Supplemental Environmental Assessment (SEA) and Finding of No Significant Impact (FONSI)

SPACE BASED INFRARED SYSTEM (SBIRS) MISSION CONTROL STATION FOR DEFENSE SUPPORT PROGRAM CONSOLIDATION

United States Air Force
Headquarters Space and Missile Systems Center
Buckley AFB, Colorado
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FINDING OF NO SIGNIFICANT IMPACT (FONSI)
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (SEA)
SPACED BASED INFRARED SYSTEMS (SBIRS)
MISSION CONTROL STATION FOR
DEFENSE SUPPORT PROGRAM CONSOLIDATION
BUCKLEY AIR FORCE BASE, COLORADO

AGENCY: United States Air Force, Space and Missile Systems Center (SMC), 2nd Space Warning Squadron.

BACKGROUND: The Space Based Infrared System (SBIRS) High Program is a "system of systems" approach to integrate space assets in multiple orbit configurations with a consolidated ground segment for more effective integration of data and better information to the warfighter. The SBIRS architecture will consist of four satellites located in Geostationary Earth Orbit, two satellites orbiting in Highly Elliptical Orbits, and a constellation of greater than 20 satellites in Low Earth Orbit to provide global coverage in support of the SBIRS missions. The SBIRS missions include enemy missile warning, missile defense, technical intelligence, and battlespace characterization. The SBIRS High Program will provide an enhanced follow-on capability to the current Defense Support Program system using state-of-the-art, highly flexible, tasking infrared sensor technology to combat emerging threats. This technology will allow the SBIRS to detect and track shorter-range missiles with greater accuracy. The benefit to the warfighter will be improved missile launch point and impact point predictions in support of offensive and defensive operations, and reduced impact and disruption to the fighting readiness of deployed forces. Construction and operation of the SBIRS Mission Control Station (MCS) facility was previously analyzed in an environmental assessment (EA) that resulted in a FONSI in April 1996 (USAF SMC, 1996).
Pursuant to the National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (40 Code of Federal Regulations [CFR] 1500-1508), Department of Defense Directive 6050.1, Regulation 5000.2-R, and Air Force Instruction 32-7061, *The Environmental Impact Analysis Process* as promulgated in 32 CFR Part 989, and other applicable federal regulations, the USAF conducted an assessment of the potential environmental consequences of the Proposed Action and the No Action Alternative.

PROPOSED ACTION: The Air Force proposes to construct and operate two 10 meter diameter SBIRS radio frequency (RF) antennas to support the mission at Buckley Air Force Base (AFB), Colorado. These antennas would be part of the SBIRS MCS facility located on the western portion of Buckley AFB. This Proposed Action is supplemental to the SBIRS MCS EA which already describes the SBIRS MCS (USAF SMC, 1996). The antennas would be operated by existing SBIRS personnel; no additional manpower would be required.

SUMMARY OF FINDINGS: The following paragraphs summarize findings of the attached environmental assessment for the Proposed Action and No Action Alternative.

Air Quality. Analysis of air quality data indicates that the overall ambient air quality within Air Quality Control Region 36 would be slightly affected by construction of the Proposed Action. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.13 percent increase for any criteria pollutant) when compared to baseline AQCR 36 emissions. Since the estimated emission for criteria pollutants does not exceed 10 percent of the air emission baseline and does not exceed the *de minimis* level, the Proposed Action is not considered regionally significant and does not violate the Colorado state implementation plan (SIP).

Due to the small percentage of increase in operational emissions associated with the backup power generator compared to baseline conditions, the Proposed Action is not anticipated to significantly impact air quality at Buckley AFB.

Biological Resources. The Proposed Action would not likely have any adverse effects on biological resources with the exception of the black-tailed prairie dogs present at the SBIRS site. Biological resources at the site are markedly absent, with no native vegetation and only sparse noxious weed cover (field bindweed) on the predominantly barren site. The Proposed Action would not have an effect on any federally- or state-listed species.

Prior to commencing construction activities on the SBIRS site, the black-tailed prairie dogs would be live-captured by vacuuming their burrows and transferred to a U.S. Fish and Wildlife Service facility for use in the black-footed ferret captive breeding program, which is an integral part of the endangered species recovery program. The United States Fish and Wildlife Service indicates this would be an acceptable and preferred method of dealing with the prairie dogs at the SBIRS site. This would be a minor adverse effect to the prairie dogs because their numbers are low, the probability for persistence of this ward (a subgroup of the larger colony) is low, and resources are very limited. When considered in the context of the black-tailed prairie dog population and the very low habitat quality at the site, loss of these individual prairie dogs would be minor.

The SBIRS site would be monitored following the relocation to determine that all the prairie dogs have been removed. The prairie dog burrows will be destroyed to prevent recolonization by prairie dogs or other species. The action would be taken prior to March 1, 2001 to avoid interference with prairie dog reproduction activities and to preclude potential effects to burrowing owls returning from migration beginning in March. Precautions would be taken to protect the prairie dogs during live-capture and transport, and to ensure the health and safety of the persons handling the animals.

Non-ionizing Energy. According to the results of the SBIRS System Safety Hazard Analysis Report prepared by Lockheed Martin, the energy hazard assessment performed by the Joint Spectrum Center, and a study conducted by the Aerospace Corporation, the radio frequency energy emitted from the SBIRS antennas is below the IEEE standards (1.2 mW/cm^2 for S-band transmitting power and 30 mW/cm^2 for Q-band) for maximum permissible exposure for uncontrolled environments at all ground and air levels. Additionally, the power density level emitted from the SBIRS antennas is much less than 5,000 $mWcm^2$, which is the level established for the safe operating distance for fuels; therefore, no potential fuel ignition hazard exists.

Utilities. The electrical and natural gas utility distribution systems have adequate capacity to accommodate planned activities.

FINDING OF NO SIGNIFICANT IMPACT: Based on requirements of the National Environmental Policy Act, the Council on Environmental Quality, and CFR Part 989, I conclude that the environmental effects of the Proposed Action are not significant, and therefore, an environmental impact statement will not be prepared. An availability notice for public review was published in the Denver Post, a Denver, CO newspaper, on February 10, 2001 for a 15-day review period. A hard copy of the Supplemental EA and Draft FONSI was placed in the public library in Aurora, CO and placed on the SMC/AXFV web site at http://ax.laafb.af.mil/ax/ for dissemination. There were no comments received during the review period. The signing of this FONSI completes the Air Force Environmental Impact Analysis Process (EIAP).

Craig C Whitehead

CRAIG C. WHITEHEAD, COLONEL, USAF
Installation Commander

13 Mar 01

Date

Supplemental Environmental Assessment (SEA) to the Space Based Infrared Systems (SBIRS) Mission Control Station for Defense Support Program Consolidation

2nd Space Warning Squadron Buckley Air Force Base, Colorado

Prepared for

Acquisition Civil Engineer Division
Environmental Management Branch

Space and Missile Systems Center
Los Angeles Air Force Base, California

and

Institute for Environment, Safety, and Occupational Health Risk Analysis (IERA)
Brooks Air Force Base, Texas

March 2001

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COVER SHEET

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (SEA) TO THE SPACE BASED INFRARED SYSTEMS (SBIRS) MISSION CONTROL STATION FOR DEFENSE SUPPORT PROGRAM CONSOLIDATION BUCKLEY AIR FORCE BASE, COLORADO

- **Responsible Agency**: United States Air Force (USAF), Space and Missile Systems Center (SMC), Los Angeles Air Force Base (AFB), California.

- **Proposed Action**: Accomplish the construction, installation, and operation of two SBIRS radio frequency (RF) antennas at the Mission Control Station (MCS) site at Buckley AFB, Colorado.

- Written comments and inquiries regarding this document should be directed to: Mr. Ted Krawczyk, U.S. Air Force, SMC/AXFV, 2420 Vela Way, Suite 1467, Los Angeles AFB, El Segundo, CA, 90245-4659 prior to 5:00 P.M. MST on February 24, 2001.

- **Report Designation**: Supplemental Environmental Assessment (EA).

- **Abstract**: The purpose of the Proposed Action is to accomplish the construction and operation of two 10-meter diameter SBIRS RF antennas to support the SMC mission at Buckley AFB, Colorado. These antennas would be part of the SBIRS MCS facility located on the western portion of Buckley AFB. The antennas would be operated by existing SBIRS personnel; no additional manpower would be required. Additionally, three smaller antennas may be erected near this same location as part of the continuing SBIRS mission to provide global coverage. The Proposed Action is supplemental to the SBIRS MCS EA which already describes the SBIRS MCS (USAF SMC, 1996). This supplemental EA evaluates the Proposed Actions and the No Action Alternative. Under the No Action Alternative, the SBIRS mission would be seriously degraded. The SBIRS antennas would not be installed and the 2 SWS would continue to rely on the Defense Support Program (DSP) antenna system. The DSP antennas are over 25-years old, beyond their life expectancy, and will not work with the new SBIRS geostationary earth orbit (GEO) satellites. The SBIRS GEO satellites use state-of-the-art, highly flexible, tasking infrared sensor technology to detect and track shorter-range missiles with greater accuracy, and are partially incompatible with the DSP antennas. Resources considered in the impact analysis were: air quality, biological resources, non-ionizing RF energy, and utilities. No significant impacts would result from the Proposed Action or the No Action Alternative.

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ACRONYMS AND ABBREVIATIONS

°F	Degrees Fahrenheit
2 SWS	2nd Space Warning Squadron
AFB	Air Force Base
AFI	Air Force Instruction
ANG	Air National Guard
ANGB	Air National Guard Base
APEN	Air Pollution Emission Notice
AQCR	Air quality control region
BMPs	Best management practices
Btu	British thermal unit
BX	Base Exchange
CAA	Clean Air Act
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and the Environment
CE	Civil Engineering
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon monoxide
CY	Calendar year
dB	Decibel
DoD	Department of Defense
DSP	Defense Support Program
EA	Environmental assessment
EIAP	Environmental impact analysis process
EIS	Environmental impact statement
EO	Executive Order
FONSI	Finding of No Significant Impact
FY	Fiscal year
GEO	Geostationary earth orbit
GHz	GigaHertz
HEO	Highly Elliptical Orbits
HM	Hazardous materials
HQ	Headquarters
HW	Hazardous waste
IRP	Installation restoration program
JSC	Joint Spectrum Center
kHz	KiloHertz
kVA	Kilovolt amperes
kW	Kilowatt
$kWCm^2$	Kilowatts per square centimeter
LBP	Lead-based paint
LEO	Low Earth Orbit
MBtu	Million British thermal units

ACRONYMS AND ABBREVIATIONS
(*...continued*)

MCS	Mission Control Station
NAAQS	National ambient air quality standards
NEPA	National Environmental Policy Act
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	Ozone
PCB	Polychlorinated biphenyl
PEL	Permissible exposure levels
PM_{10}	Diameter less than or equal to 10 micrometers
RAQC	Regional Air Quality Council
RF	Radio frequency
SB1	SBIRS Antenna No. 1
SB2	SBIRS Antenna No. 2
SBIRS	Space Based Infrared Systems
SHPO	State Historic Preservation Officer
SIP	State implementation plan
SMC	Space and Missile Systems Center
SO_2	Sulfur dioxide
SO_x	Sulfur oxides
TSP	Total suspended particulates
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile organic compound
ward	Subcolony of a larger prairie dog colony

SECTION 1
PURPOSE OF AND NEED FOR PROPOSED ACTION

This chapter includes a discussion on the background of the SBIRS High Program, a statement of the purpose and need for the Proposed Action, a statement of the Proposed Action, location of the Proposed Action, summary of the scope of the environmental review, and an overview of the organization of this supplemental EA.

1.1 BACKGROUND

The SBIRS High Program is a "system of systems" approach that will integrate space assets in multiple orbit configurations with a consolidated ground segment to provide more effective integration of data and better information to the warfighter. The SBIRS architecture will consist of four satellites located in Geostationary Earth Orbit (GEO), two satellites orbiting in Highly Elliptical Orbits (HEO), and a constellation of greater than 20 satellites in Low Earth Orbit (LEO) to provide global coverage in support of the SBIRS missions. The SBIRS missions include enemy missile warning, missile defense, technical intelligence, and battlespace characterization (LAAFB, 2001).

The SBIRS High Program is a follow-on program to the Defense Support Program (DSP) which has been in use since the 1970s. The DSP is an early warning system operated by the Air Force Space Command (AFSPC) and developed by the Air Force Space and Missile Systems Center (SMC). DSP provides 24-hour, worldwide surveillance for missile warning and nuclear burst detection and serves as the space segment of the U.S. Integrated Tactical Warning and Attack Assessment System. Although the DSP has proven to be a very capable system, it was not designed to meet the evolving theater and ballistic missile threats of the 2000s. The SBIRS High Program will provide the enhanced capabilities necessary to combat emerging threats and in turn meet U.S. infrared space surveillance needs through the next several decades (LAAFB, 2001). The legacy DSP ground stations, distributed worldwide, will be consolidated into SBIRS Mission Control Station (MCS) peace time facility. The MCS will use the three existing DSP antennas since the first phase of MCS operations will use only DSP satellite data. Once the newer SBIRS radio frequency (RF) antennas become operational and equipment in the DSP facility phases out, the existing DSP antennas will be phased out also (Miller, 2001).

The SBIRS High Program will provide an enhanced follow-on capability to the current DSP system using state-of-the-art, highly flexible, tasking infrared sensor

technology to combat emerging threats. This technology will allow SBIRS to detect and track shorter-range missiles with greater accuracy. The benefit to the warfighter will be improved missile launch point and impact point predictions in support of offensive and defensive operations, and reduced impact and disruption to the fighting readiness of deployed forces (LAAFB, 2001).

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

For over 50 years, ballistic missiles have been a threat to the United States and its military operations. During the Cold War, the strategic balance between Soviet and U.S. forces held this threat in check through the ability of each side to destroy the other after an initial attack. Since the 1991 Gulf War, there was a proliferation of ballistic missile capabilities throughout the world. Currently, over 20 countries now have ballistic missiles of theater (intermediate) range. These missiles can carry and deploy nuclear, chemical, and/or biological weapons. Furthermore, an estimated 24 countries have, or are capable of developing, these weapons of mass destruction. The U.S. Government considers the proliferation of ballistic missiles in combination with development of weapons of mass destruction a great danger to both national and global security.

In keeping with the objectives of AFSPC, the SMC SBIRS Directorate proposes to erect two RF antennas (SB1 and SB2) as part of the SBIRS High Geosynchronous Satellite Program and three RF antennas as part of the SBIRS LEO Satellite Program. These antennas are needed to support the existing SBIRS MCS facility located on the western side of Buckley AFB, Colorado. The two GEO antennas, SB1 and SB2, would be enclosed in radomes to protect them from the environment. Upon completion of the erection of SB1 and SB2, they would be capable of transmitting and receiving data from GEO satellites. The antennas would be constructed on concrete foundations, with grounding and signal duct banks interfaced with the cable duct bank attached to the existing MCS facility. If future operating parameters for the SBIRS MCS antennas are changed from the ones described in this supplemental EA, additional radiation hazard mitigation must be considered.

The purpose of antennas SB1 and SB2 would be to receive data for use by the Ground Terminal Element Segment part of the MCS to accomplish four SBIRS missions. These missions are vital to the early warning capability for the U.S. national defense system of the future. As stated above, all RF antennas are an integral part of the MCS, which would be utilized by existing SBIRS personnel. The MCS facility and its associated antennas would be used by the SBIRS GEO Ground Segment team with unique assets to provide a highly capable, cost-effective, low-risk fulfillment of the SBIRS missions. SB1 and SB2 would be capable of both transmitting and receiving data from the future SBIRS GEO satellites as well as the

DSP fly-out satellites. The MCS and associated antennas would allow consolidation of three DSP operational sites and associated communication networks into a fully integrated ground segment that fuses all infrared energy data collected from space with other data to optimize performance for all SBIRS missions. The existing DSP antennas would be used for communication until fiscal year (FY) 2004 when some of the equipment inside the DSP operations facility (Building B-430) will be retired. The MCS operations facility is located in Building B-422.

The SBIRS High Program RF antennas are the first phase of the consolidated, cost-effective, and flexible early warning system that requires specific EIAP documentation and action. A decision regarding construction and operation of the antennas at Buckley Air Force Base (AFB) would be supported by appropriate NEPA analysis. This supplemental EA provides that NEPA documentation.

1.3 PROPOSED ACTION

The USAF proposes to construct and operate two 10-meter diameter SBIRS RF antennas to support the mission at Buckley AFB, Colorado. These antennas would be part of the SBIRS MCS facility located on the western portion of Buckley AFB. The antennas would be operated by existing SBIRS personnel; no additional manpower would be required. This Proposed Action is supplemental to the SBIRS MCS EA which already describes the SBIRS MCS (USAF SMC, 1996). Additionally, three smaller LEO antennas are planned to be erected near the proposed SBIRS antennas site in the future. Information on the LEO antennas is included in Appendix B of this supplemental EA. The information includes the LEO planned antenna locations in relation to the existing DSP and SBIRS antennas, their transmitting frequencies, transmitting power, minimum operational elevation angles, and maximum operational times.

1.4 LOCATION OF THE PROPOSED ACTION

Buckley AFB, previously Buckley Air National Guard Base (ANGB), is located approximately 4.5 miles east of Denver, Colorado on the eastern edge of the City of Aurora, in Arapahoe County. Buckley AFB occupies 3,250 acres and has been in use since 1938. The base was realigned as an Air Force base in October 2000 (USAF, 2000). The 2nd Space Warning Squadron (2 SWS), owner and operator of the SBIRS mission, is a resident tenant at Buckley AFB. The SBIRS antennas would be located within the secured 2 SWS complex just west of the MCS building. Additionally, in the future three smaller LEO antennas are planned to be erected at a location near the SBIRS site. The location of Buckley AFB is shown in Figure 1-1.

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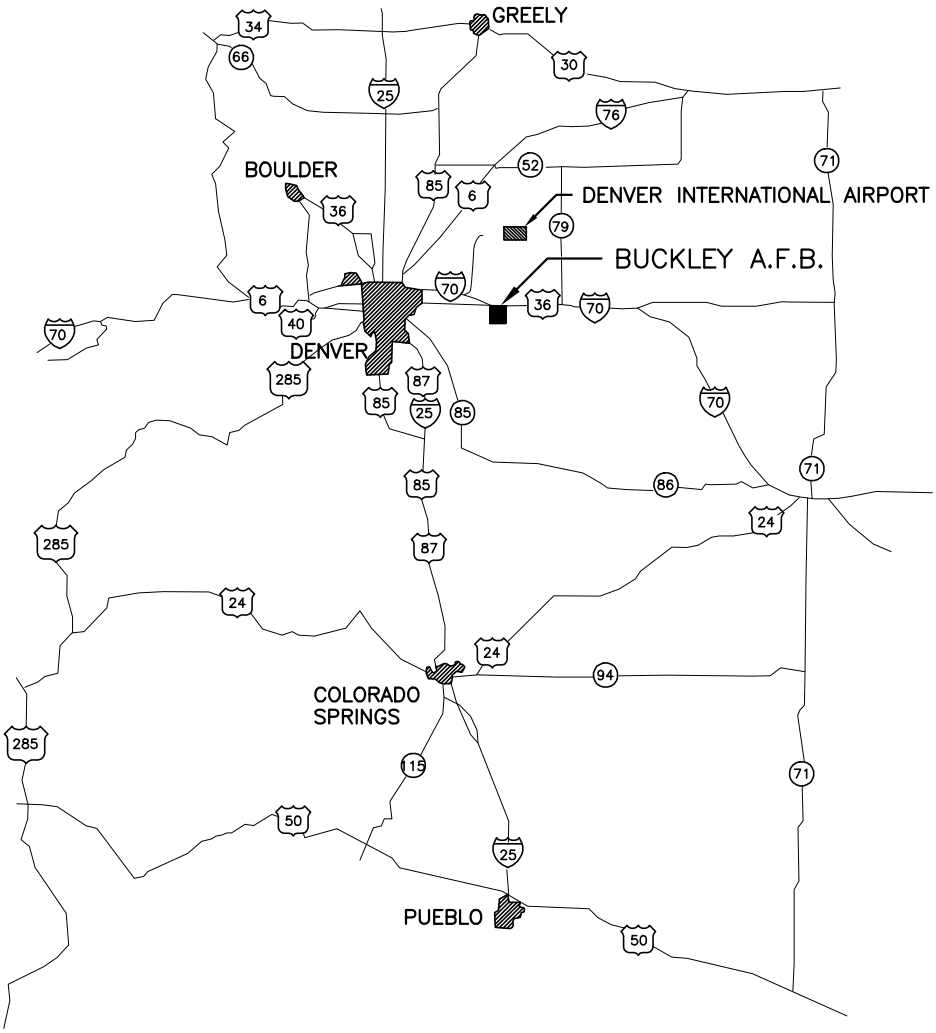

30 20 10 0 10 20 30 MILES

GRAPHIC SCALE

Figure 1-1

Location of
Buckley AFB

Buckley AFB, Colorado

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Land use surrounding Buckley AFB is changing from open, undeveloped prairie to residential and light industrial as the City of Aurora continues to grow. On the north side of the base is a golf course and environmental park. To the southwest, the land use is residential with some light industrial. There are three square miles of open space park known as "Former Plains Conservation Center" along the southernmost border of the base (Air National Guard (ANG), 1996).

1.5 SCOPE OF THE ENVIRONMENTAL REVIEW

Under the National Environmental Policy Act (NEPA) of 1969, Title 42, United States Code (USC), Section 4321, *et seq*. (42 USC 4321 *et seq*.), federal agencies are required to systematically assess the environmental consequences of Proposed Actions during the decision-making process. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process. The CEQ issued regulations implementing the process (40 Code of Federal Regulations [CFR] 1500-1508). The CEQ regulations require that an EA:

- Briefly provide evidence and analysis to determine whether the Proposed Action might have significant effects that would require preparation of an environmental impact statement (EIS). If the analysis determines that the environmental effects will not be significant, a Finding of No Significant Impact (FONSI) will be prepared.

- Facilitate preparation of an EIS, when required.

This supplemental EA provides the basis for determining the degree of environmental impacts of the Proposed and Alternative Actions. This supplemental EA is part of the EIAP for the Proposed project as set forth in Air Force Instruction 32-7061, *The Environmental Impact Analysis Process, January 24, 1995* as promulgated in 32 CFR 989, effective July 15, 1999, which implements NEPA, CEQ regulations, Department of Defense (DoD) Instruction 4715.9, *Environmental Planning and Analysis*, May 3, 1996, and Air Force Policy Directive 32-70, *Environmental Quality, July 20, 1994*.

This supplemental EA identifies, describes, and evaluates the potential environmental impacts that may result from the implementation of the Proposed Action or No Action Alternative, and includes possible cumulative impacts from all reasonably foreseeable activities at the base. It also identifies required environmental permits relevant to the Proposed Action. As appropriate, the affected environment and environmental consequences of the Proposed Action or No Action Alternative may be described in terms of site-specific descriptions or regional overview. Finally, this

supplemental EA identifies measures to prevent or minimize adverse environmental impacts.

The SBIRS MCS site was previously analyzed in an EA with a FONSI completed by the Environmental Protection Committee at Buckley ANGB on 12 April 1996 (USAF SMC, 1996). The SBIRS MCS EA assessed the environmental impacts associated with constructing and operating the new MCS facility to consolidate DSP operations. The SBIRS antennas in this supplemental EA were previously not analyzed in the SBIRS MCS EA. The MCS continues to use the existing DSP antennas at 2 SWS to carry out its mission, and now requires use of state-of-the-art, highly flexible, and enhanced equipment for communicating with existing and future early warning satellite systems. This supplemental EA will incorporate pertinent information from the previous SBIRS MCS EA, as appropriate, and supplement it with the analysis for construction and operation of the two SBIRS RF antennas.

1.5.1 Identification of Biophysical Resources Applicable to the Supplemental EA

All Proposed Action activities would occur within developed, secured areas with highly modified and disturbed landscape at Buckley AFB.

The biophysical resources which could be impacted and which are thereby analyzed in this supplemental EA include: air quality, biological resources, non-ionizing RF energy, and utilities (electric and natural gas). The following biophysical resources are not included for detailed analysis because they were either previously included in the SBIRS MCS EA, other relevant EAs, or were not applicable.

Cultural Resources

There are currently no structures at Buckley AFB listed in the National Register of Historic Places (NRHP). The historical building survey recorded 59 World War II-era structures on the base, and a review of the study documentation by the State Historic Preservation Officer (SHPO) determined that none of the buildings or sites were eligible for the NRHP. Cultural resources inventory for Buckley AFB lists 39 archaeological sites and 25 isolated finds. These include 32 sites with prehistoric components, three sites with prehistoric and historic components, and four historic properties. All archaeological sites, as well as isolated finds, were judged to be ineligible for nomination to the NRHP, and no further work was recommended at any of these locations. Additionally, a letter from the SHPO stated that results of their research indicated no known cultural resources within the SBIRS MCS site (USAF SMC, 1996). Therefore, no archaeological or historical resources are addressed further in this supplemental EA.

Geological Resources

Geological resources were previously analyzed in the SBIRS MCS EA. Impacts to geology and soils were found to be minimal. Construction activity would occur within an area in which the soils and topography have been previously disturbed and modified by building construction. The two SBIRS antennas would be located just west of the MCS facility in an area that has also been previously disturbed. Therefore, no adverse effects to geological resources are anticipated and are not addressed further in this supplemental EA.

Hazardous Waste and Hazardous Materials Management

Hazardous waste (HW) and hazardous materials (HM) management was previously analyzed in the SBIRS MCS EA. The Proposed Action would generate negligible amounts of HW and HM usage during construction of the antennas. These wastes would be handled according to the base Hazardous Waste Management Plan and Colorado Hazardous Waste Management Regulations. Therefore, no adverse effects from HW or HM management are anticipated and are not addressed further in this supplemental EA.

Installation Restoration Program (IRP)

The Proposed Action would not involve disturbances at any IRP sites. Therefore, no adverse effects to the IRP are anticipated and are not addressed further in this supplemental EA.

Lead-based Paint (LBP)

The Proposed Action would not include the use of LBP during construction or operation of the antennas or appurtenant structures, nor would it involve buildings used for lodging or housing. Therefore, no adverse effects from LBP are anticipated and are not addressed further in this supplemental EA.

Pesticides

The Proposed Action would not include the use of pesticides during construction or operation of the antennas or appurtenant structures. Therefore, no adverse effects from the storage, handling, or use of pesticides are anticipated and are not addressed further in this supplemental EA.

Polychlorinated Biphenyls (PCBs)

The Proposed Action would not include the use of equipment or transformers containing PCBs. Therefore, no adverse effects from PCBs are anticipated and are not addressed further in this supplemental EA.

Radon

The Proposed Action would not include the use of structures which would be occupied on a full-time basis. Therefore, screening of SBIRS personnel for radon exposure is not necessary and is not addressed further in this supplemental EA.

Noise

The Proposed Action would not alter current flying mission operations. The primary source of noise resulting from the Proposed Action would be generated by construction equipment and vehicles during site preparation and foundation construction. Construction noise would be intermittent, limited to normal daytime hours, and short-term in duration. Typical noise levels generated by these activities range from 75 to 89 decibels at 50 feet from the source. Additionally, noise resulting from construction activity was previously analyzed in the SBIRS MCS EA. Construction activity for the Proposed Action would be less than what occurred during the construction of the MCS facility. Therefore, no adverse effects from noise are anticipated and are not addressed further in this supplemental EA.

Socioeconomics

Military personnel authorizations would remain unchanged from that of the current mission requirements (i.e., baseline for this supplemental EA). For this reason, the community setting, which is influenced by personnel factors and considers items such as housing, population demographics, economy, and employment, would not be affected by the Proposed Action. Therefore, socioeconomics (community setting) are not assessed in this supplemental EA. The current overall level of Buckley AFB staffing was assessed in an EA entitled *Buckley Air National Guard Base Realignment, Buckley Air National Guard Base, Colorado, September 2000* (USAF, 2000). Therefore, no adverse effects to socioeconomics are anticipated and are not addressed further in this supplemental EA.

Transportation

The effects of vehicle transportation on base during peak travel times and during construction of the MCS facility were previously analyzed in the Buckley ANGB Realignment EA and the SBIRS MCS EA, respectively (USAF, 2000; USAF SMC, 1996). The base realignment EA assessed impacts of increasing base traffic by 90

government vehicles and 380 personal vehicles on the main base roads. The EA concluded there would not be a significant impact on average daily traffic on base. Additionally, during construction activities for the Proposed Action, heavy construction equipment such as bulldozers, dump trucks, and other earth-moving equipment will be parked in designated areas and should not present any interference to base operations. The proposed site is located in an area not heavily traversed by vehicles or pedestrians. Access to and from the area by construction equipment and vehicles will be from the west gate on Devil's Thumb Avenue, which traditionally has less traffic than the north and south gates. Therefore, no adverse effects from transportation are anticipated and are not addressed further in this supplemental EA.

Utilities

Utilities such as water supply and wastewater treatment were previously analyzed in the SBIRS MCS EA and Buckley ANGB Realignment EA. The base receives its water supply from the City of Aurora and has no water usage restrictions from the city. The base has a wastewater permit co-issued by the City of Aurora and the Metro Wastewater Regional District. The Metro Wastewater Regional treatment plant has enough capacity to meet the population estimates through 2010 (USAF, 2000). The Proposed Action would not include any new facilities requiring the use of water or generating wastewater. Electrical power and natural gas are the only utilities that will be used at the site. Therefore, no adverse effects to water and wastewater utilities are anticipated and are not addressed further in this supplemental EA.

Water Resources

All Proposed Action activities at Buckley AFB would occur in developed, maintained areas with highly modified and disturbed landscape. There would be no disturbance of vegetation outside developed areas of the base. The two SBIRS antennas would be located in the secure area of the base near the MCS building. The only portion of the 100-year floodplain that impinges on the base is along East Toll Gate Creek located along the southwestern, undeveloped portion of the base. According to the Buckley ANGB Realignment EA (USAF, 2000), the USFWS National Wetlands Inventory maps identified six potential wetland areas on base. These areas have not been inventoried or delineated to confirm the location and extent of jurisdictional wetlands on base. The site for the Proposed Action is predominantly bare earth, with less than 5 percent vegetative cover, and the surrounding area is either paved or has a gravel surface. The project site is not within any of the six potential wetland areas. Therefore, no adverse effects to water resources are anticipated and are not addressed further in this supplemental EA.

1.5.2 Statement of the Baseline Condition and Analysis Period

Calendar year (CY) 2000 activities will be used to establish baseline conditions. However, if CY00 data are not available, the most recent information available will be used.

As discussed in Paragraph 2.1 of Section 2 of this supplemental EA, the USAF's base facilities planning process is dynamic. When a development plan for implementation in a specific year is approved, the plan is subject to fluctuations and revisions in subsequent years. The plan is modified based on possible changes of mission requirements (e.g., new projects may be added, others may be deleted, and the sequence for other projects may be revised as needs change from year to year). Therefore, the plan analyzed in this supplemental EA is the current best estimate to meet projected requirements and is subject to change from year to year. It is a reasonable plan and serves as a reasonable basis to environmentally assess facilities requirements of the base.

1.5.3 Environmental Justice

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, encourages federal facilities to achieve "environmental justice" by identifying and addressing, as appropriate, any disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. Accompanying EO 12898 was a Presidential transmittal memorandum which referenced existing federal statutes and regulations to be used in conjunction with EO 12898. One of the items in this memorandum was the use of the policies and procedures of NEPA, specifically that, "Each federal agency shall analyze the environmental effects, including human health, economic, and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 United States Code (USC) Section 4321, *et. seq.*" Based on analysis conducted for this supplemental EA, it was determined that activities associated with the Proposed Action and No Action Alternative would not have adverse effects on populations for the following resources: air quality, non-ionizing energy, biological resources, and utilities. Additionally, it was determined in the Buckley ANGB Realignment EA that there would not be an overall disproportionately adverse environmental or human health effect on the minority population. Therefore, no disproportionately high or adverse impacts on minority and low-income populations are expected to occur.

1.5.4 Other Actions Considered for Cumulative Impact Purposes

A cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the "impact on the environment which results from the incremental impact of the action when added to other

past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time (United States Environmental Protection Agency [USEPA], 1999).

Buckley AFB proposes to construct other facilities on base over the next several years. These construction projects include a new Base Exchange (BX) and Commissary and a new Civil Engineering (CE) Complex facility. Construction of the BX and Commissary began in FY00; however, completion of the new facilities were delayed due to asbestos abatement and issues with burrowing owls at the site (Sherva, 2001b). The CE Complex facility is anticipated to be constructed in FY01. An EA was prepared in December 1998 for the new BX and Commissary (ANG, 1998). Potential impacts from construction activities (*e.g.*, noise and air emissions from construction equipment, solid waste, HW, HMs, and transportation) are temporary and would cease upon completion of the construction projects. Other biophysical resources assessed in the BX and Commissary EA were land use, biological resources, water resources, geological resources, cultural resources, utilities, and environmental justice. Potential adverse impacts from construction activities to these resources are site specific and would not combine with similar biophysical resources affected by the proposed SBIRS antenna project. These BX and Commissary and CE Complex Facility projects would result in no changes in land use designation and would be placed in previously disturbed areas.

1.6 INTRODUCTION TO THE ORGANIZATION OF THE DOCUMENT

This supplemental EA is organized into eight chapters. Chapter 1 includes a discussion on the background of the SBIRS High Program, a statement of the purpose of and need for the Proposed Action, a statement of the Proposed Action, location of the Proposed Action, a summary of the scope of the environmental review, and an overview of the organization of this supplemental EA. Chapter 2 provides a history of the formulation of alternatives, briefly describes the alternatives eliminated from further consideration, details the Proposed Action and the No Action Alternative, states other actions anticipated at Buckley AFB, summarizes the environmental impacts, states the preferred alternative, and lists the mitigation and best management practices (BMPs) which could further minimize the potential for impacts. Chapter 3 contains a general description of the biophysical resources and baseline conditions that potentially could be affected by the Proposed Action, the No Action Alternative, or cumulative actions. Chapter 4 is an analysis of the environmental consequences and discusses mitigation measures and cumulative impacts. Chapter 5 addresses regulatory review and permit

requirement. Chapter 6 lists the preparers of this document. Chapter 7 lists the persons and agencies consulted in the preparation of this supplemental EA. Chapter 8 lists source documents referenced in the preparation of this supplemental EA. Appendix A contains Air Force Form 813 for the project. Appendix B contains detailed information on the SBIRS, DSP, and LEO antennas prepared by the Aerospace Corporation. Appendix C contains a memorandum from the DoD Joint Spectrum Center (JSC) concerning its energy hazard assessment of the SBIRS antennas. Appendix D contains comment letters on the draft EA.

SECTION 2
DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter has eight sections: a history of the formulation of alternatives, identification of alternatives eliminated from further consideration, a detailed description of the Proposed Action, a description of the No Action Alternative, identification of other actions announced for the base, a comparison of the environmental impacts of all alternatives, identification of the preferred alternative, and a discussion of mitigation requirements and BMPs.

2.1 HISTORY OF THE FORMULATION OF ALTERNATIVES

2 SWS must ensure it has the facilities and infrastructure to support the assigned mission. To meet this need, the host base manages an ongoing planning process that evaluates how well existing facilities, infrastructure, and land use meet mission requirements. This evaluation process also considers long-term land use and assesses the capabilities of facilities and infrastructure to meet expected future requirements. When a facility no longer meets the mission, or it becomes apparent there will be a future insufficiency, multiple options are explored as to how best to resolve the deficiency.

SMC identified the need to replace the existing DSP antennas with SBIRS antennas to ensure the 2 SWS continues to support its assigned mission. Once a facility is identified as not satisfying the functional needs of its mission, the base planning process is used to determine how best to resolve the deficiency. This process includes development of a Proposed Action and at least one Alternative Action that consider issues such as the need for the facility, where the facility should be located to best accomplish the mission, what is the need date to ensure there is no degradation of the mission, and what is the most cost effective and efficient manner to complete and operate the facility.

2.2 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Buckley AFB and 2 SWS personnel considered an alternative location for the proposed site of the SBIRS antennas just south of the MCS building, but eliminated it from further consideration. It was decided not to have this area dedicated for the proposed antennas in the event future expansion of the SBIRS facility in Building 422 was needed. No other suitable locations in proximity to the existing SBIRS complex and

within the secured compound were available. Additionally, if the SBIRS GEO antennas were required to be relocated, stand-alone security and maintenance would be cost prohibitive to the SBIRS High Program budget. The request for EIAP (AF Form 813) for the Proposed Action is presented in Appendix A.

2.3 DETAILED DESCRIPTION OF THE PROPOSED ACTION

2.3.1 Proposed Action

The Proposed Action is the construction and operation of two 10-meter diameter SBIRS RF antennas to support the SMC mission at Buckley AFB, Colorado. These antennas would be part of the SBIRS MCS facility located on the western portion of Buckley AFB. The antennas would be operated by existing SBIRS personnel and no additional manpower would be required. Additionally, three smaller LEO antennas may be erected near the same location in the future. The three LEO antennas are addressed as a cumulative impact in Section 4.3.4.

2.3.2 Antenna Construction

Construction of the two SBIRS antennas and appurtenant structures is anticipated to occur over a nine month period beginning in mid-FY01. The SBIRS Antenna Subsystem installation consists of two antennas, SB1 and SB2. Figure 2-1 depicts the general location of the two SBIRS antennas at Buckley AFB. The location of SB1 would be constructed at coordinates 2202796.72 east and 686155.54 north. SB2 would be located at coordinates 2202796.72 east and 686055.54 north. Each 10-meter (33-foot) diameter antennas would be housed within a 15.8-meter (52-foot), air supported radome structure with related electronic equipment. A site layout of the SBIRS antennas, utilities, and foundation structures is shown in Figure 2-2. As shown in Figure 2-3, location of the antenna beam center is designed to be approximately 7.5 meters (25-feet) above the antenna base. The antennas and radomes would be installed on concrete foundations and located approximately 166 feet west of the center line of Eldora Drive.

The antenna facilities for SB1 and SB2 were designed by the Relay Ground Station contractor, Lockheed Martin Corporation. Lockheed Martin would also erect and perform operational performance checks on the SBIRS antennas once constructed.

The foundation centerlines would be located on a north–south line separated by approximately 100 feet. The reinforced concrete pad foundation for each antenna pedestal structure is 10-feet square by 36-inches thick. The concrete slab surrounding the antenna foundation is 6-inches thick from the edges of the pad out to the edges of the circular radome. The circular walls supporting the outer structure of the radome are 10-feet high and 12-inches thick. A lower equipment room would be constructed inside each radome, which is 20-feet long by 10-feet wide and 8.5 feet high.

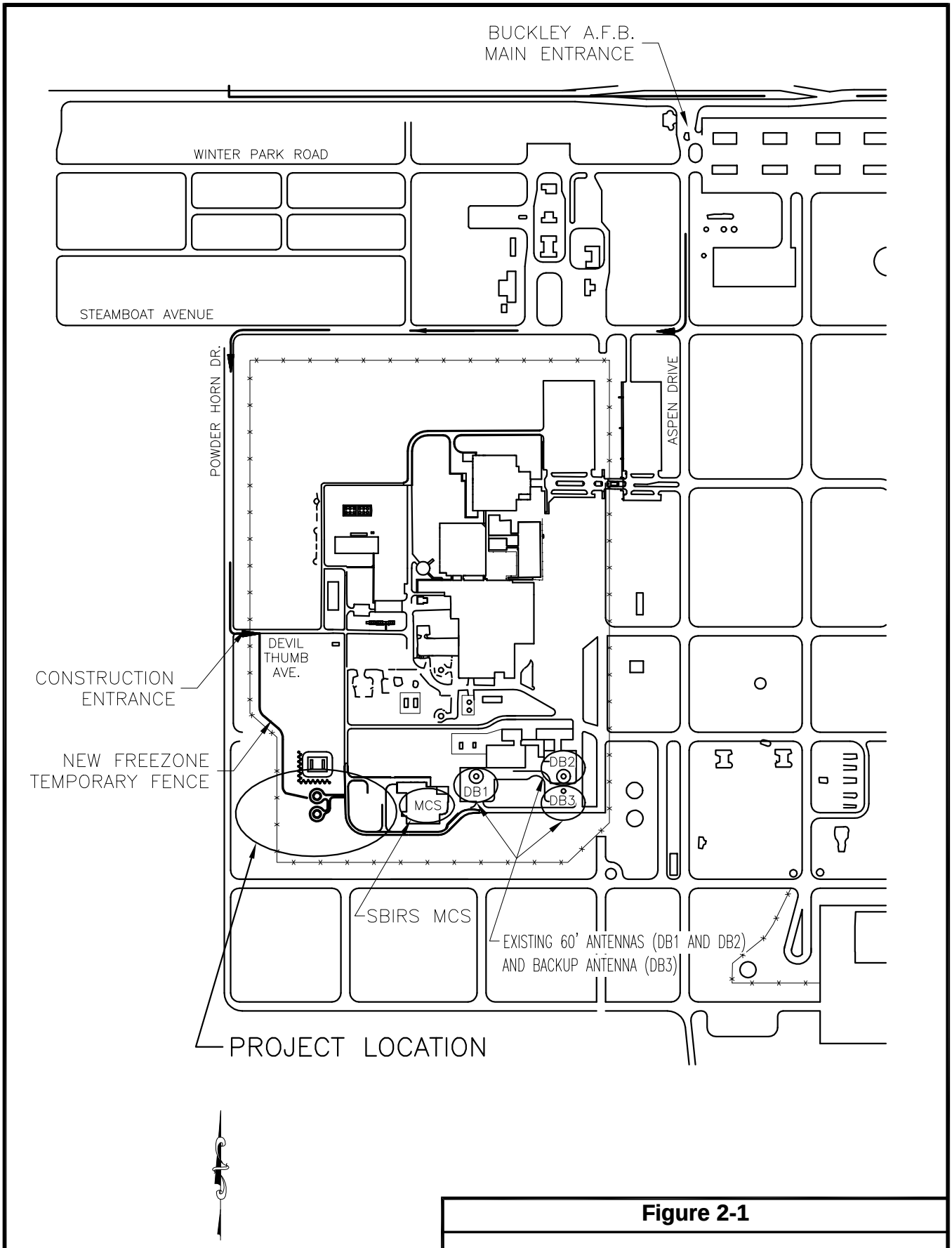

Figure 2-1

Site Location for
Antennas SB1 and SB2

Buckley AFB, Colorado

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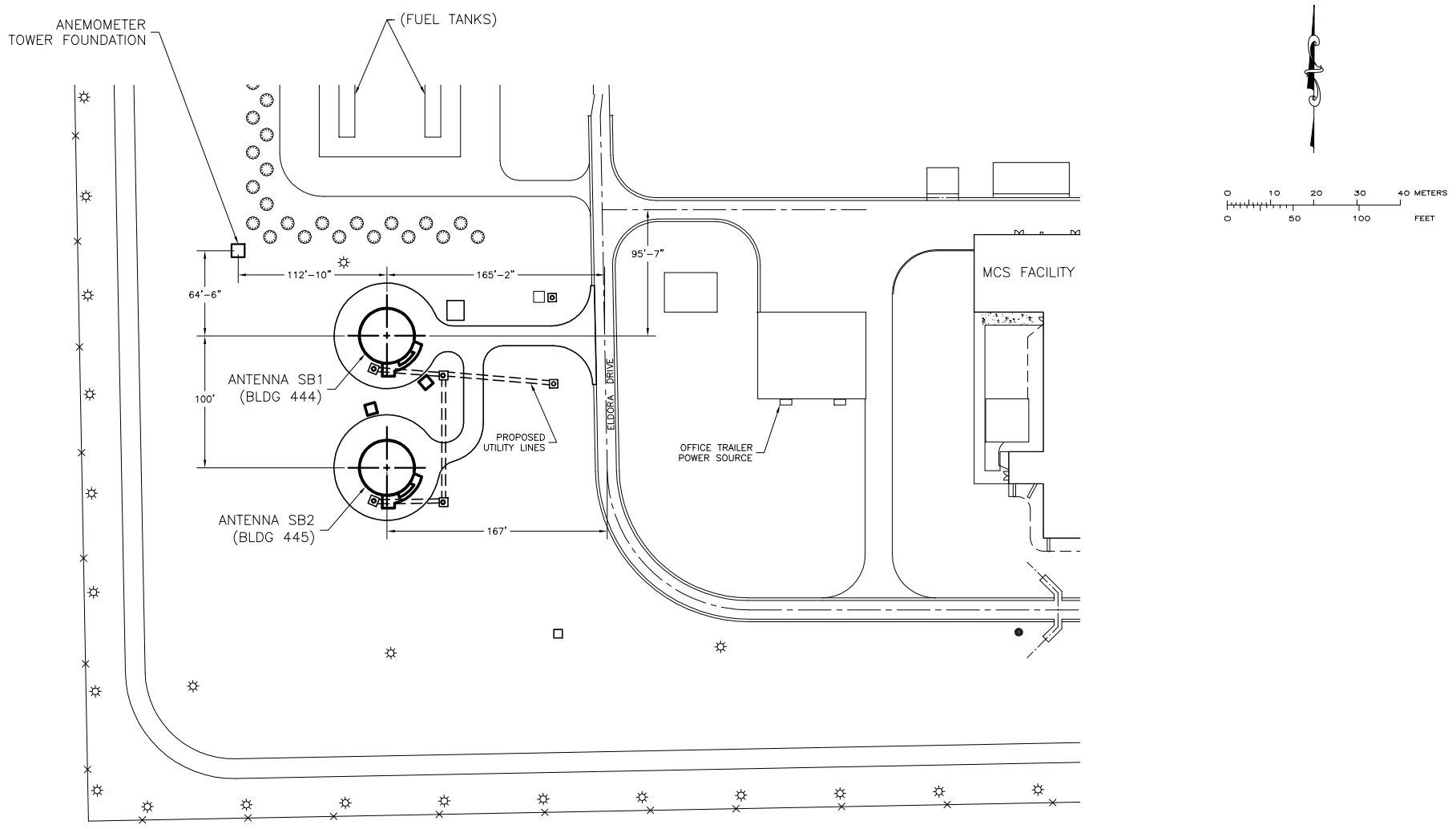

Figure 2-2

Site Layout for
Antennas SB1 and SB2

Buckley AFB, Colorado

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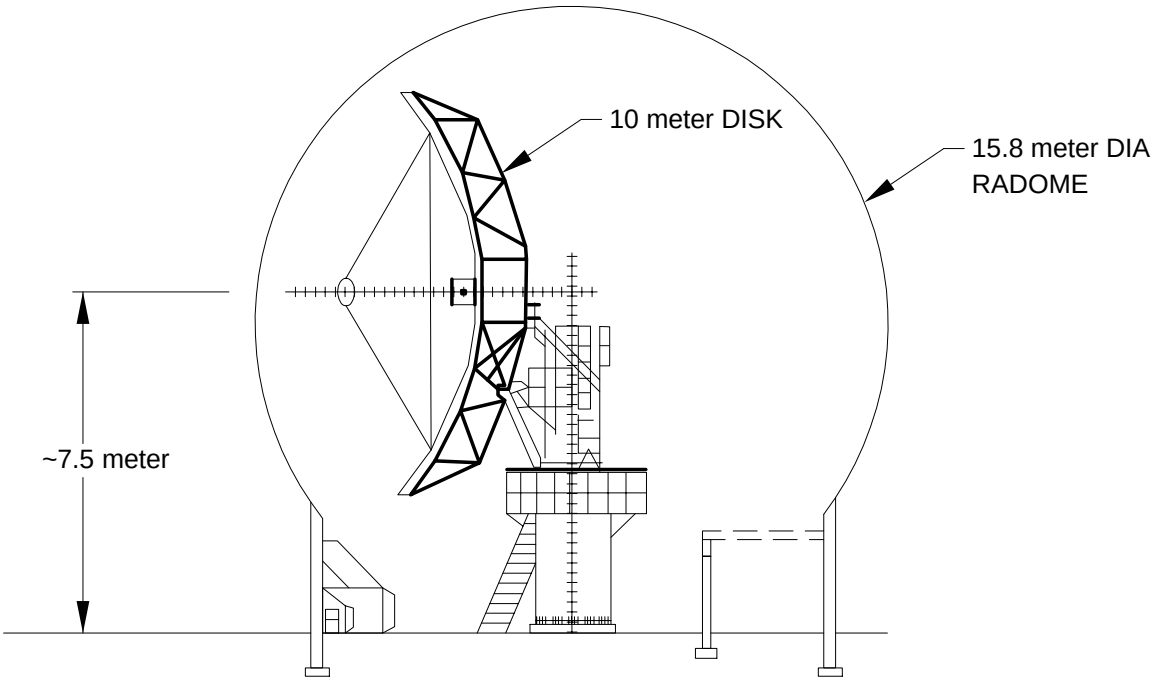

Figure 2-3

SBIRS SB1 and SB2
Antenna Disk and Radome

Buckley AFB, Colorado

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The area for the proposed antenna site is approximately 400 feet by 400 feet. Access roads would be constructed from Eldora Drive to SB1 and between SB1 and SB2. A 6-foot by 4-inch thick concrete walkway would be constructed around the outer edges of each of the circular foundations. The remaining area for the site would not be covered with impervious materials. Surface water drainage would be controlled by storm water outlets and diverted away from the foundations. A plan view of the SBIRS antenna disk and radome is shown in Figure 2-3.

Utilities for operating the antennas would include electrical power and natural gas. Maximum power requirements for the antennas would include providing 90 kilovolt amperes (kVA) for SB1 and 60 kVA for SB2. SB1 needs more power because it houses the equipment that provides positive pressure to keep both radomes inflated. Approximately 1.1 million British thermal units (MBtu) per hour of natural gas for each antenna would also be required. All external utility interface connections to the antennas would be constructed underground in concrete vaults. Landscaping to match the surrounding area would be performed by the base.

Radome auxiliary equipment includes a free standing anemometer set mounted atop a single 30-foot pole, and a single back–up diesel generator. The anemometer would be located approximately 130 feet northwest of the center of SB1. The anemometer set would be utilized to determine wind force and speed in order to adjust radome supporting air pressure. The diesel generator would provide emergency power to the radome inflation blowers in case of a primary power failure. The back-up generator would be placed on a concrete pad located on the east side of SB1. It is assumed that operational testing of the generators would occur for 1 hour per month.

It is anticipated that construction activity would be limited to weekdays only and would occur between 7:30 a.m. and 4:00 p.m. Occasionally, construction would occur on weekends as needed to meet project completion requirements. There would be no net change in the number of personnel authorizations at Buckley AFB as a result of the Proposed Action.

2.3.3 Antenna Operation

A high efficiency 10-meter diameter reflector would be mounted over the azimuth-axis pedestal. The pedestal provides +/- 160 degrees of azimuth travel from the south and 0 to 90 degrees of travel in elevation. The SBIRS antennas would receive data from satellite on a continuous basis. The satellites are in geosynchronous orbit; therefore, the antennas would typically point 5 to 10 degrees in elevation and southward between southeast to southwest. The antenna beam centers would be located 25 feet above the antenna base.

The antenna subsystem includes both an S-band transmitter and Q-band transmitter. The S-band transmitter provides a maximum RF power output capability of 2000 watts (1400 watts at the antenna feed interface) at a nominal frequency of 1.8GHz. The Q-band transmitter provides a maximum power output capability of 20 watts at the feed interface at a nominal frequency of 44.5 gigaHertz (GHz) (Lockheed, 2001).

The only time the antennas would transmit to a satellite is during operational changes (*e.g.*, instructing the satellite to put batteries in a reconditioning mode). The time sequence of transmission to the satellite per day would change throughout the year (*e.g.*, if the satellite goes into a solar eclipse). As an example, transmissions by the existing DSP antennas are less than 1 hour per day at the busiest time of the year.

The inputs used for the SBIRS S-Band and Q-Band transmission power density are:

	S-Band	Q-Band
Frequency	1.8 GHz	44.5 GHz
Diameter (feet)	32.8 ft.	32.8 feet
Power (kW)	1.4 kW (at the feed horn)	0.02 kW
Gain (dB)	42 dB	66.6 dB
RF Illumination	Uniform	Uniform

Source: Lockheed Martin Mission & Data Systems-Western Region

In operational mode, the antennas elevation angles would not drop below 0 degrees. The specified elevation tracking requirement in the ground terminal element specifications are from 5º to 75º (Lockheed, 2001).

2.4 DESCRIPTION OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the SBIRS mission would be seriously degraded. The SBIRS antennas would not be installed and the 2 SWS would continue to rely on the DSP antenna system. The DSP antennas are over 25-years old, beyond their life expectancy, and will not work with the new SBIRS GEO satellites. The SBIRS GEO satellites use state-of-the-art, highly flexible, tasking infrared sensor technology to detect and track shorter-range missiles with greater accuracy, and are partially incompatible with the DSP antennas.

2.5 OTHER ACTIONS ANNOUNCED FOR BUCKLEY AFB

As described in Paragraph 1.5.4 under other actions considered for cumulative impact purposes, there are two major construction projects being considered at Buckley AFB during the same period as the proposed projects. One includes constructing a new CE Complex consisting of two 3,500 square foot additions to the existing buildings (Building 1006 and 1007) and a 5,000 square foot pre-fabricated warehouse (Building 1009). The other project includes constructing a 115,000 square foot BX and shopping

mall and a new 70,000 square foot Commissary. These cumulative impacts are further described in Section 4, Environmental Consequences, under each resource area.

2.6 COMPARISON OF ENVIRONMENTAL EFFECTS OF ALL ALTERNATIVES

Table 2.1 summarizes impacts of the Proposed Action and the No Action Alternative.

2.7 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The preferred alternative is to implement the Proposed Action as described in Paragraph 2.3 above.

2.8 MITIGATION MEASURES

Mitigation measures would not be necessary for any of the resources analyzed in this EA. BMPs are routinely implemented to further minimize the potential for environmental impacts. These management practices are detailed in Section 4, Environmental Consequences, and summarized in Table 2.2.

Table 2.1
Summary of Environmental Impacts

Resource (Applicable Section)	Proposed Action	No Action Alternative
Air Quality (Paragraph 4.1 of Section 4)	The overall ambient air quality within AQCR 36 would be slightly affected by the construction of the Proposed Action. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.13 percent increase for any criteria pollutant) when compared to baseline AQCR 36 emissions. The effects would be temporary, fall off rapidly with distance from the proposed construction site, and would not result in any long-term impacts. Since the estimated emissions for criteria pollutants do not exceed 10 percent of the air emission baseline and do not exceed *de minimis* levels, the Proposed Action is not considered regionally significant and does not violate the Colorado SIP. Due to the small percentage increase of operational emissions associated with the backup power generator compared to baseline conditions, the operational phase of the Proposed Action is not anticipated to significantly impact air quality at Buckley AFB.	No change from the baseline condition as described in Paragraph 3.1.

Resource (Applicable Section)	Proposed Action	No Action Alternative
Biological Resources (Paragraph 4.2 of Section 4)	The Proposed Action would not likely have any adverse effects on biological resources, with the exception of the black-tailed prairie dogs present at the SBIRS site. Biological resources at the site are markedly absent, with no native vegetation and only sparse noxious weed cover (field bindweed) on the predominantly barren site. The Proposed Action would not have an effect on federally-listed or state species. Prior to commencing construction activities on the SBIRS site, the black-tailed prairie dogs would be live-captured by vacuuming their burrows and transferred to a U.S. Fish and Wildlife Service facility for use in the black-footed ferret endangered species recovery program. This would be a minor adverse effect because the number of prairie dogs present is low (likely less than 10 individuals), the probability for persistence of this ward (a subgroup of the larger colony) is low, and resources are very limited. The likelihood of predation in the open space is high, and because of the low number of individuals, it is probable that the ward will not persist. When considered in the context of the black-tailed prairie dog population and the very low habitat quality on the site, loss of these individual prairie dogs would be minor.	No change from the baseline condition as described in Paragraph 3.2.
Non-ionizing Energy Paragraph 4.3 of Section 4)	According to results of the SBIRS System Safety Hazard Analysis Report prepared by Lockheed Martin, the radiation hazard assessment preformed by the JSC, and the study conducted by the Aerospace Corporation, the RF energy emitted from the SBIRS antennas is not expected to have an effect on human health. Since the power density levels emitted from the SBIRS antennas are much less than the level established for the safe operating distance for fuels, no potential fuel ignition hazard exists.	The RF energy emitted as a result of the No Action Alternative (continued use of the existing DSP antennas) is expected to be similar to the Proposed Action.
Utilities (Paragraph 4.4 of Section 4)	The energy consumption rate for the Proposed Action is equivalent to 15 percent of the current electricity demand of SBIRS and less than 1 percent of the current base usage rates. Therefore, the Proposed Action is not anticipated to negatively impact the base electrical distribution system. The energy consumption rate for natural gas would represent approximately 2 percent of the current SBIRS natural gas usage rate, and less than 1 percent of the average annual base usage rate. Therefore, the Proposed Action is not anticipated to negatively impact the base natural gas distribution system.	No change from the baseline condition as described in Paragraph 3.4.

Table 2.2
Summary of Best Management Practices

Resource (Applicable Section)	Proposed Action
Air Quality (Paragraph 4.1 of Section 4)	Potential criteria pollutant emissions associated with the Proposed Action do not exceed significance criteria requirements. Therefore, no mitigative measures for improving the ambient air quality would be required. Although mitigation is not required, possible BMPs include watering for dust suppression to control PM_{10} emissions.
Biological Resources (Paragraph 4.2 of Section 4)	Prior to commencing construction activities on the SBIRS site, the black-tailed prairie dogs would be live-captured by vacuuming their burrows and transferred to a U.S. Fish and Wildlife Service facility for use in the black-footed ferret endangered species recovery program. The USFWS has indicated that this would be an acceptable and preferred method to deal with the prairie dogs. This action would be accomplished by using a vacuum system to remove the animals from their burrows. . The SBIRS site would be monitored following the prairie dog collection effort to determine that all the prairie dogs were removed. The prairie dog burrows will be destroyed to prevent recolonization by prairie dogs or other species.
Non-ionizing Energy (Paragraph 4.3 of Section 4)	No mitigative measures would be required. However, the following safety precautions should be followed: locate RF energy warning signs on the rear of each reflector petal; establish and mark restrictive areas to prevent personnel from entering any RF energy hazard area; ensure authorized personnel disable antenna transmissions prior to performing maintenance; and ensure that antenna lockout and stop procedures are in place and included in maintenance technical orders.

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SECTION 3
AFFECTED ENVIRONMENT

This section describes the existing environmental media that could be affected by, or could affect the Proposed Action and No Action Alternative. Within this context, only those base-specific components relevant to the potential impacts are described in detail. Anticipated effects of the Proposed Action and No Action Alternative are discussed in Section 4, Environmental Consequences.

3.1 AIR QUALITY

Buckley AFB is located in Arapahoe County within the Metropolitan Denver Intrastate Air Quality Control Region (AQCR) 36. This AQCR includes the counties of Adams, Arapahoe, Boulder, Clear Creek, Denver, Douglas, Gilpin, and Jefferson.

For purposes of this air quality analysis, the region of influence (ROI) for criteria pollutant emissions and ozone precursors from the proposed activities would be the existing air column surrounding Arapahoe County, Colorado. Project emissions of criteria pollutants, which are discussed below, are compared to regional emissions to determine if they are regionally significant. Mobile source emissions from construction activities are included as part of the analysis to determine if they contribute to a cumulative effect with respect to other construction projects occurring at Buckley AFB during the same time period.

3.1.1 Air Pollutants and Regulations

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is not only determined by types and quantities of atmospheric pollutants, but also by surface topography, size of the air basin, and by prevailing meteorological conditions.

The Clean Air Act (CAA) of 1970 directed the USEPA to develop, implement, and enforce strong environmental regulations to ensure cleaner air for all Americans. In order to protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). Promulgation of the CAA was driven by the failure of nearly 100 cities to meet the NAAQS for ozone and carbon monoxide and by the inherent limitations in previous regulations to effectively deal with these and other air quality problems. The USEPA established both primary and secondary NAAQS under provisions of the CAA. Primary standards define levels of air

quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect public welfare (*e.g.*, soils, vegetation, property, and wildlife) from any known or anticipated adverse effects.

NAAQS are currently established for six air pollutants (known as "criteria air pollutants") including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur oxides (SO_x, measured as sulfur dioxide, SO_2), lead (Pb), and particulate matter. Particulate matter standards incorporate two particulate classes: 1) particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}); and 2) particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$). Only PM_{10} is regulated by the rule.

SO_2 in the atmosphere is converted to various conjugated sulfur compounds which form physically harmful vapors or micro droplets (*e.g.*, sulfuric acid) when combined with particulate matter and water. Most SO_x compounds are irritants to the upper respiratory tract, and prolonged exposure can cause permanent lung damage. In addition, suspended SO_x compounds in the atmosphere scatter visible light resulting in a brownish haze and reduced visibility.

Although O_3 is considered one of the criteria air pollutants and is measurable in the atmosphere, it is considered a secondary pollutant since O_3 is typically not emitted directly from most emissions sources. O_3 is formed in the atmosphere by photochemical reactions involving previously emitted pollutants or ozone precursors; therefore, O_3 is not considered when calculating emissions. Ozone precursors consist primarily of nitrogen oxides (NO_X) and volatile organic compounds (VOCs) which are directly emitted from various emission sources. For this reason, an attempt is made to control O_3 through the control of NO_X and VOCs. On June 5, 1998 the USEPA issued the final rule identifying areas, which included Buckley AFB, where the 1-hour NAAQS for O_3 is no longer applicable. Under this rule, the 1-hour standard will not apply to areas in which no violation of the previous 1-hour ozone standards occurred. However, in areas in which past violations occurred, the 1-hour ozone standard will continue to apply.

The CAA does not make the NAAQS directly enforceable. However, the CAA does require each state to promulgate a state implementation plan (SIP) to provide for "implementation, maintenance, and enforcement" of the NAAQS in each air quality control region (AQCR) in the state. The CAA also allows states to adopt air quality standards that are more stringent than federal standards. As promulgated in the Colorado Air Quality Control Commission (AQCC) Regulation 11, as amended, the State of Colorado has adopted the NAAQS as the Colorado standard. (see Table 3.1-1).

Concerns of this AQCC with regard to the low odor threshold and conflicting information regarding possible effects of long-term exposure on human health and agriculture led to the adoption of ambient air standards of SO_2 more restrictive than the USEPA primary and secondary standards. Table 3.1-2 presents the State of Colorado standards. The following ambient standards for SO_2 are expressed as allowable amounts of increase in ambient concentration (increments) over an established baseline. All concentrations are expressed in micrograms per actual cubic meter under local conditions of temperature and pressure.

Table 3.1-1 National and State Ambient Air Quality Standards*

Criteria Pollutant	Averaging Time	Primary NAAQS[a,b,c]	Secondary NAAQS[a,b,d]	Colorado Standards[a,b]
Carbon Monoxide	8-hour 1-hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	No standard No standard	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)
Lead	Quarterly	1.5 μg/m^3	1.5 μg/m^3	NA
Nitrogen Dioxide	Annual	0.0543 ppm (100 μg/m^3)	0.0543 ppm (100 μg/m^3)	0.0543 ppm (100 μg/m^3)
Ozone	1 hour	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)
PM_{10}	Annual 24-hour	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3
Sulfur Oxides (measured as SO_2)	Annual 24-hour 3-hour	0.03 ppm (80 μg/m^3) 0.14 ppm (365 μg/m^3) No standard	No standard No standard 0.50 ppm (1,300 μg/m^3)	See Table 3.1-2

* Revised on March 16, 2000, effective as of May 30, 2000.

PM_{10} Particles with aerodynamic diameters less than or equal to a nominal 10 micrometers

a The 8-hour primary and secondary ambient air quality standards are met at a monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08ppm.

b The NAAQS and Colorado standards are based on standard temperature and pressure of 25 degrees Celsius and 760 millimeters of mercury.

c National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than three years after the state implementation plan is approved by the USEPA.

d National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the state implementation plan is approved by the USEPA.

Table 3.1-2 State of Colorado Ambient Air Quality Standards for Sulfur Dioxide (SO_2)

	Category I (Incremental)	Category II (Incremental)	Category III (Incremental)
Annual Arithmetic Mean	2 $\mu g/m^3$	10 $\mu g/m^3$	15 $\mu g/m^3$
24-Hour maximum	5 $\mu g/m^3$	50 $\mu g/m^3$	100 $\mu g/m^3$
3-Hour Maximum	25 $\mu g/m^3$	300 $\mu g/m^3$	700 $\mu g/m^3$

The above 24-hour and 3-hour standards are not to be exceeded at any given receptor site more than once in the twelve-month period.
The "baseline" for these incremental standards is defined as that concentration of sulfur dioxide either measured or estimated by the Division to exist on the effective date of this amended regulation.

3.1.2 Meteorology

Climate in the area of Buckley AFB is characteristic of the high plains and is classified as dry continental. The area experiences relatively low humidity, light precipitation, and abundant sunshine because it is situated a great distance from any moisture source and separated from the Pacific Ocean by several mountain barriers. The weather at Buckley AFB is influenced by four major air masses: arctic air from Canada and Alaska; warm, dry air from Mexico and the southwestern deserts; warm, moist air from the Gulf of Mexico; and moist, Pacific air modified by its passage over the mountains as it moves from west to east (USAF SMC, 1996).

Temperatures in the area are relatively mild considering its latitude and high elevation. Extremely warm or cold weather is usually of short duration. The average annual temperature is approximately 51 degrees Fahrenheit (ºF) with the average monthly temperature ranging from 25 ºF during December to 71 ºF during July. Precipitation in the area is relatively sparse with the average annual rainfall equal to 15.3 inches. Over 75 percent of the precipitation falls between March and September, and monthly average precipitation ranges from 0.51 inches in January to 2.47 inches in May. The average annual snowfall in the area is approximately 60 inches. Prevailing winds are from the south at an average annual speed of 9 miles per hour (USAF SMC, 1996).

3.1.3 Regional Air Quality

The USEPA classifies air quality within an AQCR according to whether or not criteria for concentrations of air pollutants in the atmosphere exceed primary or secondary NAAQS. All areas within each AQCR are assigned a designation of attainment, nonattainment, unclassifiable attainment, or not designated attainment for each criteria air pollutant. An attainment designation indicates that air quality within an area is as good as or better than the NAAQS. Nonattainment indicates that air quality within a specific geographical area exceeds applicable NAAQS. Unclassifiable and not designated indicates that air quality cannot be or has not been classified on the basis of available information as meeting or not meeting the NAAQS and is, therefore, treated as

attainment. Before a nonattainment area is eligible for reclassification to attainment status, the state must demonstrate compliance with NAAQS in the nonattainment area for three consecutive years and demonstrate, through extensive dispersion modeling, that attainment status can be maintained in the future even with community growth.

States with nonattainment areas submit a SIP for USEPA approval. The SIP describes how the state will bring all nonattainment areas into attainment with the NAAQS by imposing controls on sources of air pollution. For example, areas that are in nonattainment for carbon dioxide have control requirements that vary in stringency according to classification: moderate or serious.

The Colorado Air Pollution Control Division has authority to implement regulations contained in the Colorado Air Pollution Prevention and Control Act, Section 25-7-105(1)(a), requiring AQCR 36 to assure attainment and maintenance of NAAQS by promulgating applicable sections of a SIP. As part of the SIP, Colorado has incorporated the General Conformity Rule. The USEPA Conformity Rule, 40 CFR 93, subpart B, and 40 CFR 51, subpart W, implements Section 176(c) of the CAA, as amended in 42 United States Code [USC] 7506(c). Conformity to the SIP is defined in the CAA as requiring all federal agencies to ensure that any agency activity conforms to an approved SIP in nonattainment or maintenance areas. Compliance with the SIP assists with eliminating or reducing the number of violations or severity with the NAAQS, which expedites attainment of the standards. The USAF is responsible for determining if the proposed activities at Buckley AFB conform to the SIP.

The USEPA Conformity Rule requires that the total direct and indirect emissions of nonattainment criteria pollutants, including O_3 precursors (VOC and NO_x) be considered in determining conformity. The rule does not apply to actions where the total direct and indirect emissions do not exceed *de minimis* threshold levels for criteria pollutants established in 40 CFR 93.135(b). In addition to meeting *de minimis* requirements, a federal action may be considered regionally significant. Regional significance is defined by a total of direct and indirect emissions resulting from a federal agency action that equals or exceeds 10 percent of the nonattainment area's emissions inventory for any criteria pollutant.

The Denver metropolitan area where Buckley AFB is located is part of an area that is in nonattainment for CO. Carbon monoxide is a colorless, odorless, poisonous gas that can threaten those who suffer from cardiovascular disease. Carbon monoxide emissions in the Denver area are produced mostly by automotive sources resulting from the incomplete combustion of fuel.

The Denver metropolitan area has also been designated as a PM_{10} nonattainment area since 1987, but has not violated this 24-hour PM_{10} standard since 1993. Therefore, the area is now eligible for redesignation. The State of Colorado, in coordination with the Regional Air Quality Council (RAQC), is requesting that the USEPA redesignate the Denver metropolitan nonattainment area to attainment status for the 24-hour PM_{10} National Ambient Air Quality Standard. The *PM-10 Redesignation Request and Maintenance Plan For the Denver Metropolitan Area* was approved by the RAQC and the Colorado Air Quality Control Commission (AQCC) on December 13, 2000, and is now pending federal review (RAQC, 2000). Particulate matter of small size, less than 10 microns, can be inhaled into the respiratory system and cause aggravation of existing respiratory disease and a decline in lung function. Particulate matter is emitted into the air by industrial sources, construction activities, diesel fuels, and natural sources (*e.g.*, wind-blown dust).

The Colorado Department of Public Health and the Environment (CDPHE), 1995 Air Quality Data Report, indicated that CO levels have dropped at every monitoring station during the last 10 years. In 1985, there were 31 days with one or more monitors reading an exceedance of the 8-hour standard. Most of the exceedance day readings were from the Denver Metropolitan area. In Denver, it is estimated that 86 percent of CO emissions are from automotive sources. The relationship between motor vehicle emissions and CO levels has been identified as daily concentration peaks that coincide with morning and evening rush hours. The worse CO problems occur where numerous slow-moving cars congregate, such as in large parking lots and traffic jams. CO is more severe in winter due to naturally occurring inversion layers (USAF, 2000).

Major sources of pollution in AQCR 36 include power plants, oil refineries, gasoline storage terminals and transfer stations, mining activities, chemical plants, cement plants, and various agricultural operations (USAF, 2000).

De minimis thresholds are dependent upon the regional air quality classification. Due to its classification as moderately nonattainment for PM_{10} and severely nonattainment for carbon monoxide, the Denver metropolitan area *de minimis* thresholds are 100 tons per year for both pollutants. Ongoing activities currently being conducted are exempt from the Conformity Rule as long as there is no increase in emissions above the specified *de minimis* threshold levels.

3.1.4 Baseline Air Emissions

Baseline conditions for air quality associated with stationary emissions sources are FY99 emissions inventory data. An air emissions inventory is an estimate of total mass emission of pollutants generated from a source or sources over a period of time, typically a year. All emission sources may be categorized as either mobile or stationary emission

sources. Mobile sources typically include aircraft, surface vehicles, aerospace ground equipment, and weapons testing, whereas stationary sources may include boilers, generators, fueling operations, industrial processes, and burning activities, among others. Accurate air emissions inventories are needed for estimating the relationship between emissions sources and air quality. The FY99 air emissions inventory summary for Buckley AFB and AQCR 36 as well as the *de minimis* levels are presented in Table 3.1-3. The emissions inventory represents air emissions from combustion sources and fuel storage/transfer operations.

Table 3.1-3 Emissions Inventory for the Buckley AFB

Emission Source Totals (tons/yr)	CO	VOC	NO_X	SO_X	PM_{10}
FY 99 Buckley AFB Stationary Emission[a]	19.4	10.3	81.2	11.8	2.15
FY 99 Buckley AFB Mobile Emissions[b]	375	247	119	7.68	3.30
Conformity Rule De Minimis Threshold[b]	100	NA	NA	NA	100
1998 AQCR 36 Emission Inventory[b]	4,761	13,727	37,079	34,732	3,211

a Source: Sherva, 2001a
b Source: ANG, 1999
NA Not Applicable

Buckley AFB has a current Title V operating permit that includes all existing sources. New sources would be included, as applicable, as a Title V permit modification. Construction of new or modified stationary sources that are not exempt sources at Buckley AFB are subject to current permitting requirements and control technology standards until the reclassifications are effective**.** These requirements review air emissions to ensure that sources are constructed and operated without contributing significant adverse deterioration of nonattainment air quality standards (USAF, 2000).

3.2 BIOLOGICAL RESOURCES

Biological resources include native and introduced plants and animals in the project area. For discussion purposes, these are divided into vegetation, wildlife, sensitive species, and sensitive habitats. The ROI for discussion of biological resources and potential impacts on these resources is Buckley AFB.

Numerous studies have been conducted for biological resources on and around Buckley AFB. These studies include the EA of Proposed Prairie Dog Management Practices at Buckley AFB (ANG, 2000), biological resource descriptions found in the Base Master Plan, the environmental considerations report for the bombing and gunnery ranges, and the archives search report findings conducted for the base. The USFWS National Wetlands Inventory (NWI) was used to provide information about wetland

locations. The Colorado Division of Wildlife (CDOW) has species distribution results (including state listed and sensitive species) available for reptiles, amphibians, mammals, and birds, along with a data system containing element occurrence records (CDOW, 2001). The USFWS publishes a current list of threatened and endangered species on the UFSWS web site (FWS, 2001a and b). All these data sources were used in the development of the biological section of this supplemental EA.

Buckley AFB lies within the dry domain, central high plains ecological sub-region. The base is within the lowlands of the South Platte River. Areas to the north, south, and east are largely undeveloped and support grazing and farming activities. Areas to the west are mostly urbanized. Historically, the native climax vegetation for the region was primarily mixed bunchgrass prairie (ANG, 1998).

3.2.1 Vegetation and Wildlife

Buckley AFB lies in the plains grassland ecosystem that is composed of a patchwork of grass communities. The dominant habitat type on base is the crested wheatgrass *(Agropyron cristatum)* community. Midgrass prairie is dominant in the southern portion of the base, and contains species such as western wheatgrass *(Agropyron smithii)* (ANG, 1998).

Biological resources at the proposed SBIRS site are extremely limited. The ground is predominantly bare earth, with less than 5 percent vegetative cover. The limited vegetative cover that does exist is dominated by field bindweed (*Convolvulus arvensis*), an exotic noxious weed. Adjacent lands to the east and south are landscaped with 2 to 4 inches of rock, with no vegetation present. A row of landscaped evergreen trees, surrounded by rock landscaping, is north of the site. The western side of the site is bounded by a paved road with an open field further to the west.

Wildlife habitats on the base include urban landscape, grassland, midgrass prairie, riparian (including open meadows and trees along the streams), ornamental tree stands, weedy forbs, and yucca stands. A total of seven amphibian and 19 reptile species occur in Arapahoe County and may occur on Buckley AFB (ANG, 1998). Twelve of the reptile species are snakes, including the bull snake *(Pituophis melanoleucus)*, plains hognose snake *(Heterodon nasicus nasicus),* and the prairie rattlesnake *(Crotalus viridis viridis).* Other common reptiles include the western painted turtle (*Chrysemys picta belli*) and the northern prairie lizard (*Sceloporus undulatus garmani*). The great plains toad (*Bufo cognatus*) and plains spadefoot toad (*Scaphiopus bombifrons*) are among the amphibians that may be found at the base. Refer to the Buckley ANGB EA for the Construction of a BX and Commissary (ANG, 1998) for a list of wildlife and plants with the potential to occur on Buckley AFB. All migratory native North American birds, their eggs, and nests are protected by the Migratory Bird Treaty Act (MBTA) of 1912, as amended. Resident

bird species that occur near Buckley AFB include the western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), and lark bunting (*Calamospiza melanocorys*). Raptors found in the area include the burrowing owl (*Athene cunicularia*), American kestrel (*Falco sparverius*), Swainson's hawk (*Buteo swainsoni*), and prairie falcon (*Falco mexicanus*). The wetland and riparian areas on base support ducks and geese, including northern shoveler (*Anas clypeata*), blue-winged teal (*Anas discors*), and Canada goose (*Branta canadensis*).

A number of small mammals exist on Buckley AFB. Common rodents include fox squirrel (*Sciurus niger*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), prairie vole (*Microtus ochrogaster*), black-tailed prairie dog (*Cynomys ludovicianus*), and several species of mice (*Peromyscus* spp.).

Mammalian predators on base include the red fox (*Vulpes vulpes*), badger (*Taxidea taxus*), and coyote (*Canis latrans*). White-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), and pronghorn (*Antilocapra americana*) are among the larger herbivores on base. Pronghorn occurring on the base have been excluded from selected areas by an exterior fence to prevent collision hazards with aircraft (ANG, 1998).

3.2.2 Threatened, Endangered and Special Concern Species

A number of sensitive species have potential to occur on base. These species, with their respective federal and state status, are listed in Table 3.2.1.

Table 3.2.1 Sensitive Species Occurring or Potentially Occurring on Buckley AFB

Common Name	Scientific Name	Status
Plants		
Colorado butterfly plant	*Gaura neomexicana* ssp. *coloradensis*	FT, S1
Ute ladies'-tresses	*Spiranthes diluvialis*	FT, S2
Amphibians		
Northern leopard frog	*Rana pipiens*	SSC
Birds		
Bald eagle	*Haliaeetus leucocephalus*	FT, ST
Mountain plover	*Charadrius montanus*	FPT, SSC
Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	SE
Western burrowing owl	*Athene cunicularia*	ST
Ferruginous hawk	*Buteo regalis*	SSC
Mammals		
Black-footed ferret	*Mustela nigripes*	FE, SE
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	FT, ST

Common Name	Scientific Name	Status
Swift fox	*Vulpes velox*	SSC
Black-tailed prairie dog	*Cynomys ludovicianus*	FC, SSC
Kit fox	*Vulpes macrotis*	SE

Status codes: FE = federally endangered, FT = federally threatened, FC = federal candidate, FPT = federally proposed threatened, SE= state endangered, ST = state threatened, SSC = state species of special concern, S1 = critically endangered in state, S2 = endangered or threatened in state
Sources: FWS, 2001a; FWS 2001b; CDOW, 2001; CNHP, 2001

Black-tailed prairie dogs, federally listed as a candidate species and as a species of special concern by the state, are abundant at Buckley AFB. They pose a problem because of their potential to damage area utilities and because they attract raptors to the runway, increasing potential for aircraft strike hazards (ANG, 1998). In an EA prepared for proposed management practices of prairie dogs at Buckley AFB, the base proposes non-lethal relocation methods to the extent possible and lethal control measures as a "last resort" (ANG, 2000). Prairie dog habitat is dwindling as a result of development in the Denver metropolitan area. The CDOW is encouraging public landowners to keep prairie dogs that are present on their property, and allow for expansion or start up of new prairie dog colonies. Buckley AFB is also encouraged to maximize the acreage of prairie dog colonies on portions of the base where the prairie dogs do not interfere with air traffic safety concerns.

A small, low-density black-tailed prairie dog colony is present on the proposed SBIRS site. The number of burrows actively used within the past 2 to 3 months is approximately 12, and the number of individual prairie dogs on the site is probably less than 10 (4 individuals were sighted during a recent site visit). The burrows are providing shelter for what appears to be one remnant prairie dog coterie. It is uncertain why prairie dogs are inhabiting the site because the nearest food source is several hundred yards to the south or west and travel to these areas to forage would likely expose the animals to high risk of predation.

The federally endangered black-footed ferret (*Mustela nigripes*) has not been found on base during four previous surveys. The USFWS designated Buckley AFB as within a "block clearance zone" for the black-footed ferret (ANG, 1998). A "block clearance zone" is an area determined by the USFWS as not supporting the black-footed ferret.

Preble's meadow jumping mouse (*Zapus hudsonius preblei*) is listed by the state and federal government as threatened (ANG, 1998). The Preble's meadow jumping mouse has an exclusive association with riparian vegetation near ponds and streams. Willow thickets or aspen forests with a well developed grass understory are prime habitat for the mouse. Its diet is mostly grass seeds, and occasionally insects. Typically, the mouse will not move across roads, heavily grazed areas, or cultivated fields (ANG, 1998). There is a potential that the Preble's meadow jumping mouse may occur on base in the vicinity of

the creeks. A survey for rare or imperiled species and significant natural communities, conducted by the Colorado Natural Heritage Program on Buckley AFB in June 2000, specifically searched for Prebles meadow jumping mice and none were found on base(CNHP, 2000).

The swift fox *(Vulpes velox),* a small nocturnal fox, is a state species of special concern and prefers short to mid-grass prairie habitat. It is found in association with prairie dogs that, along with other small vertebrates, comprise about 75 percent of the fox's diet (ANG, 1998). The swift fox has not yet been identified as occurring on the base.

The bald eagle *(Haliaeetus leucocephalus),* federally listed as threatened, occurs around lakes and rivers in the winter. It typically forages for fish, but is also known to take small mammals, including prairie dogs. Generally, winter habitat preferences for the bald eagle include a readily available food source associated with ice-free waters, diurnal perches, nocturnal roost trees, and low human activity. The bald eagle is a transient visitor to Buckley AFB in the winter and is not known to breed in the immediate vicinity (ANG,1998). The ferruginous hawk *(Buteo regalis),* a state special concern species, is fairly common in Arapahoe County (ANG, 1998). It feeds almost exclusively on small mammals, including prairie dogs, and primarily nests in trees (ANG, 1998). Ferruginous hawks are resident on the adjacent Prairie Conservation Center property and are likely to be present on Buckley AFB.

The mountain plover *(Charadrius montanus),* is a candidate species for federal listing. The plover prefers open, arid lands that support short grasses, such as buffalograss and blue grama, and scattered cactus on the eastern plains of Colorado. The plover's reported range ends near the eastern boundary of Arapahoe County, and they are unlikely to occur on Buckley AFB (ANG, 1998).

The burrowing owl *(Athene cunicularia),* a state-threatened species, is known to occur on base. Burrowing owls are typically present in the area from early March to late October and migrate out of state during the winter months. Burrowing owls typically occur in active prairie dog towns and may be present in recently abandoned prairie dog towns (ANG, 1998). The 1999 Buckley ANG Integrated Natural Resources Management Plan recommended establishing a critical habitat in the southwestern, undeveloped part of the base to protect the owl.

Ute ladies'-tresses, *(Spiranthes diluvialis),* federally listed as threatened, is an orchid found in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated floodplains below 6,500 feet in elevation. According to the Colorado Natural Heritage Program (CNHP), current distribution of the orchid does not include

Arapahoe County. Although on-base surveys for the orchid are limited, the only potential habitat would be along the creeks.

The Colorado butterfly plant *(Gaura* n*eomexicana* ssp. *coloradensis),* federally listed as threatened, prefers alluvial soils of drainage bottoms surrounded by mixed grass prairie, typically at elevations between 5,800 and 6,200 feet. According to the CNHP, current distribution of the Colorado butterfly weed includes wetland areas of Arapahoe County. This species could occur along the creeks on the base.

3.2.3 Sensitive Habitat

Sensitive habitats are those areas considered for protection due to their ecological value. They include wetlands, critical habitat for protected species, plant communities of limited or unusual distribution, and important seasonal use areas for wildlife. Wetlands and prairie dog colonies are the only sensitive habitats known on Buckley AFB. A total of six potential wetlands are located on base according to the NWI maps. Other areas require wetland evaluation to determine if they qualify for wetland protection under Section 404 of the Clean Water Act. These areas are found along the riparian corridors and are currently designated as bottomland meadow or cottonwood/willow association.

3.3 NON-IONIZING ENERGY

Non-ionizing energy is electromagnetic energy emitted at wavelengths whose photon energy is not high enough to ionize or "charge" an absorbing molecule (*i.e.*, human tissue). Non-ionizing energy is considered to be that part of the electromagnetic energy spectrum with wavelengths greater than 10^{-7} (0.0000007) meters and consists primarily of near ultraviolet energy, visible energy or light, infrared energy, and RF energy. RF energy accounts for the largest range of frequencies among the various types of non-ionizing energy and is used extensively to transmit radio, television, and radar signals. RF energy has a frequency range of 10 kiloHertz (kHz) to 300 GHz.

The ROI for discussion of non-ionizing energy includes Buckley AFB and adjacent properties off-base.

3.3.1 Health and Safety

Numerous RF energy sources exist throughout Buckley AFB. These are typically in the form of transmitting antennas which support various space programs. An energy hazard exists when there is sufficient power contained in the incident energy to cause damage to humans. Energy hazard standards are in the form of permissible exposure levels (PELs). PELs are the exposure level expressed in electric field, magnetic field, or plane wave (far field) power density in milliwatts per square centimeter to which an individual may be repeatedly exposed and which, under conditions of exposure, will not

cause detectable bodily injury regardless of age, sex, or child-bearing status. The biological effects of RF energy depend on the frequency of the incident energy field, the polarization of the field, and the size and shape of the person and his or her ability to dissipate, by normal biological mechanisms, the energy absorbed. PELs are used to determine "safe distances" from RF sources beyond which RF energy hazards will not occur. PELs for human exposure to RF energy are established in Institute of Electrical and Electronics Engineers (IEEE) Standard C95.1-1991 (IEEE, 1992). The IEEE standard is recognized as an American National Standard by the American National Standards Institute. The USAF has established PELs for similar RF fields in Air Force Occupational Safety and Health (AFOSH) Standard 48-9.

RF energy is generated by satellite communications equipment located within the 2 SWS facility at Buckley AFB. Antennas currently located on Buckley AFB produce RF energy during operation of the DSP fly-out satellite missions. Additionally, the Aerospace Data Facility (ADF) uses various antennas that also produce RF energy. The ADF and its antennas are located north of the MCS facility. Exposures to RF energy can cause hazards to personnel, as discussed above, flammable liquids, and electro-explosive devices (ANG, 1995).

An Electromagnetic Energy Hazard Survey was conducted in 1990 of the two main 2 SWS antennas (DSP antennas, DB1 and DB2) and the survey found there were no RF hazards to electro-explosive devices on the flight line or parking apron, or to transient aircraft. The survey also found that no RF hazards to personnel exist at ground level, or at heights up to 40 feet above the ground. Above that height, RF hazards to personnel may exist. For this reason, building height restrictions of 40 feet are imposed on facilities at the base. Buildings constructed in expansion areas of 2 SWS cannot exceed 5,550 feet above mean sea level (ANG, 1995). More recent information concerning potential RF hazards above this height suggests that the RF levels at all ground and air levels are expected to be within acceptable levels (See Appendix B).

The study also concluded that under normal operations, there were no RF hazards to fuel operations, including those at the base fuel farm located just west of the southwest corner of the outer perimeter fence (ANG, 1995).

3.3.2 Airspace

Buckley AFB is the headquarters for the Colorado ANG and provides the training site for the 140th Fighter Wing of the ANG which operates F-16 aircraft. The 200th Airlift Squadron, another ANG unit, operates several T-43s and C-26 aircraft. The 2nd Battalion, 135th Aviation, an Army National Guard unit, operates attack, observation, and utility helicopters. The base also provides aircraft search and rescue and crash response for a designated geographical area in the mid to western portion of the United States.

Airspace in and around the Denver metropolitan area, including Buckley AFB, is extremely congested. The airfield at Buckley AFB is 11,000 feet long and is orientated in a northwest by southeast direction. Aircraft departing the base are required to turn left after reaching their departure altitude. Air traffic patterns are such that aircraft are restricted from flying directly over or in the general vicinity of the radomes located at 2 SWS or the ADF facilities (Ortega, 2001).

3.4 UTILITIES

The utility systems discussed in this section include electricity and natural gas. The ROI for these utility systems include the service area for each utility that serves the project site. The major attributes of these utility systems in the ROI are average daily or monthly demand. These factors are used in determining whether the existing utility systems are capable and adequate to provide services.

3.4.1 Electricity

Excel Energy (formerly Public Service Company of Colorado) provides electricity to Buckley AFB. The Excel Energy East Substation, located at the intersection of Colfax Avenue and I-225, provides electrical power to Buckley AFB through 13.2 kilovolt overhead distribution lines. Six metering points serve various areas of Buckley ANGB, which is the largest user of power from this substation.

During FY00, the tenant facilities at Buckley AFB used an average of 8,374,511 - kilowatt hours per month. Of this, SBIRS averaged 353,818 kilowatt hours per month, or 4 percent of the base usage (Tipton, 2001).

3.4.2 Natural Gas

Natural gas is provided to Buckley AFB by Excel Energy through a 4-inch gas main beneath 6th Avenue (ANG, 1998). The regional natural gas system has a capacity of 130 billion cubic feet (ANG, 1999). The average FY00 demand is 228,363.30 therms per month, or 22,836 million BTUs per month (Tipton, 2001).

SECTION 4
ENVIRONMENTAL CONSEQUENCES

This section provides scientific and analytic bases for comparing the environmental consequences of the Proposed Action and No Action Alternative. The probable effects of each alternative on environmental resources are described. Additionally, mitigation measures and cumulative impacts are discussed for each environmental resource.

4.1 AIR QUALITY

Impacts to air quality would be considered significant if pollutant emissions associated with the implementation of the federal action caused or contributed to a violation of any national, state, or local ambient air quality standard, exposed sensitive receptors to substantially increased pollutant concentrations, represented an increase of 10 percent or more in affected AQCR's emissions inventory, or exceeded any significance criteria established by the Colorado SIP.

4.1.1 Proposed Action

Implementation of the Proposed Action at Buckley AFB would generate air emissions from a variety of activities. Fugitive dust from ground disturbing activities, combustive emissions from construction equipment, and emissions from asphalt paving operations would be generated during construction of the proposed projects. Fugitive dust would be generated from activities associated with site clearing, grading, cut and fill operations, and from vehicular traffic moving over the disturbed site. These emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions.

Construction

The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area of land being worked and the level of construction activity. The USEPA estimated that uncontrolled fugitive dust emissions from ground-disturbing activities would be emitted at a rate of 80 pounds of total suspended particulates (TSP) per acre per day of disturbance (USEPA, 1995). In a USEPA study of air sampling data at a distance of 50 meters downwind from construction activities, PM_{10} emissions from various open dust sources were determined based on the ratio of PM_{10} to TSP sampling data. The average PM_{10} to TSP ratios for top soil removal, aggregate hauling, and cut and fill operations are reported as 0.27, 0.23, and 0.22, respectively (USEPA, 1988). Using

0.24 as the average ratio for purposes of analysis, emission factor for PM_{10} dust emissions becomes 19.2 pounds per acre per day of disturbance. Table 4.1-1 includes the estimated PM_{10} emissions associated with the proposed construction activities using these assumption. These emissions would produce slightly elevated short-term PM_{10} ambient air concentrations. However, the effects would be temporary and would fall off rapidly with distance from the proposed construction site.

Table 4.1-1 Proposed Construction Emissions Within AQCR 36

Construction Emissions[b]					
Construction Activity	**CO (tons)**	**VOC (tons)**	**NO_X (tons)**	**SO_X (tons)**	**PM_{10} (tons)**
Site Preparation/Ground Disturbance	-	-	-	-	4.05
New Building Construction	0.01	0.00	0.02	0.00	0.00
Asphalt Paving Operations	0.19	0.01	0.03	0.00	0.01
Concrete Paving Operations	0.32	0.06	0.74	0.08	0.05
Total Emissions	**0.52**	**0.07**	**0.80**	**0.09**	**4.11**
1998 AQCR 36 Emission Inventory[a]	4,761	13,727	37,079	34,732	3,211
Percent Increase (%)	**0.01**	**< 0.01**	**< 0.01**	**< 0.01**	**0.13**

a ANG, 1999.
b Estimated emissions based on building square footage, site areas, and project durations.

The USEPA also assumes that 230 working days are available per year for construction (accounting for weekends, weather, and holidays), and that only half of these working days would result in uncontrolled fugitive dust emissions at the emitted rate described above (USEPA, 1995). The USEPA estimates that effects of fugitive dust from construction activities would be reduced significantly with an effective watering program. Watering the disturbed area of the construction site twice per day with approximately 3,500 gallons per acre per day would reduce TSP emissions as much as 50 percent (USEPA, 1995).

Specific information describing the types of construction equipment required for a specific task, the hours equipment is operated, and the operating conditions, vary widely from project to project. For purposes of analysis, these parameters were estimated using established cost estimating methodologies for construction and experience with similar types of construction projects (Means, 1999). Combustive emissions from construction equipment exhausts were estimated from USEPA approved emissions factors for heavy-duty diesel-powered construction equipment (USEPA 1998). Annual construction emissions resulting from construction of the proposed antenna and support facilities are presented in Table 4.1-1. Estimated pollutant emissions are based on the proposed site

areas, the duration of the project, and the specified building square footage for new construction.

Analysis of the data presented in Table 4.1-1 indicates that the overall ambient air quality within AQCR 36 would be slightly affected by the construction of the Proposed Action. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.13 percent increase for any criteria pollutant) when compared to baseline AQCR 36 emissions. The effects would be temporary, fall off rapidly with distance from the proposed construction site, and would not result in any long-term impacts. Since the estimated emissions for criteria pollutants do not exceed 10 percent of the air emission baseline and do not exceed *de minimis* levels, the Proposed Action is not considered regionally significant and does not violate the Colorado SIP.

Operation

Combustive emissions emergency operations are estimated from USEPA approved emission factors (UESPA, 1995) and are based on the following assumptions:

- Generator capacity = 35,000 kW;
- Emissions control = none;
- Fuel type – diesel fuel No. 2;
- Sulfur content of fuel = 2 percent
- Operational usage = 100 hours per year; and
- Monthly operational testing = 12 hours per year.

Annual pollutant emissions resulting from operation of the proposed antennas are presented in Table 4.1-2. Due to the small percentage increase of operational emission associated with the backup power generator compared to baseline conditions, the operational phase of the Proposed Action is not anticipated to significantly impact air quality at Buckley AFB.

Table 4.1-2 Proposed Operational Emission within AQCR 36

Operational Emissions[b]					
Construction Activity	**CO (tons)**	**VOC (tons)**	**NO_X (tons)**	**SO_X (tons)**	**PM_{10} (tons)**
Backup Generator	0.014	0.001	0.063	0.042	0.002
1998 AQCR 36 Emission Inventory[a]	4,761	13,727	37,079	34,732	3,211
Percent Increase (%)	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**

a ANG, 1999.
b Estimated emissions based on building square footage, site areas, and project durations.

4.1.2 No Action Alternative

Under the No Action Alternative, there would be no change from baseline conditions.

4.1.3 Mitigative Measures

Potential criteria pollutant emissions associated with the Proposed Action do not exceed significance criteria requirements. Therefore, no mitigative measures for improving the ambient air quality would be required. Although mitigative measures are not required, possible BMPs include watering for dust suppression to control PM_{10} emissions.

4.1.4 Cumulative Impacts

There are two other major construction projects being considered at Buckley AFB during the same period as the proposed projects. One project includes constructing a new CE Complex consisting of two 3,500 square foot additions to the existing building and a 5,000 square foot pre-fabricated warehouse. The other project includes constructing a 115,000 square foot BX and shopping mall and a new 70,000 square foot Commissary.

Construction of the BX and Commissary Complex began in FY00; however, completion of the new facilities has been delayed due to asbestos abatement and issues with burrowing owls at the site (Sherva, 2001b). The CE Complex facility is anticipated to be constructed in FY01. Therefore the construction phase of the RF antennas will coincide with the construction phase of the these facilities. Emissions anticipated from this overlap are presented in Table 4.1-3.

Table 4.1-3 Proposed Cumulative Emission within AQCR 36

Cumulative Emissions[b]					
Construction Activity	**CO (tons)**	**VOC (tons)**	**NO_X (tons)**	**SO_X (tons)**	**PM_{10} (tons)**
Emissions from Proposed Action	0.52	0.07	0.80	0.09	4.11
Emissions Associated With the BX and Commissary Complex Construction	9.4	2.9	43.2	0	46.2
Emissions Associated With the Civil Engineering Complex	0.30	0.05	0.68	0.07	1.70
Total	10.22	3.02	44.68	0.16	52.01
1998 AQCR 36 Emission Inventory[a]	4,761	13,727	37,079	34,732	3,211
Percent Increase (%)	0.21	0.02	0.12	< 0.01	1.62

a ANG, 1999.
b Estimated emissions based on building square footage, site areas, and project durations.

While site clearing, preparation and new building construction activities were considered in estimating air emissions associated with the two building additions proposed for the CE complex, only site clearing/preparation activities were considered in estimating potential air emissions from installation of the prefabricated building. Estimated air emissions associated with the construction phase of the BX and Commissary complex were taken from the Air National Guard December 1998 Environmental Assessment (ANG, 1998).

Analysis of the data presented in Table 4.1-3 indicates that the overall ambient air quality within AQCR 36 would be slightly affected by construction and operation of the Proposed Action. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations; however, the increases do not exceed a 10 percent increase over baseline conditions.

4.2 BIOLOGICAL RESOURCES

An impact to biological resources would be considered significant if the federal action would impact a threatened or endangered species, substantially diminish habitat for a plant or animal species, substantially diminish a regionally or locally important plant or animal species, interfere substantially with wildlife movement or reproductive behavior, and/or result in a substantial infusion of exotic plant or animal species.

4.2.1 Proposed Action

The Proposed Action would not likely have any adverse effects on biological resources, with the exception of the black-tailed prairie dogs present at the SBIRS site.

Biological resources at the site are markedly absent, with no native vegetation and only sparse noxious weed cover (field bindweed) on the predominantly barren site.

Prairie dogs on the site would be removed as a result of the Proposed Action. This would be a minor adverse effect because the number of prairie dogs present is low (likely less than 10 individuals), the probability for persistence of this ward (a subgroup of the larger colony) is low, and resources are very limited. The prairie dogs currently have to cross several hundred yards of unvegetated open space to reach the nearest suitable forage. The likelihood of predation in the open space is high, and because of the low number of individuals, it is probable that the ward will not persist. When considered in the context of the black-tailed prairie dog population and the very low habitat quality on the site, removal of these individual prairie dogs would have a negligible effect on the prairie dog population.

The Proposed Action would not have an effect on any federal or state-listed species.

4.2.2 No Action Alternative

The No Action Alternative would not result in the removal of the black-tailed prairie dogs from the site due to construction of the SBIRS antennas. However, because of the lack of resources at the site and the high probability of exposure to predators when seeking the nearest foraging areas, the prairie dogs have a low prediction of continued presence at the site. Thus, the No Action Alternative would likely have a result similar to the Proposed Action, namely, prairie dogs are not likely to persist at the SBIRS site. No mitigation measures to compensate for this loss would take place under the No Action Alternative.

4.2.3 Mitigative Measures

Prior to commencing construction activities on the SBIRS site, the black-tailed prairie dogs on the site would be live-captured and transported to a USFWS black-footed ferret captive breeding facility to support the endangered species recovery program. The USFWS has indicated that this would be an acceptable and preferred method to deal with the prairie dogs (Leachman, pers. comm., 2001). This action would be accomplished by using a vacuum system to remove the animals from their burrows. The SBIRS site would be monitored following collection of the prairie dogs to determine that all the prairie dogs were removed. The prairie dog burrows will be destroyed to prevent recolonization by prairie dogs or other species. The action would be taken prior to March 1, 2001 to avoid interfering with prairie dog reproduction activities and to preclude potential effects to burrowing owls returning from migration beginning in March. Precautions would be taken to protect the prairie dogs during live-capture and transport and to ensure the health and safety of the persons handling the animals. No mitigative measures to offset the removal of the prairie dogs would be necessary.

4.2.4 Cumulative Impacts

The cumulative effect from construction of the SBIRS antennas would continue the trend of development of open space in the Denver metropolitan area. Wildlife habitats are being lost to development at a significant rate. However, change in land use at the proposed SBIRS site would not contribute to further degradation of wildlife or biological resources because of the lack of resources at the site. The area surrounding the SBIRS site (except to the west) is already developed, thus the surrounding area would not experience additional effects resulting from the Proposed Action. Future biological resource effects associated with the SBIRS project would likely be related to prairie dogs and the base-wide prairie dog management plan (currently in preparation) would be well-suited to deal with any potential effects. Vegetation at the site is limited to an invasive noxious weed, and its removal would have no cumulative adverse effect; rather, the effect would be somewhat beneficial by removing a potential source of unwanted, non-native vegetation. Donation of black-tailed prairie dogs to the black-footed ferret captive breeding program would have a cumulative beneficial effect in the form of support for the recovery of an endangered species.

4.3 NON-IONIZING ENERGY

Non-ionizing energy impacts would be considered significant if personnel were exposed to levels of energy in excess of the PELs established under IEEE standards for maximum permissible exposure for uncontrolled environments (1.2 mW/cm^2 for S-band [1.8 GHz] and 30 mW/ cm^2 for Q-band [45 GHz], or if the power density levels established for safe operating distance for fuels would be exceeded in the affected area (5,000 mW/cm^2). Uncontrolled environments are locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces where there are no expectations that the exposure levels may exceed the levels described above (IEEE, 1992).

RF hazards to electro-explosive devices (EEDS) and fuels may result from excessive RF energy. EEDs are small pyrotechnic or explosive devices (primers, detonators, blasting caps, squibs) that are ignited electrically by the passage of an electric current to detonate an explosive charge. Many of these devices are initiated by low levels of electrical energy and are susceptible to unintentional ignition by many forms of direct or induced stray electrical energy such as RF energy. RF energy may ignite fuel by inducing current in metallic objects, which could cause sparks in the presence of fuel vapors. The location of fuel and ordnance with respect to an RF antenna facility should be given extensive study prior to siting the RF device to ensure proper safe operating distances or separation between the antennas and the fuel or EEDS. The safe operating distance for fuels is based on a power density level equal to or less than 5 W/cm^2 (5,000 mW/cm^2) in

the affected area. The safe power density level of ordnance is dependent on frequency, exposure, and sensitivity of the particular device.

4.3.1 Proposed Action

As discussed in paragraph 3.3.1, RF electromagnetic energy is generated by satellite communications equipment located within the 2 SWS facility at Buckley AFB. This section describes the RF equipment and potential impacts associated with the two new SBIRS communications antennas, SB1 and SB2, proposed to be constructed at the locations shown in Figure 2-2. Figure 2-3 shows a plan view of the SBIRS antenna disk and radome. The existing DSP antennas would be used for communication with satellites on an interim basis and ultimately would be replaced by the SBIRS satellite communication system using the SB1 and SB2 antennas associated with the SBIRS MCS. Although the exact locations and specific operational parameters of the three future SBIRS LEO antennas (LEO1, LEO2, and LEO3) to be constructed near the MCS are not final, their cumulative RF energy effects will be discussed and compared with the SBIRS antennas and the DSP antennas (DB1, DB2, and DB3) in paragraph 4.3.4. Detailed information on the RF energy equipment and potential impacts associated with the SBIRS communications antennas and their comparisons to the three DSP antennas and the three LEO antennas are presented in Appendix B. This information was provided by the Systems Engineering Directorate of the Aerospace Corporation (Aerospace Corp, 2001).

4.3.1.1 Health and Safety

Operating parameters of the SBIRS antennas are presented in Table 4.3-1 and operate in the 3 kHz to 300 GHz frequency range and, thus the associated PELs would be 1.2 mW/cm^2 for S-band frequencies of 1.8 GHz and 30 mW/cm^2 for Q-band frequencies of 45 GHZ for uncontrolled environments. For short duration exposures, the lower threshold, below which personnel are considered safe from non-ionizing energy, is 10 mW/ cm^2. However, the "worse case" lower limit for continuous (24-hour/day, 7 days/week) exposure to all areas of the body or to any type of electrically activated explosive devices is 1 mW/cm^2.

According to the SBIRS System Safety Hazard Analysis Report, which documents the RF power density calculations, the RF power density analysis shows that RF transmissions from the SBIRS antennas do not exceed the maximum contractual requirement for RF exposure (Lockheed Martin, 2001). There would be no hazardous levels of RF power radiating from the antennas reflectors as determined by the analysis. The maximum power density calculated at horizon (ground level) for uniform illumination was 3.19 mW/cm^2 within a radius of 168 meters (551 feet.) from the antenna with the S-Band transmitter operating at rated power (Lockheed Martin, 2001). This power density level is lower than the maximum limit of 5mW/cm^2 for the S-Band and Q-Band operational frequencies.

Table 4.3-1 SBIRS Antenna Operational Parameters

Antenna Designation	Antenna Diameter (feet)	Transmit Frequency (GHz)	Transmit Power (Watts)	Maximum Operational Time (days/wk, hours/day)	Minimum Operational Elevation Angle (degrees)
SB1	33	1.8	2000	7 days/wk, 24 hrs/day	5
SB1	33	45	20	7 days/wk, 24 hrs/day	5
SB2	33	1.8	2000	7 days/wk, 24 hrs/day	5
SB2	33	45	20	7 days/wk, 24 hrs/day	5

Source: Aerospace Corp., 2001

The DoD JSC issued a memorandum to SMC in November 2000 concerning its radiation hazard assessment of the proposed SBIRS antennas. The objective of the assessment was to determine the maximum electromagnetic energy levels and associated energy hazard potential at the proposed location of the SBIRS MCS antennas. The RF energy levels were measured using a spectrum analyzer and a broadband horn antenna coupled with a laptop computer. The broadband horn antenna was mounted to a tripod anchored to a man-lift bucket and raised to a height of 54-feet. This height corresponds to the expected elevation of the SBIRS radome, the point at which the highest RF levels would be expected. Results of the RF energy measurements indicated that maximum power density of the proposed SBIRS antennas under all test conditions was 16 $\mu W/cm^2$. According to the JSC, this measurement is less than the most conservative maximum permissible exposure limit by a factor of 400 (see Appendix C for the specific details contained in the memorandum).

Results of the RF S-Band and Q-Band power density levels calculated for the SBIRS and DSP antenna study conducted by the Aerospace Corporation are presented in Appendix B and shown in Table 4.3-2. Figure 4 in Appendix B shows the Aerospace Corporation RADHAZ simulation geometry for examining the antennas. Figures 5 through 8 in Appendix B indicate the power density levels along three geometrical paths for SB1, SB2, D1, and D2 for both the S and Q-bands. The first path is along the antenna axis centerline, the second is extending away from the antenna rim, and the third is six feet above the ground in the direction the antenna is pointing. The latter configuration assumes a "worst case two-dimensional pointing angle" condition. This condition is defined as the case where the antenna is pointed at it lowest elevation angle of 5º above the horizon. This is the "worst case" in the sense that it delivers the most power to the ground as possible. In actual operation, the antenna would deliver less power to the ground than this "worse case" because it will be pointed at an angle higher than 5°. Table 4.3-2 presents the maximum power density levels for SB1, SB2, D1, and D2. These power levels are graphically shown in Figures 5 and 6 in Appendix B.

Table 4.3-2 Maximum Power Density Levels for SBIRS and DSP Antennas

	Maximum Power Density Levels (mW/cm^2)					
Antenna	**Antenna Axis (Black)**		**Away from Antenna Axis (Red)**		**6-feet Above Ground (Green)**	
	S-Band	Q-Band	S-Band	Q-Band	S-Band	Q-Band
SB1, SB2	3.19	0.1	0.25	0.0012	0.012	0.000015
D1, D2	10	-	0.14	-	0.011	-

In comparing Figures 5 and 6 and the power density levels presented in Table 4.3-2, several conclusions can be reached. First, the curves plotted in green on both figures refer to S-Band energy power density levels predicted six feet above the ground around each antenna at distances given in feet from the antenna. Note that the "green plot" power density levels (ground values) are very similar for SB1/SB2 (Figure 5) and D1/D2 (Figure 6) as the energy emanates away from the vertex of the antenna. Also note that these levels are more than 100 times below the "worst case" allowable RADHAZ exposure levels of 1 mW/cm^2 at all ground locations around the MCS.

Second, the red plots in Figures 5 and 6 and the power density levels presented in Table 4.3-2 show power levels at the beam edge or along the rim of a vector extending out from the rim of the antenna as shown in Figure 4 of Appendix B. These power levels are also below 1 mW/cm^2 and are power levels that will be reached only at significant heights above the ground. Also note that as the distance away from the antenna vertex increases, the height also increases, as shown geometrically in Figure 4.

Third, the black plots in Figures 5 and 6 and the power density levels presented in Table 4.3-2 show the maximum power levels reached in the center portion of the beam. For the Proposed Action, all S-Band power levels are below 10 mW/cm^2 at all distances from the vertex of the antenna. This is not currently true for D1 and D2 which go up to approximately 10 mW/cm^2 in the center of the beam at distances less than 100 feet. This does not imply that any unacceptable hazards exist from D1 or D2, but demonstrates that antennas SB1 and SB2 generate a safer energy power level along the beam axis, one that is lower than the D1 and D2.

Figure 7 in Appendix B shows the power density levels of the SBIRS antennas using Q-band transmitting power presented in Table 4.3-1. The information presented in Figure 7 are shown in Table 4.3-2. The results show that in all parts of the transmitting beam, SB1 and SB2 are below 1 mW/ cm^2 and do not represent a RF energy hazard.

According to results of the SBIRS System Safety Hazard Analysis Report prepared by Lockheed Martin, the energy hazard assessment preformed by the JCS, and the study conducted by the Aerospace Corporation, the RF energy emitted from the SBIRS antennas is below the IEEE standards for maximum permissible exposure for uncontrolled environments at all ground and air levels.

Additionally, the safe operating distance for fuels is based on a power density level equal to or less than 5000 mW/cm^2 in the affected area. As shown in Table 4.3-2, the power density levels emitted from the SBIRS antennas are much less than the level established for the safe operating distance for fuels, no potential fuel ignition hazard exists.

4.3.1.2 Airspace

Aircraft operating at Buckley AFB either take off or land in a northwest-southeast direction, which is east and north from the proposed location of the SBIRS antennas. Aircraft are required to turn left after reaching their departure altitude. After reaching the required altitude the aircraft are restricted from flying directly over or in the general vicinity of the radomes located at 2 SWS or the ADF facilities (Ortega, 2001). Commercial airlines would also be restricted from flying over or near the base while either approaching or departing the Denver International Airport.

Personnel flying inside aircraft could potentially be exposed for a brief moment to RF energy while crossing the beam path of the antenna. However, as discussed above, RF energy emitted from the SBIRS antennas is low enough to not have an effect on human health. Instrumentation in aircraft are typically shielded from such energy fields and therefore, would not be damaged from the RF energy emitted from the SBIRS antennas.

4.3.2 No Action Alternative

The RF energy emitted as a result of the No Action Alternative, *e.g.*, continued use of the existing DSP antennas, is expected to be similar to the Proposed Action. The RF energy assessment conducted by the Aerospace Corporation on the DSP antennas is presented in Appendix B.

4.3.3 Mitigative Measures

No mitigative measures would be required. However, the following safety precautions and BMPs should be followed: 1) locate RF energy warning signs on the rear of each reflector petal; 2) establish and mark restrictive areas to prevent personnel from entering any RF energy hazard area; 3) ensure authorized personnel disable antenna transmissions prior to performing maintenance; and 4) ensure that antenna lockout and stop procedures are in place and included in maintenance technical orders.

4.3.4 Cumulative Impacts

Three SBIRS LEO antennas will be constructed on 10 foot by 10 foot concrete foundations located in the general vicinity of the SBIRS antennas. Figure 4-1 shows the approximate locations of the three LEO antennas in relation to the two SBIR HEO/GEO antennas. Figure 4-2 shows the approximate locations of the LEO and DSP antennas in relation to the two SBIRS HEO/GEO antennas. For their antenna study, the Aerospace Corporation assumed the LEO antennas would have operational parameters as those shown in Table 1 in Appendix B (Aerospace Corp., 2001). The power density levels of the future SBIRS LEO antennas using Q-band transmitting power are shown in Figure 8 in Appendix B. Figure 8 shows that in the main beam portion of LEO1, LEO2, and LEO3 there are small excursions above 1 mW/cm^2 out to a distance of 50 feet. These areas must be controlled access for future LEO operations to minimize potential RF energy hazards (Aerospace Corp., 2001).

Two aspects to consider in assessing the cumulative RF energy impact with the operation of antennas SB1, SB2, LEO1, LEO2, and LEO3 are the nature of the energy being emitted and the operational use of the antennas. All SBIRS antennas would emit non-ionizing energy, which is not considered cumulative from a energy-biology and oncological perspective. RF fields are too low in power to produce ionized chemical atoms and cellular damage that results from ionizing energy. If the RF power levels are high, however, heating can occur, and if cellular structure cannot remove the heat over time, then biological damage can occur. This cannot occur if RF fields are below 1 mW/cm^2 and generally does not occur at levels below 5 mW/cm^2 (Aerospace Corp., 2001).

The second aspect to consider is the duty cycle for the "transmit mode" of the SBIRS antennas. The Aerospace Corporation studied the cumulative environmental impact perspective for antennas SB1, SB2, LEO1, LEO2, LEO3, DB1, DB2, and DB3 (receive only). The locations of all three sets of antennas are shown in Figure 4-2. The duty cycle consists of two elements: time or duration the transmission is occurring, and the operational elevation angle (angular pointing) aspect of the antennas. Regarding the duration of transmission, the worst-case assumption of "continuous transmission" has been assumed as presented in Table 1 of Appendix B. In the case of angular pointing, unlike radar antenna which continuously transmit in many directions, the SBIRS

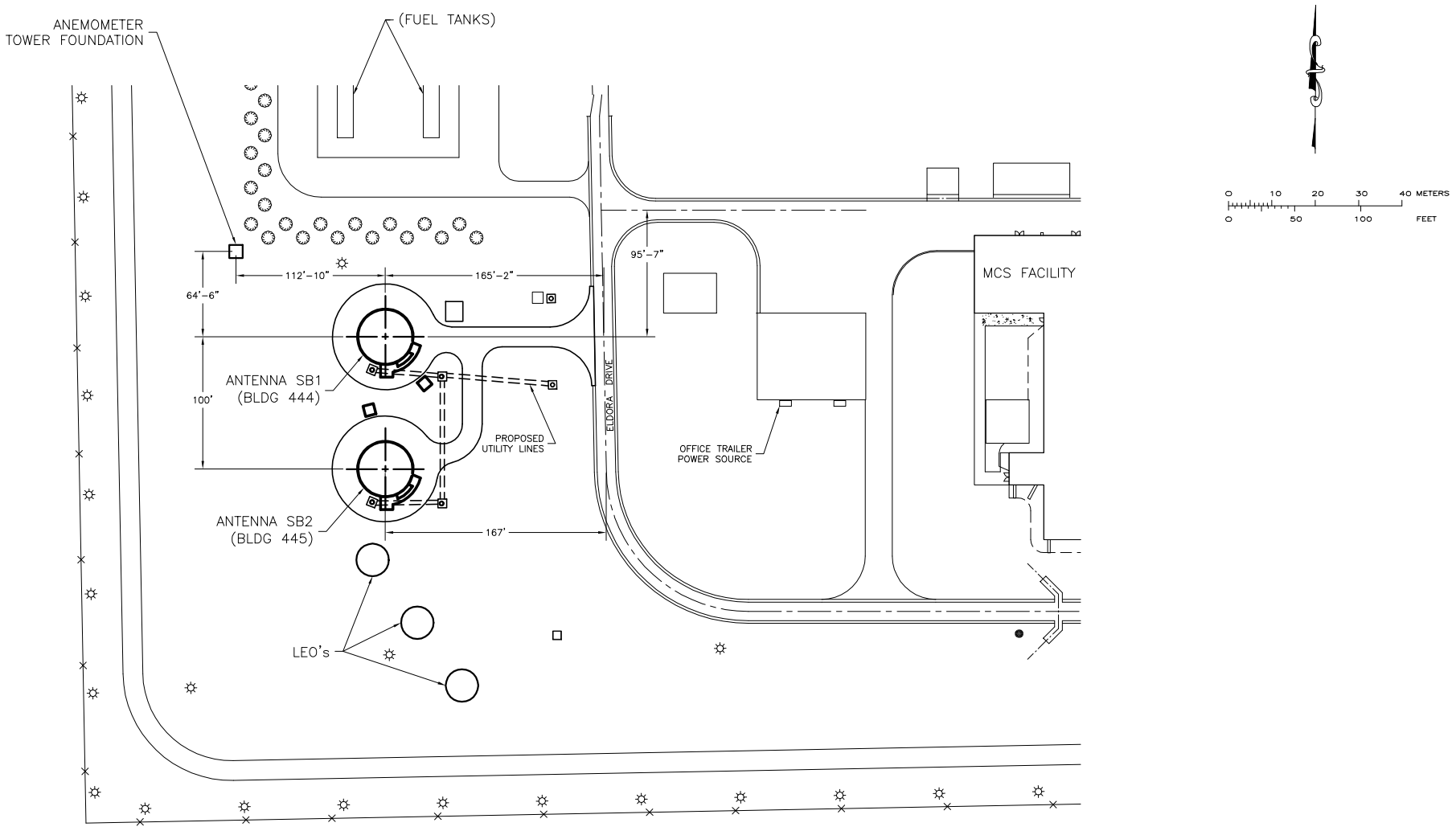

Figure 4-1

Antenna Siting of SB1, SB2,
and Three Future Leo Antennas

Buckley AFB, Colorado

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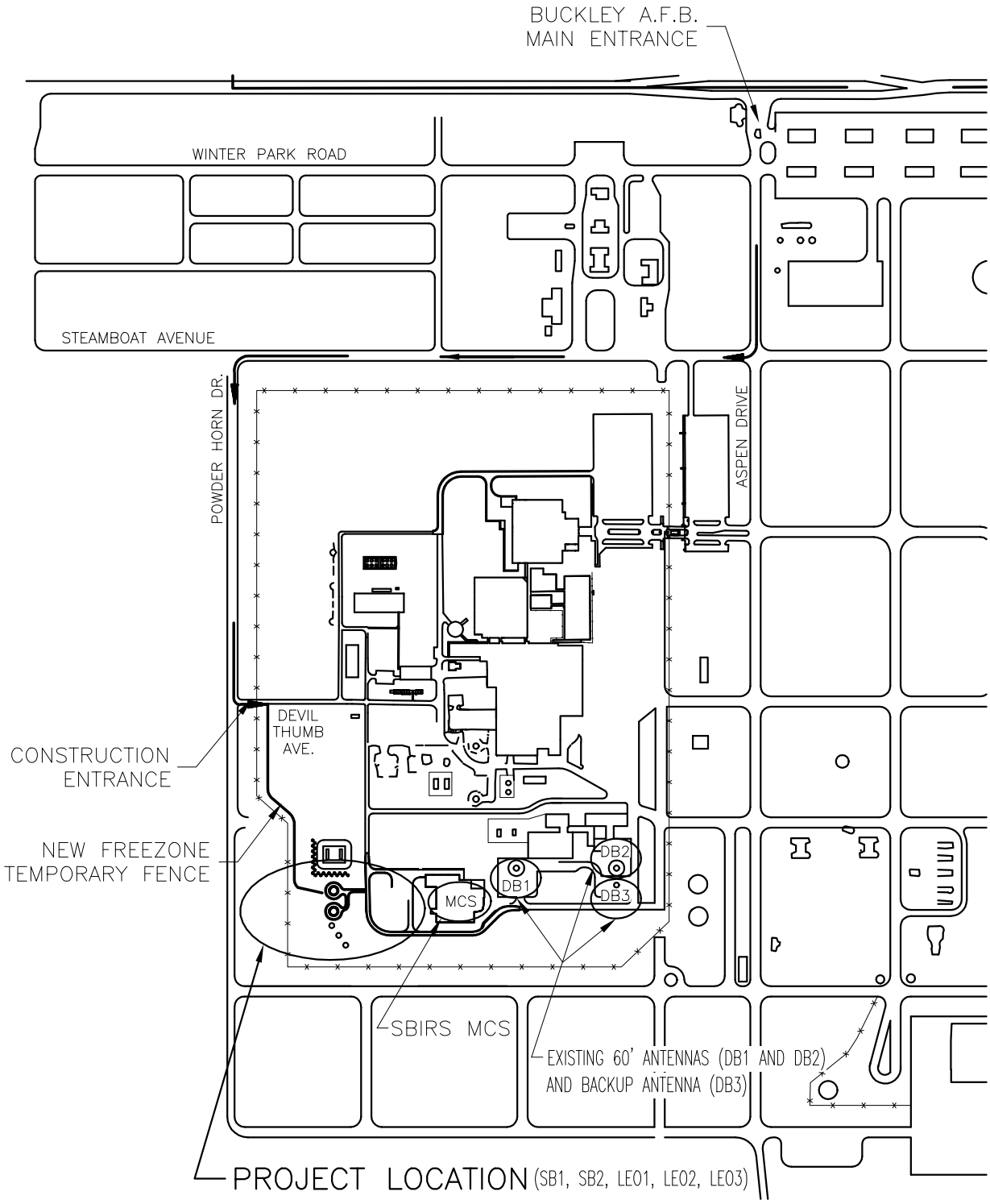

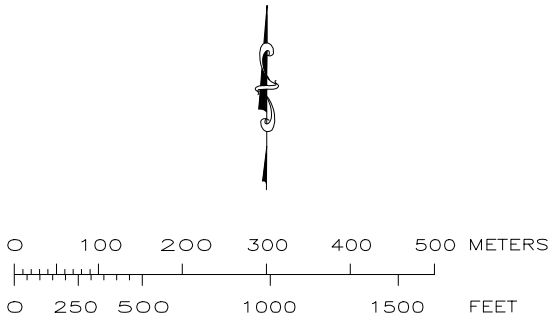

Figure 4-2

Location of
SBIRS, LEO, and DSP Antennas

Buckley AFB, Colorado

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"command and control" antennas would be fixed at a few locations and used to transmit signals in the direction of one particular satellite at a time. In other words, there would never be a time when more than one antenna was pointed at the same location in space. Therefore, the arithmetic addition of the energy fields is not a consideration in assessing cumulative RF energy hazard (Aerospace Corp., 2001).

As a result of all the studies and energy hazard assessments presented in this supplemental EA, no unacceptable hazard from the cumulative effect of RF energy is expected from the construction and operation of SB1 and SB2, or the future LEO antennas. At all ground and air locations surrounding SB1, SB2, D1, D2, and D3, the power density levels are expected to be within acceptable levels (Aerospace Corp., 2001).

4.4 UTILITIES

Impacts to the electrical and natural gas utility systems would be considered significant if the degree to which an increase in the demands on the utility distribution systems would result in the need for additional capacity or new support and/or supply facilities.

4.4.1 Electricity

4.4.1.1 Proposed Action

Under the proposed action, 150 feet of concrete encased underground electrical utility lines would extend from a utility pad located northwest of the MCS building to each antenna. Figure 2-2, Site Layout for Antennas SB1 and SB2, displays the proposed route for the utility extension.

Electrical usage would be necessary to supply power to each of the antennas as well as auxiliary support equipment and facility infrastructure. It is estimated that in order to support this auxiliary equipment, 60 kVA and 30 kVA would be required for SB1 and SB2 respectively. Assuming 24-hour energy usage of auxiliary equipment and a power factor of 0.8, 51,840 kWh per month would be used under the proposed action. This equates to approximately 15 percent of the current SBIRS electricity usage rate and less than 1 percent of current base usage rates.

Under the Proposed Action, electricity would be required to power antenna movement and RF transmission. It is estimated that 30 kVA each would be required by SB1 and SB2. Assuming a power factor of 0.8, electrical power required by both antennas would equate to a consumption rate of 3,456 kWh per month. This energy consumption rate is equivalent to 1 percent of the current electricity demand of SBIRS and less than 1 percent of the current base usage rates. Therefore, the Proposed Action is not anticipated to negatively impact the base electrical distribution system.

4.4.1.2 No Action Alternative

Under the No Action Alternative, there would be no effect on the electricity usage and the demand for energy would remain at the same levels experienced under baseline conditions for Buckley AFB.

4.4.1.3 Mitigative Measures

No mitigative measures to improve energy management practices at Buckley AFB would be required.

4.4.1.4 Cumulative Impacts

There are two other major construction projects being considered at Buckley AFB during the same period as the proposed projects. One project includes constructing a new CE Complex consisting of two 3,500 square foot (additions to the existing building) and a 5,000 square foot pre-fabricated warehouse. The other project includes constructing a 115,000 square foot BX and shopping mall and a new 70,000 square. Commissary.

As there is no significant electrical usage during construction of either the CE Complex or the BX and Commissary Complex, only operational energy usage are analyzed for cumulative impacts.

Based on 24-hour operation of the BX and Commissary Complex, an estimated electrical usage of 0.03 kWh per day per square foot would be required, resulting in 5,400 kWh per day or 162,000 kWh per month (ANG, 1998). Using this same electricity usage rate, the total electricity required for the 9,000 square foot CE Complex would be 262.7 kWh per day or 7881 kWh per month. Combining this with the 51,840 kWh per month estimated to support the Proposed Action, base usage would increase by 221,721 kWh per month. This increase represents an approximate 3 percent over current basewide electricity usage. Therefore, the cumulative impact from implementation of the Proposed Action is not anticipated to negatively impact the electrical infrastructure at Buckley AFB.

4.4.2 Natural Gas

4.4.2.1 Proposed Action

Under the Proposed Action, natural gas would be utilized for heating the work areas for each of the antennas. It is estimated that during the winter months 1.1 MBtu/hour would be necessary for each antenna, thus increasing natural gas usage by 2.2 MBtu/hour. Assuming the highest natural gas usage would occur primarily between November and March of each CY, this usage would represent approximately 2 percent of the current SBIRS natural gas usage rate, and less than 1 percent of the average annual base usage

rate. Therefore, the Proposed Action is not anticipated to negatively impact the base natural gas distribution system.

4.4.2.2 No Action Alternative

Under the No Action Alternative, there would be no effect on the natural gas usage and the demand for energy would remain at the same levels experienced under baseline conditions for Buckley AFB.

4.4.2.3 Mitigative Measures

No mitigative measures to improve energy management practices at Buckley AFB would be required.

4.4.2.4 Cumulative Impacts

There are two other major construction projects being considered at Buckley AFB during the same period as the proposed projects. One project includes constructing a new CE Complex consisting of two 3,500 square foot additions to an existing building and a 5,000 square foot pre-fabricated warehouse. The other project includes constructing a 115,000 square foot BX and shopping mall and a new 70,000 square foot Commissary. As there is no significant electrical usage during construction of either the CE Complex or the BX and Commissary Complex, only the operational energy usage are analyzed for cumulative impacts.

Based on 24-hour operation of the BX and Commissary Complex, an estimated natural gas consumption of 99.05 Btu per square foot per day would be required, resulting in 18.3 MBtu per day, or 0.76 MBtu per hour (ANG, 1998). Using this same electricity usage rate, the total electricity required for the 9,000 square foot CE Complex buildings would be 0.891 MM Btu per day, or 37,143.24 kWh per hour. Combining this with the 2.2 MBtu per hour estimated to support the Proposed Action, base usage would increase by 3 MBtu/hour. This increase represents an approximate 0.01 percent over current basewide electricity usage. Therefore, the cumulative impact from implementation of the Proposed Action is not anticipated to negatively impact the electrical infrastructure at Buckley AFB.

4.5 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Unavoidable impacts would result from the implementation of the Proposed Action. However none of the impacts would be significant. The emission of air pollutants associated with construction activities would be an unavoidable condition, but is not considered significant. The loss of aggregate used for concrete, which would become inaccessible, would occur as a result of construction activities. However, the impact would be insignificant due to the small amount needed. Site grading during construction

would remove minimal vegetation. The use of nonrenewable energy resources is unavoidable, but the amount used would be insignificant.

4.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of "...any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects the use of these resources would have on consumption or destruction of a resource that could not be replaced in a reasonable period of time.

The irreversible environmental changes that could result from implementation of the Proposed Action include consumption of material resources, energy resources, and human resources.

Material resources used for the Proposed Action include building materials for construction, conduits for utilities, concrete for the antenna foundations, slabs, and sidewalks around the perimeter of the antennas. The materials that would be consumed are not in short supply and are readily available from suppliers in the region. Use of these materials would not limit other unrelated construction activities and, therefore, would not be considered significant.

Energy resources would be irretrievably lost. These include petroleum-based products such as gasoline and diesel fuel, natural gas, and electricity. During facility construction, gasoline and diesel fuel would be used for operation of equipment and other vehicles. Natural gas and electricity would be used in the units after they are completed. However, because these units would be more energy efficient than those being replaced, consumption of these resources would be expected to decrease. Consumption of these energy resources would not place a significant demand on their availability in the region. Therefore, no adverse impacts would be expected.

The use of human resources for facility construction is considered an irretrievable loss, only in that it would preclude such personnel from engaging in other work activities. However, the use of human resources for the Proposed Action represents employment opportunities and is considered beneficial.

4.7 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The site for the SBIRS antennas has been occupied by black-tailed prairie dogs. There are no short-term uses of the site. The Proposed Action and the No Action

Alternative would not affect long-term productivity of the environment since no significant environmental impacts are anticipated and natural resources would not be affected.

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SECTION 5
REGULATORY REVIEW AND PERMIT REQUIREMENTS

This section discusses regulatory requirements that would be applicable to the Proposed Action and No Action Alternative. A permit would be required to trap and relocate black-tailed prairie dogs prior to construction of the Proposed Action.

5.1 AIR QUALITY

Colorado Regulation No. 3, Section B (ii) requires any owner or operator conducting clearing or leveling activities of land greater than 1 acre in nonattainment areas for PM_{10} to use all available and practical methods that are "technologically feasible and economically reasonable" to minimize particulate emissions. Except as specifically authorized under Regulation No. 3, sources are exempt from general construction permits because by themselves, or cumulatively as a category, are deemed to have a negligible impact on air quality. Sources exempt from Air Pollution Emission Notice (APEN) are listed in Section II, Part A of Regulation No. 3. Disturbance of surface areas that do not exceed 25 contiguous acres and do not exceed 6 months in duration are exempt from APEN permit requirements (USAF, 2000).

Air quality issues at Buckley AFB were evaluated with respect to the following regulations and permits identified in Table 5.1.

Table 5.1 Regulations and Permits Associated with Air Quality

Regulation or Permit	Responsible Agency	Relevance to Proposed Action
Title V Permit	Colorado Department of Public Health & Environment (CDPHE), Air Pollution Control Division	Possibly Relevant. A stationary source such as a backup generator may require modifications to the current Buckley AFB Title V permit, if not considered an exempt source. Dependent upon CDPHE discretion.
Conformity Analysis	United Stated Environmental Protection Agency	Not Relevant. Results in total emission do not equal or exceed 10 percent of the air quality control area's emission inventory for any criteria pollutant.

5.2 THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Threatened, endangered, and sensitive species were evaluated with respect to the following regulations and permits identified in Table 5.2.

Table 5.2 Regulations and Permits Associated with Threatened, Endangered, and Sensitive Species

Regulation or Permit	Responsible Agency	Relevance to Proposed Action
Endangered Species Act of 1973	U.S. Fish and Wildlife Service	Evaluation for presence of, and effects to, federally-listed species
Migratory Bird Treaty Act of 1912	U.S. Fish and Wildlife Service	Evaluation of effects to migratory bird species (e.g., consideration of migrating burrowing owls)
Colorado Revised Statutes 33-2-105	Colorado Wildlife Commission (CDOW)	Evaluation of presence of, and effects to, state-listed species

5.3 NON-IONIZING ENERGY

There are no local Buckley AFB regulations that govern installation and use of electromagnetic energy producing devices. Applicable USAF regulations and guidance that apply are AFR 127-100, AFOSH Standard 161-9, AFOSH Standard 127-8, and Technical Order 31Z-10-4. However, all RF transmitter installations are reviewed for frequency compatibility and potential hazard impacts.

SECTION 6
LIST OF PREPARERS

Name	Degree	Professional Discipline	Years of Experience
Anthony Davis, P.E. Parsons Engineering Science	B.S., Civil Engineering	Project Manager, DOPAA RF Energy	24
Don Kellett Parsons Engineering Science	B.S., Wildlife Biology	Biological Resources	9
Rachey Peten Parsons Engineering Science	B.S., Environmental Engineering	Air Quality, Utilities	4
R.C. Wooten, Ph.D. Parsons Engineering Science	Ph.D., Ecology/Biology	Technical Review	31

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SECTION 7
LIST OF PERSONS AND AGENCIES CONSULTED

This section lists the individuals consulted during preparation of this supplemental EA.

7.1 FEDERAL AGENCIES

Buckley AFB, Colorado

Maj Steven Miller, SMC/MTSG
Mr. Gerald O'Brian, 821 SPTS/CEV
Ms. Elise Sherva, UNITEC

Los Angeles AFB, California

Mr. Theodore Krawczyk, SMC/AXFV
Mr. Daniel Park, SMC/AXFC

Peterson AFB, Colorado

Ms. Beth Gibeau, HQ AFSPC/CEVP
Mr. William Hume, 21 SW/JA
Mr. Stan Rogers, HQ AFSPC/CEVP

U.S. Fish and Wildlife Service Ecological Services Field Office

Robert Leachman, Senior Staff Biologist
U.S. Fish and Wildlife Service
Grand Junction, CO

7.2 STATE AGENCIES

Roger Crawford, Law Enforcement Branch
Colorado Division of Wildlife
Denver, CO

7.3 OTHERS

Stewart Breck, Wildlife Ecologist
Colorado State University
Fort Collins, CO

Jan-W. Briede, Senior Project Manager
Geo-Marine, Inc.
Newport News, VA

Mr. Charles Griffice, Ph.D
The Aerospace Corporation
El Segundo, CA

SECTION 8
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT MAILING LIST

8.1 FEDERAL AGENCIES

U.S. Environmental Protection Agency
Region 8
999 18th Street, Suite 500
Denver, CO 80202
Attn: Cynthia Cody, NEPA Unit Chief

U.S. Fish and Wildlife Service
Colorado Regional Office
Box 25486
Denver, CO 20590
Attn: Lee Carlson, State Supervisor

8.2 LOCAL AGENCIES

City of Aurora
1470 South Havana
Suite 608
Aurora, CO 80012
Attn: Denise Balkas, Director of Planning
Attn: Jim Ives, Environmental Division
Attn: Mac Callison, Traffic Division

8.3 STATE AGENCIES

Colorado Department of Public Health and Environment
4300 Cherry Creek Drive, South
Denver, CO 80246-1530
Attn: Mark Kadnuck

Colorado Division of Wildlife
6060 South Broadway
Denver, CO 80216
Attn: Eliza Moore, Wildlife Manager

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SECTION 9
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Aerospace Corp., 2001. *SBIRS Antenna Study Results*, prepared by Charles P. Griffice, Ph.D., Senior Project Engineer, Systems Engineering Directorate, The Aerospace Corporation, El Segundo, California, January 26, 2001.

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ANG, 1996. Air National Guard, *Environmental Assessment of Proposed Construction at Buckley Air National Guard Base,* Colorado Air National Guard, Aurora, CO, December.

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Ortega, 2001. Personal communication between Ms. Mary Ortega, Base Operations, Buckley AFB, and Anthony Davis, Civil Engineer, Parsons Engineering Science, Inc., Austin, Texas, on January 30, 2001.

RAQC, 2000. Regional Air Quality Council (RAQC), 2000. *PM-10 Redesignation Request and Maintenance Plan for the Denver Metropolitan Area*, Denver Regional Air Quality Council, December 2000.

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Sherva, 2001b. Information provided by Elise Sherva, 821st SPTS/CEV UNJTEC, on January 10, 2001.

Tipton, 2001. Personal communication between Brenda Tipton, Budget Analyst, 821 SPTS/CER and Rachey Peten, Environmental Engineer, Parsons Engineering Science, Inc. Austin, Texas, January 22, 2001.

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APPENDIX A
AIR FORCE FORM 813
ENVIRONMENTAL IMPACT ANALYSIS

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REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS	*Report Control Symbol* *RCS:*

INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).*

SECTION I - PROPONENT INFORMATION

1. TO *(Environmental Planning Function)*	2. FROM *(Proponent organization and functional address symbol)*	2a. TELEPHONE NO.
821st SPTG/CEV	Major Steve Miller SMC/OL-AD MTSG	DSN 877-5400

3. TITLE OF PROPOSED ACTION

Mission Control Station (MCS) antenna construction, installation and operation for the Space Based Infrared System (SBIRS)

4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)*

See attached sheet for details

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)*

See attached sheet for details

6. PROPONENT APPROVAL *(Name and Grade)*	6a. SIGNATURE	6b. DATE

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental effects including cumulative effects.) (+ = positive effect; 0 = no effect; − = adverse effect; U = unknown effect)*				
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*				
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.) Note: potential fugitive dust with construction*				
9. WATER RESOURCES *(Quality, quantity, source, etc.)*				
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity -distance, etc.) potential radiation.*				
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)*				
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, flora, fauna, etc.)*				
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*				
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)*				
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)*				
16. OTHER *(Potential impacts not addressed above.) Visual Resources*				

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

7.	☐	PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR
	☐	PROPOSED ACTION DOES NOT QUALIFY FOR CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS		
19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)* GERALD O'BRIAN, GS 12	19a. SIGNATURE	19b. DATE

AF FORM 813, AUG 93 *(EF-V1)* *(Computer Generated)* THIS FORM CONSOLIDATES AF FORMS 813 AND 814.

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4.0 PURPOSE AND NEED FOR ACTION

4.1 Purpose of the Action:

The Space and Missile Systems Center (SMC) Space Based Infrared Systems Directorate (SBIRS), proposes to erect two radio frequency antennas (SB1 and SB2) as part of the SBIRS High Geosynchronous Satellite Program and three radio frequency antennas as part of the SBIRS Low Earth Orbit (LEO) Satellite Program. These antennas would be part of the SBIRS Mission Control Station (MCS) facility on the western side of Buckley AFB, Colorado. This document describes the antenna installation actions only, which are supplemental to two previously written Environmental Assessments (EA's) referenced below (ref. 1 and 2). The SBIRS Mission Control Station (MCS) site has been previously analyzed in an EA with a Finding of No Significant Impact (FONSI) completed by the Environmental Protection Committee at Buckley ANGB on 12 April 1996. The two GEO antenna, SB1 and SB2, are enclosed in radomes. SB1 and SB2 are capable to transmit and receive data and would be constructed on radome foundations, with grounding and signal duct banks to interface with the cable duct bank attached to the MCS facility. The other LEO antennas are to be erected at the same location in the future and should be addressed in future EIAP actions when their operating parameters have been established.

4.2 Need for the Action:

All of the proposed antennas are to be used to receive data for use by the Ground Terminal Element Segment (GTES) part of the MCS to accomplish the four SBIRS missions. As stated above, SB1 and SB2 have transmitter and receive capabilities, whereas the three LEO antennas need future operating parameter definition. The SBIRS missions include enemy missile warning, missile defense, technical intelligence and battlespace characterization. As covered in the EA of 1996 (ref. 1), these missions are vital to the early warning capability for the U. S. national defense system of the future. As stated above, all of the radio frequency antennas are an integral part of the MCS, which are to be utilized by SBIRS personnel. The MCS facility and its associated antennas are to be used by the SBIRS GEO Ground Segment team with unique assets to provide a highly capable, cost effective, low risk satisfaction of the SBIRS mission. SB1 and SB2 are to be capable of both transmitting data and receiving data from the future SBIRS geosynchronous orbit (GEO) satellites as well as the Defense Satellite Program (DSP) fly-out satellites. The MCS and associated antennas will allow consolidation of three DSP operational sites and associated communication networks into a fully integrated ground segment that fuses all IR data collected from space with other data to optimize performance

for all SBIRS missions. When fully operational, the SBIRS LEO satellites will provide data to the LEO antennas that can be fused with SBIRS GEO satellite data from SB1 and SB2 and processed by the GTES MCS.

5.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The Space Based Infrared System (SBIRS) is a team of government and industry professionals providing the nation a space based surveillance capability that has been vital to U.S. defense over the past 30 years. The Defense Support Program (DSP), fielded in 1970, with antenna already located on Buckley AFB, has evolved into its next-generation Space Based Infrared High and Low systems that are intended to meet nuclear threats predicted for the new century.

5.1 Proposed Action:

Figure 1 shows Buckley AFB and its vicinity to Denver, Colorado. Figure 2 shows the planned locations of the new MCS antenna on Buckley AFB. Figure 3 shows the planned locations of SB1, SB2 and the possible future location of three LEO antennas adjacent to SB1 and SB2. Note that the SBIRS Mission Control Station (MCS) is located just east of the proposed site for SB1 and SB2 as well as the three LEO antennas. The MCS complex (including antennas) are located on the western side of Buckley AFB as shown in Figure 1. The details of the utility connections are shown in Figure 4. The SB1 and SB2 antenna radome structure is shown in Figure 5.

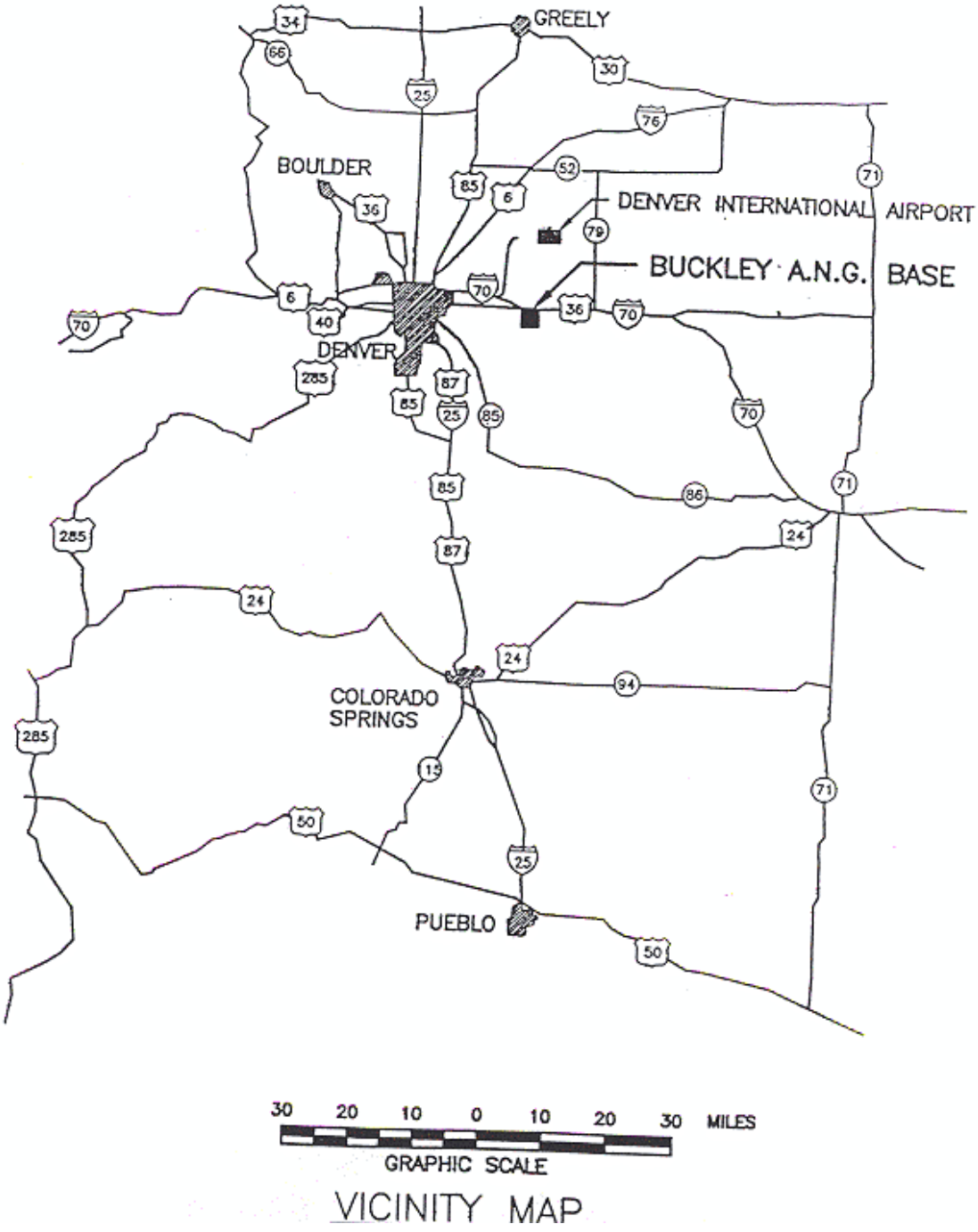

Figure 1 - Buckley AFB Near Denver, Colorado

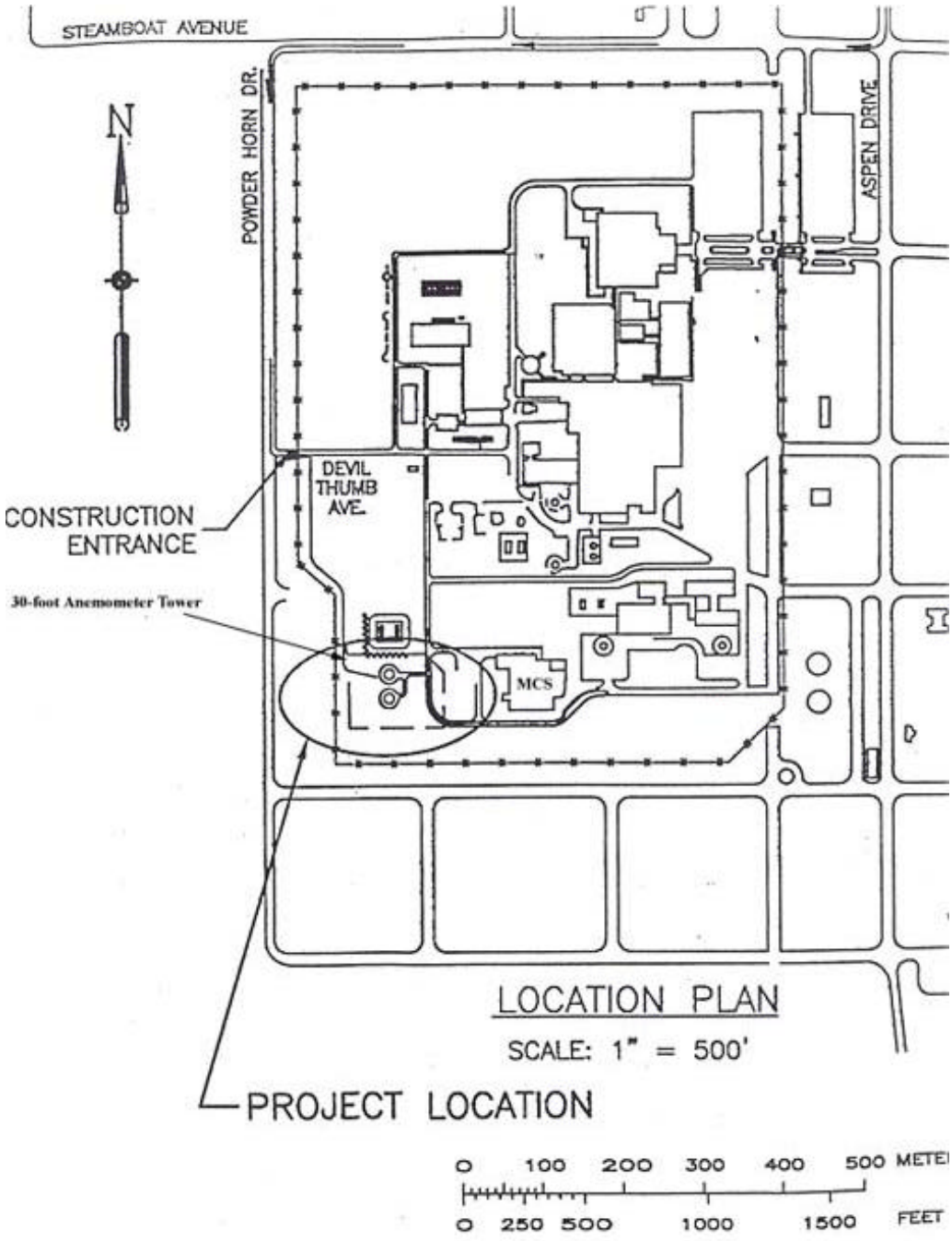

Figure 2 - Site Location for MCS Antenna

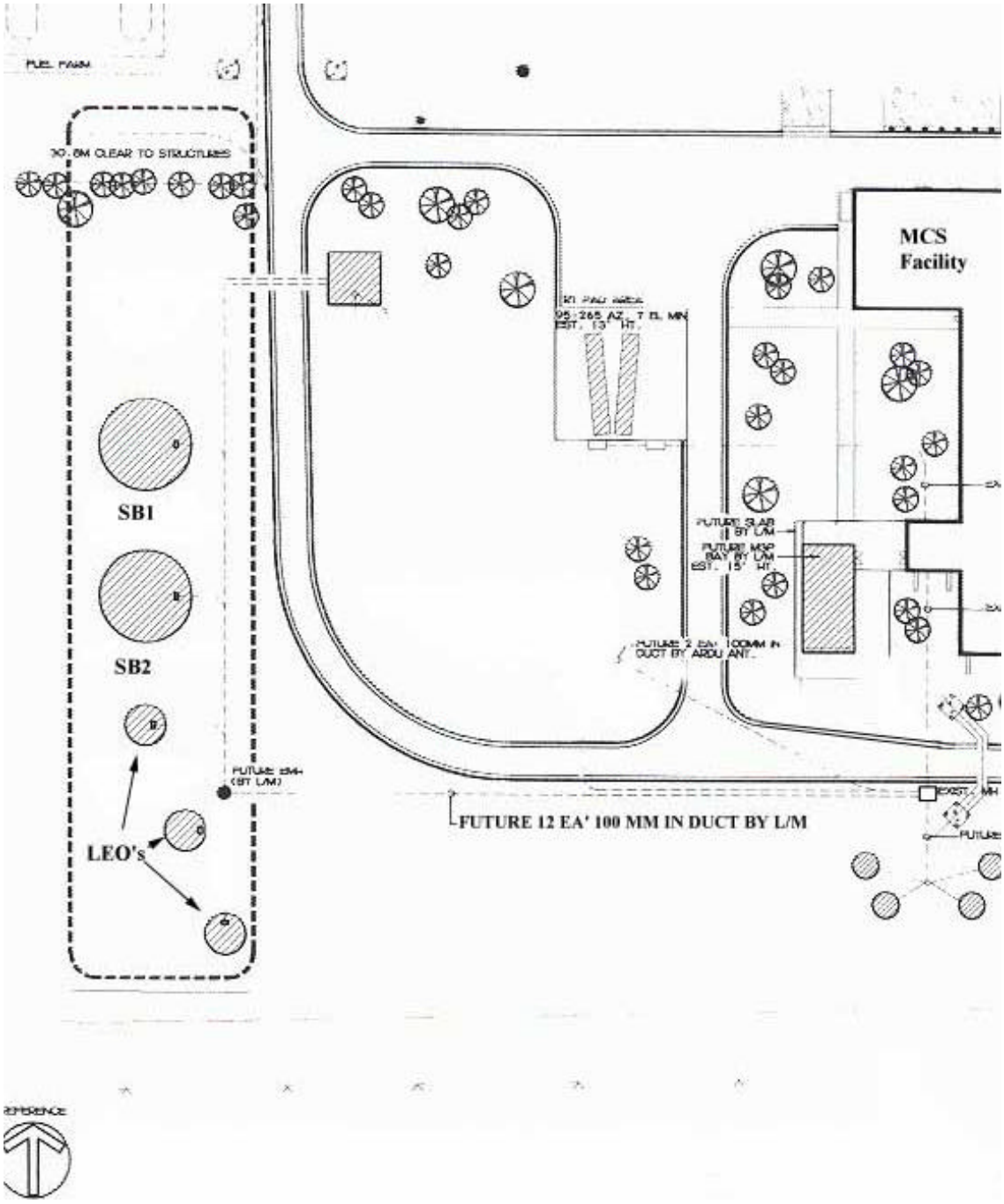

Figure 3 - Antenna Siting of SB1, SB2 and Three (possible) Future LEO Antennas

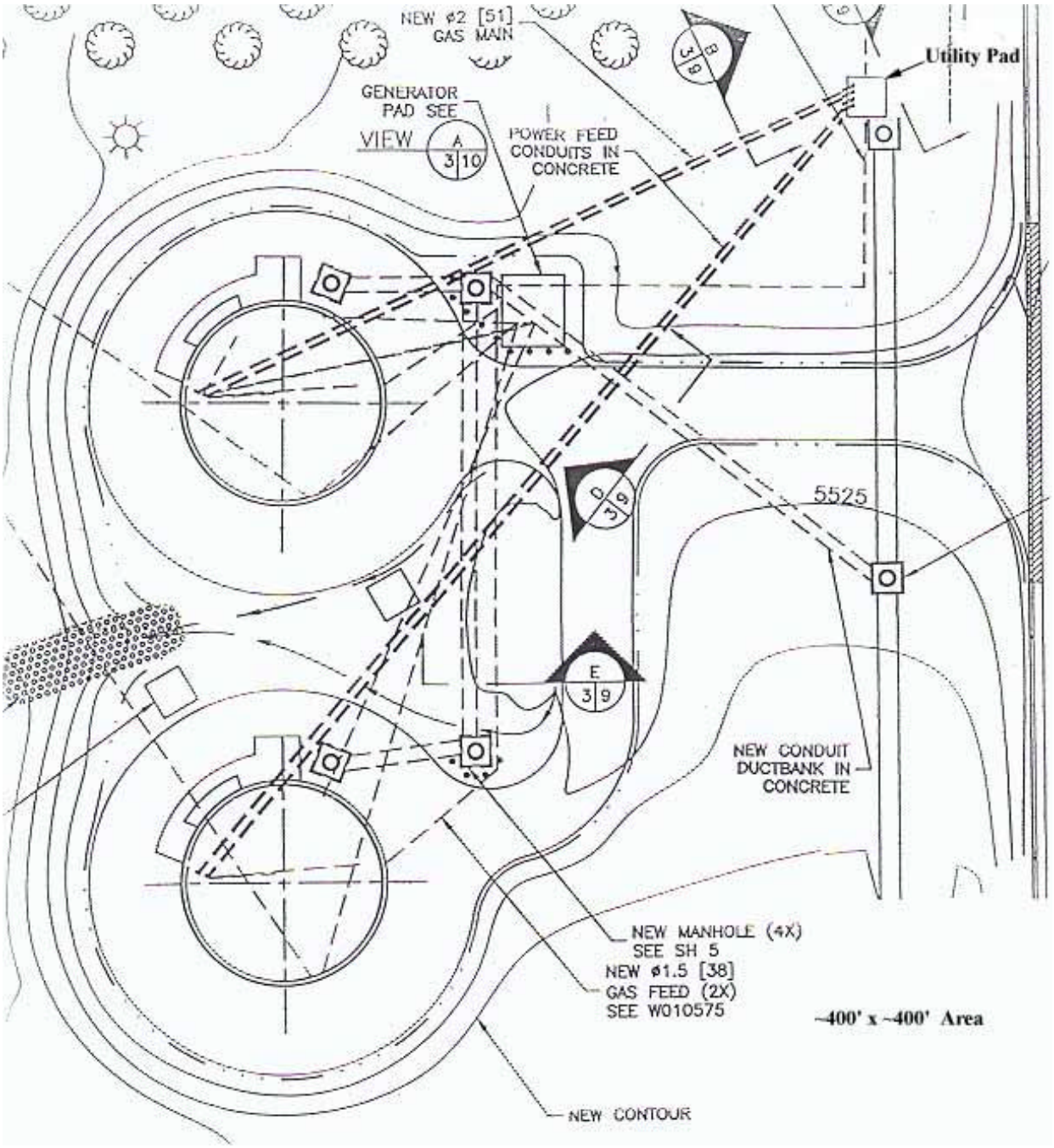

Figure 4 - SB1 and SB2 Site Utilities

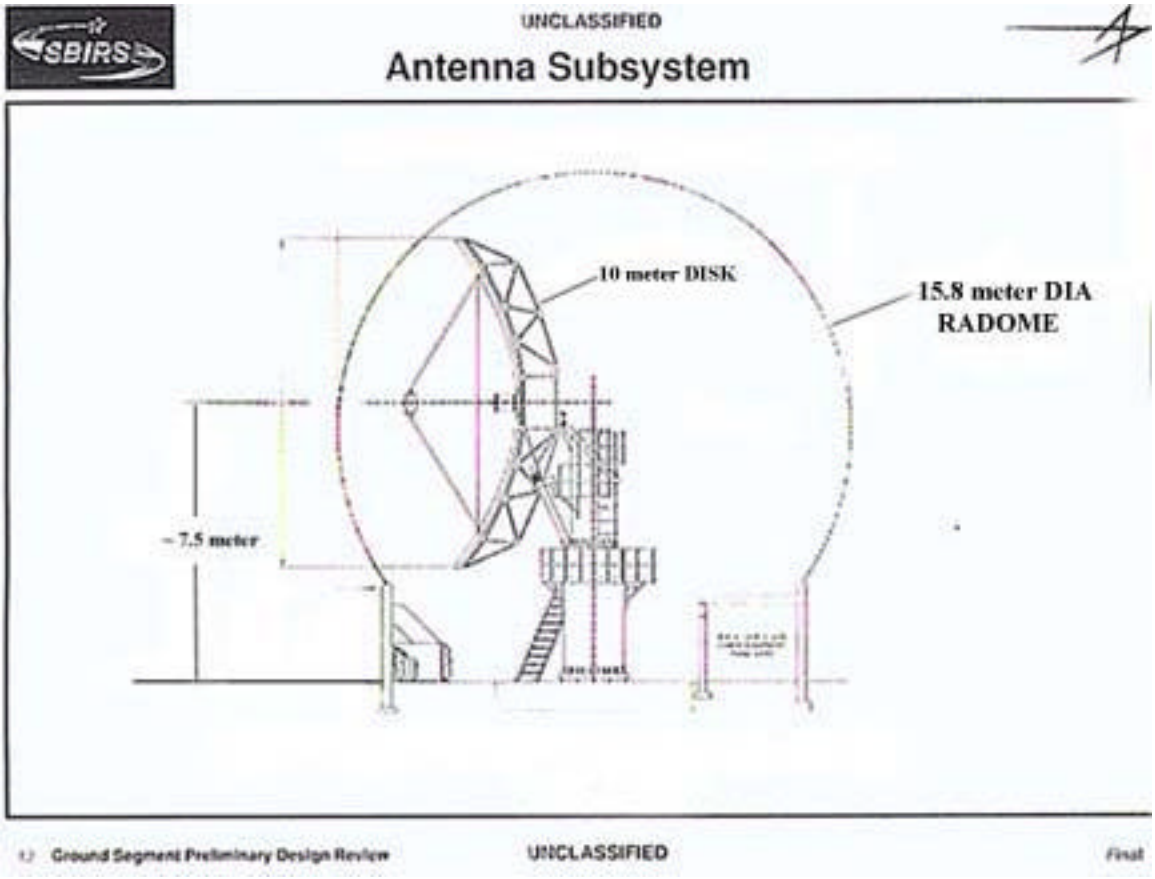

Figure 5 - SBIRS SB1 and SB2 Antenna Radome

5.1.1 SB1 and SB2 Scope

The antenna facilities are to be designed, erected and checked out by the Relay Ground Station (RGS) contractor -- a Lockheed Martin Corporation team. This RGS contractor will construct the antennas and radomes in the location described above with the government extending power, gas, alarms, and other necessary site infrastructure as described below.

5.1.2 Antenna Land Use and Infrastructure/Utilities:

SBIRS proposes the construction of SB1 at coordinates 2202796.72 E, 686155.54 N and SB2 at coordinates 2202796.72 E, 686055.54N. The physical facility requirements as presented in this section describe two ten meter diameter antenna that are inside fifty-two (52) foot air-supported radome structures with related electronic equipment as shown in Figure 5. Also shown in Figure 5 is the location of the antenna beam center designed to be approximately 25 feet above the antenna base. In addition, there will be three small SBIRS low antennas erected in the future at the same general MCS location as shown in Figure 3. These three smaller antennas will be constructed on concrete pads approximately 10 feet by 10 feet.

The location of all of these antennas is in an area that is approximately 400 feet by 800 feet west of the MCS as shown in Figure 3. As with the recent MCS construction, the antennas' site has been previously disturbed for construction of WW I and WW II barracks facilities. All external electrical and utility interface connections to these antenna facilities are underground to the maximum extent possible. The detailed locations of these utilities are shown in Figure 4. The construction of the foundation for SB1 and SB2 is, at this point in time, is expected to follow the following schedule:

17 July 99 - Design of Foundation Complete

1 Aug 99 - Final Facility Interface Control Documentation

1 Dec 00 - Start Antennas Foundation Construction

1 July 01 - Complete Antennas Foundation Construction

15 August 01 - Complete Antennas Construction

In addition to Figure 4, the utility connections for the antenna foundations are more fully described in the table below:

Interface	Distance from Utility Source to Antenna	Reference	Comment
Electrical	150 ft.	East - Northeast of Antenna SB1. Stub four conduits (4 inch) to west for low voltage switches for each antenna.	GFE power shall be available at the cold side of breakers in cross-tied panels for SB1 and SB2 Utility and Technical supplies.

Interface	Distance from Utility Source to Antenna	Reference	Comment
Gas Line	150 ft.	East - Northeast of Antenna SB1.	Gas supply line shall be sized to provide the quantity required without pressure loss in the system.
Inter-Facility Link (IFL) cable duct	110 ft.	East of Antenna SB1	Manhole at interface shall be GFE.
Alarms	As Installed	Inside Radomes	GFE alarm installation planning shall be coordinated to eliminate conflicts with electrical furnishings installation.

5.1.3 Airspace and Air Quality:

Fugitive dust from ground disturbing activities and combustion emissions from construction equipment would be generated during the construction of the foundation and entrances to SB1 and SB2. The size of this site is approximately 400 feet x 400 feet as shown in Figure 4.. It is expected that there will be minimal fugitive dust generated from site clearing, grading, cut and fill operations, and from vehicular traffic moving over the disturbed site. These emissions would be greatest during the initial site preparation activities and would vary from day to day depending on level of activity and prevailing weather conditions. During the initial construction operations, water will be sprayed on the ground to minimize fugitive dust generation. During the operation of the antennas, no gases or other air pollutants are expected to be generated at this site.

5.1.4 Land Use and Infrastructure/Utilities:

The following equipment will be used with the construction area for approximately eight months:

1. Temporary utility power, 208/120 Vac, 3 phase, 60 Hz, 30 kW.

2. Wire fencing for use as "Free Zone" boundary, quantity to be limited to that which needs to be specified.

3. Three telephone/fax connections for the RGS contractor supplied office trailer.

5.1.5 Socioeconomics and Environmental Justice:

The ROI for socioeconomics activities at Buckley Air Force Base is the Denver metropolitan area that includes the five counties of Adams, Arapahoe, Denver, Douglas and Jefferson. The baseline socioeconomics environment is described fully on pages 3-9 through 3-14 of the *Environmental Assessment (EA) for Buckley Air National Guard Base Realignment* (ref. 4). The antenna site will not be manned by any personnel and will only be maintained by a small number of personnel.

The ROI for Environmental Justice has also been reported in the Environmental Assessment referenced above. As described in the EA, on 11 Feb 94 President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.* The purpose of this order is to avoid the disproportionate placement of any adverse environmental or economic impacts from a proposed action on minority and low-income populations. The EA baseline analysis has shown zip code 80239 to have a disproportionately high minority population.

5.1.6 Visual and Aesthetic Resources:

In addition to the two radomes that enclose SB1 and SB2, there is to be a freestanding anemometer tower erected for the antenna pressurization control system. The RGS Contractor provides this 30-foot tower and is located approximately 130 feet northwest of the center of SB1 shown in Figure 2. The Inter-Facility Link (IFL) provides signal cable access between the antennas and the MCS. The IFL consists of six each four inch diameter schedule 40 PVC conduits encased in reinforced concrete. Three conduits are used for each antenna with a pull line. The IFL will interface with the duct bank located on the west side of Eldora Road at a manhole located east of SB1 as shown in Figure 3.

5.1.7 Public Health and Radiation Safety:

The two new antennas, SB1 and SB2, transmit radio frequency (RF) emissions in the non-ionizing portion of the electromagnetic energy spectrum. There are three safety hazards associated with this type of energy – personnel hazard, accidental fuel ignition/combustion hazard and accidental ordinance ignition hazard. In the case of personnel hazards, high power transmitting RF fields can be potentially debilitating by causing heating to human eyes and gonads. The radiation guidelines for the personnel hazard as well as the other two hazards are more fully described in T.O. 31Z-10-4, *Electromagnetic Radiation Hazards*, IEEE c95.1, *Standard for Safety Levels*, and AFM 91-201, *Explosive Safety Standards*. The Joint Spectrum Center, an active participant in SMC's and other government groups' spectrum management

activities, for the antennas SB1 and SB2 conducted a recent study funded by the SBIRS Program Office. The results of the study showed that none of the above safety hazard guidelines would be violated for the SBIRS proposed action of installing and operating SB1 and SB2. The details of this study are in a report which has been verified by Capt. Michael Brox, SMC/MT. Capt. Michael Brox also has a memo stating the environmental compliance of SB1 and SB2 to radio frequency emission guidelines. In addition, the Aerospace Corporation has performed a study that shows the energy hazard areas for SB1 and SB2. Figure 6 shows the Aerospace energy hazard simulation geometry scenario. Power density levels along the antenna axis, along the antenna rim and 6 feet above the ground have been calculated and are shown in figure 7. In these plots as well as results from a similar contractor study (see attached), the power density levels are 3 mW/cm^2 or less. In locations around SB1 where there will be personnel, the power density level is less than 1 mW/cm^2. As stated in the attached JSC memo, no energy hazard, cumulative or otherwise, is expected to be created by constructing SB1 or SB2. This has been confirmed by the other two independent studies as well.

Since the SBIRS low antenna will further define its operating parameters over the next few years, there needs to be a continued examination of the potential RF energy hazards at the MCS antenna site.

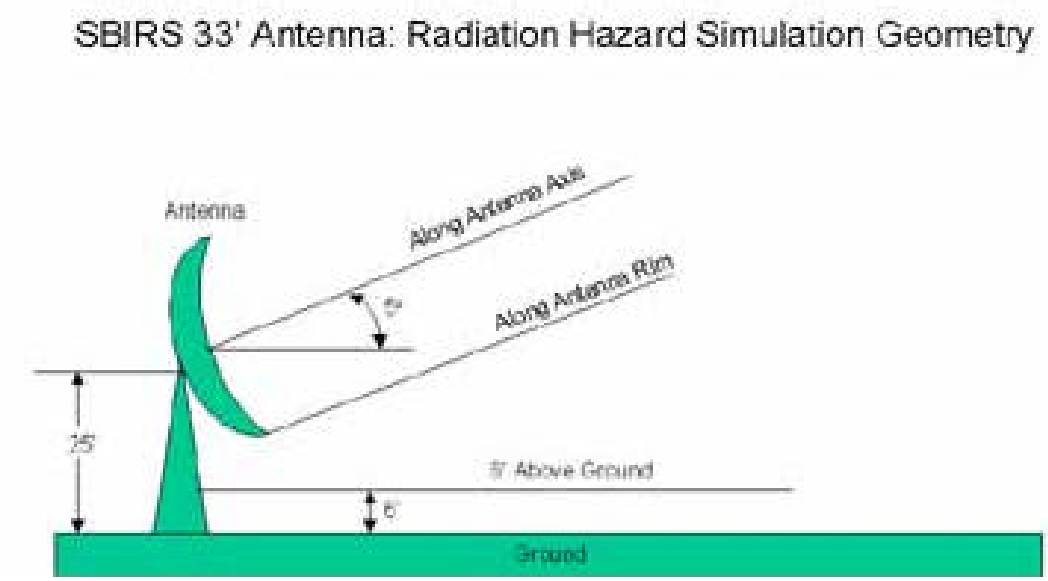

Figure 6 - SB1 and SB2 Rad Hazard Simulation Geometry

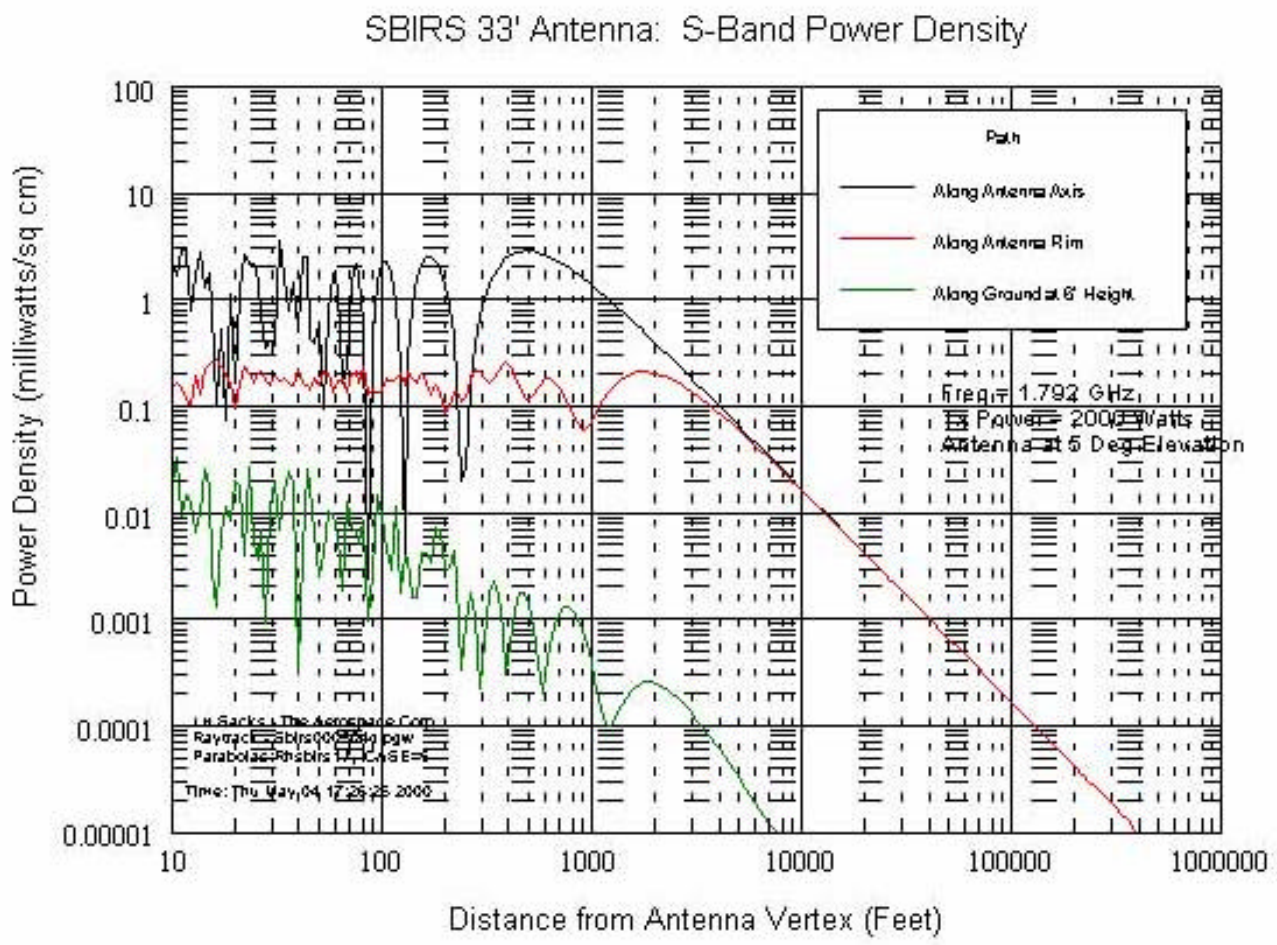

Figure 7 - SBIRS Energy Power Density Curve

5.2 Supporting Documents:

Reference 1. *Environmental Assessment, Space Based Infrared System (SBIRS) Mission Control Station for Defense Support Program Consolidation*; United States Air Force Headquarters Space and Missile Systems Center, Buckley ANGB, Colorado; April 1996.

Reference 2. *Overview Environmental Assessment for Space Based Infrared System (SBIRS);* United States Air Force Headquarters Space and Missile Systems Center; January 1997.

Reference 3. *The MCS Facility Installation Standard*, 29 Mar 98, P457038

Reference 4. *Environmental Assessment (EA) for Buckley Air National Guard Base Realignment,* prepared for U. S. Air Force Space Command by the Headquarters Air Force Center for Environmental Excellence Environmental Analysis Division, Brooks Air Force Base, TX in September 2000.

5.3 No Action Alternative:

The only alternative identified would be to allow the MCS to operate only with the existing DSP antennas. The environmental impact from the No Action Alternative, which is not to build the antennas for the MCS, is expected to be similar to the Proposed Action, which has insignificant environmental impact.

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APPENDIX B
SBIRS ANTENNA STUDY RESULTS
BY THE AEROSPACE CORPORATION

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Appendix B - SBIRS Antenna Study Results

B.1 NON-IONIZING ENERGY HAZARDS

Radio frequency (RF) electromagnetic energy is generated by satellite communications equipment located within the 2 SWS facility at Buckley AFB. This section describes the RF equipment and potential impacts associated with the two new SBIRS communications antennas, SB1 and SB2, proposed to be constructed at the locations on Buckley AFB shown in Figures 1 and 2. The existing antennas would be used for communication with satellites on an interim basis and ultimately would be replaced by the SBIRS satellite communication system using the SB1 and SB2 antennas associated with the SBIRS MCS. Although plans for future SBIRS LEO antenna construction near the MCS are not final, their environmental impact will also be discussed.

B.2 Construction of SB1 and SB2 and Future LEO Antennas

The two new SBIRS "high" antennas, to be constructed at the locations shown in Figure 1, transmit RF emissions in the non-ionizing portion of the electromagnetic energy spectrum. There are three safety hazards associated with this type of energy: personnel hazards, accidental fuel ignition/combustion hazards, and accidental ordnance ignition hazards. The RF emission power levels required for fuel ignition/combustion are much higher (5000 mW/cm^2) than can be achieved by *any* of the antennas studied.

In the case of personnel hazards, high-power transmitting RF fields can be potentially debilitating by causing heating to human eyes and gonads. Accidental ordnance ignition hazard and other RF interference (RFI) hazards can cause safety hazards to electrical explosive devices. The radiation guidelines for these energy hazards (RADHAZ) are more fully described in T.O. 31Z-10-4, *Electromagnetic Radiation Hazards*, IEEE c95.1, *Standard for Safety Levels*, and AFM 91-201, *Explosive Safety Standards*. The RADHAZ level of safety is time- and frequency-sensitive. For short-duration exposures, the lower threshold, below which personnel are considered safe from a nonionizing RADHAZ, is 10 mW/cm^2. However, the "worst case" lower limit for continuous (24 hours/day, 7 days/week) exposure to all areas of the body or to any type of electrically activated explosive devices is 1 mW/cm^2.

SBIRS proposes the construction of SB1 at coordinates 2202796.72 E, 686155.54 N and SB2 at coordinates 2202796.72 E, 686055.54N. The physical facility requirements,

as presented in AF Form 813, include two ten-meter (33-foot) diameter antennas that are inside fifty-two (52) foot, air-supported radome structures with related electronic equipment, as shown in Figure 2. Also, shown in Figure 2, is the location of the antenna beam center, which is designed to be approximately 25 feet above the antenna base. In addition, there will be three small SBIRS low antennas erected in the future at the same general MCS location as shown in Figure 3. These three smaller antennas will be constructed on concrete pads approximately 10 feet by 10 feet. For this assessment, these antennas are to have the specifications ascribed to LEO-1, LEO-2 and LEO-3 shown in table 1 below.

Antenna Location	Antenna Diameter (feet)	Transmit Frequency (GHz)	Transmit Power (Watts)	Maximum Operational Time (days/wk, hours/day)	Minimum Operational Elevation Angle (degrees)
LEO1	10	45	20	7 days/wk, 24 hrs/day	5
LEO2	10	45	20	7 days/wk, 24 hrs/day	5
LEO3	10	45	20	7 days/wk, 24 hrs/day	5
D1	60	1.8	5000	7 days/wk, 24 hrs/day	5
D2	60	1.8	5000	7 days/wk, 24 hrs/day	5
D3	33	Receive - only	2000	Backup	N/A
SB1	33	1.8	2000	7 days/wk, 24 hrs/day	5
SB1	33	45	20	7 days/wk, 24 hrs/day	5
SB2	33	1.8	2000	7 days/wk, 24 hrs/day	5
SB2	33	45	20	7 days/wk, 24 hrs/day	5

Table 1. SBIRS Antenna Operational Parameters

The antenna facilities for SB1 and SB2 would be designed, erected and checked out by the Relay Ground Station (RGS) contractor -- a Lockheed Martin Corporation team. The RADHAZ has already been assessed by this contractor with a study concluding that there would be no personnel or RFI RADHAZ introduced into the Buckley environment. In addition, two recent RADHAZ studies of antennas like SB1 and SB2 have been conducted by the Joint Spectrum Center; 120 Worthington Basin, Annapolis, MD, 21402-5064. The Joint Spectrum Center studies also concluded that there will be no unacceptable personnel or RFI RADHAZ introduced by the construction of SB1 and SB2.

Using the parameters in Table 1, the results of a recent Aerospace simulation are given below.

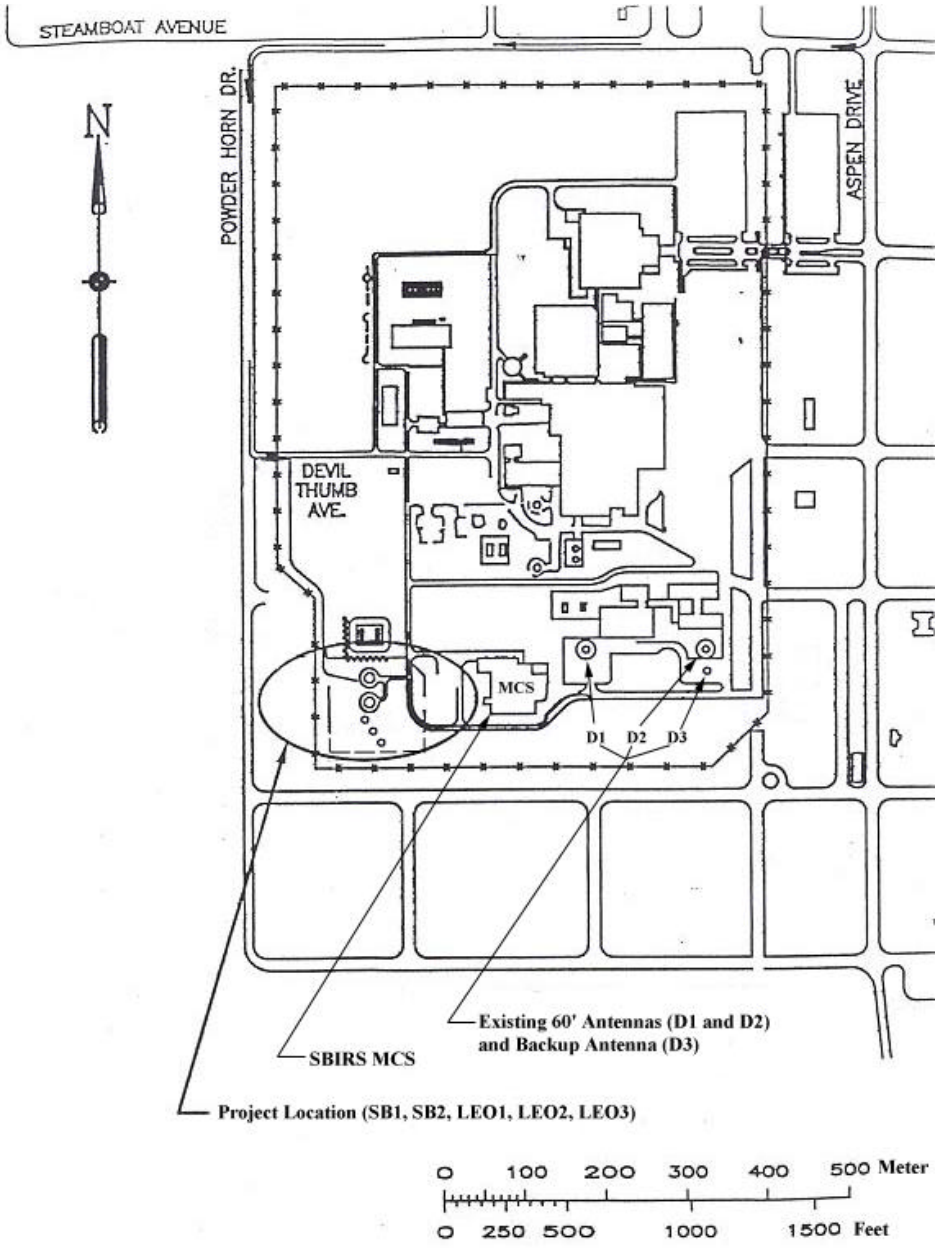

Figure 1. SBIRS GEO/LEO and DSP Antennas

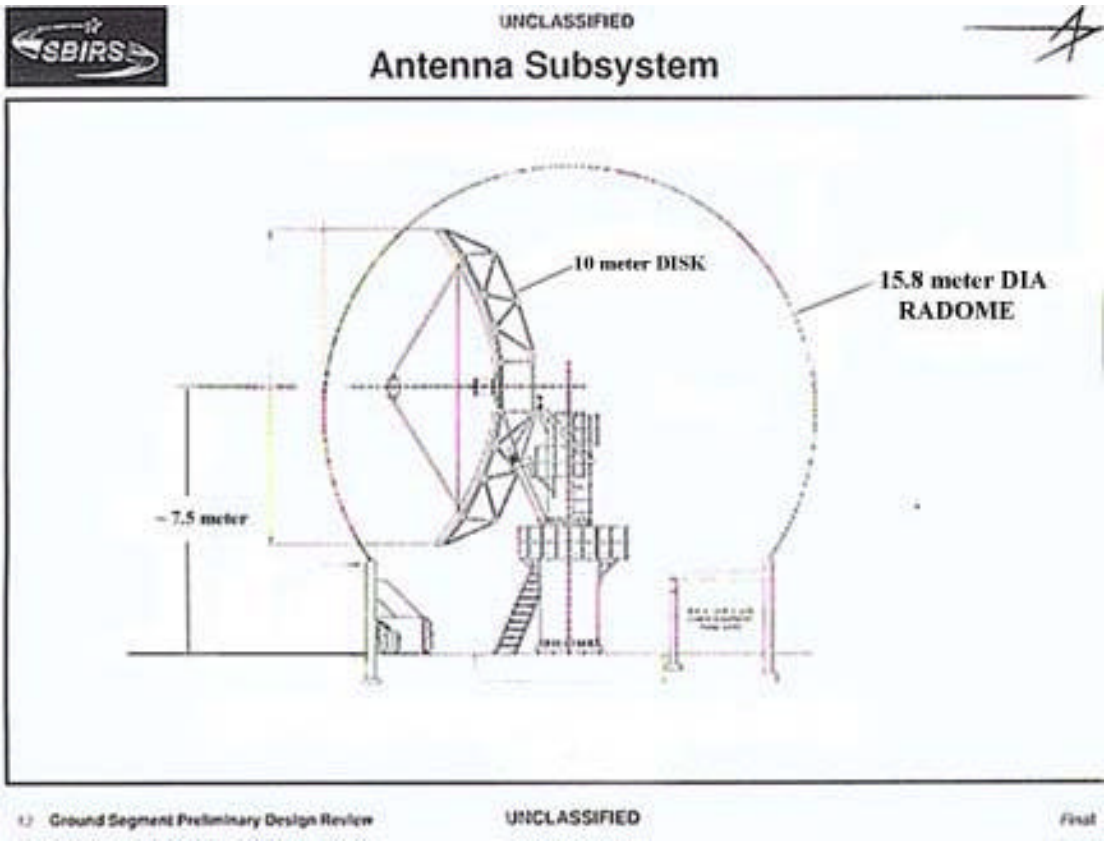

Figure 2 - SBIRS SB1 and SB2 Antenna Disk and Radome

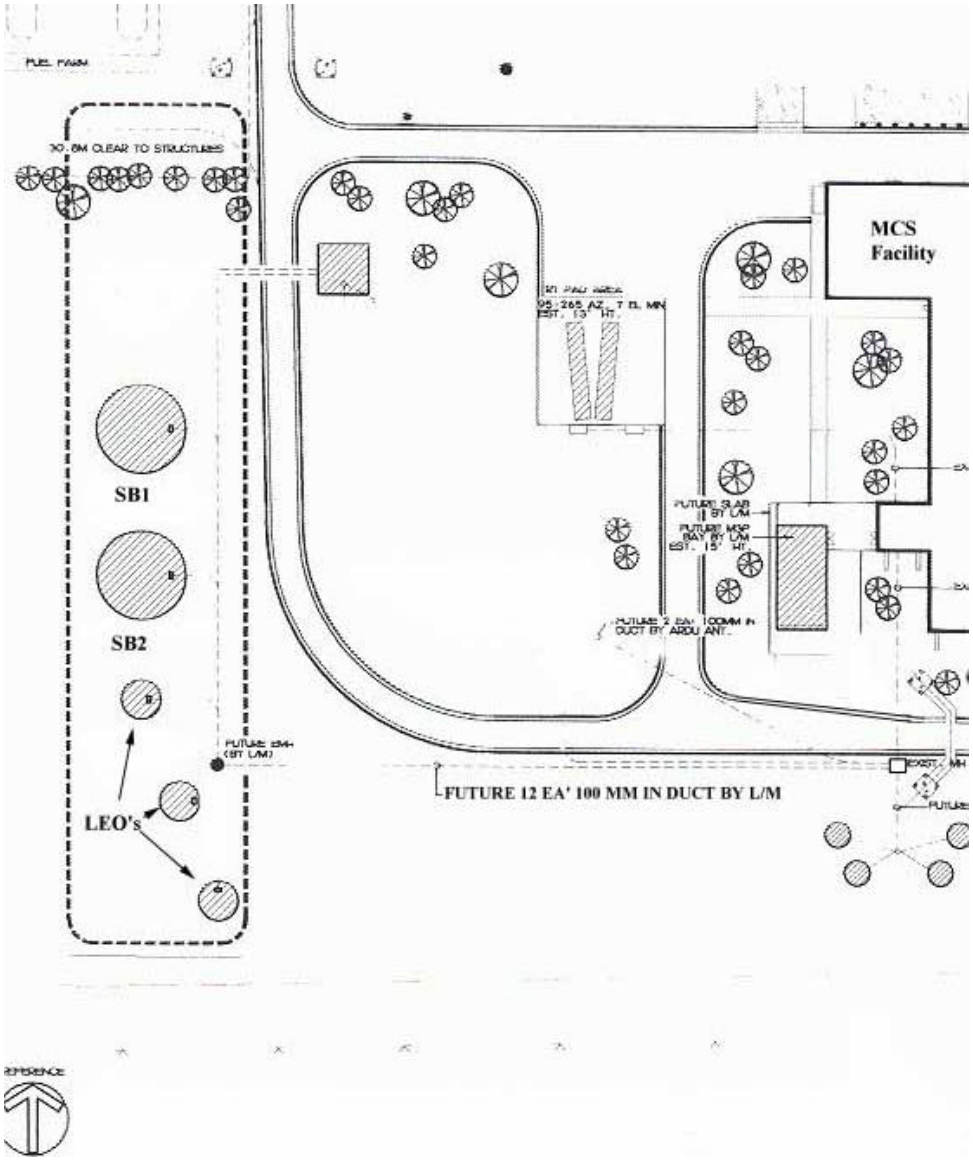

Figure 3 - Antenna Siting of SB1, SB2 and Three Future LEO Antennas

B.3 - SBIRS and DSP Antenna Comparisons

An alternative to the primary option described above, would be to allow the MCS to operate only with the existing antennas D1, D2 and D3. This would require modifications to D1, D2 and D3, or in other words, to not construct SB1 and SB2 or the future LEO antennas. This option is not realistic because the new SBIRS High satellites will need SB1 and SB2 as a requirement for operation. Nevertheless, the environmental RADHAZ impact from this option is expected to be similar to the action discussed in AF Form 813, and as described in this section. The Aerospace Corporation has performed a study that shows the RADHAZ for SB1 and SB2 compared to the existing D1, D2, and D3 (D3 is a receive-only, backup antenna), shown in Figure 1. This study also shows preliminary expected values from the LEO antenna even though these antennas are several years away from being designed and constructed. As shown below, there currently are no RADHAZ associated with D1, D2 and D3 and none is expected from the construction and operation of SB1, SB2, LEO1, LEO2, and LEO3.

Figure 4 shows the Aerospace RADHAZ simulation geometry for examining the antennas. The simulated plots shown in Figures 5 and 6, show power density levels along three geometrical paths. The first path is along the antenna axis centerline, the second is extending away from the antenna rim, and the third is six feet above the ground in the direction the antenna is pointing. This latter configuration assumes a "worst case two-dimensional pointing angle" condition. This condition is defined as the case where the antenna is pointed at its lowest elevation angle of 5º degrees above the horizon. This is the "worst case" in the sense that it delivers the most power to the ground as is possible. In actual operation, the antenna will deliver less power to the ground than this "worst case" because it will be pointed at an angle higher than 5º degrees.

In comparing Figures 5 and 6 several conclusions can be reached. First, the curves plotted in green on both figures refer to S-Band energy power density levels predicted six feet above the ground around each antenna at distances given in feet from the antenna. Note that the "green path" power density levels (ground values) are very similar for SB1/SB2 (Figure 5) and D1/D2 (Figure 6) as the energy emanates away from the vertex of the antenna. More importantly, note that these levels are more than 100 times below the "worst case" allowable RADHAZ exposure levels of 1 mW/cm^2 at all ground locations around the MCS.

Second, the red plots in Figures 5 and 6 show power levels at the beam edge or along the rim of a vector extending out from the rim of the antenna as shown in Figure 4. These power levels are also below 1 mW/cm^2 and are power levels that

will be reached only at significant heights above the ground. Also note that as the distance away from the antenna vertex increases, the height also increases, as shown geometrically in Figure 4.

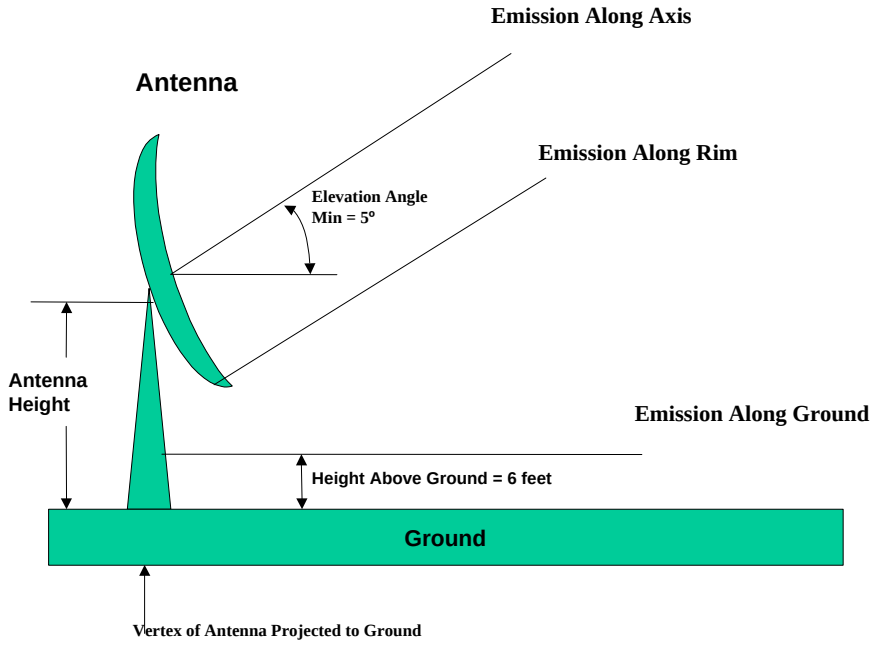

Figure 4 - Antenna Calculation Geometry

Third, the black plots in Figures 5 and 6 show the maximum power levels reached in the center portion of the beam. For the action discussed in AF Form 813, all S-Band power levels are below 10 mW/cm^2 at all distances from the vertex of the antenna. This is not currently true for D1 and D2 which go up to approximately 10 mW/cm^2 in the center of the beam at distances less than 100 feet. This does not imply that any unacceptable hazards exist from D1 or D2, but demonstrates that SB1 and SB2 generate a safer energy power level along the beam axis, one that is lower than the D1 and D2.

Figures 7 and 8 show the power levels of the future SBIRS LEO antennas using Q-band transmit powers listed in Table 1. Figure 7 shows that in all parts of the transmit beam, SB1 and SB2 are below 1 mW/cm^2 and cannot introduce a RADHAZ. Figure 8 shows that in the main beam portion of LEO1, LEO2 and LEO3 out to a distance of 50 feet, there are small excursions above 1 mW/cm^2. These areas must be controlled access for future LEO operations to minimize environmental impact. Outside of the 50-foot area, the SBIRS LEO antennas introduce no RADHAZ environmental risk.

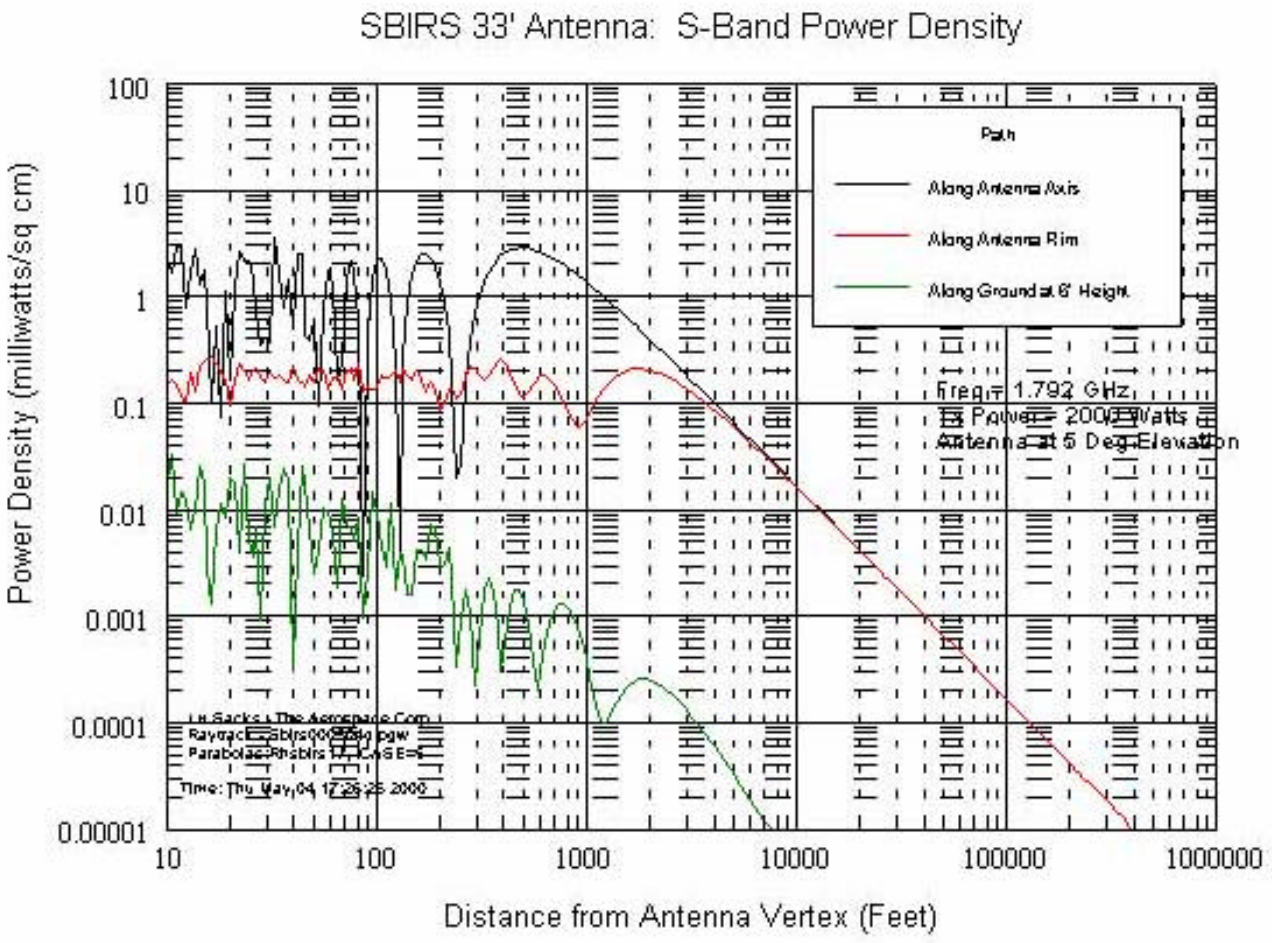

Figure 5- RF Power Density Levels From S-Band SB1/SB2

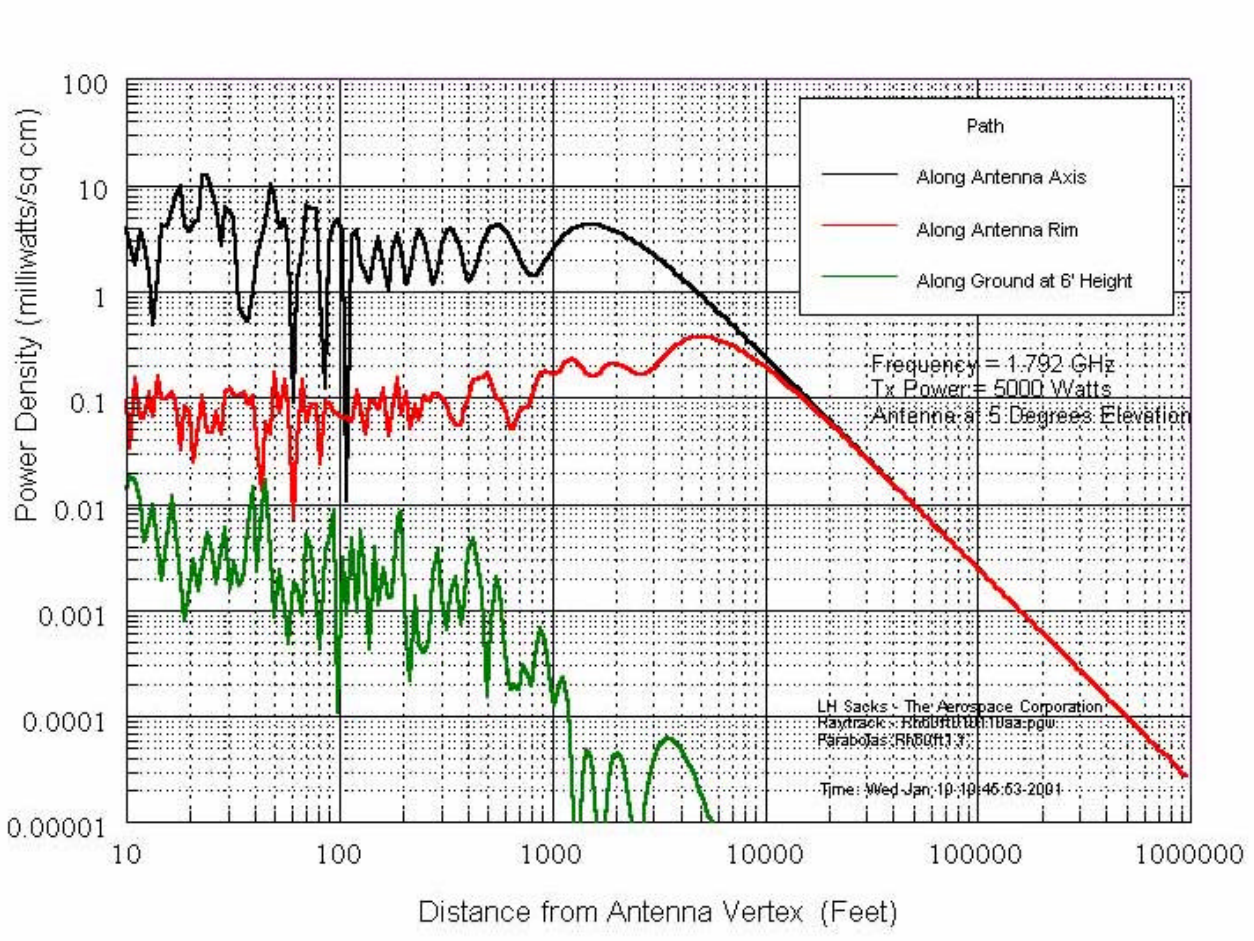

Figure 6 - RF Power Density Levels From S-Band DB1/DB2

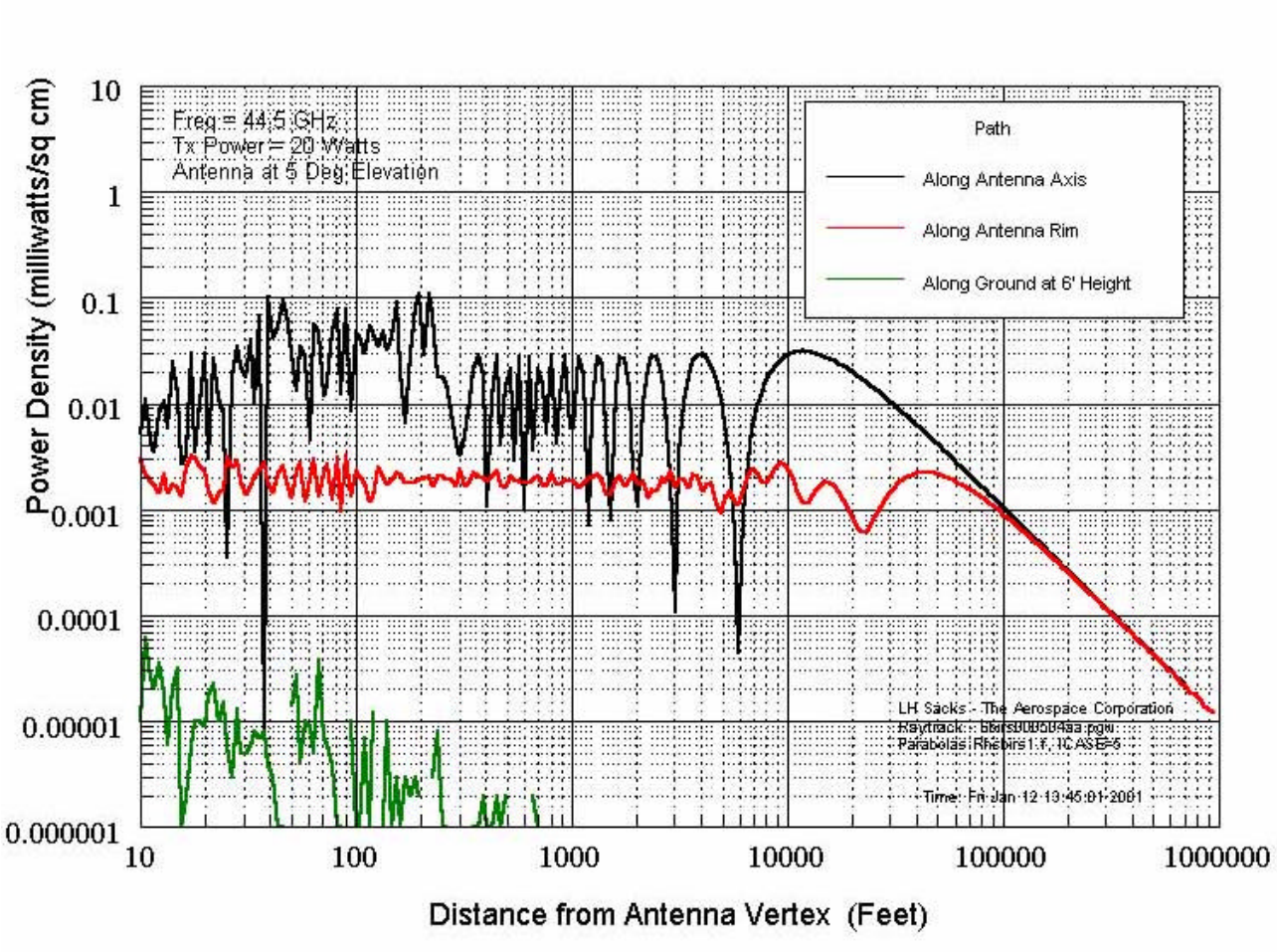

Figure 7 - RF Power Density Levels From Q-band SB1/SB2 Antennas

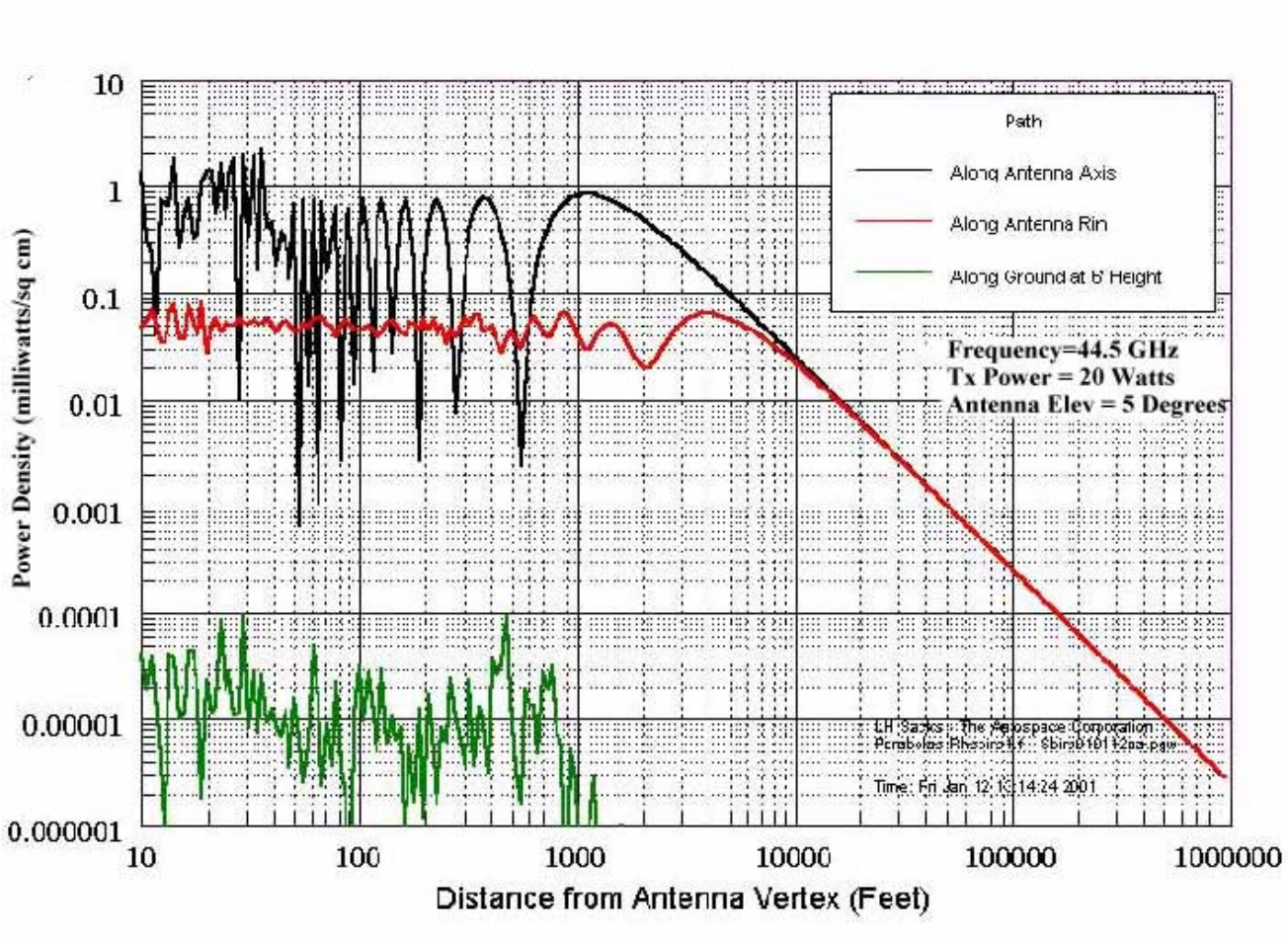

Figure 8 - RF Power Density Levels From Q-band LEO Antennas

B.4 Cumulative Impact Contributed by New SBIRS Antennas

There are two aspects to consider in assessing the cumulative RADHAZ impact with construction of SB1, SB2, LEO1, LEO2 and LEO3 next to the MCS. The first is the nature of the RF energy being emitted. All of the SBIRS antennas will emit non-ionizing energy. Non-ionizing energy is not considered cumulative from a energy biology and oncological perspective. RF fields are too low in power to produce ionized chemical atoms and cellular damage that results from ionizing energy. If the RF power levels are high, however, heating can occur, and if the cellular structure cannot remove the heat over time, then biological damage can occur. This cannot occur in RF fields below 1 mW/cm^2 and generally does not occur at levels below 5 mW/cm^2.

The second cumulative RADHAZ impact is the planned operational use of the antenna. The duty cycle for the "transmit mode" has been studied from a cumulative

environmental impact assessment perspective for antennas SB1, SB2, D1, D2, D3, LEO1, LEO2, and LEO3. The duty cycle consists of two elements, the time, or duration, that the transmission is occurring and the angular pointing aspect of the operational antenna. Regarding the duration of transmission, the worst-case assumption of "continuous transmission" has been assumed as described above. In the case of angular pointing aspect, unlike radar antenna which continuously transmit in many directions, the SBIRS "command and control" antennas would be fixed at a few locations and used to transmit signals in the direction of one particular satellite at a time. This means that there will be no time when more than one antenna is pointed at the same location in space. Therefore, the arithmetic addition of the energy fields is not a consideration in assessing the cumulative RADHAZ.

Therefore, as stated in the other studies referenced in this supplemental EA, no unacceptable energy hazard, cumulative or otherwise, is expected from constructing SB1 or SB2 or the future LEO antennas. At all ground and air locations around SB1, SB2, D1, D2 and D3, the power density levels are expected to be within acceptable levels.

APPENDIX C
DoD JOINT SPECTRUM RADIATION HAZARD ASSESSMENT

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21 NOVEMBER 2000

MEMORANDUM FOR SPACE AND MISSILE CENTER

TO: MR. DANIEL PARK (SMC/AXF)

SUBJECT: RADIATION HAZARD ASSESSMENT SUMMARY AT PROPOSED SBIRS HIGH MCS, BUCKLEY AFB, CO

BACKGROUND

The planned installation of the Space Based Infrared System (SBIRS) Mission Control Station (MCS) at Buckley Air Force Base (BAFB) (formally Buckley Air National Guard Station) in Aurora Colorado raised concerns regarding the potential for radiation hazard conditions from collocated satellite earth terminals. As a result, the DoD Joint Spectrum (JSC) was requested to conduct radiation hazard measurements at the proposed SBIRS High MCS antenna locations. Testing was conducted in the October/November 1998 timeframe.

OBJECTIVE

The objective of the measurement effort was to determine the maximum electromagnetic radiation (EMR) levels and the associated radiation hazard potential at the planned SBIRS MCS from collocated satellite ground terminals (SGTs).

APPROACH

The EMR levels from the collocated satellite earth terminals were measured using a spectrum analyzer and a broadband horn antenna coupled to laptop PC. The measurement antenna was mounted to a tripod that was anchored to a man-lift bucket and then raised to a height of 54 feet. This elevation corresponded to the expected height of the top of the SBIRS radome, the point at which the highest EMR levels on the SBIRS MCS facility were expected.

Measurements were conducted with the SGTs operating in the manual mode with the terminals set to radiate an unmodulated CW signal. Measurements were taken with the transmitter power levels at both nominal and maximum levels. To ensure identification of the maximum signal level, the SGT antenna was first directed to a pre-calculated azimuth/elevation pointing angle that corresponded to the measurement location (the

proposed SBIRS MGS location: 39-42-58.8N 104-46-46.9W). The SGT antenna was then slewed in small increments of both azimuth and elevation about the pointing angle to identify and capture the peak response. To ensure the peak response did not outside the primary pointing angle, complete azimuth and elevation scans were also performed. In all instances, the peak response was measured and recorded. It should be noted that due to the SGT antenna pointing restrictions (radiation masks), the minimum elevation angle permissible was such that the SGT beam cylinder was located above the 54-foot height of the measurement antenna.

Measurements were repeated for all collocated SGTs and associated frequency bands individually.

RESULTS

The results of the EMR measurements indicate that the maximum power density measured at the proposed SBIRS High MCS under all test conditions was -18 dBm/cm^2 (16 $\mu W/cm^2$).

The current standard for maximum permissible exposure (MPE) in an uncontrolled environment (applicable in situations where the personnel have no knowledge or control of their exposure) is 1.2 mW/ cm^2 at 1.8 GHz, 6.7 at 10 GHz and 10 mw at 18 GHz. These levels are cited in the *IEEE Standard For Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz-300 GHz, ANSI/IEEE C-95.1-1991*. This criteria has been adopted by the DoD and EPA and represents the most conservative US standard for both personnel and fuel/ordnance.

The maximum level measured at the proposed SBIRS MCS locations is less than the most conservative MPE limit by a factor of more than 400. Therefore, under the conditions tested, no radiation hazard condition at the proposed SBIRS High MCS is expected.

Based upon the current SBIRS High terminal configuration and transmit parameters, it is expected that no radiation hazards will exit from the SBIRS High SGTs, *however, measurements are required to confirm this suspicion.*

APPENDIX D
DRAFT EA COMMENT LETTERS

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PLANNING DEPARTMENT

1470 South Havana Street
Aurora, Colorado 80012
303-739-7250
FAX: 303-739-7268

March 2, 2001

Mr. Ted Krawczyk
U.S. Air Force
SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles Air Force Base, CA 90245-4659

RE: Comments – Supplemental Environmental Assessment & Draft Finding of No Significant Impact – SBIRS Mission Control Station – Buckley Air Force Base

Dear Mr. Krawczyk:

The City of Aurora, Colorado appreciates the opportunity to comment on the Supplemental Environmental Assessment and Draft Finding of No Significant Impact associated with the proposed Space Based Infrared Systems (SBIRS) Mission Control Station at Buckley Air Force Base. Our primary comment is highlighted below:

Storm Runoff and Water Quality

The assessment does not adequately address storm runoff and water quality. Does the proposed installation fit within the Base's master drainage study? How is runoff treated before leaving the facility? Will this construction increase the downstream runoff, i.e. through the City of Aurora's City Limits?

Should you have any questions regarding these comments, you can contact me at (303) 739-7250. Again, thank you for allowing the City of Aurora to have input to the environmental assessment.

Sincerely,

Denise M. Balkas

Denise M. Balkas
Director of Planning

DMB/jai

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFMC)
LOS ANGELES, CA

4 Apr 2001

SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles Air Force Base
El Segundo, CA 90245-4659

Ms. Denise M. Balkas
Director of Planning
1470 South Havana Street
Aurora, CO 80012

Dear Ms. Balkas

The present Space Based Infrared System (SBIRS) Mission Control Station (MCS) site was previously analyzed in an Environmental Assessment (EA) with a Finding of No Significant Impact (FONSI) and approved by the Environmental Protection Committee at Buckley ANGB on April 12, 1996. This 1996 EA assessed the environmental impacts associated with constructing and operating the MCS facility, including impacts on water resources resulting from construction activities and increased impervious cover. Examination and analysis of the project, concluded that the proposed action did not exceed nor interfere with the City of Aurora regional drainage or water supply system.

We have supplemented the 1996 EA with a proposal to construct and operate two SBIRS RF antennas in a maintained area with highly modified and disturbed landscape. The site for the proposed action is predominantly bare earth, with less than 5 percent vegetative cover, the surrounding area is either paved or has a gravel surface and is contiguous to the present MCS site. The effects on drainage and local water resources are anticipated to resemble results obtained from the 1996 Environmental Assessment and will not present any adverse effects. Under our Environmental Analysis Process, comments are made only to items, which have under gone change from the previous Environmental Assessment.

I trust this satisfies your question(s)/comments and if we can be of any further help, please let us know. I want to thank you and the City of Aurora, CO for its interest in our environment and yours.

Sincerely

Theodore A. Krawczyk, P.E.
Environmental Engineer
SMC/AXFV

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:
ES/CO:USAF
MS 65412 GJ

February 15, 2001

Mr. Ted Krawczyk
U.S. Air Force
SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles Air Force Base, California 90245-4659

Dear Mr. Krawczyk:

This follows your telephone conversation this morning with Bob Leachman, and your request for a written response to our review of the environmental assessment for the Buckley Air National Guard Base - Space Based Infrared System. We have reviewed the February 2001 EA and have no comments.

Please direct any questions to Bob Leachman at the letterhead address or (970) 243-2778.

Sincerely,

Richard P. Tremaine

Acting for Allan R. Pfister
Assistant Colorado Field Supervisor

cc: FWS/ES, Lakewood

BLeachman:BuckleyLtr.wpd:021501

STATE OF COLORADO
Bill Owens, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER

Russell George, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

For Wildlife-
For People

February 21, 2001

Ted Krawczyk
U. S. Air Force
SMC-AXFV
2420 Vela Way Suite 1467
Los Angeles Air Force Base, CA 90245-4659

RE: Environmental Assessment – SBIRS Mission Control Station

Dear Mr. Krawczyk:

This document has been reviewed by myself and District Wildlife Manager Liza Moore. We concur that the project will not have significant impacts to wildlife or wildlife habitat. While we are actively encouraging the preservation of prairie dog towns in the Denver metro area, the small number of prairie dogs to be removed due to this project is not significant.

Please let me know if you have any questions.

Sincerely,

Dave Weber
Habitat Biologist

cc: Liza Moore, DWM
Peter Plage, USFWS
Eric Odell, CDOW