FAA
Commercial Space Transportation

FINAL
X Prize Cup Environmental Assessment

October 2007

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Final Environmental Assessment for Experimental Permits at 2007 X Prize Cup

AGENCY: Federal Aviation Administration (FAA)

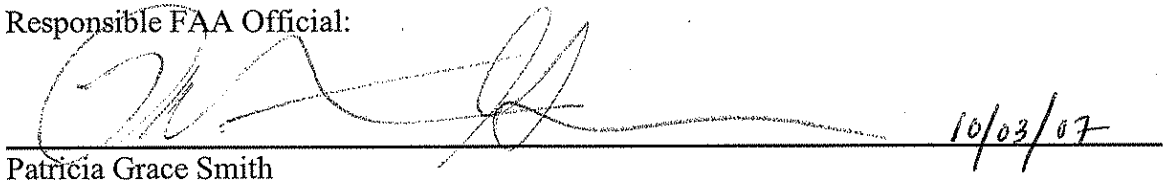
ABSTRACT: The FAA has prepared the Final Environmental Assessment (EA) for Experimental Permits at 2007 X Prize Cup and Finding of No Significant Impact (FONSI). Under the proposed action, the FAA would issue separate experimental permits to applicants proposing to participate in the Lunar Lander Challenge at the X Prize Cup, which is to be held during the Holloman Air Force Base Air and Space Show in New Mexico during October 2007.

Potential impacts of the proposed action and alternatives were analyzed in the EA for the following resources areas: air quality; biological resources (including fish, wildlife, plants, and wetlands); cultural resources (including historical, architectural, and archeological resources); Section 4(f) resources; noise and compatible land use; physical resources (including water resources [surface water, groundwater, and floodplains], hazardous materials, pollution prevention, solid waste); socioeconomic resources, environmental justice, and children's environmental health and safety risks; light emissions and visual impacts; natural resources and energy supply; and secondary (induced) impacts. Farmlands, wild and scenic rivers, and coastal resources do not exist within the region of influence, and are therefore impacts on those areas are not discussed. Construction impacts are not discussed, because no major construction activities would occur under the proposed action. Potential cumulative impacts of the proposed action also are addressed.

CONTACT INFORMATION: To obtain a copy of the EA or FONSI, visit the following internet address: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/launch_site/environmental/, or contact Ms. Stacey M. Zee, FAA Environmental Specialist, 800 Independence Avenue SW, Room 331, Washington, DC 20591. Email requests may be sent to Stacey.Zee@faa.gov or made by telephone at (202) 267-9305.

This Environmental Assessment becomes a Federal document when evaluated, signed, and dated by the responsible FAA official.

Responsible FAA Official:



10/03/07

Patricia Grace Smith
Associate Administrator for Commercial Space Transportation

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Department of Transportation

Federal Aviation Administration

Finding of No Significant Impact

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT)

ACTION: Finding of No Significant Impact

SUMMARY: The Federal Aviation Administration (FAA) prepared an Environmental Assessment (EA) to evaluate the issuance of experimental permits to applicants proposing to participate in the Lunar Lander Challenge at the October 2007 X Prize Cup, which is to be held during the Holloman Air and Space Show at Holloman Air Force Base, New Mexico. The EA evaluated the potential environmental impacts associated with the proposed action and the alternatives to make an informed decision on whether to issue experimental permits. The scope of the proposed action is defined by activities associated with the issuance of the experimental permits regulated by the FAA under Title 49, United States Code (U.S.C.), Subtitle IX, Sections 70101-70121. After reviewing and analyzing currently available data and information on existing conditions and project impacts, the FAA has determined that issuing experimental permits to the applicants would not significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act. Therefore, the preparation of an Environmental Impact Statement is not required, and the FAA is issuing a Finding of No Significant Impact. The FAA made this determination in accordance with all applicable environmental laws.

FOR A COPY OF THE ENVIRONMENTAL ASSESSMENT: Visit the following internet address: http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/launch_site/environmental/ or contact Ms. Stacey M. Zee, FAA Environmental Specialist, 800 Independence Avenue SW, Room 331, Washington, D.C. 20591. You may also send e-mail requests to Stacey.Zee@faa.gov or via telephone to (202) 267-9305.

PURPOSE AND NEED: The purpose of the proposed action is to ensure safe and responsible operation of the reusable suborbital rockets for applicants seeking to participate in the X Prize Cup Lunar Lander Challenge.

The need for the proposed action is to ensure safe commercial activities and to accelerate the technology developments supporting the commercial creation of a vehicle capable of ferrying cargo or humans back and forth between lunar orbit and the lunar surface. Such a vehicle would have direct application to the personal spaceflight industry as well as the technology development goals of the Defense Advanced Research Projects Agency and the National Aeronautics and Space Administration (NASA). In addition, the proposed action supports NASA's mission as directed by the President to return Americans to the moon by 2020 and to use the mission as a steppingstone for future manned trips to Mars and beyond.

PROPOSED ACTION: Under the proposed action, the FAA would issue experimental permits to applicants proposing to participate in the Lunar Lander Challenge. The permits would authorize the launch of the applicants' reusable suborbital rocket(s) from the Holloman Air Force Base in New Mexico. An experimental permit is valid for one year and authorizes an applicant to conduct an unlimited number of suborbital launches from a specific location. However, the suborbital launches reviewed in this EA are associated with the Lunar Lander Challenge events at the X Prize Cup, and the Holloman Air Force Base would only allow the permitted applicants to test and launch their suborbital rockets for a period of up to one week prior to and during the X Prize Cup.

Each of the proposed reusable suborbital rockets would be wingless and generally cylindrical in shape with a height from six to ten feet and a maximum diameter from four to 11.5 feet. The weights of the rockets when empty range from 90 to 1,010 pounds. The gross weights of the rockets range from 300 to 2,800 pounds. The fuel and oxidizer combinations proposed in the experimental permit applications that FAA has received were used to define the range of propellant types and quantities that may be used in the Lunar Lander Challenge.

Existing infrastructure at Holloman Air Force Base would be used for the activities related to the proposed action. Launches and landings for the Lunar Lander Challenge would occur on existing concrete pads which would either be resurfaced or re-poured.

ALTERNATIVES CONSIDERED: Alternatives analyzed in the EA include (1) the proposed action and (2) the no action alternative. Under the no action alternative, the FAA would not issue any experimental permits to the applicants seeking to participate in the Lunar Lander Challenge; therefore, there would be no permitted launches of reusable suborbital rockets from the Holloman Air Force Base. Because the FAA would not issue experimental permits, Lunar Lander Challenges would not take place. However, all the remaining Holloman Air and Space Show and X Prize Cup events would occur. This would include acrobatic and military flights for the air show; up to eight amateur rocket launches; tethered flights; and ground displays.

ENVIRONMENTAL IMPACTS

Air Quality

Emissions of any criteria pollutants associated with the proposed action would be well below Federal *de minimis* levels and would not be expected to cause exceedances of the NAAQS or New Mexico Ambient Air Quality Standards. Many of the propellant combinations are fuel rich;

therefore, carbon monoxide (CO) and carbon (as soot) may appear in the rocket emissions. However, these would readily burn in the ambient air downstream from the nozzle, forming CO_2. The CO_2 that would result would disperse into the atmosphere and would have no impact on air quality. No hazardous air pollutants would be emitted by the reusable suborbital rockets. The air quality impacts associated with the proposed action would not exceed one or more of the National Ambient Air Quality Standards for the appropriate time periods and would not exceed the applicable threshold for significance. Haze-related pollutants would have a negligible impact on visibility in the vicinity, including the designated Class I White Mountains Wilderness Area, 43 miles northeast of Holloman Air Force Base.

Biological Resources – Fish, Wildlife, Plants, and Wetlands

The proposed action would have a negligible impact on the surrounding vegetation and wildlife. Existing vegetation has been subject to ongoing human disturbance associated with the active Air Force Base. Unsuccessful launches, the deposition of rocket emissions, and localized scorching could cause temporary adverse effects to vegetation. However, the propellants for the proposed reusable suborbital launches are similar to those already in use at Holloman Air Force Base during normal operations. Additional adverse impacts on vegetation as a result of the proposed action would be negligible and short-term.

The wildlife species that exist on or near Holloman Air Force Base are tolerant of the operational disturbances (e.g., noise, aircraft, and vehicular movements) conducted at the Air Force Base and would avoid active launch areas. Wildlife may experience temporary disruptions in activities such as feeding and nesting due to noise and visual stimuli from aircrafts but these effects would be negligible and short-term. No known state or federally listed threatened or endangered species or designated critical habitat would be impacted by the proposed action. Wildlife strikes are unlikely, because the reusable suborbital rocket launches would have flight times between 90 and 180 seconds and would be moving slower than the current typical military aircraft activities. Because the proposed action is short-term in nature, impacts from propellant emissions ingested, inhaled, or absorbed by wildlife would also be negligible.

Implementation of the proposed action would have no impact on wetland resources or aquatic plants and wildlife. There are no water bodies or wetlands located within the operational area of the reusable suborbital rockets.

Cultural Resources (including Historical, Architectural, and Archeological Resources)

The proposed action would not significantly impact cultural resources at Holloman Air Force Base, and no impacts would occur to properties outside of the region of influence. No traditional cultural resources of the local Mescalero Apache tribe have been identified within the base, so no impacts are anticipated. If cultural resources were identified or discovered as a result of the proposed action, activities in the vicinity would cease and the Cultural Resources Manager would immediately contact the appropriate persons for further evaluation.

Section 4(f) Resources

The proposed action would occur in a developed area away from the Lake Holloman Wildlife Refuge, and these activities would be similar to normal operations at Holloman Air Force Base. Implementation of the proposed action would not require the use or alteration of any land protected under Section 4(f) of the Department of Transportation Act.

Noise and Compatible Land Use

The proposed action would not significantly impact noise and compatible land use at Holloman Air Force Base. Holloman Air Force Base currently supports over 97,400 aircraft operations per year with existing noise levels at approximately 85 decibels day/night average sound level in the apron area, so the proposed action would produce a minor amount of noise in comparison to existing noise. Short-term noise activities associated with the proposed action would increase overall noise levels in the area by less than 1.5 A-weighted decibels. No sonic booms are expected.

Physical Resources (including Water Resources [Surface Water, Groundwater, Floodplains], Hazardous Materials, Pollution Prevention, Solid Waste)

No surface water bodies or floodplains are located within the proposed operational area. The proposed action is not expected to impact any water resources, including groundwater, surface water, or floodplains. No water resources would be impacted during the resurfacing or re-pouring of existing launch pads. Existing potable water supply sources will be used for all X Prize Cup activities, and the proposed action would not impact the potable water supply.

During pre-flight activities, minor amounts of hazardous materials, such as oils, lubricants, and solvents, would be used to prepare the rockets for flight. Hazardous materials would also be handled during the two week period prior to the X Prize Cup when applicants are testing and launching their suborbital rockets. All hazardous materials would be handled, stored, and used in compliance with all applicable regulations. Hazardous materials that would be used under the proposed action are similar to materials already handled at the Air Force Base. Permits for handling and disposal of hazardous material would be coordinated with the Holloman Air Force Base hazardous waste program manager. The transport, use, or disposal of hazardous materials associated with operations under the proposed action would not pose a substantial hazard to the public or the environment. In the event of a spill, the applicants' personnel would be trained to respond to such an incident and would be responsible for any necessary containment, removal, and remediation. In addition, emergency response personnel would be on standby during the X Prize Cup to respond to accidents and fires. The proposed action would not result in any impacts from hazardous materials or hazardous waste.

Applicants would be required to comply with pollution prevention plans and practices currently in effect. No impacts would occur on pollution prevention or solid waste management.

Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

The proposed action would not significantly impact socioeconomic resources, environmental justice, or children's environmental health and safety risks. Because of the short-term nature of the proposed action, the community around Holloman Air Force Base would not experience adverse affects. The Holloman Air and Space Show would attract up to 50,000 spectators at any one time. This number of attendees is expected regardless of whether any permitted flights take place. There are sufficient services, such as emergency care and public utilities, to accommodate spectators during the event. The two schools located within a mile of the base may experience increased noise levels associated with test launches leading up to the X Prize Cup. However, the noise events are only expected to last between 90 and 180 seconds. The proposed action would not significantly impact children's environmental health and safety risks at Holloman Air Force Base.

Light Emissions and Visual Impacts

The reusable suborbital launch vehicles would remain within 164 feet of the ground in a specifically designated area on the Holloman Air Force Base and the visual impacts would be short-term. Suborbital launches and associated activities (e.g., ground equipment loading, propellant loading, transporting) are similar to activities that already occur at Holloman Air Force Base and would not result in new or significant visual resource impacts. The proposed action is not expected to have any light emissions.

Cumulative Impacts

Cumulative impacts are "the incremental impact of the actions when added to other past, present, and reasonably foreseeable future action regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). For this analysis, cumulative impacts include impacts from the permitted vehicles and the past, present, and reasonably foreseeable future activities that would affect the resources impacted by the events at the Lunar Lander Challenge.

The X Prize Cup is taking place during the Holloman Air and Space Show. Activities occurring during the show include up to eight amateur rocket launches; military and acrobatic flights; and ground displays. Up to 50,000 spectators could be present at any one time during the two-day X Prize Cup event. The proposed action would have no impact on any of the resource areas discussed above except for biological resources, air quality, and noise where the impacts may be notable but less than significant. Environmental consequences on Holloman Air Force Base are not expected to increase due to the proposed action, and no significant cumulative impacts to resources are expected.

Past, Present, and Reasonably Foreseeable Holloman Air Force Base and Other Military, Federal, Non-Federal, State, and Local Actions

Other past, current and reasonably foreseeable actions on Holloman Air Force Base were also considered, including new construction, facility improvements, infrastructure upgrades and maintenance and repairs on an ongoing basis. Other Federal agencies such as the Bureau of Land Management, the U.S. Fish and Wildlife Service, the Federal Highway Administration and the Federal Energy Regulatory Commission have jurisdiction in the area and are currently active on projects in the region. The State of New Mexico, Otero County, and private companies and individuals are also actively participating on projects in the area. The proposed action at the X Prize Cup would be held on Holloman Air Force Base and is a much smaller action compared to the several past, current, and reasonably foreseeable actions that would occur on base and in the surrounding areas and would last only two days. The proposed action is not expected to have an impact on other activities on the Holloman Air Force Base and the surrounding area and would have no significant cumulative impacts on the Holloman Air Force Base.

Relationship between Short-Term Uses and Long-Term Productivity

Under the proposed action, short-term uses of the environment would result in noise and minimal emission of haze-related pollutants, but the emissions and pollutants would not accumulate in sufficient volume to affect environmental resources and would not exceed the threshold of significance. Noise would also be short-term and would not result in permanent damage or long-term changes in wildlife productivity or habitat use. Due to the use of existing launch and landing infrastructure, the proposed action would not impact the long-term productivity of the air, land, water, or any other resources.

Irreversible and Irretrievable Commitment of Resources

No long-lasting impacts would result due to the proposed action due to its comparably small scale and short duration. No long-term effects from noise or emissions on wildlife and vegetation are expected. Rocket launches would involve consumption of nonrenewable resources, such as propellants for engines. No irreversible or irretrievable effects are expected for cultural resources or other natural resources, including land and water. Secondary impacts on natural resources, such as an accidental fire from a rocket mishap, are unlikely. Increased risk of fire hazard due to activities under the proposed action is very low.

Consistency with Community Planning

The proposed action has been reviewed and has been found to be consistent with state and local planning objectives from the state of New Mexico and Otero County governments.

DETERMINATION: An analysis of the proposed action has concluded that there are no significant short-term, long-term, or cumulative effects to the environment or surrounding populations. After careful and thorough consideration of the facts herein, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives set forth in Section 101(a) of the National Environmental Policy Act of 1969 and that

it will not significantly affect the quality of the human environment or otherwise include any condition requiring additional consultation pursuant to Section 102 (2) (c) of the National Environmental Policy Act. Therefore, an Environmental Impact Statement for the proposed action is not required.

Issued in Washington, DC on: 10/03/07

Patricia Grace Smith

Associate Administrator for Commercial Space Transportation

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Table of Exhibits

ACRONYMS AND ABBREVIATIONS

AST	Office of Commercial Space Transportation
BLM	Bureau of Land Management
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CSLA	Commercial Space Launch Act of 1984
CSTCA	Commercial Space Transportation Act of 2000
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibels
dBC	C-weighted decibels
DARPA	Defense Advanced Research Projects Agency
DNL	Day/night average sound level
DOI	Department of the Interior
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
H_2S	Hydrogen Sulfide
Hz	Hertz
INRMP	Integrated Natural Resource Management Plans
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Noise Level
LOX	Liquid Oxygen
MBTA	Migratory Bird Treaty Act
MGD	Million Gallons per Day
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environmental Department
NMEMND	New Mexico Energy, Minerals, and Natural Resources Department
NMRPTC	New Mexico Rare Plant Technical Council
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places

O_3	Ozone
OSHA	Occupational Health and Safety Administration
Pb	Lead
PSD	Prevention of Serious Deterioration
$PM_{2.5}$	Particulate Matter with a diameter of less than 2.5 microns
PM_{10}	Particulate Matter with a diameter of less than 10 microns
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SEL	Sound Exposure Level
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SWPPP	Stormwater Pollution Prevention Plan
TSP	Total Suspended Particulates
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
VRM	Visual Resource Management
WSMR	White Sands Missile Range
WSNM	White Sands National Monument

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1 INTRODUCTION

The Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) is evaluating experimental permit applications from multiple operators proposing to operate their reusable suborbital rockets at the 2007 X Prize Cup at Holloman Air Force Base in Otero County, New Mexico. The National Environmental Policy Act of 1969 (NEPA) as amended (42 United States Code [U.S.C.] 4321, *et seq.*), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500-1598), FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, Change 1 directs FAA lead agency officials to consider the environmental consequences when planning for, authorizing, and approving Federal actions. Issuing an experimental permit is considered a major Federal action that is subject to review as required by NEPA. Accordingly, the FAA prepared this Environmental Assessment (EA) to evaluate the potential environmental impacts of activities associated with issuing multiple experimental permits.

1.1 Background

The X Prize Cup will be held during the Holloman Air and Space Show at Holloman Air Force Base in New Mexico on October 27 and 28, 2007. Experimental permits would be issued for the rockets competing in the X Prize Cup Lunar Lander Challenge. The Lunar Lander Challenge consists of two levels: Level One, worth a total of $500,000 in prize money, and Level Two, worth a total of $1,500,000 in prize money. Details of the competition are outlined in Section 2.1.1. Contestants may test their vehicle at the Air Force Base one week prior to the X Prize Cup (X Prize Foundation, 2007a).

In addition to the Level One and Level Two Lunar Lander Challenges, the X Prize Cup events may include up to eight amateur rocket launches[1] and tethered launches. The Air and Space Show will include military and acrobatic flights and ground displays.

1.2 Purpose and Need

Purpose

The proposed action is to issue experimental permits for the operation of reusable suborbital rockets in accordance with the Commercial Space Launch Act of 1984 (CSLA), the Commercial Space Transportation Competition Act of 2000 (CSTCA), Title 49, U.S.C., Subtitle IX, Sections 70101-70121, and FAA's commercial space transportation regulations 14 CFR Parts 400-450. The purpose of the proposed action is to ensure safe and responsible operation of the reusable suborbital rockets for applicants seeking to participate in Level the X Prize Cup Lunar Lander Challenge.

[1] Amateur rocket launches are launch activities conducted at private sites involving rockets powered by a motor or motors having a total impulse of 200,000 pound-seconds or less and a total burning or operating time of less than 15 seconds, and a rocket having a ballistic coefficient, i.e., gross weight in pounds divided by frontal area of rocket vehicle, less than 12 pounds per square inch (14 CFR Part 401.5).

The purpose of the FAA's action in issuing the experimental permits is to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interest of the United States during commercial launch or reentry activities; to encourage, facilitate, and promote commercial space launches and re-entries by the private sector; and to facilitate the strengthening and expansion of the United States space transportation infrastructure, in accordance with the requirements of the CSLA, the CSTCA, Executive Order (EO) 12465, 14 CFR Parts 400-450, the National Space Transportation Policy, and the National Space Policy.

Need

The need for the proposed action is to ensure safe commercial activities and to accelerate the technology developments supporting the commercial creation of a vehicle capable of ferrying cargo or humans back and forth between lunar orbit and the lunar surface. Such a vehicle would have direct application to the personal spaceflight industry as well as the technology development goals of the Defense Advanced Research Projects Agency (DARPA) and the National Aeronautics and Space Administration (NASA). In addition, the need supports NASA's mission as directed by the President to return Americans to the moon by 2020 and to use the mission as a steppingstone for future manned trips to Mars and beyond.

The FAA action is necessary in connection with the issuance of experimental permits because the Secretary of Transportation has assigned the FAA Associate Administrator for Commercial Space Transportation responsibility for oversight of commercial space launch activities, including the issuance of experimental permits.

1.3 Scope of the Proposed Action

The scope of the proposed action is defined by activities associated with the issuance of the experimental permits, regulated by FAA under Title 49, U.S.C., Subtitle IX, Sections 70101-70121. All other activities, including the air show and the amateur rocket launches, do not require the issuance of permits or licenses by the FAA and would take place whether or not the experimental permits are issued. Therefore, these activities are not included in the scope of the proposed action. The scope is further defined by activities associated with the Lunar Lander Challenge reusable suborbital rocket launches.

This EA incorporates by reference, where appropriate, the following documents:

U.S. Air Force, *Draft Environmental Assessment Transforming the 49th Fighter Wing's Combat Capability, Holloman AFB, New Mexico*, June 2006.

Federal Aviation Administration Office of Commercial Space Transportation, *Final X Prize Cup Environmental Assessment*, September 2006.

1.4 Outline of the Environmental Assessment

Section 2 provides a description of the proposed action and alternatives, including the no action alternative. Section 3 discusses the affected environment by presenting a description of the

baseline conditions of the potentially affected resources, e.g., air quality at Holloman Air Force Base. Section 4 discusses and compares the reasonably foreseeable environmental consequences of each alternative. Section 5 discusses cumulative impacts and other environmental considerations. Sections 6, 7, and 8 present references, list of preparers, and the distribution list, respectively.

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2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

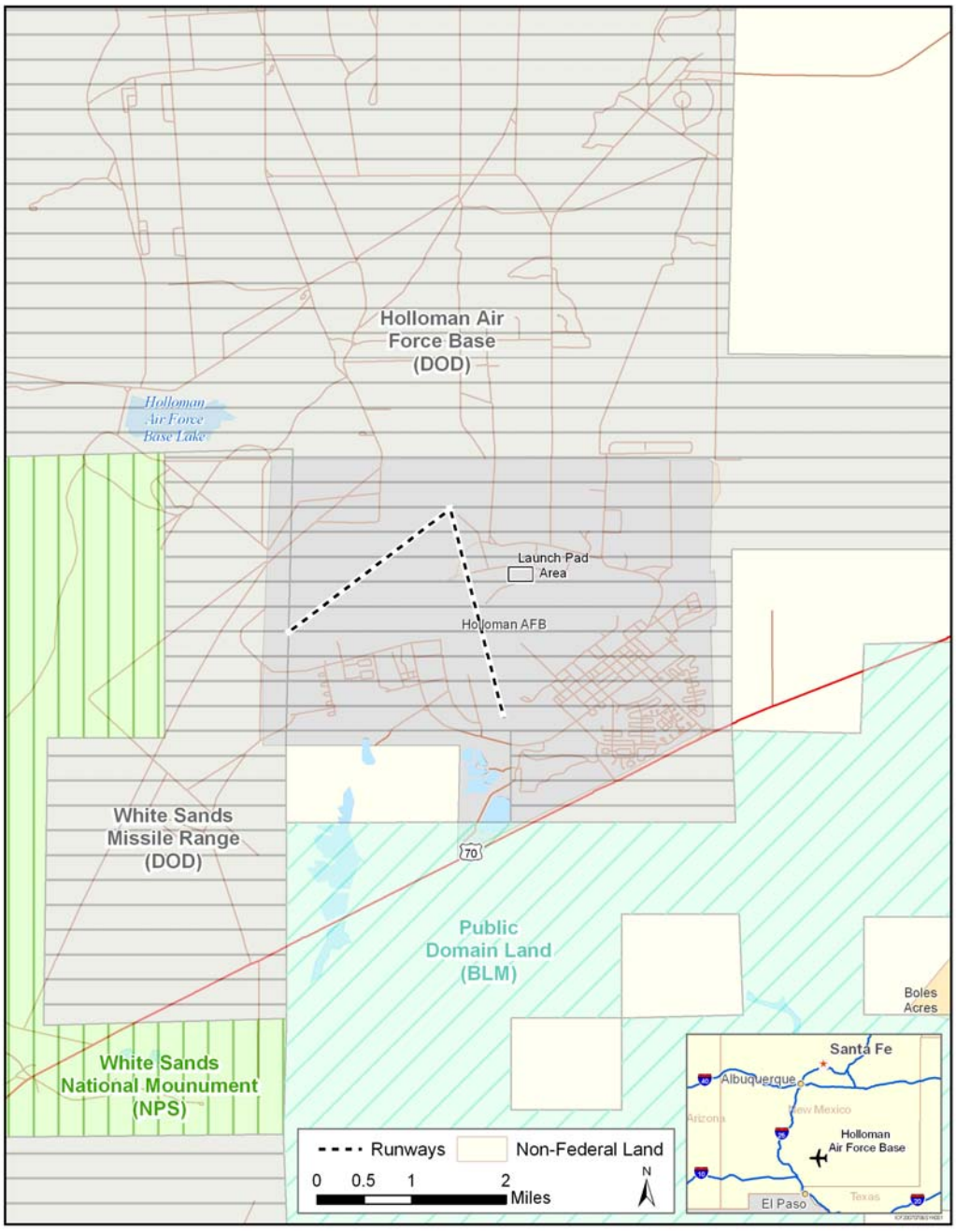
2.1 Proposed Action

Under the proposed action, which is the preferred alternative, the FAA would issue individual experimental permits to applicants proposing to participate in the X Prize Cup Lunar Lander Challenge. The permits would authorize the launch of the applicants' reusable suborbital rocket(s) from Holloman Air Force Base (see Exhibit 2-1). An experimental permit is valid for one year and authorizes an applicant to conduct an unlimited number of suborbital launches from a specific location. However, the suborbital launches reviewed in this EA are associated with the Lunar Lander Challenge events at the X Prize Cup, and Holloman Air Force Base would only allow the permitted applicants to test and launch their suborbital rockets one week prior to and during the X Prize Cup.

Under the proposed action, FAA may issue up to nine experimental permits for 16 vehicles. A portion of the applicants propose to participate in only Level One; while the remaining applicants would participate in Levels One and Two of the Lunar Lander Challenge. The completion of the environmental review process does not guarantee that the FAA would issue experimental permits to the applicants. The applicants also must meet all FAA safety, risk, airspace analysis, and operation area hazard containment requirements.

The following sections describe the activities associated with the launch of reusable suborbital rockets.

Exhibit 2-1. Holloman Air Force Base Location Map



2.1.1 Reusable Suborbital Rocket Launch

A reusable suborbital rocket launch is described by the following activities.

- Preparation of the suborbital rocket
- Pre-flight ground operations
- Vertical liftoff
- Attainment of intended altitude and flight/hover
- Powered descent
- Vertical landing
- Vehicle safing

Teams may test their reusable suborbital rockets at Holloman Air Force Base up to one week before the X Prize Cup. During the tests and the X Prize Cup ground support equipment would be used to support the suborbital rockets. Dollies and a forklift and/or a crane would be used to transfer the suborbital rocket from the transporter (typically a truck) to a staging area or launch pad. Trailers or pick-up trucks and a commercial tank truck would be used to transport the propellants from the propellant storage area to the test or launch site. The vehicle operators' ground crews would perform and supervise all pre-flight, flight, and landing operations for their respective vehicles. Test support equipment would be limited to laptop computers and radio transceivers.

Each of the proposed reusable suborbital rockets would be wingless and generally cylindrical in shape with a height from 6 to 10 feet and a maximum diameter from 4 to 11.5 feet. The weights of the rockets when empty range from 90 to 1,010 pounds. The gross weights of the rockets range from 300 to 2,800 pounds (X Prize Foundation, 2007b).

Six of the nine applicants have proposed using rockets with a single engine, two of the applicants have proposed using rockets with four engines, and one applicant has proposed using a rocket with five engines. The fuel and oxidizer combinations associated with the experimental permit applications that FAA has received were used to define the range of propellant types and quantities that may be used in Level One and Level Two (see Exhibit 2-2) of the Lunar Lander Challenge events. Applicant company and vehicle details are proprietary and confidential, therefore generic team names are used in Exhibit 2-2.

Exhibit 2-2. Summary of Reusable Suborbital Rockets Lunar Lander Challenge Level One and Level Two

Applicant	Potential Propellants (fuel and oxidizer)	Level One Propellant Quantity, pounds	Level Two Propellant Quantity, pounds
Applicant Team A	Methanol	50	85
	Hydrogen Peroxide	300	550
Applicant Team B	Ethanol	900	900
	Liquid Oxygen	1,300	1,300
Applicant Team C	Rocket Propellant 1 (RP-1)[a]	17	16
	Nitrous Oxide	153	158
Applicant Team D	Isopropyl Alcohol	346	685
	Liquid Oxygen	485	960
Applicant Team E	Methyl Alcohol	22	--
	Hydrogen Peroxide	118	--
Applicant Team F[b]	Ethanol	455	455
	Liquid Oxygen	683	683
Applicant Team G	90% Hydrogen peroxide[c]	900	--
Applicant Team H	Liquefied Natural Gas	170	170
	Liquid Oxygen	400	400
Applicant Team I	Ethanol	200	200
	Liquid Oxygen	450	450

[a]RP-1 is a special grade of kerosene suitable for rocket engines.

[b]Applicant Team F has stated that it would either compete in Level One or Level Two of the Lunar Lander Challenge. For analysis purposes, FAA will conservatively consider the launch of the vehicle under both the Level One and Level Two events.

[c]This is a mono-propellant.

During the Lunar Lander Challenge events, the applicant would transport the suborbital rocket from the staging area to the launch pad, complete the challenge event, and return the rocket to the staging area. The pre-flight ground operations would include propellant loading and preparations for launch. During preparations for launch, the suborbital rocket would be inspected prior to launch, and flight control diagnostics and health checks would be completed. The suborbital rocket would initiate its formal launch sequence (i.e., ignition of its propulsion system) after all preparation and pre-flight operations are completed. Each suborbital rocket would carry a 25-kilogram (55-pound) payload per the X Prize Foundation rules for the Lunar Lander Challenge. The mass of the payload may include the required cameras and sensors that would be used to monitor and broadcast flight attempts during the Lunar Lander Challenge events.

After ignition of the rocket engines, the reusable suborbital rocket would take off vertically from Point A (a launch/landing pad), climb to an altitude no less than 50 meters (164 feet), maintain flight for either 90 or 180 seconds, and travel to Point B (a launch/landing pad that is between

100 and 120 meters [328 to 394 feet] from Point A). Upon landing, the rocket would touch down vertically and shut down its engines. Once the suborbital rocket had landed and shut down its engines, optional propellant reloading could occur. After remaining at the Point B location for a period of time, the vehicle would take off, fly for either 90 or 180 seconds and land on its original launch/landing pad, Point A. The differences between the Level One and Level Two challenges would be the degree of difficulty for precision landing and the flight times (90 seconds for Level One; 180 seconds for Level Two). For Level One, Point B would be a relatively flat, hard, and hazard-free simulated lunar surface without boulders. For Level Two, Point B would be a simulated lunar surface, with local slopes and hazards such as boulders.

In the event of a tie, each team would have a pre-assigned 150-minute period to transport the suborbital rocket from the staging area to the Point A launch location, complete a minimum of four hops between Point A and Point B, and return to the staging area. For each suborbital rocket participating in a tiebreaker, the FAA assumed that the rocket engine would operate for a maximum of 30 minutes and the remaining 120 minutes would be required for transportation, pre-flight operations, and propellant loading activities.

Propellants (fuel and oxidizer) for the suborbital rockets would require transportable propellant storage containers, associated plumbing and pumps, and portable secondary containment structures. Other containers may be needed such as 55-gallon fuel drums, bottles of pressurized inert gases such as helium or nitrogen, or liquid nitrogen bottles. Following propellant transfer, the propellant loading equipment would be removed from the area. Standard safety precautions would be followed such as clearing the area of unnecessary personnel and ignition (including spark) sources. In the event of a spill or release, propellant loading operations would be halted until the spill is properly cleaned up by the applicant and has no reasonable chance of creating an explosion or fire.

Liquid oxygen (LOX) would be stored in dewars; all other propellants would be stored in tankers. The LOX would be secured and stored in an area designated by Holloman Air Force Base. Storage of propellants would be performed in accordance with all appropriate and relevant procedures and a specific propellant handling and storage plan for Holloman Air Force Base.

Vehicle safing would begin upon completion of all launch and landing activities and the shut down of the engine(s) and any flight control systems that are unnecessary for rocket recovery. The oxidizer system would be purged either by flash boiling, venting, or dumping. Next, the alcohol or hydrocarbon fuel lines would be drained into a suitable container approved by the Department of Transportation (DOT). Finally, the remaining pressurants (i.e., helium or nitrogen) would be vented to the atmosphere prior to moving the suborbital rocket to its transport vehicle and returning to the staging area.

As described above, the proposed action includes issuing up to nine experimental permits for the operation of up to 16 vehicles. The FAA used the propellant combinations proposed by the applicants (see Exhibit 2-2) to define the range of propellants that could be used during the Lunar Lander Challenge events. To calculate the amount of time that the rocket engines would be operating, FAA made the following conservative assumptions about the number of vehicles and the flight duration:

- Sixteen suborbital rockets would each perform up to ten 30-second static engine tests or test launches one week prior to the Lunar Lander Challenge.

- Nine suborbital rockets would compete in a Level One Lunar Lander Challenge pre-qualifying event (220 seconds of operation each).

- Seven suborbital rockets would compete in a Level Two Lunar Lander Challenge pre-qualifying event (400 seconds of operation each).

- Nine suborbital rockets would compete in the Level One Lunar Lander Challenge event (440 seconds of operation each).

- Seven suborbital rockets would compete in the Level Two Lunar Lander Challenge event (800 seconds of operation each).

- Sixteen suborbital rockets would participate in a tiebreaker event (30 minutes of operation each).

Because the Level One and Level Two Lunar Lander Challenge events would be round trip events and each vehicle could complete two attempts, the total time for each challenge would be 440 seconds and 800 seconds, respectively. Exhibit 2-3 presents the maximum total flight time for all the potential applicants and their vehicles including pre-competition testing. The values presented in Exhibit 2-3 are conservative assessments of the total amount of rocket engine operation time based on the assumptions described above.

Exhibit 2-3. Total Engine Operation Time in Seconds for All Rockets

Maximum Number of Rockets	Fuel and Oxidizer	Engine Tests or Test Launches, seconds (per rocket)	Level One Pre-qualifying Event, seconds (per rocket)	Level Two Pre-qualifying Event, seconds (per rocket)	Level One Competition Activity, seconds (per rocket)	Level Two Competition Activity, seconds (per rocket)	Tiebreaker, seconds (per rocket)	Total Rocket Engine Operation, seconds
Six[a]	Ethanol / Liquid Oxygen	300	220	400	440	800	1,800	18,180
Two[b]	Methanol / Hydrogen Peroxide	300	220	400	440	800	1,800	6,060
Two[b]	RP-1 / Nitrous Oxide	300	220	400	440	800	1,800	6,060
Two[b]	Isopropyl / Liquid Oxygen	300	220	400	440	800	1,800	6,060
Two[b]	Liquefied Natural Gas / Liquid Oxygen	300	220	400	440	800	1,800	6,060
One[c]	Methyl Alcohol / Hydrogen Peroxide	300	220	N/A	440	N/A	1,800	2,760
One[c]	90% Hydrogen Peroxide[d]	300	220	N/A	440	N/A	1,800	2,760

[a]Three rockets participating in the Level One Lunar Lander Challenge and three rockets participating in the Level Two Lunar Lander Challenge
[b]One rocket participating in the Level One Lunar Lander Challenge and one rocket participating in the Level Two Lunar Lander Challenge
[c]One rocket participating in the Level One Lunar Lander Challenge
[d]This is a mono-propellant
N/A = Not applicable

2.1.2 Infrastructure

Existing infrastructure at Holloman Air Force Base would be used for the activities related to the proposed action – staging, static test firing, and for the launches and landings of suborbital rockets. Launches and landings for the Level One and Level Two Lunar Lander Challenge events would take place on existing concrete pads.

2.2 No Action Alternative

Under the no action alternative, the FAA would not issue any experimental permits to the applicants seeking to participate in the Lunar Lander Challenge. There would be no permitted launches of reusable suborbital rockets at Holloman Air Force Base. Because the FAA would not issue experimental permits, the Lunar Lander Challenge events would not take place. However, all the remaining X Prize Cup events would occur, as discussed in Section 1.1, Background. For the purposes of this analysis, these additional activities are considered and analyzed under cumulative impacts as discussed in Section 5.

3 AFFECTED ENVIRONMENT

This section describes the environmental characteristics that may be affected by the proposed action and alternatives. The affected environmental is described succinctly to provide a context for understanding potential impacts. The level of detail provided for each research area is commensurate with the potential for impact on that resource area.

The affected environment is discussed in terms of the following resource areas: air quality; biological resources (including fish, wildlife, plants, and wetlands); cultural resources (including historical, architectural, and archeological resources); Section 4(f) resources; noise and compatible land use; physical resources (including water resources [surface water, groundwater, and floodplains], hazardous materials, pollution prevention, solid waste); socioeconomic resources, environmental justice, and children's environmental health and safety risks; light emissions and visual impacts. Farmlands, wild and scenic rivers, and coastal resources are not discussed further in this document because there are no farmlands, wild and scenic rivers, or coastal resources within the ROI; therefore, the proposed action will have no impacts on these resource areas. Natural resources and energy supply and secondary (induced) impacts are discussed in Section 4, Environmental Consequences.

The following sections present the definition, the regulatory setting, and the baseline conditions for each environmental resource. Where possible, Sections 3.2 through 3.8 summarize data from the Environmental Assessment for Transforming the 49th Fighter Wing's Combat Capability, Holloman Air Force Base, New Mexico (USAF, 2006), per Section 1.5.2 of CEQ's regulatory language.[2]

3.1 Region of Influence

The 2007 X Prize Cup will be held at Holloman Air Force Base, located six miles west of Alamogordo, New Mexico. Holloman Air Force Base encompasses 59,639 acres of land at an average altitude of 4,093 feet MSL (USAF, 2006). The region of influence (ROI) is the general area that may be affected by the implementation of the proposed action. For all resources except for air quality, noise, transportation, and socioeconomics, the ROI would be within the confines of Holloman Air Force Base. The ROI for air quality includes all of Otero County. For noise, the ROI includes the area immediately surrounding the air force base. The ROI for socioeconomics includes the local area of Otero County.

[2] Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described. No material may be incorporated by reference unless it is reasonably available for inspection by potentially interested persons within the time allowed for comment. Material based on proprietary data which is itself not available for review and comment shall not be incorporated by reference (40 CFR 1502.21).

3.2 Air Quality

3.2.1 Resource Definition

Air quality in a given location is determined by the type and concentration of pollutants in the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to Federal and/or state ambient air quality standards. The main pollutants of concern considered in the air quality analysis include volatile organic compounds (VOCs), ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_X), and particulate matter less than 10 microns in diameter (PM_{10}). Although neither VOCs nor NO_X (other than nitrogen dioxide [NO_2]) have established ambient standards, they are important as precursors to O_3 formation.

3.2.2 Regulatory Setting

Under the authority of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) has established nationwide air quality standards, known as the National Ambient Air Quality Standards (NAAQS). The NAAQS represent the maximum allowable atmospheric concentration of seven "criteria pollutants": O_3, CO, $PM_{10,}$ particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), NO_2, sulfur dioxide (SO_2), and lead (Pb) (see Exhibit 3-1). There are primary and secondary NAAQS for these pollutants. The primary standards were established to protect the public health with an adequate margin of safety; the secondary standards were established to protect the public welfare from any known or anticipated adverse effects of a pollutant (e.g., damage to crops and materials).

Under the CAA, state and local agencies may establish Ambient Air Quality Standards (AAQS) regulations of their own, provided these are at least as stringent as the Federal requirements. For selected criteria pollutants, the State of New Mexico has established its own AAQS. New Mexico standards are equivalent to the NAAQS for PM_{10}, O_3, and Pb. New Mexico AAQS are more restrictive than Federal standards for CO, NO_2, and SO_2 (see Exhibit 3-1). In addition, New Mexico regulates emissions of total suspended particulates (TSP), hydrogen sulfide (H_2S), and total reduced sulfur, three pollutants for which there are no Federal standards.

Exhibit 3-1. Federal and New Mexico Ambient Air Quality Standards

Pollutant	Federal Standard Type	Time Average	National Standard	New Mexico Standard
Carbon Monoxide	Primary	8-hour	9 ppm	8.7 ppm
	Primary	1- hour	35 ppm	13.1 ppm
Lead	Primary and Secondary	3-month	1.5 µg/m^3	--
Nitrogen Dioxide	Primary and Secondary	Annual Arithmetic Mean	0.053 ppm	0.05 ppm
	--	24-hour	--	0.10 ppm
Particulate Matter (PM_{10})	Primary	Annual Arithmetic Mean	Revoked	--
	Primary	24-hour	150 µg/m^3	--
Particulate Matter ($PM_{2.5}$)	Primary and Secondary	Annual Arithmetic Mean	15.0 µg/m^3	--
	Primary	24-hour	35 µg/m^3	--
Ozone	Primary and Secondary	8-hour	0.08 ppm	--
	Primary and Secondary	1-hour[a]	0.12 ppm	--
Sulfur Oxides	Primary	Annual Arithmetic Mean	0.03 ppm	0.02
	Primary	24-hour	0.14 ppm	0.10
	Secondary	3-hour	0.5 ppm	
Hydrogen Sulfide	--	½ - hour	--	0.010 ppm[b]
Total Reduced Sulfur[c]	--	½ - hour	--	0.003 ppm[b]
Total Suspended Particulates	--	24-hour	--	140 µg/m^3
	--	7-day	--	110 µg/m^3
	--	30-day	--	90 µg/m^3
	--	Annual Geometric Mean	--	60 µg/m^3

[a]As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour nonattainment Early Action Compact Areas.
[b]Entire state except for the Pecos-Permian Air Basin, which includes De Baca, Chaves, Curry, Quay, and Roosevelt Counties
[c]Totally Reduced Sulfur does not include H_2S
ppm = parts per million; µg/m^3 = micrograms per cubic meter
Source: EPA, 2007a; 20.2.3 New Mexico Administrative Code

To further define local and regional air quality, the EPA designates areas of the U.S. as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Nonattainment areas, upon reaching attainment, are considered to be

maintenance for a period of 10 or more years. Areas are designated as unclassifiable for a pollutant when insufficient data is available for the EPA to form an attainment designation.

For nonattainment regions, individual states are required to develop a State Implementation Plan (SIP) to describe how the state will meet or attain NAAQS. The SIP contains emissions limitations as well as record keeping and reporting requirements for affected sources. A Federal agency cannot support an action (e.g., fund, license) unless the activity will conform to the EPA-approved SIP for the region (40 CFR parts 51 and 93, General Conformity Rule). This is called a conformity determination or conformity analysis. General conformity determinations apply only to nonattainment or maintenance areas.

Section 162 of the CAA further established the goal of prevention of significant deterioration (PSD) of air quality in all international parks, national parks that exceed 6,000 acres, and national wilderness areas and memorial parks that exceed 5,000 acres if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states, tribal nations, and the Federal government have the authority to redesignate areas as (nonmandatory) Class I areas. Class I areas (mandatory and nonmandatory) are those where any appreciable deterioration of air quality is considered significant.

CAA Section 169A established the additional goal of prevention of further visibility impairment in PSD Class I areas. Visibility impairment is defined as atmospheric discoloration and a reduction in the visual range. The Regional Haze Rule calls for state and Federal agencies to work together to improve visibility in 156 national parks and wilderness areas, including 9 locations in New Mexico (40 CFR 51.309). The State of New Mexico's Regional Haze State Implementation Plan complies with the Regional Haze Rule.

Additionally, New Mexico has established standards for Toxic Air Pollutants. Toxic Air Pollutants are chemicals that are generally found in trace amounts in the atmosphere, but that can result in chronic health effects or increase the risk of cancer when present in amounts that exceed established exposure limits. The Toxic Air Pollutants regulated by the New Mexico Environment Department (NMED) may be found in the New Mexico Administrative Code 20.2.72.502, available at the following Internet address, http://www.nmcpr.state.nm.us/nmac/parts/title20/20.002.0072.htm. The NMED applies guidelines for determining if a new or modified source emitting a Toxic Air Pollutant requires air quality permitting (20.2.72.402 New Mexico Administrative Code).

3.2.3 Existing Conditions

Holloman Air Force Base is located in Otero County, New Mexico. Otero County is designated as in attainment for all criteria pollutants (EPA, 2007b). The nearest PSD Class I area is the White Mountains Wilderness Area, located approximately 43 miles northeast of Holloman Air Force Base. Baseline emissions from Holloman Air Force Base include conventional stationary sources associated with aircraft and facility maintenance, and mobile sources such as personal vehicles and facility-based utility and construction vehicles, as well as aircraft ground and flying operations within the Holloman Air Force Base airfield. Exhibit 3-2 presents the baseline

emissions at Holloman Air Force Base for employee commuting and on-base vehicles, stationary sources, and aircraft landing/take-off and touch and go operations (USAF, 2006).

Exhibit 3-2. Baseline Criteria Pollutants Emissions at Holloman Air Force Base

Source	Annual Emissions (tons/year)				
	CO	**VOC**	**NO_X**	**SO_X**	**PM_{10}**
Commuting	444.9	60.9	36.1	0.1	1.6
On-Base Vehicles	187.1	22.8	220.2	0.1	21.2
Stationary Sources	19.9	92.8	19.5	1.5	11.3
Aircraft (Airfield Only)	496.8	147.6	424.5	12.9	78.1
Total Emissions at Holloman Air Force Base	**1,148.9**	**324.4**	**700.4**	**14.6**	**112.2**

Source: USAF, 2006

3.3 Biological Resources (Fish, Wildlife, Plants, and Wetlands)

3.3.1 Resource Definition

Biological resources are described as native or naturalized vegetation and wildlife and their respective habitats. These resources are usually categorized as aquatic and terrestrial vegetation and wildlife, special status species (threatened, endangered, species of concern), and environmentally sensitive or critical habitats, such as wetlands. Biological resources are valued for their intrinsic, aesthetic, economic, and recreational aspects.

3.3.2 Regulatory Setting

The Endangered Species Act (ESA) (16 U.S.C. 1531-1544) is overseen by the U.S. Fish and Wildlife Service (USFWS) and applies to all Federal agency actions. The ESA established the protection of threatened and endangered species and any critical habitats necessary for the species' continued existence. Federal actions must be evaluated to determine if the action will have an affect on threatened and endangered species or their critical habitat. This evaluation can include the preparation of a Biological Assessment and formal consultation with the USFWS under Section 7 of the ESA.

Federal agencies must follow regulations and guidance in the protection of migratory and special status species of birds. The Migratory Bird Treaty Act (MBTA) of 1981 (16 U.S.C. 703-712) protects against the taking, killing, possession, transportation, and importation of migratory birds, their eggs, and nests except for authorized permits granted by the Department of the Interior (DOI). A take is defined as "pursue, hunt, shoot, wound, kill, trap, capture, or collect" (60 CFR §10.21). EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, provides details on the responsibilities of Federal agencies in protecting migratory birds. Federal agencies must also follow the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq*.), which protects these species from illegal taking, killing, possessing, or transporting.

The Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901-2912) promotes the conservation of non-game fish and wildlife and their habitats from Federal actions. EO 13112, Invasive Species, requests that actions taken by Federal agencies that affect the status of invasive

species use relevant programs to prevent introducing invasive species and provide means through which to restore native species and habitat conditions to their original state. The Sikes Act (16 U.S.C. 670) requires that the Department of Defense (DoD) establish Integrated Natural Resource Management Plans (INRMPs) to conserve resources under their jurisdictions which are developed in cooperation with the USFWS and state agencies.

The Clean Water Act (CWA) of 1977 (33 U.S.C. 1344) and EO 11990, Protection of Wetlands, regulate activities near water bodies or wetlands. Activities occurring in or near wetlands are subject to section 404 of the CWA and require a permit from the U.S. Army Corps of Engineers (USACE). Section 404 and EO 11990 require Federal actions to minimize the degradation, destruction, or loss of wetlands.

The State of New Mexico maintains a list of state species of concern which includes those species identified by the New Mexico Natural Heritage Program. The state also has two laws which protect vegetation and wildlife. The Wildlife Conservation Act (New Mexico Statutes Annotated 1978 § 17-2-37 *et seq*.) is overseen by the New Mexico Department of Game and Fish (NMDGF), Conservation Services Division which administers the listing of special status species (NMDGF, 2005). The Endangered Plant Species Act (New Mexico Statutes Annotated 1978 § 75-6-1) is administered by the New Mexico Energy, Minerals, and Natural Resources Department (NMEMND), Forestry Division; however, the list of endangered plants is developed and maintained by the New Mexico Rare Plant Technical Council (NMRPTC) (NMEMND, 2007).

3.3.3 Existing Conditions

Vegetation

Holloman Air Force Base is located in the Chihuahuan Desert Province. The dominant vegetation in this area are creosote bush (*Larrea tridentata*), yuccas (*Yucca* spp.), lechuguilla (*Agave lechuguilla*), and ocotillo (*Fouquieria splendens*). Honey mesquite (*Prosopis glandulosa*), cacti, and prickly pears (*Opuntia* spp.) are prevalent in areas with deeper soils (USAF, 2006).

Much of the original vegetation found in the Chihuahuan Desert Province has been replaced at Holloman Air Force Base with ornamental plants, such as desert willow (*Chilopsis linearis*), pines (*Pinus* spp.), and mulberry (*Morus* spp.). Grasses are present at the golf course and some of the residences. Silverleaf nightshade (*Solanum elaeagnifolium*), Russian thistle (*Salsola iberica*) or African rue (*Peganum harmala*) are largely found in disturbed areas and four-wing saltbush (*Atriplex canescens*), sacaton (*Sporobolus* spp.), and saltgrass (*Distichlis* spp.) are present in areas away from buildings and roads. Other areas have little or no vegetation because of alkaline soils (USAF, 2006).

The African rue (*Peganum harmala*) is an invasive species found in disturbed areas on Holloman Air Force Base. There are currently management efforts in place to limit its spread.

Wildlife

Mammals common in the Chihuahuan Desert Province include pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), blacktail jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), kangaroo rats (*Dipodomys* spp.), woodrats (*Neotoma* spp.). coyotes (*Canis latrans*), and bobcats (*Lynx rufus*). The African Oryx, also called gemsbok (*Oryx gazelle*) was introduced in southern New Mexico and is found in abundance on Holloman Air Force Base and nearby White Sands Missile Range (WSMR). Periodically, population reduction hunts are conducted in the area, and WSMR also supports trophy hunts annually (USAF, 2006).

Reptile species appear in abundance in the Chihuahuan Desert Province. Lizard species include the common chuckwalla (*Sauromalus ater*), desert spiny lizard (*Sceloporus magister*), and checkered whiptails (*Cnemidophorus tesselatus*). The Texas horned lizard (*Phrynosoma cornutum*) is occasionally found in the area. Snakes such as bullsnakes (*Pituophis melanoleucus*), prairie or western rattlesnakes (*Crotalis viridis*), and western diamondback rattlesnakes (*Crotalis atrox*) are also common at Holloman Air Force Base (USAF, 2006).

In the Chihuahuan Desert Province, the most common bird species is the black-throated sparrow (*Amphispiza bilineata*). Also in abundance are the greater roadrunner (*Geococcyx californianus*), curve-billed thrasher (*Toxostoma curvirostre*), Chihuahuan raven (*Corvus cryptoleucus*), scaled quail (*Callipepla squamata*), Gambel's quail (*Callipepla gambellii*), and great-tailed grackles (*Quiscalus mexicanus*). Other terrestrial birds include the western kingbird (*Tyrannus verticalis*), Cassin's kingbird (*Tyrannus vociferans*), and Say's phoebe (*Sayornis saya*) (USAF, 2006).

Raptor species such as the golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), and Swainson's hawk (*Buteo swainsoni*) occur in Chihuahuan Desert Province. Swainson's hawks, red-tailed hawks, and Chihuahuan ravens have been known to nest near Holloman Air Force Base (USAF, 2006).

Migratory birds utilize a minor migration corridor in the Central Flyway which is located over Holloman Air Force Base. Common migratory species include the mallard, northern pintail, blue-winged teal, northern shoveler, and Wilson's phalarope. These species utilize the Lake Holloman Wildlife Refuge Area located southwest of runway 34 on the Air Force Base. The Wildlife Refuge Area consists of small lakes, wetlands, and playas and is primarily used by the Air Force Base to store wastewater treatment effluent (USAF, 2006).

Bird collisions occasionally occur at Holloman Air Force Base. Approximately 97 percent of bird strikes occur below 3,000 feet and 30 percent occur within the on base air field property (USAF, 2006). In 2005 and 2006, sixteen and three bird strikes were reported, respectively. The Holloman Air Force Base has procedures are in place to avoid direct flights over the Lake Holloman Wildlife Refuge Area and decrease the probability of bird collisions (USAF, 2006).

The only aquatic species that exist on Holloman Air Force Base are carp and mosquitofish, which were introduced in golf course ponds. Exhibit 3-3 states that the state threatened species, the White Sands pupfish, may also be present at Holloman Air Force Base.

Special Status Species

Exhibit 3-3 presents Federal and state-listed threatened, endangered, and sensitive species that could be located on or near Holloman Air Force Base.

Exhibit 3-3. Threatened and Endangered Species in Otero County, New Mexico

Common Name	Scientific Name	Status[1]
Spotted bat	*Euderma maculatum*	ST
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallsecens*	FSC
Black-footed ferret	*Mustela nigripes*	FE
Guadalupe Pocket Gopher	*Thomomys bottae guadalupensis*	FSC
Meadow jumping mouse	*Zapus hudsonius luteus*	ST, FSC
Black-tailed prairie dog	*Cynomys ludovicianus*	SC
Arizona black-tailed prairie dog	*Cynomys ludovicianus arizonensis*	C
Guadalupe southern pocket gopher	*Thomomys umbrinus guadalupensis*	SS
Desert pocket gopher	*Geomys arenarius*	FSC
Penasco (Least) chipmunk	*Tamias minimus atristriatus*	SC
White Sands woodrat	*Neotoma micropus leucophaea*	SC
Brown pelican	*Pelecanus occidentalis*	SE
Neotropic cormorant	*Phalacrocorax brasilianus*	ST
Common black hawk	*Buteogallus anthracinus anthracinus*	ST
Varied Bunting	*Passerina versicolor versicolor; dickeyae*	ST
Bald eagle	*Haliaeetus leucocephalus alascanus*	ST, FT
American peregrine falcon	*Falco peregrinus anatum*	ST , SC
Northern aplomado falcon	*Falco femoralis septentrionalis*	SE, FE
Arctic peregrine falcon	*Falco peregrinus tundris*	SC
Northern goshawk	*Accipiter gentilis atricapillus; apache*	FSC
Common Ground-dove	*Columbina passerine pallescens*	SE
Broad-billed Hummingbird	*Cynanthus latirostris magicus*	ST
White-eared Hummingbird	*Hylocharis leucotis borealis*	ST
Mexican Spotted Owl	*Strix occidentalis lucida*	FT
Elegant Trogon	*Trogon elegans canescens*	SE
Mountain plover	*Charadrius montanus*	FSC
Yellow-billed cuckoo	*Coccyzus americanus*	SC
Interior least tern	*Sterna antillarum athalassos*	SE, FE

Common Name	Scientific Name	Status[1]
Black tern	*Chlidonias niger*	FSC
Western burrowing owl	*Athene cunicularia hypugaea*	FSC
Southwestern willow flycatcher	*Empidonax traillii extimus*	SE, FE
Bell's vireo	*Vireo bellii*	ST, SC
Gray vireo	*Vireo vicinior*	ST
Baird's sparrow	*Ammodramus bairdii*	ST, FSC
Arthropod-Invertebrate		
Sacramento Mountains blue butterfly	*Icaricia icariodes*	SC
Sacramento Mountains checkerspot butterfly	*Euphydryas anicia cloudcrofti*	SC
Sacramento Mountains silverspot butterfly	*Speyeria atlantic capitanensis*	SC
Reptiles/Amphibians		
Sacramento Mountain Salamander	*Aneides hardii*	ST, SC
Rock Mottled Rattlesnake	*Crotalus lepidus lepidus*	ST
Fish		
White Sands pupfish	*Cyprinodon tularosa*	ST , FSC
Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	SC
Plants and Lichen		
Sacramento prickly poppy	*Argemone pleiacantha pinnatisecta*	SE, FE
Kuenzler's hedgehog cactus	*Echinocereus fendleri kuenzleri*	TE, SE
Villard pincushion cactus	*Escobaria villardii*	SC, SE
Todsen's pennyroyal	*Hedeoma todsenii*	FE, SE
Sacramento Mountains Thistle	*Cirsium vinaceum*	FT, SE
Desert night-blooming cereus	*Peniocereus greggii* var. *greggii*	SC, SE
Goodding's onion	*Allium gooddingii*	SC, SE
Guadalupe rabbitbrush	*Chrysothamnus nauseosus* var. *texensis*	SC
Gypsum scalebroom	*Lepidospartum burgessii*	SC, SE
Sierra Blanca cliff daisy	*Chaetopappa elegans*	SC
Alamo beard tongue	*Penstemon alamosensis*	SC

Notes: 1. Status: FE = Federal Endangered; FSC = Federal Species of Concern; FT = Federal Threatened; SE = State Endangered; SC = Species of Concern [Taxa for which further biological research and field study are needed to resolve their conservation status OR are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies]; ST = State Threatened; C=Candidate for listing
Source: NMDGF, 2007; USDA, 2007; USFWS, 2007

Wetlands

Holloman Air Force Base has approximately 780 acres of wetlands located north and west of the golf course. Representative plant species include cattail (*Typha* spp.), bulrush (*Scirpus* spp.), saltcedar (*Tamarix ramossissima*), globe mallow (*Sphaeralcea* spp.), buffalo gourd (*Curcurbita foetidissima*), common reed (*Phragmites australis*), saltbush, silverleaf nightshade, Russian

thistle, desert willow, and creosote bush. Waterfowl also utilize the wetlands and ponds near the golf course. Representative species include American coots (*Fulica americana*), ruddy ducks (*Oxyura jamaicensis*), and American avocet (*Recurvirostra americana*). Teals (*Anas* spp.) have been observed nesting in the vegetation. The only fish species present are introduced carp and mosquitofish (USAF, 2006).

3.4 Cultural Resources (Historical, Architectural, and Archeological Resources)

3.4.1 Resource Definition

Cultural resources are typically divided to three major categories: prehistoric and historic archaeological resources, architectural resources, and traditional cultural resources (such as Native American religious sites or traditional cultural properties). Cultural resources include any prehistoric or historic district, site, structure, fossil remains, or artifact considered to be important for a cultural, scientific, traditional, religious or any other reason.

Cultural resources of significance are listed in the National Register of Historic Places (NRHP). The criteria for significance are contained in Section 106 of the National Historic Preservation Act (NHPA). Archaeological, architectural, and traditional cultural resources determined to be significant under cultural resource legislation are subject to protection or consideration by a Federal agency. In addition, Native American sites held in historical or cultural importance, which may not be listed on the NRHP, should be included as cultural resources.

3.4.2 Regulatory Setting

The management of cultural resources is regulated by numerous policies and guidelines. Below is a list of the significant regulations.

- NHPA Section 106 requires Federal agencies to take into account the effects of their undertakings on historic properties. Section 110 governs Federal agencies responsibilities to preserve historic buildings as well as designate a Federal Preservation Officer.
- Archaeological and Historical Preservation Act of 1974 provides for the survey, recovery, and preservation of historical and archaeological data, in order to ensure the preservation of historic American sites, buildings, objects, and antiquities of national significance.
- Archaeological Resources Protection Act prohibits the unauthorized excavation of archaeological items from Federal and tribal lands.
- American Indian Religious Freedom Act of 1978 protects Native Americans freedom to exercise their religion by requiring consultation with Native American tribes concerning proposed actions on sacred sites or affecting access to sacred sites.
- EO 13007, *Indian Sacred Sites* requires Federal agencies to accommodate access to sacred Indian sites and avoid adversely affecting the physical integrity of such sacred sites when developing policy and regulation. The EO has states that tribal governments should be consulted as sovereign nations.
- Native American Graves Protection and Repatriation Act governs the inadvertent discovery of cultural resources, including human remains and cultural artifacts on Federal property.

3.4.3 Existing Conditions

Holloman Air Force Base began its Cultural Resource Program in 1992 (DoD, no date). The mission of the program is to identify and inventory possible cultural resources located on the Air Force Base. To date, the program has conducted several surveys covering 96 percent of base-administered property. These surveys have identified 363 archaeological sites and approximately 1,500 architectural or historical resources on the Air Force Base (USAF, 2006).

Archaeological Resources

The surveys conducted as part of the Cultural Resource Program have identified 250 archaeological sites at Holloman Air Force Base. More than half of the sites (135) are related to settlement of Native Americans. Some of the sites date back to the first human inhabitants, the Paleo Indians. Ranching was common in the area around Holloman Air Force Base during the late 1800s and early 1900s. Evidence of this important industry was discovered at 23 sites. The military has had a presence in this region for approximately 65 years. Forty-nine of the identified resource sites are associated with the military presence. The remaining 43 sites were identified to have a combination of Native American and historic significance or remain uncategorized (USAF, 2006).

Architectural Resources

During World War II, Holloman Air Force Base served as the training grounds for B-17, B-24, and B-29 bomber crews. Following World War II, the base was utilized for unmanned aircraft and guided missile testing. Buildings constructed to support these missions may be considered an architectural resource.

A total of 1,474 architectural resources have been identified on base-administered property – 1,392 associated with the Cold War Period, 60 associated with World War II, and 22 pre-military Historic Era resources. Of these 1,474 resources, 29 are considered eligible for inclusion in the NRHP, 18 are potentially eligible, 50 are considered ineligible, and 1,377 remain unevaluated (USAF, 2006).

Traditional Cultural Resources

As early as 12,000 years ago, Native American tribes inhabited the area around Holloman Air Force Base and the Tularosa Basin (USAF, 2006). Since 1873, the Mescalero Apache reservation has been located near the Sacramento Mountains northeast of Holloman Air Force Base. The Mescalero Apache tribe is composed of three sub bands: the Mescalero Apache, the Chiricahua Apache, and the Lipan Apache (Inn, 2007). The Mescalero Apache tribe has not identified any traditional cultural resources on the Air Force Base. Holloman Air Force Base personnel continue to communicate with the tribe.

3.5 Section 4(f) Resources

3.5.1 Resource Definition

The EPA defines land use as "the way land is developed and used in terms of the kinds of anthropogenic activities that occur (e.g., agriculture, residential areas, and industrial areas)" (EPA, 2006). Section 4(f) activities include approval of a program or project within a publicly owned land from a public park, recreation area, wildlife or waterfowl refuge of national, state, or local significance, or land from an historic site of national, state, or local significance as determined by the officials having jurisdiction (FAA Order 1050.1E, Change 1).

3.5.2 Regulatory Setting

The FAA must consider impacts under Section 4(f) of the Department of Transportation Act, which was re-codified and renumbered as Section 303(c) of 49 U.S.C. It provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a public park, recreation area, wildlife or waterfowl refuge of national, state, or local significance, or land from an historic site of national, state, or local significance as determined by the officials having jurisdiction. These provisions apply unless there is no feasible and prudent alternative to the land use and the project includes all possible planning to minimize harm resulting from the use (FAA Order 1050.1E, Change 1).

3.5.3 Existing Conditions

Holloman Air Force Base is located approximately six miles west of downtown Alamogordo, New Mexico and is comprised of two parcels of land that together cover 59,639 acres. The base is predominantly undeveloped open space used for a variety of mission-related activities. To the south and northeast of Holloman Air Force Base, land is owned and administered by the Bureau of Land Management (BLM). White Sands National Monument (WSNM) is located to the southwest. WSMR surrounds the monument and borders Holloman Air Force Base to the north, west, and south. A combination of Federal, state, and private lands are located to the east, southeast, and southwest of the base (USAF, 2006), and are depicted in Exhibit 3-6.

Within the Air Force Base, the Lake Holloman Wildlife Refuge Area is located southwest of runway 34. The wildlife refuge area consists of small lakes, wetlands, and playas and is primarily used by the Air Force Base to store wastewater treatment effluent (USAF, 2006). Outside the Air Force Base, WSNM is located adjacent to Holloman Air Force Base to the southwest.

3.6 Noise and Compatible Land Use

3.6.1 Resource Definition

Noise is typically defined as unwanted sound that can disrupt normal activities or environmental quality. Sources of noise may be continuous or intermittent, steady or impulsive, and/or stationary or transient. Noise sources also may have a very broad range of frequencies, or

pitches, which can easily be identified, such as noise from an airplane take-off, or nondescript, such as noise from a crowded airport.

Noise can be quantified by its intensity, frequency, and duration (time). Sound is heard by pressure waves traveling through the air which vibrate the ear drum. These waves are created by acoustic energy and as this energy increases so does the intensity of the waves and the noise is registered as being louder. Sound Pressure Level (SPL) is measured in decibels (dB) on a logarithmic scale with 120 dB as the human threshold for pain. Because SPL is measured on a logarithmic scale, a doubling of the SPL does not equal a doubling of the number of decibels (i.e., 60 dB + 60 dB = 63 dB).

The frequency of sound is the number of times per second that the air vibrates from acoustic energy. A low frequency noise resembles a rumble, while a high frequency noise resembles a screech. Frequency is measure in hertz (Hz).

Typically the measurement of sound is A-weighted decibels (dBA), which means instruments used to monitor noise levels are calibrated to emphasize frequencies within the most sensitive human range (1,000 to 4,000 Hz). Another type of sound measurement is C-weighted decibels (dBC). Sonic booms, transient impulsive sounds generated by aircraft during flight, are C-weighted to account for low frequency energy.

Other noise metrics include the maximum noise level (L_{max}), the highest sound level generated during a single event and sound exposure level (SEL), the sum of acoustic energy generated over the duration of a single event. The SEL normalizes all the acoustic energy of a noise event as if it occurred in one second. The SEL allows comparison of noise events with different magnitudes and durations. The Day Night Average Noise Level (DNL) represents the average sound level over one day (with a 10 dB penalty for nighttime noise) and the equivalent sound level (L_{eq}) is the energy-averaged sound level over any specified time period.

Compatible land uses include land use patterns (residential, commercial, industrial, recreational), land ownership (Federal, state, private), and land use management plans. Zoning, management plans, and policies regulate how land is used.

3.6.2 Regulatory Setting

Several Federal laws, including the Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. 47501-47507), and the Noise Control Act of 1972 (49 U.S.C. 44715) regulate aircraft noise from airports. The FAA regulates noise from commercial aircraft (14 CFR Part 36) and land use compatibility (14 CFR Part 150, Airport Noise Compatibility Planning). With respect to hearing damage, the Occupational Safety and Health Administration (OSHA) regulation 1910.95 establishes a maximum noise level of 90 dBA for a continuous eight-hour exposure during a working day and higher levels for shorter exposure time in the workplace. For example, OSHA 1910.95 specifies that the noise exposure limit of 15 minutes or less is 115 dBA. OSHA also advises that impulse noise not exceed 140 dBA.

With respect to human annoyance, the EPA identified a DNL of 55 dBA as a level "…requisite to protect the public health and welfare with an adequate margin of safety" (USAF, 2006).

However, most state and Federal agencies use 65 DNL as the dividing line between acceptable and unacceptable noise environments. The FAA significant impact threshold is an increase in 1.5 dB or more from a baseline of a 65 DNL (FAA Order 1050.1E, Change 1).

Holloman Air Force Base uses the Air Installation Compatible Use Zone guidelines to inform surrounding jurisdictions on the planning and regulation of land use. Neither Otero County nor the city of Alamogordo has noise exposure regulations. The city of Alamogordo controls compatible land use near Holloman Air Force Base. Zoning and coordination between the city, county, and the base has halted encroachment upon the base.

3.6.3 Existing Conditions

Existing conditions at Holloman Air Force Base include approximately 97,400 flight activities per year and associated ground-based activities such as transportation, maintenance, and other operational activities. Exhibit 3-4 provides the average daily aircraft operations at Holloman.

Exhibit 3-4. Baseline Average Daily Aircraft Operations at Holloman Air Force Base[1]

Aircraft	Arrivals		Departures		Closed Patterns[2]	
	Day	*Night*	*Day*	*Night*	*Day*	*Night*
Based Military	66	10	72	4	211	0.5
Transient Military	2	0	2	0	0	0
Civil	6	0	6	0	0	0
Total	**74**	**10**	**80**	**4**	**211**	**0.5**

[1]Baseline daily operations are derived from the reassignment of German F-4 aircraft.
[2]Since closed patterns consist of a landing and a takeoff (two aviation operations), the 211 closed patterns shown equate to 422 aviation operations.
Source: USAF 2006

The main transportation thoroughfare near Holloman Air Force Base is U.S. Highway 70, which runs east to west and connects to U.S. Highway 54, which runs north to south near Alamogordo. Interstate highway 10 (I-10) is located further to the south and runs east and west. In 2004, the average traffic on U.S. Highway 70 was approximately 7,600 passenger cars and trucks/day and on U.S. Highway 54 going north and south of Alamogordo was 13,500 to 19,000 and 7,600 to 8,000, respectively (NMDOT, 2004). The road network on the Air Force Base consists of primary arteries (First Street and West Gate Avenue), other arteries (Delaware Avenue, 49er Avenue, and Eleventh Street), collector streets (Kelly Road), and local streets (USAF, 2006). Commercial traffic can enter the base at West Gate Avenue.

The nearest airport is the Alamogordo-White Sands Regional Airport, which has two runways (Otero County, 2005). The Las Cruces Regional Airport is located 80 miles to the west of Alamogordo and the nearest international airport, El Paso International Airport, is located 100 miles south of Alamogordo (Otero County, 2005). The Union Pacific Transportation Company

runs freight service along the same corridor as U.S. 54, and has a line extension from Alamogordo to Holloman Air Force Base (NMDOT, 2007).

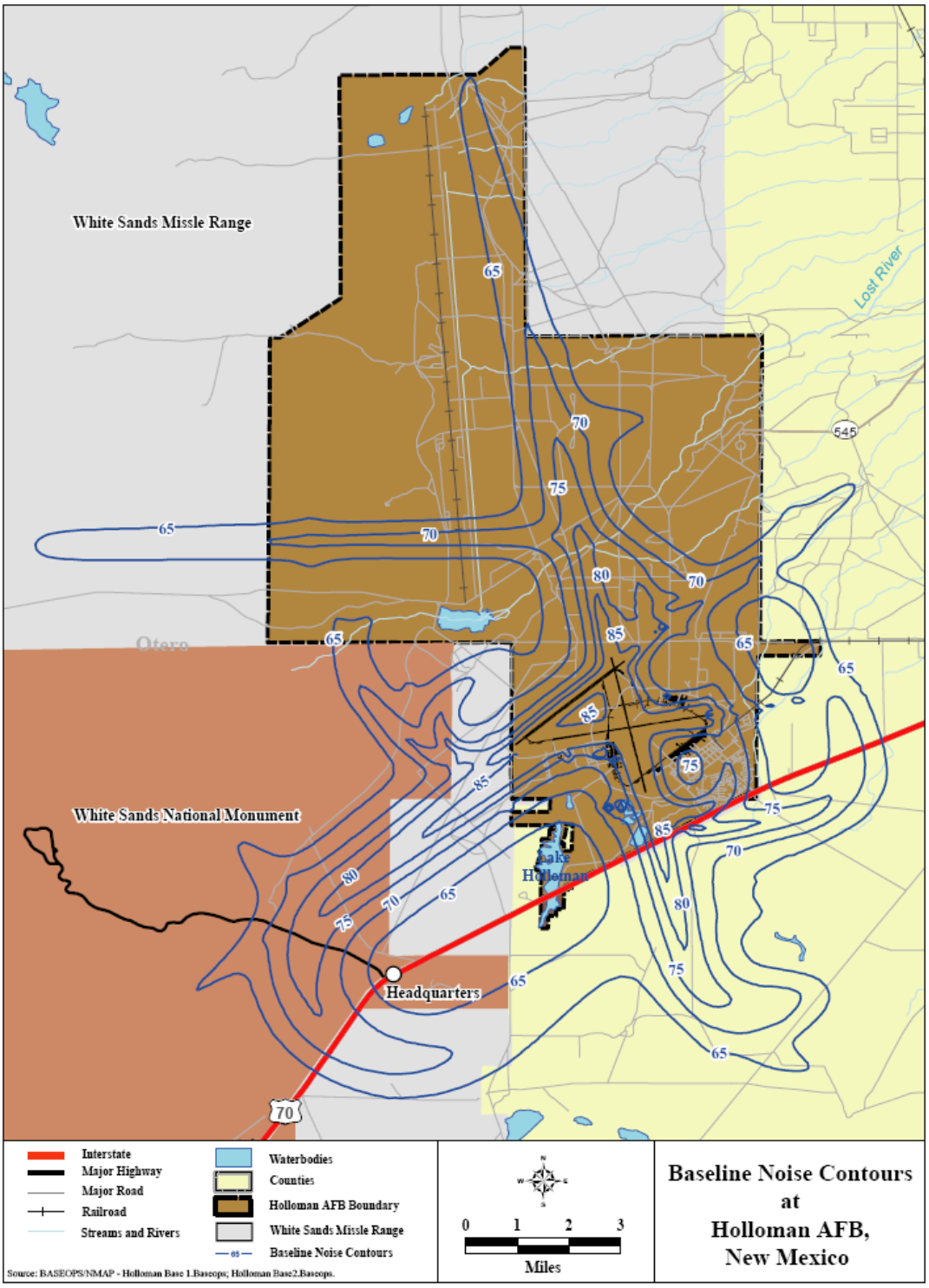
Located adjacent to Holloman Air Force Base are the WSMR to the north, west, and south and the WSNM to the southwest. The San Andres National Wildlife Refuge is located on WSMR directly west of WSNM. Also nearby are the town of Alamogordo (six miles to the west of Holloman Air Force Base), BLM property to the south and northeast which is leased for grazing, and the U.S. 70 transportation corridor to the south where a mixture of residential and light commercial enterprises are located. The WSNM and the residences and commercial buildings along U.S. 70 are potential noise sensitive receptors. However, these uses are compatible with current noise exposure levels (USAF, 2006). Exhibits 3-5 and 3-6 present day-night average sound levels on and off the Air Force Base and noise contours, respectively.

Exhibit 3-5. Land Area Exposed to Day/Night Average Sound Levels under Current Conditions

Sound Level (DNL)	**Acres of Land**		
	On Base	*Off Base*	*Total*
65 - 70	7,716	16,940	24,656
70 - 75	4,940	7,516	12,456
75 - 80	3,404	3,456	6,860
80 - 85	1,962	1,734	3,696
> 85	2,728	411	3,139
Total	20,750	30,057	50,807

Source: USAF 2006

Exhibit 3-6. Baseline Noise Contours



3.7 Physical Resources (Water Resources [Surface Water, Ground Water, Floodplains], Hazardous Materials, Pollution Prevention, Solid Waste)

3.7.1 Resource Definition

Water resources include surface water, floodplains, and groundwater resources (aquifers). Hazardous materials are any substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce (49 CFR 172). This includes hazardous substances and hazardous wastes. Hazardous substances are any element, compound, mixture, solution, or substance defined as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and listed in 40 CFR 302. If released into the environment, hazardous substances may pose substantial harm to human health or the environment.

Hazardous wastes have characteristics as defined by the Resource Conservation and Recovery Act (RCRA) in 40 CFR 261 which "… may (a) cause, or significantly contribute to, an increase in mortality or an increase in…illness or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of or otherwise managed." Hazardous waste is further defined as any solid waste that possesses hazardous characteristics of toxicity, ignitability, corrosivity, or reactivity, or is specifically listed as a hazardous waste in Subpart D of 40 CFR Part 261.

Pollution prevention is reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and re-using materials rather than putting them into the waste stream (EPA, 2007c).

Solid waste, more commonly known as trash or garbage, consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries (EPA, 2007d).

3.7.2 Regulatory Setting

Water resources are regulated by the CWA, which regulates all discharges into "waters of the United States" and sets water quality standards for all contaminants in surface waters. The goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Section 404 of the CWA requires consultation prior to the dredging or disposing of fill materials into navigable waters, and most activities require permits. Compliance with Section 404 of the CWA within the State of New Mexico is administered by the U.S. Army Corps of Engineers in Albuquerque.

Under Section 402, the CWA also requires that all point sources discharging pollutants into waters of the U.S. must obtain a National Pollution Discharge Elimination System (NPDES) permit. A water quality certificate must be obtained under Section 401 if a project is required to apply for a Section 404 Permit or a NPDES Permit (USAF, 2006). Unless the project involves the impoundment of water covering an area of less than 10 acres, the Fish and Wildlife

Coordination Act applies, and the FAA must consult with the USFWS and the applicable state agencies to identify means to prevent loss or damage to wildlife resources.

EO 11988, *Floodplain Management*, requires Federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or within floodplains.

The most important statutes governing the handling and disposal of hazardous materials, substances, and wastes to the FAA are RCRA and CERCLA. RCRA governs the generation, treatment, storage, and disposal of hazardous wastes. CERCLA provides for the cleanup of any release into the environment (FAA Order 1050.1E, Change 1). The Hazardous Materials Transportation Act (49 U.S.C. Section 1801, Parts 172-173) regulates the transportation of hazardous materials (USAF, 2006).

EO 12088 directs Federal agencies to comply with "applicable pollution control standards" in prevention, control, and abatement of environmental pollution and to consult with EPA, state, and local agencies concerning the best techniques and methods available for prevention, control, and abatement of environmental pollution (FAA Order 1050.1E, Change 1). The CEQ Memorandum on Pollution Prevention and NEPA encourages early consideration of opportunities for pollution prevention (CEQ, 1993).

Municipal solid waste is regulated and managed at the state and community level (EPA, 2007d).

3.7.3 Existing Conditions

Water Resources

The terrain at Holloman Air Force Base is nearly level, with only a very slight overall slope to the southwest. The base is crossed by several intermittent arroyos, which along with some sheet wash channels, carry storm water flow to the southwest after summer thunderstorms. These arroyos include Lost River, Dillard Draw, Malone Draw, and several smaller tributaries. Storm water generally sinks into the permeable soils before the water reaches the intermittent lakes (playas) on the west and southwest sides of the base. These runoff events recharge groundwater that typically is less than 20 feet below the surface of Holloman Air Force Base (USAF, 2006).

Holloman Air Force Base relies on off-base sources of groundwater and surface water to provide potable water to base personnel. Ground water is supplied from the Bolson Aquifer located in the Tularosa Basin, which is a closed basin fed by ephemeral drainages. Two ground level storage tanks with a total capacity of 0.9 million gallons associated with the well fields feed the Boles Field Pumping Station, which supplies the Base with potable water through two separate pipelines for storage, chlorination, and distribution within the base system (USAF, 2006).

Surface water from Bonito Lake and springs in Fresnal Canyon and La Luz Canyon is transported to the city of Alamogordo's La Luz water treatment plant, where the water is filtered and chlorinated, and potable water is pumped to the Boles Field Pumping Station, where it is transported to the base by pipeline (USAF, 2006).

Average daily water demand is approximately 2.1 million gallons per day with eight percent (0.168 million gallons per day) used by the golf course for irrigation (49 FW 2004). Potable water storage on-base is provided by three tanks (Eagle Tower with 0.3 million gallons; Challenger Tank with 0.4 million gallons; North Area Tower with 0.25 million gallons) having a total capacity of 0.95 million gallons (USAF, 2006).

Storm water, typically generated in the arid climate of New Mexico during the months of June through October, is conveyed through drainage channels, underground piping (storm sewer), and, in a few areas, by sheet flow. Holloman Air Force Base has an approved Storm Water Pollution Prevention Plan (SWPPP) that meets the requirements of the base-wide NPDES Multi-Sector General Permit for Industrial Activities.

Floodplains

Typically, issues relevant to water resources include the quality and quantity of downstream water bodies that could be affected and hazards associated with 100-year floodplains (USAF, 2006). There are no designated 100-year floodplains in the area to be affected by the proposed action.

Hazardous Materials, Pollution Prevention, and Solid Waste

The majority of hazardous materials used by Air Force and contractor personnel at Holloman Air Force Base are controlled by the hazardous materials pharmacy established at the base in 1993, which tracks products used, ensures that they are used prior to their expiration, and operates a 'just-in-time' ordering system to greatly reduce the amount of hazardous materials stored onsite (USAF, 2006).

Aircraft flight operations and maintenance, as well as installation maintenance, require the storage and use of many types of hazardous materials. These materials include flammable and combustible liquids, acids, corrosives, caustics, glycols, compressed gases, aerosols, batteries, hydraulic fluids, solvents, paints, pesticides, herbicides, lubricants, fire retardants, photographic chemicals, alcohols, and sealants.

Holloman Air Force Base is a large-quantity hazardous waste generator, generating more than 2,200 pounds of nonacute hazardous waste per month. Hazardous wastes are generated from aircraft and vehicle operations and maintenance; medical and dental facilities; cleaning and degreasing operations; and various maintenance and paint operations. These wastes include solvents, paints and paint-related material, absorbent material, rags and debris, blast material and expired shelf-life material (USAF, 2006).

Holloman Air Force Base recycles all lubricating fluids, batteries, oil filters, and shop rags. Hazardous wastes generated are managed in accordance with the Holloman Air Force Base Hazardous Waste Management Plan. Approximately 70,820 pounds of hazardous wastes were disposed of in Fiscal Year 2005 (USAF, 2006).

Holloman Air Force Base has one waste storage site (Building 149), which allows the base to store hazardous waste for up to 90 days before transfer to the Defense Reutilization Market Office. The 90-day storage site is currently operated by a contractor, with the base retaining quality control of the site. Wastes generated on base are managed under regulations set forth in Holloman Air Force Base's RCRA Part B permit. Holloman Air Force Base also holds a RCRA permit for handling the disposal and treatment of waste munitions (USAF, 2006).

Pollution prevention and solid waste management measures are in place and managed by base personnel.

3.8 Socioeconomic Resources, Environmental Justice, and Children's Environmental Health and Safety Risks

3.8.1 Resource Definition

Socioeconomics is the study of the relationship between economic activity and social life. Socioeconomic resources relate to demographics of a given area, including population, employment, income, and race.

Environmental justice is defined as the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. Meaningful involvement means that: (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) their concerns will be considered in the decision making process; and (4) the decision makers seek out and facilitate the involvement of those potentially affected.

Children's environmental health refers to the study of environmental health risks that may disproportionately affect children under the age of 18.

3.8.2 Regulatory Setting

In 1994, President Clinton signed EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The EO directs Federal agencies to:

- Integrate environmental justice into the Agency's mission;
- Develop an agency-wide environmental justice strategy;
- Establish an Interagency Working Group on environmental justice, which is chaired by the EPA Administrator and comprised of the heads of 11 departments or agencies and several White House offices; and
- Conduct reviews to ensure that minorities and low-income populations are not disproportionately impacted by Agency decisions, policies, or programs.

EO 13045, Protection of Children's Environmental Health Risks and Safety Risks, requires Federal agencies to identify and consider the environmental health and safety risks of proposed actions on children. The EO emphasizes the need to attempt to address and mitigate any disproportionate affects on children as a result of the proposed action.

3.8.3 Existing conditions

Socioeconomic Resources

Holloman Air Force Base is located approximately six miles southeast of city of Alamogordo in Otero County, New Mexico. According to the U.S. Census Bureau, the population estimate of Otero County was 63,128 in 2005. This represents an increase of 446 people since 2000. The Bureau of Business and Economic Research at the University of New Mexico projects that the population growth rate in the County will be 4 to 5 percent a decade from 2010 to 2030 (Otero County, 2005). Based on 2006 estimates Otero County is ranked as the 8th most populated county in New Mexico. Of the 63,128 residents, approximately 30 percent are under the age of 18 years old. The 2000 Census estimated that Otero County had an average population density of 9.4 persons per square mile. However, the county population densities range from 1 person per square mile, along the Texas border, to 48 persons per square mile, along the western edge of the county. The average household size in the county was 2.66 persons, which is slightly larger than the national average of 2.59 persons. Of the 45,925 persons of working-age, 29 percent are employed by the government, with the balance working for private companies or self-employed.

Otero County consists of several cities; the largest is the city of Alamogordo at a population of 36,245. Alamogordo, the County seat, was founded in 1898 as a terminal for the railroad (Otero County, 2005). Alamogordo represented approximately 57 percent of the population in Otero County in both 2005 and 2000. The city has an average household size of 2.57 persons (U.S. Census, 2000).

The available work force in Alamogordo is approximately 26,299 persons. As with Otero County, the government employs 30 percent of the Alamogordo residents (U.S. Census, 2000). Many of the 21,000 personnel employed at Holloman Air Force Base reside in Alamogordo (USAF, 2006). Therefore, the economic viability of the Alamogordo community is linked to Holloman Air Force Base.

Environmental Justice

Communities, particularly low-income and minority populations may experience disproportionate impacts from base activities. Such populations exist in the county of Otero and the city of Alamogordo. Exhibit 3-7 shows the number of minority residents in both Otero County and Alamogordo. Otero County and Alamogordo have similar demographic profiles with respect to percent minority.

Exhibit 3-7. Minority Data for Otero County and Alamogordo City

Minority Group	Otero County		Alamogordo City	
White	45,919	73.7%	26,812	75.4%
Black or African American	2,440	3.9%	1,985	5.6%
American Indian and Alaska Native	3,614	5.8%	374	1.1%
Asian	728	1.2%	545	1.5%
Native Hawaiian and Other Pacific Islander	82	0.1%	59	0.2%
Hispanic or Latino	20,033	32.2%	11,383	32.0%
Other	7,273	11.9%	4,295	12.1%
Two or more races	2,242	3.6%	1,512	4.2%

Source: 2000 U.S. Census

The 1999 median household income level in Otero County is $30,861, approximately $11,000 lower than the national average of $41, 994. Approximately 15.6 percent of the families in Otero County live below the Federal poverty level; of which 12.9 percent earn less than $10,000 per year (U.S. Census, 2000).

The U.S. Census reported that in 1999 the median household income level in city of Alamogordo was $30,928, which is slightly higher than the county average, but still below the national average. Approximately 13 percent of the families in Alamogordo live below the Federal poverty level as compared to 9 percent nationally. Additionally, 24.2 percent of families living in poverty have children under the age of five, as compared to 26.8 percent at the county level (U.S. Census, 2000).

Children's Environmental Health and Safety Risks

The 2000 U.S. Census reported that there are 189,352 children under the age of 18 residing in Otero County. This represents approximately 29.5 percent of the total population of the county. Of these, 7.4 percent are under the age of five. Similarly, children under the age of 18 represent 28.7 percent of residents in the city of Alamogordo. Both have a higher percentage of children under the age of 18 than the national average of 25.7 percent. Additionally, the state of New Mexico's average is slightly lower than that of Alamogordo at 28 percent (U.S. Census, 2000). In 2005, the percentage of children under the age of 18 had declined to 25.4 percent in New Mexico (U.S. Census, 2005). Data were not available on the county or city level.

3.9 Light Emissions and Visual Impacts

3.9.1 Resource Definition

Visual resources are any natural or developed landscapes that define the aesthetic value of an area. Visual resources can include land formations and viewsheds, vegetation and surface waters, open space, and transportation and man-made structures. Visual impacts would result if an action were to change the aesthetic value of a visual resource (e.g., constructing a hotel along an undeveloped stretch of beach). Light emissions can also impact visual resources. Unnatural, man-made light sources can distort the appearance and aesthetics of visual resources, especially at night. Visual impacts are commonly described in terms of the visual sensitivity of an area. Areas with high visual sensitivity include coastlines, prairies, open spaces, while urban developed areas characterized areas with low visual sensitivity (FAA, 2005).

3.9.2 Regulatory Setting

Visual resources on BLM lands are managed by the Visual Resource Management (VRM) system. The VRM ensures that scenic values are considered before an action on public lands negatively impacts visual resources (FAA, 2005). There are no state and local regulations concerning the management of visual resources or light emissions near Holloman Air Force Base.

3.9.3 *Existing Condition*s

The area can be described as having low visual sensitivity because Holloman Air Force Base and adjacent WSMR are developed with runways and associated air field facilities. Frequent airplane arrivals and departures, to which the public has grown accustomed, also contribute to low visual sensitivity.

Current light sources at the Holloman Air Force Base include security lighting on the grounds, safety lighting on the runways, which are on overnight, and from residences and transportation vehicles on the property. Light is also generated from existing nighttime aircraft operations.

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4 ENVIRONMENTAL CONSEQUENCES

This section of the EA describes the potential environmental consequences associated with the proposed action and no action alternative. The environmental consequences were reviewed in accordance with all relevant legal requirements, including 40 CFR Part 1502.16 and the FAA Regulations (FAA Order 1050.1E, Change 1) for implementing NEPA, which specify significance thresholds by resource. Section 4 does not have separate sections to address construction impacts or secondary (induced) impacts (impact categories listed in FAA Order 1050.1E, Change 1) because the proposed action and no action alternative involve no construction activities, and secondary (indirect) impacts are considered with the direct impacts for each impact category as necessary. Natural Resources and Energy Supply is not analyzed in detail because the proposed action would not result in any measurable effect on local supplies of energy or natural resources. In addition, the proposed action does not use unusual materials or materials in short supply, so the use of natural resources other than propellants was not examined.

4.1 Air Quality

This section addresses the potential impacts on air quality from suborbital launch activities associated with the X Prize Cup Lunar Lander Challenge. Impacts on air quality are assessed by estimating the potential to cause deterioration in air quality surrounding the launch site (Holloman Air Force Base) in accordance with the CAA. This section provides emission estimates associated with the proposed action and the no action alternative and evaluates the potential air quality impacts of these emissions.

4.1.1 Proposed Action

To estimate emissions from the launch of the reusable suborbital rockets, the FAA used vehicle propellant information, the amount of rocket engine operation time for both the challenges and the potential test launches occurring one week prior to the event, and the number of reusable suborbital rockets that would participate (See Section 2.1.1). The FAA calculated the total propellant consumed for each reusable suborbital rocket type. Propellant-specific emission weight fractions (see Exhibit 4-1) were applied to these propellant consumption estimates to calculate emissions from each type of reusable suborbital rocket. To calculate the total emissions from reusable suborbital rockets, the emission weight-fraction by emission type is multiplied by the total time of rocket engine operation and propellant consumption rate. The estimated total emissions per reusable suborbital rocket are presented in Exhibit 4-2.

Exhibit 4-1. Emission Weight Fractions[a]

Propellant Combination (Fuel/Oxidizer)	Emissions/Unit Propellant Consumed					
	H_2O	CO	CO_2	N_2	O_2	C
99% Isopropanol/70% Hydrogen Peroxide	0.74	0.02	0.25	0	0	0
95% Ethanol/LOX	0.47	0.34	0.20	0	0	0
75% Ethanol/LOX	0.47	0.12	0.42	0	0	0
RP-1/Nitrous Oxide	0.13	0.02	0.28	0.57	0	0
99% Isopropanol/LOX	0.50	0.44	0	0	0	0.06
100% Methanol/50% Hydrogen Peroxide	0.82	0.07	0.11	0	0	0
90% Hydrogen Peroxide	0.58	0	0	0	0.42	0
Liquefied Natural Gas/LOX	0.66	0.21	0	0	0	0.14

Note: Values less than 0.001 were reported as zero.

Exhibit 4-2. Total Emissions per Reusable Suborbital Rocket

Applicant Rocket	Propellant (fuel and oxidizer)	Propellant Quantity (pounds)	Consumption rate, pounds/second	Total Operation Time (seconds)	Emissions (pounds)					
					H_2O	CO_2	CO_2	NO_2	O_2	C
Applicant Team A	99% Isopropanol	81	2.95	6,060	13,196	269	4458	0	0	0
	70% Hydrogen Peroxide	569								
Applicant Team B	95% Ethanol	400	4.55	6,060	12,836	9,225	5,454	0	0	0
	LOX	600								
Applicant Team C	RP-1	17	0.77	6,060	590	112	1,302	2,683	0	0
	Nitrous Oxide	153								
Applicant Team D	99% Isopropanol	347	3.78	2,760	5,208	4,624	0	0	0	605
	LOX	485								
	99% Isopropanol	685	7.46	3,300	12,290	10,960	0	0	0	1,404
	LOX	960								
Applicant Team E	100% Methanol	22	0.64	2,760	1,442	114	200	0	0	0
	50% Hydrogen Peroxide	118								
Applicant Team F	95% Ethanol	455	5.17	6,060	14,608	10,533	6,238	0	0	0
	LOX	683								
Applicant Team G	90% hydrogen peroxide	386	1.75	2,760	2,794	0	0	0	2,048	0
Applicant Team H	Liquefied Natural Gas	170	2.59	6,060	10,300	3,281	0	2	0	2,210
	LOX	400								
Applicant Team I	75% Ethanol	109	1.19	2,760	1,545	381	1,361	0	0	0
	LOX	153								
	75% Ethanol	269	2.94	3,300	4,561	1,116	4,028	0	0	0
	LOX	378								

Holloman Air Force Base is located in Otero County, which is designated as in attainment for all criteria pollutants. Emissions of any criteria pollutants associated with the proposed action would be well below Federal *de minimis* levels and would not be expected to cause exceedances of the NAAQS or New Mexico Ambient Air Quality Standards. Many of the propellant combinations are fuel rich; therefore, carbon monoxide (CO) and carbon (as soot) may appear in the rocket emissions. However, these would readily burn in the ambient air downstream from the nozzle, forming CO_2. The CO_2 that would result would disperse into the atmosphere and would have no impact on air quality. No hazardous air pollutants would be emitted by the reusable suborbital rockets. The air quality impacts associated with the proposed action would not exceed one or more of the National Ambient Air Quality Standards for the appropriate time periods and would not exceed the applicable threshold for significance. Haze-related pollutants would have a negligible impact on visibility in the vicinity, including the designated Class I White Mountains Wilderness Area, 43 miles northeast of Holloman Air Force Base.

4.1.2 No Action Alternative

Under the no action alternative, no impacts on air quality are expected. FAA would not issue any experimental permits. There would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and associated test launches would not occur. Other Air and Space Show activities that may impact air quality are discussed under cumulative impacts.

4.2 Biological Resources

This section addresses the potential impacts on biological resources from suborbital launch activities associated with the Lunar Lander Challenge at the 2007 X Prize Cup and under the no action alternative. The proposed action would not significantly impact biological resources at Holloman Air Force Base.

4.2.1 Proposed Action

Vegetation

Under the proposed action, the reusable suborbital rockets would be supported during pre-launch activities by forklifts, cranes, and other heavy equipment. These vehicles would operate in developed areas on Holloman Air Force Base. These pre-launch operations would resemble current activities at the Air Force Base. Pre-launch operations would not result in adverse impacts on surrounding vegetation.

Test launches prior to the X Prize Cup event, and the Lunar Lander launches would occur at designated launch pads at a distance of approximately 5,000 feet away from the crowd. These launch pads would either be re-poured or resurfaced prior to the X Prize Cup. Up to 16 reusable suborbital rockets could participate in the 2007 X Prize Cup. In the event that a suborbital rocket misses the designated landing area and lands on undeveloped ground, vegetation in that area may be crushed or burned by the vehicle. Studies from other launches have shown that localized scorching could result in temporary adverse impacts, but would not cause long-term damage to the vegetation (USAF, 2006a). The deposition of rocket engine emissions on vegetation may

also cause temporary adverse effects. However, propellants proposed for the suborbital rockets are similar to fuels already used at Holloman Air Force Base during normal operations. Additional adverse impacts on vegetation from X Prize Cup activities would be negligible.

Wildlife

Under the proposed action, pre-launch and launch activities would occur in the developed area of Holloman Air Force Base. Wildlife would experience temporary disruptions in activities such as feeding and nesting due to noise. Wildlife in the area is exposed to noise from Holloman Air Force Base on a regular basis and it is commonly reported that wildlife habituates behaviorally and physiologically to noise (USAF, 2006). Therefore, long-term impacts from noise are not expected.

Emissions from Lunar Lander activities could be deposited on surrounding vegetation and soil, which could be ingested, inhaled, or absorbed by wildlife, possibly leading to adverse impacts at the individual level. Since the Lunar Lander Challenge is a two-day event, adverse effects on wildlife at the population level are not expected. Propellants proposed for pre-launch and suborbital rockets are similar to fuels already used at Holloman Air Force Base. Additional adverse impacts on wildlife from Lunar Lander activities would be negligible.

Wildlife also responds to visual stimuli. Most wildlife reacts to visual stimuli when aircraft activities are within 550 feet of the ground (USAF, 1998). The 16 reusable suborbital rockets participating in the Lunar Lander Challenge would hover at an altitude around 164 feet, which is within the threshold level for wildlife reaction to visual stimuli and could have temporary adverse impacts.

Bird strikes could occur and result in direct adverse impacts. However, the reusable suborbital rocket launches would have flight times between 90 and 180 seconds per launch and would be moving more slowly than typical military aircraft. Since these launches occur in a developed area of the Holloman Air Force Base, away from the Lake Holloman Wildlife Refuge, and Holloman Air Force Base has bird strike avoidance measures in place, adverse impacts on birds would be unlikely.

Special Status Species

Under the proposed action, Federal and state-listed threatened or endangered species would not experience adverse impacts. Holloman Air Force Base does not contain designated critical habitat for any of the threatened or endangered species listed in Exhibit 3-3. Lunar Lander activities would occur in the developed area of Holloman Air Force Base, away from the Lake Holloman Wildlife Refuge, and these activities would be similar to normal operations at the Air Force Base.

Wetlands

The reusable suborbital rockets would have no adverse impacts on wetlands as the Lunar Lander activities would occur in the developed areas of Holloman Air Force Base.

4.2.2 No Action Alternative

Under the no action alternative, no impacts on biological resources are expected. The FAA would not issue any experimental permits. There would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and the associated test launches would not occur. Other Air and Space Show activities that could impact biological resources would still occur and are discussed under cumulative impacts.

4.3 Cultural Resources

This section addresses the potential impacts on cultural resources from suborbital launch activities associated with Level One and Level Two challenges at the 2007 X Prize Cup and under the no action alternative.

4.3.1 Proposed Action

As discussed in Section 3.4, cultural surveys have identified numerous architectural, archaeological, and traditional sites on Holloman Air Force Base-administered lands. No new facilities would be constructed as part of the proposed action. No sonic booms would occur under the proposed action. Therefore, the previously identified architectural resources (USAF, 2006) would not be affected by the X Prize Cup activities. The local Mescalero Apache tribe has not identified any traditional cultural resources on the base, and no impacts are anticipated.

If cultural resources were identified or discovered as a result of the proposed action, activities in that vicinity would be stopped and the Cultural Resources Manager would immediately contact the appropriate persons for further evaluation. No impacts to cultural resources on or outside Holloman Air Force Base are anticipated.

4.3.2 No Action Alternative

Under the no action alternative, no impacts on cultural resources are expected. FAA would not issue any experimental permits; therefore, there would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and the associated test launches would not occur. Other Air and Space Show activities that could impact cultural resources would still occur and are discussed under cumulative impacts.

4.4 Section 4(f) Resources

This section addresses the potential impacts on Section 4(f) resources from suborbital launch activities associated with the Lunar Lander Challenge at the 2007 X Prize Cup and under the no action alternative.

4.4.1 Proposed Action

Lunar Lauder activities would occur in a developed area of Holloman Air Force Base, away from the Lake Holloman Wildlife Refuge, and these activities would be similar to normal operations at the Air Force Base. Noise from launch activities would be less than activities normally taking place at Holloman Air Force Base. There would be no direct or constructive use of Section 4(f) resources. Implementation of the proposed action would not require the use or alteration of any land protected under Section 4(f) of the Department of Transportation Act.

4.4.2 No Action Alternative

Under the no action alternative, no impacts on Section 4(f) resources are expected. FAA would not issue any experimental permits. There would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and the associated test launches would not occur. Other Air and Space Show activities that may impact Section 4(f) resources would still occur and are discussed under cumulative impacts.

4.5 Noise and Compatible Land Use

This section addresses the potential impacts associated with noise and compatible land use from suborbital launch activities associated with the Lunar Lander Challenge at the 2007 X Prize Cup and under the no action alternative.

4.5.1 Proposed Action

Activities associated with the proposed action that would affect ambient noise levels include sounds generated from the rocket launches. No sonic booms are expected. Holloman Air Force Base currently supports approximately 97,400 aircraft operations per year, so X Prize Cup activities over a two-day period would produce a minor amount of noise in comparison to existing noise. Residential areas are located approximately six miles east of the base in downtown Alamogordo, New Mexico.

Exhibit 4-3 shows measured noise levels at the 2006 X Prize Cup. Noise-producing activities and duration of activities for the 2007 X Prize Cup are expected to be similar to those at the 2006 event. The noise levels measured at the 2006 X Prize Cup include non-licensed FAA activities that are not part of the proposed action, so the values in Exhibit 4-3 provide a conservative estimate of noise levels associated with the proposed action of the current proposed action taking place at the 2007 X Prize Cup.

Exhibit 4-3. Measured Noise Levels at 2006 X Prize Cup

Launch Activity	Average dBA	Measurement Distance, meters[a]
Tripoli Rocket	83	678
Masten Engine Static Fire	79	182
Armadillo Lunar Lander	81	1,367
Tripoli Static Engine Test	77	182

[a]To convert from meters to feet, multiply by 3.2808

The short-term noise events associated with the proposed action would be audible above existing noise at times. The measured (annual) DNL at the 2006 X Prize Cup was 53 dBA as measured at the runway apron. Since existing noise levels at Holloman Air Force Base are at approximately 85 DNL at the apron area (USAF, 2006), X Prize Cup noise would increase overall noise levels by less than 1.5 dBA. Consequently, the proposed action would not result in noise impacts in excess of the applicable threshold of significance.

4.5.2 No Action Alternative

Under the no action alternative, no impacts on noise and compatible land use are expected. FAA would not issue any experimental permits. There would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and the associated test launches would not occur. Other Air and Space Show activities that may impact noise and compatible land use would still occur and are discussed under cumulative impacts.

4.6 Physical Resources (Water Resources [Surface Water, Groundwater, Floodplains], Hazardous Materials, Pollution Prevention, Solid Waste)

This section addresses the potential impacts on physical resources from suborbital launch activities associated with the Lunar Lander Challenges at the 2007 X Prize Cup and under the no action alternative.

4.6.1 Proposed Action

Groundwater and Surface Water

Launches prior to and during the X Prize Cup event, and the Lunar Lander Challenges would occur at designated launch and landing pads located in areas previously disturbed. No streams or floodplains are located within the proposed operational area of the reusable suborbital rockets. In addition, existing potable water supply sources would be used for all X Prize Cup activities. The proposed action is not expected to impact these potable water supplies.

Floodplains

Under the proposed action, no floodplains would be impacted.

Hazardous Materials, Pollution Prevention, and Solid Waste

As discussed in Section 2.1.1, propellants for the suborbital rockets would require various transportable propellant storage containers, associated plumbing and pumps, and portable secondary containment structures. Trailers or pick-up trucks and a commercial tank truck would be used to transport the propellants from the propellant storage area to the test or launch site. Following the propellant transfer, the propellant loading equipment would be removed from the area.

Standard safety precautions would be followed such as clearing the area of unnecessary personnel and ignition (including spark) sources. In the event of a spill or release, propellant-loading operations would be halted until the spill is properly cleaned up by the applicant and has no reasonable chance of creating an explosion or fire hazard.

The LOX would be stored in dewars; all other propellants would be stored in tankers. The LOX would be secured and stored areas designated by Holloman Air Force Base. Hazardous materials intended for use or storage in the Staging area must be pre-approved by the X Prize Foundation (X Prize Foundation, 2007a). Storage of propellants would be performed in accordance with all appropriate and relevant procedures and a specific propellant handling and storage plan for Holloman Air Force Base developed in coordination with the FAA.

During pre-flight activities, minor amounts of other hazardous materials, such as oils, lubricants, and solvents, would be used to prepare the rockets for flight. All hazardous materials would be handled, stored, and used in compliance with all applicable regulations. Hazardous materials that would be used under the proposed action are similar to materials already handled at the Air Force Base. The transport, use, or disposal of hazardous materials associated with operations under the proposed action would not pose a substantial hazard to the public or the environment.

The reusable suborbital rockets would use propellants with hazardous characteristics similar to the jet fuels currently used and stored at Holloman Air Force Base. Propellant loading operations would occur at the launch pad and would involve trained personnel. In the event of a spill, the applicant's personnel would be trained to respond to such an incident and would be responsible for any necessary containment, removal, and remediation. In addition, emergency response personnel would be on standby during the X Prize Cup to respond to accidents or fires.

Vehicle safing would begin upon completion of all launch and landing activities and the shut down of the engine and any flight control systems that are unnecessary for rocket recovery. The oxidizer system would be purged either by flash boiling, venting, or dumping. Next, the alcohol or hydrocarbon fuel lines would be drained into a suitable container approved by the DOT. Finally, the remaining pressurants (i.e., helium or nitrogen) would be vented to the atmosphere prior to moving the suborbital rocket to its transport vehicle and returning to the staging area.

Existing procedures for the centralized management of the procurement, handling, storage, and issuing of hazardous materials through the Hazardous Materials Pharmacy are adequate to handle the activities associated with the proposed action. All hazardous materials generated by the proposed project would be handled, stored, and disposed of in accordance with Federal, state, and local regulations. Permits for handling and disposal of hazardous material would be coordinated with the base hazardous waste program manager. The use of hazardous materials would not cause adverse impacts. Hazardous waste disposal procedures, including off-base disposal procedures, are adequate to handle changes in quantity and would remain the same (USAF, 2006).

The proposed action is not anticipated to result in any impacts from hazardous materials or hazardous waste. Applicants would be required to comply with pollution prevention plans and practices currently in effect.

4.6.2 No Action Alternative

Under the no action alternative, no impacts on physical resources are expected. FAA would not issue any experimental permits. There would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and associated test launches would not occur. Other Air and Space Show activities that may impact physical resources would still occur and are discussed under cumulative impacts.

4.7 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

This section addresses the potential impacts on socioeconomic resources, environmental justice, and children's environmental health and safety risks from suborbital launch activities associated with the Lunar Lander Challenge at the 2007 X Prize Cup and under the no action alternative.

4.7.1 Proposed Action

Socioeconomic Resources and Environmental Justice

The Holloman Air and Space Show is expected to attract up to 50,000 spectators at any one time. This influx could provide a temporary economic benefit for the area around the base, especially for the local hotels and restaurants. There would not be a permanent or substantial temporary change in employment relating to the proposed action. There are sufficient services such as emergency care and public utilities to accommodate the visiting spectators. This number of attendees is expected regardless of whether any permitted flights take place. The proposed action would not adversely affect the community around Holloman Air Force Base.

Children's Environmental Health and Safety Risks

There are two schools located within one mile of the base. The nearby schools may experience increased noise levels associated with these test launches leading up to the X Prize Cup. However, the noise would be temporary since launches are expected to last between 90 and 180 seconds. Additionally, the participating vehicles would not create sonic booms. The launches

could be visible to the public. Impacts on the children attending local schools are not expected. Due to the short-term effects of the proposed action, no negative effects are anticipated.

4.7.2 No Action Alternative

Under the no action alternative, no impacts on socioeconomics, environmental justice, and children's environmental health and safety risks are expected. FAA would not issue any experimental permits; therefore, there would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and associated test launches would not occur. Other Air and Space Show activities that may impact socioeconomics, environmental justice, and children's environmental health and safety risks would still occur and are discussed under cumulative impacts.

4.8 Light Emissions and Visual Impacts

This section addresses the potential impacts on visual resources from suborbital launch activities associated with Lunar Lander Challenge at the 2007 X Prize Cup and under the no action alternative.

4.8.1 Proposed Action

The proposed action would not significantly impact visual resources at Holloman Air Force Base. The reusable rockets would remain within a small, designated area of the base and within 164 feet from the ground. Since the Lunar Lander Challenge is a temporary event, visual impacts would be short-term. Additionally, suborbital launches and associated activities (e.g., ground equipment loading, propellant loading, transporting) are similar to activities that already occur at Holloman Air Force Base and would not result in new or additional visual resource impacts. The proposed action is not expected to have any light emissions.

4.8.2 No Action Alternative

Under the no action alternative, no impacts on visual resources are expected. FAA would not issue any experimental permits. There would be no permitted launches of reusable suborbital rockets at the 2007 X Prize Cup. The X Prize Cup Lunar Lander Challenge and associated test launches would not occur. Other Air and Space Show activities that may impact visual resources would still occur and are discussed under cumulative impacts.

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5 CUMULATIVE EFFECTS AND OTHER ENVIRONMENTAL CONSIDERATIONS

According to 40 CFR § 1508.7, cumulative impacts are defined as "…the incremental impact of the actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions." For this analysis, cumulative impacts include impacts from the permitted vehicles that would participate in the Northrop Grumman Lunar Lander Challenge events and the past, present, and reasonably foreseeable future activities that would affect the resources impacted by the events at the Holloman Air Force Base. The past, present, and reasonably foreseeable activities reviewed by the FAA include the X Prize Cup events that are not licensed by the FAA but that would occur, as presented in Section 1.1, Background, and discussed in detail below.

The X Prize Cup is taking place during the Holloman Air and Space Show. In addition to the Lunar Lander Challenge and prior test launches, the X Prize Cup events will include up to eight amateur rocket launches and tethered test flights. The Air and Space Show will include military and acrobatic flights and ground displays. Concrete pads may be constructed, restored, or repoured to support activities for the X Prize Cup. These activities do not require a license or permit from the FAA. Holloman Air Force Base anticipates that the total attendance for the Air and Space Show could be a maximum of 50,000 people at any one time.

The FAA reviewed the activities associated with the proposed action to identify the resources that may be notably affected by the implementation of the proposed action and then assessed the impacts from the other past, present, and reasonably foreseeable future activities that may impact the same resources. The FAA found that impacts from the proposed action would not exceed the threshold of significance for any of the resource areas discussed in Section 4.

5.1 Past, Present, and Reasonably Foreseeable Holloman Air Force Base and Other Military, Federal, Non-Federal, State, and Local Actions

Holloman Air Force Base is an active military installation. The installation undergoes changes in mission and training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the base requires new construction, facility improvements, infrastructure upgrades and maintenance and repairs on an ongoing basis. There are several recent past and ongoing actions on or related to Holloman Air Force Base. These include construction of a new bombing range on McGregor Range of Fort Bliss, a new 18-hole golf course, and the Military Family Housing project. Fort Bliss is currently evaluating proposed changes in land use on its 1.1-million acre training area complex to support Army transformation initiatives. In addition, WSMR is evaluating a proposal to support initial operations for the Future Combat System maneuver-to-test program.

Federal agencies such as the BLM, USFWS, Federal Highway Administration, and the Federal Energy Regulatory Commission have jurisdiction in the region. As a result, various Federal actions are authorized by these agencies in the area. Recent activities include a Resource Management Plan Amendment and an Environmental Impact Statement (EIS) for the McGregor

Range at Fort Bliss, an EIS for Federal Fluid Mineral Mining, and a draft EIS for a proposal to upgrade and operate a refined petroleum products pipeline in New Mexico.

Non-Federal actions at Holloman Air Force Base include State of New Mexico, county and private projects. Examples of these are the development of Spaceport America on 150,000 acres of state trust lands, and the construction of a new water desalination plant on Fort Bliss.

The proposed action at the X Prize Cup that would be held at Holloman Air Force Base is a much smaller action compared to the several past, current and reasonably foreseeable actions on Holloman Air Force Base and the surrounding areas and would last for only two days. The proposed action is not expected to have an impact on other activities on the Holloman Air Force Base and the surrounding area and would not result in substantial cumulative impacts on the Holloman Air Force Base.

5.2 Cumulative Effects Analysis

FAA reviewed the activities associated with the proposed action to identify the resources that may be notably affected by the implementation of the proposed action and then assessed the impacts from the other past, present, and reasonably foreseeable activities that may impact the same resources. FAA found that the proposed action may have a notable but less than significant impact on biological resources, air quality, and noise. The proposed action at the X Prize Cup would last for only two days and would not affect any other actions on Holloman Air Force Base and the surrounding areas, and conversely the proposed action would not be affected by any other actions. Environmental consequences on the base are not expected to increase due the proposed action, and no substantial cumulative impacts on resources are expected.

5.3 Relationship between Short-Term Uses and Long-Term Productivity

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Special attention should be given to impacts that narrow the range of beneficial uses of the environment in the long-term or pose a long-term risk to human health or safety. This section evaluates the short-term benefits of the proposed alternatives compared to the long-term productivity derived from not pursuing the proposed alternatives.

A short-term use of the environment is generally defined as a direct consequence of a project in its immediate vicinity. Short-term effects could include localized disruptions and higher noise levels. Under the X Prize Cup proposed action, short-term uses of the environment would result in noise and minimal emissions of haze-related pollutants. Haze-related pollutants and other emissions would not accumulate in sufficient volume to affect environmental resources and would not exceed the threshold of significance. Noise effects would be short term and would not be expected to result in permanent damage or long-term changes in wildlife productivity or habitat use.

The proposed action would not impact the long-term productivity of the land. Existing infrastructure at the Holloman Air Force Base would be used for the launch and landing of the

rockets under the proposed action and its related activities. Thus, the long-term quality and productive use of the land, air, or water would not be affected.

5.4 Irreversible and Irretrievable Commitment of Resources

NEPA CEQ regulations require environmental analyses to identify "...any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented" (40 CFR Section 1502.16). Primary irreversible effects result from permanent use of a nonrenewable resource (e.g., minerals or energy). Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., disturbance of a cultural site) or consumption of renewable resources that are not permanently lost (e.g., old growth forests). Secondary impacts could result from environmental accidents, such as explosive fires. Natural resources include minerals, energy, land, water, forestry and biota. Nonrenewable resources are those resources that cannot be replenished by natural means, including oil, natural gas and iron ore. Renewable natural resources are those resources that can be replenished by natural means, including water, lumber and soil.

For the proposed action at X Prize Cup, impacts are short-term and temporary. No long-lasting impacts would result due to the proposed action which is very small compared to other actions on Holloman Air Force Base and the surrounding area, and it would only last for two days. No new infrastructure is required for the proposed action. Short-term reactions of wildlife could include temporary disruptions in activities such as feeding and nesting due to noise, but habituation to noise is expected and no long-term impacts from noise would occur. Inhalation, ingestion or absorption by wildlife of emission deposition on nearby vegetation or soil may affect individuals, but since the X Prize Cup is a two-day event, effects on the population level are not expected. Rocket launches involve consumption of nonrenewable resources such as propellants for the engines. No irreversible or irretrievable effects are expected for cultural resources or other natural resources, including land and water.

Secondary impacts on natural resources could occur in the unlikely event of an accidental fire, such as caused by a rocket mishap. However, while any fire can affect wildlife and habitat, the increased risk of fire hazard due to activities under the proposed action is very low.

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