

**ENVIRONMENTAL ASSESSMENT
FOR THE PROPOSED
CONSTRUCTION AND
MAINTENANCE OF
INSTRUMENTATION LINES OF
SIGHT ON
CAPE CANAVERAL AIR STATION, FL**

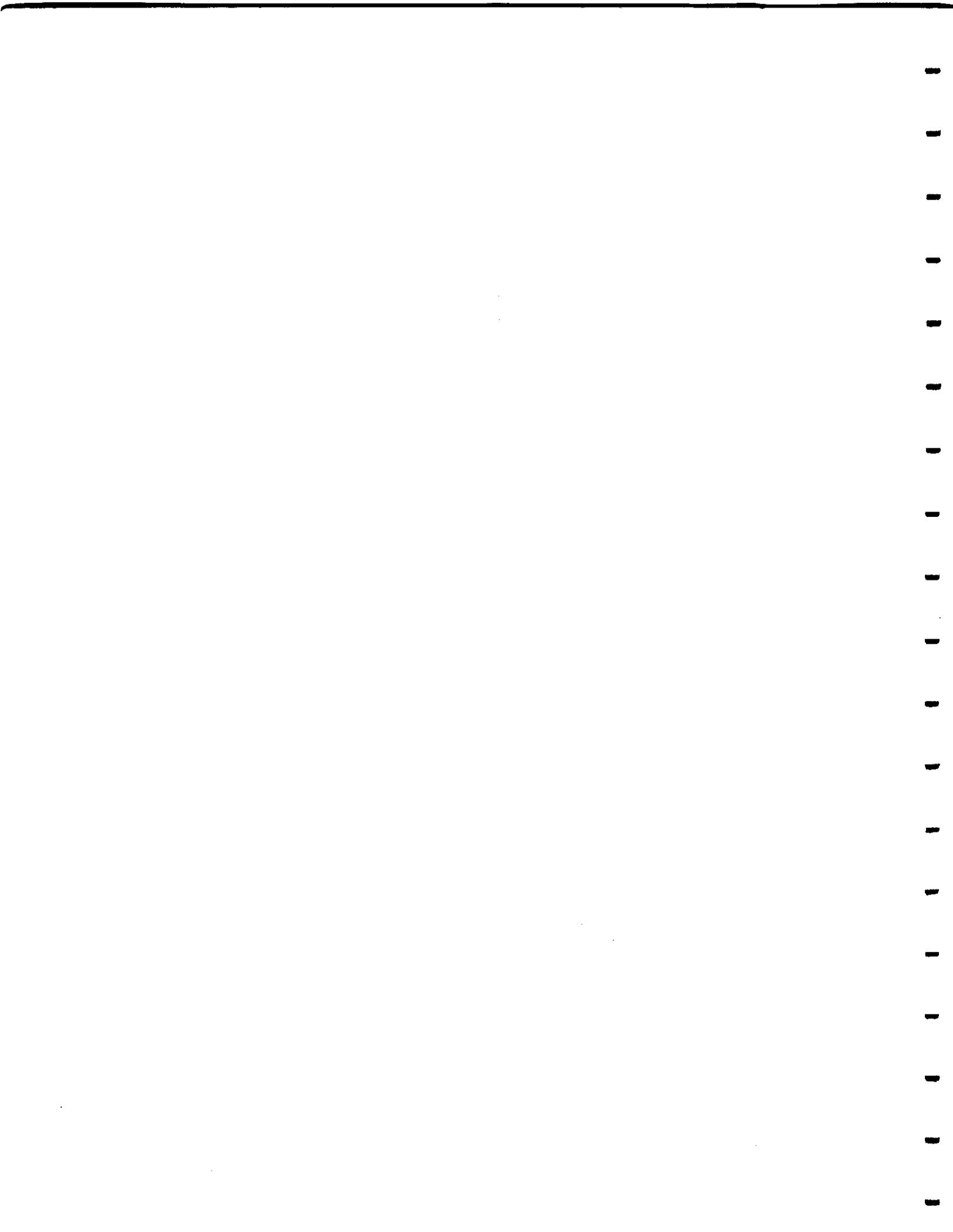
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**U. S. AIR FORCE
45TH SPACE WING**

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FINDING OF NO SIGNIFICANT IMPACT (FONSI)

FOR THE PROPOSED CONSTRUCTION AND MAINTENANCE OF INSTRUMENTATION LINES OF SIGHT

The 45th Space Wing of the U.S Air Force and the National Aeronautics and Space Administration propose to clear and maintain instrumentation lines of sight on Cape Canaveral Air Station (CCAS), and the Kennedy Space Center (KSC), Florida. The purpose of this proposed action is to provide approximately sixty-five (65) lines of sight from twenty-five (25) Universal Camera Sites (UCS) to the various Launch Complexes (LC) located on CCAS and KSC. Based upon a comprehensive evaluation of the proposed action and alternatives; the Air Force and NASA have determined that construction and maintenance of Instrumentation Lines of Sight will not significantly impact the human environment, as defined by the Council on Environmental Quality (CEQ).

An Environmental Assessment (EA) prepared for the proposed Instrumentation Lines of Sight, dated September 1996, supports this Finding of No Significant Impact (FONSI). The EA evaluates environmental effects of the preferred alternative which is to restore and maintain approximately sixty-five (65) lines of sight from twenty-five (25) Universal Camera Sites located on CCAS and KSC. The EA also describes other alternatives considered including the option to take no action. A decision to take no action was rejected because it would result in a compromise of Range Safety requirements, and thereby severely impact the mission of both installations. Construction of new universal camera sites was also evaluated and rejected due to the significant engineering and funding requirements necessary to construct replacement sites. Elevating existing camera sites in lieu of clearing was considered, but this alternative would be more costly due to the requirement for engineering design and new construction. Additionally, power and communication lines would require costly modifications to accommodate the increased elevation. Another alternative considered was to reactivate abandoned camera sites; however, the primary reason these sites were abandoned was because they were specific to other launch complexes which are also abandoned. If they could be used, the new sight lines would require more clearing than is being proposed for the preferred alternative. The last alternative considered was to relocate camera sites to buildings or other structures. These sites would also require costly engineering studies at each location and new power and communication lines would also be needed. Some of the instrumentation is extremely heavy and could cause structural damage to the proposed building/structure on which they may be located. For these reasons, this alternative was also eliminated. The design and operations described in this FONSI and in the referenced EA have been selected, by the 45th Space Wing, as the preferred alternative for the proposed action.

The action, as proposed, will require initial clearing of approximately ten (10) lines of sight, extensive clearing of approximately eleven (11) lines of sight, and maintenance of approximately forty-four (44) lines of sight that already exist. No mechanical clearing is anticipated for any wetlands, but if this does become necessary, an Environmental Resource Permit from the U.S. Army Corps of Engineers and either FDEP or the St. Johns River Water Management District will be obtained. Informal consultations were conducted with the US Fish and Wildlife Service (FWS) regarding any impacts to threatened or endangered species. The preferred method for conducting the proposed line of sight clearing is to utilize a mechanical tree cutter combined with controlled burning. Research shows that the life cycle of the Florida Scrub Jay is dependent upon low growth scrub habitat, maintained by periodic burning. The proposed methods are compatible with the natural fire cycle. In addition, mechanical clearing and controlled burning of overgrown scrub are methods used to obtain the goals of the CCAS Scrub Jay Management Plan, the Habitat Compensation Plan and the Controlled Burn Plan. These plans have been approved by the FWS, and the proposed action will be incorporated into the objectives and

implementation of these Plans. Any gopher tortoises potentially affected by land clearing activities must be protected on site (if possible), relocated off-site, or mitigated through off-site habitat preservation. If relocation of gopher tortoises is required, a permit will be obtained from the Florida Game and Freshwater Fish Commission. A number of the proposed lines of sight bisect archaeologically sensitive areas paralleling the Banana River. The sites have been identified and their boundaries are mapped in the Historic Properties Survey of Cape Canaveral Air Station and in reports of historical and archaeological sites identified on KSC during 1990-1993. Section 106 of the National Historic Preservation Act requires Federal agencies to consult with the State Historic Preservation Officer (SHPO) and Advisory Council on Historic Preservation when a proposed action may affect a site that is included in or eligible for inclusion in the National Register of Historic Places. Should any cleaning be necessary that could affect a site, the responsible agency will initiate consultation. A copy of the EA has been submitted to the SHPO for review and comment on the proposed action. However, the proposed method of avoidance will preclude disturbance of cultural resources, therefore, qualifying for a no effect determination-based upon the Secretary of Interiors standards published in 36 CFR 800.

Section 1508.27 of the CEQ regulations lists ten aspects of the human environment which should be considered in order to properly evaluate the significance of potential impact(s). An evaluation of the proposed action, utilizing these parameters has concluded that: there are no adverse health or safety impacts; no unique geographic features will be affected; no highly uncertain or unknown risks have been identified or are anticipated; no precedent for future actions will be established, the action is not considered highly controversial; no cumulative adverse effects are expected; no cultural sites or threatened or endangered species will be impacted; and no State, Federal, or local laws will be violated.

Clearing and/or periodic maintenance of these lines of sight is needed to guarantee unobstructed instrumentation and optical viewing of space launches prior to, during, and immediately after liftoff of launch vehicles from CCAS and KSC. Considering the information provided above and the data contained in the EA, the Air Force and NASA have concluded that the proposed action qualifies for a Finding of No Significant Impact, as described in AFR 19-2 and Section 1508.13 of the CEQ regulations.

Approved: Robert C. Hinson Date: 13 Dec 96
Environmental Protection Committee
Chairman - 45th Space Wing

Approved: Jay F. Honeycutt Date: JAN 17 1997
Director
John F. Kennedy Space Center

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LIST OF ACRONYMS

EA	Environmental Assessment
UCS	Universal Camera Site
CCAS	Cape Canaveral Air Station
KSC	Kennedy Space Center
PAFB	Patrick Air Force Base
LC	Launch Complex
CATEX	Categorical Exclusion
IRP	Installation Restoration Program
NASA	National Aeronautics and Space Administration
ESA	Endangered Species Act
FWS	U. S. Fish and Wildlife Service
GFC	Florida Game and Freshwater Fish Commission
SHPO	State Historic Preservation Officer
FDEP	Florida Department of Environmental Protection
COE	U. S. Army Corps of Engineers
OSHA	Occupational Safety and Health Administration
VAB	Vehicle Assembly Building
ITL	Titan Integrate Transfer and Launch Area
LOCC	Launch Operations Control Center
VIB	Vertical Integration Building
MSL	Mean Sea Level
ER	Eastern Range
IGOR	Intercept Ground Optical Recorders
ATOTS	Advanced Transportable Optical Tracking Systems
KTMs	Kineto Tracking Mounts
IFLOTs	Intermediate Focal Length Optical
MIGOR	Mobile Intercept Ground Optical Recorders
DOAMS	Distant Object Altitude Measurement System
LBS	Launch Base Support
DRMO	Defense Reutilization and Marketing Office

EA FOR LINES OF SIGHT

1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION

1.1 Purpose of and Need for Proposed Action

The purpose of the proposed action is to provide approximately sixty-five (65) lines of sight from twenty-five (25) Universal Camera Sites (UCS) to the various Launch Complexes (LC) located on Cape Canaveral Air Station (CCAS) and the Kennedy Space Center (KSC). These lines of sight are needed to provide optical tracking data to Range Safety computers within the first minute after-launch of space vehicles from CCAS and KSC. Range Safety has a requirement to view the vehicle from the base of the pad up to approximately 15-18 seconds after the missile is launched. At this point, radar takes over the tracking process. The vehicle is optically tracked from the universal camera sites which is the only source for tracking the vehicle until radar takes over. Range Safety has a requirement to operate six camera sites per launch which are used to triangulate the exact location of the vehicle. All of the optical data gathered from these six sites are fed into the central computer that provides data to the Range Safety officer. If an emergency situation were to occur in the first 15-18 seconds after launch and the vehicle had to be destroyed, the optical tracking information provided to the central computer is the only source Range Safety has to determine the exact location of the vehicle. Additionally, engineering data is gathered with these cameras and utilized later to assess flight performance. Currently, the optical pathway within a number of these lines of sight is obscured by vegetation, rendering the UCS ineffective until the vehicle has cleared the obstruction.

Clearing and/or periodic maintenance of these lines of sight is needed to guarantee unobstructed optical viewing of space launches prior to, during, and immediately preceding liftoff of launch vehicles from CCAS and the KSC. The Range Safety Officer must receive accurate tracking and telemetry data and precise optics to properly evaluate potential safety concerns which may require destruction of the launch vehicle. Insufficient tracking data from UCS sites could result in unnecessary damage of facilities and/or personnel injuries in the event of a launch vehicle guidance mishap.

1.2 Location of the Proposed Action

The proposed action will occur on Federal land within the boundaries of Cape Canaveral Air Station and the Kennedy Space Center. Both installations are located along the eastern coast of Florida in Brevard County (Figure 1 Vicinity Map). CCAS is situated on the Canaveral Peninsula approximately 20 miles north of Patrick Air Force Base (PAFB). The northern boundary of CCAS abuts the KSC boundary on the barrier island. The majority of KSC is located on Merritt Island which is separated from CCAS by the Banana River. The Atlantic Ocean also borders both installations along their eastern margins.

The areas on both installations that will be included in the proposed action consist of sixty-five (65) lines of sight originating from twenty-five (25) UCSs and terminating at one of eight (8) active Launch Complexes (LC) on CCAS or KSC.

1.3 Decision That Must Be Made

The decision that must be made is whether to create a new line of sight and provide continuing maintenance to all 65 sight lines or whether to select one of the other alternatives described in Section 2.0, Description of the Proposed Action and Alternatives.

1.4 Scope of the Environmental Analysis

This section of the EA will describe 1) efforts to involve other agencies and members of the public, 2) significant environmental issues and corresponding measurement indicators and 3) insignificant environmental considerations eliminated from detailed analysis. An Air Force Form 813 (Request for Environmental Impact Analysis) was completed prior to preparation of this EA. The Analysis determined that the proposed action did not qualify for a Categorical Exclusion (CATEX); and, therefore, further evaluation of the potential environmental impacts was required. The Air Force Form 813 identified potential impacts to Biological Resources, Cultural Resources, sites included in the Installation Restoration Program (IRP) and Soils and Geology. A copy of this analysis is provided in Appendix A.

1.4.1 Applicable Regulatory Requirements and Coordination

1.4.1.1 U.S. Fish and Wildlife Service (FWS)

The proposed action will require alteration of natural areas on CCAS and KSC which provide, or have the potential to provide, habitat for three species listed as threatened by the FWS. Section 7 of the Endangered Species Act (ESA) requires federal agencies to consult with the FWS when proposed actions may jeopardize a listed species. The Air Force (45 CES/CEV) has previously conducted informal consultation with the FWS regarding the clearing and maintenance of various lines of sight with regard to potential impacts to the threatened Florida Scrub Jay. A copy of this EA will be submitted to the FWS, Endangered Species Field Station, Jacksonville, Florida for their review and issuance of an opinion.

Due to the various habitat types encountered on KSC, and the management responsibility of the Merritt Island National Wildlife Refuge (MINWR)/USFWS for habitats on KSC, MINWR personnel (861-0667) will be consulted for recommendations prior to the clearing and maintenance of each individual line of sight origin on or crossing over KSC. MINWR should provide any comments or recommendations in a timely manner to support the individual line of sight clearing.

In this way, MINWR personnel can assist in the selection of least impact methods and practices for the clearing and maintenance of each individual line of sight. Once the clearing method

and/or maintenance plan for a line of sight is agreed upon, it will be documented and become part of the overall line of sight maintenance plan.

1.4.1.2 Florida Game and Freshwater Fish Commission (GFC)

The proposed action will result in some alteration of land known to provide habitat for the state protected Gopher Tortoise. The Florida Wildlife Code requires that any Gopher Tortoises potentially affected by land clearing activities must be protected on site (if possible), relocated off-site or mitigated through off-site habitat preservation. Relocation of Gopher Tortoises would require permitting by the GFC.

1.4.1.3 Florida State Historic Preservation Officer (SHPO)

A number of the proposed lines of sight bisect archaeologically sensitive areas paralleling the Banana River. The majority of these sites are areas which were previously occupied by the Ais Indian Tribe. The sites have been identified and their boundaries are mapped in the Historic Properties Survey of Cape Canaveral Air Force Station (31 March 1994) and in reports of historical and archaeological sites identified on KSC during 1990 - 1993. Overlaying the proposed line of sight maps on a map depicting archaeological sites will identify areas of potential impact. Section 106 of the National Historic Preservation Act requires federal agencies to consult with the SHPO and Advisory Council on Historic Preservation when a proposed action may affect a site that is included in or eligible for inclusion in the National Register of Historic Places. A copy of this EA will be submitted to the SHPO for review and comment on the proposed action.

1.4.1.4 Florida Department of Environmental Regulation (FDEP)

Construction and/or periodic maintenance of certain lines of sight will result in clearing activities which have the potential to effect numerous areas on CCAS and KSC identified as wetlands. Various wetland types on CCAS and KSC have been mapped by the FWS, National Wetlands Inventory. Overlaying the lines of sight on CCAS and KSC wetland maps will identify wetland areas which could be affected by clearing activities. Many wetland areas contain low growth species which do not obstruct line of sight visibility and therefore can be avoided. Wetlands which must be cleared will require submittal of a permit application to FDEP and the U.S. Army Corps of Engineers (COE).

1.4.2 Environmental Issues

1.4.2.1 Threatened and Endangered Species

The CCAS Fish and Wildlife Management Plan identifies thirteen federally listed threatened or endangered species which reside on or visit CCAS and KSC. Of these, it appears that three species, the threatened Florida Scrub Jay, Southeastern Beachmouse and Eastern Indigo Snake, may be impacted by the proposed action. In addition, the state-listed Gopher Tortoise and Florida Mouse are also known to inhabit land which could be impacted by the project. The Air

Force and NASA protect these animals since their burrows are commensally utilized by the Eastern Indigo Snake. The following sections will describe potential impacts to protected species occurring on both installations.

1.4.2.1.1 Florida Scrub Jay

The majority of land on CCAS and KSC is considered habitat for the Florida Scrub Jay. The Scrub Jay has been listed by the FWS as a threatened species and, therefore, impacts to the habitat of this species is considered to be an action which may affect the Scrub Jay population on CCAS and/or KSC. Section 7 of the Endangered Species Act requires federal agencies to enter into consultation with the FWS when their actions may jeopardize the continued existence of a federally listed threatened or endangered species.

The Air Force and NASA have consulted, both formally and informally, with the FWS regarding various actions which could be implemented for Scrub Jay habitat enhancement. One method recommended for attaining optimum Scrub Jay habitat is to mimic the natural fire cycle which significantly influences the CCAS and KSC ecosystems. Periodic burning controls the height and density of the scrub vegetation, and the combustion of this biomass also facilitates the nutrient cycle. As a result of this phenomenon, the Scrub Jay has evolved a habitat specificity for scrub vegetation in the one to three meter height range. Growth succession beyond three meters adversely affects nest site selection and other behavioral traits. Vegetation density also affects other life cycle characteristics which ultimately dictate population trends.

In the absence of fire, scrub vegetation can be similarly maintained by mechanical renovation. The proposed action would employ a method of cutting vegetation which preserves plant root systems, thereby facilitating regeneration. Previous habitat renovation projects conducted on CCAS and KSC have shown this practice to be effective for reducing the height of vegetation and promoting re-establishment of scrub oak growth. This process may not exactly mimic the fire/nutrient cycle; however, in the absence of wildfires, mechanical renovation followed by controlled burning of the slash material is preferred over allowing the scrub oak vegetation to succeed to hammock-like conditions.

Further, Scrub Jays nest from March through June. Mechanical renovation of Scrub Jay habitat during this period could result in the taking of Scrub Jay nests, eggs, or flightless young and should be scheduled outside the nesting period.

1.4.2.1.2 Eastern Indigo Snake

Similar to the Scrub Jay, the xeric scrub community provides habitat for the Eastern Indigo Snake. The FWS has listed the Indigo Snake as an threatened species, and the proposed action has the potential to affect some of the individuals inhabiting CCAS and KSC. Due to the large home range of these snakes, impacts resulting from habitat modification/land clearing should be minimal. However, the use of mechanical land clearing equipment could result in the death or "incidental take" of an individual snake. This potential effect will be minimized by providing equipment operator training to avoid cutting or crushing these animals.

1.4.2.1.3 Gopher Tortoise

This species is currently under review by the FWS for listing as a threatened species. The State of Florida has identified the Gopher Tortoise as a species of special concern. The Air Force and NASA are not required by law to consult with the State regarding effects to this species; however, since the Eastern Indigo Snake commensally utilizes Gopher Tortoise burrows, the Air Force and NASA must consider these potential impacts.

Gopher Tortoises inhabit xeric portions of CCAS and KSC with elevations great enough to permit construction of burrows above groundwater levels. Many of the natural areas on CCAS and KSC which are inhabited by Gopher Tortoises are the relic dune ridges which parallel the Atlantic coastline. These elevated sandy ridges also support dense stands of scrub oak trees and associated scrub vegetation. Effects to Gopher Tortoises from the proposed action could result from impacts on individuals during operation of land clearing equipment and inadvertent crushing of their burrows. Tortoises caught in collapsed burrows might be able to free themselves; however, the symbiotic organisms (the Federally listed Eastern Indigo Snake and State Species of Special Concern such as the Florida Gopher Frog, Florida Mouse and Florida Pine Snake) which utilize the burrows may not escape a significant collapse. Again, equipment operator training should help minimize adverse impacts to these animals.

1.4.2.2 Wetlands

In 1994 the FWS completed a wetland inventory of CCAS. Review of this map and the line-of-sight maps show that some of the optical pathways cross areas identified as wetlands. In addition, a number of the sight lines cross various segments of the CCAS and KSC drainage canal systems. Drainage canals are also classified as wetlands due to the types of vegetation supported by these surface waters. The majority of the canals eventually discharge into the Banana River, an Outstanding Florida Water. This designation carries the highest level of protection, and activities which could impact these waters are regulated by the Florida Department of Environmental Protection (FDEP). Wetlands are also regulated by the FDEP, and actions which could damage these areas would require permitting. For the purposes of conducting the proposed action, land clearing activity will avoid wetlands and drainage canals. Most of these areas are dominated by non-woody plant species which do not exceed the sight line height requirement.

1.4.2.3 Cultural Resources

Some of the lines of sight identified in the proposed action bisect areas on CCAS and KSC that are known to contain prehistoric archaeological sites. In 1994, a Historic Properties Survey of CCAS was published which delineates the boundaries of all the known archaeological sites on the installation. Similar to the potential impacts to wetlands, sight line construction and maintenance activity will avoid these culturally sensitive areas to prevent adverse impacts to these resources. A similar procedure utilizing KSC archaeological maps will protect culturally valuable sites on KSC.

1.4.3 Issues Eliminated from Detailed Analysis

1.4.3.1 Noise

Low to moderate levels of noise would be generated by heavy equipment, vehicles and chain saws during initial land clearing operations. Periodic maintenance of these sightlines will be conducted on an as needed basis, and again a moderate amount of equipment noise will be generated. However, the majority of land needing clearing for line of sight operations is remote from normal work sites and, therefore, should not affect CCAS and KSC personnel.

The use of personal hearing protection devices during the operation of equipment would preclude impacts to construction/contractor personnel. Noise abatement devices on equipment and vehicles further minimize the potential for adverse effects from noise on personnel and wildlife. It is anticipated that the moderate level of noise generated by initial land clearing and maintenance activity will act as a warning mechanism for wildlife within the construction zone. This inadvertent scare tactic should help minimize impacts to animals inhabiting land affected by the proposed action.

1.4.3.2 Water Resources

Water resources on CCAS and KSC are primarily surface waters, groundwater, wetlands and floodplains. The proposed action will not involve activities in surface waters nor will there be any type of excavation which could result in exposure of or impacts to groundwater. The preferred method of sight line clearing would preserve plant root systems and, therefore, should not significantly alter current water recharge characteristics or the water component of the areas nutrient cycle. Some sight lines transverse land within the 100 and 500 year floodplains. Executive Order 11988 requires all federal agencies to minimize impacts to floodplains and avoid incompatible development in these areas. The preferred method of performing the proposed action will facilitate plant regeneration in CCAS and KSC floodplains, thereby preventing long-term adverse impacts to these areas.

The proposed action could impact areas on CCAS and KSC which are identified as wetlands. Therefore, this component of CCAS and KSC water resources is described as an environmental issue in section 1.4.2.2.

1.4.3.3 Natural Resources

Natural resources on CCAS and KSC which could be affected by the proposed action include various types of vegetation, plant communities, wildlife species, soil, topographic features and natural areas. Research of the findings of similar projects on CCAS and KSC and consultation with the FWS indicates that the preferred method for conducting the proposed action will not adversely affect these natural resources. Mechanical clearing of scrub habitat, leaving root systems intact to facilitate regeneration, actually mimics the natural fire cycle of this ecosystem. Naturally occurring wildfires ignited by lightning strikes are one of the dominant factors

influencing the scrub community and all of its associated wildlife components. Due to the hazardous operations conducted on CCAS and KSC, NASA and the Air Force adopted the policy to suppress all wildfires ignited on the installation. Consequently, the suppression of naturally occurring fires has resulted in uninterrupted growth of scrub vegetation. A significant amount of the scrub community on CCAS and KSC has succeeded beyond the natural fire maintained plant community. Wildlife species which have evolved to utilize specific niches within this habitat are unable to adapt within the short time frame (± 40 years) of this significant habitat alteration. Therefore, the inadvertent changes in the scrub habitat due to fire suppression has adversely affected the life cycle of many indigenous scrub species. In addition, wildfire suppression adversely impacts the overall condition of the forest and alters the natural nutrient cycle. These changes also affect soil characteristics, water recharge, species diversification, and other ecosystem components. The preferred method of creating or re-establishing lines of sight will curb plant succession and significantly reduce biomass bulk, thereby enhancing the degradation process. Conducting a controlled burn on the remaining vegetative debris will ultimately facilitate completion of the nutrient cycle. With fire, biomass is reduced to ash which renders nutrients more accessible to further degradation and uptake by regenerating or newly establishing plants. All burning activities will be pursuant to Section 8 of the Florida Environmental Reorganization Act, which has been transferred to the State of Florida Department of Agriculture and Consumer Services, Division of Forestry. The proposed land clearing method is not as efficient as fire in its contribution to the nutrient cycle. However, the proposed methodology has a lesser cumulative impact on the overall system than allowing continued uninterrupted plant growth and habitat succession. Considering the overall effects of fire suppression without performing any type of habitat renovation, it is the conclusion of research conducted for preparation of this EA that the proposed action will improve affected natural resources. In addition, the preferred method of sight line clearing is consistent with the CCAS Fish and Wildlife Management Plan, Controlled Burn Plan, Scrub Jay Management Plan and the KSC Scrub Habitat Compensation Plan. Therefore, except for the resources specifically described in Section 1.4.2, Environmental Issues, all other CCAS and KSC natural resources have been eliminated from further analysis and evaluation.

1.4.3.4 Hazardous Materials and Waste

The use of hazardous materials such as petroleum, oil, and/or lubricants (POLs) and the generation of small quantities of non-hazardous wastes related to these materials generally occur as a result of projects involving machinery, heavy equipment and vehicles. With proper management, the small quantities of waste generated during equipment operations would not impact the health or well being of site personnel or the installation's environment. Based upon the description of the proposed action and the potential methodologies for performing this work, there should be no hazardous wastes generated during execution of this project.

Existing State and Federal laws require the proper storage and disposal of hazardous materials and wastes. To ensure compliance with applicable regulations, the construction contractor must manage hazardous materials and wastes in accordance with the 45 Space Wing Petroleum Products and Hazardous Waste Management Plan (Oplan 19-14). Spill prevention and control

would be implemented in accordance with the CCAS Oil and Hazardous Substance Pollution Contingency Plan (Oplan 19-1), Spill Prevention and Countermeasures Plan (SPCC), and Disaster Preparedness Operations Plan (Oplan 32-3).

On KSC, contractors shall comply with regulations outlined in NASA Kennedy Space Center Environmental Control Handbook - KGB 8800.6. Hazardous wastes should be handled in accordance with KHB 8800.7 "Hazardous Waste Management," and KHB 1870.1 "KSC Sanitation and Pollution and Control Handbook."

No hazardous materials or wastes would be used or generated during operation of these lines of sight.

1.4.3.5 Air-Quality

Minor effects to air quality at CCAS or KSC may result from the construction and/or maintenance of the proposed lines of sight. Generation of particulates (soil and dust) and heavy equipment exhaust emissions (NO, CO, SO₂, and VOC) would occur during construction activities (less than one year duration). Impacts to air quality would be restricted to the immediate vicinity of the construction site(s).

It is possible that particulate emissions would exceed the 150 ug/m³ PM-10 Federal and State 24-hour standard. PM-10 refers to respirable particles of 10 microns, or less, in diameter. However, there is a provision in the Florida Administrative Code 62-296.310 for controlling unconfined emissions by the application of water. Further, EPA document AP 42, Section 11.2.4-1, recommends complete coverage of the construction area with water, twice daily.

Adoption of a site watering policy, where necessary, and use of dust masks by construction personnel would preclude adverse impacts to human health and the environment.

Currently, Brevard County is unclassified with regards to criteria pollutants identified in 40 CFR part 81. However, considering the prevalence of ocean breezes most of the year and few existing sources of air pollution in this area, it is unlikely that the proposed action will affect ambient air quality on CCAS.

1.4.3.6 Activity Systems

Activity systems on a government installation typically consist of the infrastructure required to operate and maintain administrative, industrial, residential and airfield operations. On CCAS and KSC these activities primarily include, but are not limited to, transportation, fire, refuse, medical, security, food services, communications, electrical power, water and sanitation. A review of the proposed action does not reveal any indication that one or more of these activity systems would be adversely impacted. Conversely, optical/camera lines of sight have enhanced some activity systems such as fire (fire breaks) and security (clear zones) operations. Due to the remoteness of the majority of the lines of sight, the possibility of the proposed action affecting the remaining activity systems does not exist.

1.4.4 Introduction of the Organization and Content of the EA

This document follows the format established in the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508).

The remainder of this document consists of the following sections:

- **Section 2 - The Alternatives Considered.** This section describes the proposed action and alternatives to the proposed action, compares the alternatives, and identifies the Air Force and NASA's preferred alternative.
- **Section 3 - The Affected Environment.** This section describes the present condition of the environment potentially affected by the proposed action and its alternatives.
- **Section 4 - Environmental Consequences.** This section examines how the environment could be impacted by each alternative, if implemented.
- **Section 5 - List of Preparers.** This section identifies the major contributors and others who contributed to the environmental analysis and document preparation.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Description of the Proposed Action

The proposed action is to restore and maintain approximately sixty-five (65) lines of sight from twenty-five (25) universal camera sites located on CCAS and KSC. This action is to include the mechanical removal of vegetation within lines of sight identified in this EA. A typical line of sight would be an optical or electronic pathway, unobstructed from a piece of instrumentation to a designated launch vehicle. On CCAS, lines of sight are established between precisely located earthen berms (universal camera sites) and specific launch complexes/pads. The UCS distribution facilitates the triangulation method of tracking and affords various range safety and engineering data gathering functions in addition. Over the years, naturally occurring lightning ignited wildfires have been suppressed on CCAS due to explosive safety concerns. This practice allowed low-growth scrub vegetation to mature into hammocks which obstruct the necessary visual pathways between LC's and UCS's. Historically lines of sight were constructed and maintained by use of a bulldozer to push over and crush vegetation within a ± 100 foot wide corridor between the UCS and launch complex. This technique was proven to vegetatively impact wildlife utilization of these areas and periodic maintenance requirements further effects the resources of both installations.

The proposed action would establish (or re-establish) lines of sight by utilizing tree cutters that would mechanically mimic the natural tree pruning cycle with minimal impact to resources while simultaneously providing unobstructed lines of sight from all CCAS/KSC universal camera sites to the current and future launch complexes on both installations.

Initial vegetation clearing would be accomplished by using a tractor/shearing blade combination, bulldozer/roller chopper combination, or a mechanical tree chopper such as the Hydro-Ax or Brown Tree Cutter. Periodic maintenance of sight lines could be completed using these pieces of equipment, as well as bush hogs, and/or prescribed burning to keep vegetation height below the optical line of sight. Minor clearing may also be accomplished with hand tools or chain saws in sensitive areas along the line of sight. Periodic prescribed burning would be sufficient to keep vegetation height at an acceptable level in most cases. Maintenance of lines of sight would be accomplished at approximately ten-year intervals or as needed to provide unobstructed viewing.

The actual frequency of maintenance may vary for each line of sight depending on the elevations of the UCS and launch pad. It is anticipated that vegetation closer to the camera sites will require more frequent maintenance than vegetation located closer to the launch facilities due to the generally higher elevation of the launch vehicle platforms compared to the height of camera sites.

The following sub-sections will describe launch complexes, a typical UCS, and each line of sight based upon past usage and maintenance/clearing regimes. These categories are: a) new lines of sight, b) existing lines of sight requiring extensive clearing, and c) existing lines of sight requiring maintenance. Please note that new lines of sight include new requirements and existing lines which only recently became obstructed by vegetation. In addition, when initial clearing has been accomplished for category a) and b) lines of sight, all subsequent action will be considered periodic maintenance, category c).

2.1.1 Description of Launch Complexes

2.1.1.1 Launch Complex 17, Pads A and B

Launch Complex 17 (LC-17) was constructed in 1958 to support research and development of the Thor Intercontinental Ballistic Missile (ICBM). The complex is located near the Atlantic coastline on the southern portion of CCAS. After Thor became operational, the missile was modified in various configurations to support space launches. Initial modifications included the attachment of three solid rocket motors (SRM's) which resulted in the name change to the Delta.

The complex contains two identical concrete and steel launch stands, with fixed Umbilical Towers (UTs) and thirteen story Mobile Service Towers (MSTs) supporting each pad. The launch pads are situated in a north-south orientation with approximately 153 meters (500 feet) separating the two structures. Elevation of the launch pads above the surrounding grade is approximately 5.3 meters (12 feet, 8 inches).

2.1.1.2 Launch Complex 36, Pads A and B

Launch Complex 36 (LC-36) was constructed in 1961 to support research and development of the Atlas ICBM program and the Atlas/Centaur space launch vehicle. Originally constructed with a single launch pad (Pad A), the complex was expanded in 1963 to include a second launch pad (Pad B). Currently, Pad A is operated by the Air Force and Pad B is operated by Lockheed

Martin in support of their commercial launch program. Both launch pads consist of a fixed concrete launch ramp and service facility with fixed umbilical towers and mobile service towers. The MST provides access to the launch vehicle during pre-launch preparations and spacecraft encapsulation. The launch deck of each ramp/stand is approximately 10.5 meters (35 feet) above the local grade elevation.

2.1.1.3 Launch Complex 39, Pads A and B

Kennedy Space Center launch complexes 39A and 39B (LC-39A and -39B) are currently used to launch the NASA Space Shuttle. Each launch pad supports 3 to 5 Space Shuttle launches per year. These two launch pads and their associated facilities were originally used for the Apollo-Saturn launches. The LC-39A and LC-39B are essentially identical in size, shape and function with each complex covering an area of roughly 65 hectares (650,000 square meters).

The concrete launch surface at Pad A rises approximately 15 meters (50 feet) above the surrounding landscape. The Pad B launch surface stands approximately 17 meters (55 feet) above the surrounding landscape. The Space Shuttle is launched from atop the Mobile Launch Platform (MLP) parked on the pad surface. When situated for launch the 7.6 meter (25 foot) tall MLP rests on 6.7 meter (22 foot) fixed support pedestals. Thus, the zero-level of the MLP (from which the shuttle is launched) is approximately 29 meters (95 foot) above the local land elevation at Pad A and approximately 31 meters (100 feet) above the local land elevation at Pad B.

The launch complexes are located approximately 0.5 kilometers west of the Atlantic Ocean in a relict coastal dune and swale area. LC-39B is located in similar coastal dune habitat 2.6 kilometers northwest of LC-39A.

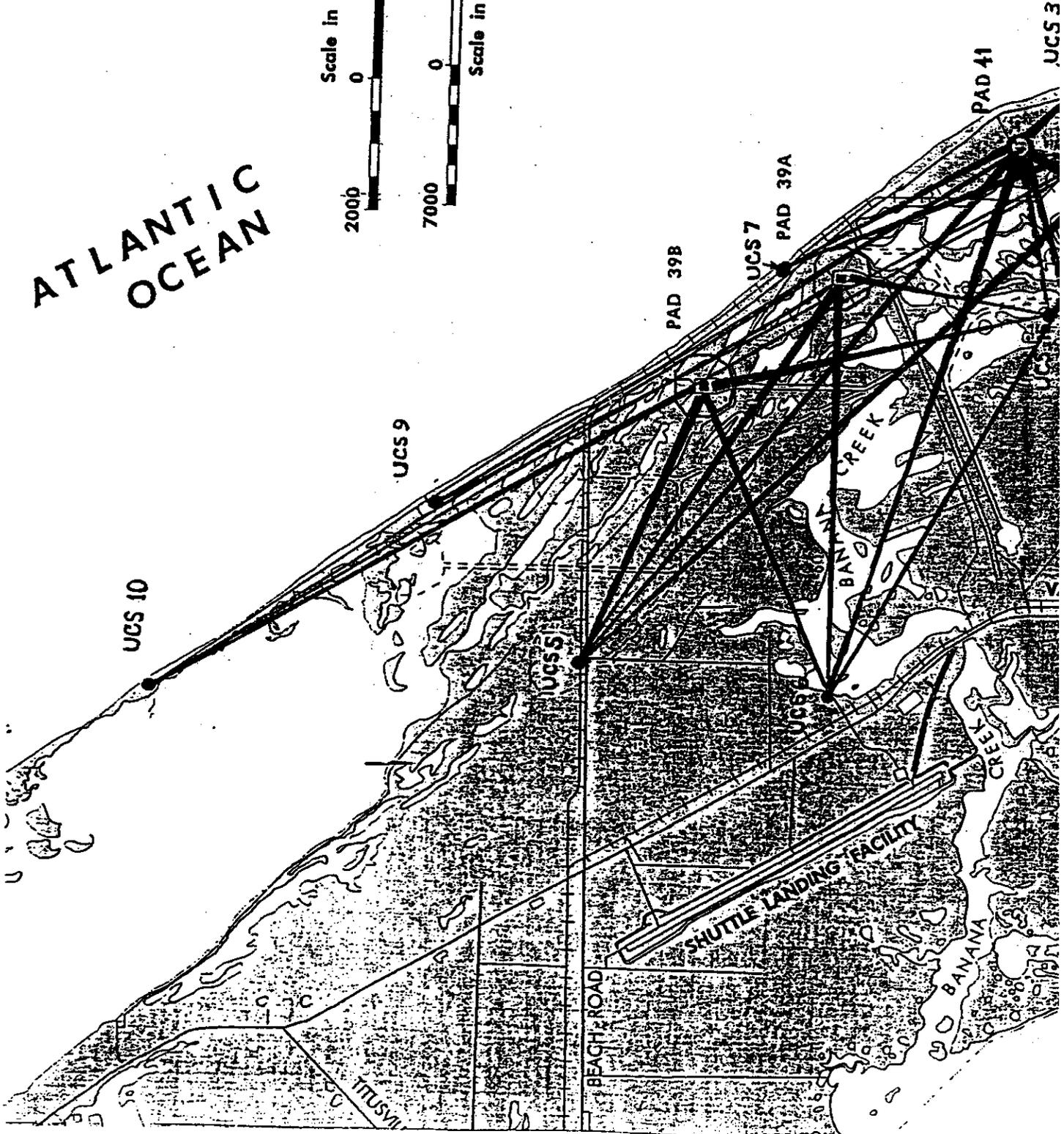
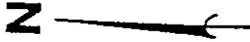
2.1.1.4 Launch Complex 40

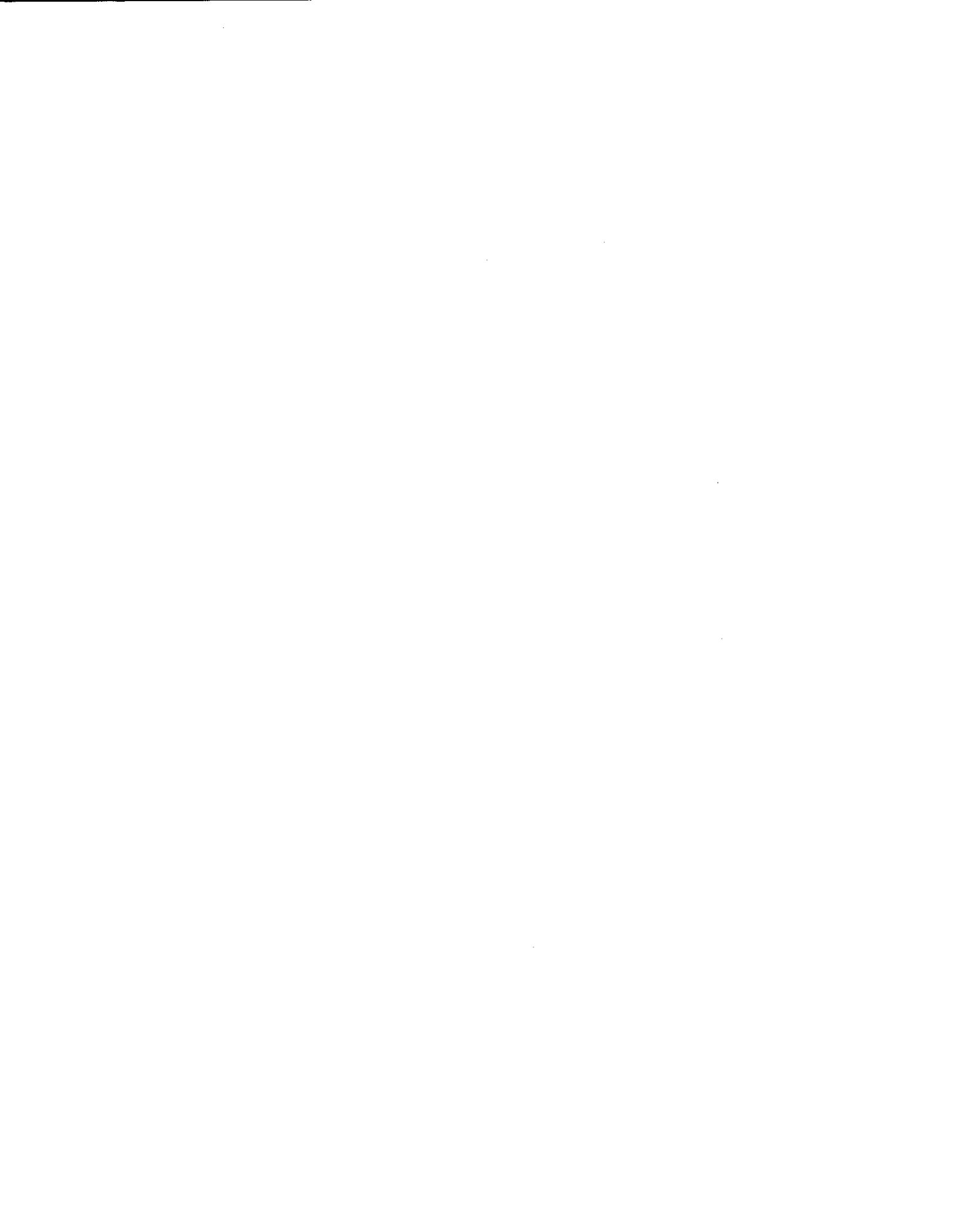
Launch Complex 40 (LC-40) is located approximately 1981 meters (6500 feet) south of LC-41 at the north end of CCAS. Complex 40 has been recently modified by Lockheed Martin to support commercial space launches. The original MST and UT were replaced with new structures; however, the basic launch pad and vehicle transporter configuration remains the same as LC-41.

2.1.1.5 Launch Complex 41

Launch Complex 41 (LC-41) is located approximately 1981 meters (6500 feet) south of Pad 39B and is surrounded by land belonging to KSC. The Air Force owns the land containing the launch complex and mobile launcher roadway which accesses the pad from CCAS to the south. LC-41 was originally used by the Air Force for Titan III rocket launches and was transferred to NASA for Titan/Centaur vehicle launches through the early 1990's. Now that all of NASA's planned launches from LC-41 have been completed, the complex is again used by the Air Force for Titan IV launches. The launch complex includes a number of single story concrete buildings and a mobile service tower building 79 meters (260 feet) high. This mobile service tower (MST) is mounted on rails and is rolled away from the pad prior to launch. The concrete pad surface is approximately 6 meters (20 feet) above sea level. Similar to the Shuttle, the Titan IV is launched

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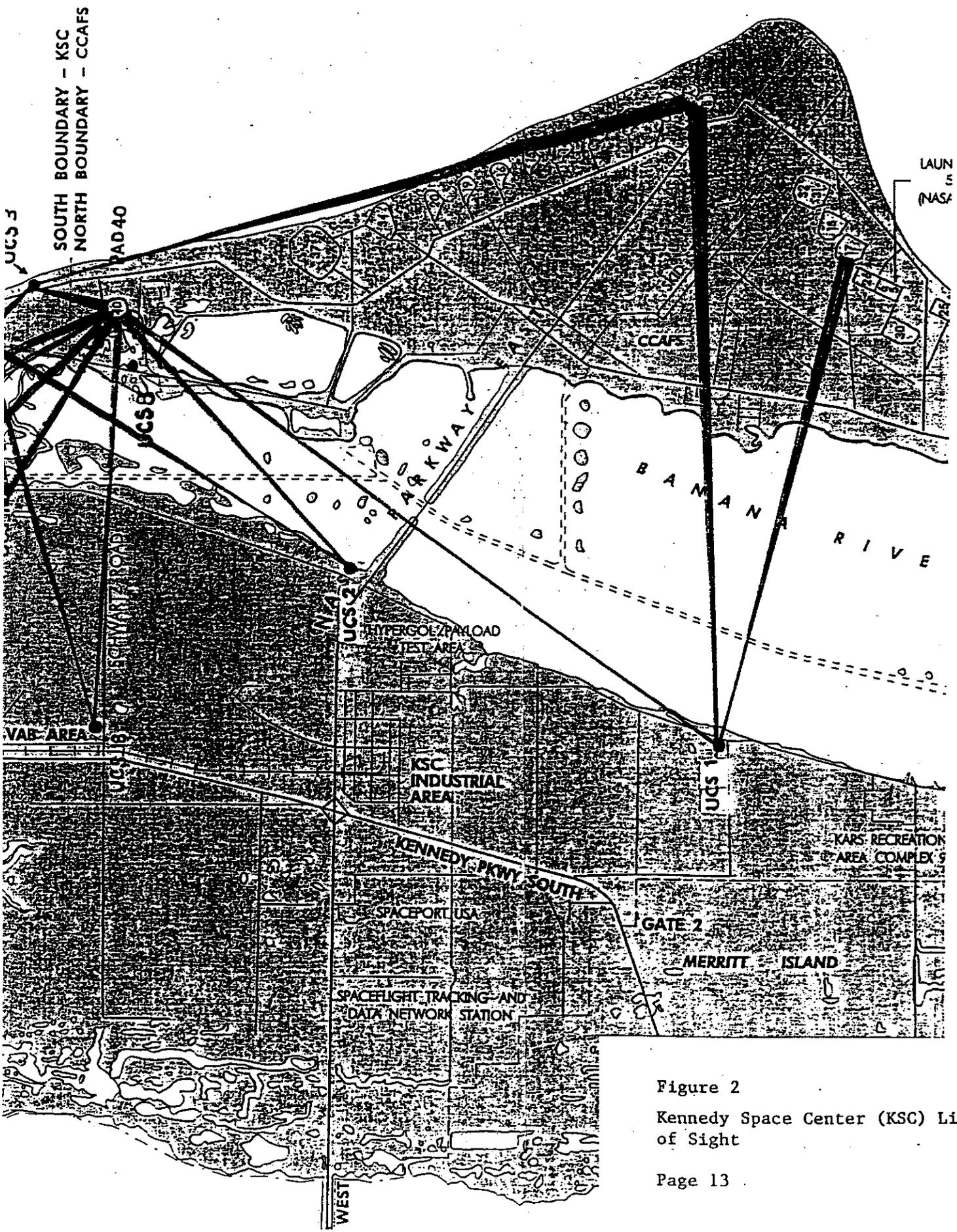


Figure 2
 Kennedy Space Center (KSC) Lines
 of Sight

CRITICAL LINES-OF-SIGHT
OPERATIONAL CAMERA SITES

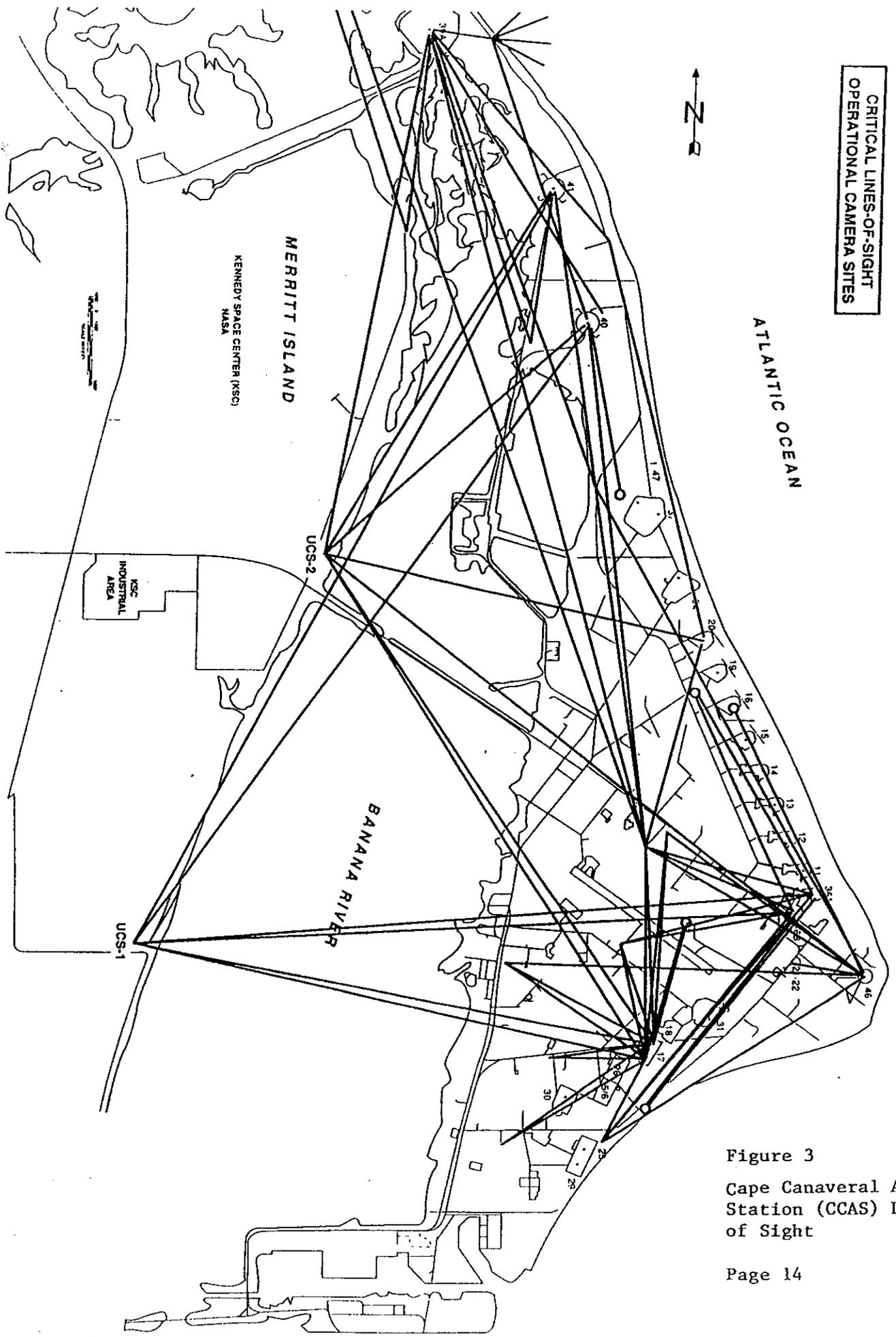


Figure 3
Cape Canaveral Air
Station (CCAS) Lines
of Sight

from a mobile platform that increases the elevation of the base of the launch vehicle (approximately 5.5 meters [18 feet]) above the pad surface.

2.1.2 Lines of Sight Requiring Initial Clearing

Research of historic aerial photographs shows that the following lines of sight do not appear to have been previously cleared. Either this particular camera angle was not required in the past or, if used, the height of the vegetation was not tall enough to previously obstruct viewing of the launch pad from a particular UCS.

2.1.2.1 UCS 23 to Launch Complex 40

Universal Camera Site 23 (Facility 19110) is located on the north side of ICBM Road where it intersects with Heavy Launch Road (Figure 2). The camera site is situated approximately 6645 meters (21,800 feet) southeast of Complex 40. Substantial plots of existing cleared land or areas of low growth vegetation between the UCS and launch pad includes: grounds within the perimeter of LC-34 and LC-37, approximately 732 meters (2400 feet) and 1097 meters (3600 feet) respectively; roads and road shoulders, including Phillips Parkway (approximately 122 meters [400 feet]), wetlands (approximately 1097 meters [3600 feet]) and the maintained grounds within Launch Complex 40 (approximately 213 meters [700 feet]). Deleting these areas from the overall distance of the proposed line of sight shows that approximately 3383 meters (11,700 linear feet) of previously undisturbed vegetation requires clearing.

The majority of vegetation within this line of sight is coastal scrub dominated by various species of scrub oak and palmettos. Historic photos from the 1950s and 1960s show the undeveloped land on CCAS was disturbed, to varying degrees, during activities related to the construction of launch complexes and support facilities. In addition, suppression of wildfires on CCAS has resulted in disruption of the natural burn cycle, thereby adversely affecting other indigenous plant and animal species. The overgrown scrub characteristic of this condition is predominant throughout the length of this, and the majority of, lines of sight on CCAS.

Wetland areas within this line of sight are dominated by non-woody low-growth plant species. Some woody wetland vegetation fringes the eastern (upland) margins of these areas; however, due to alteration of the wetlands for mosquito control, the majority of plants are exotics which have displaced the indigenous species.

2.1.2.2 UCS 23 to Launch Complex 41

Universal Camera Site 23, Facility 19110, is located on the north side of ICBM Road where it intersects with Heavy Launch Road (Figure 4). The camera site is situated approximately 9235 meters (30,300 feet) south, southeast of Launch Complex 41. This line of sight crosses over an archaeological site. Contact Mario Busacca/KSC (867-2213) or Don George/CCAS-Johnson Controls (853-6578) for any special instructions prior to clearing. Existing cleared areas within the line of sight include facilities at former Launch Complexes 34 and 37 (approximately 731

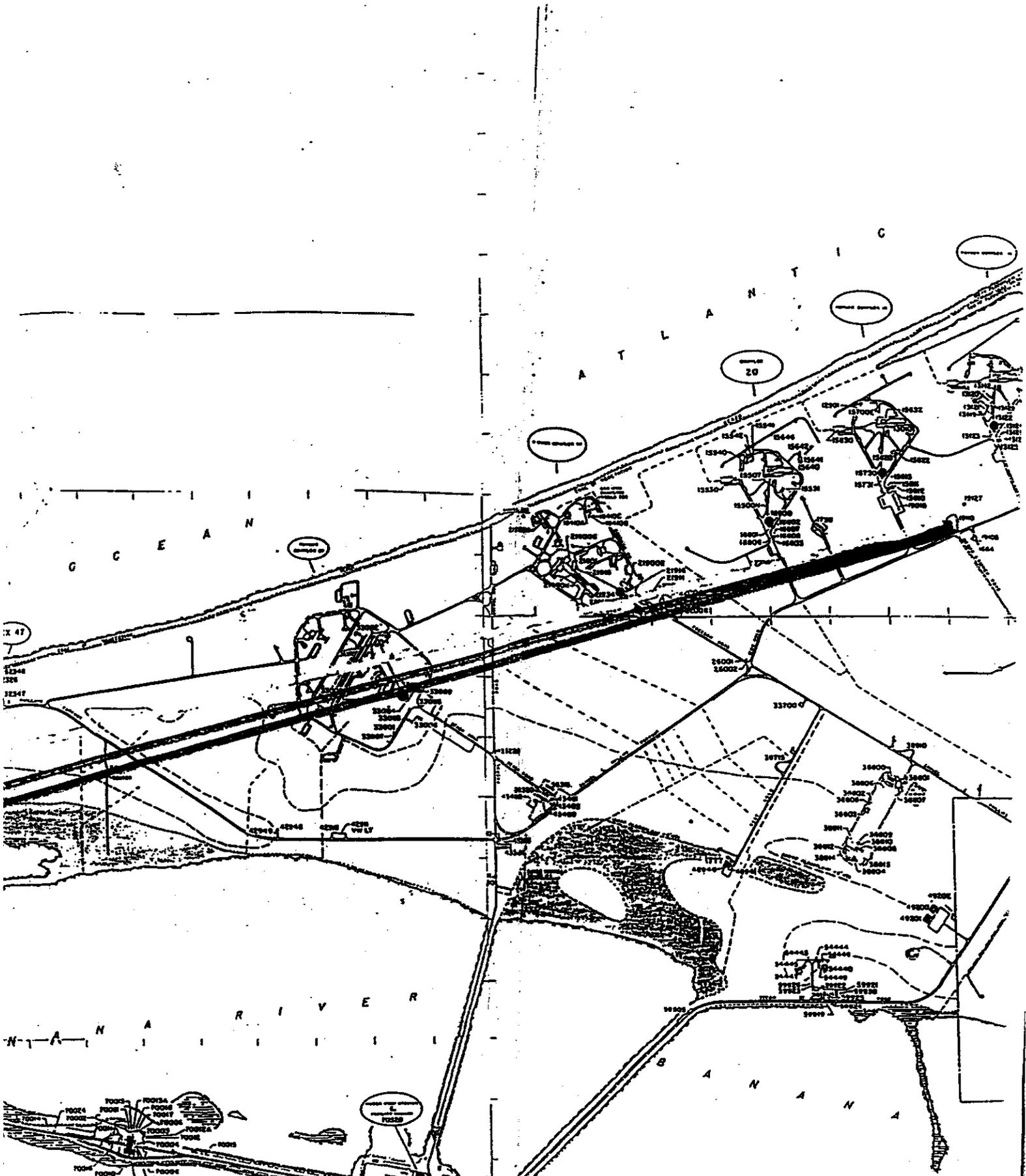


Figure 4
 UCS 23 to LC 40 and 41
 Page 16

meters [2400 feet]) and 1097 meters (3600 feet) respectively, roads and maintained road shoulders, including Phillips Parkway (approximately 396 meters [1300 feet]), Launch Complex 40 (approximately 610 meters [2000 feet]) and the maintained grounds within Launch Complex 41 (approximately 213 meters [700 feet]). The sight line also crosses wetland areas that will not Leave blank for figure 2require clearing (approximately 1493 meters [4900 feet]). Deleting these areas from the overall distance of the proposed line of sight shows that approximately 4694 meters (15,400 linear feet) of previously undisturbed vegetation requires clearing.

The majority of vegetation within this line of sight is coastal scrub dominated by various species of scrub oak and palmettos. Historic photos from the 1950s and 1960s show the undeveloped land on CCAS was disturbed, to varying degrees, during activities related to the construction of launch complexes and support facilities. In addition, suppression of wildfires on CCAS has resulted in disruption of the natural burn cycle. Uninhibited growth in a fire dependent habitat renders it unusable to indigenous plant and animal species.

Wetland areas within this line of sight are dominated by non-woody low-growth plant species. Some woody wetland vegetation fringes the eastern (upland) margins of these areas; however, due to alteration of the wetlands for mosquito control, the majority of plants are exotics which have displaced the indigenous species.

2.1.2.3 UCS 22 to Launch Complex 36, Pads A & B

Universal Camera Site 22 (USC 22) is located east of the CCAS Industrial Area, on the north side of Central Control Road near the TV Operations Building, Facility 1663. The camera site (Facility 34525) is approximately 3200 meters (10,500 feet) southwest of Complex 36 (Figure 5). Existing cleared areas within the sight line include Azusa Road (approximately 30 meters [100 feet]), numerous drainage canals (approximately 152 meters [500 feet]), ICBM Road (approximately 30 meters [100 feet]), two intersecting lines of sight for Complex 36A (approximately 61 meters [200 feet]) and two intersecting lines for Complex 36B (approximately 61 meters [200 feet]), patches of wetlands (approximately 61 meters [200 feet]) and the maintained grounds within Launch Complex 36 (\pm 152 meters [500 feet], Pad A; \pm 305 meters [1000 feet], Pad B). Deleting these areas from the overall distance of the proposed lines of sight shows that approximately 2652 meters (8700 linear feet) of previously undisturbed vegetation requires clearing for the line of sight to 36A and 2560 meters (8400 feet) to Pad B.

Vegetation within the two sight lines is classified as coastal scrub, dominated by various species of scrub oaks and palmetto. Each line of sight bisects six forest compartments previously identified in the CCAS Controlled Burning Plan. These same compartments are used in the Scrub Jay Management Plan and Scrub Compensation Plan. Methodologies used to clear and maintain these lines of sight will be compatible with the management regimes previously identified for these compartments.

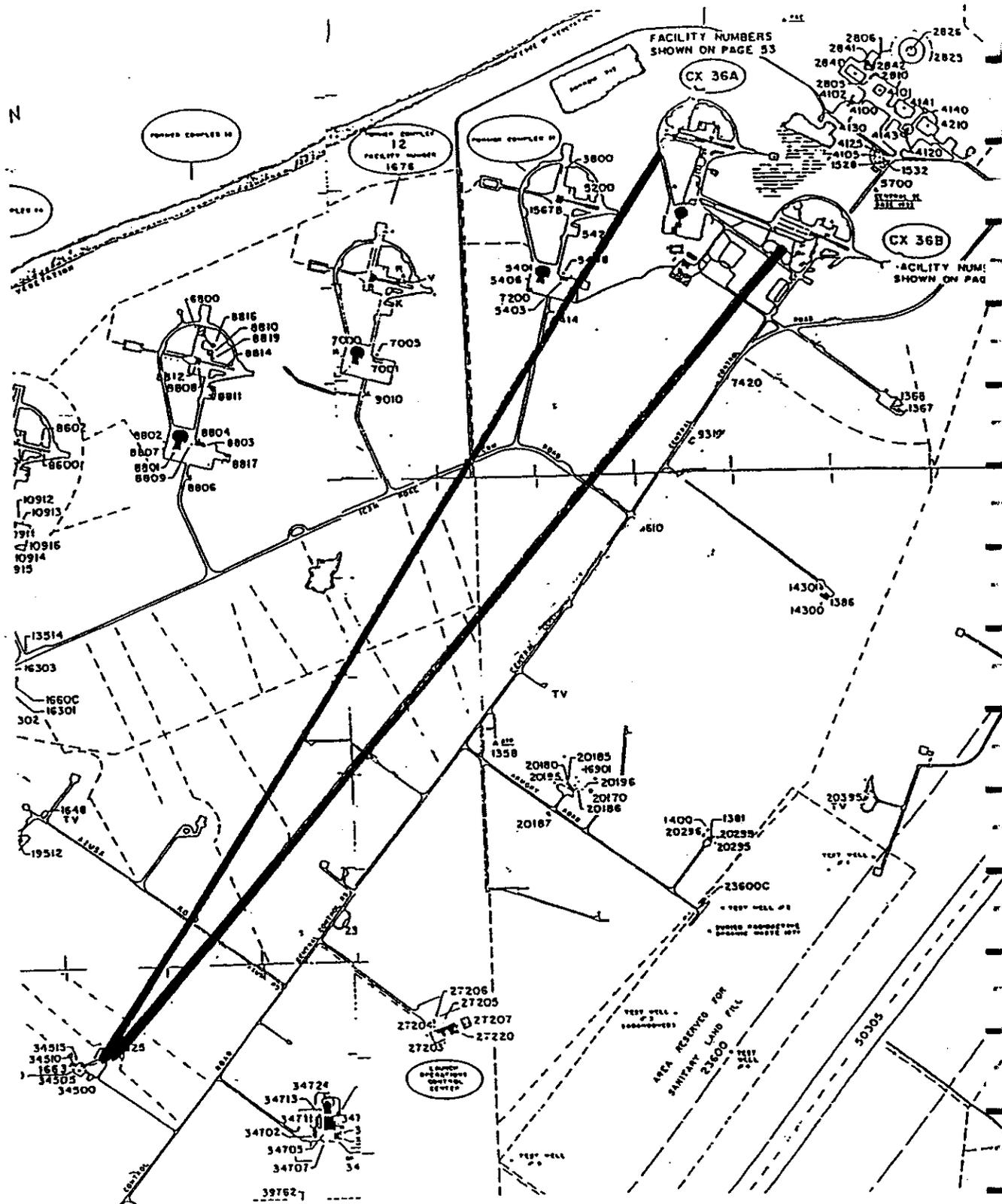


Figure 5
 UCS 22 to LC 36, Pads A and B
 Page 18

2.1.2.4 UCS 18 to Launch Complex 40

Universal Camera Site 18 (UCS 18) is located on Schwartz Road south of the VAB on the Kennedy Space Center (Figure 6). The camera site is approximately 6919 meters (22,700 feet) west of Launch Complex 40. This line of sight crosses over a habitat study area for protected Florida Scrub Jays. Please contact Dave Breininger (CCAS-Dynamac Corp./853-3281) for special instructions before clearing. Areas within the sight line that do not require vegetation removal include Static Test Road (approximately 30 meters [100 feet]), the Titan transporter tracks (approximately 61 meters [200 feet]), wetland areas (approximately 671 meters [2200 feet]), the Banana River (approximately 1524 meters [5000 feet]) and the maintained grounds within Launch Complex 40 (approximately 213 meters [700 feet]). Deleting these areas from the overall distance of the proposed line of sight shows that approximately 4420 meters (14,500 linear feet) of vegetation may require clearing.

2.1.2.5 UCS 18 to Launch Complex 41

Universal Camera Site 18 (UCS 18) is located on Schwartz Road south of the VAB on the Kennedy Space Center (KSC) (Figure 6). The camera site is approximately 6919 meters (22,700 feet) west of Launch Complex 40. This line of sight crosses a habitat study area for protected Florida Scrub Jays. Please contact Dave Breininger (CCAS/Dynamac Corp./853-3281) for special instructions before any clearing. Areas within the sight line that do not require clearing include Static Test Road (approximately 30 meters [100 feet]), wetland areas (approximately 1384 meters [4540 feet]), the Banana River (approximately 2377 meters [7800 feet]), and the maintained grounds within Launch Complex 41 (approximately 213 meters [700 feet]). Deleting these areas from the overall distance of the proposed line of sight shows that approximately 2915 meters (9560 linear feet) of vegetation requires clearing.

2.1.2.6 UCS 5 to Launch Complex 40

Universal Camera Site 5 (UCS 5) is located on KSC off State Road 407 west of the intersection with Happy Creek Road (Figure 7). This line of sight crosses over a habitat study area for protected Florida Scrub Jays. Please contact Dave Breininger (CCAS-Dynamac Corp./853-3281) for special instructions before clearing. The camera site is approximately 12,740 meters (41,800 feet) north, northwest of Launch Complex 40. This sight line shows no evidence of previous clearing. Existing cleared areas within the sight line include the Titan transporter railroad tracks (approximately 61 meters [200 feet]) and transporter roadways to Shuttle Pads A and B (approximately 305 meters [1000 feet]). In addition, there are extensive areas of low-growth vegetation such as wetlands and marshes which cover approximately 4572 meters (15,000 feet). Deleting these areas from the overall distance of the line of sight shows that approximately 7803 meters (25,600 linear feet) of vegetation will require some degree of vegetation removal.

The portion of this line of sight which traverses Air Force land on CCAS is approximately 914 meters (3000 feet). A significant percentage of this distance is over low-growth wetland vegetation that does not require clearing. In areas where the wetlands have been disturbed, such

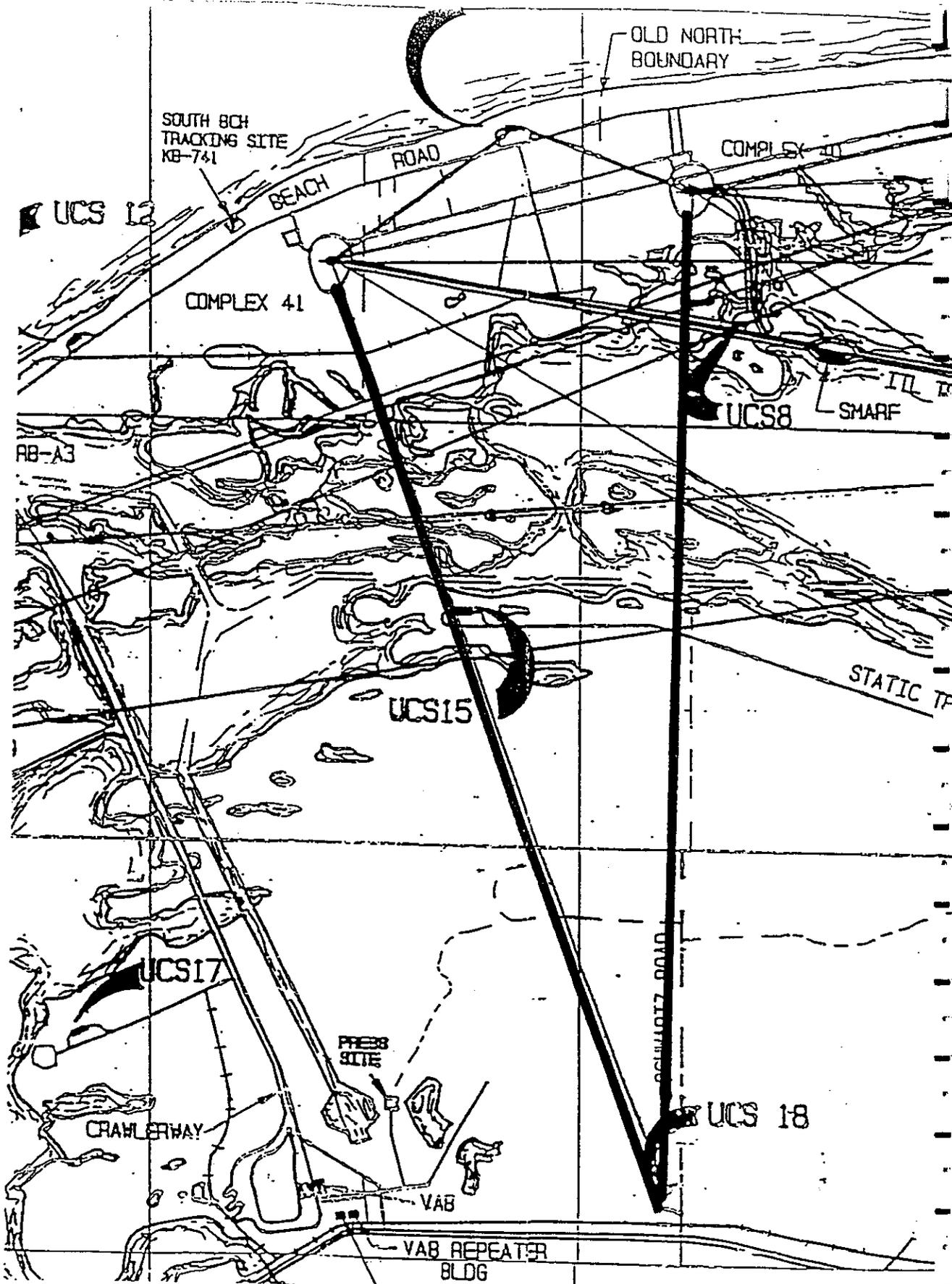


Figure 6.
 UCS 18 to LC 40 and 41
 Page 20

as the Titan transporter railways and mosquito control dikes, some exotic vegetation has established. These plants, mostly Brazilian Peppers, Wax Myrtle and Willows, may obstruct the sight line and require site specific removal actions. In addition, the area adjacent to the complex contains scrub oaks that may also necessitate some level of clearing.

2.1.2.7 UCS 5 to Launch Complex 41

Universal Camera Site 5 (UCS 5) is located on KSC off State Road 407 west of the intersection with Happy Creek Road (Figure 7). This line of sight crosses a habitat study area for protected Florida Scrub Jays. Please contact Dave Breininger (CCAS/Dynamac Corp./853-3281) for special instructions before any clearing. The camera site is approximately 10,272 meters (33,700 feet) north, northwest of Launch Complex 41. This sight line shows no evidence of previous clearing. Existing cleared areas within the sight line include the Titan railroad spur track (approximately 46 meters [150 feet]) and the crawlerways to Shuttle Pads A & B (approximately 305 meters [1000 feet]). In addition, areas of low growth vegetation, such as wetlands and marshes, comprise approximately 3597 meters (11,800 feet) of this line of sight. Approximately 2255 meters (7400 feet) of the line of sight crosses the Banana River. Deleting these areas from the overall length of the sight line shows that approximately 4069 meters (13,350 feet) of vegetation would require clearing.

2.1.2.8 UCS 12 to Launch Complex 17, Pads A & B

Universal Camera Site 12 (UCS 12) is located north of Launch Complex 41 on the east side of Phillips Parkway on KSC. The camera site is approximately 17,221 meters (56,500 feet) north, northeast of Launch Complex 17, Pads A & B (Figure 8). Existing cleared areas within the sight line include the transporter railway to Launch Complex 41 (approximately 61 meters [200 feet]), the railway to Launch Complex 40 (approximately 61 meters [200 feet]), Phillips Parkway (approximately 122 meters [400 feet]), Heavy Launch Road (approximately 61 meters [200 feet]), Central Control Road (approximately 61 meters [200 feet]), CCAS Airfield (approximately 488 meters [1600 feet]), the Landfill (approximately 610 meters [2000 feet]), approximately 7 drainage canals (approximately 213 meters [700 feet]), 5 smaller roads to various facilities (approximately 152 meters [500 feet]), maintained grounds within Launch Complex 17, Pads A and B (approximately 152 meters [500 feet] and 335 meters [1100 feet], respectively). The line of sight also crosses wetland areas that will not require clearing (approximately 4755 meters [15,600 feet]). Deleting these areas from the overall distance of the proposed line of sight shows that approximately 10,485 meters (34,400 linear feet) of vegetation will require clearing for Pad A and 10,302 meters (33,800 linear feet) for Pad B.

2.1.3 Existing Lines of Sight Requiring Extensive Clearing

Currently, there are a number of active lines of sight which have become overgrown and now obstruct visibility between the launch complexes and the various camera sites. Historically, lines of sight on CCAS were created and maintained by pushing over trees with a large bulldozer. The

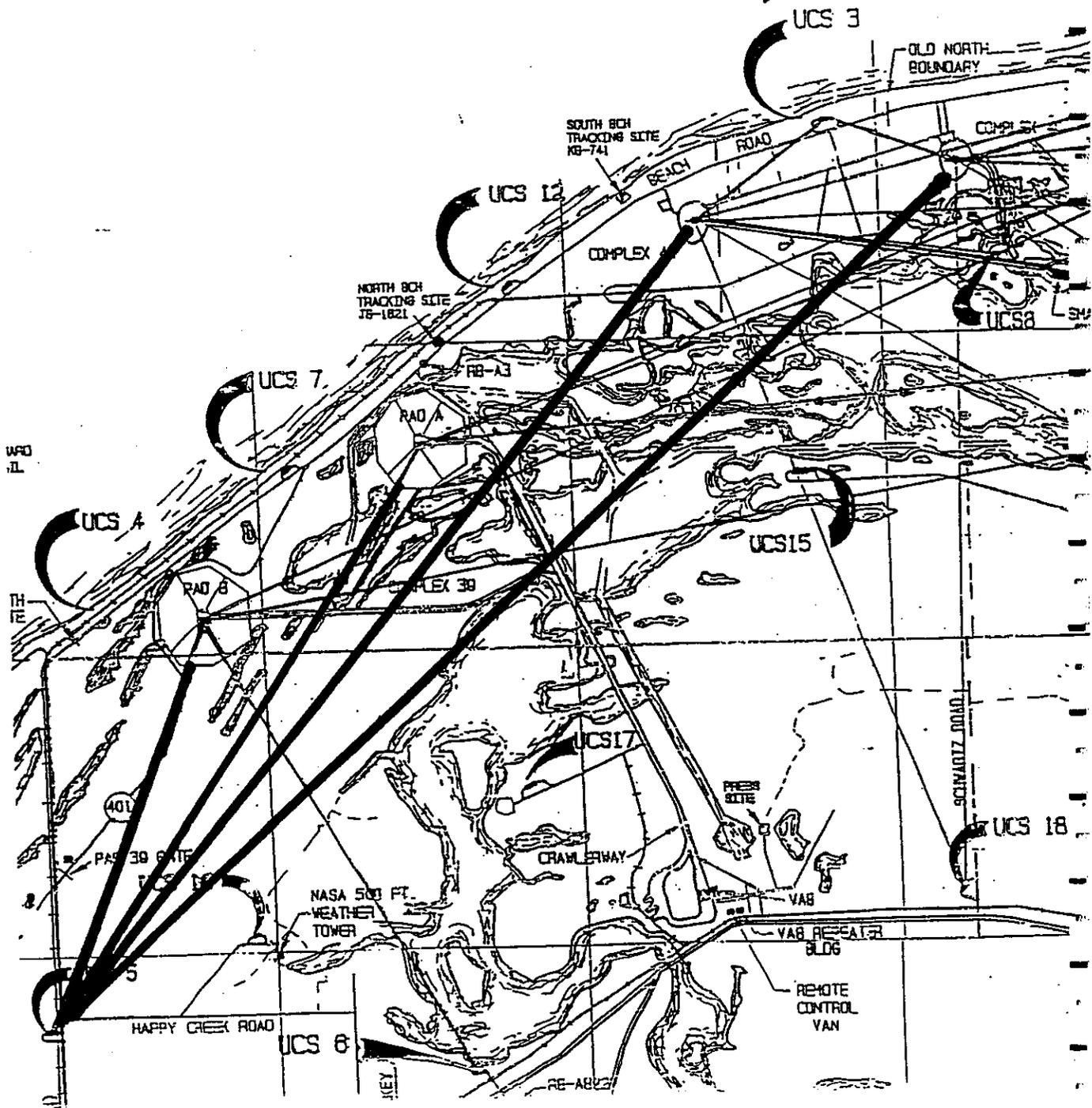
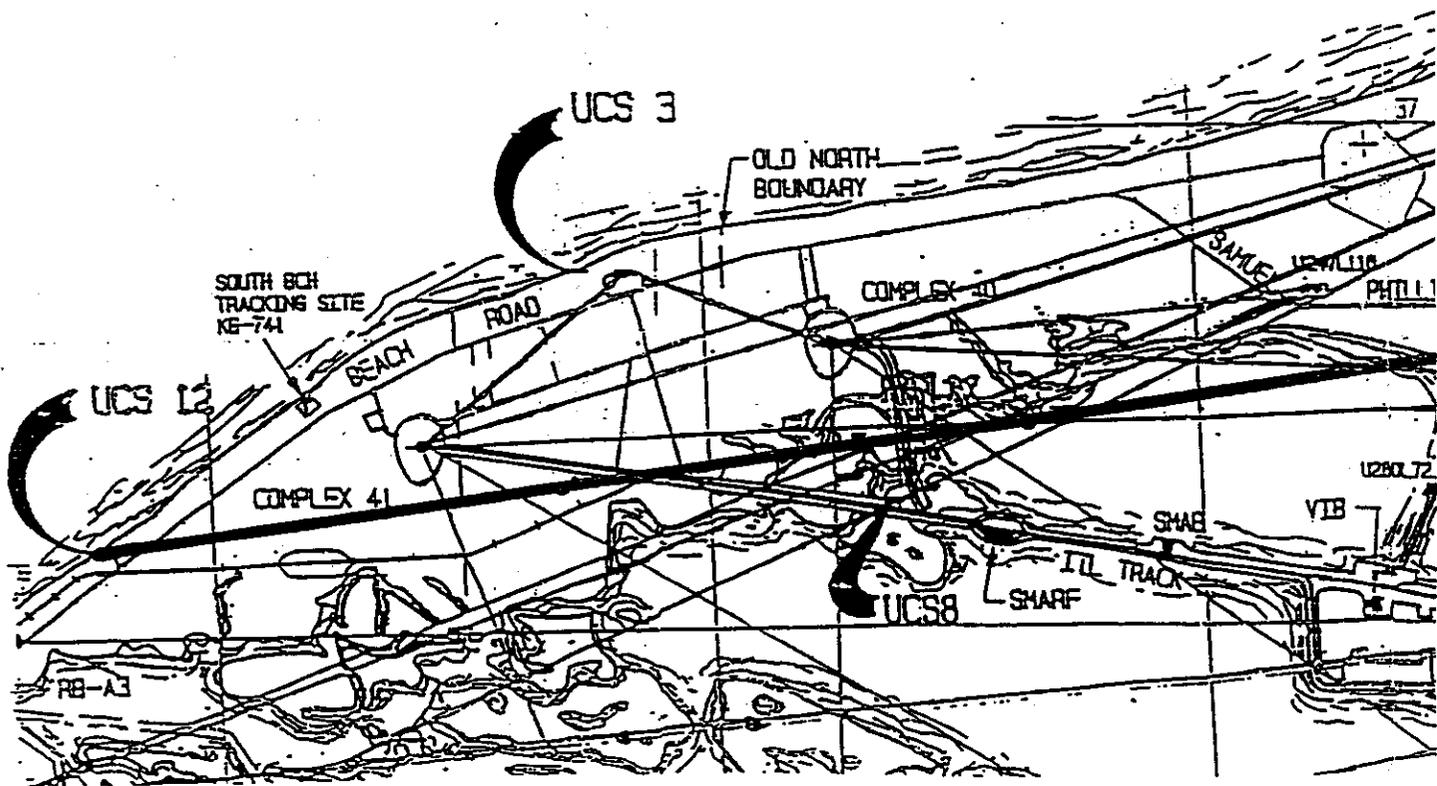


Figure 7
 UCS 5 to LC 40 and 41
 and ICI 39, Pads A and B



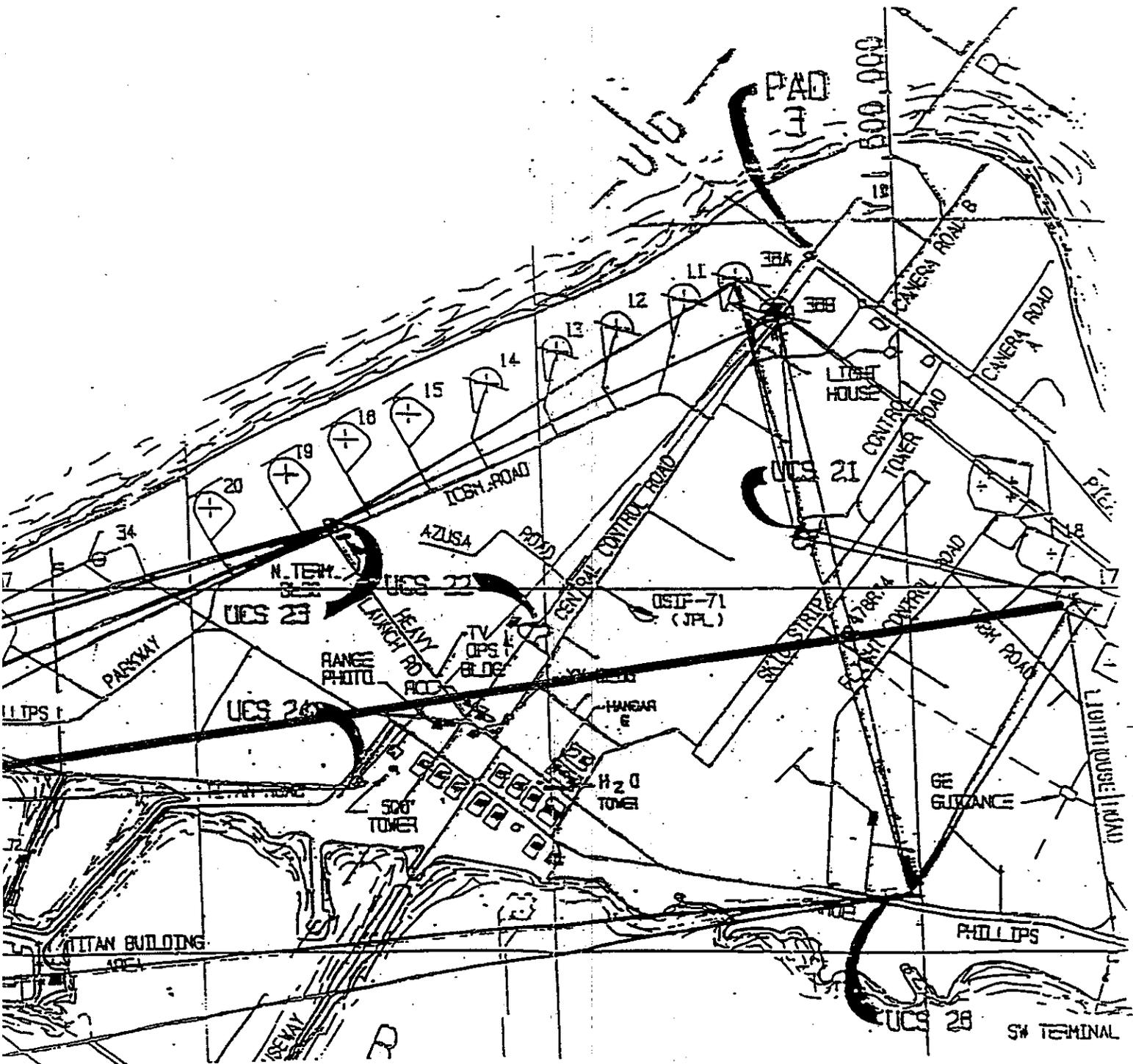


Figure 8
 UCS 12 to LC 17, Pads A and B

effectiveness of this crushing technique was temporary and did not facilitate wildlife utilization. Some of these sight lines appear to have never been cleared; however, a review of aerial photographs documents previous line of sight construction.

2.1.3.1 UCS 21 to Launch Complex 17, Pads A & B

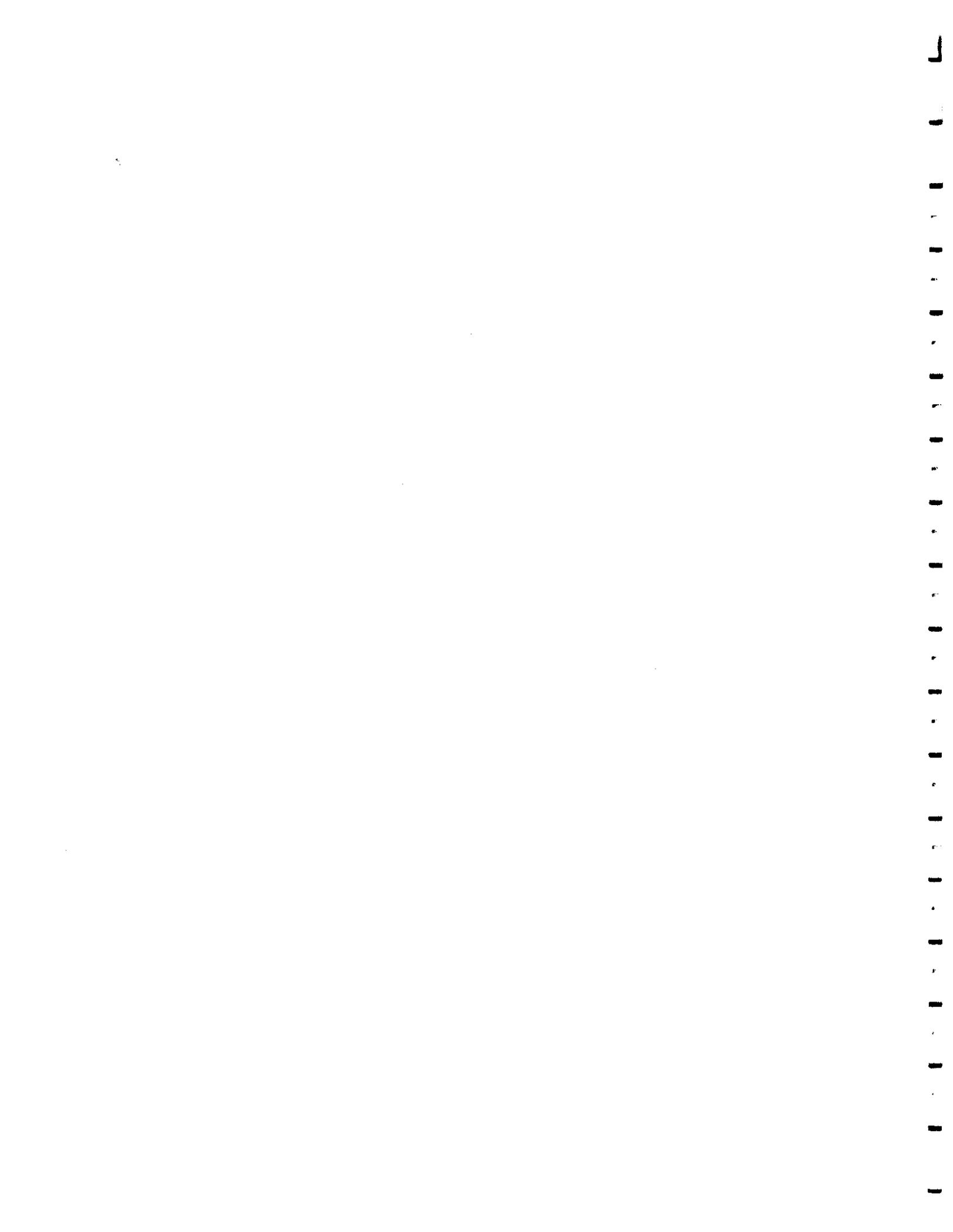
Universal Camera Site 21 (USC 21) is located north of the CCAS airfield near the western end of Control Tower Road (Figure 9). The camera site, Facility 20395, is approximately 2438 meters (8000 feet) north, northwest of Complex 17. Existing cleared areas within the sight line include the airfield and associated clear zones (approximately 488 meters [1600 feet]), Flight Control Road (approximately 61 meters [200 feet]), two drainage canals (approximately 61 meters [200 left blank for figure 6 feet]), two existing intersecting lines of sight (approximately 30 meters [100 feet]), and the maintained grounds within Launch Complex 17 (\pm 152 meters [500 feet],

Pad A; \pm 335 meters [1100 feet], Pad B). Deleting these areas from the overall distance of the proposed line of sight shows that approximately 1646 meters and 1463 meters (5400 feet and 4800 feet), respectively, of previously undisturbed vegetation will require clearing and periodic maintenance.

2.1.3.2. UCS 21 to Launch Complex 36, Pads A & B

Universal Camera Site 21 (UCS 21) is located north of the eastern end of the CCAS airfield and southeast of the Industrial Area. The camera site, Facility 20395, is approximately 2121 meters (6960 feet) west of Launch Complex 36 Pad A, and approximately 1792 meters (5880 feet) west of Pad B (Figure 10). Existing cleared areas within the sight line to Pad A include the Timing and Firing Shop (Facility 1385) area (approximately 122 meters [400 feet]), Central Control Road (approximately 91 meters [300 feet]), facilities at Launch Complex 36 (approximately 305 meters [1000 feet]), one drainage canal (approximately 30 meters [100 feet]), and maintained grounds within Launch Complex 36, Pad A (approximately 213 meters [700 feet]). Existing cleared areas for the sight line to Pad B include 2 drainage canals (approximately 61 meters [200 feet]), road to Facility 1366 and 1367 (approximately 61 meters [200 feet]), Central Control Road (approximately 91 meters [300 feet]), and maintained grounds within Launch Complex 36, Pad B (approximately 152 meters [500 feet]). Deleting these areas from the overall distance of the existing line of sight shows that approximately 1359 meters (4460 linear feet) of vegetation require clearing for Pad A and 1426 meters (4680 linear feet) for Pad B.

With the exception of some low areas (topographically) between relic dune ridges that contain wetland vegetation, the majority of land traversed by these sight lines is classified as coastal scrub. This vegetation community is dominated by various species of scrub oak trees and palmettos. The scrub bisected by the proposed lines of sight has overgrown and subsequently been included in the Scrub Jay Management Plan for habitat restoration. All of the land between the complex and camera site has been included in various scrub habitat management (burn) compartments. Land clearing and sight line maintenance will be consistent with the management techniques specified for each compartment.



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CENTRAL CONTROL RD.

TV

AIR 1358

ARMORY ROAD
20180
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20187

20185
16901
20196
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20186

1400
20296
1381
20299
20295

20395

TEST WELL #1

23600C
TEST WELL #2
BURIED RADIOACTIVE ORGANIC WASTE 1971

27220

LAUNCH OPERATIONS CONTROL CENTER

TEST WELL (ABANDONED)

AREA RESERVE FOR SANITARY LAND 23600 TEST WELL #3

50305

TEST WELL #3

TEST WELL #4

35420

40406

40433
40431
40432

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-50162

50216
50225
50226

50210

50211

50212

50215

50300

12th SKE 3rd ROAD

55817
55815

55810
55811

55824

55885

APORKE RD 50701

50802
50702

50703
50801

U-50
L-50

ALL RESTON FOOD

2.1.3.3 UCS 26 to Launch Complex 36, Pads A & B

Universal Camera Site 26 (UCS 26) is located on the east side of Samuel Phillips Parkway adjacent to the entrance to Fuel Storage Area #1, Facility 1047. The camera site is approximately 5072 meters (16,640 feet) west, southwest of Launch Complex 36, Pad A and 4892 meters (16,050 feet) west, southwest of Pad B (Figure 11). Existing cleared land and areas of low growth vegetation within the sight line to Pad A include: Flight Control Road (approximately 61 meters [200 feet]), Control Tower Road (approximately 61 meters [200 feet]), Central Control Road (approximately 61 meters [200 feet]), wetland areas (approximately 183 meters [600 feet]), the Alligator Pond (approximately 183 meters [600 feet]), CCAS airfield (approximately 183 meters [600 feet]), various facilities (approximately 244 meters [800 feet]), 3 drainage canals (approximately 91 meters [300 feet]), and the maintained grounds within Launch Complex 36 (approximately 213 meters [700 feet]). The line of sight to Launch Complex 36B was cleared and grubbed in 1985 as part of a multiple use project to establish fire breaks on CCAS. Annual mowing of this line of sight is included in the Grounds Maintenance contract. Areas within this line of sight that will not require clearing specific to the proposed action include: Control Tower Road (approximately 61 meters [200 feet]), 3 drainage canals (approximately 91 meters [300 feet]), wetland areas (approximately 91 meters [300 feet]), Central Control Road (approximately 61 meters [200 feet]), several smaller roads (approximately 61 meters [200 feet]), various facilities (approximately 244 meters [800 feet]), and the maintained grounds within Launch Complex 36, Pad B (approximately 152 meters [500 feet]). Deleting these areas from the overall distance of the existing line to Pad A shows that approximately 3792 meters (12,440) linear feet of vegetation require clearing and maintenance. For Pad B, approximately 4130 meters (13,550 linear feet) of vegetation require periodic maintenance.

2.1.3.4 UCS 15 to Launch Complex 40

Universal Camera Site 15 (UCS 15) is located at the northern end of Static Test Road on KSC (Figure 12). The camera site is approximately 3231 meters (10,600 feet) west of Launch Complex 40, separated by waters of the North Banana River. Lands within the sight line that do not require clearing include the Titan transporter railway (approximately 61 meters [200 feet]), wetland areas (approximately 853 meters [2800 feet]), marshy areas (approximately 366 meters [1200 feet]), and the maintained grounds within Launch Complex 40 (approximately 152 meters [500 feet]). Deleting these areas from the overall distance of the line of sight shows that approximately 1798 meters (5900 linear feet) of vegetation require clearing.

2.1.3.5 UCS 15 to Launch Complex 41

Universal Camera Site 15 (UCS 15) is located at the northern end of Static Test Road on KSC. The camera site is approximately 2438 meters (8000 feet) west of Launch Complex 41 (Figure 12). Lands within the sight line that do not require clearing include wetland areas (approximately 30 meters [100 feet]), marshy areas (approximately 1341 meters [4400 feet]), and the maintained grounds within Launch Complex 41 (approximately 152 meters [500 feet]).

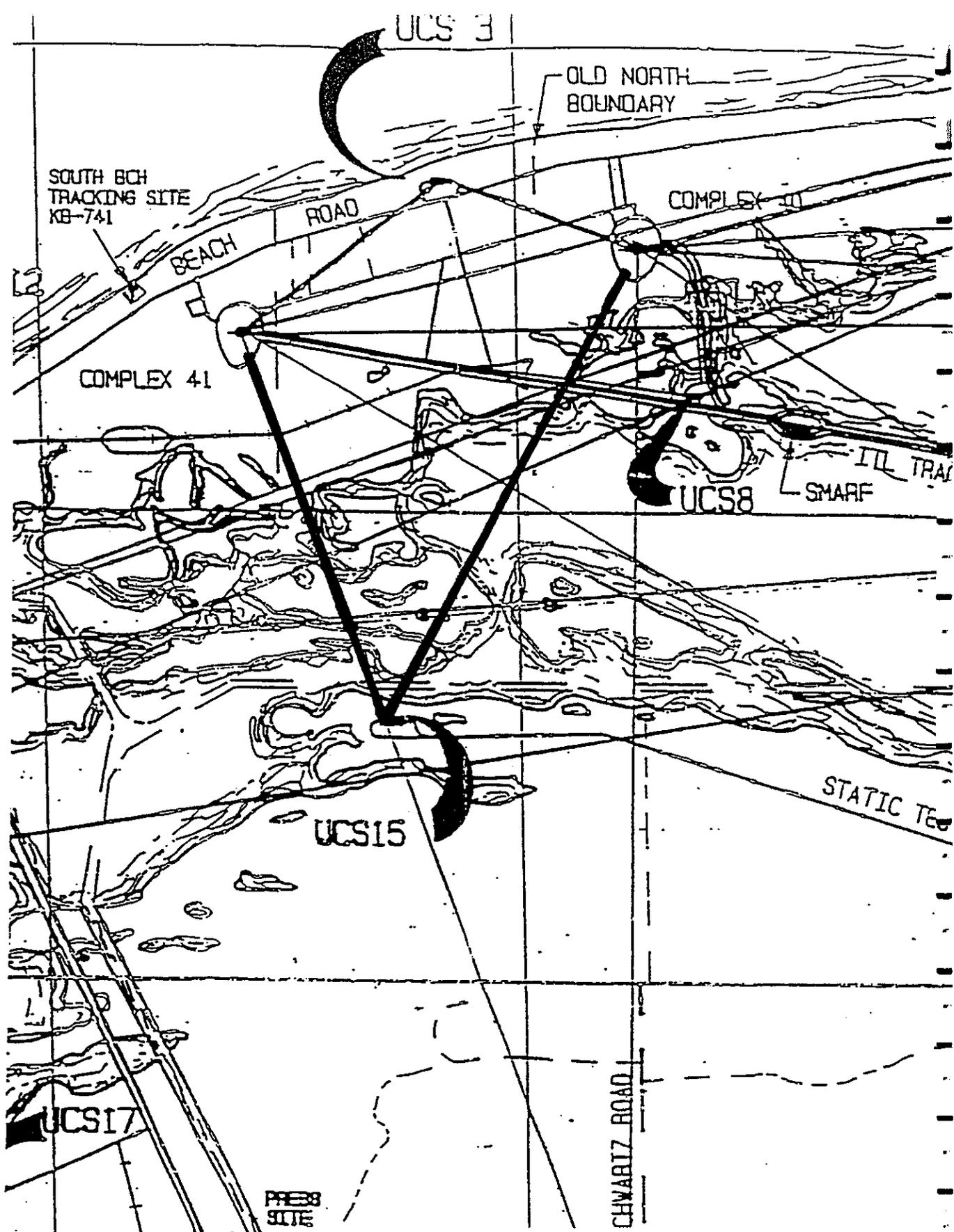


Figure 12
 UCS 15 to LC 40 and 41
 Page 29

Deleting these areas from the overall distance of the line of sight shows that approximately 610 meters (2000 linear feet) of vegetation requires clearing.

2.1.3.6 UCS 24 to Launch Complex 40

Universal Camera Site 24 (UCS 24) is located north of the CCAS Industrial Area, west of Samuel Phillips Parkway (Figure 13). The camera site is approximately 6492 meters (21,300 feet) south of Launch Complex 40. Areas within the sight line that do not require clearing include a drainage canal (approximately 30 meters [100 feet]), several smaller roads and shoulders (approximately 122 meters [400 feet]), the Banana River (approximately 3536 meters [11,600 feet]), wetland areas (approximately 671 meters [2200 feet]), and the maintained grounds around Launch Complex 40 (approximately 152 meters [500 feet]). Deleting these areas from the overall distance of the line of sight shows that approximately 1981 meters (6500 linear feet) of vegetation must be reduced in height within this previously cleared sight line.

Vegetation between the UCS and the Banana River is primarily overgrown coastal scrub with some wetland plants occurring along the Banana River shoreline.

2.1.3.7 UCS 24 to Launch Complex 41

Universal Camera Site 24 (UCS 24) is located north of the CCAS Industrial Area and west of Samuel Phillips Parkway (Figure 13). The camera site is approximately 9053 meters (29,700 feet) south of Launch Complex 41. Existing cleared areas within the sight line that do not require clearing include a drainage canal (approximately 30 meters [100 feet]), Titan transporter railway (approximately 61 meters [200 feet]), several roads (approximately 61 meters [200 feet]), wetland areas (approximately 610 meters [2000 feet]), the Banana River (approximately 6797 meters [22,300 feet]), and the maintained grounds around Launch Complex 41 (approximately 152 meters [500 feet]). Deleting these areas from the overall distance of the line of sight shows that approximately 1341 meters (4400 linear feet) of vegetation would be trimmed from this previously cleared sight line.

2.1.3.8 UCS 2 to Launch Complex 41

Universal Camera Site 2 (UCS 2) is located on the west side of the Banana River off of Static Test Road, approximately 1 km north of NASA Causeway (Figure 14). The camera pad is raised 6 meters (20 feet) above sea level. UCS 2 is situated 7440 meters (24,400 feet) southwest of Launch Complex 41 and is presently obscured by a tall oak hammock roughly 150-200 meters north of the camera site. Of the 7440 meters in the line of sight, 5366 meters cross over open waters and estuarine edge habitat of the Banana River. In addition, 1220 meters cross previously disturbed areas and impoundment dikes southwest of Complex 41. Vegetation which must be considered for impact along the line of sight is composed of broad-leaved woodlands (244 meters) and cattail and graminoid marshes (610 meters). The line of sight obstruction is some portion of the taller vegetation contained within the broad-leaved woodland, quite possibly a wetland.



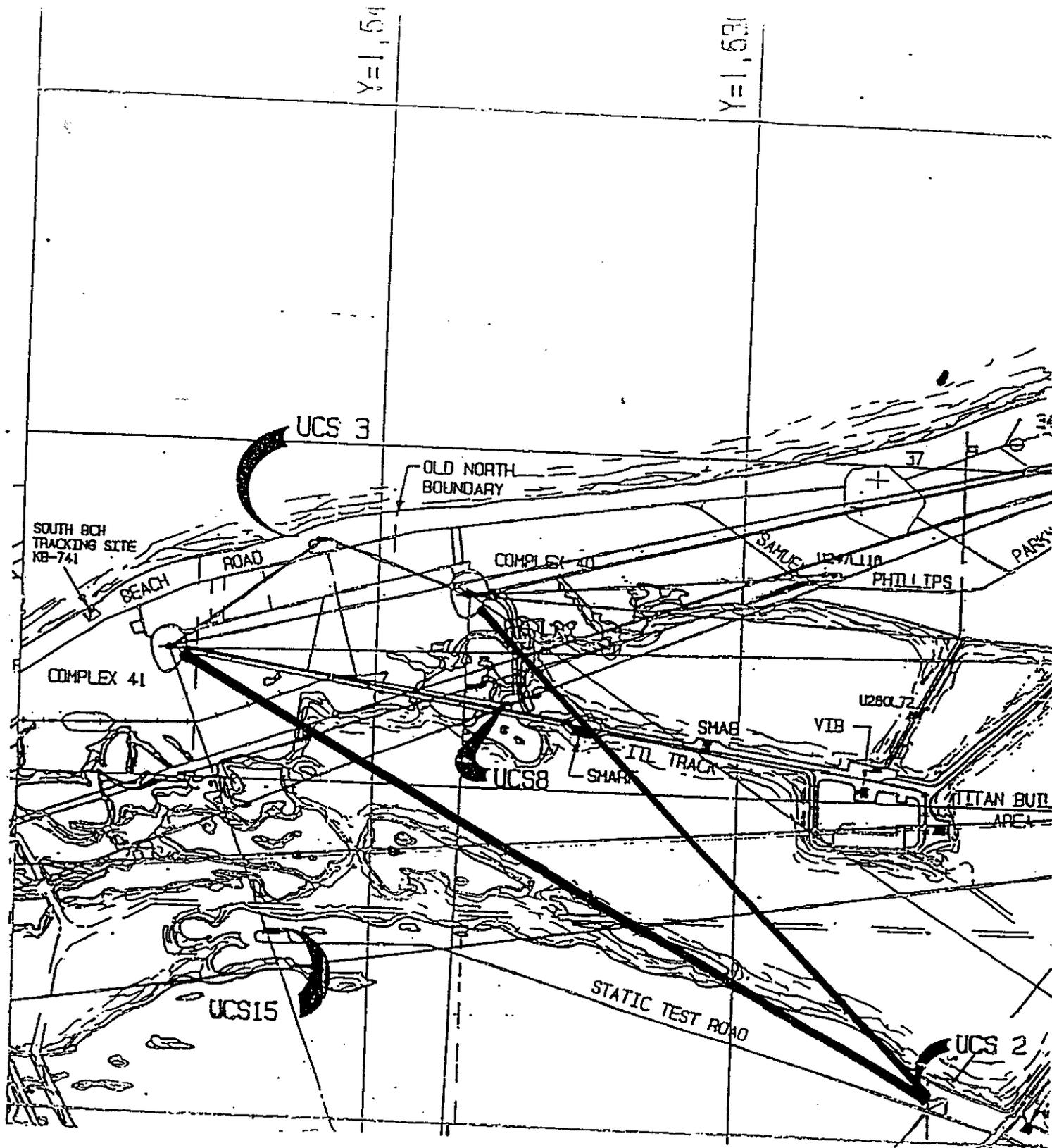


Figure 14
 UCS 2 to LC 40 and 41
 Page 32

2.1.4 Existing Lines of Sight Requiring Maintenance

The majority of sight lines on CCAS have been routinely maintained and are not significantly overgrown. In addition, a number of the lines of sight were cleared and grubbed as part of a multiple use project conducted in the late 1980s. These sight lines are periodically mowed by the grounds maintenance contractor and will not require the level of clearing as those described in Sections 2.1.1 and 2.1.2.

2.1.4.1 UCS 1 to Launch Complex 17, Pads A and B

Universal Camera Site 1 (UCS 1) is located adjacent to Tel IV (Facility N6-2296) on KSC (Figure 15). The camera site is 305 meters (1000 feet) inland from the west shore of the Banana River on Twenty Eight Street, SE. This site is approximately 8839 meters (29,000 feet) west of Launch Complex 17. The line of sight crosses the Banana River, which is 5425 meters (17,800 feet) wide at this point. Therefore, the length of the sight line on CCAS, where the majority of clearing would be needed, is approximately 3414 meters (11,200 feet).

On KSC, half of the 305 meters (1000 feet) is maintained grounds surrounding the camera site, Tel IV, and adjacent facilities. The remaining 152 meters (500 feet) is wetlands which have been isolated from the Banana River by construction of a mosquito control impoundment. Some exotic vegetation, which has volunteered into the disturbed wetland, would require removal.

On CCAS, the majority of the land bisected by these sight lines is classified as coastal scrub, dominated by scrub oaks and palmetto. Some wetland and tropical hammock vegetation is present adjacent to the eastern shoreline of the Banana River and large tree removal may be required in this area. In addition, the two sight lines cross Phillips Parkway, IRBM Road and Lighthouse Road, which cumulatively contribute approximately 152 meters (500 feet) of existing maintained land within each line of sight, which will not require clearing.

2.1.4.2 UCS 1 to Launch Complex 36, Pads A and B

Universal Camera Site 1 (UCS 1) is located adjacent to Tel IV (Facility N6-2296) on KSC (Figure 15). The camera site is 305 meters (1000 feet) inland from the west shoreline of the Banana River, on Twenty Eight Street, S.E. This site is approximately 11,278 meters (37,000 feet) west of Launch Complex 36 (LC-36).

Areas within these sight lines which would not require vegetation removal include: the Banana River, approximately 5486 meters (18,000 feet); maintained grounds surrounding the UCS, 152 meters (500 feet); power line right of way, 30 meters (100 feet); South Phillips Parkway, 61 meters (200 feet); the Spacecraft Processing Facility, 305 meters (1000 feet); CCAS airfield, 457 meters (1500 feet); and various access roadways, 91 meters (300 feet). The total of these areas shows that approximately 6553 meters (21,500 feet) of this 11,278 meter (37,000 foot) line of sight will not require any type of clearing or maintenance in support of the proposed action.

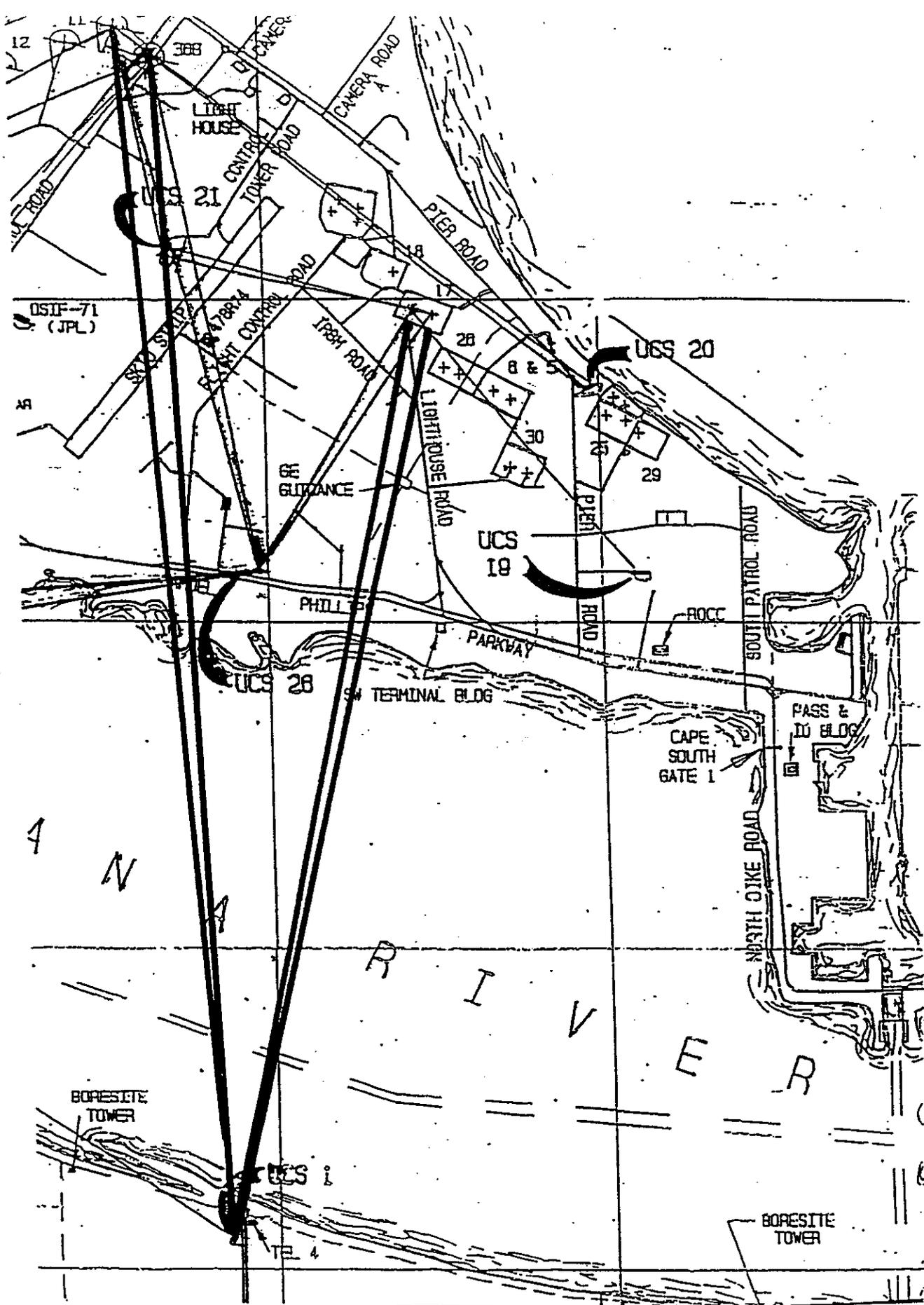


Figure 15

UCS 1 to LC 36, Pads A & B and LC 17, Pads A & B

On KSC, east of the improved grounds and pavements surrounding the UCS and Tel IV is a wetland which has been impounded. Some exotic and native wetland species exist in, and adjacent to, this wetland. The larger plants such as Brazilian Pepper, Wax Myrtle and Willows may obstruct the line of sight and, therefore, would require removal.

On CCAS some wetland vegetation occurs along the Banana River shoreline and inland where soil types and elevation are conducive to their establishment. With the exception of some mangroves along the river, all other wetland species which would obstruct the sight line are exotic species. The remainder of uplands on CCAS within these lines of sight are classified as coastal scrub. A detailed description of this habitat type is provided in Section 3.2.1. Deleting the previously cleared, maintained grounds from the portion of sight line on CCAS shows approximately 5029 meters (16,500 feet) of scrub vegetation which would require periodic clearing and maintenance. Similar to most other upland areas on CCAS, the scrub oaks have become hammock-like and no longer maintain the unique features needed to support scrub associated animal species.

2.1.4.3 UCS 26 to Launch Complex 17, Pads A & B

Universal Camera Site 26 (UCS 26) is located on Samuel Phillips Parkway between Flight Control Road and Lighthouse Road (Figure 11). The camera site is approximately 2633 meters (8640 feet) northwest of Launch Complex 17, Pad A, and 2560 meters (8400 feet) northwest of Pad B. The sight line for Pad A has previously been cleared but will require future maintenance of low-growth oak scrub. The sight line for Pad B has also previously been cleared and should only require maintenance mowing of ruderal vegetation.

Both lines of sight traverse approximately 1524 meters (5000 feet) of coastal scrub habitat which will require periodic maintenance. Existing maintained grounds (Fuel Storage Area #5, approximately 610 meters [2000 feet]); IRBM Road, approximately 30 meters (100 feet); Lighthouse Road, approximately 30 meters (100 feet); and improved grounds within and adjacent to LC 17, 152 - 305 meters (500-1000 feet) comprise the remaining portions of each sight line.

2.1.4.4 UCS 19 to Launch Complex 17, Pads A & B

Universal Camera Site 19 (UCS 19) is located off Pier Road, southwest of Complex 17. The camera site (Facility 1125) is approximately 2896 meters (9500 feet) southwest of the complex (Figure 16). This sight line was previously cleared (within the last five years) and will probably require clearing again in the next five years.

Approximately 1219 meters (4000 feet) of these lines of sight traverse maintained grounds, roadways and pavements. The remaining land primarily consists of coastal scrub vegetation which will require periodic maintenance.

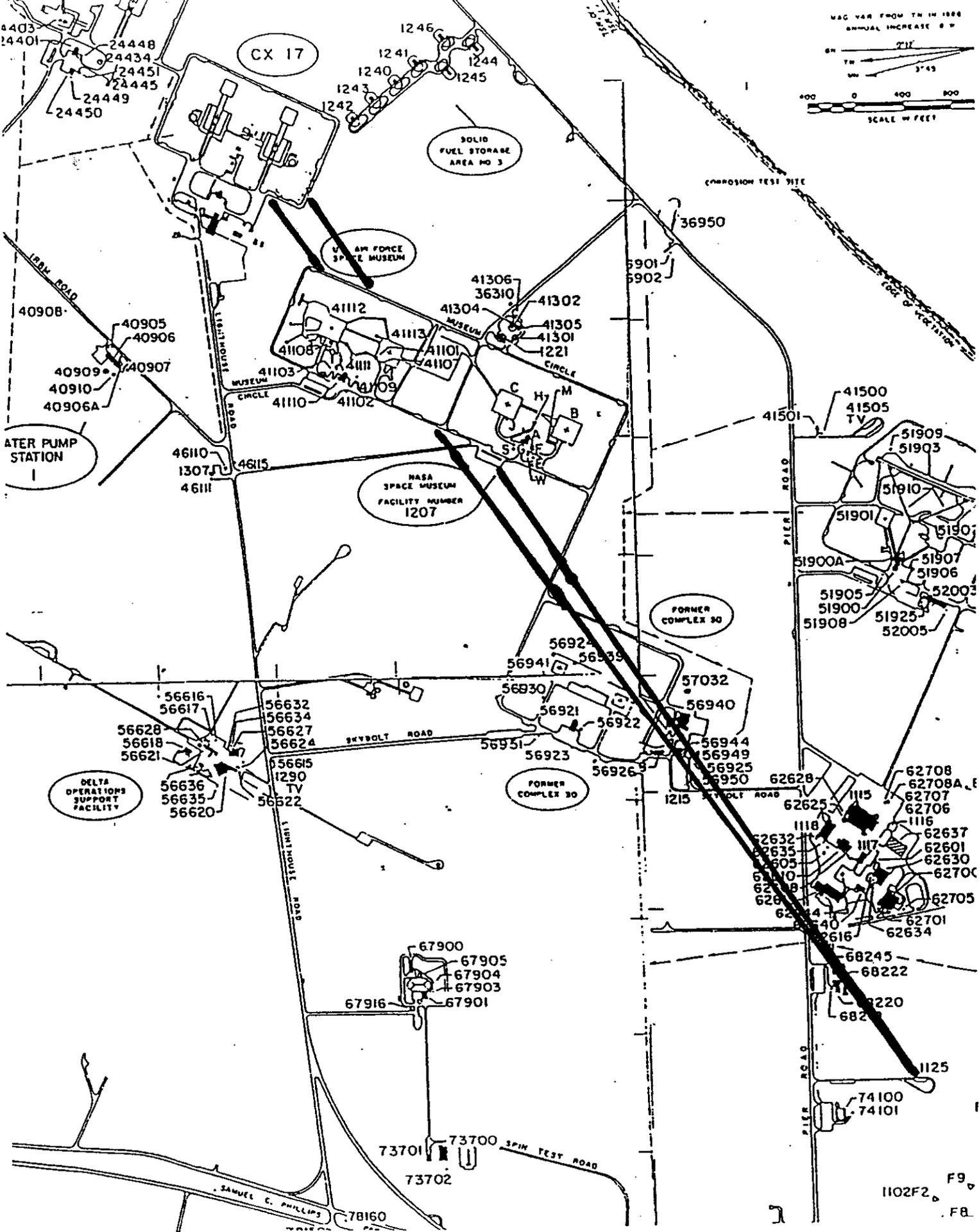


Figure 16
 UCS 19 to LC 17, Pads A & B
 Page 36

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2.1.4.5 UCS 3 to Launch Complex 36, Pads A & B

Universal Camera Site 3 (UCS 3) is located north of the CCAS/KSC boundary, southeast of Complex 41 (Figure 17). The camera site (Facility 95415) is approximately 12,497 meters (41,000 feet) north, northwest of Launch Complex 36, Pad A, and 12,055 meters (39,550 feet) north, northwest of Pad B. Existing cleared areas within the sight line include nine abandoned launch complexes and the maintained grounds within Launch Complex 36. The majority of these sight lines traverse open water (the Atlantic Ocean), its associated shoreline and the adjacent coastal strand plant community. Vegetation endemic to the coastal strand typically does not exceed 3 meters (10 feet) in height and, therefore, should not obstruct either line of sight.

2.1.4.6 UCS 20 to Launch Complex 36, Pads A & B

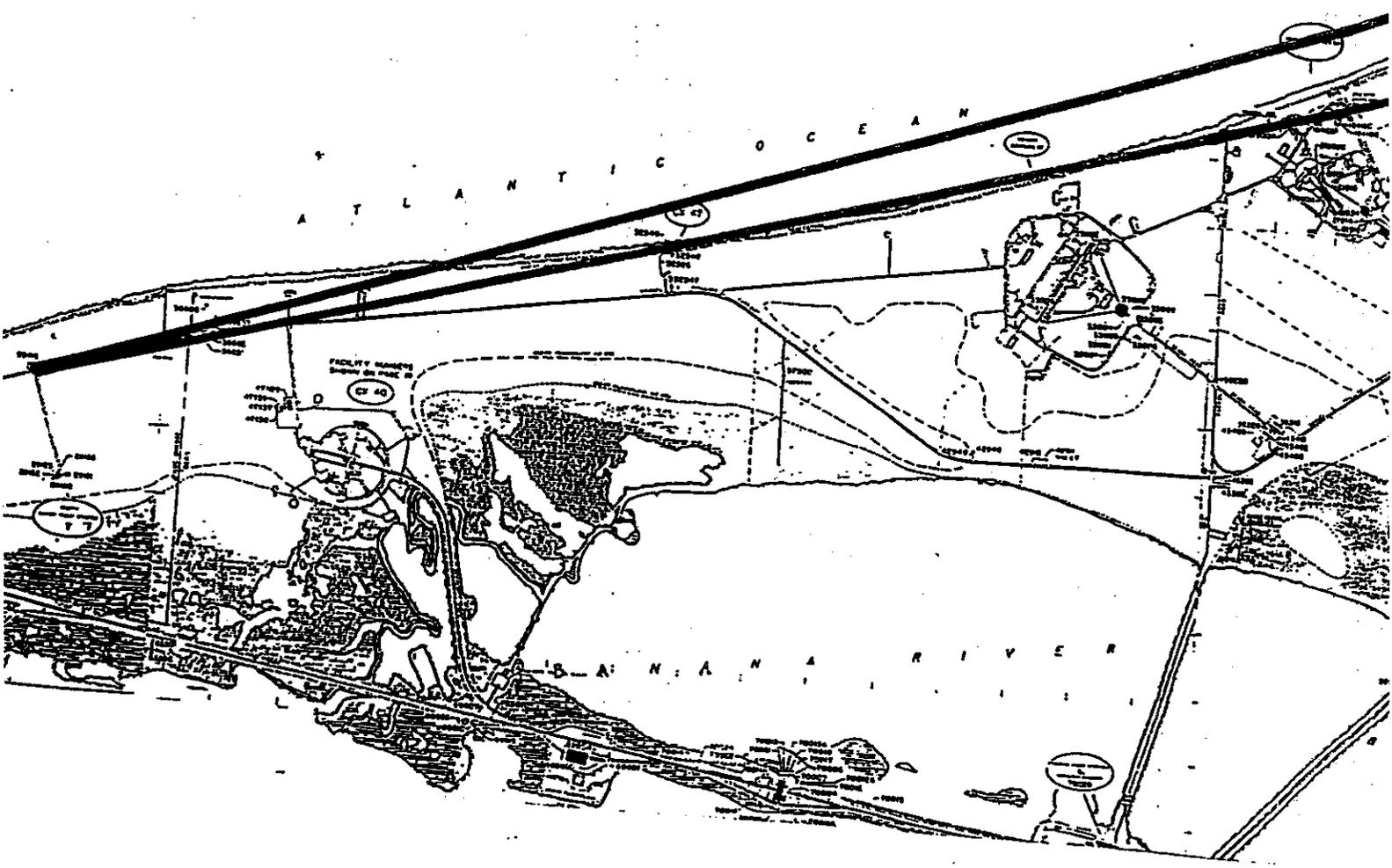
Universal Camera Site 20 (UCS 20) is located southeast of the U.S. Air Force Space Museum on the south side of Pier Road. The camera site, Facility 41505, is approximately 5578 meters (18,300 feet) southwest of Launch Complex 36, Pad A, and 4999 meters (16,400 feet) southwest of Pad B (Figure 18). Due to the proximity of these lines to the coast, a large portion of the sight lines traverse coastal strand vegetation which typically consists of low-growth plants that do not obstruct the optical and visual pathways. The coastal scrub/scrub oak plant communities which would compromise these lines of sight have been previously cleared and maintained. Therefore, these sight lines will be maintained as required in the future. It is expected that other scrub renovation activities will preclude the need for sight line specific maintenance. However, should maintenance be necessary, vegetation removal will be conducted in a manner that is consistent with the established scrub renovation program.

2.1.4.7 UCS 25 to Launch Complex 36, Pads A & B

Universal Camera Site 25 (UCS 25) is located on Pier Road southeast of the U.S. Air Force Museum. The camera site, Facility 36950, is approximately 4846 meters (15,900 feet) southwest of Complex 36, Pad A, and 4206 meters (13,800 feet) southwest of Pad B (Figure 18). Both lines of sight have been previously cleared and maintained and currently no obstructions exist. The southern half of these lines traverses land considered to be part of the CCAS coastal strand plant community. The plant species which dominate this habitat are typically low-growth shrubs and various grass species. Due to the proximity of the ocean, salt spray inhibits plant growth in these areas, thereby precluding the requirement to remove vegetation. The remaining portions bisect coastal scrub and scrub oak hammocks which are included in the CCAS scrub restoration program. These are the areas which have been previously cleared and would only require periodic maintenance in the future.

2.1.4.8 UCS 23 to Launch Complex 36, Pads A & B

Universal Camera Site 23 (UCS 23) is located northeast of the CCAS Industrial Area at the intersection of Heavy Launch Road and ICBM Road (Figure 19). The camera site, Facility 19110, is approximately 3871 meters (12,700 feet) from Pad A and 4176 meters (13,700 feet) from Pad B. The line of sight to Pad A bisects portions of former Launch Complexes 11, 12, 13



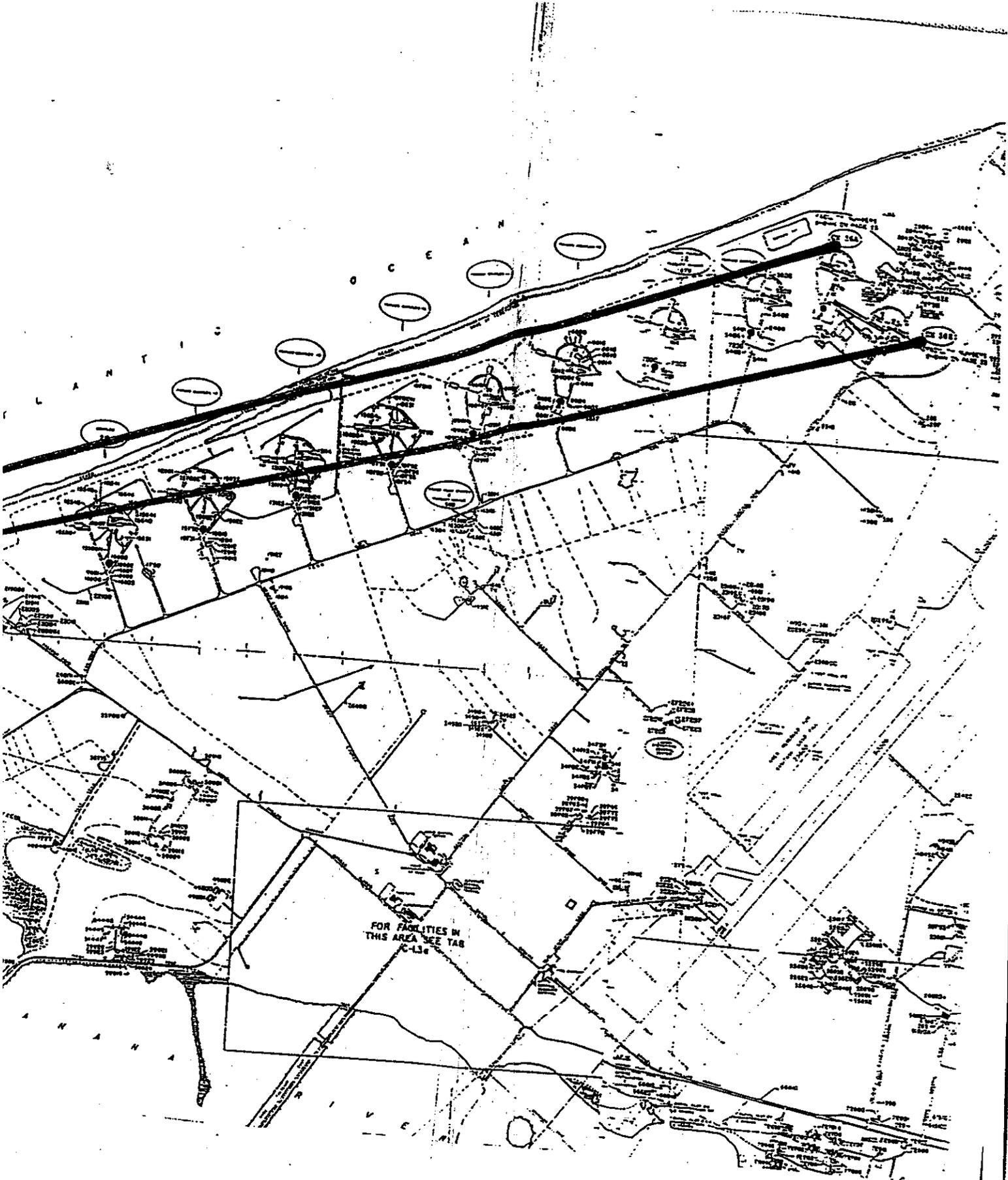


Figure 17
UCS 3 to LC 36, Pads A & B
Page 38

and 14, thereby reducing clearing requirements for this line. Similar to the sight line to Pad A, the Pad B line crosses the access roads to six abandoned complexes.

The wooded land between abandoned launch complexes is predominantly scrub oak trees which have exceeded the height typically associated with scrub habitat. These areas have been identified in the Scrub Jay Management Plan and should be renovated (reduction in plant height and density) in the near future. Currently, the lines of sight are functional and should not require maintenance prior to scrub renovation activities. If renovation does not occur within five years, some site specific maintenance will be needed.

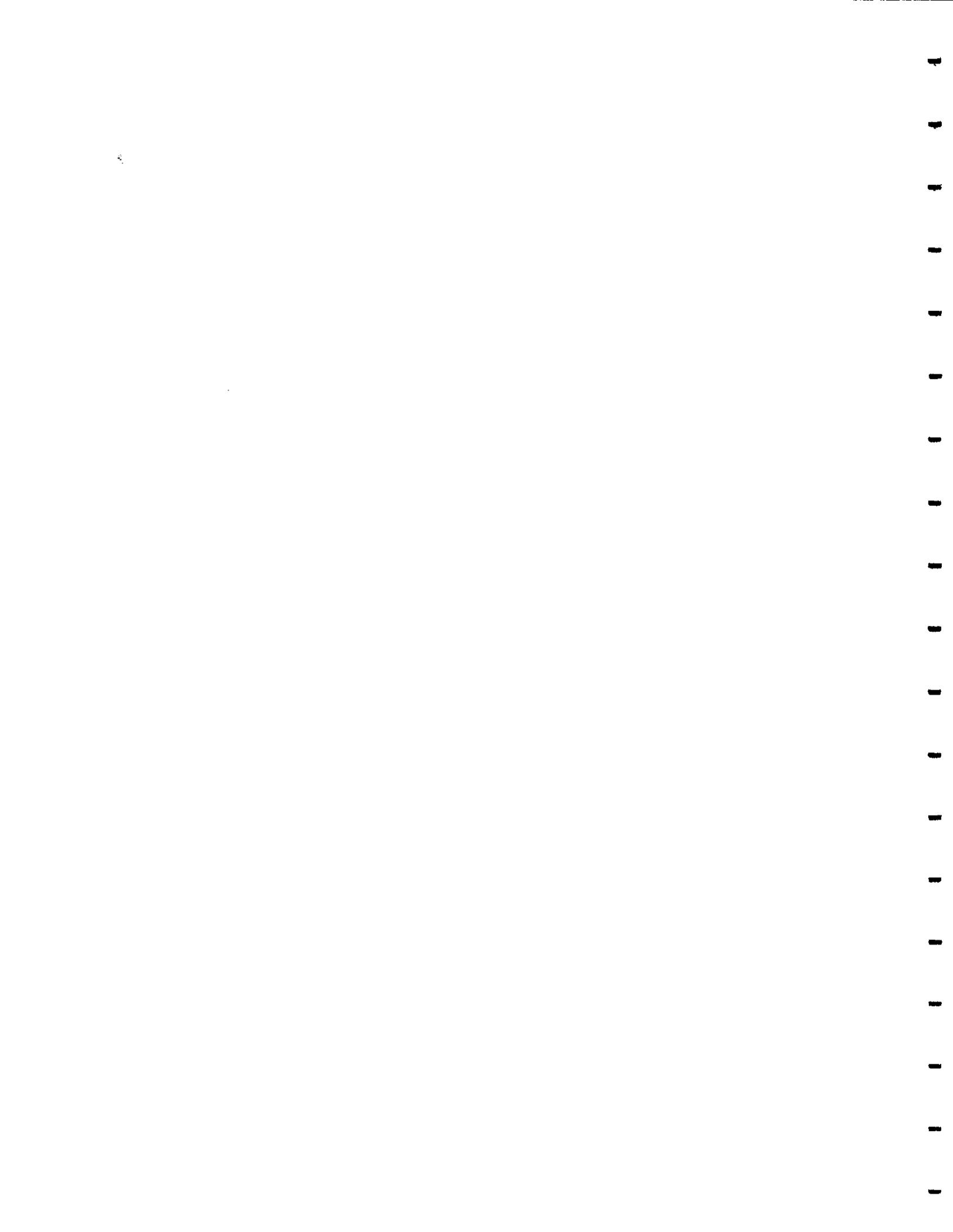
Further, a recent wetlands survey of CCAS identified areas between Complexes 14 and 15, 11 and 12, and 11 and 36 as containing wetland soils and vegetation. Most of these wetlands are dominated by Willows and Brazilian Pepper trees in a density that significantly deters from the value of these areas with regards to wildlife utilization.

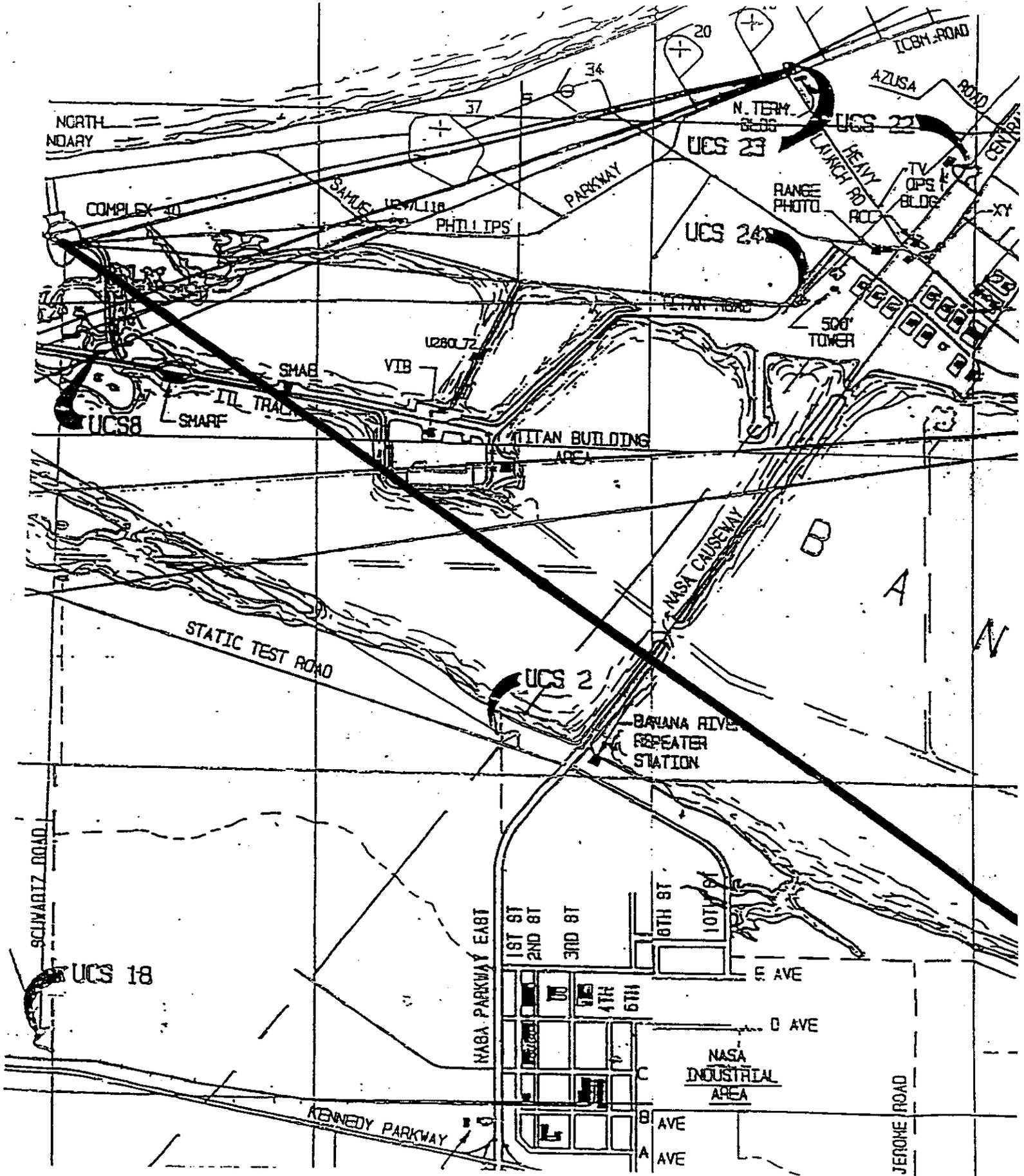
2.1.4.9 UCS 1 to Launch Complex 40

Universal Camera Site 1 (UCS 1) is located northwest of Tel IV (Facility N6-2296) on KSC (Figure 20). The camera site is situated approximately 305 meters (1000 feet) inland from the west shoreline of the Banana River on Twenty Eight Street, S.E. The site is approximately 13,259 meters (43,500 feet) southwest of Complex 40. The vast majority of this sight line (approximately 11,887 meters [39,000 feet]) traverses the open water of the Banana River and associated impoundments. The only vegetation that could obstruct this line of sight occurs within 610 meters (2000 feet) of the UCS and the Launch Complex.

On KSC, vegetation within the line of sight is transitional from the upland pine flatwood association to the wetlands bordering the Banana River. The Banana River shoreline in this area of KSC has been altered by construction of mosquito control structures. These modifications have changed dominant wetland species from natural, indigenous plants to exotic species which have invaded the disturbed riparian habitat. The majority of wetland plants in this area which could obstruct a line of sight are Brazilian Pepper, Willows and Wax Myrtle.

On CCAS, a similar situation regarding wetlands has occurred adjacent to Launch Complex 40. The land surrounding Complex 40, both uplands and wetlands, was altered significantly by construction of the Titan ITL area and related facilities. In addition, the wetlands were also isolated from the Banana River by construction of mosquito control structures. The cumulative effect of these modifications was an altered hydrology that resulted in loss of the indigenous wildlife and plant communities. Consequently, the impacted areas have been invaded by non-native plant species. Wildlife species that cannot adapt to these changes quickly enough are displaced from their territories which further depreciates the immediate ecosystem.





NORTH
BOUNDARY

COMPLEX 40

PHILLIPS

PHILLIPS

UCS 23

UCS 24

UCS 22

UCS 8

SMAB

VIB

U280J2

TITAN BUILDING
AREA

RANGE
PHOTO

500'
TOWER

TV
OPS
BLDG

STATIC TEST ROAD

UCS 2

BAYANA RIVER
REPEATER
STATION

SCHWARTZ ROAD

UCS 18

NASA PARKWAY EAST

18TH ST

18TH ST

18TH ST

18TH ST

18TH ST

10TH ST

E AVE

D AVE

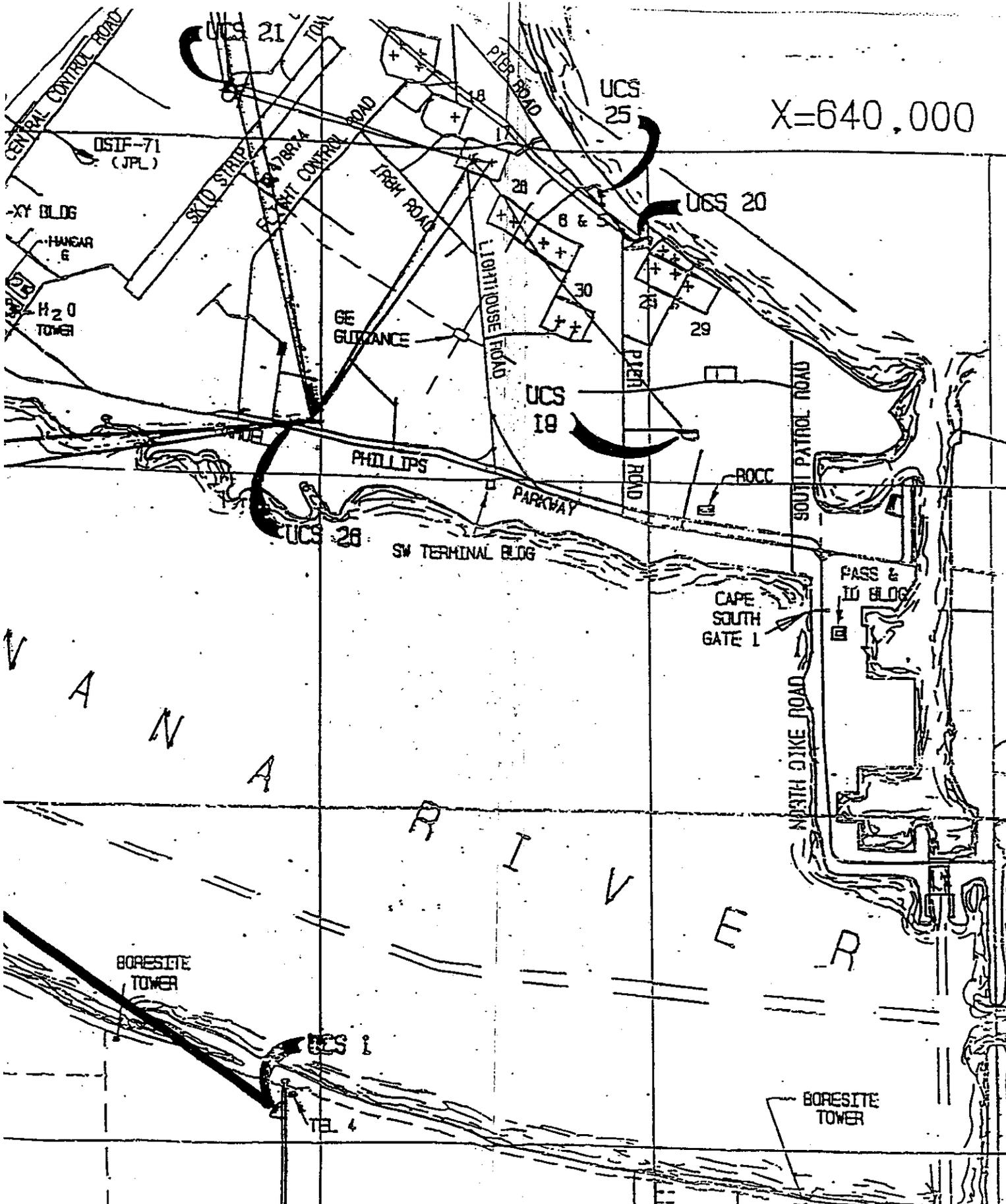
NASA
INDUSTRIAL
AREA

KENNEDY PARKWAY

B1 AVE

A AVE

JEROME ROAD



X=640,000

Figure 20
 UCS 1 to LC 40
 Page 42

2.1.4.10 UCS 2 to Complex 40

Universal Camera Site 2 (UCS 2) is located on the west side of the Banana River off of Static Test Road, approximately 1 km north of NASA Causeway (Figure 14). UCS 2 is situated 5976 meters (19,600 feet) southwest of Launch Complex 40. Of the total 5976 meters, 3903 meters are across open estuarine waters of the Banana River, 1585 meters cross previously disturbed and paved areas on CCAS, and only roughly 488 meters cross salt marsh or cattail and gramminoid marsh. Present line of sight obstruction is caused by Wax Myrtle, Brazilian Pepper and other miscellaneous shrub sapling species along the west side of the Banana River.

2.1.4.11 UCS 3 to Launch Complex 40

Universal Camera Site 3 (UCS 3) is located on the east side of Phillips Parkway at the entrance to Water Pump Station 7 on KSC (Figure 21). The camera site, Facility 95415, is approximately 1128 meters (3700 feet) north, northeast of the Complex. Half of the sight line is on CCAS with the remainder on KSC. Vegetation within the line of sight is predominantly scrub oak and associated scrub species. The area is known to be inhabited by the Federally listed Florida Scrub Jay, Eastern Indigo Snake and possibly the Southeastern Beachmouse. In addition, the State listed Gopher Tortoise is abundant in the sparsely vegetated tracts within this area.

The line of sight has been previously cleared and is currently operational. If the forested land in the area is not totally renovated and subsequently managed for optimal Scrub Jay habitat, some line of sight maintenance would be necessary in the future.

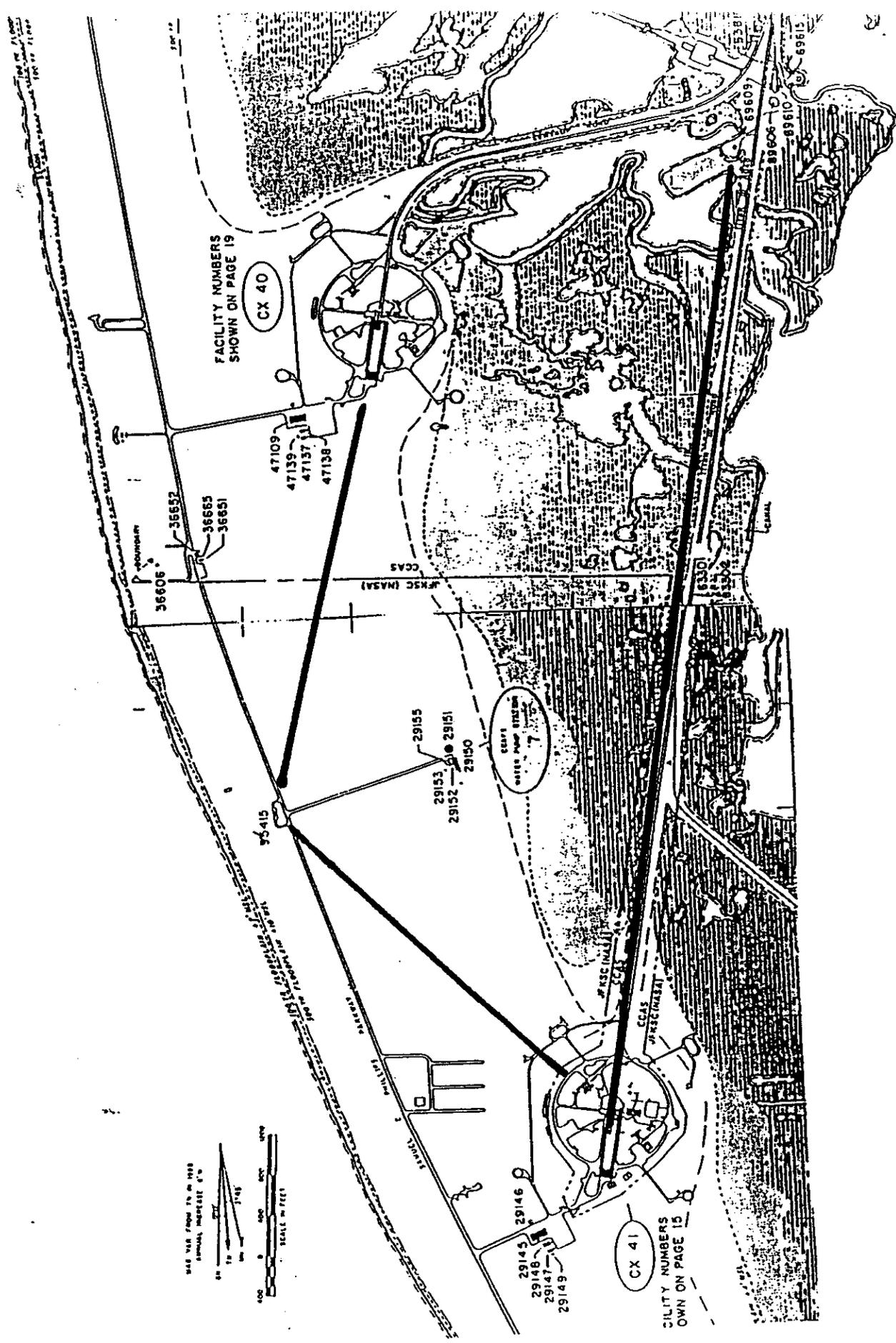
2.1.4.12 UCS 3 to Launch Complex 41

Universal Camera Site 3 (UCS 3) is located on the east side of Phillips Parkway at the entrance to Water Pump Station #7 on KSC (Figure 21). The site is approximately 1128 meters (3700 feet) southeast of Complex 41. The entire sight line is on KSC property. Vegetation within the line of sight is predominantly scrub oak and associated scrub species. The area is known to be inhabited by the Federally listed Florida Scrub Jay, Eastern Indigo Snake and possibly the Southeastern Beachmouse. In addition, the State listed Gopher Tortoise is abundant in the sparsely vegetated tracts within this area.

The line of sight has been previously cleared and is currently operational. If the forested land in the area is not totally renovated and subsequently managed for optimal Scrub Jay habitat, some line of sight maintenance would be necessary in the future.

2.1.4.13 UCS 5 to Launch Complex 39A

Universal Camera Site 5 (UCS 5) is located immediately north of the railroad bed (along the old Playalinda Beach Road) about 3.2 kilometers east of the Kennedy Parkway/Beach Road intersection (Figure 7). The camera road is raised 5.8 meters (19 feet) above sea level. UCS 5 is situated 7710 meters (23,500 feet) northwest of Launch Complex 39A. Approximately 1247



meters is across previously disturbed lands or areas such as paved roads, the cleared pad perimeter, and the crawlerway. Approximately 984 meters consists of estuarine waters and edge habitat, and the remaining 5479 meters crosses a mixture of scrub and slash pine, cattail and gramminoid marsh, and very small segments of broad-leaved woodlands. The line of sight is presently partially obstructed by cabbage palms, oaks, and shrub sapling hardwoods within 500 meters of the camera site.

2.1.4.14 UCS 5 to Launch Complex 39B

Universal Camera Site 5 (UCS 5) is situated 5446 meters (16,600 feet) northwest of Launch Complex 39B (Figure 7). The line of sight is dominated by disturbed areas, oak scrub and slash pine, and cattail and gramminoid marsh. 2100 meters crosses paved access roads and the cleared launch pad perimeter; 3346 meters passes through the oak scrub and marsh communities mentioned above. Complex 39B is currently clearly visible though there are some nuisance powerlines in the line of sight.

2.1.4.15 UCS 6 to Launch Complex 39A

Universal Camera Site 6 (UCS 6) is located on the west edge of North Banana Creek about 1 km north of the Banana Creek VIP viewing site (Figure 22). The camera pad surface is elevated 6.7 meters (22 feet) above sea level. The line of sight to LC-39A runs east to west roughly 6824 meters (20,800 feet) and is predominantly estuarine waters and edge habitat (3478 meters). Approximately 1312 meters within the line of sight crosses over oak scrub and slash pine vegetation, 820 meters are over spoil and islands, 787 meters is previously disturbed, and 427 meters crosses freshwater impoundments and mudflats.

2.1.4.16 UCS 6 to Launch Complex 39B

Universal Camera Site 6 is roughly 5545 meters (16,900 feet) southwest of LC-39B (Figure 22). The line of sight passes through predominantly oak scrub and slash pine vegetation and cattail and gramminoid marsh (3018 meters). Roughly 1837 meters is over estuarine waters and edge vegetation, 197 meters is across spoil islands, and 492 meters crosses other previously disturbed areas including the cleared pad perimeter and miscellaneous access roads.

2.1.4.17 UCS 7 to Launch Complex 40

Universal Camera Site 7 (UCS 7) is located on KSC between Complexes 39A and 39B (Figure 23). The camera site is situated on the east side of Beach Road, approximately 7071 meters (23,200 feet) north, northwest of Launch Complex 40. The majority of land within this line of sight is north of the CCAS boundary on KSC property. Significant portions of this sight line traverse dune, strand and wetland communities, comprised of low growth vegetation. The remaining land, on both KSC and CCAS, supports coastal scrub vegetation, dominated by oaks and palmettos of various heights.

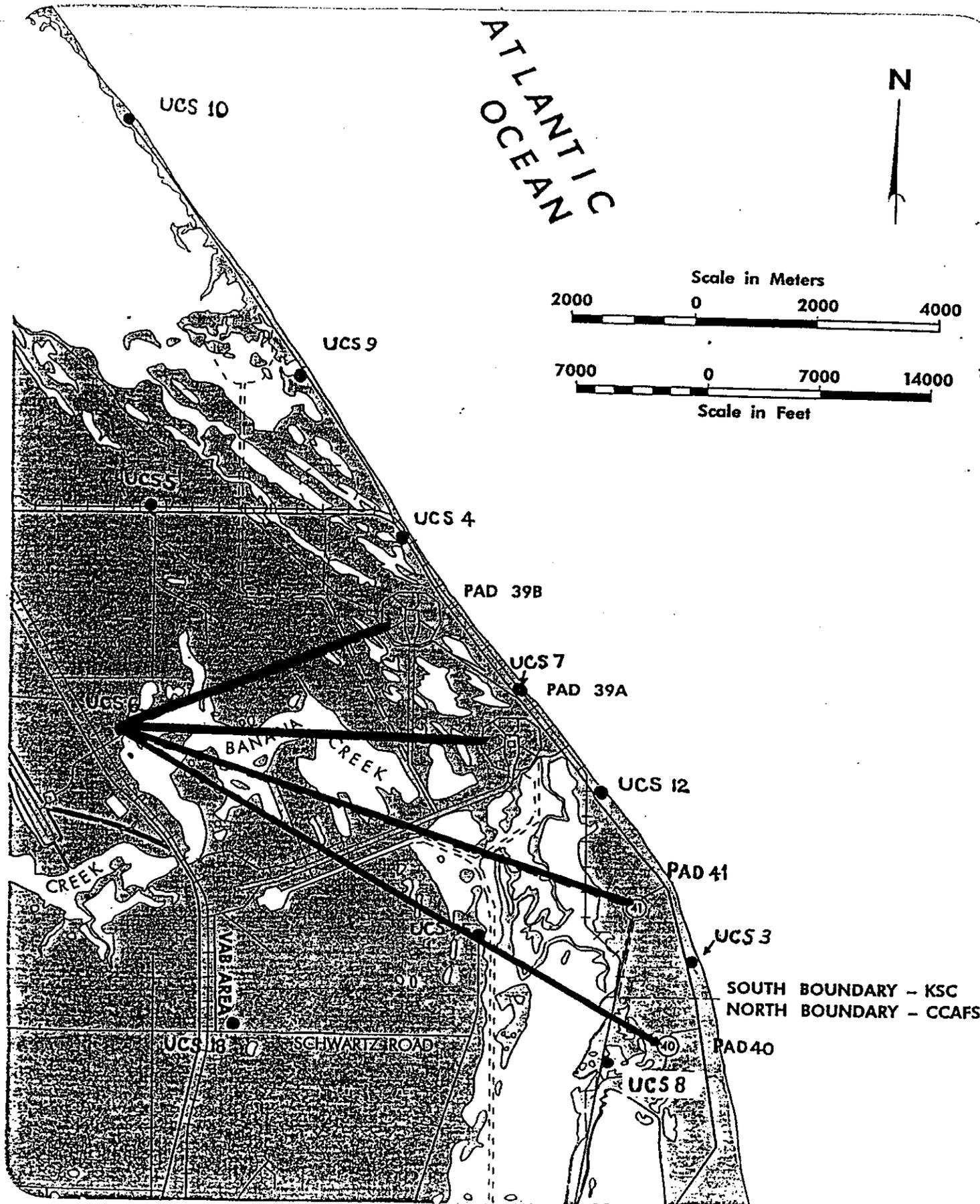
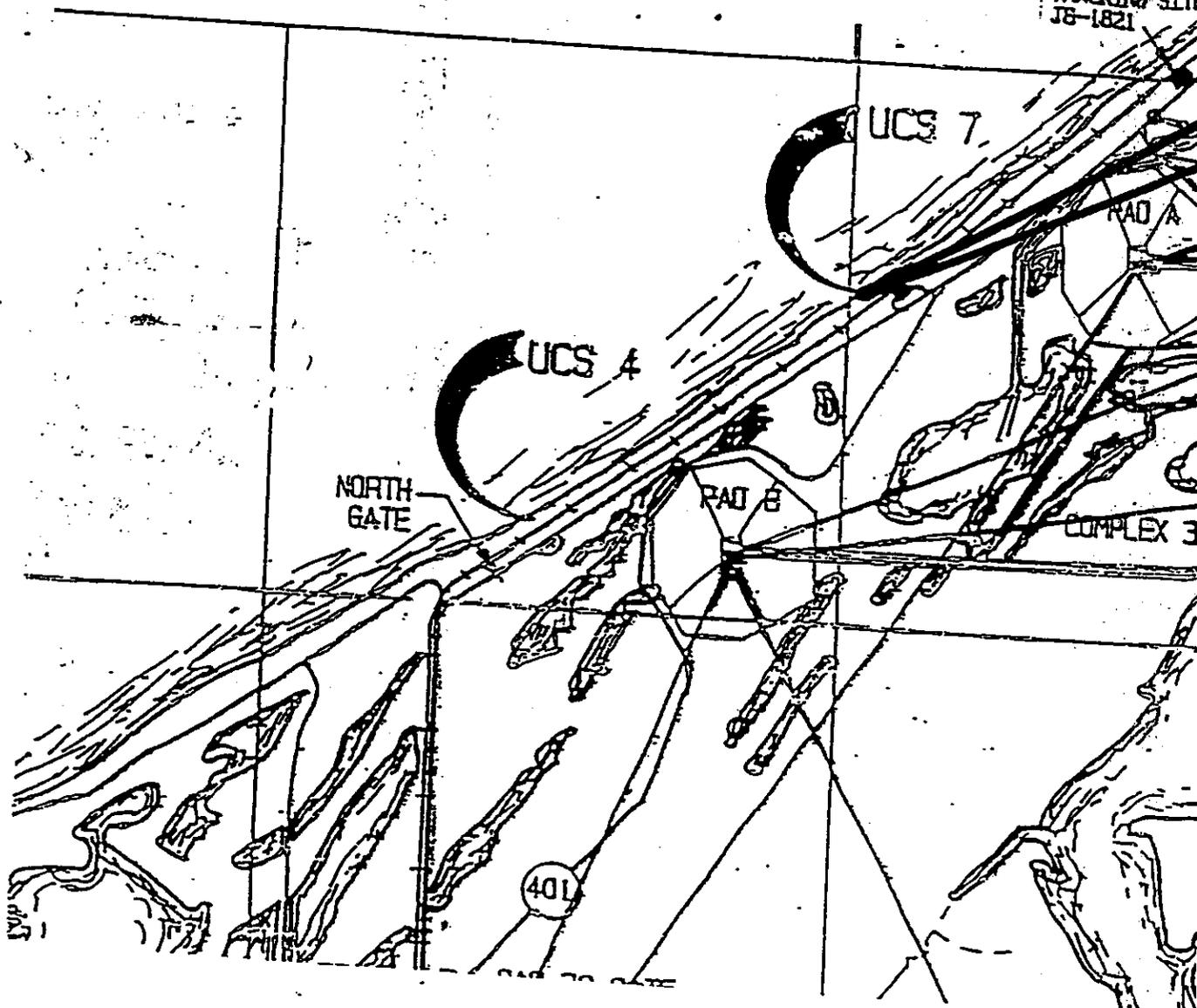


Figure 22
UCS 6 to LC 40 and 41
and Launch Complex 39, Pads A & B
Page 46

NORTH BCH
TRACKING SITE
J8-1821



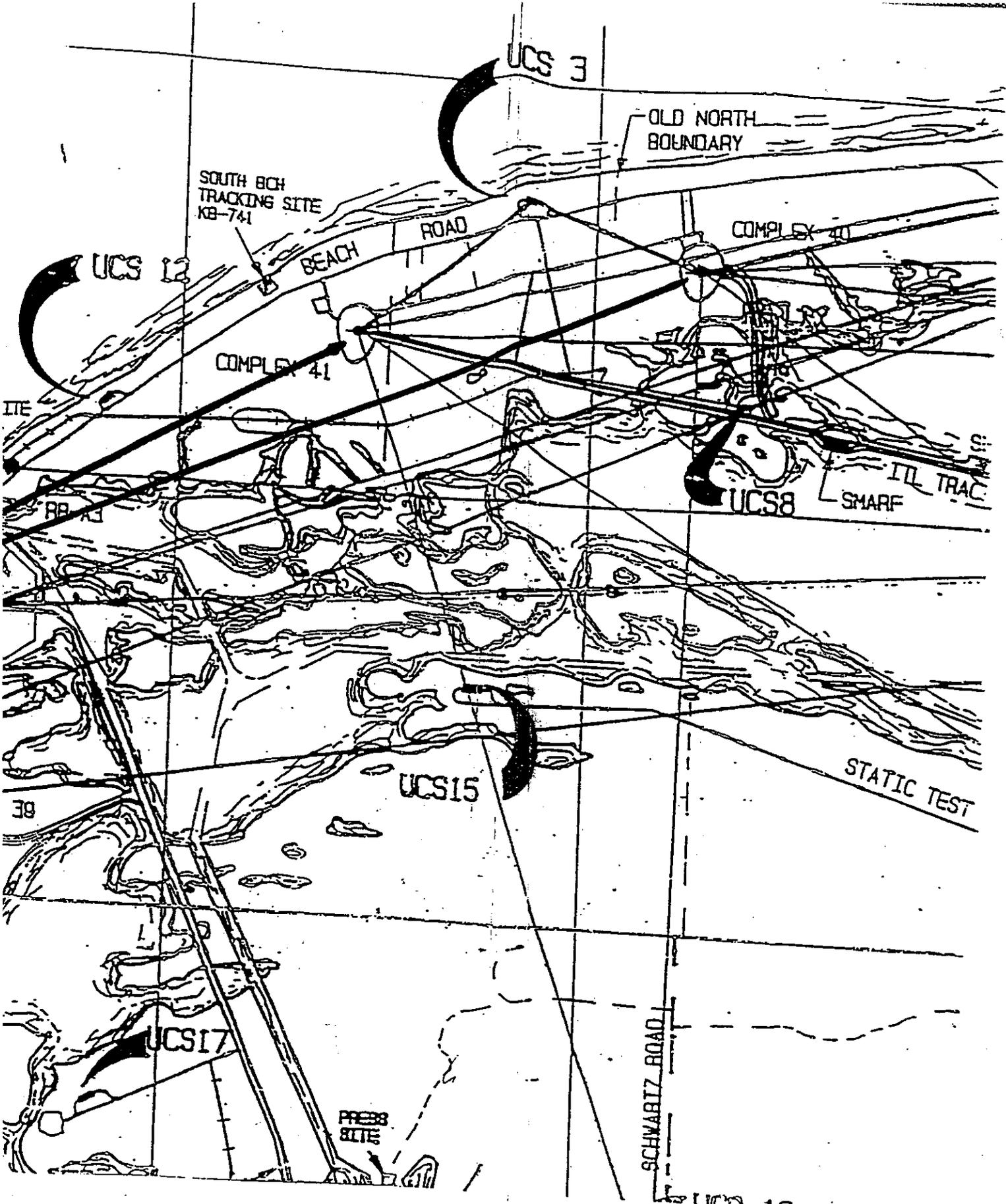


Figure 23
 UCS 7 to IC 40 and 41
 Page 47

This line of sight has been previously cleared, and, currently, none of the vegetation has grown to a height which obstructs the optical pathway between the USC and launch pad. However, periodic maintenance of this sight line will be required throughout the duration of the Titan program.

2.1.4.18 UCS 7 to Launch Complex 41

Universal Camera Site 7 (UCS 7) is located on KSC between Complex 39A and 39B (Figure 23). The camera site is situated on the east side of Beach Road, approximately 4450 meters (14,600 feet) north, northwest of Launch Complex 41. All of the land within this line of sight is north of the CCAS boundary on KSC property. Significant portions of this sight line traverse dune, strand and wetland communities comprised of low growth vegetation, dominated by oaks and palmettos of various heights.

This line of sight has been previously cleared, and, currently, none of the vegetation has grown to a height which obstructs the optical pathway between the USC and launch pad.

However, the liquid hydrogen storage tank on Complex 39A obstructs visibility of the launch pad on Launch Complex 41. Periodic maintenance of this sight line will be required throughout the duration of the Titan program to minimize the potential for obstructing the optical pathway.

2.1.4.19 UCS 6 to Launch Complex 40

Universal Camera Site 6 (UCS 6) is located north of the VAB, off State Road 3 on KSC (Figure 22). The camera site (Facility J6-1725) is approximately 10,058 meters (33,000 feet) northwest of the Complex and traverses a significant amount of wetlands, impoundments and open water associated with the north Banana River. The majority of land requiring vegetation removal is on KSC, with a small portion (less than 1219 meters [4000 feet]) occurring on CCAS.

The upland vegetation on CCAS is adjacent to the launch complex and appears to be overgrown coastal scrub. The majority of the sight line on CCAS traverses wetlands which have become impounded by construction of the Titan transporter roadways. Other woody vegetation that could obstruct the sight line is exotic plants which have volunteered into disturbed lands (fill) associated with construction of the Titan roadway and mosquito control structures.

2.1.4.20 UCS 6 to Launch Complex 41

Universal Camera Site 6 (UCS 6) is located off Courtenay Parkway (State Road 3), north of the Vehicle Assembly Building (VAB) on KSC (Figure 22). The site is approximately 8534 meters (28,000 feet) west, northwest of Launch Complex 41.

A significant portion of this sight line traverses open water, wetlands and previously disturbed and maintained grounds. A review of aerial photographs and on-site observation indicates this line of sight has been previously cleared. Consequently, no immediate clearing or maintenance actions are needed. However, periodic maintenance will be required in the future.

2.1.4.21 UCS 8 to Launch Complex 39A

Universal Camera Site 8 (UCS 8) is located on CCAS approximately 0.5 kilometers southwest of Launch Complex 40 and just off the east side of the road/railroad connecting the Titan Vertical Integration Building and Launch Complex 41 (Figure 24). The line of sight to LC-39A is 6200 meters (18,900 feet) in length, roughly 5270 meters is across estuarine waters and edge, 370 meters crosses previously disturbed areas, 310 meters crosses over spoil and islands, and 250 meters crosses impoundments and mud flats.

2.1.4.22 UCS 8 to Launch Complex 39B

Universal Camera Site 8 (UCS 8) is located on CCAS approximately 0.5 kilometers southwest of Launch Complex 40 and just off the east side of the road/railroad connecting the Titan Vertical Integration Building and Launch Complex 41 (Figure 24). The line of sight to LC-39B is 7870 meters (24,000 feet). Of this total length, roughly 6295 meters is across estuarine waters and edge, 785 meters crosses previously disturbed areas, 390 meters crosses over spoil and islands, and 390 meters crosses impoundments and mud flats.

2.1.4.23 UCS 8 to Launch Complex 41

Universal Camera Site 8 (UCS 8) is located west of Launch Complex 40 at the intersection of the Titan transporter roadways to Complexes 40 and 41 (Figure 21). The camera site (Facility 63700) is approximately 2896 meters (9500 feet) south of Launch Complex 41 on the east side of Titan III Road. The northern 1646 meters (5400 feet) of the line of sight is beyond the CCAS/KSC boundary. However, the sight line falls within the CCAS land corridor paralleling the transporter roadway to Launch Complex 41. Similarly, the northern portion of this sight line overlaps the transporter roadway and its adjacent maintained right-of-way. As a result of this feature, it is estimated that only the southern 1219 meters (4000 feet) of this sight line will require clearing and/or maintenance.

Prior to construction of the Titan Integrate, Transfer and Launch (ITL) area, which includes the launch complexes and transporter roadways, this portion of CCAS was salt marsh wetlands and open water. Vegetation obstructing this line of sight is primarily exotic wetland type plants which have established on the edges of the fill material used to construct the road beds. The dominant woody plant species are Brazilian Pepper, Wax Myrtle and Willows.

2.1.4.24 UCS 9 to Launch Complexes 39A and 39B

Universal Camera Site 9 (UCS 9) is located just west of Playalinda Road on the Canaveral National Seashore (CNS) approximately 3 km north of the KSC/Playalinda Beach security boundary. The camera pad surface is elevated 6.7 meters (22 feet) above sea level. The lines of sight to both 39A and 39B launch pads are presently unobstructed. UCS 9 is roughly 6825

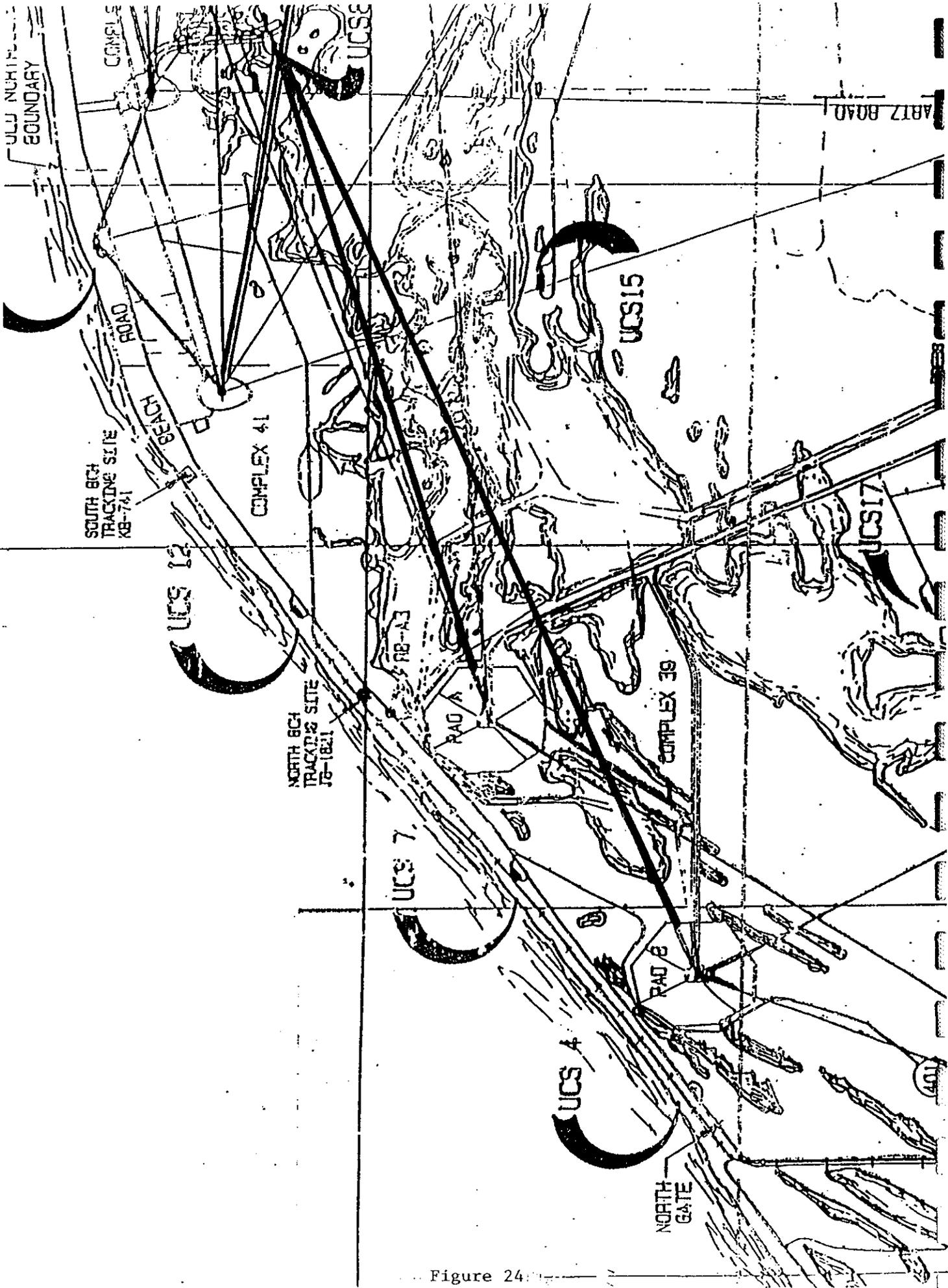


Figure 24

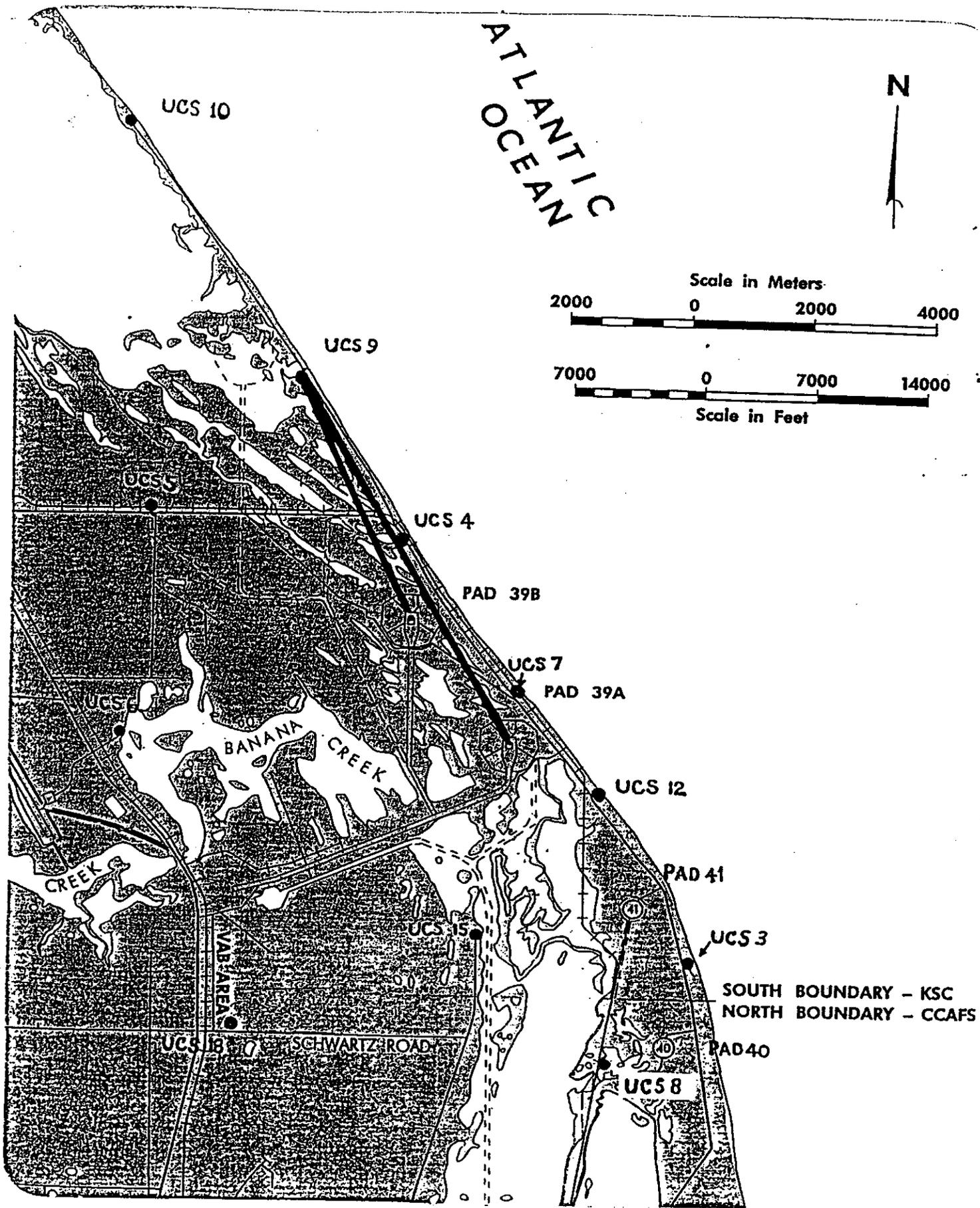


Figure 25
 UCS 9 to LC 39, Pads A and B
 Page 51

meters (26,800 feet) northwest of 39A and about 4260 meters (16,500 feet) northwest of 39B (Figure 25). The camera pad is situated in coastal dune and strand vegetation. The lines of sight to both 39A and 39B cross predominantly estuarine waters and edge habitat (approximately 70%), as well as impoundments and mud flats (10%), spoil areas and islands (10%), and other disturbed areas such as roadways and railroad beds (10%).

2.1.4.25 UCS 10 to Launch Complexes 39A and 39B

Universal Camera Site 10 (UCS 10) is located just west of Playalinda Road on the CNS; approximately 7000 meters (22,966 feet) north of the KSC/Playalinda Beach security boundary. The camera pad surface is elevated 7.5 meters (25 feet) above sea level. The camera pad is situated in coastal dune and strand habitat. Lines of sight to both 39A and 39B cross predominantly estuarine water and edge habitat (approximately 70-75%), as well as impoundments and mud flats (10-15%), spoil areas and islands (5%), and other disturbed areas such as roadways and railroad beds (10%). Figure 26 shows this line of sight.

2.1.4.26 UCS 10 to Launch Complex 40

Universal Camera Site 10 (UCS 10) is located at the north end of the paved road (Boondocks Road) that provides access to the CNS and Playalinda Beach on KSC (Figure 27). The site is approximately 17,800 meters (58,400 feet) north of Complex 40. The majority of this line of sight crosses non-woody wetlands and impoundments dominated by grassy wetland plant species. These areas typically contain low-growth plant species which do not obstruct the camera's view of the launch pad. Portions of the land that contains drier soil types may support growth of woody vegetation which would eventually reach a height that could obstruct the required optical pathway. Currently, this situation does not exist; however, future site-specific tree removal may be needed.

2.1.4.27 UCS 10 to Launch Complex 41

Universal Camera Site 10 (UCS 10) is located at the north end of the paved road (Boondocks Road) providing access to the CNS and Playalinda Beach on KSC (Figure 27). The site is approximately 15,240 meters (50,000 linear feet) north of the Complex. Due to the distance of this line of sight and the fact that the optical pathway traverses wetlands, impoundments, improved grounds and other areas containing low growth vegetation, no clearing or maintenance activities are currently required or anticipated.

2.1.4.28 U247L116 to Launch Complex 40

Universal Camera Site U247L116 is located on the east side of North Phillips Parkway adjacent to former Launch Complex 37 (Figure 28). The camera site (Facility 42910) is approximately 3749 meters (12,300 linear feet) south of Complex 40. The majority of this sight line traverses non-woody wetlands containing vegetation that does not reach a height that would obstruct the camera's view of the launch pad. Some of the upland areas closer to the complex and the UCS have been previously cleared and subsequently maintained. Currently, a small portion of the

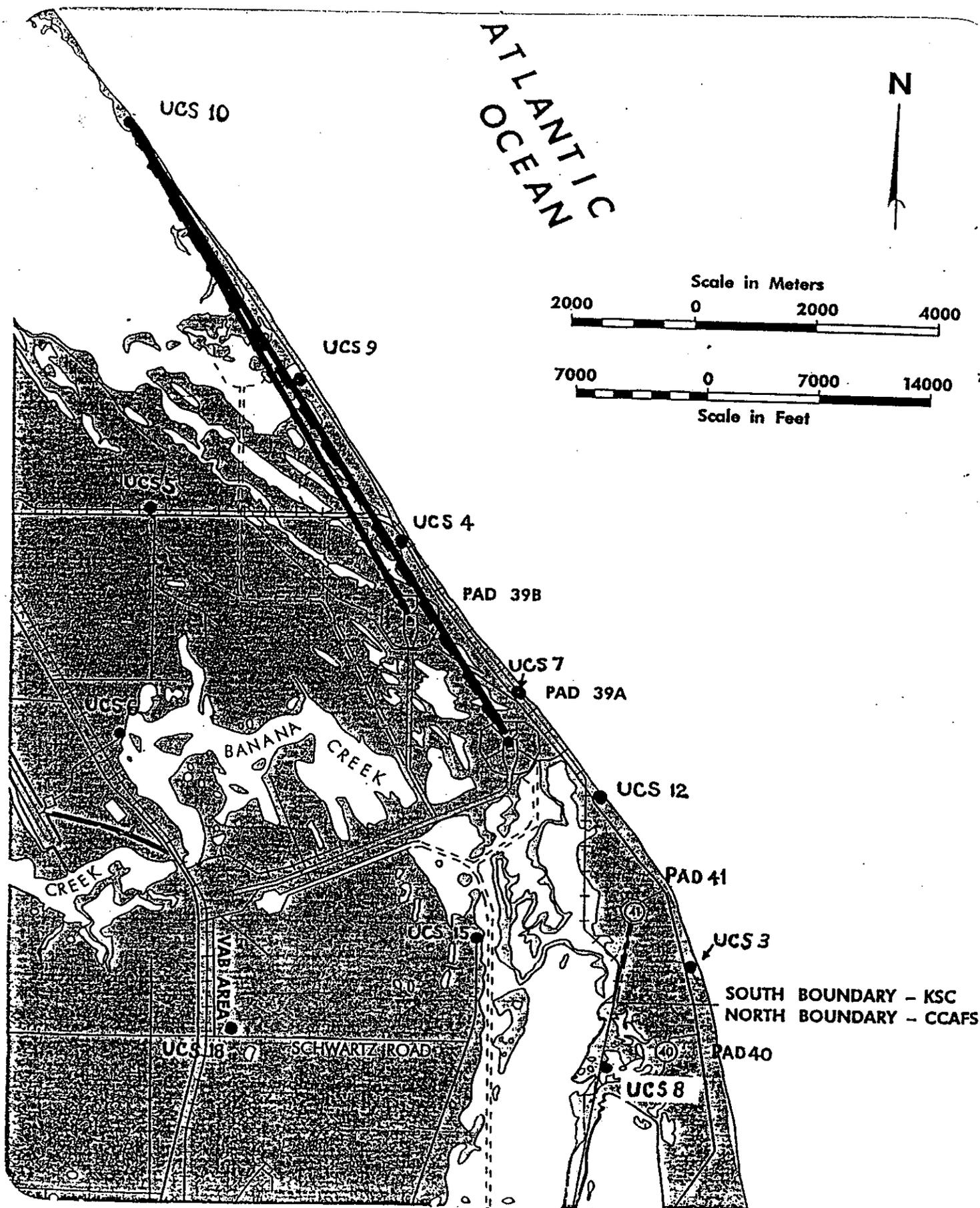
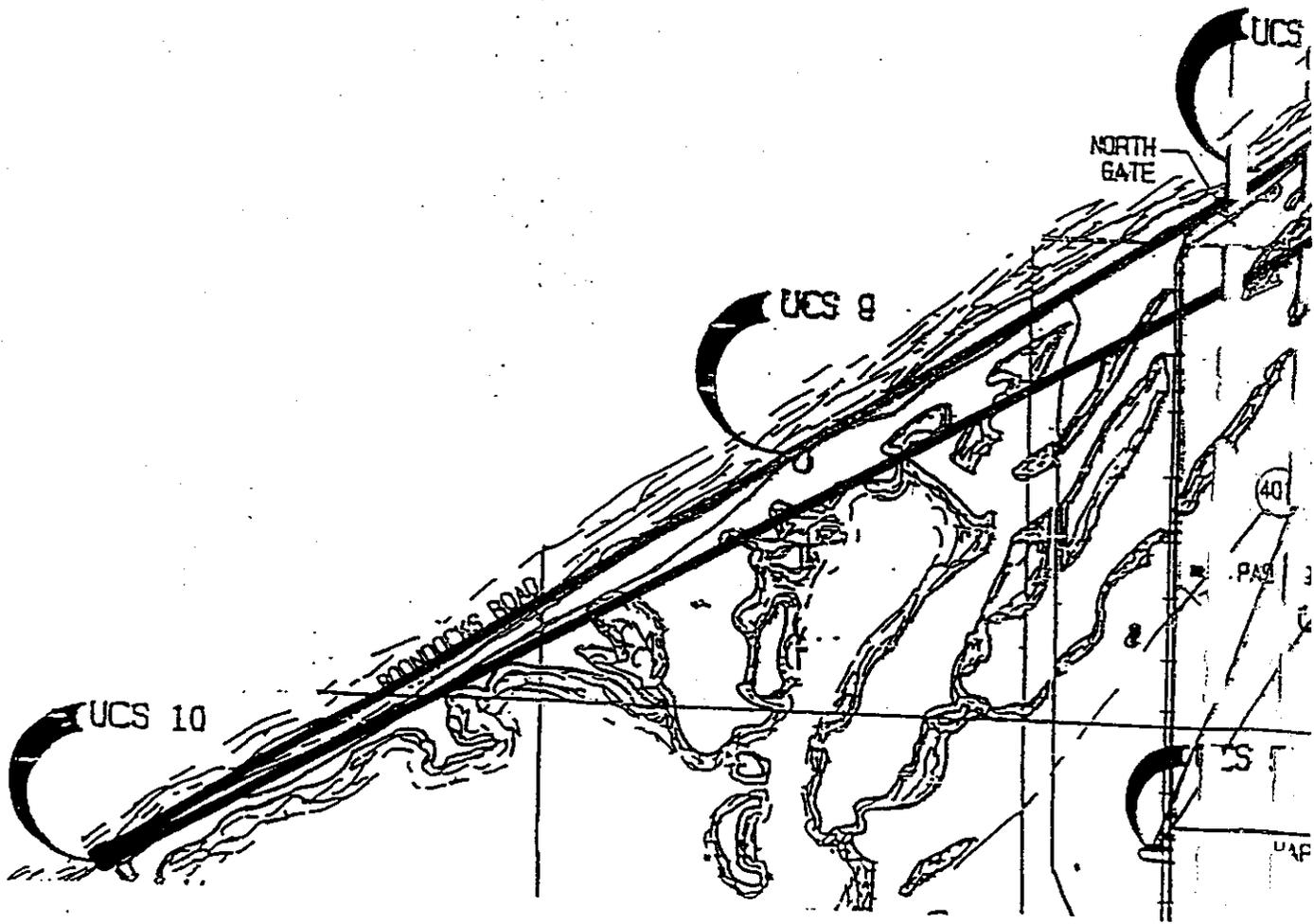


Figure 26
 UCS 10 to LC 39, Pads A and B
 Page 53



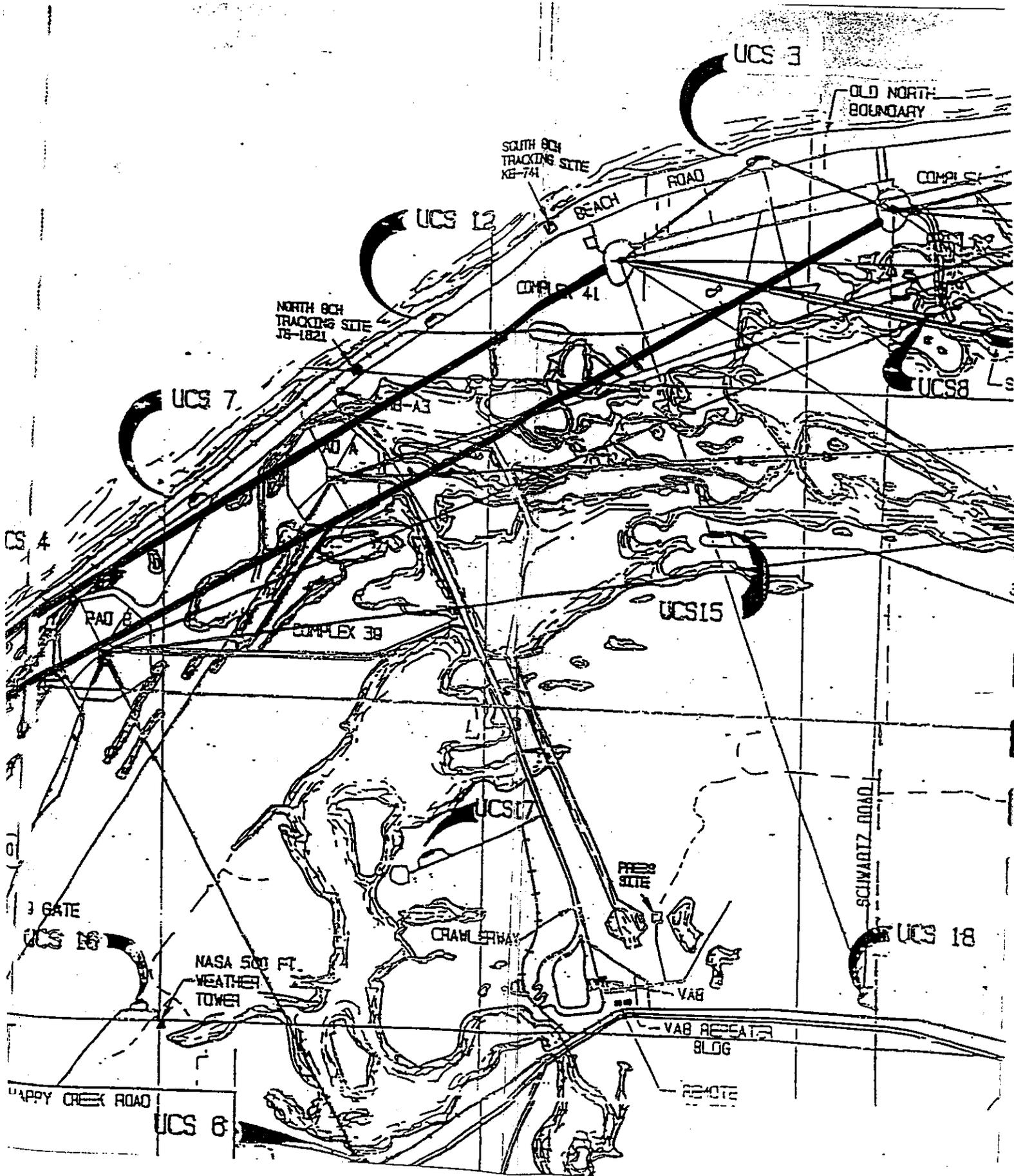


Figure 27
 UCS 10 to LC 40 and 41
 Page 54

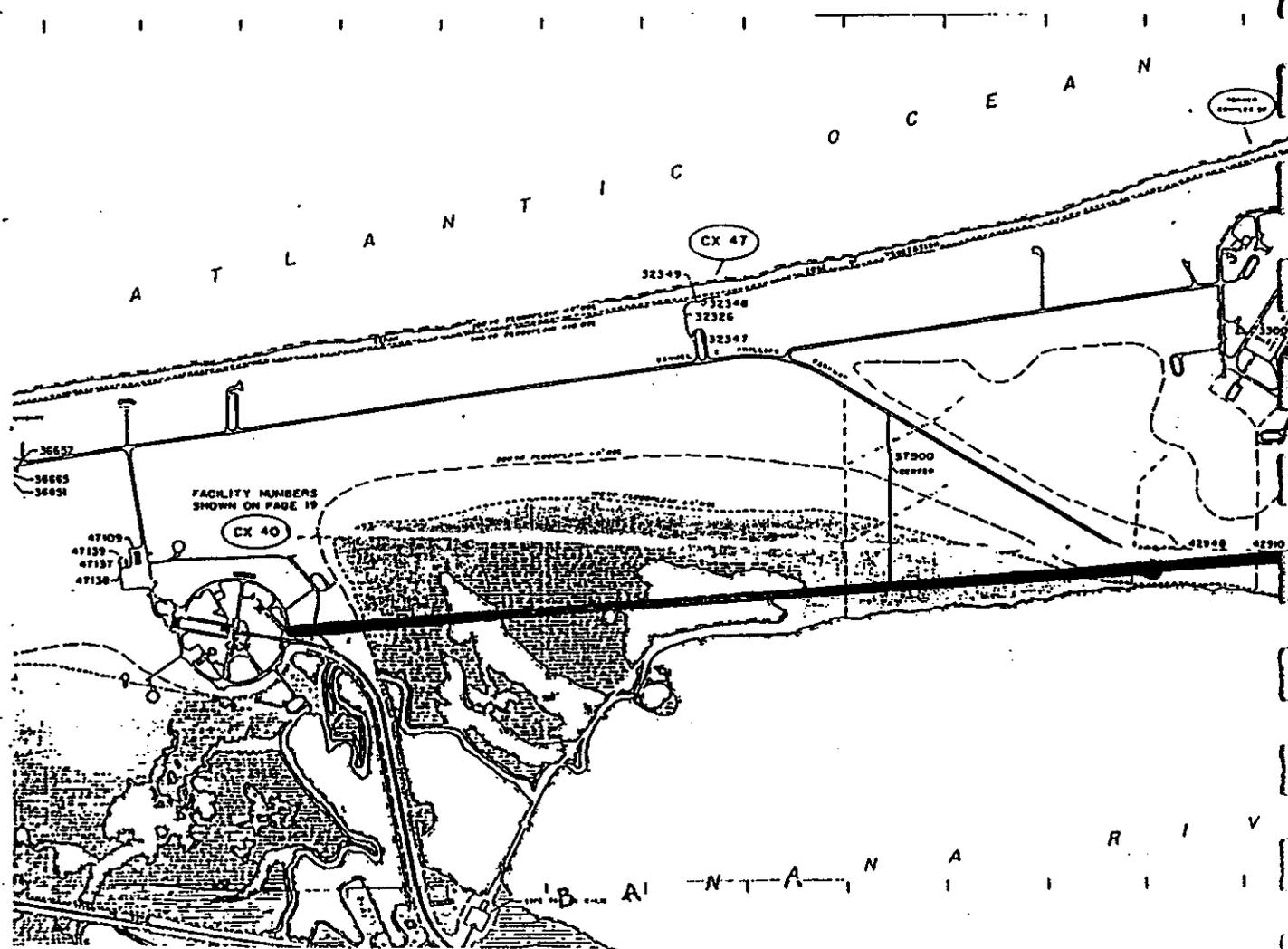


Figure 28
 U247LL16 to LC 40
 Page 55

sight line (approximately 67 meters [220 feet]) requires clearing. However, the remaining upland areas are adequately cleared and will be included in a periodic maintenance schedule that complements CCAS Scrub Jay habitat renovation goals and objectives.

2.1.4.29 UCS 2 to Launch Complex 41

Universal Camera Site 2 (UCS 2) is located on KSC, north of the NASA Causeway on the east side of Static Test Road (Figure 14). The camera site is approximately 7925 meters (26,000 feet) south, southwest of Complex 41. The majority of this sight line crosses the northern Banana River and wetlands southwest of the Complex. Therefore, the amount of land requiring clearing/maintenance is relatively small (217,500 square feet). The vegetated areas which could obstruct this line of sight are dominated by Brazilian Pepper, Wax Myrtle and Willows. These are non-native wetland plants that volunteer into wetland/riparian lands which have been disturbed. The wetland west of Launch Complex 41 has been altered by construction of the complex and a system of impoundments for mosquito control. Similarly, the land northeast of the camera site, on KSC, has also been disturbed and does not represent native land with an indigenous plant community.

2.1.4.30 LOCC to Launch Complex 36, Pads A & B

This camera site is mounted on the roof of the Launch Operations Control Center (LOCC), Facility 27220, on CCAS (Figure 10). The site is located approximately 2926 meters (9600 feet) west, southwest of Launch Complex 36A and 2743 meters (9,000 feet) west of Launch Complex 36B. Previously developed land within the lines of sight include: Central Control Road (approximately 122 meters [400 feet], 36A, and 30 meters [200 feet], 36B); ICBM Road (approximately 46 meters [150 feet], 36A only); Armory Road (approximately 30 meters [100 feet]); some smaller access roads (approximately 122 meters [400 feet]); grounds and facilities at the LOCC (122 meters [400 feet]); and the land at the launch complex (610 meters [2000 feet]). Deleting these distances from the overall length of each sight line shows a distance of 1875 meters (6150 feet) to Launch Complex 36A and 1783 meters (5850 feet) to Launch Complex 36B which traverses undisturbed land. However, due to the elevation of the camera and the launch pads, the optical pathway currently exceeds the height of the scrub vegetation between the camera site and the Launch Complex. Some reduction in height of the vegetation may be needed in the future but this requirement is not anticipated. The land between the LOCC and Launch Complex 36 has been subdivided into wildlife/burn management compartments. Similar to all of these compartments throughout CCAS, the primary objective is to re-introduce the natural fire cycle into the scrub habitat to restore this fire dependent ecosystem to its natural state. Attaining this objective in the compartments bisected by these lines of sight will preclude the need for specific clearing and/or maintenance.

2.1.4.31 U71R147 to Launch Complex 17, Pads A & B

Universal Camera Site U71R147 is located west of Launch Complex 17 at the intersection of Lighthouse Road and Skybolt Road. The site is approximately 1463 meters (4800 feet) west of the complex (Figure 29). These two lines of sight have been previously cleared and maintained. However, due to the soil/plant association, regeneration will occur, and the scrub oaks and various other tree species will eventually obstruct the required visual pathway. Further, these sight lines may require widening in addition to periodic maintenance.

2.1.4.32 LOCC Camera Site to Launch Complex 17, Pads A and B

The Launch Operations and Control Center (LOCC) is located north of the CCAS Air Field (Skid Strip) and southeast of the Industrial Area (Figure 9). The camera, Facility 1290, is mounted on the roof of the LOCC building, approximately 9 meters (30 feet) above grade. This site is 3219 meters (10,560 feet) north of Pad A on Complex 17 and 3277 meters (10,750 feet) north of Pad B. Areas containing significant amounts of paved and/or maintained grounds between the LOCC and the launch pads include: the Air Field and associated clear zones, 488 meters (1600 feet); the sanitary landfill, 610 meters (2000 feet); IRBM and Flight Control roads, 183 meters (600 feet); drainage canals, 91 meters (300 feet); and land within the complex boundary to Pad A or Pad B, 152 meters (500 feet) and 335 meters (1100 feet), respectively. These areas represent approximately half the distance from the camera site to the launch pads. Land which has not been previously cleared includes the area immediately south of the LOCC and north of the landfill, approximately 366 meters (1200 feet). Due to the elevation of the roof-mounted camera, clearing within this section is not anticipated. Therefore, the total length of the lines of sight which will require initial clearing and/or periodic maintenance from the LOCC to Complex 17A and 17B would be approximately 1219 meters (4000 feet) and 1372 meters (4500 feet), respectively. The majority of vegetation within these two lines of sight is scrub oak which has been permitted to succeed to a xeric oak hammock with a canopy elevation greater than 7.6 meters (25 feet).

2.2 Alternatives to the Proposed Action

2.2.1 No Action Alternative

Selection of the no action alternative would preclude all activities related to clearing and/or maintaining active lines of sight on CCAS and KSC. Failure to provide unobstructed optical pathways from existing universal camera sites to active launch complexes would compromise Range Safety requirements. The inability to provide real-time launch data to the Range Safety officer would result in termination of the launch sequence. Since radar and telemetry acquisition does not occur or become a reliable source until the launch vehicle has attained a certain altitude, visual contact with the vehicle is imperative to ensure all systems are functioning properly and the missile does not need to be destroyed.

An elaborate destruct system is designed and constructed into each launch vehicle to prevent potential hazards which could result from an errant missile launch or in-flight loss of control.

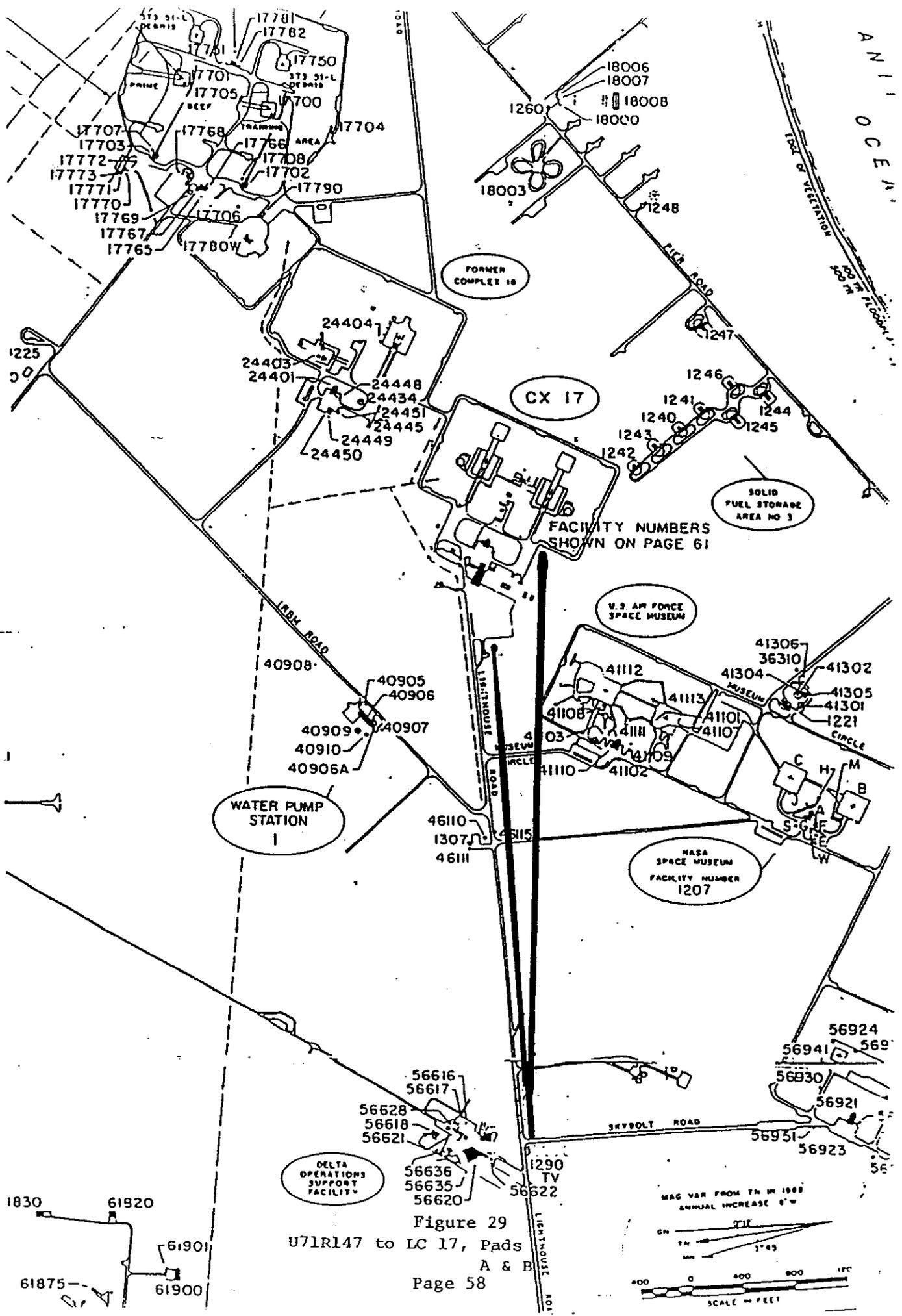


Figure 29
 U71R147 to LC 17, Pads
 A & B
 Page 58

Without the ability to identify a situation which may require destruction of a launch vehicle, the Air Force cannot safely conduct the mission of CCAS. Therefore, selection of the no action alternative is not considered a viable option and certainly does not support the interests of the United States and the Department of Defense.

2.2.2 Construct New Universal Camera Sites

In order for a new universal camera site to be used, the new site would require the proper angular separation between the pad and the other five camera sites used during each launch. Precise triangulation is a Range Safety requirement to adequately track the missile. New camera sites would require an engineering study/survey to pinpoint an exact location for each new site. Additionally, new communication and power lines would be required for each new camera site. If a new camera site were chosen, the possibility exists that the resulting line of sight would require clearing to meet Range Safety requirements. This alternative, in addition to being costly, could result in as much or more land clearing than the proposed action alternative.

2.2.3 Elevate an Existing Camera Site

Elevating an existing camera site is a possible alternative; however, it could prove to be costly. New engineering surveys/studies would be required to ensure that the proper angle to the pads is achieved for optical tracking of the missile. Although power and communication lines already exist at these sites, they would require modification to accommodate a new elevation. In order to view the base of the pad, some of the existing camera sites would require a significant increase in elevation. The resulting greater slope of the UCS access roads would reduce the flexibility in the number of instruments which could be used to track launches. In addition, the elevation would have to be high enough to remain above the projected growth of the vegetation for several years. Eventually the site could not be elevated any further and the site line would require clearing. For these reasons, this alternative is not preferred.

2.2.4 Reactivate Abandoned Camera Site(s)

There are several abandoned universal camera sites that could be reactivated; however, the primary reason these sites were abandoned originally is because the sight lines were not being used or maintained. Although this alternative is possible, sight lines would probably require extensive clearing, more so than being proposed in the preferred alternative. Since these sites were abandoned, new communication and power lines would be required. This action could create a greater impact to existing vegetation since these sight lines have not been maintained for several years.

2.2.5 Relocate Camera Sites to Buildings or Other Structures

Since Range Safety has a requirement for six camera sites per launch, and these six sites are used to triangulate the location of the missile, any new site would require the proper angular separation to the pad from the other five sites in order to track the missile. This would require an engineering study/survey for each new site. New power and communication lines would also be

required. The weight of some of the equipment used in optical tracking is extremely heavy. The concern is whether or not the proposed building/structure could support several tons of tracking equipment. The building/structure would also require enough height to avoid clearing any new sight lines. For these reasons, this alternative is not preferred.

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This section will provide a detailed description of various CCAS and KSC environmental attributes which would be impacted by the proposed action. A preliminary evaluation of these attributes shows impacts which range from potentially adverse to positive enhancements. The potentially significant impacts are described in Section 1.4.2, Significant Environmental Issues. All identified impacts resulting from the proposed action would affect either natural or cultural resources. The natural resources which would be potentially affected are mostly terrestrial plant communities, wetlands, and a number of wildlife species.

The following sub-sections will describe the various habitats and plant communities on CCAS and KSC and the wildlife species associated with these habitats. In addition, there are portions of CCAS and KSC, such as the area paralleling the Banana River shoreline, which contain archaeological resources that could be impacted by the proposed action. These cultural resources will also be described in this section.

3.2 Terrestrial Plant Communities

3.2.1 Coastal Scrub

Coastal scrub is a phase of scrub vegetation which appears to be a temporary stage that displays features of xeric flatwoods, sand pine scrub, and/or xeric coastal hammock. In profile, the community appears as a single layer varying in height from 1 to 6 meters. Very little ground cover vegetation is present. The distribution of coastal scrub is correlated with areas of recent sand deposition and excessive drainage. On CCAS and KSC, soils related to coastal scrub sites are classified in the Canaveral-Palm Beach-Welaka Association

Numerous coastal scrub sites have been inventoried on CCAS and a list of primary species follows:

SHRUBS/TREES

Cabbage palm	<u>Sabal palmetto</u>
Chapman oak	<u>Quercus chapmanii</u>
Hercules club	<u>Zanthoxylum clava-herculis</u>
Live oak	<u>Quercus virginiana</u>
Myrsine (unidentified)	<u>Myrsine spp.</u>
Myrtle oak	<u>Quercus myrtifolia</u>

Naked wood	<u>Myrcianthes fragrans</u>
Red bay	<u>Persea borbonia</u>
Rusty lyonia	<u>Lyonia ferruginea</u>
Sand live oak	<u>Quercus geminata</u>
Saw palmetto	<u>Serenoa repens</u>
Scrub hickory	<u>Carya floridana</u>
Shiny blueberry	<u>Vaccinium myrsinites</u>
Wax myrtle	<u>Myrica cerifera</u>
Wild mulberry	<u>Morus spp.</u>

HERBS

--Dog fennel	<u>Eupatorium aromaticum</u>
Gopher apple	<u>Licania michauxii</u>
Prickly-pear cactus	<u>Opuntia spp.</u>
Sandbur	<u>Cenchrus incertus</u>

VINES

Greenbrier	<u>Smilax spp.</u>
Wild grape vine	<u>Vitis spp.</u>

EPIPHYTES

Spanish moss	<u>Tillandsia spp.</u>
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Featured animal species in this habitat include the following:

Florida White-tailed Deer (Odocoileus virginianus)

White-Tailed Deer rumen samples analyzed and reported in The White-Tailed Deer in Florida (Harlow and Jones), indicated oak leaves comprised 47.7 percent of the volume taken from 21 deer sampled from a scrub oak-sand pine association. Four species of oaks, Quercus myrtifolia, Quercus virginiana, Quercus geminata, and Quercus chapmanii, dominate the Cape Canaveral scrub with a quantity capable of maintaining a deer population well above limits which would normally be imposed regarding the animals range. Additionally, all of the plant species listed above, with the exception of Hercules Club have been identified as food items in these analyses.

Florida Scrub Jay (Aphelocoma c. coerulescens)

The Florida Scrub Jay is considered a featured species due to its federal status as a threatened species and relative abundance on CCAS and KSC. Up to 10% of the state-wide Scrub Jay

population resides on the station. Populations on private lands throughout Florida are experiencing serious decline due to loss of habitat. The CCAS Scrub Jay population, although not at carrying capacity, is large enough to maintain a viable population with proper management.

Scrub Jays are restricted to coastal strand and coastal oak scrub communities and prefer edge habitats where an open area is adjacent to scrub vegetation. Numerous miles of maintained roadways, canals, power-line clearings, firebreaks, and lines of sight have created extensive edge habitats utilized by this species. However, exclusion of fire has facilitated succession of coastal scrub habitats into a condition unsuitable for Scrub Jays in many areas of CCAS.

A Scrub Jay Management Plan for CCAS has been developed to specifically address habitat management for this species. Prescribed burning techniques and mechanical renovation of scrub habitats will be implemented to enhance the Scrub Jay population on the station.

The largest population of Florida Scrub Jays occurs on KSC. This population is one of only three that comprise nearly 80% of the entire population. The best estimate of the KSC population is 700 territories, with two to eight birds per territory. Florida Scrub Jay densities and habitat characteristics have been estimated at nearly a hundred locations.

Primary habitat includes well drained interior and coastal scrub and slash pine. Secondary habitat includes poorly drained slash pine and coastal strand. KSC is now required to offset losses of Scrub Jay habitat by creating habitat in abandoned orange groves and through restoration of tall, unburned habitat via cutting or controlled burning as described in the KSC Scrub Habitat Compensation Program.

Associated mammalian species include the following:

MAMMALS

Armadillo	<u>Dasyus novemcinctus</u>
Bobcat	<u>Lynx rufus</u>
Cotton Mouse	<u>Peromyscus gossypinus</u>
Cotton Rat	<u>Sigmodon hispidus</u>
Feral hogs (introduced)	<u>Sus scrofa</u>
Florida mouse	<u>Podomys floridanus</u>
Grey fox	<u>Urocyon cineroargenteus</u>
Grey squirrel	<u>Sciurus carolinensis</u>
Opossum	<u>Didelphis marsupialis</u>
Rabbit	<u>Sylvilagus spp.</u>
Raccoon	<u>Procyon lotor</u>
Southeastern Beachmouse	<u>Promyscus polionotus niveiventris</u>
Spotted skunk	<u>Spilogale putorius</u>

Associated avian species identified in the coastal scrub habitat include the following:

AVIAN SPECIES

American crow	<u>Corvus brachyrhychos</u>
American kestrel	<u>Falco sparverius</u>
American robin	<u>Turdus migratorius</u>
Black vulture	<u>Coragyps atratus</u>
Cardinal	<u>Richmondia cardinalis</u>
Caroline Wren	<u>Thryothorus ludovicianus</u>
Common barn owl	<u>Tyto alba</u>
Coopers hawk	<u>Accipiter cooperii</u>
Florida bobwhite	<u>Colinus virginianus</u>
Gray catbird	<u>Dumetella carolinensis</u>
Mockingbird	<u>Mimus polyglottos</u>
Mourning dove	<u>Zenaidura macroura</u>
Osprey	<u>Pandion haliaetus</u>
Red-headed woodpecker	<u>Melanerpes erythrocephalus</u>
Red-tailed hawk	<u>Buteo jamaicensis</u>
Red-winged blackbird	<u>Agelaius phoeniceus</u>
Sharp shinned hawk	<u>Accipiter striatus</u>
Sparrows (various)	<u>Passerculus spp.</u>
Turkey vulture	<u>Cathartes aura</u>
White-eyed vireo	<u>Vireo griseus</u>
Yellow-rumped warbler	<u>Dendroica coronata</u>

Reptilian species found in CCAS and KSC scrub oak environments include the following:

REPTILES

Corn snake	<u>Elaphe guttata</u>
Eastern box turtle	<u>Terrapene carolina</u>
Eastern coachwhip	<u>Masticophis flagellum</u>
Eastern diamondback rattlesnake	<u>Crotalus adamanteus</u>
Eastern indigo snake	<u>Drymarchon corais couperi</u>
Florida scrub lizard	<u>Sceloporus woodi</u>
Florida skink	<u>Eumeces inexpectatus</u>
Gopher tortoise	<u>Gopherus polyphemus</u>
Rough green snake	<u>Opheodrys aestivus</u>
Southern black racer	<u>Coluber constrictor</u>
Yellow rat snake	<u>Elaphe obsoleta</u>

3.2.2 Coastal Strand

The occurrence of strand vegetation is correlated with the limits of the salt-spray zone immediately inland from the coastal dunes and Atlantic coastline. This community type is composed of a dense thicket of woody plants. In profile, the strand displays a single layer which, depending on exposure, varies from 1 to 4 meters in height. Shrubs on the eastern margin of the strand are hedged by salt spray.

The continuous stretch of KSC, CCAS, and CNS coastline represents the longest stretch of coastal dune and coastal strand along the east coast of Florida. Much of the coastal habitats from Brevard to Dade County have been developed or are highly fragmented except on KSC and CCAS.

On CCAS, the relief of the coastal strand community undulates from flat to slightly ridged where relic dune lines have been stranded by continued sand deposition on the ocean side. Aerial photography of the Canaveral peninsula shows this ridging effect and the resultant influence on the distribution of vegetation types.

The CCAS coastal strand has been inventoried at three separate locations. The major species comprising the strand are listed below:

SHRUBS/TREES

Cabbage palm	<u>Sabal palmetto</u>
Florida privet	<u>Forestiera segregata</u>
Hercules club	<u>Zanthoxylum clava-herculis</u>
Saw palmetto	<u>Serenoa repens</u>
Tough buckthorn	<u>Bumelia tenax</u>
Wax myrtle	<u>Myrica cerifera</u>

HERBS

Grasses (various)	
Partridge pea	<u>Cassia chamaecrista</u>
Prickly-pear cactus	<u>Opuntia spp.</u>

MAMMALS

Armadillo	<u>Dasyopus novemcinctus</u>
Bobcat	<u>Lynx rufus</u>
Cotton rat	<u>Sigmodon hispidus</u>
Feral hogs	<u>Sus scrofa</u>

Florida mouse	<u>Peromyscus floridanus</u>
Opossum	<u>Didelphis marsupialis</u>
Raccoon	<u>Procyon lotor</u>
Rabbits	<u>Sylvilagus spp.</u>
Southeastern beachmouse	<u>Peromyscus polionotus niveiventris</u>
White-tailed deer	<u>Odocoileus virginianus</u>

REPTILES

Gopher tortoise	<u>Gopherus polyphemus</u>
Eastern diamondback rattlesnake	<u>Crotalus adamanteus</u>
Eastern indigo snake	<u>Drymarchon corais couperi</u>

The coastal strand environment on CCAS appears to be stable. Variations occur when succession toward the coastal scrub community climaxes or as dune accretion creates additional land available for plant colonization. Many areas within the coastal strand have been disturbed by construction of launch complexes and support facilities. Coastal strand vegetation quickly invades these previously maintained areas soon after they have been abandoned and grounds maintenance has been precluded.

The coastal strand may be important for the Florida Pine Snake on KSC but virtually nothing is known about this species. Coastal dunes and strand support large number of Gopher Tortoises. Eastern Indigo Snakes also use these habitats. Coastal strand is used by Florida Scrub Jays when adjacent to scrub oaks and coastal live oak woodlands. Coastal dune and coastal strand on KSC and CCAS provide most of the protected habitat for the largest population of the Southeastern Beachmouse. These areas are essential for maintaining this unique mammal. The Florida Mouse is also abundant in this habitat.

Avian species associated with this habitat are the same as those listed for coastal scrub. One featured plant in this community which is a food source for various bird species is the partridge pea (Cassia chamaecrista).

3.2.3 Coastal Dune

The coastal dune habitat includes the area from the high tide line to a point somewhere between the primary and secondary dune crest. All examples of this community exist within the salt-spray zone. This zone is also referred to as the Sea Oat (Uniola paniculata) zone and is usually delineated by the most inland limit of Sea Oat growth.

The vegetation of the coastal dune appears as one layer of grass, herbs, and small shrubs. The soils are well-drained to excessively drained beach sand and shell fragments. Soil conditions combined with salt spray are the major factors limiting species diversity within this zone. To a lesser degree, areas which have been disturbed by humans and erosion, (both wind and wave activated) further stress the habitat of the coastal dune zone.

Sea Oats are the featured plant species within this zone on CCAS and KSC. Sea Oats have been listed as a species of special concern, and Florida Statute 370.41 prohibits the disturbance or removal of them. These plants and this fragile habitat must be considered in future development and land management policies.

A species list of major types of vegetation found on CCAS and KSC coastal dunes is listed below:

SHRUBS/TREES

Cabbage palm	<u>Sabal palmetto</u>
Saw palmetto	<u>Serenoa repens</u>
Sea grape	<u>Coccoloba uvifera</u>
Shrub verbena	<u>Lantana camara</u>
Spanish bayonet	<u>Yucca aloifolia</u>
Tough buckthorn	<u>Bumelia tenax</u>
Wax myrtle	<u>Myrica cerifera</u>

HERBS

Beach elder	<u>Iva imbricata</u>
Beach grass	<u>Panicum amarulum</u>
Beach sunflower	<u>Helianthus debilis</u>
Broom sedge	<u>Andropogon virginicus</u>
Crotons	<u>Croton punctatus</u>
Gopher apple	<u>Licania michauxii</u>
Partridge pea	<u>Cassia chamaecrista</u>
Prickly-pear cactus	<u>Opuntia spp.</u>
Sandbur	<u>Cenchrus incertus</u>
Sea oat	<u>Uniola paniculata</u>
Slender cordgrass	<u>Spartina patens</u>
Spider lily	<u>Hymenocallis latifolia</u>
Water pennywort	<u>Hydrocotyle umbellata</u>

VINES

Beach bean	<u>Canavalia maritima</u>
Beach morning glory	<u>Ipomoea stolonifera</u>
Greenbrier	<u>Smilax spp.</u>
Railroad vine	<u>Ipomoea pes-caprae</u>

Australian Pine Trees (Casuarina spp.) occur in various locations along the dune but will not be recognized as a major coastal dune species since these trees are exotics, introduced by landowners prior to the establishment of CCAS and KSC.

The featured mammalian species inhabiting the dune are raccoons and various rodent species. The raccoon status is not related to vegetation indigenous to the dune but rather from sea turtle nests (eggs) deposited on the beach and from trash, fish, and food items washing ashore. In addition, the presence of drainage canals excavated behind the primary dune has created an excellent raccoon habitat.

A population of feral hogs (Sus scrofa) also exists on CCAS and KSC. These animals are not indigenous to the Canaveral peninsula, yet they have readily adapted to the various habitats and food types available on CCAS and KSC. In addition to raccoons, hogs actively predate sea turtle nests deposited on the beach during the summer months. An active hunting and trapping program conducted by the LBS Security Department Wildlife Control Officer maintains the hog population at diminished levels for the protection of sea turtle hatchlings and other plant and animal species adversely impacted by hogs.

A list of animal species known to inhabit and/or utilize the dune habitat are listed below:

MAMMALS

Armadillo	<u>Dasypus novemcinctus</u>
Bobcat	<u>Lynx rufus</u>
Cotton rat	<u>Sigmodon hispidus</u>
Feral hogs	<u>Sus scrofa</u>
Florida mouse	<u>Podomys floridanus</u>
Florida white-tailed deer	<u>Odocoileus virginianus</u>
Rabbit	<u>Sylvilagus spp.</u>
Southeastern beach mouse	<u>Peromyscus polionotus niveiventris</u>

Associated avian species include the following:

AVIAN SPECIES

Arctic peregrine falcon	<u>Falco peregrinus tundrius</u>
Brown pelican	<u>Pelecanus occidentalis</u>
Florida scrub jay	<u>Apelocoma c. coerulescens</u>
Mockingbird	<u>Mimus polyglottos</u>
Mourning dove	<u>Zenaida macroura</u>
Sandpipers	Scolopacidae family
Terns (various)	<u>Sterna spp.</u>

3.2.4 Hammocks

Hammocks are forests primarily dominated by broadleaf evergreen trees. Typically three layers of vegetation are found in hammocks. These layers are tree, shrub, and herb. A well-developed tree layer is always present and may vary from 5 to 20 meters in height. Shrub layers vary in

height from 0.5 to 3 meters. An herbaceous or ground layer is always present, but the degree of development is determined by numerous factors such as soil conditions, light, water, etc.

3.2.4.1 Hammocks (CCAS)

Physical locations of hammocks on CCAS are in areas that have had stable soil conditions for long periods of time. These sites tend to be on the interior sides of barrier strands and on higher portions of the undulating Cape Canaveral terrain. One CCAS hammock described in literature is the Indian Mound Hammock located south of Fuel Storage Area 1 on the west side of South Phillips Parkway extending to the wetland vegetation paralleling the Banana River. Similar hammocks exist north of the fuel storage area. Other isolated hammocks are found where sufficient nutrients and organic materials have accumulated to allow the development of this type of plant community.

Due to the lack of naturally occurring fires, scrub communities throughout the Cape appear to be developing toward a hammock-type association and some areas may be identified as xeric scrub-oak hammocks in the future. Existing hammocks on CCAS appear as semi-tropical hammocks located adjacent to the Banana River shoreline and in areas known to have been homesteaded. Consequently, these hammocks contain a number of exotic and introduced species. Below is a list of major vegetation types found in CCAS hammocks.

CANOPY TREES

Australian pine	* <u>Casuarina spp.</u>
Cabbage palm	<u>Sabal palmetto</u>
Carolina laurel cherry	<u>Prunus caroliniana</u>
Live oak	<u>Quercus virginiana</u>
Red bay	<u>Persea borbonia</u>
Strangler fig	<u>Ficus aurea</u>

SUBCANOPY TREES

Florida elder	<u>Sambucus canadensis</u>
Hackberry (sugarberry)	<u>Celtis laevigata</u>
Marlberry	<u>Ardisia escallonioides</u>
Naked wood	<u>Myrcianthes fragrans</u>
Red mulberry	<u>Morus rubra</u>
Stopper (various types)	<u>Eugenia spp.</u>
Tough buckthorn	<u>Bumelia tenax</u>

SHRUBS

Brazilian pepper	* <u>Schinus terebinthefolius</u>
Coral beans	<u>Erythrina herbacea</u>

Saw palmetto
Wild coffee

Serenoa repens
Psychotria spp.

HERBS

Boston fern
Broom sedge

Nephrolepis cordifolia
Andropogon virginicus

VINES

Greenbrier
Wild grapes
Virginia creeper

Similax bona-nox
Vitis spp.
Parthenocissus quinquefolia

EPIPHYTES

Resurrection fern
Spanish moss

Polypodium polypodioides
Tillandsia usneoides

*Introduced exotic species

Wildlife species associated with CCAS hammocks are primarily those species inhabiting adjacent coastal scrubs. A greater diversity of avian species, including several migratory birds, would be expected due to the variation of plant species and available niches. Additionally, numerous fruit-bearing trees were identified in the areas studied, providing a variety of bird food items.

Mammalian and reptilian species found in CCAS hammocks are as follows:

MAMMALS

Armadillo
Bobcat
Grey squirrel
Opossum
Raccoon
Spotted skunk
White-tailed deer

Dasyopus novemcinctus
Lynx rufus
Sciurus carolinensis
Didelphis marsupialis
Procyon lotor
Spilogale putorius
Odocoileus virginianus

AMPHIBIANS AND REPTILES

Eastern diamondback rattlesnake
Eastern indigo snake

Crotalus adamanteus
Drymarchon corais couperi

Green tree frog
Southern toad

Hyla cinerea
Bufo terrestris

3.2.4.2 Hammocks (KSC)

Four major broad leafed woodland habitat types occur on KSC. These include oak-cabbage palm hammock, red bay-live oak-laurel oak hammock, hardwood swamp, and willow swamp as described below:

- Oak-cabbage palm hammock has a canopy typically dominated by Live Oak, but Cabbage Palm, Laurel Oak, Elm, and Red Mulberry also occur.
- Red bay-live oak-laurel oak hammock (RBL) has a canopy dominated by Live or Laurel Oak, but Red Bay often occurs. The understory is dominated by Saw Palmetto.
- Hardwood swamps are typically dominated by deciduous species, especially Red Maple; Elm and Persimmon may be common. These swamps often include evergreen taxa such as Laurel Oak and Cabbage Palm. Ferns are often abundant in the understory.
- Willow swamps are dominated by the deciduous Carolina Willow. However, Red Maple and Wax Myrtle are often present. The understory is dominated by aquatic plants such as Arrowhead. Willow swamps occur in deeper water and on sites with longer hydroperiods than other hardwood swamps. Coastal woodlands also occur in patches along the coastline, especially in areas not subject to recent fire either due to man-made or natural landscape features.

These hammock types are often located in areas associated with shallow standing surface water, and/or understory shrub sapling and herbaceous plant species designated as wetland plant types. Therefore, KSC hammocks are often designated as wetland areas by the state of Florida and are therefore subject to special protection or mitigation procedures if modified or disturbed.

3.2.5 Scrub and Pine Flatwoods (KSC)

Scrub and pine flatwoods are the dominant vegetative habitat type on KSC, covering approximately 50% of KSC's total land area. Habitat management must include consideration for various species such as the Southern Bald Eagle, Florida Scrub Jays, Eastern Indigo Snakes, and Gopher Tortoises.

Scrub and pine flatwoods on KSC have similar shrub layers, but pine flatwoods differ by having an open overstory of Slash Pine (Pinus elliotii) and occasionally Pond Pine (P. serotina). Scrub oaks (Quercus myrtifolia, Q. Geminata, Q. chapmanii) dominate drier sites, while Saw Palmetto dominates the wetter end of the scrub. On most sites, a mixed oak/palmetto shrub layer occurs. Scrub, except saw palmetto scrub, is often a term used to describe an excessively drained desert-like habitat. Most scrub and pine flatwoods on KSC differ by having a water table that is close to the surface for most of the year. Well drained ridges occur as a series of long narrow strips formed on relict dunes oriented north-to-south. These comprise only 14% of the scrub and slash

pine flatwoods; however, scrub oaks are abundant within patches in at least half of the remaining scrub and pine flatwoods.

No other habitat has more endangered or potentially endangered wildlife species that are permanent residents. Many of the amphibians found in scrub and slash pine flatwoods use nearby marshes for reproduction. Amphibians are part of the food chain for numerous species inhabiting scrub and slash pine, particularly the Eastern Indigo Snake which uses Gopher Tortoise burrows as den sites and marshes for hunting. Indigo Snakes use all habitats within the scrub and pine flatwoods landscape and may occur far from well drained areas (Kehl et al. 1991). Gopher Tortoises also have a wide distribution, using nearly all scrub and pine flatwoods.

Mammalian and reptilian wildlife species inhabiting the scrub and slash pine areas include:

MAMMALS

Armadillo	<u>Dasyopus novemcinctus</u>
Bobcat	<u>Lynx rufus</u>
Feral hogs	<u>Sus scrofa</u>
Florida mouse	<u>Podomys floridanus</u>
Gray squirrel	<u>Sciurus carolinensis</u>
Opossum	<u>Didelphis marsupialis</u>
Rabbit	<u>Sylvilagus spp.</u>
Raccoon	<u>Procyon lotor</u>

REPTILES

Eastern coachwhip	<u>Masticophis flagellum</u>
Easter diamondback rattlesnake	<u>Crotalus adamanteus</u>
Eastern indigo snake	<u>Drymarchon corais couperi</u>
Gopher tortoise	<u>Gopherus polyphemus</u>
Pigmy rattlesnake	<u>Sistrurus miliarius</u>

AVIAN SPECIES

Downy woodpecker	<u>Picoides pubescens</u>
Florida scrub jay	<u>Aphelocoma coerulescens coerulescens</u>
Southern bald eagle	<u>Haliaeetus leucocephalus</u>

3.2.6 Disturbed Areas (KSC)

This habitat type consists of vegetation which has been altered, usually through human disturbance. This disturbance allows weedy and exotic species to take a foothold and eliminate the native vegetation.

Disturbed habitat on KSC includes large cleared areas surrounding the shuttle launch pads, the crawlerway, access roads, and numerous office and vehicle processing support buildings which have been landscaped with ruderal grasses.

These habitats are dominated by herbaceous plants, shrubs, and/or trees and comprise old fields (some areas mapped as ruderal), citrus groves, dikes, and other areas with Wax Myrtle, Brazilian Pepper, Melaleuca, and Australian Pine. This habitat category excludes impoundments, ditches, disturbed scrub and pine flatwoods, spoil islands, and ruderal grass. Brazilian Pepper is most abundant where there was soil disturbance although scattered individuals can be found in some mesic and hydric areas. Brazilian Pepper and Australian Pine are not common in disturbed scrub and pine flatwoods except where planted, or areas with dredge spoil material, or in disturbed coastal scrub. The invasion into native habitats may be limited by periodic freezes because these exotics tend to be sensitive to frost. Many native herbaceous plants - Wax Myrtle, Groundsel, Grape Vine, and Cabbage Palms - are common in disturbed areas. Some abandoned citrus groves have been invaded by Cabbage Palms and Grape Vine.

Some disturbed areas are used by many endangered and potentially endangered species but are required by few or none. Most disturbed habitat types support fewer endangered and potentially endangered species than the native habitat that originally occurred on these sites. Brazilian Pepper stands, for example, have a less diverse and lower density of native birds than undisturbed habitats. Gopher Tortoises are sometimes very abundant in disturbed areas as are Common Ground Doves.

Control of exotic vegetation, especially Melaleuca and Australian Pine, is being performed by Merritt Island National Wildlife Refuge and CNS. Brazilian Pepper is difficult, if not nearly impossible to control. These disturbed habitats are recommended sites for future development and some are recommended sites for habitat restoration and creation.

Much, or perhaps nearly all, of the vegetation and fauna native to sandhill areas can be restored on abandoned citrus groves sites. We believe that scrub can also be restored on these sites, at least in a manner that provides good quality habitat for many species of concern. This has been recommended as one of the actions to offset construction in scrub habitat elsewhere on KSC.

3.2.7 Spoil Areas and Island (KSC)

This habitat includes natural islands that are dominated by salt marsh vegetation and spoil islands that are man-made. Most occur in the Indian and Banana Rivers, Banana Creek, or Mosquito Lagoon, as well as the natural salt marsh islands within Mosquito Lagoon, Banana Creek, and Moore Creek. These were dominated by mangroves in the 1970's and much of the 1980's, but subsequent freezes have converted them back into salt marshes. Spoil islands are made of material dredged from the estuary to provide channels for water navigation. They were constructed between 1937 - 1974 and range in size from 0.04-13.2 ha. There are 75-100 spoil islands on KSC property or immediately adjacent to KSC. Most are in public access areas where they are heavily utilized; large bird colonies in these areas are posted off limits and are under jurisdiction of the FWS.

The following summarizes typical succession patterns on spoil islands. Marsh species, including mangroves, colonize the intertidal area within a few years. Other grasses and herbaceous plants typically become established within 3-5 years. Low woody shrubs become established within 5-50 years. Subsequently, Australian Pine, Cabbage Palm, Brazilian Pepper, or Southern Red Cedar may eventually dominate. Some portions of islands may remain bare.

Some islands may be important for the East Coast Diamondback Terrapin although habitat features important to terrapins are largely unknown. Islands on KSC are used for roosting, loafing, nesting, and feeding by many resident and migratory waterbirds. Mostly bare and sparse grassy habitat are the two most limiting habitat types on spoil islands due to successional processes. Many spoil islands have bare and grassy patches but they also include many trees and large shrubs which may provide cover and perch sites for predators. Spoil islands on KSC were described as one of two primary nesting sites for Royal Terns in Florida. There are many years when no Royal Tern nesting was reported on KSC for unknown reasons. Least Terns have nested in many NASA operational areas perhaps because there are few suitable islands that remain. Except for those on rooftops and islands, nesting Least Terns are extremely susceptible to ground predators and often have poor or no reproductive success. The population of Least Terns on KSC was once estimated to be 300-400 birds.

Avian species associated with spoil islands with shrubs and trees include the following:

AVIAN SPECIES

Black-crowned night-heron	<u>Nycticorax nycticorax</u>
Black-whiskered vireo	<u>Vireo altiloquus</u>
Brown pelican	<u>Pelecanus occidentalis</u>
Florida prairie warbler	<u>Dendroica discolor</u>
Glossy ibis	<u>Plegadis falcinellus</u>
Great egret	<u>Casmerodius albus</u>
Little blue heron	<u>Egretta caerulea</u>
Osprey	<u>Pandion haliaetus</u>
Reddish egret	<u>Egretta rufescens</u>
Roseate spoonbill	<u>Ajaia ajaja</u>
Tricolored heron	<u>Egretta tricolor</u>
White ibis	<u>Eudocimus albus</u>
Wood stork	<u>Mycteria americana</u>

3.3 Wetlands

Wetlands are defined in AFI 32-7025, Chapter 3, as those areas that are inundated by surface or ground waters with a frequency sufficient to support (and under normal circumstances does or would support) a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil for growth and reproduction. Wetland ecosystems are considered to be some of the

most biologically productive of all habitats. For this reason, wetlands are protected under Executive Order 11990, "Protection of Wetlands."

Several types of wetland environments are found on CCAS and KSC. These include mangrove estuaries and shorelines, salt marsh wetlands, fresh water wetlands, impoundments and drainage canals. Due to the importance of these areas, they will be described separately.

3.3.1 Mangrove Wetlands

CCAS and KSC estuarine wetlands dominated by woody cover are typically mangrove communities located on the fringes of the Banana River, Indian River, and adjacent impoundments. Estuarine habitat comprises 39% of KSC lands. Several hard freezes experienced in Brevard County during the 1980's drastically reduced the extent of mangrove communities on CCAS and KSC. Former mangrove lined shorelines are often succeeded by emergent grasses typical of saltmarshes. Given favorable weather conditions, mangroves will eventually become re-established along the Banana River shoreline, although exotic species are now directly competing with the mangroves. Mangrove communities are very fragile and can be easily altered by dredging, flooding, impounding, and clearing. Mangrove leaf detritus is an important energy source within the complex marine food chain. Consequently, mangroves are protected by Florida Statute 861.02, and two species are listed as species of special concern by the State.

All three North American mangrove species are found on CCAS and KSC and are listed below with other plant species associated with this community:

SHRUBS/TREES

Black mangrove	<u>Avicennia germinans</u>
Buttonwood	<u>Conocarpus erecta</u>
Red mangrove	<u>Rhizophora mangle</u>
Salt bush	<u>Baccharis halimifolia</u>
Sea oxeye	<u>Borrchia frutescens</u>
White mangrove	<u>Languncularia racemosa</u>

HERBS

Black needle rush	<u>Juncus roemerianus</u>
Cordgrass	<u>Spartina bakeri</u>
Salt grass	<u>Distichlis spicata</u>

Featured wildlife species in a mangrove community are too numerous to identify within the scope of this EA. Due to its riparian location, species diversity within a mangrove habitat is widely varied. Use of mangrove communities on CCAS by wading birds and migratory waterfowl is extensive but the ichthyofauna receive the majority of the energy flowing from this association.

Associated avian species include the following:

AVIAN SPECIES

American coot	<u>Fulica americana</u>
Anhinga	<u>Anhinga anhinga</u>
Belted kingfisher	<u>Megaceryle alcyon</u>
Brown pelican	<u>Pelecanus occidentalis</u>
Cattle egret	<u>Bubulcus ibis</u>
Great blue heron	<u>Ardea herodias</u>
Great egret	<u>Casmerodius albus</u>
Little blue heron	<u>Florida caerulea</u>
Osprey	<u>Pandion haliaetus</u>
Roseate spoonbill	<u>Ajaia ajaja</u>
Snowy egret	<u>Leucophoux thula</u>
Tricolored heron	<u>Egretta tricolor</u>
Wood stork	<u>Mycteria americana</u>

AMPHIBIANS AND REPTILES

Atlantic salt marsh snake	<u>Nerodia fasciata taeniata</u>
Florida east coast terrapin	<u>Malaclemys terrapin tequesta</u>

Additionally, migratory waterfowl winter in these environments on CCAS and KSC. A survey of migratory bird species will be made in the future for inclusion in this plan.

3.3.2 Salt Marshes

Salt marsh wetlands are dominated by nonwoody vegetation. These areas exist amidst the intertidal shorelines and tidal wetlands of the Indian River lagoon system throughout CCAS and KSC. The majority of the Banana riverfront along CCAS has been disturbed by the construction of mosquito control ditches and dikes or construction of facilities by the Air Force to support the missile testing program. Consequently, it is difficult to assess the original extent of salt marshes on the Canaveral peninsula. Some remnants of a salt marsh environment exist west of Complex 40. These areas have been isolated from the waters of the Banana River and are presently experiencing a successional change to a freshwater marsh community.

There are over 10,000 acres of brackish and salt water marshes and impoundments on KSC. Many of the salt or brackish water marshes on KSC are located in managed mosquito control areas and intertidal mud flats with controlled culvert openings and/or uncontrolled dike breaches connecting the marsh areas with the Indian River estuarine habitat. The KSC salt water marsh areas impacted by the lines of sight discussed herein are found around the western and northern perimeter of the Banana River and on both sides of North Banana Creek.

2



Salt marsh wetlands are typically dominated by emergent grasses such as black needle rush and cordgrass. These and other nonwoody dominant wetland plant types identified on CCAS are listed below.

SHRUBS/TREES

Sea-oxeye	<u>Borrichia frutescens</u>
Swamp willow	<u>Salix caroliniana</u>

HERBS

Black needle rush	<u>Juncus roemerianus</u>
Cordgrass	<u>Spartina bakeri</u>
Glass worts	<u>Salicornia spp.</u>
Salt grass	<u>Distichlis spicata</u>
Sea Blites	<u>Suaeda spp.</u>

Featured wildlife species for this habitat on CCAS have not been identified due to the isolated nature of the marshes and the relatively small amount of acreage involved.

Animal species known to inhabit and/or utilize this area include the following:

ANIMALS

Alligator	<u>Alligator mississippiensis</u>
Armadillo	<u>Dasyus novemcinctus</u>
Feral hogs	<u>Sus scrofa</u>
Florida east coast terrapin	<u>Malaclemys terrapin tequesta</u>
Florida white-tailed deer	<u>Odocoileus virginianus</u>
Marsh Rabbit	<u>Sylvilagus palustris</u>
Opossum	<u>Didelphis marsupialis</u>
Raccoon	<u>Procyon lotor</u>
Rice rat	<u>Oryzomys palustris</u>
Salt marsh snake	<u>Nerodia spp.</u>

Avian species using this habitat include the wading birds described in 3.3.1, various migratory waterfowl (usually wintering ducks), and the White Pelican (Pelecanus erythrorhynchos).

The trend of this habitat appears to be changing due to alterations imposed by man. The area is used by wildlife but was certainly more productive prior to construction of Complexes 40 and 41 and their corresponding transporter roadways. This marsh could be restored in the future should the Titan project be discontinued and the area abandoned.

3.3.3 Freshwater Wetlands

Freshwater wetlands located on CCAS and KSC are actually ponds, borrow pits, inter-dunal swales, drainage canals, or watersheds which have undergone succession and are presently in the marsh stage.

On KSC, this habitat includes areas mapped as cattail marsh, gramminoid marsh, and cabbage palm savannah. These commonly occur as isolated wetlands interspersed among other vegetation types, especially scrub and slash pine flatwoods. Cattail marsh is dominated by Typha dominigensis and T. latifolia. Cattail marshes often characterize disturbed areas with longer hydroperiods than other gramminoid marshes.

Marsh-like conditions exist in some sections of the CCAS and KSC drainage canal system and other low-lying areas associated with topographic undulations between relic dune ridges transecting the Cape. A number of these marshy areas are temporary conditions resulting from seasonal variation in precipitation. The areas are periodically utilized by resident and migratory wildlife species but will not be cited specifically due to their seasonal variability. One marsh area near the tip of the Cape is actually the remnants of the only natural permanent freshwater pond which existed on the Cape prior to Government acquisition. Freshwater wetland plants observed on CCAS and KSC are listed below.

FRESHWATER WETLAND PLANTS

Beardgrass	<u>Andropogon spp.</u>
Bladderwort	<u>Utricularia spp.</u>
Common arrowhead	<u>Sagittarian lancifolia</u>
Common cattail	<u>Typha latifolia</u>
Common duckweed	<u>Lemna minor</u>
Curtis' reedgrass	<u>Calamovilfa curtissii</u>
Elodea	<u>Egeria densa</u>
Hydrilla	<u>Hydrilla verticillata</u>
Maidencane	<u>Panicum hemitomon</u>
Sawgrass	<u>Cladium jamaicense</u>
Spatterdock	
(yellow cow lily)	<u>Nuphar luteum</u>
Torpedograss	<u>Panicum repens</u>
Water pennywort	<u>Hydrocotyle umbellata</u>

The few freshwater wetlands on CCAS and KSC are used extensively by raccoons and red-winged blackbirds (Agelaius phoeniceus). Raccoons (Procyon lotor) appear to be primarily attracted by the large populations of Leopard Frogs (Rana sphenoccephala) inhabiting these environments. The Red-Winged Blackbird nests in the marsh vegetation and feeds on hatching insects emerging from marsh waters.

Additional species observed utilizing freshwater wetlands on CCAS and KSC are listed below.

MAMMALS

Florida white-tailed deer	<u>Odocoileus virginianus</u>
Marsh rabbit	<u>Sylvilagus palustris</u>
Rice rat	<u>Oryzomys palustris</u>
River otter	<u>Lutra canadensis</u>

AVIAN SPECIES

American coot	<u>Fulica americana</u>
Belted kingfisher	<u>Megaceryle alcyon</u>
Common moorhen	<u>Gallinule chloropus</u>
Double-crested coormorant	<u>Phalacrocorax auritus</u>
Great blue heron	<u>Ardea herodias</u>
Great egret	<u>Casmerodius albus</u>
Little blue heron	<u>Egretta caerulea</u>
Marsh hawk	<u>Circus cyaneus</u>
Snowy egret	<u>Egretta thula</u>
Tricolored heron	<u>Egretta tricolor</u>
Waterfowl (various)	
Wood stork	<u>Mycteria americana</u>

REPTILES & AMPHIBIANS

Alligator	<u>Alligator mississippiensis</u>
Florida cooter	<u>Pseudemys floridana</u>
Florida water snake	<u>Nerodia fasciata pictiventris</u>
Red-eared slider	<u>Trachemys scripta elegans</u>
Soft shelled turtle	<u>Trionyx ferox</u>
Southern leopard frog	<u>Rana sphenoccephala</u>
Water moccasin	<u>Agkistrodon piscivorus</u>

Significant drainage of surface waters and lowering of the groundwater table has resulted from the extensive canal network constructed on CCAS. Drainage has encouraged encroachment of woody vegetation into existing wetlands and subsequent degradation of these habitats.

Application of controlled fire to marsh habitats would reduce coverage by woody species and improve these ecosystems.

3.3.4 Drainage Canal System

There are approximately 52 miles of drainage canals comprising 63 acres of surface waters on CCAS. These canals were constructed by the Air Force to provide drainage of low-lying areas throughout the Cape to facilitate missile launch complex construction. The major canals of this

system offer habitat for numerous species of fish and wildlife. The canals are used by most species found on CCAS due to the riparian zones associated with this habitat.

Major species observed using aquatic and terrestrial canal habitats are listed below:

MAMMALS

Armadillo	<u>Dasypus novemcinctus</u>
Feral hogs	<u>Sus scrofa</u>
Marsh rabbit	<u>Sylvilagus palustris</u>
Opossum	<u>Didelphis marsupialis</u>
Raccoon	<u>Procyon lotor</u>
River otter	<u>Lutra canadensi</u>
White-tailed deer	<u>Odocoileus virginianus</u>

AMPHIBIANS AND REPTILES

Alligator	<u>Alligator mississippiensis</u>
Florida cooter	<u>Pseudemys floridana</u>
Snapping turtle	<u>Macrolemys temmincki</u>
Soft shelled turtle	<u>Trionyx ferox</u>
Southern leopard frog	<u>Rana sphenoccephala</u>
Water moccasin	<u>Agkistrodon piscivorus</u>

AVIAN SPECIES

American kestrel	<u>Falco sparverius</u>
Belted kingfisher	<u>Megaceryle alcyon</u>
Common gallinule	<u>Gallinule chloropus</u>
Great blue heron	<u>Ardea herodias</u>
Red-winged blackbird	<u>Agelaius phoeniceus</u>
Snowy egret	<u>Egretta thula</u>

FISHES

Bluegill	<u>Lepomis macrochirus</u>
Garfish	<u>Lepisosteus platyrhincus</u>
Largemouth bass	<u>Micropterus salmoides</u>

*MINNOWS

Killifish	<u>Fundulus spp.</u>
Sailfin molly	<u>Poecilia latipinna</u>
Top minnow	<u>Fundulus chrysotus</u>

*Minnows are described as being members of the order Atheriniformes, which includes silversides, killifishes, and live bearers.

Drainage canal habitats are constantly changing due to the influence of canal maintenance by the LBS contractor. The LBS contractor is contractually obligated to ensure that adequate flow is maintained in the canals. Consequently, the canals are periodically cleaned with a drag line to remove excessive emergent vegetation from the canals. This practice destroys some environmental attributes temporarily, but observations show habitat stabilization and utilization by wildlife occurs within a few weeks after cleaning.

3.3.5 Brackish Water Impoundments

There are four major brackish water impoundments located on CCAS. The impoundments were created by construction of a power line access roadway across the tips of convoluted portions of the North Banana River shoreline. This construction was in support of the Air Force's Titan III missile testing project. An additional impounded area exists between Complex 40 and the Complex 41 transporter roadways. This area appears to have originally existed as a salt marsh dominated by nonwoody vegetation. Observations show cattails and some woody species are invading this habitat since it is no longer influenced by the Banana River. Wading birds have been observed in this area, but the extent of utilization has not been determined.

One of the four major impoundments was fitted with two culverts (24-inch diameter and 48-inch diameter) by the Brevard County Mosquito Control District. The culverts have been opened to allow the exchange of water between the impoundments and adjacent lagoon waters. As a mosquito control project, water levels were fluctuated within this impoundment to prevent egg laying by some salt marsh mosquitoes. Unfortunately, this practice also results in deleterious effects to woody wetland plants (e.g., mangroves) and changes the chemical parameters of the impounded water. The impoundment was opened as a pilot project to determine potential benefits which could be provided by opening the remaining impoundments. Surveys of the study site have shown numerous fish species listed as inhabiting area lagoons had moved through the large culvert into the previously impounded waters.

In 1990, a new 36-inch culvert was installed in the southernmost impoundment under the powerline maintenance road bed. This action was taken as partial mitigation for impacts to an isolated wetland adjacent to the Vertical Integration Building (VIB) extension project. The culvert was installed by the Brevard County Mosquito Control District and was fitted with a riser on the lagoon side to facilitate seasonal mosquito control activity. For the remainder of the year, the culvert is opened to facilitate the transfer of energy from this previously isolated system.

3.4 Floodplains

Floodplains are lowland and relatively flat areas adjoining inland and coastal waters that are subject to flooding. The 100-year floodplain is subject to a one percent (.01%) or greater chance of flooding in any given year. On CCAS, the 100-year floodplain extends into the Cape to 7 feet above mean sea level (MSL) on the ocean side and 4 feet above MSL on the Banana River side. The 500-year floodplain is within areas which are subject to a two percent (.002%) chance of flooding in any given year. The 500-year floodplain elevations are 10 feet above MSL on the ocean side of CCAS and 6 feet above MSL along the Banana River. Floodplains provide for the natural control and conveyance of floodwaters. Alteration and reduction of floodplains can lead to higher flow velocities and increased erosion, as well as property damage and loss of life within the modified floodplain area and areas downstream. Floodplains also provide a number of water quality maintenance, cultural resource, and living resource values.

Executive Order 11988 requires all federal agencies to provide leadership and take action to reduce the risk of flood loss; to minimize the impacts of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains in acquiring, managing, and disposing of Federal lands; providing Federally undertaken, financed, or assisted construction and improvements; and conducting Federal activities and programs affecting land use. Air Force installations have the responsibility to determine if proposed actions will occur in a floodplain, evaluate and document the potential effects; and consider alternatives to avoid these effects and incompatible development in the floodplain.

Due to the lack of significant variances in topography on CCAS and KSC, floodplains extend beyond the coastal dunes and wetlands into portions of all of the CCAS and KSC upland plant communities.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The Environmental Consequences section will identify potential impacts to the affected environmental attributes described in Section 3.0. The potential effects will be described as they are related to the feasible alternatives identified in Section 2.0. For the purposes of this section, and, as shown in Section 2.0, the only feasible alternatives are the proposed action and the no action alternative. Therefore, the mission objectives and significant environmental issues will be evaluated for the following potential effects:

- The direct, indirect and/or cumulative effects of both feasible alternatives,
- Unavoidable adverse environmental effects,

- The relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, and
- The irreversible and irretrievable commitment of resources, if any, from implementation of each alternative.

After the potential environmental consequences have been described, the mitigation section will explain various items which could be incorporated into the methods of the proposed action to prevent and/or offset impacts to the effected environment. In addition, the mitigation section will also describe suggested actions which the Air Force and NASA could implement to offset impacts to threatened and endangered species habitat. These actions are suggested for consideration by the FWS to facilitate issuance of their opinion regarding the proposed action.

4.2 Mission Objectives

The Air Force mission on CCAS is to provide reliable access to space for the purposes of maintaining national defense and supporting the commercial interests of various domestic and international space related companies. KSC is NASA's major installation for preparation, launch, and landing of manned and unmanned space vehicles and their payloads from Launch Pads 36, 17, 39A, 39B, 41, and the shuttle landing facility. Lines of sight are required to provide unobstructed optical viewing of space launch vehicles prior to and during launch. Range Safety television and forward observers at selected universal camera sites are the only means of monitoring launch deviation prior to radar acquisition.

In the past, the Air Force and NASA have consulted with the FWS and SHPO when individual lines of sight required clearing and/or maintenance (Appendix B). The typical response concluded that the line of sight work would not jeopardize the continued existence of potentially impacted species provided the action was performed after Florida Scrub Jay nesting season and in accordance with previously approved scrub rehabilitation methodologies.

The following is a brief description of Range optics and the various types of equipment used at the camera sites to achieve a level of safety monitoring required to support the launch related mission objectives.

The Eastern Range (ER) optics capabilities include metric, engineering sequential, and documentary imagery. Metric optic systems provide two-dimensional position-versus-time data; these systems include Intercept Ground Optical Recorders (IGOR), Advanced Transportable Optical Tracking Systems (ATOTS), tracking cinetheodolites, and fixed-site telescopes. Engineering sequential imagery provides mission event-versus-time data such as umbilical disconnect, hold-down release, engine ignition, liftoff, and booster separation. This data is produced for Range Safety, launch vehicle contractors and various Range users.

All mission-related optical coverage on F-1 day (day before launch) and launch day is coordinated through and monitored by the Photo Control Console (PCC) located in Facility

44410 at CCAS. The console is manned at the beginning of the operation count down and remains manned through data retrieval.

ER metric optics are divided into fixed and mobile tracking instruments. ATOTSs, Mobile IGORs (MIGORs), cinetheodolites, and fixed-site telescopes are manually or computer operated to track moving targets. The ER has 24 Universal Camera Sites (UCS) that can accommodate most of the Range mobile optics systems. These systems include the Contraves cinetheodolites, mobile tracking telescopes, Kineto Tracking Mounts (KTMs), and Intermediate Focal Length Optical Trackers (IFLOTs).

Cinetheodolites. Cinetheodolites and tracking telescopes are the main optical sources of trajectory data from liftoff to altitudes of 50,000 feet or more. Each cinetheodolite used on the Range is the Contraves Model 151. The Range's six mobile Contraves instruments may be located at any of the UCSs. One instrument is permanently located atop the Launch Operations Control Center (LOCC) facility at CCAS.

Tracking Telescopes. The Range has seven long focal length tracking telescopes. Three of these telescopes are permanently mounted atop concrete towers at Cocoa Beach, Patrick AFB, and Melbourne Beach, Florida. The other four are attached to mobile trailers and can be used from any universal camera site or from any site if supported by electrical power and data communications. Each of the Range telescopes can be operated either by computer control or by manual input.

Intercept Ground Optical Recording (IGOR) System. The IGOR telescopes are long focal length tracking telescopes. The systems provide real-time input to the central computer for use by the Range Safety officer. One of the IGOR telescopes is mounted atop a tower at Patrick AFB, and the other two are installed in mobile trailers for use at any UCS site. These two mobile IGORs, or MIGORs, are similar functionally to the Patrick IGOR but can be moved to any site that has adequate power and communication support. The mobile units are 5th wheel trailers that, once in place, are jacked up for stability and leveling.

Distant Object Altitude Measurement Systems (DOAMS). The DOAMS consists of twin 24-inch aperture telescopes. This unit utilizes similar equipment for Range Safety input as do other telescope sites.

Advanced Transportable Optical Tracking Systems (ATOTS). Each ATOTS transporter is a low-boy Fruehauf trailer that is 42 feet long and 12 feet wide. This trailer is divided into three compartments that house the optics pedestal, the equipment control room, and a darkroom.

4.2.1 No-Action Alternative

Selection of this alternative would result in continuation of current operations until vegetation in all CCAS lines of sight would effectively obstruct the visual and/or optical pathways between the various camera sites and the eight active launch pads on CCAS and KSC. This choice of alternatives does not meet mission objectives since it is imperative that the Range Safety Officer

and other launch personnel are able to physically observe the missile's behavior prior to and immediately following launch of the respective launch vehicles. These visual evaluations are imperative for conducting safe space vehicle launches from CCAS and KSC. Without an unobstructed view of launch vehicles, the Range Safety Officer cannot guarantee the safety of launch personnel, facilities, equipment, and, more importantly, the civilian population and private property within the potential impact zone(s) of errant missiles and spacecraft. Consequently, established safety procedures prohibit space launches without adequate visual and optical evaluation of the entire launch operation. Therefore, selection of the no action alternative would ultimately result in termination of space launches from CCAS and KSC (the mission).

4.2.2 Proposed Action

The removal of vegetation that obstructs established optical lines of sight, between active launch complexes and existing camera sites, will assure uninterrupted continuation of the space launch mission of CCAS and KSC. Periodic maintenance through controlled burning and/or mechanical clearing will prevent future impacts to the mission schedule from obstructed optical pathways. In addition, the proposed action is consistent with the goals of CCAS and KSC natural resource management programs such as the Controlled Burning Program, Scrub Jay Management, the CCAS Habitat Compensation Plan and the KSC Scrub Habitat Compensation Program.

Therefore, selection of the proposed action (preferred) alternative will fulfill Air Force and KSC requirements without adversely impacting environmental attributes on CCAS or KSC.

4.3 Florida Scrub Jay

4.3.1 No-Action Alternative

Selection of the no-action alternative would eliminate all potential Scrub Jay impacts which might be associated with line-of-sight land clearing and/or maintenance activities. However, the option to take no action would result in continued uninterrupted succession of scrub vegetation within these sight lines. Excessive growth would eventually alter the habitat significantly enough to preclude use by Scrub Jays, which could jeopardize their continued existence on CCAS.

4.3.2 Proposed Action

Selection of the proposed action (preferred) alternative should not adversely impact or jeopardize scrub jays on CCAS or KSC. The vast majority of land that needs to be cleared for lines of sight exists within previously identified controlled burn compartments. These compartments are included in the CCAS Controlled Burn Plan, CCAS Scrub Jay Management Plan and/or CCAS and KSC Habitat Compensation Plans. Included in these plans are descriptions of proposed management techniques for restoring Scrub Jay habitat within each compartment. Therefore, vegetation which obstructs the visual pathway of a line of sight would eventually be reduced/removed by burning or some type of mechanical clearing as an attempt to renovate Scrub Jay habitat. This action is scheduled over a period of ten years and would not occur within

the time frame required to prevent potential mission impacts from loss of optical launch tracking capabilities. In some instances, the proposed action will facilitate rehabilitation of scrub habitat. In addition, the actions described in Section 4.8, Mitigation, could further enhance the habitat and increase the overall population of Scrub Jays on the installation. To further minimize potential impacts to Scrub Jays, the Air Force and NASA will not schedule line-of-sight clearing or maintenance during the officially recognized Scrub Jay nesting season (March 1 through June 30). Further, the action(s) taken to create/maintain lines of sight would enhance the quality of scrub habitat on CCAS and NASA which facilitates bio-diversity and habitat utilization by other indigenous species.

4.4 Eastern Indigo Snake

The Eastern Indigo Snake (*Drymarchon corais couperi*) has been identified as a threatened species by the FWS and the state of Florida. This reptile was listed as threatened due to loss and/or degradation of habitat within its historic natural range. On CCAS and KSC, the Indigo Snake population appears to be stable. This is probably due to the quantity of undeveloped land on the installation. No significant number of single event related Indigo Snake deaths have ever been observed or documented on CCAS or on KSC.

4.4.1 No-Action Alternative

Selection of the no-action alternative would eliminate the potential for impact(s) to Indigo Snakes from the proposed action.

4.4.2 Proposed Action

Implementation of the proposed action would result in impacts to land considered to be habitat for the Federally listed Eastern Indigo Snake. Observations and monitoring of previous construction projects occurring on undisturbed land has not revealed an incident of Indigo Snakes killed or injured by land clearing activities. It is theorized that noise, ground vibrations and general localized disturbance act as an alarm or scare tactic which causes wildlife to migrate out of construction project sites during land clearing activity. Indigo Snakes utilizing land within a line of sight should have adequate opportunity to avert contact with land clearing equipment due to the disturbance generated and the slow forward progression of the land clearing operation.

In addition, the Indigo Snake is known to commensally utilize Gopher Tortoise burrows during the winter season. In xeric habitats, such as the scrub found on CCAS, these retreats are also utilized to prevent desiccation due to overheating. The potential exists for an Indigo Snake to be present in a tortoise burrow that might have the entrance accidentally closed during land clearing operations. Should a tortoise become entrapped inside its burrow, it is theorized that the animal would burrow through the obstructing soil. However, Indigo Snakes are not a burrowing species, and should an individual become entrapped, it would probably perish. A study conducted by the Florida Natural Areas Inventory recorded the contents of over 200 Gopher Tortoise burrows on CCAS during the winter of 1994-1995. There were no incidents of Indigo Snake occupation of these burrows observed during the survey. Therefore, significant impact(s) to Indigo Snakes on

CCAS as a result of burrow collapse during the proposed line-of-sight clearing is not expected to occur.

In addition, efforts to renovate scrub habitat for species such as the Florida Scrub Jay and Gopher Tortoise ultimately benefit the Indigo Snake. The proposed initial land clearing, followed by controlled re-vegetation and periodic sight line maintenance, should provide a more suitable habitat than currently exists. It is believed that the proposed action will actually enhance Indigo Snake habitat and, therefore, not jeopardize the continued existence of this species on CCAS.

4.5 Gopher Tortoise

The Gopher Tortoise (Gopherus polyphemus) is listed as a species of special concern by the State of Florida. In addition, this tortoise is currently under review by the FWS for inclusion on the Federal list. Due to the large number of Gopher Tortoises which inhabit CCAS and the fact that the Federally threatened Indigo Snake commensally utilizes Gopher Tortoise burrows, this species will be evaluated for potential effects from the proposed action.

4.5.1 No-Action Alternative

Selecting the no-action alternative would eliminate the potential for impact(s) to Gopher Tortoises and their burrows which may result from conducting the proposed line-of-sight clearing and maintenance.

4.5.2. Proposed Action

Land clearing activities associated with implementation of the proposed action would affect land known to be habitat for the State listed (species of special concern) Gopher Tortoise. The status of this species is of special concern to the State of Florida due to loss and/or degradation of habitat resulting from development of land within its historic range. Large numbers of tortoises have been documented throughout CCAS where elevation and soil type create dry conditions suitable for burrow construction. Many of the lines of sight included in the proposed action intersect relic dune ridges and xeric land known to contain tortoises and their burrows. Some equipment used to clear vegetation for the proposed action could crush tortoises and portions of their burrows. Tortoises entombed in their burrows have the ability to dig out and, therefore, should not be adversely impacted. Since Gopher Tortoises eat "ground cover" type vegetation, their principal source of food will not be destroyed or adversely impacted.

Gopher Tortoises require relatively open land due to their inability to traverse dense vegetation. The vast majority of land requiring initial or extensive clearing has become so overgrown that utilization by tortoises is minimal. Consequently, significant impact(s) to the CCAS Gopher Tortoise population is not anticipated as a result of these extensive clearing operations.

4.6 Wetlands

Wetlands on CCAS have been mapped by the U.S. Fish and Wildlife Service. This map has been superimposed on a CCAS map to show locations of lines of sight and where they intersect wetlands. Wetland areas on KSC are identified in each line of sight description. A map of KSC terrestrial vegetation communities, developed by Dynamac Corporation, was used to locate wetlands habitat along each line of sight. As an individual line of sight is surveyed for clearing, the quality and acreage of impacted wetlands will need to be surveyed and addressed on a case by case basis. The majority of these areas appear as swales or low-lying troughs paralleling relic dune ridges. Vegetation in these inter-dunal swales is typically non-woody plants and grasses. The value of these wetlands with regards to supporting wildlife species has not been investigated or documented; however, significant wetland-dependent animal species have not been observed in these areas.

4.6.1 No Action Alternative

Selection of the no-action alternative would eliminate any potential impact(s) to CCAS and KSC wetlands which might result from the proposed line-of-sight clearing project. Since no land clearing activity would be conducted, the potential effects on wetland vegetation, soils and/or hydrology would be precluded.

4.6.2 Proposed Action

Selection of the proposed action (preferred) alternative could result in land clearing activity in proximity to areas which have been identified as wetlands. To prevent impact(s) to CCAS and KSC wetlands, each line of sight will be mapped and over-laid on the CCAS and KSC wetlands maps to identify potential areas of concern. The proposed method of preventing potential impacts to wetlands would be avoidance. Since the majority of wetlands occurring within the sight lines are dominated by non-woody plants, these areas should not contain vegetation which obstructs their respective optical pathways. If wetland plants that obstruct optical pathways are identified within a line of sight, these plants will be removed by hand cutting and without significant impacts to the affected wetland or plants contained therein. Heavy equipment will not be used in wetlands which intersect lines of sight.

The plant species inhabiting the swales between relic dune ridges are typically grasses and some low growth shrubs. These inter-dunal wetlands should not require land clearing. The only impact anticipated would be vehicle transiting from one dune ridge to another. Minor, localized impacts such as this are not expected to have an adverse or cumulative impact to these wetland areas.

4.7 Cultural Resources

Cultural resources on CCAS and KSC include pre-historic (Native American) archaeological sites, historic archaeological sites (pioneers and early twentieth century occupation), and historic buildings and facilities resulting from the space program. Surveys conducted on CCAS and KSC

in 1993 and 1994 have located and identified significant cultural resources on CCAS and KSC. The proposed lines of sight will be overlaid on a cultural resource map to determine if they intersect significant historic or archaeological sites.

4.7.1 No-Action Alternative

Selection of the no-action alternative would preclude any potential for disturbance of and/or impacts to cultural resources which may exist within the lines of sight described in Section 2.0

4.7.2 Proposed Action

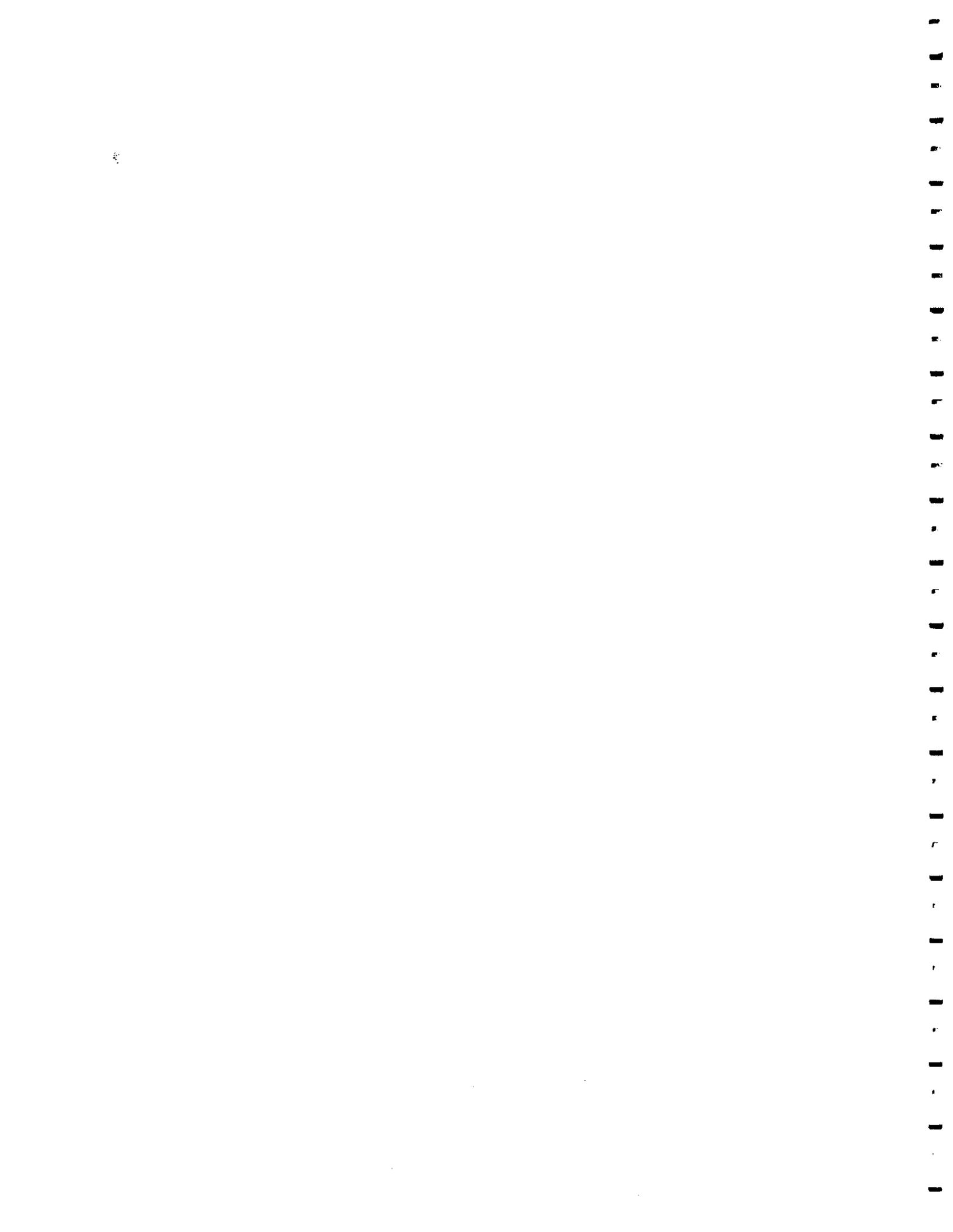
Selection of the proposed action (preferred) alternative could result in some land clearing activity in close proximity to areas which have been identified as significant cultural resources. Earth disturbing activity is considered to be an adverse effect on historic and archaeological sites. Therefore, the proposed method to prevent impact to cultural resources on CCAS and KSC will be avoidance. Historically, the Launch Base Support (LBS) contractor has provided initial clearing and maintenance of sight lines on CCAS. The LBS contractor is also responsible for management of cultural resources on the installation. In prior instances where vegetation on or near a cultural resource obstructed a line of sight, the site was delineated and all vegetation removal in the area was performed by hand clearing thereby avoiding adverse impact to the resource. This method will be continued to prevent effects to cultural resources from the proposed action.

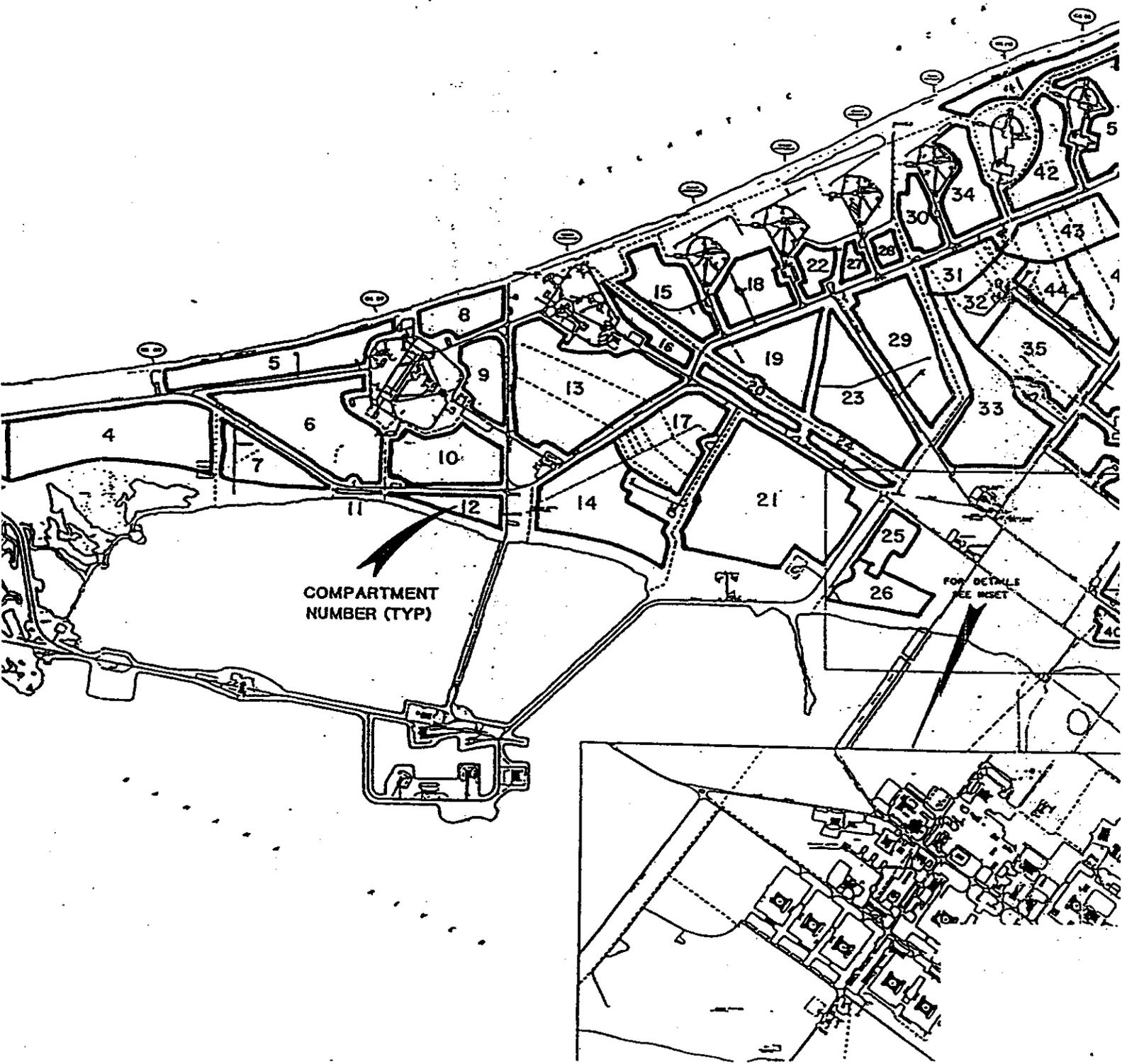
4.8 Actions to Offset Impacts

The proposed action, by its very nature, implies the potential for significant environmental impacts to land on the KSC and CCAS. However, the Air Force and NASA have worked closely with the FWS to preserve and enhance the unique ecosystems that occur on these Federal lands. As the result of extensive research, the findings of numerous pilot projects and the development of comprehensive installation specific management plans, the Air Force and NASA agree that implementation of the following methodologies to perform line of sight clearing and maintenance will not adversely affect the environment on CCAS or KSC. Conversely, employing methods of land clearing previously approved by the FWS and implementing the objectives and schedules of the CCAS Burn Plan, Scrub Jay Management Plan, and Habitat Compensation Plan, should fulfill the requirements of the proposed action while facilitating efforts to restore and manage the affected lands.

4.8.1 Controlled Burning Program

It has been determined that one of the most influential parameters in the development and sustenance of the dominant, coastal scrub, habitat on CCAS and KSC is the frequent occurrence of lightning ignited forest fires. Consequently, the associated indigenous plant and wildlife communities have become dependent upon the effects of periodic burning. Historically on CCAS and KSC, wildfires have been suppressed due to safety and security constraints.





COMPARTMENT
NUMBER (TYP)

FOR DETAILS
SEE INSET

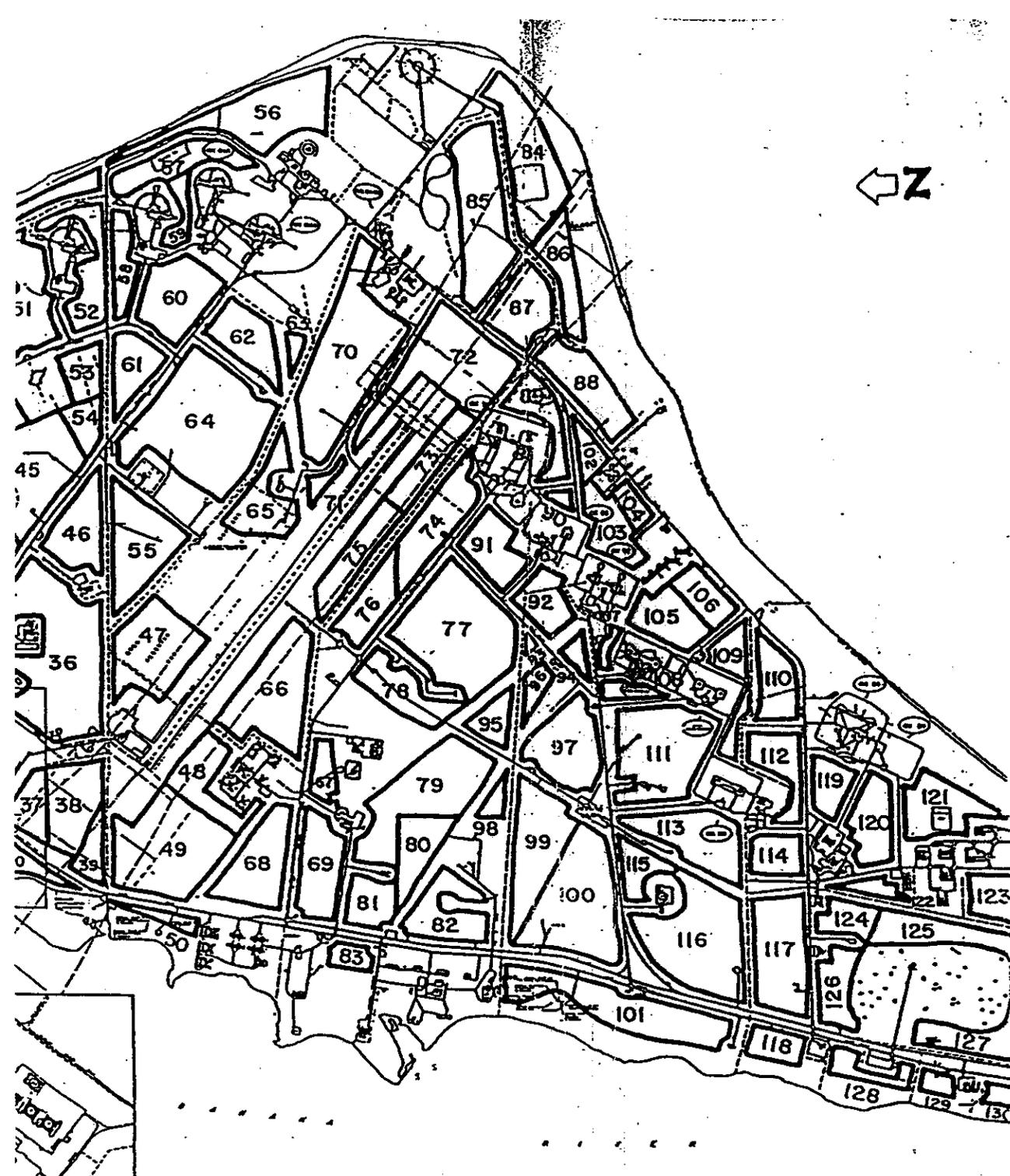


Figure 30
CCAS Scrub Management Compartments
Page 89

Development in Florida over the past forty years has resulted in the loss of the majority of coastal scrub habitat throughout its limited range. As a consequence, CCAS has become an important component in a FWS plan to preserve the threatened Florida Scrub Jay, a scrub dependent species. The Air Force and NASA, in partnership with the FWS, Endangered Species Field Station, Jacksonville, Florida, has developed a set of goals and objectives for restoration burn cycle occurs at a frequency that maintains the habitat within this height range. These periodic fires not only fulfill Scrub Jay nesting requirements, they also provide habitat restoration benefits to the entire scrub ecosystem.

Due to the elevation of the camera sites and the launch pads, the Air Force and NASA believe that, by duplicating the natural burn cycle in the compartments bisected by lines of sight, the majority of sight line obstructing vegetation would be removed in a manner that would immediately benefit the habitat without creating adverse impacts.

4.8.2 Mechanical Clearing

On CCAS, and some areas of KSC, certain scrub oak stands have succeeded to a xeric hammock stage as a result of forest fire suppression. Previous controlled burns conducted on CCAS and KSC show that these areas cannot be successfully burned. As an alternative, the agencies have agreed that initial removal of hammock-like vegetation by mechanical land clearing methods, followed by the burning of the vegetative debris and a scheduled cycle for maintenance burns, would be the most effective and beneficial means of restoring and preserving this type of scrub habitat.

The methods or types of equipment employed to achieve the mechanical clearing are varied, and the use of each has been proposed and agreed upon by the agencies. Currently, the primary method for land clearing is the use of a tree cutter. On CCAS, the Air Force recently purchased a Hydro-Ax brand tree cutter. This piece of equipment is in operation and has the capability of clearing two acres in an eight hour work day. A number of areas on CCAS have been cleared utilizing tree cutters, and no adverse impacts have been observed during operations. At each site, scrub vegetation has regenerated similar to the burned sites. Trees that are too large for the tree cutter would be removed manually with chain saws. In some cases, the larger oaks have been palletized and sold as fire wood through the Defense Reutilization and Marketing Office (DRMO).

On KSC, FWS personnel conduct similar land clearing operations to facilitate the controlled burn program and scrub restoration activities. These operations have been successful, and use of the equipment will be continued where needed. Both installations have plans to use mechanical clearing as the primary scrub management tool in areas where controlled burns cannot be conducted for reasons of safety and/or national security.

Therefore, for the purposes of clearing and maintaining lines of sight in areas where vegetation obstructs an optical pathway and controlled burning is not successful or an option, the use of a mechanical tree cutter will be employed to re-establish the sight line. Since tree cutters are an integral component of the scrub restoration program, it is determined that use of this equipment

in a manner that is compatible with the applicable management plans will not adversely impact any protected species or habitats on CCAS or KSC. Where feasible, entire compartments will be cleared since creating narrow corridors could increase predation on some species of concern such as the Florida Scrub Jay. If an entire compartment cannot be cleared, the line of sight will be cleared to various widths to minimize the potential impact of increase predation.

4.8.3 Wetlands

As described in Section 3.3., various types of wetlands occur on both CCAS and KSC. The primary method for preventing impacts to wetlands on these federal lands is avoidance. Similarly, wetlands that are bisected by camera lines of sight will be avoided by land clearing equipment to the maximum extent practicable. The majority of wetland vegetation on both installations is low-growth non-woody plant species indigenous to fresh and salt water marshes in this area. As described previously in this EA, the salt marsh wetlands associated with the shorelines of the North Banana River have been altered significantly by the construction of mosquito control structures. These alterations have contributed to a decline in wetland productivity resulting from interruption in hydrology characteristics and the invasion of exotic species. Vegetation that typically obstructs lines of sight crossing wetland areas is non-native exotic species. Both installations are currently conducting programs to restore impounded wetlands and remove exotic species. The exotic vegetation removal program is currently oriented toward removing species such as the Brazilian Pepper trees which have invaded disturbed wetlands on CCAS and KSC. Removal of exotic species that obstruct lines of sight within or immediately adjacent to wetlands will be accomplished manually to prevent impacts from equipment operations in these sensitive areas. Exotic vegetation removal in wetland areas is consistent with existing programs and will be accomplished in a manner that will not adversely impact the resource or associated wildlife species.

On CCAS, and to a lesser degree on KSC, deposition of relic dune ridges has created inter-dunal swales that have evolved into isolated wetlands. These wetlands on CCAS have been mapped by an FWS contractor and by a NASA contractor on KSC. Wetlands are identified in the individual sight line descriptions in Section 2.1. Due to the soil type and hydrology in the swales, the native vegetation is primarily grasses and some shrub species. Similar to the disturbed salt marshes, these wetland areas have also been invaded by exotic species such as Brazilian Pepper, Willow and Wax Myrtle.

The primary method of preventing adverse impacts to wetlands will be avoidance. Sight line clearing and maintenance will be coordinated, and the wetland/line of sight map will be referenced to determine wetland intersections. The swales will be topographically evident to equipment operators; however, the most prominent feature is the dramatic change in vegetation. Equipment operators will cease land clearing/maintenance activity upon reaching areas of lower elevation containing low-growth vegetation. These sites will be evaluated to locate a no-impact or low-impact access to adjacent uplands where sight line operations can continue.

Should there be vegetation in the inter-dunal wetlands that obstructs a particular optical pathway, land clearing personnel will manually remove site specific plants in a manner that minimizes

regeneration. Exotic species will be cut and a systemic herbicide, such as "Rodeo," will be applied to each stump. Native species will be pruned as appropriate to comply with applicable regulatory policy.

4.8.4 Cultural Resources

Both CCAS and KSC have been surveyed for the presence of historic and archaeological resources. These sites are mapped and, similar to wetlands, the pre-operation evaluation process will identify areas where a line of sight could bisect a cultural resource. At that time, measures will be implemented to delineate the resource boundary which will include a sufficient buffer zone to preclude equipment from disturbing the site. Large trees within an archaeological or historic site will be removed manually, and only obstructing vegetation will be impacted. Vehicles and equipment will use established accesses when in proximity to cultural resources. By implementing these constraints, the Air Force and NASA have determined that the proposed action will not affect cultural resources on either installation.

5.0 List of Preparers

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APPENDIX A
AIR FORCE FORM 813

REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS

Report Control Symbol
RCS: W80517

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) 45CEC	2. FROM (Proponent organization and functional address symbol) 45 CS/SCOT	2a. TELEPHONE NO. 3-5112
3. TITLE OF PROPOSED ACTION Clear Lines-of-Sight, CCAS and KSC		
4. PURPOSE AND NEED FOR ACTION (Identify decision to be made and need date) Clear lines of sight are required between UCS sites and launch pads to provide a clear optical track of dynamic launch events. (30 June 94)		
5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES (POAAA) (Provide sufficient details for evaluation of the total action.) Impacts (as noted during the last Titan launch) degrade the ability of Range Safety Functions during launch operations. No alternatives.		
6. PROPONENT APPROVAL (Name and Grade) Henry Rydzinski GS-12	6a. SIGNATURE <i>Henry Rydzinski</i>	6b. DATE 19 May 94

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)

	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE (Noise, accident potential, encroachment, etc.)		X		
8. AIR QUALITY (Emissions, attainment status, state implementation plan, etc.)		X		
9. WATER RESOURCES (Quality, quantity, source, etc.)		X		
10. SAFETY AND OCCUPATIONAL HEALTH (Asbestos/radiation/chemical exposure, explosives safety quantity-distance, etc.)		X		
11. HAZARDOUS MATERIALS/WASTE (Use/storage/generation, solid waste, etc.) Potential to impact Solid Waste Management Units (SWMUs)/IRP sites.				X
12. BIOLOGICAL RESOURCES (Wetlands/floodplains, flora, fauna, etc.)				X
13. CULTURAL RESOURCES (Native American burial sites, archaeological, historical, etc.)				X
14. GEOLOGY AND SOILS (Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)				X
15. SOCIOECONOMIC (Employment/population projections, school and local fiscal impacts, etc.)		X		
16. OTHER (Potential impacts not addressed above.) Consistency with Coastal Barrier Re-sources Act/Florida Coastal Management Program		X		

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17.	<input type="checkbox"/> PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR
	<input checked="" type="checkbox"/> PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.
18. REMARKS The proposed action has the potential to affect biological resources including State and Federally-listed threatened and endangered species and wetlands. Impacts to archaeological resources near the Banana River shoreline on CCAS and possibly on KSC could result from mechanical clearing activities. In addition, soil disturbance within contaminated or potentially contaminated sites could occur.	
CONTINUED...	
19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION (Name and Grade) <i>gc</i> Olin C. Miller GM-14	19a. SIGNATURE <i>Olin C. Miller</i>
19b. DATE AUG 3 / 1994	

813.18 - Continued...

All wetland areas within Lines-of-Sight must be identified and avoided if at all possible. Clearing activities within wetlands would require State and Federal wetland resource permits. Impacts to both Federal and State threatened and endangered species must be assessed for all areas to be cleared. A Biological Assessment of potential impacts to Federally protected species (primarily the Florida scrub jay and eastern indigo snake) must be submitted to the U.S. Fish and Wildlife Service (FWS) in accordance with Section 7 of the Endangered Species Act. Florida Wildlife Code requires that any gopher tortoises potentially affected by clearing activities must be protected on site (if possible), relocated off-site or mitigated through off-site preservation. Relocation of gopher tortoises would require permitting by the Florida Game and Freshwater Fish Commission.

Mechanical clearing within archaeological sites or high sensitivity archaeological zones requires consultation with the Florida State Historic Preservation Office (SHPO).

Potential areas of contamination within lines-of-sight must be identified and avoided if possible. Activities occurring within known or suspected contaminated sites must not expose or spread contaminants and should be coordinated with CCAS and KSC Installation Restoration Program (IRP) personnel.

The proposed action could adversely affect the human environment and does not qualify for a Categorical Exclusion. An Environmental Assessment is required.

Attached CCAS and KSC Environmental Checklists apply.

No site plan required.

MAM/pw/08/19/94

Coordination and concurrence with Merrit Island Wildlife Refuge is required.

VJC 8/30/94

KSC ENVIRONMENTAL CHECKLIST

PROJECT NAME Clear Lines-of-Sight, CCAS and KSC
PROJECT LEAD Henry Rydzinski; Tech. POC, Don Michiels, 853-5386
FACILITY NO. Various PROJECT NO. W80517
ORGANIZATION USAF DATE 10 August 1994
PHONE NO. 853-5112 ESTIMATED COMPLETION DATE Jan., 1995

1. PURPOSE OF PROJECT The purpose of the proposed project is to restore approximately twenty-nine (29) lines-of-sight from 11 UCS (Universal Camera Sites) located on CCAS and KSC. The lines-of-sight are essential to provide optical tracking data to Range Safety computers during the first minute after launch of vehicles. Currently, the optical path within the majority of these lines-of-sight are obscured by vegetation rendering UCS ineffective.

2. PROJECT DESCRIPTION (INCLUDE APPROPRIATE MAPS AND DRAWINGS FOR EACH ALTERNATIVE)
(PROVIDE EXISTING PERMIT NUMBER(S) IF APPLICABLE)

The proposed action will include the mechanical renovation of vegetation within lines-of-sight identified in Table 1 and located on the attached figure. Clearing would be completed using a tractor/roller chopper combination or a mechanical tree chopper such as the Hydro-ox or Brown Tree Cutter. Periodic maintenance of sight-lines using brush hogs or the above equipment would be required to keep vegetation height below the required line-of-sight. In some cases, periodic prescribed burning may be sufficient to keep vegetation height at an acceptable level.

3. OPERATIONAL IMPACT IF NOT IMPLEMENTED

Range Safety requirements for shuttle and LOD/commercial expendable vehicles will not be met. Insufficient tracking data from UCS sites could result in unnecessary damage of facilities and personnel injuries in the event of a launch vehicle guidance mishap.

4. PROJECT LOCATION: KSC CCAFS OTHER _____

DOES THE CONSTRUCTION, INSTALLATION, REMOVAL, ACTIVATION, OR OPERATION OF THE PROPOSED PROJECT INVOLVE: (FILL OUT ONE PAGE FOR EACH ALTERNATIVE CONSIDERED: SEE INSTRUCTIONS. WHEN IN DOUBT, MARK YES)

ALTERNATIVE # AND DESCRIPTION:

YES	NO	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	a. Discharge of any substance to the environment Mark all appropriate media; list substance(s) in Block 6 Air <input type="checkbox"/> Surface Water <input type="checkbox"/> Groundwater <input type="checkbox"/> Soil <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	b. Land alteration, excavation or dewatering
<input checked="" type="checkbox"/>	<input type="checkbox"/>	c. Construction in wetlands
<input checked="" type="checkbox"/>	<input type="checkbox"/>	d. Construction in floodplain If Yes: 100 Year <input type="checkbox"/> 500 Year <input type="checkbox"/> (Mark both if appropriate)
<input type="checkbox"/>	<input checked="" type="checkbox"/>	e. Generation of ionizing or non-ionizing radiation or use of any radiation source
<input type="checkbox"/>	<input checked="" type="checkbox"/>	f. Asbestos-containing materials or facilities
<input type="checkbox"/>	<input checked="" type="checkbox"/>	g. PCB-contaminated materials or equipment
<input type="checkbox"/>	<input checked="" type="checkbox"/>	h. Generation of waste other than normal construction debris If Yes, list waste (s) in Block 6
<input type="checkbox"/>	<input checked="" type="checkbox"/>	i. Use or storage of Hazardous or Toxic Materials If Yes, list materials and quantities for each in Block 6
<input type="checkbox"/>	<input checked="" type="checkbox"/>	j. Aboveground or underground storage tanks If Yes, list material (s) stored in Block 6
<input type="checkbox"/>	<input checked="" type="checkbox"/>	k. Generation of high noise levels outdoors (above 85 dBA)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	l. An area of archaeological significance If Yes, indicate potential: High <input type="checkbox"/> Medium <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	m. Endangered species habitat
<input checked="" type="checkbox"/>	<input type="checkbox"/>	n. Solid Waste Management Unit (SWMU) site
<input type="checkbox"/>	<input type="checkbox"/>	o. Other issues which could produce environmental impacts

IF ANY YES RESPONSES, DESCRIBE IN BLOCK 6

6. COMMENTS/ ADDITIONAL INFORMATION:

- b. Chopping of vegetation to ground level and periodic follow-up maintenance of sight-lines required. Conversion of natural areas to improved grounds is not proposed.
- c. Wetlands are located within many lines-of-sight but should not require alteration since vegetation is typically low to the ground. An exception to this could be forested wetlands.
- d. No facilities would be constructed in floodplain.
- l. Potential for disturbance of archaeologically sensitive areas from operation of heavy equipment exists.
- m. Habitat alteration resulting from chopping could impact the Florida scrub jay, eastern indigo snake, gopher tortoise and possibly other T&E species.
- n. The potential for earth disturbing activities in the vicinity of SWMUS exists

7. ENVIRONMENTAL EVALUATION

This project has been analyzed in accordance with NHD 8800.11 and KHD 8800.6 and:

It has been determined that this NASA action will have no impacts to the human environment,
or,
 Further environmental evaluation by the NASA Environmental Management Office is requested.

NASA Environmental Coordinator Concurrence (Type or Print)

Name: _____ Mail Code: _____ Phone: _____

Signature: _____ Date: _____

45 SPW ENVIRONMENTAL IMPACT CHECKLIST, July 1992

Title of Proposed Action Clear Lines of Sight

Will the proposed action involve any of the following:

	YES	NO	DON'T KNOW
Creating \geq 500 sq ft paved surface for vehicles		<input checked="" type="checkbox"/>	
Creating \geq 1000 sq ft paved/impervious surface		<input checked="" type="checkbox"/>	
Change to or near ponds, ditches, shores, or wetlands			<input checked="" type="checkbox"/>
Siting of a new facility, expansion of existing facility or demolition of a facility		<input checked="" type="checkbox"/>	
Land clearing or digging	<input checked="" type="checkbox"/>		
Wells, generators, incinerators, A/O units, cooling towers, transformers, exterior lighting, fire hydrants, lift stations, manholes, boilers		<input checked="" type="checkbox"/>	
Tanks (including piping)		<input checked="" type="checkbox"/>	
New water or sewage lines		<input checked="" type="checkbox"/>	
Disturbance of any Asbestos Containing Material (roofs, ceilings, walls, floors, insulation, piping, counter tops, etc.)		<input checked="" type="checkbox"/>	
Painting and/or paint removal		<input checked="" type="checkbox"/>	
Use/storage of any hazardous material or petroleum product		<input checked="" type="checkbox"/>	
Exterior lighting		<input checked="" type="checkbox"/>	
A new program or lease transfer		<input checked="" type="checkbox"/>	
Generation of wastes other than sewage or dry, nonhazardous trash		<input checked="" type="checkbox"/>	

IF the answer is Yes or Don't Know for any of the above then the proponent must complete blocks 1 through 10 of AF Form 813 and attach it to the work request.

Organizational Commander or Unit Environmental Coordinator:

Name Henry Rydzanski Signature [Signature]

Date 19 May 92

Atch 1

Project Number: W 80517

Project Name: Clear Lines-of-Sight

Environmental Compliance Checklist

Permit Type	Permits Required				Significant Dates		Certif. of Comp. Req'd (Y/N)
	From AF Form 813		From Design Review		Application Submitted to CEV	Permit Issued	
	Yes	No	Yes	No			
Stormwater		X					
NPDES		X					
Wastewater		X					
Ind. Wastewater		X					
Potable Water		X					
Air Emissions		X					
Haz. Waste		X					
* Dredge & Fill (State)		X					
* Dredge & Fill (Fed.)		X					
Dewatering		X					
Solid Waste		X					
Animal Trapping		X					
Other:		X					

* ordinarily no dredge & fill permits required. However, some lines of-sight cross wetlands. Alteration of wetland vegetation (excluding Natural Resources (Threatened and Endangered Species): hand clearing) would require permit

Consultation Required: Yes No
 Consultation Completed: Yes No N/A
 Mitigation Required: Yes No N/A

Comments: Mitigation will probably not be required since these are existing lines-of-sight, but can't make final
 Cultural Resources: determination until B.O. is issued.

Consultation Required: Yes No
 Consultation Completed: Yes No N/A
 Action Required: Yes No N/A

Comments: CONSULTATION WOULD ONLY BE REQUIRED IF EARTH DISTURBANCE is proposed within known ARCHAEOLOGICAL ASBESTOS: SITES ALONG BANANA RIVER. These areas can be protected

Survey Performed for ACM: by hand clearing brush. Yes No N/A
 ACM Identified in Survey: Yes No N/A
 ACM Removal Included in Project Specs: Yes No N/A
 Date Notification Made to CEV on Project Completion: Yes No N/A

Environmental Impact Analysis Process (EIAP):

Environmental Assessment Required: Yes No
 Date Finding of No Significant Impact (FONSI) Signed: Yes No N/A

Installation Restoration Program (IRP):

IRP Site Involved: Yes No
 Comments: Some of the launch facilities are IRP/potential IRP sites. However, maintenance of lines-of-sight will not affect IRP implementation or integrity of IRP sites.

APPENDIX B

U. S. FISH AND WILDLIFE SERVICE
CONSULTATION LETTERS



United States Department of the Interior

FISH AND WILDLIFE SERVICE
3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216



August 1, 1991

Colonel Kevin P. Hansen
Range/Base Civil Engineer
Department of the Air Force
Patrick Air Force Base, Florida 32925-6045

FWS Log No: 4-1-91-110

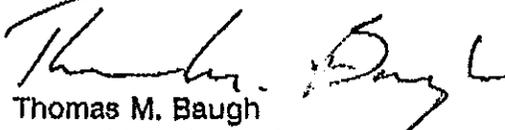
Dear Colonel Hansen:

This responds to your letter of July 15, 1991, pursuant to Section 7 of the Endangered Species Act of 1973, as amended. The Air Force proposes to clear vegetation along a 5,600-foot-long by 60-foot wide corridor for optical line-of-site between Radar 1.16 and Cape Canaveral Air Force Station's (CCAFS) Weather Station on CCAFS. Vegetation will be allowed to revegetate and attain a height of ten feet before maintenance is required. The vegetation is characterized as undisturbed coastal woodlands and disturbed coastal scrub. The work will involve about 7.7 acres, of which 0.4 acre is considered suitable Florida scrub jay habitat. The Air Force evaluated the impact this project would have on the federally threatened Florida scrub jay, and determined a no effect. The Air Force will clear before March or after May to avoid disturbing a possible scrub jay nest.

Based on our review, we believe the clearing will improve the scrub jay habitat by opening up the coastal forest and reducing the height of the vegetation. Maintaining the height of the scrub vegetation at ten feet will create suitable nesting habitat for jays. We recommend limiting the clearing to avoid the months of March through May, to avoid the nesting season. We concur, therefore, with the Air Force's determination of no effect.

Although this does not represent a Biological Opinion as described under Section 7 of the Act, it does fulfill the requirements of the Act, and no further action is required. If modifications are made in the project, please notify our office as reinitiation of consultation may be necessary.

Sincerely,


Thomas M. Baugh
Acting Field Supervisor



United States Department of the Interior

FISH AND WILDLIFE SERVICE

3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216



August 18, 1992

Lt. Colonel Kevin P. Hansen
Range/Base Civil Engineer-Commander
Department of The Air Force
45th Engineering Squadron
Patrick Air Force Base, Florida 32925

Dear Lt. Colonel Hansen:

This is in further response to your letter of July 17, 1992, pursuant to Section 7 of the Endangered Species Act of 1973, as amended. Two proposed projects described in your letter were not addressed in our August 6, 1992, response. The first project is the Site Support For Modular Facility, DSCS Payload Program (FWS Log No. 4-1-92-418C) and the Line-of-Sight, Universal Camera Site 26 to Launch Complex 36A and 36B (FWS Log No. 4-1-92-419C) on Cape Canaveral Air Force Station.

The Site Support for Modular Facility project calls for the construction of a 8,400 square-foot building, which will require the clearing of about 0.41 acre of undisturbed coastal scrub. During the field review for this project, no scrub jays were observed. The Air Force determined the project would not affect the Florida scrub jay. Biologists from this office inspected the site on June 26, 1992. The scrub habitat in and around the project site is mature coastal scrub. In habitat such as this on the installation, scrub jays are normally found along the edge of the scrub and the maintained road rights-of-way. Unless there are large clearings in the scrub, the habitat remains too dense to be suitable for scrub jays. Based on our review of this site, the clearing of 0.41 acre of scrub is not likely to adversely affect the Florida scrub jay. We recommend that no clearing be done during the nesting season, mid-March through June.

Recently, the Air Force has proposed the clearing of several lines-of-sight on Cape Canaveral Air Force Station. The coastal scrub habitat has attained a height that precludes a visual contact with a launch complex from a fixed point. The Service has been concerned that cutting large acreage of mature coastal scrub would have an impact on scrub jays. Based on several site visits and discussions with biologists from Johnson Controls World Services, Inc., the scrub jays on the installation are primarily found along the edge of the scrub and maintained road rights-of-way. The mature scrub is too dense to be considered suitable scrub jay habitat. Unless there are large openings inside the scrub creating edge, the habitat remains unoccupied.

APPENDIX C

IRP MEMO FOR RECORD

MEMO FOR THE RECORD

TO: Curtis Byrd, LBS Environmental
FROM: Mark Kershner, 45 CES/CEVR ✓
SUBJ: Review of Draft EA on Lines of Sight Plan
DATE: 16 Sep 96

- 1) I've reviewed the *Draft* Environmental Assessment Proposed Construction & Maintenance of Instrumentation Lines of Sight, and have the following comments related to the Installation Restoration Program (IRP) concerns.
- 2) The areas in which the proposed work occurs transverses some of the IRP investigation areas. However, it appears that the proposed action of using the mechanical device to trim down the vegetation along the lines of sight will not cause a disturbance of the surface soil to the extent that an exposure pathway would be complete. I would recommend passing this by the Bio-Environmental Engineering Office (Jeanne Hawkins, 494-5435) for her determination. The main concern areas for the IRP are normally found within the confines of the launch facilities fence line. Since these areas are landscaped and routinely maintained, I envision less of the proposed landclearing activities occurring within the launch facilities, hence less exposure scenarios even more.
- 3) If this office could be of anymore assistance in this matter, please feel free to contact me @ 853-0964 or via the WANG e-mail system.

To clear for a line-of-site, the vegetation is crushed using a tractor. The area is not usually root-raked. Within a short period of time, the scrub oaks root sprout, and within about 4 years, the oaks begin to produce acorns, a primarily food item for scrub jays.

While prescribed fire is the preferred method of choice to maintain suitable scrub jay habitat, mechanical clearing appears to accomplish similar results. On Cape Canaveral Air Force Station, the lines-of-site are probably providing suitable scrub jay habitat if the corridor is wide enough and the Air Force does not reenter the site too often. Based on the preceding discussion, we do not believe clearing for the Universal Camera Site line-of-site is likely to adversely affect the Florida scrub jay. We recommend, however, that no clearing be done during the nesting season, mid-March through June. We also recommend that the corridor not be root-raked.

Although this does not represent a Biological Opinion as described under Section 7 of the Act, it does fulfill the requirements of the Act, and no further action is required. If modifications are made in the project, please notify our office as reinitiation of consultation may be necessary.

Sincerely yours,



Donald T. Palmer
Acting Field Supervisor

cc

Mark Mercadante
Johns Controls World Services, Inc.
Cape Canaveral AFS
P.O. Box 4608MU LBS 6380
Patrick Air Force Base, Fl. 32925



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Pls return to MAOL
FILES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216



DBP

July 16, 1992

Lt. Colonel Kevin P. Hansen
Department of the Air Force
45th Civil Engineering Squadron
Patrick Air Force Base, Florida 32925

Dear Colonel Hansen:

This responds to your letter of May 4, 1992, requesting Section 7 consultation on a number of construction projects on Cape Canaveral Air Force Station (CCAFS), Brevard County. On May 12 and June 26, 1992, biologists from this office met with representatives from Johnson Control, and inspected the projects identified in your letter and future projects. Listed below by project are our comments with a corresponding reference number. We request you use the reference numbers in future correspondence. This letter also discusses general concerns we have on the loss of coastal scrub habitat on CCAFS.

✓ South Cape Sewage Treatment Facility; FWS Log No. 4-1-92-302C

The facility will occupy approximately four acres. The site is vegetated in mature coastal scrub typical of that found on CCAFS. The canopy is closed, and about 30 feet in height. Small patches of open habitat are scattered throughout the site. During the site inspections, Florida scrub jays were observed on the edge of the project area, adjacent to the maintained road right-of-way. Due to the density of the vegetation, we believe scrub jay activity is confined to the ecotone between the roadway and the scrub.

On our June 26 inspection, we were informed the scope of the project has changed, reducing the area of impact. Final plans, however, are not available. We request you send a copy of the plans for our review. We will provide our final comments at that time.

✓ Operation of CCAFS Landfill, Facility No 23600; FWS Log No. 4-1-92-303C.

The purpose of the proposed action is to continue operation of the landfill at its existing location for disposal of construction/demolition debris. The total area for the landfill is about 165 acres. The proposed project will result in the destruction of about 23 acres of mature coastal scrub vegetation over the next 10 years. Johnson Control has not done a Florida scrub jay survey. Before we are able to comment further on this project, we

recommend that a scrub jay survey of the entire site be completed and the results forwarded to our office.

Shelters, Primary EEAP, CCAFS; FWS Log No. 4-1-92-304C

The purpose of the proposed action is to provide seven module shelters at five locations for Emergency Evacuation Assembly Points. One module will impact potential scrub jay habitat, located at Launch Complex (LC) 41 and within Merritt Island National Wildlife Refuge. Based on our site inspection, there appears to be an alternate site to erect the structure. Due to the small size of the building (20 by 30 feet), we request you consider constructing the structure on the grassy area adjacent to the existing cement pad, which is used for storage.

Line-of-Sight (LOS), Press Site 1 to SLC 36A; FWS Log No. 4-1-92-305C

The proposed project calls for clearing a 15,000-foot-long by 60-foot-wide LOS from the press site to the launch complex. Based on current vegetation height and density, this LOS was cleared approximately 15 years ago. While scrub jays were not observed, we believe scrub jays use the ecotone between the coastal scrub and the grassy right-of-way. Based on the location of the press bleachers, about 2/3 of the launch tower is visible at the current vegetation height. We do not believe clearing for this LOS will impact scrub jays because of the density and height of the vegetation. We recommend that the Air Force not clear this LOS during the scrub jay nesting season, mid-March through June, in the event scrub jays are nesting on the edge of the LOS.

Fire Training Area, CCAFS; FWS Log No. 4-1-92-306C

The proposed action involves the construction of a two-acre fire training area adjacent to the existing Fire Station, Facility No. 1608. However, we were informed this site has been dropped. The new site is a cleared field, devoid of scrub vegetation. We do not believe this project, as currently proposed, will impact the Florida scrub jay.

Line-of-Site 19 to Launch Complex 17A; FWS Log No. 4-1-92-313C

The vegetation impacted by this project is mature coastal scrub which has not been burned for many years. The height is approximately 20-30 feet, unsuitable for scrub jays, except on the edge of the scrub habitat. While we do not oppose this project, we do recommend that no clearing be done during the scrub jay nesting season, mid-March through June.

Storage Magazine, CCAFS; FWS Log No. 4-1-92-316C

The purpose of this proposed military construction project is to build a 5,500 foot storage magazine near Facility 1322. Work will include the construction of a 50 by 110 foot building, installation of necessary utilities, building an access road, and placement of a security fence. The security fence will be erected 50 feet from all sides of the new

facility and an additional 30 feet will be cleared outside of the fence for security reasons. The proposed action will result in the loss of about 0.7 acre of mature coastal scrub habitat. The remaining acreage has previously been cleared, and several old buildings occupy the site. Based on our site visit, if the Air Force removes the old control tower, less scrub habitat will have to be destroyed.

On June 18, we were contacted by the Air Force's Environmental Section and were informed that the Air Force would reduce the size of the clearing from 0.7 acre to 0.1 acre; the reduced size of the project was a result of eliminating the fencing requirement. The control tower would remain, however, due to lack of demolition funds. We request the Air Force send us revised drawings for this project. We will provide our comments after we have reviewed the final plans.

Line-of-Site 1.17/CCAFS Weather Station; FWS Log No. 4-1-92-314C.

The purpose of the project is to provide a LOS from the existing radar tracking facility to the weather station. As it currently exists, weather balloons can not be observed at ground level, and the Air Force requires a clear LOS from the radar facility to the station. The corridor will be 9,200 linear feet by 60 feet wide. The quality of the vegetation is consistent with other areas on the installation that have not burned for many years. Except along the edge of the scrub oak habitat, the vegetation is too dense and tall to be considered suitable for scrub jays. The clearing should be done outside of the scrub jay nesting season (mid-March through June).

Remove Concrete Rubble from Beaches, CCAFS; FWS Log No. 4-1-92-315C.

The purpose of the project is to restore three areas along the beach which were previously used as concrete dump sites or armored to protect facilities. The proposed restoration will affect about 3,080 feet of shoreline east of former LC 34. As stated in the environmental report, the work will take place outside the turtle nesting season. The removal of this material should improve this reach of beach for nesting turtles.

Two issues remain that we believe require further discussion. First involves the methods used to clear for LOS's and future management of these corridors. The second addresses the cumulative impact of clearing mature coastal scrub on CCAFS, and the long-term effect this will have on future management and recovery of scrub jays on the installation.

To clear for an LOS, the Air Force either crushes the vegetation or after crushing, root-rakes the site and maintains a grassy corridor. A significant percentage of CCAFS is occupied by mature coastal scrub, which is currently unsuitable for scrub jays. It appears the majority of scrub jays found on the installation are surviving along the edges of maintained road rights-of-way, and clearings found within otherwise unsuitable habitat. Johnson Control has prepared a scrub jay management plan and fire management plan for the installation, which we believe will improve the habitat conditions over the long term.

These corridors probably do improve conditions for scrub jays in the immediate area, but we have no data to support this statement. The corridors open the mature scrub and provide an ecotone for the birds. It appears that if the vegetation is only crushed, scrub oaks begin to root sprout in less than one year. Research is needed to determine the impact of crushing over other means of vegetation control. We suggest that the Air Force investigate other methods of clearing LOS's. For example, a tree cutter would provide a line-of-sight, but cause less soil disturbance.

RESERVED
BROWN TOWN
CUTTING

These corridors are quite narrow, and may not provide scrub jays with enough open area to detect avian predators. This being the case, these corridors will not be used by jays regardless how suitable they appear. It may be more beneficial for scrub jays to make the corridors wider, or at least, if several corridors are adjacent to each other, remove the mature vegetation that lies between the corridors. This will open up wide areas for jay occupancy, which is consistent with the scrub jay management plan.

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The second issue addresses cumulative impacts. During the June 26 inspection, Johnson Control showed us several new proposed project sites. These sites are within mature coastal scrub, and will result in the loss of approximately 45 acres. These projects are in the planning stage. We are concerned that as military development continues on CCAFS, the cumulative loss of mature coastal scrub will have a significant impact on the ability to provide sufficient habitat for scrub jays in the future. In our opinion, jays are primarily found along road rights-of-way on CCAFS and in the scrub adjacent to the coast. While the scrub jay and fire management plans provide for scrub jays, it does not address cumulative loss of habitat as a result of military activity.

In an attempt to address this issue on Kennedy Space Center (KSC), the Service and KSC developed a compensation plan to off-set the loss of scrub habitat. The plan provides for the restoration and enhancement of 300 acres of scrub habitat to compensate for the loss of 150 acres of scrub habitat from construction projects over the next 3 years. In cooperation with Bionetics and Merritt Island National Wildlife Refuge (MINWR), KSC identified habitat that could be restored and enhanced. As a part of this compensation effort, KSC will provide funds to monitor the restoration/enhancement work. The Service (MINWR), will do the restoration/enhancement work.

We believe the Air Force should consider a similar compensation plan for CCAFS. We are available to meet with you to discuss this concept in further detail. We have enclosed a copy of the KSC compensation plan for your review.

Based on our review of the information and the on-site visits, we concur with the Air Force's determination of no effect on the following projects: LOS-Puess site 1 to SLC36A; Fire Training Area; LOS 19 to LC 17A; Los 1.17/CCAFS Weather Station; and removal of beach rubble. We recommend that no clearing be done from mid-March through June. With reference to the remaining projects, please review the recommended modifications and suggestions.

Although this does not constitute a Biological Opinion described under Section 7 of the Endangered Species Act, it does fulfill the requirements of the Act and no further action is required. If modifications are made in the project or if additional information involving potential impacts on listed species becomes available, please notify our office. If you have a question, please contact Don Palmer in this office.

Sincerely yours,

Michael M. Bentzien

Michael M. Bentzien
Assistant Field Supervisor

cc
Merritt Island NWR

memorandum

DATE: February 2, 1996

REPLY TO
ATTN OF: Refuge Manager, Merritt Island National Wildlife Refuge

SUBJECT: Comments on line of sight Draft EA

TO: Chuck Tatro, DE-EMO

These are Merritt Island National Wildlife Refuge's comments on the *Preliminary Draft Environmental Assessment for proposed construction and maintenance of Instrumentation Lines of Sight*. The general comments cover those items that are applicable to the entire project. In addition, there are specific comments on several of the lines that require initial clearing.

GENERAL COMMENTS:

The Draft Environmental Assessment does a very good job of describing the terrestrial communities on Cape Canaveral Air Force Station (CCAFS), but does not address those found on Kennedy Space Center (KSC). In some cases, the vegetation types are similar, such as the xeric scrub areas, while others are quite different. Hammocks on the KSC side include mesic and hydric hammocks, in addition to the xeric hammocks described. There are also differences in the scrub lands. Much of the scrub area on KSC, that would be affected by lines of sight, is scrubby flatwoods rather than the xeric scrub found on CCAFS. This variety of scrub has more palmetto and different species of oaks. The rate of regrowth after treatment is quicker, which may influence the time between treatments. Finally, pine flatwoods, which are habitat for the southern bald eagle and other species, are not even addressed.

Another point of concern is the methods described creating or maintaining the lines of sight. The Draft EA spends a lot of time describing the mechanical cutting and burning process that will be used. As noted in the EA, this procedure has been used quite successfully in rehabilitating scrub vegetation as habitat for the threatened Florida Scrub jay. However, this method will not benefit other upland vegetation, such as the hammocks and pine lands.

Fire is not a significant component of the hammock ecosystem. Hammocks historically burned only under conditions of extreme drought, and fire can drastically change the nature of these areas. In addition, the removal of the trees in the sight lines would damage the integrity of the hammocks more than fire. While burning of the pine flatwoods is an acceptable practice, the cutting of pines to create the sight lines would change the nature of the stands. The effects of line of sight construction on both hammocks and pine lands on KSC needs to be addressed in the EA.

A final concern is the shape of the sight lines. Studies have shown that long, straight openings in scrub can lead to increased predation of jays. When there are insufficient openings in scrub, the jay occupancy of edges increases. Raptors learn this, and fly along the corridors seeking prey. Other predators, such as snakes, also seem to pick up on this edge effect, and thereby increase their capture success. Treating a large area around the sight line to create a landscape mosaic would be preferable to having a series of narrow corridors.

COMMENTS ON SPECIFIC LINES OF SIGHT:

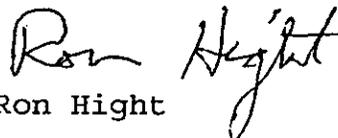
Our main concern is lines of sight that require initial clearing. None of the existing lines that require extensive work are on KSC, and no specific comments on these are offered. The routine maintenance of existing lines presents no problem, but efforts to reduce the effects of increased predation should be incorporated into any maintenance activities. Landscape burning around the lines of sight is recommended.

USC 23 TO LAUNCH COMPLEXES 40 AND 41: Both of these sight lines are in a critical area that links the jay populations on KSC and those on CCAFS. The current thinking is that this corridor is extremely important to the overall viability of scrub jay populations in the area. Long, narrow clearing would most likely have negative impacts on the jays. However, managing by cutting and burning large patches of scrub would benefit jay habitat.

UCS 18 TO LAUNCH COMPLEXES 40 AND 41: These lines will affect both scrubby flatwoods and pine lands. Some determination of how much of each habitat type needs to be removed before the affects on habitat and wildlife can be assessed. The burn unit that these lines cross is quite large and needs to be subdivided for fire operational considerations. It is possible that these sight lines could also serve as interior firelines for the unit. In any event, landscape burns should be used in conjunction with line construction to reduce the negative impacts on jays.

UCS 5 TO LAUNCH COMPLEX 39 A AND B, AND COMPLEXES 40 AND 41: This line goes across another large burn unit with scrub vegetation in it, and there is again the possibility of using them as interior fire breaks. Burning large areas along the proposed site lines would help create a landscape suitable to scrub jays. The lines cross mesic hammock areas near Banana Creek. the affect of the lines on the hammock ecosystem needs to be addressed.

If there are any questions about our response, please contact Fred Adrian at 861-0667.


Ron Hight



United States Department of the Interior

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SEP 16 1996

Major Anibal E. Caussade
Acting Chief, Environmental Flight
45 CES/CEV
1225 Jupiter Street
Patrick Air Force Base, Florida 32925-3343

Dear Major Caussade:

This responds to your letter regarding section 7 consultation, in accordance with the Endangered Species Act of 1973, as amended, for the proposed construction and maintenance of Instrumentation Lines of Sight (LOS) on Cape Canaveral Air Force Station (CCAFS) and Kennedy Space Center (KSC), Brevard County, Florida. The Air Force evaluated the impact of these projects on the Florida scrub-jay (*Aphelocoma coerulescens*), eastern indigo snake (*Drymarchon corais couperi*), and southeastern beach mouse (*Peromyscus polionotus niveiventris*), and determined not likely to adversely affect these species.

The purpose of the proposed action is to provide 65 LOS from 25 Universal Camera Sites to the various Launch Complexes located on CCAFS and KSC. On August 27, 1996, biologists from this office inspected typical examples of the LOS on CCAFS and KSC. The Service had previously reviewed similar projects on a case-by-case basis on CCAFS and have agreed with the Air Force's determinations with reference to listed species.

The LOS will be constructed and/or maintained using a tractor /shearing blade combination, bulldozer/roller chopper combination or a mechanical tree chopper such as the Hydro-Ax or Brown Tree Cutter. Maintenance of the LOS will be accomplished at about ten-year intervals.

The intent of the proposed action is to maintain a clear line-of-sight from the elevated camera pad to the base of the launch pad. This requirement will necessitate, in some instances, cutting vegetation to the ground. In other instances, only the tallest trees will be cut, leaving the lower growing trees and shrubs intact. Both CCAFS and KSC have prescribed fire programs in place. KSC, in particular, has burned large areas in which LOS are required; thereby, cutting or mowing the coastal scrub vegetation will not be required. On CCAFS, because of the lack of prescribed burning over the last 20 or so years, it will be necessary to cut vegetation. The width of the corridors will be variable; however, the average width is about 100 feet.

Isolated wetlands are intermixed in the upland habitats on both facilities. While clearing of vegetation in these wetlands may not be required, tracked vehicles could alter the hydrology in these areas. We recommend that every effort be made to avoid these isolated wetlands. If wetland

impacts are anticipated, however, we recommend that the Army Corps of Engineers be contacted to determine if a permit will be required.

The majority of the LOS on CCAFS are located in prescribed burn compartments. Therefore, vegetation which obstructs the visual pathway would eventually be reduced by burning or a combination of mechanical treatment to renovate scrub habitat. When clearing the LOS within these compartments, we encourage that extra effort be made to clear mature scrub habitat to assist in the renovation effort. To minimize the potential impact of vegetative clearing on the scrub-jay, vegetative clearing will be timed to avoid the nesting season, March 1 through June.

Eastern indigo snakes are found on both installations. However, the actual chopping operation should not affect this species as the equipment moves slowly, allowing the animals to move away from the work area.

Habitat for the southeastern beach mouse is the primary and secondary dunes. It will not be necessary to cut vegetation in the dunes because the height of the vegetation is low enough to provide a line of sight.

Based on our review of this proposed action, we concur with the Air Force's determination that these LOS are not likely to adversely affect the Florida scrub-jay, eastern indigo snake or southeastern beach mouse.

An issue on CCAFS that still needs to be addressed involves vegetation communities on the installation. Recent studies have indicated that what was believed to be mature coastal scrub habitat may in fact be maritime forest. Depending on the outcome of this debate, method of clearing, amount of clearing and width of clearing for the LOS may have to be modified. We are aware that the construction/maintenance of the LOS will not occur quickly; therefore, there is opportunity to make corrections in management.

Although this does not represent a biological opinion as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required. If modifications are made in the project or additional information becomes available on listed species, reinitiation of consultation may be required.

Sincerely yours,



For Michael M. Bentzien
Assistant Field Supervisor

cc
Ron Hight-MINWR

