounds/1000 Pounds Fuel									
F/A-18 C/D	F404-GE-402	2	85% N	3,318	0.44	2.44	6.74	0.40	6.36	6.36	3,096	0.10	0.09	AESO Memo Rpt 9815E, 11/02
F-35	F404-GE-402	2	85% N	3,318	0.44	2.44	6.74	0.40	6.36	6.36	3,096	0.10	0.09	F-18 as a surrogate
Joint FW (1)	F100-PW-100	1	Intermediate	7,617	0.14	0.91	30.89	0.96	2.06	6.36	3,096	0.10	0.09	F-16 as a surrogate
KC-130	T56-A-16	4	8,000 Q	1,300	0.36	1.58	8.75	0.40	3.97	3.97	3,096	0.10	0.09	AESO Memo Rpt 2000-09B, 1/01
AV-8B	F-402-RR-404	1	Intermediate	6,186	4.33	50.73	49.49	0.40	6.19	6.19	3,096	0.10	0.09	EPA (1992), p. 187
AH-1	T700-GE-401C	2	38% Q - Cruise	425	0.56	10.54	5.55	0.40	4.20	4.20	3,096	0.10	0.09	AESO Memo Rpt 9824a, 1/00
UH-1	T53-L-13B	2	58% Q - Climbout	363	0.13	0.88	6.02	0.40	4.20	4.20	3,096	0.10	0.09	AESO Memo Rpt 9904A, 1/00
CH-53E	T64-GE-416 and -416A	3	70% Q - Cruise	1,488	0.15	2.13	8.08	0.40	2.21	2.21	3,096	0.10	0.09	AESO Memo Rpt 9822C, 2/00
MV-22	T406-AD-400	2	Helo (16°) Cruise	1,530	0.01	0.79	11.64	0.40	1.58	1.58	3,096	0.10	0.09	AESO Memo Rpt 9946E, 1/01
Joint RW (2)	T700-GE-401C	2	38% Q - Cruise	425	0.56	10.54	5.55	0.40	4.20	4.20	3,096	0.10	0.09	AH-1 as a surrogate
EA-6B	J52-P408	2	Intermediate	5,752	3.85	18.29	48.20	0.96	5.75	5.75	3,096	0.10	0.09	EPA (1992), p. 186
Joint AR (3)	F108-CF-100	4	Intermediate	5,650	0.03	1.61	13.53	0.96	0.65	0.65	3,096	0.10	0.09	IERA 2002

Notes: (1) Assumes F-16 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

(4) GHG Emission Factors from General Reporting Protocol, Tables C.3 and C.6 jet fuel (California Climate Action Registry 2009).

Table A1-39. Aircraft Emission Factors - Landing/Take-off Modes of Operation - 29 Palms LAS EIS Project Alternatives

Aircraft	Engine Type	# Engines	Fuel Usage (Pounds per LTO)	Pounds/LTO									Source of EF
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	
F/A-18 C/D	F404-GE-402	2	2,232	54.43	143.03	15.95	0.89	16.61	16.61	6,911	0.22	0.20	AESO Memo Rpt 9815E, 11/02
F-35	F404-GE-402	2	2,232	54.43	143.03	15.95	0.89	16.61	16.61	6,911	0.22	0.20	F-18 as a surrogate
Joint FW (1)	F100-PW-100	1	1,207	4.74	23.33	9.89	1.12	2.17	2.17	3,737	0.12	0.11	USAF IERA 2002
KC-130	T56-A-16	4	2,387	7.65	14.79	17.35	0.95	9.03	9.03	7,329	0.24	0.21	AESO Memo Rpt 2000-09B, 1/01
AV-8B	F-402-RR-404	1	1,137	17.49	19.55	11.48	0.84	1.55	1.55	3,520	0.11	0.10	EPA (1992), p. 187
AH-1	T700-GE-401C	2	428	0.33	7.08	2.09	0.17	1.80	1.80	1,325	0.04	0.04	AESO Memo Rpt 9824a, 1/00
UH-1	T53-L-13B	1	280	0.67	3.32	1.28	0.11	1.18	1.18	867	0.03	0.02	AESO Memo Rpt 9904A, 1/00
CH-53E	T64-GE-416 and -416A	3	1,746	11.24	22.86	8.86	0.70	3.76	3.76	5,406	0.18	0.15	AESO Memo Rpt 9822C, 2/00
MV-22	T406-AD-400	2	1,464	11.51	5.44	11.51	0.08	2.01	2.01	4,533	0.15	0.13	AESO Memo Rpt 9946E, 1/01
Joint RW (2)	T700-GE-401C	2	428	0.33	7.08	2.09	0.17	1.80	1.80	1,325	0.04	0.04	AH-1 as a surrogate
EA-6B	J52-P408	2	1,819	22.55	45.91	12.10	0.98	1.82	1.82	5,632	0.18	0.16	EPA (1992), p. 186
Joint AR (3)	F108-CF-100	4	5,399	3.33	103.38	32.90	5.13	34.49	34.49	16,716	0.54	0.47	IERA 2002

Notes: (1) Assumes F-16 aircraft.

(2) Assumes AH-1 helicopter.

(3) Assumes KC-135 aircraft.

(4) GHG Emission Factors from General Reporting Protocol, Tables C.3 and C.6 (California Climate Action Registry 2009).

Table A1-40. Aircraft Emission Factors - Pad Landings - 29 Palms LAS EIS Project Alternatives

Aircraft	Engine Type	# Engines	Fuel Usage (Pounds per Landing)	Pounds/Landing									Source of EF
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	
AH-1	T700-GE-401C	2	60	0.03	0.69	0.32	0.02	0.25	0.25	185.8	0.01	0.01	AESO Memo Rpt 9961, 7/99
UH-1 (4)	T53-L-13B	1	159	0.02	0.30	0.57	0.05	0.46	0.46	492.3	0.02	0.01	AESO Memo Rpt 9904A, 1/00
CH-53E	T64-GE-416 and -416A	3	540	0.52	1.94	4.03	0.22	1.19	1.19	1,671.9	0.05	0.05	AESO Memo Rpt 9960, Revision B, 4/00
MV-22	T406-AD-400	2	592	0.01	0.29	8.87	0.24	0.94	0.94	1,832.9	0.06	0.05	AESO Memo Rpt 2000-09B, 1/01
Joint RW (2)	T700-GE-401C	2	60	0.03	0.69	0.32	0.02	0.25	0.25	185.8	0.01	0.01	AH-1 as a surrogate

Notes: (1) Equal to hover, climbout, descent, and approach modes.

Table A1-41. Aircraft Fugitive Dust Emission Factors - Landing/Take-off Modes of Operation - 29 Palms LAS EIS Project Alternatives

Aircraft	Soil Silt Content (%)	Rain Days per Year	% of Time Wind Speed > 12 Knots	Exposed Area (Acres)	PM10	PM2.5	Location of EF	Source of EF
					Pounds/Landing or Take O			
EAF								
AH-1	9.1	8	0.17	0.04	1.30	0.52	2007 CEIP -	MDAQMD Mine Operations
UH-1	9.1	8	0.04	0.04	0.30	0.12	2007 CEIP -	MDAQMD Mine Operations
CH-53E	9.1	8	0.16	0.45	13.72	5.49	2007 CEIP -	MDAQMD Mine Operations
MV-22	9.1	8	0.02	0.51	1.94	0.78	2007 CEIP -	MDAQMD Mine Operations
Joint RW (1)	9.1	8	0.17	0.04	1.30	0.52	2007 CEIP -	MDAQMD Mine Operations
R-2501								
AH-1	9.1	8	0.33	0.37	23.27	9.31	2007 CEIP -	MDAQMD Mine Operations
UH-1	9.1	8	0.08	0.37	5.64	2.26	2007 CEIP -	MDAQMD Mine Operations
CH-53E	9.1	8	0.32	1.01	61.61	24.64	2007 CEIP -	MDAQMD Mine Operations
MV-22	9.1	8	0.04	1.14	8.69	3.48	2007 CEIP -	MDAQMD Mine Operations
Joint RW (1)	9.1	8	0.33	0.37	23.27	9.31	2007 CEIP -	MDAQMD Mine Operations

Table A1-42. Total Proposed Aircraft Emissions within all MCAGCC Airspaces - 29 Palms LAS EIS Project Alternatives

Airspace	*Tons per Year*					
	ROG/HC	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*
Airspaces	0.86	11.20	23.01	0.95	7.62	7.63
EAF LTOs	24.53	60.38	12.86	0.80	8.63	8.63
Range LTOs	0.16	1.29	3.90	0.16	1.00	1.00
Prop Wash - Fugitive Dust					42.36	16.94
Total	**25.55**	**72.87**	**39.77**	**1.91**	**59.60**	**34.20**

Table A1-43. Proposed Ground Forces Annual Ordnances - 29 Palms LAS EIS Project Alternatives

Ordnance Type/Activity	*Item #*	Usage	Units	Weight/Unit (Lb)	Total Explosive Weight (Tons)
Ground Forces Munitions					
Cartridges Smaller than 30 mm	A059, A063, A064, A131, A576, A976	936,270	EA		
Cartridges 30-75 mm	B519, B535, B576, B630, B643, B647	24,242	EA		
Cartridges 75 mm and Larger	C784, C785, C868, C870, C871, C995	11,468	EA	3.06	17.52
Projectiles, Canisters, and Chargers	D505, D528, D532, D533, D541, D544, D579	38,332	EA	4.96	95.00
Grenades	G878, G930, G940, G945	666	EA		
Rockets, Rocket Motors, and Igniters	HX05, HX07, J143	144	EA	0.11	0.01
Mines and Smoke Pots	K143	144	EA	0.22	0.02
Signals and Simulators	L312, L314, L324	360	EA		
Blasting Caps, Demo. Charges, and Detonators	M Series - Detonating cord	8,829	Ft	0.01	0.02
Blasting Caps, Demo. Charges, and Detonators	M Series - Other explosives	8,829	EA		
Fuses and Primers	N289, N340, N523	24,642	EA	0.003	0.04
Guided Missiles	PB99, WF10	144	EA	1.59	0.11
Total		1,057,160			

Table A1-44. Air-Delivered Munitions Used During MEB Exercises - 29 Palms LAS EIS Project Alternatives

	Identification Code	Usage	Units	Weight/Unit	Total Explosive Weight (Tons)
Unguided Munitions					
General Purpose Bomb (25 Lb) - Inert	MK-76 (Inert)	1,950	EA		
General Purpose Bomb (500 Lb)	MK-82	1,020	EA	154.00	78.54
General Purpose Bomb (1,000 Lb) Inert	MK-83 (Inert)	156	EA		
General Purpose Bomb (1,000 Lb)	MK-83	132	EA	165.50	10.92
General Purpose Bomb (2,000 Lb)	MK-84	36	EA	331.00	5.96
Inert Practice Bomb	BDU-45 (Inert)	360	EA		
2.75-inch Rocket	HE/WP/RP Rocket	8,400	EA	0.91	3.84
5-inch Zuni Rocket	HE/WP/ILLUM Rocket	792	EA	4.95	1.96
Guided Munitions [1]					
Hellfire missile	MK-114	72	EA	17.60	0.63
Laser Guided Bomb (500 lb)	GBU-12	432	EA	154.00	33.26
Laser Guided Bomb (1000 lb)	GBU-16	54	EA	165.50	4.47
Laser Guided Bomb (2000 lb)	GBU-10	4	EA	331.00	0.66
Joint Direct Attack Munitions (250 lb)	GB-38 version 4	252	EA	77.00	9.70
Joint Direct Attack Munitions (500 lb)	GBU-38, GBU-54	576	EA	154.00	44.35
Joint Direct Attack Munitions (1000 lb)	GBU-32	24	EA	165.50	1.99
Joint Direct Attack Munitions (2000 lb)	GBU-31	64	EA	331.00	10.59
Hard Target Penetrator	GBU-24	4	EA	331.00	0.66
Small Diameter Missile	GBU-39	24	EA	38.00	0.46
TOW Missile	BGM-71	84	EA	7.92	0.33
Laser Guided Training Round	-	432	EA	0.0066	0.001
Penetrator (500 lb)	BLU-111	384	EA	154.00	29.57
Aircraft Gun Systems Munitions					
20 mm	-	198,000	EA		
25 mm	-	181,000	EA		
7.62 mm	-	336,000	EA	0.002	0.32
.50 Cal	-	790,000	EA	0.01	4.29
Chaff and Flares					
Chaff (Assorted)	-	6,400	EA	0.01	0.04
Flares (Assorted)	-	20,862	EA	0.001	0.01

Table A1-45. Ordnance Combustive Emission Factors - 29 Palms LAS EIS Project Alternatives

Ordnance Type	*Pounds per Item or (lb/ton of Explosive)*						
	ROG	*CO*	*NOx*	*SO_2*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Ground Forces Munitions							
Cartridges Smaller than 30 mm	7.95E-06	1.60E-03	8.50E-05	--	1.08E-06	5.60E-07	3.23E-08
Cartridges 30-75 mm	2.99E-06	3.50E-04	3.59E-05	--	8.22E-07	4.27E-07	2.47E-08
Cartridges 75 mm and Larger	0.85	82.0	9.25	--	4.10E-03	2.13E-03	1.23E-04
Projectiles, Canisters, and Chargers	11.44	777	0.57	--	5.12E-02	2.66E-02	1.54E-03
Grenades	2.39E-05	1.75E-04	4.15E-05	--	3.29E-06	1.71E-06	9.86E-08
Rockets, Rocket Motors, and Igniters	3.26	309	7.28	--	1.74E-02	9.05E-03	5.22E-04
Mines and Smoke Pots	0.58	223.61	0.00	--	2.06E-02	1.07E-02	6.18E-04
Signals and Simulators	0.00	0.01	0.01	--	5.66E-05	2.94E-05	1.70E-06
M Series - Detonating cord	1.21	252.47	0.00	--	4.00E-05	2.08E-05	1.20E-06
M Series - Other explosives	-	0.01	0.01	--	3.44E-03	1.79E-03	1.03E-04
Fuses and Primers	3.44	170.00	-	--	5.70E-06	2.96E-06	1.71E-07
Guided Missiles (3)	3.48	263.66	53.00	--	0.0137	0.0071	0.0004

Notes: (1) Data are averages of emission factors for munitions categories found in 2007 CEIP Appendix D.9.

(2) PM emission factors are for a per blast unit

(3) Used PA45 Surface Attack MGM-51C, from Appendix D.9 of the 2007 CEIP

Table A1-46. Air Delivered Munitions Combustive Emission Factors - 29 Palms LAS EIS Project Alternatives

Ordnance Type/Pollutant	*Pounds per Item or (lb/ton of Explosive)*						
	ROG	*CO*	*NOx*	*SO_2*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Unguided Munitions							
General Purpose Bomb (25 Lb) - Inert							
General Purpose Bomb (500 Lb)	11.73	796.00	0.00	--	0.53	0.27	0.02
General Purpose Bomb (1,000 Lb) Inert							
General Purpose Bomb (1,000 Lb)	7.01	554.89	0.00	--	1.36	0.71	0.04
General Purpose Bomb (2,000 Lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Inert Practice Bomb							
2.75-inch Rocket	11.73	796.00	0.00	--	0.010	0.005	0.0003
5-inch Zuni Rocket	3.91	429.67	0.00	--	0.067	0.035	0.002
Guided Munitions							
Hellfire missile	3.91	429.67	0.00	--	0.01	0.01	0.0004
Laser Guided Bomb (500 lb)	11.73	796.00	0.00	--	0.53	0.27	0.02
Laser Guided Bomb (1000 lb)	7.01	554.89	0.00	--	1.36	0.71	0.04
Laser Guided Bomb (2000 lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Joint Direct Attack Munitions (250 lb)	11.73	796.00	0.00	--	0.26	0.14	0.01
Joint Direct Attack Munitions (500 lb)	11.73	796.00	0.00	--	0.53	0.27	0.02
Joint Direct Attack Munitions (1000 lb)	7.01	554.89	0.00	--	1.36	0.71	0.04
Joint Direct Attack Munitions (2000 lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Hard Target Penetrator	7.01	554.89	0.00	--	2.72	1.41	0.08
Small Diameter Missile	3.91	429.67	0.00	--	0.01	0.01	0.0004
TOW Missile	3.91	429.67	0.00	--	0.01	0.01	0.0004
Laser Guided Training Round	0.90	77.00	0.00	--	0.26	0.14	0.01
Penetrator (500 lb)	7.01	554.89	0.00	--	2.72	1.41	0.08
Aircraft Gun Systems Munitions							
20 mm	0.0002	0.03	0.0004	--	2.00E-05	1.04E-05	6.01E-07
25 mm		0.06		--	5.48E-05	2.85E-05	1.64E-06
7.62 mm	86.44	125.82	5.97	--	1.77E-06	9.19E-07	5.30E-08
.50 Cal	- 0.55	92.38	- 19.88	--	8.70E-06	4.52E-06	2.61E-07
Chaff and Flares							
Chaff (Smokeless Powder)	0.49	159.33	17.67	--	3.28E-05	1.71E-05	9.84E-07
Flares	1.64	117.00	17.67	--	2.89E-06	1.50E-06	8.68E-08

Notes: (1) Data are averages of emission factors for munitions categories found in 2007 CEIP Appendix D.9.

(2) PM emission factors are for a per blast unit

(3) TOG Emission factors were converted from ROG by multiplying by 0.82

Table A1-47. Proposed Ground Forces Combustive Emissions - 29 Palms LAS EIS Project Alternatives

Ordnance Type	*Annual Emissions (Pounds/Year)*						
	ROG	CO	NO_X	SO_2	PM	PM_{10}	$PM_{2.5}$
Ground Forces Munitions							
Cartridges Smaller than 30 mm	7.4	1,498.0	79.6	--	1.0	0.5	0.0
Cartridges 30-75 mm	0.1	8.5	0.9	--	0.0	0.0	0.0
Cartridges 75 mm and Larger	14.9	1,437.1	162.1	--	47.1	24.5	1.4
Projectiles, Canisters, and Chargers	1,086.6	73,846.4	54.2	--	1,962.6	1,019.6	59.0
Grenades	0.0	0.1	0.0	--	0.0	0.0	0.0
Rockets, Rocket Motors, and Igniters	0.0	2.5	0.1	--	2.5	1.3	0.1
Mines and Smoke Pots	0.0	3.5	-	--	3.0	1.5	0.1
Signals and Simulators	-	3.6	3.6	--	0.0	0.0	0.0
M Series - Detonating cord	0.0	6.1	-	--	0.4	0.2	0.0
M Series - Other explosives	-	88.3	88.3	--	30.4	15.8	0.9
Fuses and Primers	0.1	6.3	-	--	0.1	0.1	0.0
Guided Missiles [1]	0.4	30.2	6.1	--	2.0	1.0	0.1
Total Ground Forces Emissions - Pounds	1,110	76,931	395	-	2,049	1,065	62
Total Ground Forces Emissions - Tons	0.55	38.47	0.20	-	1.02	0.53	0.03

Table A1-48. Air Delivered Munitions Combustive Emissions - 29 Palms LAS EIS Project Alternatives

Ordnance Type	Pounds/Year						
	ROG	CO	NOx	SO2	PM	PM_{10}	$PM_{2.5}$
Unguided Munitions							
General Purpose Bomb (25 Lb) - Inert							
General Purpose Bomb (500 Lb)	921.0	62,517.8	-	--	538.6	279.5	16.1
General Purpose Bomb (1,000 Lb) Inert							
General Purpose Bomb (1,000 Lb)	76.6	6,061.1	-	--	179.5	93.3	5.4
General Purpose Bomb (2,000 Lb)	41.8	3,306.1	-	--			
Inert Practice Bomb							
2.75-inch Rocket	45.0	3,055.7	-	--	86.5	45.1	2.5
5-inch Zuni Rocket	7.7	842.7	-	--	52.7	27.4	1.6
Guided Munitions							
Hellfire missile	2.5	272.2	-	--	1.0	0.5	0.0
Laser Guided Bomb (500 lb)	390.1	26,478.1	-	--	228.1	118.4	6.8
Laser Guided Bomb (1000 lb)	31.3	2,479.5	-	--	73.4	38.2	2.2
Laser Guided Bomb (2000 lb)	4.6	367.3	-	--	10.9	5.7	0.3
Joint Direct Attack Munitions (250 lb)	113.8	7,722.8	-	--	66.5	34.5	2.0
Joint Direct Attack Munitions (500 lb)	520.1	35,304.2	-	--	304.1	157.8	9.1
Joint Direct Attack Munitions (1000 lb)	13.9	1,102.0	-	--	32.6	17.0	1.0
Joint Direct Attack Munitions (2000 lb)	74.3	5,877.4	-	--	174.1	90.5	5.2
Hard Target Penetrator	4.6	367.3	-	--	10.9	5.7	0.3
Small Diameter Missile	1.8	195.9	-	--	0.3	0.2	0.0
TOW Missile	1.3	142.9	-	--	1.2	0.6	0.0
Laser Guided Training Round	0.0	0.1	-	--	114.0	59.2	3.4
Penetrator (500 lb)	207.4	16,407.1	-	--	1,044.5	543.0	31.3
Aircraft Gun Systems Munitions							
20 mm	40.6	5,940.0	85.1	--	4.0	2.1	0.1
25 mm	-	9,955.0	-	--	9.9	5.2	0.3
7.62 mm	27.7	40.3	1.9	--	0.6	0.3	0.0
.50 Cal	2.4	396.2	85.2	--	6.9	3.6	0.2
Chaff and Flares							
Chaff (Smokeless Powder)	0.0	6.7	0.7	--	0.2	0.1	0.0
Flares	0.0	0.7	0.1	--	0.1	0.0	0.0
Total Air-Delivered Emissions - Pounds	2,528	188,839	173	-	2,941	1,528	88
Total Air-Delivered Emissions - Tons	1.26	94.42	0.09	-	1.47	0.76	0.04
Total Combustive Ordnance Emissions - Pounds	3,638	265,770	568	-	4,990	2,592	150
Total Combustive Ordnance Emissions - Tons	1.82	132.88	0.28	-	2.49	1.30	0.07

Table A1-49. Annual Construction and Operational Emissions - 29 Palms LAS EIS - Alternative 6

	Annual Emissions (Tons per Year)						
Activity/Source	*VOC*	*CO*	*NO_x*	*SO_x*	*PM*	*PM_{10}*	*$PM_{2.5}$*
Road Construction							
Mobile Equipment	0.08	0.30	0.83	0.00		0.04	0.03
Fugitive Dust						0.41	0.04
Subtotal	**0.08**	**0.30**	**0.83**	**0.00**		**0.45**	**0.07**
Communication Tower Construction							
Mobile Equipment	0.00	0.00	0.00	0.00		0.00	0.00
Fugitive Dust	0.09	0.40	0.11	0.01		0.40	0.16
Mobile Equipment	0.00	0.01	0.02	0.00		0.13	0.02
Subtotal	**0.09**	**0.40**	**0.12**	**0.01**		**0.53**	**0.18**
Total Construction	**0.17**	**0.71**	**0.96**	**0.01**		**0.98**	**0.25**
MEB Exercises							
Tactical Vehicles	5.29	23.73	64.39	7.35		2.33	2.33
Tactical Support Equipment	1.50	6.48	16.43	2.06		0.70	0.70
Fugitive Dust						565.25	86.56
Subtotal	**6.79**	**30.21**	**80.82**	**9.41**		**568.29**	**89.59**
Aircraft Operations							
Airspaces	0.86	11.20	23.01	0.95		7.62	7.63
EAF LTOs	24.53	60.38	12.86	0.80		8.63	8.63
Range LTOs	0.16	1.29	3.90	0.16		1.00	1.00
Fugitive Dust						42.36	16.94
Subtotal	**25.55**	**72.87**	**39.77**	**1.91**		**59.60**	**34.20**
Ordnance Activities							
Combustive	1.82	132.88	0.28				
Fugitive						2.49	1.30
Subtotal	**1.82**	**132.88**	**0.28**			**2.49**	**1.30**
Personnel Commutes							
On-road Vehicles	0.05	0.60	1.84	0.00		0.02	0.02
Total Operations - Tons per Year (1)	**34.21**	**236.56**	**122.71**	**11.33**		**630.40**	**125.10**
Reduction of West Area Emissions - Tons per Year (2)	**(1.90)**	**(15.60)**	**(0.93)**	**(0.02)**		**(141.23)**	**(17.28)**
Reduction of South Area Emissions - Tons per Year (3)	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**		**(0.36)**	**(0.04)**
Total Operations Net Change - Tons per Year (1)	**32.31**	**220.94**	**121.78**	**11.31**		**488.81**	**107.78**
Conformity Thresholds - Tons per Year	**25**	---	**25**	---	---	**100**	---
Exceed De Minimis Thresholds?	**Y**	**NA**	**Y**	**NA**	**NA**	**Y**	**NA**

Notes: (1) Excludes construction, as this would occur in a calendar year prior to initiation of the proposed exercises.

(2) Alternative 6 would eliminate 13/15% of year 2015 PM10/VOC and NOx emissions from Johnson Valley.

(3) Alternative 6 would eliminate 10% of year 2015 emissions from the South Area.

ATTACHMENT A-2

PM$_{10}$ Dispersion Modeling Analyses

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Table A2-1. Dispersion Modeling Scenario for 24-Hour PM10
Emissions - 29 Palms LAS EIS - Alternative 6

Activity/Source	*Pounds per Hour* *PM_{10}*
MEB Exercises	
Tactical Vehicles	6.8
Tactical Support Equipment	2.0
Fugitive Dust	1,648.7
Subtotal	1,657.5
Aircraft Operations	
Airspaces	7.9
EAF LTOs	36.0
Range LTOs	2.1
Fugitive Dust - EAF LTOs	10.4
Fugitive Dust - Range LTOs	83.0
Subtotal	139.4
Ordnance Activities	
Combustive	-
Fugitive	16.6
Subtotal	16.6
Total Operations - PPH	1,813.5
Without EAF	1,767.2

Note: These emissions would occur within the West Area.

Table A2-2. Simulation of Combustive/Fugitive Dust PM10 Emissions from TV/TSE- 29 Palms LAS EIS - Alternative 6

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor (1)*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
MEB Exercises								
1a	2,500	6,250,000	1	6,250,000	0.02	0.01	0.67	11.0
1b	2,500	6,250,000	1	6,250,000	0.02	0.02	0.67	22.1
1c	2,500	6,250,000	1	6,250,000	0.02	0.06	0.67	66.3
1d	2,500	6,250,000	1	6,250,000	0.02	0.09	0.67	99.4
1dE	2,500	6,250,000	1	6,250,000	0.02	0.07	0.67	77.3
1e	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1f	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1g	2,500	6,250,000	1	6,250,000	0.02	0.04	0.67	44.2
1h	2,500	6,250,000	1	6,250,000	0.02	0.06	0.67	66.3
1hE	2,500	6,250,000	1	6,250,000	0.02	0.05	0.67	55.2
1i	2,500	6,250,000	1	6,250,000	0.02	0.06	0.33	33.1
1j	2,500	6,250,000	1	6,250,000	0.02	0.06	0.33	33.1
1k	2,500	6,250,000	1	6,250,000	0.02	0.04	0.67	44.2
1l	2,500	6,250,000	1	6,250,000	0.02	0.05	0.67	55.2
1lE	2,500	6,250,000	1	6,250,000	0.02	0.03	0.67	33.1
1m	2,500	6,250,000	1	6,250,000	0.02	0.08	0.33	44.2
1n	2,500	6,250,000	1	6,250,000	0.02	0.08	0.33	44.2
1o	2,500	6,250,000	1	6,250,000	0.02	0.06	0.33	33.1
1p	2,500	6,250,000	1	6,250,000	0.02	0.04	0.33	22.1
1pE	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1q	2,500	6,250,000	1	6,250,000	0.02	0.06	0.33	33.1
1r	2,500	6,250,000	1	6,250,000	0.02	0.06	0.33	33.1
1s	2,500	6,250,000	1	6,250,000	0.02	0.04	0.33	22.1
1t	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1tE	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1u	2,500	6,250,000	1	6,250,000	0.02	0.03	0.33	16.6
1v	2,500	6,250,000	1	6,250,000	0.02	0.03	0.33	16.6
1w	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1x	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1xE	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1y	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1z	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
1aa	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1bb	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1cc	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1dd	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1ee	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1ff	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1gg	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
1hh	2,500	6,250,000	1	6,250,000	0.02	0.01	0.33	5.5
2	2,500	6,250,000	1	6,250,000	0.02	0.03	0.67	33.1
2n	2,500	6,250,000	1	6,250,000	0.02	0.02	0.67	22.1
3	2,500	6,250,000	1	6,250,000	0.02	0.01	0.67	11.0
4	2,500	6,250,000	1	6,250,000	0.02	0.02	0.33	11.0
4s	2,500	6,250,000	1	6,250,000	0.02	0.04	0.33	22.1
5	2,500	6,250,000	1	6,250,000	0.02	0.04	0.33	22.1
5n	2,500	6,250,000	1	6,250,000	0.02	0.05	0.33	27.6
6	2,500	6,250,000	1	6,250,000	0.02	0.07	0.67	77.3
6n	2,500	6,250,000	1	6,250,000	0.02	0.04	0.67	44.2
7a	2,500	6,250,000	1	6,250,000	0.02	0.08	0.67	88.4
7b	2,500	6,250,000	1	6,250,000	0.02	0.05	0.67	55.2
7c	2,500	6,250,000	1	6,250,000	0.02	0.04	0.67	44.2
7d	2,500	6,250,000	1	6,250,000	0.02	0.04	0.67	44.2
7e	2,500	6,250,000	1	6,250,000	0.02	0.04	0.67	44.2
7nw	2,500	6,250,000	1	6,250,000	0.02	0.06	0.67	66.3
Total MEB Exercises				343,750,000	1.00	2.00		1,657

Note: (1) Total amounts to 2.0, as the sources are divided into 2 sectors: one each for 2 battalions and 1 battalion.

Table A2-3. Simulation of Combustive PM10 Emissions from Aircraft Operations in Airspaces - 29 Palms LAS EIS - Alternative 6

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
Aircraft Operations - Airspaces								
1a	2,500	6,250,000	1	6,250,000	0.03	0.05		0.4
1b	2,500	6,250,000	1	6,250,000	0.03	0.05		0.4
1c	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
1d	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
1dE	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
1e	2,500	6,250,000	1	6,250,000	0.03	0.05		0.4
1f	2,500	6,250,000	1	6,250,000	0.03	0.05		0.4
1g	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
1h	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
1hE	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
1i	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
1j	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
1k	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
1l	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
1lE	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
1m	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
1n	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
1o	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
1p	2,500	6,250,000	1	6,250,000	0.03	0.01		0.1
1pE	2,500	6,250,000	1	6,250,000	0.03	0.01		0.1
2	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
2n	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
3	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
4	2,500	6,250,000	1	6,250,000	0.03	0.04		0.3
4s	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
5n	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
6	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
6n	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
7a	2,500	6,250,000	1	6,250,000	0.03	0.03		0.2
7b	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
7c	2,500	6,250,000	1	6,250,000	0.03	0.01		0.1
7d	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
7e	2,500	6,250,000	1	6,250,000	0.03	0.01		0.1
7nw	2,500	6,250,000	1	6,250,000	0.03	0.02		0.2
Total Aircraft Operations - Airspaces				212,500,000	1.00	1.00		7.94

Table A2-4. Simulation of PM10 Emissions from Aircraft Ops Range LTOs, Ordnance Usage, and EAF LTOs - 29 Palms LAS EIS - Alternative 6

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
Aircraft Operations - Range LTOs								
5n	2,500	6,250,000	1	6,250,000	0.50			42.6
7a	2,500	6,250,000	1	6,250,000	0.50			42.6
Total Aircraft Operations - Range LTOs				12,500,000				85.1
Ordnance Activities								
1a	2,500	6,250,000	1	6,250,000	0.07	0.10		1.7
1b	2,500	6,250,000	1	6,250,000	0.07	0.10		1.7
1c	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
1e	2,500	6,250,000	1	6,250,000	0.07	0.10		1.7
1f	2,500	6,250,000	1	6,250,000	0.07	0.10		1.7
1g	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
1i	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
1j	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
1k	2,500	6,250,000	1	6,250,000	0.07	0.04		0.7
2	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
3	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
4	2,500	6,250,000	1	6,250,000	0.07	0.08		1.3
4s	2,500	6,250,000	1	6,250,000	0.07	0.06		1.0
6	2,500	6,250,000	1	6,250,000	0.07	0.04		0.7
Total Ordnance Activities				87,500,000	1.00	1.00		16.5
Aircraft Operations - EAF LTOs								
8	2,500	6,250,000	1	6,250,000	1.00			46.4

Table A2-5. Total Combined Volume Source PM10 Emissions - 29 Palms LAS EIS - Alternative 6

Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
1a								13.1
1b								24.2
1c								67.7
1d								99.7
1dE								77.5
1e								13.1
1f								13.1
1g								45.6
1h								66.5
1hE								55.4
1i								34.5
1j								34.5
1k								45.1
1l								55.4
1lE								33.3
1m								44.4
1n								44.4
1o								33.4
1p								22.2
1pE								11.1
1q								33.1
1r								33.1
1s								22.1
1t								11.0
1tE								5.5
1u								16.6
1v								16.6
1w								11.0
1x								5.5
1xE								5.5
1y								11.0
1z								11.0
1aa								5.5
1bb								5.5
1cc								5.5
1dd								5.5
1ee								5.5
1ff								5.5
1gg								5.5
1hh								5.5
2								34.5
2n								22.3
3								12.4
4								12.7
4s								23.3
5								64.9
5n								27.6
6								78.3
6n								44.4
7a								131.2
7b								55.4
7c								44.3
7d								44.4
7e								44.3
7nw								66.5
8								46.4
Total Hourly Emissions								1,813.5

Table A2-6. Dispersion Modeling Scenario for 24-Hour PM10
Emissions in Alternative 6 Central Area - 29 Palms LAS EIS

Activity/Source	*Pounds per Hour PM 10*
MEB Exercises	
Tactical Vehicles	3.4
Tactical Support Equipment	1.0
Fugitive Dust	824.3
Subtotal	828.7
Aircraft Operations	
Airspaces	7.9
EAF LTOs	
Range LTOs	1.0
Fugitive Dust - EAF LTOs	
Fugitive Dust - Range LTOs	41.5
Subtotal	50.5
Ordnance Activities	
Combustive	
Fugitive	
Subtotal	-
Total Operations - PPH	879.2

Generally = 50% of activity and emissions within West Area.

Table A2-7. Simulation of Combustive/Fugitive Dust PM10 Emissions from All Sources in Alternative 6 Central Area - 29 Palms LAS EIS

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Volume Source PM10 Lb/Hr*
All Activities						
16a	2,500	6,250,000	1	6,250,000	0.04	32.6
16b	2,500	6,250,000	1	6,250,000	0.04	32.6
16c	2,500	6,250,000	1	6,250,000	0.04	32.6
16d	2,500	6,250,000	1	6,250,000	0.04	32.6
17a	2,500	6,250,000	1	6,250,000	0.04	32.6
17b	2,500	6,250,000	1	6,250,000	0.04	32.6
17c	2,500	6,250,000	1	6,250,000	0.04	32.6
17d	2,500	6,250,000	1	6,250,000	0.04	32.6
26a	2,500	6,250,000	1	6,250,000	0.04	32.6
26b	2,500	6,250,000	1	6,250,000	0.04	32.6
26c	2,500	6,250,000	1	6,250,000	0.04	32.6
26d	2,500	6,250,000	1	6,250,000	0.04	32.6
26e	2,500	6,250,000	1	6,250,000	0.04	32.6
26f	2,500	6,250,000	1	6,250,000	0.04	32.6
26g	2,500	6,250,000	1	6,250,000	0.04	32.6
26h	2,500	6,250,000	1	6,250,000	0.04	32.6
26i	2,500	6,250,000	1	6,250,000	0.04	32.6
26j	2,500	6,250,000	1	6,250,000	0.04	32.6
26k	2,500	6,250,000	1	6,250,000	0.04	32.6
26l	2,500	6,250,000	1	6,250,000	0.04	32.6
26m	2,500	6,250,000	1	6,250,000	0.04	32.6
26n	2,500	6,250,000	1	6,250,000	0.04	32.6
26o	2,500	6,250,000	1	6,250,000	0.04	32.6
26p	2,500	6,250,000	1	6,250,000	0.04	32.6
41	2,500	6,250,000	1	6,250,000	0.04	32.6
42	2,500	6,250,000	1	6,250,000	0.04	32.6
44	2,500	6,250,000	1	6,250,000	0.04	32.6
Total All Sources				168,750,000	1.00	879.2

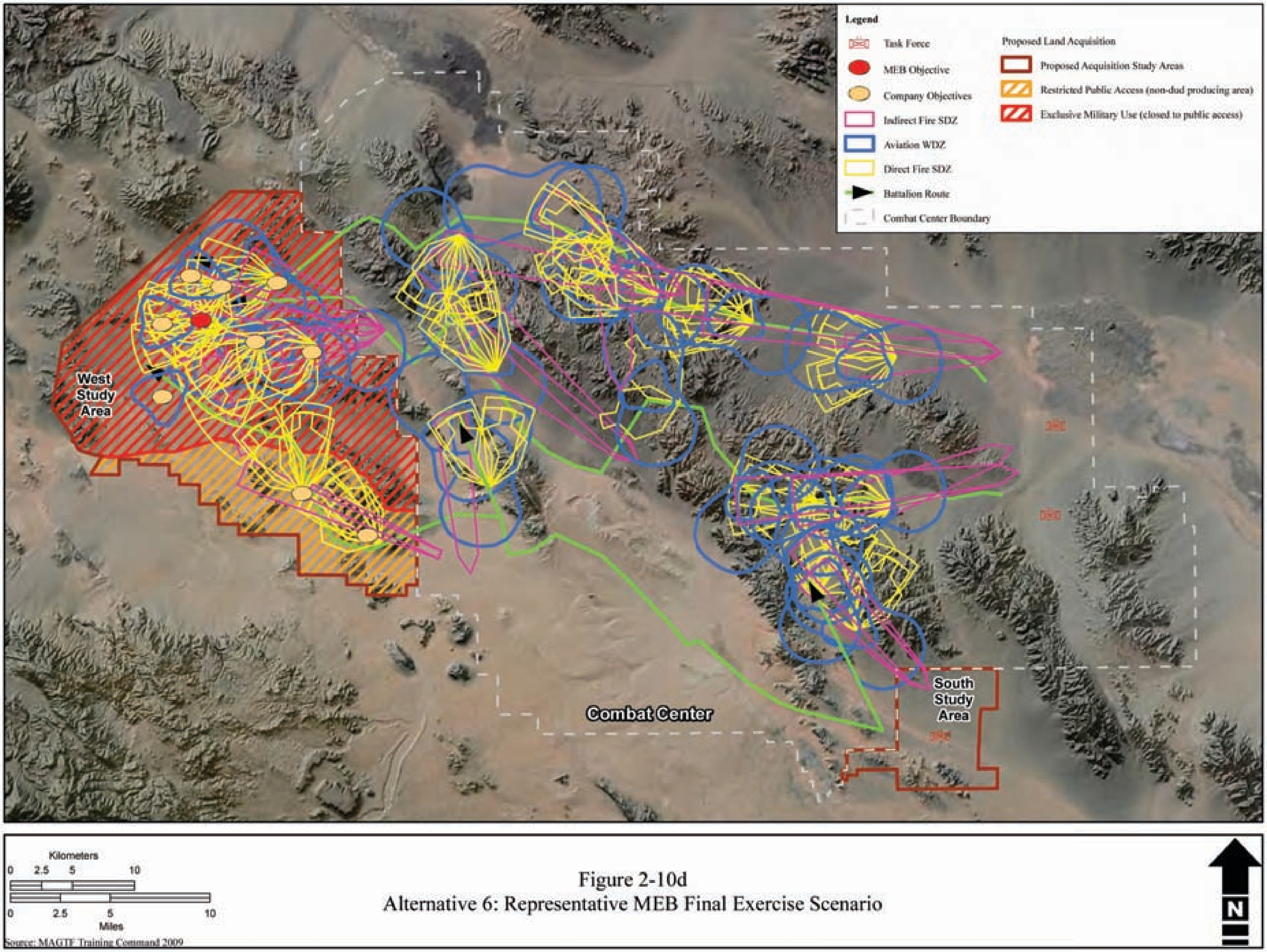
Table A2-8. Dispersion Modeling Scenario for 24-Hour PM10 Emissions in Alternative 6 Eastern Area - 29 Palms LAS EIS

Activity/Source	*Pounds per Hour PM 10*
MEB Exercises	
Tactical Vehicles	3.4
Tactical Support Equipment	1.0
Fugitive Dust	824.3
Subtotal	828.7
Aircraft Operations	
Airspaces	7.9
EAF LTOs	
Range LTOs	1.0
Fugitive Dust - EAF LTOs	
Fugitive Dust - Range LTOs	41.5
Subtotal	50.5
Ordnance Activities	
Combustive	
Fugitive	
Subtotal	-
Total Operations - PPH	879.2

Generally = 50% of activity and emissions within West Area.

Table A2-9. Simulation of Combustive/Fugitive Dust PM10 Emissions from All Sources in Alternative 6 Eastern Area - 29 Palms LAS EIS

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Volume Source PM10 Lb/Hr*
All Activities						
29a	2,500	6,250,000	1	6,250,000	0.04	36.6
29b	2,500	6,250,000	1	6,250,000	0.04	36.6
29c	2,500	6,250,000	1	6,250,000	0.04	36.6
29d	2,500	6,250,000	1	6,250,000	0.04	36.6
30a	2,500	6,250,000	1	6,250,000	0.04	36.6
30b	2,500	6,250,000	1	6,250,000	0.04	36.6
30c	2,500	6,250,000	1	6,250,000	0.04	36.6
30d	2,500	6,250,000	1	6,250,000	0.04	36.6
30e	2,500	6,250,000	1	6,250,000	0.04	36.6
30f	2,500	6,250,000	1	6,250,000	0.04	36.6
30g	2,500	6,250,000	1	6,250,000	0.04	36.6
30h	2,500	6,250,000	1	6,250,000	0.04	36.6
30i	2,500	6,250,000	1	6,250,000	0.04	36.6
30j	2,500	6,250,000	1	6,250,000	0.04	36.6
30k	2,500	6,250,000	1	6,250,000	0.04	36.6
30l	2,500	6,250,000	1	6,250,000	0.04	36.6
30m	2,500	6,250,000	1	6,250,000	0.04	36.6
30n	2,500	6,250,000	1	6,250,000	0.04	36.6
30o	2,500	6,250,000	1	6,250,000	0.04	36.6
30p	2,500	6,250,000	1	6,250,000	0.04	36.6
31a	2,500	6,250,000	1	6,250,000	0.04	36.6
31b	2,500	6,250,000	1	6,250,000	0.04	36.6
31c	2,500	6,250,000	1	6,250,000	0.04	36.6
31d	2,500	6,250,000	1	6,250,000	0.04	36.6
Total All Sources				150,000,000	1.00	879.2



Source: MAGTF Training Command 2009

Figure 2-10d
Alternative 6: Representative MEB Final Exercise Scenario

Figure A-1. Maximum 24-Hour PM10 Concentrations Predicted for the LAS MEB Exercises (ug/m^3) - Project Alternative 6

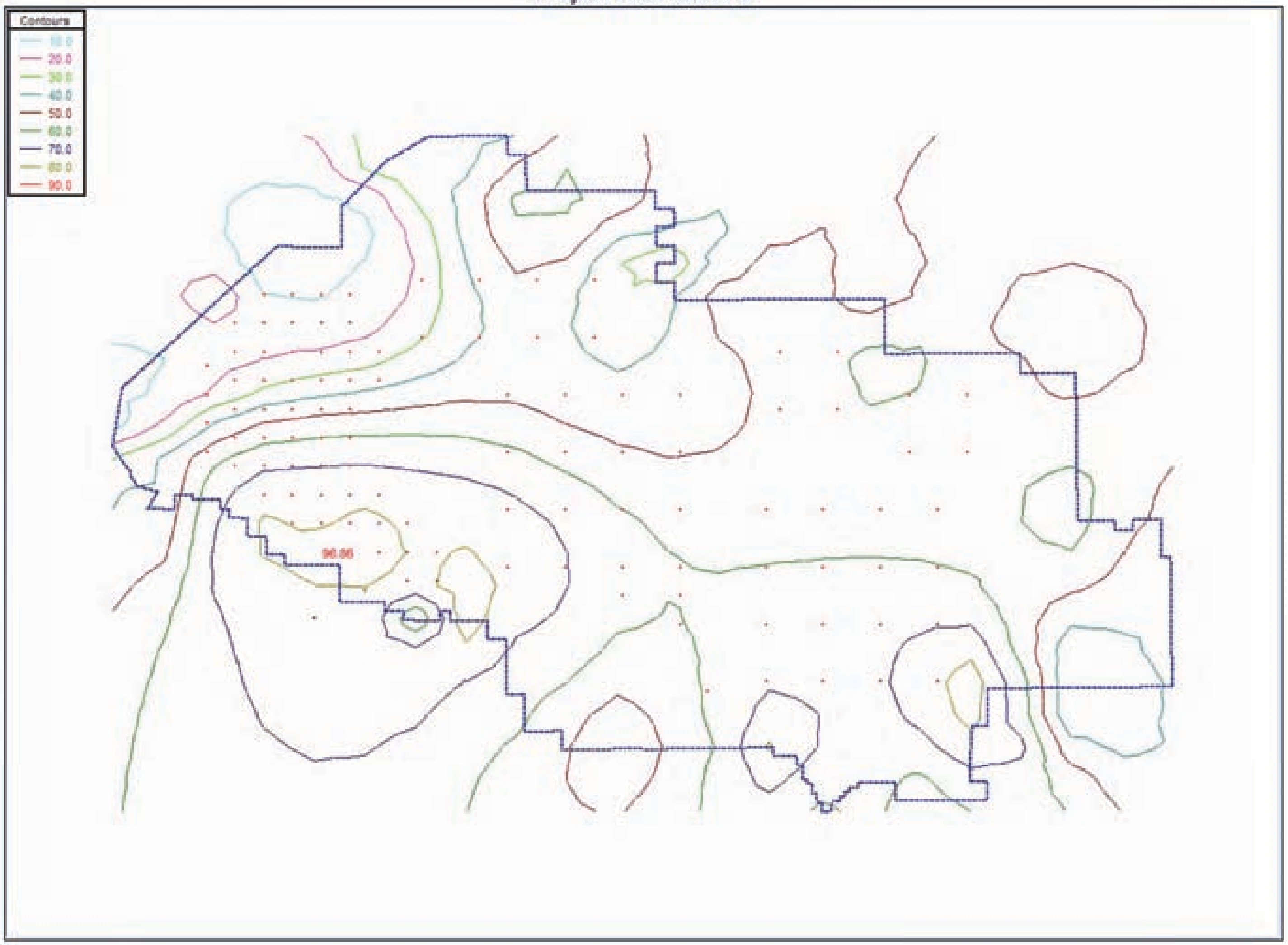


Figure A-2. 24-Hour PM10 Concentrations Predicted at the Maximum Impact Location – LAS MEB Exercise Project Alternative 6 (ug/m^3)

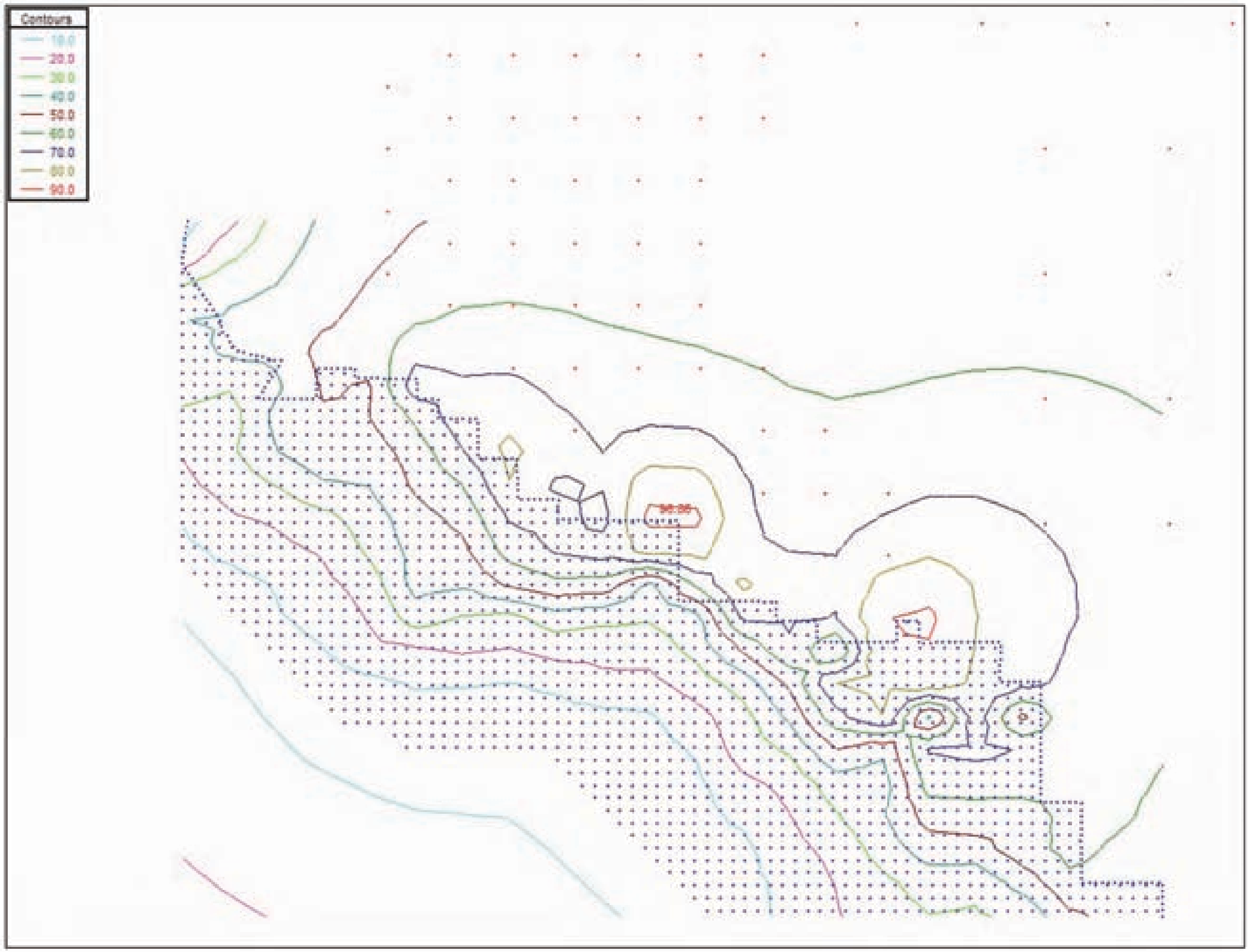
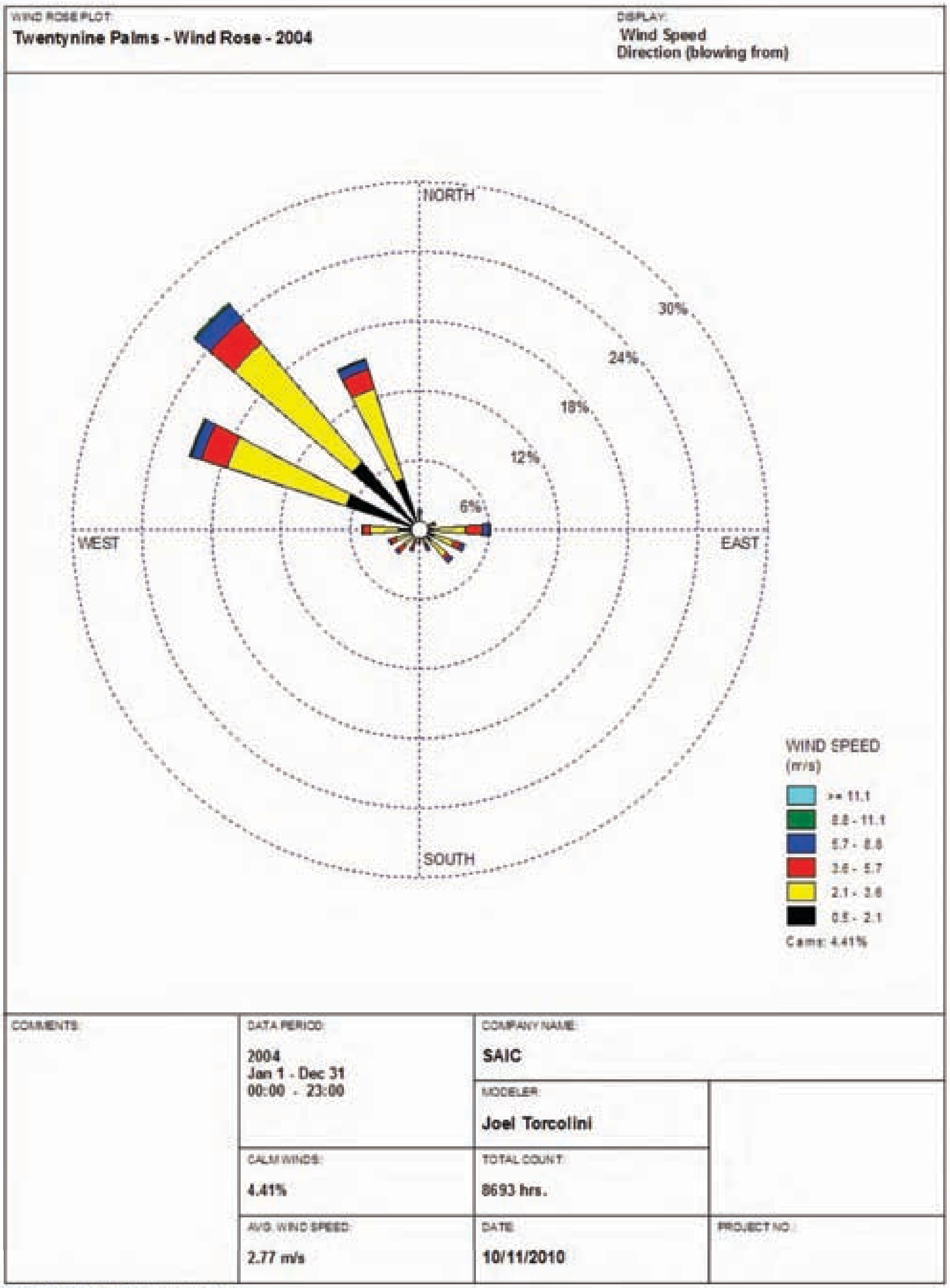


Figure A-3. Wind Rose of MCAGCC Mainside Monitoring Station Winds for 2004



WRPLOT View - Lakes Environmental Software

APPENDIX G.1.1

29 Palms LAS Proposed Action Conformity Evaluations –
Regulatory Review Status

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Mojave Desert Air Quality Management District
14306 Park Avenue, Victorville, CA 92392-2310
760.245.1661 • fax 760.245.2699
Visit our web site: http://www.mdaqmd.ca.gov
Eldon Heaston, Executive Director

November 2, 2010

Major W. M. Rowley, Director, NREA
United States Marine Corps
Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center
Box 788100
Twentynine Palms, CA 92278-8106

Re: Request for Conformity Analysis Review and Determination, Land Acquisition and Airspace Establishment Proposed Action

The Mojave Desert Air Quality Management District (MDAQMD) appreciates the opportunity to review the Conformity Evaluation for the Land Acquisition and Airspace Establishment (LAS) action at Marine Corps Combat Center Twentynine Palms (Combat Center), as proposed by the Department of Navy.

The District has reviewed the Conformity Analysis and makes the following determinations in compliance with Rule 2002 – ***General Conformity:***

- The MDAQMD commits to include the ozone precursor emissions from the proposed LAS action into a revision of its ozone attainment plan in the California State Implementation Plan revision pursuant to Rule 2002 §(H)(1)(e)(i)(B).
- The MDAQMD concurs with the dispersion modeling analysis which demonstrates that PM_{10} emissions from the proposed LAS action would not contribute to an exceedance of the PM_{10} NAAQS pursuant to Rule 2002 §(H)(1)(d)(i).

Thank you for allowing the District to provide this input into the proposed Land Acquisition and Airspace Establishment proposed action. If you have any questions regarding this letter, please contact Alan De Salvio, Supervising Air Quality Engineer at extension 6726.

Sincerely,

Alan J. De Salvio
Supervising Air Quality Engineer

cc: Director, USEPA Region IX
Chief, Planning Division, CARB

AJD/tw USMC Conformity Eval.doc

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APPENDIX G.2

NO_2 Dispersion Modeling Analyses - LAS Project Alternative 1

Table G.2-1. Dispersion Modeling Scenario for Annual NOx Operational Emissions - 29 Palms LAS Project EIS - Alternative 1

Activity/Source	*Pounds per Hour NOx (1)*
MEB Exercises	
Tactical Equipment	89.4
Tactical Support Equipment	22.8
Fugitive Dust	
Subtotal	112.2
Aircraft Operations	
Airspaces	32.0
EAF LTOs	17.9
Range LTOs	5.4
Fugitive Dust - EAF LTOs	
Fugitive Dust - Range LTOs	
Subtotal	55.2
Ordnance Activities	
Combustive	0.4
Fugitive	
Subtotal	0.4
Total Operations - Pounds per Hour	167.9

Note: (1) Equates to total annual emissions for each source category divided by (60 days * 24 hours).

Table G.2-2. Operational NOx Emission Simulations - 29 Palms LAS Project EIS - Alternative 1

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Fraction of Total Source Area*	*Volume Source NOx Emissions (Lbs/Hr)*	
						Individual	*Combined*
MEB Exercises							
9a	2,500	6,250,000	1	6,250,000	0.02	1.7	2
11a-d	2,500	6,250,000	4	25,000,000	0.02	1.7	7
12	2,500	6,250,000	1	6,250,000	0.02	1.7	2
13	2,500	6,250,000	1	6,250,000	0.02	1.7	2
14	2,500	6,250,000	1	6,250,000	0.02	1.7	2
15a-d	2,500	6,250,000	4	25,000,000	0.02	1.7	7
16a-d	2,500	6,250,000	4	25,000,000	0.02	1.7	7
17a-d	2,500	6,250,000	4	25,000,000	0.02	1.7	7
18a-i	2,500	6,250,000	9	56,250,000	0.02	1.7	16
19a-jj	2,500	6,250,000	36	225,000,000	0.02	1.7	62
Total MEB Exercises		62,500,000	65	406,250,000			112.2
Aircraft Operations - Airspaces + Range LTOs							
9a	2,500	6,250,000	1	6,250,000	0.02	0.6	1
11a-d	2,500	6,250,000	4	25,000,000	0.02	0.6	2
12	2,500	6,250,000	1	6,250,000	0.02	0.6	1
13	2,500	6,250,000	1	6,250,000	0.02	0.6	1
14	2,500	6,250,000	1	6,250,000	0.02	0.6	1
15a-d	2,500	6,250,000	4	25,000,000	0.02	0.6	2
16a-d	2,500	6,250,000	4	25,000,000	0.02	0.6	2
17a-d	2,500	6,250,000	4	25,000,000	0.02	0.6	2
18a-i	2,500	6,250,000	9	56,250,000	0.02	0.6	5
19a-jj	2,500	6,250,000	36	225,000,000	0.02	0.6	21
Total Aircraft Operations - Airspaces + Range LTOs		62,500,000	65	406,250,000			37.4
Ordnance Activities							
9a	2500	6250000	1	6,250,000	0.02	0.01	0
11a-d	2500	6250000	4	25,000,000	0.02	0.01	0
12	2500	6250000	1	6,250,000	0.02	0.01	0
13	2500	6250000	1	6,250,000	0.02	0.01	0
14	2500	6250000	1	6,250,000	0.02	0.01	0
15a-d	2500	6250000	4	25,000,000	0.02	0.01	0
16a-d	2500	6250000	4	25,000,000	0.02	0.01	0
17a-d	2500	6250000	4	25,000,000	0.02	0.01	0
18a-i	2500	6250000	9	56,250,000	0.02	0.01	0
19a-jj	2500	6250000	36	225,000,000	0.02	0.01	0
Total Ordnance Activities		62,500,000	65	406,250,000			0.4
Aircraft Operations - EAF LTOs							
8	2,500	6,250,000	1	6,250,000	1.00	17.9	17.9
Total Combined Emissions							
8			1			17.9	17.9
9a			1			2.31	2.31
11a-d			4			2.31	9.23
12			1			2.31	2.31
13			1			2.31	2.31
14			1			2.31	2.31
15a-d			4			2.31	9.23
16a-d			4			2.31	9.23
17a-d			4			2.31	9.23
18a-i			9			2.31	20.77
19a-jj			36			2.31	83.08
Total Hourly Emissions			66				167.9

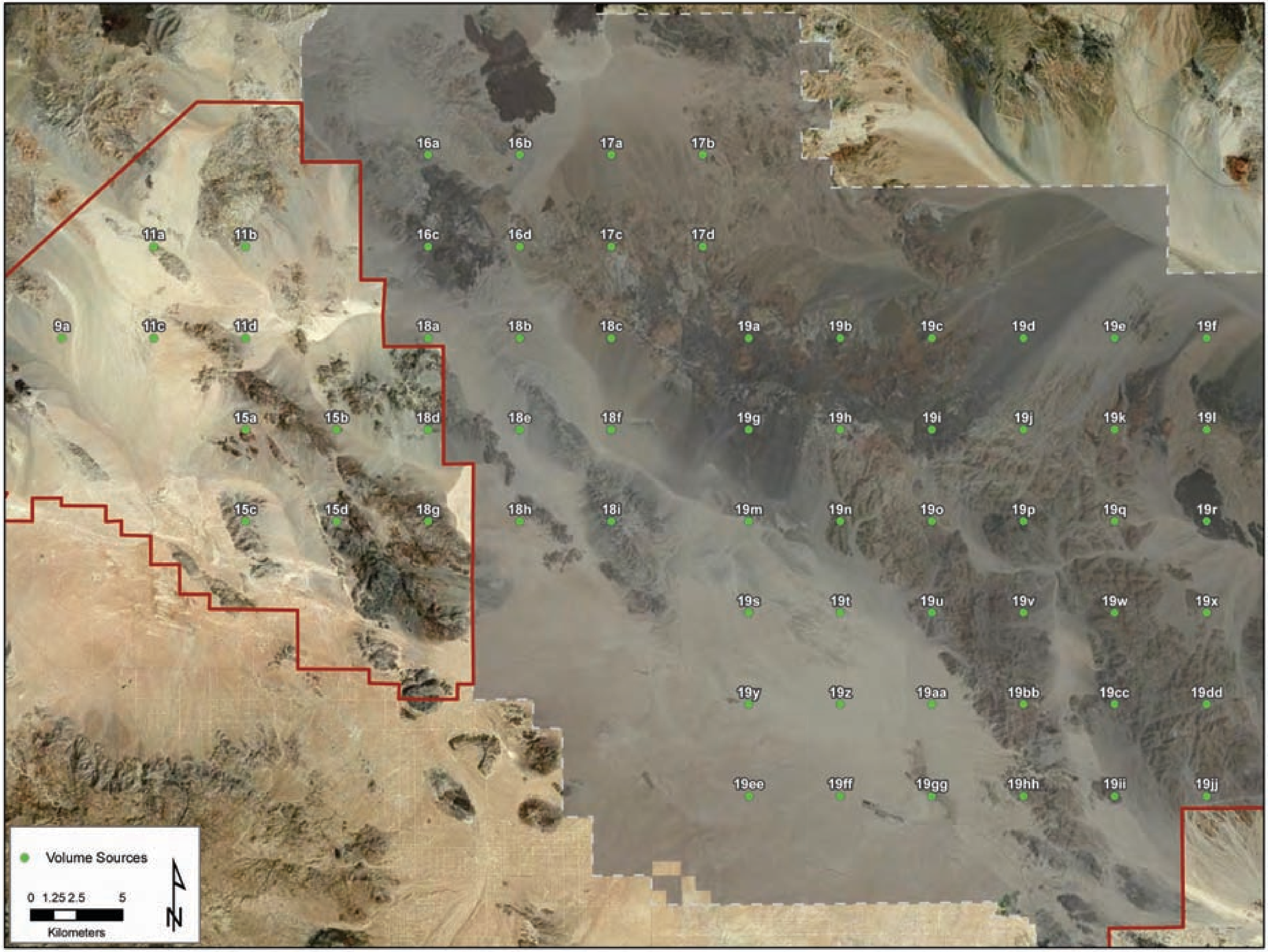
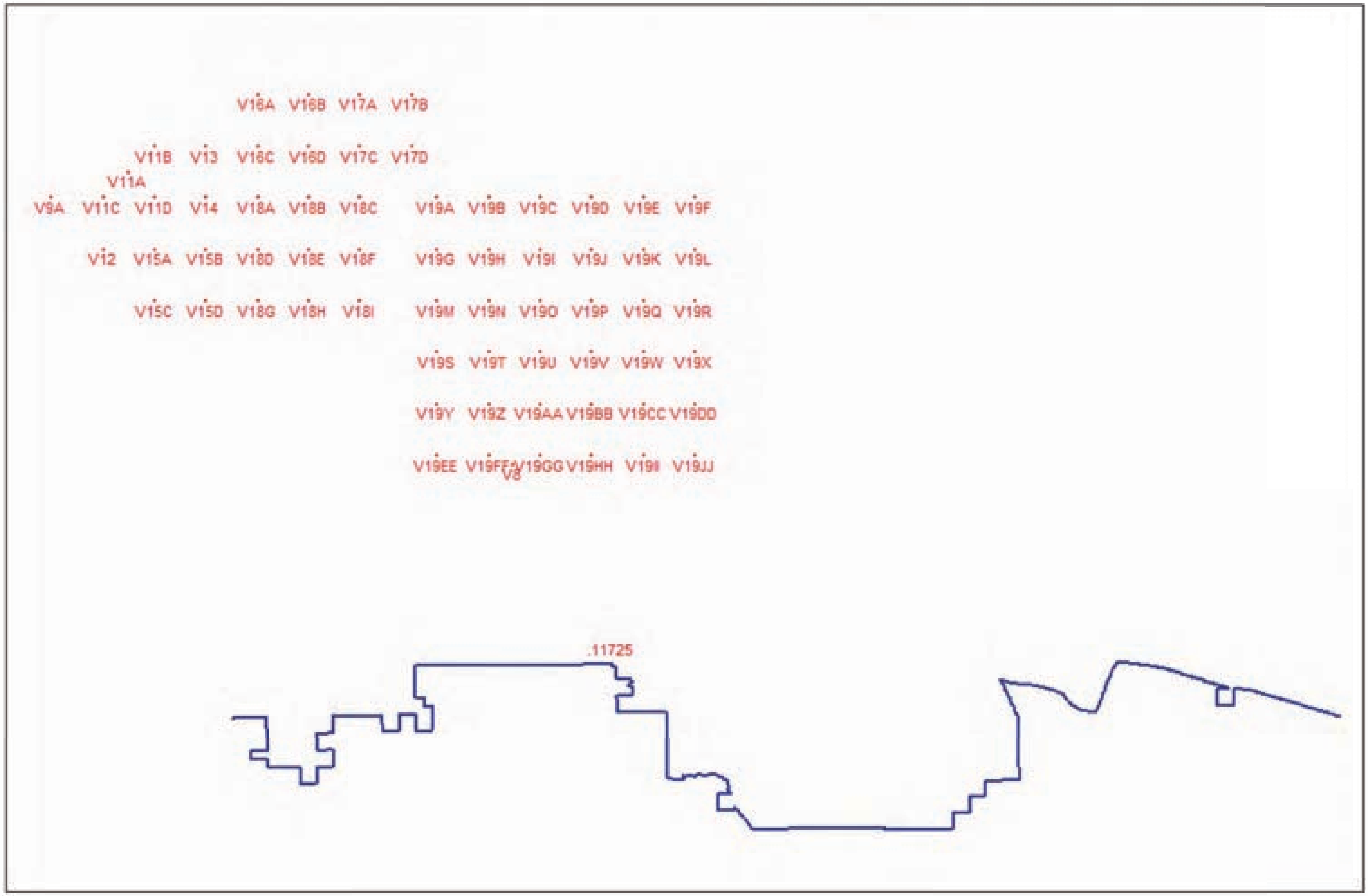


Figure G.2-1. Simulation of Emission Sources for NO2 Modeling Analysis - 29 Palms LAS Project EIS - Alternative 1

Figure G.2-2. Maximum Annual NOx Concentration Predicted for the 29 Palms LAS Project (ug/m^3) -Alternative 1.



APPENDIX G.3

Dispersion Modeling Analyses - LAS Project Alternative 3

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APPENDIX G.3.1

PM_{10} Dispersion Modeling Analyses - LAS Project Alternative 3

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Table G.3.1-1. Dispersion Modeling Scenario for 24-Hour PM10 Emissions - 29 Palms LAS Alternative 3 - West Area

Activity/Source	*Pounds per Hour PM 10*
MEB Exercises	
Tactical Vehicles	8.1
Tactical Support Equipment	2.0
Fugitive Dust	1,956.9
Subtotal	1,967.1
Aircraft Operations	
Airspaces	7.9
EAF LTOs	36.0
Range LTOs	2.1
Fugitive Dust - EAF LTOs	10.4
Fugitive Dust - Range LTOs	83.0
Subtotal	139.4
Ordnance Activities	
Combustive	-
Fugitive	16.6
Subtotal	16.6
Total Operations - PPH	2,123.2

Note: These emissions would occur within the West Area.

Table G.3.1-2. Simulation of Combustive/Fugitive Dust PM10 Emissions from TV/TSE- 29 Palms LAS Alternative 3 - West Area

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor (1)*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
MEB Exercises								
20	2,500	6,250,000	1	6,250,000	0.03	0.03	0.67	39.3
21a	2,500	6,250,000	1	6,250,000	0.03	0.07	0.67	91.8
21b	2,500	6,250,000	1	6,250,000	0.03	0.07	0.67	91.8
21c	2,500	6,250,000	1	6,250,000	0.03	0.04	0.67	52.5
21d	2,500	6,250,000	1	6,250,000	0.03	0.04	0.67	52.5
22a	2,500	6,250,000	1	6,250,000	0.03	0.10	0.33	65.6
22b	2,500	6,250,000	1	6,250,000	0.03	0.10	0.33	65.6
22c	2,500	6,250,000	1	6,250,000	0.03	0.08	0.33	52.5
22d	2,500	6,250,000	1	6,250,000	0.03	0.10	0.67	131.1
22e	2,500	6,250,000	1	6,250,000	0.03	0.10	0.67	131.1
22f	2,500	6,250,000	1	6,250,000	0.03	0.10	0.67	131.1
22g	2,500	6,250,000	1	6,250,000	0.03	0.10	0.67	131.1
22h	2,500	6,250,000	1	6,250,000	0.03	0.10	0.67	131.1
22i	2,500	6,250,000	1	6,250,000	0.03	0.10	0.67	131.1
23	2,500	6,250,000	1	6,250,000	0.03	0.06	0.33	39.3
24a	2,500	6,250,000	1	6,250,000	0.03	0.03	0.33	19.7
24b	2,500	6,250,000	1	6,250,000	0.03	0.03	0.33	19.7
24c	2,500	6,250,000	1	6,250,000	0.03	0.02	0.33	13.1
24d	2,500	6,250,000	1	6,250,000	0.03	0.05	0.33	32.8
24e	2,500	6,250,000	1	6,250,000	0.03	0.05	0.33	32.8
24f	2,500	6,250,000	1	6,250,000	0.03	0.04	0.33	26.2
24g	2,500	6,250,000	1	6,250,000	0.03	0.08	0.33	52.5
24h	2,500	6,250,000	1	6,250,000	0.03	0.06	0.33	39.3
24i	2,500	6,250,000	1	6,250,000	0.03	0.04	0.33	26.2
25a	2,500	6,250,000	1	6,250,000	0.03	0.03	0.33	19.7
25b	2,500	6,250,000	1	6,250,000	0.03	0.02	0.33	13.1
25c	2,500	6,250,000	1	6,250,000	0.03	0.03	0.33	19.7
25d	2,500	6,250,000	1	6,250,000	0.03	0.02	0.33	13.1
45	2,500	6,250,000	1	6,250,000	0.03	0.08	0.33	52.5
46	2,500	6,250,000	1	6,250,000	0.03	0.08	0.33	52.5
47	2,500	6,250,000	1	6,250,000	0.03	0.03	0.67	39.3
48	2,500	6,250,000	1	6,250,000	0.03	0.03	0.67	39.3
49	2,500	6,250,000	1	6,250,000	0.03	0.02	0.67	26.2
50	2,500	6,250,000	1	6,250,000	0.03	0.03	0.67	39.3
51	2,500	6,250,000	1	6,250,000	0.03	0.01	0.67	13.1
52	2,500	6,250,000	1	6,250,000	0.03	0.02	0.67	26.2
53	2,500	6,250,000	1	6,250,000	0.03	0.01	0.67	13.1
Total MEB Exercises				231,250,000	1.00	2.00		1,967

Note: (1) Total amounts to 2.0, as the sources are divided into 2 sectors: one each for 2 battalions and 1 battalion.

Table G.3.1-3. Simulation of Combustive PM10 Emissions from Aircraft Operations in Airspaces - 29 Palms LAS Alternative 3 - West Area

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
Aircraft Operations - Airspaces								
20	2,500	6,250,000	1	6,250,000	0.05	0.01		0.1
21a	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
21b	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
21c	2,500	6,250,000	1	6,250,000	0.05	0.03		0.2
21d	2,500	6,250,000	1	6,250,000	0.05	0.03		0.2
22a	2,500	6,250,000	1	6,250,000	0.05	0.08		0.6
22b	2,500	6,250,000	1	6,250,000	0.05	0.08		0.6
22c	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
22d	2,500	6,250,000	1	6,250,000	0.05	0.08		0.6
22e	2,500	6,250,000	1	6,250,000	0.05	0.08		0.6
22f	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
22g	2,500	6,250,000	1	6,250,000	0.05	0.08		0.6
22h	2,500	6,250,000	1	6,250,000	0.05	0.08		0.6
22i	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
23	2,500	6,250,000	1	6,250,000	0.05	0.03		0.2
24d	2,500	6,250,000	1	6,250,000	0.05	0.01		0.1
24g	2,500	6,250,000	1	6,250,000	0.05	0.03		0.2
45	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
46	2,500	6,250,000	1	6,250,000	0.05	0.05		0.4
47	2,500	6,250,000	1	6,250,000	0.05	0.03		0.2
Total Aircraft Operations - Airspaces				125,000,000	1.00	1.00		7.94

Table G.3.1-4. Simulation of PM10 Emissions from Aircraft Ops Range LTOs, Ordnance Usage, and EAF LTOs - 29 Palms LAS Alternative 3 - West Area

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Location Factor*	*Battalion Factor*	*Volume Source PM10 Lb/Hr*
Aircraft Operations - Range LTOs								
20	2,500	6,250,000	1	6,250,000	0.50			42.6
23	2,500	6,250,000	1	6,250,000	0.50			42.6
Total Aircraft Operations - Range LTOs				12,500,000				85.1
Ordnance Activities								
22a	2,500	6,250,000	1	6,250,000	0.11	0.10		1.7
22b	2,500	6,250,000	1	6,250,000	0.11	0.10		1.7
22c	2,500	6,250,000	1	6,250,000	0.11	0.03		0.5
22d	2,500	6,250,000	1	6,250,000	0.11	0.25		4.2
22e	2,500	6,250,000	1	6,250,000	0.11	0.25		4.2
22f	2,500	6,250,000	1	6,250,000	0.11	0.04		0.7
22g	2,500	6,250,000	1	6,250,000	0.11	0.10		1.7
22h	2,500	6,250,000	1	6,250,000	0.11	0.10		1.7
22i	2,500	6,250,000	1	6,250,000	0.11	0.03		0.5
Total Ordnance Activities				56,250,000	1.00	1.00		16.6
Aircraft Operations - EAF LTOs								
8	2,500	6,250,000	1	6,250,000	1.00			46.4

Table G.3.1-5. Total Combined Volume Source PM10 Emissions - 29 Palms LAS Alternative 3 - West Area

Volume Source #		*Volume Source PM10 Lb/Hr*
8		46.4
20		82.0
21a		92.2
21b		92.2
21c		52.7
21d		52.7
22a		67.9
22b		67.9
22c		53.4
22d		135.9
22e		135.9
22f		132.2
22g		133.4
22h		133.4
22i		132.0
23		82.1
24a		19.7
24b		19.7
24c		13.1
24d		32.9
24e		32.8
24f		26.2
24g		52.7
24h		39.3
24i		26.2
25a		19.7
25b		13.1
25c		19.7
25d		13.1
45		52.9
46		52.9
47		39.6
48		39.3
49		26.2
50		39.3
51		13.1
52		26.2
53		13.1
Total Hourly Emissions		2,123.2

Table G.3.1-6. Dispersion Modeling Scenario for 24-Hour PM10 Emissions in Alternative 3 Central Area - 29 Palms LAS EIS

Activity/Source	*Pounds per Hour* *PM_{10}*
MEB Exercises	
Tactical Vehicles	4.9
Tactical Support Equipment	1.2
Fugitive Dust	1,174.2
Subtotal	1,180.3
Aircraft Operations	
Airspaces	4.8
EAF LTOs	
Range LTOs	1.2
Fugitive Dust - EAF LTOs	
Fugitive Dust - Range LTOs	49.8
Subtotal	55.8
Ordnance Activities	
Combustive	
Fugitive	
Subtotal	
Total Operations - PPH	1,236.1

Note: = 60% of activity and emissions within West Area.

Table G.3.1-7. Simulation of Combustive/Fugitive Dust PM10 Emissions from All Sources in Alternative 3 Central Area - 29 Palms LAS

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Volume Source PM10 Lb/Hr*
All Activities						
26c	5,000	25,000,000	1	25,000,000	0.03	35.3
26d	5,000	25,000,000	1	25,000,000	0.03	35.3
26g	5,000	25,000,000	1	25,000,000	0.03	35.3
26h	5,000	25,000,000	1	25,000,000	0.03	35.3
26k	5,000	25,000,000	1	25,000,000	0.03	35.3
26l	5,000	25,000,000	1	25,000,000	0.03	35.3
26o	5,000	25,000,000	1	25,000,000	0.03	35.3
26p	5,000	25,000,000	1	25,000,000	0.03	35.3
28	5,000	25,000,000	1	25,000,000	0.03	35.3
43	5,000	25,000,000	1	25,000,000	0.03	35.3
44	5,000	25,000,000	1	25,000,000	0.03	35.3
29a	5,000	25,000,000	1	25,000,000	0.03	35.3
29b	5,000	25,000,000	1	25,000,000	0.03	35.3
29c	5,000	25,000,000	1	25,000,000	0.03	35.3
29d	5,000	25,000,000	1	25,000,000	0.03	35.3
30a	5,000	25,000,000	1	25,000,000	0.03	35.3
30b	5,000	25,000,000	1	25,000,000	0.03	35.3
30c	5,000	25,000,000	1	25,000,000	0.03	35.3
30d	5,000	25,000,000	1	25,000,000	0.03	35.3
30e	5,000	25,000,000	1	25,000,000	0.03	35.3
30f	5,000	25,000,000	1	25,000,000	0.03	35.3
30g	5,000	25,000,000	1	25,000,000	0.03	35.3
30h	5,000	25,000,000	1	25,000,000	0.03	35.3
30i	5,000	25,000,000	1	25,000,000	0.03	35.3
30j	5,000	25,000,000	1	25,000,000	0.03	35.3
30k	5,000	25,000,000	1	25,000,000	0.03	35.3
30l	5,000	25,000,000	1	25,000,000	0.03	35.3
30m	5,000	25,000,000	1	25,000,000	0.03	35.3
30n	5,000	25,000,000	1	25,000,000	0.03	35.3
30o	5,000	25,000,000	1	25,000,000	0.03	35.3
30p	5,000	25,000,000	1	25,000,000	0.03	35.3
31a	5,000	25,000,000	1	25,000,000	0.03	35.3
31b	5,000	25,000,000	1	25,000,000	0.03	35.3
31c	5,000	25,000,000	1	25,000,000	0.03	35.3
31d	5,000	25,000,000	1	25,000,000	0.03	35.3
Total All Sources				875,000,000	1.00	1,236

Table G.3.1-9. Simulation of Combustive/Fugitive Dust PM10 Emissions from All Sources in Alternative 3 Eastern Area - 29 Palms LAS EIS

Activity/Volume Source #	*Width (meters)*	*Area (m2)*	*#of Sources*	*Total Source Area (m2)*	*Indi. Source Area/ Total Source Area*	*Volume Source PM10 Lb/Hr*
All Activities						
32	7,500	56,250,000	1	56,250,000	0.14	115.9
33	7,500	56,250,000	1	56,250,000	0.14	115.9
34a	5,000	25,000,000	1	25,000,000	0.06	51.5
34b	5,000	25,000,000	1	25,000,000	0.06	51.5
34c	5,000	25,000,000	1	25,000,000	0.06	51.5
34d	5,000	25,000,000	1	25,000,000	0.06	51.5
35	5,000	25,000,000	1	25,000,000	0.06	51.5
36	5,000	25,000,000	1	25,000,000	0.06	51.5
37	5,000	25,000,000	1	25,000,000	0.06	51.5
38	7,500	56,250,000	1	56,250,000	0.14	115.9
39	7,500	56,250,000	1	56,250,000	0.14	115.9
Total All Sources				400,000,000	1.00	824.1

Table G.3.1-8. Dispersion Modeling Scenario for 24-Hour PM10 Emissions in Alternative 3 Eastern Area - 29 Palms LAS EIS

Activity/Source	*Pounds per Hour* *PM_{10}*
MEB Exercises	
Tactical Vehicles	3.3
Tactical Support Equipment	0.8
Fugitive Dust	782.8
Subtotal	786.8
Aircraft Operations	
Airspaces	3.2
EAF LTOs	
Range LTOs	0.8
Fugitive Dust - EAF LTOs	
Fugitive Dust - Range LTOs	33.2
Subtotal	37.2
Ordnance Activities	
Combustive	
Fugitive	
Subtotal	
Total Operations - PPH	824.1

Note: = 40% of activity and emissions within West Area.

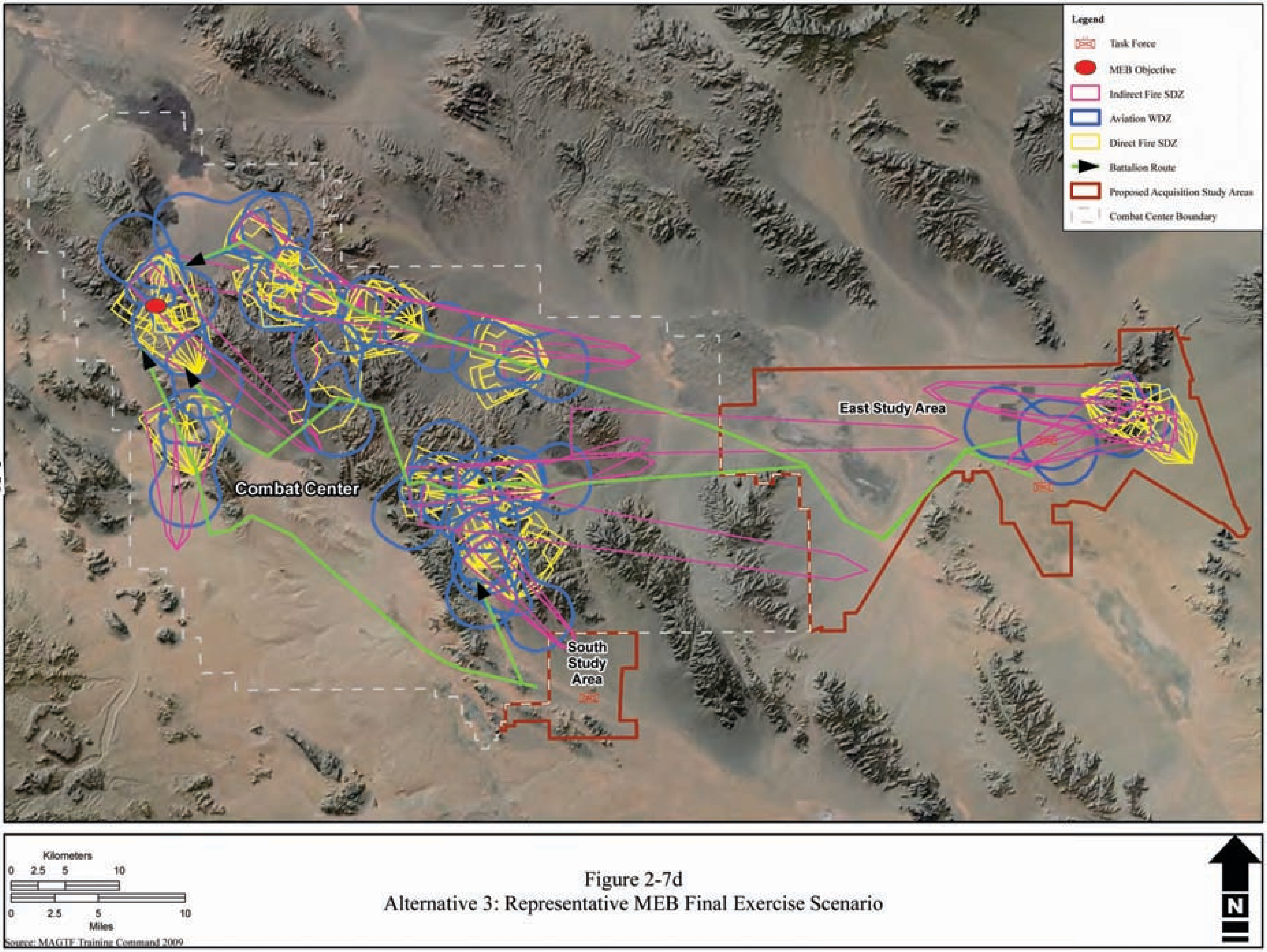
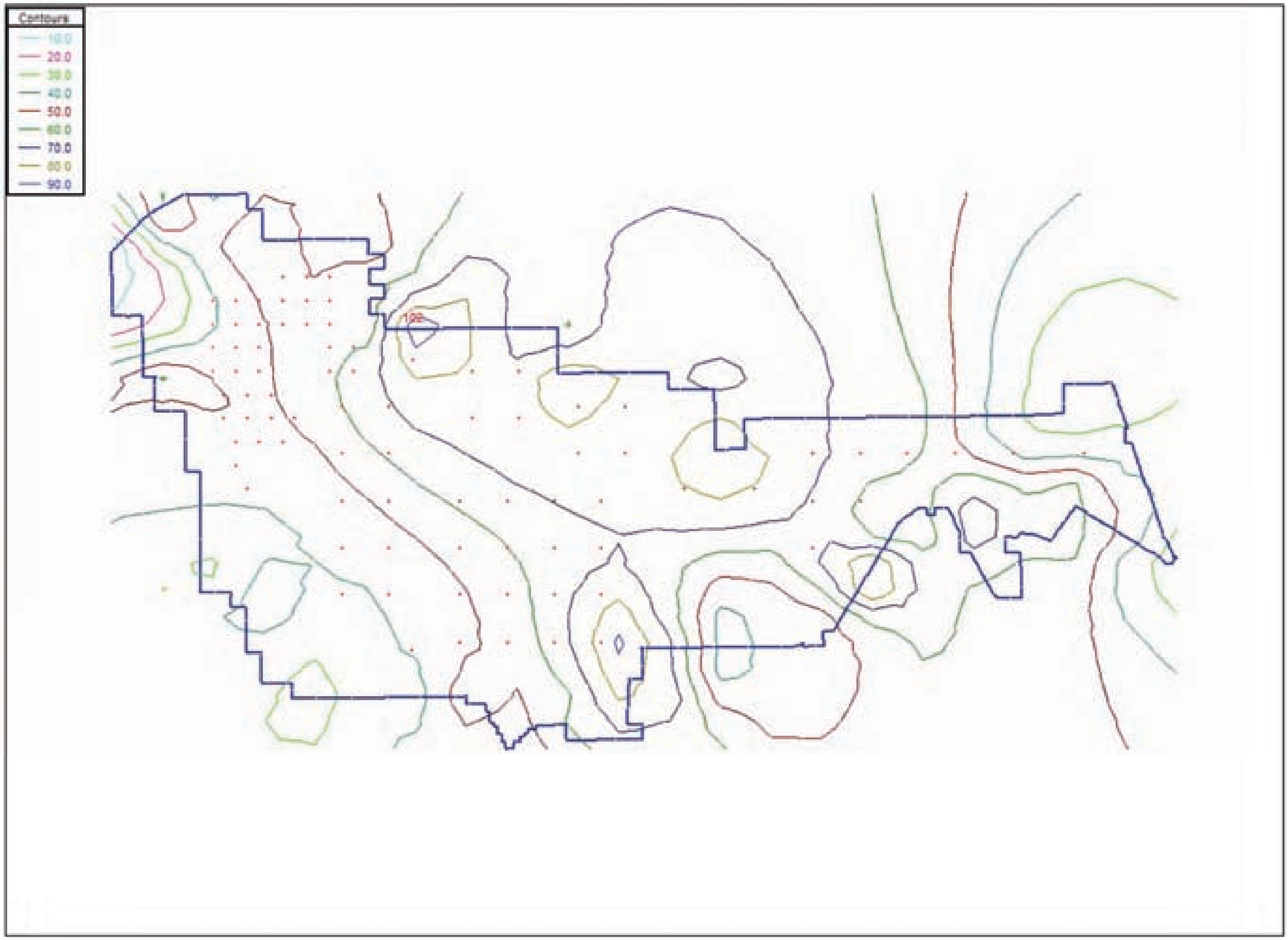


Figure 2-7d
Alternative 3: Representative MEB Final Exercise Scenario

Source: MAGTF Training Command 2009

Figure G.3.1-1. Maximum 24-Hour PM10 Concentrations Predicted for the LAS MEB Exercises (ug/m^3) - Project Alternative 3



APPENDIX G.3.2

NO_2 Dispersion Modeling Analyses - LAS Project Alternative 3

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Table G.3.2-1. Dispersion Modeling Scenario for Annual NOx Operational Emissions - 29 Palms LAS EIS - Alternative 3

Activity/Source	*Pounds per Hour NOx (1)*
MEB Exercises	
Tactical Equipment	106.8
Tactical Support Equipment	22.8
Fugitive Dust	
Subtotal	129.6
Aircraft Operations	
Airspaces	32.0
EAF LTOs	17.9
Range LTOs	5.4
Fugitive Dust - EAF LTOs	
Fugitive Dust - Range LTOs	
Subtotal	55.2
Ordnance Activities	
Combustive	0.4
Fugitive	
Subtotal	0.4
Total Operations - Pounds per Hour	185.2

Note: (1) Equates to total annual emissions for each source category divided by (60 days * 24 hours).

Table G.3.2-2. Operational NOx Emission Simulations - 29 Palms LAS EIS - Alternative 3

Activity/Volume Source #	Width (meters)	Area (m2)	#of Sources	Total Source Area (m2)	Indi. Source Fraction of Total Source Area	Volume Source NOx Emissions (Lbs/Hr) Individual	Volume Source NOx Emissions (Lbs/Hr) Combined
MEB Exercises							
26a-26p	5,000	25,000,000	4	100,000,000	0.02	2.9	12
29a-29d	5,000	25,000,000	16	400,000,000	0.02	2.9	47
30a-30p	5,000	25,000,000	16	400,000,000	0.02	2.9	47
31a-31d	5,000	25,000,000	4	100,000,000	0.02	2.9	12
34a-34d	5,000	25,000,000	4	100,000,000	0.02	2.9	12
Total MEB Exercises		125,000,000	44	1,100,000,000			129.6
Aircraft Operations - Airspaces + Range LTOs							
26a-26p	5,000	25,000,000	4	100,000,000	0.02	0.20	7.5
29a-29d	5,000	25,000,000	16	400,000,000	0.02	0.20	7.5
30a-30p	5,000	25,000,000	16	400,000,000	0.02	0.20	7.5
31a-31d	5,000	25,000,000	4	100,000,000	0.02	0.20	7.5
34a-34d	5,000	25,000,000	4	100,000,000	0.02	0.20	7.5
Total Aircraft Operations - Airspaces + Range LTOs		125,000,000	44	1,100,000,000			37.4
Ordnance Activities							
26a-26p	5,000	25,000,000	4	100,000,000	0.02	0.20	0.1
29a-29d	5,000	25,000,000	16	400,000,000	0.02	0.20	0.1
30a-30p	5,000	25,000,000	16	400,000,000	0.02	0.20	0.1
31a-31d	5,000	25,000,000	4	100,000,000	0.02	0.20	0.1
34a-34d	5,000	25,000,000	4	100,000,000	0.02	0.20	0.1
Total Ordnance Activities		125,000,000	44	1,100,000,000			0.4
Aircraft Operations - EAF LTOs							
8	2,500	6,250,000	1	6,250,000	1.00	1.00	17.9
Total Combined Emissions							
8						17.9	17.9
26a-26p						3.3	19.3
29a-29d						3.3	54.7
30a-30p						3.3	54.7
31a-31d						3.3	19.3
34a-34d						3.3	19.3
Total Hourly Emissions							185.2

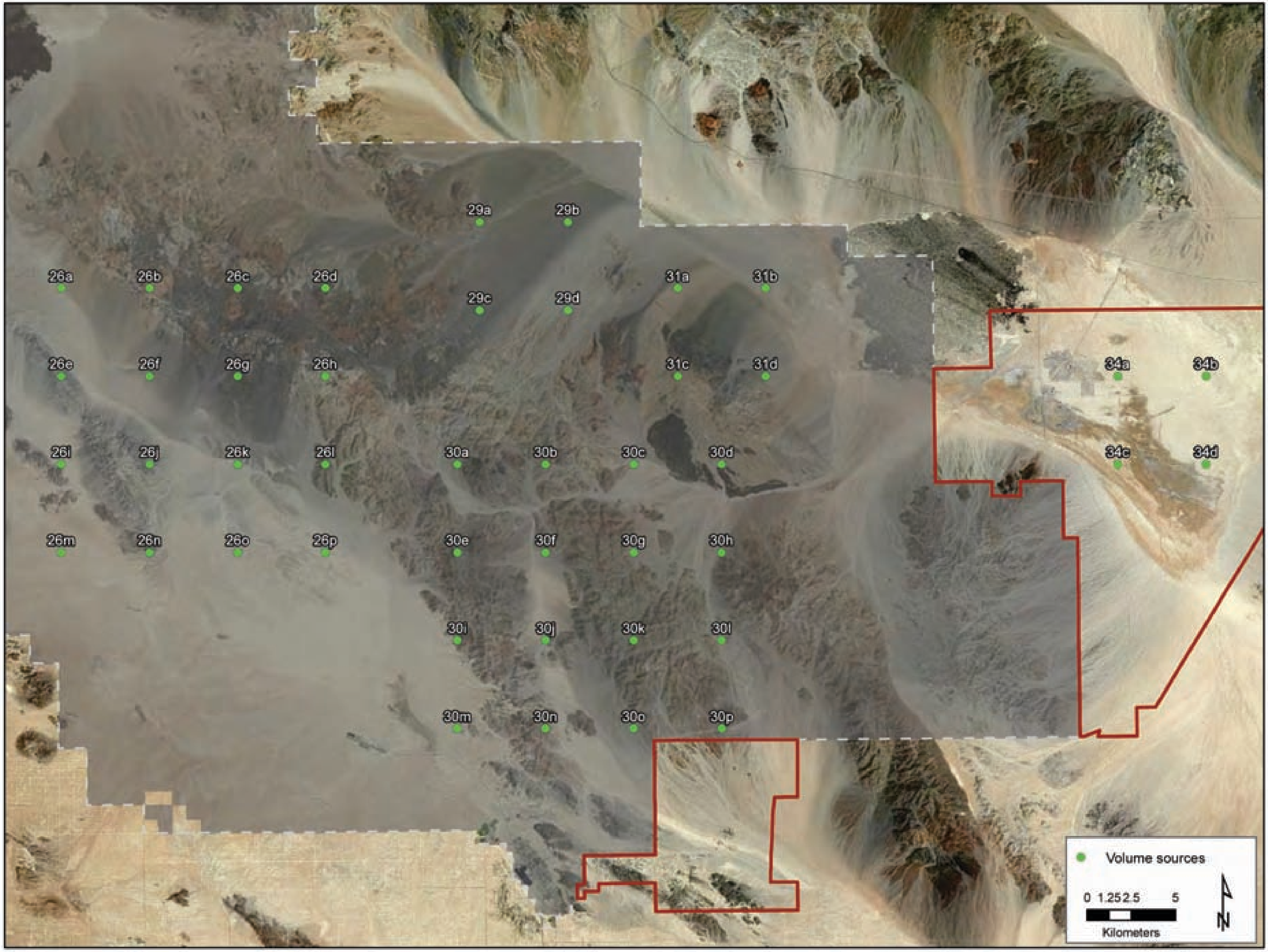
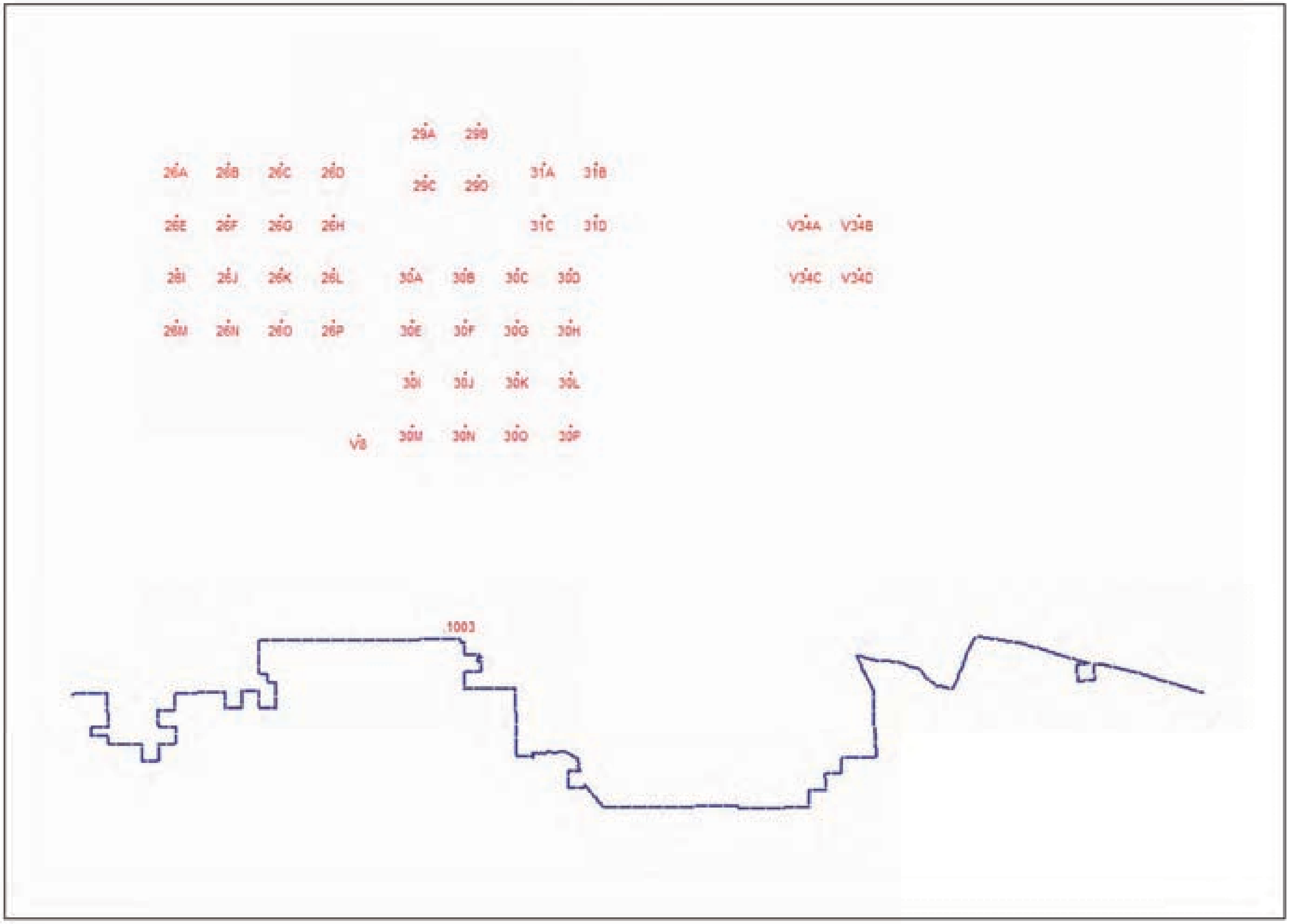


Figure G.3.2-1. Simulation of Emission Sources for NO2 Modeling Analysis - 29 Palms LAS EIS - Alternative 3

Figure G.3.2-2. Maximum Annual NOx Concentration Predicted for Joshua Tree National Park (ug/m^3) - 29 Palms LAS Project Alternative 3



APPENDIX H
NOISE MODELING

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H-1 EXPEDITIONARY AIRFIELD

+-1.1 Modeled Flight Operations

Baseline Operations at 29 Palms EAF

Assumed Category	Aircraft Type	Departure				Non Break Arrival				Overhead Break				Touch and Go (1)				Camp Wilson (1)				Drop Zone Sandhill (1)				Grand Total			
		Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
Jet	F/A-18A/C(3)	1,473	295	-	1,768	637	360	-	997	759	-	-	759	32	49	-	81	-	-	-	-	-	-	-	-	2,901	704	-	3,605
	F/A-18E/F(3)	77	16	-	93	33	19	-	52	40	-	-	40	2	3	-	5	-	-	-	-	-	-	-	-	152	38	-	190
	AV-8B	354	289	-	643	250	107	-	357	357	-	-	357	43	29	-	72	-	-	-	-	-	-	-	-	1,004	425	-	1,429
	F-35	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	EA-6B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prop	C-12	24	-	-	24	24	-	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	48
	C-130	208	6	-	214	89	36	-	125	89	-	-	89	249		-	249	-	-	-	-	-	-	-	-	635	42	-	677
	KC-130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rotary Wing	CH-46E	1,707	528	-	2,235	1,374	622	70	2,066	219	-	-	219	88	-	-	88	112	70	-	182	58	82	-	140	3,558	1,302	70	4,930
	CH-53E	968	496	17	1,481	731	474	12	1,217	261	-	-	261	77	71	-	148	125		-	125	142		-	142	2,304	1,041	29	3,374
	MV-22B	388	233	60	681	74	44	11	129	314	189	48	551	217	131	33	381	-	-	-	-	-	-	-	-	993	597	152	1,742
	AH/UH-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Joint AR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Joint FW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Joint RW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	UAS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	11	-	-	11	11	-	-	11
Modeled Total		5,199	1,863	77	7,139	3,212	1,662	93	4,967	2,039	189	48	2,276	708	283	33	1,024	237	70	-	307	200	82	-	282	11,595	4,149	251	15,995
Not Modeled Total		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	11	-	-	11	11	-	-	11
Grand Total		5,199	1,863	77	7,139	3,212	1,662	93	4,967	2,039	189	48	2,276	708	283	33	1,024	237	70	-	307	211	82	-	293	11,606	4,149	251	16,006

day = 0700-1900 local; eve = 1900-2200 local; night = 2200-0700 local

(1) Counted here as two (2) operations

(2) Modeled aircraft are shaded

(3) F/A-18A/C ops from 2001 study modeled here as 95% F/A-18A/C and 5% F/A-18E/F

Proposed Operations at 29 Palms EAF

Assumed Category	Aircraft Type	Departure				Non Break Arrival				Overhead Break				Touch and Go (1)				Camp Wilson (1)				Drop Zone Sandhill (1)				Grand Total			
		Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
Jet	F/A-18A/C(3)	1,763	389	78	2,230	927	454	78	1,459	759	-	-	759	32	49	-	81	-	-	-	-	-	-	-	-	3,481	892	156	4,529
	F/A-18E/F(3)	91	20	4	115	47	23	4	74	40	-	-	40	2	3	-	5	-	-	-	-	-	-	-	-	180	46	8	234
	AV-8B	550	355	40	945	446	173	40	659	357	-	-	357	43	29	-	72	-	-	-	-	-	-	-	-	1,396	557	80	2,033
	F-35 (4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	EA-6B	50	16	8	74	50	16	8	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	32	16	148
Prop	C-12	24	-	-	24	24	-	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	48
	C-130	208	6	-	214	89	36	-	125	89	-	-	89	249	-	-	249	-	-	-	-	-	-	-	-	635	42	-	677
	KC-130 (5)	88	30	20	138	88	30	20	138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176	60	40	276
Rotary Wing	CH-46E	1,707	528	-	2,235	1,374	622	70	2,066	219	-	-	219	88	-	-	88	112	70	-	182	58	82	-	140	3,558	1,302	70	4,930
	CH-53E	1,126	550	37	1,713	889	528	32	1,449	261	-	-	261	77	71	-	148	125	-	-	125	142	-	-	142	2,620	1,149	69	3,838
	MV-22B	568	295	86	949	254	106	37	397	314	189	48	551	217	131	33	381	-	-	-	-	-	-	-	-	1,353	721	204	2,278
	AH/UH-1 (6)	716	242	134	1,092	716	242	134	1,092		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,432	484	268	2,184
	Joint AR	18	4	14	36	18	4	14	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	8	28	72
	Joint FW (7)	20	6	14	40	20	6	14	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	12	28	80
	Joint RW (8)	214	74	32	320	214	74	32	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	428	148	64	640
	UAS	154	50	36	240	154	50	36	240	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	11	319	100	72	491
Modeled Total		7,125	2,511	453	10,089	5,138	2,310	469	7,917	2,039	189	48	2,276	708	283	33	1,024	237	70	-	307	200	82	-	282	15,447	5,445	1,003	21,895
Not Modeled Total		172	54	50	276	172	54	50	276	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	11	355	108	100	563
Grand Total		7,297	2,565	503	10,365	5,310	2,364	519	8,193	2,039	189	48	2,276	708	283	33	1,024	237	70	-	307	211	82	-	293	15,802	5,553	1,103	22,458

day = 0700-1900 local; eve = 1900-2200 local; night = 2200-0700 local

(1) Counted here as two (2) operations

(2) Modeled aircraft are shaded

(3) F/A-18A/C ops from 2001 study modeled here as 95% F/A-18A/C and 5% F/A-18E/F

(4) Assumed the F-35 will not use the EAF

(5) Modeled as C-130H&N&P

(6) Modeled as AH-1N

(7) Modeled as F/A-18E/F

+-1.2 Modeled Runway and Flight Track Utilization for Expeditionary Airfield

Baseline F/A-18A/C, F/A-18E/F, AV-8B, C-12, and C-130 Runway and Flight Track Utilization

Operation Type	Runway	Runway Mix %	Flight Track ID	Flight Track %
Departures	10	25%	10D1	70%
			10D2	10%
			10D5	20%
	28	75%	28D1	10%
			28D2	40%
			28D3	40%
			28D4	10%
Straight-In/ Full Stop Arrivals	10	25%	10A1	100%
	28	75%	28A1	100%
Overhead Arrivals	10	25%	10O1	10%
			10O2	90%
	28	75%	28O1	10%
			28O2	90%
Touch and Go	10	25%	10T1	100%
	28	75%	28T1	100%

Baseline CH-46, CH-53 and MV-22 Runway and Flight Track Utilization

Operation Type	Runway	Runway Mix %	Flight Track ID	Flight Track %
Departures	10	25%	10D1	20%
			10D2	30%
			10D3	10%
			10D4	30%
			10D5	10%
	28	75%	28D1	45%
			28D4	45%
			28D5	10%
	Wilson	100%	WD1	33%
			WD2	33%
			WD3	34%
Straight-In/	10	25%	10A1	50%
			10A2	50%
	28	75%	28A1	25%
			28A2	75%
	Wilson	100%	WA1	10%
			WA2	35%
			WA3	10%
			WA4	35%
			WA5	10%
	Sandhill	100%	SA1	100%
Overhead Arrivals	10	25%	10O1	10%
			10O2	90%
	28	75%	28O1	50%
			28O2	50%
Touch and Go	10	25%	10T1	100%
	28	75%	28T1	100%
Interfacility Departures from Sandhill to Runway	Sandhill	100%	SI1	50%
			SI2	50%

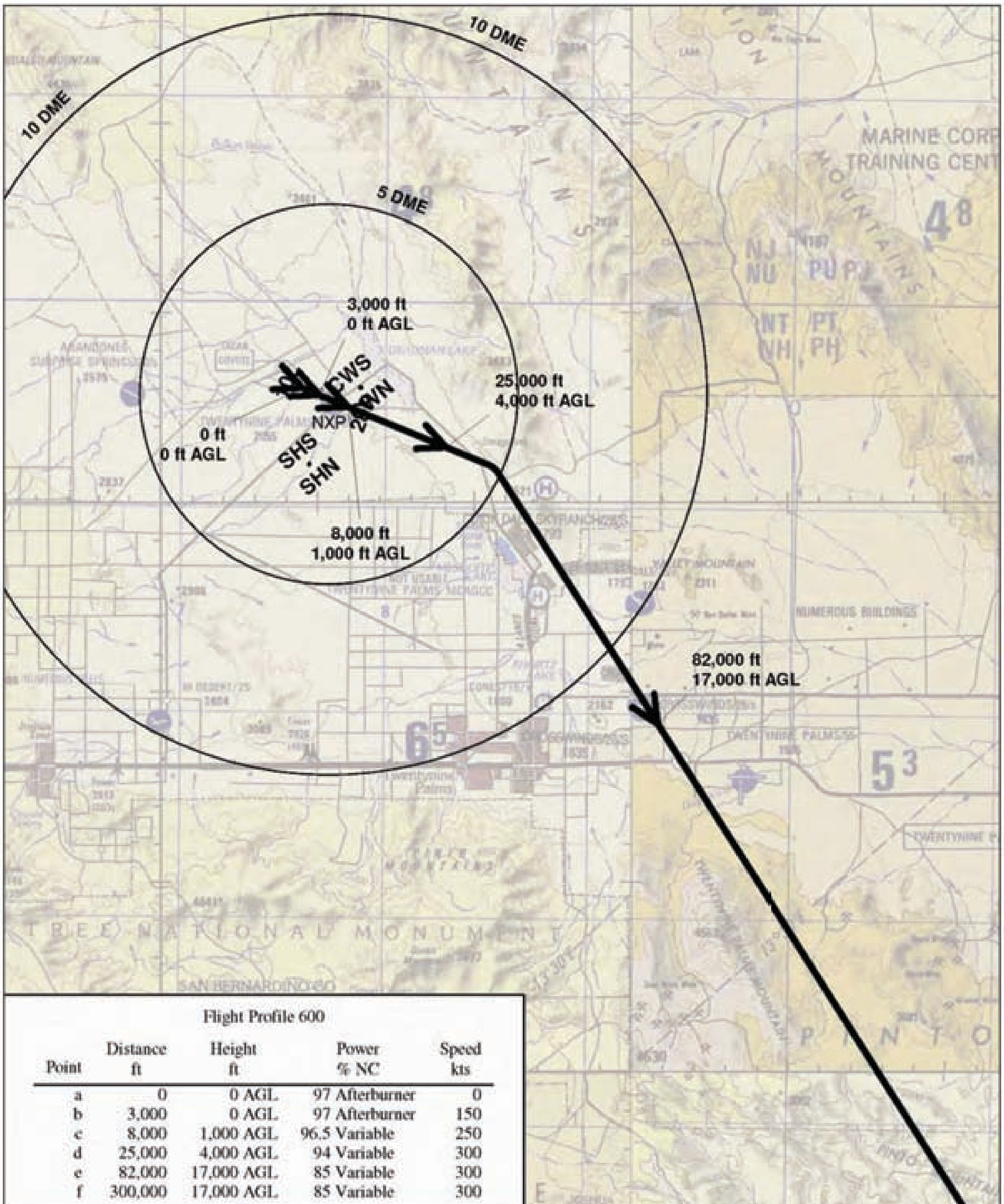
Proposed EA-6B Runway and Flight Track Utilization

Operation Type	Runway	Runway Mix %	Flight Track ID	Flight Track %
Departures	10	25%	10D1	70%
			10D2	10%
			10D5	20%
	28	75%	28D1	10%
			28D2	40%
			28D3	40%
			28D4	10%
Straight-In/ Full Stop Arrivals	10	25%	10A1	100%
	28	75%	28A1	100%
Overhead Arrivals	10	25%	10O1	10%
			10O2	90%
	28	75%	28O1	10%
			28O2	90%
Touch and Go	10	25%	10T1	100%
	28	75%	28T1	100%

Proposed AH-1 and UH-1 Runway and Flight Track Utilization

Operation Type	Runway	Runway Mix %	Flight Track ID	Flight Track %
Departures	10	25%	10D1	20%
			10D2	30%
			10D3	10%
			10D4	30%
			10D5	10%
	28	75%	28D1	45%
			28D4	45%
			28D5	10%
	Wilson	100%	WD1	33%
			WD2	33%
			WD3	34%
Straight-In/	10	25%	10A1	50%
			10A2	50%
	28	75%	28A1	25%
			28A2	75%
	Wilson	100%	WA1	10%
			WA2	35%
			WA3	10%
			WA4	35%
			WA5	10%
	Sandhill	100%	SA1	100%
Overhead Arrivals	10	25%	10O1	10%
			10O2	90%
	28	75%	28O1	50%
			28O2	50%
Touch and Go	10	25%	10T1	100%
	28	75%	28T1	100%
Interfacility Departures from Sandhill to Runway	Sandhill	100%	SI1	50%
			SI2	50%

+-1.3 Modeled Representative Flight Profiles for Key Aircraft at Expeditionary Airfield



Flight Profile 600

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	97 Afterburner	0
b	3,000	0 AGL	97 Afterburner	150
c	8,000	1,000 AGL	96.5 Variable	250
d	25,000	4,000 AGL	94 Variable	300
e	82,000	17,000 AGL	85 Variable	300
f	300,000	17,000 AGL	85 Variable	300

Flight Profile 600 - Departure to SE - Lake Bandini Sewage Disposal Ponds

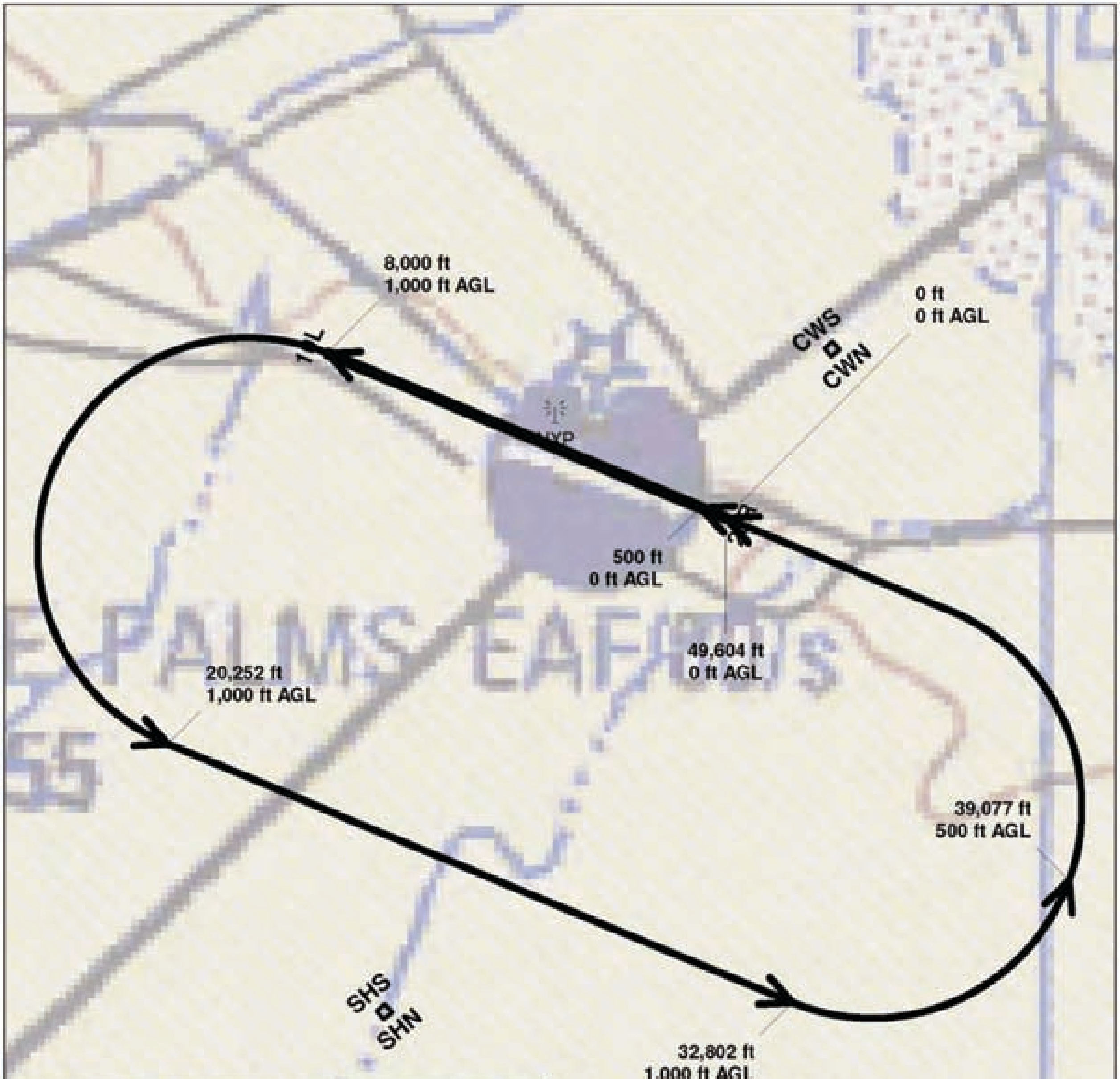
F-18E/F

on Runway 10L, Flight Track 10D1

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000

Scale in Feet 1:295,000 (1 inch = 24,600 feet)

N



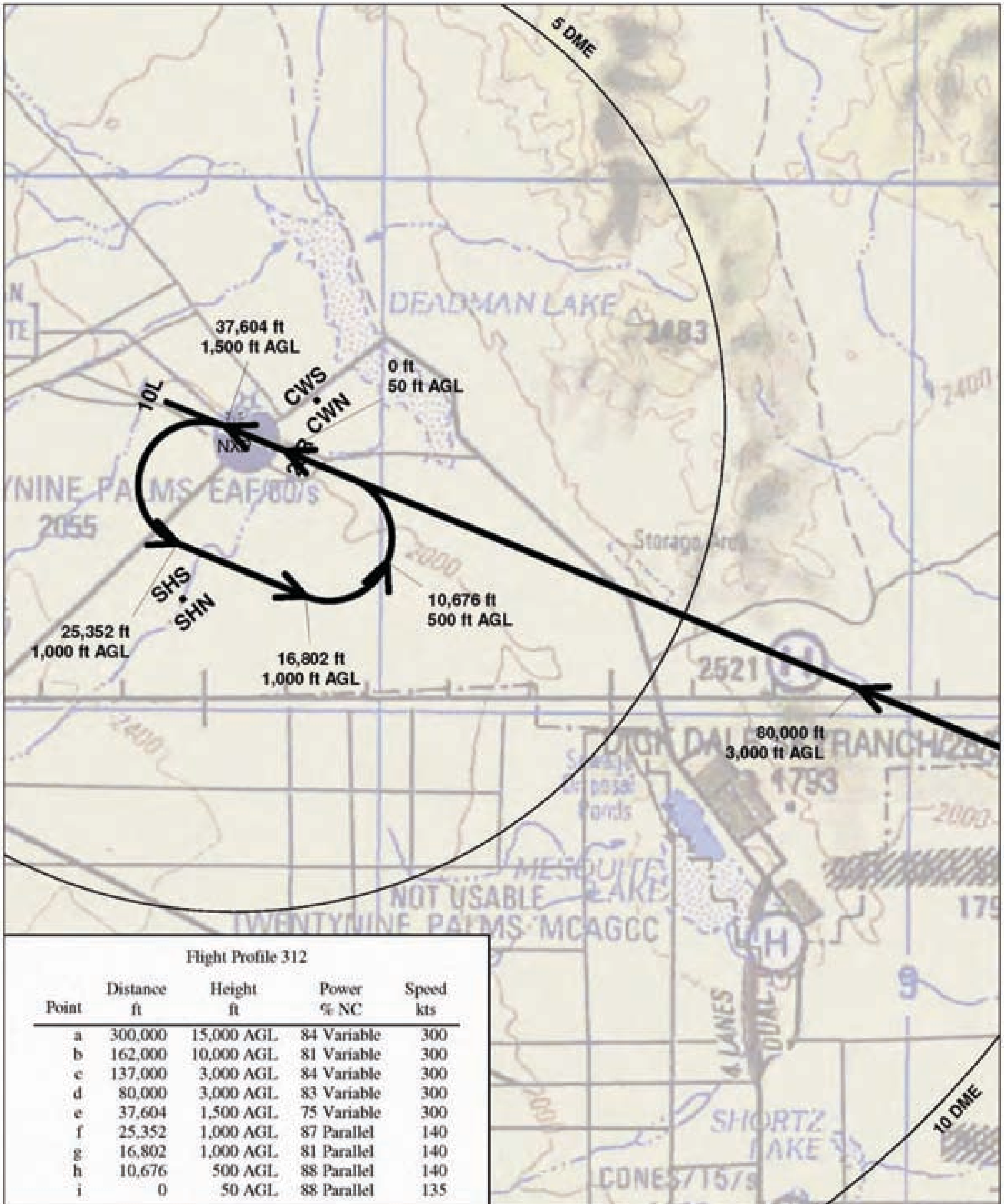
Flight Profile 314

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	96.5 Variable	140
b	500	0 AGL	96.5 Variable	150
c	8,000	1,000 AGL	87 Parallel	150
d	20,252	1,000 AGL	87 Parallel	140
e	32,802	1,000 AGL	81 Parallel	140
f	39,077	500 AGL	88 Parallel	140
g	49,604	0 AGL	88 Parallel	140

Flight Profile 314 - Touch and Go on Runway 28 (to the south of the Runway)
F-18A/C
on Runway 28R, Flight Track 28T1

0 2,000 4,000 6,000 8,000 10,000 12000

Scale in Feet 1:38,100 (1 inch = 3,170 feet)



Flight Profile 312

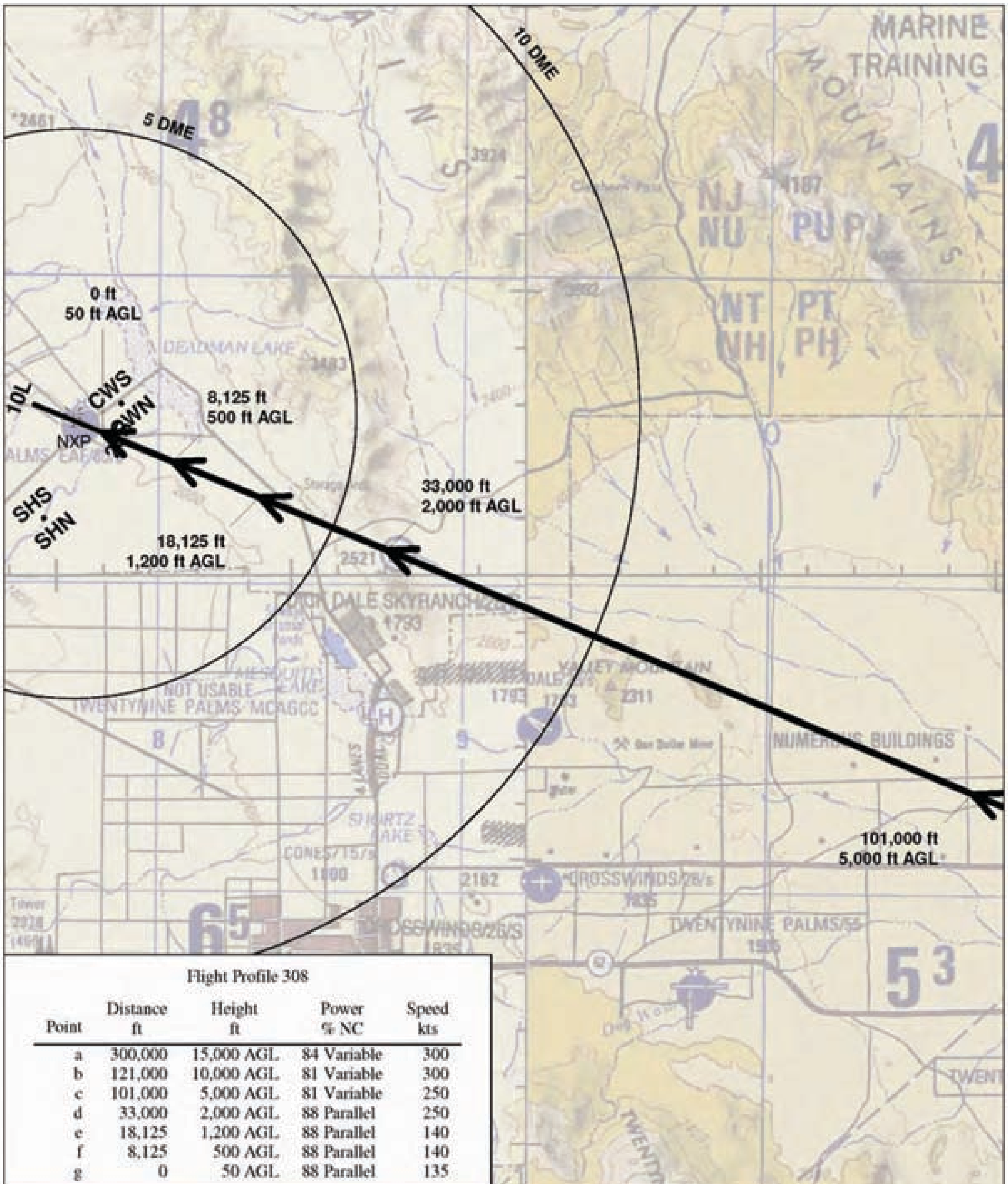
Point	Distance ft	Height ft	Power % NC	Speed kts
a	300,000	15,000 AGL	84 Variable	300
b	162,000	10,000 AGL	81 Variable	300
c	137,000	3,000 AGL	84 Variable	300
d	80,000	3,000 AGL	83 Variable	300
e	37,604	1,500 AGL	75 Variable	300
f	25,352	1,000 AGL	87 Parallel	140
g	16,802	1,000 AGL	81 Parallel	140
h	10,676	500 AGL	88 Parallel	140
i	0	50 AGL	88 Parallel	135

Flight Profile 312 - Overhead Break Arrival Mid Runway (90% of the time)
F-18A/C
on Runway 28R, Flight Track 28O2

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:114,000 (1 inch = 9,480 feet)

N



Point	Distance ft	Height ft	Power % NC	Speed kts
a	300,000	15,000 AGL	84 Variable	300
b	121,000	10,000 AGL	81 Variable	300
c	101,000	5,000 AGL	81 Variable	250
d	33,000	2,000 AGL	88 Parallel	250
e	18,125	1,200 AGL	88 Parallel	140
f	8,125	500 AGL	88 Parallel	140
g	0	50 AGL	88 Parallel	135

Flight Profile 308

Flight Profile 308 - Straight-In Arrival from SE - Lake Bandini Sewage Disposal Ponds

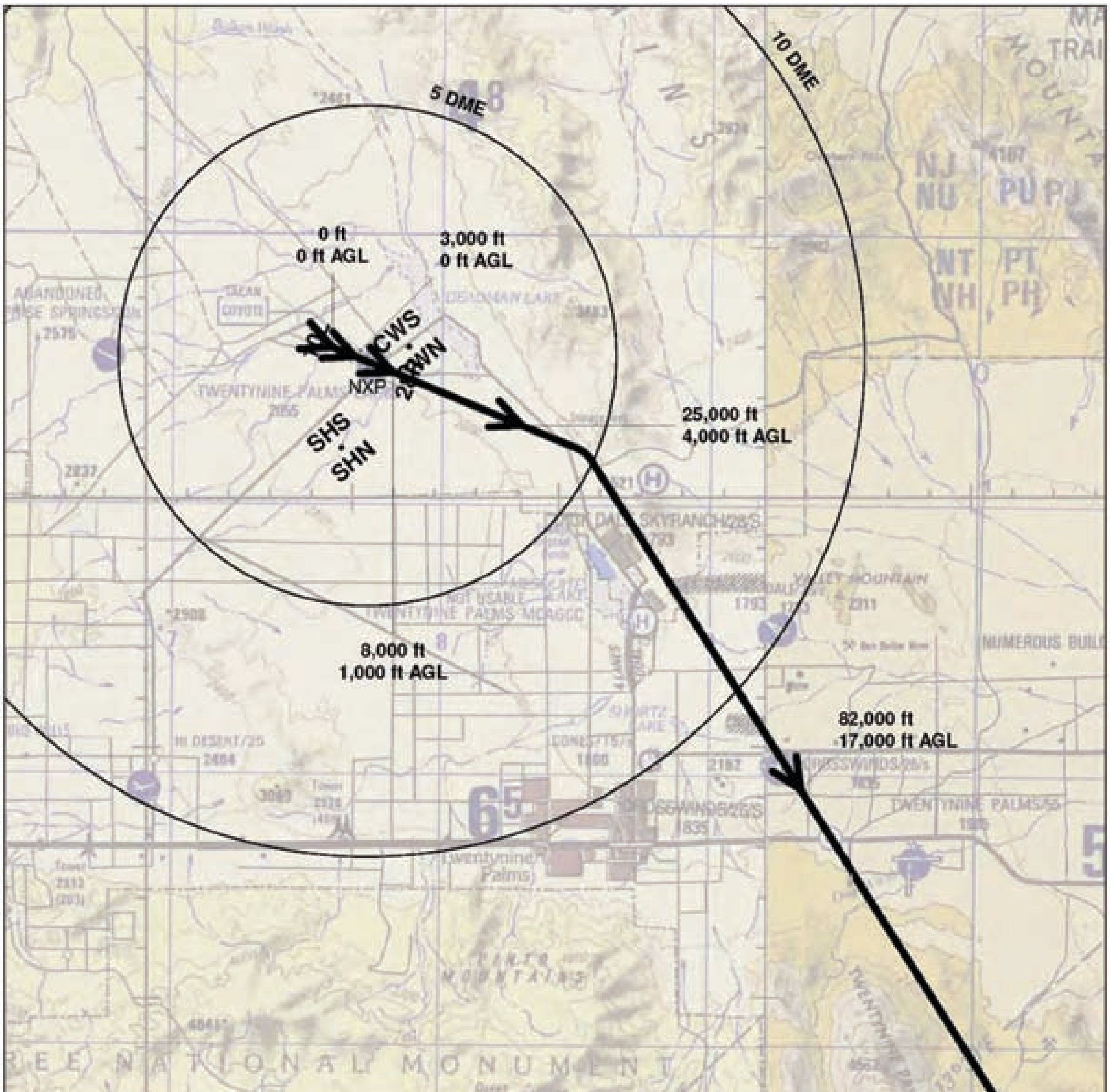
F-18A/C

on Runway 28R, Flight Track 28A1

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:198,000 (1 inch = 16,500 feet)

N



Flight Profile 300

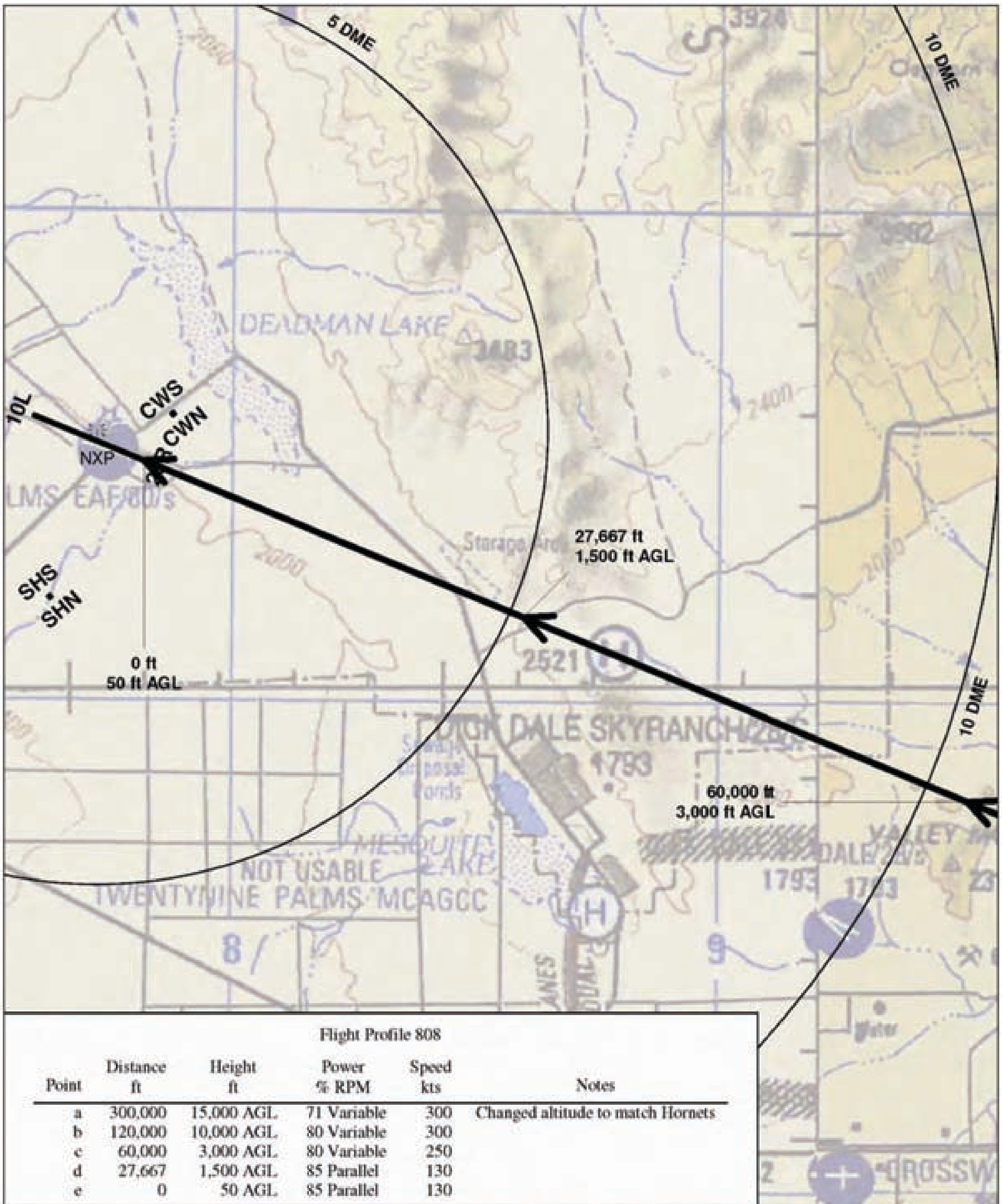
Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	96.7 Afterburner	0
b	3,000	0 AGL	96.7 Afterburner	150
c	8,000	1,000 AGL	96.5 Variable	250
d	25,000	4,000 AGL	94 Variable	300
e	82,000	17,000 AGL	85 Variable	300
f	300,000	17,000 AGL	85 Variable	300

Flight Profile 300 - Departure to SE - Lake Bandini Sewage Disposal Ponds
F-18A/C
on Runway 10L, Flight Track 10D1

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

Scale in Feet 1:248,000 (1 inch = 20,700 feet)

N



Flight Profile 808

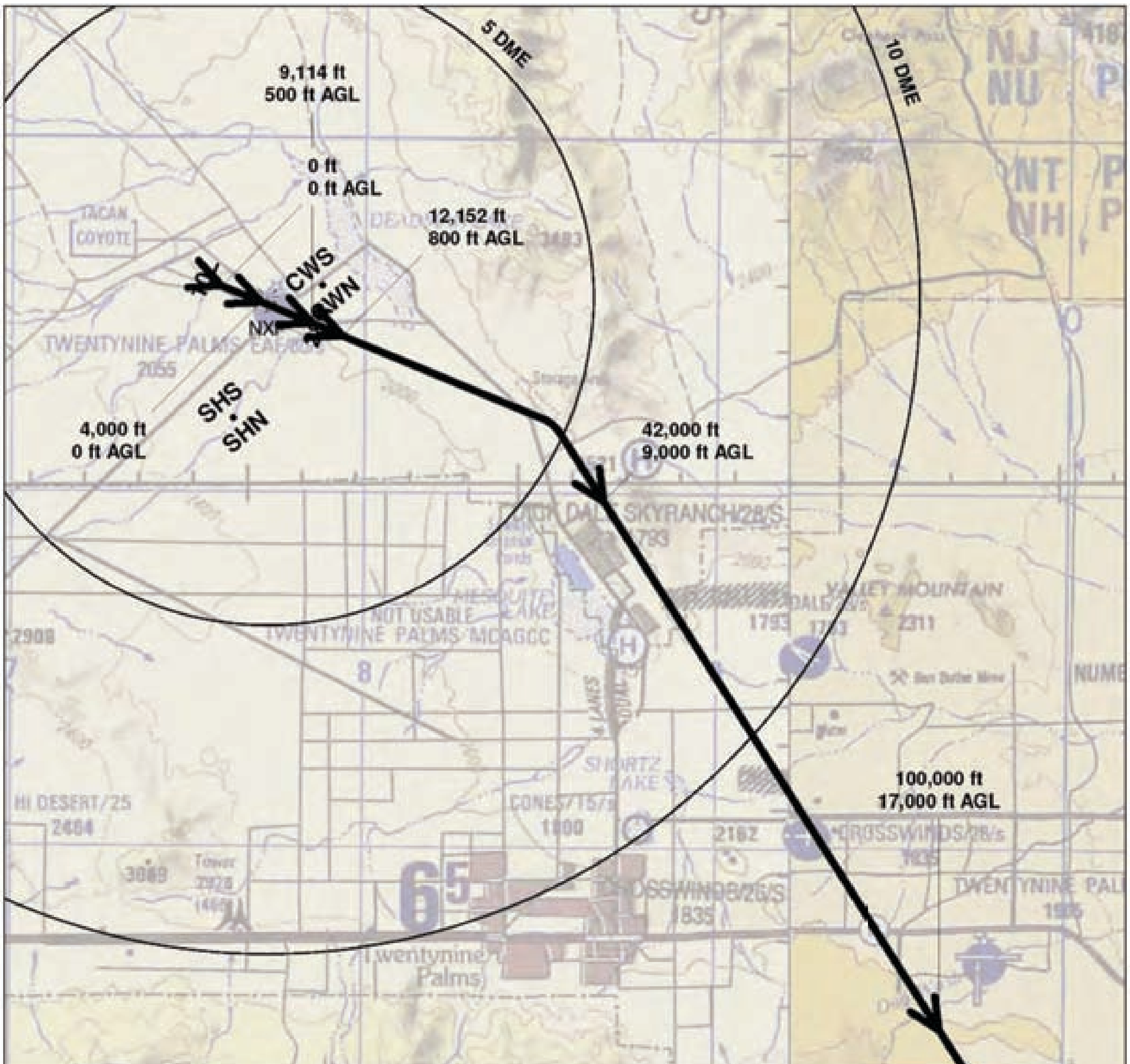
Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	300,000	15,000 AGL	71 Variable	300	Changed altitude to match Hornets
b	120,000	10,000 AGL	80 Variable	300	
c	60,000	3,000 AGL	80 Variable	250	
d	27,667	1,500 AGL	85 Parallel	130	
e	0	50 AGL	85 Parallel	130	

Flight Profile 808 - Straight-In Arrival from W - Pt Giant
EA-6B
on Runway 28R, Flight Track 28A1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:124,000 (1 inch = 10,300 feet)

N



Flight Profile 800

Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	0 AGL	95 Variable	0	
b	4,000	0 AGL	95 Variable	150	
c	9,114	500 AGL	95 Variable	250	
d	12,152	800 AGL	95 Variable	300	
e	42,000	9,000 AGL	95 Variable	300	
f	100,000	17,000 AGL	85 Variable	300	altitude change to level off at 17k like Hornets
g	200,000	17,000 AGL	85 Variable	300	altitude change to level off at 17k like Hornets

Flight Profile 800 - Departure to SE - Lake Bandini Sewage Disposal Ponds

EA-6B

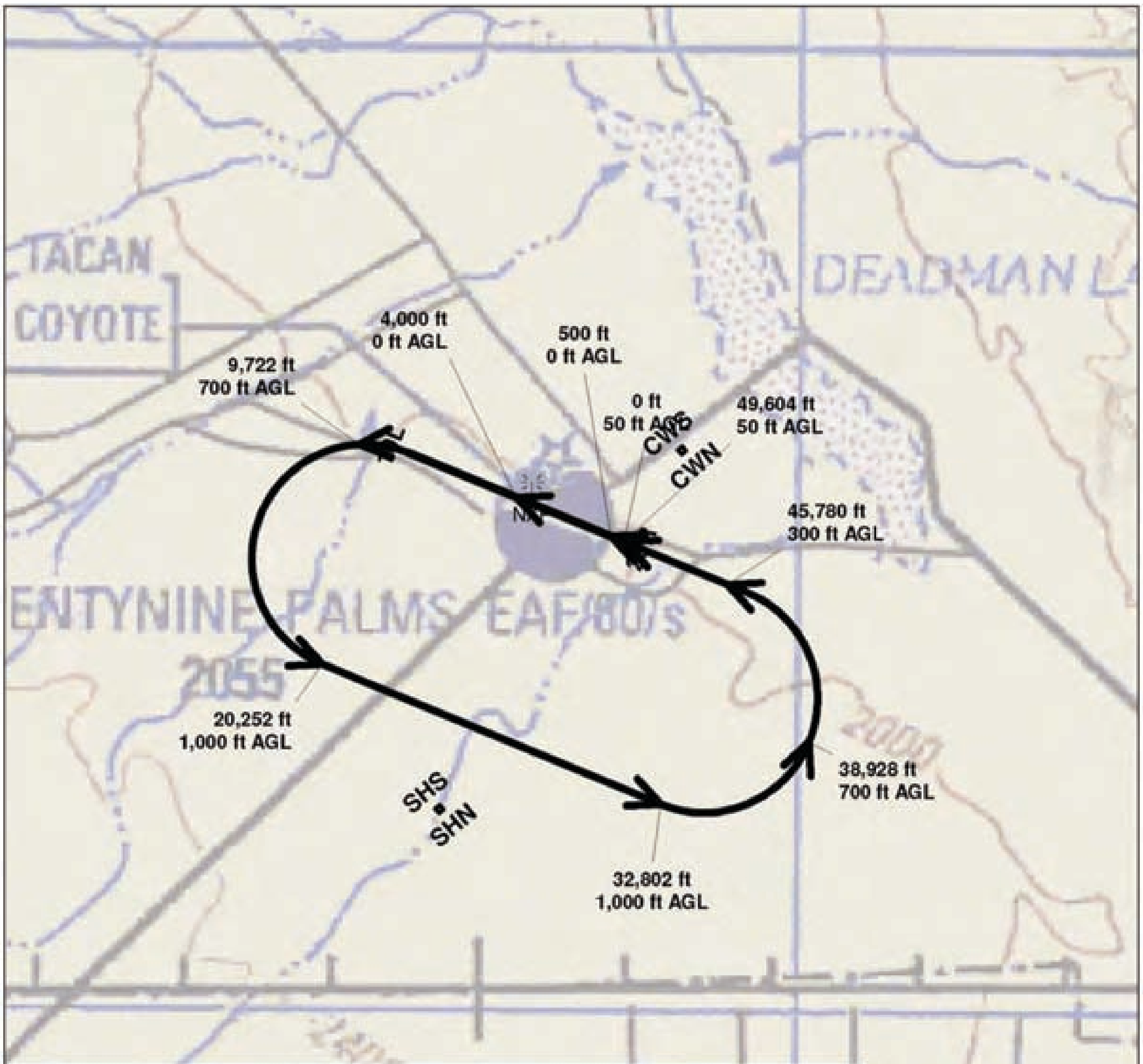
on Runway 10L, Flight Track 10D1

Prior to brake release, aircraft sits at 95 % RPM Variable for 1 seconds

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:192,000 (1 inch = 16,000 feet)

N



Flight Profile 714

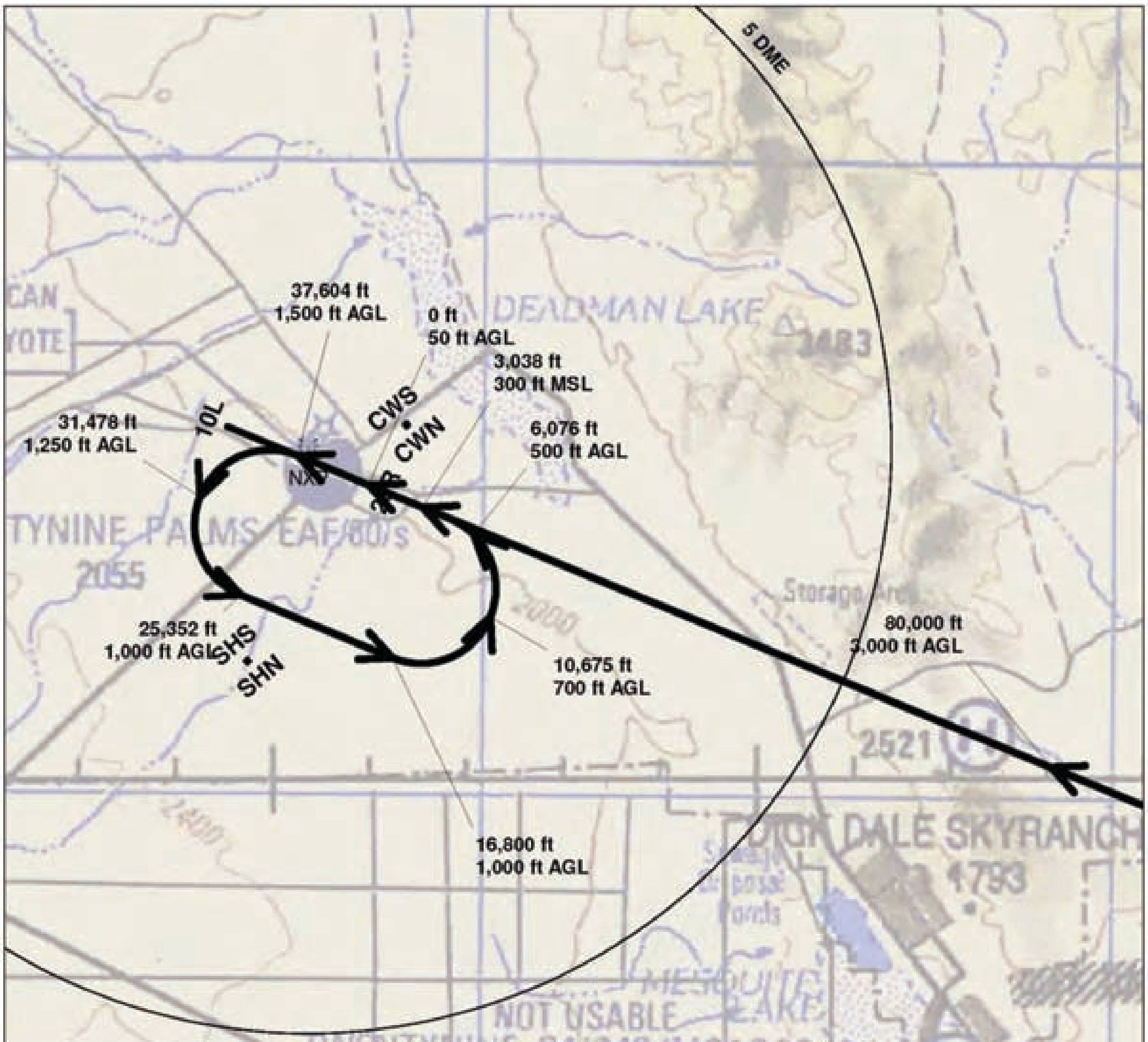
Point	Distance ft	Height ft	Power IN-LBS	Speed kts	Notes
a	0	50 AGL	3000 Approach	125	
b	500	0 AGL	500 Approach	115	
c	4,000	0 AGL	15000 Approach	120	
d	9,722	700 AGL	15000 Approach	135	
e	20,252	1,000 AGL	7000 Approach	145	begin downwind
f	32,802	1,000 AGL	3000 Approach	145	End downwind
g	38,928	700 AGL	3000 Approach	140	shifted forward 600'; crosswind
h	45,780	300 AGL	3000 Approach	130	
i	49,604	50 AGL	3000 Approach	125	

Flight Profile 714
C-130H&N&P
on Runway 28R, Flight Track 28T1

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:71,800 (1 inch = 5,980 feet)

N

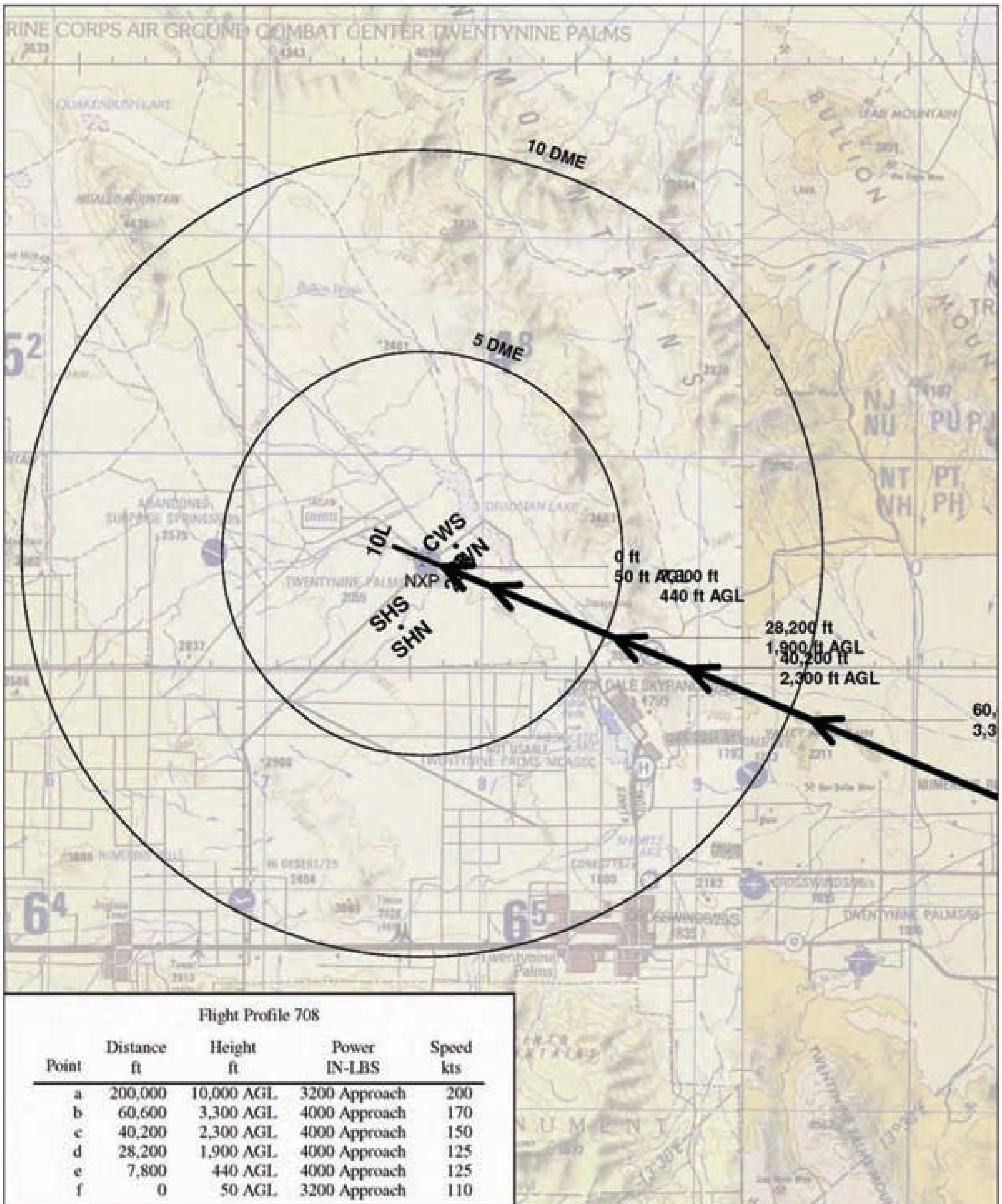


Flight Profile 712

Point	Distance ft	Height ft	Power IN-LBS	Speed kts	Notes
a	137,000	3,000 AGL	8000 Approach	240	
b	80,000	3,000 AGL	8000 Approach	240	
c	37,604	1,500 AGL	500 Variable	240	break point
d	31,478	1,250 AGL	500 Variable	220	halfway thru crosswind leg
e	25,352	1,000 AGL	500 Variable	200	Begin Downwind
f	16,800	1,000 AGL	500 Variable	170	End Downwind
g	10,675	700 AGL	3000 Approach	150	crosswind
h	6,076	500 AGL	3000 Approach	145	
i	3,038	300 MSL	3000 Approach	135	
j	0	50 AGL	3000 Approach	125	

Flight Profile 712
C-130H&N&P
on Runway 28R, Flight Track 28O2

Scale in Feet 1:109,000 (1 inch = 9,110 feet)



Flight Profile 708

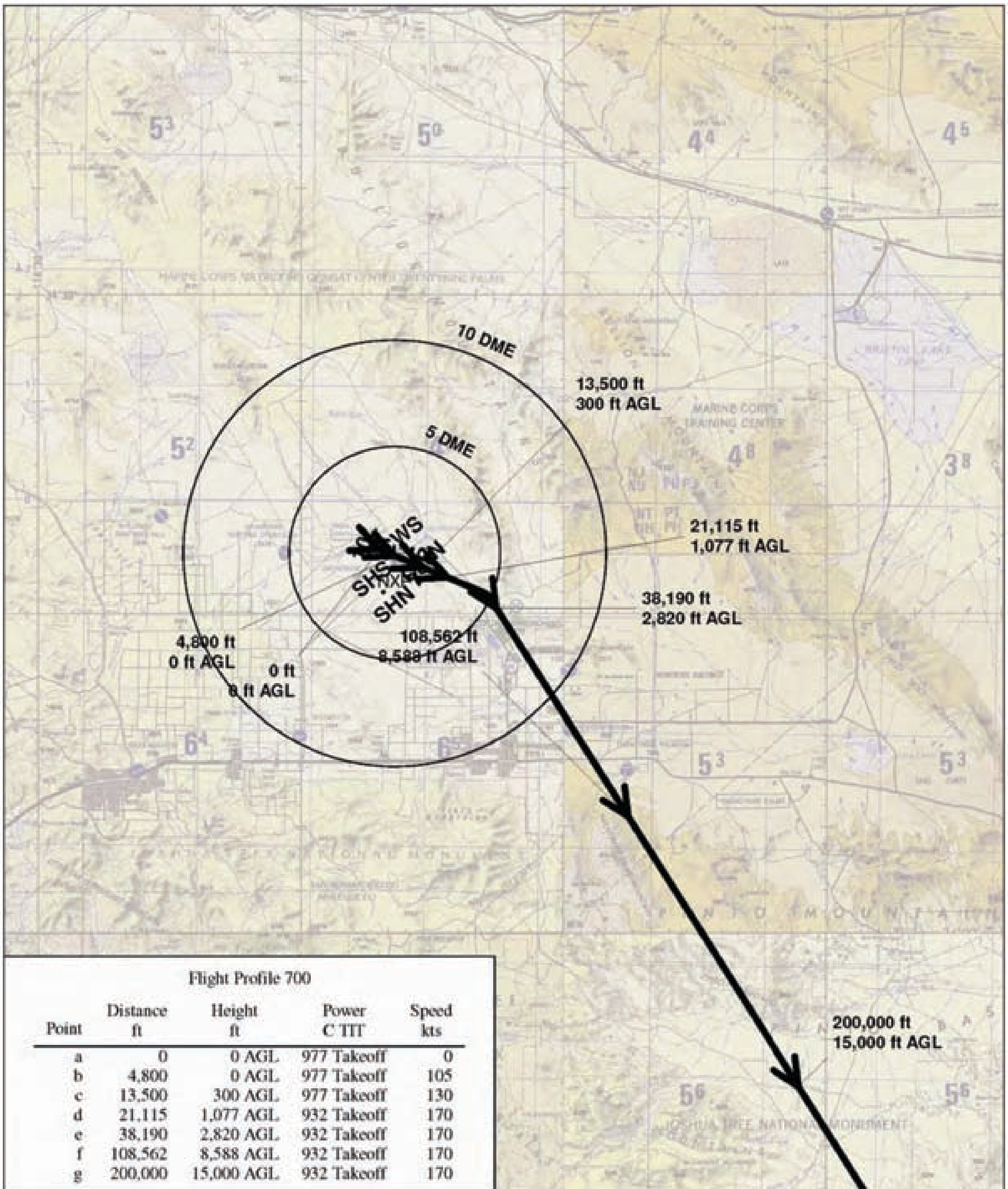
Point	Distance ft	Height ft	Power IN-LBS	Speed kts
a	200,000	10,000 AGL	3200 Approach	200
b	60,600	3,300 AGL	4000 Approach	170
c	40,200	2,300 AGL	4000 Approach	150
d	28,200	1,900 AGL	4000 Approach	125
e	7,800	440 AGL	4000 Approach	125
f	0	50 AGL	3200 Approach	110

Flight Profile 708
C-130H&N&P
on Runway 28R, Flight Track 28A1

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

Scale in Feet 1:278,000 (1 inch = 23,200 feet)

N

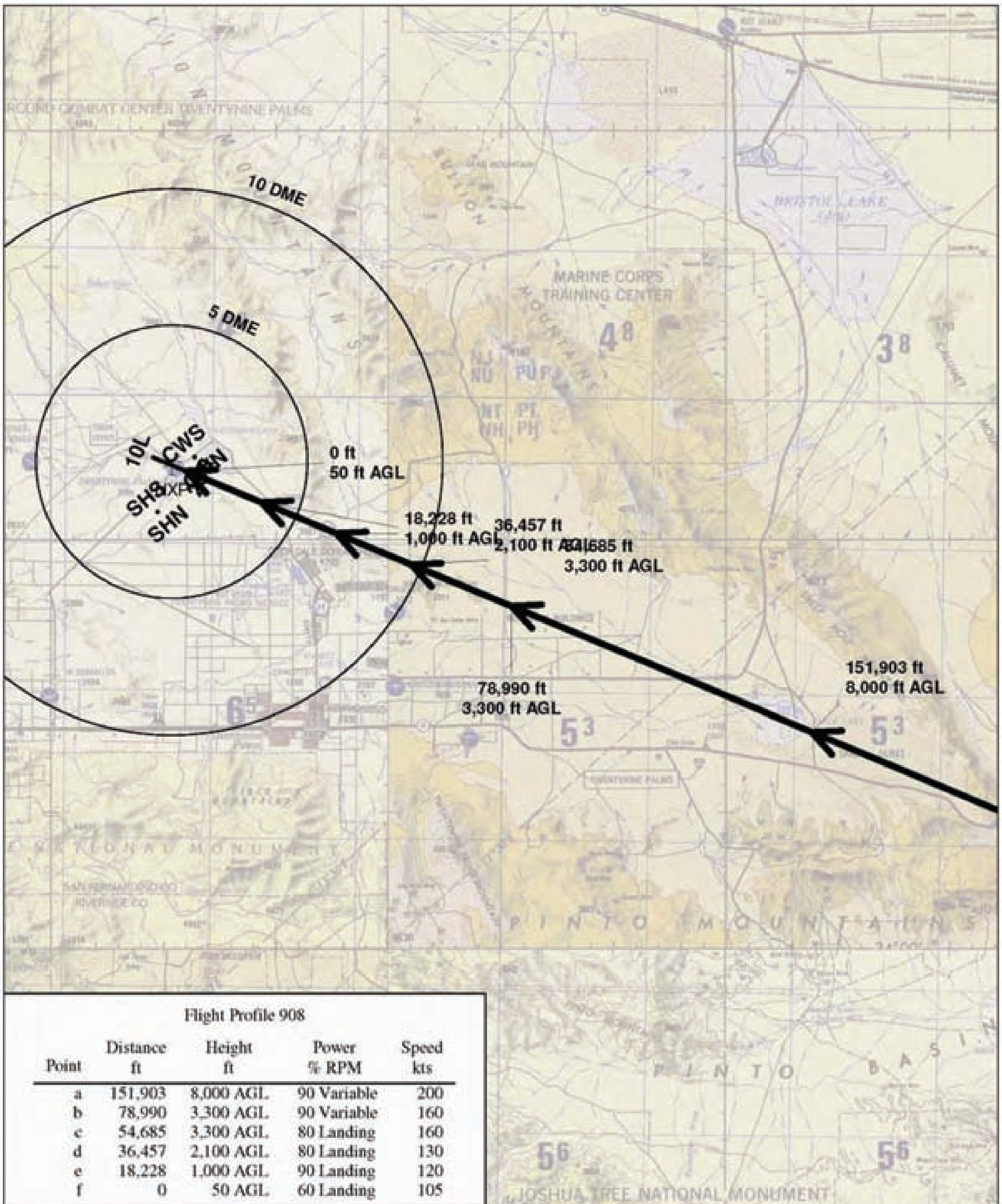


Flight Profile 700

Point	Distance ft	Height ft	Power C TIT	Speed kts
a	0	0 AGL	977 Takeoff	0
b	4,800	0 AGL	977 Takeoff	105
c	13,500	300 AGL	977 Takeoff	130
d	21,115	1,077 AGL	932 Takeoff	170
e	38,190	2,820 AGL	932 Takeoff	170
f	108,562	8,588 AGL	932 Takeoff	170
g	200,000	15,000 AGL	932 Takeoff	170

Flight Profile 700
C-130H&N&P
on Runway 10L, Flight Track 10D1
Prior to brake release, aircraft sits at 977 C TIT Takeoff for 5 seconds

Scale in Feet 1:530,000 (1 inch = 44,200 feet)



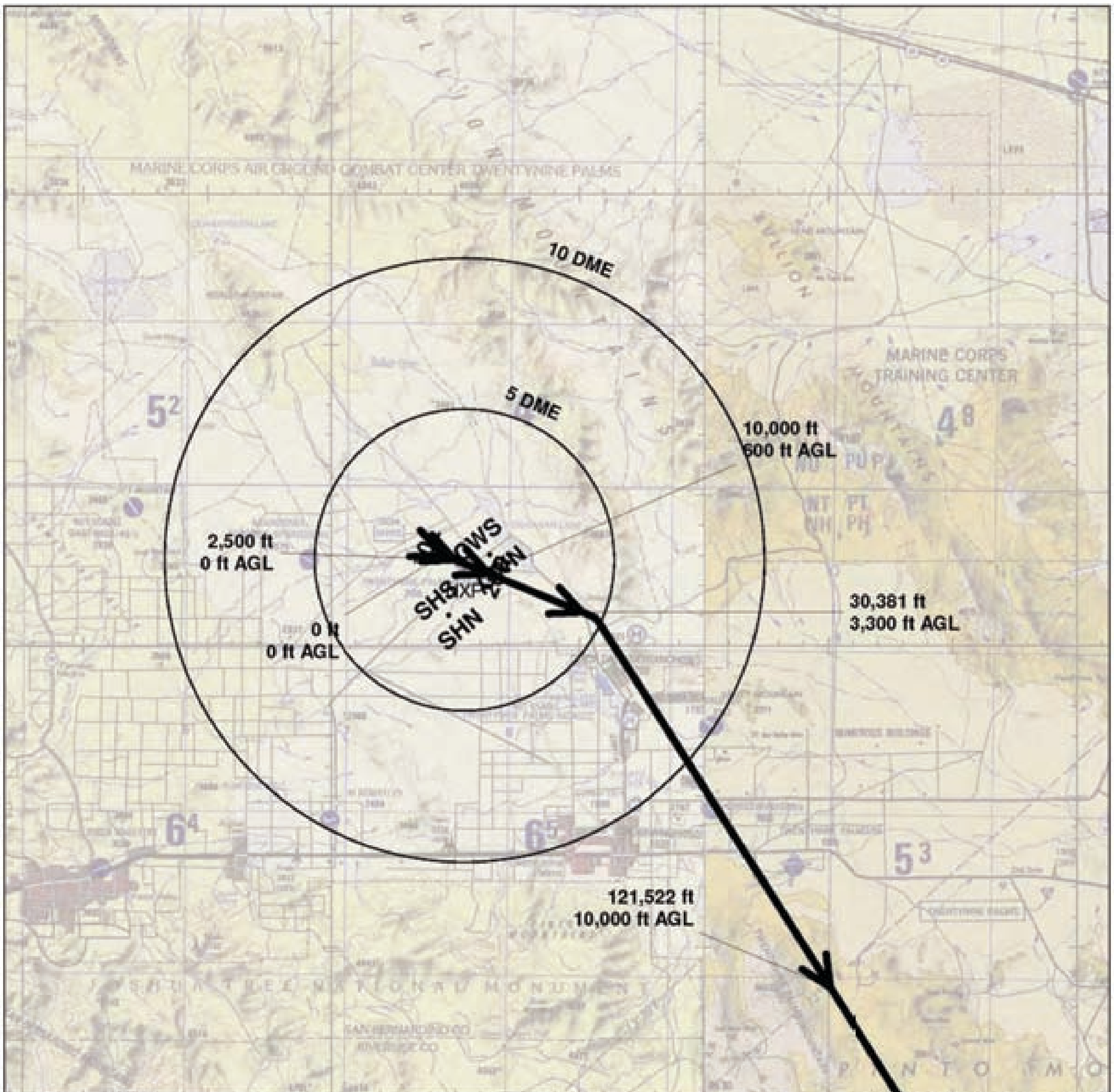
Flight Profile 908

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	151,903	8,000 AGL	90 Variable	200
b	78,990	3,300 AGL	90 Variable	160
c	54,685	3,300 AGL	80 Landing	160
d	36,457	2,100 AGL	80 Landing	130
e	18,228	1,000 AGL	90 Landing	120
f	0	50 AGL	60 Landing	105

Flight Profile 908
C-12
on Runway 28R, Flight Track 28A1

0 20,000 40,000 60,000 80,000 100,000 120,000

Scale in Feet 1:411,000 (1 inch = 34,200 feet)



Flight Profile 900

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	100 Takeoff	0
b	2,500	0 AGL	100 Takeoff	106
c	10,000	600 AGL	95 Takeoff	160
d	30,381	3,300 AGL	95 Takeoff	160
e	121,522	10,000 AGL	95 Takeoff	160

Flight Profile 900

C-12

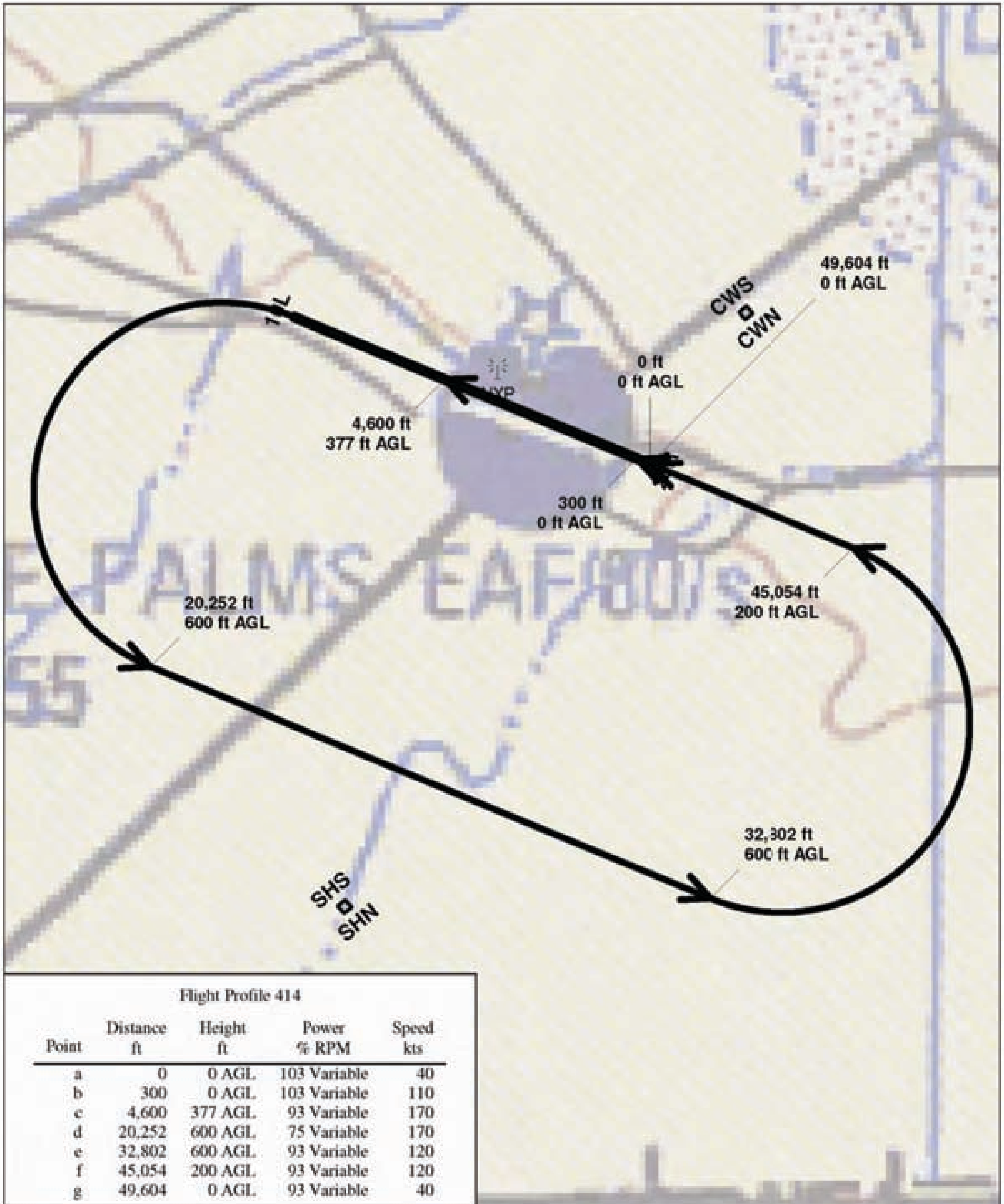
on Runway 10L, Flight Track 10D1

Prior to brake release, aircraft sits at 100 % RPM Takeoff for 15 seconds

0 20,000 40,000 60,000 80,000 100,000 120,000

Scale in Feet 1:413,000 (1 inch = 34,400 feet)

N



Flight Profile 414

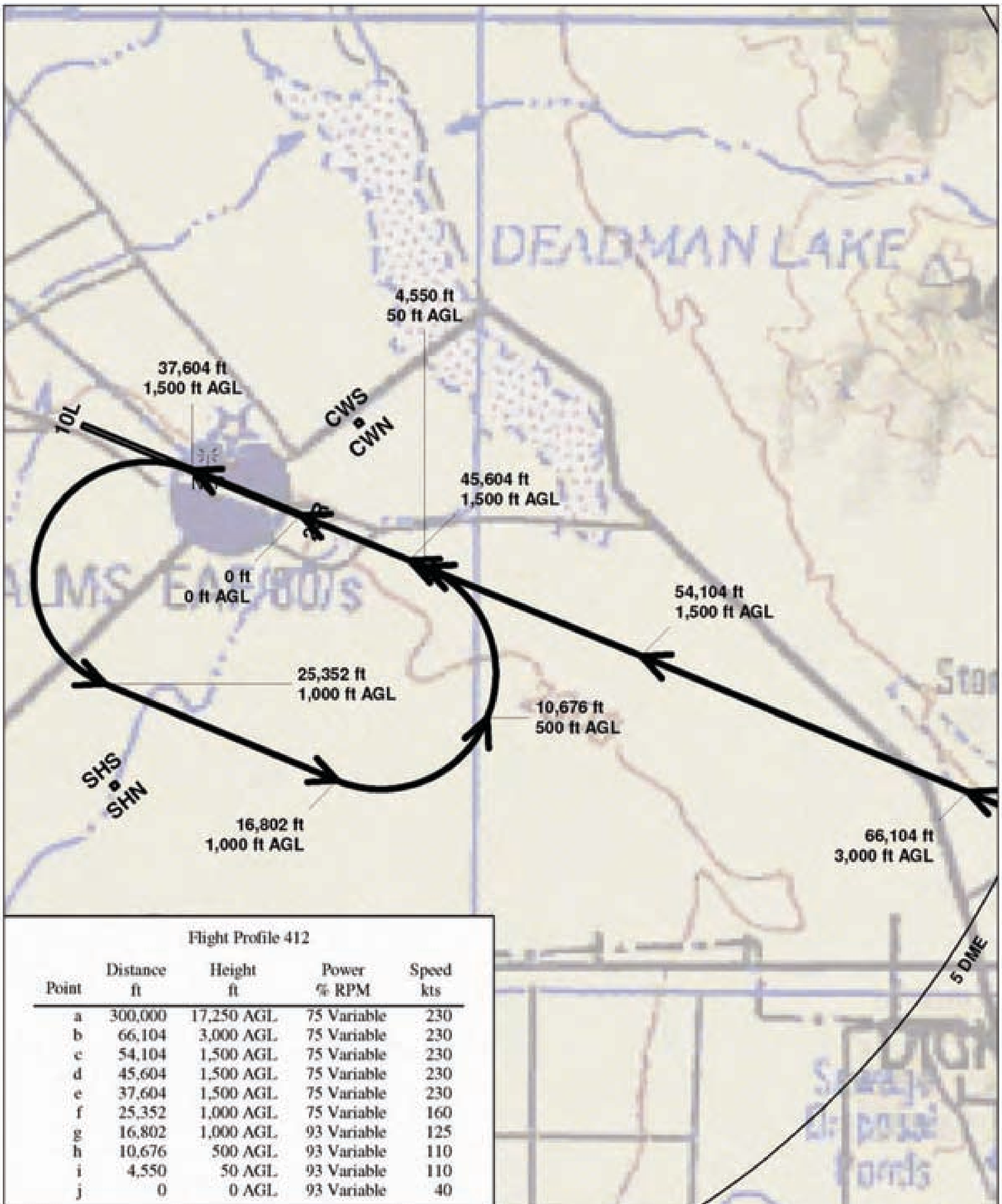
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	103 Variable	40
b	300	0 AGL	103 Variable	110
c	4,600	377 AGL	93 Variable	170
d	20,252	600 AGL	75 Variable	170
e	32,802	600 AGL	93 Variable	120
f	45,054	200 AGL	93 Variable	120
g	49,604	0 AGL	93 Variable	40

Flight Profile 414
AV-8B
on Runway 28R, Flight Track 28T1

0 2,000 4,000 6,000 8,000 10,000 12000

Scale in Feet 1:38,100 (1 inch = 3,170 feet)

N



Flight Profile 412

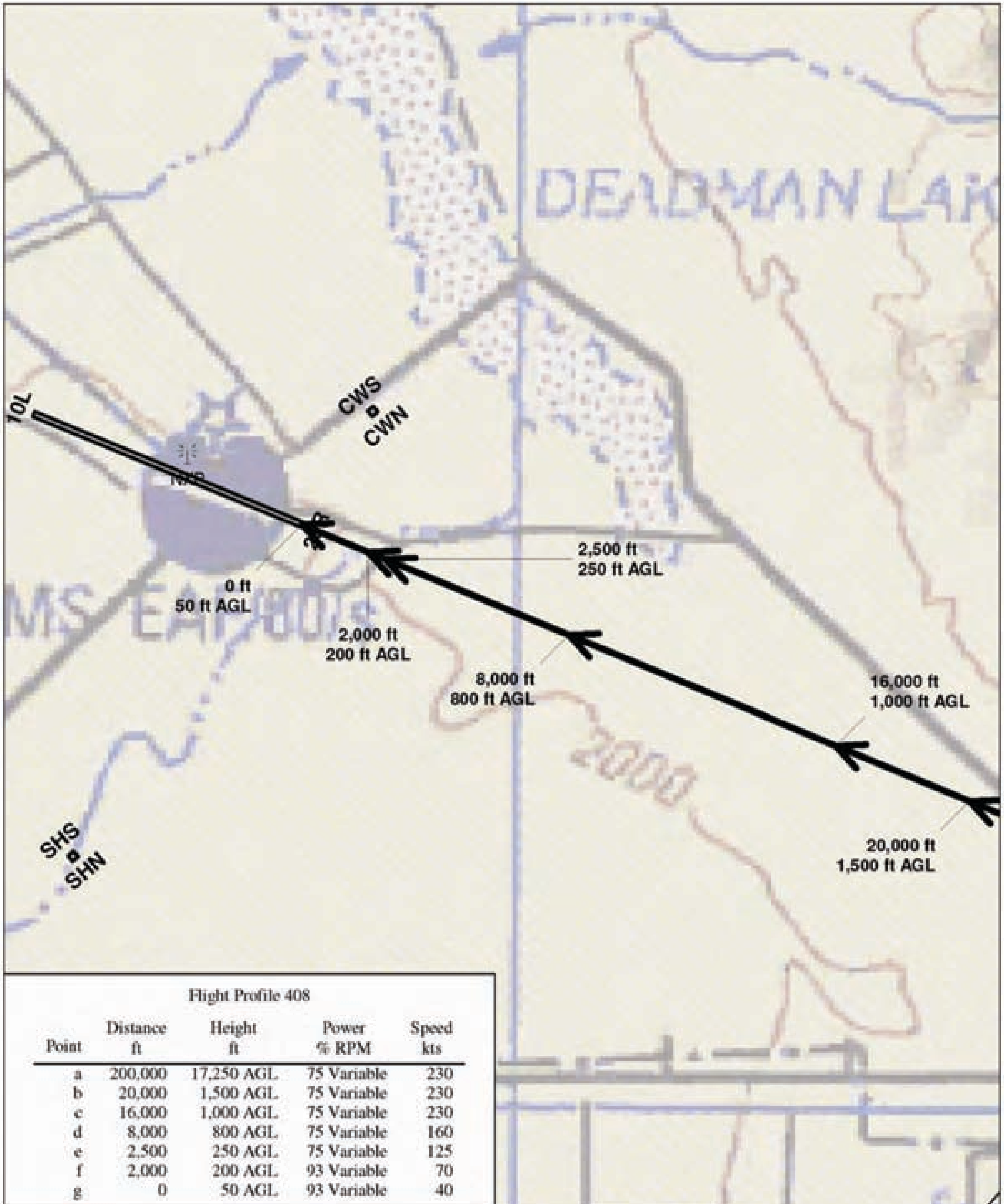
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	300,000	17,250 AGL	75 Variable	230
b	66,104	3,000 AGL	75 Variable	230
c	54,104	1,500 AGL	75 Variable	230
d	45,604	1,500 AGL	75 Variable	230
e	37,604	1,500 AGL	75 Variable	230
f	25,352	1,000 AGL	75 Variable	160
g	16,802	1,000 AGL	93 Variable	125
h	10,676	500 AGL	93 Variable	110
i	4,550	50 AGL	93 Variable	110
j	0	0 AGL	93 Variable	40

Flight Profile 412
AV-8B
on Runway 28R, Flight Track 28O2

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000

Scale in Feet 1:62,300 (1 inch = 5,190 feet)

N



Flight Profile 408

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	17,250 AGL	75 Variable	230
b	20,000	1,500 AGL	75 Variable	230
c	16,000	1,000 AGL	75 Variable	230
d	8,000	800 AGL	75 Variable	160
e	2,500	250 AGL	75 Variable	125
f	2,000	200 AGL	93 Variable	70
g	0	50 AGL	93 Variable	40

Flight Profile 408
AV-8B
on Runway 28R, Flight Track 28A1

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000

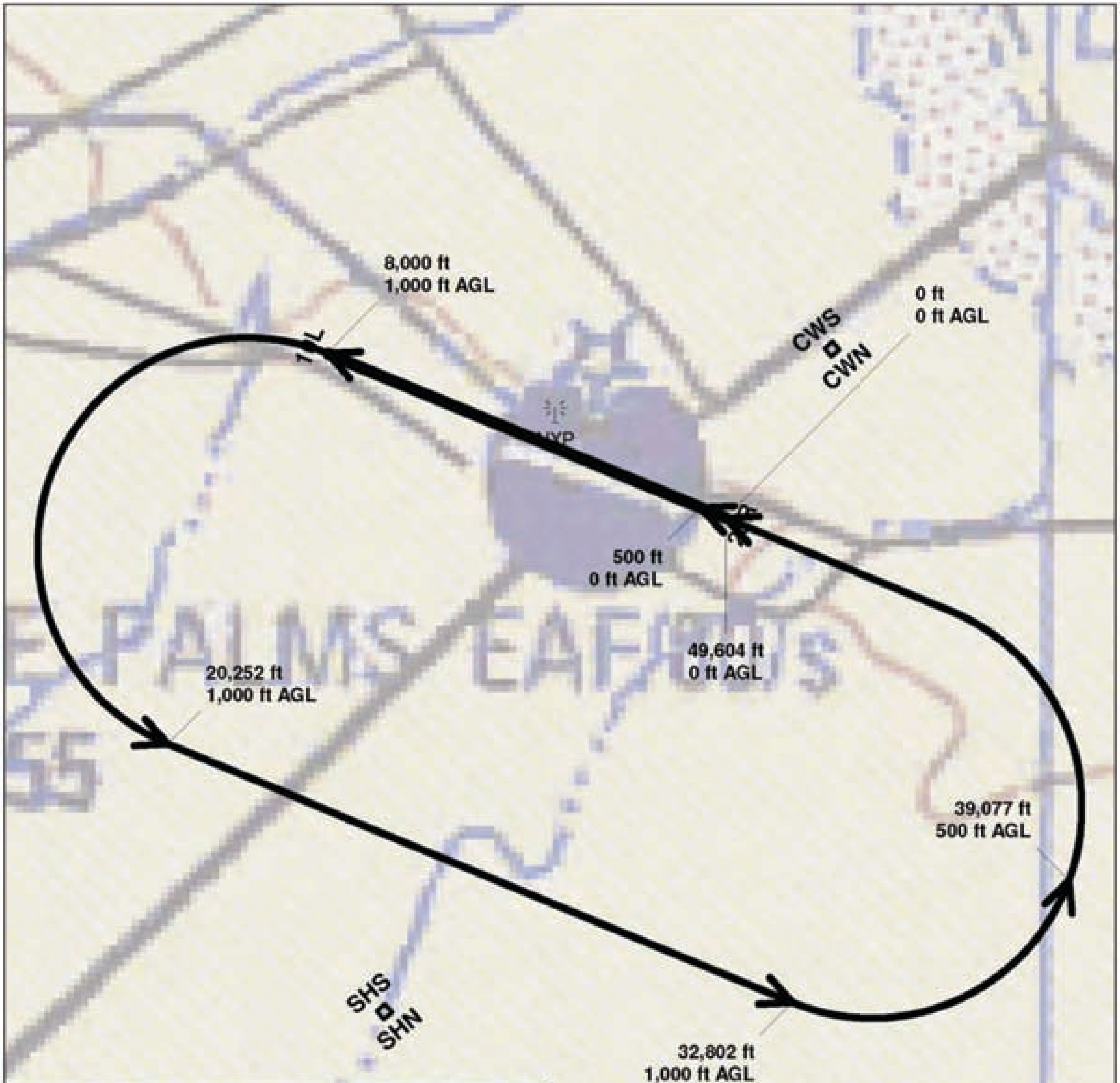
Scale in Feet 1:50,900 (1 inch = 4,240 feet)

Flight Profile 400

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	103 Variable	0
b	3,000	0 AGL	103 Variable	110
c	4,600	100 AGL	93 Variable	110
d	13,700	1,000 AGL	93 Variable	145
e	23,200	1,500 AGL	85 Variable	200
f	42,300	2,500 AGL	85 Variable	300
g	100,000	15,000 AGL	85 Variable	300

Flight Profile 400
AV-8B
on Runway 10L, Flight Track 10D1

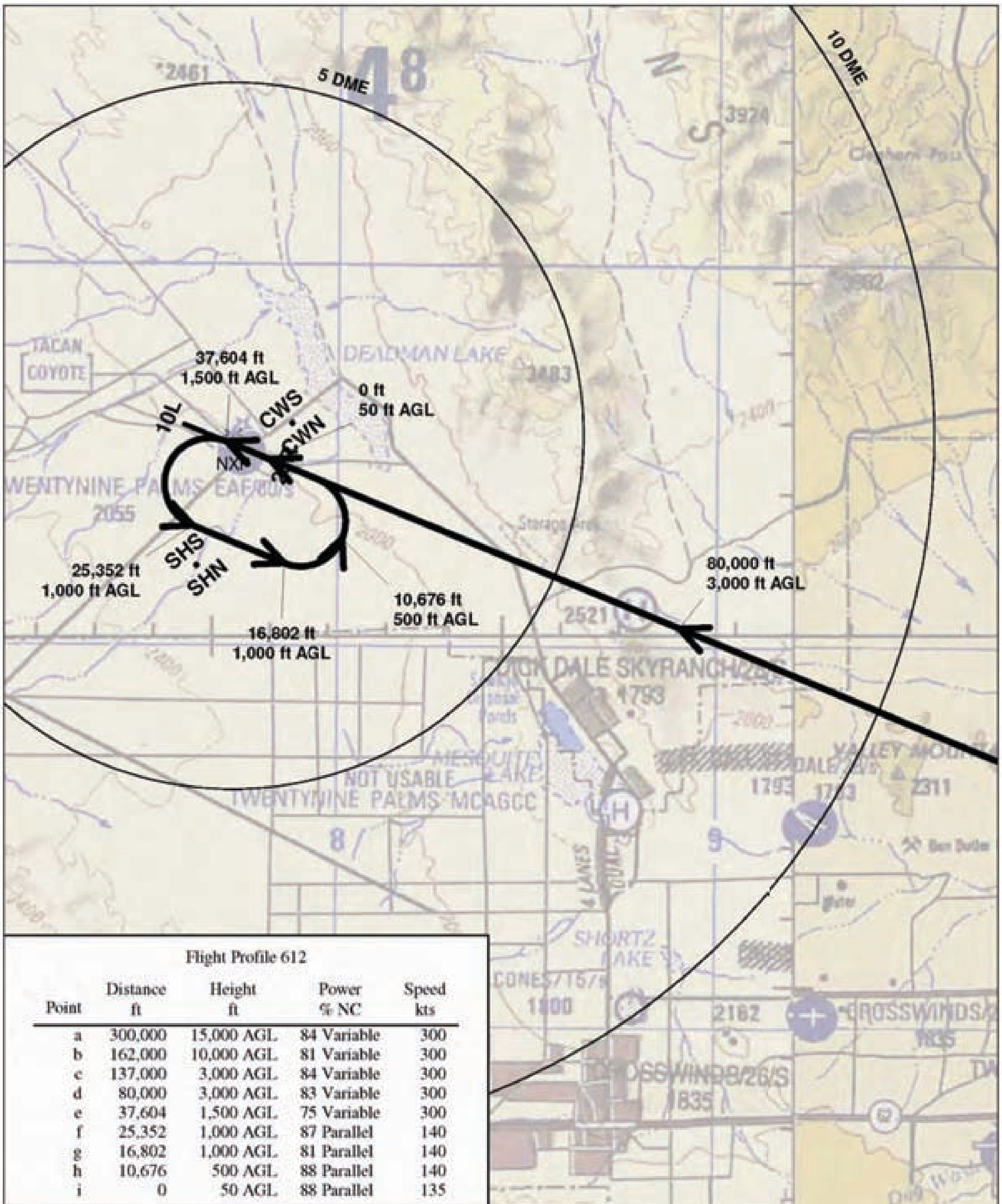
Scale in Feet 1:72,300 (1 inch = 6,030 feet)



Flight Profile 614

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	96.5 Variable	140
b	500	0 AGL	96.5 Variable	150
c	8,000	1,000 AGL	87 Parallel	150
d	20,252	1,000 AGL	87 Parallel	140
e	32,802	1,000 AGL	81 Parallel	140
f	39,077	500 AGL	88 Parallel	140
g	49,604	0 AGL	88 Parallel	140

Flight Profile 614 - Touch and Go on Runway 28 (to the south of the Runway)
F-18E/F
on Runway 28R, Flight Track 28T1



Point	Distance ft	Height ft	Power % NC	Speed kts
a	300,000	15,000 AGL	84 Variable	300
b	162,000	10,000 AGL	81 Variable	300
c	137,000	3,000 AGL	84 Variable	300
d	80,000	3,000 AGL	83 Variable	300
e	37,604	1,500 AGL	75 Variable	300
f	25,352	1,000 AGL	87 Parallel	140
g	16,802	1,000 AGL	81 Parallel	140
h	10,676	500 AGL	88 Parallel	140
i	0	50 AGL	88 Parallel	135

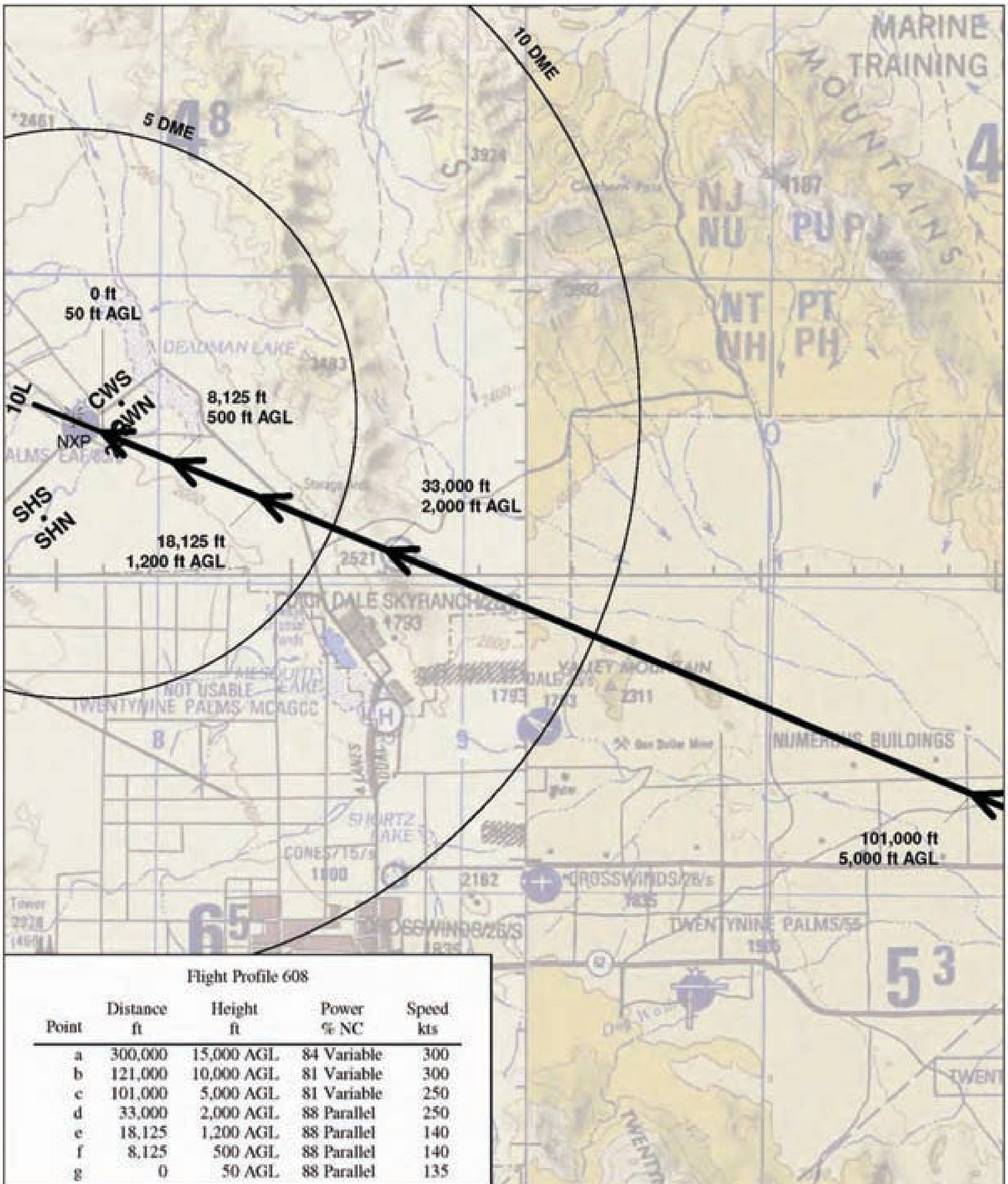
Flight Profile 612

Flight Profile 612 - Overhead Break Arrival Mid Runway (90% of the time)
F-18E/F
on Runway 28R, Flight Track 28O2

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:159,000 (1 inch = 13,200 feet)

N



Flight Profile 608

Point	Distance ft	Height ft	Power % NC	Speed kts
a	300,000	15,000 AGL	84 Variable	300
b	121,000	10,000 AGL	81 Variable	300
c	101,000	5,000 AGL	81 Variable	250
d	33,000	2,000 AGL	88 Parallel	250
e	18,125	1,200 AGL	88 Parallel	140
f	8,125	500 AGL	88 Parallel	140
g	0	50 AGL	88 Parallel	135

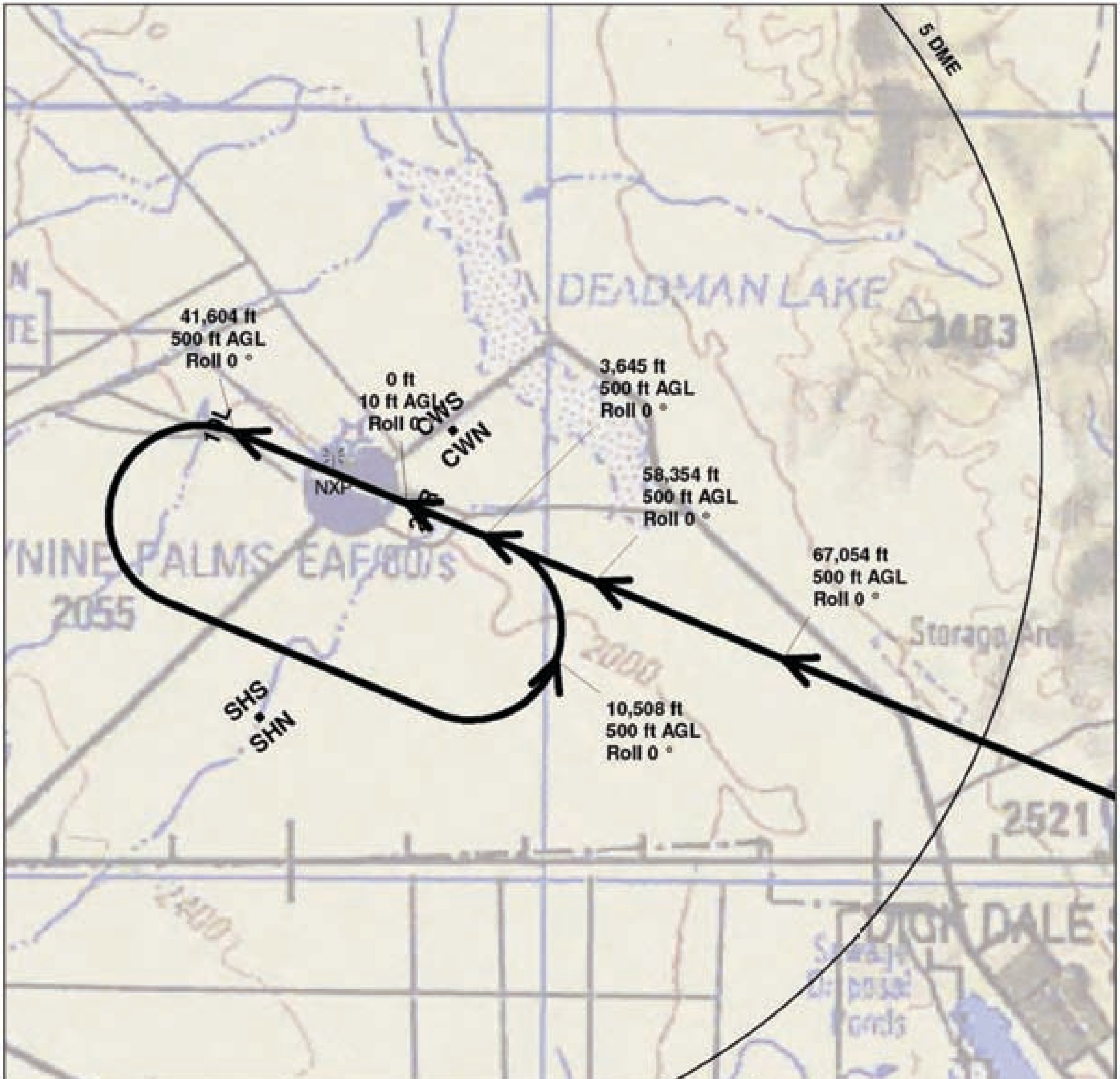
Flight Profile 608 - Straight-In Arrival from SE - Lake Bandini Sewage Disposal Ponds

F-18E/F

on Runway 28R, Flight Track 28A1

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:198,000 (1 inch = 16,500 feet)



Flight Profile 123

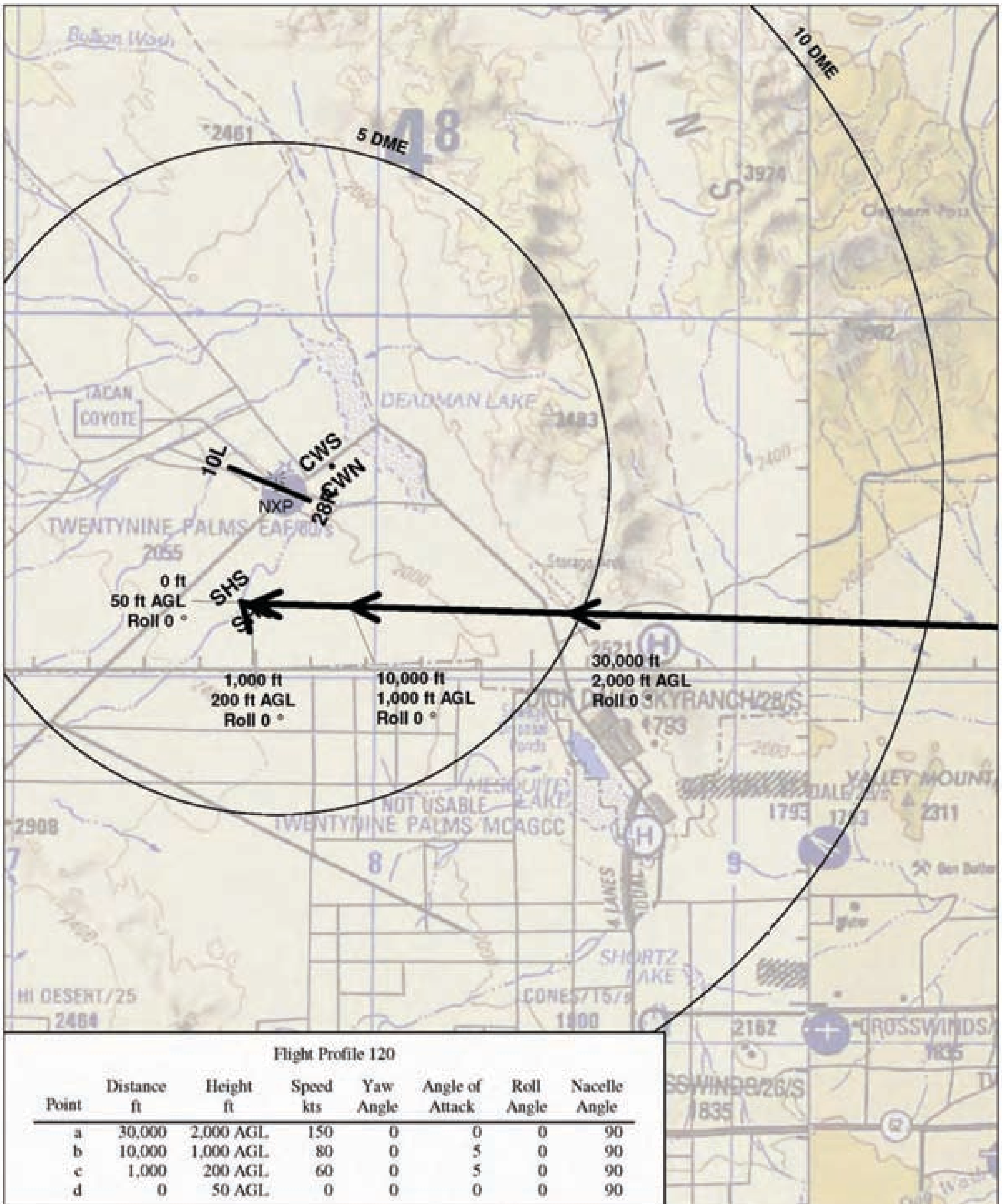
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	200,000	10,000 AGL	200	0	0	0	90
b	67,054	500 AGL	200	0	0	0	90
c	58,354	500 AGL	200	0	0	0	90
d	41,604	500 AGL	200	0	0	0	90
e	10,508	500 AGL	200	0	0	0	90
f	3,645	500 AGL	200	0	0	0	90
g	0	10 AGL	200	0	0	0	90

Flight Profile 123
CH53E
on Runway 28R, Flight Track 28O1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:87,900 (1 inch = 7,330 feet)

N



Flight Profile 120

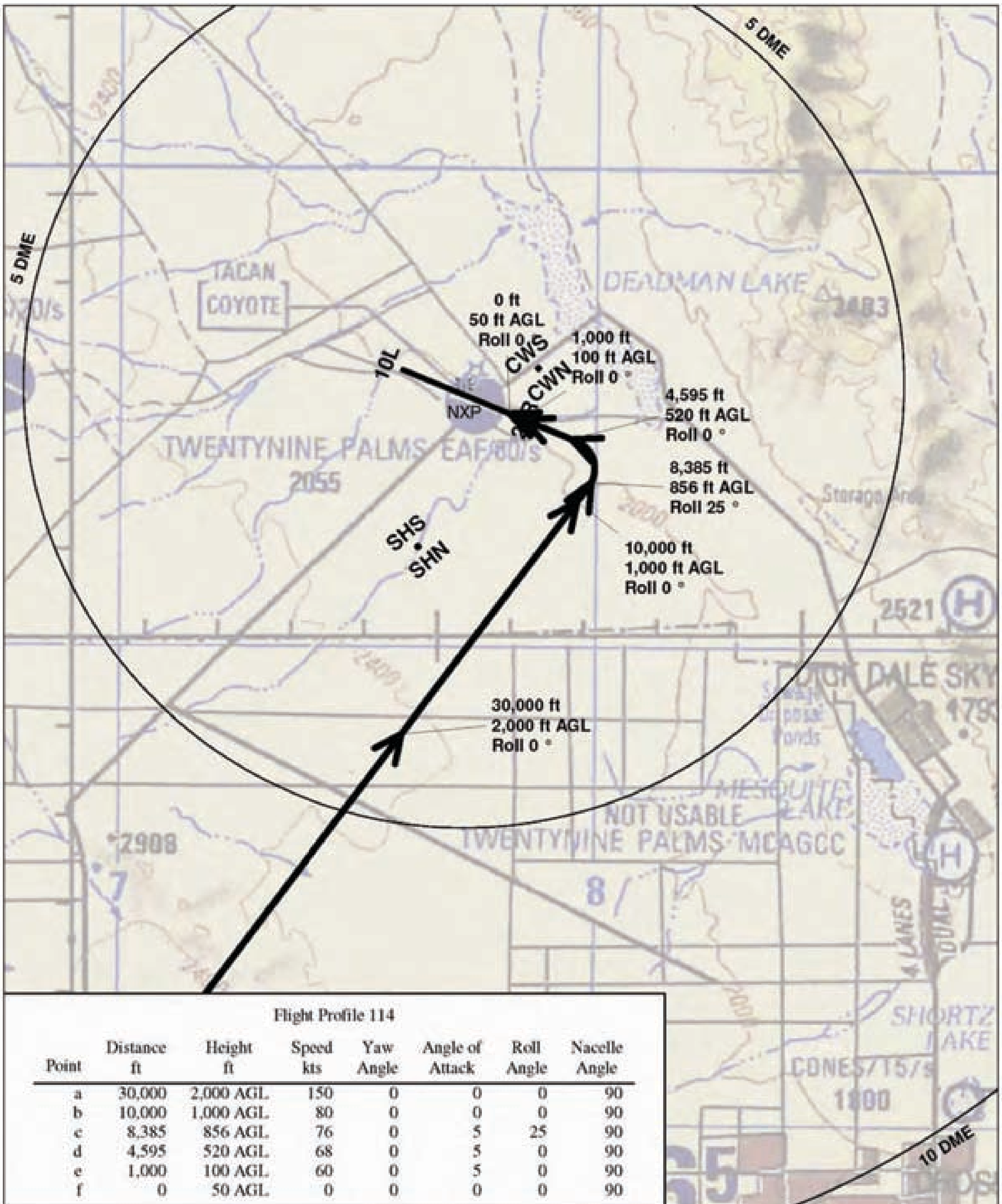
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	30,000	2,000 AGL	150	0	0	0	90
b	10,000	1,000 AGL	80	0	5	0	90
c	1,000	200 AGL	60	0	5	0	90
d	0	50 AGL	0	0	0	0	90

Flight Profile 120
CH53E
on Runway SHN, Flight Track SA1

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:167,000 (1 inch = 13,900 feet)

N



Flight Profile 114

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	30,000	2,000 AGL	150	0	0	0	90
b	10,000	1,000 AGL	80	0	0	0	90
c	8,385	856 AGL	76	0	5	25	90
d	4,595	520 AGL	68	0	5	0	90
e	1,000	100 AGL	60	0	5	0	90
f	0	50 AGL	0	0	0	0	90

Flight Profile 114
CH53E
on Runway 28R, Flight Track 28A2

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:127,000 (1 inch = 10,500 feet)

N

Flight Profile 108

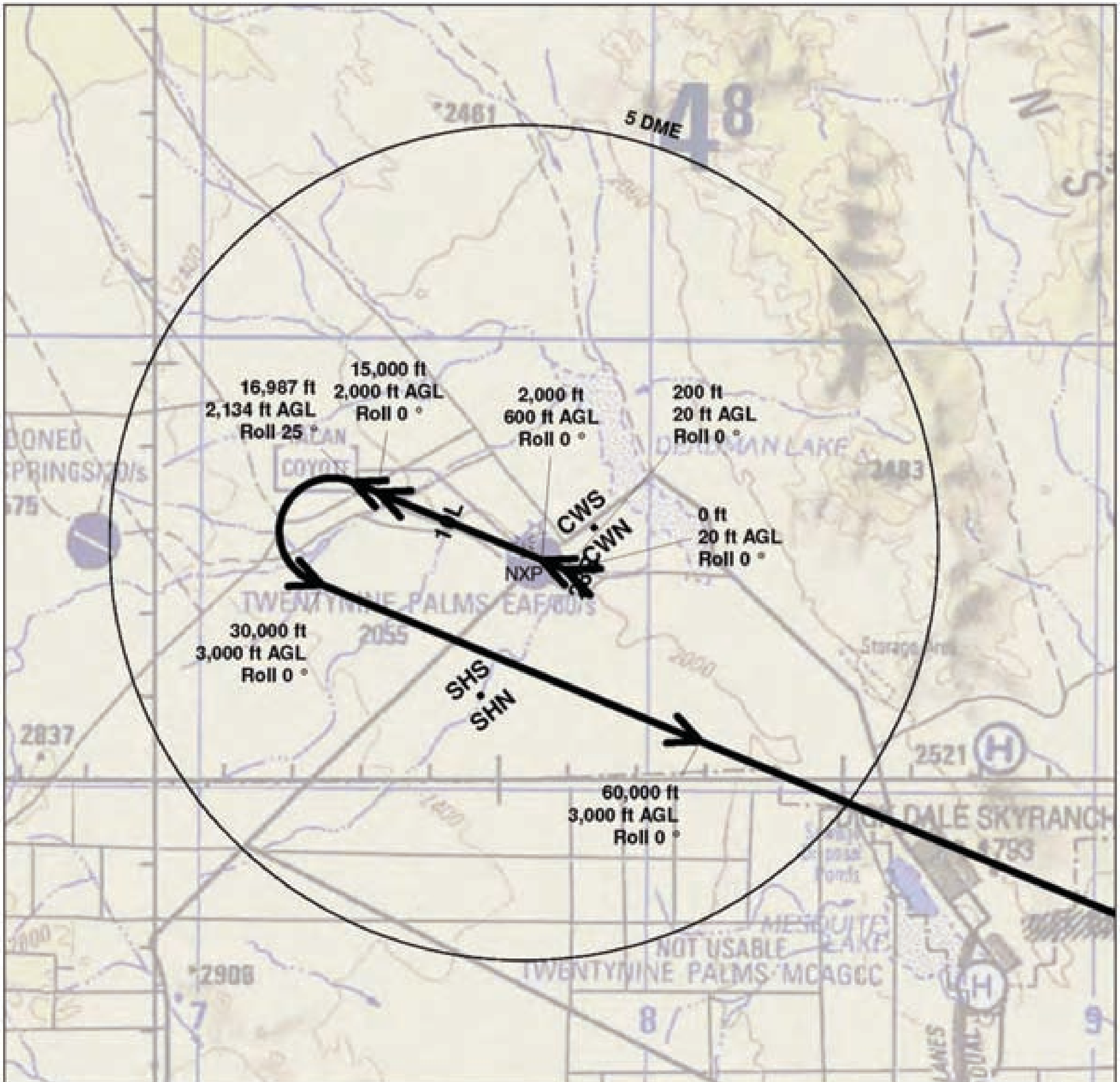
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	200	0	0	0	90	altitude changed from 0 to 20 ft AGL
b	200	20 AGL	20	0	-5	0	90	
c	2,000	600 AGL	105	0	-5	0	90	
d	15,000	2,000 AGL	120	0	0	0	90	
e	19,947	2,330 AGL	120	0	0	15	90	
f	25,360	2,691 AGL	120	0	0	0	90	
g	30,000	3,000 AGL	120	0	0	0	90	
h	60,145	5,000 AGL	120	0	0	0	90	

Flight Profile 108
CH53E
on Runway CWN, Flight Track WD1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:134,000 (1 inch = 11,100 feet)

N



Flight Profile 105

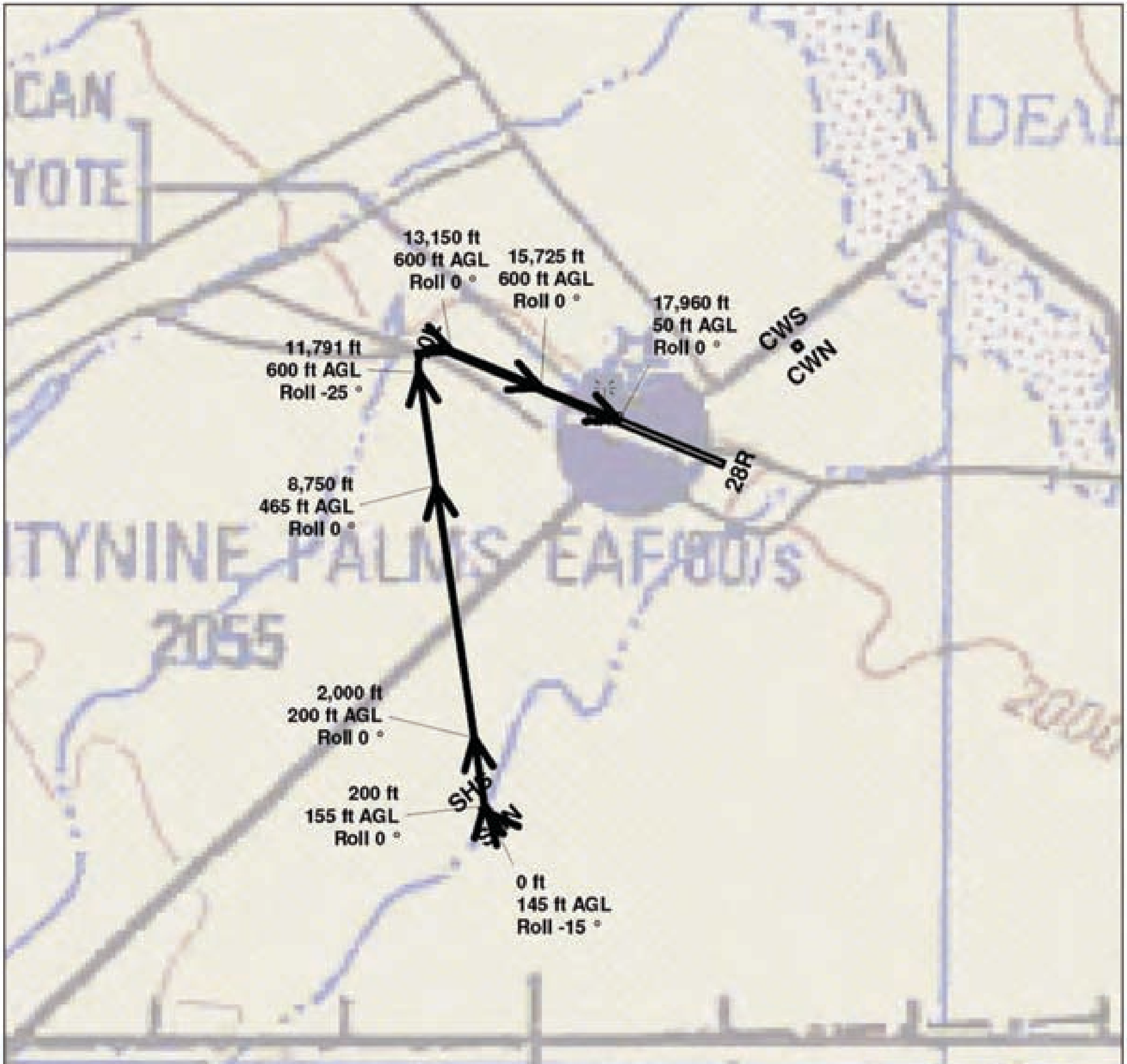
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	200	0	0	0	90	altitude changed from 0 to 20 ft AGL
b	200	20 AGL	20	0	-5	0	90	
c	2,000	600 AGL	105	0	-5	0	90	
d	15,000	2,000 AGL	120	0	0	0	90	
e	16,987	2,134 AGL	120	0	0	25	90	
f	30,000	3,000 AGL	120	0	0	0	90	
g	60,000	3,000 AGL	120	0	0	0	90	

Flight Profile 105
CH53E
on Runway 28R, Flight Track 28D1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000

Scale in Feet 1:150,000 (1 inch = 12,500 feet)

N



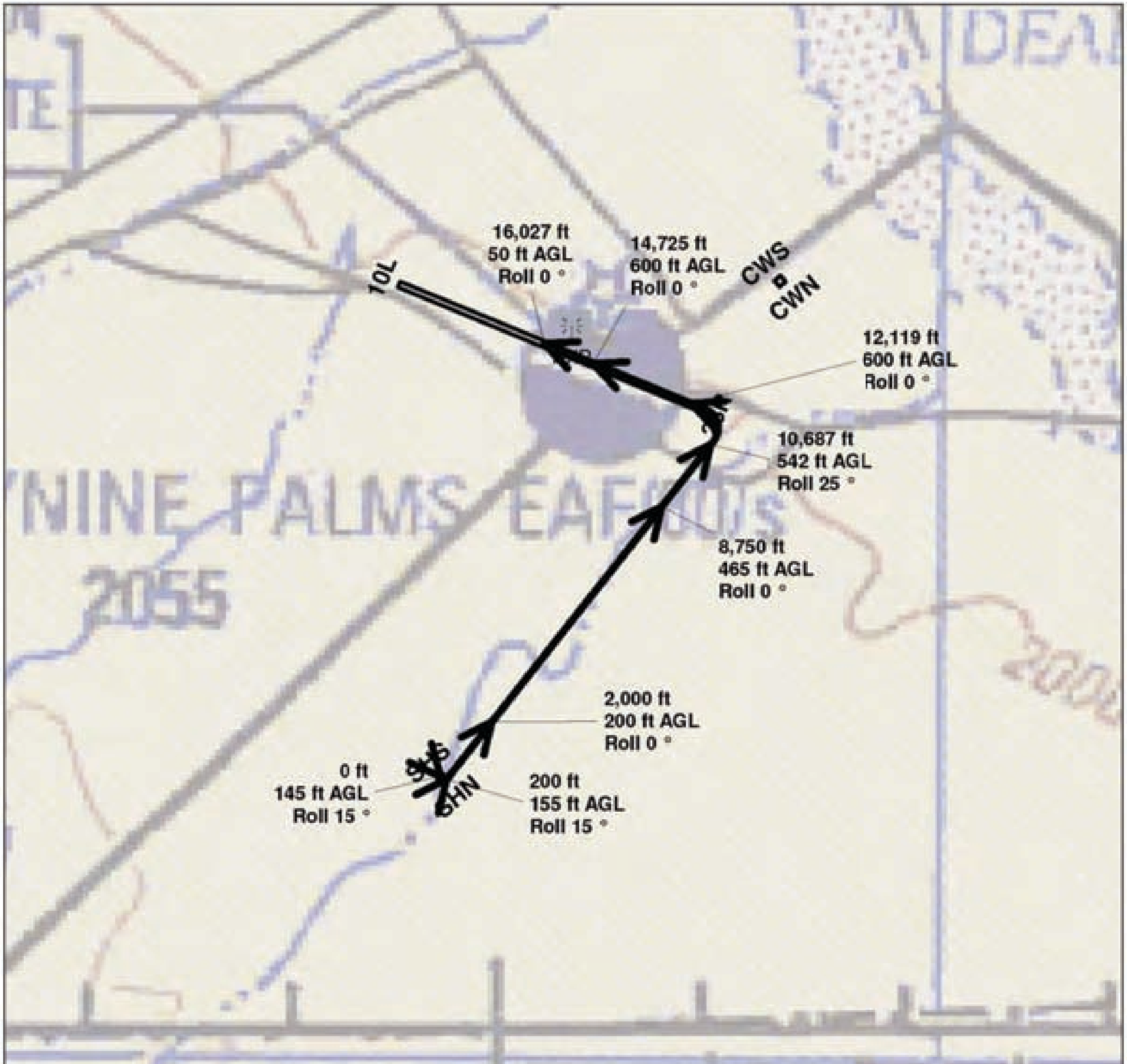
Flight Profile 228

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	145 AGL	0	0	0	-15	90
b	200	155 AGL	20	0	-5	0	90
c	2,000	200 AGL	70	0	0	0	90
d	8,750	465 AGL	70	0	0	0	90
e	11,791	600 AGL	70	0	0	-25	90
f	13,150	600 AGL	63	0	0	0	90
g	15,725	600 AGL	60	0	5	0	90
h	17,960	50 AGL	0	0	0	0	90

Flight Profile 228
CH46E
on Runway SHN, Flight Track SI2

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,300
Scale in Feet 1:54,900 (1 inch = 4,570 feet)

N



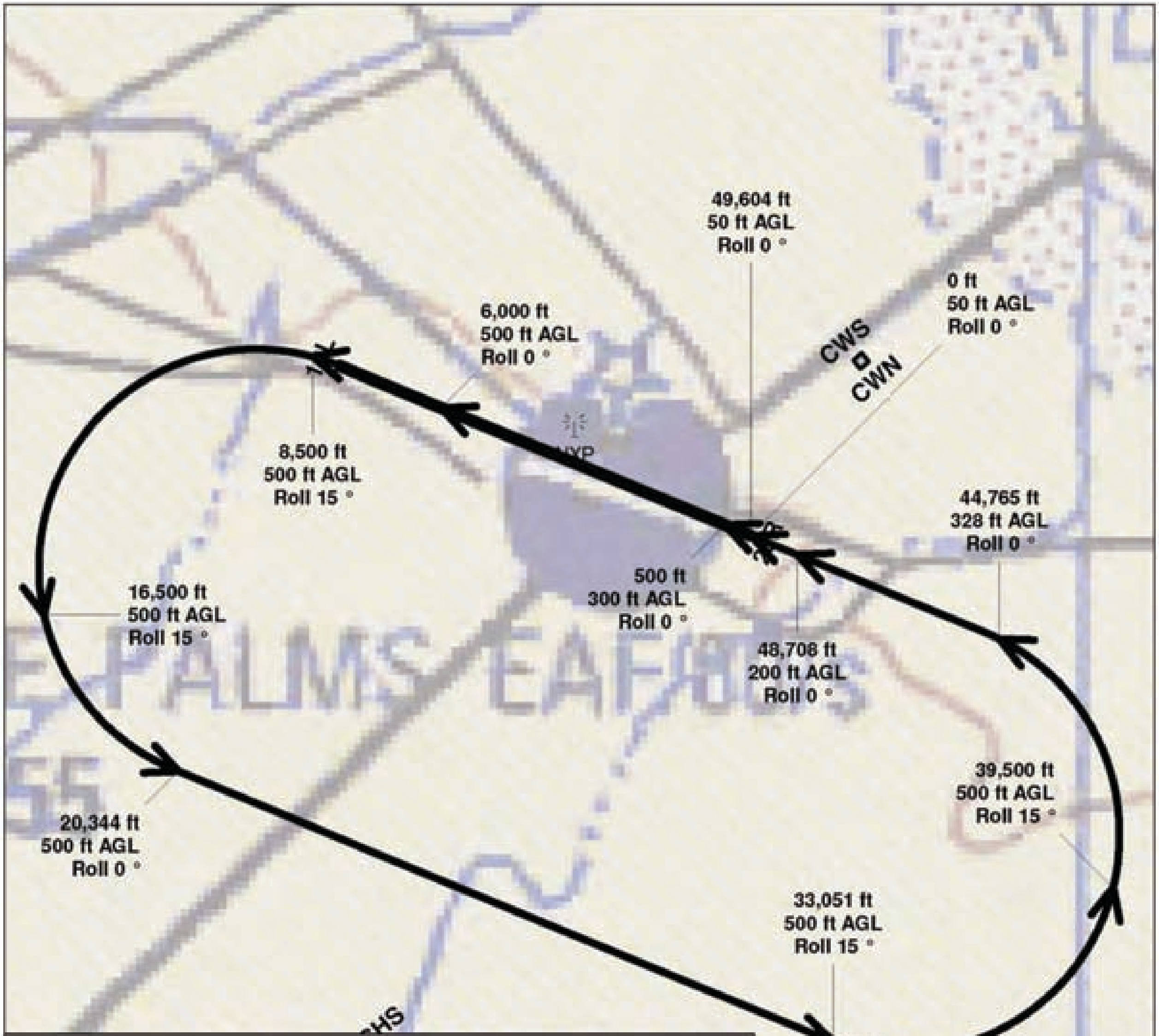
Flight Profile 227

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	145 AGL	0	0	0	15	90
b	200	155 AGL	20	0	-5	15	90
c	2,000	200 AGL	70	0	0	0	90
d	8,750	465 AGL	70	0	0	0	90
e	10,687	542 AGL	70	0	0	25	90
f	12,119	600 AGL	70	0	0	0	90
g	14,725	600 AGL	60	0	5	0	90
h	16,027	50 AGL	0	0	0	0	90

Flight Profile 227
CH46E
on Runway SHS, Flight Track SI1

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000

Scale in Feet 1:50,900 (1 inch = 4,240 feet)

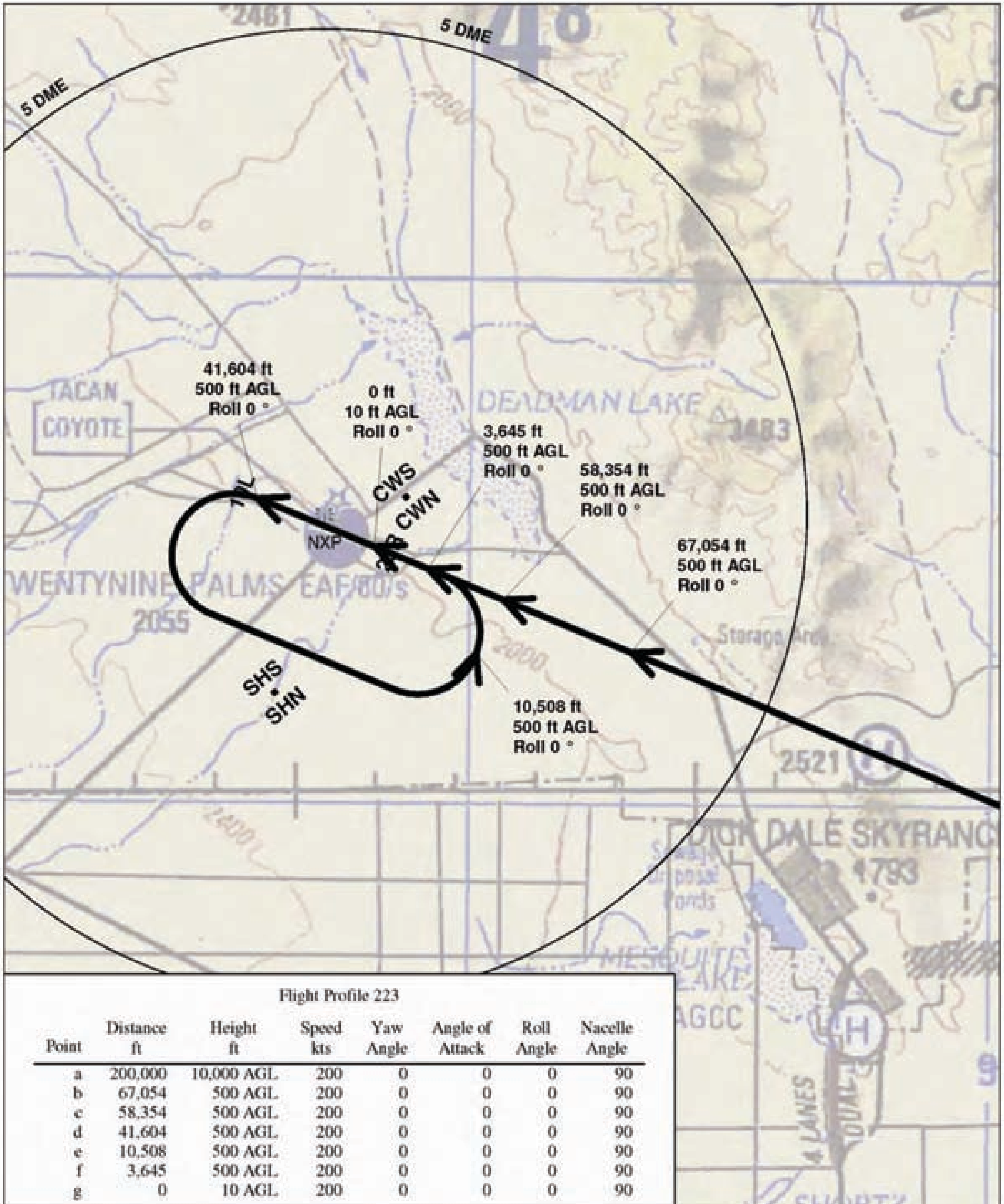


Flight Profile 226

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	50 AGL	0	0	0	0	90
b	500	300 AGL	60	0	-5	0	90
c	6,000	500 AGL	110	0	0	0	90
d	8,500	500 AGL	110	0	0	15	90
e	16,500	500 AGL	110	0	0	15	90
f	20,344	500 AGL	110	0	0	0	90
g	33,051	500 AGL	90	0	0	15	90
h	39,500	500 AGL	80	0	0	15	90
i	44,765	328 AGL	68	0	0	0	90
j	48,708	200 AGL	60	0	0	0	90
k	49,604	50 AGL	0	0	0	0	90

Flight Profile 226
CH46E
on Runway 28R, Flight Track 28T1

Scale in Feet 1:38,100 (1 inch = 3,170 feet)



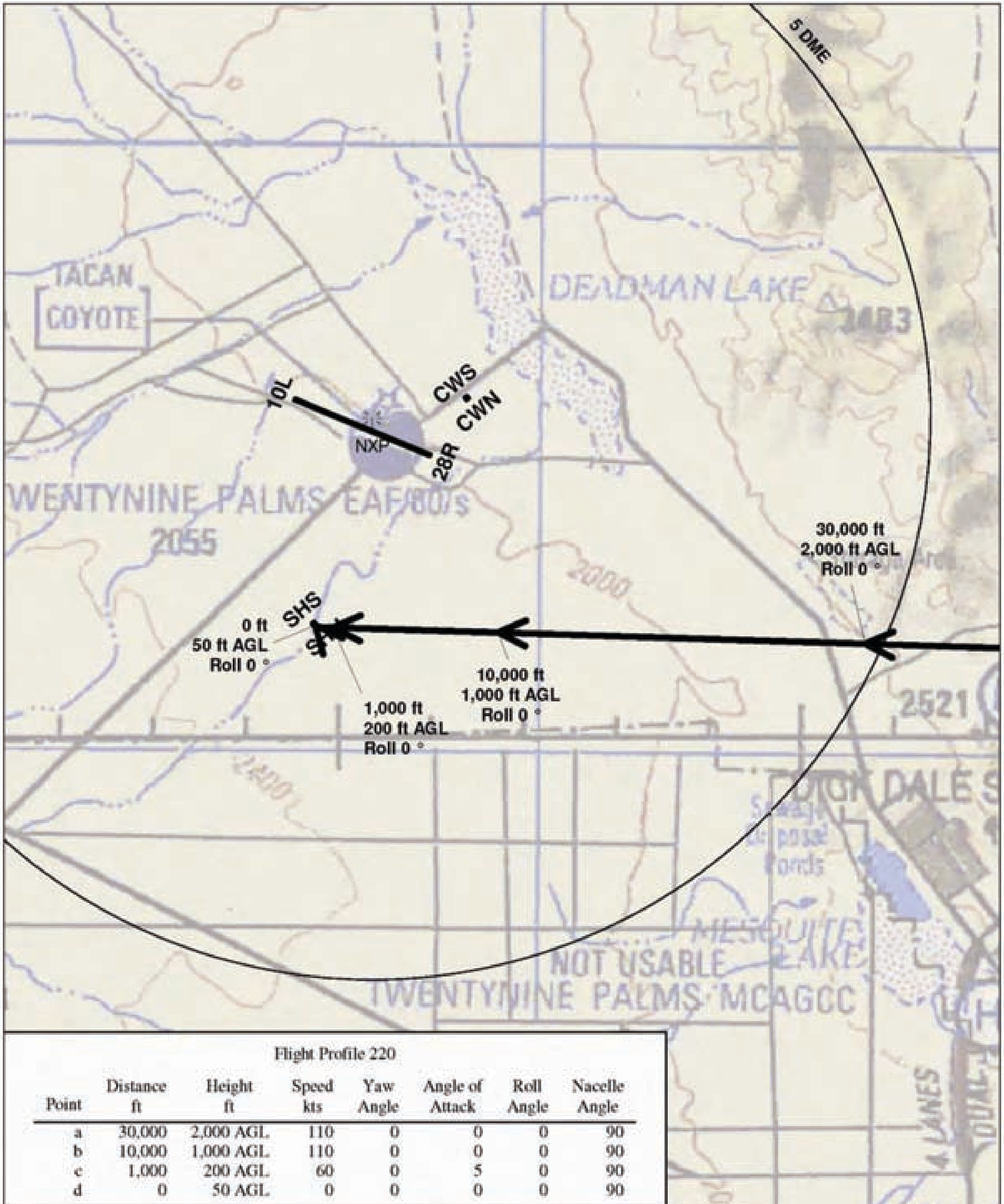
Flight Profile 223

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	200,000	10,000 AGL	200	0	0	0	90
b	67,054	500 AGL	200	0	0	0	90
c	58,354	500 AGL	200	0	0	0	90
d	41,604	500 AGL	200	0	0	0	90
e	10,508	500 AGL	200	0	0	0	90
f	3,645	500 AGL	200	0	0	0	90
g	0	10 AGL	200	0	0	0	90

Flight Profile 223
CH46E
on Runway 28R, Flight Track 28O1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:116,000 (1 inch = 9,640 feet)



Flight Profile 220

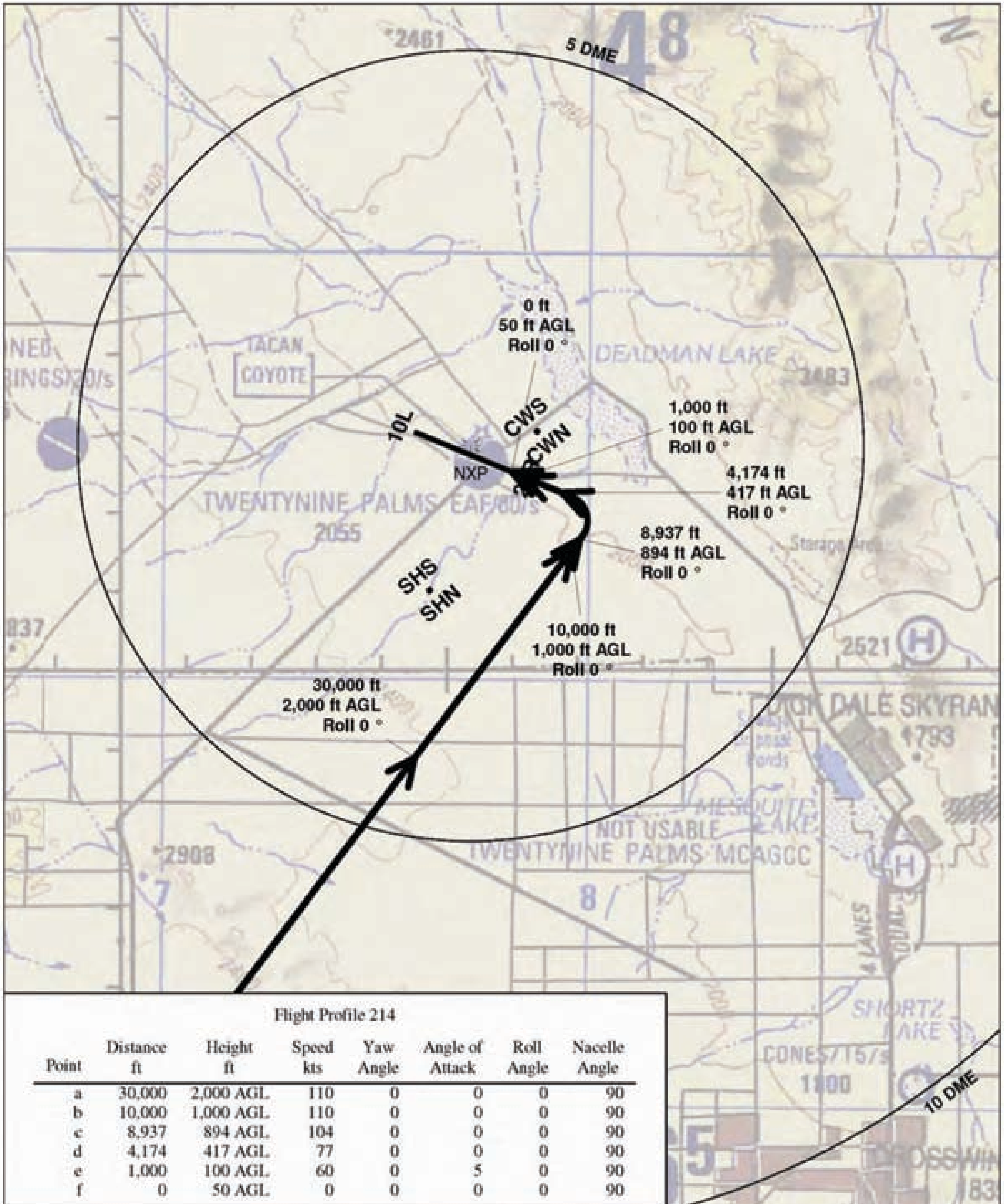
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	30,000	2,000 AGL	110	0	0	0	90
b	10,000	1,000 AGL	110	0	0	0	90
c	1,000	200 AGL	60	0	5	0	90
d	0	50 AGL	0	0	0	0	90

Flight Profile 220
CH46E
on Runway SHN, Flight Track SA1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000

Scale in Feet 1:100,000 (1 inch = 8,340 feet)

N



Flight Profile 214

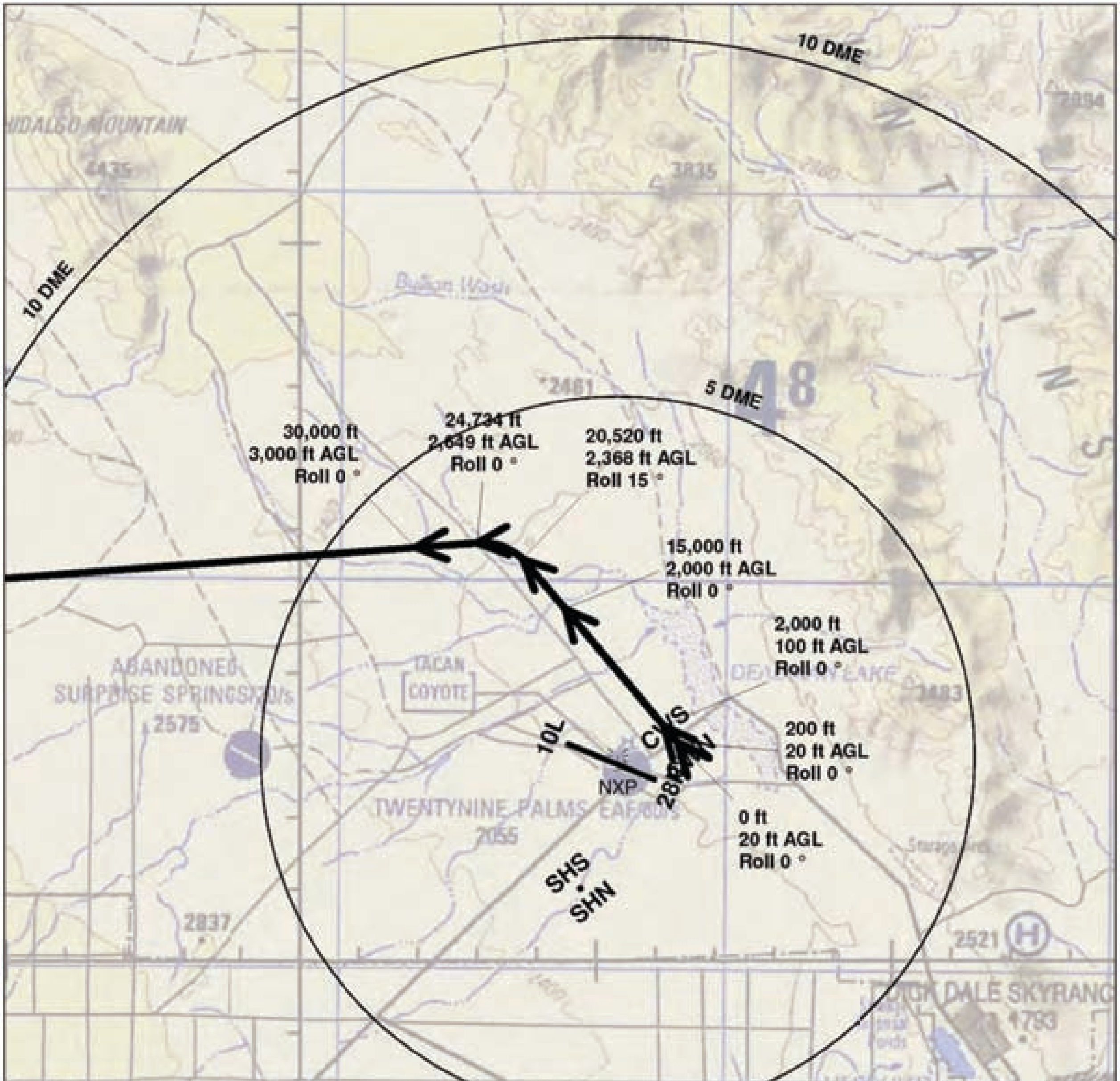
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	30,000	2,000 AGL	110	0	0	0	90
b	10,000	1,000 AGL	110	0	0	0	90
c	8,937	894 AGL	104	0	0	0	90
d	4,174	417 AGL	77	0	0	0	90
e	1,000	100 AGL	60	0	5	0	90
f	0	50 AGL	0	0	0	0	90

Flight Profile 214
CH46E
on Runway 28R, Flight Track 28A2

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:142,000 (1 inch = 11,800 feet)

N



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	0	0	0	0	90	altitude changed from 0 to 20 ft AGL
b	200	20 AGL	20	0	-5	0	90	
c	2,000	100 AGL	105	0	-5	0	90	
d	15,000	2,000 AGL	110	0	0	0	90	
e	20,520	2,368 AGL	110	0	0	15	90	
f	24,734	2,649 AGL	110	0	0	0	90	
g	30,000	3,000 AGL	110	0	0	0	90	

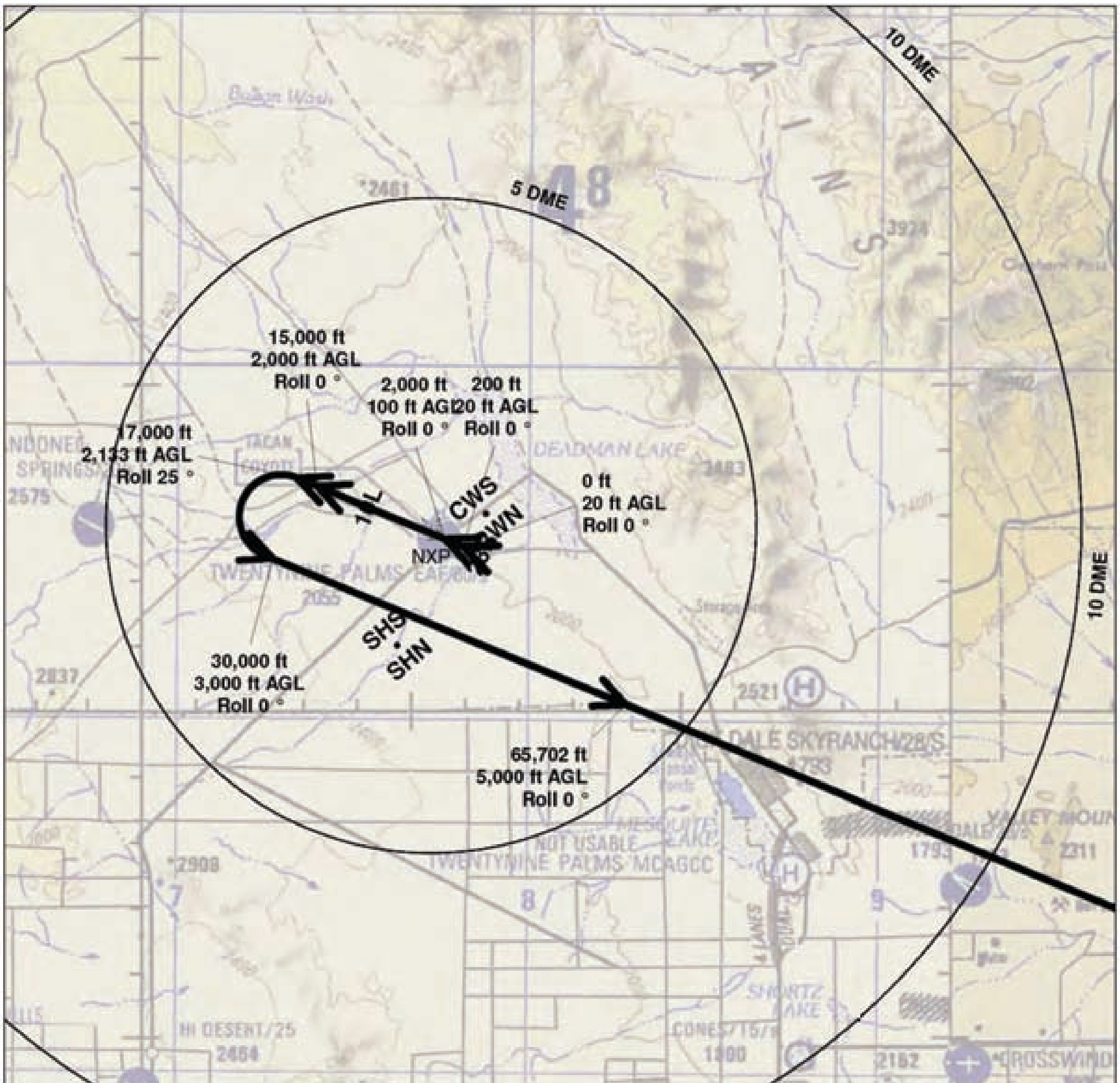
Flight Profile 208

Flight Profile 208
CH46E
on Runway CWN, Flight Track WD1

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:174,000 (1 inch = 14,500 feet)

N



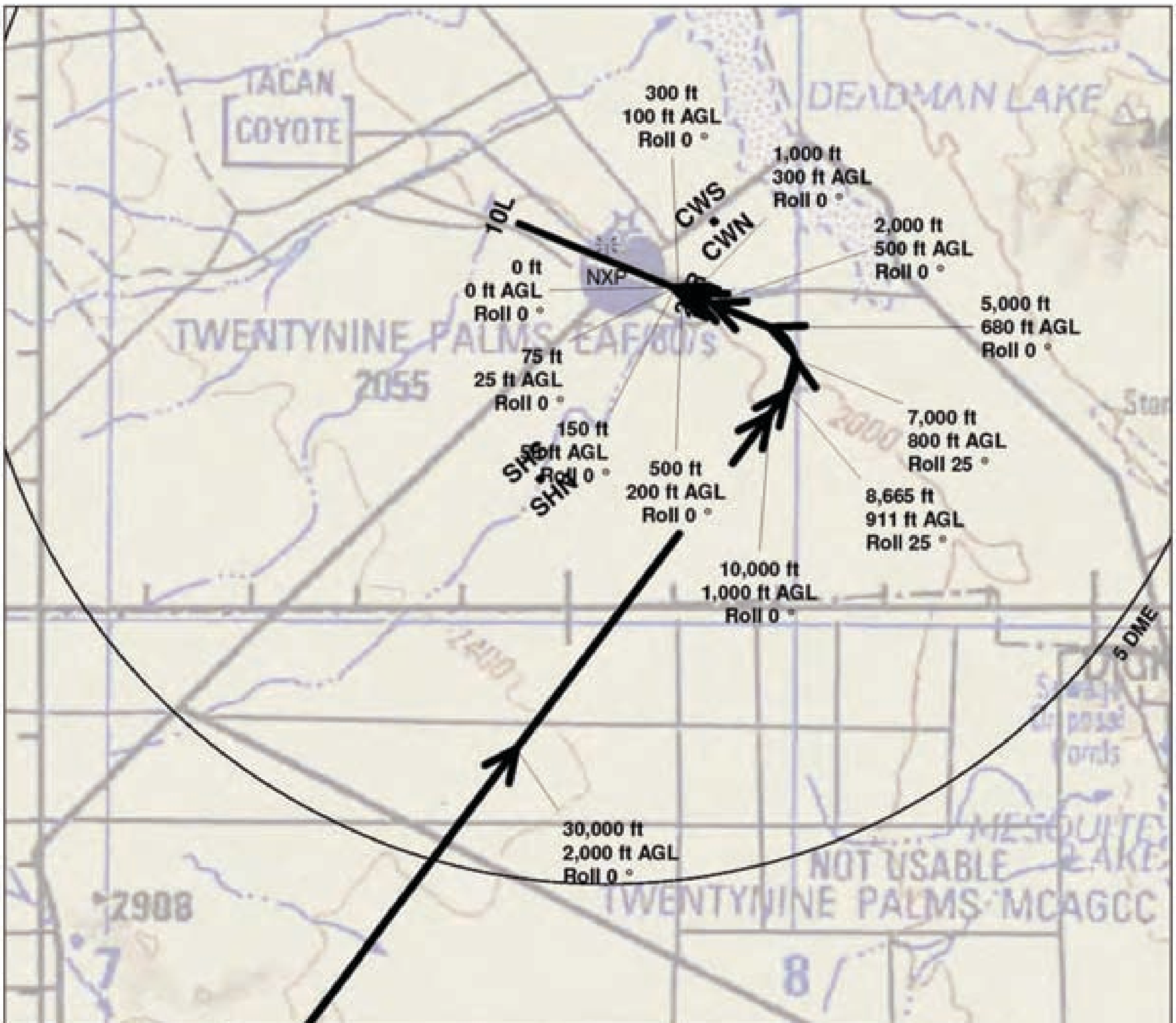
Flight Profile 205

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	0	0	0	0	90	altitude changed from 0 to 20 ft AGL
b	200	20 AGL	20	0	-5	0	90	
c	2,000	100 AGL	105	0	-5	0	90	
d	15,000	2,000 AGL	110	0	0	0	90	
e	17,000	2,133 AGL	110	0	0	25	90	
f	30,000	3,000 AGL	110	0	0	0	90	
g	65,702	5,000 AGL	110	0	0	0	90	

Flight Profile 205
CH46E
on Runway 28R, Flight Track 28D1

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:192,000 (1 inch = 16,000 feet)



Flight Profile 1014

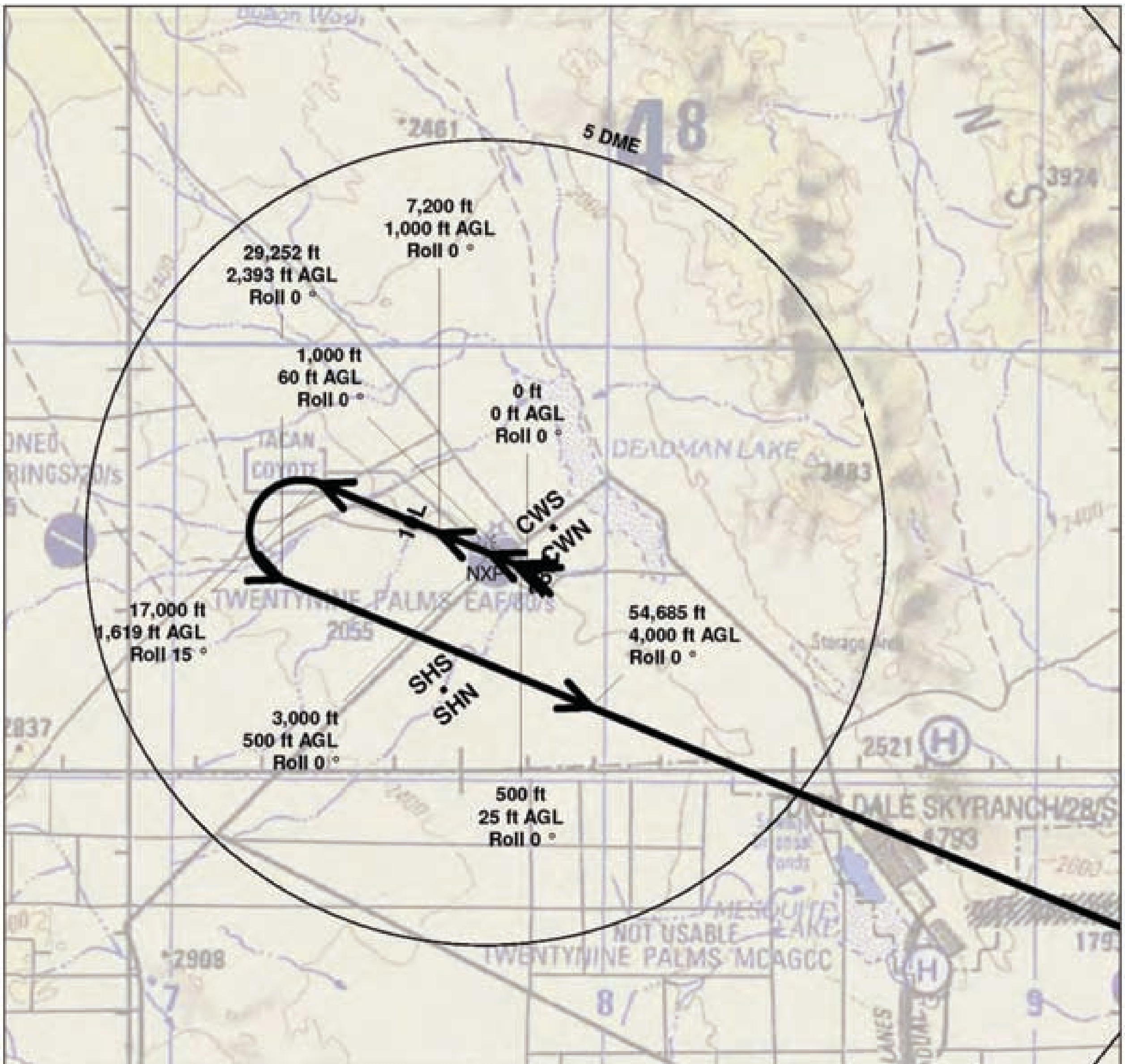
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	30,000	2,000 AGL	100	0	-2	0	90	
b	10,000	1,000 AGL	100	0	-2	0	90	
c	8,665	911 AGL	100	0	-2	25	90	begin turn; interpolated pt
d	7,000	800 AGL	100	0	-2	25	90	
e	5,000	680 AGL	92	0	-2	0	90	end turn; interpolated pt
f	2,000	500 AGL	80	0	-1	0	90	
g	1,000	300 AGL	70	0	0	0	90	
h	500	200 AGL	60	0	0	0	90	
i	300	100 AGL	40	0	0	0	90	
j	150	50 AGL	20	0	2	0	90	
k	75	25 AGL	10	0	0	0	90	
l	0	0 AGL	0	0	0	0	90	

Flight Profile 1014
AH-1W
on Runway 28R, Flight Track 28A2

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000

Scale in Feet 1:103,000 (1 inch = 8,580 feet)

N



Flight Profile 1005

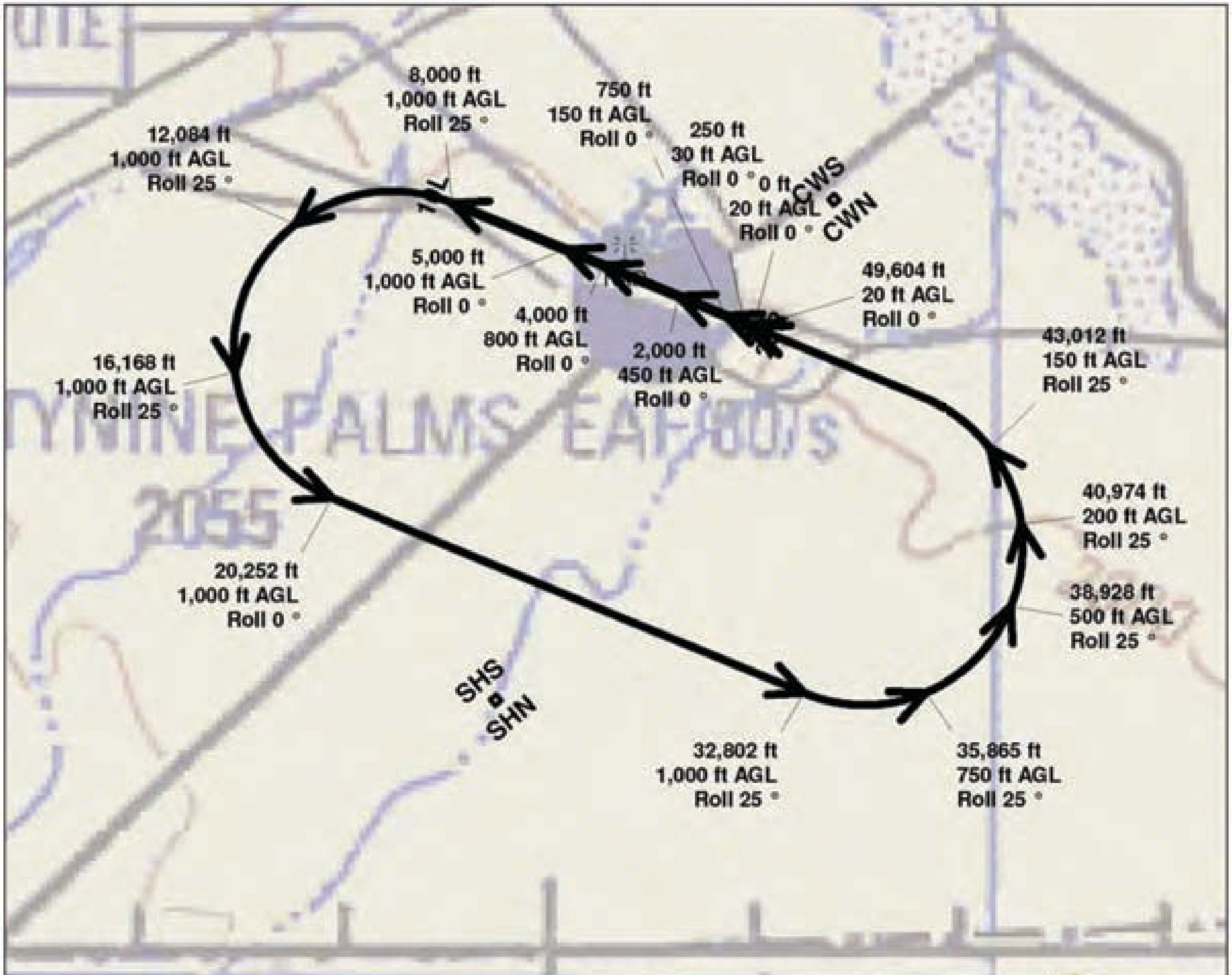
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	0 AGL	0	0	0	0	90	
b	500	25 AGL	50	0	-5	0	90	
c	1,000	60 AGL	70	0	-5	0	90	
d	3,000	500 AGL	80	0	-5	0	90	
e	7,200	1,000 AGL	120	0	0	0	90	
f	17,000	1,619 AGL	120	0	0	15	90	begin turn; interpolated pt
g	29,252	2,393 AGL	120	0	0	0	90	end turn; interpolated pt
h	54,685	4,000 AGL	120	0	0	0	90	

Flight Profile 1005
AH-1W
on Runway 28R, Flight Track 28D1

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:156,000 (1 inch = 13,000 feet)

N



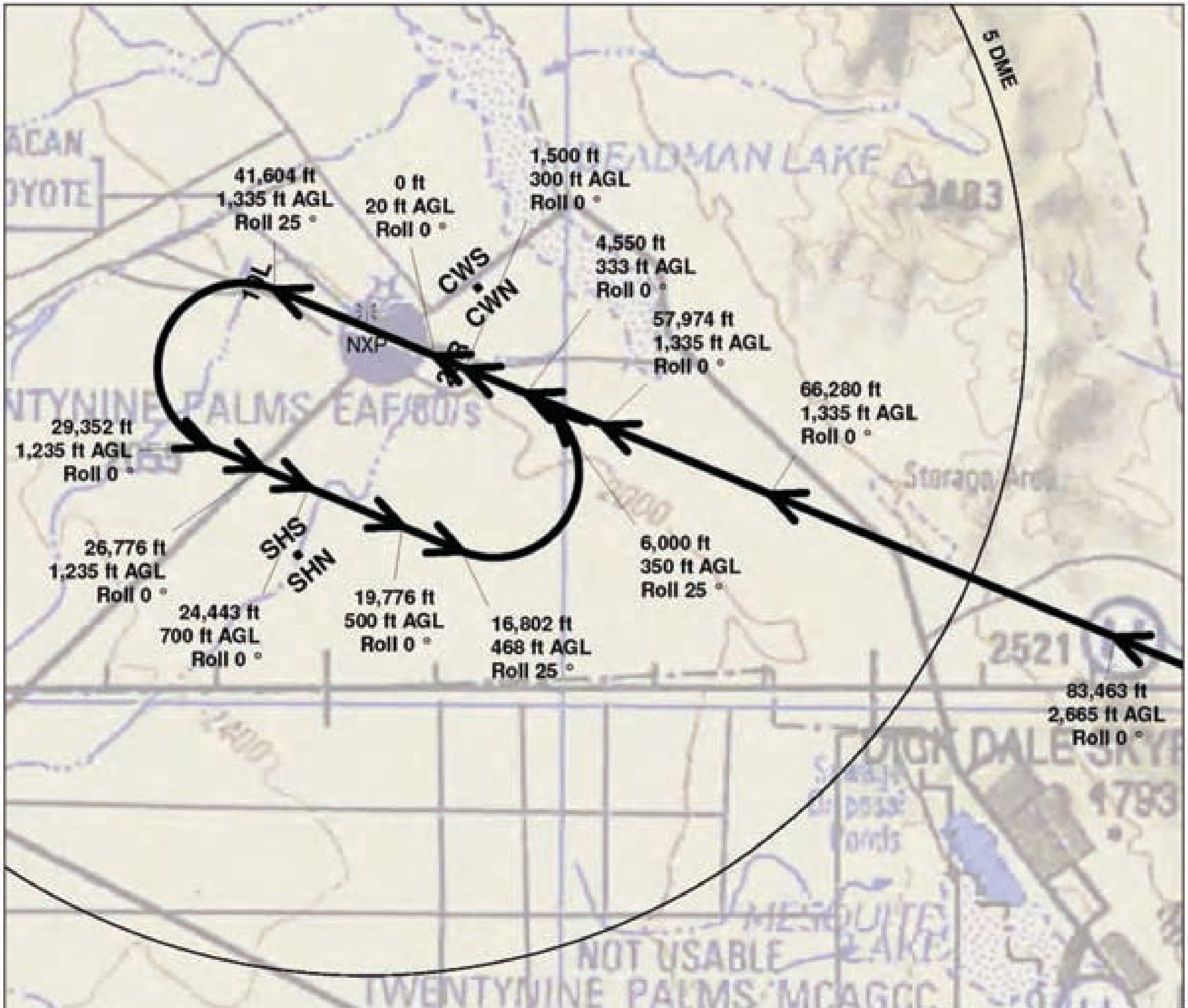
Flight Profile 526

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	5	0	0	0	60	5 kt start
b	250	30 AGL	45	0	-6	0	60	
c	750	150 AGL	65	0	0	0	60	
d	2,000	450 AGL	110	0	3	0	30	
e	4,000	800 AGL	135	0	10	0	0	
f	5,000	1,000 AGL	145	0	0	0	0	
g	8,000	1,000 AGL	170	0	7	25	0	begin turn to downwind
h	12,084	1,000 AGL	150	0	7	25	0	MOVE TO 1/3 turn
i	16,168	1,000 AGL	170	0	7	25	0	MOVE TO 2/3 turn
j	20,252	1,000 AGL	170	0	7	0	0	begin downwind
k	32,802	1,000 AGL	170	0	3	25	0	end downwind
l	35,865	750 AGL	140	0	3	25	0	1/4 thru turn
m	38,928	500 AGL	110	0	0	25	60	1/2 thru turn
n	40,974	200 AGL	60	0	0	25	87	2/3 thru turn
o	43,012	150 AGL	50	0	0	25	90	5/6 thru turn
p	49,604	20 AGL	5	0	0	0	90	

Flight Profile 526
MV22B
on Runway 28R, Flight Track 28T1

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000

Scale in Feet 1:55,400 (1 inch = 4,620 feet)



Flight Profile 523

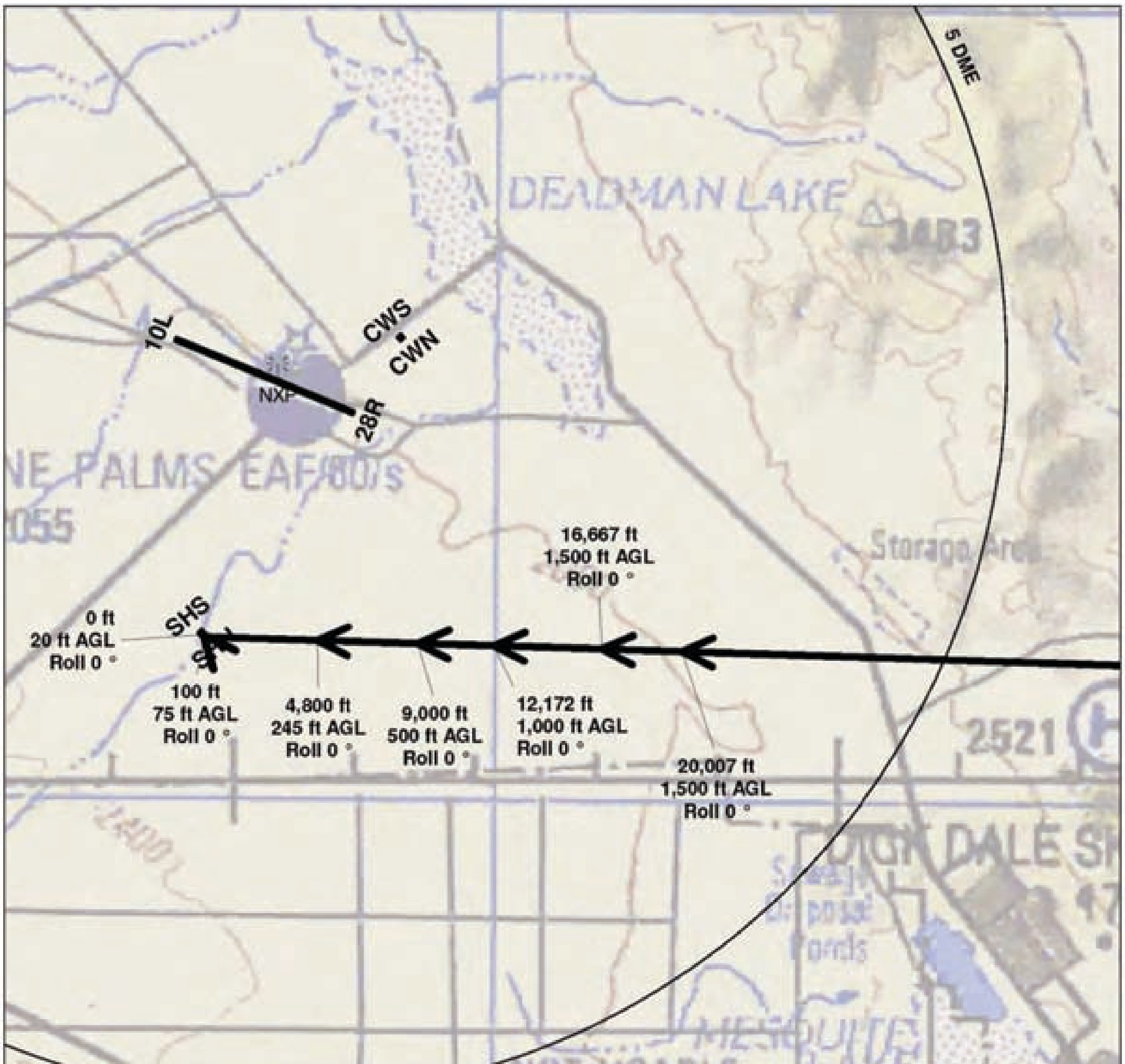
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	83,463	2,665 AGL	220	0	0	0	0	
b	66,280	1,335 AGL	200	0	0	0	0	
c	57,974	1,335 AGL	170	0	0	0	0	
d	41,604	1,335 AGL	114	0	0	25	0	
e	29,352	1,235 AGL	110	0	0	0	60	begin downwind leg
f	26,776	1,235 AGL	110	0	0	0	60	Course Rules Break Alt =1600 MSL; begin downw
g	24,443	700 AGL	110	0	0	0	60	
h	19,776	500 AGL	80	0	0	0	73	
i	16,802	468 AGL	77	0	0	25	74	end of downwind
j	6,000	350 AGL	65	0	7	25	79	~1nm out
k	4,550	333 AGL	60	0	8	0	81	
l	1,500	300 AGL	50	0	10	0	85	1500ft out
m	0	20 AGL	5	0	10	0	90	cross threshold

Flight Profile 523
MV22B
on Runway 28R, Flight Track 28O1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000

Scale in Feet 1:100,000 (1 inch = 8,340 feet)

N



Flight Profile 520

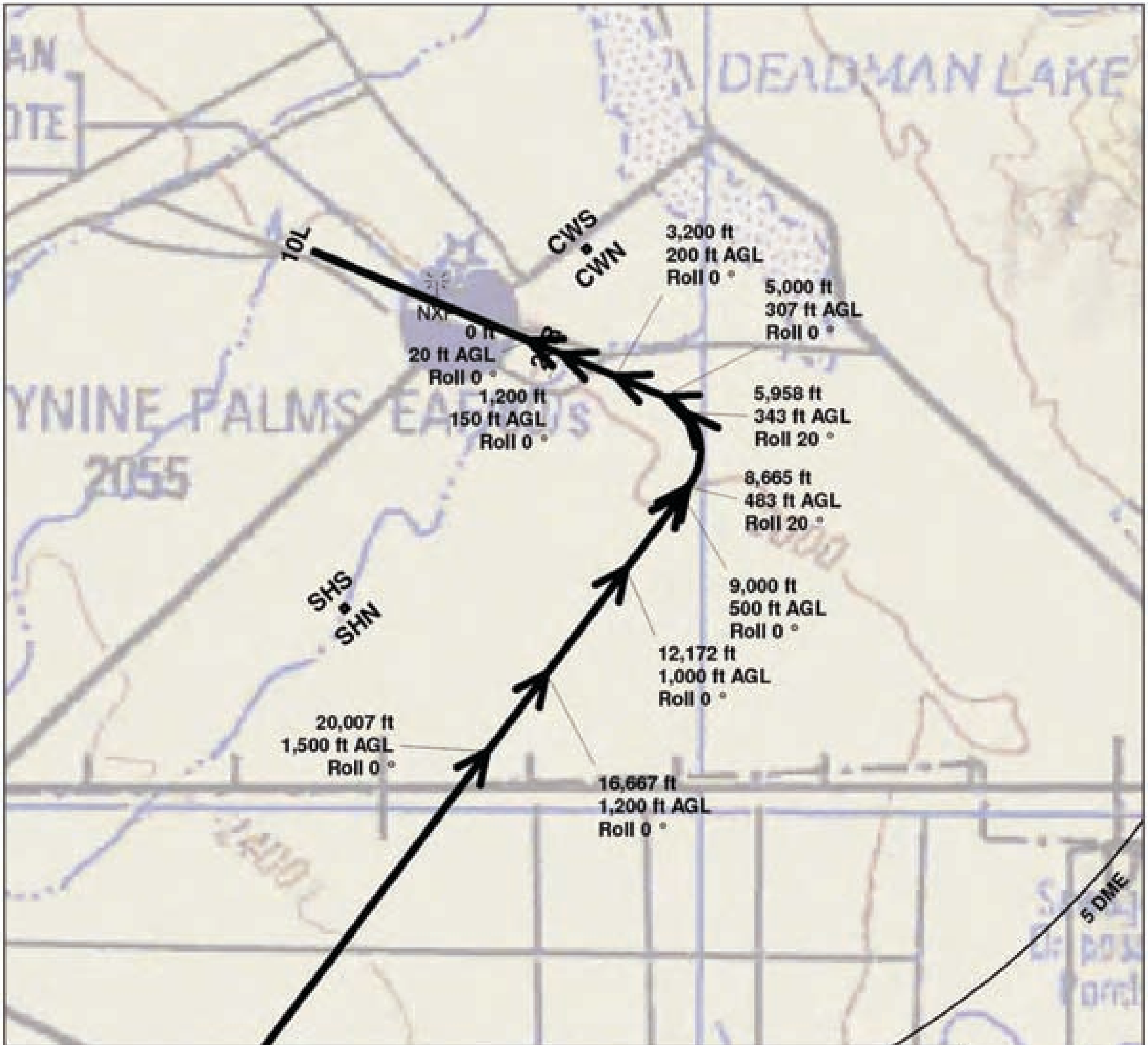
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	50,000	5,000 AGL	220	0	5	0	0	+5deg aoa for level @220kts
b	20,007	1,500 AGL	220	0	5	0	0	begin 1800 fpm desc;
c	16,667	1,500 AGL	150	0	-1	0	10	700 fpm desc
d	12,172	1,000 AGL	150	0	-1	0	20	1800 fpm desc
e	9,000	500 AGL	80	0	0	0	79	400 fpm desc; 3deg gs
f	4,800	245 AGL	80	0	0	0	80	400 fpm desc; 3deg gs
g	100	75 AGL	9	0	0	0	0	
h	0	20 AGL	5	0	0	0	90	5 knot stop

Flight Profile 520
MV22B
on Runway SHN, Flight Track SA1

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:85,800 (1 inch = 7,150 feet)

N



Flight Profile 514

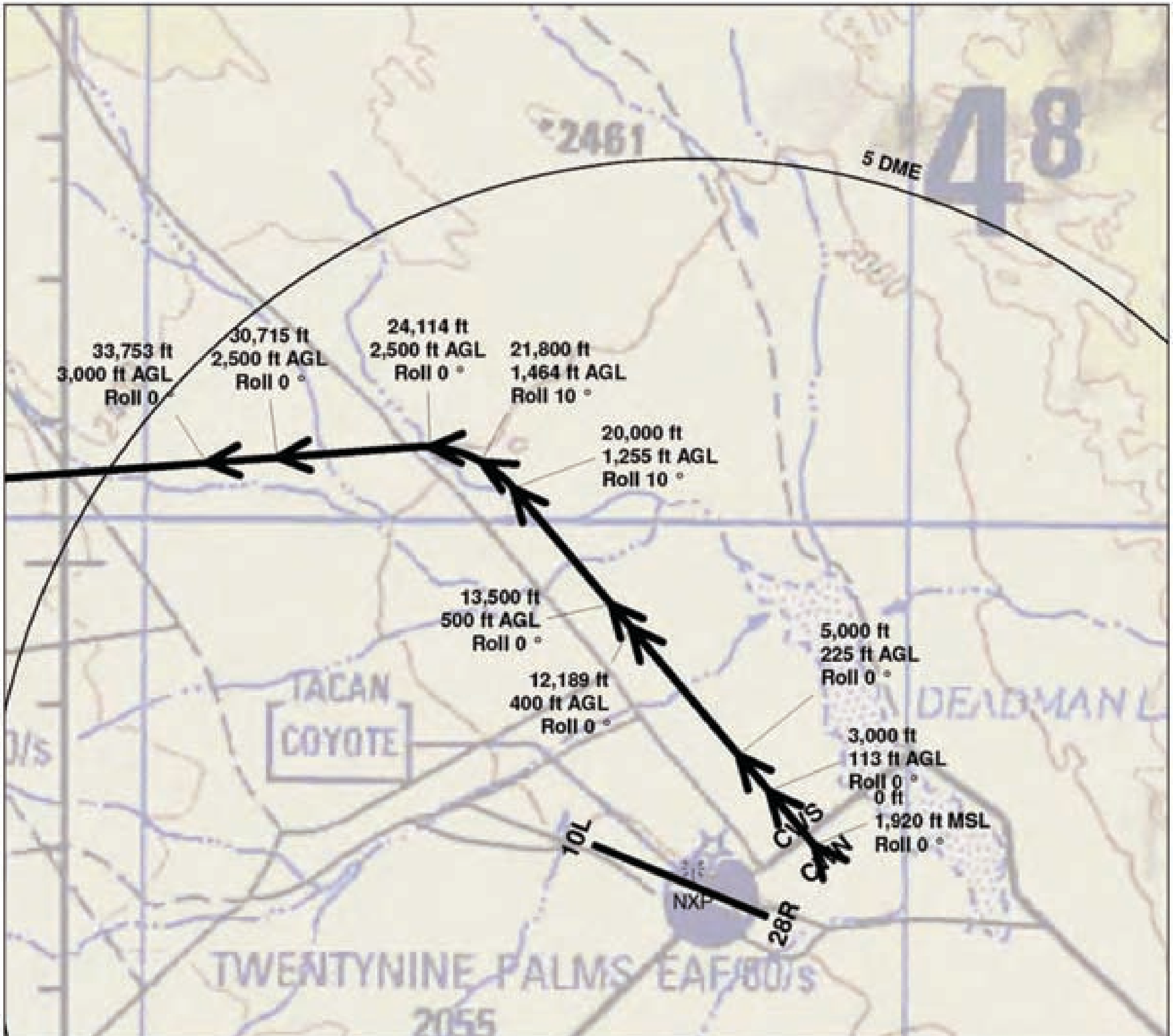
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	20,007	1,500 AGL	220	0	-1	0	0	begin 1800 fpm desc;
b	16,667	1,200 AGL	170	0	-1	0	10	700 fpm desc
c	12,172	1,000 AGL	150	0	-1	0	20	1800 fpm desc
d	9,000	500 AGL	80	0	0	0	79	400 fpm desc; 3deg gs
e	8,665	483 AGL	80	0	0	20	79	
f	5,958	343 AGL	80	0	0	20	80	
g	5,000	307 AGL	80	0	0	0	80	
h	3,200	200 AGL	60	0	-1	0	87	200 fpm desc; 2deg gs
i	1,200	150 AGL	50	0	5	0	90	300 fpm desc; 6deg gs
j	0	20 AGL	5	0	0	0	90	5 knot stop

Flight Profile 514
MV22B
on Runway 28R, Flight Track 28A2

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:72,000 (1 inch = 6,000 feet)

N



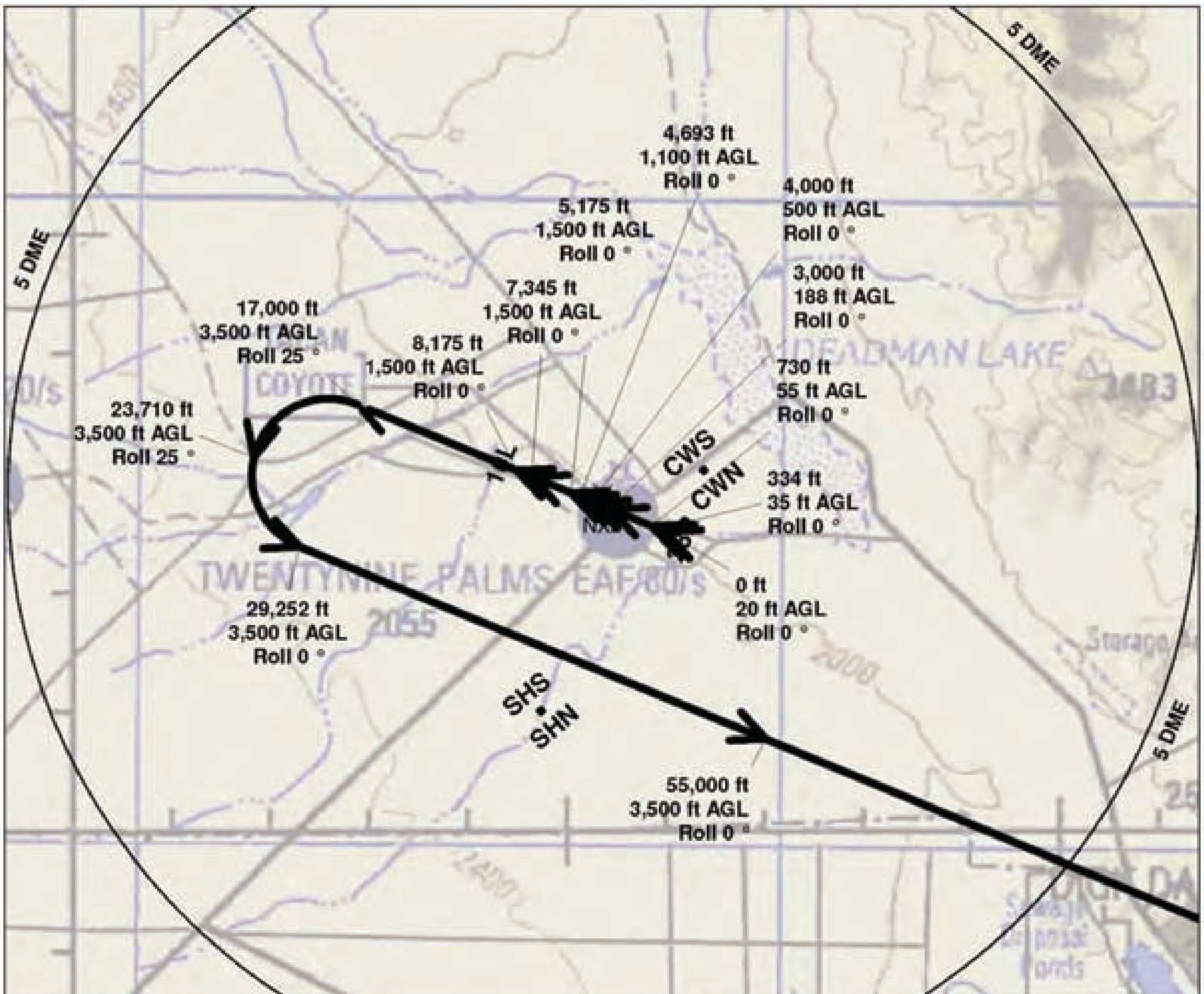
Flight Profile 508

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	1,920 MSL	5	0	0	0	87	5 knot start
b	3,000	113 AGL	71	0	0	0	77	
c	5,000	225 AGL	115	0	0	0	70	
d	12,189	400 AGL	162	0	0	0	11	
e	13,500	500 AGL	170	0	6	0	0	2000 fpm climb; +7deg aoa for 2500 fpm climb; r
f	20,000	1,255 AGL	170	0	6	10	0	
g	21,800	1,464 AGL	170	0	6	10	0	
h	24,114	2,500 AGL	220	0	6	0	0	point added at end of turn; interpolated
i	30,715	2,500 AGL	170	0	7	0	0	accel to 220 within 0.5nm; +7deg aoa for level crui
j	33,753	3,000 AGL	220	0	5	0	0	+5deg for level cruise @ 220kts

Flight Profile 508
MV22B
on Runway CWN, Flight Track WD1
Prior to brake release, aircraft sits at 100 N/A Variable for 120 seconds

Scale in Feet 1:92,400 (1 inch = 7,700 feet)

N



Flight Profile 505

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	5	0	0	0	60	Normal 60 STO transition to APLN to 1500 ft
b	334	35 AGL	50	0	-4	0	60	
c	730	55 AGL	66	0	-2	0	60	
d	3,000	188 AGL	125	0	5	0	9	
e	4,000	500 AGL	135	0	10	0	0	
f	4,693	1,100 AGL	145	0	7	0	0	point added at beginning of turn: interpolated
g	5,175	1,500 AGL	155	0	6	0	0	
h	7,345	1,500 AGL	165	0	7	0	0	point added at end of turn: interpolated
i	8,175	1,500 AGL	170	0	7	0	0	steady state climb APLN 170kts 1500-3500 ft
j	17,000	3,500 AGL	170	0	7	25	0	straight and level, 170 kts, 7 deg pitch
k	23,710	3,500 AGL	170	0	7	25	0	straight and level, 170 kts, 7 deg pitch
l	29,252	3,500 AGL	170	0	7	0	0	straight and level, 170 kts, 7 deg pitch
m	55,000	3,500 AGL	170	0	7	0	0	straight and level, 170 kts, 7 deg pitch

Flight Profile 505

MV22B

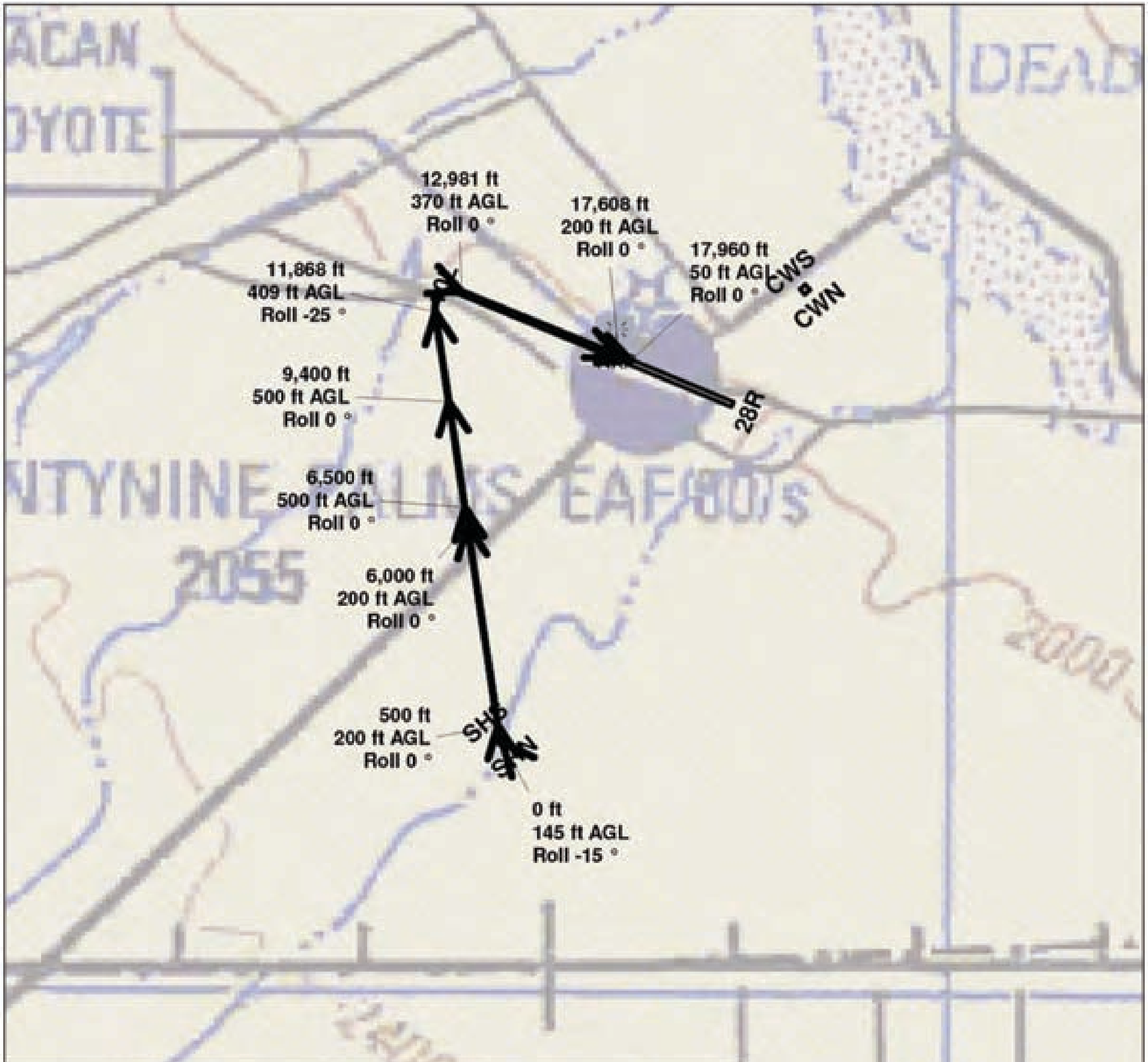
on Runway 28R, Flight Track 28D1

Prior to brake release, aircraft sits at 100 N/A Variable for 120 seconds

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:113,000 (1 inch = 9,380 feet)

N



Flight Profile 128

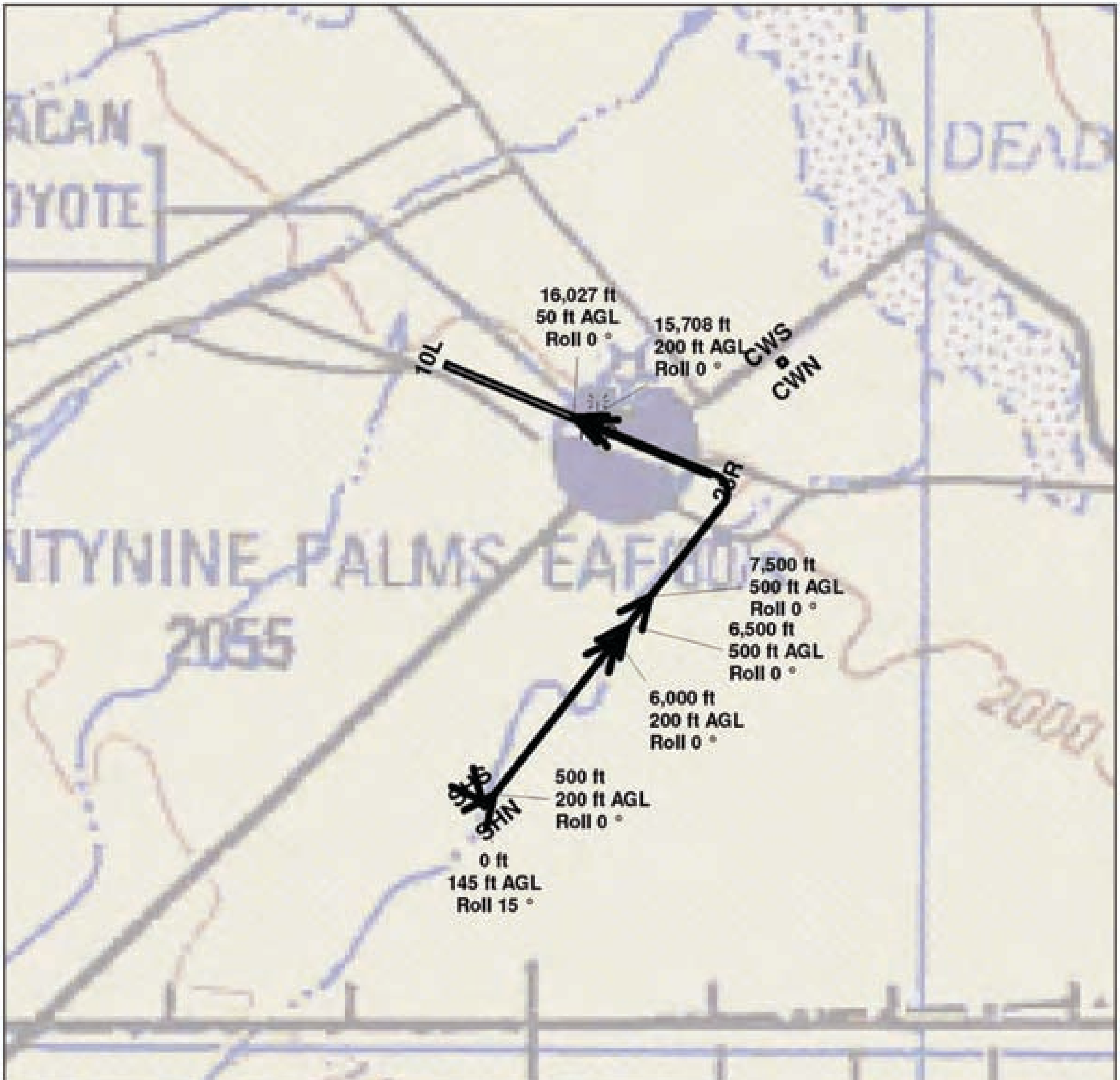
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	145 AGL	0	0	0	-15	90
b	500	200 AGL	60	0	-5	0	90
c	6,000	200 AGL	120	0	0	0	90
d	6,500	500 AGL	120	0	0	0	90
e	9,400	500 AGL	80	0	5	0	90
f	11,868	409 AGL	74	0	5	-25	90
g	12,981	370 AGL	71	0	5	0	90
h	17,608	200 AGL	60	0	5	0	90
i	17,960	50 AGL	0	0	0	0	90

Flight Profile 128
CH53E
on Runway SHN, Flight Track SI2

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000

Scale in Feet 1:57,400 (1 inch = 4,780 feet)

N



Flight Profile 127

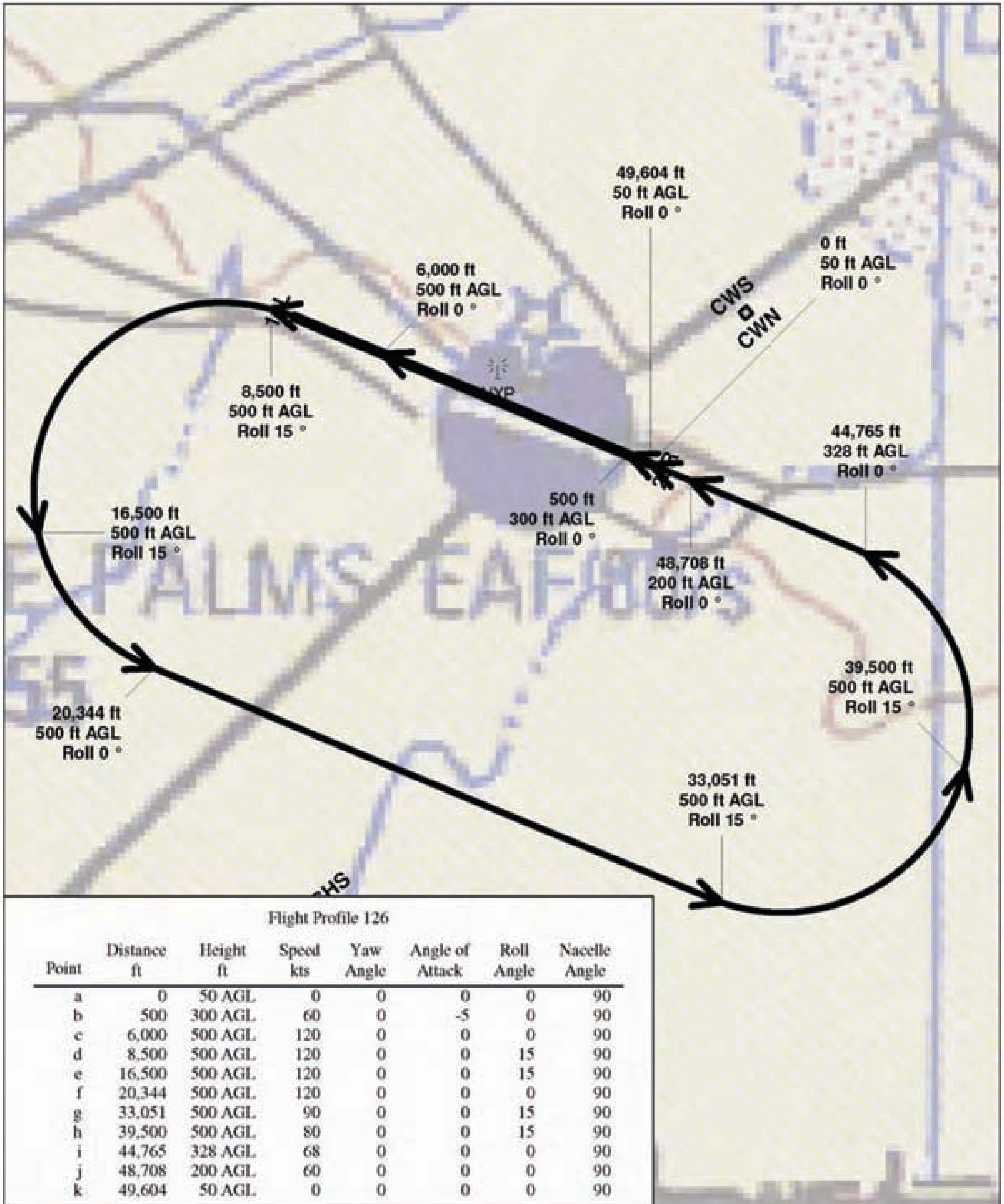
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	145 AGL	0	0	0	15	90
b	500	200 AGL	60	0	-5	0	90
c	6,000	200 AGL	120	0	0	0	90
d	6,500	500 AGL	120	0	0	0	90
e	7,500	500 AGL	80	0	5	0	90
f	15,708	200 AGL	60	0	5	0	90
g	16,027	50 AGL	0	0	0	0	90

Flight Profile 127
CH53E
on Runway SHS, Flight Track SI1

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000

Scale in Feet 1:57,200 (1 inch = 4,770 feet)

N



Flight Profile 126

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	50 AGL	0	0	0	0	90
b	500	300 AGL	60	0	-5	0	90
c	6,000	500 AGL	120	0	0	0	90
d	8,500	500 AGL	120	0	0	15	90
e	16,500	500 AGL	120	0	0	15	90
f	20,344	500 AGL	120	0	0	0	90
g	33,051	500 AGL	90	0	0	15	90
h	39,500	500 AGL	80	0	0	15	90
i	44,765	328 AGL	68	0	0	0	90
j	48,708	200 AGL	60	0	0	0	90
k	49,604	50 AGL	0	0	0	0	90

Flight Profile 126
CH53E
on Runway 28R, Flight Track 28T1

0 2,000 4,000 6,000 8,000 10,000 12000

Scale in Feet 1:38,100 (1 inch = 3,170 feet)

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H-2 AIRSPACE

H-2.1 Operations & Sorties

Baseline Area Operations at 29 Palms Airspace

Aircraft Type		LAVIC LAKE				EMERSON LAKE				LEAD MTN NORTH				LEAD MOUNTAIN SOUTH				NOBLE PASS				DELTA				FASP			
		Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
MV-22	T&R	22	12	4	38	4	1	-	5	30	11	-	41	48	23	4	75	6	1	-	7	6	1	-	7	4	1	-	5
	WTI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL		22	12	4	38	4	1	-	5	30	11	-	41	48	23	4	75	6	1	-	7	6	1	-	7	4	1	-	5

Aircraft Type		R-2501N				R-2501S				R-2501E				R-2501W				Sundance MOA				Bristol MOA				Totals			
		Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
F/A-18C/D		1,021	17	-	1,038	1,302	22	-	1,324	1,009	16	-	1,025	965	16	-	981	95	2	-	97	220	5	-	225	4,612	78	-	4,690
F/A-18E/F		54	1	-	55	69	1	-	70	53	1	-	54	51	1	-	52	5	-	-	5	12	-	-	12	244	4	-	248
F-5E		36	-	-	36	44	-	-	44	35	-	-	35	33	-	-	33	3	-	-	3	7	-	-	7	158	-	-	158
KC-130		340	18	-	358	433	23	-	456	335	17	-	352	322	17	-	339	32	2	-	34	75	5	-	80	1,537	82	-	1,619
AV-8B		645	250	-	895	821	319	-	1,140	636	247	-	883	611	237	-	848	60	23	-	83	140	54	-	194	2,913	1,130	-	4,043
AH-1		876	214	54	1,144	1,119	275	69	1,463	867	212	53	1,132	829	203	51	1,083	83	20	5	108	192	47	12	251	3,966	971	244	5,181
UH-1		359	-	-	359	458	-	-	458	354	-	-	354	339	-	-	339	34	-	-	34	79	-	-	79	1,623	-	-	1,623
CH-53E		537	18	-	555	684	23	-	707	530	17	-	547	508	17	-	525	50	2	-	52	116	5	-	121	2,425	82	-	2,507
CH-46E		896	161	18	1,075	1,143	206	23	1,372	884	159	17	1,060	846	152	17	1,015	84	15	2	101	195	35	5	235	4,048	728	82	4,858
MV-22	T&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	50	8	178
	WTI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UAV(1)		161	18	107	286	206	23	137	366	159	17	106	282	152	17	101	270	15	2	10	27	35	5	23	63	728	82	484	1,294
TOTAL		4,925	697	179	5,801	6,279	892	229	7,400	4,862	686	176	5,724	4,656	660	169	5,485	461	66	17	544	1,071	156	40	1,267	22,374	3,207	818	26,399

(1) Unmanned Aerial Vehicle (Not Modeled)

Baseline Route Operations at 29 Palms Airspace

Aircraft Type		Route: Bristol Aerial Refueling Track 19k				Route: Bristol Aerial Refueling Track 22k				Route: Perimeter Route[2]				Totals			
		Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total
F/A-18C/D		93	2	-	95	93	2	-	95	-	-	-	-	186	4	-	190
F/A-18E/F		5	-	-	5	5	-	-	5	-	-	-	-	10	-	-	10
F-5E		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KC-130		383	25	-	408	383	25	-	408	-	-	-	-	766	50	-	816
AV-8B		63	25	-	88	63	25	-	88	-	-	-	-	126	50	-	176
AH-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UH-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CH-53E		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CH-46E		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MV-22	T&R	-	-	-	-	-	-	-	-	130	104	35	269	130	104	35	269
	WTI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UAV[1]		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL		544	52	-	596	544	52	-	596	130	104	35	269	1,218	208	35	1,461

(1) Unmanned Aerial Vehicle (Not Modeled)
(2) Includes MV-22 High Light Level (HLL) and Low Light Level (LLL) Night Vision Goggle training and Tactics (TAC) sorties
(3) MV-22 operations scaled to 59 percent of MV22 West Coast Basing EIS proposed ops

Proposed Reduced Area operations at 29 Palms Airspace

Aircraft Type		LAVIC LAKE Day	Eve	Night	Total	EMERSON LAKE Day	Eve	Night	Total	LEAD MTN NORTH Day	Eve	Night	Total
MV-22	T&R	22	12	4	38	4	1	-	5	30	11	-	41
	WTI	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL		22	12	4	38	4	1	-	5	30	11	-	41

Aircraft Type		LEAD MOUNTAIN SOUTH Day	Eve	Night	Total	NOBLE PASS Day	Eve	Night	Total	DELTA Day	Eve	Night	Total	FASP Day	Eve	Night	Total
MV-22	T&R	48	23	4	75	6	1	-	7	6	1	-	7	4	1	-	5
	WTI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL		48	23	4	75	6	1	-	7	6	1	-	7	4	1	-	5

Aircraft Type		R-2501N Day	Eve	Night	Total	R-2501S Day	Eve	Night	Total	R-2501E Day	Eve	Night	Total
F/A-18C/D		613	10	-	623	1,302	22	-	1,324	908	14	-	922
F/A-18E/F		32	1	-	33	69	1	-	70	48	1	-	49
F-5E		22	-	-	22	44	-	-	44	32	-	-	32
KC-130		204	11	-	215	433	23	-	456	302	15	-	317
AV-8B		387	150	-	537	821	319	-	1,140	572	222	-	794
AH-1		526	128	32	686	1,119	275	69	1,463	780	191	48	1,019
UH-1		215	-	-	215	458	-	-	458	319	-	-	319
CH-53E		322	11	-	333	684	23	-	707	477	15	-	492
CH-46E		538	97	11	646	1,143	206	23	1,372	796	143	15	954
MV-22	T&R	-	-	-	-	-	-	-	-	-	-	-	-
	WTI	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-
UAV[1]		97	11	64	172	206	23	137	366	143	15	95	253
TOTAL		2,956	419	107	3,482	6,279	892	229	7,400	4,377	616	158	5,151

Aircraft Type		R-2501W Day	Eve	Night	Total	Sundance MOA Day	Eve	Night	Total	Bristol MOA Day	Eve	Night	Total
F/A-18C/D		579	10	-	589	95	2	-	97	220	5	-	225
F/A-18E/F		31	1	-	32	5	-	-	5	12	-	-	12
F-5E		20	-	-	20	3	-	-	3	7	-	-	7
KC-130		193	10	-	203	32	2	-	34	75	5	-	80
AV-8B		367	142	-	509	60	23	-	83	140	54	-	194
AH-1		497	122	31	650	83	20	5	108	192	47	12	251
UH-1		203	-	-	203	34	-	-	34	79	-	-	79
CH-53E		305	10	-	315	50	2	-	52	116	5	-	121
CH-46E		508	91	10	609	84	15	2	101	195	35	5	235
MV-22	T&R	-	-	-	-	-	-	-	-	-	-	-	-
	WTI	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-
UAV[1]		91	10	61	162	15	2	10	27	35	5	23	63
TOTAL		2,794	396	102	3,292	461	66	17	544	1,071	156	40	1,267

Aircraft Type		R-2511 and Johnson Valley MOA Day	Eve	Night	Total	CAX and Turtle MOA Day	Eve	Night	Total	Totals Day	Eve	Night	Total
F/A-18C/D		794	13	-	807	101	2	-	103	4,612	78	-	4,690
F/A-18E/F		42	-	-	42	5	-	-	5	244	4	-	248
F-5E		26	-	-	26	4	-	-	4	158	-	-	158
KC-130		264	14	-	278	34	2	-	36	1,537	82	-	1,619
AV-8B		502	195	-	697	64	25	-	89	2,913	1,130	-	4,043
AH-1		682	167	42	891	87	21	5	113	3,966	971	244	5,181
UH-1		280	-	-	280	35	-	-	35	1,623	-	-	1,623
CH-53E		418	14	-	432	53	2	-	55	2,425	82	-	2,507
CH-46E		696	125	14	835	88	16	2	106	4,048	728	82	4,858
MV-22	T&R	-	-	-	-	-	-	-	-	120	50	8	178
	WTI	-	-	-	-	-	-	-	-	-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-
UAV[1]		125	14	83	222	16	2	11	29	728	82	484	1,294
TOTAL		3,829	542	139	4,510	487	70	18	575	22,374	3,207	818	26,399

Notes:
(1) Unmanned Aerial Vehicle (Not Modeled)
(2) Portion of baseline ops in R-2501N and R-2501W moved to R-2511 and Johnson Valley MOA for Alternatives 1, 2, 4, 5, 6. In Alt 3 no ops are moved
(3) Portion of baseline ops in R-2501E moved to CAX and Turtle MOA for all Alternatives

Proposed Route Operations at 29 Palms Airspace

Aircraft Type		Route																Totals			
		Bristol Aerial Refueling Track 19k				Bristol Aerial Refueling Track 22k				Perimeter Route[2]											
		Day	Eve	Night	Total	Day	Eve	Night	Total	Day	Eve	Night	Total					Day	Eve	Night	Total
F/A-18C/D		93	2	-	95	93	2	-	95	-	-	-	-					186	4	-	190
F/A-18E/F		5	-	-	5	5	-	-	5	-	-	-	-					10	-	-	10
F-5E		-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
KC-130		383	25	-	408	383	25	-	408	-	-	-	-					766	50	-	816
AV-8B		63	25	-	88	63	25	-	88	-	-	-	-					126	50	-	176
AH-1		-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
UH-1		-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
CH-53E		-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
CH-46E		-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
MV-22	T&R	-	-	-	-	-	-	-	-	130	104	35	269					130	104	35	269
	WTI	-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
	Desert Talon	-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
UAV[1]		-	-	-	-	-	-	-	-	-	-	-	-					-	-	-	-
TOTAL		544	52	-	596	544	52	-	596	130	104	35	269					1,218	208	35	1,461

(1) Unmanned Aerial Vehicle (Not Modeled)

(2) Includes MV-22 High Light Level (HLL) and Low Light Level (LLL) Night Vision Goggle training and Tactics (TAC) sorties

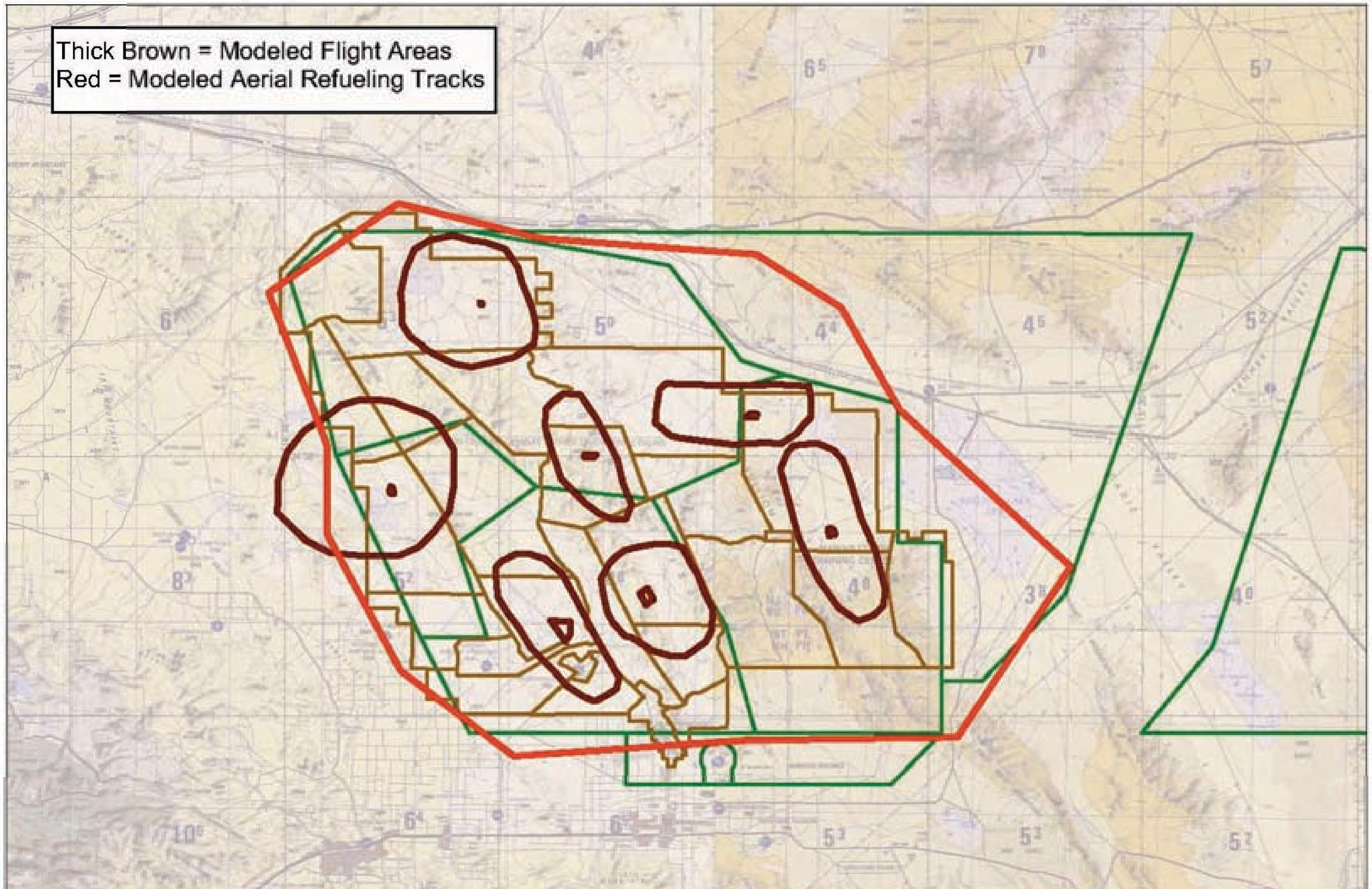
(3) MV-22 operations scaled to 59 percent of MV22 West Coast Basing EIS proposed ops

Proposed Annual MEBEX Sorties

Aircraft Type	Workup				Finex				TOTAL			
	Day (0700-1900)	Eve (1900-2200)	Night (2200-0700)	Total	Day (0700-1900)	Eve (1900-2200)	Night (2200-0700)	Total	Day (0700-1900)	Eve (1900-2200)	Night (2200-0700)	Total
AV-8B	160	58	12	230	36	8	28	72	196	66	40	302
F/A-18C/D	208	74	16	298	82	20	62	164	290	94	78	462
F/A-18E/F	10	4	-	14	4	-	4	8	14	4	4	22
F-35B*	78	28	6	112	22	6	16	44	100	34	22	156
Joint FW (e.g., F-16)	2	2	-	4	18	4	14	36	20	6	14	40
AH-1/ UH-1	596	214	42	852	120	28	92	240	716	242	134	1,092
CH-53	146	52	10	208	12	2	10	24	158	54	20	232
MV-22	162	58	12	232	18	4	14	36	180	62	26	268
Joint RW (e.g., H-60)	190	68	14	272	24	6	18	48	214	74	32	320
EA-6B	40	14	2	56	10	2	6	18	50	16	8	74
KC-130	70	26	6	102	18	4	14	36	88	30	20	138
Joint AR (KC-10, KC-135)	-	-	-	-	18	4	14	36	18	4	14	36
UAS	118	42	8	168	36	8	28	72	154	50	36	240
TOTAL	**1,780**	**640**	**128**	**2,548**	**418**	**96**	**320**	**834**	**2,198**	**736**	**448**	**3,382**

** comprised of 10% of original F-18 sorties and 25% of original AV-8 sorties*

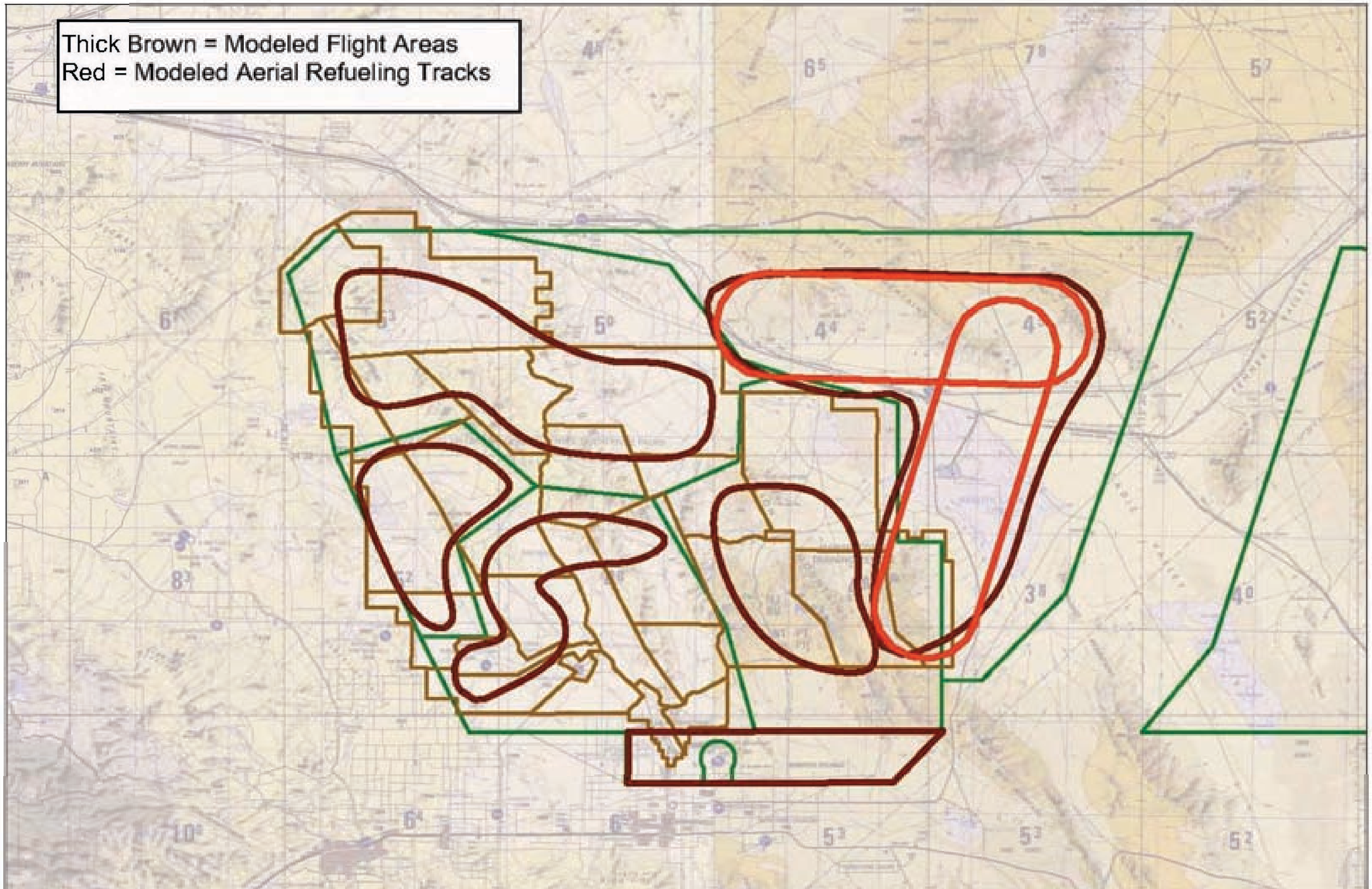
H-2.2 Airspace Maps



Baseline - Modeled Flight Areas and Routes for MV-22

0 20,000 40,000 60,000 80,000 100,000 120,000 140,000 160,000 180,000 200,000 220,000 240,000 260,000 280,000 300,000 320,000 340,000 360,000 380,000

Scale in Feet 1:576,000 (1 inch = 48,000 feet)

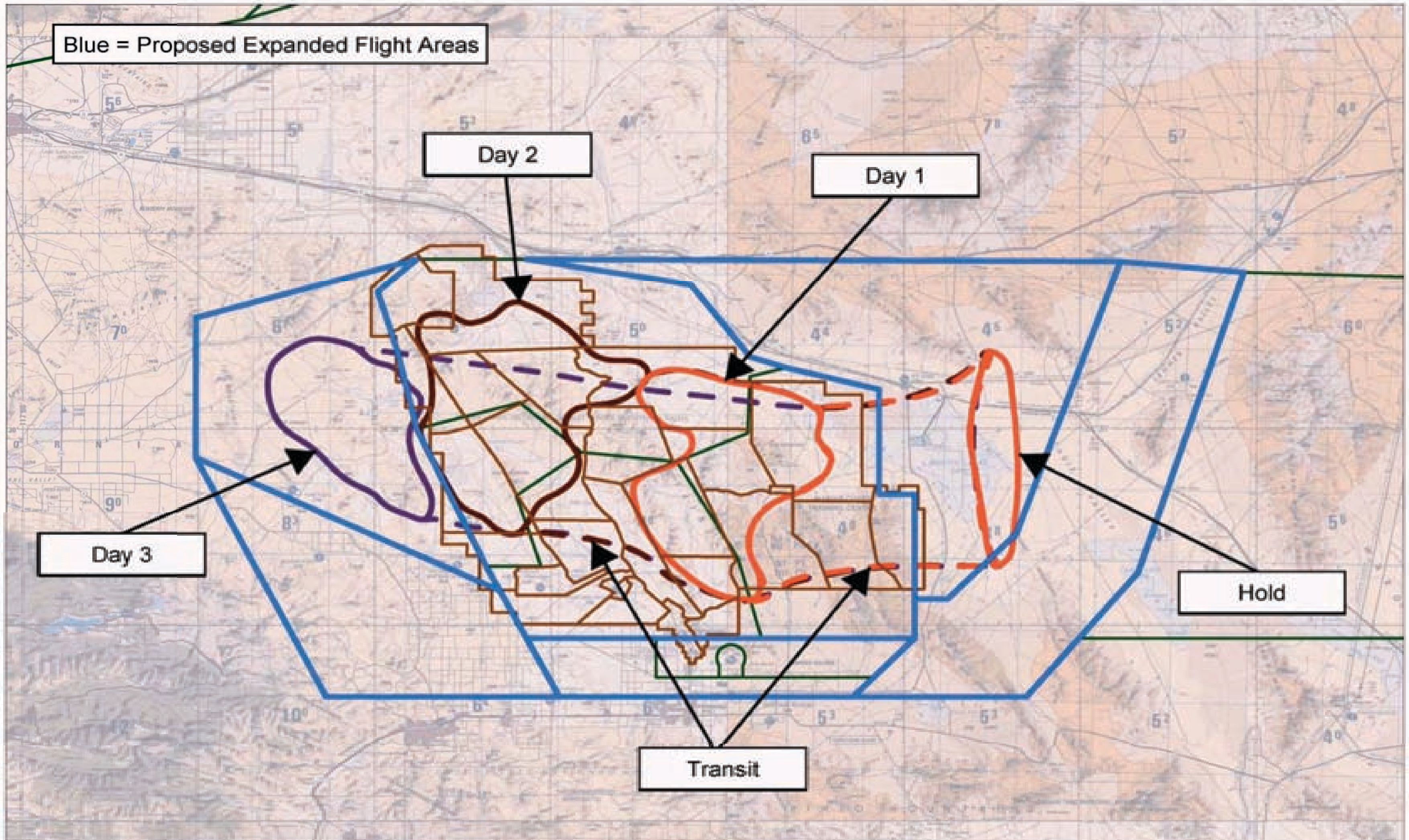


Baseline - Modeled Flight Areas and Routes (except MV-22)

0 20,000 40,000 60,000 80,000 100,000 120,000 140,000 160,000 180,000 200,000 220,000 240,000 260,000 280,000 300,000 320,000 340,000 360,000 380,000

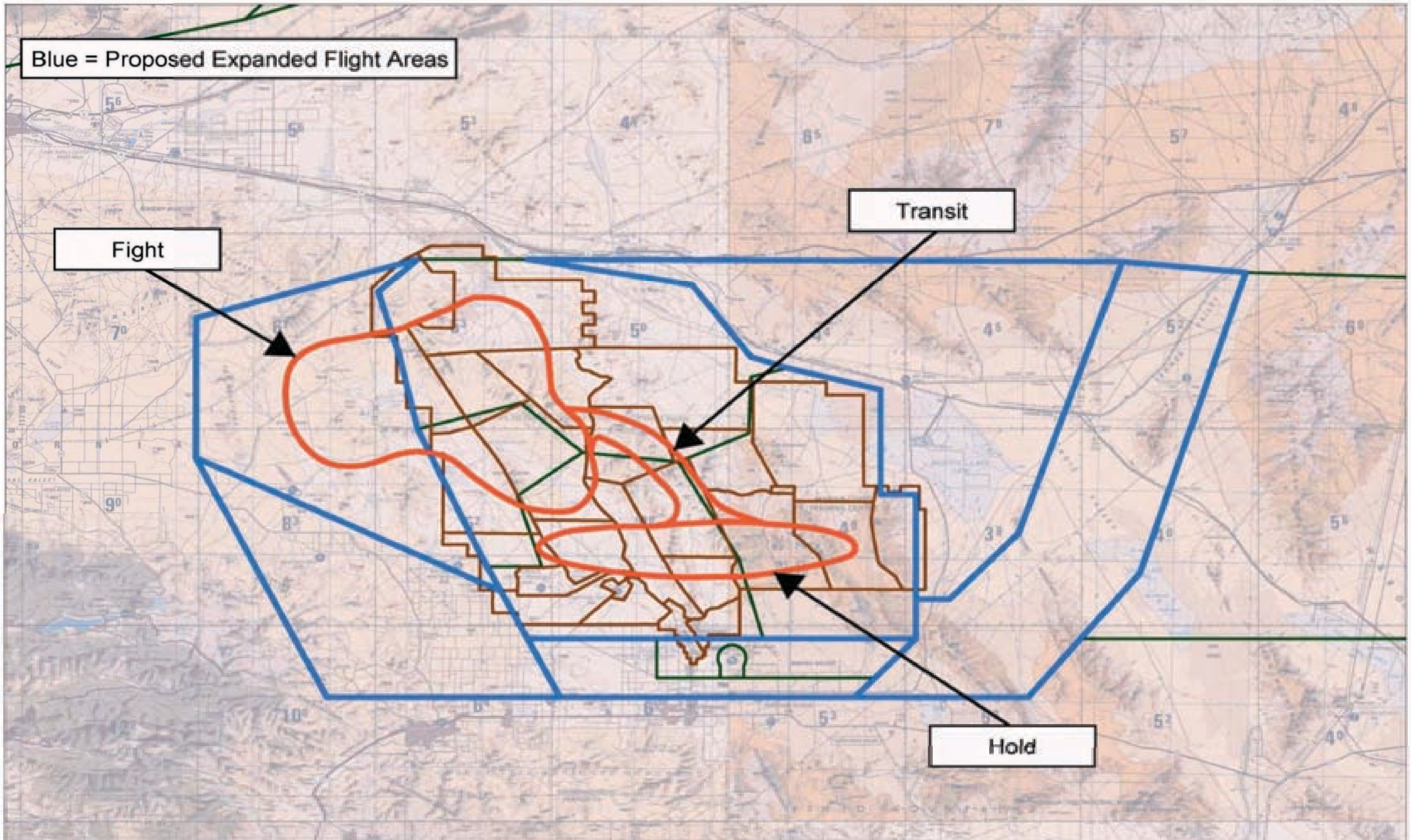
Scale in Feet 1:576,000 (1 inch = 48,000 feet)

N



Alternative's 1 and 6 - Finex Modeled Flight Areas

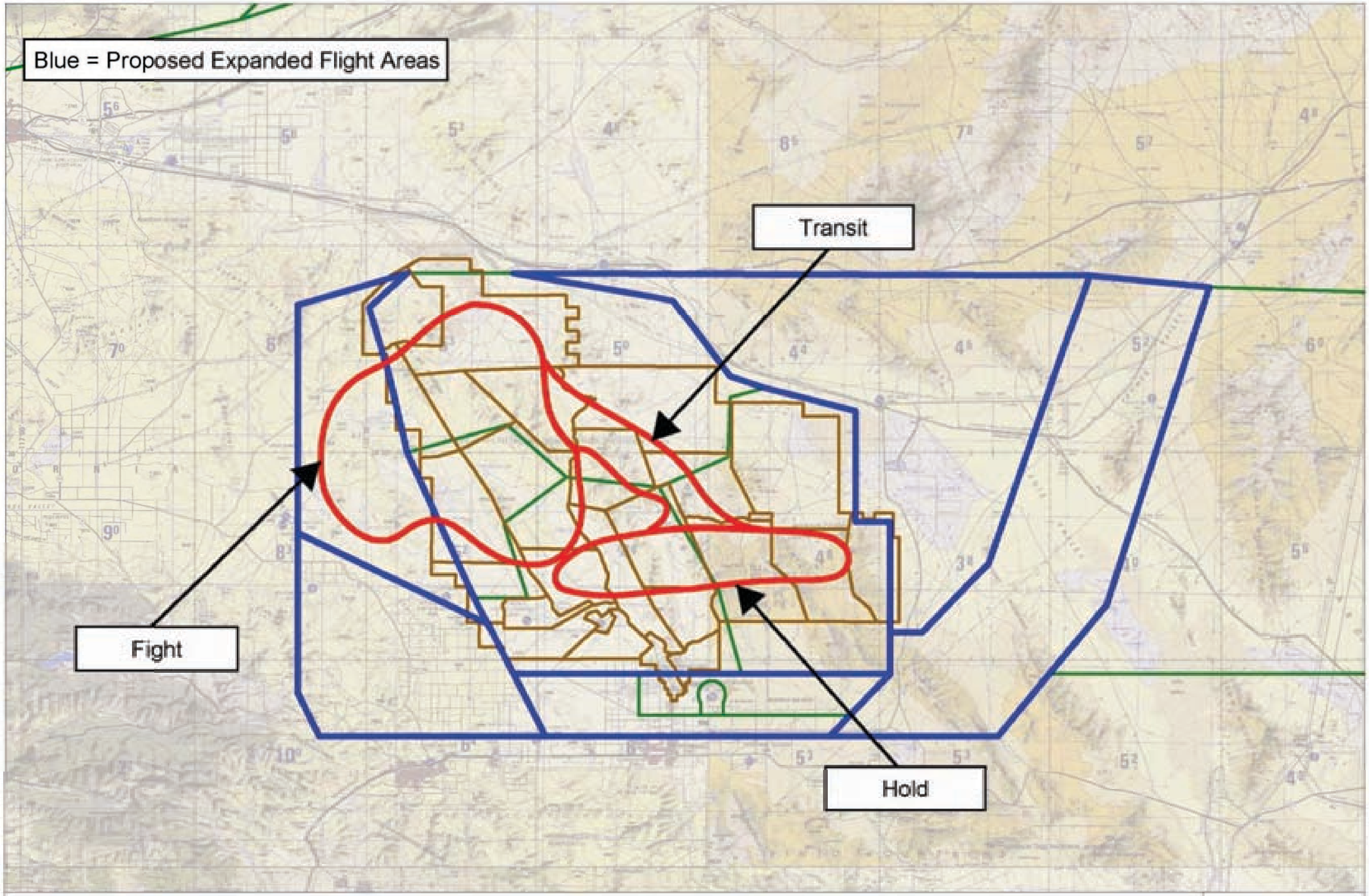
Scale in Feet 1:720,000 (1 inch = 60,000 feet)



Alternative's 1 and 6 - Workup Modeled Flight Areas

0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

Scale in Feet 1:720,000 (1 inch = 60,000 feet)

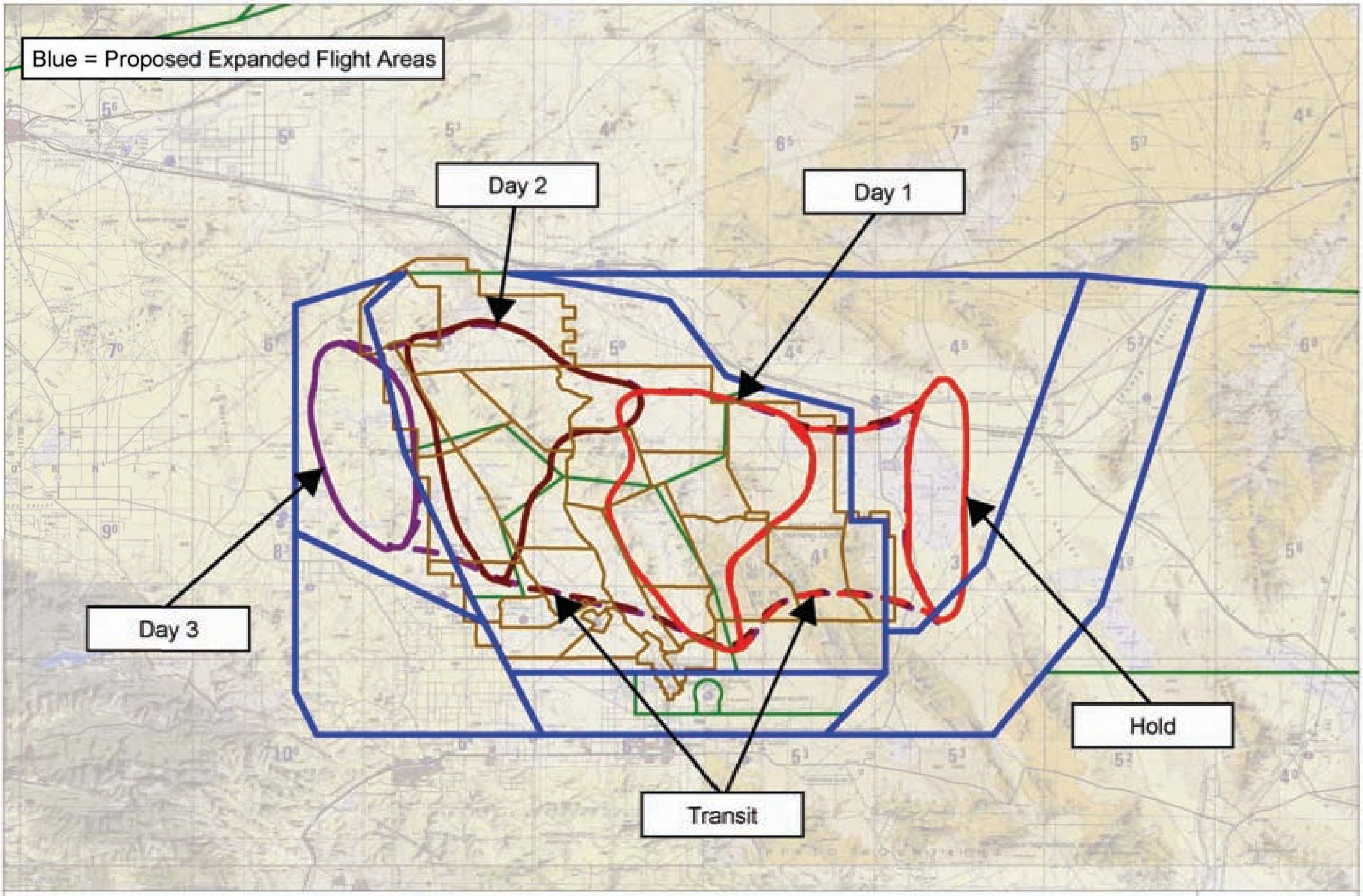


Alternative 2 - Workup Modeled Flight Areas

0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

Scale in Feet 1:720,000 (1 inch = 60,000 feet)

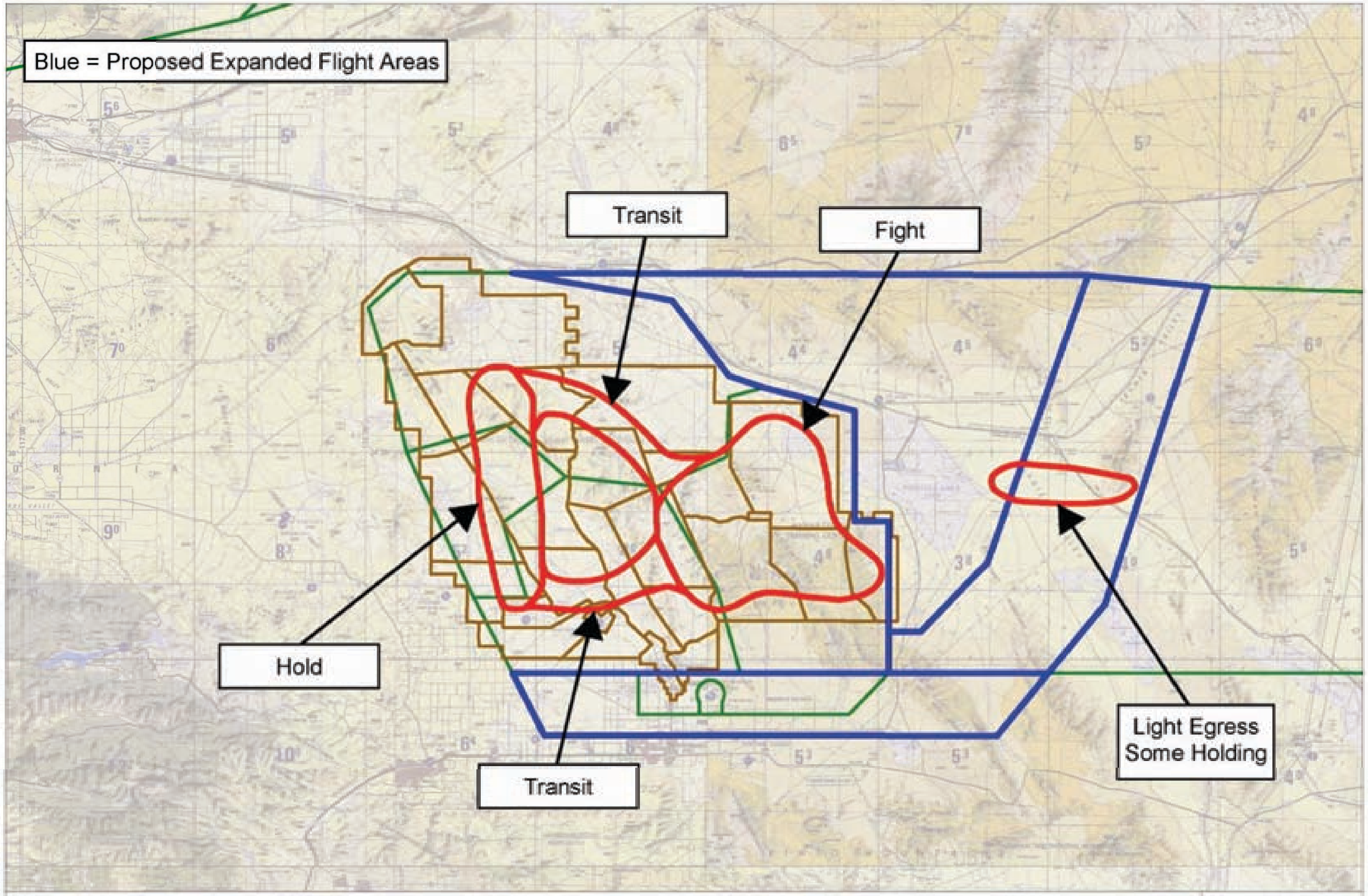
N



Alternative 2 - Finex Modeled Flight Areas

0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

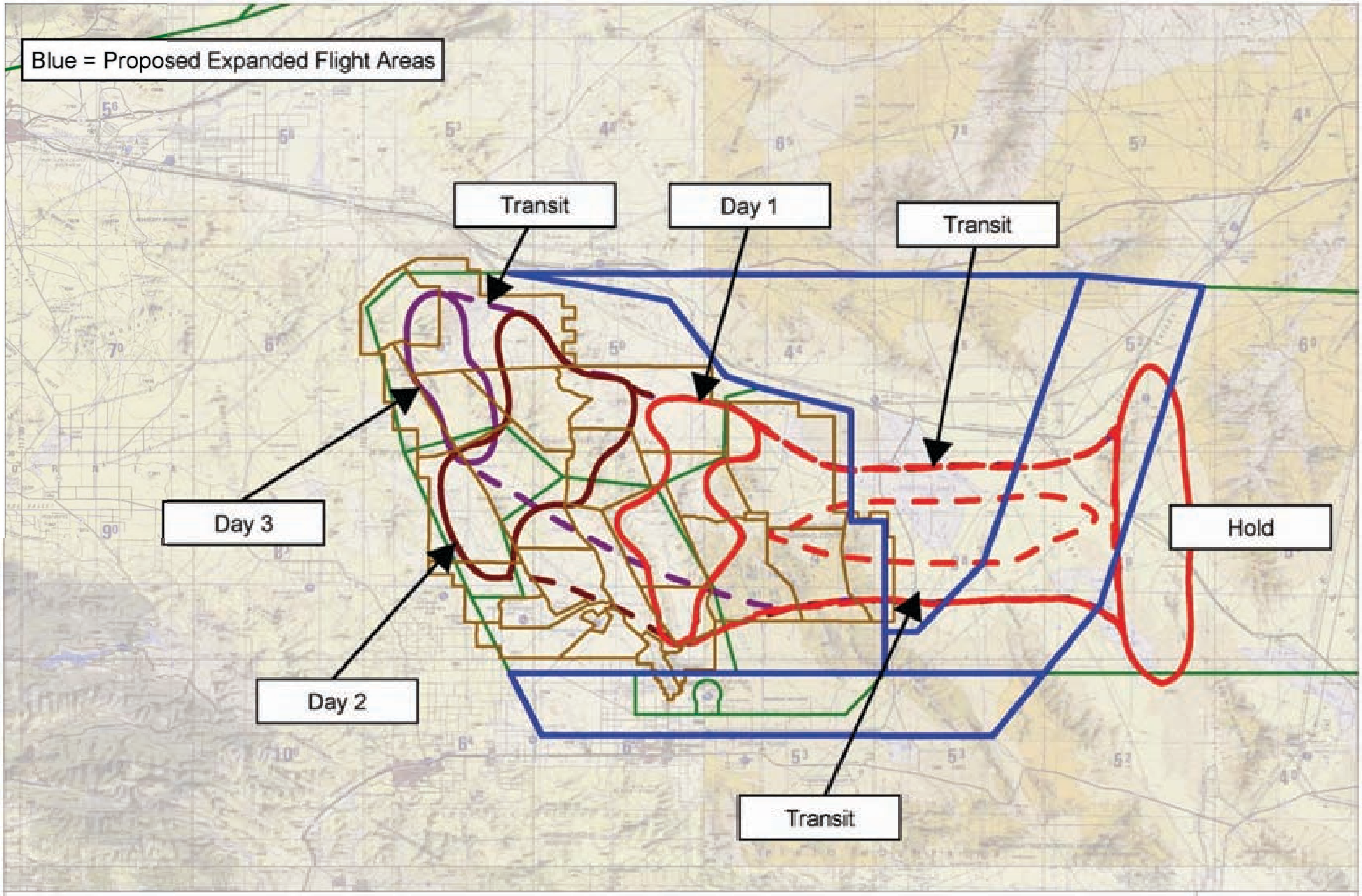
Scale in Feet 1:720,000 (1 inch = 60,000 feet)



Alternative 3 - Workup Modeled Flight Areas

0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

Scale in Feet 1:720,000 (1 inch = 60,000 feet)

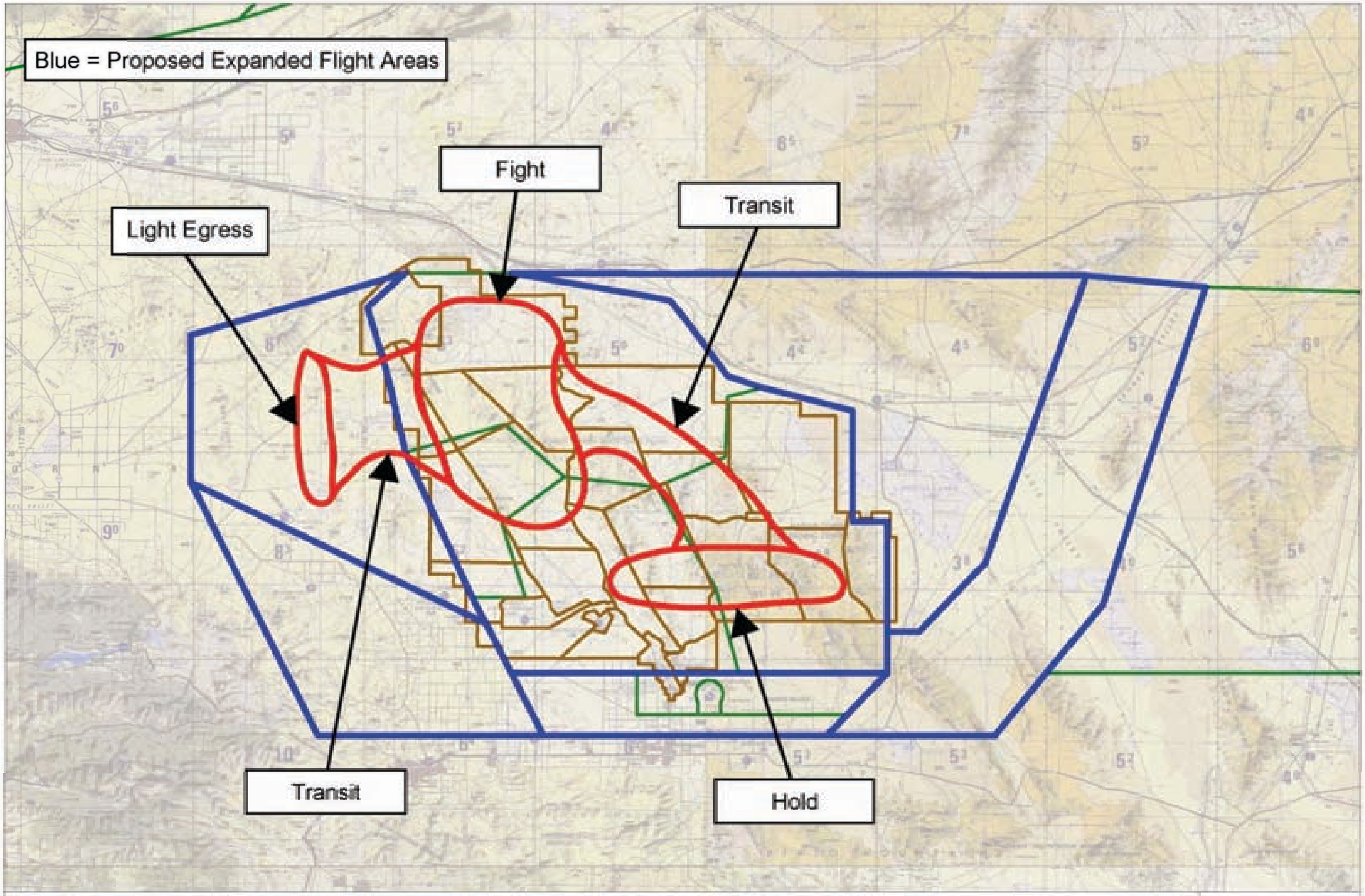


Alternative 3 - Finex Modeled Flight Areas

0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

Scale in Feet 1:720,000 (1 inch = 60,000 feet)

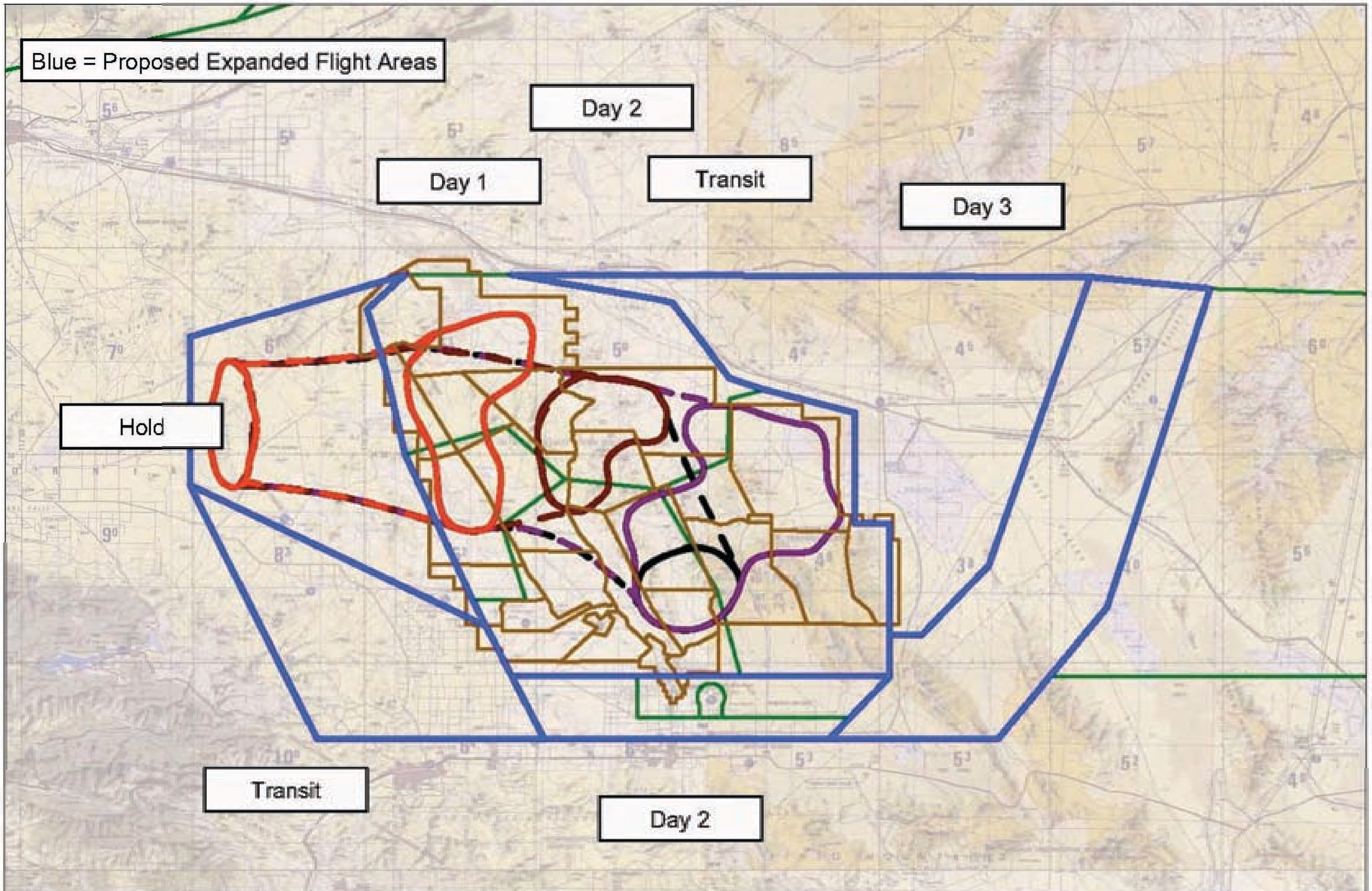
N



Alternative 4 - Workup Modeled Flight Areas

0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

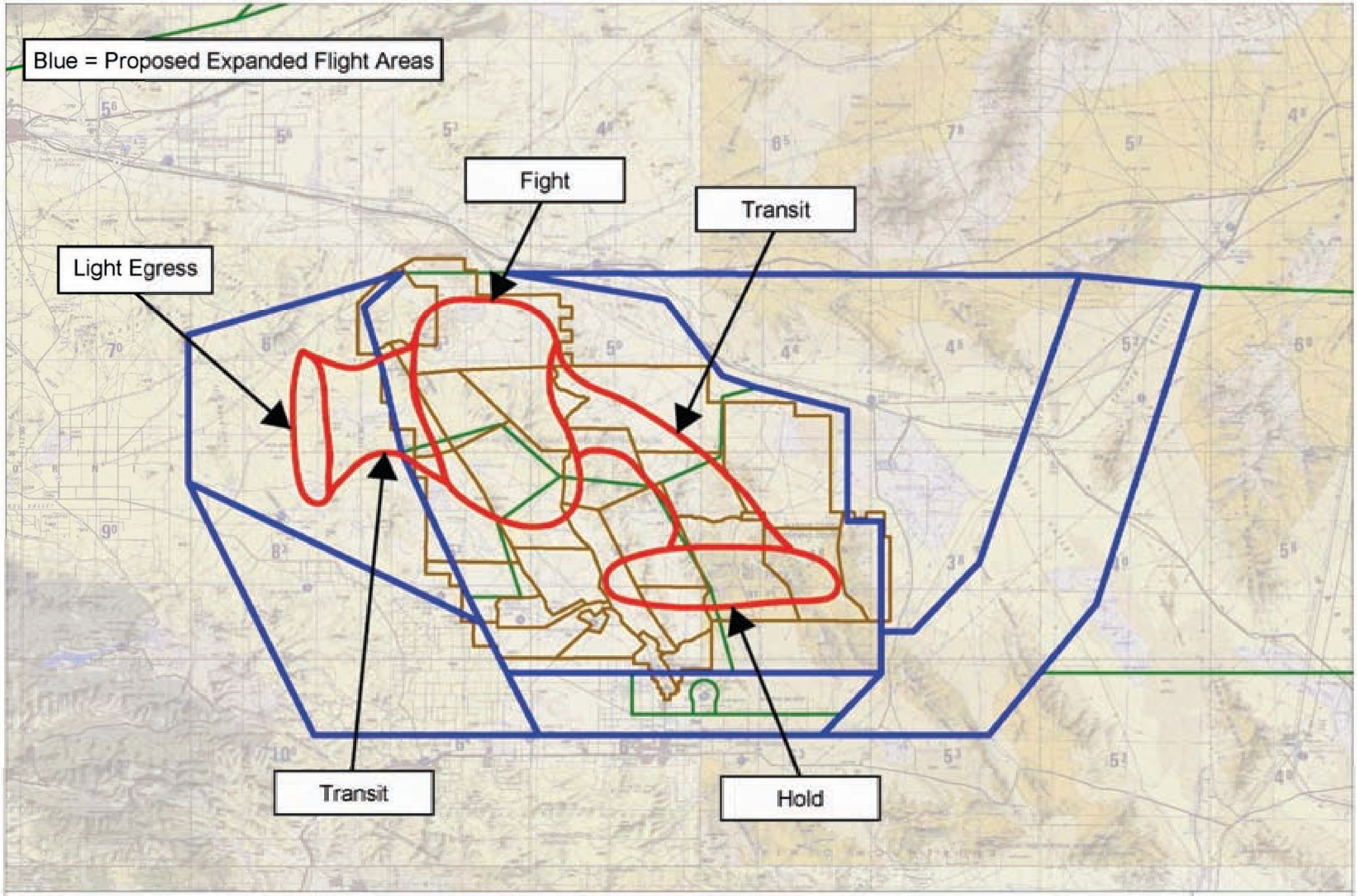
Scale in Feet 1:720,000 (1 inch = 60,000 feet)



Alternative 4 - Finex Modeled Flight Areas

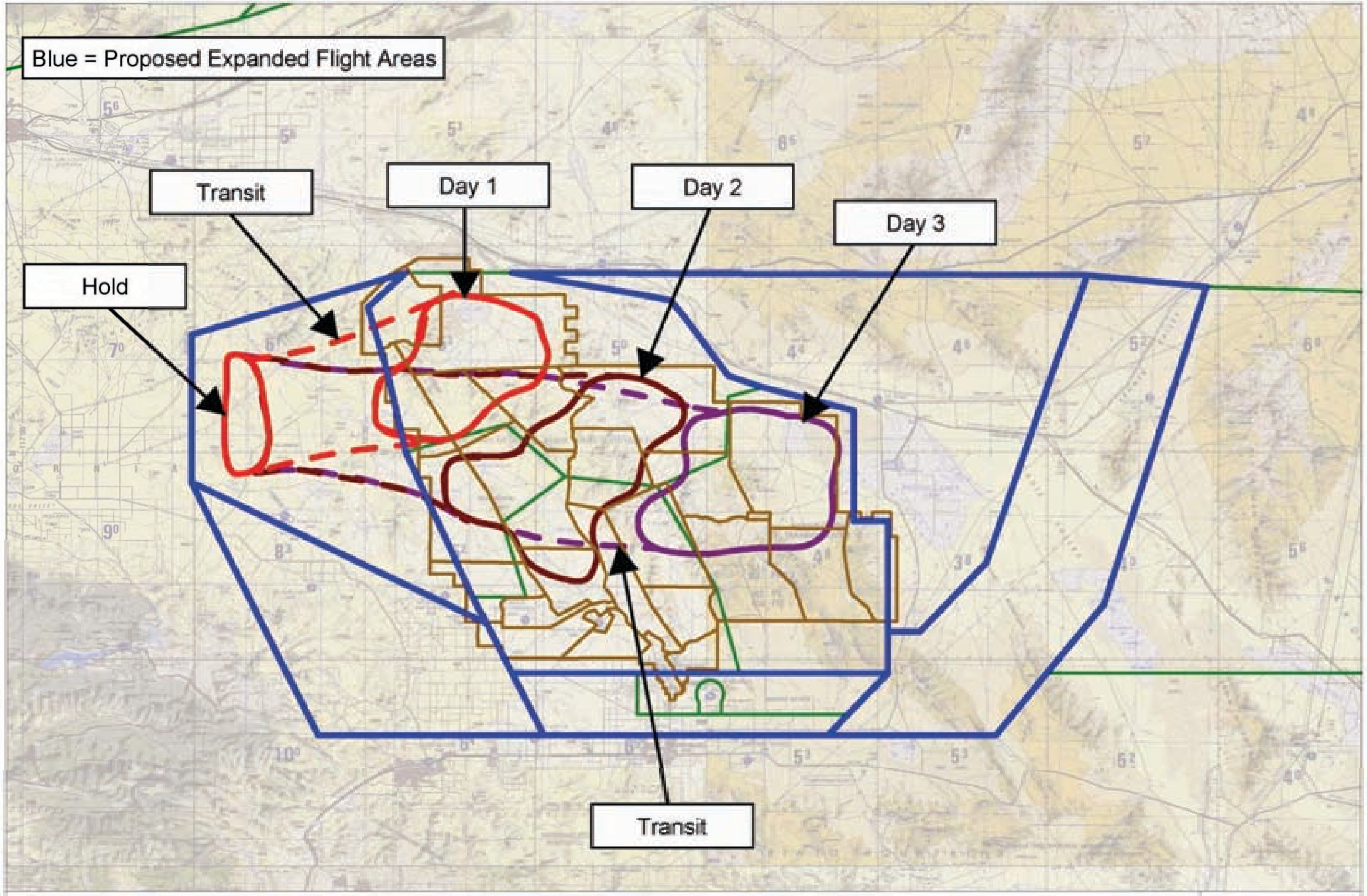
0 40,000 80,000 120,000 160,000 200,000 240,000 280,000 320,000 360,000 400,000 440,000

Scale in Feet 1:720,000 (1 inch = 60,000 feet)



Alternative 5 - Workup Modeled Flight Areas

Scale in Feet 1:720,000 (1 inch = 60,000 feet)



Alternative 5 - Finex Modeled Flight Areas

Scale in Feet 1:720,000 (1 inch = 60,000 feet)

H-2.3 Flight Profiles Database

MCAGCC Twentynine Palms Modeled Airspace

MODELED CONDITIONS								TIME (% OR MINUTES) IN RANGE OF ALTITUDE (FT AGL)								
AIRSPACE ID	MISSION ID	AIRCRAFT ID	SPEED (KIAS)	POWER DESCRIPTION	POWER SETTING	POWER UNIT	PERIOD OF DAY	MIN: 22000 MAX: 22000	0 500	0 1000	500 1000	1000 5000	1500 5000	1500 22000	19000 19000	TOTAL
BRISTOL	F-18 BRI	F-18	400	CRUISE POWER	88	% NC	daytime							100		100
BRISTOL	F-5 BRI	F-5E	325	CRUISE POWER	86	% RPM	daytime							100		100
BRISTOL	KC-130 BRI	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime							100		100
BRISTOL	AV-8B BRI	AV-8B	300	TRAFFIC PATTERN	85	% RPM	daytime							100		100
BRISTOL	AH-1 BRI	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	daytime						100			100
BRISTOL	AH-1 BRI	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	nighttime						100			100
BRISTOL	UH-1 BRI	UH-1N	100	FLT AT 80 KTS	100	% RPM	daytime						100			100
BRISTOL	CH-53E BRI	CH-53E	120	CRUISE POWER	68	%Q-BPA	daytime						100			100
2501E	F-18 RES	F-18	400	CRUISE POWER	88	% NC	daytime		20		40	40				100
2501E	F-5 RES	F-5E	325	CRUISE POWER	86	% RPM	daytime		20		40	40				100
2501E	KC-130 RES	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime		20		40	40				100
2501E	AV-8B RES	AV-8B	300	TRAFFIC PATTERN	85	% RPM	daytime		20		40	40				100
2501E	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	daytime		20		40	40				100
2501E	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	nighttime		20		40	40				100
2501E	UH-1 RES	UH-1N	100	FLT AT 80 KTS	100	% RPM	daytime			100						100
2501E	CH-53E RES	CH-53E	120	CRUISE POWER	68	%Q-BPA	daytime			100						100
2501E	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	daytime			100						100
2501E	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	nighttime			100						100
2501N	F-18 RES	F-18	400	CRUISE POWER	88	% NC	daytime		20		40	40				100
2501N	F-5 RES	F-5E	325	CRUISE POWER	86	% RPM	daytime		20		40	40				100
2501N	KC-130 RES	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime		20		40	40				100
2501N	AV-8B RES	AV-8B	300	TRAFFIC PATTERN	85	% RPM	daytime		20		40	40				100
2501N	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	daytime		20		40	40				100
2501N	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	nighttime		20		40	40				100
2501N	UH-1 RES	UH-1N	100	FLT AT 80 KTS	100	% RPM	daytime			100						100
2501N	CH-53E RES	CH-53E	120	CRUISE POWER	68	%Q-BPA	daytime			100						100
2501N	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	daytime			100						100
2501N	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	nighttime			100						100
2501S	F-18 RES	F-18	400	CRUISE POWER	88	% NC	daytime		20		40	40				100
2501S	F-5 RES	F-5E	325	CRUISE POWER	86	% RPM	daytime		20		40	40				100
2501S	KC-130 RES	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime		20		40	40				100
2501S	AV-8B RES	AV-8B	300	TRAFFIC PATTERN	85	% RPM	daytime		20		40	40				100
2501S	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	daytime		20		40	40				100
2501S	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	nighttime		20		40	40				100
2501S	UH-1 RES	UH-1N	100	FLT AT 80 KTS	100	% RPM	daytime			100						100
2501S	CH-53E RES	CH-53E	120	CRUISE POWER	68	%Q-BPA	daytime			100						100
2501S	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	daytime			100						100
2501S	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	nighttime			100						100
2501W	F-18 RES	F-18	400	CRUISE POWER	88	% NC	daytime		20		40	40				100
2501W	F-5 RES	F-5E	325	CRUISE POWER	86	% RPM	daytime		20		40	40				100
2501W	KC-130 RES	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime		20		40	40				100
2501W	AV-8B RES	AV-8B	300	TRAFFIC PATTERN	85	% RPM	daytime		20		40	40				100
2501W	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	daytime		20		40	40				100
2501W	AH-1 RES	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	nighttime		20		40	40				100
2501W	UH-1 RES	UH-1N	100	FLT AT 80 KTS	100	% RPM	daytime			100						100
2501W	CH-53E RES	CH-53E	120	CRUISE POWER	68	%Q-BPA	daytime			100						100
2501W	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	daytime			100						100
2501W	CH-46E RES	CH-46E	110	CRUISE POWER	79	%Q-BPA	nighttime			100						100
SUNDANCE	F-18 SUN	F-18	400	CRUISE POWER	88	% NC	daytime				100					100
SUNDANCE	F-5 SUN	F-5E	325	CRUISE POWER	86	% RPM	daytime				100					100
SUNDANCE	KC-130 SUN	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime				100					100
SUNDANCE	AV-8B SUN	AV-8B	300	TRAFFIC PATTERN	85	% RPM	daytime				100					100
SUNDANCE	AH-1 SUN	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	daytime				100					100
SUNDANCE	AH-1 SUN	AH-1G	100	LFO LITE 100 KTS	100	KNOTS	nighttime				100					100
SUNDANCE	UH-1 SUN	UH-1N	100	FLT AT 80 KTS	100	% RPM	daytime				100					100
SUNDANCE	CH-53E SUN	CH-53E	120	CRUISE POWER	68	%Q-BPA	daytime				100					100
SUNDANCE	CH-46E SUN	CH-46E	110	CRUISE POWER	79	%Q-BPA	daytime				100					100
SUNDANCE	CH-46E SUN	CH-46E	110	CRUISE POWER	79	%Q-BPA	nighttime				100					100

MCAGCC Twentynine Palms Modeled Airspace (concluded)

MODELED CONDITIONS								TIME (% OR MINUTES) IN RANGE OF ALTITUDE (FT AGL)								
AIRSPACE ID	MISSION ID	AIRCRAFT ID	SPEED (KIAS)	POWER DESCRIPTION	POWER SETTING	POWER UNIT	PERIOD OF DAY	MIN: 22000 MAX: 22000	0 500	0 1000	500 1000	1000 5000	1500 5000	1500 22000	19000 19000	TOTAL
LMTNN	MV22_110	TAKEOFF PO	110	110			daytime		100							100
LMTNN	MV22_110	TAKEOFF PO	110	110			evening		100							100
LMTNS	MV22_110	TAKEOFF PO	110	110			daytime		100							100
LMTNS	MV22_110	TAKEOFF PO	110	110			evening		100							100
LMTNS	MV22_110	TAKEOFF PO	110	110			nighttime		100							100
NOBLE	MV22_110	TAKEOFF PO	110	110			daytime		100							100
NOBLE	MV22_110	TAKEOFF PO	110	110			evening		100							100
DELTA	MV22_110	TAKEOFF PO	110	110			daytime		100							100
DELTA	MV22_110	TAKEOFF PO	110	110			evening		100							100
FASP	MV22_110	TAKEOFF PO	110	110			daytime		100							100
FASP	MV22_110	TAKEOFF PO	110	110			evening		100							100
EMERSON	MV22_110	TAKEOFF PO	110	110			daytime		100							100
EMERSON	MV22_110	TAKEOFF PO	110	110			evening		100							100
LAVIC	MV22_110	TAKEOFF PO	110	110			daytime		100							100
LAVIC	MV22_110	TAKEOFF PO	110	110			evening		100							100
LAVIC	MV22_110	TAKEOFF PO	110	110			nighttime		100							100
LAVICSUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
LAVICSUB	MV22_110	TAKEOFF PO	110	110			evening		100							100
LAVICSUB	MV22_110	TAKEOFF PO	110	110			nighttime		100							100
LMTNNSUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
LMTNNSUB	MV22_110	TAKEOFF PO	110	110			evening		100							100
NOBLESUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
NOBLESUB	MV22_110	TAKEOFF PO	110	110			evening		100							100
EMERSONSUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
EMERSONSUB	MV22_110	TAKEOFF PO	110	110			evening		100							100
LMTNSSUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
LMTNSSUB	MV22_110	TAKEOFF PO	110	110			evening		100							100
LMTNSSUB	MV22_110	TAKEOFF PO	110	110			nighttime		100							100
FASPSUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
FASPSUB	MV22_110	TAKEOFF PO	110	110			evening		100							100
DELTASUB	MV22_110	TAKEOFF PO	110	110			daytime		100							100
DELTASUB	MV22_110	TAKEOFF PO	110	110			evening		100							100

MODELED CONDITIONS								TIME (% OR MINUTES) IN RANGE OF ALTITUDE (FT AGL)								
AIRSPACE ID	MISSION ID	AIRCRAFT ID	SPEED (KIAS)	POWER DESCRIPTION	POWER SETTING	POWER UNIT	PERIOD OF DAY	MIN: 22000 MAX: 22000	0 500	0 1000	500 1000	1000 5000	1500 5000	1500 22000	19000 19000	TOTAL
FLTRK22	KC130#2FTK	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime	100								
FLTRK22	F18#2FLTRK	F-18	250	TRAFFIC PATTERN	82	% NC	daytime	100								
FLTRK22	AV8#2FLTRK	AV-8B	250	TRAFFIC PATTERN	70	% RPM	daytime	100								
FLTRK19	KC130#1FTK	C-130H&N&P	250	TAKEOFF POWER	850	C TIT	daytime									100
FLTRK19	F18#1FLTRK	F-18	250	TRAFFIC PATTERN	82	% NC	daytime									100
FLTRK19	AV8#1FLTRK	AV-8B	250	TRAFFIC PATTERN	70	% RPM	daytime									100
PERIMETER	MV22_220	TAKEOFF PO	110	110	VC10		daytime			100						100
PERIMETER	MV22_220	TAKEOFF PO	110	110	VC10		evening			100						100
PERIMETER	MV22_220	TAKEOFF PO	110	110	VC10		nighttime			100						100

MEBEX Flight Profiles for Work-up and FINEX Phases

Aircraft Type	Holding													
	Average Power Setting	Average Airspeed (kts)	Sortie Duration (minutes)	0-500	500-1k	1k-3k	3k-4k	0-4k	4-10k	10-14k	14k-24k	22k-24k	24k-26k	Total
AV-8B	85% RPM	300	30								90	10		100
F/A-18C/D	88% NC	400	30								90	10		100
F-35B*	85% ETR	350	30								90	10		100
Joint FW (e.g., F-16)	87% NC	400	30								90	10		100
EA-6B	80% RPM	300	30								100			100
KC-130	850 CTIT	250	30							100				100
Joint AR (KC-10, KC-135)	85% NF	450	30										100	100
AH-1/ UH-1	n/a	100	30	100										100
CH-53	n/a	120	30	100										100
MV-22	n/a	200	30						100					100
Joint RW (e.g., H-60)	n/a	100	30	100										100
UAS	Not Modeled	90	30							100				100

Aircraft Type	Transit													
	Average Power Setting	Average Airspeed (kts)	Sortie Duration (minutes)	0-500	500-1k	1k-3k	3k-4k	0-4k	4-10k	10-14k	14k-24k	22k-24k	24k-26k	Total
AV-8B	85% RPM	300	10								100			100
F/A-18C/D	88% NC	400	10								100			100
F-35B*	85% ETR	350	10								100			100
Joint FW (e.g., F-16)	87% NC	400	10								100			100
EA-6B	80% RPM	300	10								100			100
KC-130	850 CTIT	250	10						100					100
Joint AR (KC-10, KC-135)	85% NF	450	10								100			100
AH-1/ UH-1	n/a	100	10	100										100
CH-53	n/a	120	10	100										100
MV-22	n/a	200	10			80	20							100
Joint RW (e.g., H-60)	n/a	100	10	100										100
UAS	Not Modeled	90	10						100					100

MEBEX Flight Profiles for Work-up and FINEX Phases (concluded)

Aircraft Type	Range													
	Average Power Setting	Average Airspeed (kts)	Sortie Duration (minutes)	0-500	500-1k	1k-4k	3k-4k	0-4k	4-10k	10-14k	14k-24k	22k-24k	24k-26k	Total
AV-8B	85% RPM	300	38	5	1	2			35	57				100
F/A-18C/D	88% NC	400	50	5	1	2			35	57				100
F-35B*	85% ETR	350	50	5	1	2			35	57				100
Joint FW (e.g., F-16)	87% NC	400	50	5	1	2			35	57				100
EA-6B	80% RPM	300	80								100			100
KC-130	850 CTIT	250	140					100						100
Joint AR (KC-10, KC-135)	85% NF	450	200								100			100
AH-1/ UH-1	n/a	100	50	100										100
CH-53	n/a	120	50	100										100
MV-22	n/a	200	80	50	50									100
Joint RW (e.g., H-60)	n/a	100	80	100										100
UAS	Not Modeled	90	560					100						100

Aircraft Type	Transit Back													
	Average Power Setting	Average Airspeed (kts)	Sortie Duration (minutes)	0-500	500-1k	1k-3k	3k-4k	0-4k	4-10k	10-14k	14k-24k	22k-24k	24k-26k	Total
AV-8B	85% RPM	300	10								100			100
F/A-18C/D	88% NC	400	10								100			100
F-35B*	85% ETR	350	10								100			100
Joint FW (e.g., F-16)	87% NC	400	10								100			100
EA-6B	80% RPM	300	10								100			100
KC-130	850 CTIT	250	10						100					100
Joint AR (KC-10, KC-135)	85% NF	450	10								100			100
AH-1/ UH-1	n/a	100	10	100										100
CH-53	n/a	120	10	100										100
MV-22	n/a	200	10			80	20							100
Joint RW (e.g., H-60)	n/a	100	10	100										100
UAS	Not Modeled	90	10						100					100

H-3 ORDNANCE

H-3.1 Baseline Events

Appendix H – Noise Modeling Data

Baseline (CY01) Ground-to-Ground Firings for Fixed (Numbered) Ranges

Reported Ammunition Type	Description	Modeled As (if modeled)[2]	Annual Firings			
			0700-1900	1900-2200	2200-0700	Total
RANGE 101						
5.56MM (DUMMY, BLK)	Semi Automatic Rifle		310	0	0	310
TOTAL			310	0	0	310
RANGE 101A						
12GA (00BCK,#7)	Shot Gun		199	0	0	199
5.56MM (4/1,BALL)	Semi Automatic Rifle		8,519	0	0	8,519
9MMB	Sub Machine Gun		7,240	0	0	7,240
TOTAL			15,958	0	0	15,958
RANGE 103						
40MM	Grenade Launcher	40-MM GREN LN M203	12	0	0	12
40MM ILLUM	Grenade Launcher (Illumination Rounds)		15	0	0	15
66MM AT	Grenade (Inert)		7	0	0	7
5.56MM (M885,LINKD,4/1,BAL,M193,BM200,BLK)	Semi Automatic Rifle		325,612	0	0	325,612
7.62MM (39BAL,BLK)	Machine Gun		1,965	0	0	1,965
60MMHE	Light Weight Mortar	60-MM MORTAR	42	0	0	42
TOTAL			327,653	0	0	327,653
RANGE 104						
SUBCAL	Sub Machine Gun		327	0	0	327
9MMB	Sub Machine Gun		1,898	0	0	1,898
ATP[1]			208	0	0	208
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	4,983	0	0	4,983
40MM (CS,PRLKD,TP)	Grenade Launcher (Practice Rounds)		1,583	0	0	1,583
M 203	40mm Grenade Launcher (Inert Rounds)		583	0	0	583
AT4	Rocket	AT4 ROCKET	72	0	0	72
GRNFRM67 (2/5E)	Hand Grenade	HAND GRENADE M67	5,783	0	0	5,783
GRNPRM228	Practice Hand Grenade		369	0	0	369
83MM SMAW	Shoulder-Launched Multipurpose Assault Weapon	AT4 ROCKET	28	0	0	28
DRAGON PR	Practice Dragon Missile	DRAGON MISSILE (inert)	15	0	0	15
DRAGON HE	High Explosive Dragon Missile	DRAGON MISSILE	21	0	0	21
TOTAL			15,870	0	0	15,870
RANGE 105						
9MMB	Sub Machine Gun		60	0	0	60
CSGAS	CS Hand Grenade		549	0	0	549
5.56MBAL	Semi Automatic Rifle		1,932	0	0	1,932
TOTAL			2,541	0	0	2,541
RANGE 105A						
12GA, #7	Shot Gun		642	0	0	642
5.56MM (4/1,M193,BALSAW,BLK)	Semi Automatic Rifle		69,632	0	0	69,632
7.62MM (39BAL,BLK)	Machine Gun		7,900	0	0	7,900
9MMB	Sub Machine Gun		8,660	0	0	8,660
.50 (4&1A/T,BALL)	.50 Caliber Machine Gun		2,400	0	0	2,400
90MMHE	90mm Mortar	90-MM REC RIFLE M67	3,000	0	0	3,000
CSGAS	CS Hand Grenade		17	0	0	17
TOTAL			92,251	0	0	92,251
RANGE 106						
60MMHE	60mm Mortar	60-MM MORTAR	2,327	1,552	0	3,879
60MMTP	60mm Mortar (Practice Rounds)	60-MM MORTAR (inert)	37	24	0	61
81MM (HE,HEPU)	81mm Mortar	81-MM MORTAR	1,824	1,216	0	3,040
81MMSMKWP	81mm Mortar (Smoke)	81-MM MORTAR (inert)	18	12	0	30
DEMO CH	Demolition Charge	TNT (8 LBS)	3	2	0	5
TOTAL			4,209	2,806	0	7,015
RANGE 107						
5.56MM (BAL,BLK)	Semi Automatic Rifle		95,938	5,049	0	100,987
7.62MM BLK	Machine Gun		594	31	0	625
40MM	Grenade Launcher	40-MM GREN LN M203	12	1	0	13
SMOKE HC	Smoke Canisters		373	20	0	393
TOTAL			96,917	5,101	0	102,018
TOTAL (this page)			555,709	7,907	0	563,616

Baseline (CY01) Ground-to-Ground Firings for Fixed (Numbered) Ranges (continued)

Reported Ammunition Type	Description	Modeled As (if modeled)[2]	Annual Firings			
			0700-1900	1900-2200	2200-0700	Total
RANGE 108						
5.56MM (BALSAW,BLK)	Semi Automatic Rifle		298,826	15,727	0	314,553
7.62MM (4/1,39BAL,BLK)	Machine Gun		38,394	2,021	0	40,415
9MM	Sub Machine Gun		11	1	0	12
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	1,383	73	0	1,456
40MM TP	Grenade Launcher (Practice Rounds)		67	4	0	71
FRAGM67	Hand Grenade	HAND GRENADE M67	45	2	0	47
60MMHE	60mm Mortar	60-MM MORTAR	14	1	0	15
TOTAL			338,740	17,829	0	356,569
RANGE 109						
.50 (4&1A/T,4&1B/T,BALL,API,BLK)	.50 Caliber Machine Gun		85,506	57,004	0	142,510
20MM (LKDTPT,TPI)	20mm Automatic Gun	20-MM GUN	1,092	728	0	1,820
25MM (TPDS,TPT)	25mm Automatic Gun	20-MM GUN	5,698	3,798	0	9,496
25MM HEI	25mm Automatic Gun	20-MM GUN	929	620	0	1,549
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	1,670	1,114	0	2,784
83MM SMAW	Shoulder-Launched Multipurpose Assault Weapon	AT4 ROCKET	4	2	0	6
TOW (PRA,INERT)	Tow Missile (Inert)	TOW MISSILE (inert)	2	2	0	4
TOTAL			94,901	63,268	0	158,169
RANGE 110						
.50 BALL	.50 Caliber Machine Gun		23,007	0	0	23,007
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	80,983	0	0	80,983
40MM TP	Grenade Launcher (Practice Rounds)		1,291	0	0	1,291
C4 1-1/4	Demolition Charge	C4 1-1/4	16	0	0	16
BLCAPM6	General Purpose Dispenser		1	0	0	1
TOTAL			105,298	0	0	105,298
RANGE 113						
5.56MM (BALSAW,BLK)	Semi Automatic Rifle		63,924	5,559	0	69,483
7.62MM (BPACK,39BAL,BLK)	Machine Gun		310,258	26,979	0	337,237
60MM	60mm Mortar	60-MM MORTAR	15	1	0	16
TOTAL			374,197	32,539	0	406,736
RANGE 113A						
.50 (BALL,API)	.50 Caliber Machine Gun		1,375	120	0	1,495
7.62MM (BPACK,BM82,LKD,BLK)	Machine Gun		16,433	1,429	0	17,862
5.56MM BAL	Semi Automatic Rifle		7,575	659	0	8,234
TOTAL			25,383	2,208	0	27,591
RANGE 114						
TNT 1LB	Demolition Charge	TNT (1 LBS)	26	0	0	26
C4 1-1/4	Demolition Charge	C4 1-1/4	16	0	0	16
TOTAL			42	0	0	42
RANGE 400						
.50 (BALL,BLK)	.50 Caliber Machine Gun		25,137	254	0	25,391
10MM[1]			75	1	0	76
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	3,292	33	0	3,325
40MM (ILLUM,CS)	Grenade Launcher (Illumination Rounds, Gas)		357	3	0	360
5.56MM (BLK,BLSAW,TM196)	Semi Automatic Rifle		352,547	3,561	0	356,108
60MMHE	60mm Mortar	60-MM MORTAR	2,785	28	0	2,813
60MMTP	60mm Mortar (Practice Rounds)	60-MM MORTAR (inert)	372	4	0	376
7.62MM (39BAL,BLK,BM118,L4/1,LTM62)	Machine Gun		211,280	2,135	0	213,415
81MMHE	81mm Mortar	81-MM MORTAR	2,880	30	0	2,910
81MMILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	20	0	0	20
83MM SMAW	Shoulder-Launched Multipurpose Assault Weapon	AT4 ROCKET	9	0	0	9
AT4	Rocket	AT4 ROCKET	101	1	0	102
9MMB	Sub Machine Gun		429	4	0	433
BANGTORP	Bangalore Torpedo	BANGALORE M1A1 (90 LBS)	7	0	0	7
DEMO CH	Demolition Charge	TNT (8 LBS)	2	0	0	2
DRAGON HE	Dragon Missile	DRAGON MISSLE	2	0	0	2
FRAGM67	Hand Grenade	HAND GRENADE M67	24	0	0	24
TOTAL			599,319	6,054	0	605,373
TOTAL (this page)			1,537,880	121,898	0	1,659,778

Baseline (CY01) Ground-to-Ground Firings for Fixed (Numbered) Ranges (concluded)

Reported Ammunition Type	Description	Modeled As (if modeled)[2]	Annual Firings 0700-1900	1900-2200	2200-0700	Total
RANGE 410						
12GA, #7	Shot Gun		30	0	0	30
20MM TPI	Automatic Gun (Practice)		40	0	0	40
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	520	5	0	525
40MM TP	Grenade Launcher (Practice)		112	1	0	113
5.56MM (BALL,,BLSAW)	Semi Automatic Rifle		116,896	1,181	0	118,077
7.62MM (39BAL,BLK)	Machine Gun		40,590	410	0	41,000
9MMB	Sub Machine Gun		519	5	0	524
CLAYMORE	Claymore Mines	CLAYMORE M18A1	2	0	0	2
	TOTAL		158,709	1,602	0	160,311
RANGE 410A						
.22 CAL	.22 Caliber Machine Gun		10,687	108	0	10,795
40MM (HEDP)	Grenade Launcher	40-MM GREN LN M203	1,488	14	0	1,502
40MM (ILLUM,TP)	Grenade Launcher (Illumination Rounds, Practice)		221	2	0	223
5.56MM (TR,BAL,LINKD,BLK)	Semi Automatic Rifle		283,913	2,867	0	286,780
7.62MM (4/1,39BAL,BLK,LKD)	Machine Gun		204,336	2,064	0	206,400
83MM SMAW	Shoulder-Launched Multipurpose Assault Weapon	AT4 ROCKET	9	0	0	9
9MMB	Sub Machine Gun		18	0	0	18
GRNM69	Practice Hand Grenade		834	8	0	842
	TOTAL		501,506	5,063	0	506,569
RANGE 500						
.22 CAL	.22 Caliber Machine Gun		118	15	15	148
.50 (4&1B/T,API,BALL,BLK)	.50 Caliber Machine Gun		13,889	1,737	1,737	17,363
120MM HE/PD	120mm Mortar	120-MM MORTAR	830	104	104	1,038
120 ILLUM	120mm Mortar (Illumination Rounds)	120-MM MORTAR (inert)	32	4	4	40
20MM (LKDTPT,TPI)	20mm Automatic Gun (Practice)	20-MM GUN (inert)	2,661	332	332	3,325
25MM HEI	25mm Automatic Gun	25-MM GUN	10,778	1,347	1,347	13,472
25MM(TPT,APDS,TPDS)	25mm Automatic Gun (Practice)	25-MM GUN (inert)	7,155	894	894	8,943
30MM (APIHEI)	30mm Gun (Armor Piercing Incendiary)	25-MM GUN	24	3	3	30
5.56MM BAL	Semi Automatic Rifle		640	80	80	800
7.62MM (4/1,39BAL,BLK)	Machine Gun		65,872	8,234	8,234	82,340
75MM BLK	75mm Pack Howitzer (Blank)	4.2-IN MORTAR (inert)	366	46	46	458
AT4	Rocket	AT4 ROCKET	400	50	50	500
	TOTAL		102,765	12,846	12,846	128,457
RANGE 601						
C4 1-1/4	Demolition Charge	C4 1-1/4	42	0	0	42
	TOTAL		42	0	0	42
RANGE 603						
.50 BALL	.50 Caliber Machine Gun		1,800	200	0	2,000
	TOTAL		1,800	200	0	2,000
	TOTAL (this page)		764,822	19,711	12,846	797,379
	GRAND TOTAL (all pages)		2,858,411	149,516	12,846	3,020,773

[1] Unknown Ammunition (Not Modeled)

[2] Corresponding "Modeled As (If Modeled)" column presented only for modeled ammunitions.

LBS = Pound

Yellow shading indicates update regarding WR 03-11

Baseline (CY01) Ground-to-Ground Firings for Training Ranges

Reported Ammunition Type	Description	Modeled As (if modeled)[2]	Annual Firings			
			0700-1900	1900-2200	2200-0700	Total
AMERICA MINE						
.50 BALL	.50 Caliber Machine Gun		4,817	1,606	1,606	8,029
25MM APDS	25mm Automatic Gun	25-MM GUN	1,326	442	442	2,210
25MM TPT	25mm Automatic Gun	25-MM GUN	4,665	1,555	1,555	7,775
40MM	Grenade Launcher	40-MM GREN LN M203	60	20	20	100
40MM (TP,TPHEL)	Grenade Launcher (Practice Rounds)		65	22	22	109
5.56MM (BAL,BLK)	Semi Automatic Rifle		7,437	2,479	2,479	12,395
7.62MM (4/1,39BAL,BLK)	Machine Gun		10,425	3,475	3,475	17,375
81MM	81mm Mortar	81-MM MORTAR	297	99	99	495
9MMB	Sub Machine Gun		1,445	481	481	2,407
AT4	Rocket	AT4 ROCKET	5	2	2	9
DRAGON HE	Dragon Missile	DRAGON MISSILE	10	4	3	17
TOW HE	Tow Missile	TOW MISSILE	1	1	0	2
TOTAL			30,553	10,186	10,184	50,923
BLACKTOP						
.50 (BALL,BLK)	.50 Caliber Machine Gun		14,721	4,907	4,907	24,535
120 HE/PD	120mm Mortar	120-MM MORTAR	65	22	22	109
120 TPT	120mm Mortar (Practice Rounds)	120-MM MORTAR (inert)	77	26	26	129
155MM HE	155mm Howitzer	155-MM HOWITZER M109	2,483	827	827	4,137
155MM ILLUM	155mm Howitzer (Illumination Rounds)	155-MM HOWITZER M109 (inert)	59	20	20	99
20MM HEI	20mm Automatic Gun	20-MM GUN	2,361	787	787	3,935
25MM TPT	25mm Automatic Gun	25-MM GUN	1,165	388	388	1,941
40MM (ILLUM,TP)	Grenade Launcher (Illumination Rounds)		346	116	116	578
5.56MM (4/1,LINKD,BAL,BLK)	Semi Automatic Rifle		49,788	16,596	16,596	82,980
60MM HE	60mm Mortar	60-MM MORTAR	481	160	160	801
7.62MM (4/1,39BAL,BLM82)	Machine Gun		38,617	12,872	12,872	64,361
81MM ILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	7	2	2	11
81MMHE	81mm Mortar	81-MM MORTAR	1,323	441	441	2,205
TOW HE	Tow Missile	TOW MISSILE	2	1	1	4
TOW INERT	Tow Missile (Inert)	TOW MISSILE (inert)	17	6	6	29
TOW SIMBL	Tow Missile (Inert)	TOW MISSILE (inert)	1	0	0	1
TOTAL			111,513	37,171	37,171	185,855
BULLION						
.50 BALL	.50 Caliber Machine Gun		2,520	840	840	4,200
81MMHE	81mm Mortar	81-MM MORTAR	1	0	0	1
TOW HEAT	Tow Missile	TOW MISSILE	13	5	5	23
TOTAL			2,534	845	845	4,224
DELTA						
.50 BALL	.50 Caliber Machine Gun		11,530	3,844	3,843	19,217
120 HE/PD	120mm Mortar	120-MM MORTAR	63	21	21	105
155MM HE	155mm Howitzer	155-MM HOWITZER M109	651	218	217	1,086
155MM ILL	155mm Howitzer (Illumination Rounds)	155-MM HOWITZER M109 (inert)	7	2	2	11
2.75HY70	2.75 inch Rocket	2.75-IN ROCKET	2	1	1	4
20MMAPI	20mm Automatic Gun	20-MM GUN	90	30	30	150
40MM	Grenade Launcher	40-MM GREN LN M203	1,521	507	507	2,535
5.56MM (LINKD,BAL)	Semi Automatic Rifle		54,120	18,040	18,040	90,200
60MMHE	60mm Mortar	60-MM MORTAR	195	65	65	325
7.62MM (39BAL,LKDB,BLK)	Machine Gun		33,288	11,096	11,096	55,480
81MM ILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	7	3	2	12
81MMHE	81mm Mortar	81-MM MORTAR	249	84	83	416
AT4	Rocket	AT4 ROCKET	1	0	0	1
C4 1-1/4	Demolition Charge	C4 1-1/4	7	3	2	12
TOW HEAT	Tow Missile	TOW MISSILE	6	2	2	10
TOWINERT	Tow Missile (Inert)	TOW MISSILE (inert)	1	0	0	1
TOWPRA	Tow Missile (Practice)	TOW MISSILE (inert)	1	1	0	2
TOTAL			101,739	33,917	33,911	169,567
TOTAL (this page)			246,339	82,119	82,111	410,569

Baseline (CY01) Ground-to-Ground Firings for Training Ranges (continued)

Reported Ammunition Type	Description	Modeled As (if modeled)[2]	CY01 Annual Firings			
			0700-1900	1900-2200	2200-0700	Total
EMERSON LAKE						
.50 BALL	.50 Caliber Machine Gun		88,834	29,612	29,612	148,058
120 HE/PD	120mm Mortar	120-MM MORTAR	299	100	100	499
155MM HE	155mm Howitzer	155-MM HOWITZER M109	417	139	139	695
25MM APDS	25mm Automatic Gun (Armor Piercing)	25-MM GUN	61	20	20	101
25MM HEI	25mm Automatic Gun	25-MM GUN	4,609	1,536	1,536	7,681
25MM TPT	25mm Automatic Gun (Practice Rounds)	25-MM GUN	2,106	702	702	3,510
40MM	Grenade Launcher	40-MM GREN LN M203	319	106	106	531
40MM HEDP	Grenade Launcher	40-MM GREN LN M203	544	181	181	906
5.56MM BAL	Semi Automatic Rifle		14,470	4,823	4,823	24,116
60MMHE	60mm Mortar	60-MM MORTAR	21	7	7	35
7.62MM (39BAL,BLK)	Machine Gun		101,038	33,679	33,679	168,396
81MMHE	81mm Mortar	81-MM MORTAR	119	40	40	199
AT4	Rocket	AT4 ROCKET	4	2	2	8
9MMB	Sub Machine Gun		20	7	7	34
DEMOBLK	Demolition Charge	TNT (3.5 LBS)	1	0	0	1
SMK GREEN	Green Smoke		24	8	8	40
TOW HEAT	Tow Missile	TOW MISSILE	3	1	1	5
TOWINERT	Tow Missile (Inert)	TOW MISSILE (inert)	8	3	2	13
	TOTAL		212,897	70,966	70,965	354,828
GAYS PASS						
.50 BALL	.50 Caliber Machine Gun		5,160	1,720	1,720	8,600
155MM HE	155mm Howitzer	155-MM HOWITZER M109	276	92	92	460
155MM ILL	155mm Howitzer (Illumination Rounds)	155-MM HOWITZER M109 (inert)	10	3	3	16
5.56MM (BAL,BLK)	Semi Automatic Rifle		4,896	1,632	1,632	8,160
7.62MM (39BAL,BLK)	Machine Gun		4,560	1,520	1,520	7,600
81MMHE	81mm Mortar	81-MM MORTAR	197	66	66	329
84MM AT4	Rocket	AT4 ROCKET	12	4	4	20
9MMB	Sub Machine Gun		720	240	240	1,200
BLCAPM6	M6 Blasting Cap		10	3	3	16
C4 1-1/4	Demolition Charge	C4 1-1/4	10	3	3	16
DEMO CH	Demolition Charge	TNT (8 LBS)	1	0	0	1
MRLSPR[1]			17	6	6	29
TOWINERT	Tow Missile (Inert)	TOW MISSILE (inert)	5	2	2	9
	TOTAL		15,874	5,291	5,291	26,456
LAVA						
.50 BALL	.50 Caliber Machine Gun		2,430	810	810	4,050
25MM TPT	25mm Automatic Gun	25-MM GUN	659	220	220	1,099
40MM	Grenade Launcher	40-MM GREN LN M203	149	50	50	249
40MMTP	Grenade Launcher (Practice Rounds)		136	45	45	226
7.62M39BAL	Machine Gun		4,289	1,430	1,430	7,149
BLCAPM7	M7 Blasting Cap		3	1	1	5
C4 1-1/4	Demolition Charge	C4 1-1/4	6	2	2	10
	TOTAL		7,672	2,558	2,558	12,788
LAVIC LAKE						
2.75FBAT	2.75 inch Rocket	2.75-IN ROCKET	8	3	3	14
20MM HEI	20mm Automatic Gun	20-MM GUN	840	280	280	1,400
	TOTAL		848	283	283	1,414
LEAD MOUNTAIN						
.50 (BALL,4&1A/T,4&1B/T)	.50 Caliber Machine Gun		2,112	704	704	3,520
155MM HE	155mm Howitzer	155-MM HOWITZER M109	1,000	334	334	1,668
155MM ILL	155mm Howitzer (Illumination Rounds)	155-MM HOWITZER M109 (inert)	65	22	22	109
155MMCHEM	155mm Howitzer (Chemicals)	155-MM HOWITZER M109 (inert)	3	1	1	5
2.75M257	2.75 inch Rocket	2.75-IN ROCKET	19	6	6	31
20MM HEI	20mm Automatic Gun	20-MM GUN	120	40	40	200
5.56MM (BAL,BLK)	Semi Automatic Rifle		600	200	200	1,000
7.62MM (4/1,39BAL,BLK)	Machine Gun		2,760	920	920	4,600
81MMHE	81mm Mortar	81-MM MORTAR	336	112	112	560
81MMILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	115	38	38	191
81MMSMKWP	81mm Mortar (Smoke)	81-MM MORTAR (inert)	8	3	3	14
TOWHEAT	Tow Missile	TOW MISSILE	11	4	4	19
TOWINERT	Tow Missile (Inert)	TOW MISSILE (inert)	13	4	4	21
	TOTAL		7,162	2,388	2,388	11,938
	TOTAL (this page)		244,453	81,486	81,485	407,424

Baseline (CY01) Ground-to-Ground Firings for Training Ranges (concluded)

Reported Ammunition Type	Description	Modeled As (if modeled)[2]	CY01 Annual Firings 0700-1900	1900-2200	2200-0700	Total
MAUMEE						
.50 BALL	.50 Caliber Machine Gun		3,600	1,200	1,200	6,000
25MMAPDS	25mm Automatic Gun	25-MM GUN	61	20	20	101
40MM	Grenade Launcher	40-MM GREN LN M203	7	2	2	11
7.62M39BAL	Machine Gun		1,979	660	660	3,299
	TOTAL		5,647	1,882	1,882	9,411
NOBLE						
40MM	Grenade Launcher	40-MM GREN LN M203	2	1	1	4
5.56MBAL	Semi Automatic Rifle		7,200	2,400	2,400	12,000
60MMHE	60mm Mortar	60-MM MORTAR	89	30	30	149
60MMTP	60mm Mortar (Practice Rounds)	60-MM MORTAR (inert)	2	1	1	4
7.62MM (39BAL,BLK)	Machine Gun		7,200	2,400	2,400	12,000
81MMHE	81mm Mortar	81-MM MORTAR	6	2	2	10
81MMILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	21	7	7	35
AT4	Rocket	AT4 ROCKET	1	0	0	1
C4 1-1/4	Demolition Charge	C4 1-1/4	10	3	3	16
DEMO CH	Demolition Charge	TNT (8 LBS)	1	0	0	1
	TOTAL		14,532	4,844	4,844	24,220
PROSPECT						
.50 BALL	.50 Caliber Machine Gun		6,384	2,128	2,128	10,640
155MM HE	155mm Howitzer	155-MM HOWITZER M109	208	69	69	346
155MM ILL	155mm Howitzer (Illumination Rounds)	155-MM HOWITZER M109 (inert)	5	2	2	9
40MM	Grenade Launcher	40-MM GREN LN M203	169	57	57	283
40MMHEDP	Grenade Launcher	40-MM GREN LN M203	48	16	16	80
40MMTP	Grenade Launcher (Practice Rounds)		97	32	32	161
5.56MM (TR,M885,BAL,LINKD,BLK)	Semi Automatic Rifle		43,611	14,537	14,537	72,685
60MMHE	60mm Mortar	60-MM MORTAR	2,573	858	858	4,289
60MMTP	60mm Mortar (Practice Rounds)	60-MM MORTAR (inert)	136	45	45	226
7.62MM (39BAL,BLK)	Machine Gun		22,020	7,340	7,340	36,700
81MMHE	81mm Mortar	81-MM MORTAR	842	281	281	1,404
81MMILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	2	1	1	4
83MM SMAW	Shoulder-Launched Multipurpose Assault Weapon	AT4 ROCKET	2	1	1	4
84MMAT4	Rocket	AT4 ROCKET	33	11	11	55
9MMB	Sub Machine Gun		212	71	71	354
	TOTAL		76,342	25,449	25,449	127,240
QUACKENBUSH LAKE						
.50 (BALL,BLK)	.50 Caliber Machine Gun		2,705	902	902	4,509
120 SMK/WP	120mm Mortar (Smoke)	120-MM MORTAR (inert)	62	21	21	104
155MM HE	155mm Howitzer	155-MM HOWITZER M109	1,665	555	555	2,775
155MM ILL	155mm Howitzer (Illumination Rounds)	155-MM HOWITZER M109 (inert)	17	6	6	29
155MM SMK	155mm Howitzer (Smoke)	155-MM HOWITZER M109 (inert)	8	3	3	14
40MM	Grenade Launcher	40-MM GREN LN M203	211	70	70	351
40MM PRLKD	Grenade Launcher (Practice Rounds)		490	163	163	816
5.56MM BAL	Semi Automatic Rifle		96	32	32	160
60MMHE	60mm Mortar	60-MM MORTAR	94	31	31	156
7.62MM (39BAL,BLK)	Machine Gun		6,151	2,050	2,050	10,251
81MMHE	81mm Mortar	81-MM MORTAR	1,568	523	523	2,614
81MMHEI	81mm Mortar	81-MM MORTAR	109	36	36	181
81MMILLUM	81mm Mortar (Illumination Rounds)	81-MM MORTAR (inert)	5	2	2	9
83MM SMAW	Shoulder-Launched Multipurpose Assault Weapon	AT4 ROCKET	6	2	2	10
84MMHE	84mm MAAWS	AT4 ROCKET	151	50	50	251
STINGER	Stinger Missile	AT4 ROCKET	88	28	28	144
TOW HEAT	Tow Missile	TOW MISSILE	6	2	2	10
	TOTAL		13,432	4,476	4,476	22,384
RAINBOW CANYON						
155MM HE	155mm Howitzer	155-MM HOWITZER M109	21	7	7	35
165MM HE	165mm	165-MM CANNON M135	42	14	14	70
	TOTAL		63	21	21	105
	TOTAL (this page)		110,016	36,672	36,672	183,360
	GRAND TOTAL		600,808	200,277	200,268	1,001,353

[1] Unidentified Ammunition (Not Modeled)
[2] Corresponding "Modeled As (If Modeled)" column presented only for modeled ammunition types.
LBS = Pounds
Yellow shading indicates update regarding WR 03-11

Baseline (FY02) Air-to-Ground Ordnance Expenditure for Training Ranges

Weapon Type	Description	Modeled As (if modeled)[2]	FY02 Events			
			0700-1900	1900-2200	2200-0700	Total
BOMB,GENERAL PURPOSE,MK 84 MOD (6A,3,4,1 & 2)	Low Drag General Purpose bombs	MK-84	25	8	8	41
MK 82 BOMB	Low Drag General Purpose bombs	MK-82	161	53	53	267
MK 83 BOMB THERMAL	Low Drag General Purpose bombs	MK-83	687	230	230	1,147
CLUSTER BOMB	Cluster Bombs	MK-82	146	49	49	244
BOMB,PRACTICE (MK 76,BDU-45/B,BDU-48/B)	Practice Low Drag General Purpose bombs	BDU-48	1,899	633	633	3,165
CARTRIDGE 20MM (LINKED, TARGET PRACTICE)	Automatic Gun	20-MM GUN	66,190	22,063	22,063	110,316
CARTRIDGE .50 CAL (API LINKED, BALL LINKED 100 RD)	Machine Gun		276,569	92,190	92,190	460,949
CARTRIDGE, 25MM	Automatic Gun	25-MM GUN	3,333	1,111	1,111	5,555
CARTRIDGE, 7.62MM (LINKED 4 BALL M80, NATO, LINKED 4 BALL M80)	Machine Gun		329,040	109,680	109,680	548,400
HE 2.75 RKT WARHEAD	2.75" Rocket	2.75-IN ROCKET	2,749	916	916	4,581
ILLUM 2.75 RKT WARHEAD	2.75" Rocket (Illumination Rounds)	2.75-IN ROCKET (inert)	2,092	697	697	3,486
GRENADE SMOKE (GREEN,RED,VIOLET,WHITE,YELLOW)	Grenade (Smoke)		173	58	58	289
LASER (LGTR, BDU-59A/B)	Laser Guided Low Drag General Purpose bombs (Practice Rounds)		138	46	46	230
WHD, 2.75 RKT (PRACTICE, RKT FLRE M278)	2.75" Rocket (Practice Rounds)	2.75-IN ROCKET (inert)	130	43	43	216
WHD, 5" (MK 24, MK 63)	Light Weight Gun Mount	5-IN MK41	361	121	121	603
WHD, 5" (PRACTICE MK6, WTU-11/B)	Light Weight Gun Mount (Practice Rounds)	5-IN MK41 (inert)	637	213	213	1,063
GRAND TOTAL			684,330	228,111	228,111	1,140,552

[1]Corresponding "Modeled As (If Modeled)" column presented only for modeled ordnance

Yellow shading indicates update regarding WR03-11

H-3.2 Baseline Ordnance Firing/Target Location Maps

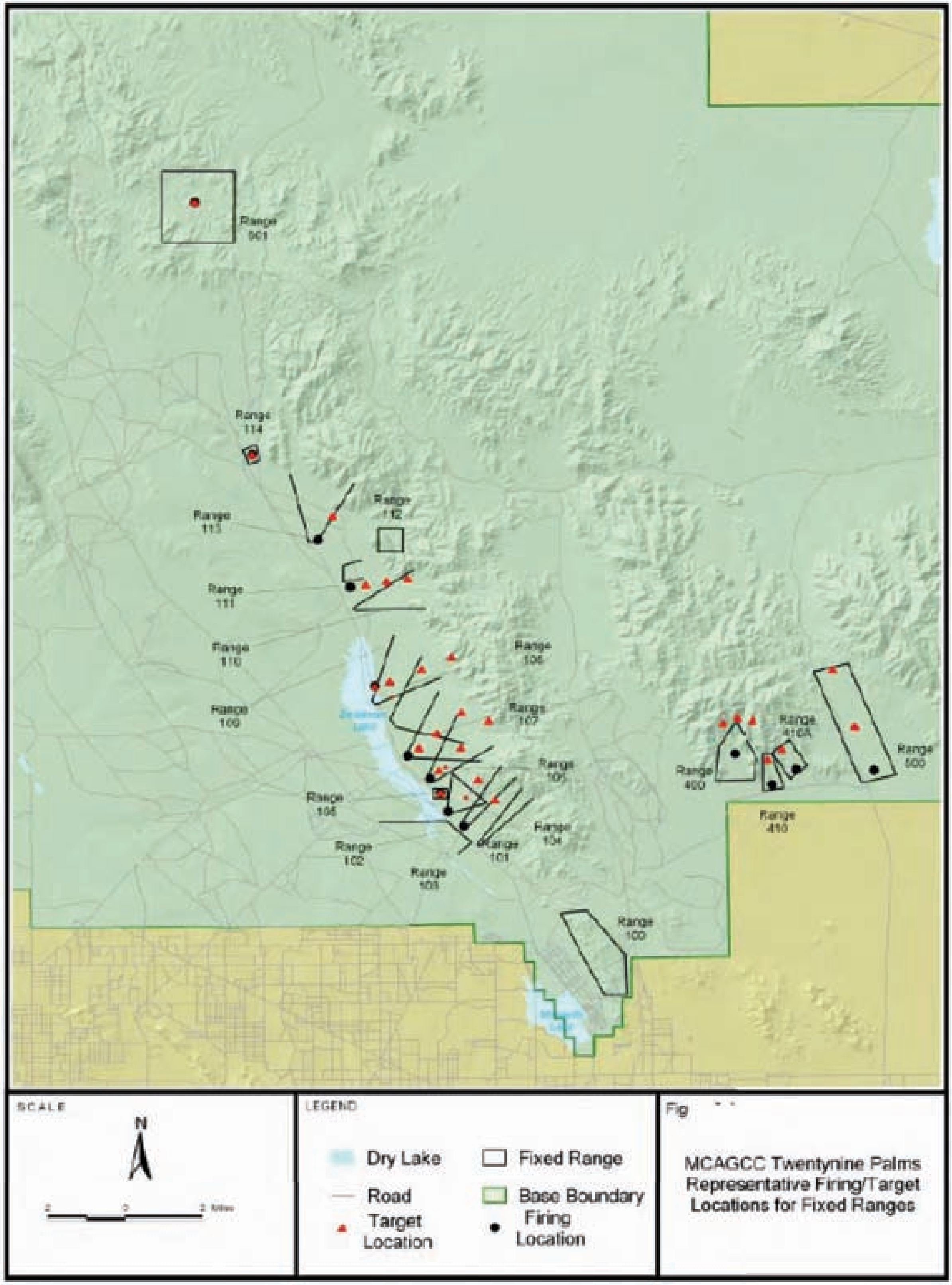
Appendix H – Noise Modeling Data

Baseline Fixed Ranges

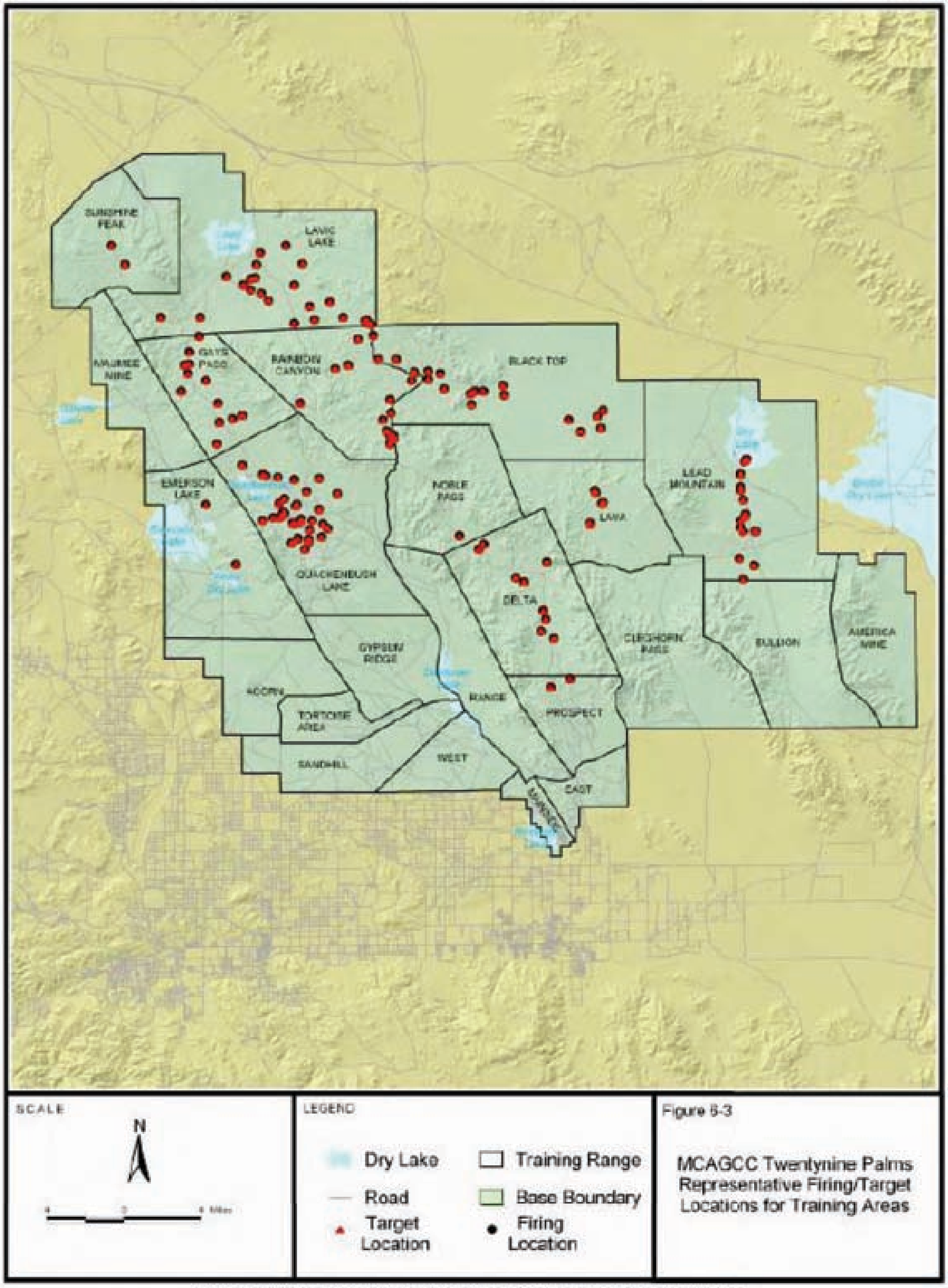
Fixed Ranges	Description	Allowable Munitions
Range 100	Squad Maneuver Range (Land navigation, nonlive)	Blank ammunition only, trip flares, flash bangs, pop-ups, smoke grenades
Range 101	Armor, Gun Training Range	5.56mm, 7.62mm, .50 cal
Range 101A	Small Arms Battle Sight Zero (BZO)	9 mm, 5.56 mm, 12 gauge
Range 102	Land Navigation	None
Range 103	Squad Defense Fire Range (Automated)	5.56mm, 7.62mm, 40 mm and 60 mm (illumination rounds)
Range 104	Antimechanized/Grenade Range	40 mm (Except CS), Grenade, Light Anti-Tank Weapon (LAW), Dragon Missiles, Shoulder-Launched Multipurpose Assault Weapon (SMAW), AT4 Rockets
Range 105	Gas Chamber	CS Capsules (tear gas)
Range 105A	Small Arms BZO	5.56mm, 7.62mm, .50 cal
Range 106	Mortar Range	60 mm, 81 mm
Range 107	Infantry Squad Assault Range	5.56mm, 7.62mm, 40 mm and 60 mm (illumination rounds), pyrotechnics
Range 108	Infantry Squad Battle Course	5.56mm, 7.62mm, 40 mm, SMAW, AT4 Rocket, pyrotechnics, 60 mm (illumination rounds)
Range 109	Anti-armor Live Fire Tracking Range	Dragon, Tow missiles, 25 mm Chain Gun, 40 mm (inert rounds), 9 mm spotter rounds, SMAW, M-2
Range 110	MK-19 Range	40 mm
Range 111	Military Operations in Urban Terrain (MOUT) Assault Course	None
Range 112	Range Residue Storage	None
Range 113	Multi-purpose Machine Gun Range	5.56mm, 7.62mm, 60 mm (illumination rounds)
Range 113A	Machine Gun BZO	5.56mm, 7.62mm, .50 cal
Range 114	Combat Engineer Demolition Range	Demolitions, mines and line charges
Range 400	Company Fire and Maneuver Range	5.56mm, 7.62mm, .50 cal, 40 mm, 60 mm, 81 mm, SMAW, Dragon missile, AT4 Rocket, Hand Grenade, Pyrotechnics, Demolition and Bangalore Torpedoes
Range 410	Platoon Fire and Maneuver Range	5.56mm, 7.62mm, .50 cal, 40 mm, 60 mm, 81 mm, SMAW, Dragon missile, AT4 Rocket, Hand Grenade, Pyrotechnics, Demolition and Bangalore Torpedoes
Range 410A	Platoon Hasty Attack and Maneuver Range	5.56mm, 7.62mm, .50 cal, 40 mm, 60 mm, 81 mm, SMAW, Dragon missile, AT4 Rocket, Hand Grenade, Pyrotechnics, Demolition and Bangalore Torpedoes
Range 500	Armor Multi-purpose Range Complex	5.56mm, 7.62mm, .50 cal, 40 mm, Tank Main Gun, 25 mm, 60 mm, 81 mm, SMAW, Dragon missile, AT4 Rocket, Hand Grenade, Pyrotechnics
Range 601	Sensitive Fuze Munition Range	Artillery and Air (MK-20, CBU-58, 63, 75, 77, 83, 2.75 " Rocket)
Range 603	Weapon Impact Scoring System (WISS)	2.75 " Rocket, Practice Bombs
Range 605	Door Gunner Range	7.62 mm, .50 cal, 20 mm, 30 mm, 2.75 " Rocket
Range 607	Strafe Range	20 mm, 30 mm canon

Baseline Training Ranges

Training Areas	Area (acres)	Uses
Acorn	17486	Non live fire
America Mine	20933	Patrolling, mortar fire, infantry, Land Assault Vehicles (LAV)
Black Top	50909	Tank gunnery, artillery, small arms, major exercises
Bullion	28894	Aviation bombing and strafing, gunnery practice, artillery, infantry maneuvers, ranges
Cleghorn Pass	36345	Small arms, tank gunnery, LAV live fire maneuvers, ranges
Delta	29785	Live fire maneuvers, major exercises
East	6899	Non live fire, staging area, range
Emerson Lake	32183	Tank maneuver, aerial bombardment and targetry
Gays Pass	18331	Artillery, ground-based live fire
Gypsum Ridge	17569	Ground-based live fire, aerial impacts, tank maneuvers
Lava	22802	Battalion tactical, ground-based live fire, combined ground/air live fire, artillery
Lavic Lake	54831	Aviation, live fire, major exercises
Lead Mountain	53609	Ground-based live fire, aviation, artillery, major exercises
Maumee Mine	16124	Artillery and maneuvers
Noble Pass	24059	Aerial and ground-based live fire, tank maneuvers, infantry, CAX, artillery
Prospect	13162	Maneuvers, artillery, range
Quackenbush Lake	42470	Artillery, ground-based live fire, aviation training, maneuvers
Rainbow Canyon	25599	Maneuvers, artillery, range
Range	21767	Aerial bombardment, fixed ranges, sensitive fuze ranges
Sandhill	16808	Maneuvers, staging areas, Expeditionary Facilities, ESB
Sunshine Peak	22921	Emergency drops
West	10635	Non-live fire maneuvers, staging area for major exercises, drop zones



Representative Firing/Target Locations for Baseline Fixed Ranges



Representative Firing/Target Locations for Baseline Training Ranges

H-3.3 Proposed Events

The Baseline ordanance operations of approximately 1 million live and inert munitions rounds was based on CY2001 ordnance tempo as reported in the 2003 RAICUZ study (WR 03-11). Since that time training operations have increased in support of the Iraq and Afghan war efforts to an estimated 5 million munition rounds annually. For the 2014-15 time frame land-use planning is anticipated that training activities will decrease significantly from current (2010) tempo as war efforts are reduced but to not less than 2 million munition rounds annually. It was assumed that the distribution of weapon type and firing/target locations remained the same as the 2003 RAICUZ study. The munitions tempo scaled accordingly through present and into the 2014-15 scenario. Therefore the No Action Alternative was assumed to be twice (2x) the Baseline (approximately 2 million live and inert munition rounds) with the same weapon type and firing/target location distributions. The No Action Activity represents existing, on-going training activities. All proposed activity including the MEBEX, FINEX and MEB Building Block is in addition to No Action Activity.

No Action Alternative = Baseline × 2

Alternative 1 = No Action (but with 25% of the No Action numbers of events relocated to the Western Study Area for MEB Building Block) + Alt 1 MEBEX Work-Up + Alt 1 FINEX.

Alternative 2 = No Action (but with 25% of the No Action numbers of events relocated to the Western Study Area for MEB Building Block) + Alt 2 MEBEX Work-Up + Alt 2 FINEX.

Alternative 3 = No Action (but with 25% of the No Action numbers of events relocated to the Eastern Study Area for MEB Building Block) + Alt 3 MEBEX Work-Up + Alt 3 FINEX.

Alternative 4 = No Action + Alt 4 MEBEX Work-Up + Alt 4 FINEX.

Alternative 5 = No Action + Alt 5 MEBEX Work-Up + Alt 5 FINEX.

Alternative 6 = No Action (but with 25% of the No Action numbers of events relocated to the Western Study Area for MEB Building Block) + Alt 6 MEBEX Work-Up + Alt 6 FINEX.

Numbers of MEBEX and FINEX ordnance events are identical for each action Alternative; only locations where they occur would be different among the action Alternatives.

Proposed MEBEX Ground-To-Ground Firings

			Annual MEBEX Work-up				Annual FINEX				Annual Total			
Munitions Type	Reported Ammuntition Type	Modeled As (If Modeled)	0700-1900	1900-2200	2200-0700	Total	0700-1900	1900-2200	2200-0700	Total	0700-1900	1900-2200	2200-0700	Total
Cartridges smaller than 30 mm	A059 5.56MM BALL		104664	37380	7476	149,520	37,380	8,971	28,409	74,760	142,044	46,351	35,885	224,280
	A063 5.56MM TRACER		17942.4	6408	1281.6	25,632	6,408	1,538	4,870	12,816	24,350	7,946	6,152	38,448
	A064 5.56MM 4&1 LINK		143354.4	51198	10239.6	204,792	51,198	12,288	38,910	102,396	194,552	63,486	49,150	307,188
	A131 7.62MM 4&1 LINK		129360	46200	9240	184,800	46,200	11,088	35,112	92,400	175,560	57,288	44,352	277,200
	A576 CAL .50 4&1 LINK		37800	13500	2700	54,000	13,500	3,240	10,260	27,000	51,300	16,740	12,960	81,000
	A976 25MM TP-T	25-MM GUN	3805.2	1359	271.8	5,436	1,359	326	1,033	2,718	5,164	1,685	1,305	8,154
Cartridges 30-75 mm	B519 40MM TP	40-MM GREN LN M203	3166.8	1131	226.2	4,524	1,131	271	860	2,262	4,298	1,402	1,086	6,786
	B535 40MM WSP	40-MM GREN LN M203	554.4	198	39.6	792	198	48	150	396	752	246	190	1,188
	B576 40MM TP (MK 19)	40-MM GREN LN M203	6232.8	2226	445.2	8,904	2,226	534	1,692	4,452	8,459	2,760	2,137	13,356
	B630 60MM WP LWCMS	60-MM MORTAR	61.6	22	4.4	88	12	3	9	24	74	25	14	112
	B643 60MM HEDP	60-MM MORTAR	1386	495	99	1,980	270	65	205	540	1,656	560	304	2,520
	B647 60MM ILLUM	60-MM MORTAR (firing only)	154	55	11	220	30	7	23	60	184	62	34	280
Cartridges 75 mm and larger	C784 120MM TP-T	120-MM MORTAR	770	275	55	1,100	150	36	114	300	920	311	169	1,400
	C785 120MM TPCSD-T	120-MM MORTAR	770	275	55	1,100	150	36	114	300	920	311	169	1,400
	C868 81MM HEPD	81-MM MORTAR	4219.6	1507	301.4	6,028	822	197	625	1,644	5,042	1,704	926	7,672
	C870 81MM WP	81-MM MORTAR	215.6	77	15.4	308	42	10	32	84	258	87	47	392
	C871 81MM ILLUM	81-MM MORTAR (firing only)	292.6	104.5	20.9	418	57	14	43	114	350	118	64	532
	C995 AT-4	AT-4 ROCKET	33.6	12	2.4	48	12	3	9	24	46	15	12	72
Projectiles, Canisters, and Charges	D505 155MM ILLUM	155-MM HOWITZER M109 (firing only)	554.4	198	39.6	792	108	26	82	216	662	224	122	1,008
	D528 155MM SMK M825	155-MM HOWITZER M109 (firing only)	154	55	11	220	30	7	23	60	184	62	34	280
	D532 CHG 155 RAP	155-MM HOWITZER M109	107.8	38.5	7.7	154	21	5	16	42	129	44	24	196
	D533 CHG REDBAG	155-MM HOWITZER M109	2571.8	918.5	183.7	3,674	501	120	381	1,002	3,073	1,039	564	4,676
	D541 CHG WHITEBAG	155-MM HOWITZER M109	7869.4	2810.5	562.1	11,242	1,533	368	1,165	3,066	9,402	3,178	1,727	14,308
	D544 155MM HE	155-MM HOWITZER M109	9717.4	3470.5	694.1	13,882	1,893	454	1,439	3,786	11,610	3,925	2,133	17,668
	D579 PRJ 155MM RA	155-MM HOWITZER M109	107.8	38.5	7.7	154	21	5	16	42	129	44	24	196
Grenades	G878 FUZE GRENADE PRACTICE		168	60	12	240	60	14	46	120	228	74	58	360
	G930GRENADE SMOKE TA		42	15	3	60	15	4	11	30	57	19	14	90
	G940GRENADE SMOKE GREEN		50.4	18	3.6	72	18	4	14	36	68	22	17	108
	G945GRENADE SMOKE YELLOW		50.4	18	3.6	72	18	4	14	36	68	22	17	108
Rockets, Rocket Motors, and Igniters	HX05 ROCKET SMAW HE	83-MM SMAW	25.2	9	1.8	36	9	2	7	18	34	11	9	54
	HX07 ROCKET SMAW PRACT	83-MM SMAW (firing only)	33.6	12	2.4	48	12	3	9	24	46	15	12	72
	J143 ROCKET MOTOR 5"		8.4	3	0.6	12	3	1	2	6	11	4	3	18

Proposed MEBEX Ground-To-Ground Operations (concluded)

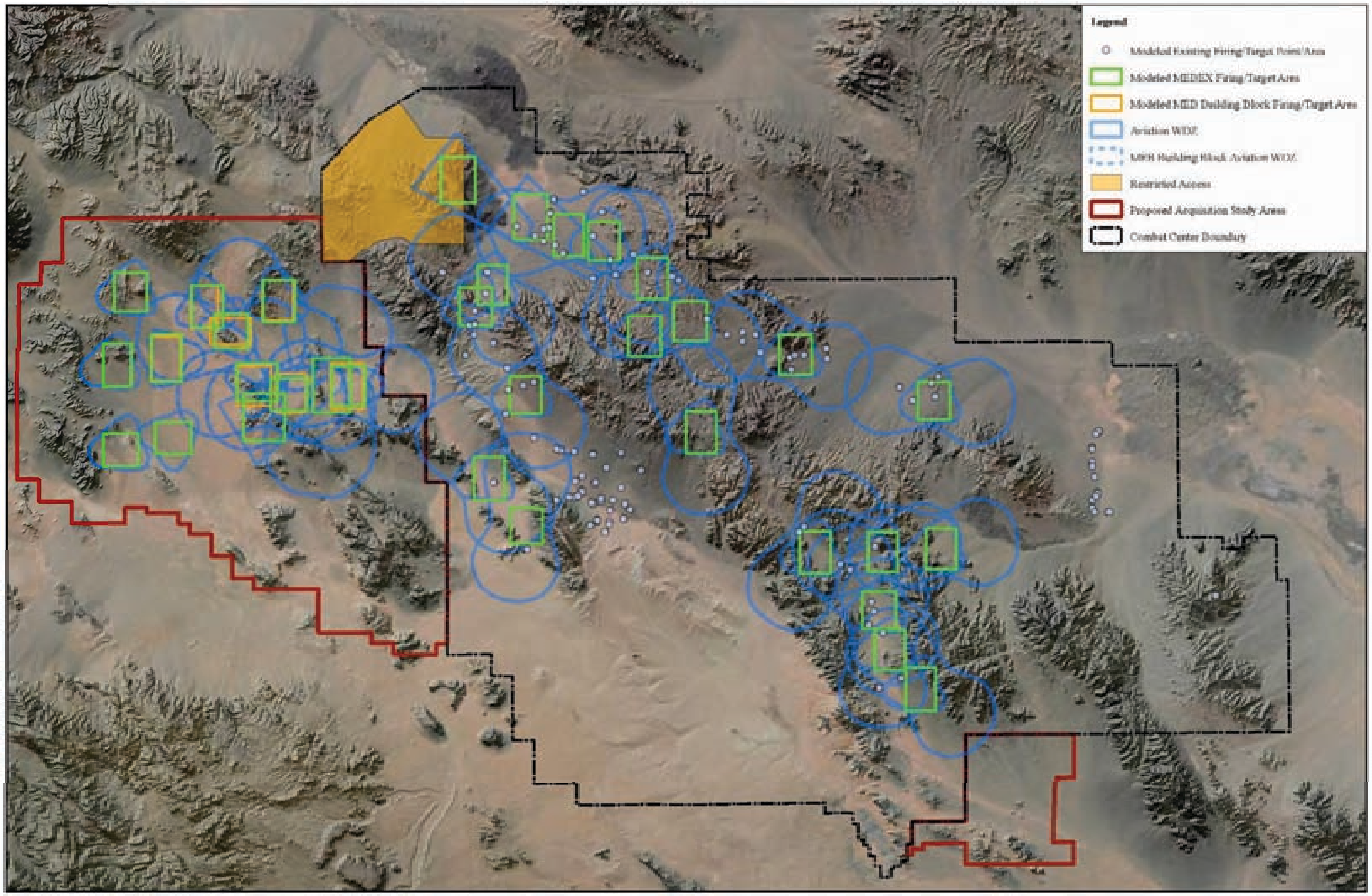
Munitions Type	Reported Ammuntition Type	Modeled As (If Modeled)	Annual MEBEX Work-up				Annual FINEX				Annual Total			
			0700-1900	1900-2200	2200-0700	Total	0700-1900	1900-2200	2200-0700	Total	0700-1900	1900-2200	2200-0700	Total
Mines and Smoke Pots	K143 CLAYMORE MINE	CLAYMORE M18A1	67.2	24	4.8	96	24	6	18	48	91	30	23	144
Signals and Simulators	L307 SIGNAL WHITE STAR CLSTR		50.4	18	3.6	72	18	4	14	36	68	22	17	108
	L312 SIGNAL WHITE STAR PARACHUTE		50.4	18	3.6	72	18	4	14	36	68	22	17	108
	L314 SIGNAL GREEN STAR CLSTR		50.4	18	3.6	72	18	4	14	36	68	22	17	108
	L324 SIGNAL GREEN STAR PARACHUTE		16.8	6	1.2	24	6	1	5	12	23	7	6	36
Blasting Caps, Demolition Charges, and Detonators	M028 BANGALORE	BANGALORE M1A1 (90 LBS)	8.4	3	0.6	12	3	1	2	6	11	4	3	18
	M032 DEMO 1LB TNT	TNT (1 LBS)	33.6	12	2.4	48	12	3	9	24	46	15	12	72
	M039 DEMO CRTR 40 LB	CRATER CHRG (40 LB)	16.8	6	1.2	24	6	1	5	12	23	7	6	36
	M130 CAP BLASTING ELECTRIC		142.8	51	10.2	204	51	12	39	102	194	63	49	306
	M131 CAP BLASTING NONELECTRIC		142.8	51	10.2	204	51	12	39	102	194	63	49	306
	M421 DEMO SHPD 40LB	SHAPE CHARGE M3 SERIES (40 LB)	16.8	6	1.2	24	6	1	5	12	23	7	6	36
	M456 DETONATION CORD		7140	2550	510	10,200	2,550	612	1,938	5,100	9,690	3,162	2,448	15,300
	M670 FUZE BLASTING TIME		562.8	201	40.2	804	201	48	153	402	764	249	193	1,206
	M757 DEMOLITION M183 W/ACC		16.8	6	1.2	24	6	1	5	12	23	7	6	36
	M766 IGNITER TIME BLASTING		142.8	51	10.2	204	51	12	39	102	194	63	49	306
	ML25 LINE CHARGE HE		8.4	3	0.6	12	3	1	2	6	11	4	3	18
	MN79 APOBS		8.4	3	0.6	12	3	1	2	6	11	4	3	18
Fuses and Primers	N289 FUZE ELEC TIME		394.8	141	28.2	564	141	34	107	282	536	175	135	846
	N340 FUZE PD M739		5359.2	1914	382.8	7,656	1,914	459	1,455	3,828	7,273	2,373	1,837	11,484
	N523 PRIMER		5745.6	2052	410.4	8,208	2,052	492	1,560	4,104	7,798	2,544	1,970	12,312
Guided Missiles	PB99 TOW PRAC	TOW MISSILE (firing only)	33.6	12	2.4	48	12	3	9	24	46	15	12	72
	WF10 TOW E-MIOC	TOW MISSILE	33.6	12	2.4	48	12	3	9	24	46	15	12	72
	Subtotal		496,286	177,245	35,449	708,980	172,545	41,411	131,134	345,090	668,831	218,656	166,583	1,054,070

TAMCN	Surface-to-Surface Weapons													
E0207	JAVELIN (M98A1)	DRAGON MISSILE	22	8	2	32	8	2	6	16	30	10	8	48
E0671	155-MM Howitzer (M777)	155-MM TOW HOWITZER M198	17	6	1	24	6	1	5	12	23	7	6	36
E0915	Rocket Launcher (83mm, MK153, Mod 0)	83-MM SMAW	78	28	6	112	28	7	21	56	106	35	27	168
E0935	TOW Launcher (M220A3)	TOW MISSILE	47	17	3	67	17	4	13	33	63	21	16	100
E0980	0.50 Cal Machine Gun (Browning, M2)		427	153	31	611	153	37	116	305	580	189	147	916
E0989	M240B Machine Gun (7.62mm)		483	173	35	691	173	41	131	345	656	214	166	1,036
E0994	40-MM Grenade Launcher (MK-19, Mod 3)	40-MM GREN LN M203	315	113	23	451	113	27	86	225	428	140	108	676
E1065	60-MM Mortar (M224)	60-MM MORTAR	25	9	2	36	9	2	7	18	34	11	9	54
E1070	120-MM Mortar	120-MM MORTAR	6	2	0	8	2	0	2	4	8	2	2	12
E1095	81-MM Mortar (M252)	81-MM MORTAR	22	8	2	32	8	2	6	16	30	10	8	48
	Subtotal		1,444	516	103	2,063	516	124	392	1,031	1,960	639	495	3,094
									Annual GG Total		**670,791**	**219,295**	**167,078**	**1,057,164**

Proposed Air-To-Ground Ordnance Expenditure

Munitions Type	Reported Ammuntition Type	Description	Modeled As (If Modeled)	Annual MEBEX Work-Up				Annual FINEX				Annual Total			
				0700-1900	1900-2200	2200-0700	Total	0700-1900	1900-2200	2200-0700	Total	0700-1900	1900-2200	2200-0700	Total
Air-to-Ground Missiles	AGM-65E	Laser Maverick Missile		-	-	-	-	-	-	-	-	-	-	-	-
Unguided Munitions	MK-76 Inert	25# GP Practice bomb		1,092	390	78	1,560	195	47	148	390	1,287	437	226	1,950
	MK-82	500# GP bomb	MK-82	420	150	30	600	210	50	160	420	630	200	190	1,020
	MK-83	1000# HE GP bomb	MK-83	50	18	4	72	30	7	23	60	80	25	26	132
	Mk-83 Inert	1000# Inert bomb		67	24	5	96	30	7	23	60	97	31	28	156
	MK-84	2000# GP bomb	MK-84	-	-	-	-	18	4	14	36	18	4	14	36
	BDU-45	500# Inert practice bomb		252	90	18	360	-	-	-	-	252	90	18	360
	2.75" Rockets	HE/WP/RP rocket	2.75-IN ROCKET	4,200	1,500	300	6,000	1,200	288	912	2,400	5,400	1,788	1,212	8,400
	5" ZUNI	HE/WP/ILLUM rocket	3.5-IN MISSILE	403	144	29	576	108	26	82	216	511	170	111	792
Guided Munitions	MK 114	Hellfire Missile	HELLFIRE MISSILE	17	6	1	24	24	6	18	48	41	12	19	72
	GBU-12	500# LGB	MK-82	202	72	14	288	72	17	55	144	274	89	69	432
	GBU-16	1000# LGB	MK-83	-	-	-	-	27	6	21	54	27	6	21	54
	GBU-10	2000# LGB	MK-84	3	1	0	4	-	-	-	-	3	1	0	4
	GBU-38 version 4	250# LCD JDAM	MK-81	76	27	5	108	72	17	55	144	148	44	60	252
	GBU-38	500# JDAM	MK-82	202	72	14	288	72	17	55	144	274	89	69	432
	GBU-54	500# Laser JDAM	MK-82	67	24	5	96	24	6	18	48	91	30	23	144
	GBU-32	1000# JDAM	MK-83	8	3	1	12	6	1	5	12	14	4	5	24
	GBU-31	2000# JDAM	MK-84	36	13	3	52	6	1	5	12	42	14	7	64
	GBU-24	Hard Target Penetrator	MK-84	3	1	0	4	-	-	-	-	3	1	0	4
	GBU-39	Small Diameter missile (SDM)	MK-81	6	2	0	8	8	2	6	16	14	4	6	24
	BGM-71	TOW Missile	TOW MISSILE	17	6	1	24	30	7	23	60	47	13	24	84
	LGTR	Laser Guided Training Round		202	72	14	288	72	17	55	144	274	89	69	432
	BLU-111	500# Penetrator	MK-82	168	60	12	240	72	17	55	144	240	77	67	384
Aircraft Gun Systems Munitions	20-MM	Projectile Gun Unit TP/HEI	20-MM GUN	100,800	36,000	7,200	144,000	27,000	6,480	20,520	54,000	127,800	42,480	27,720	198,000
	25-MM TP	Projectile Gun Unit 23/U	25-MM GUN	84,000	30,000	6,000	120,000	22,500	5,400	17,100	45,000	106,500	35,400	23,100	165,000
	25-MM HEI	Projectile Gun Unit 25/U	25-MM GUN	-	-	-	-	8,000	1,920	6,080	16,000	8,000	1,920	6,080	16,000
	7.62-MM	Helicopter gun		184,800	66,000	13,200	264,000	36,000	8,640	27,360	72,000	220,800	74,640	40,560	336,000
	.50 Cal	Helicopter door/tail gun		427,000	152,500	30,500	610,000	90,000	21,600	68,400	180,000	517,000	174,100	98,900	790,000
Flares	LUU-19	IR Parachute Flare		378	135	27	540	225	54	171	450	603	189	198	990
	Luu-2 B/B	Parachute Flare		269	96	19	384	144	35	109	288	413	131	129	672
	Decoy Flares	IR EO expendable countermeasures		10,920	3,900	780	15,600	1,800	432	1,368	3,600	12,720	4,332	2,148	19,200
Chaff	Decoy Chaff	Radar expendable countermeasures		3,640	1,300	260	5,200	600	144	456	1,200	4,240	1,444	716	6,400
		Total		819,297	292,606	58,521	1,170,424	188,545	45,251	143,294	377,090	1,003,602	336,413	201,099	1,541,114

H-3.4 Proposed
Ordnance Firing/Target Location Maps

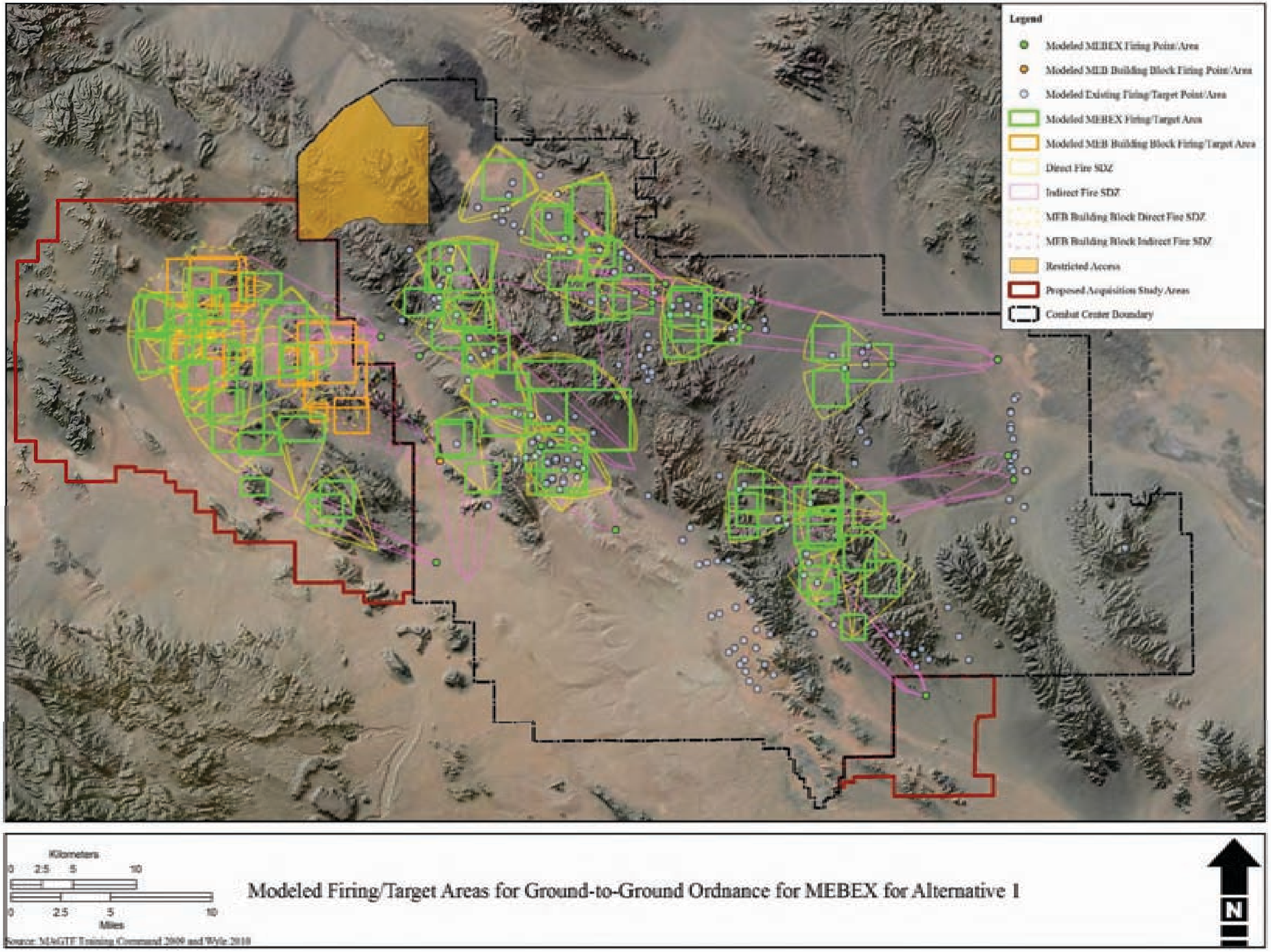


Kilometers
0 2.5 5 10
0 2.5 5 10
Miles

Source: MAGTF Training Command 2009 and Wyle 2010

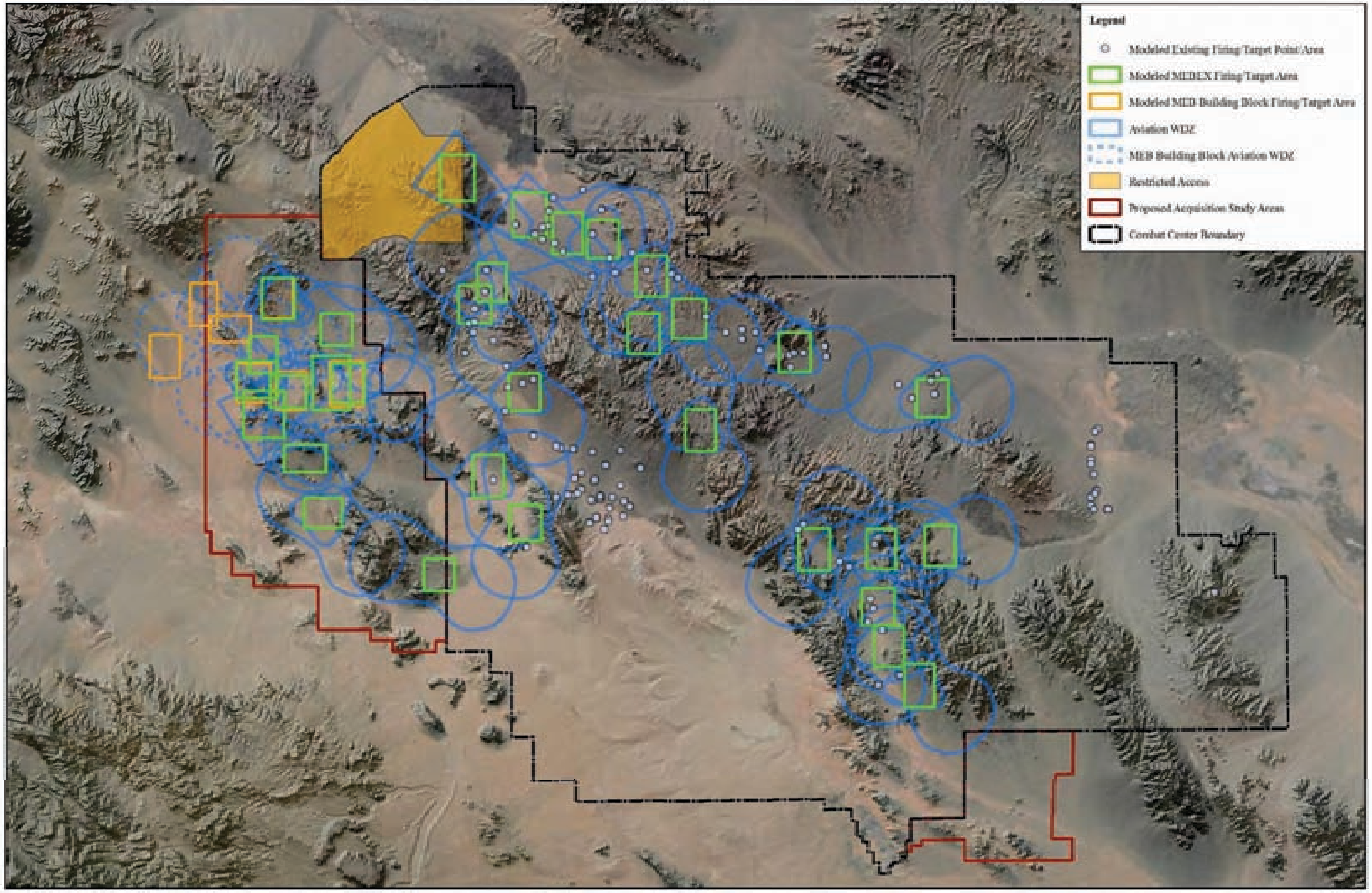
Modeled Firing/Target Areas for Air-to-Ground Ordnance for MEBEX for Alternative 1

N



Modeled Firing/Target Areas for Ground-to-Ground Ordnance for MEBEX for Alternative 1

Source: MAGTF Training Command 2009 and Wyle 2010



Kilometers
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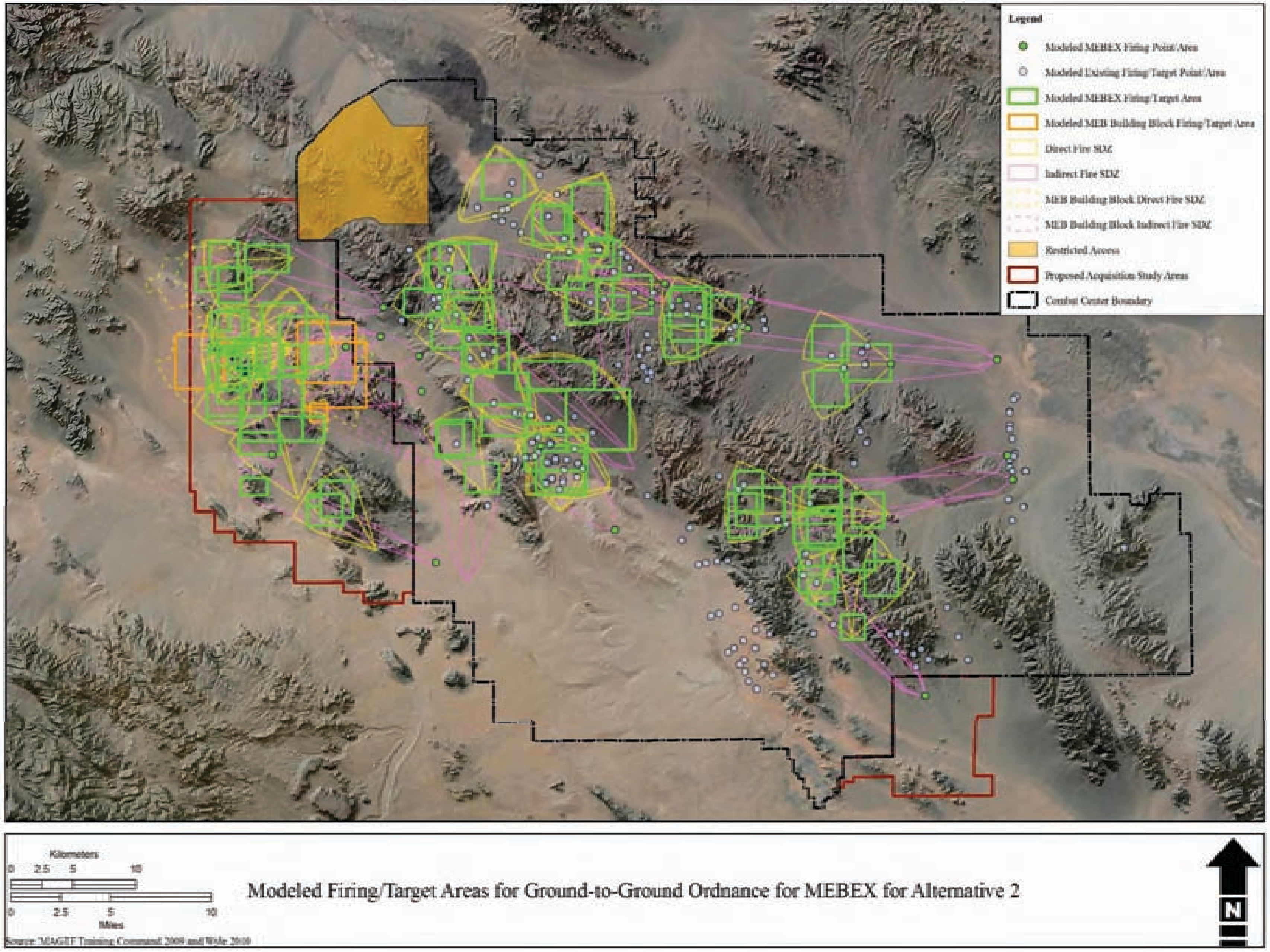
0 2.5 5 10
Miles
Source: MAGTF Training Command 2009 and Wyle 2010

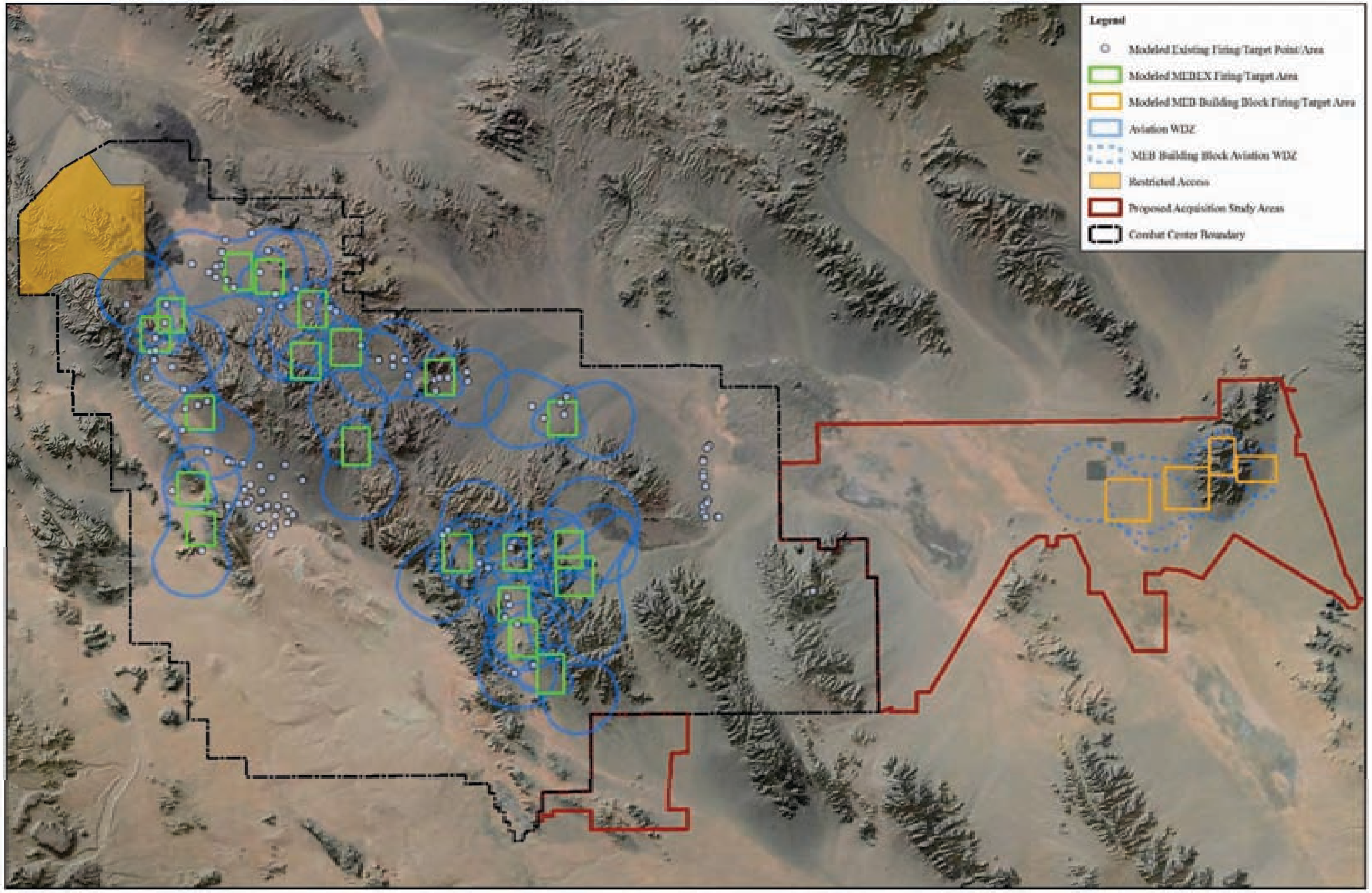
Modeled Firing/Target Areas for Air-to-Ground Ordnance for MEBEX for Alternative 2

N



Modeled Firing/Target Areas for Ground-to-Ground Ordnance for MEBEX for Alternative 2

Source: MAGTF Training Command 2009 and Wyle 2010



Kilometers
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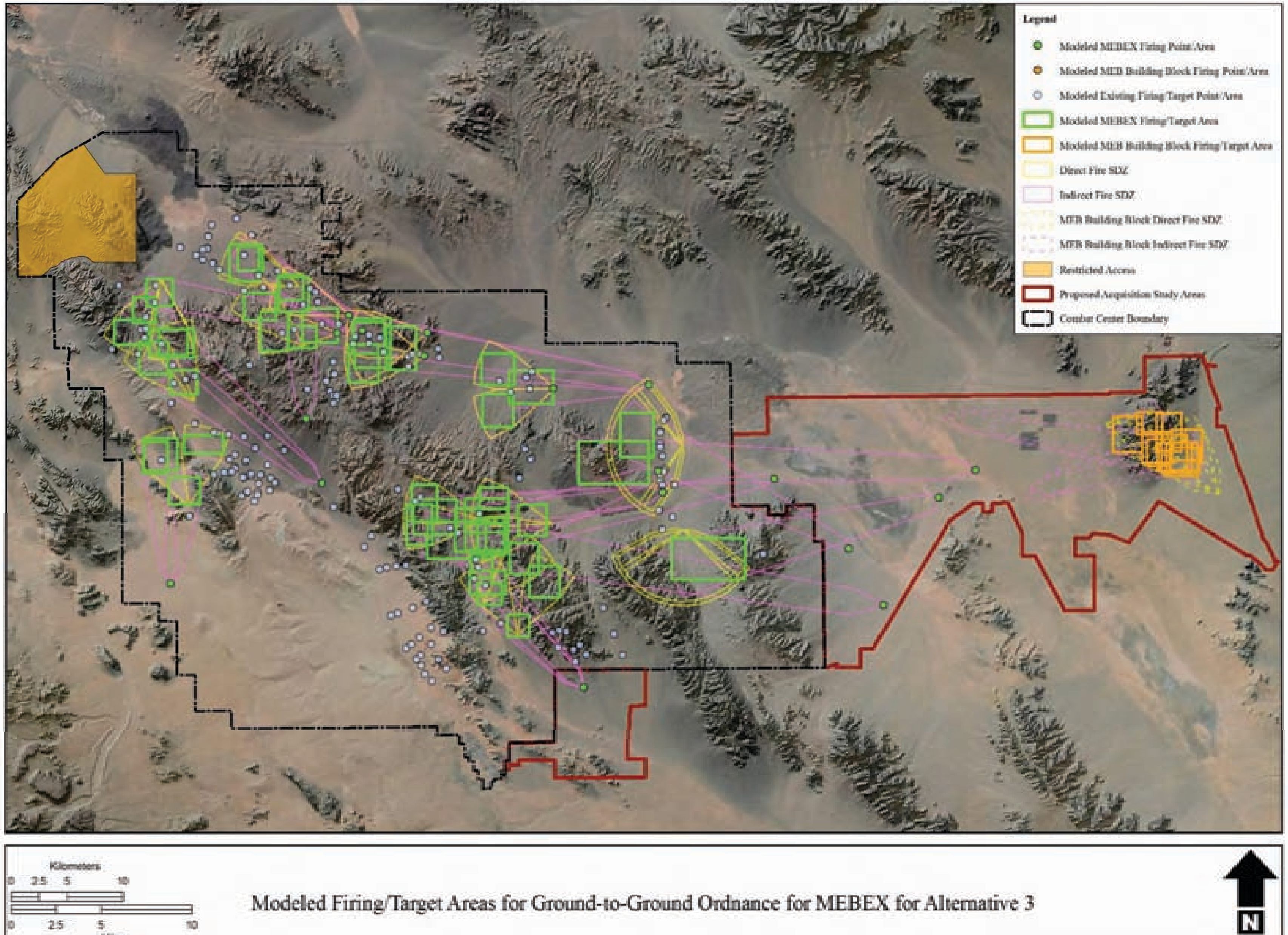
0 2.5 5 10
Miles

Modeled Firing/Target Areas for Air-to-Ground Ordnance for MEBEX for Alternative 3

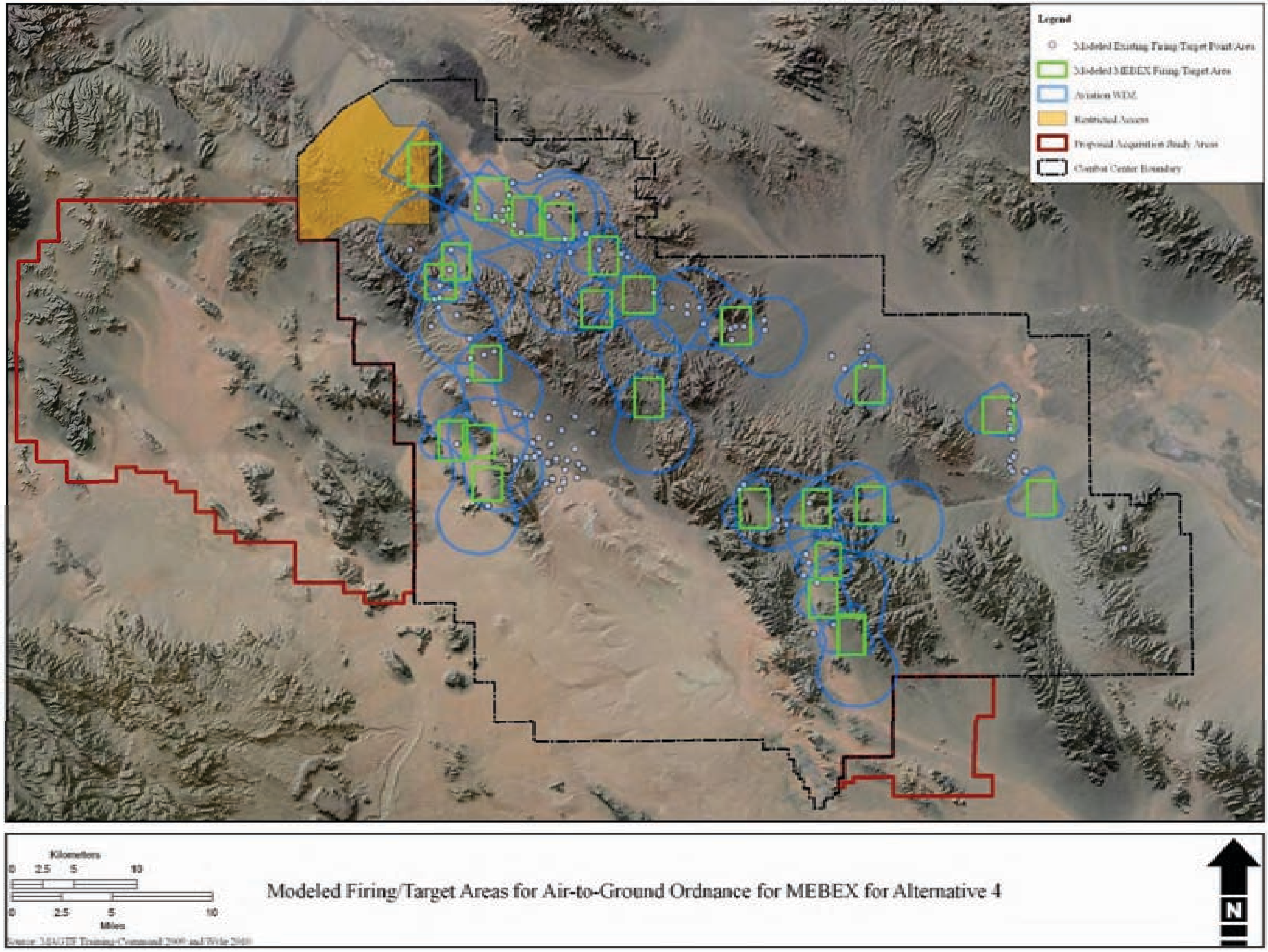
N

Source: MAGTF Training Command 2009 and Wyle 2010

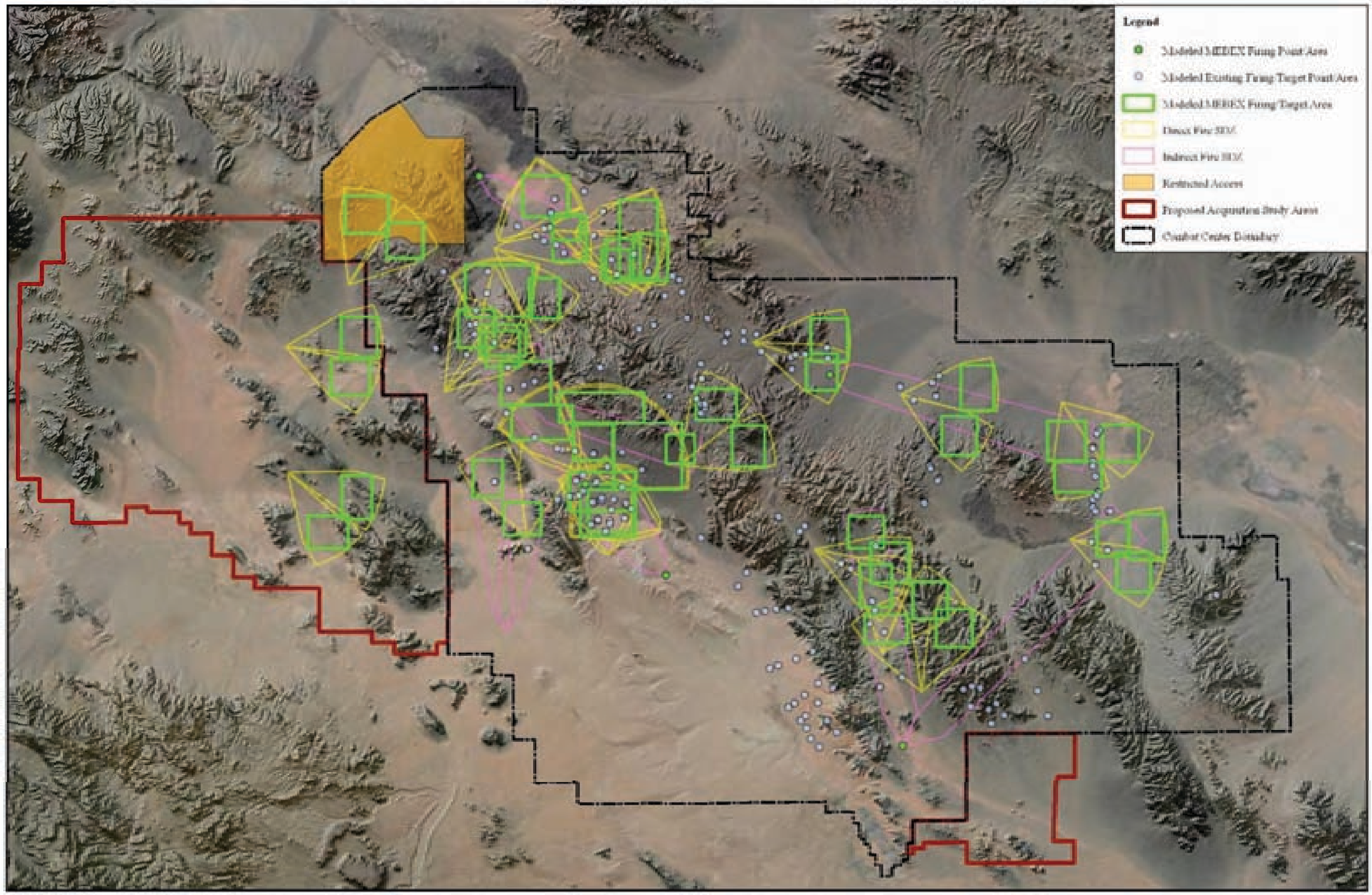


Modeled Firing/Target Areas for Ground-to-Ground Ordnance for MEBEX for Alternative 3

Source: MAGTF Training Command 2009 and Wyle 2010

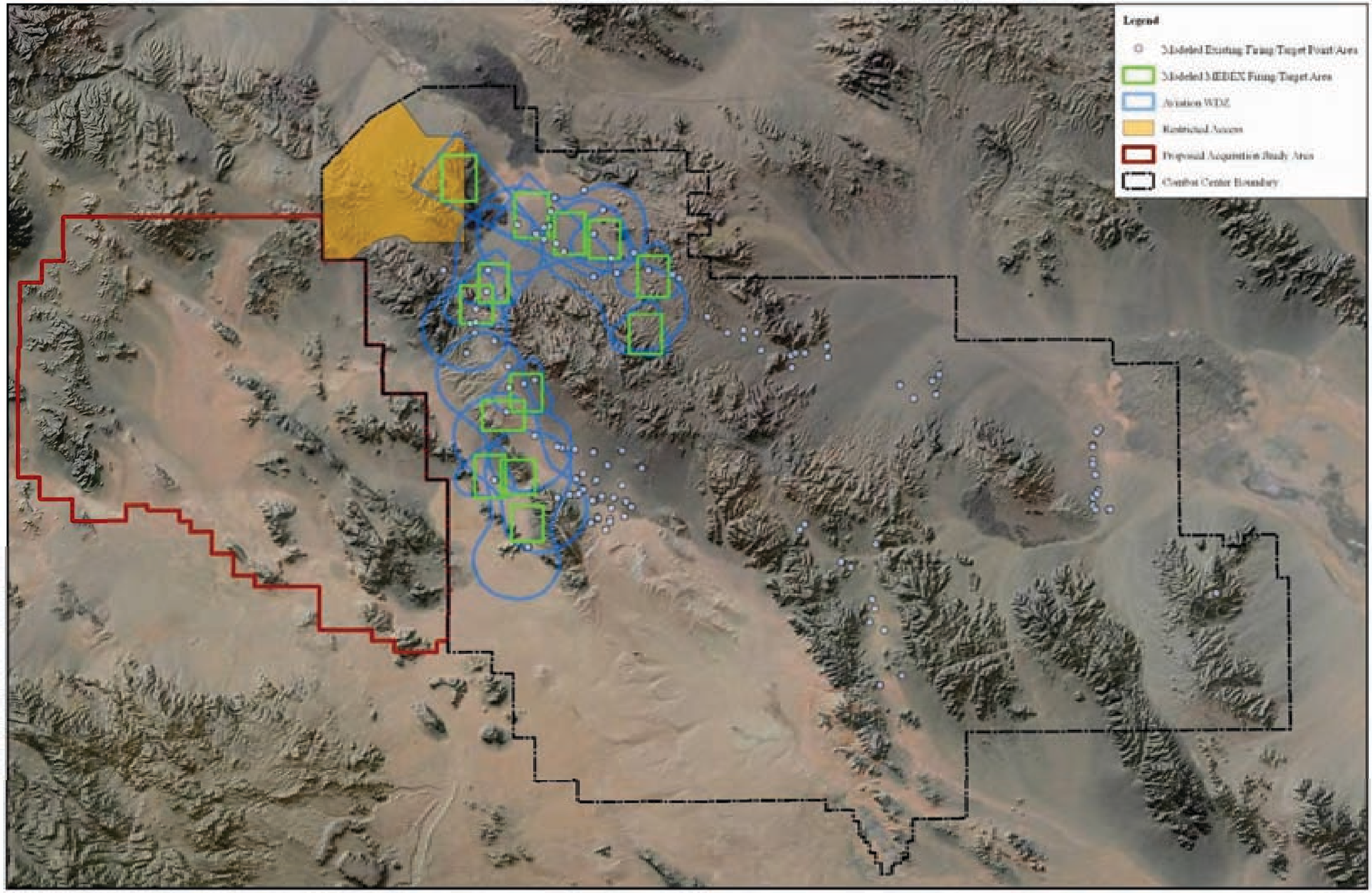


Modeled Firing/Target Areas for Air-to-Ground Ordnance for MEBEX for Alternative 4



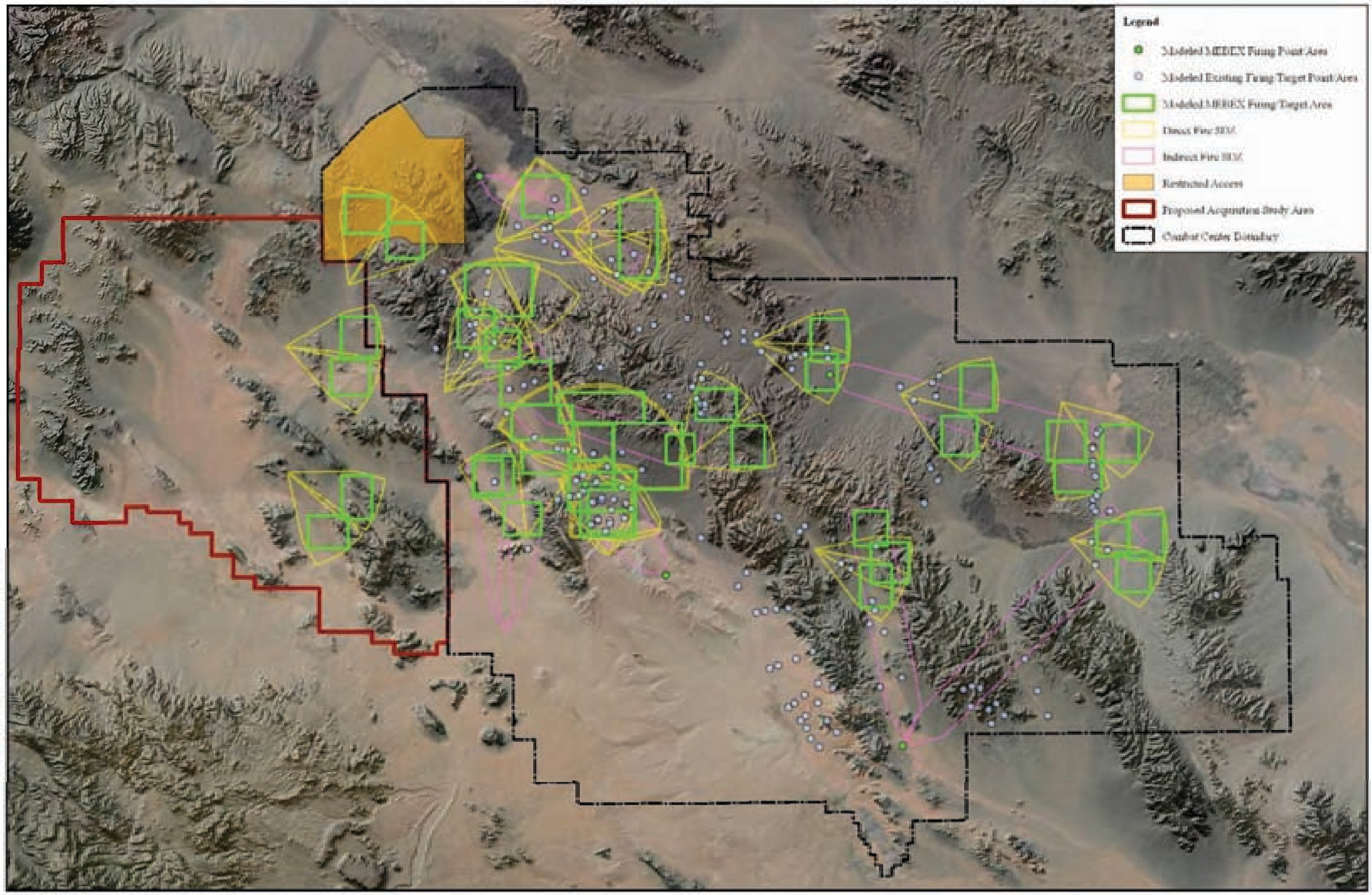
Modeled Firing/Target Areas for Ground-to-Ground Ordnance for MEBEX for Alternative 4

Source: MAGTF Training Command 2009 and Wyle 2010



Modeled Firing/Target Areas for Air-to-Ground Ordnance for MEBEX for Alternative 5

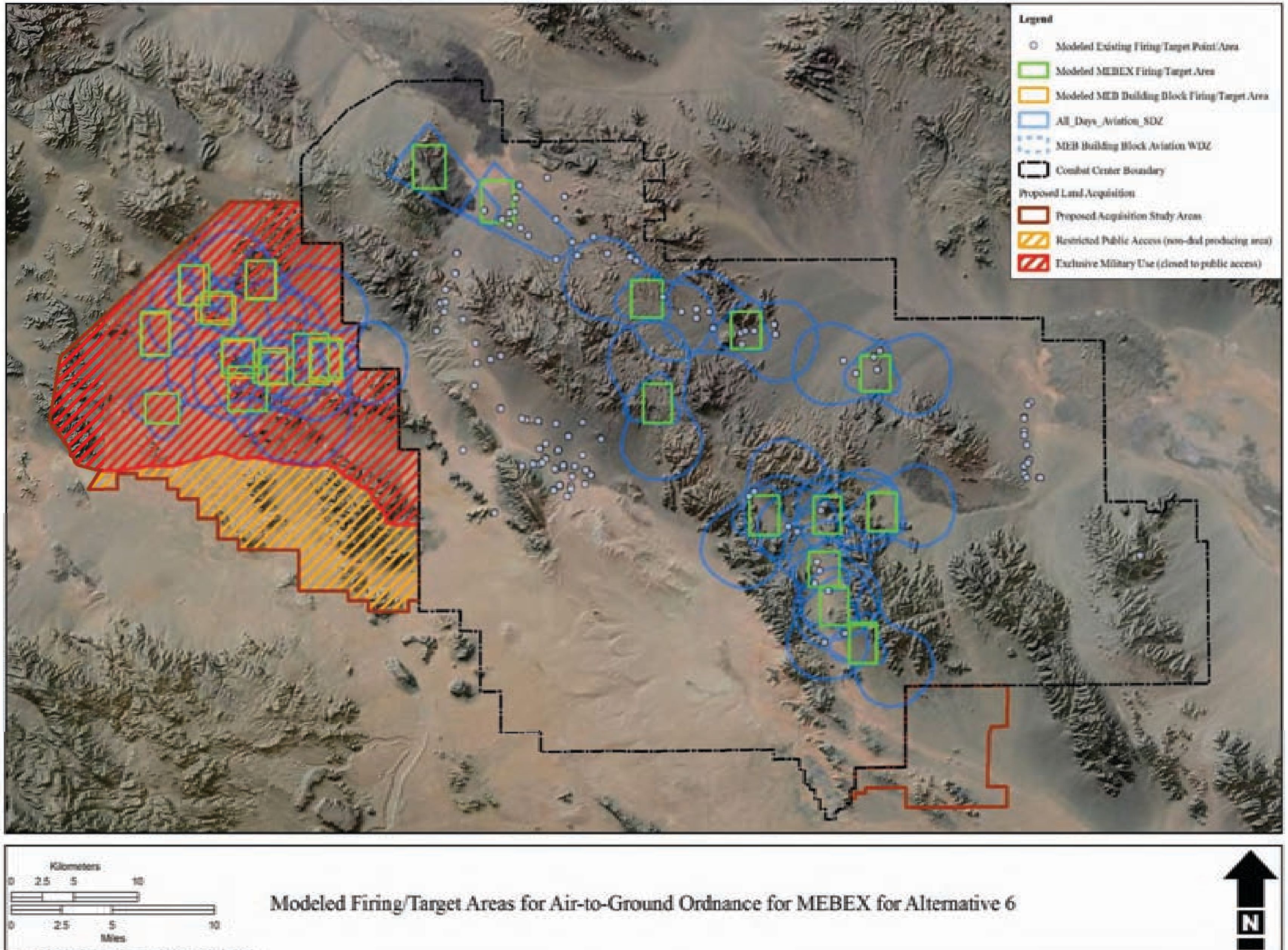
Source: MAGTF Training Command 2009 and Wyle 2010



Kilometers
0 2.5 5 10
0 2.5 5 10
Miles

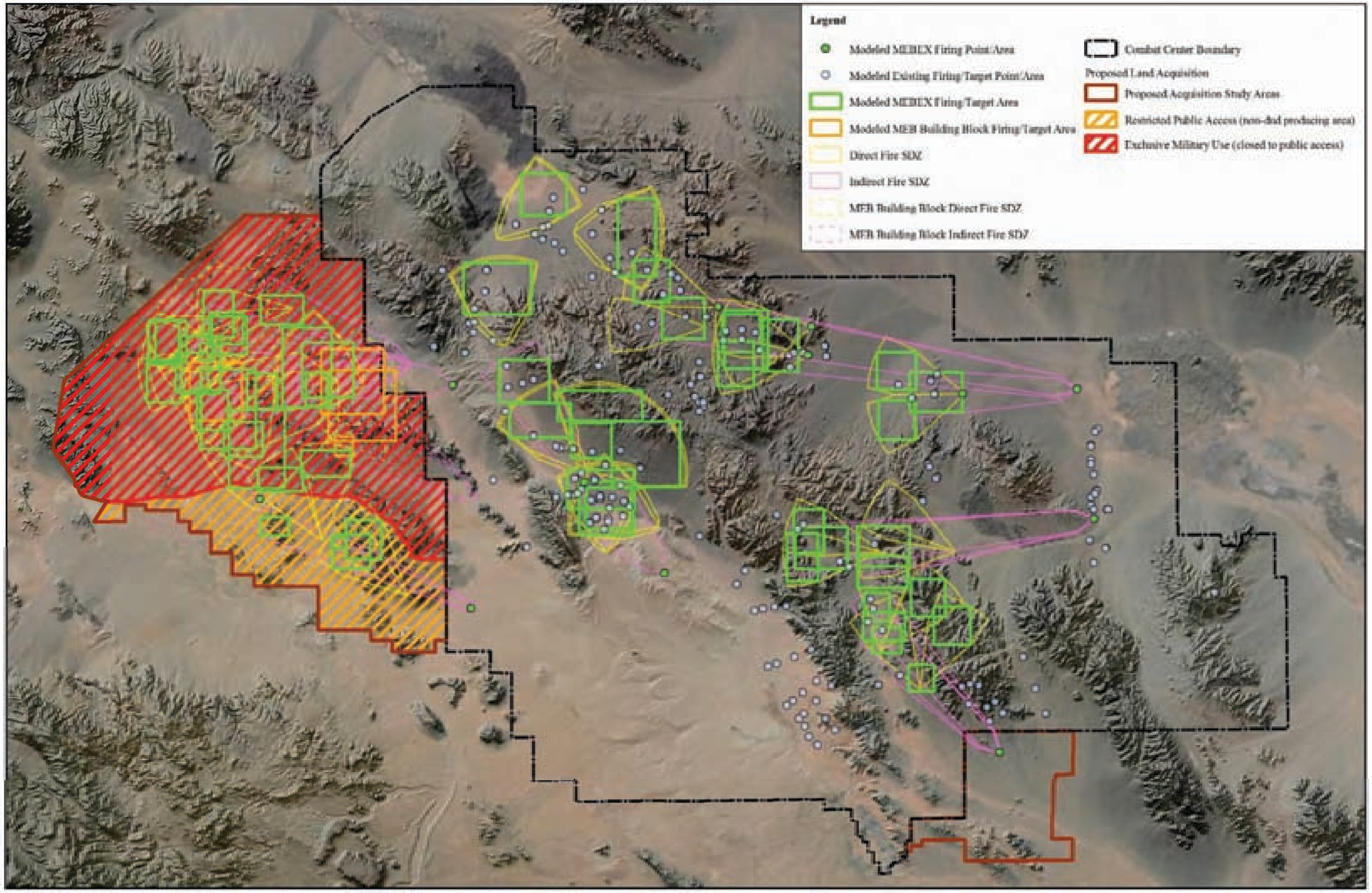
Modeled Firing/Target Areas for Ground-to-Ground Ordnance for MEBEX for Alternative 5

N



Modeled Firing/Target Areas for Air-to-Ground Ordnance for MEBEX for Alternative 6

Source: MAGTF Training Command 2009 and Wyle 2010



Modeled Firing/Target Areas for Ground-to-Ground Ordnance for MEBEX for Alternative 6

Source: MAGTF Training Command 2009 and Wyle 2010

H.4.1 Basics of Sound

Noise is unwanted sound. Sound is all around us; sound becomes noise when it interferes with normal activities, such as sleep or conversation.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (e.g., music) or unpleasant (e.g., jackhammers) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound.

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration. First, intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic of sound is frequency, which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches. The third important characteristic of sound is duration or the length of time the sound can be detected.

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. Because of this vast range, using a linear scale to represent the intensity of sound becomes very unwieldy. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB; sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 to 140 dB are felt as pain (Berglund and Lindvall 1995).

Because of the logarithmic nature of the decibel unit, sound levels cannot be arithmetically added or subtracted and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

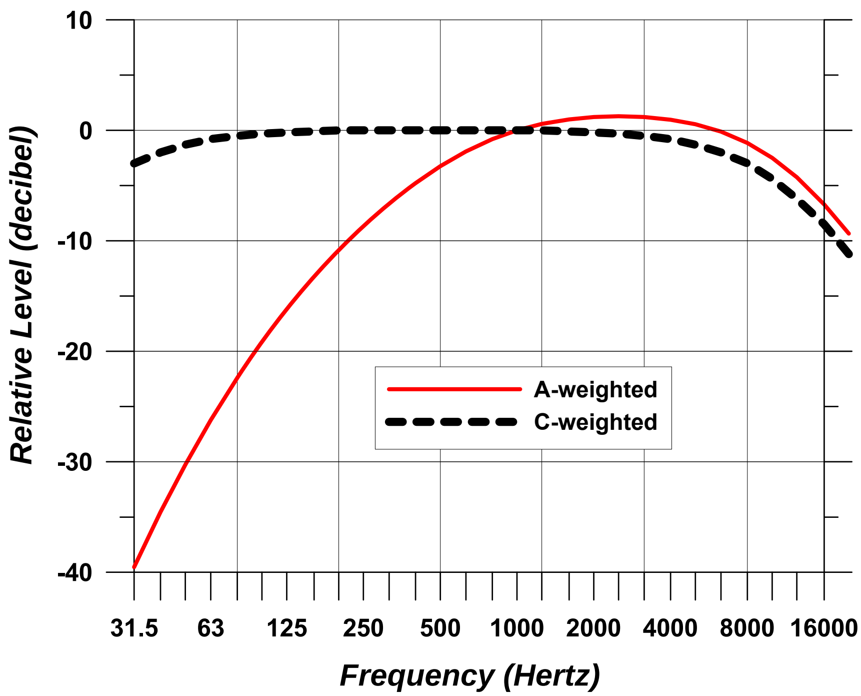
Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels is different than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that what we are really doing when we add decibel values is first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness, and this relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the standard unit for cps. The normal human ear can detect sounds that range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally by the human ear, which is most sensitive to frequencies in the 1,000 to 4,000 Hz range. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. A-weighting accounts for frequency dependence by adjusting the very high and very low frequencies (below approximately 500 Hz and above approximately 10,000 Hz) to approximate the human ear's lower sensitivities to those frequencies. C-weighting is nearly flat throughout the range of audible frequencies, hardly de-emphasizing the low frequency sound while approximating the human ear's sensitivity to higher intensity sounds. The two curves shown in Figure H-1 are also the most adequate to quantify environmental noises.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure H-1. Frequency Response Characteristics of A- and C-Weighting Networks

H.4.1.1 A-weighted Sound Level

Sound levels that are measured using A-weighting, called A-weighted sound levels, are often denoted by the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the adjective “A-weighted” is often omitted and the measurements are expressed as dB. In this report (as in most environmental impact documents), dB units refer to A-weighted sound levels.

Noise potentially becomes an issue when its intensity exceeds the ambient or background sound pressures. Ambient background noise in metropolitan, urbanized areas typically varies from 60 to 70 dB and can be as high as 80 dB or greater; quiet suburban neighborhoods experience ambient noise levels of approximately 45-50 dB (U.S. Environmental Protection Agency (EPA) 1978).

Figure H-2 is a chart of A-weighted sound levels from typical sounds. Some noise sources (air conditioner, vacuum cleaner) are continuous sounds which levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle pass-by. Some (urban daytime, urban nighttime) are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods, as discussed below.

Aircraft noise consists of two major types of sound events: aircraft takeoffs and landings, and engine maintenance operations. The former can be described as intermittent sounds and the latter as continuous. Noise levels from flight operations exceeding background noise typically occur beneath main approach and departure corridors, in local air traffic patterns around the airfield, and in areas immediately adjacent to parking ramps and aircraft staging areas. As aircraft in flight gain altitude, their noise contribution drops to lower levels, often becoming indistinguishable from the background.

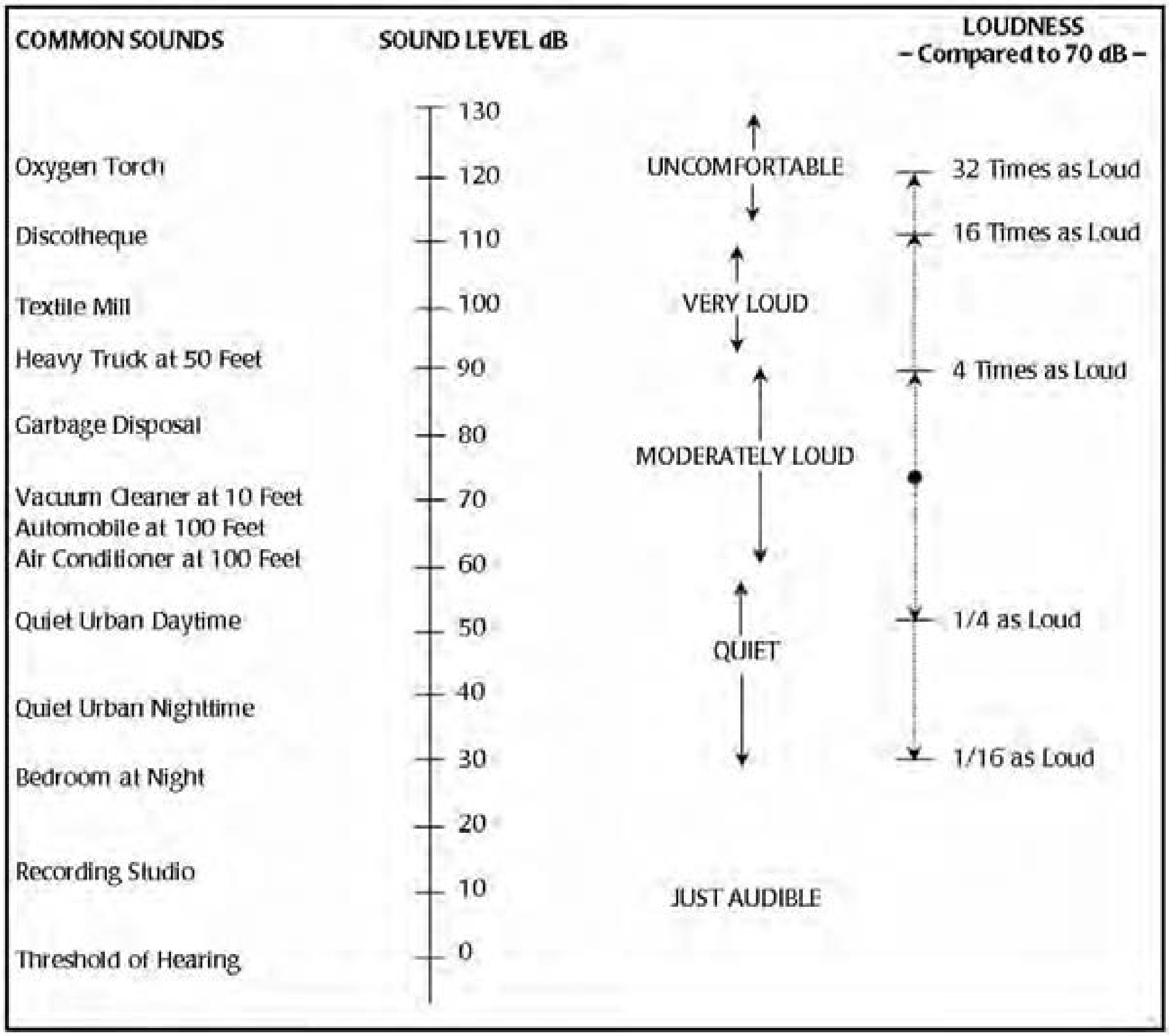
C-weighted Sound Level

Sound levels measured using a C-weighting are most appropriately called C-weighted sound levels (and denoted dBC). C-weighting is nearly flat throughout the audible frequency range, hardly de-emphasizing the low frequency. This weighting scale is generally used to describe impulsive sounds. Sounds that are characterized as impulsive generally contain low frequencies. Impulsive sounds may induce secondary effects, such as shaking of a structure, rattling of windows, inducing vibrations. These secondary effects can cause additional annoyance and complaints.

The following definitions in the American National Standard Institute (ANSI) Report S12.9, Part 4 provide general concepts helpful in understanding impulsive sounds (ANSI 1996).

Impulsive Sound: Sound characterized by brief excursions of sound pressure (acoustic impulses) that significantly exceeds the ambient environmental sound pressure. The duration of a single impulsive sound is usually less than one second (ANSI 1996).

Highly Impulsive Sound: Sound from one of the following enumerated categories of sound sources: small-arms gunfire, metal hammering, wood hammering, drop hammering, pile driving, drop forging, pneumatic hammering, pavement breaking, metal impacts during rail-yard shunting operation, and riveting.



SOURCE: Handbook of Noise Control, *C.M. Harris, Editor McGraw-Hill Book Co., 1979, and FICAN 1997*

Figure H-2. Typical A-weighted Sound Levels of Common Sounds

High-energy Impulsive Sound: Sound from one of the following enumerated categories of sound sources: quarry and mining explosions, sonic booms, demolition and industrial processes that use high explosives, military ordnance (e.g., armor, artillery and mortar fire, and bombs), explosive ignition of rockets and missiles, explosive industrial circuit breakers, and any other explosive source where the equivalent mass of dynamite exceeds 25 grams.

H4.2 Noise Metrics

In general, a metric is a statistic for measuring or quantifying. A noise metric quantifies the noise environment. There are three families of noise metrics described herein – one for single noise events such as an aircraft flyby, one for cumulative noise events such as a day's worth of aircraft activity and one which quantifies the events or time relative to single noise events.

Within the single noise event family, metrics described below include Peak Sound Pressure Level, Maximum Sound Level and Sound Exposure Level. Within the cumulative noise events family, metrics described below include Equivalent Sound Level, Day-Night Average Sound Level and several others. Within the events/time family, metrics described below include Number of Events Above a Threshold Level and Time Above a Specified Level.

H.4.2.1 Maximum Sound Level (L_{max})

The highest A-weighted integrated sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level or Maximum Sound Level.

During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. The L_{max} indicates the maximum sound level occurring for a fraction of a second. For aircraft noise, the "fraction of a second" over which the maximum level is defined is generally one-eighth of a second, and is denoted as "fast" response (ANSI 1988). Slowly varying or steady sounds are generally measured over a period of one second, denoted "slow" response. The L_{max} is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities. Although it provides some measure of the intrusiveness of the event, it does not completely describe the total event, because it does not include the period of time that the sound is heard.

H.4.2.2 Peak Sound Pressure Level (L_{pk})

The Peak Sound Pressure Level, is the highest instantaneous level obtained by a sound level measurement device. The L_{pk} is typically measured using a 20 microseconds or faster sampling rate, and is typically based on unweighted or linear response of the meter.

H.4.2.3 Sound Exposure Level (SEL)

Sound Exposure Level is a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., aircraft overflights) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. SEL provides a measure of the net impact of the entire acoustic event, but it does not directly represent the sound level heard at any given time. During an aircraft flyover, SEL would include both the L_{max} and the lower noise levels produced during onset and recess periods of the overflight.

SEL is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of a constant sound that would, in one second, generate the same acoustic energy as the actual time-varying noise event. For sound from aircraft overflights, which typically lasts more than one second, the SEL is usually greater than the L_{max} because an individual overflight takes seconds and the L_{max} occurs instantaneously. SEL represents the best metric to compare noise levels from overflights.

H.4.2.4 Equivalent Sound Level (L_{eq})

A cumulative noise metric useful in describing noise is the Equivalent Sound Level. L_{eq} is the continuous sound level that would be present if all of the variations in sound level occurring over a specified time period were smoothed out as to contain the samed total sound energy.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise. For example, the sum of all noise-generating events during the period of 7 a.m. to 4 p.m. could provide the relative impact of noise generating events for a school day.

H.4.2.5 Day-Night Average Sound Level (DNL or L_{dn}) and Community Noise Equivalent Level (CNEL)

Day-Night Average Sound Level and Community Noise Equivalent Level are composite metrics that account for all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, a 10 dB penalty is applied to nighttime events (10:00 p.m. to 7:00 a.m. time period). A variant of the DNL, the CNEL includes a 5 dB penalty on noise during the 7:00 a.m. to 10:00 p.m. time period, and a 10 dB penalty on noise during the 10:00 p.m. to 7:00 a.m. time period. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

Like L_{eq}, DNL and CNEL without their penalties are average quantities, mathematically representing the continuous A-weighted or C-weighted sound level that would be present if all of the variations in sound level that occur over a 24-hour period were smoothed out so as to contain the same total sound energy. These composite single-measure time-average metrics account for the SELs, L_{max}, the duration of the events (sorties or operations), and the number of events that occur over a 24-hour period but do not provide specific informatation on the number of noise events or the individual sound levels that occur during the 24-hour day. Like SEL, neither DNL nor CNEL represent the sound level heard at any particular time, but quantifies the total sound energy received. While it is normalized as an average, it represents all of the sound energy, and is therefore a cumulative measure.

The nighttime penalties in both DNL and CNEL account for the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period.

The inclusion of daytime, evening and nighttime periods in the computation of the DNL and CNEL reflects their basic 24-hour definition. They can, however, be applied over periods of multiple days. For application to civil airports, where operations are consistent from day to day, DNL and CNEL are usually applied as an annual average.

The logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average. A DNL of 65 dB could result from a very few noisy events or a large number of quieter events.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example, that 10 such 30-second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.

Daily average sound levels are typically used for the evaluation of community noise effects (i.e., long-term annoyance), and particularly aircraft noise effects. In general, scientific studies and social surveys have found a high correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (EPA 1978 and Schultz 1978).

H4.2.6 Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) and Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$)

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes (MTRs), Military Operating Areas (MOAs) and Restricted Areas/Ranges generate a noise environment that is somewhat different from that associated with airfield operations. As opposed to patterned or continuous noise environments associated with airfields, flight activity in SUAs is highly sporadic, and often seasonal ranging from ten per hour to less than one per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, exhibiting a rate of increase in sound level (onset rate) of up to 150 dB per second.

To represent these differences, the conventional SEL metric is adjusted to account for the “surprise” effect of the sudden onset of aircraft noise events on humans with an adjustment ranging up to 11 dB above the normal SEL (Stusnick, et al. 1992). Onset rates between 15 to 150 dB per second require an adjustment of 0 to 11 dB, while onset rates below 15 dB per second require no adjustment. The adjusted SEL is designated as the onset-rate adjusted sound exposure level (SEL_r).

Because of the sporadic characteristic of SUA activity and so as not to dilute the resultant noise exposure, the month with the most operations or sorties from a yearly tabulation for the given SUA is examined -- the so-called busiest month. The cumulative exposure to noise in these areas is computed by DNL over the busy month, but using SEL_r instead of SEL. This monthly average is denoted L_{dnmr}. If onset rate adjusted DNL is computed over a period other than a month, it would be designated L_{dnr} and the period must be specified. In the state of California, a variant of the L_{dnmr} includes a penalty for evening operations (7 p.m. to 10 p.m) and is denoted $CNEL_{mr}$.

H.4.2.7 Number-of-Events Above (NA) a Threshold Level (L)

The Number-of-events Above metric (NA) provides the total number of noise events that exceed the selected noise level threshold during a specified period of time. Combined with the selected threshold level (L), the NA metric is symbolized as NAL. The threshold L can be defined in terms of either the SEL or L_{max} metric, and it is important that this selection is reflected in the nomenclature. When labeling a contour line or point of interest (POI) on a map the NAL will be followed by the number of events in parentheses for that line or POI. For example, the noise environment at a location where 10 events exceed an SEL of 90 dB, over a given period of time, would be represented by the nomenclature NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA can be portrayed for single or multiple locations, or by means of noise contours on a map similar to the common DNL contours. A threshold level is selected that best meets the need for that situation. An L_{max} threshold is normally selected to analyze speech interference, whereas an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that has been developed that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

H.4.2.8 Time Above (TA) a Specified Level (L)

The Time Above (TA) metric is a measure of the total time that the A-weighted aircraft noise level is at or above a defined sound level threshold. Combined with the selected threshold level (L), the TA metric is symbolized as TAL. TA is not a sound level, but rather a time expressed in minutes. TA values can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data to define the time period of interest.

TA has application for describing the noise environment in schools, particularly when comparing the classroom or other noise sensitive environments for different operational scenarios. TA can be portrayed by means of noise contours on a map similar to the common DNL contours.

The TA metric is a useful descriptor of the noise impact of an individual event or for many events occurring over a certain time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis so the results show not only how many events occur above the selected threshold(s), but also the total duration of those events above those levels for the selected time period.

H4.3 Noise Effects

This noise effects section includes discussions of annoyance, speech interference and sleep disturbance, and the effects of noise on hearing, health, performance, learning, animals, property values, terrain and archaeological sites.

H.4.3.1 Annoyance

The primary effect of aircraft noise on exposed communities is one of long-term annoyance, defined by the Environmental Protection Agency (EPA) as any negative subjective reaction on the part of an individual or group. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response because it attempts to account for all negative aspects of effects from noise, e.g., increased annoyance due to being awakened the previous night by aircraft and interference with everyday conversation.

Numerous laboratory studies and field surveys have been conducted to measure annoyance and to account for a number of variables, many of which are dependent on a person's individual circumstances and preferences. Laboratory studies of individual response to noise have helped isolate a number of the factors contributing to annoyance, such as the intensity level and spectral characteristics of the noise, duration, the presence of impulses, pitch, information content, and the degree of interference with activity. Social surveys of community response to noise have allowed the development of general dose-response relationships that can be used to estimate the proportion of people who will be highly annoyed by a given noise level. The results of these studies have formed the basis for criteria established to define areas of compatible land use.

A wide variety of responses have been used to determine intrusiveness of noise and disturbances of speech, sleep, audio/video entertainment, and outdoor living; but the most useful metric for assessing peoples' responses to noise is the percentage of the population expected to be "highly annoyed." The concept of "percent highly annoyed" has provided the most consistent response of a community to a particular noise environment. In his synthesis of several different social surveys that employed different response scales, Schultz (1978) defined "highly annoyed" respondents as those respondents whose self-described annoyance fell within the upper 28 percent of the response scale where the scale was numerical or un-named. For surveys where the response scale was named, Schultz counted those who claimed to be highly annoyed, combining the responses of "very annoyed" and "extremely annoyed." Schultz's definition of "percent highly annoyed" (%HA) became the basis for the Federal policy on environmental noise. Daily average sound levels are typically used for the evaluation of community noise effects, such as long-term annoyance.

In general, scientific studies and social surveys have found a correlation between the percentages of groups of people highly annoyed and the level of average noise exposure. Thus, the results are expressed as the average %HA at various exposure levels measured in DNL. The classic analysis is Schultz's original 1978 study, whose results are shown in Figure H-3. This figure is commonly referred to as the Schultz curve. It represents the synthesis of a large number of social surveys (161 data points in all), that relates the long-term community response to various types of noise sources, measured using the DNL metric.

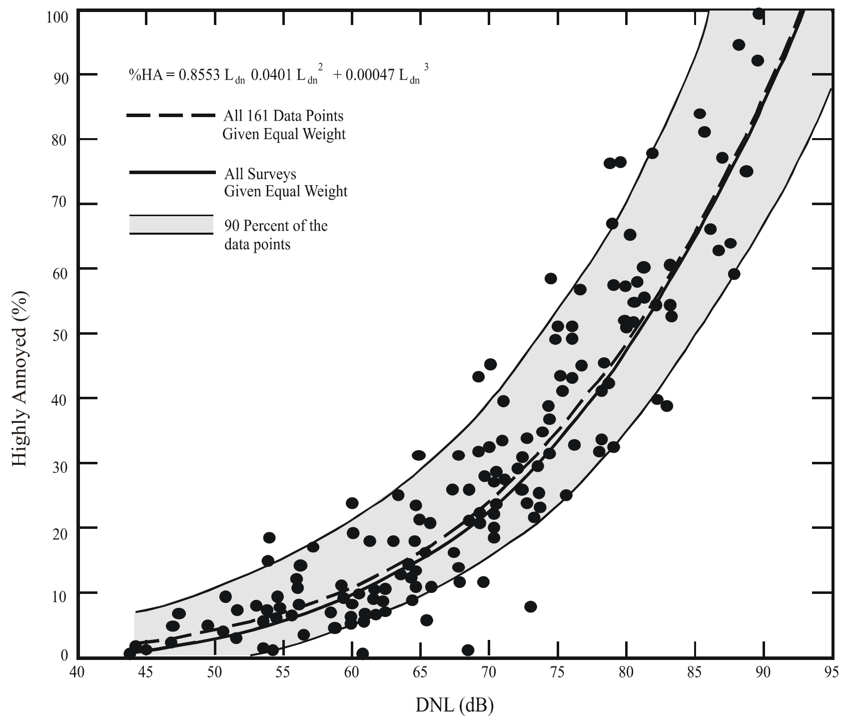
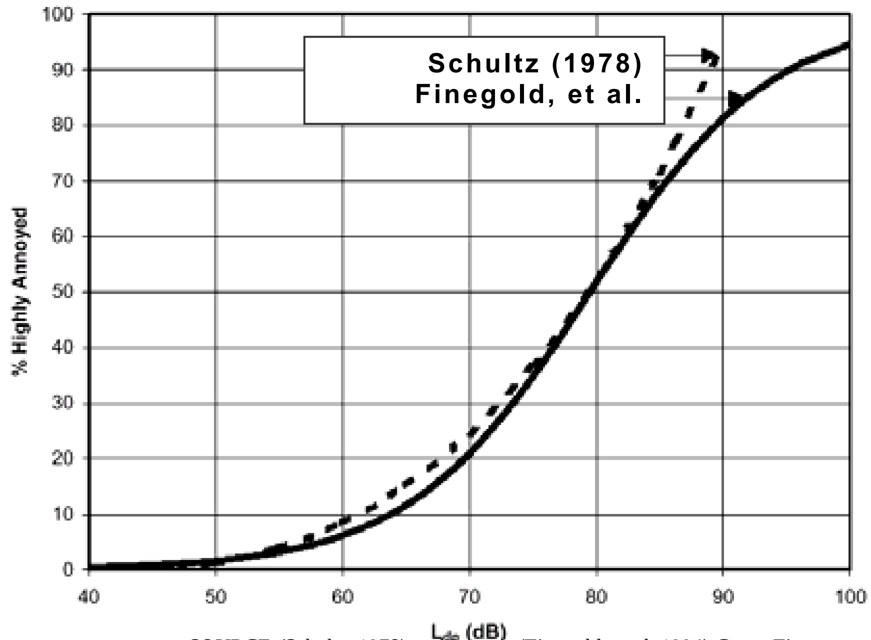


Figure H-3. Community Surveys of Noise Annoyance

An updated study of the original Schultz data based on the analysis of 400 data points collected through 1989 essentially reaffirmed this relationship. Figure H-4 shows an updated form of the curve fit in comparison with the original Schultz curve (Finegold 1994). The updated fit, which does not differ substantially from the original, is the preferred form in the U.S. The relationship between %HA and DNL is:

$$\%HA = 100/[1+ \exp(11.13 - 0.141L_{dn})]$$



SOURCE:(Schultz, 1978) andCurrent (Finegold, et al. 1994) Curve Fits

Figure H-4. Response of Communities to Noise; Comparison of Original

In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. However, the correlation coefficients for the annoyance of individuals are relatively low, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise.

A number of non-acoustic factors have been identified that may influence the annoyance response of an individual. Newman and Beattie (1985) divided these factors into emotional and physical variables.

Emotional Variables:

- Feelings about the necessity or preventability of the noise;
- Judgment of the importance and value of the activity that is producing the noise;
- Activity at the time an individual hears the noise;
- Attitude about the environment;
- General sensitivity to noise;
- Belief about the effect of noise on health; and
- Feeling of fear associated with the noise.

Physical Variables:

- Type of neighborhood;
- Time of day;
- Season;
- Predictability of noise;
- Control over the noise source; and
- Length of time an individual is exposed to a noise.

The low correlation coefficients for individuals' reactions reflect the large amount of scatter among the data drawn from the various surveys and point to the substantial uncertainty associated with the equation representing the relationship between %HA and DNL. Based on the results of surveys it has been observed that noise exposure can explain less than 50 percent of the observed variance in annoyance, indicating that non-acoustical factors play a major role. As a result, it is not possible to accurately predict individual annoyance in any specific community based on the aircraft noise exposure. Nevertheless, changes in %HA can be useful in giving the decision maker more information about the relative effects that different alternatives may have on the community.

The original Schultz curve and the subsequent updates do not separate out the annoyance from aircraft noise and other transportation noise sources. This was an important element, in that it allowed Schultz to obtain some consensus among the various social surveys from the 1960s and 1970s that were synthesized in the analysis. In essence, the Schultz curve assumes that the effects of long-term annoyance on the general population are the same, regardless of whether the noise source is road, rail, or aircraft. In the years after the classical Schultz analysis, additional social surveys have been conducted to better understand the annoyance effects of various transportation sources.

Miedema & Vos (1998) present synthesis curves for the relationship between DNL and percentage "Annoyed" and percentage "Highly Annoyed" for three transportation noise sources. Separate, non-identical curves were found for aircraft, road traffic, and railway noise. Table H-1 illustrates that, for a DNL of 65 dB, the percent of the people forecasted to be Highly Annoyed is 28 percent for air traffic, 18 percent for road traffic, and 11 percent for railroad traffic. For an outdoor DNL of 55 dB, the percent highly annoyed would be close to 12 percent if the noise is generated by aircraft operations, but only 7 percent and 4 percent, respectively, if the noise is generated by road or rail traffic. Comparing the levels on the Miedema & Vos curve to those on the updated Schultz curve indicates that the percentage of people highly annoyed by aircraft noise may be higher than previously thought when the noise is solely generated by aircraft activity.

Table H-1. Percent Highly Annoyed for Different Transportation Noise Sources

DNL (dB)	Percent Hightly Annoyed (%HA)			
	Miedema and Vos			Schultz Combined
	Air	Road	Rail	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema & Vos 1998

As noted by the World Health Organization (WHO), even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO 2000). The WHO noted that five major parameters should be randomly distributed for the analyses to be valid: personal, demographic, and lifestyle factors, as well as the duration of noise exposure and the population experience with noise.

The FICON found that the updated Schultz curve remains the best available source of empirical dosage effect information to predict community response to transportation noise without any segregation by transportation source (FICON 1992); a position held by the FICAN in 1997 (FICAN 1997). However, FICON also recommended further research to investigate the differences in perceptions of aircraft noise, ground transportation noise (highways and railroads), and general background noise.

H.4.3.2 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance for communities. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is particularly important in classrooms and offices. In industrial settings it can cause fatigue and vocal strain in those who attempt to communicate over the noise.

The disruption of speech in the classroom is a primary concern, due to the potential for adverse effects on children's learning ability. There are two aspects to speech comprehension:

1. *Word Intelligibility* - the percent of words transmitted and received. This might be important for students in the lower grades who are learning the English language, and particularly for students who have English as a Second Language.

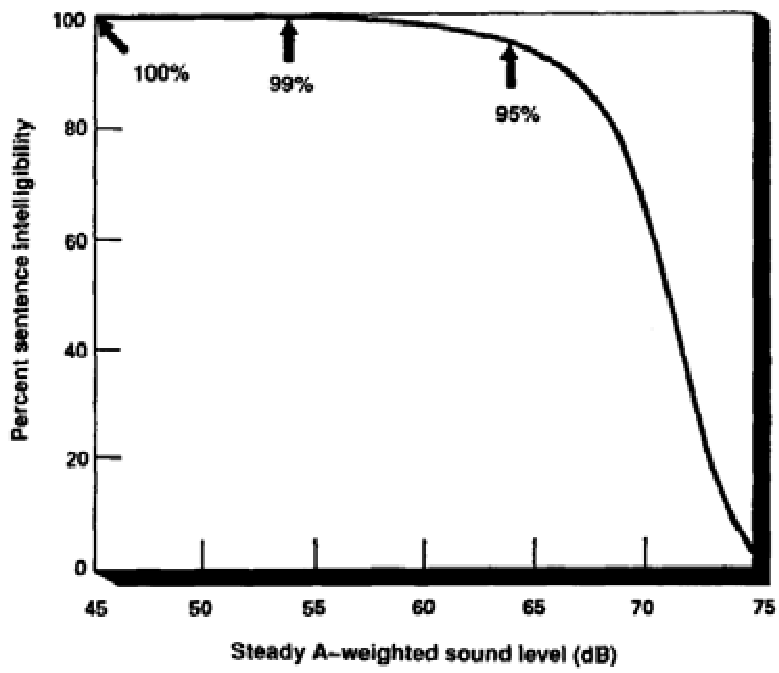
2. S*entence Intelligibility* – the percent of sentences transmitted and understood. This might be important for high-school students and adults who are familiar with the language, and who do not necessarily have to understand each word in order to understand sentences.

For teachers to be clearly understood by their students, it is important that regular voice communication is clear and uninterrupted. Not only does the background sound level have to be low enough for the teacher to be clearly heard, but intermittent outdoor noise events also need to be minimized. It is therefore important to evaluate the steady background level, the level of voice communication, and the single-event level due to aircraft overflights that might interfere with speech.

Several research studies have been conducted and guideline documents been developed resulting in a fairly consistent set of noise level criteria for speech interference. This section provides an overview of the results of these studies.

U.S. Federal Criteria for Interior Noise

In 1974, the EPA identified a goal of an indoor 24-hour average sound level $L_{eq(24)}$ of 45 dB to minimize speech interference based on the intelligibility of sentences in the presence of a steady background noise (EPA 1974). Intelligibility pertains to the percentage of speech units correctly understood out of those transmitted, and specifies the type of speech material used, i.e. sentences or words . The curve displayed in Figure H-5 shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background sound levels indoors of less than 45 dB L_{eq} are expected to allow 100 percent intelligibility of sentences.



Source: EPA 1974

Figure H-5. Speech Intelligibility Curve

The curve shows 99 percent sentence intelligibility for background levels at a L_{eq} of 54 dB, and less than 10 percent intelligibility for background levels above a L_{eq} of 73 dB. Note that the curve is especially sensitive to changes in sound level between 65 dB and 75 dB - an increase of 1 dB in background sound level from 70 dB to 71 dB results in a 14 percent decrease in sentence intelligibility, whereas a 1 dB increase in background sound level from 60 dB to 61 dB results in less than 1 percent decrease in sentence intelligibility.

Classroom Criteria

For listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., the difference between the speech level and the level of the interfering noise) is in the range 15-18 dB (Lazarus 1990).

Both the ANSI and the American Speech-Language-Hearing Association (ASHLA) recommend at least a 15 dB signal-to-noise ratio in classrooms, to ensure that children with hearing impairments and language disabilities are able to enjoy high speech intelligibility (ANSI 2002; ASHLA 1995). As such, provided that the average adult male or female voice registers a minimum of 50 dB L_{max} in the rear of the classroom, the ANSI standard requires that the continuous background noise level indoors must not exceed a L_{eq} of 35 dB (assumed to apply for the duration of school hours).

The WHO reported for a speaker-to-listener distance of about 1 meter, empirical observations have shown that speech in relaxed conversations is 100 percent intelligible in background noise levels of about 35 dB, and speech can be fairly well understood in the presence of background levels of 45 dB. The WHO recommends a guideline value of 35 dB L_{eq} for continuous background levels in classrooms during school hours (WHO 2000).

Bradley suggests that in smaller rooms, where speech levels in the rear of the classroom are approximately 50 dB L_{max}, steady-state noise levels above 35 dB L_{eq} may interfere with the intelligibility of speech (Bradley 1993).

For the purposes of determining eligibility for noise insulation funding, the Federal Aviation Administration (FAA) guidelines state that the design objective for a classroom environment is 45 dB L_{eq} resulting from aircraft operations during normal school hours (FAA 1985).

However, most aircraft noise is not continuous and consists of individual events where the sound level exceeds the background level for a limited time period as the aircraft flies over. Since speech interference in the presence of aircraft noise is essentially determined by the magnitude and frequency of individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate when evaluating the overall effects. In addition to the background level criteria described above, single-event criteria, which account for those sporadic intermittent outdoor noisy events, are also essential to specifying speech interference criteria.

In 1984, a report to the Port Authority of New York and New Jersey recommended utilizing the Speech Interference Level (SIL) metric for classroom noise criteria (Sharp and Plotkin 1984). This metric is based on the maximum sound levels in the frequency range (approximately 500 Hz to 2,000 Hz) that directly affects speech communication. The study identified an SIL (the average of the sound levels in the 500, 1000, and 2000 Hz octave-bands) of 45 dB as the desirable goal, which was estimated to provide 90 percent word intelligibility for the short time periods during aircraft over-flights. Although early classroom level criteria were defined in terms of SIL, the use and measurement of L_{max} as the primary metric has since become more popular. Both metrics take into consideration the L_{max} associated with intermittent noise events and can be related to existing background levels when determining speech interference percentages. An SIL of 45 dB is approximately equivalent to an A-weighted L_{max} of 50 dB for aircraft noise (Wesler 1986).

In 1998, a report also concluded that if an aircraft noise event's indoor L_{max} reached the speech level of 50 dB, 90 percent of the words would be understood by students seated throughout the classroom (Lind, Pearsons, and Fidell 1998). Since intermittent aircraft noise does not appreciably disrupt classroom communication at lower levels and other times, the authors also adopted an indoor L_{max} of 50 dB as the maximum single-event level permissible in classrooms. Note that this limit was set based on students with normal hearing and no special needs; at-risk students may be adversely affected at lower sound levels.

Bradley recommends SEL as a better indicator of indoor estimated speech interference in the presence of aircraft overflights (Bradley 1985). For acceptable speech communication using normal vocal efforts, Bradley suggests that the indoor SEL be no greater than 64 dB. He assumes a 26 dB outdoor-to-indoor noise reduction that equates to 90 dB SEL outdoors. Aircraft events producing outdoor SEL values greater than 90 dB would result in disruption to indoor speech communication. Bradley's work indicates that, for speakers talking with a casual vocal effort, 95 percent intelligibility would be achieved when indoor SEL values did not exceed 60 dB, which translates approximately to an L_{max} of 50 dB.

In the presence of intermittent noise events, ANSI states that the criteria for allowable background noise level can be relaxed since speech is impaired only for the short time when the aircraft noise is close to its maximum value. Consequently, they recommend when the background noise level of the noisiest hour is dominated by aircraft noise, the indoor criteria (35 dB L_{eq} for continuous background noise) can be increased by 5 dB to an Leq of 40 dB, as long as the noise level does not exceed 40 dB for more than 10 percent of the noisiest hour. (ANSI 2002).

The WHO does not recommend a specific indoor Lmax criterion for single-event noise, but does place a guideline value at L_{eq} of 35 dB for overall background noise in the classroom. However, WHO does report that "for communication distances beyond a few meters, speech interference starts at sound pressure levels below 50 dB for octave bands centered on the main speech frequencies at 500 Hz, 1kHz, and 2 kHz." (WHO 2000). One can infer this can be approximated by an L_{max} value of 50 dB.

The United Kingdom Department for Education and Skills (UKDFES) established in its classroom acoustics guide a 30-minute time-averaged metric [$L_{eq(30min)}$] for background levels and $L_{A1,30}$ min for intermittent noises, at thresholds of 30-35 dB and 55 dB, respectively. $L_{A1,30}$ min represents the A-weighted sound level that is exceeded one percent of the time (in this case, during a 30 minute teaching session) and is generally equivalent to the L_{max} metric (UKDFES 2003).

Summary

As the previous section demonstrates, research indicates that it is not only important to consider the continuous background levels using time-averaged metrics, but also the intermittent events, using single-event metrics such as L_{max}. Table H-2 provides a summary of the noise level criteria recommended in the scientific literature.

Table H-2. Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
U.S. FAA (1985)	L_{eq}(during school hours) = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / SIL 45	Single event level permissible in the classroom
WHO (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB
U.S. ANSI (2002)	L_{eq} = 40 dB, Based on Room Volume	Acceptable background level for continuous noise/ relaxed criteria for intermittent noise in the classroom
U.K. DFES (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs

When considering intermittent noise caused by aircraft overflights, a review of the relevant scientific literature and international guidelines indicates that an appropriate criteria is a limit on indoor background noise levels of 35 to 40 dB L_{eq} and a limit on single events of 50 dB L_{max}.

H.4.3.3 Sleep Disturbance

The disturbance of sleep is a major concern for communities exposed to nighttime aircraft noise. There have been numerous research studies that have attempted to quantify the complex effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies that have been conducted, with particular emphasis placed on those studies that have influenced U.S. federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on laboratory sleep observations.
2. Later studies performed in the 1990s up to the present, where the research was focused on field observations, and correlations to laboratory research were sought.

Initial Studies

The relationship between noise levels and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep, but also on the previous exposure to aircraft noise, familiarity with the surroundings, the physiological and psychological condition of the recipient, and a host of other situational factors. The most readily measurable effect of noise on sleep is the number of arousals or awakenings, and so the body of scientific literature has focused on predicting the percentage of the population that will be awakened at various noise levels. Fundamentally, regardless of the tools used to measure the degree of sleep disturbance (awakenings, arousals, etc.), these studies have grouped the data points into bins to predict the percentage of the population likely to be disturbed at various sound level thresholds.

FICON produced a guidance document that provided an overview of the most pertinent sleep disturbance research that had been conducted throughout the 1970s (FICON 1992). Literature reviews and meta-analysis conducted between 1978 and 1989 made use of the existing datasets that indicated the effects of nighttime noise on various sleep-state changes and awakenings (Lukas 1978; Griefahn 1978; Peasons et. al. 1989). FICON noted that various indoor A-weighted sound levels – ranging from 25 to 50 dB were observed to be thresholds below which significant sleep effects were not expected. Due to the large variability in the data, FICON did not endorse the reliability of the results.

However, FICON did recommend the use of an interim dose-response curve—awaiting future research—which predicted the percent of the exposed population expected to be awakened as a function of the exposure to single event noise levels expressed in terms of SEL. This curve was based on the research conducted for the U.S. Air Force (Finegold 1994). The dataset included most of the research performed up to that point, and predicted that ten percent of the population would be awakened when exposed to an interior SEL of approximately 58 dB. The data utilized to derive this relationship were primarily the results of controlled laboratory studies.

Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted in the early sleep disturbance research that the controlled laboratory studies did not account for many factors that are important to sleep behavior, such as habituation to the environment and previous exposure to noise and awakenings from sources other than aircraft noise. In the early 1990s, field studies were conducted to validate the earlier laboratory work. The most significant finding from these studies was that an estimated 80 to 90 percent of sleep disturbances were not related to individual outdoor noise events, but were instead the result of indoor noise sources and other non-noise-related factors . The results showed that there was less of an effect of noise on sleep in real-life conditions than had been previously reported from laboratory studies .

FICAN

The interim FICON dose-response curve that was recommended for use in 1992 was based on the most pertinent sleep disturbance research that was conducted through the 1970s, primarily in laboratory settings. After that time, considerable field research was conducted to evaluate the sleep effects in peoples' normal, home environment. Laboratory sleep studies tend to show higher values of sleep disturbance than field studies because people who sleep in their own homes are habituated to their environment and, therefore, do not wake up as easily (FICAN 1997).

Based on the new information, FICAN updated its recommended dose-response curve in 1997, depicted as the lower curve in Figure H-6. This figure is based on the results of three field studies (Ollerhead 1992; Fidell et. al. 1994; Fidell et al. 1995a and 1995b), along with the datasets from six previous field studies.

The new relationship represents the higher end, or upper envelope, of the latest field data. It should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened" or the "maximum percent awakened" for a given residential population. According to this relationship, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB, compared to 10 percent using the 1992 curve. An indoor SEL of 58 dB is equivalent to outdoor SEL's of 73 and 83 dB respectively assuming 15 and 25 dB noise level reduction from outdoor to indoor with windows open and closed, respectively.

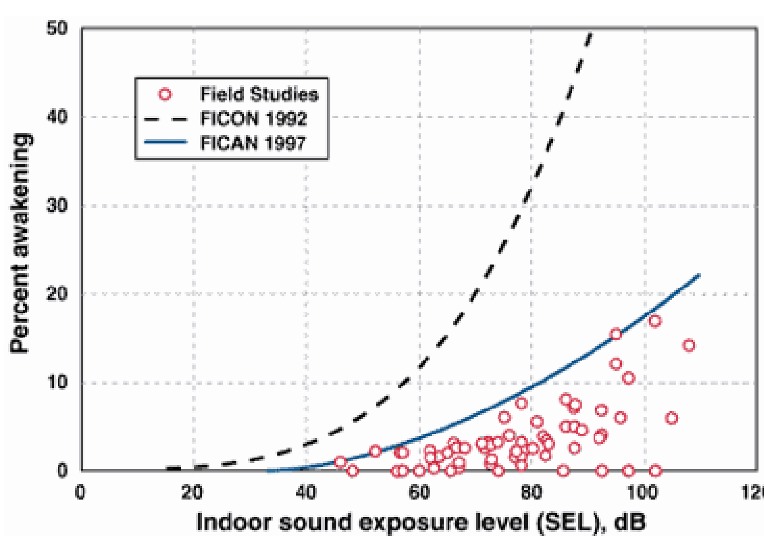


Figure H-6. FICAN's 1997 Recommended Sleep Disturbance Dose-Response Relationship

The FICAN 1997 curve is represented by the following equation:

$$\text{Percent Awakenings} = 0.0087 \times [\text{SEL} - 30]^{1.79}$$

Note the relatively low percentage of awakenings to fairly high noise levels. People think they are awakened by a noise event, but usually the reason for awakening is otherwise. For example, the 1992 UK CAA study found the average person was awakened about 18 times per night for reasons other than exposure to an aircraft noise – some of these awakenings are due to the biological rhythms of sleep and some to other reasons that were not correlated with specific aircraft events.

Number of Events and Awakenings

In recent years, there have been studies and one proposal that attempted to determine the effect of multiple aircraft events on the number of awakenings. The German Aerospace Center (DLR) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and other related human performance factors (Basner 2004). The DLR study was one of the largest studies to examine the link between aircraft noise and sleep disturbance and involved both laboratory and in-home field research phases. The DLR investigators developed a dose-effect curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

In July 2008 ANSI and the Acoustical Society of America (ASA) published a method to estimate the percent of the exposed population that might be awakened by multiple aircraft noise events based on statistical assumptions about the probability of awakening (or not awakening) (ANSI 2008). This method relies on probability theory rather than direct field research/experimental data to account for multiple events.

Figure H-7 depicts the awakenings data that form the basis and equations of ANSI S12.9-2008. The curve labeled 'Eq. (B1)' is the relationship between noise and awakening endorsed by FICAN in 1997. The ANSI recommended curve labeled 'Eq. (1)' quantifies the probability of awakening for a population of sleepers who are exposed to an outdoor noise event as a function of the associated indoor SEL in the bedroom. This curve was derived from studies of behavioral awakenings associated with noise events in "steady state" situations where the population has been exposed to the noise long enough to be habituated. The data points in Figure H-7 come from these studies. Unlike the FICAN curve, the ANSI 2008 curve represents the average of the field research data points.

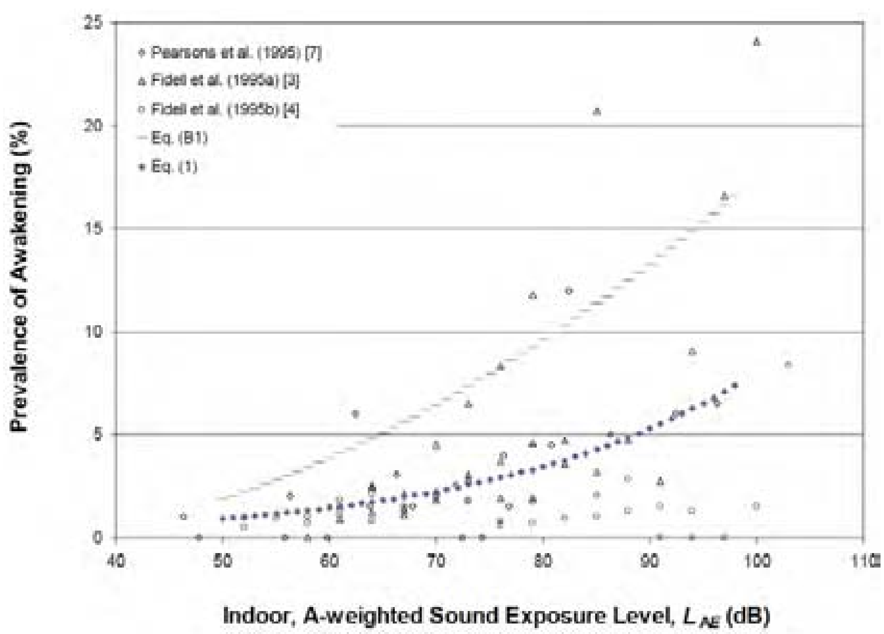


Figure H-7. Plot of Sleep Awakening Data versus Indoor SEL

In December 2008, FICAN recommended the use of this new estimation procedure for future analyses of behavioral awakenings from aircraft noise. In that statement, FICAN also recognized that additional sleep disturbance research is underway by various research organizations, and results of that work may result in additional changes to FICAN's position. Until that time, FICAN recommends the use of ANSI S12.9-2008.

H.4.3.4 Noise-Induced Hearing Impairment

Residents in surrounding communities express concerns regarding the effects of aircraft noise on hearing. This section provides a brief overview of hearing loss caused by noise exposure. The goal is to provide a sense of perspective as to how aircraft noise (as experienced on the ground) compares to other activities that are often linked with hearing loss.

Hearing Threshold Shifts

Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound; i.e. a shift in the hearing threshold to a higher level. This change can either be a Temporary Threshold Shift (TTS), or a Permanent Threshold Shift (PTS) (Berger 1995) .

TTS can result from exposure to loud noise over a given amount of time, yet the hearing loss is not necessarily permanent. An example of TTS might be a person attending a loud music concert. After the concert is over, the person may experience a threshold shift that may last several hours, depending upon the level and duration of exposure. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the speech range (typically near 4,000 Hz) . Normal hearing ability eventually returns, as long as the person has enough time to recover within a relatively quiet environment.

PTS usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover from the strain and fatigue of exposure. A common example of PTS is the result of working in a loud environment such as a factory. It is important to note that a temporary shift (TTS) can eventually become permanent (PTS) over time with continuous exposure to high noise levels. Thus, even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a Temporary Threshold Shift results in a Permanent Threshold Shift is difficult to identify and varies with a person's sensitivity.

Criteria for Permanent Hearing Loss

Considerable data on hearing loss have been collected and analyzed by the scientific/medical community. It has been well established that continuous exposure to high noise levels will damage human hearing (EPA 1978). The Occupational Safety and Health Administration (OSHA) regulation of 1971 standardizes the limits on workplace noise exposure for protection from hearing loss as an average level of 90 dB over an 8-hour work period or 85 dB over a 16-hour period (the average level is based on a 5 dB decrease per doubling of exposure time) (US Department of Labor 1970). Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) is an average sound level of 70 dB over a 24-hour period.

The US EPA established 75 dB for an 8-hour exposure and 70 dB for a 24-hour exposure as the average noise level standard requisite to protect 96 percent of the population from greater than a 5 dB PTS (EPA 1978). The National Academy of Sciences Committee on Hearing, Bioacoustics, and Biomechanics identified 75 dB as the minimum level at which hearing loss may occur (CHABA 1977). Finally, the WHO has concluded that environmental and leisure-time noise below an L_{eq24} value of 70 dB "will not cause hearing loss in the large majority of the population, even after a lifetime of exposure" (WHO 2000).

Hearing Loss and Aircraft Noise

The 1982 EPA Guidelines report specifically addresses the criteria and procedures for assessing the noise-induced hearing loss in terms of the Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in hearing level, or threshold, caused by exposure to noise (EPA, 1982). Numerically, the NIPTS is the change in threshold averaged over the frequencies 0.5, 1, 2, and 4 kHz that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure beginning at an age of 20 years. A grand average of the NIPTS over time (40 years) and hearing sensitivity (10 to 90 percentiles of the exposed population) is termed the Average NIPTS, or Ave NIPTS for short. The Average Noise Induced Permanent Threshold Shift (Ave. NIPTS) that can be expected for noise exposure as measured by the DNL metric is given in Table H-3.

Table H-3. Ave. NIPTS and 10th Percentile NIPTS as a Function of DNL

DNL	Ave. NIPTS dB*	10th Percentile NIPTS dB*
75-76	1.0	4.0
76-77	1.0	4.5
77-78	1.6	5.0
78-79	2.0	5.5
79-80	2.5	6.0
80-81	3.0	7.0
81-82	3.5	8.0
82-83	4.0	9.0
83-84	4.5	10.0
84-85	5.5	11.0

* Rounded to the nearest 0.5 dB

For example, for a noise exposure of 80 dB DNL, the expected lifetime avereage value of NIPTS is 2.5 dB, or 6.0 dB for the 10th percentile. Characterizing the noise exposure in terms of DNL will usually overestimate the assessment of hearing loss risk as DNL includes a 10 dB weighting factor for aircraft operations occuring between 10 p.m. and 7 a.m. If, however, flight operations between the hours of 10 p.m. and 7 a.m. account for 5 percent or less of the total 24-hour operations, the overestimation is on the order of 1.5 dB.

From a civilian airport perspective, the scientific community has concluded that there is little likelihood that the resulting noise exposure from aircraft noise could result in either a temporary or permanent hearing loss. Studies on community hearing loss from exposure to aircraft flyovers near airports showed that there is no danger, under normal circumstances, of hearing loss due to aircraft noise (Newman and Beattie 1985). The EPA criterion (L_{eq24} = 70 dBA) can be exceeded in some areas located near airports, but that is only the case outdoors. Inside a building, where people are more likely to spend most of their time, the average noise level will be much less than 70 dBA (Eldred and von Gierke 1993). Eldred and von Gierke also report that "several studies in the U.S., Japan, and the U.K. have confirmed the predictions that the possibility for permanent hearing loss in communities, even under the most intense commercial take-off and landing patterns, is remote."

With regard to military airbases, as individual aircraft noise levels are increasing with the introduction of new aircraft, a 2009 DoD policy directive requires that hearing loss risk be estimated for the at risk population, defined as the population exposed to DNL greater than or equal to 80 dB and higher (DoD 2009). Specifically, DoD components are directed to "*use the 80 Day-Night A-Weighted (DNL) noise contour to identify populations at the most risk of potential hearing loss*". This does not preclude populations outside the 80 DNL contour, i.e. at lower exposure levels, from being at some degree of risk of hearing loss. However, the analysis should be restricted to populations within this contour area, including residents of on-base housing. The exposure of workers inside the base boundary area should be considered occupational and evaluated using the appropriate DoD component regulations for occupational noise exposure.

With regard to military airspace activity, studies have shown conflicting results. A 1995 laboratory study measured changes in human hearing from noise representative of low-flying aircraft on MTRs (Nixon, et al. 1993). The potential effects of aircraft flying along MTRs is of particular concern because of maximum overflight noise levels can exceed 115 dB, with rapid increases in noise levels exceeding 30 dB per second. In this study, participants were first subjected to four overflight noise exposures at A-weighted levels of 115 dB to 130 dB. Fifty percent of the subjects showed no change in hearing levels, 25 percent had a temporary 5 dB *increase* in sensitivity (the people could hear a 5 dB wider range of sound than before exposure), and 25 percent had a temporary 5 dB decrease in sensitivity (the people could hear a 5 dB narrower range of sound than before exposure). In the next phase, participants were subjected to a single overflight at a maximum level of 130 dB for eight successive exposures, separated by 90 seconds or until a temporary shift in hearing was observed. The temporary hearing threshold shifts showed an *increase* in sensitivity of up to 10 dB.

In another study of 115 test subjects between 18 and 50 years old in 1999, temporary threshold shifts were measured after laboratory exposure to military low-altitude flight noise (Ising, et al. 1999). According to the authors, the results indicate that repeated exposure to military low-altitude flight noise with L_{max} greater than 114 dB, especially if the noise level increases rapidly, may have the potential to cause noise induced hearing loss in humans.

Summary

Aviation and typical community noise levels near airports are not comparable to the occupational or recreational noise exposures associated with hearing loss. Studies of aircraft noise levels associated with civilian airport activity have not definitively correlated permanent hearing impairment with aircraft activity. It is unlikely that airport neighbors will remain outside their homes 24 hours per day, so there is little likelihood of hearing loss below an average sound level of 75 dB DNL. Near military airbases, average noise levels above 75 dB may occur, and while new DoD policy dictates that NIPTS be evaluated, no research results to date have definitively related permanent hearing impairment to aviation noise.

H.4.3.5 Nonauditory Health Effects

Studies have been conducted to determine whether correlations exist between noise exposure and cardiovascular problems, birth weight, and mortality rates. The nonauditory effect of noise on humans is not as easily substantiated as the effect on hearing. The results of studies conducted in the United States, primarily concentrating on cardiovascular response to noise, have been contradictory (Cantrell 1974). Cantrell concluded that the results of human and animal experiments show that average or intrusive noise can act as a stress-provoking stimulus. Prolonged stress is known to be a contributor to a number of health disorders. Kryter and Poza (1980) state, "It is more likely that noise-related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body." Psychological stresses may cause a physiological stress reaction that could result in impaired health.

The National Institute for Occupational Safety and Health and EPA commissioned CHABA in 1981 to study whether established noise standards are adequate to protect against health disorders other than hearing defects. CHABA's conclusion was that:

Evidence from available research reports is suggestive, but it does not provide definitive answers to the question of health effects, other than to the auditory system, of long-term exposure to noise. It seems prudent, therefore, in the absence of adequate knowledge as to whether or not noise can produce effects upon health other than damage to auditory system, either directly or mediated through stress, that insofar as feasible, an attempt should be made to obtain more critical evidence.

Since the CHABA report, there have been more recent studies that suggest that noise exposure may cause hypertension and other stress-related effects in adults. Near an airport in Stockholm, Sweden, the prevalence of hypertension was reportedly greater among nearby residents who were exposed to energy averaged noise levels exceeding 55 dB and maximum noise levels exceeding 72 dB, particularly older subjects and those not reporting impaired hearing ability (Rosenlund, et al. 2001). A study of elderly volunteers who were exposed to simulated military low-altitude flight noise reported that blood pressure was raised by L_{max} of 112 dB and high speed level increase (Michalak, et al. 1990). Yet another study of subjects exposed to varying levels of military aircraft or road noise found no significant relationship between noise level and blood pressure (Pulles, et al. 1990).

The U.S. Department of the Navy prepared a programmatic Environmental Assessment (EA) for the continued use of non-explosive ordnance on the Vieques Inner Range. Following the preparation of the EA, it was learned that research conducted by the University of Puerto Rico, Ponce School of Medicine, suggested that Vieques fishermen and their families were experiencing symptoms associated with vibroacoustic disease (VAD) (U.S. Department of the Navy 2002). The study alleged that exposure to noise and sound waves of large pressure amplitudes within lower frequency bands, associated with Navy training activities—specifically, air-to-ground bombing or naval fire support—was related to a larger prevalence of heart anomalies within the Vieques fishermen and their families. The Ponce School of Medicine study compared the Vieques group with a group from Ponce Playa. A 1999 study conducted on Portuguese aircraft-manufacturing workers from a single factory reported effects of jet aircraft noise exposure that involved a wide range of symptoms and disorders, including the cardiac issues on which the Ponce School of Medicine study focused. The 1999 study identified these effects as VAD.

Johns Hopkins University (JHU) conducted an independent review of the Ponce School of Medicine study, as well as the Portuguese aircraft workers study and other relevant scientific literature. Their findings concluded that VAD should not be accepted as a syndrome, given that exhaustive research across a number of populations has not yet been conducted. JHU also pointed out that the evidence supporting the existence of VAD comes largely from one group of investigators and that similar results would have to be replicated by other investigators. In short, JHU concluded that it had not been established that noise was the causal agent for the symptoms reported and no inference can be made as to the role of noise from naval gunfire in producing echocardiographic abnormalities (U.S. Department of the Navy 2002).

Most studies of nonauditory health effects of long-term noise exposure have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. One of the best scientific summaries of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on 22 to 24 January 1990 in Washington, D.C.:

> "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an 8-hour day). At the recent (1988) International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem, but also any potential nonauditory health effects in the work place" (von Gierke 1990).

Although these findings were specifically directed at noise effects in the workplace, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies that purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, two UCLA researchers apparently found a relationship between aircraft noise levels under the approach path to Los Angeles International Airport (LAX) and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the “noise-exposed” population (Meacham and Shaw 1979). Nevertheless, three other UCLA professors analyzed those same data and found no relationship between noise exposure and mortality rates (Frerichs, et al. 1980).

As a second example, two other UCLA researchers used this same population near LAX to show a higher rate of birth defects for 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the Center for Disease Control performed a more thorough study of populations near Atlanta’s Hartsfield International Airport (ATL) for 1970 to 1972 and found no relationship in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds, et al. 1979).

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

The potential for noise to affect physiological health, such as the cardiovascular system, has been speculated; however, no unequivocal evidence exists to support such claims (Harris 1997). Conclusions drawn from a review of health effect studies involving military low-altitude flight noise with its unusually high maximum levels and rapid rise in sound level have shown no increase in cardiovascular disease (Schwartze and Thompson 1993). Additional claims that are unsupported include flyover noise producing increased mortality rates and increases in cardiovascular death, aggravation of post-traumatic stress syndrome, increased stress, increase in admissions to mental hospitals, and adverse affects on pregnant women and the unborn fetus (Harris 1997).

H.4.3.6 Performance Effects

The effect of noise on the performance of activities or tasks has been the subject of many studies. Some of these studies have established links between continuous high noise levels and performance loss. Noise-induced performance losses are most frequently reported in studies employing noise levels in excess of 85 dB. Little change has been found in low-noise cases. It has been cited that moderate noise levels appear to act as a stressor for more sensitive individuals performing a difficult psychomotor task.

While the results of research on the general effect of periodic aircraft noise on performance have yet to yield definitive criteria, several general trends have been noted including:

- A periodic intermittent noise is more likely to disrupt performance than a steady-state continuous noise of the same level. Flyover noise, due to its intermittent nature, might be more likely to disrupt performance than a steady-state noise of equal level.
- Noise is more inclined to affect the quality than the quantity of work.
- Noise is more likely to impair the performance of tasks that place extreme demands on theworker.

H.4.3.7 Noise Effects on Children

In response to noise-specific and other environmental studies, Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (1997), requires federal agencies to ensure that policies, programs, and activities address environmental health and safety risks to identify any disproportionate risks to children.

A review of the scientific literature indicates that there has not been a tremendous amount of research in the area of aircraft noise effects on children. The research reviewed does suggest that environments with sustained high background noise can have variable effects, including noise effects on learning and cognitive abilities, and reports of various noise-related physiological changes.

H.4.3.7.1 Effects on Learning and Cognitive Abilities

In 2002 ANSI refers to studies that suggest that loud and frequent background noise can affect the learning patterns of young children (ANSI 2002). ANSI provides discussion on the relationships between noise and learning, and stipulates design requirements and acoustical performance criteria for outdoor-to-indoor noise isolation. School design is directed to be cognizant of, and responsive to surrounding land uses and the shielding of outdoor noise from the indoor environment. The ANSI acoustical performance criteria for schools include the requirement that the one-hour-average background noise level shall not exceed 35 dBA in core learning spaces smaller than 20,000 cubic-feet and 40 dBA in core learning spaces with enclosed volumes exceeding 20,000 cubic-feet. This would require schools be constructed such that, in quiet neighborhoods indoor noise levels are lowered by 15 to 20 dBA relative to outdoor levels. In schools near airports, indoor noise levels would have to be lowered by 35 to 45 dBA relative to outdoor levels (ANSI 2002).

The studies referenced by ANSI to support the new standard are not specific to jet aircraft noise and the potential effects on children. However, there are references to studies that have shown that children in noisier classrooms scored lower on a variety of tests. Excessive background noise or reverberation within schools causes interferences of communication and can therefore create an acoustical barrier to learning (ANSI 2002). Studies have been performed that contribute to the body of evidence emphasizing the importance of communication by way of the spoken language to the development of cognitive skills. The ability to read, write, comprehend, and maintain attentiveness, are, in part, based upon whether teacher communication is consistently intelligible (ANSI 2002).

Numerous studies have shown varying degrees of effects of noise on the reading comprehension, attentiveness, puzzle-solving, and memory/recall ability of children. It is generally accepted that young children are more susceptible than adults to the effects of background noise. Because of the developmental status of young children (linguistic, cognitive, and proficiency), barriers to hearing can cause interferences or disruptions in developmental evolution.

Research on the impacts of aircraft noise, and noise in general, on the cognitive abilities of school-aged children has received more attention in recent years. Several studies suggest that aircraft noise can affect the academic performance of schoolchildren. Although many factors could contribute to learning deficits in school-aged children (e.g., socioeconomic level, home environment, diet, sleep patterns), evidence exists that suggests that chronic exposure to high aircraft noise levels can impair learning.

Specifically, elementary school children attending schools near New York City's two airports demonstrated lower reading scores than children living farther away from the flight paths (Green, et al. 1982). Researchers have found that tasks involving central processing and language comprehension (such as reading, attention, problem solving, and memory) appear to be the most affected by noise (Evans and Lepore 1993; Hygge 1994; and Evans, et al. 1998). It has been demonstrated that chronic exposure of first- and second-grade children to aircraft noise can result in reading deficits and impaired speech perception (i.e., the ability to hear common, low-frequency [vowel] sounds but not high frequencies [consonants] in speech) (Evans and Maxwell 1997).

The Evans and Maxwell (1997) study found that chronic exposure to aircraft noise resulted in reading deficits and impaired speech perception for first- and second-grade children. Other studies found that children residing near the Los Angeles International Airport had more difficulty solving cognitive problems and did not perform as well as children from quieter schools in puzzle-solving and attentiveness (Bronzaft 1997; Cohen, et al. 1980). Children attending elementary schools in high aircraft noise areas near London's Heathrow Airport demonstrated poorer reading comprehension and selective cognitive impairments (Haines, et al. 2001a, and 2001b). Similarly, a 1994 study found that students exposed to aircraft noise of approximately 76 dBA scored 20% lower on recall ability tests than students exposed to ambient noise of 42-44 dBA (Hygge 1994). Similar studies involving the testing of attention, memory, and reading comprehension of school children located near airports showed that their tests exhibited reduced performance results compared to those of similar groups of children who were located in quieter environments (Evans, et al. 1998; Haines, et al. 1998). The Haines and Stansfeld study indicated that there may be some long-term effects associated with exposure, as one-year follow-up testing still demonstrated lowered scores for children in higher noise schools (Haines, et al. 2001a, and 2001b). In contrast, a 2002 study found that although children living near the old Munich airport scored lower in standardized reading and long-term memory tests than a control group, their performance on the same tests was equal to that of the control group once the airport was closed. (Hygge, et al. 2002).

Finally, although it is recognized that there are many factors that could contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led the World Health Organization and a North Atlantic Treaty Organization working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (World Health Organization 2000; North Atlantic Treaty Organization 2000).

H.4.3.7.2 Health Effects

Physiological effects in children exposed to aircraft noise and the potential for health effects have also been the focus of limited investigation. Studies in the literature include examination of blood pressure levels, hormonal secretions, and hearing loss.

As a measure of stress response to aircraft noise, authors have looked at blood pressure readings to monitor children's health. Children who were chronically exposed to aircraft noise from a new airport near Munich, Germany, had modest (although significant) increases in blood pressure, significant increases in stress hormones, and a decline in quality of life (Evans, et al. 1998). Children attending noisy schools had statistically significant average systolic and diastolic blood pressure ($p<0.03$). Systolic blood pressure means were 89.68 mm for children attending schools located in noisier environments compared to 86.77 mm for a control group. Similarly, diastolic blood pressure means for the noisier environment group were 47.84 mm and 45.16 for the control group (Cohen, et al. 1980).

Although the literature appears limited, studies focused on the wide range of potential effects of aircraft noise on school children have also investigated hormonal levels between groups of children exposed to aircraft noise compared to those in a control group. Specifically, two studies analyzed cortisol and urinary catecholamine levels in school children as measurements of stress response to aircraft noise (Haines, et al. 2001b and 2001c). In both instances, there were no differences between the aircraft-noise-exposed children and the control groups.

Other studies have reported hearing losses from exposure to aircraft noise. Noise-induced hearing loss was reportedly higher in children who attended a school located under a flight path near a Taiwan airport, as compared to children at another school far away (Chen, et al. 1997). Another study reported that hearing ability was reduced significantly in individuals who lived near an airport and were frequently exposed to aircraft noise (Chen and Chen 1993). In that study, noise exposure near the airport was reportedly uniform, with DNL greater than 75 dB and maximum noise levels of about 87 dB during overflights. Conversely, several other studies that were reviewed reported no difference in hearing ability between children exposed to high levels of airport noise and children located in quieter areas (Fisch 1977; Andrus, et al. 1975; Wu, et al. 1995).

H.4.3.8 Effects on Domestic Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci, et al. (1988), assert that the consequences that physiological effects may have on behavioral patterns is vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intra-inter specific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960's and 1970's on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci, et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci, et al. 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights. Secondary effects may include non-auditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects, and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects, and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith, et al. 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci, et al. 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Apparently, animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith, et al. 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the 1988 Manci, et al., literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci, et al. (1988), reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

H.4.3.8.1 Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci, et al. 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Cattle

In response to concerns about overflight effects on pregnant cattle, milk production, and cattle safety, the U.S. Air Force prepared a handbook for environmental protection that summarizes the literature on the impacts of low-altitude flights on livestock (and poultry) and includes specific case studies conducted in numerous airspaces across the country. Adverse effects have been found in a few studies but have not been reproduced in other similar studies. One such study, conducted in 1983, suggested that 2 of 10 cows in late pregnancy aborted after showing rising estrogen and falling progesterone levels. These increased hormonal levels were reported as being linked to 59 aircraft overflights. The remaining eight cows showed no changes in their blood concentrations and calved normally (U.S. Air Force 1994b). A similar study reported abortions occurred in three out of five pregnant cattle after exposing them to flyovers by six different aircraft (U.S.Air Force 1994b). Another study suggested that feedlot cattle could stampede and injure themselves when exposed to low-level overflights (U.S. Air Force 1994b).

A majority of the studies reviewed suggests that there is little or no effect of aircraft noise on cattle. Studies presenting adverse effects to domestic animals have been limited. A number of studies (Parker and Bayley 1960; Casady and Lehmann 1967; Kovalcik and Sottnik 1971) investigated the effects of jet aircraft noise and sonic booms on the milk production of dairy cows. Through the compilation and examination of milk production data from areas exposed to jet aircraft noise and sonic boom events, it was determined that milk yields were not affected. This was particularly evident in those cows that had been previously exposed to jet aircraft noise.

A study examined the causes of 1,763 abortions in Wisconsin dairy cattle over a one-year time period and none were associated with aircraft disturbances (U.S.Air Force 1993). In 1987, Anderson contacted seven livestock operators for production data, and no effects of low-altitude and supersonic flights were noted. Three out of 43 cattle previously exposed to low-altitude flights showed a startle response to an F/A-18 aircraft flying overhead at 500 feet above ground level and 400 knots by running less than 10 meters. They resumed normal activity within one minute (U.S.Air Force 1994b). Beyer (1983) found that helicopters caused more reaction than other low-aircraft overflights, and that the helicopters at 30 to 60 feet overhead did not affect milk production and pregnancies of 44 cows and heifers in a 1964 study (U.S. Air Force 1994b).

Additionally, Beyer reported that five pregnant dairy cows in a pasture did not exhibit fright-flight tendencies or disturb their pregnancies after being overflown by 79 low-altitude helicopter flights and 4 low-altitude, subsonic jet aircraft flights (U.S. Air Force 1994b). A 1956 study found that the reactions of dairy and beef cattle to noise from low-altitude, subsonic aircraft were similar to those caused by paper blowing about, strange persons, or other moving objects (U.S. Air Force 1994b).

In a report to Congress, the U. S. Forest Service concluded that “evidence both from field studies of wild ungulates and laboratory studies of domestic stock indicate that the risks of damage are small (from aircraft approaches of 50 to 100 meters), as animals take care not to damage themselves (U.S. Forest Service 1992). If animals are overflown by aircraft at altitudes of 50 to 100 meters, there is no evidence that mothers and young are separated, that animals collide with obstructions (unless confined) or that they traverse dangerous ground at too high a rate." These varied study results suggest that, although the confining of cattle could magnify animal response to aircraft overflight, there is no proven cause-and-effect link between startling cattle from aircraft overflights and abortion rates or lower milk production.

Horses

Horses have also been observed to react to overflights of jet aircraft. Several of the studies reviewed reported a varied response of horses to low-altitude aircraft overflights. Observations made in 1966 and 1968 noted that horses galloped in response to jet flyovers (U.S. Air Force 1993). Bowles (1995) cites Kruger and Erath as observing horses exhibiting intensive flight reactions, random movements, and biting/kicking behavior. However, no injuries or abortions occurred, and there was evidence that the mares adapted somewhat to the flyovers over the course of a month (U.S. Air Force 1994b). Although horses were observed noticing the overflights, it did not appear to affect either survivability or reproductive success. There was also some indication that habituation to these types of disturbances was occurring.

LeBlanc, et al. (1991), studied the effects of F-14 jet aircraft noise on pregnant mares. They specifically focused on any changes in pregnancy success, behavior, cardiac function, hormonal production, and rate of habituation. Their findings reported observations of "flight-fright" reactions, which caused increases in heart rates and serum cortisol concentrations. The mares, however, did habituate to the noise. Levels of anxiety and mass body movements were the highest after initial exposure, with intensities of responses decreasing thereafter. There were no differences in pregnancy success when compared to a control group.

Swine

Generally, the literature findings for swine appear to be similar to those reported for cows and horses. While there are some effects from aircraft noise reported in the literature, these effects are minor. Studies of continuous noise exposure (i.e., 6 hours, 72 hours of constant exposure) reported influences on short-term hormonal production and release. Additional constant exposure studies indicated the observation of stress reactions, hypertension, and electrolyte imbalances (Dufour 1980). A study by Bond, et al. (1963), demonstrated no adverse effects on the feeding efficiency, weight gain, ear physiology, or thyroid and adrenal gland condition of pigs subjected to observed aircraft noise. Observations of heart rate increase were recorded, noting that cessation of the noise resulted in the return to normal heart rates. Conception rates and offspring survivorship did not appear to be influenced by exposure to aircraft noise.

Similarly, simulated aircraft noise at levels of 100 dB to 135 dB had only minor effects on the rate of feed utilization, weight gain, food intake, or reproduction rates of boars and sows exposed, and there were no injuries or inner ear changes observed (Manci, et al. 1988; Gladwin, et al. 1988).

Domestic Fowl

According to a 1994 position paper by the U.S. Air Force on effects of low-altitude overflights (below 1,000 ft) on domestic fowl, overflight activity has negligible effects (U.S. Air Force 1994a). The paper did recognize that given certain circumstances, adverse effects can be serious. Some of the effects can be panic reactions, reduced productivity, and effects on marketability (e.g., bruising of the meat caused during "pile-up" situations).

The typical reaction of domestic fowl after exposure to sudden, intense noise is a short-term startle response. The reaction ceases as soon as the stimulus is ended, and within a few minutes all activity returns to normal. More severe responses are possible depending on the number of birds, the frequency of exposure, and environmental conditions. Large crowds of birds, and birds not previously exposed, are more likely to pile up in response to a noise stimulus (U.S. Air Force 1994a). According to studies and interviews with growers, it is typically the previously unexposed birds that incite panic crowding, and the tendency to do so is markedly reduced within five exposures to the stimulus (U.S. Air Force 1994a). This suggests that the birds habituate relatively quickly. Egg productivity was not adversely affected by infrequent noise bursts, even at exposure levels as high as 120 to 130 dBA.

Between 1956 and 1988, there were 100 recorded claims against the Navy for alleged damage to domestic fowl. The number of claims averaged three per year, with peak numbers of claims following publications of studies on the topic in the early 1960s (U.S. Air Force 1994a). Many of the claims were disproved or did not have sufficient supporting evidence. The claims were filed for the following alleged damages: 55% for panic reactions, 31% for decreased production, 6% for reduced hatchability, 6% for weight loss, and less than 1% for reduced fertility (U.S. Air Force 1994a).

Turkeys

The review of the existing literature suggests that there has not been a concerted or widespread effort to study the effects of aircraft noise on commercial turkeys. One study involving turkeys examined the differences between simulated versus actual overflight aircraft noise, turkey responses to the noise, weight gain, and evidence of habituation (Bowles, et al. 1990a). Findings from the study suggested that turkeys habituated to jet aircraft noise quickly, that there were no growth rate differences between the experimental and control groups, and that there were some behavioral differences that increased the difficulty in handling individuals within the experimental group.

Low-altitude overflights were shown to cause turkey flocks that were kept inside turkey houses to occasionally pile up and experience high mortality rates due to the aircraft noise and a variety of disturbances unrelated to aircraft (U.S. Air Force 1994a).

H.4.3.8.2 Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock (Manci, et al. 1988). This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci, et al. 1988).

MAMMALS

Terrestrial Mammals

Studies of terrestrial mammals have shown that noise levels of 120 dBA can damage mammals' ears, and levels at 95 dBA can cause temporary loss of hearing acuity. Noise from aircraft has affected other large carnivores by causing changes in home ranges, foraging patterns, and breeding behavior. One study recommended that aircraft not be allowed to fly at altitudes below 2,000 feet above ground level over important grizzly and polar bear habitat (Dufour 1980). Wolves have been frightened by low-altitude flights that were 25 to 1,000 feet off the ground. However, wolves have been found to adapt to aircraft overflights and noise as long as they were not being hunted from aircraft (Dufour 1980).

Wild ungulates (American bison, caribou, bighorn sheep) appear to be much more sensitive to noise disturbance than domestic livestock (Weisenberger, et al. 1996). Behavioral reactions may be related to the past history of disturbances by such things as humans and aircraft. Common reactions of reindeer kept in an enclosure exposed to aircraft noise disturbance were a slight startle response, raising of the head, pricking ears, and scenting of the air. Panic reactions and extensive changes in behavior of individual animals were not observed. Observations of caribou in Alaska exposed to fixed-wing aircraft and helicopters showed running and panic reactions occurred when overflights were at an altitude of 200 feet or less. The reactions decreased with increased altitude of overflights, and, with more than 500 feet in altitude, the panic reactions stopped. Also, smaller groups reacted less strongly than larger groups. One negative effect of the running and avoidance behavior is increased expenditure of energy. For a 90-kg animal, the calculated expenditure due to aircraft harassment is 64 kilocalories per minute when running and 20 kilocalories per minute when walking. When conditions are favorable, this expenditure can be counteracted with increased feeding; however, during harsh winter conditions, this may not be possible. Incidental observations of wolves and bears exposed to fixed-wing aircraft and helicopters in the northern regions suggested that wolves are less disturbed than wild ungulates, while grizzly bears showed the greatest response of any animal species observed.

It has been proven that low-altitude overflights do induce stress in animals. Increased heart rates, an indicator of excitement or stress, have been found in pronghorn antelope, elk, and bighorn sheep. As such reactions occur naturally as a response to predation, infrequent overflights may not, in and of themselves, be detrimental. However, flights at high frequencies over a long period of time may cause harmful effects. The consequences of this disturbance, while cumulative, is not additive. It may be that aircraft disturbance may not cause obvious and serious health effects, but coupled with a harsh winter, it may have an adverse impact. Research has shown that stress induced by other types of disturbances produces long-term decreases in metabolism and hormone balances in wild ungulates.

Behavioral responses can range from mild to severe. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate disturbance may be nervous behaviors, such as trotting a short distance. Escape is the typical severe response.

Marine Mammals

The physiological composition of the ear in aquatic and marine mammals exhibits adaptation to the aqueous environment. These differences (relative to terrestrial species) manifest themselves in the auricle and middle ear (Manci, et al. 1988). Some mammals use echolocation to perceive objects in their surroundings and to determine the directions and locations of sound sources (Simmons 1983 in Manci, et al. 1988).

In 1980, the Acoustical Society of America held a workshop to assess the potential hazard of manmade noise associated with proposed Alaska Arctic (North Slope-Outer Continental Shelf) petroleum operations on marine wildlife and to prepare a research plan to secure the knowledge necessary for proper assessment of noise impacts (Acoustical Society of America, 1980). Since 1980 it appears that research on responses of aquatic mammals to aircraft noise and sonic booms has been limited. Research conducted on northern fur seals, sea lions, and ringed seals indicated that there are some differences in how various animal groups receive frequencies of sound. It was observed that these species exhibited varying intensities of a startle response to airborne noise, which was habituated over time. The rates of habituation appeared to vary with species, populations, and demographics (age, sex). Time of day of exposure was also a factor (Muyberg 1978 in Manci, et al. 1988).

Studies accomplished near the Channel Islands were conducted near the area where the space shuttle launches occur. It was found that there were some response differences between species relative to the loudness of sonic booms. Those booms that were between 80 and 89 dBA caused a greater intensity of startle reactions than lower-intensity booms at 72 to 79 dBA. However, the duration of the startle responses to louder sonic booms was shorter (Jehl and Cooper 1980 in Manci, et al. 1988).

Jehl and Cooper (1980) indicated that low-flying helicopters, loud boat noises, and humans were the most disturbing to pinnipeds. According to the research, while the space launch and associated operational activity noises have not had a measurable effect on the pinniped population, it also suggests that there was a greater "disturbance level" exhibited during launch activities. There was a recommendation to continue observations for behavioral effects and to perform long-term population monitoring (Jehl and Cooper 1980).

The continued presence of single or multiple noise sources could cause marine mammals to leave a preferred habitat. However, it does not appear likely that overflights could cause migration from suitable habitats as aircraft noise over water is mobile and would not persist over any particular area. Aircraft noise, including supersonic noise, currently occurs in the overwater airspace of Eglin, Tyndall, and Langley AFBs from sorties predominantly involving jet aircraft. Survey results reported in Davis, et al. (2000), indicate that cetaceans (i.e., dolphins) occur under all of the Eglin and Tyndall marine airspace. The continuing presence of dolphins indicates that aircraft noise does not discourage use of the area and apparently does not harm the locally occurring population.

In a summary by the National Parks Service (1994) on the effects of noise on marine mammals, it was determined that gray whales and harbor porpoises showed no outward behavioral response to aircraft noise or overflights. Bottlenose dolphins showed no obvious reaction in a study involving helicopter overflights at 1,200 to 1,800 feet above the water. Neither did they show any reaction to survey aircraft unless the shadow of the aircraft passed over them, at which point there was some observed tendency to dive (Richardson, et al. 1995). Other anthropogenic noises in the marine environment from ships and pleasure craft may have more of an effect on marine mammals than aircraft noise (U.S. Air Force 2000). The noise effects on cetaceans appear to be somewhat attenuated by the air/water interface. The cetacean fauna along the coast of California have been subjected to sonic booms from military aircraft for many years without apparent adverse effects (Tetra Tech, Inc. 1997).

Manatees appear relatively unresponsive to human-generated noise to the point that they are often suspected of being deaf to oncoming boats [although their hearing is actually similar to that of pinnipeds (Bullock, et al. 1980)]. Little is known about the importance of acoustic communication to manatees, although they are known to produce at least ten different types of sounds and are thought to have sensitive hearing (Richardson, et al. 1995). Manatees continue to occupy canals near Miami International Airport, which suggests that they have become habituated to human disturbance and noise (Metro-Dade County 1995). Since manatees spend most of their time below the surface and do not startle readily, no effect of aircraft overflights on manatees would be expected (Bowles, et al. 1991b).

BIRDS

Auditory research conducted on birds indicates that they fall between the reptiles and the mammals relative to hearing sensitivity. According to Dooling (1978), within the range of one to five kHz, birds show a level of hearing sensitivity similar to that of the more sensitive mammals. In contrast to mammals, bird sensitivity falls off at a greater rate to increasing and decreasing frequencies. Passive observations and studies examining aircraft bird strikes indicate that birds nest and forage near airports. Aircraft noise in the vicinity of commercial airports apparently does not inhibit bird presence and use.

High-noise events (like a low-altitude aircraft overflight) may cause birds to engage in escape or avoidance behaviors, such as flushing from perches or nests (Ellis, et al. 1991). These activities impose an energy cost on the birds that, over the long term, may affect survival or growth. In addition, the birds may spend less time engaged in necessary activities like feeding, preening, or caring for their young because they spend time in noise-avoidance activity. However, the long-term significance of noise-related impacts is less clear. Several studies on nesting raptors have indicated that birds become habituated to aircraft overflights and that long-term reproductive success is not affected (Grubb and King 1991; Ellis, et al. 1991). Threshold noise levels for significant responses range from 62 dB for Pacific black brant (Branta bernicla nigricans) (Ward and Stehn 1990) to 85 dB for crested tern (Sterna bergii) (Brown 1990).

Songbirds were observed to become silent prior to the onset of a sonic boom event (F-111 jets), followed by “raucous discordant cries.” There was a return to normal singing within 10 seconds after the boom (Higgins 1974 in Manci, et al. 1988). Ravens responded by emitting protestation calls, flapping their wings, and soaring.

Manci, et al. (1988), reported a reduction in reproductive success in some small territorial passerines (i.e., perching birds or songbirds) after exposure to low-altitude overflights. However, it has been observed that passerines are not driven any great distance from a favored food source by a nonspecific disturbance, such as aircraft overflights (U.S. Forest Service 1992). Further study may be warranted.

A recent study, conducted cooperatively between the DoD and the USFWS, assessed the response of the red-cockaded woodpecker to a range of military training noise events, including artillery, small arms, helicopter, and maneuver noise (Pater, et al. 1999). The project findings show that the red-cockaded woodpecker successfully acclimates to military noise events. Depending on the noise level that ranged from innocuous to very loud, the birds responded by flushing from their nest cavities. When the noise source was closer and the noise level was higher, the number of flushes increased proportionately. In all cases, however, the birds returned to their nests within a relatively short period of time (usually within 12 minutes). Additionally, the noise exposure did not result in any mortality or statistically detectable changes in reproductive success (Pater, et al. 1999). Red-cockaded woodpeckers did not flush when artillery simulators were more than 122 meters away and SEL noise levels were 70 dBA.

Lynch and Speake (1978) studied the effects of both real and simulated sonic booms on the nesting and brooding eastern wild turkey (Meleagris gallopavo silvestris) in Alabama. Hens at four nest sites were subjected to between 8 and 11 combined real and simulated sonic booms. All tests elicited similar responses, including quick lifting of the head and apparent alertness for between 10 and 20 seconds. No apparent nest failure occurred as a result of the sonic booms.

Twenty-one brood groups were also subjected to simulated sonic booms. Reactions varied slightly between groups, but the largest percentage of groups reacted by standing motionless after the initial blast. Upon the sound of the boom, the hens and poults fled until reaching the edge of the woods (approximately 4 to 8 meters). Afterward, the poults resumed feeding activities while the hens remained alert for a short period of time (approximately 15 to 20 seconds). In no instances were poults abandoned, nor did they scatter and become lost. Every observation group returned to normal activities within a maximum of 30 seconds after a blast.

RAPTORS

In a literature review of raptor responses to aircraft noise, Manci, et al. (1988), found that most raptors did not show a negative response to overflights. When negative responses were observed they were predominantly associated with rotor-winged aircraft or jet aircraft that were repeatedly passing within 0.5 mile of a nest.

Ellis, et al. (1991), performed a study to estimate the effects of low-level military jet aircraft and mid- to high-altitude sonic booms (both actual and simulated) on nesting peregrine falcons and seven other raptors (common black-hawk, Harris' hawk, zone-tailed hawk, red-tailed hawk, golden eagle, prairie falcon, bald eagle). They observed responses to test stimuli, determined nest success for the year of the testing, and evaluated site occupancy the following year. Both long- and short-term effects were noted in the study. The results reported the successful fledging of young in 34 of 38 nest sites (all eight species) subjected to low-level flight and/or simulated sonic booms. Twenty-two of the test sites were revisited in the following year, and observations of pairs or lone birds were made at all but one nest. Nesting attempts were underway at 19 of 20 sites that were observed long enough to be certain of breeding activity. Reoccupancy and productivity rates were within or above expected values for self-sustaining populations.

Short-term behavior responses were also noted. Overflights at a distance of 150 m or less produced few significant responses and no severe responses. Typical responses consisted of crouching or, very rarely, flushing from the perch site. Significant responses were most evident before egg laying and after young were "well grown." Incubating or brooding adults never burst from the nest, thus preventing egg breaking or knocking chicks out of the nest. Jet passes and sonic booms often caused noticeable alarm; however, significant negative responses were rare and did not appear to limit productivity or reoccupancy. Due to the locations of some of the nests, some birds may have been habituated to aircraft noise. There were some test sites located at distances far from zones of frequent military aircraft usage, and the test stimuli were often closer, louder, and more frequent than would be likely for a normal training situation.

Manci, et al. (1988), noted that a female northern harrier was observed hunting on a bombing range in Mississippi during bombing exercises. The harrier was apparently unfazed by the exercises, even when a bomb exploded within 200 feet. In a similar case of habituation/non-disturbance, a study on the Florida snail-kite stated the greatest reaction to overflights (approximately 98 dBA) was "watching the aircraft fly by." No detrimental impacts to distribution, breeding success, or behavior were noted.

Bald Eagle

A study by Grubb and King (1991) on the reactions of the bald eagle to human disturbances showed that terrestrial disturbances elicited the greatest response, followed by aquatic (i.e., boats) and aerial disturbances. The disturbance regime of the area where the study occurred was predominantly characterized by aircraft noise. The study found that pedestrians consistently caused responses that were greater in both frequency and duration. Helicopters elicited the highest level of aircraft-related responses. Aircraft disturbances, although the most common form of disturbance, resulted in the lowest levels of response. This low response level may have been due to habituation; however, flights less than 170 meters away caused reactions similar to other disturbance types. Ellis, et al. (1991), showed that eagles typically respond to the proximity of a disturbance, such as a pedestrian or aircraft within 100 meters, rather than the noise level. Fleischner and Weisberg (1986) stated that reactions of bald eagles to commercial jet flights, although minor (e.g., looking), were twice as likely to occur when the jets passed at a distance of 0.5 mile or less. They also noted that helicopters were four times more likely to cause a reaction than a commercial jet and 20 times more likely to cause a reaction than a propeller plane.

The USFWS advised Cannon AFB that flights at or below 2,000 feet AGL from October 1 through March 1 could result in adverse impacts to wintering bald eagles (U.S. Fish and Wildlife Serice 1998). However, Fraser, et al. (1985), suggested that raptors habituate to overflights rapidly, sometimes tolerating aircraft approaches of 65 feet or less.

Osprey

A study by Trimper, et al. (1998), in Goose Bay, Labrador, Canada, focused on the reactions of nesting osprey to military overflights by CF-18 Hornets. Reactions varied from increased alertness and focused observation of planes to adjustments in incubation posture. No overt reactions (e.g., startle response, rapid nest departure) were observed as a result of an overflight. Young nestlings crouched as a result of any disturbance until they grew to 1 to 2 weeks prior to fledging. Helicopters, human presence, float planes, and other ospreys elicited the strongest reactions from nesting ospreys. These responses included flushing, agitation, and aggressive displays. Adult osprey showed high nest occupancy rates during incubation regardless of external influences.

The osprey observed occasionally stared in the direction of the flight before it was audible to the observers. The birds may have been habituated to the noise of the flights; however, overflights were strictly controlled during the experimental period. Strong reactions to float planes and helicopter may have been due to the slower flight and therefore longer duration of visual stimuli rather than noise-related stimuli.

Red-tailed Hawk

Anderson, et al. (1989), conducted a study that investigated the effects of low-level helicopter overflights on 35 red-tailed hawk nests. Some of the nests had not been flown over prior to the study. The hawks that were naïve (i.e., not previously exposed) to helicopter flights exhibited stronger avoidance behavior (nine of 17 birds flushed from their nests) than those that had experienced prior overflights. The overflights did not appear to affect nesting success in either study group. These findings were consistent with the belief that red-tailed hawks habituate to low-level air traffic, even during the nesting period.

MIGRATORY WATERFOWL

A study of caged American black ducks was conducted by Fleming, et al. in 1996. It was determined that noise had negligible energetic and physiologic effects on adult waterfowl. Measurements included body weight, behavior, heart rate, and enzymatic activity. Experiments also showed that adult ducks exposed to high noise events acclimated rapidly and showed no effects.

The study also investigated the reproductive success of captive ducks, which indicated that duckling growth and survival rates at Piney Island, North Carolina, were lower than those at a background location. In contrast, observations of several other reproductive indices (i.e., pair formation, nesting, egg production, and hatching success) showed no difference between Piney Island and the background location. Potential effects on wild duck populations may vary, as wild ducks at Piney Island have presumably acclimated to aircraft overflights. It was not demonstrated that noise was the cause of adverse impacts. A variety of other factors, such as weather conditions, drinking water and food availability and variability, disease, and natural variability in reproduction, could explain the observed effects. Fleming noted that drinking water conditions (particularly at Piney Island) deteriorated during the study, which could have affected the growth of young ducks. Further research would be necessary to determine the cause of any reproductive effects.

Another study by Conomy, et al. (1998) exposed previously unexposed ducks to 71 noise events per day that equaled or exceeded 80 dBA. It was determined that the proportion of time black ducks reacted to aircraft activity and noise decreased from 38 percent to 6 percent in 17 days and remained stable at 5.8 percent thereafter. In the same study, the wood duck did not appear to habituate to aircraft disturbance. This supports the notion that animal response to aircraft noise is species-specific. Because a startle response to aircraft noise can result in flushing from nests, migrants and animals living in areas with high concentrations of predators would be the most vulnerable to experiencing effects of lowered birth rates and recruitment over time. Species that are subjected to infrequent overflights do not appear to habituate to overflight disturbance as readily.

Black brant studied in the Alaska Peninsula were exposed to jets and propeller aircraft, helicopters, gunshots, people, boats, and various raptors. Jets accounted for 65% of all the disturbances. Humans, eagles, and boats caused a greater percentage of brant to take flight. There was markedly greater reaction to Bell-206-B helicopter flights than fixed wing, single-engine aircraft (Ward, et al. 1986).

The presence of humans and low-flying helicopters in the Mackenzie Valley North Slope area did not appear to affect the population density of Lapland longspurs, but the experimental group was shown to have reduced hatching and fledging success and higher nest abandonment. Human presence appeared to have a greater impact on the incubating behavior of the black brant, common eider, and Arctic tern than fixed-wing aircraft (Gunn and Livingston 1974).

Gunn and Livingston (1974) found that waterfowl and seabirds in the Mackenzie Valley and North Slope of Alaska and Canada became acclimated to float plane disturbance over the course of three days. Additionally, it was observed that potential predators (bald eagle) caused a number of birds to leave their nests. Non-breeding birds were observed to be more reactive than breeding birds. Waterfowl were affected by helicopter flights, while snow geese were disturbed by Cessna 185 flights. The geese flushed when the planes were under 1,000 feet, compared to higher flight elevations. An overall reduction in flock sizes was observed. It was recommended that aircraft flights be reduced in the vicinity of premigratory staging areas.

Manci, et al. 1988 reported that waterfowl were particularly disturbed by aircraft noise. The most sensitive appeared to be snow geese. Canada geese and snow geese were thought to be more sensitive than other animals such as turkey vultures, coyotes, and raptors (Edwards, et al. 1979).

WADING AND SHORE BIRDS

Black, et al. (1984), studied the effects of low-altitude (less than 500 feet AGL) military training flights with sound levels from 55 to 100 dBA on wading bird colonies (i.e., great egret, snowy egret, tricolored heron, and little blue heron). The training flights involved three or four aircraft, which occurred once or twice per day. This study concluded that the reproductive activity--including nest success, nestling survival, and nestling chronology--was independent of F-16 overflights. Dependent variables were more strongly related to ecological factors, including location and physical characteristics of the colony and climatology. Another study on the effects of circling fixed-wing aircraft and helicopter overflights on wading bird colonies found that at altitudes of 195 to 390 feet, there was no reaction in nearly 75 percent of the 220 observations. Ninety percent displayed no reaction or merely looked toward the direction of the noise source. Another 6 percent stood up, 3 percent walked from the nest, and 2 percent flushed (but were without active nests) and returned within 5 minutes (Kushlan 1978). Apparently, non-nesting wading birds had a slightly higher incidence of reacting to overflights than nesting birds. Seagulls observed roosting near a colony of wading birds in another study remained at their roosts when subsonic aircraft flew overhead (Burger 1981). Colony distribution appeared to be most directly correlated to available wetland community types and was found to be distributed randomly with respect to military training routes. These results suggest that wading bird species presence was most closely linked to habitat availability and that they were not affected by low-level military overflights (U.S. Air Force 2000).

Burger (1986) studied the response of migrating shorebirds to human disturbance and found that shorebirds did not fly in response to aircraft overflights, but did flush in response to more localized intrusions (i.e., humans and dogs on the beach). Burger (1981) studied the effects of noise from JFK Airport in New York on herring gulls that nested less than 1 kilometer from the airport. Noise levels over the nesting colony were 85 to 100 dBA on approach and 94 to 105 dBA on takeoff. Generally, there did not appear to be any prominent adverse effects of subsonic aircraft on nesting, although some birds flushed when the concorde flew overhead and, when they returned, engaged in aggressive behavior. Groups of gulls tended to loaf in the area of the nesting colony, and these birds remained at the roost when the Concorde flew overhead. Up to 208 of the loafing gulls flew when supersonic aircraft flew overhead. These birds would circle around and immediately land in the loafing flock (U.S. Air Force 2000).

In 1970, sonic booms were potentially linked to a mass hatch failure of Sooty Terns on the Dry Tortugas (Austin, et al. 1970). The cause of the failure was not certain, but it was conjectured that sonic booms from military aircraft or an overgrowth of vegetation were factors. In the previous season, Sooties were observed to react to sonic booms by rising in a “panic flight,” circling over the island, then usually settling down on their eggs again. Hatching that year was normal. Following the 1969 hatch failure, excess vegetation was cleared and measures were taken to reduce supersonic activity. The 1970 hatch appeared to proceed normally. A colony of Noddies on the same island hatched successfully in 1969, the year of the Sooty hatch failure.

Subsequent laboratory tests of exposure of eggs to sonic booms and other impulsive noises (Bowles, et al. 1991a; Bowles, et al. 1994; Cottereau 1972; Cogger and Zegarra 1980) failed to show adverse effects on hatching of eggs. A structural analysis (Ting, et al. 2002) showed that, even under extraordinary circumstances, sonic booms would not damage an avian egg.

Burger (1981) observed no effects of subsonic aircraft on herring gulls in the vicinity of JFK International Airport. The Concorde aircraft did cause more nesting gulls to leave their nests (especially in areas of higher density of nests), causing the breakage of eggs and the scavenging of eggs by intruder prey. Clutch sizes were observed to be smaller in areas of higher-density nesting (presumably due to the greater tendency for panic flight) than in areas where there were fewer nests.

H.4.3.8.3 Fish, Reptiles, and Amphibians

The effects of overflight noise on fish, reptiles, and amphibians have been poorly studied, but conclusions regarding their expected responses have involved speculation based upon known physiologies and behavioral traits of these taxa (Gladwin, et al. 1988). Although fish do startle in response to low-flying aircraft noise, and probably to the shadows of aircraft, they have been found to habituate to the sound and overflights. Reptiles and amphibians that respond to low frequencies and those that respond to ground vibration, such as spadefoots (genus Scaphiopus), may be affected by noise. Limited information is available on the effects of short-duration noise events on reptiles. Dufour (1980) and Manci, et al. (1988), summarized a few studies of reptile responses to noise. Some reptile species tested under laboratory conditions experienced at least temporary threshold shifts or hearing loss after exposure to 95 dB for several minutes. Crocodilians in general have the most highly developed hearing of all reptiles. Crocodile ears have lids that can be closed when the animal goes under water. These lids can reduce the noise intensity by 10 to 12 dB (Wever and Vernon 1957). On Homestead Air Reserve Station, Florida, two crocodilians (the American Alligator and the Spectacled Caiman) reside in wetlands and canals along the base runway suggesting that they can coexist with existing noise levels of an active runway including DNLs of 85 dB.

H.4.3.8.4 Summary

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied. Therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

H.4.3.9 Property Values

Property within a noise zone (or Accident Potential Zone) may be affected by the availability of federally guaranteed loans. According to U.S. Department of Housing and Urban Development (HUD), Federal Housing Administration (FHA), and Veterans Administration (VA) guidance, sites are acceptable for program assistance, subsidy, or insurance for housing in noise zones of less than 65 dB DNL, and sites are conditionally acceptable with special approvals and noise attenuation in the 65 to 75 dB DNL noise zone and the greater than 75 dB DNL noise zone. HUD’s position is that noise is not the only determining factor for site acceptability, and properties should not be rejected only because of airport influences if there is evidence of acceptability within the market and if use of the dwelling is expected to continue. Similar to the Navy’s and Air Force’s Air Installation Compatible Use Zone Program, HUD, FHA, and VA recommend sound attenuation for housing in the higher noise zones and written disclosures to all prospective buyers or lessees of property within a noise zone (or Accident Potential Zone).

Newman and Beattie (1985) reviewed the literature to assess the effect of aircraft noise on property values. One paper by Nelson (1978), reviewed by Newman and Beattie, suggested a 1.8 to 2.3 percent decrease in property value per decibel at three separate airports, while at another period of time, they found only a 0.8 percent devaluation per decibel change in DNL. However, Nelson also noted a decline in noise depreciation over time which he theorized could be due to either noise sensitive people being replaced by less sensitive people or the increase in commerical value of the property near airports; both ideas were supported by Crowley (1978). Ultimately, Newman and Beattie summarized that while an effect of noise was observed, noise is only one of the many factors that is part of a decision to move close to, or away from, an airport, but which is sometimes considered an advantage due to increased opportunities for employment or ready access to the airport itself. With all the issues associated with determining property values, their reviews found that decreases in property values usually range from 0.5 to 2 percent per decibel increase of cumulative noise exposure.

More recently Fidell, et al. (1996) studied the influences of aircraft noise on actual sale prices of residential properties in the vicinity of two military facilities and found that equations developed for one area to predict residential sale prices in areas unaffected by aircraft noise worked equally well when applied to predicting sale prices of homes in areas with aircraft noise in excess of 65 dB DNL. Thus, the model worked equally well in predicting sale prices in areas with and without aircraft noise exposure. This indicates that aircraft noise had no meaningful effect on residential property values. In some cases, the average sale prices of noise exposed properties were somewhat higher than those elsewhere in the same area. In the vicinity of Davis-Monthan AFB in Tucson, AZ, Fidell found the homes near the AFB were much older, smaller and in poorer condition than homes elsewhere. These factors caused the equations developed for predicting sale prices in areas further away from the base to be inapplicable with those nearer the AFB. However, again Fidell found that, similar to other researchers, differences in sale prices between homes with and without aircraft noise were frequently due to factors other than noise itself.

H.4.3.10Noise Effects on Structures

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally used to determine the possibility of damage. In general, with peak sound levels above 130 dB, there is the possibility of the excitation of structural component resonances. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (Committee on Hearing, Bioacoustics, and Biomechanics 1977).

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or rattling of objects within the dwelling such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise. In general, such noise-induced vibrations occur at peak sound levels of 110 dB or greater. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

H.4.3.11Noise Effects on Terrain

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects would result from routine, subsonic aircraft operations.

H.4.3.12Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Particularly in older structures, seemingly insignificant surface cracks initiated by vibrations from aircraft noise may lead to greater damage from natural forces (Hanson, et al. 1991). There are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the Concorde airplane at Dulles (Wesler 1977). There was special concern for the building’s windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning.

As noted above for the noise effects of noise-induced vibrations of conventional structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

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APPENDIX I
BIOLOGICAL RESOURCES APPENDIX

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I.1 METHODOLOGY FOR DESCRIPTION AND QUANTIFICATION OF EXISTING AND PROJECTED FUTURE DISTURBANCE TO BIOLOGICAL RESOURCES

This section describes the methodology and assumptions used to prepare the Geographic Information System (GIS)-based analysis of disturbance to vegetation and occupied desert tortoise habitat, and estimated take of desert tortoises.

Quantitative information regarding the existing level of disturbance on the Marine Corps Air Ground Combat Center at Twentynine Palms, CA (Combat Center) was not available, so qualitative analysis was used when possible. General information regarding disturbance of the Combat Center from military training is included below, based on information in Section 1 of the EIS. Information regarding existing disturbance to the west and south study areas was available from analysis performed by Karl (2010b), based on interpretation of photos, aerial photos, and notes of tracks and trails observed in the study areas during desert tortoise surveys in 2008 and 2009.

I.1.1 Existing Level of Disturbance on the Combat Center (adapted from the EIS Description of the Proposed Action and Alternatives) (MAGTF Training Command 2009)

Disturbance from Vehicle Maneuvers

Vehicles use the Combat Center's training areas, fixed ranges, and road network daily and are a crucial element in operational activities. Normally, the main supply routes (MSRs) and secondary roads are used to transport Marines and supplies to fixed ranges and other training sites. However, off-road use of vehicles is an integral part of the real-life battle scenarios that take place during major exercises, when large numbers of vehicles travel off-road for varying durations. Vehicles involved in training operations are categorized as follows:

- Tracked Vehicles – vehicles with non-rubber wheels or tracks (e.g., tanks, Amphibious Assault Vehicles);
- Heavy Wheeled Vehicles – vehicles with multiple axles and/or more than four rubber tires (e.g., Light Armored Vehicles, five- and seven-ton trucks, personnel carriers); and
- Light Wheeled Vehicles – vehicles with four rubber tires (e.g., utility vehicles, high-mobility multi-purpose wheeled vehicles [also known as "Humvees"], and smaller trucks).

Tracked vehicles function as weapons systems, armored personnel carriers, engineering devices, and recovery systems. The Abrams M1A1 Main Battle Tank and the Amphibious Assault Vehicle are the main components of mechanized operations. In a combat environment, the capabilities of tracked vehicles are influenced by terrain-related factors such as surface, subsurface, and slope. Tracked vehicles utilize terrain to the maximum advantage and have the capability of traveling over virtually any flat or gently sloping land (a 22% grade is normally used as a planning factor to evaluate tracked vehicle movement). When moving into position, vehicles use terrain for cover and concealment; vehicles also spread out over washes, hills, rocky outcrops, and sloping terrain to cover and mask their movements. Depending upon the tactical training requirements and terrain, tracked vehicles may or may not utilize roads. During the 250 days per year on which major training exercises are conducted, tracked vehicles travel an estimated aggregate average of 220 miles (354 km) per day or approximately 55,000 miles (88,514 km) per year.

Wheeled vehicles (both heavy and light) primarily function as weapons systems, reconnaissance vehicles, Marine transports, and combat service support vehicles. Many of the same tactics and limitations that apply to tracked vehicles also apply to wheeled vehicles. Excessive slopes and rough terrain can severely impair mobility or stop travel altogether, and the vehicles typically spread out during travel to present smaller targets. During major exercises, all heavy-wheeled vehicles collectively travel an estimated average of 3,280 miles (5,279 km) per day or 820,000 miles (1,319,662 km) per year. Light-wheeled vehicle use under the same conditions involves an estimated aggregate average of 4,500 miles (7,242 km) per day or 1,125,000 miles (1,810,512 km) per year.

When in a stationary position for an extended period of time, such as in defense or in preparation for an ambush, vehicles must be dug in. Digging in is the act of constructing a fighting position below the surface of the ground to provide the vehicle and crew with protection against direct and indirect enemy fire and to conceal their position from enemy forces. This critical skill typically utilizes engineering equipment or other large machinery. Digging in is normally done during defensive operations and takes place in only a few locations at the Combat Center. Obstacles are also built to channelize, slow down, or stop enemy forces. There are various types of natural and mechanical obstacles that can be constructed, but the most common is a tank ditch. In addition, anti-tank training relies on berm and trench systems called "tank traps." Three such traps have been constructed in strategic locations at the Combat Center.

Disturbance from Infantry Operations

Infantry or "dismounted" operations are essential elements of training at the Combat Center. Dismounted attacks are necessary and must be practiced to ensure that Marine units are capable of achieving mission objectives. These operations occur in all training areas, including those that are geographically restrictive to vehicles. Annually, infantry maneuvers at the Combat Center involve approximately 1,500 Marines per day. Such maneuvers are often extensive in the distance and area covered on foot, with an average of 3 miles (5 km) traveled per Marine per day (DoN 2003; MAGTF Training Command 2009).

Ground training exercises and activities can last for extended periods of time and require bivouacking in which Marines camp on the range and conduct various operations. Staged operations can include excavation of soils for trenches and fighting positions (to provide individuals with protection against enemy fire or for sanitation reasons). Digging activities associated with staged operations create ground disturbances below the normal soil horizon of 12 inches (30 centimeters). On average, an estimated 12% of the ground element forces will dig a fighting hole on any given day. Finally, infantry maneuvers also require the use of restrictive materials (e.g., razor wire) with associated berms and trenches to facilitate realistic battle scenarios.

Disturbance from Aircraft-Delivered Ordnance

The delivery of air-to-ground ordnance is one of the characteristic training activities conducted at the Combat Center. The majority of air-to-ground ordnance delivery occurs on approximately 80,000 acres (32,375 hectares) (13.4% of total area) encompassing many different training areas. These include almost all of Quackenbush, the southern half of Gays Pass, Lavic Lake, the northern portions of Rainbow Canyon and Noble Pass, most of Lead Mountain, the central portion of Black Top, and the Delta Training Area corridor. Fixed Range 601 and Fixed Range 605 are used exclusively for aircraft-delivered ordnance, and several areas of these fixed ranges have experienced substantial degradation (USFWS 1999).

Disturbance from Heavy Artillery

Artillery use occurs on approximately 110,000 acres (44,515 hectares) (18%) of the installation, but is concentrated on approximately 45,000 acres (18,211 hectares) (7.5%). Most artillery firing is directed at fixed targets and areas that are already heavily disturbed. Most of the explosive ordnance fired leaves craters about 2 feet (0.6 meter) wide and 6 inches (15 centimeters) deep (Marine Corps 1999). Very little artillery use occurs in the mountainous areas of the Combat Center. Currently, an estimated 58,000 units of artillery ordnance are fired annually within the Combat Center, including mortar shells, missiles, and heavy artillery munitions.

Disturbance from Tank and Other Armor Ordnance

Tank operations are conducted over approximately 200,000 acres (80,937 hectares) (33%) of the Combat Center, but most of the ordnance delivered from tanks and associated maneuvers are concentrated in 132,000 acres (53,419 hectares) (22%). The majority of tank operations take place in areas that are already moderately to highly disturbed (USFWS 1999). Tank firing occurs in all or parts of the following training areas: Black Top, Lavic Lake, Emerson Lake, Quackenbush, Gays Pass, Delta Corridor, Bullion, Lead Mountain, Maumee Mine, and Cleghorn Pass. Unit-level tank, Amphibious Assault Vehicle, and Light Armored Vehicle training and annual gunnery qualifications occur at Range 500 in the Cleghorn Pass Training Area.

I.1.2 Existing Level of Disturbance in the West and South Study Areas

A report describing existing disturbance along survey transects in west and south study areas (Karl 2010) categorized the lands within the study areas as follows:

High Disturbance: Typically includes areas containing race routes used for large events (e.g., King of the Hammers), designated off-highway vehicle (OHV) routes, and areas used for camping. A visual representation of a highly disturbed area in the west study area is presented in Figure 1. Note that a highly disturbed area could have even fewer plants and more soil disturbance than shown in this photo; this is intended to represent the minimum amount of disturbance considered "High Disturbance."

Medium Disturbance: Typically includes areas where OHV activity occurs regularly, but with lower diversity of routes (three to five established trails) and lower overall traffic levels. A visual representation of a moderately disturbed area is presented in Figure 2.

Low Disturbance: Typically includes areas used infrequently for OHV recreation, with little to no off-trail riding or camping. These areas also would include steep slopes, rocky mountainous areas not used for "rock crawling." A visual representation of a low-disturbance area is presented in Figure 3.

Figure 1. This photo represents the level of disturbance in the west study area determined to be "High Disturbance." More than five established trails or all high-use areas (race routes, staging areas, RV camping areas, hill-climbs, obvious vegetation loss obvious from aerials and photographs) or high track volume or heavy use of specific washes (as described by surveyor) (Karl 2010b). Several hundred tire tracks would be present within a square kilometer, soils are damaged, and the distance between plants is high.

Figure 2. This photo repr esents the level of disturbance in the west stu dy area determined to be "Medium Disturbance." Three to five establishe d trails. Single tracks were observed throughout, although there were no he avily tracked areas (Karl 2010b). S oils show less damage as compared to "high disturbance" areas, and the spacing between plants is reduced.

Figure 3. This photo represents the level of disturbance in the west study area determined to be "Low Disturbance." Zero to two established trails with occasional single tracks or tracks in washes, and described as low impact by surveyor (Karl 2010b). Soils are intact off-trail, and the spacing between plants is not substantially different from a non-impacted area.

I.1.3 Projected Disturbance under the Proposed Action (Common to all GIS-Based Analyses)

For the task force routes as identified in Section 2.4 of the EIS, disturbance "footprints" were developed to represent the areas in which companies and platoons would spread out as they move across the Combat Center and study areas. These footprints were developed in consultation with the Combat Center and take into account physical constraints of the terrain (e.g., rocky areas, playas, lava flows) and operational constraints (e.g., no maneuver areas, Special Use Areas). In some areas the footprint is limited to the width of the MSR, but for the areas that were identified by the Combat Center as especially appropriate for the platoons and companies to spread out (e.g., Black Top Training Area), the frontage for each battalion can reach as much as 2 km in width. The footprint for each alternative is included on Figures 4.10-1 through 4.10-6.

Disturbance was only identified and mapped for "High Intensity" and "Medium Intensity" levels of anticipated disturbance described below, as "Low Intensity" disturbance would not result in a substantial impact to biological resources:

High Intensity: Areas where projected activities would be expected to result in high levels of disturbance, meaning a complete or near-complete loss of vegetation and soil surface disruption. GIS layers were developed to identify the geographic area covered by the following disturbances:

1. An area-specific radius around MSRs, to account for disturbance from high levels of Marine vehicle and foot traffic. For the Combat Center, MSRs were assumed to already be highly disturbed and were not included in calculations. However, in the study areas, all MSRs were assumed to be new disturbance and were assumed to be an average of 32 feet wide, consistent with the current average width of MSRs on the Combat Center. For all areas, a radius of 100 meters from the edge of the MSR was assumed to be subject to high disturbance, regardless of the width of the disturbance "footprint" as described above. MSRs are assumed to be constructed along the path of MAGTF travel under each MEB Final Exercise; no other locations for MSRs have been identified. No locations for minor dirt roads have been identified for the project or alternatives, so disturbance associated with these roads was not specifically included in GIS modeling.
2. A radius of 250 meters around centers of aviation target arrays, to account for disturbance resulting from aviation ordnance explosion.
3. A 2.5-kilometer radius surrounding the MEB objective, to account for ordnance explosion and high levels of Marine vehicle traffic.
4. A 100-meter radius surrounding company objectives, to account for high levels of Marine vehicle traffic and foot traffic and bivouacking,
5. A 1-kilometer radius surrounding MAGTF assembly areas to account for high levels of Marine vehicle traffic, foot traffic..
6. A 100-meter radius surrounding helicopter landing zones to account for downwash from rotors and physical disturbance from the landing of the helicopters.

Medium Intensity: These are areas where disturbance, while less than in high intensity areas, would still be obvious to an untrained observer. Distance between plants would be noticeably reduced as compared to undisturbed areas (1-2 meters between individual plants in many places), remaining plants would have smaller canopies, and soil surface disruption would be present but not extensive. The following areas were assumed to be subject to medium intensity disturbance under the proposed action:

1. The remaining radius from 100 meters from the edge of the MSR out to the boundary of the disturbance footprints. As stated above, the maximum width of the disturbance footprint was assumed to be 2 km.
2. A radius from 250 meters to 500 meters around centers of aviation target arrays to account for lower levels of impact from aviation ordnance explosion.
3. A radius from 2.5 kilometers to 5 kilometers away from the center of the MEB objective to account for lower levels of Marine vehicle and foot traffic.
4. A radius from 1 kilometer to 2 kilometers from the center of MAGTF assembly areas to account for lower levels of Marine vehicle and foot traffic.

I.1.4 Projected Disturbance to Vegetation

The sources of disturbance from military training described above were overlaid on the vegetation map GIS layers for the Combat Center (Agri-chemical and Supply 2008) and study areas (CDF 2003, USGS 2004). Based on these overlays, the acreage of each vegetation type within high- and medium-intensity disturbance areas was quantified within the GIS system. These acreages were summed together for each vegetation type (vegetation types based on California Native Plant Society [2009] classifications). Where medium and high-intensity disturbance areas overlapped, the medium-intensity disturbance was ignored to avoid double counting.

Notes regarding these calculations:

- As for all of the GIS-based calculations, the routes of travel and areas of ordnance explosion are intended to be illustrative of future exercise design, but may not match them exactly. Therefore, actual future impacts to vegetation may differ substantially from those described. However, the use of impact "footprints" (refer to Section 1.3 above) in GIS-based calculations provides for a conservative estimate of impacts, as the areas in which military training is likely to occur have been accounted for.
- The calculated and mapped disturbance to vegetation would occur over the 50-year lifetime of the project. Disturbance would be greatest during the first few years of expanded military training, and would be expected to fairly quickly reach a level of disturbance that would not substantially be affected by new exercises. The area of vegetation disturbed annually would be substantially lower than indicated in GIS-based calculations.
- The CDF (2003) mapping that covers approximately 40% of the west study area is low resolution, so there are likely to be several vegetation communities located within that mapping area that are not captured in that mapping effort.

I.1.5 Projected Disturbance to Occupied Desert Tortoise Habitat

The sources of disturbance from military activities described above were overlaid on the desert tortoise density GIS layers provided by Woodman *et al.* (2001) and Karl (2010a). The acreage of medium and high-intensity disturbance were then calculated separately for each specified tortoise density category, in an effort to capture the area of effect to occupied desert tortoise habitat from project activities. Where medium and high-intensity disturbance areas overlapped, the medium-intensity disturbance was ignored to avoid double counting.

Because different density categories were used for the Combat Center desert tortoise density analysis (MAGTF Training Command 2001) and the study area desert tortoise density analysis (Karl 2010a), the categories for which disturbance was calculated included the following: Study areas – 1-3 adults per km^2, 4-6 adults per km^2, 7-9 adults per km^2, 10-12 adults per km^2, 13-15 adults per km^2; Combat Center – 0-20 adults per mi^2, 21-50 adults per mi^2, and 51-100 adults per mi^2.

Notes regarding these calculations:

- As for all of the GIS-based calculations, the routes of travel and areas of ordnance explosion are intended to be illustrative of future exercise design, but may not match them exactly. Therefore, actual future impacts to desert tortoise habitat may differ substantially from those described. However, the use of impact "footprints" (refer to Section 1.3 above) in GIS-based calculations provides for a conservative estimate of impacts, as the areas in which military training is likely to occur have been accounted for.
- The desert tortoise density GIS information for the Combat Center (Woodman *et al.* 2001) did not include a true "zero" density class. To more accurately represent the density of tortoises on the

Combat Center, the following areas were assigned a "zero" density for the purposes of assessing impacts:

  - Playas.
  - Elevations above 4,495 feet (1,370 meters).
  - Slopes steeper than 30%.

- Existing disturbance to occupied desert tortoise habitat has not been subtracted from the calculations of new disturbance; however, it is assumed that substantial existing disturbance to tortoise habitat is reflected in the tortoise densities observed. Therefore, these calculations do account for existing disturbance.
- The disturbance to desert tortoise habitat calculated via this effort represents that which would occur over the 50-year lifetime of the project. Disturbance would be greatest during the first few years of expanded military training, and would be expected to fairly quickly reach a level of disturbance that would not substantially be affected by new exercises. Annual disturbance levels would be much lower than shown in figures and calculations.

I.1.6 Projected Take of Desert Tortoises

Bounds for Projected Take in High-Intensity Disturbance Areas

The area of high-intensity disturbance was calculated from GIS overlay on desert tortoise density layers. Areas were output as km^2 or mi^2 of high-intensity disturbance. Each area of disturbance was then multiplied times the lower bound of tortoise density in that area, then by the higher bound of tortoise density. This was repeated for each density class and then summed to provide the high and low bounds for the estimated total number of tortoises located within high-intensity disturbance areas. These sums were then multiplied times 50% (estimated take in high-intensity disturbance areas) to provide the estimated take in high-intensity disturbance areas.

Bounds for Projected Take in Medium-Intensity Disturbance Areas

The number of tortoises located within medium-intensity disturbance areas was calculated in the same manner as above, using the medium-intensity disturbance areas instead of the high-intensity disturbance areas. The upper and lower bounds of the total number of tortoises within medium-intensity disturbance areas were then multiplied times 10% (estimated take in medium-intensity disturbance areas) to provide the estimated take in medium-intensity disturbance areas.

Major assumptions and caveats regarding calculation of projected take of desert tortoises:

- Take in high-intensity disturbance areas would be 50%
- Take in medium-intensity disturbance areas would be 10%
- Take in low-intensity disturbance areas would be zero and is not calculated.
- The desert tortoise density GIS information for the Combat Center (Woodman et al. 2001) did not include a true "zero" density class. To more accurately represent the density of tortoises on the Combat Center, the following areas were assigned a "zero" density for the purposes of assessing impacts:

  - Playas.
  - Elevations above 4,495 feet (1,370 meters).
  - Slopes steeper than 30%.

- Densities of tortoises are assumed to remain constant throughout the project lifetime. Calculations do not account for movement of tortoises from outside of disturbed areas into disturbed areas.
- Take is calculated over the 50-year project lifetime and does not represent a rate of take, simply a total take over that time.
- Only take of adult tortoises is calculated.
- Take from recreational OHV use and other public access in the west study area is not included in calculations as no existing estimates of take exist. Depending on the alternative, take from recreational use in the west study area would be zero (Alternative 1) due to closure to public access, the same (Alternative 3), or less than currently occurs due to partial closure or access restrictions (Alternatives 2, 4, 5, and 6) .
- As for all of the GIS-based calculations, the routes of travel and areas of ordnance explosion are intended to be illustrative of future exercise design, but may not match them exactly. Therefore, actual future take of desert tortoise may differ substantially from that described. However, the use of impact "footprints" (refer to Section 1.3 above) in GIS-based calculations provides for a conservative estimate of impacts, as the areas in which military training is likely to occur have been accounted for. Because the routes and target locations chosen for the representative exercise largely avoid those areas with higher desert tortoise density, deviation from the representative exercise may result in increased take compared to the values calculated in this EIS.

I.2 LIST OF SPECIES REFERENCED IN THE EIS

Common Name	Scientific Name
Reptiles	
Desert iguana	*Dipsosaurus dorsalis dorsalis*
Chuckwalla	*Sauromalus ater*
Banded gecko	*Coleonx variegatus variegatus*
Zebra-tailed lizard	*Callisaurus draconoides*
Mojave fringe-toed lizard	*Uma scoparia*
Great Basin collared lizard	*Crotaphytus bicinctores*
Long-nosed leopard lizard	*Gambelia wislizenii*
Yellow-backed spiny lizard	*Sceloporus magister uniformis*
Desert side-blotched lizard	*Uta stansburiana stejnegeri*
Western long-tailed brush lizard	*Urosaurus graciosus graciosus*
Desert horned lizard	*Phrynosoma platyrhinos calidiarum*
Desert night lizard	*Xantusia vigilis vigilis*
Western whiptail	*Cnemidophorus tigris*
Rosy boa	*Charina trivirgata gracia*
Spotted leaf-nosed snake	*Phyllorhynchus decurtatus perkinsi*
Coachwhip	*Masticophis flagellum piceus*
Desert glossy snake	*Arizona elegans eburnata*
Pine snake	*Pituophis melanoleucus*
Western long-nosed snake	*Rhinocheilus lecontei lecontei*
Mojave shovel-nosed snake	*Chionactis occipitalis occipitalis*
Southwestern speckled rattlesnake	*Crotalus mitchelli pyrrhus*
Mojave desert sidewinder	*Crotalus cerastes cerastes*
Desert tortoise	*Gopherus agassizi*
Plants	
Creosote bush	*Larrea tridentata*
White bursage	*Ambrosia dumosa*
Brittlebush	*Encelia farinosa*
Sweetbush	*Bebbia juncea*
Cheesebush	*Hymenoclea salsola*
Spiny senna	*Senna armata*
Desert lavender	*Hyptis emoryi*
Big galleta	*Pleuraphis rigida*
Indian ricegrass	*Achnatherum hymenoides*
Bush encelia	*Encelia frutescens*
All-scale	*Atriplex polycarpa*
Bush seepweed	*Sueda moquinii*
Fourwing saltbush	*Atriplex canescens*
Desert holly	*Atriplex hymenelytra*
Smoke tree	*Psorothamnus spinosus*
Honey mesquite	*Prosopis glandulosa* var. *torreyana*
Desert willow	*Chilopsis linearis*
Catclaw acacia	*Acacia gregii*
Black brush	*Coleogyne ramosissima*
Storksbill	*Erodium cicutarium*
California buckwheat	*Eriogonum fasciculatum*
Shadscale	*Atriplex confertifolia*
Mojave yucca	*Yucca schidigera*
Joshua tree	*Yucca brevifolia*
Parish's onion	*Allium parishii*

Common Name	Scientific Name
Crucifixion thorn	*Castela emoryi*
Red brome	*Bromus madritensis* ssp. *rubens*
Winged cryptantha	*Cryptantha holoptera*
Utah swallow-wort	*Cynanchum utahense*
Foxtail cactus	*Coryphantha alversonii*
N/A	*Eriastrum harwoodii*
Barrel cactus	*Ferocactus cylindraceus*
Slender bedstraw	*Galium angustifolium* ssp. *gracillimum*
Split grass	*Schismus barbatus, S. arabicus*
Crowned muilla	*Muilla coronata*
Whitemargin beardtongue	*Penstemon albomarginatus*
Spectacle fruit	*Wislizenia refracta* ssp. *refracta*
Cheat grass	*Bromus tectorum*
Biennial mustard	*Hirschfeldia incana*
Sahara mustard	*Brassica tournefortii*
Tumbleweed	*Salsola tragus*
Bristly fiddleneck	*Amsinckia tessellata*
Booth's evening primrose	*Camissonia boothii* spp. *Boothii*
Mojave spineflower	*Chorizanthe spinosa*
Riverside spineflower	*Chorizanthe xanti* var. *leucotheca*
Ribbed cryptantha	*Cryptantha costata*
Panamint liveforever	*Dudleya saxosa* ssp. *saxosa*
Mojave woolly sunflower	*Eriophyllum mohavense*
Coulter's goldfields	*Lasthenia glabrata* ssp. *Coulteri*
Spearleaf	*Matelea parvifolia*
Robison's monardella	*Monardella robisonii*
Thurber's penstemon	*Penstemon thurberi*
Chinese lantern	*Physalis lobata*
Silkcotton purslane	*Portulaca halimoides*
Redspined fishhook cactus	*Sclerocactus polyancistrus*
Salt spring checkerbloom	*Sidalcea neomexicana*
Desert twinbugs	*Dicoria canescens*
Desert sand verbena	*Abronia villosa*
Burrobush	*Ambrosia salsola*
Burgrass	*Cenchrus tribuloides*
Crabgrass	*Digitaria* sp.
Tumble mustard	*Sisymbrium altissimum*
Lambsquarter	*Chenopodium album*
Tansy mustard	*Descaurainia pinnata*
Plantain	*Plantago lanceolata*
Saltcedar	*Tamarix ramossisima*
Puncture vine	*Tribulus terrestris*
Invertebrates	
Versatile fairy shrimp	*Branchinecta lindahli*
Fishes	
Mosquito fish	*Gambusia affinis*
Amphibians	
Western toad	*Anaxyrus boreas halophilus*
Red-spotted toad	*Anaxyrus punctatus*
Birds	
Black-throated sparrow	*Amphispiza bilineata*
House finch	*Carpodacus mexicana*

Common Name	Scientific Name
Gambel's quail	*Callipepla gambellii*
Ground dove	*Columbina passerina*
Mourning dove	*Zenaida macroura*
White-crowned sparrow	*Zonotrichia leucophrys*
Fox sparrow	*Passerella iliaca*
Common raven	*Corvus corax*
Bald eagle	*Haliaeetus leucocephalus*
Eared grebe	*Podiceps nigricollis*
Greater white-fronted goose	*Anser albifrons*
Snow goose	*Chen caerulescens*
Ross' goose	*Chen rossii*
Canada goose	*Branta canadensis*
Mallard	*Anas platyrhynchos*
American wigeon	*Anas americana*
Northern shoveler	*Anas clypeata*
Ruddy duck	*Oxyura jamaicensis*
Redhead	*Aythya americana*
Sora	*Porzana carolina*
American coot	*Fulica americana*
American avocet	*Recurvirostra americana*
Black-necked stilt	*Himantopus mexicanus*
Killdeer	*Charadrius vociferus*
Solitary sandpiper	*Tringa solitaria*
Least sandpiper	*Calidris minutilla*
Golden eagle	*Aquila chrysaetos*
Northern harrier	*Circus cyaneus*
Sharp-shinned hawk	*Accipiter striatus*
Red-tailed hawk	*Buteo jamaicensis*
Cooper's hawk	*Accipiter cooperii*
American kestrel	*Falco sparverius*
Prairie falcon	*Falco mexicanus*
Gambel's quail	*Callipepla gambelii*
Rock dove	*Columba livia*
Mourning dove	*Zenaida macroura*
White-winged dove	*Zenaida asiatica*
Greater roadrunner	*Geococcyx californianus*
Barn owl	*Tyto alba*
Great horned owl	*Bubo virginianus*
Long-eared owl	*Asio otus*
Burrowing owl	*Athene cunicularia*
Common poorwill	*Phalaenoptilus nuttallii*
Lesser nighthawk	*Chordeiles acutipennis*
White-throated swift	*Aeronautes saxatalis*
Costa's hummingbird	*Calypte costae*
Anna's hummingbird	*Calypte anna*
Northern flicker	*Colaptes auratus*
Ladder-backed woodpecker	*Picoides scalaris*
Western kingbird	*Tyrannus verticalis*
Ash-throated flycatcher	*Myiarchus cinerascens*
Black phoebe	*Sayornis nigricans*
Say's phoebe	*Sayornis saya*
Horned lark	*Eremophila alpestris*

Common Name	Scientific Name
Cliff swallow	*Hirundo pyrrhonota*
Common raven	*Corvus corax*
Verdin	*Auriparus flaviceps*
Marsh wren	*Cistothorus palustris*
Canyon wren	*Catherpes mexicanus*
Rock wren	*Salpinctes obsoletus*
Cactus wren	*Campylorhynchus brunneicapillus*
Ruby-crowned kinglet	*Regulus calendula*
Black-tailed gnatcatcher	*Polioptila melanura*
Mountain bluebird	*Sialia currucoides*
American robin	*Turdus migratorius*
Loggerhead shrike	*Lanius ludovicianus*
Northern mockingbird	*Mimus polyglottos*
LeConte's thrasher	*Toxostoma lecontei*
California thrasher	*Toxostoma redivivum*
American pipit	*Anthus rubescens*
Phainopepla	*Phainopepla nitens*
European starling	*Sturnus vulgaris*
Yellow-rumped warbler	*Dendroica coronata*
Common yellowthroat	*Geothlypis trichas*
Spotted towhee	*Pipilo maculatus*
Savannah sparrow	*Passerculus sandwichensis*
Black-throated sparrow	*Amphispiza bilineata*
Sage sparrow	*Amphispiza belli*
Brewer's sparrow	*Spizella breweri*
Dark-eyed junco	*Junco hyemalis*
White-crowned sparrow	*Zonotrichia leucophrys*
Lincoln's sparrow	*Melospiza lincolnii*
Western meadowlark	*Sturnella neglecta*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Red-winged blackbird	*Agelaius phoeniceus*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Great-tailed grackle	*Quiscalus mexicanus*
Scott's oriole	*Icterus parisorum*
Bullock's oriole	*Icterus bullocki*
Hooded oriole	*Icterus cucullatus*
House sparrow	*Passer domesticus*
Lesser goldfinch	*Carduelis psaltria*
Red crossbill	*Loxia curvirostra*
House finch	*Carpodacus mexicanus*
Western snowy plover	*Charadrius alexandrinus nivosus*
Least Bell's vireo	*Vireo bellii pusillus*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Gilded flicker	*Colaptes chrysoides*
Bank swallow	*Riparia riparia*
Peregrine falcon	*Falco peregrinus anatum*
Ferruginous hawk	*Buteo regalis*
Yellow warbler	*Dendroica petechia brewsteri*
Black tern	*Chlidonias niger*
Double-crested cormorant	*Phalacrocorax auritus*
White-faced ibis	*Plegadis chihi*

Common Name	Scientific Name
Osprey	*Pandion haliaetus*
Merlin	*Falco columbarius*
Short-eared owl	*Asio flammeus*
Vaux's swift	*Chaetura vauxi*
Brown-crested flycatcher	*Myiarchus tyrannulus*
Mammals	
Black-tailed jackrabbit	*Lepus californicus*
Desert cottontail	*Sylvilagus audubonii*
White-tailed antelope ground squirrel	*Ammospermophilus leucurus*
Round-tailed ground squirrel	*Spermophilus tereticaudus*
Merriam's kangaroo rat	*Dipodomys merriami*
Panamint kangaroo rat	*Dipodomys panamintinus*
Desert kangaroo rat	*Dipodomys deserti*
Deer mouse	*Peromyscus maniculatus*
Long-tailed pocket mouse	*Chaetodipus formosus*
Desert pocket mouse	*Chaetodipus penicillatus*
Little pocket mouse	*Perognathus longimembris*
Southern grasshopper mouse	*Onchomys torridus*
California ground squirrel	*Spermophilus beecheyi*
Botta's pocket gopher	*Thomomys bottae*
Pallid San Diego pocket mouse	*Chaetodipus fallax pallidus*
Canyon mouse	*Peromyscus crinitus*
Cactus mouse	*Peromyscus eremicus*
Desert woodrat	*Neotoma lepida*
Feral dog	*Canis lupus familiaris*
Common gray fox	*Urocyon cinereoargenteus*
Common raccoon	*Procyon lotor*
Striped skunk	*Mephitis mephitis*
Domestic cat	*Felis catus*
Coyote	*Canis latrans*
Kit fox	*Vulpes macrotis*
Bobcat	*Lynx rufus*
Badger	*Taxidea taxus*
Nelson's bighorn sheep	*Ovis canadensis nelsoni*
Mountain lion	*Felis concolor*
Townsend's big-eared bat	*Plecotus townsendii*
California leaf-nosed bat	*Macrotus californicus*
California myotis	*Myotis californicus*
Hoary bat	*Lasiurus cinereus*
Western pipistrelle	*Pipistrellus hesperus*
Big brown bat	*Eptesicus fuscus*
Pallid bat	*Antrozous pallidus*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Western mastiff bat	*Eumops perotis*

I.3 Draft Disturbance in the West and South Study Areas (Karl 2010)

DRAFT SUMMARY OF METHODS AND RESULTS

Determination of Disturbance Categories

A variety of anthropogenic activities in the WSA and SSA have likely influenced tortoise densities. These include off-highway-vehicle (OHV) recreation, other outdoor recreation such as shooting and camping, grazing, mining, transmission lines, and nearby residences. The factors resulting from these activities that are expected to be similar to those from military training activities include:

- Loss of habitat (i.e., loss or degradation of vegetation and soils)
- Crushing of tortoises, either in their burrows or aboveground
- Dust deposition
- Attraction of predators to the area
- Introduction and spread of exotic weed species

OHV activity, and to a far lesser extent, influences from transmission lines and residences are the recent and current source of these factors. The entire WSA is in the U.S. Bureau of Land Management's (BLM's) Johnson Valley Off-Highway-Vehicle Area (BLM 1992). While the Johnson Valley OHV area was only designated in 1980, Johnson Valley has been a popular OHV recreation area for over 60 years (BLM 1992). Organized race events that are run annually may include over 12,000 participants (motorcycles and/or four-wheel-drive [4WD] vehicles) and 40,000 spectators (BLM 1992). These cross-country races are concentrated along specific routes, resulting in a dense swath of tracks may be hundreds of meters wide. Other intensive-use areas include staging areas and camping areas that host small cities of motor homes (RV's) during the events. Beyond organized events, the WSA hosts intensive OHV use year-round and in all areas of the Johnson Valley OHV Area. Effects on the native habitat range from entire loss of vegetation and soils in concentrated use areas (staging areas, race routes, RV camp areas, hill-climbs), to well established trails (defined as a multi-pass, compacted path, one to a few meters wide, with no vegetation), to single tracks across the landscape and in washes. In addition to varying levels of focused surface disturbance, other factors associated with OHV recreation that may directly affect tortoises include crushing of tortoises and tortoise collecting. Indirect effects to tortoises in the vicinity of concentrated use areas include dust deposition on neighboring vegetation, which may affect photosynthesis and the growth of tortoise forage and cover, and predator attraction. In most areas where OHV activities are concentrated, surveyors noted the presence of trash. Food and trash are attractants for ravens and coyotes, which may subsequently prey on tortoises in the area after campers depart.

The SSA experiences little OHV use, most of which is confined to minor motorcycle activity in the far southern portion of the SSA, near the Valley Mountain, and in the southwest.

Transmission lines on the western side of the WSA provide recreational access to remote areas. However, there is not a direct association between the level of OHV or recreational use of a particular area and the presence of transmission lines. Thus, the degree of tortoise crushing and collecting that might be associated with a transmission line is difficult to assess. The only direct effect that is quantifiable is the loss of habitat for the twenty-foot-wide access road and tower pads. Indirect effects may result from increased raven predation on the local tortoise population. Transmission lines support the expansion of raven populations into many areas by providing roosts and nest sites and it has been demonstrated that ravens nesting in the towers prey on tortoises.

Scattered residences in the far southwestern corner and along the southeastern border of the WSA, and along the southern SSA border may affect tortoises because of increased localized recreational activity and depredation by domestic dogs.

Exotic weeds, especially Russian thistle (*Salsola tragus*) and Sahara mustard (*Brassica tournefortii*), are associated with disturbed areas. Their introduction and spread is facilitated by construction and agriculture and dense populations of these weeds are especially evident along roads, utility corridors, along agricultural edges or in abandoned cropland, and around towns and tracts cleared for housing or commerce. Heavy equipment that travels between infested sites is likely a major factor in the spread of these species, which is further exacerbated along roads, where seeds are transported long distances by vehicles.

A level of use, which incorporates surface disturbance and possible ancillary impacts to tortoises associated with the use level, was determined for each square kilometer in the study areas. This was accomplished using Google Earth© aerials, descriptions by surveyors, and multiple photographs taken for each square kilometer by the surveyors. Use levels in adjacent square kilometers were also taken into consideration, in the context of similarity of habitat. Three use categories were developed based on examination of the range of surface disturbance observed and the types of anthropogenic influences. The following criteria defined each category. (For purposes of clarification, a track is defined as a single pass by a vehicle, either motorcycle or 4WD. A trail is one to a few meters wide of compacted, unvegetated soils, created by multiple vehicle passes.)

- **High**– More than five established trails or all high-use areas (race routes, staging areas, RV camping areas, hill-climbs, obvious vegetation loss obvious from aerials and photographs) or high track volume or heavy use of specific washes (as described by surveyor)
- **Medium** – Three to five established trails. Single tracks were observed throughout although there were no heavily tracked areas.
- **Low** – None to two established trails with occasional single tracks or tracks in washes and described as low impact by surveyor

Categories were necessarily broad for several reasons. First, information about OHV impacts provided by the tortoise survey was qualitative and descriptions were not consistent or standardized among the surveyors. While anthropogenic features were described for every square kilometer in the study areas, they were not the focus of the tortoise survey and were only one of many factors that were described to characterize the habitat. Second, Google Earth aerials were not adequate to see tracks or very small trails, but was very useful in identifying major trails, race routes, and other intensive-use areas. Finally, categorization was subjective. While I strove to maintain consistency, data interpretation often involved a subjective element.

Summary of Results

Use levels were assessed for 879 square kilometers in the WSA and SSA. For purposes of associating tortoise density to use levels, those square kilometers with no tortoise habitat (n = 69) were removed prior to the analysis.

Average Tortoise Density by Use Level

High Use Areas: A total of 343 km^2 in the WSA and SSA were considered to have high use. Mean adult tortoise density was 3.7 (S.E. = 0.08).

Medium Use Areas: A total of 159 km^2 in the WSA and SSA were considered to have medium use. Mean adult tortoise density was 4.5(S.E. = 0.16).

Low Use Areas: A total of 306 km^2 in the WSA and SSA were considered to have low use. Mean adult tortoise density was 4.6 (S.E. = 0.12).

Conclusion: Because of the large sample size and low spread in tortoise density in the study areas (2.3 – 13.6 adult tortoises/ km^2) average density is not very meaningful.

Chi-Square Analysis

Tortoise Density Category	**Use Level**			**Total**
	High	**Medium**	**Low**	
Lowest **(1-2 tortoises/km2)**	94	28	49	171
Very Low **(3-4 tortoises/km2)**	157	57	122	336
Low **(5-7tortoises/km2)**	83	62	111	256
Moderate **(8-14 tortoises/km2)**	9	12	24	45
Total	343	159	306	808

Conclusion: Chi-square analysis identifies a significant difference in use levels among four tortoise density categories (Chi-square = 843.15, df = 12, P<0.001). In the lowest tortoise density category, there is a higher proportion of square kilometers with high use. In the highest tortoise density category (moderate), there is a higher proportion of square kilometers with low use and a low proportion with high use. This pattern is similar for the next highest tortoise density category (low), although not as clear.

Appendix 1. Adult tortoise density in the WSA and SSA, by square kilometer, and use (disturbance) levels.

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
WSA	22	15	2.9	1.8	4.0	High
	22	16	2.9	1.8	4.0	Medium
	22	17	2.9	1.8	4.0	Medium
	22	18	2.9	1.8	4.0	High
	22	19	2.9	1.8	4.0	High
	22	20	2.9	1.8	4.0	High
	22	21	2.9	1.8	4.0	High
	22	22	3.5	2.4	4.6	High
	22	23	3.5	2.4	4.6	High
	22	24	3.5	2.4	4.6	High
	22	25	4.2	3.1	5.3	High
	22	26	4.2	3.1	5.3	High
	22	27	4.2	3.1	5.3	High
	22	28	4.2	3.1	5.3	High
	22	29	4.2	3.1	5.3	High
	22	30	4.2	3.1	5.3	High
	23	15	2.9	1.8	4.0	High
	23	16	2.9	1.8	4.0	Medium
	23	17	2.9	1.8	4.0	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	23	18	2.9	1.8	4.0	High
	23	19	2.9	1.8	4.0	High
	23	20	2.9	1.8	4.0	High
	23	21	2.9	1.8	4.0	High
	23	22	2.9	1.8	4.0	High
	23	23	3.5	2.4	4.6	High
	23	24	3.8	2.7	4.9	High
	23	25	4.2	3.1	5.3	High
	23	26	4.2	3.1	5.3	High
	23	27	4.2	3.1	5.3	High
	23	28	4.2	3.1	5.3	High
	23	29	4.2	3.1	5.3	High
	23	30	4.2	3.1	5.3	High
	24	13	2.9	1.8	4.0	High
	24	14	3.0	1.9	4.1	High
	24	15	3.0	1.9	4.1	High
	24	16	3.0	1.9	4.1	High
	24	17	5.5	4.4	6.6	Medium
	24	18	5.5	4.4	6.6	Low
	24	19	5.5	4.4	6.6	Low
	24	20	2.3	1.2	3.4	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	24	21	2.3	1.2	3.4	High
	24	22	3.5	2.4	4.6	High
	24	23	4.2	3.1	5.3	High
	24	24	4.2	3.1	5.3	High
	24	25	2.9	1.8	4.0	Low
	24	26	4.2	3.1	5.3	Low
	24	27	2.9	1.8	4.0	Medium
	24	28	2.9	1.8	4.0	Medium
	24	29	2.9	1.8	4.0	High
	24	30	4.5	3.4	5.6	High
	24	31	4.5	3.4	5.6	High
	25	13	2.3	1.2	3.4	High
	25	14	2.3	1.2	3.4	High
	25	15	2.3	1.2	3.4	High
	25	16	2.9	1.8	4.0	High
	25	17	2.9	1.8	4.0	Low
	25	18	2.9	1.8	4.0	Low
	25	19	5.5	4.4	6.6	Low
	25	20	5.5	4.4	6.6	Low
	25	21	4.0	2.9	5.1	Medium
	25	22	6.0	4.9	7.1	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	25	23	4.5	3.4	5.6	High
	25	24	4.2	3.1	5.3	Low
	25	25	2.9	1.8	4.0	Low
	25	26	2.9	1.8	4.0	Low
	25	27	2.9	1.8	4.0	High
	25	28	2.9	1.8	4.0	High
	25	29	2.9	1.8	4.0	High
	25	30	2.9	1.8	4.0	High
	25	31	2.9	1.8	4.0	High
	26	12	2.3	1.2	3.4	High
	26	13	2.3	1.2	3.4	High
	26	14	0.0	0.0	0.0	High
	26	15	2.3	1.2	3.4	High
	26	16	2.3	1.2	3.4	High
	26	17	0.0	0.0	0.0	Low
	26	18	2.9	1.8	4.0	Low
	26	19	2.9	1.8	4.0	Low
	26	20	2.9	1.8	4.0	Low
	26	21	5.5	4.4	6.6	Low
	26	22	5.5	4.4	6.6	High
	26	23	5.5	4.4	6.6	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	26	24	2.9	1.8	4.0	Low
	26	25	0.0	0.0	0.0	Low
	26	26	0.0	0.0	0.0	Low
	26	27	2.9	1.8	4.0	High
	26	28	2.9	1.8	4.0	High
	26	29	2.9	1.8	4.0	High
	26	30	3.5	2.4	4.6	Medium
	26	31	2.3	1.2	3.4	Medium
	26	32	3.8	2.7	4.9	High
	26	33	5.4	4.3	6.5	High
	26	34	2.3	1.2	3.4	High
	27	12	2.3	1.2	3.4	High
	27	13	0.0	0.0	0.0	High
	27	14	0.0	0.0	0.0	High
	27	15	2.3	1.2	3.4	Low
	27	16	0.0	0.0	0.0	Low
	27	17	0.0	0.0	0.0	Low
	27	18	2.9	1.8	4.0	Medium
	27	19	2.9	1.8	4.0	Medium
	27	20	2.9	1.8	4.0	Medium
	27	21	5.5	4.4	6.6	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	27	22	5.5	4.4	6.6	High
	27	23	5.5	4.4	6.6	High
	27	24	2.3	1.2	3.4	Medium
	27	25	2.3	1.2	3.4	High
	27	26	2.9	1.8	4.0	High
	27	27	3.8	2.7	4.9	High
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	27	29	4.2	3.1	5.3	High
	27	30	3.5	2.4	4.6	Medium
	27	31	2.3	1.2	3.4	Medium
	27	32	2.3	1.2	3.4	High
	27	33	3.8	2.7	4.9	High
	27	34	3.8	2.7	4.9	High
	28	12	2.3	1.2	3.4	High
	28	13	0.0	0.0	0.0	High
	28	14	2.3	1.2	3.4	High
	28	15	2.3	1.2	3.4	High
	28	16	2.3	1.2	3.4	High
	28	17	2.9	1.8	4.0	High
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	28	19	2.9	1.8	4.0	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	28	20	2.9	1.8	4.0	Medium
	28	21	4.2	3.1	5.3	High
	28	22	2.9	1.8	4.0	High
	28	23	2.3	1.2	3.4	High
	28	24	2.3	1.2	3.4	Medium
	28	25	2.3	1.2	3.4	High
	28	26	2.9	1.8	4.0	High
	28	27	4.8	3.7	5.9	High
	28	28	4.8	3.7	5.9	High
	28	29	4.5	3.4	5.6	Medium
	28	30	4.2	3.1	5.3	High
	28	31	2.3	1.2	3.4	Medium
	28	32	2.3	1.2	3.4	Low
	28	33	2.3	1.2	3.4	Low
	28	34	2.3	1.2	3.4	Low
	29	12	2.3	1.2	3.4	High
	29	13	2.3	1.2	3.4	High
	29	14	2.3	1.2	3.4	High
	29	15	2.3	1.2	3.4	High
	29	16	2.3	1.2	3.4	High
	29	17	2.3	1.2	3.4	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	29	18	2.8	1.7	3.9	High
	29	19	2.3	1.2	3.4	High
	29	20	4.2	3.1	5.3	High
	29	21	3.8	2.7	4.9	High
	29	22	2.9	1.8	4.0	High
	29	23	2.9	1.8	4.0	High
	29	24	2.9	1.8	4.0	High
	29	25	2.9	1.8	4.0	Medium
	29	26	2.9	1.8	4.0	High
	29	27	4.8	3.7	5.9	High
	29	28	4.8	3.7	5.9	High
	29	29	2.9	1.8	4.0	Low
	29	30	2.9	1.8	4.0	Low
	29	31	2.9	1.8	4.0	Medium
	29	32	2.3	1.2	3.4	Low
	29	33	4.8	3.7	5.9	Low
	29	34	4.8	3.7	5.9	Low
	30	12	2.3	1.2	3.4	High
	30	13	2.3	1.2	3.4	High
	30	14	2.3	1.2	3.4	High
	30	15	2.3	1.2	3.4	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	30	16	2.9	1.8	4.0	High
	30	17	2.5	1.4	3.6	High
	30	18	2.9	1.8	4.0	High
	30	19	2.5	1.4	3.6	High
	30	20	2.3	1.2	3.4	High
	30	21	6.0	4.9	7.1	High
	30	22	4.5	3.4	5.6	High
	30	23	3.5	2.4	4.6	High
	30	24	3.5	2.4	4.6	Medium
	30	25	2.9	1.8	4.0	Medium
	30	26	4.2	3.1	5.3	Low
	30	27	2.9	1.8	4.0	High
	30	28	2.9	1.8	4.0	Low
	30	29	2.9	1.8	4.0	Low
	30	30	2.9	1.8	4.0	Low
	30	31	3.5	2.4	4.6	Medium
	30	32	3.5	2.4	4.6	Low
	30	33	4.8	3.7	5.9	Low
	30	34	4.8	3.7	5.9	Low
	31	13	2.3	1.2	3.4	High
	31	14	2.3	1.2	3.4	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	31	15	2.3	1.2	3.4	High
	31	16	2.9	1.8	4.0	High
	31	17	2.3	1.2	3.4	High
	31	18	2.9	1.8	4.0	High
	31	19	2.3	1.2	3.4	High
	31	20	3.5	2.4	4.6	High
	31	21	3.3	2.2	4.4	High
	31	22	2.9	1.8	4.0	High
	31	23	2.9	1.8	4.0	High
	31	24	2.9	1.8	4.0	High
	31	25	2.9	1.8	4.0	High
	31	26	2.9	1.8	4.0	Low
	31	27	5.4	4.3	6.5	Medium
	31	28	2.9	1.8	4.0	Low
	31	29	2.9	1.8	4.0	Low
	31	30	6.0	4.9	7.1	Low
	31	31	6.0	4.9	7.1	Medium
	31	32	6.0	4.9	7.1	Low
	31	33	4.8	3.7	5.9	Low
	31	34	2.3	1.2	3.4	Low
	32	13	2.3	1.2	3.4	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	32	14	2.3	1.2	3.4	High
	32	15	2.5	1.4	3.6	High
	32	16	2.9	1.8	4.0	High
	32	17	2.5	1.4	3.6	High
	32	18	2.3	1.2	3.4	High
	32	19	2.3	1.2	3.4	High
	32	20	2.3	1.2	3.4	High
	32	21	2.5	1.4	3.6	High
	32	22	2.5	1.4	3.6	High
	32	23	2.3	1.2	3.4	High
	32	24	2.3	1.2	3.4	High
	32	25	2.3	1.2	3.4	High
	32	26	2.3	1.2	3.4	High
	32	27	5.4	4.3	6.5	High
	32	28	7.3	6.2	8.4	Medium
	32	29	2.9	1.8	4.0	Low
	32	30	6.0	4.9	7.1	Low
	32	31	5.8	4.7	6.9	Medium
	32	32	6.0	4.9	7.1	Low
	32	33	2.3	1.2	3.4	Low
	32	34	0.0	0.0	0.0	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	33	13	2.3	1.2	3.4	High
	33	14	2.3	1.2	3.4	High
	33	15	2.5	1.4	3.6	High
	33	16	2.5	1.4	3.6	High
	33	17	2.3	1.2	3.4	High
	33	18	2.3	1.2	3.4	High
	33	19	2.3	1.2	3.4	High
	33	20	2.3	1.2	3.4	High
	33	21	2.3	1.2	3.4	High
	33	22	2.3	1.2	3.4	High
	33	23	2.3	1.2	3.4	High
	33	24	2.3	1.2	3.4	High
	33	25	2.3	1.2	3.4	High
	33	26	2.3	1.2	3.4	High
	33	27	4.8	3.7	5.9	High
	33	28	5.4	4.3	6.5	High
	33	29	7.9	6.8	9.0	Medium
	33	30	7.0	5.9	8.2	Low
	33	31	5.4	4.3	6.5	Low
	33	32	5.8	4.7	6.9	Low
	33	33	0.0	0.0	0.0	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	33	34	0.0	0.0	0.0	Low
	34	12	4.2	3.1	5.3	High
	34	13	4.2	3.1	5.3	High
	34	14	4.2	3.1	5.3	High
	34	15	4.2	3.1	5.3	High
	34	16	2.9	1.8	4.0	High
	34	17	2.3	1.2	3.4	High
	34	18	2.3	1.2	3.4	High
	34	19	2.3	1.2	3.4	High
	34	20	2.3	1.2	3.4	High
	34	21	2.3	1.2	3.4	High
	34	22	2.3	1.2	3.4	High
	34	23	2.3	1.2	3.4	High
	34	24	2.3	1.2	3.4	High
	34	25	2.3	1.2	3.4	High
	34	26	3.5	2.4	4.6	High
	34	27	4.3	3.2	5.4	High
	34	28	5.3	4.2	6.4	High
	34	29	6.0	4.9	7.1	High
	34	30	7.9	6.8	9.0	Medium
	34	31	6.8	5.7	7.9	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	34	32	5.5	4.4	6.6	Low
	34	33	0.0	0.0	0.0	Low
	34	34	0.0	0.0	0.0	Low
	35	11	6.0	4.9	7.1	High
	35	12	6.0	4.9	7.1	High
	35	13	6.0	4.9	7.1	High
	35	14	6.0	4.9	7.1	High
	35	15	2.9	1.8	4.0	High
	35	16	2.9	1.8	4.0	High
	35	17	2.3	1.2	3.4	High
	35	18	2.3	1.2	3.4	High
	35	19	3.3	2.2	4.4	High
	35	20	2.3	1.2	3.4	High
	35	21	2.5	1.4	3.6	High
	35	22	2.3	1.2	3.4	High
	35	23	3.5	2.4	4.6	High
	35	24	4.8	3.7	5.9	High
	35	25	6.7	5.6	7.8	High
	35	26	5.4	4.3	6.5	High
	35	27	2.9	1.8	4.0	High
	35	28	2.9	1.8	4.0	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	35	29	2.9	1.8	4.0	High
	35	30	4.5	3.4	5.6	Medium
	35	31	7.3	6.2	8.4	Low
	35	32	6.7	5.6	7.8	Low
	35	33	6.7	5.6	7.8	Low
	35	34	0.0	0.0	0.0	Low
	36	11	6.0	4.9	7.1	High
	36	12	6.0	4.9	7.1	High
	36	13	3.5	2.4	4.6	High
	36	14	2.3	1.2	3.4	High
	36	15	2.9	1.8	4.0	High
	36	16	2.9	1.8	4.0	High
	36	17	2.3	1.2	3.4	High
	36	18	3.3	2.2	4.4	High
	36	19	2.9	1.8	4.0	High
	36	20	2.9	1.8	4.0	High
	36	21	2.9	1.8	4.0	High
	36	22	4.8	3.7	5.9	High
	36	23	4.8	3.7	5.9	High
	36	24	6.8	5.7	7.9	High
	36	25	6.7	5.6	7.8	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	36	26	5.4	4.3	6.5	Medium
	36	27	5.4	4.3	6.5	Medium
	36	28	2.9	1.8	4.0	Medium
	36	29	4.8	3.7	5.9	High
	36	30	2.9	1.8	4.0	High
	36	31	4.5	3.4	5.6	Medium
	36	32	6.7	5.6	7.8	Medium
	36	33	6.0	4.9	7.1	Low
	36	34	2.3	1.2	3.4	Low
	37	09	0.0	0.0	0.0	High
	37	10	0.0	0.0	0.0	High
	37	11	2.3	1.2	3.4	High
	37	12	2.3	1.2	3.4	High
	37	13	0.0	0.0	0.0	High
	37	14	0.0	0.0	0.0	High
	37	15	3.5	2.4	4.6	High
	37	16	3.0	1.9	4.1	High
	37	17	3.8	2.7	4.9	High
	37	18	5.4	4.3	6.5	High
	37	19	3.8	2.7	4.9	High
	37	20	2.9	1.8	4.0	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	37	21	4.3	3.2	5.4	High
	37	22	6.0	4.9	7.1	High
	37	23	9.2	8.1	10.3	High
	37	24	6.7	5.6	7.8	High
	37	25	5.4	4.3	6.5	High
	37	26	7.5	6.4	8.7	Medium
	37	27	4.2	3.1	5.3	Medium
	37	28	8.6	7.4	9.7	High
	37	29	5.4	4.3	6.5	Medium
	37	30	5.3	4.2	6.4	Medium
	37	31	4.2	3.1	5.3	Medium
	37	32	6.8	5.7	7.9	Medium
	37	33	5.4	4.3	6.5	Medium
	37	34	2.9	1.8	4.0	Low
	38	08	6.0	4.9	7.1	Medium
	38	09	6.0	4.9	7.1	Medium
	38	10	3.5	2.4	4.6	High
	38	11	0.0	0.0	0.0	High
	38	12	0.0	0.0	0.0	High
	38	13	0.0	0.0	0.0	High
	38	14	0.0	0.0	0.0	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	38	15	3.5	2.4	4.6	High
	38	16	3.5	2.4	4.6	High
	38	17	5.0	3.9	6.1	High
	38	18	5.8	4.7	6.9	High
	38	19	4.2	3.1	5.3	High
	38	20	5.0	3.9	6.1	High
	38	21	7.3	6.2	8.4	High
	38	22	6.5	5.4	7.7	High
	38	23	5.4	4.3	6.5	High
	38	24	6.0	4.9	7.1	High
	38	25	6.8	5.7	7.9	High
	38	26	6.8	5.7	7.9	Medium
	38	27	11.7	10.6	12.8	Medium
	38	28	11.7	10.6	12.8	High
	38	29	4.8	3.7	5.9	Medium
	38	30	5.4	4.3	6.5	Medium
	38	31	6.0	4.9	7.1	Medium
	38	32	11.7	10.6	12.8	Medium
	38	33	5.4	4.3	6.5	Medium
	38	34	7.9	6.8	9.0	Medium
	39	08	6.0	4.9	7.1	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	39	09	6.0	4.9	7.1	Medium
	39	10	3.5	2.4	4.6	High
	39	11	0.0	0.0	0.0	Medium
	39	12	0.0	0.0	0.0	Medium
	39	13	0.0	0.0	0.0	Medium
	39	14	2.9	1.8	4.0	High
	39	15	2.3	1.2	3.4	High
	39	16	4.8	3.7	5.9	High
	39	17	6.0	4.9	7.1	High
	39	18	5.5	4.4	6.6	High
	39	19	4.8	3.7	5.9	High
	39	20	7.3	6.2	8.4	High
	39	21	7.3	6.2	8.4	High
	39	22	5.5	4.4	6.6	High
	39	23	4.2	3.1	5.3	High
	39	24	7.9	6.8	9.0	High
	39	25	7.8	6.7	8.9	High
	39	26	8.0	6.9	9.2	High
	39	27	4.8	3.7	5.9	High
	39	28	7.3	6.2	8.4	High
	39	29	5.4	4.3	6.5	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	39	30	5.0	3.9	6.1	Medium
	39	31	4.2	3.1	5.3	Medium
	39	32	4.8	3.7	5.9	Medium
	39	33	4.2	3.1	5.3	Low
	39	34	11.7	10.6	12.8	Low
	40	07	6.0	4.9	7.1	Medium
	40	08	3.5	2.4	4.6	Medium
	40	09	3.5	2.4	4.6	High
	40	10	0.0	0.0	0.0	Medium
	40	11	0.0	0.0	0.0	Medium
	40	12	0.0	0.0	0.0	Medium
	40	13	2.9	1.8	4.0	Medium
	40	14	3.5	2.4	4.6	High
	40	15	3.3	2.2	4.4	High
	40	16	3.5	2.4	4.6	High
	40	17	4.3	3.2	5.4	High
	40	18	4.8	3.7	5.9	Medium
	40	19	4.5	3.4	5.6	High
	40	20	4.2	3.1	5.3	High
	40	21	4.8	3.7	5.9	High
	40	22	4.8	3.7	5.9	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	40	23	5.4	4.3	6.5	High
	40	24	9.8	8.7	10.9	High
	40	25	7.3	6.2	8.4	High
	40	26	5.0	3.9	6.1	Medium
	40	27	2.9	1.8	4.0	Medium
	40	28	0.0	0.0	0.0	Low
	40	29	6.3	5.2	7.4	Medium
	40	30	4.8	3.7	5.9	Medium
	40	31	3.8	2.7	4.9	Low
	40	32	3.5	2.4	4.6	Medium
	40	33	4.2	3.1	5.3	Medium
	40	34	12.9	11.8	14.1	Medium
	41	07	6.0	4.9	7.1	Low
	41	08	3.5	2.4	4.6	High
	41	09	3.5	2.4	4.6	High
	41	10	3.5	2.4	4.6	High
	41	11	0.0	0.0	0.0	Medium
	41	12	0.0	0.0	0.0	Low
	41	13	2.9	1.8	4.0	Low
	41	14	3.3	2.2	4.4	Medium
	41	15	3.5	2.4	4.6	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	41	16	3.3	2.2	4.4	High
	41	17	2.9	1.8	4.0	High
	41	18	4.0	2.9	5.1	Medium
	41	19	4.2	3.1	5.3	Medium
	41	20	5.0	3.9	6.1	Medium
	41	21	6.3	5.2	7.4	Medium
	41	22	3.1	2.0	4.2	High
	41	23	4.8	3.7	5.9	High
	41	24	7.5	6.4	8.7	Medium
	41	25	5.5	4.4	6.6	Low
	41	26	2.9	1.8	4.0	Low
	41	27	3.8	2.7	4.9	Low
	41	28	0.0	0.0	0.0	Low
	41	29	0.0	0.0	0.0	Low
	41	30	0.0	0.0	0.0	Low
	41	31	3.5	2.4	4.6	Low
	41	32	3.8	2.7	4.9	Low
	41	33	6.8	5.7	7.9	Medium
	41	34	8.6	7.4	9.7	Low
	42	07	6.0	4.9	7.1	Medium
	42	08	4.8	3.7	5.9	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	42	09	4.8	3.7	5.9	High
	42	10	5.0	3.9	6.1	High
	42	11	6.5	5.4	7.7	Low
	42	12	7.3	6.2	8.4	Low
	42	13	5.4	4.3	6.5	Low
	42	14	2.9	1.8	4.0	Medium
	42	15	3.1	1.9	4.2	Medium
	42	16	3.1	1.9	4.2	Medium
	42	17	2.8	1.7	3.9	High
	42	18	2.3	1.2	3.4	High
	42	19	4.3	3.2	5.4	Medium
	42	20	6.0	4.9	7.1	Medium
	42	21	5.3	4.2	6.4	Medium
	42	22	6.7	5.6	7.8	High
	42	23	5.5	4.4	6.6	High
	42	24	4.3	3.2	5.4	Medium
	42	25	2.3	1.2	3.4	Low
	42	26	4.3	3.2	5.4	Low
	42	27	4.8	3.7	5.9	Low
	42	28	3.8	2.7	4.9	Low
	42	29	2.3	1.2	3.4	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	42	30	0.0	0.0	0.0	Low
	42	31	2.3	1.2	3.4	Low
	42	32	3.8	2.7	4.9	Low
	42	33	6.8	5.7	7.9	Low
	42	34	6.8	5.7	7.9	Low
	43	07	6.0	4.9	7.1	High
	43	08	6.0	4.9	7.1	High
	43	09	2.3	1.2	3.4	High
	43	10	5.4	4.3	6.5	Medium
	43	11	6.7	5.6	7.8	Medium
	43	12	6.3	5.2	7.4	Medium
	43	13	7.9	6.8	9.0	Medium
	43	14	2.3	1.2	3.4	Medium
	43	15	2.9	1.8	4.0	Medium
	43	16	2.9	1.8	4.0	Medium
	43	17	2.3	1.2	3.4	Medium
	43	18	2.3	1.2	3.4	Medium
	43	19	2.8	1.7	3.9	Medium
	43	20	4.0	2.9	5.1	Medium
	43	21	2.9	1.8	4.0	Medium
	43	22	6.3	5.2	7.4	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	43	23	5.4	4.3	6.5	Medium
	43	24	3.8	2.7	4.9	Medium
	43	25	3.8	2.7	4.9	Medium
	43	26	5.4	4.3	6.5	Low
	43	27	5.5	4.4	6.6	Low
	43	28	2.9	1.8	4.0	Low
	43	29	2.3	1.2	3.4	Low
	43	30	0.0	0.0	0.0	Low
	43	31	2.3	1.2	3.4	Low
	43	32	2.3	1.2	3.4	Low
	43	33	0.0	0.0	0.0	Low
	43	34	0.0	0.0	0.0	Low
	44	07	2.3	1.2	3.4	High
	44	08	2.3	1.2	3.4	High
	44	09	2.3	1.2	3.4	High
	44	10	4.2	3.1	5.3	High
	44	11	5.4	4.3	6.5	High
	44	12	8.6	7.4	9.7	Medium
	44	13	5.3	4.2	6.4	High
	44	14	4.8	3.7	5.9	Medium
	44	15	6.0	4.9	7.1	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	44	16	7.9	6.8	9.0	Medium
	44	17	2.3	1.2	3.4	Medium
	44	18	2.3	1.2	3.4	Low
	44	19	4.8	3.7	5.9	Medium
	44	20	2.9	1.8	4.0	Medium
	44	21	3.5	2.4	4.6	High
	44	22	4.8	3.7	5.9	Medium
	44	23	5.0	3.9	6.1	Medium
	44	24	3.8	2.7	4.9	High
	44	25	3.8	2.7	4.9	High
	44	26	4.2	3.1	5.3	Medium
	44	27	3.5	2.4	4.6	Low
	44	28	3.0	1.9	4.1	Low
	44	29	2.8	1.7	3.9	Low
	44	30	2.3	1.2	3.4	Low
	44	31	2.3	1.2	3.4	Low
	44	32	2.3	1.2	3.4	Low
	44	33	2.3	1.2	3.4	Low
	44	34	6.8	5.7	7.9	Low
	45	04	4.2	3.1	5.3	Low
	45	05	3.2	2.1	4.3	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	45	06	0.0	0.0	0.0	Medium
	45	07	0.0	0.0	0.0	High
	45	08	0.0	0.0	0.0	High
	45	09	0.0	0.0	0.0	High
	45	10	3.1	2.0	4.2	High
	45	11	2.3	1.2	3.4	High
	45	12	5.8	4.7	6.9	Medium
	45	13	2.9	1.8	4.0	High
	45	14	4.8	3.7	5.9	High
	45	15	4.8	3.7	5.9	Medium
	45	16	6.0	4.9	7.1	Medium
	45	17	2.3	1.2	3.4	Medium
	45	18	6.8	5.7	7.9	Medium
	45	19	6.7	5.6	7.8	Medium
	45	20	4.0	2.9	5.1	Medium
	45	21	3.8	2.7	4.9	High
	45	22	2.3	1.2	3.4	High
	45	23	2.3	1.2	3.4	Medium
	45	24	4.8	3.7	5.9	High
	45	25	2.9	1.8	4.0	High
	45	26	2.9	1.8	4.0	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	45	27	3.0	1.9	4.1	Low
	45	28	2.9	1.8	4.0	Low
	45	29	3.0	1.9	4.1	Low
	45	30	2.3	1.2	3.4	Low
	45	31	4.2	3.1	5.3	Low
	45	32	2.3	1.2	3.4	Low
	45	33	2.3	1.2	3.4	Low
	45	34	6.8	5.7	7.9	Low
	46	04	3.2	2.1	4.3	Medium
	46	05	2.3	1.2	3.4	Medium
	46	06	0.0	0.0	0.0	High
	46	07	0.0	0.0	0.0	High
	46	08	0.0	0.0	0.0	High
	46	09	2.6	1.5	3.7	High
	46	10	2.9	1.8	4.0	High
	46	11	2.6	1.5	3.7	High
	46	12	2.3	1.2	3.4	High
	46	13	4.3	3.2	5.4	High
	46	14	4.8	3.7	5.9	High
	46	15	5.0	3.9	6.1	Medium
	46	16	7.3	6.2	8.4	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	46	17	9.8	8.7	10.9	Medium
	46	18	6.7	5.6	7.8	High
	46	19	6.7	5.6	7.8	High
	46	20	5.0	3.9	6.1	Medium
	46	21	3.5	2.4	4.6	High
	46	22	2.3	1.2	3.4	High
	46	23	2.3	1.2	3.4	Medium
	46	24	4.8	3.7	5.9	High
	46	25	5.0	3.9	6.1	Low
	46	26	4.3	3.2	5.4	Low
	46	27	2.9	1.8	4.0	Low
	46	28	3.5	2.4	4.6	Low
	46	29	4.2	3.1	5.3	Low
	46	30	4.2	3.1	5.3	Low
	46	31	6.0	4.9	7.1	Low
	47	04	2.3	1.2	3.4	Medium
	47	05	2.3	1.2	3.4	Medium
	47	06	0.0	0.0	0.0	High
	47	07	0.0	0.0	0.0	High
	47	08	0.0	0.0	0.0	High
	47	09	2.9	1.8	4.0	High

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	47	10	2.9	1.8	4.0	Medium
	47	11	0.0	0.0	0.0	Medium
	47	12	2.3	1.2	3.4	High
	47	13	4.8	3.7	5.9	High
	47	14	4.8	3.7	5.9	High
	47	15	4.8	3.7	5.9	High
	47	16	8.6	7.4	9.7	High
	47	17	8.6	7.4	9.7	High
	47	18	5.4	4.3	6.5	High
	47	19	6.0	4.9	7.1	Medium
	47	20	2.3	1.2	3.4	Low
	47	21	3.5	2.4	4.6	High
	47	22	2.3	1.2	3.4	High
	47	23	2.3	1.2	3.4	Medium
	47	24	6.0	4.9	7.1	Low
	47	25	7.3	6.2	8.4	Low
	47	26	5.0	3.9	6.1	Low
	47	27	3.5	2.4	4.6	Low
	47	28	4.2	3.1	5.3	Low
	47	29	4.2	3.1	5.3	Low
	47	30	4.2	3.1	5.3	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	47	31	5.0	3.9	6.1	Low
	48	04	2.3	1.2	3.4	High
	48	05	2.3	1.2	3.4	Low
	48	06	2.3	1.2	3.4	High
	48	07	0.0	0.0	0.0	High
	48	08	0.0	0.0	0.0	High
	48	09	2.3	1.2	3.4	High
	48	10	2.3	1.2	3.4	Medium
	48	11	2.3	1.2	3.4	Low
	48	12	2.3	1.2	3.4	Low
	48	13	4.8	3.7	5.9	High
	48	14	6.7	5.6	7.8	Medium
	48	15	4.5	3.4	5.6	Low
	48	16	5.5	4.4	6.6	Medium
	48	17	5.4	4.3	6.5	Low
	48	18	5.4	4.3	6.5	Low
	48	19	2.3	1.2	3.4	Low
	48	20	3.5	2.4	4.6	Medium
	48	21	3.5	2.4	4.6	High
	48	22	3.5	2.4	4.6	Medium
	48	23	2.3	1.2	3.4	Medium

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	48	24	7.3	6.2	8.4	Low
	48	25	7.3	6.2	8.4	Low
	48	26	7.3	6.2	8.4	Low
	48	27	4.2	3.1	5.3	Low
	48	28	4.2	3.1	5.3	Low
	48	29	4.2	3.1	5.3	Low
	48	30	4.2	3.1	5.3	Low
	48	31	4.3	3.2	5.4	Low
	49	03	2.3	1.2	3.4	High
	49	04	2.3	1.2	3.4	Medium
	49	05	2.3	1.2	3.4	Low
	49	06	4.5	3.4	5.6	High
	49	07	0.0	0.0	0.0	Low
	49	08	0.0	0.0	0.0	Low
	49	09	0.0	0.0	0.0	Low
	49	10	0.0	0.0	0.0	Low
	49	11	2.3	1.2	3.4	High
	49	12	2.3	1.2	3.4	High
	49	13	4.2	3.1	5.3	High
	49	14	5.4	4.3	6.5	Low
	49	15	6.7	5.6	7.8	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	49	16	4.2	3.1	5.3	Low
	49	17	2.9	1.8	4.0	High
	49	18	6.3	5.2	7.4	Low
	49	19	2.3	1.2	3.4	Low
	49	20	3.5	2.4	4.6	Low
	49	21	3.5	2.4	4.6	Low
	49	22	3.5	2.4	4.6	Low
	49	23	2.3	1.2	3.4	Medium
	49	24	3.5	2.4	4.6	Low
	49	25	3.5	2.4	4.6	Low
	50	02	2.3	1.2	3.4	High
	50	03	2.3	1.2	3.4	High
	50	04	2.9	1.8	4.0	High
	50	05	4.5	3.4	5.6	High
	50	06	5.4	4.3	6.5	Medium
	50	07	4.5	3.4	5.6	Low
	50	08	0.0	0.0	0.0	Low
	50	09	0.0	0.0	0.0	Low
	50	10	0.0	0.0	0.0	Low
	50	11	2.3	1.2	3.4	Medium
	50	12	2.3	1.2	3.4	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	50	13	4.0	2.9	5.1	Low
	50	14	4.2	3.1	5.3	Low
	50	15	4.8	3.7	5.9	Low
	50	16	6.7	5.6	7.8	Low
	50	17	4.8	3.7	5.9	Medium
	50	18	5.8	4.7	6.9	Low
	50	19	5.8	4.7	6.9	Low
	50	20	5.8	4.7	6.9	Low
	50	21	3.5	2.4	4.6	Low
	51	02	0.0	0.0	0.0	Low
	51	03	2.3	1.2	3.4	Low
	51	04	2.9	1.8	4.0	High
	51	05	3.5	2.4	4.6	Medium
	51	06	4.5	3.4	5.6	Medium
	51	07	4.5	3.4	5.6	Low
	51	08	0.0	0.0	0.0	Low
	51	09	2.3	1.2	3.4	Low
	51	10	2.3	1.2	3.4	Low
	51	11	2.3	1.2	3.4	Low
	51	12	3.5	2.4	4.6	Low
	51	13	4.2	3.1	5.3	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	51	14	6.7	5.6	7.8	Low
	51	15	9.2	8.1	10.3	Low
	51	16	7.3	6.2	8.4	Low
	51	17	9.8	8.7	10.9	Low
	51	18	5.8	4.7	6.9	Low
	51	19	2.3	1.2	3.4	Low
	51	20	2.3	1.2	3.4	Low
	51	21	3.5	2.4	4.6	Low
	52	02	2.3	1.2	3.4	Medium
	52	03	2.3	1.2	3.4	Medium
	52	04	2.3	1.2	3.4	Medium
	52	05	2.9	1.8	4.0	Medium
	52	06	2.9	1.8	4.0	Medium
	52	07	6.0	4.9	7.1	Low
	52	08	6.0	4.9	7.1	Low
	52	09	6.0	4.9	7.1	Low
	52	10	0.0	0.0	0.0	Low
	52	11	2.3	1.2	3.4	Low
	52	12	2.3	1.2	3.4	Low
	52	13	7.5	6.4	8.7	Low
	52	14	8.6	7.4	9.7	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	52	15	11.1	10.0	12.2	Low
	52	16	7.3	6.2	8.4	Low
	52	17	8.0	6.9	9.2	Low
	52	18	2.3	1.2	3.4	Low
	52	19	5.8	4.7	6.9	Low
	52	20	3.5	2.4	4.6	Low
	52	21	3.5	2.4	4.6	Low
	53	02	2.3	1.2	3.4	Medium
	53	03	2.3	1.2	3.4	Medium
	53	04	2.6	1.5	3.7	Medium
	53	05	2.9	1.8	4.0	Medium
	53	06	2.9	1.8	4.0	Low
	53	07	6.7	5.6	7.8	Low
	53	08	6.0	4.9	7.1	Low
	53	09	6.7	5.6	7.8	Low
	53	10	2.3	1.2	3.4	Low
	53	11	0.0	0.0	0.0	Low
	53	12	2.3	1.2	3.4	Low
	53	13	0.0	0.0	0.0	Low
	53	14	2.3	1.2	3.4	Low
	53	15	9.8	8.7	10.9	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	53	16	7.3	6.2	8.4	Low
	53	17	8.0	6.9	9.2	Low
	53	18	2.3	1.2	3.4	Low
	53	19	5.8	4.7	6.9	Low
	53	20	3.5	2.4	4.6	Low
	53	21	3.5	2.4	4.6	Low
	54	03	2.3	1.2	3.4	Medium
	54	04	2.3	1.2	3.4	Medium
	54	05	2.6	1.5	3.7	Medium
	54	06	2.9	1.8	4.0	Medium
	54	07	6.7	5.6	7.8	Low
	54	08	7.3	6.2	8.4	Low
	54	09	6.7	5.6	7.8	Low
	54	10	2.3	1.2	3.4	Low
	54	11	0.0	0.0	0.0	Low
	54	12	0.0	0.0	0.0	Low
	54	13	0.0	0.0	0.0	Low
	54	14	0.0	0.0	0.0	Low
	54	15	0.0	0.0	0.0	Low
SSA	00	86	2.9	1.8	4.0	Low
	00	87	2.3	1.2	3.4	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	00	88	2.9	1.8	4.0	Low
	00	89	4.2	3.1	5.3	Low
	00	90	5.9	4.8	7.0	Low
	00	91	9.8	8.7	10.9	Low
	00	92	5.4	4.3	6.5	Low
	00	93	5.0	3.9	6.1	Low
	00	94	7.3	6.2	8.4	Low
	00	95	7.9	6.8	9.0	Low
	00	96	8.6	7.4	9.7	Low
	01	86	2.9	1.8	4.0	Low
	01	87	2.9	1.8	4.0	Low
	01	88	2.9	1.8	4.0	Low
	01	93	5.0	3.9	6.1	Low
	01	94	5.0	3.9	6.1	Low
	01	95	7.9	6.8	9.0	Low
	01	96	7.9	6.8	9.0	Low
	89	87	4.8	3.7	5.9	Low
	89	88	4.8	3.7	5.9	Low
	89	89	4.8	3.7	5.9	Low
	90	88	4.8	3.7	5.9	Low
	90	89	4.8	3.7	5.9	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	91	88	3.5	2.4	4.6	Low
	91	89	6.0	4.9	7.1	Low
	92	88	6.0	4.9	7.1	Low
	92	89	4.6	3.5	5.7	Low
	93	86	4.2	3.1	5.3	Low
	93	87	4.2	3.1	5.3	Low
	93	88	4.2	3.1	5.3	Low
	93	89	4.2	3.1	5.3	Low
	93	90	6.8	5.7	7.9	Low
	93	91	2.3	1.2	3.4	Low
	93	92	5.4	4.3	6.5	Low
	93	93	4.2	3.1	5.3	Low
	93	94	3.5	2.4	4.6	Low
	93	95	2.9	1.8	4.0	Low
	93	96	2.9	1.8	4.0	Low
	94	86	4.8	3.7	5.9	Low
	94	87	4.8	3.7	5.9	Low
	94	88	4.8	3.7	5.9	Low
	94	89	5.4	4.3	6.5	Low
	94	90	13.6	12.5	14.7	Low
	94	91	6.0	4.9	7.1	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	94	92	4.8	3.7	5.9	Low
	94	93	3.7	2.6	4.8	Low
	94	94	3.5	2.4	4.6	Low
	94	95	2.9	1.8	4.0	Low
	94	96	2.9	1.8	4.0	Low
	95	86	7.3	6.2	8.4	Low
	95	87	7.3	6.2	8.4	Low
	95	88	10.6	9.5	11.7	Low
	95	89	6.0	4.9	7.1	Low
	95	90	8.6	7.4	9.7	Low
	95	91	4.2	3.1	5.3	Low
	95	92	4.0	2.9	5.1	Low
	95	93	2.9	1.8	4.0	Low
	95	94	3.2	2.1	4.3	Low
	95	95	2.9	1.8	4.0	Low
	95	96	2.9	1.8	4.0	Low
	96	86	8.8	7.7	9.9	Low
	96	87	8.8	7.7	9.9	Low
	96	88	8.8	7.7	9.9	Low
	96	89	5.0	3.9	6.1	Low
	96	90	2.3	1.2	3.4	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	96	91	5.0	3.9	6.1	Low
	96	92	3.5	2.4	4.6	Low
	96	93	3.2	2.1	4.3	Low
	96	94	3.5	2.4	4.6	Low
	96	95	2.9	1.8	4.0	Low
	96	96	2.9	1.8	4.0	Low
	97	86	7.3	6.2	8.4	Low
	97	87	7.3	6.2	8.4	Low
	97	88	5.5	4.4	6.6	Low
	97	89	6.7	5.6	7.8	Low
	97	90	3.3	2.2	4.4	Low
	97	91	2.9	1.8	4.0	Low
	97	92	4.1	3.0	5.2	Low
	97	93	4.2	3.1	5.3	Low
	97	94	2.7	1.6	3.8	Low
	97	95	2.3	1.2	3.4	Low
	97	96	2.9	1.8	4.0	Low
	98	86	3.5	2.4	4.6	Low
	98	87	3.5	2.4	4.6	Low
	98	88	4.2	3.1	5.3	Low
	98	89	4.6	3.5	5.7	Low

Study Area	UTM (NW Corner)		Tortoise Point Density	Confidence Interval		Use Level
	Easting	Northing		Lower	Upper	
	98	90	3.5	2.4	4.6	Low
	98	91	3.5	2.4	4.6	Low
	98	92	4.1	3.0	5.2	Low
	98	93	4.2	3.1	5.3	Low
	98	94	2.3	1.2	3.4	Low
	98	95	5.4	4.3	6.5	Low
	98	96	5.4	4.3	6.5	Low
	99	86	4.2	3.1	5.3	Low
	99	87	4.2	3.1	5.3	Low
	99	88	3.5	2.4	4.6	Low
	99	89	4.2	3.1	5.3	Low
	99	90	3.8	2.7	4.9	Low
	99	91	9.8	8.7	10.9	Low
	99	92	5.4	4.3	6.5	Low
	99	93	5.0	3.9	6.1	Low
	99	94	6.0	4.9	7.1	Low
	99	95	8.6	7.4	9.7	Low
	99	96	8.6	7.4	9.7	Low

APPENDIX J
CULTURAL RESOURCES APPENDIX

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J.1 PREVIOUS INVESTIGATIONS

Three major sources of information are available to provide for this project. The first comes from sample inventories completed by the BLM in the late 1970s-early 1980s as part of an overall Mojave Desert Conservation Plan. The second consists of previous inventory reports, archeological site records, historic maps, and related archival materials on file at the Combat Center, at BLM offices in Barstow and Sacramento, and available online from BLM and other websites. The third is a collection of archeological data from recent cultural resources inventories in the three study areas that were completed in support of this EIS.

California Desert Plan

Between 1978 and 1980 the Desert Plan Staff (DPS) collected existing data on known archeological resources and aimed to verify them in the field. These archeologists also developed a standardized approach to information collecting and compiled it in a useable format. They devised a survey that involved randomly placed sample units; these were at first 0.75 mile quadrants (160 acres), but later were changed to transects $^{1}/_{16}$-mile wide and 1 mile long quadrants (80 acres). The DPS inventories ultimately covered approximately 1% of a 12-million-acre conservation area.

Key general documents on the results of the work undertaken by the DPS include:

- The Draft California Desert Conservation Area Plan Alternatives and Environmental Impact Statement (published February 1980),
- The Final Environmental Statement and Proposed Plan: California Desert Conservation Area (published September 1980),
- The California Desert Conservation Plan 1980 (and as amended March 1999), and
- Summary of the California Desert Conservation Plan.

To reach a conclusion as to the significance of resources in the CDCA according the Desert Plan, each of the variables was combined with intuitive and judgmental knowledge of the geographic regions studied, and polygons were drawn indicating the areas of significance and sensitivity. Johnson Valley was part of the Western Mojave Desert Study Area (Stickel et al. 1980) and fell within the Johnson/Morongo Planning Unit. Locations of concern to the BLM were "Hercules' Finger," a solitary rock outcrop in the Cinnamon Roll Buttes area (Ibid 1980:184); the Willie Boy site (Ibid 1980:186) south of California State Highway 62; Giant Rock (Ibid 1980:208); and the Emerson Mill (Ibid 1980:37), which is located in the WSA at Emerson Lake and was revisited and formally recorded in 2009 (Fryman 2009; Lechner et al. 2010).

Ultimately, the BLM analysis stated that:

> "Generally, past activities have resulted in the following, known and expected site types and distribution. Prehistoric sites consist mainly of lithic scatters, artifact isolates, small temporary camps, petroglyph loci, and various other special activity sites (e.g. milling stations). Perhaps as many as 560 such aboriginal sites exist in the expansive (358 square mile) area. These sites would occur primarily along the margins of playas and atop alluvial fans. Obviously these landforms cover a good deal of the proposed area. One could, therefore, expect to have these sites dispersed across the entire area."
>
> "Historically, the area was utilized primarily for mining. Earlier mines included the Elsie Gold Peak-1906 and Gold Pin 1909 mines. Later discoveries included the Emerson –

> 1923, Johnson and Los Padres Mines. Historically, mining sites are located primarily in the mountainous regions with a very few sites in the flatlands (e.g., Man's Well, Emerson Mill and Well.) The majority of the known activity centered in the Fry Mountains, Iron Ridge and smaller mountains along the eastern boundary of this open area. As many as 140+ historic sites are predicted within this entire area."
>
> "Six major areas of known cultural sensitivity/significance are located within the Johnson Valley Open Area. The most important areas though these areas are located along the northern and eastern margins of the vehicle management area."

Archival Records

Prior to the first inventories conducted in the west, east, and south study areas, ASM completed an archival records search at the San Bernardino Archaeological Information Center (SBAIC) for a 5-mile (8.0 km) radius around each study area. Additional searches were made of historic topographic maps, mining maps, GLO maps, and land patent documents to identify any historic roads, homesteads, mines, or other sites in the three study areas.

Full lists of cultural resources reports identified in the SBAIC records search are presented by study area in Table J-1 (see section J.2 below). Most of these reports are dated, indicating that relatively little archeological study had been completed in the three study areas prior to recent inventories. Of note is that few inventories conducted by BLM Field Office staff are represented; these data may be unavailable except through a detailed examination of BLM archives. It is also likely, however, that additional field inventories have been conducted in the various study areas but have not been reported to the SBAIC. Reports for such efforts may be obtainable through direct contact with whatever cultural resources management firm(s) completed the work.

Many previously identified archaeological sites are known to exist in the east and west study areas based on the results of the SBAIC search and archival study. Some had been previously recorded, while others were known but had never been mapped or documented by archeologists. Ultimately, records or specific information was obtained for 29 properties, including 12 in the east study area and 17 in the west study area (Table J-2, see section J.2 below). No information was available on previously identified or recorded sites in the south study area. Some of these sites were relocated and their records updated during inventories and select visits in 2008-2009 (Fryman 2009; Lechner and Giambastiani 2009a, 2009b; Lechner et al. 2010), while others did not fall within surveyed areas (e.g., CA-SBR-1811, SBR-3812 to -3845 in the west study area) or did so and were subsumed within updated site trinomials (e.g., SBR-1810/H and SBR-3405H in the west study area).

Archival work also provided data for 59 previously recorded sites lying outside the three study areas, but within the Area of Indirect Effect (i.e., the 5-mile [8 km] radius, excluding the Combat Center). These include 47 sites outside the east study area (mainly to the north), 11 outside the west study area, and one in the vicinity of the south study area (Table J-3, see section J.2 below).

Cultural Resources Inventory

Inventories completed in 2008-2009 for this EIS total 50,090 acres (20,270 hectares), including 20,560 acres (8,320 hectares) in the east study area, 2,345 acres (948 hectares) in the south study area, and 27,185 acres (11,256 hectares) in the west study area. Initial inventories (11,560 acres [4,678 hectares] in the east study area, 2,345 acres [948 hectares] in the south study area, and 16,485 acres [6,671 hectares] in the west study area) were completed in elongate transects (2-15 km long, 250 to 500 m wide) that were placed more or less systematically within the three study areas. The rest of the inventories consisted of block parcels of various sizes, allocated judgmentally based on the results of transect inventories. The initial boundaries of the east study area, south study area, and west study area were slightly larger than currently outlined, shifted after the first round of inventories in consideration with survey findings. Within the boundaries of the three study areas, as presently configured, inventory acreage amounts to 12.7% of the east study area, 12.1% of the south study area, and 15.1% of the west study area.

In all, approximately 114 archaeological sites and 1,514 isolate finds were recorded during cultural resources inventories for this EIS. In addition, 24 historic sites (19 in the east study area and 5 in the west study area) not encompassed by inventory parcels were visited and recorded or updated (refer to Tables J-4, J-5, and J-6, see section J.2 below). This totals some 138 sites recorded and/or updated, for this EIS, including 75 sites within the original boundaries of the east study area, 9 sites within the initial boundaries of the south study area, and 54 sites within the original boundaries of the west study area. All of these newly identified sites have been assessed for NRHP eligibility based on surface data. However, revisions to the various study area boundaries subsequent to inventories have dropped 14 sites from future consideration; these are now included within the Area of Indirect Effect (refer to Table J-3, see section J.2 below). This leaves a total of 124 evaluated archeological sites within the current study areas to be considered in the context of proposed land acquisition efforts.

J.2 RECORDS SEARCHES AND PREVIOUSLY RECORDED RESOURCES

Table J-1a. Record Search Results for East Study Area – Cultural Resources Reports and Historic Literature

EIC Number	Author and Date	Report Title or Summary
1060004	Campbell (1931)	An Archaeological Survey of the Twentynine Palms Region
1060291	King (1976)	Background to the Prehistory of East Mojave
1060292	Casebier (1976)	Historic Sketch of East Mojave Planning Unit
1060707	Brooks et al. (1978)	Archaeological Inventory of Owlshead/Amargosa Planning Units
1060833	Musser (1979)	Cultural Resources Survey for Drill Permit No. CA 202
1060874	Barker et al. (1979)	Allen-Warner Valley Energy System, Western Transmission Line Corridors Survey
1060888	Knack (1980)	Ethnographic Overview of Amargosa Planning Unit
1060892	Gallegos et al. (1980)	Cultural Resources Inventory of the Central Mojave and Colorado Deserts
1060964	Norwood (1980)	Cultural Resource Survey, Earp to Johnson Valley, Enduro Racecourse Route
1061063	Sutton (1980)	Investigations at SBR-4037 and SBR-4055
1061069	Von Till Warren et al. (1981)	Cultural Resources Overview of the Colorado Desert
1061092	Leonard (1981)	A Cultural Resources Evaluation of Eight Borrow Sites in San Bernardino County
1061154	Musser (1981)	Reclamation Plan for the Bristol Dry Lake Salt Concentrators, Leslie Salt Company
1061449	Weil et al. (1984)	Cultural Resources Literature Search and Sample Survey for Celeron/All-American Pipeline
1061512	Wilke (1985)	Class III Cultural Resources Inventory for a Proposed Road Easement in Cadiz
1061548	Lerch (1986)	Archaeological Survey of Eighteen Sections of Land near Cadiz
1061979	New Mexico State University (1989)	Cultural Resources Report for All-American Pipeline Project
1062017	Jenkins (1982)	A Study of Aboriginal Land Use: Southern Paiute Subsistence in the Eastern Mojave Desert
1062159	Bergin and Lerch (1990)	Archaeological Literature Search and Survey for the America Mine Project Drilling Program
1062166	White (1985)	Archaeological Reconnaissance of Exploratory Drilling Locations at Bristol Lake
1062201	Lerch (1990)	Cultural Resources Site Characterization Study, Class III Cultural Resources Inventory
1062255	Westec Services, Inc. (1973)	Class II Cultural Resources Inventory
1062256	Ludwig (1989)	U.S. Marines at Twentynine Palms, California
1062258	Swanson (1991)	Cultural Resource Survey in Redlands Area
1062388	McGuire (1990)	A Cultural Resources Inventory and Evaluation of the Proposed Mojave Pipeline Corridor
1062408	Lerch (1991b)	Addendum to Cultural Resources Characterization Study, Class II Cultural Resources Inventory
1062450	Lerch (1991a)	Cultural Resources Significance Evaluation and Treatment Plan for Bolo Station Facilities
1062555	Hanks (1976)	Cultural Resources Analysis for East Mojave Planning Unit
1062583	McGuire (1991)	Archaeological Reconnaissance for the Mojave Pipeline
1063203	Lerch (1992)	Cultural Resources Inventory and Significance Evaluation of Rail Cycle Bolo Station Facilities
1063298	Buffington and Macko (1995)	A Class III Intensive Survey for Seismic Reflection Survey Line in Cadiz Valley
1063840	Horne (1999)	Cultural Resources Survey for Cadiz Groundwater Storage and Dry-Year Supply Program
1063894	Duke (1999)	Cultural Resources Assessment
1064234	Earle (2004)	Ethnohistorical/Ethnographic Overview of Fort Irwin

Table J-1a. Record Search Results for East Study Area – Cultural Resources Reports and Historic Literature

EIC Number	Author and Date	Report Title or Summary
1064564	Craft (2004)	Negative Survey Report for Lava 12kV Circuit for SCE Pole Replacement Program
1065047	Schmidt (2004)	Phase I Cultural Resource Investigation for the Automated Switch Project for SCE
1065634	McKenna et al. (2004)	Survey Report for San Bernardino County Bridge Replacement Project (Bridges 81 and 82)
1065635	McKenna et al. (2004)	Evaluation of San Bernardino County Bridges #81 and 82 on Historic National Trails Highway

Note: SCE = Southern California Electric

Table J-1b. Record Search Results for South Study Area – Cultural Resources Reports and Historic Literature

EIC Number	Author and Date	Report Title or Summary
1060004	Campbell (1931)	An Archaeological Survey of the Twentynine Palms Region
1060932	Lippincott (1980)	Negative Survey for Two Uranium Drill Holes
1061031	BLM (1980)	Cultural Resources Assessment for Woodmancy’s House Parcel
1062257	BLM (1970s)	Negative Survey for Private Parcels
1062861	DeBarros and Mason (1993)	Cultural Resources Survey for Four Corners Pipeline Company Line
1062982	Taylor (1993)	Archaeological Survey Report for Brose Property
1063544	Love (2000)	Historic Properties Identification for AT&T Wireless Site C981.2

Table J-1c. Record Search Results for West Study Area – Cultural Resources Reports and Historic Literature

EIC Number	Author and Date	Report Title or Summary
NRHP L-82-2240	Hanks (1982)	Rodman Mountain Petroglyph and Archaeological District
1060123	King (1972)	Archaeological Research in the Cinnamonroll Hills
1060153	Hanks (1973)	Impact Assessment for SCE Lucerne Valley Survey
1060701	Stumpf (1978)	Archaeological Reconnaissance Report for Checkers Motorcycle Race
1060874	Barker et al. (1979)	Allen-Warner Valley Energy System, Western Transmission Line Corridors Survey
1060900	Weil (1979)	Summary Report for SCE Lucerne Valley Survey
1060901	Weil (1980)	SCE Lucerne Valley Survey Report
1060956	BLM (1980)	Cultural Resources Assessment of USGS Seismic Test Locations
1060964	Norwood (1980)	Cultural Resources Inventory for the Enduro Racecourse
1061203	Brock (1993)	Negative Records Search for Old Woman Springs
1061306	Robinson (1982)	Rodman Mountain Field Trip – Archaeological Survey Association
1061377	BLM (1983)	Cultural Resources Assessments for Various Parcels
1062153	Mortland (1974)	Impact Assessment for SCE Generating Station
1062470	Cook and Pallette (1991)	Cultural Resources Assessment for 13 Pacific Telephone Microwave Towers
1062515	Lerch (1992)	Class III Inventory for Morongo Basin Pipeline Project
1062800	Brock (1993)	Cultural Resources Assessment for Filling Station at Old Woman Springs Ranch
1063065	Gacs (1978)	Ethnological/Archival Study for SCE Lucerne Valley
1063525	Swope (1999)	Archaeological Survey and Historic Study for Highway 247 Realignment
1065067	Pollock and Lerch (2005)	Survey of Tower 155-2 Access Road on Lugo-Pisgah 220 kV Transmission Line

Table J-2. Previously Recorded and Mapped Cultural Resources, East and West Study Areas

Study Area	Era	Site	Site Record	Description	USGS 7.5' Quad
East	Prehistoric	CA-SBR-3243	Eckhardt 1978	Lithic scatter	Cadiz Lake NW
		CA-SBR-4150	Norwood 1980	Lithic scatter	Cadiz Lake NW
		CA-SBR-4759	Leonard 1981	Lithic scatter	Cadiz Lake NW
		CA-SBR-5815	Dietler 2001	Rock ring	Cadiz Lake NW
		CA-SBR-6682	Lerch 1990	Habitation	Cadiz
		CA-SBR-9848	Inoway et al. 1999	Lithic scatter	Cadiz Summit
		CA-SBR-9852	Inoway et al. 1999	Lithic scatter	Cadiz Lake NW
	Historic	CA-SBR-3282H	Crowley 1978	Cemetery and well	Cadiz Lake NW
		CA-SBR-9849H	Inoway et al. 1999	Refuse deposit– **updated by ASM**	Cadiz Lake NW
		CA-SBR-9850H	Inoway et al. 1999	Refuse deposit – **updated by ASM**	Cadiz lake NW
		CA-SBR-9851H	Inoway et al. 1999	Refuse deposit – **updated by ASM**	Cadiz Lake NW
		CA-SBR-9853H	Easter et al. 1999	AT & SF Railroad – Parker Branch – **updated by ASM**	Cadiz Lake NE, NW, Cadiz Summit
		CA-SBR-9856H	McDougall et al. 1999	Railroad maintenance camp – **updated by ASM**	Cadiz Lake NE
		CA-SBR-10644H	Dietler 2001	Military refuse deposit, WWII-era	Cadiz Lake NW
		CA-SBR-11582H	Underwood and Gregory 2004	Military camp, Desert Strike (1964) – **updated by ASM**	Cadiz Summit
		CA-SBR-11583H	Underwood and Hilliard 2004	Cadiz-Rice Road – **updated by ASM**	Cadiz, Cadiz Lake NW
		CA-SBR-11586H	Underwood and Hilliard 2004	Pacific Telephone/Telegraph Line – **updated by ASM**	Bristol Lake NW, SW, Cadiz, etc.
West	Prehistoric	CA-SBR-1810/H	Strieler 1970	Lithic scatter – **updated by ASM as SBR-12933**	Galway Lake
		CA-SBR-1811	None	Rock Art (unclassified)	Galway Lake
		CA-SBR-1880	Unknown author 1965	Habitation complex – **updated by ASM**	Melville Lake
		CA-SBR-1883	Unknown author and date	Ceramics and "notched point"	Old Woman Springs
		CA-SBR-3812	Aasved 1979	Lithic scatter	Iron Ridge
		CA-SBR-3813	Aasved 1979	Lithic scatter	Iron Ridge
		CA-SBR-3820	Jenkins 1979	Lithic scatter	Iron Ridge
		CA-SBR-3843	Decker et al. 1973	Lithic scatter	Iron Ridge
		CA-SBR-3844	Decker et al. 1973	Lithic scatter	Iron Ridge
		CA-SBR-3845	Decker et al. 1973	Lithic scatter	Iron Ridge
	Historic	CA-SBR-3405H	Unknown author and date	"Los Padres Mine" – **updated as ASM H-13**	Emerson Lake
		CA-SBR-8946H	Hall and Schultze 1998	"Emerson Mill" – **updated by ASM**	Emerson Lake

Table J-3. Identified Cultural Resources Outside Study Areas but Within the Area of Indirect Effect (5-Mile Radius)

Study Area	Era	Site	Site Record	Description	USGS 7.5' Quad
RECORDS SEARCH AND ARCHIVAL RESEARCH					
East	Prehistoric	CA-SBR-3246	Gallegos and Carrico 1978	Lithic scatter	Lead Mountain NE
		CA-SBR-3248	Gallegos and Carrico 1978	Lithic scatter	Amboy Crater
		CA-SBR-3263	Gallegos and Carrico 1978	Lithic scatter	Amboy Crater
		CA-SBR-3264	Gallegos and Carrico 1978	Ceramics and DSN point	Amboy Crater
		CA-SBR-3265	Gallegos and Carrico 1978	Rock cairns and cleared area	Amboy Crater
		CA-SBR-3266/H	Davis 1978	Rockshelter and ethnohistoric refuse	Amboy Crater
		CA-SBR-3267	Lowe 1978	Rockshelter	Amboy Crater
		CA-SBR-5472	Drover 1985	Navajo railworker's sweathouse	Cadiz
		CA-SBR-6677	Lerch and Goodman 1990	Lithic scatter	Amboy
		CA-SBR-6678	Lerch and Goodman 1990	Lithic quarry	Amboy
		CA-SBR-6679	Lerch and Yohe 1990	Lithic scatter	Cadiz
		CA-SBR-6680	Lerch and Yohe 1990	Lithic scatter	Cadiz
		CA-SBR-6681	Lerch and Quintero 1990	Lithic scatter	Cadiz
		CA-SBR-6683	Lerch and Yohe 1990	Lithic scatter	Cadiz
		CA-SBR-6684	Lerch and Yohe 1990	Lithic scatter	Cadiz
		CA-SBR-6794	Bergin 1990	Trail feature (age unknown)	Lead Mountain NE
	Historic	CA-SBR-2910H	McDougall et al. 2004	National Old Trails Highway	Amboy, Amboy Crater, Cadiz, etc.
		CA-SBR-3273H	Davis 1978	Mining/homestead	Cadiz Lake
		CA-SBR-3280H	Crowley 1978	Cadiz railroad camp	Cadiz Summit
		CA-SBR-3284H	Dietler 2001	Refuse deposit	Amboy
		CA-SBR-3285H/5810H	Rose and Berdzar 2001	Town/mining area with structures	Amboy
		CA-SBR-5514H	Turner 1982	Refuse deposit	Amboy
		CA-SBR-5811H	Rose and Berdzar 2001	Refuse deposit	Amboy
		CA-SBR-5812H	Dietler 2001	Refuse deposit	Amboy
		CA-SBR-5813H	Rose and Berdzar 2001	Refuse deposit	Cadiz
		CA-SBR-5814H	Lerch 1990	Railroad camp 1902-1920	Cadiz
		CA-SBR-6685H	Swope and Yohe 1990	Campsite	Amboy
		CA-SBR-6686H	Swope and Yohe 1990	Campsite	Amboy
		CA-SBR-6687H	Swope and Yohe 1990	Refuse deposit	Amboy
		CA-SBR-6688H	Lerch and Yohe 1990	Refuse deposit	Amboy
		CA-SBR-6689H	Swope and Yohe 1990	Campsite	Amboy

Table J-3. Identified Cultural Resources Outside Study Areas but Within the Area of Indirect Effect (5-Mile Radius)

Study Area	Era	Site	Site Record	Description	USGS 7.5' Quad
East (cont.)	Historic (cont.)	CA-SBR-6690H	Swope and Yohe 1990	Refuse deposit	Amboy
		CA-SBR-6691H	Lerch and Quintero 1990	Refuse deposit	Cadiz
		CA-SBR-6692H	Lerch and Goodman 1990	Telephone pole insulator cache	Cadiz
		CA-SBR-6693H	Easter and Bircheff 1999	AT & SF Railroad	Amboy, Cadiz, Cadiz Summit
		CA-SBR-6694H	Lerch 1990	Road and poleline	Cadiz
		CA-SBR-6834H	Lerch and Johnson 1990	Refuse deposit	Cadiz
		CA-SBR-9857H	Dietler and Toenjes 2001	Mining site	Cadiz Lake NE
		CA-SBR-10638H	Dietler and Toenjes 2001	Refuse deposit	Cadiz
		CA-SBR-10652H	Rose and Berdzar 2001	Refuse deposit	Cadiz
		CA-SBR-10653H	Rose and Berdzar 2001	Road segments (3)	Cadiz
		CA-SBR-10654H	Rose and Berdzar 2001	Refuse deposit	Cadiz
		CA-SBR-11503H	Fulton and Gibson 2003	Residential structure remnant	Cadiz Summit
		CA-SBR-11584H	Underwood and Hilliard 2004	Cadiz-Cadiz Summit Road	Cadiz, Cadiz Summit
		CA-SBR-11648H	McDonald and Cottrell 2004	Refuse deposit	Bristol Lake NW
		CA-SBR-13584H	McKenna et al. 2001	Bridge	Cadiz
		CA-SBR-13585H	Sheets and Coats 2007	Cabin foundation	Cadiz
West	Prehistoric	CA-SBR-118/H	Troike 1955	Lithic scatter and historic refuse	Old Woman Springs
		CA-SBR-554	Walker 1969; King 1972; Mone 1979	"Jellyroll Cave"	Grand View Mine
		CA-SBR-1185	MacGregor (no date)	Rockshelter	Grand View Mine
		CA-SBR-1531	Smith and MacGregor (no date)	Rockshelter	Grand View Mine
		CA-SBR-1532	Hammond (no date)	Midden	Grand View Mine
		CA-SBR-1533	Smith and MacGregor (no date)	Rockshelter	Grand View Mine
		CA-SBR-1569	Shepard 1964	Rockshelter	Grand View Mine
		CA-SBR-2846	Wilke 1978	"Going Home Rockshelter"	Grand View Mine
		CA-SBR-4350/H	Teal 1980	Habitation and historic refuse	Old Woman Springs
	Historic	CA-SBR-9590H	Swope and Hammond 1998	Refuse deposit and well	Old Woman Springs
		CA-SBR-9591H	Swope and Hammond 1998	Refuse deposit	Old Woman Springs
South	Historic	CA-SBR-10525H	Purcell 2000	State Route 62	Valley Mountain

Table J-3. Identified Cultural Resources Outside Study Areas but Within the Area of Indirect Effect (5-Mile Radius)

Study Area	Era	Site	Site Record	Description	USGS 7.5' Quad
ASM RECORDED SITES					
East	Prehistoric	CA-SBR-13219	Lechner and Giambastiani 2009b	SRL	Cadiz
		CA-SBR-13220	Lechner and Giambastiani 2009b	SRL	Cadiz
		CA-SBR-13223	Lechner and Giambastiani 2009b	Habitation	Cadiz
		CA-SBR-13232	Lechner and Giambastiani 2009b	SRL	Amboy
		CA-SBR-13233	Lechner and Giambastiani 2009b	SRL	Cadiz Summit
East	Historic	CA-SBR-13234H	Lechner and Giambastiani 2009b	Refuse deposit	Cadiz Summit
		CA-SBR-13235H	Lechner and Giambastiani 2009b	Refuse deposit	Cadiz Summit
		CA-SBR-13236H	Lechner and Giambastiani 2009b	Refuse deposit	Bristol Lake NW
West	Prehistoric	CA-SBR-12937	Lechner and Giambastiani 2009a	SRL	Old Woman Springs
	Historic	CA-SBR-12947H	Lechner and Giambastiani 2009a	Refuse deposit	Fry Mountains
South	Historic	CA-SBR-12957H	Lechner and Giambastiani 2009a	Refuse deposit	Valley Mountain
		CA-SBR-12958H	Lechner and Giambastiani 2009a	Refuse deposit	Valley Mountain
		CA-SBR-12959H	Lechner and Giambastiani 2009a	Refuse deposit	Valley Mountain
		CA-SBR-12960H	Lechner and Giambastiani 2009a	Refuse deposit	Valley Mountain

Legend: DSN = Desert Side-notched; SRL = segregated reduction locus.

J.3 KNOWN SITES AND PRELIMINARY NRHP ELIGIBILITY

Table J-4. Known Sites and Preliminary NRHP Eligibility, East Study Area

Site	Description	Age	Evaluated for NRHP Eligibility	Data Potential	Preliminary NRHP
CA-SBR-3243	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-4150	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-4759	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-5815	Rock ring	Prehistoric	No	NA	U
CA-SBR-6682	Habitation	Prehistoric	No	NA	U
CA-SBR-9848	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-9852	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-13214	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13215	Habitation	Prehistoric	Yes	High	E
CA-SBR-13216	Habitation	Prehistoric	Yes	High	E
CA-SBR-13217	Habitation	Prehistoric	Yes	High	E
CA-SBR-13218	Habitation	Prehistoric	Yes	High	E
CA-SBR-13219	SRL	Prehistoric	Yes	Low	I
CA-SBR-13220	SRL	Prehistoric	Yes	Low	I
CA-SBR-13221	SRL	Prehistoric	Yes	Low	I
CA-SBR-13223	Lithic scatter	Prehistoric	Yes	Moderate	E
CA-SBR-13225	Habitation	Prehistoric	Yes	Moderate	E
CA-SBR-13227	SRL	Prehistoric	Yes	Low	I
CA-SBR-13228	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13229	Habitation	Prehistoric	Yes	High	E
CA-SBR-13230	Habitation	Prehistoric	Yes	Moderate	E
CA-SBR-13231	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13232	SRL	Prehistoric	Yes	Low	I
CA-SBR-13233	SRL	Prehistoric	Yes	Low	I
CA-SBR-13326	Ceramic scatter	Prehistoric	Yes	Low	I
CA-SBR-13327	SRL	Prehistoric	Yes	Low	I
CA-SBR-13328	Habitation	Prehistoric	Yes	High	E
CA-SBR-13329	Lithic scatter	Prehistoric	Yes	Moderate	E
CA-SBR-13330	Lithic scatter	Prehistoric	Yes	Moderate	E
CA-SBR-13331	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13332	Habitation	Prehistoric	Yes	High	E
CA-SBR-13333	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13334	Habitation	Prehistoric	Yes	Moderate	E

Table J-4. Known Sites and Preliminary NRHP Eligibility, East Study Area

Site	Description	Age	Evaluated for NRHP Eligibility	Data Potential	Preliminary NRHP
CA-SBR-13335	Lithic scatter	Prehistoric	Yes	Moderate	E
CA-SBR-13336	Habitation	Prehistoric	Yes	High	E
CA-SBR-13337	Habitation	Prehistoric	Yes	High	E
CA-SBR-13338	Habitation	Prehistoric	Yes	Moderate	E
CA-SBR-13339	Lithic scatter	Prehistoric	Yes	High	E
CA-SBR-13340	Lithic scatter	Prehistoric	Yes	Moderate	E
ASM-EA-KIS-3✳	SRL	Prehistoric	Yes	Low	I
ASM-EA-KIS-5✳	SRL	Prehistoric	Yes	Low	I
ASM-EA-TL-2✳	Lithic scatter	Prehistoric	Yes	Low	I
ASM-EA-TL-3✳	Habitation	Prehistoric	Yes	Moderate	E
ASM-EA-TL-4✳	Lithic scatter	Prehistoric	Yes	High	E
ASM-EA-TL-5✳	Lithic scatter	Prehistoric	Yes	Low	I
ASM-EA-TL-6✳	Lithic scatter	Prehistoric	Yes	High	E
ASM-EA-TL-7✳	Habitation	Prehistoric	Yes	High	E
ASM-EA-TL-8✳	Habitation	Prehistoric	Yes	High	E
ASM-EA-TL-9✳	Lithic scatter	Prehistoric	Yes	High	E
ASM-EA-TL-10✳	Habitation	Prehistoric	Yes	High	E
CA-SBR-3282H	Cemetery and well	Historic	No	NA	U
CA-SBR-9849H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-9850H	Railroad maintenance camp	Historic	Yes	Moderate	E
CA-SBR-9853H	Santa Fe Railroad - Parker Branch	Historic	Yes	Low	I
CA-SBR-9851H	Railroad maintenance camp	Historic	Yes	Moderate	E
CA-SBR-9856H	Refuse deposit	Historic	Yes	Moderate	E
CA-SBR-10644H	Military refuse deposit, WWII-era	Historic	No	NA	U
CA-SBR-11582H	Military camp, 1964 Desert Strike	Historic	Yes	Low	I
CA-SBR-11583H	Cadiz-Rice Road	Historic	Yes	Low	I
CA-SBR-11586H	Pacific Telephone/Telegraph line	Historic	Yes	Moderate	E
CA-SBR-13213H	Dry well	Historic	Yes	Low	I
CA-SBR-13222H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13224H	Military	Historic	Yes	Moderate	E
CA-SBR-13226H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13234H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13235H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13236H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13325H	Pacific Telephone/Telegraph pole	Historic	Yes	Low	I

Table J-4. Known Sites and Preliminary NRHP Eligibility, East Study Area

Site	Description	Age	Evaluated for NRHP Eligibility	Data Potential	Preliminary NRHP
CA-SBR-13341H	Mining and refuse deposit	Historic	Yes	Low	I
ASM-EA-KIS-1✳	Refuse deposit	Historic	Yes	Low	I
ASM-EA-KIS-2✳	Refuse deposit	Historic	Yes	Low	I
ASM-EA-KIS-4✳	Mining	Historic	Yes	Low	I
ASM-EA-TL-1✳	Military	Historic	Yes	Moderate	E
ASM H-1✳	Mining and refuse deposit	Historic	Yes	Low	I
ASM H-2✳	Mining camp	Historic	Yes	Moderate	E
ASM H-3✳	Chambless Homestead	Historic	Yes	High	E
ASM H-4✳	Amboy Road	Historic	Yes	Low	I
ASM H-6✳	Archer Railroad Station	Historic	Yes	High	E
ASM H-7✳	Railroad maintenance camp	Historic	Yes	Moderate	E
ASM H-8✳	Railroad maintenance camp	Historic	Yes	Moderate	E
ASM H-9✳	Railroad maintenance camp	Historic	Yes	Moderate	E
ASM H-10✳	Railroad maintenance camp	Historic	Yes	Moderate	E
ASM H-11✳	Refuse deposit	Historic	Yes	Low	I
ASM H-12✳	Refuse deposit	Historic	Yes	Low	I

Notes: NA. Not Applicable; E = eligible; I = ineligible; U, unevaluated; SRL = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

Table J-5. Known Sites and Preliminary NRHP Eligibility, South Study Area

Site	Description	Age	Evaluated for NRHP Eligibility	Data Potential	Preliminary NRHP
CA-SBR-12961	SRL	Prehistoric	Yes	Low	I
CA-SBR-12962	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12963	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12964	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12956H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-12957H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-12958H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-12959H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-12960H	Refuse deposit	Historic	Yes	Low	I

Notes: I = Ineligible; SRL = segregated reduction locus.

Table J-6. Known Sites and Preliminary NRHP Eligibility, West Study Area

Site	Description	Age	Evaluated for NRHP Eligibility	Data Potential	Preliminary NRHP
CA-SBR-1811	Rock Art (unclassified)	Prehistoric	No	NA	U
CA-SBR-1883	Ceramics and projectile point	Prehistoric	No	NA	U
CA-SBR-3812	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-3813	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-3820	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-3843	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-3844	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-3845	Lithic scatter	Prehistoric	No	NA	U
CA-SBR-1880	Habitation	Prehistoric	Yes	High	E
CA-SBR-12929	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12930	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12931	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12932	SRL	Prehistoric	Yes	Low	I
CA-SBR-12933	Habitation	Prehistoric	Yes	High	E
CA-SBR-12934	Lithic quarry	Prehistoric	Yes	Moderate	E
CA-SBR-12935	SRL	Prehistoric	Yes	Low	I
CA-SBR-12936	SRL	Prehistoric	Yes	Low	I
CA-SBR-12937	SRL	Prehistoric	Yes	Low	I
CA-SBR-12942	Habitation	Prehistoric	Yes	High	E
CA-SBR-12944	Possible trail	Prehistoric	Yes	Low	I
CA-SBR-12949	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12950	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12951	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12952	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12953	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-12954	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13358	Habitation	Prehistoric	Yes	Moderate	E
CA-SBR-13359	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13360	Habitation	Prehistoric	Yes	Low	I
CA-SBR-13361	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13362	Habitation	Prehistoric	Yes	High	E
CA-SBR-13363	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13365	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13366	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13368	Habitation	Prehistoric	Yes	High	E

Table J-6. Known Sites and Preliminary NRHP Eligibility, West Study Area

Site	Description	Age	Evaluated for NRHP Eligibility	Data Potential	Preliminary NRHP
CA-SBR-13369	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-13370	Habitation	Prehistoric	Yes	High	E
CA-SBR-13371	Lithic scatter	Prehistoric	Yes	Low	I
ASM-WA-CL-1✳	Lithic scatter	Prehistoric	Yes	Low	I
CA-SBR-8946H	"Emerson Mill"	Historic	Yes	Moderate	E
CA-SBR-12938H	Mining and refuse deposit	Historic	Yes	Low	I
CA-SBR-12939H	Military bombing target, WW II-era	Historic	Yes	Moderate	I
CA-SBR-12940H	Prospect and refuse deposit	Historic	Yes	Low	I
CA-SBR-12941H	Prospect and refuse deposit	Historic	Yes	Low	I
CA-SBR-12943H	Prospect	Historic	Yes	Low	I
CA-SBR-12945H	Refuse deposit	Historic	Yes	Moderate	I
CA-SBR-12946H	Prospect and refuse deposit	Historic	Yes	Low	I
CA-SBR-12947H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-12948H	Mining and refuse deposit	Historic	Yes	Moderate	I
CA-SBR-12955H	Mining and road/"Los Padres Mine"	Historic	Yes	Low	I
CA-SBR-13357H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13364H	Mining	Historic	Yes	Low	I
CA-SBR-13367H	Refuse deposit	Historic	Yes	Low	I
CA-SBR-13372H	Refuse deposit	Historic	Yes	Low	I
ASM-WA-CL-2✳	Mine shaft and refuse deposit	Historic	Yes	Low	I
ASM-WA-TL-1✳	"Means Well"	Historic	Yes	Low	I
ASM-WA-TL-2✳	Refuse deposit	Historic	Yes	Low	I
ASM-WA-TL-3✳	Refuse deposit	Historic	Yes	Low	I
ASM-WA-H-13✳	"Los Padres Mine" (CA-SBR-3405)	Historic	Yes	Moderate	E
ASM-WA-H-14✳	Mining and refuse deposit	Historic	Yes	Moderate	E
ASM-WA-H-15✳	Mining and refuse deposit	Historic	Yes	Moderate	E
ASM-WA-H-18✳	Transmission/telephone line	Historic	Yes	Low	I

Notes: E = eligible; I = ineligible; SRL = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

J.4 REGIONAL CULTURAL CONTEXT

Archaeological research on the prehistory of the Mojave Desert has been conducted for roughly a century, with particular attention directed at chronology and human-environment adaptations. Warren (1984; Warren and Crabtree 1986; see also Whitley et al. 1988; Sutton 1996) has synthesized much of the resulting data, developing a temporal sequence that is widely cited by regional researchers. The summary below largely follows Warren's cultural-historical model.

It is important to note at the outset that the contemporary Mojave Desert climate and environment differ, in some cases substantially, from conditions during the prehistoric past. The earliest human occupation of the region occurred during the Late Pleistocene, or Ice Age. This period was colder and wetter than today, including times when large lakes or lake systems filled the internally-draining basins that are common in the region. The overall trend since the start of the Holocene (or contemporary) period, 10,000 years ago, has been toward the current, relatively warmer and drier Mojave Desert. However, recent research has demonstrated that climatic and environmental changes have been far from unidirectional since the Pleistocene, with oscillations between warm-cold and wet-dry periods (e.g., Bender et al. 1994; Meese et al. 1994; Bach 1995; Ramirez and Bryson 1996; Bond et al. 1999; Perry and Hsu 2000). The latest studies identify 12 wet and 13 dry periods in the last 12,500 years alone (Liu and Broecker 1999, 2007, 2008a, 2008b; Liu et al. 2000; Broecker and Liu 2001). These intervals range from 1,800 to 250 years, averaging 1,000 years in length. One implication of this back-and-forth change is that the dry mud playas currently covering many valley bottoms held lakes for certain periods during the Holocene, and that these lakes may have been important factors in environmental adaptation and prehistoric settlement patterns (Warren n.d.). Another is that human occupation in and adaptation to the Mojave required periodic adjustments to these sometimes rapidly changing conditions and environments.

Prehistoric Context

Late Pleistocene (circa 12,000 – 10,000 YBP)

Although the timing of earliest human entry into the Americas has not yet been determined, substantial evidence indicates that the Mojave Desert was occupied during the Late Pleistocene, by at least 10,000 YBP (years before present) if not earlier (e.g., Rogers 1939; Brott 1966; Davis and Shutler 1969; Davis 1975; Davis and Panlaqui 1978; Skinner 1984; Warren et al. 1989; Basgall and Hall 1991; Yohe 1992; Basgall 2004, 2007; Warren 2008; Giambastiani and Bullard 2010). This interval is commonly called the Paleoindian period and, in the Mojave Desert, has characteristic artifacts such as large, basally-fluted stone spear tips called "Great Basin Concave Base" or, alternatively, "Western Fluted" points (Beck and Jones 2010). These are similar to well known Clovis points from the Plains area of North America but tend to be of somewhat smaller stature. Western Fluted points are most frequently found as isolated surface finds (rather than in site assemblages), complicating interpretations of Paleoindian population size, environmental adaptation, and even chronology. However, many have been discovered near Pleistocene lake shorelines, implying that subsistence patterns at least partly emphasized lacustrine resource use. Human populations in the Mojave Desert during Paleoindian times are generally believed to have been small and very mobile, hence the seeming paucity of substantial residential sites. Studies of obsidian and other stone tool sources also indicate that Paleoindian peoples had extensive settlement ranges and may have participated in long-distance trade.

Early Holocene (10,000 – 7500 YBP)

The Early Holocene occupation of the Mojave Desert is marked by a change in projectile point styles, with the appearance of so-called "Great Basin Stemmed" points. This interval is sometimes called the

Lake Mohave period (see Amsden 1937; Campbell et al. 1937; Harrington 1957; Hunt 1960; Borden 1971; Davis 1973; Davis and Panlaqui 1978; Meighan 1981; Warren 1984; Jenkins 1991; Basgall and Hall 1991, 1994; Basgall 1993). Earlier studies suggested that Lake Mohave sites occurred only along ancient lakeshores, like the Paleoindian sites (Bedwell 1970, 1973; Hester 1973). Recent research indicates that Lake Mohave site distribution is more variable than first thought (e.g., Warren 1967, 1980; Borden 1971; Basgall and McGuire 1988; Jenkins 1991;) and is not restricted to lakeshores alone. Lake Mohave period stone tool assemblages show considerable variability, including diversity in the use of tool stones. Animal bones in sites (and thus the animal-food diet), in contrast, exhibit little change over time during this period (Jenkins 1985; Warren et al. 1986; Douglas et al. 1988; Hall 1991; Basgall 1991, 1993), with a focus on small rather than large game mammals (Douglas et al. 1988; Basgall 1991; Basgall and Hall 1992).

Middle Holocene (7500 – 4000 YBP)

The Pinto period dates to the Middle Holocene, an interval that may include a hot and dry climatic stage known as the Altithermal (Antevs 1955). The Pinto period is signaled by the appearance of “Pinto” projectile points, with tipped darts used with atlatls or spear-throwers (Campbell and Campbell 1935; Rogers 1939, 1966; Harrington 1957; Hunt 1960; Smith 1963; Borden 1971; Warren 1980, 1985; Meighan 1981; Schroth 1994). While Pinto residential sites are somewhat more common than those of Lake Mohave or Paleoindian times, they are still few in number and testify to an increased but relatively low population density. The distribution of Pinto sites may reflect regional population variations: they appear to be more common in the central and southern than in the northern Mojave Desert (Whitley et al. 1988; Lechner and Giambastiani 2009a). Pinto tool assemblages include significant numbers of ground stone implements used for seed grinding (millingstones and handstones), indicating a relatively greater emphasis on vegetal foods. Faunal assemblages from Fort Irwin and Twentynine Palms reflect a hunting focus on small game such as rabbits, hares, rodents, and reptiles, with larger mammals taken opportunistically (Douglas et al. 1988; Basgall 1990; Hall 1992; Basgall and Hall 1993; Welsh 2000). The implication is that subsistence practices were generalized rather than specialized, and diet breadth somewhat greater than during the previous two periods (Giambastiani and Basgall 2000).

Late Holocene (4000 YBP – Historic)

Following Warren (1984), three cultural intervals are recognized during the last 4,000 years of Mojave Desert prehistory: the Gypsum (4000-1500 YBP), Saratoga Springs (1500-700 YBP), and Shoshonean (700-100 YBP) periods. Gypsum sites typically have “Gypsum,” “Elko,” and/or “Humboldt” style dart points. Residential sites are common and are typically located on valley bottoms near springs. Because many of these sites continued to be occupied through Saratoga and into Shoshonean times, they are assumed to be winter settlements representing the aggregation phase of the seasonal adaptive round—following the ethnographic pattern documented during the historic period. This was the time of year when families congregated at a central habitation site, living off stored resources until the spring when they could disperse into single-family units for greater mobility and efficiency.

The subsequent Saratoga Springs period is marked by the appearance of “Rose Spring” or “Saratoga Springs” arrow points, representing a change in hunting technology from the atlatl-and-dart to the bow-and-arrow (Yohe 1992). A shift in arrow point styles occurred during the following Shoshonean period, with the smaller “Desert Side-Notched” and “Cottonwood Triangular” points in use. A variety of ground stone tools, needed for plant processing, is common throughout the Late Holocene, signaling the importance of vegetal resources for the last 4,000 years.

Two cultural processes further characterize human adaptations in the Mojave Desert during the Late Holocene. The first was a shift toward intensified land-use strategies, resulting from changes in environmental productivity, population size and dynamics, and in subsistence-settlement organization and technology. The second was the influence of Southwestern cultures on desert inhabitants. This was manifested in the development of long-distance trade, the diffusion of material culture and adaptive strategies (e.g., irrigation agriculture), and in the occupation of certain desert regions by Southwest groups.

Ethnographic Context

The ethnographic period began with the entry of the Spanish into the Mojave Desert in the 1770s, although heavy Euro-American influence on the local tribes did not develop until after about 1820. While a number of aboriginal groups shared portions of the central Mojave Desert during contact times, the two main groups known to have regularly used the Johnson Valley-Twentynine Palms region are the Serrano and the Chemehuevi. Both groups are Uto-Aztecans linguistically, although the first are members of the Takic branch, whereas the second are Southern Paiute (Numic branch) speakers.

The broad desert region containing Lucerne Valley, Johnson Valley, and extending east to Twentynine Palms was evidently inhabited by groups of Serrano people (Benedict 1924; Kroeber 1925:Plate 57; Strong 1929: Map 1, Table 1; Bean and Smith 1978). Although possible earlier contacts may have occurred between the Serrano and Euro-Americans, most historical sources mark the first encounter in 1776 when Francisco Garcés visited a community of about 40 people near present-day Victorville. Kroeber (1925) estimates the pre-contact Serrano population at roughly 1,500 people, while Bean and Smith (1978) suggest approximately 2,500. Spanish influence on the Serrano was limited until about 1819, when an asistencia was built near Redlands, and by 1834 most of the western Serrano had been moved to southern California missions like San Gabriel (Cook 1943; Bean and Smith 1978). Strong (1929:5) noted that the 1910 federal census identified 119 Serrano.

Prior to contact, the desert-dwelling Serrano maintained a hunting and gathering economy. Staple plant foods included acorns, pinyon nuts, yucca (flowers, stalks, and roots), mesquite, screwbeans, and cactus fruit, these often supplemented with various roots, bulbs, shoots, and seeds like chia (Salvia columbariae) and ricegrass (Oryzopsis spp.). Principal game included deer, mountain sheep, rabbits and larger rodents, and many birds (Bean and Smith 1978). Various basketry tools were used to gather, winnow, and cook plant foods (Bean and Vane 2002), many of which were stored in large, elevated basketry granaries at village locations. Pottery was also used for food storage, particularly to hold mesquite and pinyon flour (Benedict 1924). Hunting was accomplished with throwing sticks, various types of traps, nets and snares, sinew-backed bows and arrows (Drucker 1937; Bean and Smith 1978). Principal trading partners were the Mojave people to the east and the Gabrielino to the west, but they also traded often with their closer neighbors, the Chemehuevi and Cahuilla.

Families traditionally lived in single-family dwellings that were circular, domed, or conical structures with central fire-pits. The walls were constructed of willow frames with exterior tule thatching secured with yucca withes (Drucker 1937; Bean and Smith 1978). Each house generally had a small “ramada” attached to it, an unwalled shade structure consisting of a willow-framed roof covered with thatching and supported by poles (Benedict 1924; Kroeber 1925; Drucker 1937). The homes of several families were generally clustered in small groups, each of which usually had shared facilities such as granaries, a sweathouse, and a larger ceremonial house where the lineage leader resided (Strong 1929; Bean and Smith 1978).

Basic items of material culture included baskets, pottery, rabbit skin blankets, awls, arrow straighteners, bows and arrows, mortars and pestles, stone pipes, musical instruments, bags and pouches, mats, and cordage (Bean and Smith 1978). Baskets were fabricated from yucca fiber, willow, and other reeds and grasses found in the area, while pots were made by coiling, smoothed with a paddle and anvil, and left undecorated (Benedict 1924; Stickel et al. 1980). Arrows were made of hardwood and tipped with stone points (Drucker 1937), and food-grinding tools featured basketry hoppers with portable stone mortars (attached with adhesive), deep wooden mortars, and bedrock mortars (Benedict 1924; Drucker 1937). Fibers of yucca, agave, and other plants were used to make clothing and other textiles, mats, and cordage.

A series of tribal territorial changes apparently occurred in the Las Vegas area of southern Nevada and along the Colorado River, between Arizona and California, during the historical period. One of these involved the movement of the Chemehuevi, a dialectical group of the Southern Paiute, into the region. The southwestern limits of Chemehuevi territory apparently extended west from the Colorado River to the San Bernardino Mountains (bordering the Serrano), north to the Kingston Range south of Death Valley, and south beyond Joshua Tree National Park to the vicinity of Palm Springs and Indio (bordering the Desert Cahuilla). Kelly and Fowler (1986; Kelly 1934) draw Chemehuevi territory roughly between Needles and Blythe along the Colorado and extending west to Bristol Lake and Danby Lake, but not including Twentynine Palms. Baksh and Hilliard (2005) also place Twentynine Palms within Serrano, not Chemehuevi territory, but allow the latter more acreage west of Bristol and Danby Lake. Kroeber (1925) also argued that Twentynine Palms was not part of traditional, or "old" Chemehuevi territory; but, following a war between the Mojave and Chemehuevi from 1864 to 1867 (Kroeber and Kroeber 1973), many Chemehuevi fled into the Mojave Desert and ultimately settled in places like the Coachella Valley and Twentynine Palms (Kroeber 1925; Johnston 1965; Miller and Miller 1967; Trafzer et al. 1997; Bean and Vane 2002; Baksh and Hilliard 2005).

In 1867, efforts were made to convince the group of Chemehuevi at Twentynine Palms to move to the Colorado River Indian Reservation, but to no avail. The group persisted over the next few years in the face of increasing Euro-American settlement, even when denied access to water at the Oasis of Mara by the Southern Pacific Railroad Company in the early 1870s (Trafzer et al. 1997; Bean and Vane 2002). A reservation for the Chemehuevi at Twentynine Palms (including some Serranos) was patented in 1895, placing the group under the supervision of the Mission Indian Agency. Most of the families were removed to the Morongo Reservation in 1908 so that their children could be (forcibly) enrolled in school. In 1910, the government issued a trust patent for 640 acres jointly to the Cabazon and Twentynine Palms Bands of Mission Indians, and encouraged the Chemehuevi at Twentynine Palms to move to the Cabazon reservation. When conflict eventually arose between Chemehuevis and Cahuillas at Cabazon, most of the Chemehuevis left, some returning to Twentynine Palms for a time. The federal census of that year recorded 260 Chemehuevi in California (Kroeber 1925).

At settlements along the Colorado River, pre-contact Chemehuevi practiced horticulture and grew corn, winter wheat, sunflower, beans, squash, pumpkins, watermelons, muskmelons, and other foods (Kelly and Fowler 1986). Kroeber (1925) downplayed the role of agriculture in Chemehuevi subsistence, as did Bean and Vane (2002), but it was certainly an important part of riverine life. The desert adaptation of the Chemehuevi, however, was very similar to that of their western Serrano neighbors. Staple plant foods in upland and foothill environments included pinyon nuts, yucca (flowers, stalks, and roots), agave, and cactus fruit, along with berries (e.g., Lycium spp.) and ricegrass; aphid sugar from Carrizo grass (Phragmites spp.) was also an important low altitude resource (Earle 2003). Mesquite, screwbeans, and various salt-tolerant, seed-bearing plants (e.g., saltgrass [Distichlis spicata]) were exploited in playa basin landscapes. Principal game included the chuckwalla, lizards, desert tortoise, rabbits and larger rodents, and many birds (Bean and Vane 2002), although antelope and bighorn sheep were pursued whenever present (Kelly and Fowler 1986). The Chemehuevi were skilled basketmakers, using various basketry tools to gather, winnow, and parch pinyon nuts and seeds (Kelly and Fowler 1986) and making water jugs, caps, cradles, and other items of woven plants (Kroeber 1925). Pottery was made occasionally at riverine settlements but was not much used by desert groups. Hunting was accomplished with various types of throwing clubs, traps, nets and snares, sinew-backed bows, and arrows fitted with stone points (Drucker 1937; Kelly and Fowler 1986). The Chemehuevi were amicable with many surrounding groups, including the Shoshone, Kawaiisu, Serrano, Vanyume, Cahuilla, and Diegueño, but were most closely aligned with the Mojave. In fact, Chemehuevi groups that eventually settled along the Colorado River adopted many Mojave cultural traits of material, social, and religious nature (Kroeber 1925; Kelly and Fowler 1986; Earle 2003).

In winter, desert families lived in small dwellings that were circular, domed, or conical structures with central firepits. Walls were constructed of juniper or willow frames with exterior brush, bark, or other thatching. Some of the more permanent villages had a communal, flat-topped shade house, a large, unwalled shade structure consisting of a wood-framed roof covered with thatching and supported by poles (Benedict 1924; Kroeber 1925; Drucker 1937; Kelly and Fowler 1986). Basic items of material culture included baskets, pottery, rabbit skin blankets, awls, arrow straighteners, bows and arrows, mortars and pestles, stone pipes, musical instruments, bags and pouches, mats, and cordage.

Historic Euroamerican Context

Overviews of Euro-American history in the Mojave Desert have been published by Peirson (1970), Stickel et al. (1980), Vredenburgh et al. (1981), and Smith (2006). The brief sketch presented here summarizes these sources, with an emphasis on the Johnson Valley-Twentynine Palms area.

Initial Euro-American interest in the Mojave Desert emphasized exploration and travel, initially with the desert area representing little more than an impediment in east-to-west movements. Francisco Garcés was the first Euro-American credited with crossing the desert. He was a member of Captain Juan Bautista de Anza's 1774-5 expedition, which was tasked with finding an overland route for supplies, livestock, families, and missionaries from New Spain to the coastal settlements of Alta California (Stickel et al. 1980). Garces was followed sporadically by a series of additional explorers, including Jedediah Smith (in 1826), George C. Yount (1827), James O. Pattie (1828), and Ewing Young (1829). In 1830 Antonio Armijo, a Mexican merchant, took the first caravan of pack animals from Santa Fe, NM, all the way across the Mojave and through Cajon Pass. Armijo's route became known as the Spanish Trail and it served as the main caravan route between Santa Fe and Los Angeles (Stickel et al. 1980).

California by the early 1850s had become a part of the United States, and was experiencing significant immigration, partly if not largely due to the 1849 Gold Rush. One result was the need for a transcontinental railroad. In 1853, four surveys were organized by the War Department to find the most practical route to the Pacific. Lt. Robert Stockman Williamson led a survey of the Mojave Desert for this effort. At about the same time, other federal agencies began to sponsor land surveys in and around the Mojave Desert. In 1852, the Boundary Commission sent Col. Henry Washington to erect a baseline monument on Mt. San Bernardino, which became a fixed reference point for all future southern California surveys. In 1855, Washington was dispatched into the central Mojave, mapping areas in Morongo Valley, near the Oasis of Mara, and along the southern end of Johnson Valley (Stickel et al. 1980). The first transcontinental railroad was completed in 1869, linking the Central Pacific and Union Pacific lines. Near the end of its construction in early 1868, General William J. Palmer (Director of Surveys for Union Pacific) began surveying parts of the Mojave Desert in search of a route for a second transcontinental railroad. His surveys brought him through Morongo Valley in an effort to find a connecting route to San Diego.

Westbound wagon traffic also increased in the late 1850s along the Spanish Trail or, as it was then known, the Mormon Road. This ultimately led to a rise in hostilities between native people still living in the desert and the immigrants. In an effort to protect U.S. citizens, the government set out military detachments to construct and man various redoubts and forts in the Mojave Desert. Some of these were located near the Colorado River, including Fort Mojave (active by 1859) and Camp Cady (ca. 1860), but others were erected at Marl Springs, Rock Springs, and Bitter Springs (Belden 1964; Hardesty 1988). The presence of the military in the desert temporarily worsened conditions, resulting in battles and the forced removal of Indians to reservations, but by the early 1870s much of the conflict had ceased.

Mining also played a significant role in Mojave Desert history. The first miners in the region were those passing through on their way to the goldfields of northern California. Gold and silver mining in the Mojave developed in the 1880s, although there are reports of earlier activities. The initial excitement continued until 1885 when the price of silver dropped (Nadeau 1999). There was a brief but short-lived revival in 1890. Later in the 1890s, many men went back into the Mojave looking for gold; this surge continued past the turn of the twentieth century but quickly dwindled. In addition to the precious metals, mining in borates, copper, tungsten, iron, and non-metals established the Mojave as a keystone to the California mining industry in the early decades of the twentieth century. The Great Depression sent the unemployed into the desert in the 1930s to renew efforts in locating gold (Stickel et al. 1980). The mining of various ores and other materials has continued in the Mojave sporadically since that time, depending largely on fluctuations in production costs, as well as demand and value on the world market.

The initial Euro-American settlement of the Johnson and Morongo Valleys area resulted from ranching and homesteading, with grazing apparently occurring as early as the 1870s (Stickel et al. 1980:166). The first homesteader may have been Peter Davidson, who settled at Rabbit Springs (the original name for the area), north of the present-day town of Lucerne Valley, and lived there until he died in 1902. His homestead was an important way-station for miners and prospectors, and became a frequented crossroads in the 1880s and 1890s (Stickel et al. 1980).

In 1895, Albert Swarthout filed on a piece of land in Lucerne Valley in the hopes of establishing a cattle ranch (Wilson 1992), subsequently also homesteading the location of Old Woman Springs. He constructed major developments to the water source there, and by 1909 had a working 400-acre ranch with a house, orchards, and 9 acres of alfalfa (Stickel et al. 1980; Wilson 1992). In 1912, the name Lucerne Valley was given to the area by Dr. F. J. Gobar, a physician from Fullerton, California, who homesteaded near Rabbit Springs because he apparently "liked the climate" (Stickel et al. 1980). The word "lucerne" is a synonym for "alfalfa," and was probably applied to the area for the many alfalfa fields growing there at the time.

The first known Euro-American residents of Morongo Valley (originally called Little Morongo Valley) were the deCrevecouer families, who settled there in 1873. The nearby town of Yucca Valley (first named Yucca Village) was established a few miles west of the crossroads of what are now the Twentynine Palms Highway and Old Woman Springs Road. The former was an old wagon road from Banning to Twentynine Palms, and the latter a route between the Victorville area and the Dale Mining District, both established sometime in the 1860s. Early settlers included Mark Warren (circa 1880), William L. Burton (1888), and Joseph W. Preston and R. J. Martin (both in 1889). Ranches and settlements continued to spread out slowly from Yucca Village subsequently, but a store did not open until 1931. The Twentynine Palms Highway was paved in 1937, and electricity was available in Yucca Village by 1946, leading to the first real population boom in the area (Stickel et al. 1980).

Mining in the general region may have begun as early as 1859, with the first major discovery in Holcomb Valley in 1860. An influx of prospectors quickly followed the discovery with new services for the increasing population (O'Neal 1981:49-89; Vredenburgh et al. 1981). Miners began looking for minerals in the Morongo Valley area in the 1870s, but at that time no major mining operations yet existed.

The main surge in historic mining in the Morongo Valley area took place between 1890 and 1953, focusing on the search for gold, silver, copper, and iron. There are no available estimates of the number of prospectors that explored the area during this period, but it is likely that the bulk of mining occurred between the 1930s and early 1940s. While gold was a strong producer from this area, the extraction of iron from a few local mines was essential for the production of World War II maritime vessels and provided a boost to local settlement and the regional economy during the 1940s and 1950s.

History of the Combat Center

Military interest in the greater Twentynine Palms area began in January 1942 when the U.S. Army took control of a civil Twenty Nine Palms airfield and established Condor Field (Freeman 2002). The U.S. Army Air Corps (predecessor of the U.S. Air Force) constructed Condor Field as one was of the many WWII airfields built across California. Condor Field offered training for the first Army glider pilots and was one of three glider facilities (Bagley 1978; O'Hara 2007). Condor Field was thought to be the most efficient location to train glider pilots due to consistent and favorable wind and thermal conditions, allowing for longer training time for the pilots. From 1941 to 1943, Condor Field became a full-service air station with extensive runways, hangers, refueling, and maintenance facilities. However, it eventually became apparent to the Army Air Corps that sailplanes used at Condor Field for training were far different from the gliders that would be used during the war. Thereafter other advanced glider training bases were established across the U.S. and eventually glider planes made sailplanes training at Condor Field obsolete (National WWII Glider Pilots Association, Inc. 2009). Control of the facility was transferred to the Twentynine Palms Air Academy in 1943 for the purpose of training pilots in powered fighter planes. The next year, the Department of the Navy took command of the area establishing the Naval Auxiliary Air Station (NAAS) and began using the facility for flight training, particularly machine gun strafing and bombing (Ludwig 1989; MCAGCC ICRMP 2007).

The entry of the United States into WWII prompted the establishment of a number of wartime-related facilities across the country. One training facility established by the U.S. Army was the Desert Training Center (DTC)/California-Arizona Maneuver Area (C-AMA), an important stretch of land that crossed the deserts of southern California and western Arizona and provided enough space for wartime training exercises. Opened on April 30, 1942, DTC was the largest military training installation ever created (approximately 10,130 miles^2); it served the military for two years until April 30, 1944. The famed General George S. Patton, Jr. led the missions for training and field testing as its first commanding officer (Bischoff 2000; Meller 1946). Conditioning the troops for desert warfare environs and tactics proved a critical component in preparation for the North African Campaign. The DTC also provided a large space for field testing equipment and supplies before entering combat. Originally the DTC extended from the Colorado River on the east to a point slightly west of present-day Desert Center on the west, and from Searchlight, Nevada, on the north to Yuma, Arizona, on the south. This expansive and relatively isolated region was ideally suited for a military purpose in that it contained a variety of terrain types and no large population centers (Howard 1985:273-274; Schaefer and Laylander 2008). A series of 11 camps served both the DTC and the C-AMA with the headquarters, Camp Young, located near Indio, California. Seven of the 11 camps were located in California and four in Arizona. Larger divisional camps that may have deployed troops into the eastern project area include Camp Iron Mountain, Camp Coxcomb, and Camp Granite, all located approximately 10 to 20 mi. north of Desert Center. Each of these large divisional camps was named after mountains or mountain ranges near the locations of the camps. Troops deployed from these larger divisional camps would then often have to create smaller camps on multiple-day field or deployment exercises scattered throughout the training facility. A network of railroad lines such as the Cadiz-Rice branch AT&SF Railroad and major roads connected all the divisional camps and depots. Smaller camps and bivouacs sporadically dotted the desert landscape as posts for special field exercises such as practicing the defense of a mountain pass behind constructed rock blinds (Schaefer and Laylander 2008; Vredenburgh et al. 1981). The last training exercises were held at the C-AMA on April 30, 1944, when the Army closed C-AMA and abandoned its camps (General Patton Memorial Museum 2009). Deactivation of C-AMA required efforts to police the area, close the camps, and collect, salvage, and ship thousands of pieces of equipment and tons of material for reuse at other facilities (Lynch et al. 1982:15; Schaefer and Laylander 2008).

After WWII, the NAAS (previously Condor Field) was also closed and custody of the installation property transferred to San Bernardino County. On August 20, 1952, the U.S. Marine Corps selected Twentynine Palms as a site for increased open-space training. Necessitated by new developments in weapon technology, the present-day Combat Center property was activated as the Camp Detachment Marine Corps Training Center. Although the size of the installation (more than 998 mi2) has remained the same over the years, the name of the installation has changed several times over the years. The installation was named the Marine Corps Training Center in 1953, Marine Corps Base in 1957, Marine Corps Air Ground Combat Training Center in 1978 and C in 1979 (Ludwig 1989). Finally, in October 2000, command of the installation was transferred to the Marine Air Ground Task Force Training Command (MAGTF Training Command 2007).

The military sporadically trained in the deserts of southern California, including the eastern project area. In 1964, a majority of the old DTC/C-AMA land was utilized once more during a massive war-game training exercise – Joint Exercise Desert Strike (Desert Strike) – from May 17-30 (Underwood and Gregory 2004). The training exercise involved approximately 100,000 military personnel and covered a 12 million-acre area designed for training joint military operations. The military forces employed conventional and tactical nuclear weapons, tested contemporary electronic warfare capabilities, conducted intelligence operations, and evaluated the overall operations and procedures (Underwood and Gregory 2004). The selection of this area for the massive training exercise most likely had less to do with the desire to train in a desert environment than it did with the need for a large expense of land for solving larger operational problems and issues. During Desert Strike, the area just southeast of Cadiz was assigned as an assembly area that was able to utilize both the AT&SF railroad line and Route 66.

From the early days of General Patton's DTC to the expanded C-AMA and then the Cold War-era to contemporary times, the need for realistic and integrated training for the military has been vital to the preparedness of the U.S. military forces. General Patton addressed the importance of realistic training when discussing the proposed DTC and said, "The California desert can kill quicker than the enemy. We will lose a lot of men from heat, but the training will save hundreds of lives when we get into combat" (Bischoff 2000:10). During WWII, the need for realistic training for U.S. soldiers seemed to necessitate desert training at the DTC, but as the war progressed the ability to train in larger formations and operational levels achieved priority as part of C-AMA. It was during WWII that the world first recognized the importance and power of combined or integrated infantry, armor, and air power for military operations. Military establishments, such as Condor Field and the DTC/C-AMA, provided important and necessary training ground during WWII with reuse of DTC/C-AMA during the Cold War.

J.5 SITES AND PRELIMINARY NRHP ELIGIBILITY BY ALTERNATIVE

Table J-7. Sites and Preliminary NRHP Eligibility for Alternatives 1 and 4

Era	Site	Description	Study Area	Preliminary NRHP
Prehistoric	CA-SBR-1880	Habitation	West	E
	CA-SBR-12929	Lithic scatter	West	I
	CA-SBR-12930	Lithic scatter	West	I
	CA-SBR-12931	Lithic scatter	West	I
	CA-SBR-12932	SRL	West	I
	CA-SBR-12933	Habitation	West	E
	CA-SBR-12934	Lithic quarry	West	E
	CA-SBR-12935	SRL	West	I
	CA-SBR-12936	SRL	West	I
	CA-SBR-12942	Habitation	West	E
	CA-SBR-12944	Possible trail	West	I
	CA-SBR-12949	Lithic scatter	West	I
	CA-SBR-12950	Lithic scatter	West	I
	CA-SBR-12951	Lithic scatter	West	I
	CA-SBR-12952	Lithic scatter	West	I
	CA-SBR-12953	Lithic scatter	West	I
	CA-SBR-12954	Lithic scatter	West	I
	CA-SBR-12961	SRL	South	I
	CA-SBR-12962	Lithic scatter	South	I
	CA-SBR-12963	Lithic scatter	South	I
	CA-SBR-12964	Lithic scatter	South	I
	CA-SBR-13358	Habitation	West	E
	CA-SBR-13359	Lithic scatter	West	I
	CA-SBR-13360	Habitation	West	I
	CA-SBR-13361	Lithic scatter	West	I
	CA-SBR-13362	Habitation	West	E
	CA-SBR-13363	Lithic scatter	West	I
	CA-SBR-13365	Lithic scatter	West	I
	CA-SBR-13366	Lithic scatter	West	I
	CA-SBR-13368	Habitation	West	E
	CA-SBR-13369	Lithic scatter	West	I
	CA-SBR-13370	Habitation	West	E
	CA-SBR-13371	Lithic scatter	West	I
	ASM-WA-CL-1✳	Lithic scatter	West	I

Table J-7. Sites and Preliminary NRHP Eligibility for Alternatives 1 and 4

Era	Site	Description	Study Area	Preliminary NRHP
Historic	CA-SBR-8946H	“Emerson Mill”	West	E
	CA-SBR-12938H	Mining and refuse deposit	West	I
	CA-SBR-12939H	Military bombing target, WW II-era	West	I
	CA-SBR-12940H	Prospect and refuse deposit	West	I
	CA-SBR-12941H	Prospect and refuse deposit	West	I
	CA-SBR-12943H	Prospect	West	I
	CA-SBR-12945H	Refuse deposit	West	I
	CA-SBR-12946H	Prospect and refuse deposit	West	I
	CA-SBR-12948H	Mining and refuse deposit	West	I
	CA-SBR-12955H	Mining and road/”Los Padres Mine”	West	I
	CA-SBR-12956H	Refuse deposit	South	I
	CA-SBR-13357H	Refuse deposit	West	I
	CA-SBR-13364H	Mining	West	I
	CA-SBR-13367H	Refuse deposit	West	I
	CA-SBR-13372H	Refuse deposit	West	I
	ASM-WA-CL-2✳	Mine shaft and refuse deposit	West	I
	ASM-WA-TL-1✳	“Means Well”	West	I
	ASM-WA-TL-2✳	Refuse deposit	West	I
	ASM-WA-TL-3✳	Refuse deposit	West	I
	ASM H-13✳	“Los Padres Mine” (CA-SBR-3405)	West	E
	ASM H-14✳	Mining and refuse deposit	West	E
	ASM H-15✳	Mining and refuse deposit	West	E
	ASM H-18✳	Transmission/telephone line	West	I

Source: E =eligible; I = ineligible; SRL = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

Table J-8. Sites and Preliminary NRHP Eligibility for Alternative 2

Era	Site	Description	Study Area	Preliminary NRHP
Prehistoric	CA-SBR-1880	Habitation	West	E
	CA-SBR-12931	Lithic scatter	West	I
	CA-SBR-12932	SRL	West	I
	CA-SBR-12933	Habitation	West	E
	CA-SBR-12934	Lithic quarry	West	E
	CA-SBR-12935	SRL	West	I
	CA-SBR-12936	SRL	West	I
	CA-SBR-12942	Habitation	West	E
	CA-SBR-12944	Possible trail	West	I
	CA-SBR-12949	Lithic scatter	West	I
	CA-SBR-12950	Lithic scatter	West	I
	CA-SBR-12951	Lithic scatter	West	I
	CA-SBR-12952	Lithic scatter	West	I
	CA-SBR-12953	Lithic scatter	West	I
	CA-SBR-12954	Lithic scatter	West	I
	CA-SBR-12961	SRL	South	I
	CA-SBR-12962	Lithic scatter	South	I
	CA-SBR-12963	Lithic scatter	South	I
	CA-SBR-12964	Lithic scatter	South	I
	CA-SBR-13358	Habitation	West	E
	CA-SBR-13359	Lithic scatter	West	I
	CA-SBR-13360	Habitation	West	I
	CA-SBR-13361	Lithic scatter	West	I
	CA-SBR-13362	Habitation	West	E
	CA-SBR-13363	Lithic scatter	West	I
	CA-SBR-13365	Lithic scatter	West	I
	CA-SBR-13366	Lithic scatter	West	I
	CA-SBR-13368	Habitation	West	E
	CA-SBR-13369	Lithic scatter	West	I
	CA-SBR-13370	Habitation	West	E
	CA-SBR-13371	Lithic scatter	West	I
	ASM-WA- CL-1✳	Lithic scatter	West	I

Table J-8. Sites and Preliminary NRHP Eligibility for Alternative 2

Era	Site	Description	Study Area	Preliminary NRHP
Historic	CA-SBR-8946H	"Emerson Mill"	West	E
	CA-SBR-12938H	Mining and refuse deposit	West	I
	CA-SBR-12939H	Military bombing target, WW II-era	West	I
	CA-SBR-12940H	Prospect and refuse deposit	West	I
	CA-SBR-12941H	Prospect and refuse deposit	West	I
	CA-SBR-12943H	Prospect	West	I
	CA-SBR-12955H	Mining and road/"Los Padres Mine"	West	I
	CA-SBR-12956H	Refuse deposit	South	I
	CA-SBR-13357H	Refuse deposit	West	I
	CA-SBR-13364H	Mining	West	I
	CA-SBR-13367H	Refuse deposit	West	I
	CA-SBR-13372H	Refuse deposit	West	I
	ASM-WA-CL-2✳	Mine shaft and refuse deposit	West	I
	ASM-WA-TL-1✳	"Means Well"	West	I
	ASM-WA-TL-2✳	Refuse deposit	West	I
	ASM H-13✳	"Los Padres Mine" (CA-SBR-3405)	West	E
	ASM H-14✳	Mining and refuse deposit	West	E
	ASM H-18✳	Transmission/telephone line	West	I

Legend: E = eligible; I = ineligible; SRL = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

Table J-9. Sites and Preliminary NRHP Eligibility for Alternative 3

Era	Site	Description	Study Area	Preliminary NRHP
Prehistoric	CA-SBR-12961	SRL	South	I
	CA-SBR-12962	Lithic scatter	South	I
	CA-SBR-12963	Lithic scatter	South	I
	CA-SBR-12964	Lithic scatter	South	I
	CA-SBR-13214	Lithic scatter	East	I
	CA-SBR-13215	Habitation	East	E
	CA-SBR-13216	Habitation	East	E
	CA-SBR-13217	Habitation	East	E
	CA-SBR-13218	Habitation	East	E
	CA-SBR-13221	SRL	East	I
	CA-SBR-13225	Habitation	East	E
	CA-SBR-13227	SRL	East	I
	CA-SBR-13228	Lithic scatter	East	I
	CA-SBR-13229	Habitation	East	E
	CA-SBR-13230	Habitation	East	E
	CA-SBR-13231	Lithic scatter	East	I
	CA-SBR-13326	Ceramic scatter	East	I
	CA-SBR-13327	SRL	East	I
	CA-SBR-13328	Habitation	East	E
	CA-SBR-13329	Lithic scatter	East	E
	CA-SBR-13330	Lithic scatter	East	E
	CA-SBR-13331	Lithic scatter	East	I
	CA-SBR-13332	Habitation	East	E
	CA-SBR-13333	Lithic scatter	East	I
	CA-SBR-13334	Habitation	East	E
	CA-SBR-13335	Lithic scatter	East	E
	CA-SBR-13336	Habitation	East	E
	CA-SBR-13337	Habitation	East	E
	CA-SBR-13338	Habitation	East	E
	CA-SBR-13339	Lithic scatter	East	E
	CA-SBR-13340	Lithic scatter	East	E
	ASM-EA-KIS-3✳	SRL	East	I
	ASM-EA-KIS-5✳	SRL	East	I
	ASM-EA-TL-2✳	Lithic scatter	East	I
	ASM-EA-TL-3✳	Habitation	East	E
	ASM-EA-TL-4✳	Lithic scatter	East	E

Table J-9. Sites and Preliminary NRHP Eligibility for Alternative 3

Era	Site	Description	Study Area	Preliminary NRHP
Prehistoric	ASM-EA-TL-5✳	Lithic scatter	East	I
	ASM-EA-TL-6✳	Lithic scatter	East	E
	ASM-EA-TL-7✳	Habitation	East	E
	ASM-EA-TL-8✳	Habitation	East	E
	ASM-EA-TL-9✳	Lithic scatter	East	E
	ASM-EA-TL-10✳	Habitation	East	E
Historic	CA-SBR-9849H	Refuse deposit	East	I
	CA-SBR-9850H	Railroad maintenance camp	East	E
	CA-SBR-9853H	Santa Fe Railroad - Parker Branch	East	I
	CA-SBR-9851H	Railroad maintenance camp	East	E
	CA-SBR-9856H	Refuse deposit	East	E
	CA-SBR-11582H	Military camp, Desert Strike (1964)	East	I
	CA-SBR-11583H	Cadiz-Rice Road	East	I
	CA-SBR-11586H	Pacific Telephone/Telegraph line	East	E
	CA-SBR-12956H	Refuse deposit	South	I
	CA-SBR-13213H	Dry well	East	I
	CA-SBR-13222H	Refuse deposit	East	I
	CA-SBR-13224H	Military	East	E
	CA-SBR-13226H	Refuse deposit	East	I
	CA-SBR-13325H	Pacific Telephone/Telegraph pole	East	I
	CA-SBR-13341H	Mining and refuse deposit	East	I
	ASM-EA-KIS-1✳	Refuse deposit	East	I
	ASM-EA-KIS-2✳	Refuse deposit	East	I
	ASM-EA-KIS-4✳	Mining	East	I
	ASM-EA-TL-1✳	Military	East	E
	ASM H-1✳	Mining and refuse deposit	East	I
	ASM H-2✳	Mining camp	East	E
	ASM H-3✳	Chambless Homestead	East	E
	ASM H-4✳	Amboy Road	East	I
	ASM H-6✳	Archer Railroad Station	East	E
	ASM H-7✳	Railroad maintenance camp	East	E
	ASM H-8✳	Railroad maintenance camp	East	E
	ASM H-9✳	Railroad maintenance camp	East	E
	ASM H-10✳	Railroad maintenance camp	East	E
	ASM H-11✳	Refuse deposit	East	I
	ASM H-12✳	Refuse deposit	East	I

Legend: E = eligible; I = ineligible; SR = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

Table J-10. Sites and Preliminary NRHP Eligibility for Alternative 5

Era	Site	Description	Study Area	Preliminary NRHP
Prehistoric	CA-SBR-1880	Habitation	West	E
	CA-SBR-12929	Lithic scatter	West	I
	CA-SBR-12930	Lithic scatter	West	I
	CA-SBR-12931	Lithic scatter	West	I
	CA-SBR-12932	SRL	West	I
	CA-SBR-12933	Habitation	West	E
	CA-SBR-12934	Lithic quarry	West	E
	CA-SBR-12935	SRL	West	I
	CA-SBR-12936	SRL	West	I
	CA-SBR-12942	Habitation	West	E
	CA-SBR-12944	Possible trail	West	I
	CA-SBR-12949	Lithic scatter	West	I
	CA-SBR-12950	Lithic scatter	West	I
	CA-SBR-12951	Lithic scatter	West	I
	CA-SBR-12952	Lithic scatter	West	I
	CA-SBR-12953	Lithic scatter	West	I
	CA-SBR-12954	Lithic scatter	West	I
	CA-SBR-13358	Habitation	West	E
	CA-SBR-13359	Lithic scatter	West	I
	CA-SBR-13360	Habitation	West	I
	CA-SBR-13361	Lithic scatter	West	I
	CA-SBR-13362	Habitation	West	E
	CA-SBR-13363	Lithic scatter	West	I
	CA-SBR-13365	Lithic scatter	West	I
	CA-SBR-13366	Lithic scatter	West	I
	CA-SBR-13368	Habitation	West	E
	CA-SBR-13369	Lithic scatter	West	I
	CA-SBR-13370	Habitation	West	E
	CA-SBR-13371	Lithic scatter	West	I
	ASM-WA-CL-1✳	Lithic scatter	West	I
Historic	CA-SBR-8946H	“Emerson Mill”	West	E
	CA-SBR-12938H	Mining and refuse deposit	West	I
	CA-SBR-12939H	Military bombing target, WW II-era	West	I
	CA-SBR-12940H	Prospect and refuse deposit	West	I
	CA-SBR-12941H	Prospect and refuse deposit	West	I
	CA-SBR-12943H	Prospect	West	I

Table J-10. Sites and Preliminary NRHP Eligibility for Alternative 5

Era	Site	Description	Study Area	Preliminary NRHP
Historic	CA-SBR-12945H	Refuse deposit	West	I
	CA-SBR-12946H	Prospect and refuse deposit	West	I
	CA-SBR-12948H	Mining and refuse deposit	West	I
	CA-SBR-12955H	Mining and road/"Los Padres Mine"	West	I
	CA-SBR-13357H	Refuse deposit	West	I
	CA-SBR-13364H	Mining	West	I
	CA-SBR-13367H	Refuse deposit	West	I
	CA-SBR-13372H	Refuse deposit	West	I
	ASM-WA-CL-2✳	Mine shaft and refuse deposit	West	I
	ASM-WA-TL-1✳	"Means Well"	West	I
	ASM-WA-TL-2✳	Refuse deposit	West	I
	ASM-WA-TL-3✳	Refuse deposit	West	I
	ASM H-13✳	"Los Padres Mine" (CA-SBR-3405)	West	E
	ASM H-14✳	Mining and refuse deposit	West	E
	ASM H-15✳	Mining and refuse deposit	West	E
	ASM H-18✳	Transmission/telephone line	West	I

Source: E = eligible; I = ineligible; SRL = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

Table J-11. Sites and Preliminary NRHP Eligibility for Alternative 6

Access/Era	Site	Description	Study Area	Preliminary NRHP
Restricted				
Prehistoric	CA-SBR-1880	Habitation	West	E
	CA-SBR-12942	Habitation	West	E
	CA-SBR-12951	Lithic scatter	West	I
	CA-SBR-12952	Lithic scatter	West	I
	CA-SBR-12953	Lithic scatter	West	I
	CA-SBR-12954	Lithic scatter	West	I
	CA-SBR-13369	Lithic scatter	West	I
	CA-SBR-13370	Habitation	West	E
	CA-SBR-13371	Lithic scatter	West	I
Historic	CA-SBR-12938H	Mining and refuse deposit	West	I
	CA-SBR-12940H	Prospect and refuse deposit	West	I
	CA-SBR-12941H	Prospect and refuse deposit	West	I
	CA-SBR-12955H	Mining and road/"Los Padres Mine"	West	I
	CA-SBR-13372H	Refuse deposit	West	I
	ASM-WA-CL-2✳	Mine shaft and refuse deposit	West	I
	ASM-WA-TL-1✳	"Means Well"	West	I
	ASM H-13✳	"Los Padres Mine" (CA-SBR-3405)	West	E
Military Only				
Prehistoric	CA-SBR-12929	Lithic scatter	West	I
	CA-SBR-12930	Lithic scatter	West	I
	CA-SBR-12931	Lithic scatter	West	I
	CA-SBR-12932	SRL	West	I
	CA-SBR-12933	Habitation	West	E
	CA-SBR-12934	Lithic quarry	West	E
	CA-SBR-12935	SRL	West	I
Prehistoric	CA-SBR-12936	SRL	West	I
	CA-SBR-12944	Possible trail	West	I
	CA-SBR-12949	Lithic scatter	West	I
	CA-SBR-12950	Lithic scatter	West	I
	CA-SBR-12961	SRL	South	I
	CA-SBR-12962	Lithic scatter	South	I

Table J-11. Sites and Preliminary NRHP Eligibility for Alternative 6

Access/Era	Site	Description	Study Area	Preliminary NRHP
	CA-SBR-12963	Lithic scatter	South	I
	CA-SBR-12964	Lithic scatter	South	I
	CA-SBR-13358	Habitation	West	E
	CA-SBR-13359	Lithic scatter	West	I
	CA-SBR-13360	Habitation	West	I
	CA-SBR-13361	Lithic scatter	West	I
	CA-SBR-13362	Habitation	West	E
	CA-SBR-13363	Lithic scatter	West	I
	CA-SBR-13365	Lithic scatter	West	I
	CA-SBR-13366	Lithic scatter	West	I
	CA-SBR-13368	Habitation	West	E
	ASM-WA-CL-1✳	Lithic scatter	West	I
Historic	CA-SBR-8946H	"Emerson Mill"	West	E
	CA-SBR-12939H	Military bombing target, WW II-era	West	I
	CA-SBR-12943H	Prospect	West	I
	CA-SBR-12956H	Refuse deposit	South	I
	CA-SBR-13357H	Refuse deposit	West	I
	CA-SBR-13364H	Mining	West	I
	CA-SBR-13367H	Refuse deposit	West	I
	ASM-WA-TL-2✳	Refuse deposit	West	I
	ASM-WA-TL-3✳	Refuse deposit	West	I
	ASM H-14✳	Mining and refuse deposit	West	E

Notes: E =eligible; I = ineligible; SRL = segregated reduction locus; ✳, temporary ASM designation for sites not yet assigned state trinomials by the San Bernardino County Information Center.

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APPENDIX K
SOCIOECONOMICS MODELING

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SOCIOECONOMICS MODELING
TECHNICAL APPENDIX

K.1 Economic Impact Forecast System (EIFS) Model Overview (USACE 1994)

The U.S. Army, with the assistance of many academic and professional economists and regional scientists, developed the Economic Impact Forecast System (EIFS) to address the economic impacts of NEPA-requiring actions and to measure their significance. The entire system is designed for the scrutiny of a populace affected by the actions being studied. The algorithms in EIFS are simple and easy to understand, but still have firm, defensible bases in regional economic theory.

EIFS is developed under a joint project of the U.S Army Corps of Engineers (USACE), the U.S. Army Environmental Policy Institute (AEPI), and the Computer and Information Science Department of Clark Atlanta University, Georgia. EIFS is an on-line system, and the EIFS Web application is hosted by the USACE, Mobile District.

The databases in EIFS are national in scope and cover the approximately 3,700 counties, parishes, and independent cities that are recognized as reporting units by federal agencies. EIFS allows the user to define an economic ROI by identifying the counties, parishes, or cities to be analyzed. Once the Region of Influence (ROI) is defined, the system aggregates the data, calculates multipliers and other variables used in the various models in EIFS, and prompts the user for forecast input data.

The basis of the EIFS analytical capabilities is the calculation of multipliers that are used to estimate the impacts resulting from military-related changes in local expenditures or employment. In calculating the multipliers, EIFS uses the economic base model approach, which relies on the ratio of total economic activity to basic economic activity. Basic, in this context, is defined as the production or employment engaged to supply goods and services outside the ROI or by federal activities (such as military installations and their employees). According to economic base theory, the ratio of total income to basic income is measurable (as the multiplier) and sufficiently stable so that future changes in economic activity can be forecast. This technique is especially appropriate for estimating aggregate impacts and makes the economic base model ideal for the NEPA process.

The multiplier is interpreted as the total impact on the economy of the region resulting from a unit change in its base sector; for example, a dollar increase in local expenditures due to an expansion of its military installation. EIFS estimates its multipliers using a location quotient approach based on the concentration of industries within the region relative to the industrial concentrations for the nation.

The user inputs into the model the data elements that describe the military action: the change in expenditures, or dollar volume of the construction project(s); change in civilian or military employment; average annual income of affected civilian or military employees; the percent of civilians expected to relocate due to the military's action; and the percent of military living on-base. Once these are entered into the EIFS model, a projection of changes in the local economy is provided. These are projected changes in sales volume, income, employment and population. These four indicator variables are used to measure and evaluate socioeconomic impacts. Sales volume is the direct and indirect change in local business activity and sales (total retail and wholesale trade sales, total selected service receipts, and value-added by manufacturing). Employment is the total change in local employment due to the proposed action, including not only the direct and secondary changes in local employment, but also those personnel who are initially affected by the military action. Income is the total change in local wages and salaries due to the proposed action, which includes the sum of the direct and indirect wages and salaries, plus the income of the civilian and military personnel affected by the proposed action. Population is the increase or decrease in the local population as a result of the proposed action.

Once model projections are obtained, the Rational Threshold Value (RTV) profile allows the user to evaluate the significance of the impacts. This analytical tool reviews the historical trends for the defined region and develops measures of local historical fluctuations in sales volume, income, employment, and population. These evaluations identify the positive and negative changes within which a project can affect the local economy without creating a significant impact. The greatest historical changes define the boundaries that provide a basis for comparing an action's impact on the historical fluctuation in a particular area.

Therefore, if the change in a given variable resulting from the proposed action, such as sales volume, income, employment, or population is more than the maximum positive historical deviation, i.e., more than 100 percent of the maximum positive historical deviation, it is considered a significant positive impact. However, if the change in a given variable caused by the proposed action is more than 75 percent of the maximum negative historical deviation of sales, it will be considered a significant negative impact.

The major strengths of the RTV are its specificity to the region under analysis and its basis on actual historical data for the region. The EIFS impact model, in combination with the RTV, has proven successful in addressing perceived socioeconomic impacts. The EIFS model and the RTV technique for measuring the intensity of impacts have been reviewed by economic experts and have been deemed theoretically sound.

K.2 Modeling Methodology and Assumptions

The first step in the methodology used in this analysis involved compiling available data and making reasonable assumptions to conservatively estimate the direct project-related changes in expenditures (both positive and negative) from various sources. Note that the focus was primarily on the anticipated changes in expenditures or personnel more so than any absolute amount (although direct changes in recreation expenditures were derived relative to an estimated baseline scenario). The analysis also considered direct changes in other sources of spending, representing both increases (e.g., new government personnel) as well as decreases (e.g., reduced property taxes due to removal of private property from tax rolls; elimination of sodium chloride mining and agricultural ventures in the east study area). As appropriate for the analysis of each project alternative, all relevant spending changes of appreciable size were combined to yield a net change in direct spending.

The estimates of spending related to recreational use of each project study area were based on a range of variables, including:

- the total average annual visitor-days of use in each area;
- the allocation of OHV visitors by purpose of trip (dispersed-use or attendance at an organized event);
- the tendency to visit for a single day or multiple days, the average number of days per multi-day visit, and the average number of people in the same visitor group;
- the average per capita spending per day (plus appropriate sales taxes);
- for Johnson Valley only, the spending pattern differences based on visitor origin (e.g., "local" visitors are assumed to spend all of the daily amount within the local area, while visitors from outside the county are expected to spend some proportion in their home county before they leave, some on the way, and the rest in the local area during their visit);

- the reduction in recreational visitor-days and annual film industry expenditures that would be likely to result; and
- the proportion of displaced visitors and film industry spending that would potentially transfer to an alternative recreational area or film location within the county, thereby retaining economic benefits that accrue to the region from those activities.

The specific assumptions applied to these variables are described for each action alternative followed by the detailed calculations of each scenario. Several of these assumptions were first applied to estimate the baseline conditions associated with recreational visitor use and associated spending behavior. Additional assumptions were then used to estimate the change in these variables under each of the project alternatives.

Baseline Conditions Assumptions & Input Variables Applicable to All Alternatives:

- **Baseline Visitors - West:** For the west area, the total annual average visitor level for 2010 was 291,348 visitor-days per year (all recreation, not just OHV), as detailed in Table 3.2-9 of the EIS. Based on projected changes in visitor totals by BLM, the year 2015 baseline level was estimated to be 337,000 visitor-days/year, and this was used as the baseline for modeling purposes.
- **Baseline Visitors – East and South:** For purposes of this analysis, 800 visitor-days per year (all recreation, not just OHV) was assumed for the south study area and 500 visitor-days per year was assumed for the east area: all visits to the south area were assumed to be single-day visits and all by local area residents only; 10% of visitor-days to the east area were assumed to be multi-day use, also by local area residents.
- **Purpose of Visits - West:** For the west study area, it was assumed that 17% of the visitor-days/year are directly linked to organized race events ("event-related") and would not occur if race events were not held. The other 83% of visitor-days would be "dispersed-use" (including casual use unrelated to race events plus would-be race spectators that would still recreate in the area even if races were displaced).
- **Day Use vs. Overnight – West:**
  - For both dispersed-use and event-related groups, it was assumed that 20% of visitor-days/year are by single-day users (arrive and depart same day) and the other 80% of visitor-days/year are multi-day visits.
  - Assumed an *average* of 2.5 days/2 nights duration for all multi-day visits.
- **Average Group Size:** Assumed the *average* group size is 3 people for both dispersed-use and event-related trips. This means that there is an average of one main transport vehicle for each 3 visitors to and from the recreational area.
- **Origin of Visitors within the County:**
  - For day-use visits, assumed the origin of users is 50% from "local" area (within 50 miles of JV); 30% from elsewhere in San Bernardino County; and 20% from outside County.
  - For multi-day trips, assumed the origin of visitors is 20% from "local" area; 20% from elsewhere in San Bernardino County; and 60% from outside County.

- **Visitor Spending Patterns:**
    - Assumed that "local" visitors spend 100% of the cost of the trip "locally" (within 50 miles).
    - Visitors from elsewhere in San Bernardino County spend 60% "locally" and 40% elsewhere in the county;
    - Visitors from outside the County spend 30% "locally," 10% in the rest of San Bernardino County, 60% outside San Bernardino County.
    - Average per capita recreation spending was assumed to be $35 per person per visitor-day (based on Kroeger and Manalo 2007 - adjusted to 2015 dollars).
    - Sales tax rate is 8.75%.
    - 35% of total recreational expenditures were assumed to be food-related and not subject to sales tax.
- **Film Industry Assumptions:**
    - The assumed baseline level of film industry spending in the project area is approximately $1.6 million per year, based on the total level of such spending in the Johnson Valley area between 2001 and 2008 (Inland Empire Film Commission 2010a).
    - All benefit from film industry spending was assumed to occur in the "local" area within 50 miles of Johnson Valley.
    - Half of film industry expenditures were assumed to be taxable at a 10% rate (average transient occupancy tax rate for the area).
    - Film industry spending is 50% taxable at 10% (transient occupancy tax) and 50% not taxable (catering, etc.).

Alternative 1 Assumptions:

- **Displacement of Event-Related Visits:** Based on input from the BLM Recreation Branch Chief, the analysis assumed that 100% of organized races (and race-related visits as defined above) would be eliminated from Johnson Valley under Alt 1 and none of these displaced events would be accommodated at other venues in the county (in reality some race events may be able to proceed in a reduced or truncated form, or be held elsewhere as a weekday event, but for the sake of a conservative analysis, it is assumed that no current Johnson Valley race events would be held anywhere in the county).
- **Displacement of Dispersed-Use Visits:**
    - assume that 75% of the baseline dispersed-use visitor-days in Johnson Valley (as defined above) and 100% of the baseline visitor-days in the south study area would be displaced by Alt 1. The other 25% of Johnson Valley dispersed-use visitor-days would continue in Johnson Valley because a few popular areas within the OHV Area would remain available to the public.
    - assume that 90% of the dispersed-use that would be displaced by Alternative 1 would shift to other recreational resources in San Bernardino County. The other 10% of the displaced JV dispersed-users would stay outside the county.

- **Origin of Displaced Visitors within the County:**
  - For day-use visits remaining in the county under Alt 1, assume the origin of users is 65% from "local" area; 25% from elsewhere in San Bernardino County; and 15% from outside County.
  - For multi-day trips remaining in the county, assume the origin of visitors is 20% from "local" area; 20% from elsewhere in San Bernardino County; and 60% from outside County.
- **Displacement of Film In dustry Use:**The assumed direct reduction in "local" area film activity due to implementation of Alternative 1 was assumed to be 75%, with 80% of that displaced filming assumed to be transferred to other potential filming sites in San Bernardino County.
- **Combat Center Personnel:** The mix of required military personnel for Alternative 1 yielded an average salary of $39,602 for military and $38,658 for civilian positions. All new civilian personnel would be expected to live within the 30-minute commute area that currently encompasses 99% of Combat Center personnel living outside the installation. New military personnel were assumed to be distributed 25% living on the installation and 75% living in surrounding communities. It was also assumed that 70% of all new positions would be filled by people migrating from outside the County.

Alternative 2 Assumptions:

- **Displacement of Event- Related Visits:** assume that 60% of the organized races (including "King of the Hammers" in its current form) would be eliminated entirely under Alt 2, along with 60% of the strictly "event-related" visits. The displaced race events would not be absorbed at other county venues.
- **Displacement of Dispersed-Use Visits:**
  - assume that 25% of the baseline dispersed-use visitor-days in the west study area and 100% of the baseline visitor-days in the south study area would be displaced by Alt 2. The other 75% of Johnson Valley dispersed-use visitor-days would continue in Johnson Valley.
  - assume that 90% of the dispersed-use that would be displaced by Alternative 2 would shift to other recreational resources in San Bernardino County. The other 10% of the displaced Johnson Valley dispersed-users would stay outside the county.
- **Origin of Displaced Visitors within the County:** (same as baseline)
  - For day-use visits remaining in the county under Alt 2, assume the origin of users is 50% from "local" area; 30% from elsewhere in San Bernardino County; and 20% from outside County.
  - For multi-day trips remaining in the county, assume the origin of visitors is 20% from "local" area; 20% from elsewhere in San Bernardino County; and 60% from outside County.
- With regard to film industry expenditures, the assumed direct reduction in "local" area film activity due to implementation of Alternative 2 was assumed to be 20%. The analysis also

assumed that 80% of that displaced filming would be transferred to other potential filming sites in San Bernardino County instead of leaving the region entirely.

- The mix of required military personnel for Alternative 2 yielded an average salary of $39,098 for military and $37,408 for civilian positions. All new civilian personnel would be expected to live within the 30-minute commute area surrounding the installation. The analysis assumed that 25% of new military personnel would live on the installation and 75% would live in surrounding communities. It was also assumed that 70% of all new positions would be filled by people migrating from outside the County.

Alternative 3 Assumptions:

- Since the recreational and film industry activities in the west study area would not be affected under Alternative 3, the analysis assumed that the full baseline economic benefit of such activities in that area would be realized in the Alternative 3 modeling scenario.
- Assumed that 100% of the visitors to the south and east study areas would be displaced by Alternative 3 and 90% of those would visit other county recreational areas.
- The mix of required military personnel for Alternative 3 yielded an average salary of $39,098 for military and $36,226 for civilian positions. All new civilian personnel would be expected to live within the 30-minute commute area surrounding the installation. The analysis assumed that 25% of new military personnel would live on the installation and 75% would live in surrounding communities. It was also assumed that 70% of all new positions would be filled by people migrating from outside the County. All 150 employees of the three companies that would be displaced under this alternative were assumed to have the same average salary as the civilian personnel at the installation.

Alternative 4 and 5 Assumptions:

- **Displacement of Event-Related Visits :** assumed that 15% of the organized races in Johnson Valley (not including "King of the Hammers") would be eliminated entirely under Alt 4 or 5, along with 15% of the strictly "event-related" visits. The displaced race events would not be absorbed at other county venues.
- **Displacement of Dispersed-Use Visits:**
  - assume that 15% of the multi-day dispersed-use and 30% of the single-day dispersed-use in Johnson Valley would be displaced by Alt 4 or 5. The other 85% of multi-day and 70% of single-day dispersed-use would continue in Johnson Valley during the 10 months of restricted public access each year. In the south study area, 100% of baseline visitors would be displaced under Alternative 4 only. Under Alternative 5, recreational use would continue to occur in the south study area.
  - assume that 90% of the dispersed-use that would be displaced by Alt 4 or 5 would shift to other recreational resources in San Bernardino County. The other 10% of the displaced JV dispersed-users would stay outside the county.
- **Origin of Displaced Visitors within the County:** (same as baseline)
  - For day-use visits remaining in the county under Alt 4 or 5, assume the origin of users is 50% from "local" area (within 50 miles of JV); 30% from elsewhere in San Bernardino County; and 20% from outside County.

  - For multi-day trips remaining in the county, assume the origin of visitors is 20% from “local” area (within 50 miles of JV); 20% from elsewhere in San Bernardino County; and 60% from outside County.

- With regard to film industry expenditures, it was assumed that “local” area film activity would be reduced an average of 25%. This assumption takes into account the two-month exclusive use period and the generally short lead time for film location scheduling that may cause some productions to bypass Johnson Valley because of the uncertainty in scheduling. The analysis also assumed that 80% of the displaced filming would occur at other potential filming sites in San Bernardino County instead of leaving the region entirely.

- Average salaries of $39,098 for military and $41,583 for civilian positions was assumed based on the pay grade distribution of the required positions and standard 2010 government pay scales. Other assumptions about the distribution of these personnel were the same as for Alternative 1.

Alternative 6 Assumptions:

- **Displacement of Event-Related Visits :** assume that 60% of the organized races in Johnson Valley (not including some modified form of “King of the Hammers”) would be eliminated entirely under Alt 6, along with 60% of the strictly “event-related” visits. The displaced race events would not be absorbed at other county venues.

- **Displacement of Dispersed-Use Visits:**
  - assume that 30% of the dispersed-use (both multi- and single-day) would be displaced by Alt 6. The other 70% of dispersed-use would continue in Johnson Valley during the 10 months of restricted public access each year. In the south study area, 100% of recreational visitors would be displaced.
  - assume that 90% of the dispersed-use that would be displaced by Alternative 6 (i.e., 90% of the 30% displaced) would shift to other recreational resources in San Bernardino County. The other 10% of the displaced dispersed-users would stay outside the county.

- **Origin of Displaced Visitors within the County:** (same as baseline)
  - For day-use visits remaining in the county under Alt 6, assume the origin of users is 50% from “local” area; 30% from elsewhere in San Bernardino County; and 20% from outside County.
  - For multi-day trips remaining in the county, assume the origin of visitors is 20% from “local” area; 20% from elsewhere in San Bernardino County; and 60% from outside County.

- With regard to film industry expenditures, it was assumed that “local” area film activity would be reduced an average of 30% due to implementation of Alternative 6. This assumption takes into account the lack of access to the exclusive military use area, the partial lack of access to the RPAA, the diversity of the remaining Johnson Valley film location opportunities not affected by Alternative 6, and the generally short lead time for film location scheduling that may cause some productions to bypass the RPAA portion of Johnson Valley because of the uncertainty in scheduling. The analysis also assumed that 80% of the displaced filming would occur at other potential filming sites in San Bernardino County instead of leaving the region entirely.

- Average salaries of $39,098 for military and $41,583 for civilian positions was assumed based on the pay grade distribution of the required positions and standard 2010 government pay scales. Other assumptions about the distribution of these personnel were the same as for Alternative 1.

K.3 Calculation of Direct Changes in Recreational and Film Industry Expenditures

The following tables illustrate the calculations used to derive the direct changes in spending by visitors to Johnson Valley, and the amount of displacement of such visits that would occur under each action alternative, based on the assumptions above.

SUMMARY of DIRECT CHANGES IN EXPENDITURES	Total In-County Expenditures from Recreation & Filming (incl. Sales Taxes)			
	Baseline	ALT	NET Change [1]	% Change
ALT 1	$8,709,328	$8,027,471	($681,857)	-8%
ALT 2	$8,709,328	$8,411,393	($297,936)	-3%
ALT 3	$8,709,328	$8,685,107	($24,221)	-0.3%
ALT 4	$8,709,328	$8,389,227	($320,101)	-4%
ALT 5	$8,709,328	$8,403,905	($305,423)	-4%
ALT 6	$8,709,328	$8,493,481	($215,847)	-2%

	Total Local Area Only Expenditures from Recreation & Filming (incl. Sales Taxes)			
	Baseline	ALT	NET Change	% Change
ALT 1	$5,966,844	$2,372,890	($3,593,953)	-60%
ALT 2	$5,966,844	$4,558,271	($1,408,573)	-24%
ALT 3	$5,966,844	$5,918,386	($48,458)	-0.8%
ALT 4	$5,966,844	$4,987,798	($979,046)	-16%
ALT 5	$5,966,844	$5,017,390	($949,453)	-16%
ALT 6	$5,966,844	$4,494,404	($1,472,440)	-25%

Notes: [1] Input to EIFS model.

Assumptions: % Displaced From Baseline: Recreational Visitor Days					% Reduction in Film Industry Spending (west	
West Study Area		South Study Area	East Study Area	% Stay in County	% Reduced	% Stay in Co.
Dispersed[1]	Events					
75%	100%	100%	0%	90%	75%	80%
25%	60%	100%	0%	90%	20%	80%
0%	0%	100%	100%	90%	0%	N/A
15%	15%	100%	0%	90%	25%	80%
15%	15%	0%	0%	90%	25%	80%
30%	60%	100%	0%	90%	30%	80%

Notes: [1] For dispersed use in west study area under Alts 4 and 5 only, %

ALTERNATIVE 1

ENTER % REDUCTION in USE	
West - Dispersed	75.00%
West - Events	100.00%
South Study Area	100.00%
East Study Area	0.00%

ENTER % REDUCTION in JV FILMING	75.00%

ENTER % of Displaced Visitors Likely to Use Other County Resource

90.00% All Study Areas

ENTER % of Lost Filming that would stay in County

80.00%

If applicable, also change distribution of user origins in Table 3 below

Table 1. Visitor-Day Assumptions for Study Areas - ALT ONE

Area	*Annual Visitor Days*	*Assumed % single-day use*	*Annual Visitor Days (Day Use Only)*	*Annual Visitor Days (Multi Day use)*	*Ave. Days per Multi-Day Visit*	*Total Annual Day Use Visitors*	*Total Annual Multi-Day Visitors*	*Total Annual Visitors*	*Annual Average Visitors per weekend*	*Average group size*	*Total Annual Groups*	*Annual Average Groups per weekend*
West - Dispersed	69,928	20%	13,986	55,942	2.5	13,986	22,377	36,362	699	3	12,121	233
West - Events	-	20%	-	-	2.5	-	-	-	-	3	-	-
Total West Area	69,928		13,986	55,942		13,986	22,377	36,362	699		12,121	233
South Study Area	-	100%	-	-	-	-	-	-	-	3	-	-
East Study Area	500	90%	450	50	2.5	450	20	470	9	3	150	3

Johnson Valley OHV Assumptions:

126,201	2010 Annual visitor days - Events	
165,147	2010 Annual visitor days - Dispersed	
291,348	Total annual visitor days (2010)	
		% of total
57,290	2015 Annual Event-related Visitor Days (17%)	17%
279,710	2015 Annual Dispersed Use Visitor Days (83%)	83%
337,000	2015 Total annual visitor days Assumed	100%

Status of Displaced Visitors:

267,873	total visitor-days displaced
90.00%	% goes elsewhere in county
241,085	# visitor-days elsewhere in county
48,217	visitor-days day use
192,868	visitor-days multi-day
48,217	total day use visitors (displaced in Co.)
77,147	total multi-day visitors (displaced in Co.)
125,364	total annual visitors (stay in Co.)

Table 2. Estimate of Total Direct Expenditures

Area	Total Day Use Visitors	Total Multi-Day Visitors	Average # Days per Multi-day Trip	Average per capita daily expenditures	Expenditures - Day Use	Expenditures - Multi-Day	Subtotal Annual Expenditures	
West -Dispersed	13,986	22,377	3	$35.00	$489,493	$2,349,564	$2,839,057	
West - Events	-	-	3	$35.00	$0	$0	$0	
Total West Area	13,986	22,377			$489,493	$2,349,564	$2,839,057	
South Study Area	-	-	-	$35.00	$0	$0	$0	
East Study Area	450	20	3	$35.00	$15,750	$2,100	$17,850	$2,856,907
Displaced stay in Co.	48,217	77,147	3	$35.00	$1,687,597	$8,100,464	$9,788,061	

Table 3. Estimate of Direct Expenditures by Area (Day Use)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West -Dispersed	65%	25%	10%	100%
West - Events	50%	30%	20%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	90%	10%	100%

Daily $$ Distribution - JV Visitors

Table 4. Estimate of Direct Expenditures by Area (Multi-Day)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West -Dispersed	20%	20%	60%	100%
West - Events	20%	20%	60%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	40%	60%	100%

Daily $$ Distribution - Displaced Stay in County Visitors

	Local Visitors	Rest of Co. Visitors	Outside Co. Visitors
% of Avg. Daily $$ Spent Locally	100%	60%	30%
% of Avg. Daily $$ Spent Rest of Co.	0%	40%	10%
% of Avg. Daily $$ Spent Outside Co.	0%	0%	60%
Amt. of Avg. Daily $$ Spent Locally	$35.00	$21.00	$10.50
Amt. of Avg. Daily $$ Spent Rest of Co.	$0.00	$14.00	$3.50
Amt. of Avg. Daily $$ Spent Outside Co.	$0.00	$0.00	$21.00
	$35.00	$35.00	$35.00

County-Based Visitors	Outside Co. Visitors	
N/A	N/A	Note: 'local' is relative to JV area only
100%	40%	
0%	60%	
N/A	N/A	
$35.00	$14.00	
$0.00	$21.00	
$35.00	$35.00	

West -Dispersed					
Day Use $ - Local	$318,170	$73,424	$14,685	$406,279	
Day Use $ - Rest	$0	$48,949	$4,895	$53,844	
Day Use $ - Outside	$0	$0	$29,370	$29,370	
				$489,493	Expenditures - Day Use
Multi-Day $ - Local	$469,913	$0	$0	$469,913	
Multi-Day $ - Rest	$281,948	$187,965	$0	$469,913	
Multi-Day $ - Outside	$422,922	$140,974	$845,843	$1,409,738	
				$2,349,564	Expenditures - Multi-Day Use
West - Events					
Day Use $ - Local	$0	$0	$0	$0	
Day Use $ - Rest	$0	$0	$0	$0	
Day Use $ - Outside	$0	$0	$0	$0	
				$0	Expenditures - Day Use
Multi-Day $ - Local	$0	$0	$0	$0	
Multi-Day $ - Rest	$0	$0	$0	$0	
Multi-Day $ - Outside	$0	$0	$0	$0	
				$0	Expenditures - Multi-Day Use
Displaced Stay in County					
Day Use $ - Rest	N/A	$1,518,837	$67,504	$1,586,341	
Day Use $ - Outside	N/A	$0	$101,256	$101,256	
					$1,687,597 Expenditures - Day Use
Multi-Day $ - Rest	N/A	$3,240,186	$0	$3,240,186	
Multi-Day $ - Outside	N/A	$1,944,111	$2,916,167	$4,860,279	
					$8,100,464 Expenditures - Multi-Day Use
				$12,644,968	Total Expenditures

Total Recreation Expenditures by Area (incl. South Study Area)			
Expenditures by Area		Associated Sales Taxes (8.75%)	Notes
Local Expenditures	$894,042	$50,849	Of total expenditures, approx. 35% is for food-related items that are not subject to sales tax.
Rest of Co. Expenditures	$5,350,284	$304,297	
Outside Co. Expenditures	$6,400,642	$364,037	sales tax outside county
	$12,644,968		

Total Annual Expenditures in County (excl. sales tax)	For use in EIFS Model			
Recreation	$6,244,325	$355,146		
Filming	$1,360,000	$68,000		Assumes film spending all in County and is 50% taxable at 10% (avg. transient occupancy tax) and 50% not (catering, etc.)
Total In-County	$7,604,325	$423,146	$8,027,471	

ALTERNATIVE 2

ENTER % REDUCTION VISITS	
West - Dispersed	25.00%
West - Events	60.00%
South Study Area	100.00%
East Study Area	0.00%

ENTER % REDUCTION in IV VISITS	20.00%

ENTER % of Displaced Visitors Likely to Use Other County Resource	
90.00%	All Study Areas

ENTER % of Lost Visiting that would stay in County
80.00%

If appropriate, also change distribution of user origins in Table 3 below

Table 1. Visitor Day Assumptions for Study Areas - ALT 2

Area	Annual Visitor Days	Assumed % single day use	Annual Visitor Days (Day Use Only)	Annual Visitor Days (Multi Day use)	Ave. Days per Multi Day Visit	Total Annual Day Use Visitors	Total Annual Multi Day Visitors	Total Annual Visitors	Annual Average Visitors per weekend	Average group size	Total Annual Groups	Annual Average Groups per weekend
West - Dispersed	209,783	20%	41,957	167,826	2.5	41,957	67,130	109,087	2,098	3	36,362	699
West - Events	22,916	20%	4,583	18,333	2.5	4,583	7,333	11,916	229	3	3,972	76
Total West Area	232,699		46,540	186,159		46,540	74,464	121,003	2,327		40,334	776
South Study Area		100%	-	-	-	-	-	-	-	3	-	-
East Study Area	500	90%	450	50	2.5	450	20	450	9	3	150	3

Johnson Valley OHV Assumptions:

		% of total
126,201	2010 Annual visitor days - Events	
165,147	2010 Annual visitor days - Dispersed	
291,348	Total annual visitor days (2010)	
57,290	2015 Annual Event-related Visitor Days (17%)	17%
279,710	2015 Annual Dispersed Use Visitor Days (83%)	83%
337,000	2015 Total annual visitor days Assumed	100%

Status of Displaced Visitors:

105,102 total visitor days displaced
90.00% % goes elsewhere in county
94,591 # visitor days elsewhere in county
18,918 visitor days day use
75,673 visitor days multi-day
18,918 total day use visitors (displaced in Co.)
30,269 total multi-day visitors (displaced in Co.)
49,188 total annual visitors (stay in Co.)

Table 2. Estimate of Total Direct Expenditures

Area	Total Day Use Visitors	Total Multi-Day Visitors	Average # Days per Multi-day Trip	Average per capita daily expenditures	Expenditures - Day Use	Expenditures - Multi-Day	Subtotal Annual Expenditures	
West - Dispersed	41,957	67,130	3	$35.00	$1,468,478	$7,048,692	$8,517,170	
West - Events	4,583	7,333	3	$35.00	$160,412	$769,978	$930,390	
Total West Area	46,540	74,464			$1,628,890	$7,818,670	$9,447,559	
South Study Area	-	-	-	$35.00	$0	$0	$0	
East Study Area	450	20	3	$35.00	$15,750	$2,100	$17,850	$9,465,409
Displaced stay in Co.	18,918	30,269	3	$35.00	$662,139	$3,178,269	$3,840,409	

Table 3. Estimate of Direct Expenditures by Area (Day Use)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West - Dispersed	50%	30%	20%	100%
West - Events	50%	30%	20%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	80%	20%	100%

Table 4. Estimate of Direct Expenditures by Area (Multi-Day)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West - Dispersed	20%	20%	60%	100%
West - Events	20%	20%	60%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	40%	60%	100%

Daily $$ Distribution - JV Visitors

	Local Visitors	Rest of Co. Visitors	Outside Co. Visitors
% of Avg. Daily $$ Spent Locally	100%	60%	30%
% of Avg. Daily $$ Spent Rest of Co.	0%	40%	10%
% of Avg. Daily $$ Spent Outside Co.	0%	0%	60%
Amt. of Avg. Daily $$ Spent Locally	$35.00	$21.00	$10.50

Daily $$ Distribution - Displaced Stay in County Visitors

County-Based Visitors	Outside Co. Visitors
N/A	N/A
100%	40%
0%	60%
N/A	N/A

Note: "local" is relative to JV area only.

Amt. of Avg. Daily $$ Spent Rest of Co.	$0.00	$14.00	$3.50		$35.00	$14.00
Amt. of Avg. Daily $$ Spent Outside Co.	$0.00	$0.00	$21.00		$0.00	$21.00
	$35.00	$35.00	$35.00		$35.00	$35.00

West -Dispersed

Day Use $ - Local	$734,219	$264,326	$88,109	$1,086,673	
Day Use $ - Rest	$0	$176,217	$29,370	$205,587	
Day Use $ - Outside	$0	$0	$176,217	$176,217	
				$1,468,478	Expenditures - Day Use
Multi-Day $ - Local	$1,409,738	$0	$0	$1,409,738	
Multi-Day $ - Rest	$845,843	$563,895	$0	$1,409,738	
Multi-Day $ - Outside	$1,268,765	$422,922	$2,537,529	$4,229,215	
				$7,048,692	Expenditures - Multi-Day Use

West - Events

Day Use $ - Local	$85,206	$26,874	$9,625	$118,705	
Day Use $ - Rest	$0	$19,249	$3,208	$22,458	
Day Use $ - Outside	$0	$0	$19,249	$19,249	
				$160,412	Expenditures - Day Use
Multi-Day $ - Local	$153,996	$0	$0	$153,996	
Multi-Day $ - Rest	$92,397	$61,598	$0	$153,996	
Multi-Day $ - Outside	$138,596	$46,199	$277,192	$461,987	
				$769,978	Expenditures - Multi-Day Use

Displaced Stay in County

Day Use $ - Rest	N/A	$529,712	$52,971	$582,683	
Day Use $ - Outside	N/A	$0	$79,457	$79,457	
					$662,139 Expenditures - Day Use
Multi-Day $ - Rest	N/A	$1,271,308	$0	$1,271,308	
Multi-Day $ - Outside	N/A	$762,785	$1,144,177	$1,906,962	
					$3,178,269 Expenditures - Multi-Day Use
				$13,805,818	Total Expenditures

[illegible]

Expenditures by Area		Associated Sales Taxes (8.75%)	Notes
Local Expenditures	$2,786,962	$238,508	Of total expenditures, approx. 35% is for food-related items that are not subject to sales tax.
Rest of Co. Expenditures	$3,645,769	$207,351	
Outside Co. Expenditures	$4,873,087	$390,907	sales tax outside county
	$13,805,818		

Total Annual Expenditures in County (excl. sales tax)	For use in EIFS Model		
Recreation	$6,432,731	$365,862	
Filming	$1,536,000	$76,800	Assumes film spending all in County and is 50% taxable at 10% (avg. transient occupancy tax) and 50% not (catering, etc.)
Total In-County	$7,968,731	$442,662	$8,411,393

[illegible]

	Baseline	ALT	NET Change[1]	% Change
Local Expenditures	$4,056,150	$2,786,962	($1,269,188)	
Local sales taxes	$310,694	$235,308	($75,385)	
Filming	$1,600,000	$1,536,000	($64,000)	
Subtotal Local	$5,966,844	$4,558,271	($1,408,573)	-23.61%
Rest of Co. Expenditure	$2,594,900	$3,645,769	$1,050,869	
Rest of Co. Sales Taxes	$147,585	$207,351	$59,768	
Subtotal Rest of Co.	$2,742,485	$3,853,122	$1,110,637	40.50%
Total County Impact	$8,709,328	$8,411,393	($297,936)	-3.42%

ALTERNATIVE 3

ENTER % REDUCTION in [illegible]	
West - Dispersed	0.00%
West - Events	0.00%
South Study Area	100.00%
East Study Area	100.00%

ENTER % REDUCTION in JV FUNDING	0.00%

ENTER % of Displaced Visitors Likely to Use Other County Resources

90.00% All Study Areas

[illegible]

100.00%

If appropriate, also change distribution of user origins in Table 3 below.

Table 1. Visitor Day Assumptions for Study Areas - ALT 3

Area	Annual Visitor Days	Assumed % single day use	Annual Visitor Days (Day Use Only)	Annual Visitor Days (Multi Day use)	Ave. Days per Multi Day Visit	Total Annual Day Use Visitors	Total Annual Multi Day Visitors	Total Annual Visitors	Annual Average Visitors per weekend	Average group size	Total Annual Groups	Annual Average Groups per weekend
West - Dispersed	279,710	20%	55,942	223,768	2.5	55,942	89,507	145,449	2,797	3	48,483	932
West - Events	57,290	20%	11,458	45,832	2.5	11,458	18,333	29,791	573	3	9,930	191
Total West Area	337,000		67,400	269,600		67,400	107,840	175,240	3,370		58,413	1,123
South Study Area	-	100%	-	-	-	-	-	-	-	3	-	-
East Study Area	-	90%	-	-	2.5	-	-	-	-	3	-	-

Johnson Valley OHV Assumptions:

		% of total
126,201	2010 Annual visitor days - Events	
165,147	2010 Annual visitor days - Dispersed	
291,348	Total annual visitor days (2010)	
57,290	2015 Annual Event-related Visitor Days (17%)	17%
279,710	2015 Annual Dispersed Use Visitor Days (83%)	83%
337,000	2015 Total annual visitor days Assumed	100%

Status of Displaced Visitors:

1,300	total visitor days displaced
90.00%	% goes elsewhere in county
1,170	# visitor days elsewhere in county
234	visitor days day use
936	visitor days multi-day
234	total day use visitors (displaced in Co.)
374	total multi-day visitors (displaced in Co.)
608	total annual visitors (stay in Co.)

Table 2. Estimate of Total Direct Expenditures

Area	Total Day Use Visitors	Total Multi-Day Visitors	Average # Days per Multi-day Trip	Average per capita daily expenditures	Expenditures - Day Use	Expenditures - Multi-Day	Subtotal Annual Expenditures	
West- Dispersed	55,942	89,507	3	$35.00	$1,957,970	$9,398,256	$11,356,226	
West - Events	11,458	18,333	3	$35.00	$401,030	$1,924,944	$2,325,974	
Total West Area	67,400	107,840			$2,359,000	$11,323,200	$13,682,200	
South Study Area	-	-	-	$35.00	$0	$0	$0	
East Study Area	-	-	3	$35.00	$0	$0	$0	$13,682,200
Displaced stay in Co.	234	374	3	$35.00	$8,190	$39,312	$47,502	

Table 3. Estimate of Direct Expenditures by Area (Day Use)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West- Dispersed	50%	30%	20%	100%
West - Events	50%	30%	20%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	80%	20%	100%

Table 4. Estimate of Direct Expenditures by Area (Multi-Day)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West- Dispersed	20%	20%	60%	100%
West - Events	20%	20%	60%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	40%	60%	100%

Daily $$ Distribution - JV Visitors

	Local Visitors	Rest of Co. Visitors	Outside Co. Visitors
% of Avg. Daily $$ Spent Locally	100%	60%	30%
% of Avg. Daily $$ Spent Rest of Co.	0%	40%	10%
% of Avg. Daily $$ Spent Outside Co.	0%	0%	60%
Amt. of Avg. Daily $$ Spent Locally	$35.00	$21.00	$10.50

Daily $$ Distribution - Displaced Stay in County Visitors

	County Based Visitors	Outside Co. Visitors
% of Avg. Daily $$ Spent Locally	N/A	N/A
% of Avg. Daily $$ Spent Rest of Co.	100%	40%
% of Avg. Daily $$ Spent Outside Co.	0%	60%
Amt. of Avg. Daily $$ Spent Locally	N/A	N/A

Note: "local" is relative to JV area only.

Amt. of Avg. Daily $$ Spent Rest of Co.	$0.00	$14.00	$3.50		$35.00	$14.00
Amt. of Avg. Daily $$ Spent Outside Co.	$0.00	$0.00	$21.00		$0.00	$21.00
	$35.00	$35.00	$35.00		$35.00	$35.00

West Dispersed					
Day Use $ - Local	$979,985	$352,435	$117,478	$1,448,898	
Day Use $ - Rest	$0	$234,956	$39,159	$274,116	
Day Use $ - Outside	$0	$0	$234,956	$234,956	
				$1,957,970	Expenditures - Day Use
Multi-Day $ - Local	$1,879,651	$0	$0	$1,879,651	
Multi-Day $ - Rest	$1,127,791	$751,860	$0	$1,879,651	
Multi-Day $ - Outside	$1,691,686	$563,895	$3,383,372	$5,638,954	
				$9,398,256	Expenditures - Multi-Day Use
West Events					
Day Use $ - Local	$200,515	$72,185	$24,062	$296,762	
Day Use $ - Rest	$0	$48,124	$8,021	$56,144	
Day Use $ - Outside	$0	$0	$48,124	$48,124	
				$401,030	Expenditures - Day Use
Multi-Day $ - Local	$384,989	$0	$0	$384,989	
Multi-Day $ - Rest	$230,993	$153,996	$0	$384,989	
Multi-Day $ - Outside	$346,490	$115,497	$692,980	$1,154,966	
				$1,924,944	Expenditures - Multi-Day Use
Displaced Stay in County					
Day Use $ - Rest	N/A	$6,352	$655	$7,207	
Day Use $ - Outside	N/A	$0	$983	$983	
					$8,190 Expenditures - Day Use
Multi-Day $ - Rest	N/A	$15,725	$0	$15,725	
Multi-Day $ - Outside	N/A	$9,435	$14,152	$23,587	
					$39,312 Expenditures - Multi-Day Use
				$13,729,702	Total Expenditures

Total Recreation Expenditures by Area (Incl. South Study Area)

Expenditures by Area		Associated Sales Taxes (8.75%)	Notes
Local Expenditures	$4,010,300	$228,086	Of total expenditures, approx. 35% is for food-related items that are not subject to sales tax.
Rest of Co. Expenditures	$2,617,832	$148,889	
Outside Co. Expenditures	$7,101,570	$403,902	sales tax outside county
	$13,729,702		

Total Annual Expenditures in County (excl. sales tax)	For use in [illegible] Model			
Recreation	$6,628,132	$376,975		
Filming	$1,600,000	$80,000		Assumes film spending all in County and is 50% taxable at 10% (avg. transient occupancy
Total in-County	$8,228,132	$456,975	$8,685,107	

Impact from ALT is the difference b/w BASELINE and ALT total expenditures

	Baseline	ALT	NET Change	% Change
Local Expenditures	$4,056,150	$4,010,300	($45,850)	
Local sales taxes	$310,694	$308,086	($2,608)	
Filming	$1,600,000	$1,600,000	$0	
Subtotal Local	$5,966,844	$5,918,386	($48,458)	-0.81%
Rest of Co. Expenditure	$2,594,900	$2,617,832	$22,932	
Rest of Co. Sales Taxes	$147,585	$148,889	$1,304	
Subtotal Rest of Co.	$2,742,485	$2,766,721	$24,236	0.88%
Total County Impact	$8,709,329	$8,685,107	-$24,222	-0.28%

ALTERNATIVE 4

ENTER % REDUCTION in USE	
West - Dispersed - Single-Day	30.00%
West - Dispersed - Multi-Day	15.00%
West - Events	15.00%
South Study Area	100.00%
East Study Area	0.00%

ENTER % REDUCTION in JV FUNDING:	25.00%

If appropriate, also change distribution of user origins in Table 3 below

ENTER % of Displaced Visitors Likely to Use Other County Resources	
90.00%	All Study Areas

ENTER % of Users Visiting that would stay in County
60.00%

Table 1. Visitor Day Assumptions for Study Areas - ALT 4

Area	*Annual Visitor Days*	*Assumed % single day use*	*Annual Visitor Days (Day Use Only)*	*Annual Visitor Days (Multi-Day use)*	*Ave. Days per Multi Day Visit*	*Total Annual Day Use Visitors*	*Total Annual Multi-Day Visitors*	*Total Annual Visitors*	*Annual Average Visitors per weekend*	*Average group size*	*Total Annual Groups*	*Annual Average Groups per weekend*
West - Dispersed	229,362	20%	39,159	190,203	2.5	39,159	76,081	115,241	2,216	3	38,414	739
West - Events	48,697	20%	9,739	38,957	2.5	9,739	15,583	25,322	487	3	8,441	162
Total West Area	278,059		48,899	229,160		48,899	91,664	140,563	2,703		46,854	901
South Study Area	-	100%	-	-	-	-	-	-	-	3	-	-
East Study Area	500	90%	450	50	2.5	450	20	450	9	3	150	3

Johnson Valley OHV Assumptions:

126,201	2010 Annual visitor days - Events	
165,147	2010 Annual visitor days - Dispersed	
291,348	Total annual visitor days (2010)	
		% of total
57,290	2015 Annual Event-related Visitor Days (17%)	17%
279,710	2015 Annual Dispersed Use Visitor Days (83%)	83%
337,000	2015 Total annual visitor days Assumed	100%

Status of Displaced Visitors:

59,741	total visitor-days displaced
90.00%	% goes elsewhere in county
53,767	# visitor-days elsewhere in county
10,753	visitor-days day use
43,014	visitor-days multi-day
10,753	total day use visitors (displaced in Co.)
17,205	total multi-day visitors (displaced in Co.)
27,959	total annual visitors (stay in Co.)

Table 2. Estimate of Total Direct Expenditures

Area	Total Day Use Visitors	Total Multi-Day Visitors	Average # Days per Multi-day Trip	Average per capita daily expenditures	Expenditures - Day Use	Expenditures - Multi-Day	Subtotal Annual Expenditures	
West -Dispersed	39,159	76,081	3	$35.00	$1,370,579	$7,988,518	$9,359,097	
West - Events	9,739	15,583	3	$35.00	$340,876	$1,636,202	$1,977,078	
Total West Area	48,899	91,664			$1,711,455	$9,624,720	$11,336,175	
South Study Area	-	-	-	$35.00	$0	$0	$0	
East Study Area	450	20	3	$35.00	$15,750	$2,100	$17,850	$11,354,025
Displaced stay in Co.	10,753	17,205	3	$35.00	$376,370	$1,806,577	$2,182,947	

Table 3. Estimate of Direct Expenditures by Area (Day Use)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West -Dispersed	50%	30%	20%	100%
West - Events	50%	30%	20%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	80%	20%	100%

Table 4. Estimate of Direct Expenditures by Area (Multi-Day)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West -Dispersed	20%	20%	60%	100%
West - Events	20%	20%	60%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	40%	60%	100%

Daily $$ Distribution - JV Visitors

	Local Visitors	Rest of Co. Visitors	Outside Co. Visitors
% of Avg. Daily $$ Spent Locally	100%	60%	30%
% of Avg. Daily $$ Spent Rest of Co.	0%	40%	10%

Daily $$ Distribution - Displaced Stay in County Visitors

County-Based Visitors	Outside Co. Visitors
N/A	N/A
100%	40%

Note: "local" is relative to JV area only.

% of Avg. Daily $$ Spent Outside Co.	0%	0%	60%
Amt. of Avg. Daily $$ Spent Locally	$35.00	$21.00	$10.50
Amt. of Avg. Daily $$ Spent Rest of Co.	$0.00	$14.00	$3.50
Amt. of Avg. Daily $$ Spent Outside Co.	$0.00	$0.00	$21.00
	$35.00	$35.00	$35.00

	0%	60%
	N/A	N/A
	$35.00	$14.00
	$0.00	$21.00
	$35.00	$35.00

West - Dispersed					
Day Use $ - Local	$685,290	$246,704	$82,235	$1,014,228	
Day Use $ - Rest	$0	$164,469	$27,412	$191,881	
Day Use $ - Outside	$0	$0	$164,469	$164,469	
				$1,370,579	Expenditures - Day Use
Multi-Day $ - Local	$1,597,704	$0	$0	$1,597,704	
Multi-Day $ - Rest	$958,622	$639,081	$0	$1,597,704	
Multi-Day $ - Outside	$1,437,933	$479,311	$2,875,866	$4,793,111	
				$7,988,518	Expenditures - Multi-Day Use
West - Events					
Day Use $ - Local	$170,438	$61,358	$20,453	$252,248	
Day Use $ - Rest	$0	$40,905	$6,818	$47,723	
Day Use $ - Outside	$0	$0	$40,905	$40,905	
				$340,876	Expenditures - Day Use
Multi-Day $ - Local	$327,240	$0	$0	$327,240	
Multi-Day $ - Rest	$196,344	$130,896	$0	$327,240	
Multi-Day $ - Outside	$294,516	$98,172	$589,033	$981,721	
				$1,636,202	Expenditures - Multi-Day Use
Displaced Stay in County					
Day Use $ - Rest	N/A	$301,096	$30,110	$331,206	
Day Use $ - Outside	N/A	$0	$45,164	$45,164	
					$376,370 Expenditures - Day Use
Multi-Day $ - Rest	N/A	$722,631	$0	$722,631	
Multi-Day $ - Outside	N/A	$433,578	$650,368	$1,083,946	
					$1,806,577 Expenditures - Multi-Day Use
				$13,536,972	Total Expenditures

Total Recreation Expenditures by Area (incl. South Study Area)

Expenditures by Area		Associated Sales Taxes (8.75%)	Notes
Local Expenditures	$3,209,270	$182,527	Of total expenditures, approx. 35% is for food-related items that are not subject to sales tax.
Rest of Co. Expenditures	$3,218,384	$183,046	
Outside Co. Expenditures	$7,109,317	$404,342	sales tax outside county
	$13,536,972		

Total Annual Expenditures in County (excl. sales tax)	For use in EPS Model		
Recreation	$6,427,654	$365,573	
Filming	$1,520,000	$76,000	
Total In-County	$7,947,654	$441,573	$8,389,227

Assumes film spending all in County and is 50% taxable at 10% (avg. transient occupancy tax) and 50% not (catering, etc.)

Impact from ALT is the difference b/w BASELINE and ALT total expenditures

	Baseline	ALT	NET Change	% Change
Local Expenditures	$4,056,150	$3,209,270	($846,880)	
Local sales taxes	$310,694	$258,527	($52,166)	
Filming	$1,600,000	$1,520,000	($80,000)	
Subtotal Local	$5,966,844	$4,987,798	($979,046)	-16.41%
Rest of Co. Expenditure	$2,594,900	$3,218,384	$623,484	
Rest of Co. Sales Taxes	$147,585	$183,046	$35,461	
Subtotal Rest of Co.	$2,742,485	$3,401,430	$658,945	24.03%
Total County Impact	$8,709,328	$8,389,227	-$320,101	-3.68%

ALTERNATIVE 5

ENTER % REDUCTION in use	
West - Dispersed - Single Day	30.00%
West - Dispersed- Multi-Day	15.00%
West - Events	15.00%
South Study Area	0.00%
East Study Area	0.00%

ENTER % REDUCTION in JV FILMING	25.00%

ENTER % of Displaced Visitors Likely to Use Other County Facilities

90.00% All Study Areas

ENTER % of Lost Filming that would stay in County

90.00%

If appropriate, also change distribution of user origins in Table 3 below

Table 1. Visitor Day Assumptions for Study Areas - ALT 5

Area	Annual Visitor Days	Assumed % single day use	Annual Visitor Days (Day Use Only)	Annual Visitor Days (Multi-Day use)	Ave. Days per Multi Day Visit	Total Annual Day Use Visitors	Total Annual Multi-Day Visitors	Total Annual Visitors	Annual Average Visitors per weekend	Average group size	Total Annual Groups	Annual Average Groups per weekend
West - Dispersed	229,362	20%	39,159	190,203	2.5	39,159	76,081	115,241	2,216	3	38,414	739
West - Events	48,697	20%	9,739	38,957	2.5	9,739	15,583	25,322	487	3	8,441	162
Total West Area	278,059		48,899	229,160		48,899	91,664	140,563	2,703		46,854	901
South Study Area	800	100%	800	-	-	800	-	800	15	3	267	5
East Study Area	500	90%	450	50	2.5	450	20	450	9	3	150	3

Johnson Valley OHV Assumptions:

		% of total
126,201	2010 Annual visitor days - Events	
165,147	2010 Annual visitor days - Dispersed	
291,348	Total annual visitor days (2010)	
57,290	2015 Annual Event-related Visitor Days (17%)	17%
279,710	2015 Annual Dispersed Use Visitor Days (83%)	83%
337,000	2015 Total annual visitor days Assumed	100%

Status of Displaced Visitors:

58,941 total visitor-days displaced
90.00% % goes elsewhere in county
53,047 # visitor-days elsewhere in county
10,609 visitor-days day use
42,438 visitor-days multi-day
10,609 total day use visitors (displaced in Co.)
16,975 total multi-day visitors (displaced in Co.)
27,585 total annual visitors (stay in Co.)

Table 2. Estimate of Total Direct Expenditures

Area	Total Day Use Visitors	Total Multi-Day Visitors	Average # Days per Multi-day Trip	Average per capita daily expenditures	Expenditures - Day Use	Expenditures - Multi-Day	Subtotal Annual Expenditures	
West -Dispersed	39,159	76,081	3	$35.00	$1,370,579	$7,988,518	$9,359,097	
West - Events	9,739	15,583	3	$35.00	$340,876	$1,636,202	$1,977,078	
Total West Area	48,899	91,664			$1,711,455	$9,624,720	$11,336,175	
South Study Area	800	-	-	$35.00	$28,000	$0	$28,000	
East Study Area	450	20	3	$35.00	$15,750	$2,100	$17,850	$11,382,025
Displaced stay in Co.	10,609	16,975	3	$35.00	$371,330	$1,782,385	$2,153,715	

Table 3. Estimate of Direct Expenditures by Area (Day Use)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West -Dispersed	50%	30%	20%	100%
West - Events	50%	30%	20%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	80%	20%	100%

Table 4. Estimate of Direct Expenditures by Area (Multi-Day)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West -Dispersed	20%	20%	60%	100%
West - Events	20%	20%	60%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	40%	60%	100%

Daily $$ Distribution - JV Visitors

	Local Visitors	Rest of Co. Visitors	Outside Co. Visitors
% of Avg. Daily $$ Spent Locally	100%	60%	30%
% of Avg. Daily $$ Spent Rest of Co.	0%	40%	10%

Daily $$ Distribution - Displaced Stay in County Visitors

County Based Visitors	Outside Co. Visitors	
N/A	N/A	Note: "local" is relative to JV area only.
100%	40%	

% of Avg. Daily $$ Spent Outside Co.	0%	0%	60%
Amt. of Avg. Daily $$ Spent Locally	$35.00	$21.00	$10.50
Amt. of Avg. Daily $$ Spent Rest of Co.	$0.00	$14.00	$3.50
Amt. of Avg. Daily $$ Spent Outside Co.	$0.00	$0.00	$21.00
	$35.00	$35.00	$35.00

0%	60%
N/A	N/A
$35.00	$14.00
$0.00	$21.00
$35.00	$35.00

West -Dispersed

Day Use $ - Local	$685,290	$246,704	$82,235	$1,014,228	
Day Use $ - Rest	$0	$164,469	$27,412	$191,881	
Day Use $ - Outside	$0	$0	$164,469	$164,469	
				$1,370,579	Expenditures - Day Use
Multi-Day $ - Local	$1,597,704	$0	$0	$1,597,704	
Multi-Day $ - Rest	$958,622	$639,081	$0	$1,597,704	
Multi-Day $ - Outside	$1,437,933	$479,311	$2,875,866	$4,793,111	
				$7,988,518	Expenditures - Multi-Day Use

West - Events

Day Use $ - Local	$170,438	$61,358	$20,453	$252,248	
Day Use $ - Rest	$0	$40,905	$6,818	$47,723	
Day Use $ - Outside	$0	$0	$40,905	$40,905	
				$340,876	Expenditures - Day Use
Multi-Day $ - Local	$327,240	$0	$0	$327,240	
Multi-Day $ - Rest	$196,344	$130,896	$0	$327,240	
Multi-Day $ - Outside	$294,516	$98,172	$589,033	$981,721	
				$1,636,202	Expenditures - Multi-Day Use

Displaced Stay in County

Day Use $ - Rest	N/A	$297,064	$29,706	$326,771	
Day Use $ - Outside	N/A	$0	$44,560	$44,560	
					$371,330 Expenditures - Day Use
Multi-Day $ - Rest	N/A	$712,954	$0	$712,954	
Multi-Day $ - Outside	N/A	$427,772	$641,659	$1,069,432	
					$1,782,385 Expenditures - Multi-Day Use

$13,535,740 Total Expenditures

Total Recreation Expenditures by Area (incl. South Study Area)

Expenditures by Area		Associated Sales Taxes (8.75%)	Notes
Local Expenditures	$3,237,270	$184,120	Of total expenditures, approx. 35% is for food-related items that are not subject to sales tax.
Rest of Co. Expenditures	$3,204,272	$182,243	
Outside Co. Expenditures	$7,094,197	$403,482	Sales tax outside county
	$13,535,740		

Total Annual Expenditures in County (excl. sales tax)	For use in EIPS Model		
Recreation	$6,441,542	$366,363	
Filming	$1,520,000	$76,000	
Total In-County	$7,961,542	$442,363	$8,403,905

Assumes film spending all in County and is 50% taxable at 10% (avg. transient occupancy tax) and 50% not (catering, etc.)

Impact from ALT is the difference b/w BASELINE and ALT total expenditures

	Baseline	ALT	NET Change	% Change
Local Expenditures	$4,056,150	$3,237,270	($818,880)	
Local sales taxes	$310,694	$260,120	($50,574)	
Filming	$1,600,000	$1,520,000	($80,000)	
Subtotal Local	$5,966,844	$5,017,390	($949,453)	-15.91%
Rest of Co. Expenditure	$2,594,900	$3,204,272	$609,372	
Rest of Co. Sales Taxes	$147,585	$182,243	$34,658	
Subtotal Rest of Co.	$2,742,485	$3,386,515	$644,030	23.48%
Total County Impact	$8,709,328	$8,403,905	-$305,423	-3.51%

ALTERNATIVE 6

ENTER % REDUCTION in USE	
West - Dispersed	80.00%
West - Events	60.00%
South Study Area	100.00%
East Study Area	0.00%

ENTER % REDUCTION in JV FLYING	50.00%

ENTER % of Displaced Visitors Likely to Use Other County Resources

90.00% All Study Areas

ENTER % of Local Hiring that would stay in County

80.00%

If appropriate, also change distribution of user origins in Table 3 below

Table 1. Visitor Day Assumptions for Study Areas - ALT 6

Area	Annual Visitor Days	Assumed % single-day use	Annual Visitor Days (Day Use Only)	Annual Visitor Days (Multi-Day use)	Ave. Days per Multi-Day Visit	Total Annual Day Use Visitors	Total Annual Multi-Day Visitors	Total Annual Visitors	Annual Average Visitors per weekend	Average group size	Total Annual Groups	Annual Average Groups per weekend
West - Dispersed	195,797	20%	39,159	156,638	2.5	39,159	62,655	101,814	1,958	3	33,938	653
West - Events	22,916	20%	4,583	18,333	2.5	4,583	7,333	11,916	229	3	3,972	76
Total West Area	218,713		43,743	174,970		43,743	69,988	113,731	2,187		37,910	729
South Study Area		100%	-	-	-	-	-	-	-	3	-	-
East Study Area	500	90%	450	50	2.5	450	20	450	9	3	150	3

Johnson Valley OHV Assumptions:

		% of total
126,201	2010 Annual visitor days - Events	
165,147	2010 Annual visitor days - Dispersed	
291,348	Total annual visitor days (2010)	
57,290	2015 Annual Event-related Visitor Days (17%)	17%
279,710	2015 Annual Dispersed Use Visitor Days (83%)	83%
337,000	2015 Total annual visitor days Assumed	100%

Status of Displaced Visitors:

119,087 total visitor-days displaced
90.00% % goes elsewhere in county
107,178 # visitor-days elsewhere in county
21,436 visitor-days day use
85,743 visitor-days multi-day
21,436 total day use visitors (displaced in Co.)
34,297 total multi-day visitors (displaced in Co.)
55,733 total annual visitors (stay in Co.)

Table 2. Estimate of Total Direct Expenditures

Area	Total Day Use Visitors	Total Multi-Day Visitors	Average # Days per Multi-day Trip	Average per capita daily expenditures	Expenditures - Day Use	Expenditures - Multi-Day	Subtotal Annual Expenditures	
West- Dispersed	39,159	62,655	3	$35.00	$1,370,579	$6,578,779	$7,949,358	
West - Events	4,583	7,333	3	$35.00	$160,412	$769,978	$930,390	
Total West Area	43,743	69,988			$1,530,991	$7,348,757	$8,879,748	
South Study Area	-	-	-	$35.00	$0	$0	$0	
East Study Area	450	20	3	$35.00	$15,750	$2,100	$17,850	$8,897,598
Displaced stay in Co.	21,436	34,297	3	$35.00	$750,240	$3,601,191	$4,351,431	

Table 3. Estimate of Direct Expenditures by Area (Day Use)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West- Dispersed	80%	20%	10%	100%
West - Events	50%	30%	20%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	90%	10%	100%

Table 4. Estimate of Direct Expenditures by Area (Multi-Day)

Area	% Visitors Local (<= 50 mi of JV)	% Visitors from Rest of County	% Visitors from Outside County	All Rows Must Total 100%
West- Dispersed	20%	20%	60%	100%
West - Events	20%	30%	60%	100%
South Study Area	100%	0%	0%	100%
East Study Area	100%	0%	0%	100%
Displaced stay in Co.	0%	40%	60%	100%

Daily $$ Distribution - JV Visitors

	Local Visitors	Rest of Co. Visitors	Outside Co. Visitors
% of avg. likely to spent Locally	100%	60%	30%
% of avg. likely to spent Rest of Co.	0%	40%	10%
% of avg. likely to spent Outside Co.	0%	0%	60%

Daily $$ Distribution - Displaced Stay in County Visitors

County-Based Visitors	Outside Co. Visitors
N/A	N/A
100%	40%
0%	60%

Note: 'local' is relative to JV area only.

Amt. of Avg. Daily $$ Spent Locally	$35.00	$21.00	$10.50		N/A	N/A
Amt. of Avg. Daily $$ Spent Rest of Co.	$0.00	$14.00	$3.50		$35.00	$14.00
Amt. of Avg. Daily $$ Spent Outside Co.	$0.00	$0.00	$21.00		$0.00	$21.00
	$35.00	$35.00	$35.00		$35.00	$35.00

West - Dispersed					
Day Use $ - Local	$890,876	$205,587	$41,117	$1,137,581	
Day Use $ - Rest	$0	$137,058	$13,706	$150,764	
Day Use $ - Outside	$0	$0	$82,235	$82,235	
				$1,370,579	Expenditures - Day Use
Multi-Day $ - Local	$1,315,756	$0	$0	$1,315,756	
Multi-Day $ - Rest	$789,454	$526,302	$0	$1,315,756	
Multi-Day $ - Outside	$1,184,180	$394,727	$2,368,361	$3,947,268	
				$6,578,779	Expenditures - Multi-Day Use
West - Events					
Day Use $ - Local	$104,268	$24,062	$4,812	$133,142	
Day Use $ - Rest	$0	$16,041	$1,604	$17,645	
Day Use $ - Outside	$0	$0	$9,625	$9,625	
				$160,412	Expenditures - Day Use
Multi-Day $ - Local	$153,996	$0	$0	$153,996	
Multi-Day $ - Rest	$92,397	$61,598	$0	$153,996	
Multi-Day $ - Outside	$138,596	$46,199	$277,192	$461,987	
				$769,978	Expenditures - Multi-Day Use
Displaced Stay in County					
Day Use $ - Rest	N/A	$675,223	$30,010	$705,233	
Day Use $ - Outside	N/A	$0	$45,015	$45,015	
					$750,248 Expenditures - Day Use
Multi-Day $ - Rest	N/A	$1,440,476	$0	$1,440,476	
Multi-Day $ - Outside	N/A	$864,286	$1,296,429	$2,160,715	
					$3,601,191 Expenditures - Multi-Day Use
				$13,249,037	Total Expenditures

Total Recreation Expenditures by Area (incl. South Study Area)

Expenditures by Area		Associated Sales Taxes (8.75%)	Notes
Local Expenditures	$2,758,324	$156,880	Of total expenditures, approx. 35% is for food-related items that are not subject to sales tax.
Rest of Co. Expenditures	$3,783,870	$215,208	
Outside Co. Expenditures	$6,706,843	$381,452	sales tax outside county
	$13,249,037		

Total Annual Expenditures in County (excl. sales tax)	For use in EPS Model			
Recreation	$6,542,194	$372,087		
Filming	$1,504,000	$75,200		Assumes film spending all in County and is 50% taxable at 10% (avg. transient occupancy tax) and 50% not (catering, etc.)
Total In-County	$8,046,194	$447,287	$8,493,481	

Impact from ALT is the difference b/w BASELINE and ALT total expenditures

	Baseline	ALT	NET Change	% Change
Local Expenditures	$4,056,150	$2,756,324	($1,297,826)	
Local sales taxes	$310,694	$232,080	($78,614)	
Filming	$1,600,000	$1,504,000	($96,000)	
Subtotal Local	$5,966,844	$4,494,404	($1,472,440)	-24.68%
Rest of Co. Expenditure	$2,594,900	$3,783,870	$1,188,970	
Rest of Co. Sales Taxes	$147,585	$215,208	$67,623	
Subtotal Rest of Co.	$2,742,485	$3,999,078	$1,256,593	46%
Total County Impact	$8,709,328	$8,493,481	-$215,847	-2.48%

Land Acquisition EIS: Consolidated List of Personnel by Alternative

Weighted AVERAGES

Program	Position	Pay Grade	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Annual Salary		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Conservation	Conservation Law Enforcement Supv.	GS-12	1	1	1	1	1	1	$80,276		$80,276	$80,276	$80,276	$80,276	$80,276	$80,276
	Conservation Law Enforcement Officer	GS-9/11	1	1	1	2	2	2	$60,963	used GS-10	$60,963	$60,963	$60,963	$121,926	$121,926	$121,926
	Recreation Specialist	GS-9/11	0	0	0	1	1	1	$60,963		$0	$0	$0	$60,963	$60,963	$60,963
	Natural Resources Specialist	GS-9/11	2	1	2	2	2	2	$60,963		$121,926	$60,963	$121,926	$121,926	$121,926	$121,926
	Cultural Resources Specialist	GS-9/11	2	1	2	2	2	2	$60,963		$121,926	$60,963	$121,926	$121,926	$121,926	$121,926
	NEPA Coordinator Assistant	GS-9/11	1	1	1	1	1	1	$60,963		$60,963	$60,963	$60,963	$60,963	$60,963	$60,963
Range Residue Processing	Unexploded Ordanance Supv.	GS-11	1	1	0	1	1	1	$66,974		$66,974	$66,974	$0	$66,974	$66,974	$66,974
	Range Cleanup Technician	WG-7	6	4	0	6	6	6	$44,616		$267,696	$178,464	$0	$267,696	$267,696	$267,696
Recycling Program	Trash Collection Technician	WG-7	0	0	0	1	1	1	$44,616		$0	$0	$0	$44,616	$44,616	$44,616
	Recycling Technician	WG-7	0	0	0	1	1	1	$44,616		$0	$0	$0	$44,616	$44,616	$44,616
Hazardous Waste Processing	Spill Abatement Technician	GS-7/9	1	1	1	1	1	1	$50,117	used GS-8	$50,117	$50,117	$50,117	$50,117	$50,117	$50,117
	Hazardous Waste Handler	WG-7	2	1	2	2	2	2	$44,616		$89,232	$44,616	$89,232	$89,232	$89,232	$89,232
Pollution Prevention	Engineering Technician	GS-7/9	1	1	1	1	1	1	$50,117		$50,117	$50,117	$50,117	$50,117	$50,117	$50,117
Range Maintenance (G3)	Range Maintenance Leader	WL-8	1	1	1	1	1	1	$52,666		$52,666	$52,666	$52,666	$52,666	$52,666	$52,666
	Range Maintenance Laborer	WG-5	4	4	2	4	4	4	$37,814		$151,258	$151,258	$75,629	$151,258	$151,258	$151,258
Range Safety Specialists	Range Safety Officer	GS-11	2	2	2	2	2	2	$66,974		$133,948	$133,948	$133,948	$133,948	$133,948	$133,948
G5 PAO/Comm Rel / Encroach																
	Communications Specialist	GS-9/11	1	1	1	1	1	1	$60,963		$60,963	$60,963	$60,963	$60,963	$60,963	$60,963
	Communications Technician	GS-6/7	2	2	2	2	2	2	$45,258	used GS-7	$90,516	$90,516	$90,516	$90,516	$90,516	$90,516
	Admin Specialist	GS-5/6	1	1	1	1	1	1	$40,723	used GS-6	$40,723	$40,723	$40,723	$40,723	$40,723	$40,723
	Comm Outreach Specialist	GS-9/11	2	2	2	2	2	2	$60,963		$121,926	$121,926	$121,926	$121,926	$121,926	$121,926
EOD									Same for all Alts							
	2305	O3	1	1	1	1	1	1	$64,488	Over 8	$64,488	$64,488	$64,488	$64,488	$64,488	$64,488
	2336	MSgt E8	1	1	1	1	1	1	$54,060	Over 18	$54,060	$54,060	$54,060	$54,060	$54,060	$54,060
	2336	GySgt E7	2	2	2	2	2	2	$47,640	Over 16 yrs	$95,280	$95,280	$95,280	$95,280	$95,280	$95,280
	2336	SSgt E6	2	2	2	2	2	2	$40,728	Over 14 yrs	$81,456	$81,456	$81,456	$81,456	$81,456	$81,456
	2336	Sgt E5	2	2	2	2	2	2	$35,088	Over 12 yrs	$70,176	$70,176	$70,176	$70,176	$70,176	$70,176
PMO added patrols (G7)									All may be Civilian Equivelents							
	58XX	SSgt E6	1	1	1	1	1	1	$40,728	Over 14 yrs	$40,728	$40,728	$40,728	$40,728	$40,728	$40,728
	58XX	Sgt E-5	3	2	2	2	2	2	$35,088	Over 12 yrs	$105,264	$70,176	$70,176	$70,176	$70,176	$70,176
	58XX	Cpl E4	3	4	4	4	4	4	$27,528	Over 8 yrs	$82,584	$110,112	$110,112	$110,112	$110,112	$110,112
	Other (E3 or Civilain FTE)	CIV FTE (E3)	17	17	17	17	17	17	$23,076	Over 4 yrs	$392,292	$392,292	$392,292	$392,292	$392,292	$392,292
Long-Term Management																
	Lead		1	1	1	1	1	1	$80,276	Assume GS-12	$80,276	$80,276	$80,276	$80,276	$80,276	$80,276
	Web master	GS-9/11	1	1	1	1	1	1	$60,963		$60,963	$60,963	$60,963	$60,963	$60,963	$60,963
	Scheduler	GS-12	1	1	1	3	3	3	$80,276		$80,276	$80,276	$80,276	$240,828	$240,828	$240,828
	JV Liaison	GS-9/11	2	2	0	2	2	2	$60,963	Alts 1 / 2 are temporary o	$121,926	$121,926	$0	$121,926	$121,926	$121,926
	Course designer	GS-12	0	0	0	1	1	1	$80,276		$0	$0	$0	$80,276	$80,276	$80,276
	Liaison	GS-12 / 11	2	2	2	2	2	2	$80,276		$160,552	$160,552	$160,552	$160,552	$160,552	$160,552
		Totals	**70**	**65**	**59**	**77**	**77**	**77**								
		Military	**15**	**15**	**15**	**15**	**15**	**15**			$594,036	$586,476	$586,476	$586,476	$586,476	$586,476
		Civilain	**55**	**50**	**44**	**62**	**62**	**62**	Assumes 17 MP are Civ FTEs		$2,126,182	$1,870,408	$1,593,957	$2,578,168	$2,578,168	$2,578,168
									MIL Weighted Avg.		$39,602	$39,098	$39,098	$39,098	$39,098	$39,098
									CIV Weighted Avg.		$38,658	$37,408	$36,226	$41,583	$41,583	$41,583

K.4 EIFS Modeling Results

To estimate the amount of indirect economic impact that would be associated with the direct changes in net spending, the EIFS economic model was identified as an appropriate modeling system for the EIS analysis, given the limited scope of the direct spending (focused largely on relatively few economic sectors such as retail sales). The model was used to calculate direct and indirect impacts in San Bernardino County using 2010 expenditures data adjusted for inflation to 2015 dollars).

The EIFS model takes as input certain details about direct local expenditures, employment, and income, and outputs forecasts of the associated direct, indirect, and total impacts on sales volume, income, employment, and population. Estimated direct changes in net expenditures related to the local area (within 50 miles of the trip destination) and the remainder of the county were then combined for input into the EIFS model. Only the total county spending changes were input to the model to calculate indirect impacts. Estimated direct changes in net spending outside the county (from more distant travelers) were not modeled for evaluation of indirect impacts, and were provided only for comparison to local and in-County expenditure changes.

The following are the EIFS inputs and output data and the RTV values for the baseline scenario and the action alternatives. These data form the basis for the socioeconomic impact analysis presented in Section 4.3 of the EIS.

Economic Impact Forecast System

US Army Corps of Engineers
Mobile District

EIFS Report Date September 8, 2010

EIS Alternative: Alternative 1

PROJECT NAME

EIS

STUDY AREA

06071 San Bernardino, CA

FORECAST INPUT

Change In Local Expenditures	($681,857)
Change In Civilian Employment	55
Average Income of Affected Civilian	$38,658
Percent Expected to Relocate	70
Change In Military Employment	15
Average Income of Affected Military	$39,602
Percent of Militart Living On-post	25

FORECAST OUTPUT

Employment Multiplier	3.54	
Income Multiplier	3.54	
Sales Volume - Direct	$1,286,448	
Sales Volume - Induced	$3,267,579	
Sales Volume - Total	$4,554,028	0.01%
Income - Direct	$2,606,911	
Income - Induced)	$542,996	
Income - Total(place of work)	$3,149,908	0.01%
Employment - Direct	76	
Employment - Induced	14	
Employment - Total	90	0.01%
Local Population	133	
Local Off-base Population	124	0.01%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	13.46 %	12.75 %	3.64 %	3.64 %
Negative RTV	-5.93 %	-4.33 %	-3.85 %	-2.16 %

Economic Impact Forecast System

US Army Corps of Engineers
Mobile District

EIFS Report Date: September 8, 2010

EIS Alternative: Alternative 2

PROJECT NAME

EIS

STUDY AREA

06071 San Bernardino, CA

FORECAST INPUT

Change In Local Expenditures	($297,936)
Change In Civilian Employment	50
Average Income of Affected Civilian	$37,408
Percent Expected to Relocate	70
Change In Military Employment	15
Average Income of Affected Military	$39,098
Percent of Militart Living On-post	25

FORECAST OUTPUT

Employment Multiplier	3.54	
Income Multiplier	3.54	
Sales Volume - Direct	$1,461,420	
Sales Volume - Induced	$3,712,007	
Sales Volume - Total	$5,173,427	0.01%
Income - Direct	$2,407,360	
Income - Induced)	$616,850	
Income - Total(place of work)	$3,024,210	0.01%
Employment - Direct	71	
Employment - Induced	16	
Employment - Total	88	0.01%
Local Population	124	
Local Off-base Population	115	0.01%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	13.46 %	12.75 %	3.64 %	3.64 %
Negative RTV	-5.93 %	-4.33 %	-3.85 %	-2.16 %

Economic Impact Forecast System

US Army Corps of Engineers
Mobile District

EIFS Report Date: September 8, 2010

EIS Alternative: Alternative 3

PROJECT NAME

EIS

STUDY AREA

06071 San Bernardino, CA

FORECAST INPUT

Change In Local Expenditures	($24,221)
Change In Civilian Employment	-106
Average Income of Affected Civilian	$36,226
Percent Expected to Relocate	70
Change In Military Employment	15
Average Income of Affected Military	$39,098
Percent of Militart Living On-post	25

FORECAST OUTPUT

Employment Multiplier	3.54	
Income Multiplier	3.54	
Sales Volume - Direct	($2,855,992)	
Sales Volume - Induced	($7,254,219)	
Sales Volume - Total	($10,110,210)	-0.02%
Income - Direct	($3,257,511)	
Income - Induced)	($1,205,484)	
Income - Total(place of work)	($4,462,996)	-0.01%
Employment - Direct	-104	
Employment - Induced	-32	
Employment - Total	-135	-0.02%
Local Population	-147	
Local Off-base Population	-157	-0.01%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	13.46 %	12.75 %	3.64 %	3.64 %
Negative RTV	-5.93 %	-4.33 %	-3.85 %	-2.16 %

Economic Impact Forecast System

US Army Corps of Engineers
Mobile District

EIFS Report Date: September 8, 2010

EIS Alternative: Alternative 4

PROJECT NAME

EIS

STUDY AREA

06071 San Bernardino, CA

FORECAST INPUT

Change In Local Expenditures	($320,101)
Change In Civilian Employment	62
Average Income of Affected Civilian	$41,583
Percent Expected to Relocate	70
Change In Military Employment	15
Average Income of Affected Military	$39,098
Percent of Militart Living On-post	25

FORECAST OUTPUT

Employment Multiplier	3.54	
Income Multiplier	3.54	
Sales Volume - Direct	$2,008,283	
Sales Volume - Induced	$5,101,038	
Sales Volume - Total	$7,109,321	0.02%
Income - Direct	$3,111,422	
Income - Induced)	$847,675	
Income - Total(place of work)	$3,959,098	0.01%
Employment - Direct	86	
Employment - Induced	22	
Employment - Total	108	0.02%
Local Population	145	
Local Off-base Population	136	0.01%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	13.46 %	12.75 %	3.64 %	3.64 %
Negative RTV	-5.93 %	-4.33 %	-3.85 %	-2.16 %

Economic Impact Forecast System

US Army Corps of Engineers
Mobile District

EIFS Report Date: September 8, 2010

EIS Alternative: Alternative 5

PROJECT NAME

EIS

STUDY AREA

06071 San Bernardino, CA

FORECAST INPUT

Change In Local Expenditures	($305,423)
Change In Civilian Employment	62
Average Income of Affected Civilian	$41,583
Percent Expected to Relocate	70
Change In Military Employment	15
Average Income of Affected Military	$39,098
Percent of Militart Living On-post	25

FORECAST OUTPUT

Employment Multiplier	3.54	
Income Multiplier	3.54	
Sales Volume - Direct	$2,022,961	
Sales Volume - Induced	$5,138,320	
Sales Volume - Total	$7,161,281	0.02%
Income - Direct	$3,113,862	
Income - Induced)	$853,871	
Income - Total(place of work)	$3,967,732	0.01%
Employment - Direct	86	
Employment - Induced	23	
Employment - Total	108	0.02%
Local Population	145	
Local Off-base Population	136	0.01%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	13.46 %	12.75 %	3.64 %	3.64 %
Negative RTV	-5.93 %	-4.33 %	-3.85 %	-2.16 %

Economic Impact Forecast System

US Army Corps of Engineers
Mobile District

EIFS Report Date: September 8, 2010

EIS Alternative: Alternative 6

PROJECT NAME

EIS

STUDY AREA

06071 San Bernardino, CA

FORECAST INPUT

Change In Local Expenditures	($215,847)
Change In Civilian Employment	62
Average Income of Affected Civilian	$41,583
Percent Expected to Relocate	70
Change In Military Employment	15
Average Income of Affected Military	$39,098
Percent of Militart Living On-post	25

FORECAST OUTPUT

Employment Multiplier	3.54	
Income Multiplier	3.54	
Sales Volume - Direct	$2,112,536	
Sales Volume - Induced	$5,365,843	
Sales Volume - Total	$7,478,380	0.02%
Income - Direct	$3,128,747	
Income - Induced)	$891,680	
Income - Total(place of work)	$4,020,427	0.01%
Employment - Direct	86	
Employment - Induced	24	
Employment - Total	110	0.02%
Local Population	145	
Local Off-base Population	136	0.01%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	13.46 %	12.75 %	3.64 %	3.64 %
Negative RTV	-5.93 %	-4.33 %	-3.85 %	-2.16 %

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APPENDIX L
MILITARY CONSTRUCTION PROJECTS AT THE COMBAT CENTER

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Project-specific site improvements or design features, as well as proposed size of each structure or infrastructure footprint for each of the projects, are summarized below for all known and reasonably foreseeable future actions at Mainside that may have impacts additive to the effects of the proposed alternatives.

P-175: Consolidated Emergency Response Center

P-175 would construct a 29,504-square foot, two-story consolidated emergency response center for the Provost Marshalls Office and main base Fire Department. This project is needed to provide an adequate consolidated facility for the emergency response functions of Marine Corps Air Ground Combat Center at Twentynine Palms, CA (Combat Center) that can meet all compliance requirements for life/safety/fire/seismic and quality of life standards, and meet the basic anti-terrorism/force protection standards of construction and set back distances from adjacent roadways and parking. Co-location of Police and Fire Departments would provide a continuity of operations in the emergency response and dispatching areas.

The Fire Station would comprise approximately 22,906 square feet of the building, while the Provost Marshalls Office would comprise 6,598 square feet. Specific building construction would include seven double deep drive-thru bays with large roll-up doors for fire apparatus and equipment, individual sleeping rooms with personnel lockers for 3-Engine Company, hose drying space, radio antenna for receiving fire alarms, secured storage room, combination day room and training area, dining room, kitchen, exercise room and medical deep sinks, and floor drain in each bay with oil/water separator, emergency standby generator, vehicle exhaust system, compressed air system, fireman gear lockers, steam generator and medical vault/secure storage container, a reinforced concrete arms vault with the appropriate security measures, prisoner-holding cells, radio antenna equipped with state of the art Space and Naval Warfare Systems Command security system for Military Police, administrative areas, and Navy Marine Corps Intranet computer room.

Site improvements would include sidewalks, parking lots for organizational vehicles, roadway access, stormwater pollution measures and prevention plans, grading, and landscaping. Supporting facilities would include site and building utility and communication connections (water, sanitary sewers, electrical, telephone, local area network and cable television). Electrical systems would include fire alarms, exterior lighting, energy saving electronic monitoring and control system, intrusion detection system, information systems, and an electrical transformer. Mechanical systems would include plumbing, fire protection, heating, ventilation, and air conditioning, and fire hydrants.

P-175 would also demolish Buildings 1407, 1408, and 1516 (all replaced fire and provost stations).

This project is planned to occur in FY 2014.

P-190: Combat Center Band Facility

P-190 would construct a permanent facility (15,389 square feet) to house Marine Corps Band personnel at the Combat Center. This project would construct a low-rise, single-story band building. The facility would include large and small group rehearsal rooms, recording/audio control room, individual practice rooms, administrative spaces, library, restrooms, storage, and receiving space. Special construction features would include sound attenuation and a loading dock.

Paving and site improvements would include an asphalt-paved area for drilling, 8-foot chain link fencing and gates, non-organizational parking, sidewalks, and a trash enclosure. The pitched standing seam metal roof cannot accommodate the mechanical equipment that used to be located on flat roof systems. Therefore, an enclosed, mechanical yard would be required to house mechanical units.

This project is planned to occur in FY 2015.

P-191: Addition to Camp Wilson Gym (Building 5411)

P-191 consists of a pre-engineered building (3,208 square feet) as an addition to the existing Camp Wilson Gym (Building 5411). The addition is needed to achieve required machine spacing and meet safety requirements of 36 inches between equipment and for pathways. The building would be built adjacent to the southwest wall of Building 5411. The buildings would be accessible through the existing main entrance into Building 5411 and by two 12-foot openings that would be cut into the adjacent walls. The addition would include two unisex restrooms, each with only a sink and a toilet. White lights would be used to light the building and rubber matting would be used for flooring.

Supporting facilities would include electrical utilities, water utilities, sanitary sewer utilities, gas utilities, steam, and controls. Paving and site improvements would include paved roads and parking, curbs and gutters, specialty walks/pavers, sidewalks, pedestrian and bicycle features, stormwater drainage improvements, and fencing and gates.

This project is planned to occur in FY 2016.

P-192: Deadman Lake Subbasin Well Field

P-192 involves developing the Deadman Lake sub-basin aquifer by drilling and installing three new potable water production wells at 750 gallons/minute, a new three-million gallon ground-level reservoir, four new well and pump control buildings, and approximately 15,000 linear feet of 8-inch potable water transmission lines from three wells to the new reservoir and to the existing potable water transmission lines for blending of groundwater from the Surprise Springs subbasin aquifer. The development of the Deadman Lake subbasin and blending would prolong the usefulness of Surprise Springs subbasin and sustain Combat Center potable water demands to an estimated 75 years.

Structural fill is required as a special foundation requirement for the ground-level reservoir. Electrical system includes Systems Control and Data Acquisition (SCADA) system, electrical distribution system, exterior lighting, pad-mounted transformers, and emergency back-up generators. Mechanical system includes well controls and valves, blending manifold, and chemical constituent monitoring meters. Paving and site improvements include gravel access roads to well heads and reservoir, chain link fencing and gates, and anti-terrorism/force protection and Safe Drinking Water Act security requirements at wells, pump houses, and reservoir sites.

This project is planned to occur in FY 2015.

P-193: Consolidated Emergency Response Center

P193 would construct 11,916 SF multipurpose classroom facility. The project consists of constructing a one-story multipurpose classroom facility for use by Marksmanship Training Unit (MTU), Explosive Ordinance Disposal (EOD), & Range Training Area Maintenance Section (RTAMS). MTU, EOD, and RTAMS facilities are located several miles from Mainside, near the Rifle Range and Range 200. The classroom facility will be located close to and used by these organizations for the classroom portions of their training.

This project is planned to occur in FY 2015.

P-194: Convert Building 2025 to Wheeled Vehicle Maintenance Facility

P-194 would renovate and repair Building 2025, a 22,680-square foot facility constructed of pre-cast, tilt-up, concrete in 1986. Building 2025 is used to maintain heavy equipment and Humvees. The south side of the building is used for field utility equipment (lights, generators) and a tire shop. A portion of the building is used for tire storage, and there is a sunshade adjacent to Building 2025 where maintenance is currently being conducted when there is not enough space to complete work in the maintenance bays. Building 2025 is in fair condition, but is a large, poorly designed space.

P-194 would convert the existing warehouse space into 12 wheeled vehicle maintenance bays, while the existing office space would be relocated adjacent to the existing toilet rooms. The existing metal stud walls, doors, ceilings, and flooring would be demolished and replaced with new 20 gauge metal stud walls finished with abuse-resistive drywall. Four openings would be saw cut in the exterior walls on the western and eastern sides of the facility to accommodate new electric roll-up doors. Ramps would be added to the west side of the building, leading to the existing loading dock, to provide access to the new service bays. A new, self-supporting metal canopy would be erected on the west side of the facility, adjacent to the existing tire shop, to provide tire storage. The storage area would be secured with a chain-link fence and gate. Upgrades/improvements would also be made to restrooms, mechanical systems, power distribution equipment, heating systems, ventilation systems, interior (air handling unit) and exterior (remote condensing unit) air conditioning units, lighting, etc.

Site improvements would include stormwater drainage improvements. Electrical systems would include communications, electrical distribution, exterior lighting, and a 500 kilovolt-ampere (KVA) pad-mounted transformer. Special construction includes a separate hazardous materials containment area, with provisions for proper ventilation, expansion of the vehicle exhaust system, and a crane center to accommodate two 20-25,000 pound top running cranes, lube systems, and compressed air systems.

This project is planned to occur in FY 2016.

P-204: ATG COP Shadow Compound

P-204 would construct an ATG training complex which include constructing an area to provide immersion training and an area for administrative functions. The immersion training area would construct buildings to provide billeting for the teams and various mock buildings that can be transformed to depict the culture the team will become partner-security force service-level advisors. Construction in the administrative area would provide operational buildings for instructors and administrative personnel.

This project is planned to occur in FY 2014.

P-212: Child Development Center

P-212 would construct a 35,822 SF single-story Child Development Center (CDC). The facility would be handicapped accessible and comply with the currently adopted International Building Code and latest Unified Facilities Criteria (UFC) standards, including UFC 4-740-14, Child Development Centers. The building would be constructed with a spread footing foundation, concrete floor, concrete masonry exterior walls, and pitched standing seam metal roof. The facility would include a telecommunication system, closed circuit TV system, and public address system, fire protection system including fire hydrants, plumbing system, electrical system, heating ventilation and air conditioning system, storm drainage system, sanitary sewer system, mechanical and electrical utilities, and renewable energy systems. Functional areas include a mechanical room, electrical room, telecommunications room, dedicated NMCI telecommunications room, entrance vestibule, lobby, reception and work area, administration offices, staff break room, training room, central storage, staff and public toilet rooms, kitchen, janitorial and laundry room. Child activity rooms would be provided for infants, pre-toddlers, toddlers and preschool aged children.

This project is planned to occur in FY 2012.

P-504: Consolidated Community Support Facility

P-504 would construct a 114,356-square foot, multi-story consolidated family services and community support facility consisting of an administrative facility (32,442 square feet), family services center (13,003 square feet), religious ministry facility (12,938 square feet), and parking structure (55,972 square feet). This project is needed to provide community and service support facilities that are centrally located to adequately serve the families and service members stationed at the Combat Center. A consolidated facility, prominently sited in the central core area of the base, would provide the visibility and access to the public that these various programs require. Consolidation would also permit an economy of scale with many common functions shared by the different service groups. The single, new facility, with current energy efficient construction and connection to the central heating and cooling system, would also significantly reduce energy consumption, operating, and maintenance costs over the present demands.

Site improvements would include sidewalks, outdoor amenities, roadway access, earthwork, grading, and landscaping. Electrical systems would include fire alarms, energy saving electronic monitoring and control system, and information systems. Mechanical systems would include plumbing, fire protection systems, heating, ventilation, and air conditioning, connections to a central chilled water plant and high temperature hot water lines with secondary distribution loops, and installation of an additional modular chiller unit to the existing central chilled water plant. Special construction features would include two elevators with four stops each.

P-504 would also demolish Buildings 1521, 1523, 1525, and 1551 (a total of 58,388 square feet of inadequate facilities) permitting the redevelopment of the site. The existing buildings to be demolished were built in 1953 and have uninsulated concrete walls and ceilings. Heating and cooling loads due to infiltration and lack of insulation have made these old facilities inefficient and increasingly costly to operate.

This project is planned to occur in FY 2014.

P-571: Roads Southeast Access

P-571 would construct additional roads to and from ranges. The following four routes are being considered:

- From the base of Range 500 in Cleghorn Pass Training Area in a southerly direction to the Bureau of Land Management (BLM) corridor off base, through the corridor in a northeasterly direction through the Bullion Pass into the Bullion Training Area, and intersecting the Bullion main supply route (MSR) within 2500 meters of the southern base boundary (on base).
- From Amboy Road, off base, on the northern side of the Wilderness Area on the southeastern corner of American Mine Training Area, in a westerly direction, to the base boundary, then along the southern base boundary in South American mine, to the Bullion Training Area, to the Bullion Training Area MSR near the southern base boundary.
- From Amboy Road into the center of the American Mine Training Area, (either by the northern jeep trail or by the eastern jeep trail), to the vicinity of Observation Post Buff (base of ridge) and

then as terrain allows into the Bullion Training Area and egressing into Bullion Training Area to the vicinity of Observation Post Frito.

- From Observation Post Crampton road at the base of the mountain and wash to the top of the hill near the old abandoned pre-engineered building via Delta/Prospect/Miner's pass MSRs.

This project is currently unprogrammed

P-581: MCAGCC HQ Building

P-581 would construct a 22,270 SF facility to provide an administration building to house Command Staff of the Training Center and replace 50 year old single story buildings that are safety hazards, and not efficient in the arena of energy consumption.

This project is planned to occur in FY 2015.

P-602: Training Integration Center

P-602 would construct a 41,635-square foot, multi-story Training Integration Center to provide a consolidated, efficiently configured, processing center and adequate temporary billeting for newly arriving junior enlisted students. The first level of the facility would contain a single primary entrance, duty room/control point with linen issue and storage, administrative processing areas, 250 occupant multi-purpose space, recreation/television viewing areas, multi-media classroom, library and study areas, public restrooms, and equipment storage lockers/rooms. The upper levels would consist of open bay barrack spaces for temporary billeting with central laundry, janitorial, and vending spaces. There would be four squad bays per floor; each squad bay would hold 20 students for a total sleeping capacity of 240 students. Each bay would have direct access to its own shower/restroom facilities. Student barracks would comprise 33,583 square feet of the facility, while 8,051 square feet would comprise the processing center. Community and service core areas would consist of laundry facilities, TV lounge, administrative offices, housekeeping areas, and public restrooms.

Site improvements would include sidewalks, outdoor recreation facilities/courts, bus drop off lane, earthwork/grading, stormwater management, and water efficient landscaping. Electrical systems would include fire alarms, energy saving electronic monitoring and control system, and information systems. Mechanical systems would include plumbing, fire protection systems, and heating, ventilation, and air conditioning. Built-in equipment would include one service elevator. Connections to the high temperature hot water lines with secondary distribution loops would also be constructed.

This project is planned to occur in FY 2016.

P-603: Vehicle Training and Equipment Facility

P-603 would include alterations and additions to Building 1855 (27,706 square feet) to provide the required vehicle maintenance space for the assigned communications vehicles of the Marine Corps Communications Electronics School. P-603 would construct classroom and covered exterior instruction space for drivers of tactical vehicles and communications equipment operators. Permanent facilities would be constructed of concrete and masonry construction, steel roof framing, decking, and 5-ply built-up roofing. The project would include the construction of insulated and air conditioned classroom space, a vehicle hoist in the maintenance facility, heads for male and female students, and covered parking space for communications vehicles.

This project is planned to occur in FY 2018.

P-617: Waste Handling and Recovery Complex

P-617 would construct a material recovery facility complex, consisting of four separate buildings: a general waste sorting facility (6,501 square feet), recycled material sorting and bailing facility (8,999 square feet), recycled material storage building (7,502 square feet), vehicle holding shed (2,357 square feet), and a multi-story administrative support facility (11,216 square feet) for the Natural Resources and Environmental Affairs Division that includes the Sections of Administrative, Compliance, Pollution Prevention, Hazardous Waste, Natural and Cultural Resources, Total Waste Management, and Range Residue Processing. The project would allow for complete management of solid waste through a material recovery facility complex to remove all recyclables prior to disposal in the expanded compliant sanitary landfill, thus allowing the Combat Center to meet its regulatory requirements by extending the life of the landfill another 15 to 20 years.

Each facility in the complex would be constructed with concrete slab on grade and insulated standing seam metal roofing over steel framing. The two-bay vehicle holding shed would be cantilever type with a photovoltaic system. Site improvements would consist of site preparation, access roads, appropriate site drainage measures for a 100 year flood, oil/water separator, concrete and asphalt flatwork, screened perimeter fencing, and staff/employee parking lots. Electrical systems would include exterior lighting, electrical utilities, and outside communications lines. Mechanical systems would include heating, ventilation, and air conditioning with the highest Energy Efficiency Ratio per tonnage.

P-617 would also demolish Building 1451 and eight relocatable administrative trailers.

This project is planned to occur in FY 2014.

P-618: Multi-Purpose Administration Building

P-618 would provide an administration building (29,084 square feet) to house the general administration functions that support the Combat Center and replace the six, old, single-story buildings that are safety hazards and energy consuming structures. Building 1551 (old hospital) would also be demolished. A three-story, permanent facility would be constructed of reinforced steel, concrete framing, and masonry block infill. The project would provide sidewalks, landscaping, irrigation, paved parking, curbs and gutters, exterior lighting, and 40 tons of air conditioning.

Supporting facilities include electrical, water, sanitary sewer and gas utilities. Paving and site improvements include signage, landscaping and irrigation, roads, and sidewalks.

This project is planned to occur in FY 2016.

P-641: Addition East Gym 1588

P-641 would construct a 19,999-square foot, multi-story addition including renovation to the existing east gymnasium (Building 1588) at the Combat Center. The addition would be constructed of reinforced concrete slab-on-grade with perimeter footing and spread beam foundation, reinforced concrete masonry exterior walls, and a standing seam metal roof. Special construction features include sound attenuation and upgrades to the building’s existing electrical distribution system to handle the increased load.

Site preparation would include excavation, grading, structural fill, and site cleanup. Site improvements would include sidewalks and an additional 160 surface parking spaces. Electrical systems would include communications, fiber optic, electrical distribution, and a 300 kVA transformer to replace the existing 225 kVA transformer. Mechanical systems would include potable water utilities, fire hydrants, mechanical utilities, sanitary sewer utilities, and an Energy Management Control System.

P-641 would also include miscellaneous demolition to permit the expansion of the existing facility, including removal of a store front system, concrete sidewalk, steps, and railing.

This project is planned to occur in FY 2014.

P-662: Expeditionary Fighting Vehicle Maintenance Facility

This project would construct a new Expeditionary Fighting Vehicle Maintenance Facility (67,371 square feet) to accommodate 58 Expeditionary Fighting Vehicle tracked and non-tracked vehicles for the 3rd Amphibious Assault Battalion. The primary facility would consist of a 10,514-square foot Amphibian Vehicle Maintenance Shop and a 3,868-square foot Automotive Organizational Shop. The facilities would be constructed with reinforced concrete masonry block walls, concrete foundation, concrete slab, and a standing seam metal roof over steel trusses. The maintenance facilities would include six Maintenance Bays to perform maintenance on Expeditionary Fighting Vehicles.

This project would also construct a 39,310-square foot Vehicle Holding Shed to protect wheeled and tracked armored vehicles from accelerated deterioration due to extreme environmental conditions and a 9,054-square foot Closed Loop Tactical Vehicle Wash Platform with six washracks, including a crane to remove engines to allow for secondary hull cleaning. This project would construct 4,628 square feet of office space. Paving and site improvements would include paved privately-owned vehicle parking, sidewalks, roadway access, earthwork, grading, and landscaping. Anti-terrorism/force protection features include fencing, barriers, and gates

This project is planned to occur in FY 2018.

P-680: Addition to West Gym, 1518

P-680 would construct a 19,999 SF multi-story addition, including renovation to the existing west gymnasium (B-1518), and the re-location of weight room functions from this facility to the new addition. The addition would consist of aerobics, cardiovascular training, athletic gear issue, physical fitness training, gymnastics, racket/hand-ball courts, spin room and weight training facilities. The building would include a group meeting area(s), expansion of mens/ladies locker/shower areas and an integrated sound system.

This project is planned to occur in FY 2017.

P-688: Public Works Shops

No project DD1391 documentation available at this time. This project would provide maintenance support facilities for installations' facilities management sections.

This project is planned to occur in FY 2019.

P-808: Concrete Ramp, F/W; Expeditionary Air Field (EAF)

P-808 would construct a 742,904-square foot reinforced concrete aircraft parking apron with areas for hangar access, aircraft refueling, supporting yellow gear, and ordnance handling sleds. It would also construct all associated drainage structures and install all airfield lighting. The project would replace the current apron with permanently installed, reinforced concrete pavement. The project would include all necessary excavation cut and fill, shoulders, drainage structures, environmental mitigation, airfield lighting, service area lighting, and security lighting.

This project is currently unprogrammed

P-810: Concrete Taxiway

P-810 would replace the EAF taxiway and throats constructed of interlocking aluminum matting with 943,326 square feet of new, permanently installed, reinforced concrete pavement. The project includes all necessary excavation cut and fill, shoulders, drainage structures, environmental mitigation, airfield lighting, service area lighting, and security lighting as required. This project is planned to occur in FY 2019.

P-811: Concrete Ramp, R/W; EAF

P-811 would replace 89,289 SY of apron constructed of interlocking AM-2 aluminum matting with 93,287 SY of new, permanently installed, reinforced concrete pavement for parking and access for rotary wing aircraft. The project includes all necessary excavation cut and fill, shoulders, drainage structures, environmental mitigation, airfield lighting, service area lighting, and security lighting as required by NAVFAC P-80.

This project is planned to occur in FY 2019.

P-900: Marine Corps Communication and Electronic Classroom

P-900 would construct a 91,762-square foot, three-story academic and applied instruction facility for the training mission at the Combat Center in direct support of the Marine Corps Communications and Electronic School. Community and service core areas would consist of instructor administrative spaces, multipurpose rooms, housekeeping areas, and public restrooms. Special building design would include built-in equipment for two freight elevators, one-hour construction walls for computer areas, and raised flooring in all classroom and laboratory areas.

Site improvements would include paved parking, sidewalks, outdoor furniture, lighting, roadway access, earthwork, grading, and landscaping. Electrical systems would include fire alarms, energy saving electronic monitoring and control system, and information systems. Mechanical systems include plumbing, fire protection systems, heating, ventilation, and air conditioning, and connections to a central chilled water plant and relocation of high temperature hot water lines with secondary distribution loops.

P-900 would also demolish two existing classrooms, Buildings 1757 and 1758 (each 30,160 square feet).

This project is planned to occur in FY 2015.

P-902: Marine Corps Communications and Electronic School Bulk Supply Warehouse

P-902 would provide a new, permanent, single-story, concrete warehouse building (12,109 square feet) in direct support of the Marine Corps Communications and Electronic School, located within the boundaries of the Marine Corps Communications and Electronic School campus. The building would consist of concrete foundation, concrete floor slab reinforcement run continuously through both faces of the slab and into beams and columns, tilt-up concrete walls, and sloped standing seam metal roofing. The building would have open web steel joist roof support. Community and service core areas would consist of administrative offices, housekeeping areas, and public restrooms.

Supporting facilities work would include site and building utility connections (water, sanitary sewers, electrical, telephone, local area network, and cable television). Electrical systems would include fire alarms, energy saving electronic monitoring and control system, and information systems. Mechanical systems would include plumbing, fire protection systems, and heating, ventilation, and air conditioning. Paving and site improvements would include loading docks, sidewalks, roadway access, earthwork, grading, and landscaping.

This project is planned to occur in FY16.

P-903: Marine Corps Communications and Electronic School Consolidated Radar Classroom

P-903 would consolidate radar training that is currently located in three obsolete buildings constructed in 1967. This project would construct an approximately 32,292-square foot consolidated radar classroom. The project would also construct five external radar sites adjacent to the new facility. Buildings 1826, 1828, and 1839 would be demolished as a part of this project.

This project is planned to occur in FY 2014.

P-920: Multi-Battalion Operations Center

P-920 would construct a 65,789 SF multi-story reinforced concrete masonry CMU Battalion and CO Headquarters for two battalions with seismic upgrades, concrete foundation and floors, and standing seam metal roofing, providing administration offices and other support functions such as Navy and Marine Corps Intranet (NMCI). Built-in equipment includes two elevators. Special costs include seismic construction, additional cost of standing seam metal roofing and construction of a temporary prefab building and its supporting facilities at another site.

This project is planned to occur in FY 2016.

P-921: Electronic/Communications Maintenance and Storage Facility

P-921 would construct a consolidated electronic and communications maintenance shop (10,204 square feet) and unit storage facility (24,649 square feet). Community and service core areas would consist of administrative offices, maintenance shops, public restrooms, and storage areas.

Site improvements would include a loading dock, concrete pavement for the loading area, sidewalks with curbs and gutters, new roadway access to the west side of the new building, earthwork, grading, landscaping, shaded vehicle yards surrounded with security fences and gates, repair of storm drainage, and repair of existing roadway access. Electrical systems would include fire alarms, energy saving electronic monitoring and control system, and information systems including public address system and security monitoring system. Mechanical systems would include plumbing, fire protection systems, compressed air system and heating, ventilation, and air conditioning system, and repair of existing high temperature hot water lines.

P-921 would demolish Buildings 1721, 1723, 1724 (totaling 10,215 square feet), including necessary asbestos and lead base paint removal and clearing of existing underground utilities.

This project is planned to occur in FY 2017.

P-926B: Library/Lifelong Learning Center, Phase II

P-926B is Phase II of a two-phase project that constructs a three-story facility to support the library functions at the Combat Center. Phase I of the project is to construct an adjoining three-story Life Long Learning Center (Education Center). P-926B, Phase II, would construct a 21,000-square foot library to be utilized as the Command Reference Center and support the increase of personnel at the Combat Center. The project would construct library spaces to include large areas for office space, classrooms, book racks, computer rooms, reading rooms, and supporting areas.

Site improvement would include excavation, grading, excess material removal, curbs and gutters, parking and an access road, sidewalks, desert landscaping with irrigation, stormwater control features, pedestrian and bicycle features, and a pedestrian bridge to connect the Library and Learning Center. Special construction would include a fire pump, four stop personnel elevator, and basement excavation and shoring for an elevator maintenance room. Electrical systems would include fire alarms, energy saving Electronic Monitoring and Control System, electrical connection to the grid, exterior lighting and information system connections. The mechanical system would include fire protection systems, high temperature hot water and chilled water systems, and water and sewer connections.

This project is planned to occur in FY 2014.

P-927: Marine Corps Communication and Electronic Classroom

P-927 would construct a 91,106-square foot, multi-story academic and applied instruction facility for the training mission at the Combat Center in direct support of training at the Marine Corps Communications and Electronic School. Special design features would include one-hour construction walls for computer areas, raised flooring in all classroom and laboratory areas, and one freight elevator. Community and service core areas would consist of instructor administrative spaces, multipurpose rooms, housekeeping areas, and public restrooms. Supporting facilities would include site and building utility connections, i.e., water, sanitary sewers, electrical, telephone, local area network, and cable television. The building would connect to a central chilled water plant and relocate high temperature hot water lines with secondary distribution loops.

Site improvements would include paved parking, sidewalks, outdoor furniture, lighting, roadway access, earthwork, grading, and landscaping. Electrical systems would include fire alarms, energy saving electronic monitoring and control system, and information systems. Mechanical systems would include plumbing, fire protection systems, and heating, ventilation, and air conditioning.

P-927 would also demolish two existing classrooms (each 30,160 square feet), Buildings 1747 and 1748.

This project is planned to occur in FY 2017.

P-928: MCCES Classroom

No project DD1391 documentation available at this time. This project would provide academic & applied instruction facilities for communications & electronics formal school.

This project is planned to occur in FY 2018.

P-930: Construct PWD, ROICC, NREA Compound

No project DD1391 documentation available at this time. This project would construct facilities management, operational/administrative facilities, and ROICC offices.

This project is planned to occur in FY 2019

P-978: Rifle Range Water Distribution System

P-978 would construct a new 120,000-gallon ground-level reservoir that would provide required demand and pressure for the Rifle Range Area. The projects would also place 3,100 linear feet of new 12-, 8- and 6-inch potable water distribution lines in a new utility corridor connecting the 20-inch water mains to the reservoir and to the Rifle Range Complex Area. Backflow prevention and check valves devices would be installed to standard. The existing 30,000-gallon steel tank would be demolished and the existing 6-inch polyvinyl chloride water line from the 20-inch water main would be abandoned.

Supporting facilities would include a retaining wall constructed to prevent erosion onto the reservoir. Structural fill would be required as a special foundation requirement. Electrical systems would include communication fiber for the SCADA utilities management system, electrical distribution, exterior lighting, and a pad mounted transformer. Mechanical system would be required to reconnect new lines to existing facilities at the Rifle Range Complex. Paving and site improvements would include an access road to the reservoir, chain link fencing and gate, and closed-circuit cameras to meet Safe Drinking Water Act requirements for Anti-Terrorism. The project would provide for site preparation, including excavation and fill for the reservoir and water lines. Demolition of Building 2110 and the existing 30,000-gallon reservoir would be included in this project.

This project is unprogrammed and expected to occur in FY 2015.

P-980: Substation SCADA System

P-980 would provide an Electrical Distribution SCADA system for Mainside of the Combat Center. Construction would include the installation of fiber optic lines and associated equipment from 11 existing substations to existing Main Control Room located in the Heating Plant (Building 1557) via Co-Gen Plant (Building 1574). Construction would include reconfiguration of existing Main Control Room located in the Heating Plant in order to accommodate new SCADA system. The project would also include revising and displaying the substation control wiring and one-line diagram in each of the substations. The one-line diagram would be displayed in a lockable glass case.

This project is planned to occur in FY 2014.

P-987: Addition to Temporary Lodging Facility

P-987 would construct a two-story, 20-room, 8,860-square foot detached addition to the existing facility and a 6,050-square foot macadam parking lot to accommodate the additional occupancy. Other project components include paving and site improvements including parking, sidewalks, earthwork, grading, and landscaping. The Temporary Lodging Facility is required to provide lodging to military members and their families assigned to the Combat Center while they await assignment to government quarters or locate housing in the local community.

This project is planned to occur in FY 2012.

P-988: Combat Center Gate Reconfiguration, Anti-Terrorism/Force Protection Upgrades

P-988 would construct a new gate house facility (2,497 square feet) including vehicle inspection lanes, sentry inspection houses (194 square feet), and related supporting facilities at the Main Gate and two auxiliary gates at the Combat Center.

Supporting facilities would include a special foundation of borrow and fill of entrance areas, electrical requirements of transformer, electrical distribution, overhead lighting, interior communications and telephone; mechanical utilities include connection to water, sewer, and natural gas. Site improvements would include grading, asphalt and concrete pavements, concrete curbs, concrete dividers, traffic medians, sidewalks, parking areas, overhead signs, road striping and traffic signs, flag poles, and landscaping and irrigation.

P-988 would demolish existing gate facilities and related asphalt and concrete pavement, concrete curbs, and related supporting facilities. The project would also demolish five gate facilities totaling 1,456 square feet: Buildings 900, 901, and 904 (Main Gate), 1000 (Condor Gate), and 3334 (Ocotillo Gate).

This project is planned to occur in FY 2015.

P-989: ATFP Perimeter Fence

No project DD1391 documentation available at this time. This project would fence off the MCAGCC Mainside area to provide a secure perimeter for critical assets.

This project is planned to occur in FY 2018