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JOHN F. KENNEDY
SPACE CENTER

AMENDMENT NUMBER 1

TO THE

INSTITUTIONAL ENVIRONMENTAL IMPACT STATEMENT

(SPACE SHUTTLE DEVELOPMENT AND OPERATIONS)

SHUTTLE PROJECT OFFICE

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SUMMARY

AMENDMENT NUMBER 1

INSTITUTIONAL ENVIRONMENTAL IMPACT STATEMENT (SPACE SHUTTLE DEVELOPMENT AND OPERATIONS)

( ) DRAFT (X) FINAL

Responsible Federal Agency: National Aeronautics and Space Administration (NASA), Office of Manned Space Flight, Space Shuttle Program.

a. (X) Administrative Action (X) Legislative Action

b. This action proposes to establish, at John F. Kennedy Space Center (KSC), NASA, facilities for receiving, inspection, checkout, launch, recovery and refurbishment of Space Shuttle flight hardware. Many existing facilities and systems, constructed for the Apollo and Skylab programs, are capable of supporting Shuttle operations with little or no modification. Presently identified modifications to such areas as the Vehicle Assembly Building (VAB) for Orbiter maintenance and checkout, Orbiter tank storage and space vehicle vertical integration; the Mobile Launchers (ML) and Launch Pad for adaptation to a new space vehicle configuration; and numerous minor modifications to existing shop and laboratory areas are structural in nature and generally fall within the modification and rehabilitation category. When a new use or an existing facility could not be accommodated, studies were initiated to determine the best site, weighing equally the concerns of environment, cost, and operations. Present Apollo systems designed to handle propellant and entrap accidental spills are available and, considering environmental matters, will be utilized to the fullest extent possible. Apollo techniques and procedures developed for safe handling of propellants and radioactive materials are also available. We do not foresee an effect on the environment from these sources at this time.

c. Studies indicate that land use to accommodate Space Shuttle operations may have the most significant impact whereas the impacts on air, water and noise quality are predicted to be a lessor degree on the on-site environment. Considerations of operating modes indicate that long and short term land uses will not affect wildlife productivity. The potential for adverse environmental impact is small; such impacts that are foreseen

will be local, short in duration, controllable, and environmentally acceptable. There was no significant consumption of natural resources identified which are considered irreversible and irretrievable. Where the possibility of some detrimental environmental impact exists, operational constraints will be imposed to minimize these impacts.

d. Alternates to KSC and the Vandenberg Air Force Base as launch and landing sites have been determined to be more expensive and not environmentally superior.

e. Amendment Number 1 to the KSC Institutional Environmental Impact Statement was prepared as required by the National Environmental Policy Act of 1969 and the April 23, 1971 Guidelines of the Council on Environmental Quality (CEQ) for the proposed Shuttle operations from KSC.

(1) On March 3, 1971, the Federal Register (Vol. 36, No. 42) announced availability of the KSC Institutional Environmental Impact Statement (EIS). Comments received were included in the final Statement dated August 11, 1971.

(2) The final KSC Statement was forwarded to CEQ on September 29, 1971. Subsequent comments transmitted by EPA on October 8, 1971 have been taken into account in the preparation of this draft to cover Space Shuttle Development Operations.

(3) Comments on Draft Amendment Number 1 (October 1972) were requested from EPA, DOI, DOD, HUD, DOT, DOC, OMB, AEC, and State.

(4) On November 17, 1972 the KSC Draft Amendment Number 1 (October 1972) was forwarded to CEQ.

(5) On November 25, 1972, the Federal Register (VOL 37, No. 228) announced availability of the KSC Draft Amendment Number 1 (October 1972).

(6) Comments were received from EPA, DOD, DOT, DOC, DOI, AEC and the State on the draft statement (October 1972). All comments were given consideration in the preparation of this final statement.

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GLOSSARY

AEC	Atomic Energy Commission
AFETR	Air Force Eastern Test Range
Al_2O_3	Aluminum Oxide
CBI	Chesapeake Bay Institute
CCF	Converter Compressor Facility
CEQ	Council on Environmental Quality
CKAFS	Cape Kennedy Air Force Station
CO	Carbon Monoxide
db	Decibel
DOC	Department of Commerce
DOD	Department of Defense
DOI	Department of Interior
DOT	Department of Transportation
EIS	Environmental Impact Statement
EST	Eastern Standard Time
ETR	Eastern Test Range
FIT	Florida Institute of Technology
FTU	Florida Technological University
GMT	Greenwich Mean Time
GPD	Gallons per Day
GPM	Gallons per Minute
HCl	Hydrogen Chloride
HO	Hydrogen Oxygen
HUD	Housing and Urban Development
ICAO	International Civil Aviation Organization
JSC	Johnson Space Center
nm	Nautical Mile
KSC	Kennedy Space Center
LCC	Launch Control Center
LC-39	Launch Complex 39
LDS	Landing, Deservicing and Safing (facility)
LH_2	Liquid Hydrogen
LOX	Liquid Oxygen
MCF	Maintenance and Checkout Facility
ML	Mobile Launcher
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
N/m^2	Newtons per square meter
N_2H_4	Hydrazine (fuel)
N_2O_4	Nitrogen Tetroxide (oxidizer)

OASPL	Overall Sound Pressure Level
OMB	Office of Management and the Budget
OMS	Orbital Maneuvering System
OMSF	Office of Manned Space Flight
OTV	Operational Television
ppm	Parts per million
psf	Pounds per square foot
RP1	Rocket Propellant No. 1 (Kerosene)
scf	Standard cubic foot
SRB	Solid Rocket Booster
SRM	Solid Rocket Motor
STS	Space Transportation System
VAB	Vehicle Assembly Building
VAFB	Vandenberg Air Force Base
WHOI	Woods Hole Oceanographic Institute
WTR	Western Test Range

SECTION 1
DESCRIPTION OF PROPOSED ACTION

1. DESCRIPTION OF PROPOSED ACTION

a. Background

The KSC is the principal launch center for the NASA. The basic KSC Institutional Environmental Impact Statement was issued on August 11, 1971 and submitted to the Council on Environmental Quality on September 29, 1971 and to the general public.

On January 5, 1972, the President announced that the United States should proceed at once with the development of a new type of Space Transportation System, a piloted reusable vehicle capable of carrying large payloads to and from earth orbit.

The Shuttle will consist of a manned reusable Orbiter mounted at launch "piggy back" on a large expendable propellant hydrogen-oxygen tank and two recoverable and reusable solid rocket boosters (SRBs). The Orbiter will appear similar to a delta-winged aircraft, about the size of a DC-9 jet liner. It will be powered by three liquid fueled rocket engines, piloted by a crew of two, and have a cargo bay about 18 meters (60 feet) long and about 4.5 meters (15 feet) in diameter.

At launch, both the SRBs and Orbiter liquid rocket engines will ignite and burn simultaneously. When the complete vehicle attains an altitude of about 40 kilometers (approximately 25 statute miles) the SRBs will be staged, and recovered in the ocean. The Orbiter and its propellant tank will continue into low Earth orbit. After the desired orbit is attained, the Orbiter tank will be jettisoned by retrorockets into a remote ocean location. The Orbiter with its crew and payload will remain in orbit to carry out its mission, normally about seven days, but when required as long as 30 days. When the mission is completed the Orbiter will return to land like an airplane.

On April 14, 1972 the selection was made by NASA to operate the Space Shuttle from two sites. The initial launch and landing site will be KSC, Florida. This site will be used for research and development launches expected to begin in 1978, and for all operational flights launched into easterly orbits. Facilities for all Shuttle users at KSC will be provided by NASA, through modifications of existing facilities built for

the Apollo and other programs, and by construction of new facilities to include Landing, Deservicing and Safing (LDS), Solid Rocket Booster (SRB), and Maintenance and Checkout Facility (MCF).

It is planned that a second operational site will be phased in at Vandenberg Air Force Base, California, for Shuttle flights requiring high inclination orbits. The basic Shuttle facilities required at Vandenberg are planned to be provided by the Department of Defense on a schedule compatible with progress in the Shuttle development program.

Continued space activity at KSC is expected to result in no significant effect on the environment. Establishment of major community institutions such as schools and local governments have been accomplished through the years of the Apollo program, and any future development of this nature resulting from the Shuttle will generally be caused by processes related to normal development.

The NASA Environmental Statement for the Space Shuttle Program dated July 1972 details the environmental implications of the development and operations of the Space Shuttle Program. This program level document stipulated that institutional environmental statements would be forthcoming to document the environmental evaluations made for the respective launch and landing sites. Therefore as required, this Amendment to the KSC Institutional Environmental Impact Statement for the Space Shuttle Program, is submitted by NASA as required by the National Environmental Policy Act of 1969 and the April 23, 1971 Guidelines of the Council on Environmental Quality (CEQ) on statements covering proposed Federal actions that might affect the environment. It is limited to Space Shuttle facility development and operations at KSC and to a treatment of the Space Shuttle as a transportation system for rapid, easy access to space for men and equipment. The statement covers the environmental effects associated with facility development and eventual Shuttle operations. The Department of the Air Force is performing the necessary environmental assessment for the preparation of an environmental impact statement on the Vandenberg facilities. When operational, the Space Shuttle will be able to carry many diverse payloads and to execute many different missions; if required, separate

environmental statements will be prepared for those payloads which may have significant potential environmental implications.

This final Environmental Impact Statement was prepared utilizing the latest data available and incorporates additional data necessitated by the review of the draft. This final statement has been submitted to the CEQ and made available to the public.

b. Shuttle Benefits

Through its many earth applications and its effect on the economy, the space program has favorably benefited many segments of the Nation -- science, commerce, industry, education, agriculture, aviation, communications, ecology, medicine, and national security. Advances in technical fields have been stimulated at an unprecedented pace and have been a significant factor in helping the United States to maintain a position of technological leadership.

Continued space activities can yield significant long-term improvements to life on earth. To achieve these improvements, it is first necessary to operate more economically in space so that its full utilization will be possible within the larger context of other national goals and programs. The Shuttle will reduce the cost of space transportation by providing a reusable system with a flexible launch rate capability and a short turn-around time. In addition to the transportation savings, very significant economies will be realized in reduced payload costs due to relaxed weight and volume constraints, capability to revisit and return payloads for repair and reuse, and safe, intact abort of payloads.

Environmental quality stands high on the list of potential beneficiaries of the Space Shuttle Program. Earth sensing and the corollary data analysis technologies are today largely still undergoing development, but already show much promise in monitoring air and water pollution, land-use patterns, and other factors comprising environmental quality. Development and operation of the Space Shuttle, because of its capability of reducing costs and increasing flexibility, will foster the application of earth sensing technologies to the monitoring and control of environmental quality.

The same technologies can be applied to the improved management of the earth's resources, both renewable (e.g., food) and non-renewable (e.g., minerals), and extensive research and development in these applications is underway. Operation of the Space Shuttle will greatly contribute to conservation and wise utilization of these finite, and, in some cases, dwindling resources on a national and global basis.

The Shuttle will contribute to conservation of resources in yet another way. Reusability of nearly all the Shuttle components and of the satellites and other payloads will reduce the consumption of structural metals, such as aluminum, steel, and titanium, and the valuable auxiliary materials, such as copper, silver, and gold, all used in current expendable launch vehicles and their satellite payloads.

Environmental effects are summarized in the following sections. They are shown to be highly localized, of short duration, and controllable. Where the possibility of some detrimental environmental impact exists, operational constraints will be imposed to minimize these impacts.

c. Review of Existing Facilities

John F. Kennedy Space Center, previously the Launch Operations Directorate of Marshall Space Flight Center (MSFC), was established at Cape Kennedy, Florida, as an independent Center in June 1962, and subsequently renamed KSC in November 1963. It serves as the primary center for assembly, test, checkout and launch of NASA space vehicles. This includes responsibility for the launch of manned or unmanned vehicles at the KSC Merritt Island and Cape Kennedy launch sites. It also includes responsibility for launch of NASA manned or unmanned vehicles from KSC/Eastern Test Range (ETR) and for unmanned vehicles at Western Test Range (WTR). The responsibilities of KSC have recently been amended to include the development of ground support equipment, facilities, and recovery operations for the Space Shuttle.

The Center is located on approximately 140 000 acres on Merritt Island, in Brevard County, Florida, and adjoins the Cape Kennedy Air Force Station (CKAFS), the launch site for the AFETR (the site plan is shown in Figure 1-1). Facilities at KSC are provided for the assembly, test, checkout, and launch of Saturn-class boosters and associated spacecraft. The major facilities at KSC (Figure 1-2) are:

(1) Launch Complex 39, for Saturn V and Saturn IB vehicle processing and launch

(2) The KSC Industrial Area, comprising management and technical offices and labs, and

(3) Launch Complex 17, 36 and 41 which are used to launch unmanned vehicles.

Complexes 34 and 37 were formerly used to launch Saturn IB manned vehicles have been dismantled. All complexes except 41 are operated by KSC, but complexes 17 and 36 are physically located on the CKAFS (USAF).

Average elevations of the land are from 4 to 6 feet above mean sea level. The Banana and Indian Rivers are shallow lagoons which lie to the east and west of Merritt Island respectively. Average depths are from 3 to 4 feet except for the channel of the Intracoastal Waterway which is maintained at a depth of 12 feet. Brush and dense scrub palmetto growth, 2 to 6 feet high, cover much of the land. Severe storms from the northeast occasionally breach the natural protective sand dunes along the beach and cause flooding of low areas.

This area is part of the Gulf-Atlantic coastal flats. The land is flat with essentially no relief. The site is situated on platform deposits overlying basement rock of the Paleozoic Age. Sedementary rock is from recent time, at most from the Pleistocene Age. There are no caverns, or significant metal or mineral deposits in the area. There have been no recent earthquakes. The soil on land around the island is either warm moist cracking clay or warm wet podsols. The island itself is sandy and vegetation is principally live oak, sea oats and southern mixed forest.

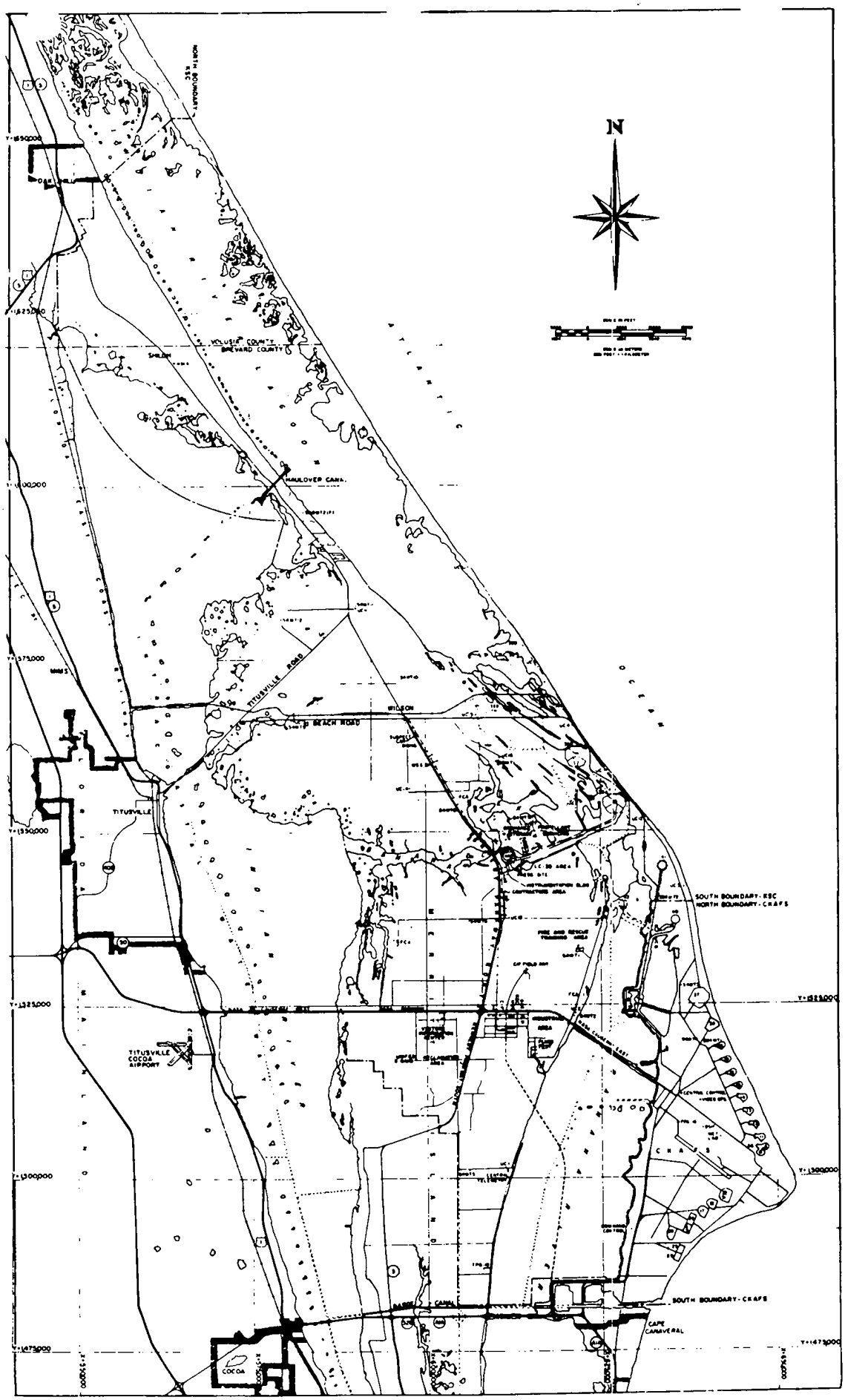

Figure 1-1. Kennedy Space Center Site Plan

FACILITIES AT KSC AND CKAFS

(WITH PROPOSED SHUTTLE RUNWAY)

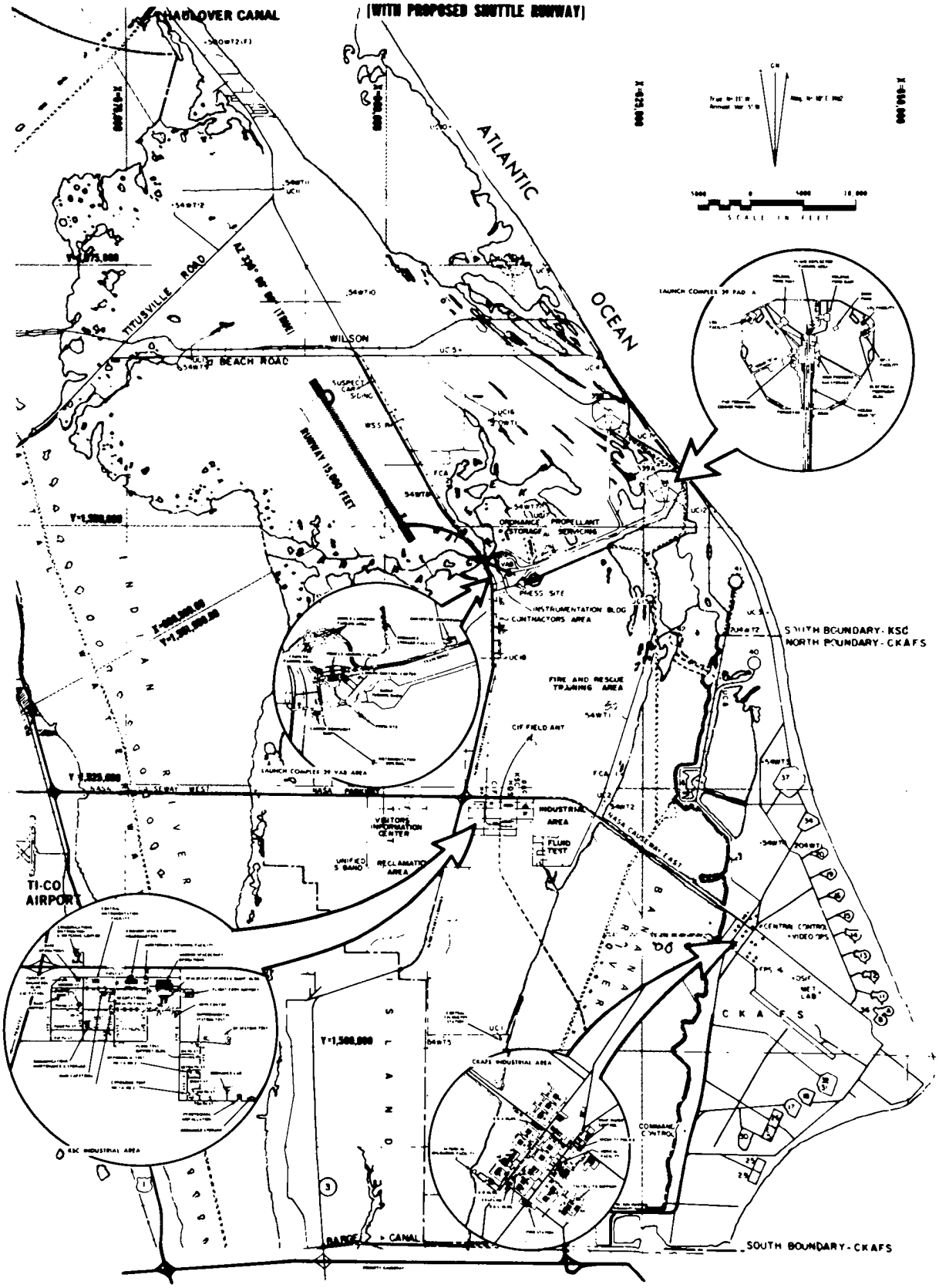

Figure 1-2. Facilities at KSC and CKAFS

d. Scope of Space Shuttle Actions

(1) General

KSC now has a large complement of facilities that can be adapted for Space Shuttle use. Launch Complex 39 with two pads and supporting systems is quite suitable for Space Shuttle needs after some modification. The large VAB will be modified for erection and mating of the booster and Orbiter in the high bay portion while other areas of the VAB will be adapted to additional Space Shuttle functions. The existing Industrial Area will provide shop, laboratory, office and warehousing facilities. New facilities for solid rocket motor receiving, storage and recovery/disassembly, maintenance and checkout, and a new airfield for Orbiter landing will have to be provided on the site.

Table 1-1 is a summary of the anticipated new facilities and modifications to existing facilities presently considered to be required to support the Space Shuttle launch and landing operations. At present, only conceptual designs have been developed, and minor modifications or new facilities which by the nature of the proposed action were deemed as not contributing to an effect different from the original effect stated in the KSC Institutional Environmental Statement dated August 11, 1971, were omitted from detailed discussion in this Amendment and noted in Table 1. As with any major research and development program, it should be recognized that support requirements at the launch and landing site may change and perhaps eliminate a need for some of the listed facilities, require major changes to the concepts listed, or add new facilities. Figure 1-3 indicates the proposed siting for these primary candidate facilities.

A brief discussion on the anticipated receiving, checkout and launch preparation flow of the Space Shuttle Systems through the proposed launch and landing site facilities follows in order to acquaint the reader with requirement for the facility actions shown in Table 1-1.

TABLE 1-1. SUMMARY OF ENVIRONMENTAL IMPACT OF FACILITY ACTIONS

TYPE OF ACTION	ENVIRONMENTAL EFFECT*
MODIFICATIONS TO EXISTING FACILITIES	
1. VAB Modifications (Internal) External Orbiter Tank Storage and Checkout Facilities High Bay Mod for Vertical Vehicle Integration	None. Additional use of existing stabilized land already committed to Apollo to be used for VAB Mods. Remainder of mods inside VAB consisting of facility type mods only. Quantities of safing wastes (cleaning, chemicals, propellants) to be small, will be piped to portable tankers for transport to disposal area. Sanitary waste flow into existing System and Plant.
2. Mobile Launcher Modifications	None. All structural and mechanical mods to an existing system. Some mods to propellant and gases servicing system, but no basic change in concept for Apollo.
3. Launch Complex 39 Pad Modifications	None. Mods inside perimeter fence, no change in land use, on existing stabilized land, industrial construction type work. Relatively small work for fuel line installation. All cleaning according to existing procedures. Sanitary facilities exist.
4. Launch Control Center Modifications	None. Mods are internal to building and in support changes to electrical/electronic systems.
5. Support Facilities and Shop Modifications	None. Provision will be made to catch pollutants/chemicals; dispose of according to existing procedures.
6. Launch Complex 39 Pad Service Tower	None. Steel structure to be added to launch pad utilizing pad foundation. No change land use.
NEW FACILITIES	
1. Landing, Deservicing and Safing Facility (LDS)	Land Use. Utilization of approximately 1350 acres of high ground Controlled water runoff on landing and safing by swales, ditches, sumps and bulkheads. Provision for air discharge from servicing facilities. New sanitary facilities provided.
2. Solid Rocket Booster Facilities	Water Quality. No manufacturing, essentially clean assembly operation, rocket casing flush water contained/treated. Land use is stabilized land already in use by Apollo program. Contaminants will be contained and treated.
3. Crawler/Transporter Maintenance Building	None. Land use is in stabilized area. Used hydrocarbons controlled to prevent pollution by recycle in heat plant or by sales. Sanitary facilities available.
4. Hypergolic Pod Processing and Storage Facility	Water and Air Quality. Accidental spills provided for with catch basins and holding ponds. Propellant venting performed in controlled areas and diluted.
5. Parachute Building	Water Quality. Parachute wash/rinse water controlled. New land use for all candidate sites.
6. Maintenance and Checkout Facility	None. Land use is in existing statilized area. Provisions will be made to catch pollutants/chemicals; dispose of according to existing procedures. Sanitary facilities are available.

*Principal effect is underlined.

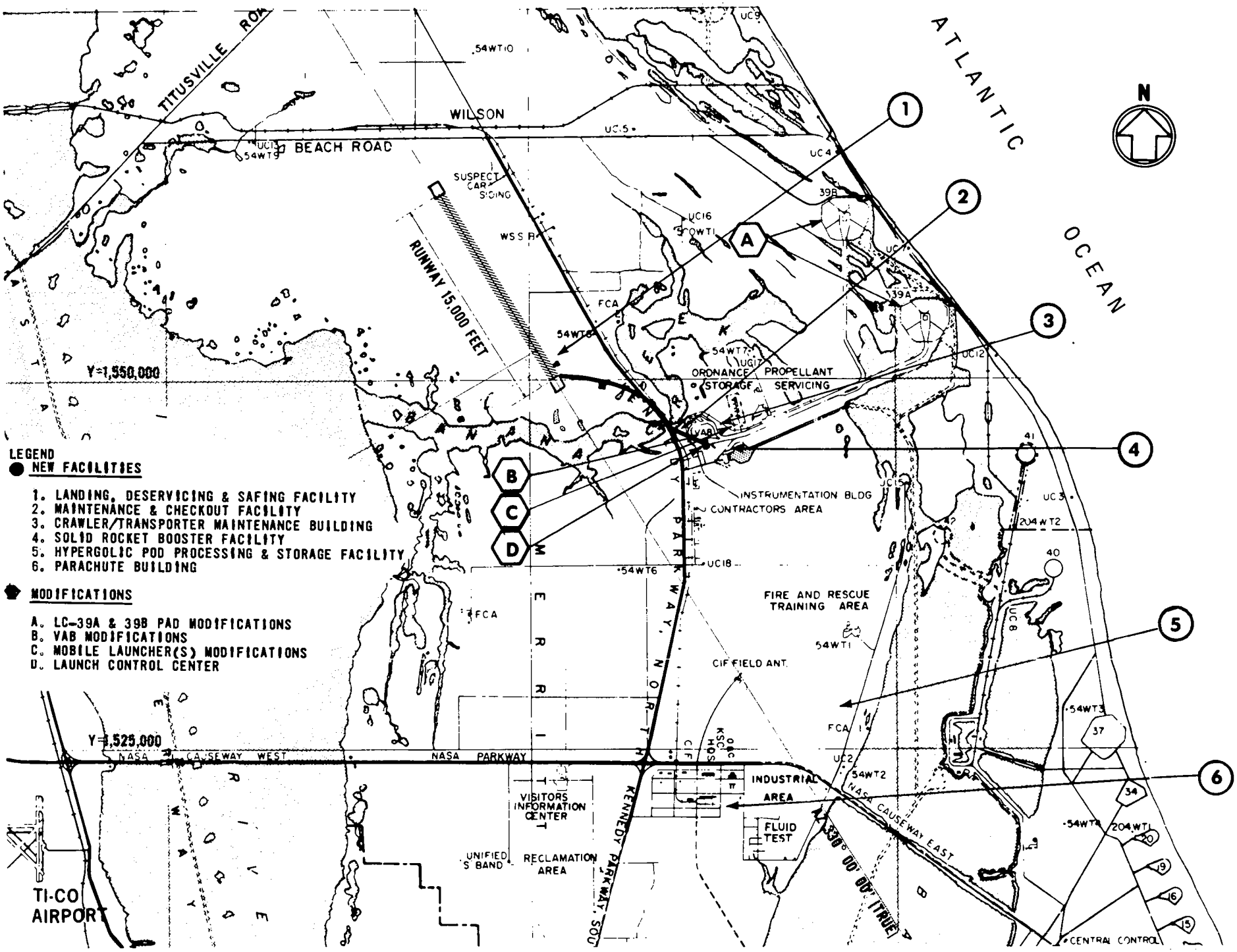

Figure 1-3. Proposed Siting for Space Shuttle Facilities

The SRBs will be received at KSC in segments by rail or barge and off-loaded, inspected, stored, and prepared for flight at the new solid rocket booster facility. The segments will be moved by dolly to the VAB transfer aisle and erected on the ML in either High Bay 1 or 3 with the existing 250-ton cranes. Erection and checkout of the SRBs is accomplished prior to Orbiter tank mating.

The Orbiter tank will be on a dolly and received at KSC by barge; and moved to the VAB High Bays 2 or 4 for vertical checkout and storage. Subsequent to Orbiter tank checkout, the Orbiter tank will be mated with the SRBs in either High Bay 1 or 3.

The Orbiter maintenance and checkout will be performed in the Maintenance and Checkout facility. After completion of maintenance and checkout, the Orbiter will be towed to the transfer aisle for erection and mating to the Orbiter tank in High Bay 1 or 3.

The payloads will be moved to the Maintenance and Checkout Facility (MCF), on a dolly from the payload processing area, removed from the dolly and inserted in the Orbiter cargo bay. When the Orbiter returns to the Landing, Deservicing and Safing Area upon completion of a mission with a payload, the payload will be removed at the MCF. The payload will then be moved to the appropriate payload processing area.

Once the Shuttle vehicle stages have been vertically assembled in High Bays 1 or 3, the Shuttle VAB integration checkout will be initiated. Upon completion of integration testing, the Shuttle will be moved from the mating cell by the Crawler/Transporter to Pad A or B for final checkout and launch.

The Orbiter will return from orbit to the Landing, Deservicing and Safing Facility for deservicing and safing, then towed to the MCF for the next mission processing.

The empty SRB casings will be recovered at sea for return to the combined SRB facility. The casings will be off-loaded at dockside, washed down with fresh water and all reusable components removed for rework at KSC. The casings will be disassembled into individual segments, the insulation removed and a protective coating applied to the joining surface. Segments will then be returned to the manufacturer for reprocessing.

Since the deservicing and servicing of the hypergolic fuels used in the Shuttle's attitude and control and orbital maneuvering propulsion systems are considered hazardous, these operations are planned for a remote controlled area between the KSC VAB area and the Industrial Area. The propulsion modules or pods will be removed from the Orbiter at the Safing Area and transported to the Hypergolic Pod Processing Facility for removal of residual fuel, storage and refueling in support of subsequent missions. The fueled pods will be reinstalled on the Orbiter in MCF just prior to the Shuttle vehicle's move to the VAB for vertical assembly.

Booster parachutes will be recovered at sea and taken to the Industrial Area Parachute Building for washing, drying and repacking. These will be stored in the Parachute Building, to be transferred to the SRB processing area for installation in the SRB nose section.

(2) Modified Facilities Required

Modifications to existing Launch Complex 39 pads A and B, VAB, MLs, Launch Control Center (LCC) and some facility and support shops will be required to support the launching of the Shuttle vehicles. These modifications will consist of changes to fluid, mechanical, instrumentation, communications, electrical and electronic systems, brick and mortar and equipment. All modifications are within the existing facility sites and do not involve additional or changed land usage. The operations planned for these areas are similar to those conducted for Apollo and are non-noise producing (the single exception being launch), clean and are conducted under controlled and proven procedures.

(3) New Facilities Required

(a) Landing, Deservicing and Safing Facility (LDS)

The proposed location for the Landing, Deservicing and Safing Facility is shown in Figure 1-4.

In examining the problem of the Orbiter landing, the following factors were investigated by KSC:

- Terrain in the landing zone.
- Terrain in the Orbiter approach paths.
- Land use.
- Safety
- Use of the Cape Kennedy Air Force Station "Skid Strip."
- Other possible landing sites.
- Interference with existing civil air routes.
- Impact to the environment.
- Cost.

In Figure 1-4, the suggested runway orientation and air traffic pattern are indicated along with the elevation above sea level of the area under the flight path.

The field site shown is at an approximate elevation of 9 feet above mean sea level. The VAB extends 131 feet above the conical imaginary airfield surface and a weather tower (approximately 17 000 feet northeast) extends 160 feet above the conical surface. Because of the obstructions on the east side of the runway, mission approach courses for conventional aircraft, based upon Federal Aviation Regulations (FAR) part 77, would use westerly turns. Special missed approach patterns with easterly turns to safely clear obstructions should be devised for the Space Shuttle. There is no high terrain in the area which would be a factor in the Orbiter landing performance.

The arrangement of facilities within the Landing, Deservicing and Safing area is shown in Figure 1-5.

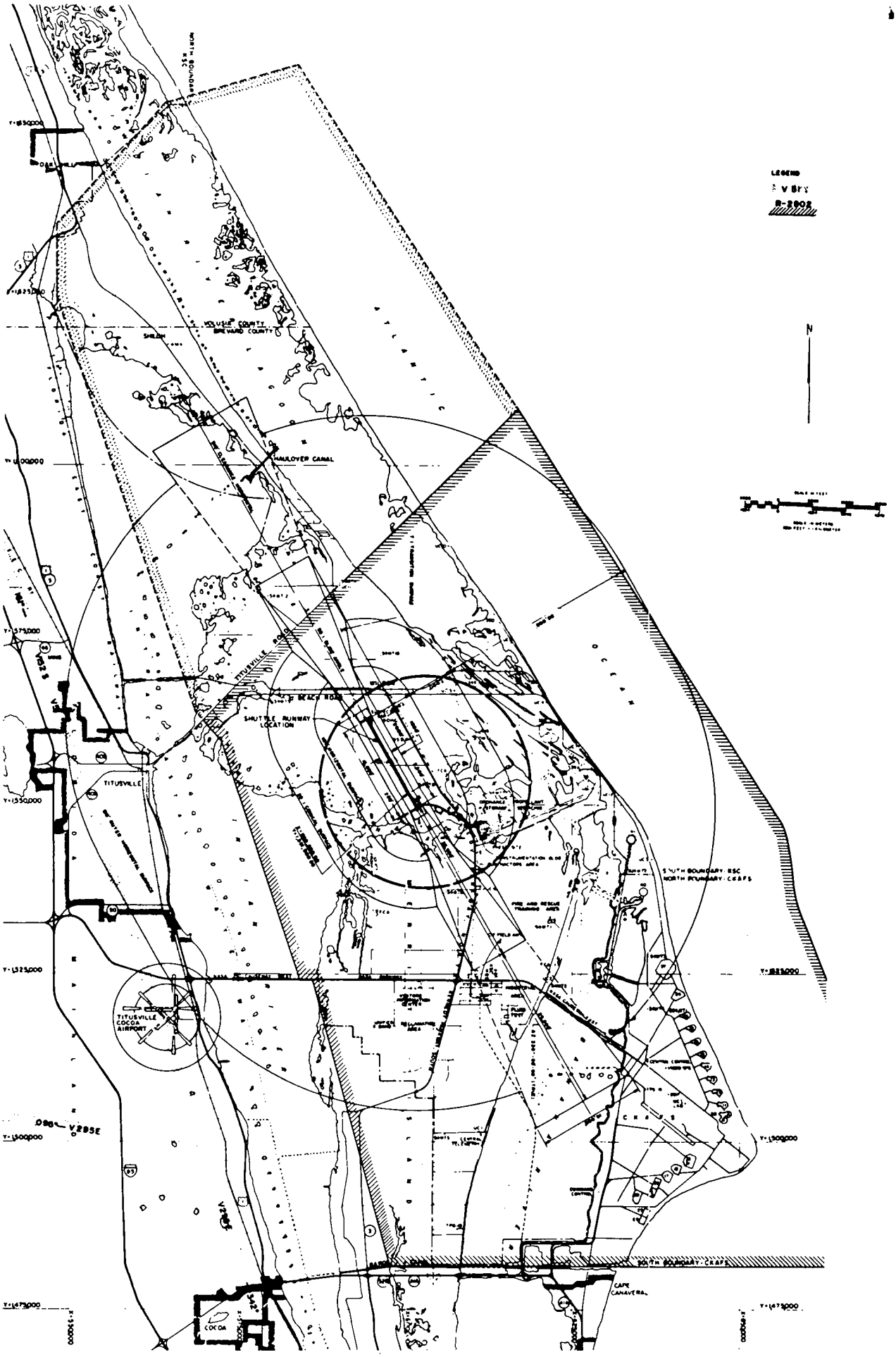

Figure 1-4. Air Space Clearances for Runway Location

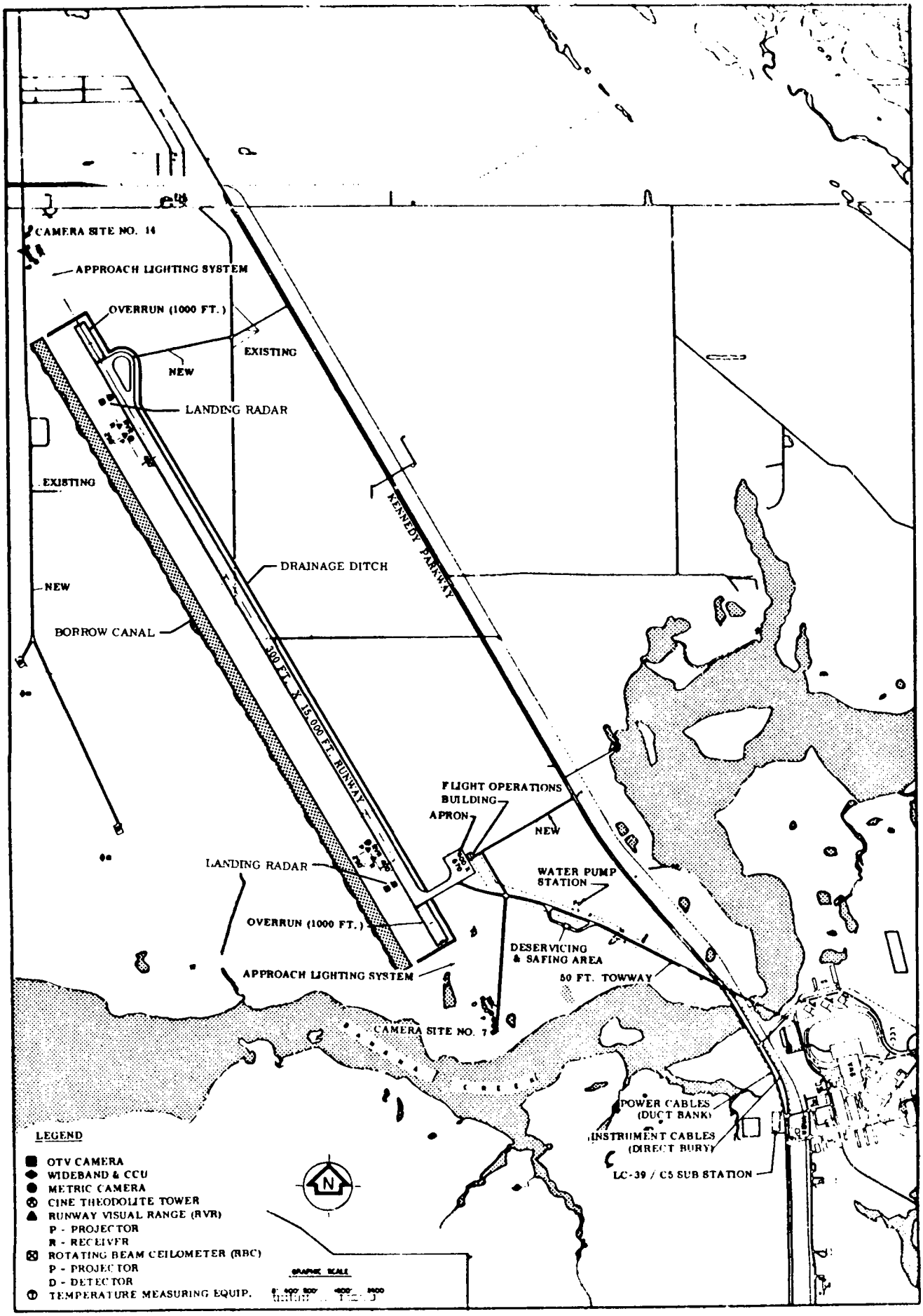

Figure 1-5. Landing, Deservicing and Safing Facility Site Layout

The landing facilities are comprised of the runway, turnarounds, aircraft parking apron for conventional aircraft, Flight Operations Building, and systems and equipment for the support and safety of flight operations. Provisions will be made for control of runoff and for future expansion in the event of an increased scope of operations. The initial runway installation will be 15 000 feet long by 300 feet wide, with 1000 foot overruns at each end.

The Flight Operations Building is a multipurpose structure which includes a control tower, a flight operations support area, and garaging for miscellaneous aircraft servicing equipment. The control tower shall be of standard Department of Defense design (drawing number AD86-06-05R1).

A Safing and Deservicing Facility will be provided for weather protection and to provide a facility where the LOX, LH_2 and JP4 systems can be safed and hypergolic pods removed. The facility will be able to support payload removal operations in a non-clean environment.

The towway connects the runway with the Space Shuttle maintenance and checkout area. Turnouts provide vehicle access to the Deservicing and Safing Facilities.

The area proposed for the Landing, Deservicing and Safing Facilities is presently a part of a National Wildlife Refuge established by NASA with the Department of the Interior. Birdlife, reptiles and mammals are abundant and may be seen in and around the Launch Complex areas as well as throughout the KSC Cape Kennedy areas.

The planned location of the Landing, Deservicing and Safing Facilities represents only a small portion of the extensive land and water areas (approximately 140 000 acres) that makes up the Center. The major portion of the area planned for use is on dry land. The sites for all buildings, tow-ways, and the runway

will be excavated to a depth of 1.5 to 2.5 feet; removing approximately 1 850 000 cubic yards of unsuitable material. This material will be retained in the site area and used for diking and as mulch blanket for grassing along the sides of the runway. No permanent spoil area requirement is anticipated. Approximately 2 175 000 cubic yards of fill (borrow) material will then be added to raise the surface to an elevation of approximately 9 feet above mean sea level. A portion of the fill material will be obtained from drainage ditch construction in the LDS area; however, the majority of the fill will be obtained by creating one or more irregularly shaped lakes, in the immediate vicinity of the project (see (Figure 1-5).

Present plans are to use mobile scraper type earth moving machines and/or portable dredges to relocate the fill material required by this project. KSC is presently conducting studies to determine the most economical methods to be used that would result in minimum impact to the environment.

(b) Solid Rocket Booster Facility

The proposed SRB Facility is planned to be located at the southwest corner of the VAB barge turning basin and will be constructed on existing compacted fill, part of which will be removed to bring the finished grade to the same level as the existing barge unloading dock. Excess material will be used in filling for the railroad. Slopes upward to existing grade will be 3:1 and will be grassed to prevent erosion. Area drainage will be away from the barge terminal basin to catch basins with drains leading to the turning basin or to an existing drainage ditch on the south side of the site. The facility consists of a dock, rotating crane, destacking tower, processing cells and roads, railroads, spur, outside storage slab area for storage of center segments and unprocessed forward segments.

The SRB Facility at KSC will be used to receive and process the various components that make up the solid rocket motors. Facilities must be provided to receive, offload, process, protect, store and ship the SRB segments, fairings, nose sections and associated subassemblies. The buildup of the major SRB components will

be accomplished at the facility in preparation for shipment of the completed segments to the VAB for stacking and integration with other Shuttle components.

The SRB Facility will provide a capability to lift the spent SRBs from a barge or the water at the VAB Turning Basin, place in horizontal processing position, flush with fresh water, disassemble into its major segments and prepare these segments for return to the SRB manufacturer for reprocessing.

The disassembly facility will be served by a fresh water main to provide normal water service and wash down for the SRB segments as they are disassembled. Water from the SRB segment washdown area will be routed to a holding tank or basin for appropriate treatment prior to entering the sanitary system. Sanitary lines from the building will be routed to the sewage treatment plant at the press site. This plant is adequately sized and will have no difficulty in handling the discharge from the disassembly facility.

The processing cells will be utilized for minor disassembly capability to separate sub-components from the major components. Additionally, a capability will be provided for compressed air and grit blast (small), capability to apply preservative to major components for shipment and to paint those sub-assemblies that remain at KSC for reuse. This will include facilities for abrasive cleaning and for spray painting. The painting area will be protected against fire by a sprinkler system and will have a special air filtration and circulation equipment. The painting area will be provided with a paint spray waterfall and will be separated from the rest of the building by a firewall type construction. A new bulkhead will be constructed, using precast concrete sheet piling with a reinforced concrete cap to match the type of construction and cap elevation of the existing unloading dock. This bulkhead will connect to the existing bulkhead and extend east and southeast past the site. The hardstand area adjacent to the dock will be constructed of compacted fill and asphaltic concrete designed for the wheel loads to be imposed by SRB segment handling equipment.

A single track railway spur will be constructed to the site connecting to the existing rail line that runs south from LC-39 to the KSC Industrial Area.

(c) Hypergolic Pod Processing and Storage Facility

The Hypergolic Pod Processing Facility will require two areas: (1) an area for pod refurbishment and storage; and (2) a hazardous area for pod decontamination and test firing. Pod refurbishment and storage will require a standard pre-fab metal building. The pod decontamination and test firing facility will be constructed of a combination of reinforced concrete with masonry slab and divided in half by a reinforced concrete wall. Test firing will occur in a reinforced concrete shelter. The facilities will be amply separated from other facilities and roads for safety purposes.

The design of the Shuttle Orbiter is to have all toxic propellant systems (hypergolic or mono-propellant) completely removable as self-contained "pods." The Hypergolic Pod Processing Facility will allow the pods to be maintained and checked out at a site remote from the mainstream maintenance and checkout operations on the Orbiter for personnel safety, Orbiter safety, and assuring minimum turnaround time between Shuttle flights.

When the Orbiter lands, the pod modules will be removed from the Orbiter, transferred to enclosed over-the-road trailers and transported to the hazardous area for decontamination. All residual propellants will be drained into waste containers for treatment/disposal. After draining, the necessary flushing and purging operations will be accomplished to inert and dry the pods.

After decontamination, the pods will be transported to the non-hazardous area for pneumatic and electrical testing, refurbishing, and storage. Test firing will only be required after significant maintenance, such as a major overhaul or engine replacement. This will require the use of the Test Firing Shelter.

As an Orbiter nears completion of its preparation for launch, a full set of pods will be removed from storage, transferred to the hazardous area for fueling and then transported to the VAB for installation on the Orbiter.

(d) Parachute Processing Facility

This facility is required to prepare the recovered Shuttle Booster and Orbiter parachutes for reuse. The facility will provide the following parachute functions:

- Receive, wash and dry
- Lay out, inspect and repair
- Fold and pack into cannisters
- Store in cannisters

The facility will be a combination of reinforced concrete, structural steel and concrete masonry construction with concrete foundation and floor slab. It will include a wash and dry tower approximately 70 feet high. The facility includes the tower overhead hoists, water deluge/flushing system, a warm-air blower system and a monorail hoist system over the table packing area.

A new facility is being constructed because the longer and larger parachutes for Shuttle would require extensive modifications to any existing facility including the addition of the Wash/Dry Tower.

(e) Maintenance and Checkout Facility

The Maintenance and Checkout Facility will be located northwest of the Vehicle Assembly Building (VAB) between Road "K" and the railroad. This area is currently utilized for crawler-transporter parking and servicing functions.

This facility is required to refurbish the Orbiters after each mission and prepare them for the next mission. The functions provided will include:

- Paint removal and/or application.
- Refurbishing thermal protection systems.
- Maintenance of the Orbiter.

- Off-loading down payload and insertion of up payload.
- Installation of OMS pods.

This facility will be aircraft hangar type construction with three bays. One bay will be required for the thermal protection and painting operations and two bays will be required for the remainder of the preparations for relaunch. This facility will include cranes, pneumatic, electric and water utilities. Sanitary system will be tied into the adjacent sewage treatment plant.

SECTION 2

PROBABLE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

2. PROBABLE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

a. General

The relationships of the NASA Space Shuttle program to the environment are treated in the Shuttle Program Environmental Impact Statement dated July, 1972. The local effects on air quality, water quality, meteorological and hydrological conditions, and the management of engine noise and sonic boom effects, are discussed herein. The questions of land use and cultural, social, and demographic effects are directly related to the sites of program activities and are also treated herein.

Solid waste generated by KSC activity will be disposed of in an existing land fill that is controlled by a KSC procedure in accordance with the Rules of the Florida State Board of Health, Chapter 170C-10. The effect of the operations is monitored through use of a water sampling grid. Open burning of general solid waste at KSC was terminated in January 1967. KSC has considered the use of the proposed Brevard County Solid Waste Disposal Project and found that it is not cost effective for KSC. No radioactive materials are planned to be used as part of the Space Shuttle transportation system.

The Shuttle related construction and development activity that will occur at KSC during the fiscal years 1974-1980 period is not expected to significantly affect the environment. The hardware for the Shuttle development program will depend largely on existing aerospace facilities already located and equipped to provide for the safety and protection of the environment from noise and waste produced by the manufacturing and test activities. At KSC, orbiter engine tests (not solid rocket motors) will be conducted in the existing areas and at generally infrequent intervals. The orbiter propellants are hydrogen and oxygen and the exhaust products are basically H_2O. The noise of a static test if required would be considerably less than for a launch. Horizontal flight tests will be carried out in locations and under conditions similar to those for development flight tests of jet powered aircraft.

During the construction period, it is planned to continually monitor environmental conditions at the KSC. To assist in assessing the effect its operations have on the local site environment, which is a wildlife refuge, KSC recently issued grants to the Florida Technological University and the Florida Institute of Technology for ecological studies in the KSC area. The work will identify the living processes that would most likely lend themselves for use as indicators of changes in the environment. It is intended that the information gained from the study will be made available to interested agencies and will be used as a basis to guide the Center efforts to protect the environment. The work will be accomplished in cooperation with the local representative of the Bureau of Sport Fisheries and Wildlife, Department of the Interior.

For the on-going launch and landing operations, KSC is advantageously situated. The terrain is flat thereby permitting low altitude vehicle exhaust to disperse. At high altitudes, winds are generally westerly thereby causing emissions to disperse over the Atlantic Ocean. There is adequate land within the controlled confines of KSC to assure that noise produced by Shuttle operations has attenuated to acceptable levels and that rocket exhaust emissions are adequately dispersed well below acceptable levels at the KSC boundaries. The physical characteristics (geology and ground water hydrology, surface water hydrology and meteorology) of the Cape Kennedy area is described in reference document (1)* "Environmental and Demographic Data Summary for the Cape Kennedy, Florida Vicinity." Portions of this referenced document will be repeated herein to support the understanding of the topics of water and air quality.

Many aspects of the Space Shuttle impact of the environment are covered as separate subjects in other parts of this impact statement. Table 2-1, "Space Shuttle Environmental Impact Summary" provides a summary of the pollution and ecology considerations as they pertain to KSC. Also, it contains a reference to the paragraph where each characteristic and condition is discussed.

The summary is an adaptation of the procedure for evaluating environmental impact contained in Geological Survey Circular 645. (2) The left side outlines the

*Numbers in the superscript parentheses are references, see Appendix A.

TABLE 2-1. SPACE SHUTTLE ENVIRONMENTAL IMPACT EVALUATION SUMMARY

EXISTING CHARACTERISTICS & CONDITIONS		IMPACT OF DEVELOPMENT AND OPERATIONS ON EXISTING ENVIRONMENT
Paragraph Reference (Where Items are Discussed in this Document)	Characteristics & Condition Summary	Summary of Changes to Existing Environment
Physical & Chemical Characteristics		
a. Earth 1.b.(3), 1.c.(1), 2.f.(3)	a. Flat sandy beach and salt marsh	a. Alteration of ground cover, paving
b. Water 1.c.(3)(a), 2.c.	b. Marsh water is non-potable despite processing	b. No change in water quality
c. Atmosphere 2.b.	c. Warm, humid, little pollution	c. Rocket exhaust
d. Earth Quakes 1.b.	d. Seismic Zone 0	d. None
Biological Conditions		
a. Flora 1.b., 2.f.(3).	a. Live oak, sea oats, southern mixed forest	a. Changes due to clearing construction on Landing Facility
b. Fauna 1.b., 2.f.(3).	b. Several species of animal & bird life	b. Some displacement of 1 mile or less, likely.
Cultural Factors		
a. Land Use 2.f.(3).	a. Government Facility (Space Center)	a. Land use on KSC. County institutions now support more KSC employment than during Shuttle
b. Recreation 2.f.(3)	b. Water sports, parks & game preserve	b. None
c. Esthetic 2.f.	c. Large areas of undisturbed beach & marshes	c. None
d. Cultural Patterns 2.f.	d. Outdoor, casual life-style	d. None
e. Population Density 2.f.	e. Near-zero (overwater) to east; low to west	e. Net change from 1970 is negligible
f. Health & Safety 2.d.(2) & (3)	f. Excellent. Some workers exposed to industrial hazards.	f. Accidents are unknown hazards.
g. Employment 2.f.	g. Space & tourist oriented declining due to cut-back in space program	g. Significant impact on local employment
h. Man-Made Fac's & Act's 1.c.	h. Many structures on site utilities and access adequate.	h. Several structures & expansion facilities required.
Ecological Relationships	a. Can be enhanced by conservation practices on KSC.	a. Definite change - Good conservation practices can mitigate the impact.
Other		
a. Noise 2.d.	a. Periodic - Accepted by community	a. Noise generally less than 115 db to public. Over land sonic boom overpressures less than 96 N/m^2 (2psf).

existing characteristics or conditions that may be affected by Space Shuttle operations. The right side assesses the impact of Space Shuttle operations on existing characteristics or conditions and states briefly the changes to the existing environment that are expected.

It is apparent that at this early phase of the Space Shuttle program the system characteristics are not sufficiently defined to support a detailed and definitive assessment of the environmental impact. Accordingly, this assessment is necessarily broad and is subject to further analysis as the system concepts and designs are defined in more detail.

b. Air Quality[3]

(1) Source and Nature of Emissions

The Space Shuttle flight system will be powered by chemical rocket engines. These engines operate by the combustion of a fuel and self-contained oxidizer. The products of combustion exhausted from the rocket nozzle may include compounds and molecular species which are not stable at ambient conditions, or which may react with the ambient atmosphere. Knowledge of the detailed composition of rocket exhaust gases is based on thermochemical calculations and confirmed by thrust measurements and rocket plume and exhaust studies.

Of the major exhaust constituents, carbon monoxide (CO), hydrogen chloride (HCl), and aluminum oxide (Al_2O_3) could be classified as air pollutants. Though the carbon monoxide will generally completely oxidize to carbon dioxide in the plume at low altitudes[4], it is retained in the following discussion for conservatism. The molecular weights and maximum allowable concentrations for a 10-minute emergency exposure (MAC_{10}) to industrial workers for CO and HCl recommended to military and space agencies by the Committee on Toxicology, National Research Council [5] and for Al_2O_3[6], are listed in Table 2-2.

TABLE 2-2. SELECTED ROCKET ENGINE COMBUSTION PRODUCTS MOLECULAR WEIGHTS AND 10-MINUTE MAXIMUM ALLOWABLE CONCENTRATIONS (MAC_{10}) FOR INDUSTRIAL WORKERS [5][6]

Components	Molecular Weight	MAC_{10}
CO	28.01	1 500 ppm
HCl	36.47	30 ppm
Al_2O_3	101.94	50 Mg m^{-3}

In the upper atmosphere, water and carbon dioxide may be considered as potential pollutants due to their low natural concentration, and their possible influence on the earth's heat balance and on the ozone and electron concentration.

Knowledge of the meteorology of the Cape area must be understood to study the effects it may have on the dispersion of the foregoing described emissions such that the concentration at ground level can be predicted. The next section on Meteorology of the Cape Area summarizes those characteristics which influence emission dispersion.

(2) Meteorology of KSC Area [1]

The detailed meteorology of the Cape area which has been documented (Reference 1) is considered in two parts: (1) Surface Meteorology and (2) Upper Air (500 to 5 000 Meters) Meteorology.

(a) Surface Meteorology Data[1]

The surface meteorological data used was obtained from two sources: (1) the hourly records of the Cape Kennedy Air Force Station (CKAFS) Weather Station and (2) the hourly records of the 150 meter NASA Ground Wind Tower.

The location of these two stations are shown in Figure 2-1.

The ground level meteorological data were reduced to provide summaries of four meteorological parameters important to a consideration of atmospheric transport. These are wind direction, speed, persistance and atmospheric stability. The results of these analyses are presented in the following paragraphs:

1- Wind Direction[1]

Wind direction is available from both the CKAFS weather station and the NASA 150 meter ground wind tower. The distribution of wind direction, based on the CKAFS data, is graphically illustrated in Figures 2-2 and 2-3. Figure 2-2 shows the wind direction distribution in each of the seasons for the entire eight years of data, and Figure 2-3 shows a similar distribution separated into daytime (between sunrise and sunset) and nighttime (between sunset and sunrise) periods.

In each of these figures, the percentage of occurrence for each of the sixteen directions is represented by the length of the bar (in percent of the total number of observations in the period). The directions are those from which the wind blows.

It can be observed that spring (Season 1) and summer (Season 2) are characterized by southerly and easterly winds. During the fall, north and easterly winds occur most often, while in winter the predominant winds are north and north-westerly.

Periods of indicated calm are more likely during the summer months. The average annual occurrence of calms is 5.2 percent of the total hours. During the nighttime hours, calms are more common than during daytime hours.

Kennedy Space Center is subject to the sea breeze and land breeze phenomena. The former, a wind blowing from sea to land, occurs

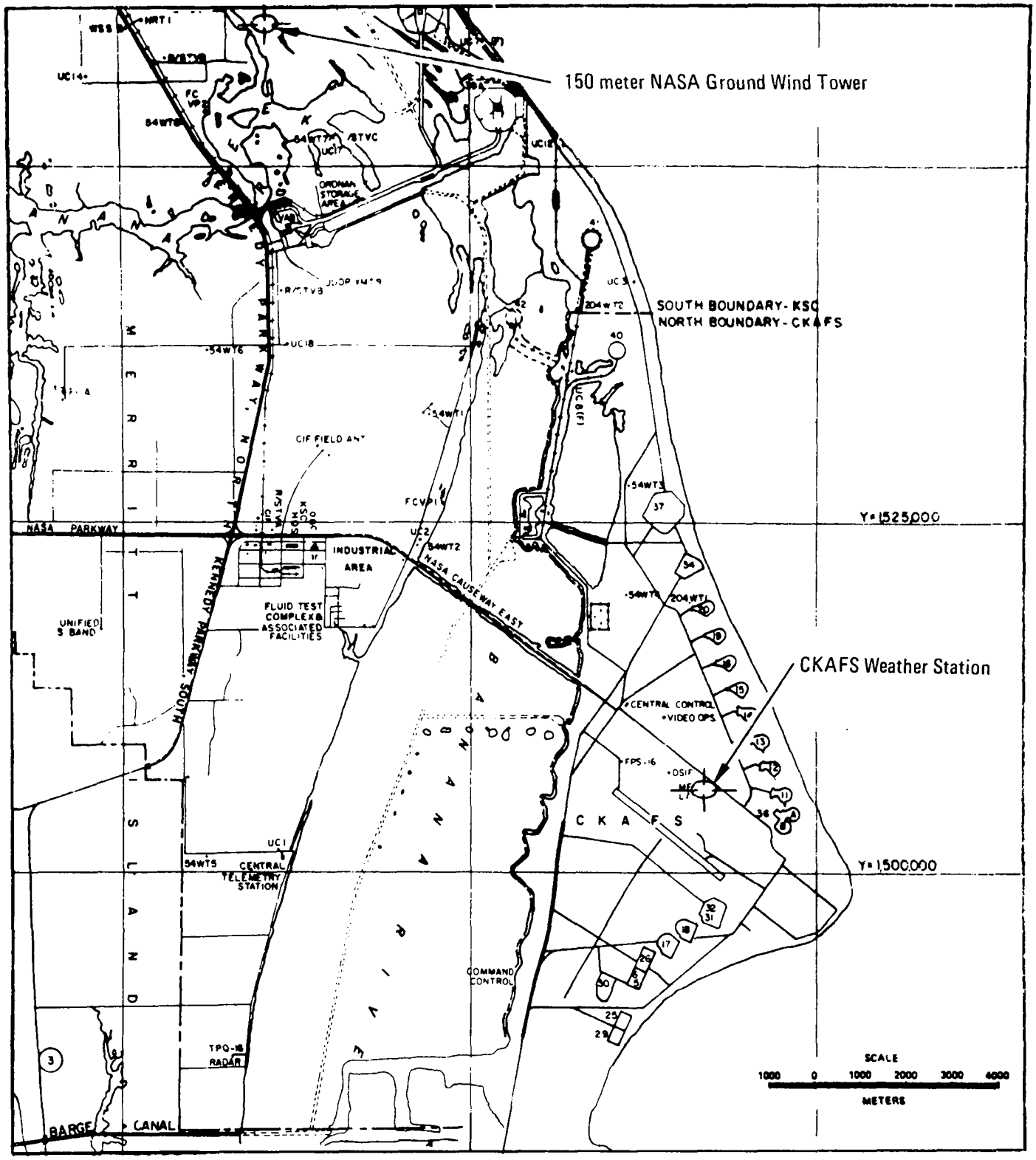

Figure 2-1. Location of Meteorological Data Recording Stations

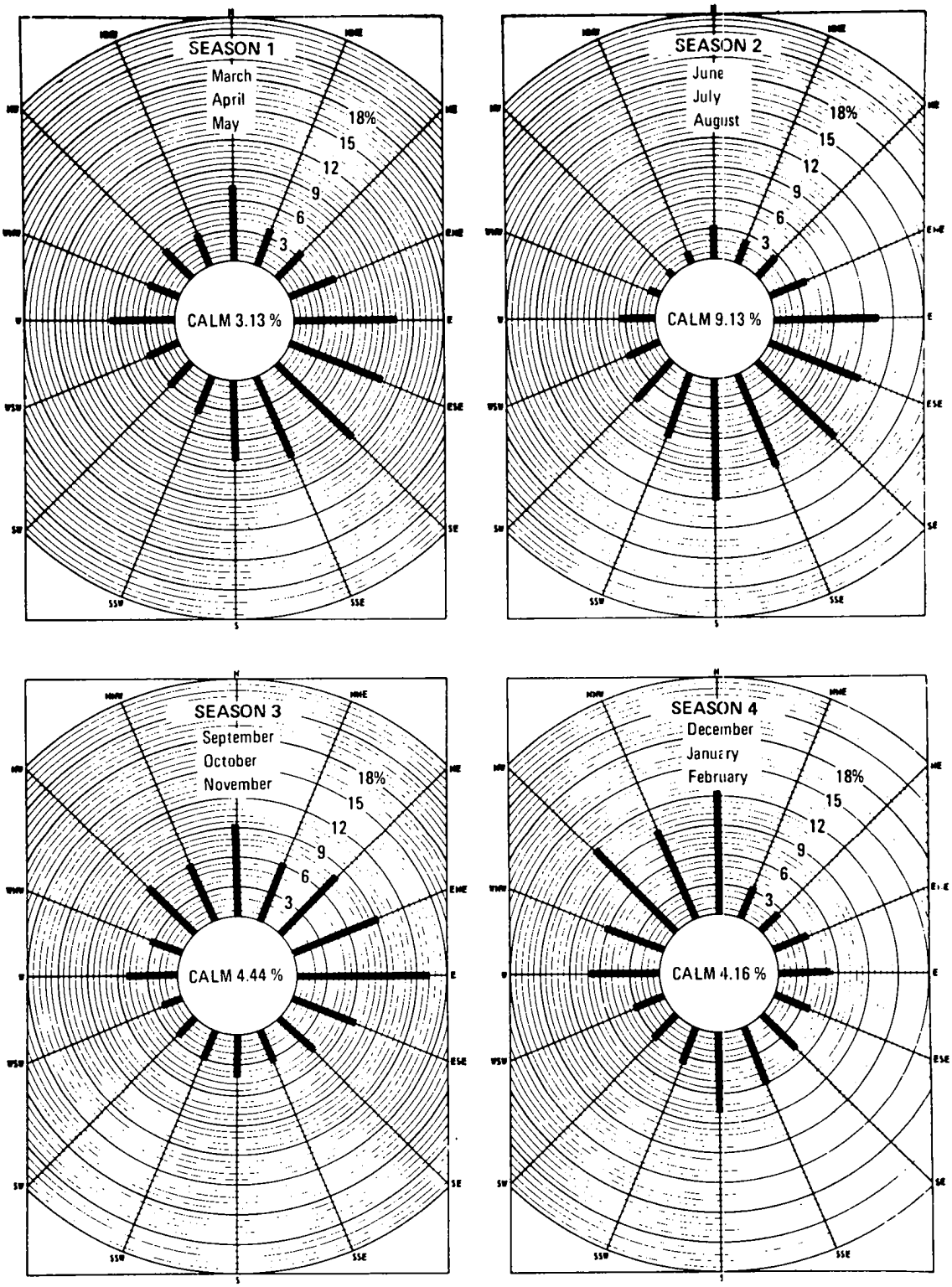

Figure 2-2. Seasonal Wind Rose for KSC 1961 thru 1968

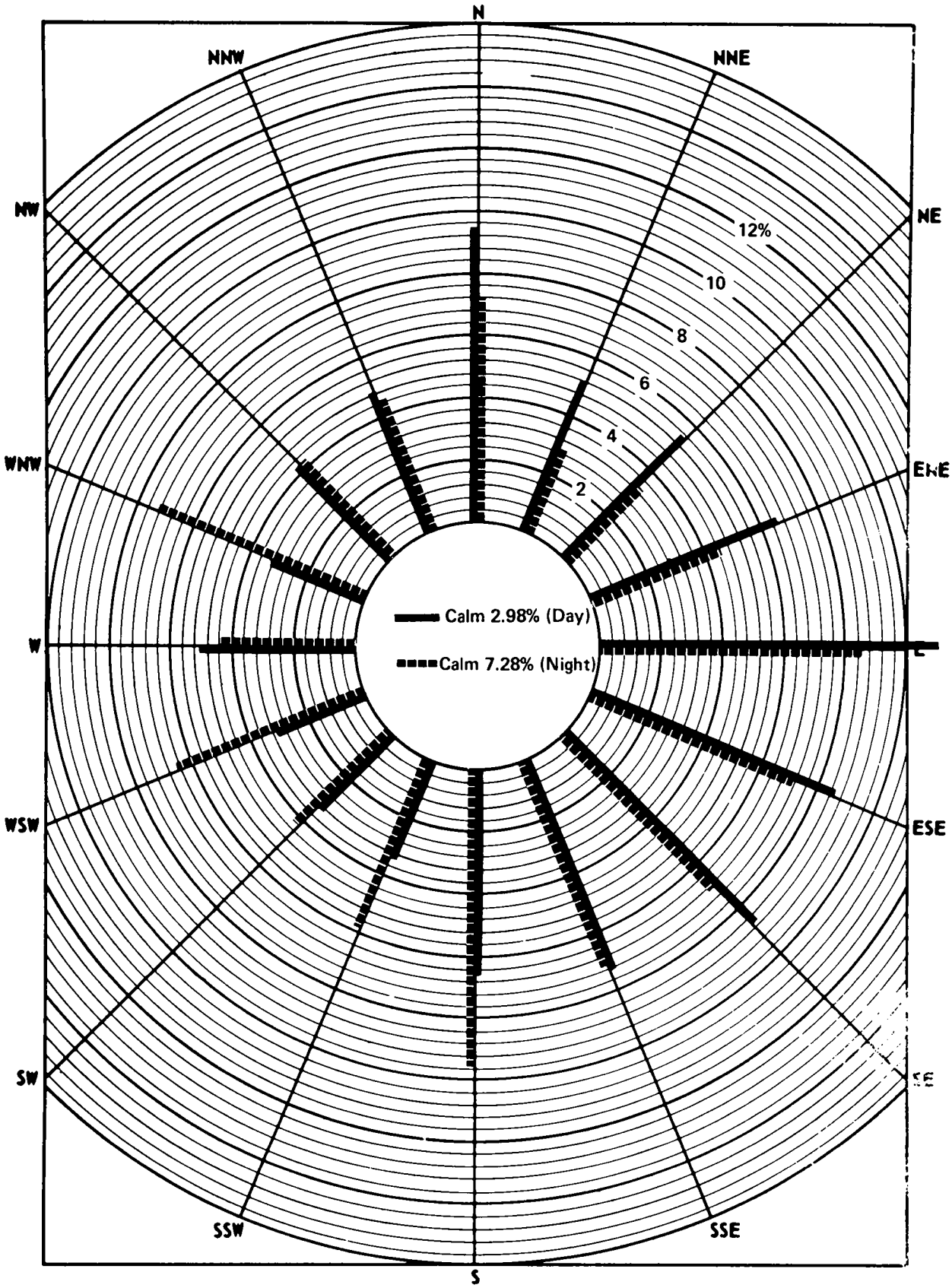

Figure 2-3. Average (Day-Night) Wind Distribution

during the daytime when air over land has been heated by the sun to a higher temperature than that over the neighboring sea; the latter occurs at night when the air over land has cooled to a temperature lower than that over the sea. In both cases, the cooler air moves in to replace the warmer air. Both phenomena occur commonly at KSC during the summer and infrequently during the winter. Intermediate frequencies occur during the fall and spring transitions. The effect of these two phenomena on frequency of wind direction is displayed in Figure 2-3. Onshore winds are more frequent during the daytime than at night while offshore winds are more frequent at night than during the daytime. The sea breeze has a depth of about 1 000 meters while the land breeze is considerably shallower. The inland penetration of the sea breeze is considerable during the summer time when the general flow must have an opposing component of the order of 6 mps to prevent onset of the sea breeze. Wintertime sea breezes do not penetrate very far inland.

2- Atmospheric Stability and Wind Speed[1]

Atmospheric stability is a measure of the degree of air turbulence and thus an indication of the capability of the atmosphere to dilute or disperse gaseous or fine particulate effluents. Stability together with wind speed are the two most important parameters for estimating dispersion characteristics of the atmosphere.

Other things being equal, stable atmospheric conditions result in poor dispersion. Stable conditions are most likely to occur during the nighttime. This is illustrated in Figure 2-4 which also shows that such conditions occur during about half of the nighttime hours.

Table 2-3 shows that stable conditions are more frequent in winter than in summer. Frequencies intermediate to those shown occur during the transition season of the spring and fall.

Practical formulae for estimation of diffusion given by Pasquill[7] indicate that downstream concentration is generally inversely proportional to average wind speed.

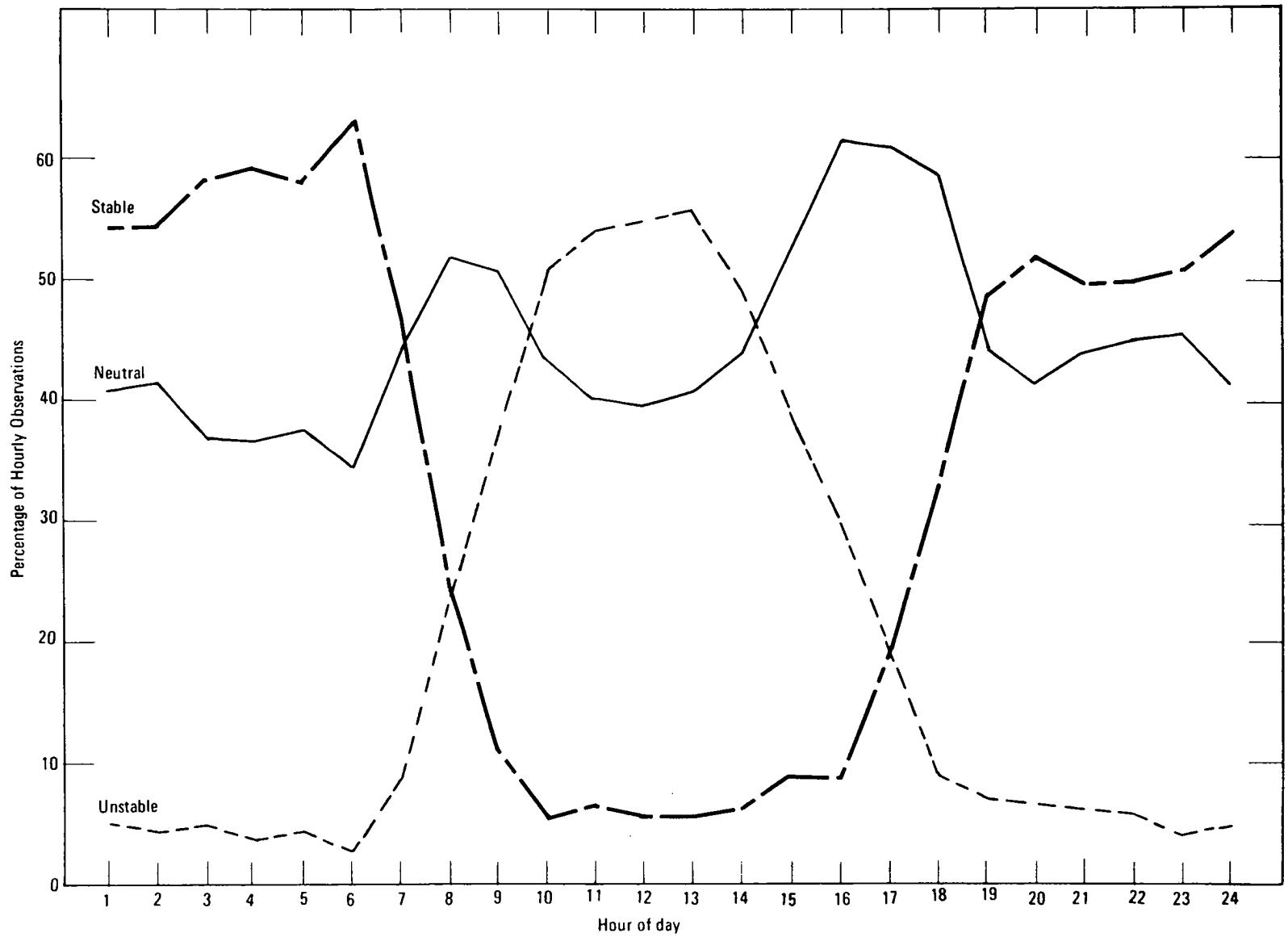

Figure 2-4. Frequency Distribution of Stability Classes by Hours of the Day

Table 2-3. SEASONAL DISTRIBUTION OF ATMOSPHERIC STABILITY
18 METER LEVEL - 150 METER NASA TOWER

Atmospheric Turbulence	Stability Classification	Summer June-Aug. %	Summer June-Aug. Wind Speed m/sec.	Winter Dec.-Feb. %	Winter Dec.-Feb. Wind Speed m/sec.	Annual Average %	Annual Average Wind Speed m/sec.
	Extremely unstable	1.8	2.8	0.6	2.2	1.1	2.9
High	Unstable	4.4	3.7	1.9	4.1	2.8	4.1
	Slightly unstable	19.4	4.6	12.9	5.1	15.2	5.0
Moderate	Neutral	44.9	4.3	40.4	5.1	44.9	4.9
	Slightly stable	21.4	3.1	28.9	4.3	24.6	3.8
Low	Stable	7.3	2.1	12.9	3.0	9.8	2.7
	Extremely stable	0.8	1.6	2.6	2.6	1.6	2.3

3- Wind Direction Persistence[1]

As defined here, wind persistence is the period of time that the wind blows continuously in a given direction range. These data are valuable when attempting to make subjective judgements regarding the length of time one might expect a cloud of released material to travel in any given direction.

There is a tendency for the greater persistence to occur in winds from the north and east. Winds from the north persisted for more than 10 hours for 18 percent of the time in one sector, and winds from the east persisted for more than 10 hours for 16 percent of the time, compared to the seven percent average for all directions.

(b) Upper Air Meteorology[1]

The Upper Air Meteorological data used were obtained from Rawinsonde recordings during the period May 1957 to November 1967 for the CKAFS weather station. Rawinsonde balloon soundings of the upper atmosphere are made at certain weather stations throughout the world at 1200 (7:00 A.M. EST) and 00 hours (7:00 P.M. EST) GMT. The data were reduced by computer processing to obtain summaries of seasonal and annual average wind direction and speed and vertical temperature structure data. The data were also reduced to provide information on wind speed and direction and inferred stability from temperature structure. These are discussed in the following:

1- Wind Direction and Speed[1]

The upper air data tape records provide wind data for the surface and at one kilometer increments of height. The upper air wind roses (Figure 2-5) show a difference in dominant wind direction in relation to the surface winds during all seasons. The radial values are percent occurrence of winds from direction indicated by wind rose. The upper level winds, at 2 000 to 5 000 meters, are from the west (blow out over the ocean) the great majority of the time, whereas the 1 000 meter winds are more equally divided between on-shore and off-shore components. During the winter months (December - February), the winds above 2 000 meters are almost entirely directed out to sea. The change in wind pattern is illustrated in Figure 2-5 showing the annual average wind roses plotted for levels from 1 000 to 5 000 meters.

The wind speeds are highest in the winter (December - February) months and lowest in the summer months (June - August) as shown in Table 2-4[1] Further, the speeds tend to increase with height. Values intermediate to those given occurred in spring and fall.

2- Temperature Structure and Stability[1]

Although no direct measurement of upper air stability is available, the temperature lapse rate (the negative of the vertical temperature

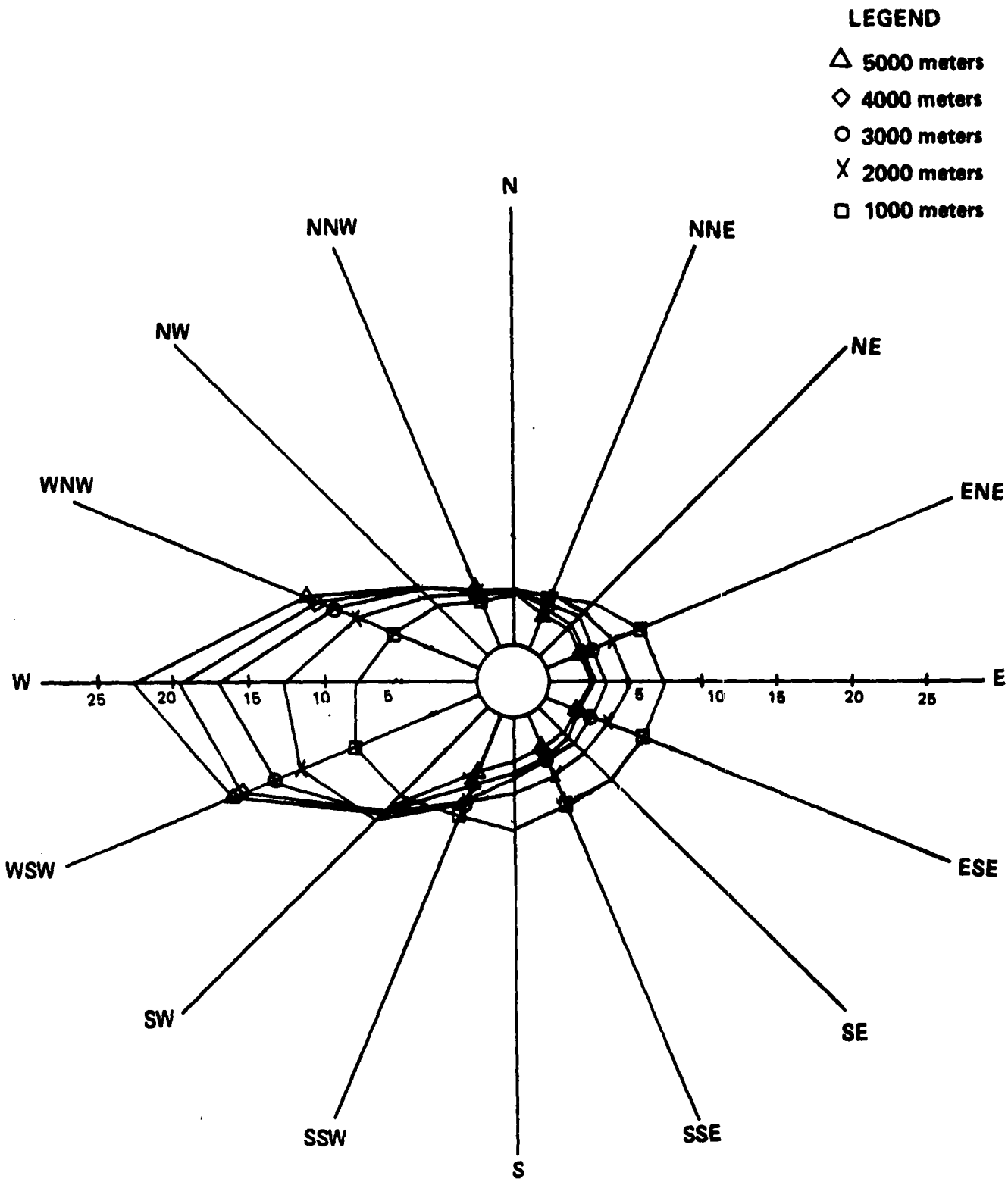

Figure 2-5. Upper Air Wind Rose at KSC from 7 AM and 7 PM Rawinsonde Data 1957 - 1967

TABLE 2-4. SEASONAL AND ANNUAL AVERAGE WIND SPEED AT KSC

Height (m)	Summer June-Aug (m/sec)	Winter Dec-Feb (m/sec)	Annual Average (m/sec)	Annual (4) (Median) (m/sec)
1 000	5.5	8.6	7.2	5.9
2 000	5.2	10.1	7.2	5.9
3 000	5.3	12.7	8.9	6.5
4 000	5.5	15.8	10.4	7.6
5 000	5.8	19.2	12.2	8.8

gradient) does provide an indication of stability when more exact measurements are not available. Thus, the availability of recorded temperatures as part of the Rawinsonde data provides a crude means of implying atmospheric mixing in the upper level air. Stable type conditions are estimated to extend from the surface to the 500-1 500 meter layer about one percent of the time.

Inversion conditions in which temperatures increase with height sometimes exist in the upper atmosphere and are of concern for atmospheric transport analysis since their occurrence may restrict vertical diffusion. In order to get a measure of the occurrence of upper air inversions, the upper air data were examined in 100 meter increments to obtain the percent of observations that include an inversion base (above 100 meters in height). This information is illustrated in Figure 2-6, showing the frequency of occurrence of inversion conditions as a function of base height. The most probable upper air inversion above 100 meters and below 3 000 meters is on the order of 2.1 percent. Of the inversions observed in the data, 80 percent were found to have a thickness between 100 and 600 meters.

(3) Distribution of Emissions[3]

The dispersion characteristics within selected layers of the atmosphere up to 10 KM are shown in Table 2-5[8][9]. The nocturnal inversion conditions referred to in the first line would correspond to the stable and extremely stable conditions listed in Table 2-5.

The distribution of combustion products into these layers for the Space Shuttle is shown in Tables 2-6 and 2-7.

(a) Lower Atmosphere Effects[3]

In a normal launch, the exhaust products are distributed along the vehicle trajectory (for about 135 seconds for the booster and about 8 minutes for the Orbiter). Due to the acceleration of the vehicle, the quantities emitted per unit length of trajectory are greatest at ground level and decrease continuously along the flight path.

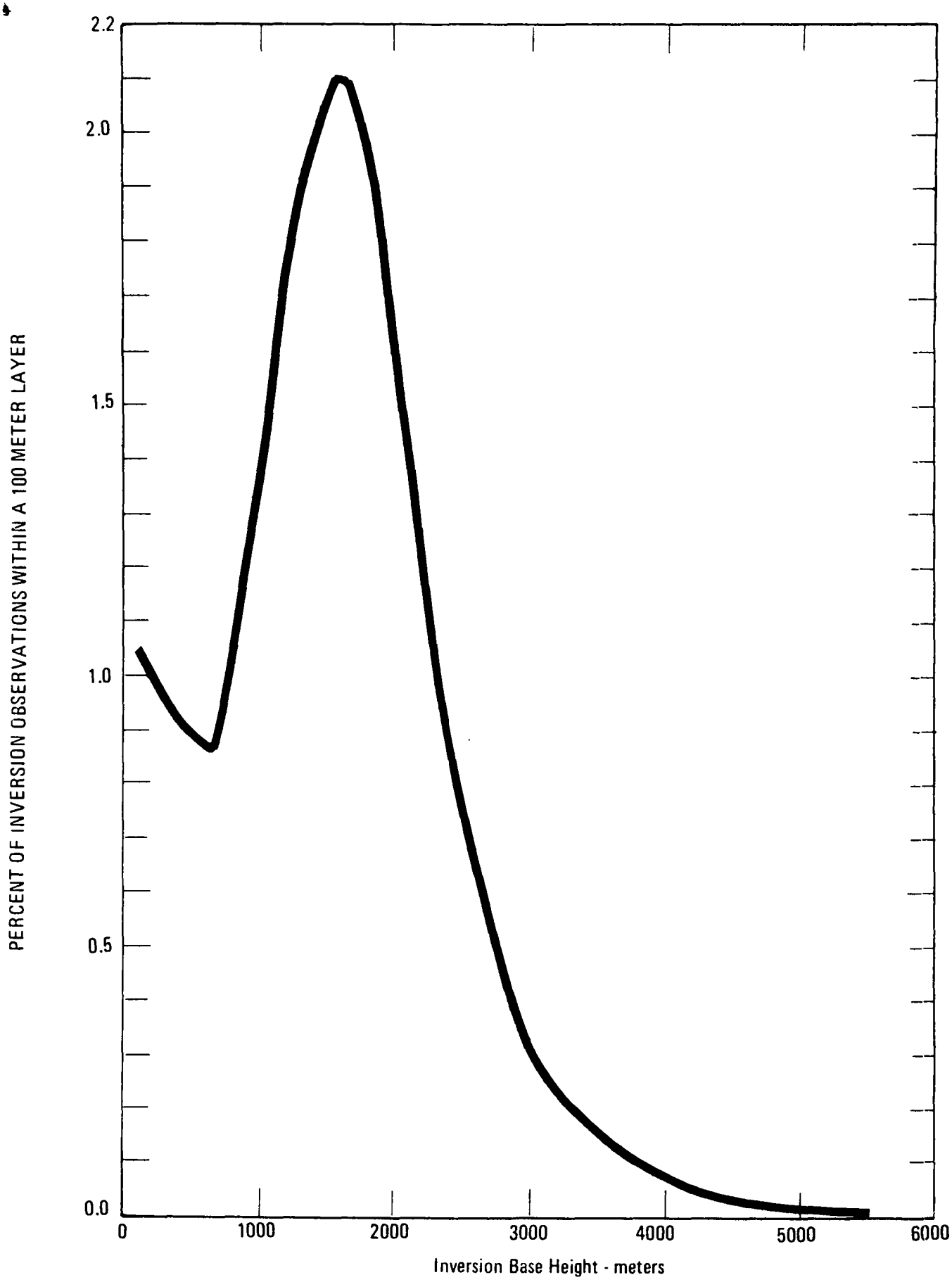

Figure 2-6. Frequency of Inversions at KSC from 7 AM and 7 PM Rawinsonde Data 1957 - 1967

TABLE 2-5. DISPERSION CHARACTERISTICS WITHIN SELECTED ATMOSPHERIC LAYERS [8][9] (UP TO 10 KM)

Atmospheric Layers; Altitude Range	Temperature Structure	Wind Structure	Characteristic Mixing Rate
Below nocturnal inversion 0-500 m	Increase with height	Very light or calm	Very poor
Below subsidence inversion 0-1 500 m	Decrease with height to inversion base	Variable	Generally fair to inversion base
Troposphere (above boundary layer) 0.5 - 10 km	Decrease with height	Variable; increase with height	Generally very good

TABLE 2-6. COMBUSTION PRODUCTS OF CONCERN EMITTED BY THE SPACE SHUTTLE VEHICLE - PARALLEL SRM AND ORBITER LOX/LH$_2$ ENGINES - INTO SELECTED ATMOSPHERIC LAYERS

Atmospheric Layer	Altitude Range	Combustion Product	Single Mission Quantity Emitted (Kilograms)	
			SRM	Orbiter
Surface Boundary Layer	0-500 m	CO	37 200	
		CO_2	6 600	
		HCl	31 900	
		Cl_2	91.6	
		Al_2O_3	43 300	
		H_2O	15 870	19 520
Troposphere	0.5-10 km	CO	113 100	
		CO_2	20 100	
		HCl	96 900	
		Cl_2	278	
		Al_2O_3	131 600	
		H_2O	48 100	62 200

TABLE 2-7. COMBUSTION PRODUCTS OF CONCERN EMITTED BY THE SPACE SHUTTLE VEHICLE - PARALLEL SRB AND ORBITER LOX/LH_2 ENGINES - INTO SELECTED ATMOSPHERIC LAYERS

Atmospheric Layer	Altitude Range	Combustion Product	Single Mission Quantity Emitted (lbs)	
			SRM	Orbiter
Surface Boundary Layer	0-1 600 ft	CO	81 883	
		CO_2	14 515	
		HCl	70 224	
		Cl_2	202	
		Al_2O_3	95 222	
		H_2O	34 900	43 000
Troposphere	0.27-5.5 n.mi.	CO	249 159	
		CO_2	44 168	
		HCl	213 682	
		Cl_2	613	
		Al_2O_3	289 748	
		H_2O	106 000	137 000

To permit assessment of potential air pollution from normal Shuttle launch, the amounts of CO, HCl, and Al_2O_3 have been calculated and are shown in Tables 2-6, and 2-7 for the low altitudes considered here. The motion and diffusion of the exhaust cloud rising from the launch pad after launch is calculated for the appropriate exhaust products and atmospheric conditions[10][11] The result of most importance is the history of the concentration of the pollutant at ground level downwind of the launch point should wind currents move a portion of the cloud to the ground. In all normal launch cases, the peak concentrations are well below the applicable maximum allowable 10-minute concentration levels to industrial workers* shown in Table 2-2. Figures 2-7, 2-8, and 2-9, show the peak centerline concentrations downwind from a normal launch with the VAB, Industrial Area and nearest uncontrolled populated area annotated on the figures.

To permit assessment of potential air pollution from an accident, the case of a pad abort with burning of solid rocket propellants on the pad has been considered. Exhaust cloud concentrations of CO, HCl, and Al_2O_3 have been calculated as a function of distance downwind of the launch pad for this abort case. Peak concentrations are about 5 to 10 times larger for this case than for the normal launch, but would still be below the 10-minute maximum allowable concentration levels to industrial workers* of Table 2-2 for distances beyond 300 to 400 meters (1 000 to 1 300 feet), well within the controlled area. See Figures 2-10, 2-11 and 2-12 for abort case.

Additional criteria have been developed for the general public for exposure to hydrogen chloride[12] and are annotated on Figures 2-9 and 2-11. Guides for hydrogen chloride are:

Concentration	Effect
1-10 ppm	Odor threshold
5-10 ppm	Disagreeable or irritating

*The maximum allowable 10-minute exposure concentration levels to industrial workers, for varied conditions, are also shown in Figures 2-7 thru 2-12.

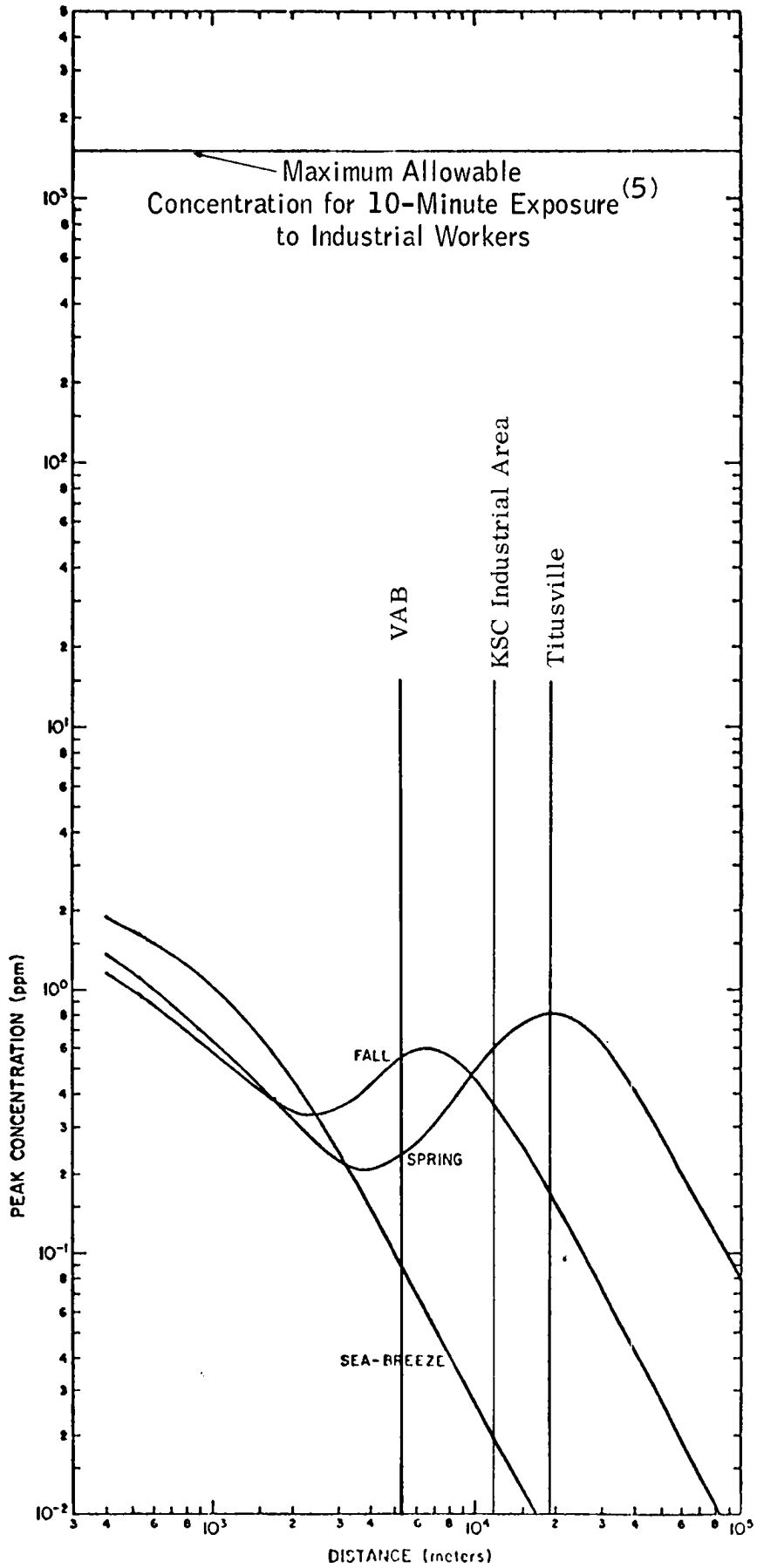

Figure 2-7. Peak Centerline Concentration of CO at the Surface Downwind from a Normal Launch

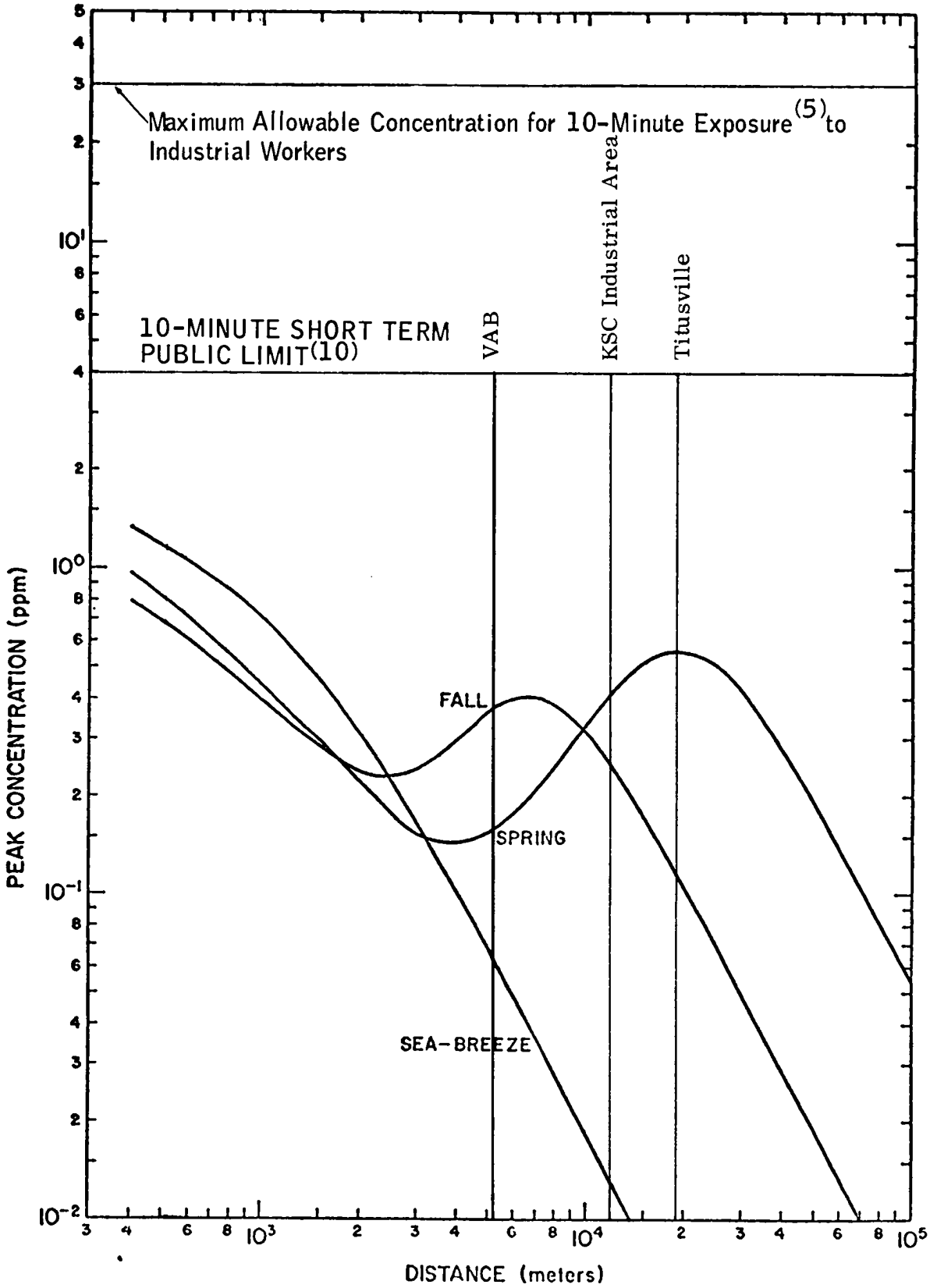

Figure 2-8. Peak Centerline Concentration of HCl at the Surface Downwind from a Normal Launch

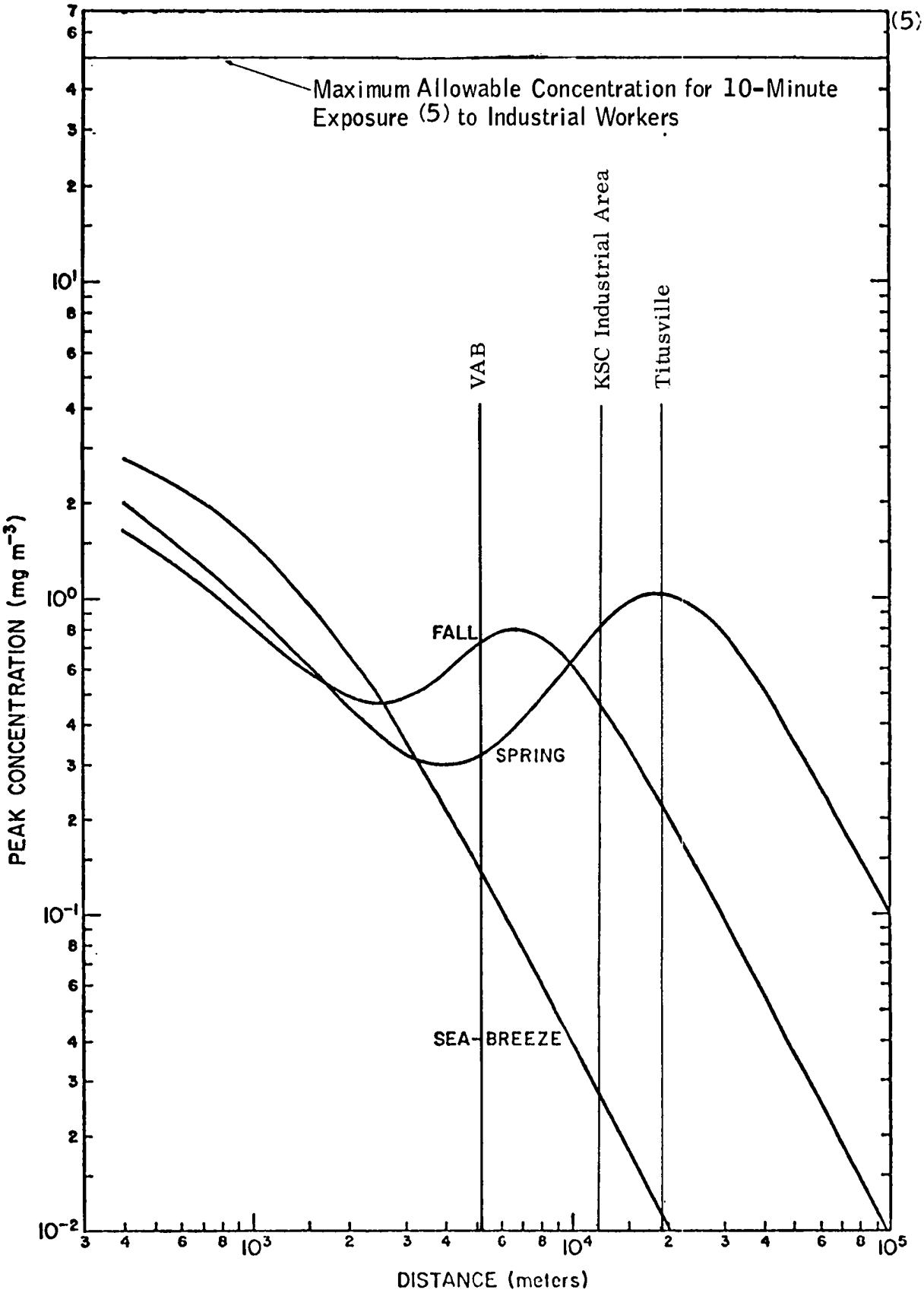

Figure 2-9. Peak Centerline Concentration of Al_2O_3 at the Surface Downwind from a Normal Launch

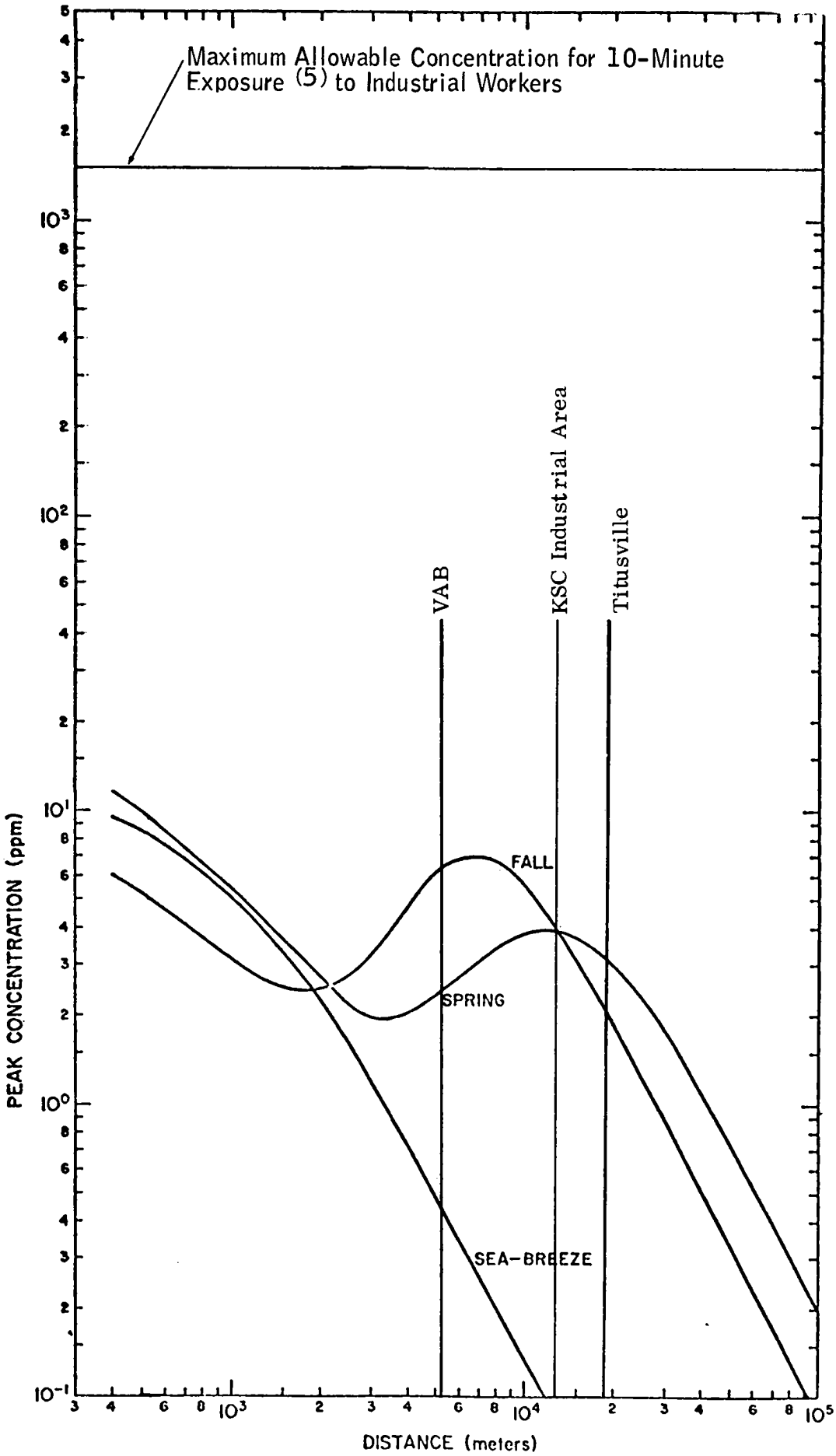

Figure 2-10. Peak Centerline Concentration of CO at the Surface Downwind from a Pad Abort

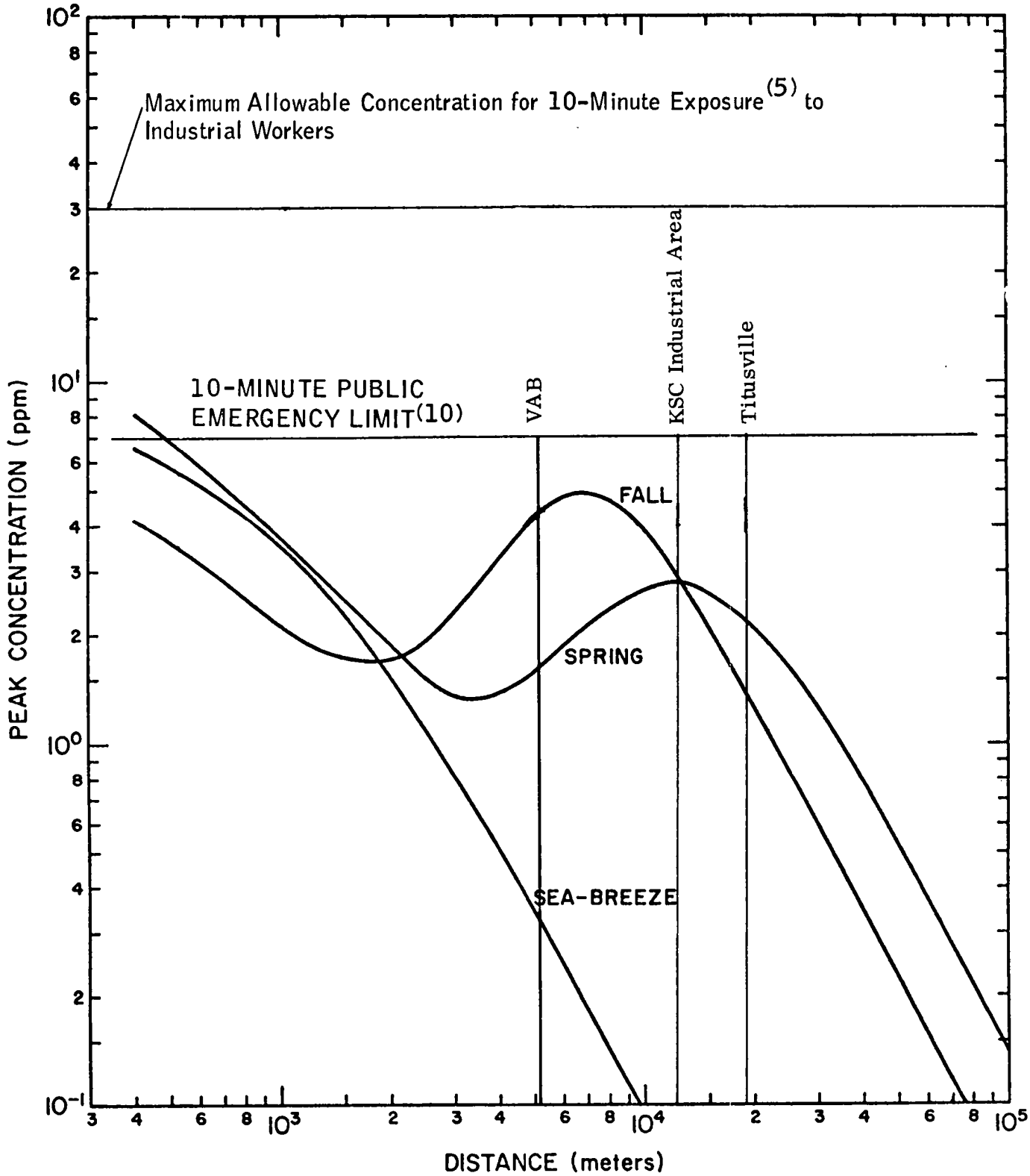

Figure 2-11. Peak Centerline Concentration of HCl at the Surface Downwind from a Pad Abort

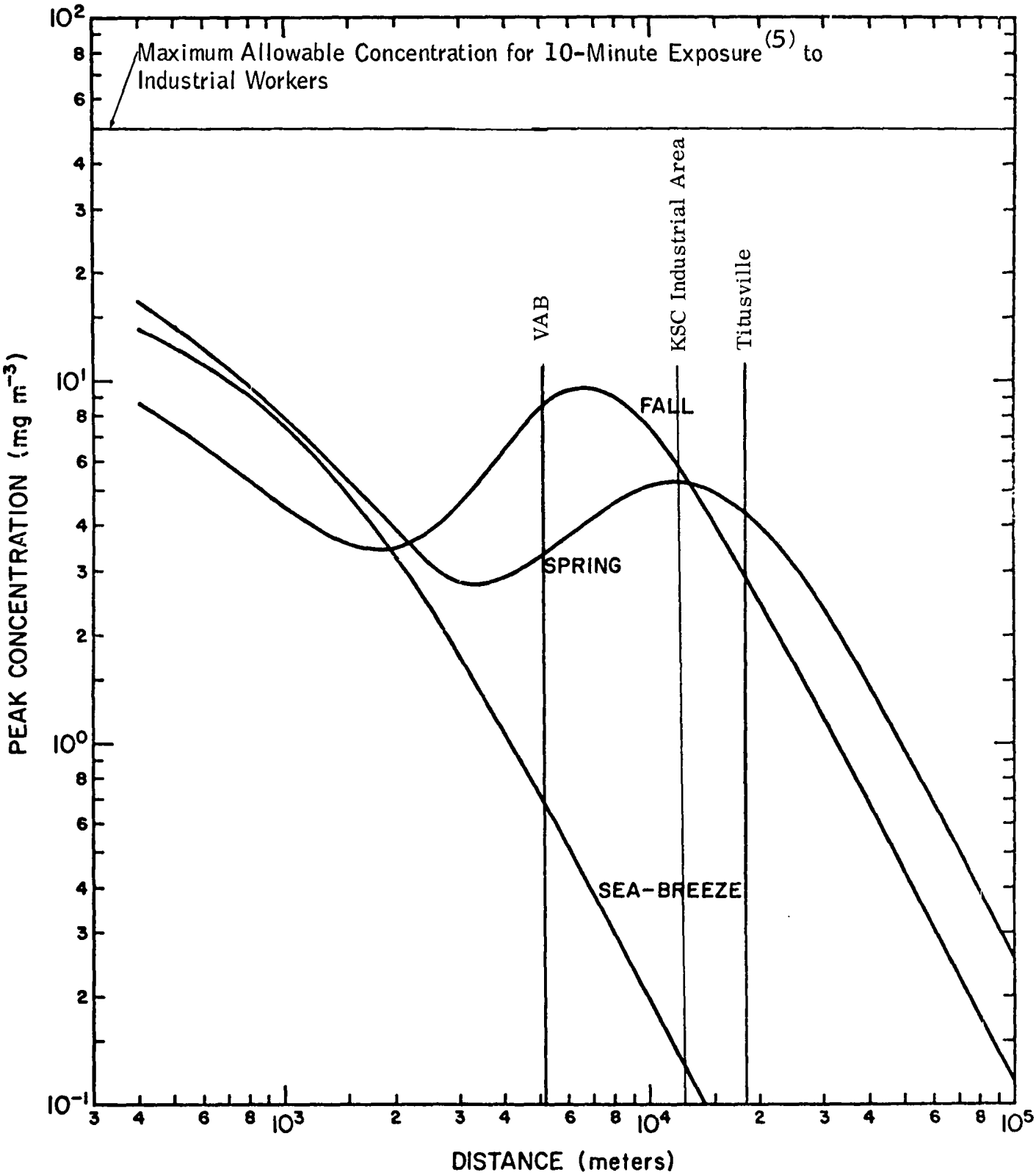

Figure 2-12. Peak Centerline Concentration of Al_2O_3 at the Surface Downwind from a Pad Abort

Short Term Public Limits (Normal Launch)

Concentration	Recommended Limit
4 ppm	10 minute public limit
2 ppm	60 minute public limit

Public Emergency Limits (Pad Abort)

7 ppm	10 minute public limit
3 ppm	60 minute public limit

These concentration levels are time-weighted averages considered to present no health hazards. Excursions above these levels are likely to produce objectionable odors and/or irritation. Although at some locations downwind the recommended limits for 10- and 60-minute exposures may be exceeded briefly as the result of a pad abort or fire at SRB facility or VAB, the time dependence of the concentration at these locations is such that the time-averaged concentration is less than the recommended limits for the specified periods of time. Environmental health personnel conduct surveillance to establish levels and zones of contamination. The action taken to assure protection will depend on exposure within these zones.

The National Academy of Sciences/National Research Council Report[11] summarizes the known effects of HCl on wildlife. There would be no effects of even the predicted peak ground level concentrations of 9 ppm for a pad abort.

HCl is reported[10] to be of only minor concern as to its effects on vegetation in comparison to other phytotoxic air pollutants such as ozone, hydrogen fluoride and ethylene. The threshold of injury is apparently 5 to 10 ppm if continued for a few hours. In the Space Shuttle worst case situation (a pad abort), this threshold limit could be reached for the order of a few minutes and only in the immediate environs of the pad itself.

It should be noted that, since the outset of the manned space program through February 1972, 100 percent of the NASA manned launch vehicles have

been successful through first staging. It is expected that the reliability of the booster and orbiter will be as good as that demonstrated to date by manned launch vehicles.

(b) Upper Atmosphere Effects

No adverse atmospheric pollution effects of shuttle operations are foreseen in the troposphere (the region of the atmosphere up to about 10 km) because of the short residence time of particulates and the rapid mixing with the ambient atmosphere of shuttle-produced water vapor and gases, except for HCl scavenging by rain in the atmospheric boundary layer (i.e., from the surface of the earth up to approximately 1 000 meters).

The discussion of stratosphere (the region of the atmosphere between about 10 km and 50 km), not peculiar to KSC and beyond, can be found in the program statement [3]

(c) Effects of Rain [3]

In addition to dispersal by air currents, possible precipitation (rain) scavenging of HCl from the solid rocket exhaust cloud has been analyzed[11] This phenomenon may occur only if the Space Shuttle is launched during rain showers or if such showers occur along the first 100 kilometers (54 nautical miles) of the downwind trajectory of the elevated ground cloud of the exhaust products. If this trajectory is over water rather than land, there are no potential harmful effects because of immediate dilution. For the over-land trajectories of the exhaust cloud, the possible harmful effects of rain containing HCl will be analyzed prior to each firing. Operational constraints to eliminate the possibility of unacceptable scavenging conditions will be imposed on Space Shuttle launches.

(4) Construction Phase

Three sources of air pollutants associated with the construction phase of the LDS and the MCF Facilities can be identified. They are: (1) dust raised by construction activities: (2) exhaust emissions from construction equipment; and (3) burning of brush cleared from the site and waste construction materials.

The environmental importance of sources (1) and (2) is not expected to be significant and no controls are needed. Source (3), burning of brush and waste construction materials will be carefully controlled to minimize the environmental impact.

An estimated 1350 acres of brush will be cleared. Smaller pieces of this brush will be shredded and used as stabilizing compost material. Larger size material that cannot be shredded will be gathered into piles of optimal size for controlled burning. Burning operations will be allowed only during periods of favorable atmospheric conditions in accordance with existing Florida and Federal Regulations. The EPA Office of Solid Waste Management Programs has advised that the "area overburden" is not subject to Mandatory Guidelines, and is classified as agricultural type waste.

Experience at KSC indicates that burning can be made to coincide with suitable meteorological conditions and in such a way as not to have a significant environmental effect.

c. Water Quality[3]

(1) Source and Nature

In the Space Shuttle Flight System, with planned recovery of all elements of the Space Shuttle except the Orbiter tank, the potential impact of the program flight aspects on water quality is limited to:

- On-pad accidents and propellant spills which may result in run-off of propellants to local drainage systems.
- In-flight failures which may result in vehicle hardware and propellant landing in the ocean.
- Controlled reentry of spent Booster and Orbiter HO tanks (treated separately in this statement).
- Construction and operation of facilities.

Provisions such as dikes and catch basins are made for containing on-pad spills and disposing of the spilled propellant without contaminating the water

(or air) environment. On-pad vehicle failures would normally be expected to result in a fire that consumed most or all of the propellants, and, thus, have been handled in the section on air quality. Any unconsumed propellant would be treated in the same way as a spill.

Potential sources of pollutants to the marine environment and the major pollutants as described in the Program EIS are:

Hardware	- Heavy metal ions and miscellaneous compounds
Solid propellants	- Ammonium perchlorate
Liquid propellants	- Monomethylhydrazine, N_2H_4, Aerozine-50, N_2O_4
Lubricants, hydraulic fluid	- Hydrocarbons

Possibilities of water pollution are primarily associated with toxic materials which may be released to and are soluble in the water environment. Rocket propellants are the dominant source of such materials. Impact of the Orbiter tank would release liquid hydrogen and liquid oxygen which would burn or evaporate rapidly into the atmosphere. The two toxic materials (low maximum allowable concentration), hydrazine and Aerozine 50, are contained in the Orbiter only, and would be returned to the launch site. However, if the Orbiter were forced to abort to a water landing, these materials would enter into the water. The quantities listed in Table 1 of Reference 3 would be the maximum quantity involved and would dilute to non-toxic levels of concentration within the area affected by the emergency landing.

The ammonium perchlorate in solid propellants is mixed in a rubber binder and would thus dissolve slowly. Toxic concentrations would be expected only in the immediate (within a few feet) vicinity of the propellant, if they occur at all. As noted in Table 7, of Reference 3, the toxicity is relatively low (high maximum allowable concentration).

A secondary consideration relates to oils and other hydrocarbon materials which may be essentially immiscible with water but, if released, may float on the surface of the water. Quantities of hydrocarbons used are small (Table 2 of Reference 3).

Jettisoned or reentered hardware will corrode and thus contribute various metal ions to the environment. The rate of corrosion is slow in comparison with the mixing and dilution rate expected in a marine environment, and hence, toxic concentrations of metal ions are not expected to be produced. The miscellaneous materials (e.g., battery electrolyte, hydraulic fluid) are present in such small quantities that, at worst, only extremely localized and temporary effects would be expected. In the immediate offshore areas of KSC there is ample current to ensure dispersion of these materials. Reference water movement studies[13][14]

(2) Local Geology and Hydrology[1]

The principal ground water source in the coastal lowlands arises from the Floridan aquifer, a limestone aquifer which underlies the entire Saint Johns River and adajacent coastal basins of Florida. It is the principal source of water for all uses except some industrial processes and in the generation of electric power. In addition to the Floridan aquifer, some small municipalities and rural domestic users obtain ground water from shallow sand or sand and shell aquifers that occur above the Floridan aquifer.

Moderate amounts of good quality water can be obtained from the shallow sand and shell aquifers and from sand and shell beds in the area along the coast where the water in the Floridan aquifer is of poor quality. Below these sand and shell beds overlying the artesian aquifier are beds of sandy clay, shells and clays which serve to confine water under pressure in the underlying artesian aquifer. Ground water in Brevard County occurs under both unconfined conditions (nonartesian aquifer) and confined conditions (artesian aquifer). Generalized hydrologic conditions are shown in Figure 2-13.

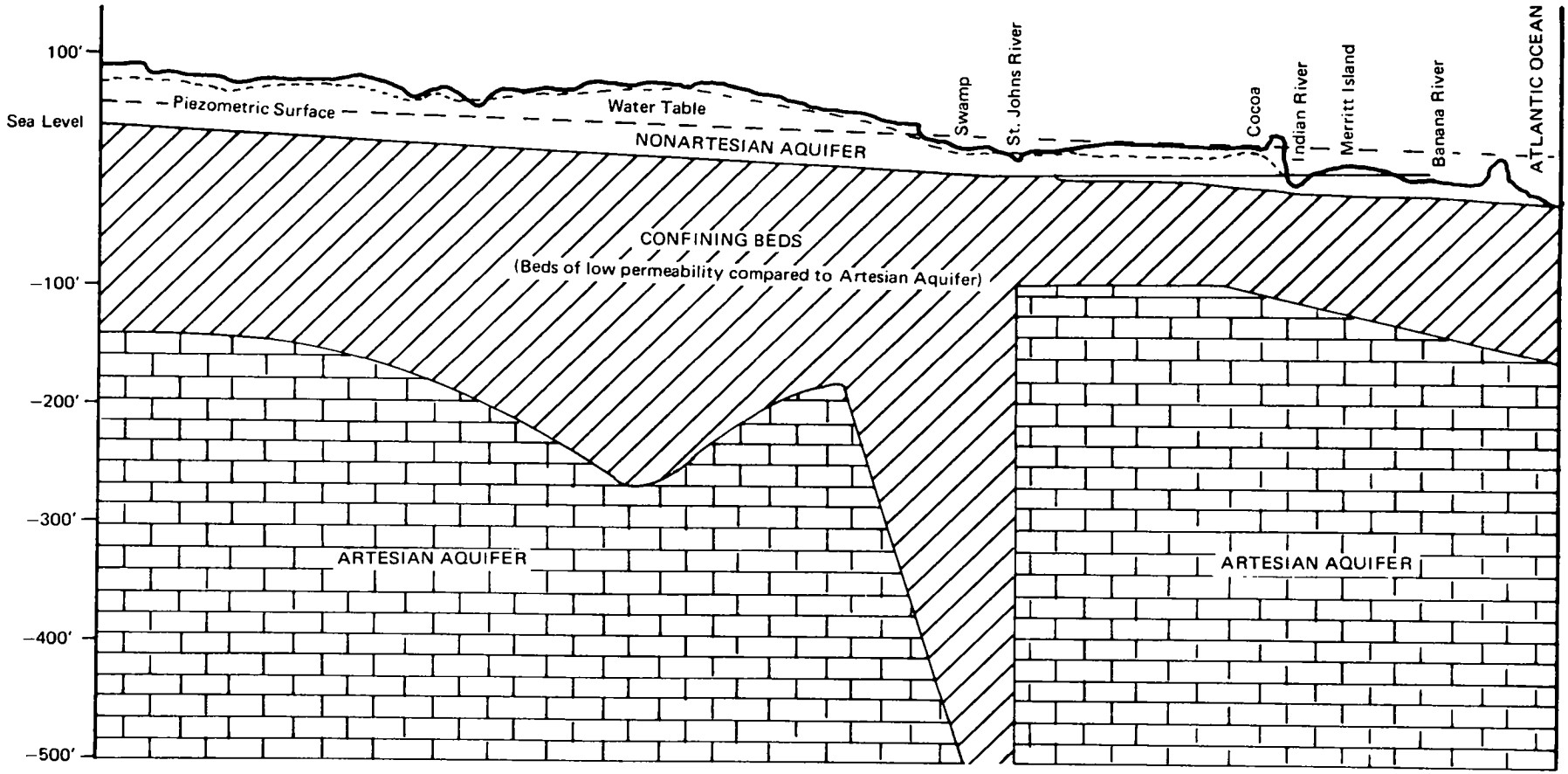

Figure 2-13. Generalized Hydrologic Conditions in East Central Florida [12]

(a) Nonartesian Aquifer[1]

On Merritt Island where the soil is very sandy, a large part of the rainfall soaks into the ground. Although part of this water is returned to the atmosphere by evaporation and transpiration, most of it seeps downward to the zone of saturation. Water in the zone of saturation moves laterally toward the ocean or river. On the mainland, flow is generally east and west from the water table divide which is parallel to and 0.5 to 1.5 miles west of the Indian River. Recharge of the shallow aquifers occurs directly by local rainfall and by percolation from bodies of surface water.

(b) Artesian Aquifer[1,15,16]

The confining beds below the shallow aquifers have very low permeability. There is no probable way that pollutants introduced into the nonartesian aquifer could permeate to the artesian aquifer below. This artesian aquifer is the source of local municipal water supply. The Floridan aquifer through which most of the ground water flows is made up of several hydraulically connected permeable limestone beds.

Recharge to the artesian aquifer is almost entirely from rainfall within the Saint Johns River Basin.

The source of the largest supply of ground water in Brevard County is, as for the whole of the Saint Johns River Basin, the Floridan aquifer. Ground water moves generally toward the northeast and leaks upward into the shallow aquifers and discharges to submarine springs off the coast. On Merritt Island and the other barrier islands, it flows northwestward in the area north of Cocoa Beach; northeastward in the area between Cocoa Beach and Melbourne, and directly east in the area south of Melbourne. KSC receives its water through the City of Cocoa municipal supply whose wells are located in Orange County.

In 1970, KSC used approximately one million gallons per day (gpd) out of a peak of 26 million gpd supplied by the Cocoa Municipal Water Supply.

In 1980, when the Shuttle requirements are expected to reach a maximum usage, it is predicted that KSC will require about 0.85 to 0.9 million gpd out of an estimated output of 35 million gpd. The requirements of KSC for the operational period are projected to be less than that required for the Apollo program and will amount to only a relatively small portion of the overall demand for water resources.

Of the 0.9 million gpd currently being used, about 25 percent is estimated to reach Banana Creek or the Indian River, and 32 percent is estimated to percolate into the ground water table. There is presently no program underway for artificial recharge back to the aquifer. The remainder of the water is cooling tower loss and evaporation.

KSC recognizes that ground water along coastal plans is becoming a serious problem and that overpumping will result in salt inundation. However, overpumping at KSC does not occur. KSC has seven small wells 200 to 300 feet deep that have a total capacity of 2450 gallons per minute (gpm). These wells are used as standby only. It is estimated that these wells, which are operated for maintenance checks only, did not pump over 600 000 gallons in 1971, not a significant drawdown from ground water aquifer in this location. Also, there are eight standby shallow wells about 25 feet deep which have a total capacity of 315 gpm.

(c) Surface Water Hydrology[1]

As described in the preceding section, surface waters are plentiful in the Cape area. Aside from the ocean itself, these include the mainland streams and lakes, and the Indian River Basin. The latter is considered to include the many sloughs and marshes in the Merritt Island area. In fact it has been estimated from Reference (13) that the total land associated area of approximately one million acres within 50 kilometers (~30 miles) of the launch site, approximately 228 000 acres are covered by surface water. Approximately one-half of the land associated surface area within 20 kilometers (~13 miles) is covered with surface water. Most

of this surface water area consists of the Indian and Banana Rivers and the Mosquito Lagoon.

Drainage in the coastal strip between the Saint Johns River and the Atlantic Ocean is into lagoons, formed by barrier islands, and to the ocean.

The Indian River has only one direct connection to the ocean at Sebastian Inlet, located in south Brevard County. It has two indirect connections: at the northern end, the indirect connection is through Haulover Canal to the Mosquito Lagoon and then through Ponce de Leon inlet to the Atlantic, southward, the connection is through the Fort Pierce inlet at Fort Pierce.

Out to depths of about 60 feet sandy shoals dominate the underwater topography. The bottom continues seaward at about the same slope out to about 30 miles where the bank slopes down to depths of 2 400 to 3 000 feet to the Blake Plateau. The Blake Plateau extends out to about 200 nautical miles to the Blake Escarpment which is the name given to the Continental Slope in these waters and then a sharp drop in depth to about 16 000 feet to the western edge of the Blake-Bahama Basin, at a downrange distance of about 220 nautical miles.

Water movements in the area have been investigated by oceanographers of the Woods Hole Oceanographic Institute (WHOI) and the Chesapeake Bay Institute (CBI) of the Johns Hopkins University[13] working in support of Space Nuclear Systems Division, USAEC.

The results of a study carried out during March and April 1962 by WHOI indicate a shoreward direction of the current for the entire depth, surface to bottom, in the region out to depths of 60 feet (~16 nautical miles) at speeds of several miles per day[13] Wind-driven currents generally determine the current flow at the surface. In the region out to the sloping bank (Blake Plateau), the flow is slightly to the north with an east reversal when the winds blow to the south. Water over the Blake Plateau flows to the north most of the time, (known as the Florida Current of the Gulf Stream), and begins at the Straits of Florida and runs northward to Cape Hatteras at a mean speed of 3.5 knots, transporting about $38 \times 10^6 m^3$/sec on the average.

(3) Effect on the Environment

Two factors are of concern when addressing the subject of water quality. The first is associated with its availability to support the project in sufficient quantity without impacting the available sources and competing requirements (industrial, municipal, agricultural); the second is whether the proposed action results in possible pollution of the water sources.

The primary municipal water supplies are obtained from ground water sources. Approximately 97 percent is derived from these sources with the Floridan artesian aquifer supplying the greatest part. The majority of the public water supply is also obtained from this source where possible; otherwise they employ shallow wells to 120 feet where high levels of chloride are present in the Floridan aquifer. In 1980 when the Shuttle requirements are expected to reach a maximum usage, it is predicted that KSC will require about 0.85 million gpd out of an estimated output of Cocoa Municipal Supply of 35 million gpd. The requirements of KSC for the operational period are projected to be less than that required for the Apollo program and will amount to only a relatively small portion of the overall demand for water resources.

The chief potential for water pollution is the propellants, and since in a normal launch essentially all propellants or propellant products are injected into the atmosphere and the hardware is recovered (except for the HO tank), the case of abnormal launch is considered. In the event of an in-flight failure in the early stages of flight, the booster and HO tank would probably impact intact and the quantities of propellants remaining is shown in tables of Reference 3. The orbiter would be expected to separate intact and return to the launch site. In the event of an aborted flight, EPA will be notified of any large discharge of hazardous material to assure that further investigation can be accomplished by suitable scientists.

Handling of propellants at KSC will follow the same procedures established and proven by the successful operations for the Apollo and other program efforts.

The following contaminants may be flushed from the casings:

- Salt water
- Residue from burnt insulation and combustion products
- By-products of corrosion
- Preservative/petroleum base
- Paint, paint products

The contaminants are basically inert except for the preservatives and paint products. Applications and handling of these products will be closely controlled and industrial waste drain system will be designed to capture excess or spilled materials. Disposal of these small quantities will be in compliance with governing regulations. The control of potential pollutants will be accomplished by a carefully designed industrial waste system, and will be in accordance with existing Florida and Federal Regulations.

(c) Parachute Building

All operations in this facility are basically clean. All waste water from the flushing/rinsing cycle for the parachutes will be diluted to less than 2 percent salinity prior to introduction into the existing treatment plant system. The toilets will also be connected to the existing sanitary treatment facilities.

(d) Hypergolic Pod Processing and Storage Facility

The construction and operation of the Hypergolic Pod Processing Facility will not adversely affect the environment. There will be no propellants used at this facility that have not been used at KSC or CKAFS during other programs. Accidental spills could cause some impact on the environment by releasing propellants such as nitrogen-tetroxide, hydrazine and aerozine-50 into the surrounding air and water; however, actions will be taken to prevent or minimize the effect of such accidents by use of rigid processing and handling procedures, and by the construction of facilities to collect spills, immediately dilute with water, and prevent escape of harmful materials to the adjacent ground, water, or air.

(e) Maintenance and Checkout Facility

The construction and the operation of the Maintenance and Checkout Facility will be controlled so as to not adversely effect the environment. Erosion control practices will be used during construction to control erosion run-off. Sanitary/sewage disposal facilities existing in the area will be utilized. Fluids used in the operation of this facility will be handled and disposed of in accordance with current standards set by the Federal Water Pollution Act as implemented by State Regulations.

d. Noise[3]

(1) Source and Nature

The major sources of noise associated with the Space Shuttle program will be the noise generated by the rocket engine exhaust flow during engine tests and launches and that of the sonic boom. The nature of the rocket engine noise may be generally described as intense, of relatively short duration, and spectrally composed of predominately low frequency energy. Operations planned in the new and modified facilities listed previously are of an industrial assembly nature (the exception being the Landing Field), and do not produce significant noise. Noise pollution as a result of construction projects is not anticipated to be a problem as all projects will be carried on within the boundaries of KSC which includes a large buffer zone for rocket launches. Transportation of construction materials to the site will be via normal commercial train and truck traffic over existing rail and limited access highway systems.

The abruptness of the acoustic pressure changes is responsible for much of the concern about the sonic boom. It gives it the startling audibility and dynamic characteristics of an explosion, and even at great distances from the vehicle where pressure levels produced are physically harmless, some public complaints are received. Sonic boom is likely to be of concern in Shuttle operations because segments of the trajectories followed during ascent and descent involve supersonic flight within the atmosphere.

Extensive research on the effects of noise on man and structures[3] has been conducted. These research studies have provided some means to establish realistic damage and annoyance criteria. A particularly useful reference is the authoritative summation of this work by the International Civil Aviation Organization (ICAO)[17]. In this review of the effects of sonic booms, the ICAO found:

(a) The probability of immediate direct injury to persons exposed to sonic boom is essentially zero.

(b) The percentage of persons queried who rated sonic booms occurring 10 to 15 times daily as annoying increased with increasing overpressures. For overpressures less than about 24 newtons per square meter (N/m^2) (one-half pound per square foot), no one rated the boom as annoying; about ten percent considered 48 N/m^2 (one psf) sonic booms annoying and nearly all considered 144 N/m^2 (three psf) booms annoying.

(c) Primary (loadbearing) structures meeting acceptable construction standards or in good repair showed no damage up to overpressures of about 950 N/m^2 (20 psf). Nonprimary structures such as plaster, windows and bric-a-brac sustained some damage at overpressures of from 48 to 144 N/m^2 (one to three psf).

(d) Ground motions from sonic booms were found to be of the magnitude caused by footsteps.

These results provide general criteria against which to consider sonic booms generated by the Space Shuttle. The annoyance criteria are conservative in view of the expected low frequency of shuttle flights (at most about one per week).

The environmental effect of noise presented herein are provided for two regions surrounding the Space Shuttle launch site, controlled and uncontrolled areas, see Figure 2-14. The controlled areas are those areas in which personnel and facilities are under direct government control, i.e., government-owned land and buildings. Uncontrolled areas are those regions which are not under direct government control. The

data for resident population[18] has been reduced to a population wheel (out to 100 kilometers) in Figure 2-15.

(2) Environmental Effects - Controlled Areas

Damage risk criteria for the rocket engine noise for personnel in controlled areas are presented in Table 9 of the Space Shuttle Program Environmental Statement. Space Shuttle operational personnel within this area will be protected either by personnel protective equipment or by isolation so that these limits will not be exceeded. Throughout the Apollo/Saturn V Program, vehicles generated frequencies and intensities of the same order as those predicted for the Space Shuttle, operational observers were stationed 3 500 meters (11 500 feet) from the launch pad in a small enclosure, and emergency crews were located approximately 550 meters (1800 feet) from the launch site in standard armored personnel carriers. None of these personnel have suffered injury or distress from noise parameters.

Structural damage is possible with low-frequency high-intensity noise. Therefore, structures within the controlled area will be designed to withstand the noise environment to which they are to be exposed.

Figure 2-16 "Launch Site Zones", shows the predicted noise contours during launch of the Space Shuttle. The contours shown are drawn to allow for launch on all of the suitable azimuths. The existing VAB is located inside the 120 db contour within the control zone. The entire area on land within the 115 db contour is on existing government reservation with a small portion extending onto the CKAFS to the south along the coast. No uncontrolled population will exist within the 115 db contour.

(3) Environmental Effects - Uncontrolled Areas[3]

For these areas, a general noise exposure criterion of a maximum overall sound pressure level of 115 db, referenced to 0.00002 N/m^2, for both man

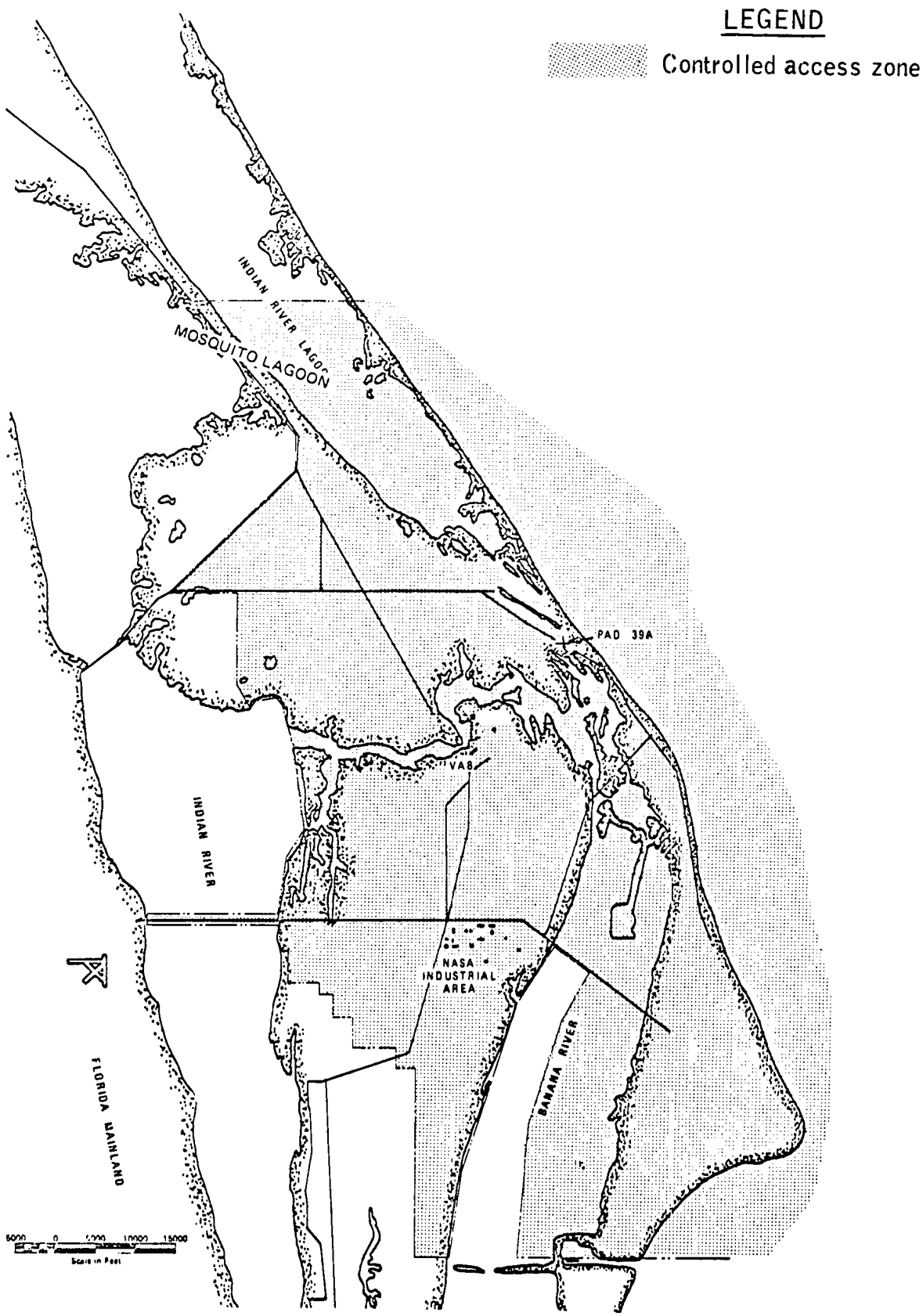

Figure 2-14. Controlled Access Zone and Vicinity

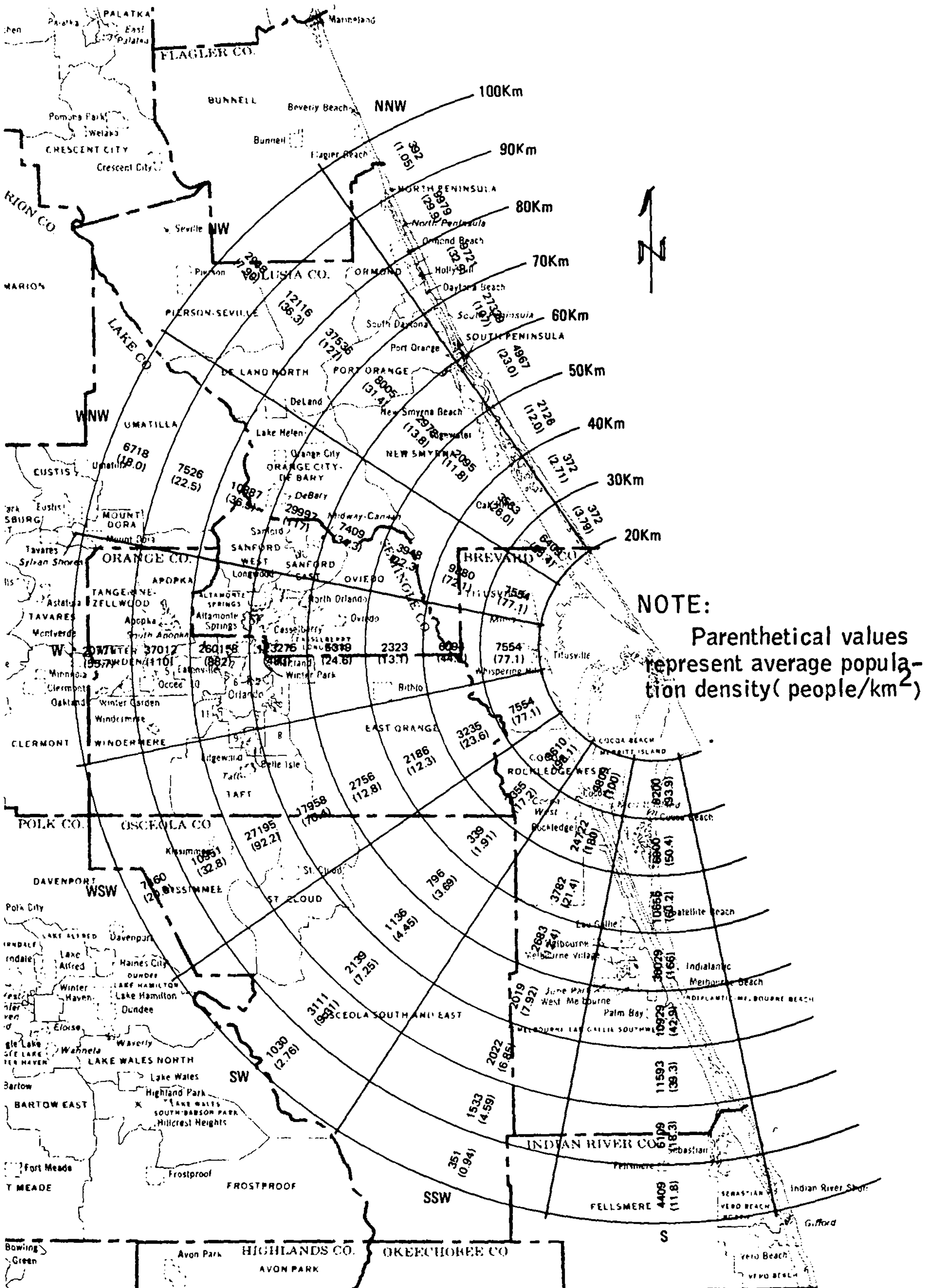

Figure 2-15. Population Wheel (1970 Population) for East Central Florida

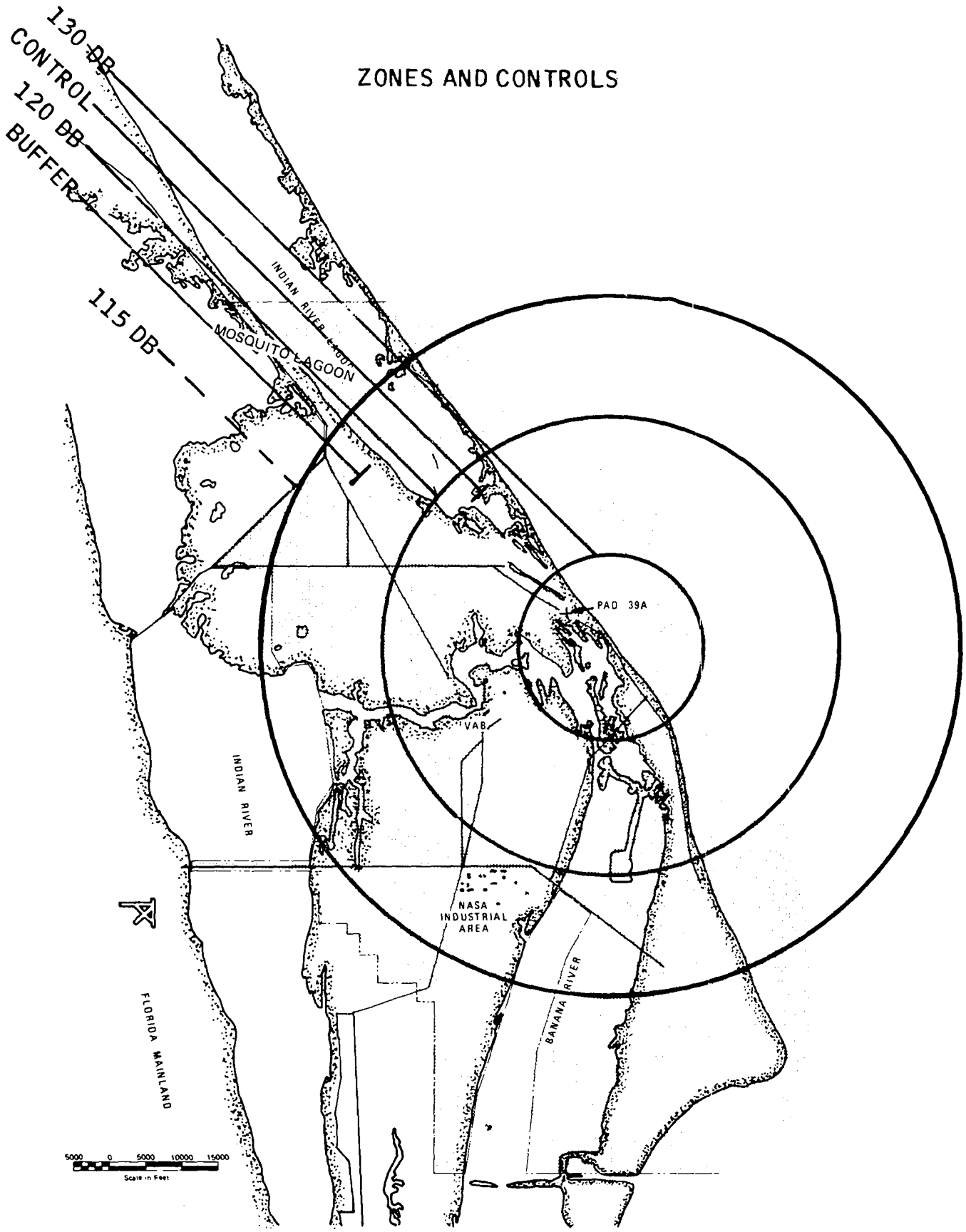

Figure 2-16. Launch Site Zones

and structures has been established by the Launch and Landing Site Review Board with respect to rocket engine noise. Normally, the acoustic energy which propagates into this region is of low frequency content, i.e., 100 Hertz and below. For acoustic energy in this frequency range, the 115 db Overall Sound Pressure Level (OASPL) criterion is considered acceptable and has been substantiated by personnel and community noise exposure experienced during Apollo/Saturn 1B and V Launches[18] and analysis of structural damage from low frequency noise.

Figure 2-16, "Launch Site Zones", outlines the predicted noise contours associated with the launch of the Space Shuttle from Launch Complex 39. The contours are drawn assuming launches into various orbits on northerly through east and southerly azimuths. As shown on Figure 2-16 the noise contours determine the boundaries of the control and buffer zones. The distance between the outer edge of the buffer zone (115 db) and Titusville on the mainland is about two miles. Titusville is about 12 miles from the launch pad and is not expected to experience significantly different noise levels from Space Shuttle launch than those associated with the Apollo launches from Launch Complex 39.

The KSC launch site meets the above criterion. KSC has existing land area that is adequate for the Space Shuttle control zones and the noise generated will not affect the local area populace to any higher degree than previously experienced.

The runway orientation for Orbiter and logistics aircraft landing is such that overflights of populated areas and interference with existing civil air routes are minimized. Noise pollution affecting neighboring communities is estimated to be significantly less than that emitted from commercial jet carrier operations at the neighboring Titusville/Cocoa Airport. The KSC buffer zone extends well into the Indian River west of the proposed new runway where the Orbiter will land.

Space Shuttle sonic booms will occur during the ascent after launch, during booster descent after separation, and during orbiter descent after reentry from orbit. The most severe booms result when a vehicle engages in certain types of maneuvers that tend

to amplify the over-pressures. These maneuvers cause focusing of the sound pressures over a very small, but predictable area on the surface. Fortunately, focus on populated areas can be avoided by properly programming the flight maneuvers of the vehicles.

During shuttle ascent an area of possible focusing exists approximately 60 km or 33 miles downrange after launch with possible overpressures as high as 1 400 N/m^2 (30 psf). The possible focusing at this point is associated with the gravity turn (pitchover maneuver is completed about 20 seconds after launch) required for transition to the angle necessary to go into orbit. The boom impingement on the surface at this phase of flight persists for a short distance (to approximately 85 km or 45 miles down range) until the vehicles reach an altitude where the detectable overpressure no longer reaches the ground. Areas concerned will be at sea, and appropriate warnings of impending launches will be issued to shipping in the area as in the practice for current launches. Current safety policies and requirements for the ascent phase is defined in AFETR Manual 127-1. As a result of the policies and requirements for safety, constraints on operations may be imposed for the protection of non-participants. No sonic boom disturbance will occur between the launch site and the shock wave touchdown point.

During descent, the spent SRBs will generate a sonic boom striking the surface of the ocean over an area from 280 to 370 kilometers (150 to 200 nautical miles) downrange from the launch site. In this area, maximum overpressures rise to levels between about 96 and 144 N/m^2 (2 and 3 psf) similar to that experienced with current launch vehicles. This area of maximum overpressure coincides with the SRB impact area which must be kept under surveillance to effect recovery as was done for the Apollo capsule recovery.

Depending on mission orbit, return opportunity, and maneuverability, orbiter re-entry sonic boom, however, may occur over land. The sonic boom characteristics for the returning orbiter have been calculated based upon extensive analytical work throughout NASA and on an exhaustive experimental program conducted by the Ames Research Center. They are summarized in the following paragraphs:

Re-entry sonic boom overpressures build up slowly during the orbiter return, reaching overpressures on the ground of about 24 N/m^2 (one-half psf) about 650 km (350 nautical miles) from the landing site. Overpressures will continue to increase as altitude decreases, reaching 48 N/m^2 (one psf) at about 185 km (100 nautical miles) from the landing site and peaking well under 96 N/m^2 (two psf) somewhere between 185 and 19 km (100 and 10 nautical miles) from the landing site, depending upon the return flight path and flight maneuvers. Sonic boom cuts off when the vehicle goes subsonic at about 19 km (10 nautical miles) from the landing site prior to final approach and touchdown. The lateral extent of the affected area begins as very narrow zone at 650 km (350 nautical miles) where the boom is first noticeable and widens to a maximum of 170 km (90 nautical miles) at a distance of 185 km (100 nautical miles) from the landing site.

These overpressures are chiefly in the range of nuisance or annoyance, according to the ICAO[17]. They will be sufficiently infrequent (fewer than one per week) that even the annoyance should be minor (compared to the 10 to 15 sonic boom events per day of the ICAO report). Furthermore, public knowledge of re-entries and landings is likely to exist, effectively removing the startling aspects of sonic boom.

It must be emphasized that the ground track and sonic boom pattern of an orbiter return will vary from flight to flight as a result of orbit and re-entry variations. Returns to KSC from any one direction will occur less frequently than once per week. Therefore, any given land area is not likely to be in the sonic boom pattern more than a few times per year, with the possible exception of limited regions near the landing site. Maneuverability of the orbiter will make it possible to alter return trajectories.

Figure 2-17 shows the areas of the southeastern United States surrounding the KSC landing site with two potential ground tracks for the returning orbiter. The trajectory identified as Path A is a "straight-in" approach from an orbit inclination of 28.5°. The trajectory identified as Path B is an approach from the same orbit inclination

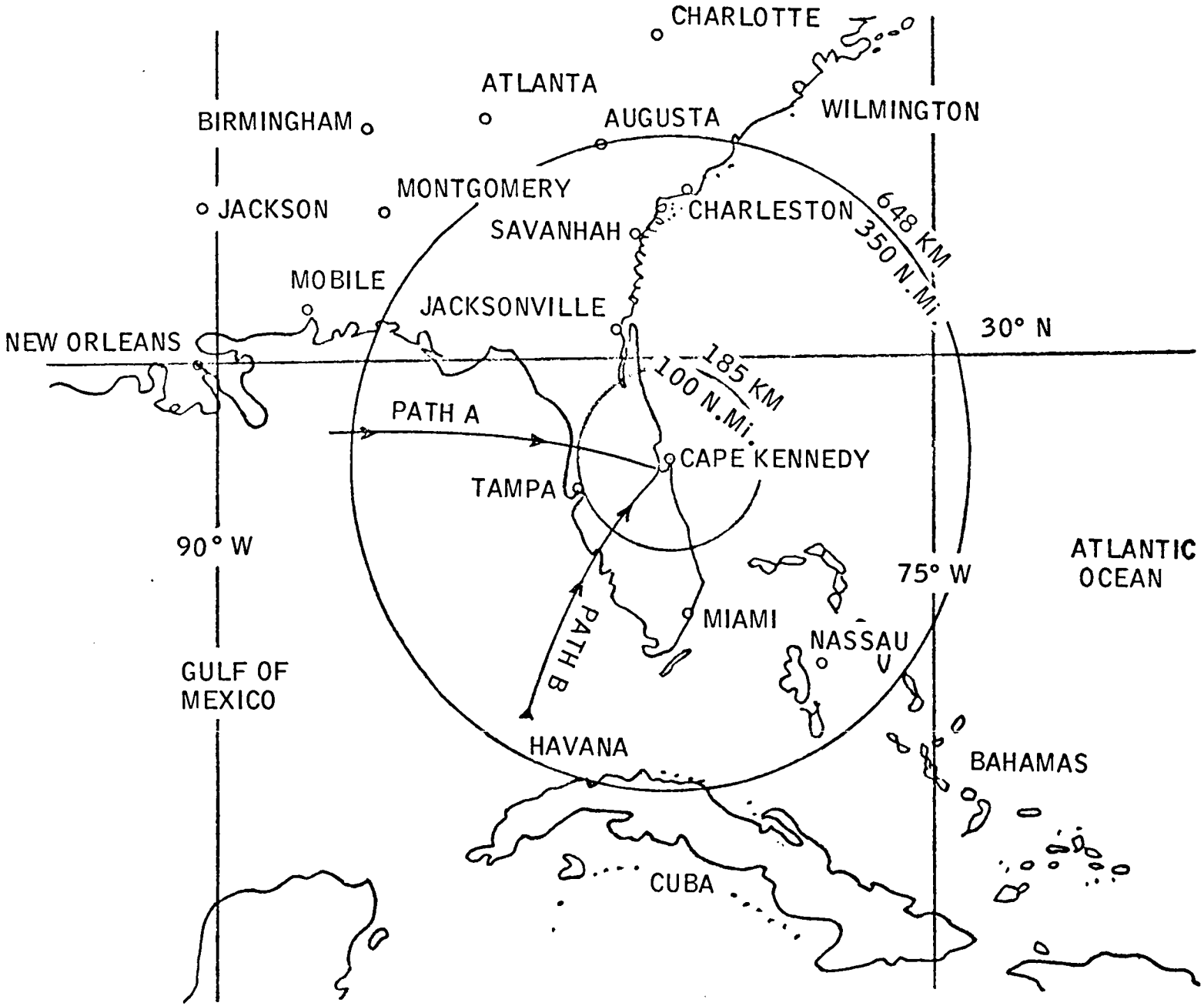

Figure 2-17. Overpressure Areas

resulting from maximum operational use of the orbiter cross range maneuverability. Figures 2-18 and 2-19 show the predicted overpressure contours along these trajectories. Both trajectories and their associated overpressure contours are typical for returns to KSC from other orbit inclinations using the "straight-in" and maximum cross range maneuverability of the orbiter even though the approaches will be from different directions. The first test missions will probably be designed for "straight-in" approaches with the logical build-up in following missions to gradually determine the actual maximum operational cross range maneuverability. In any event the overpressures shown are typical for all approaches with only variations in overpressure contours being dependent on the degree of cross range maneuverability required for each mission design.

In summary, the low overpressures, infrequent occurrence, and public awareness of sonic boom resulting from orbiter return to KSC lead to the conclusion that no environmental effect to people, structural and natural condition of significance results. Some disturbance to eagles, ospreys and other wildlife may occur. The degree of disturbance will be evaluated when Space Shuttle launchings begin.

e. Reentry of Spent Solid Rocket Booster and Orbiter Tank

(1) Source and Nature

Both the spent booster and the Orbiter HO tank will reenter the atmosphere during the course of each Shuttle mission. The spent solid rocket motor booster cases will land in the water between 185 and 370 kilometers (100 and 200 nm) down range from the launch site and will be recovered and reused. Landing will be at low velocities through the use of parachutes. The open ocean recovery areas cannot be totally controlled (as government property), and thus warnings of impending launches will be issued. The same is true of areas between the launch sites and recovery zone and within the recovery zones where impact could occur in an abnormal launch situation. Such impacts could conceivably be at higher velocity (e.g., with parachute failure) and could include local explosion involving previously unburned liquid propellants.

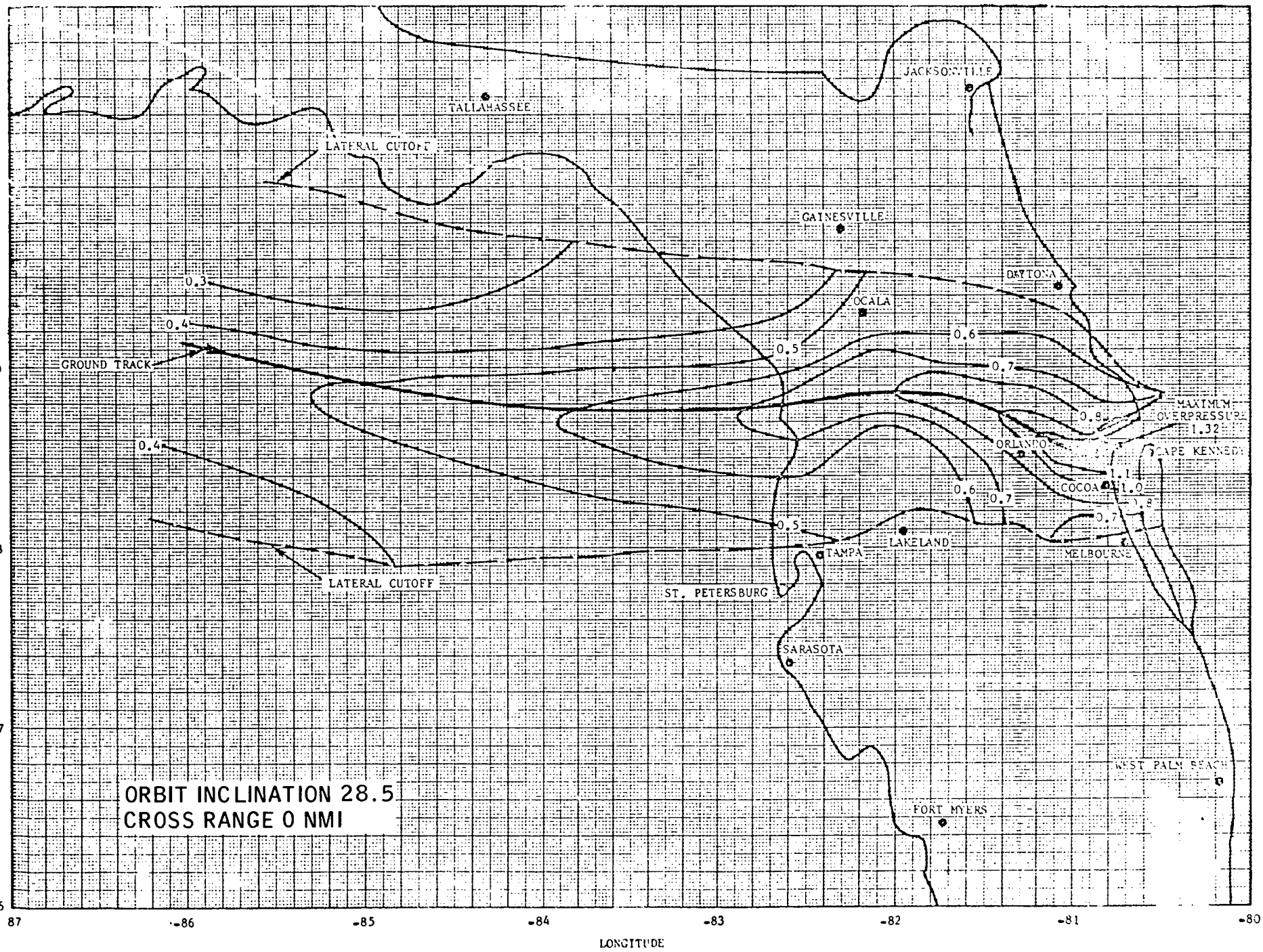

Figure 2-18. Ground Level Sonic Boom Constant Overpressure Contours (Path A Trajectory)

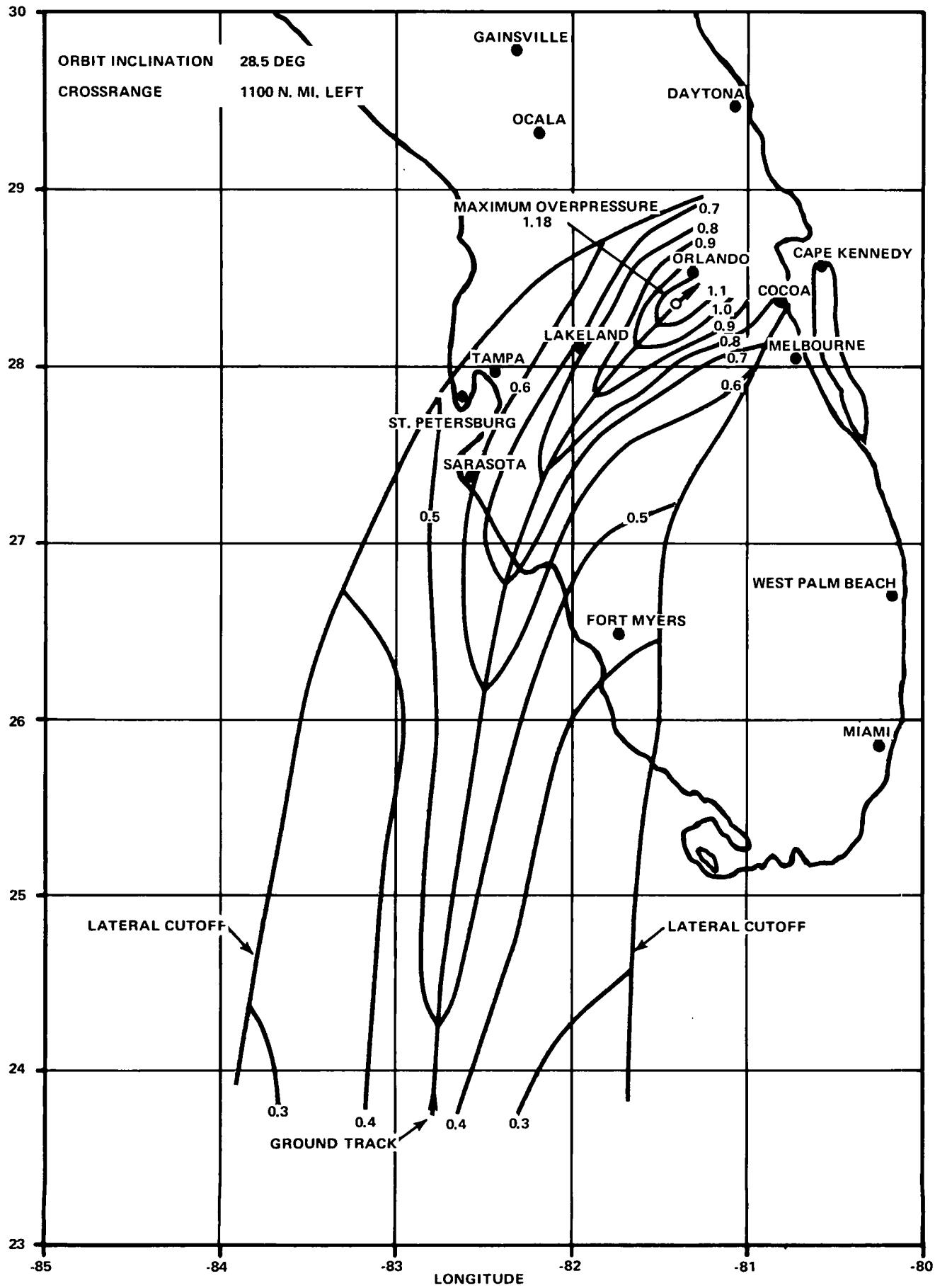

Figure 2-19. Ground Level Sonic Boom Constant Overpressure Contours (Path B Trajectory)

(2) Environmental Effects

Should it be necessary to abort the mission prior to the attainment of orbit, the HO tank will be jettisoned to impact in a safe area. For an abort early in the flight, the Orbiter will maneuver to return to the launch site after placing the tank on a trajectory to impact in a safe ocean or land area. Should this maneuver not be possible, the tank will be jettisoned on its launch trajectory and will impact downrange. As in conventional U. S. space launches, downrange impact locations will be predicted as a function of time from launch for the ascent phase and the trajectories chosen to avoid hazards in the event of system failure.

Every reasonable precaution is taken in the flight planning to assure the safe operation of the vehicle, including constraints on azimuths that can be flown and wind conditions under which operations are permitted. There are also specific requirements relative to the location of the possible impact area for jettisoned bodies such as spent booster stages. Range safety requirements are that no missile, space vehicle, payload, reentry vehicle or jettisoned component will be intentionally impacted on land. Studies have shown that no significant hazard level exists to ships when the planned impact area is in open ocean.

Launch Complex 39 is located very close to the ocean shore on Merritt Island which projects out from the mainland. As a result of the location the launch pads are sufficiently remote from uncontrolled population that any on or near-pad catastrophic failure would not endanger the local populace.

f. Social, Cultural and Demographic Characteristics

Two general demographic characteristics are considered in this section, these are: Population and Land Use.

(1) Current Population and Potential Vicinity Support

KSC is located in Brevard County, Florida. Other contiguous counties (within a 60-mile radius) to the launch site are Indian River, Lake, Osceola, Orange,

Seminole and Volusia. The following population statistics for Brevard and the six contiguous counties surrounding the site are based on 1970 census data.[19]

	Brevard County	Contiguous Counties	Total
TOTAL	230 006	728 054	958 060
Population Change 1960-1970	106%	33%	46%
Land Area (Square Miles)	1 011	5 055	6 066

Most of the current population supporting the Space Center resides in the communities of Titusville, Cocoa, Cocoa Beach, Eau Gallie, Satellite Beach, Melbourne, Merritt Island and Orlando. The average rural density is estimated to be 84 persons per square mile for Brevard and its contiguous counties. It is estimated that 450 000 persons live in urban communities within the contiguous area.

The major population centers around Kennedy Space Center are as follows:

City/Urban	Miles/Direction	1970 Census[19]
Orlando	50/West	99 006
Titusville	12/West	30 515
Daytona Beach	50/North	45 327
Melbourne	40/South	40 236
Merritt Island	14/South	29 233

The Space Shuttle orbital flights will begin in 1978. This period will be preceded by approximately four years of Shuttle construction and activation of facilities, beginning in 1974. The buildup of this program will tend to negate the impact of the termination of the Apollo program. The present work force of the Center of 15 000 will continue through 1973. After 1973, the only manned flight projected is the Apollo Soyuz rendezvous and docking mission. By retaining the Apollo/Saturn 1B capability necessary for this mission, the personnel strength retained will be in the order of 9 000. With the buildup in Shuttle personnel beginning in 1976, the work force will return to a 10 000 level where it should remain stable.

(2) Current Economic Base and Potential Industrial Support

The original economy of the area was based on agriculture. With the advent of the Space Age, the economic basis became Federal Government spending on new facilities and programs at CKAFS, KSC and the ETR. Cutbacks in this spending during the past few years have resulted in a severe short term economic blow to the local communities which triggered actions to reorient the economic base.

The future economy of the area will be based to a large extent on agriculture, tourism and retirement living, plus government activities such as NASA and Air Force aerospace work.

The variety of small aerospace-oriented industrial firms have been established in Brevard and Orange Counties as a result of past programs. This support would be available to the Space Shuttle. Orlando, 50 miles west, serves as the local economic hub and can provide some industrial support. Major industrial support, however, would not come from the local area.

The Florida East Coast Railway provides service to the Center and connections to other major railroads. The railroad system and the major highways serving the site are shown in Figure 2-20, "KSC Rail, Road and Water Access". Highway access to Kennedy Space Center consists of the following:

Route	Lanes	From
Titusville Road	2	Titusville
NASA Causeway West	4	U.S. 1 & I-95
NASA Causeway East	2	Cape Kennedy
State Route 3	2	Merritt Island

U. S. Highway 1 and Interstate Highway 95 provide good access to Miami and Jacksonville.

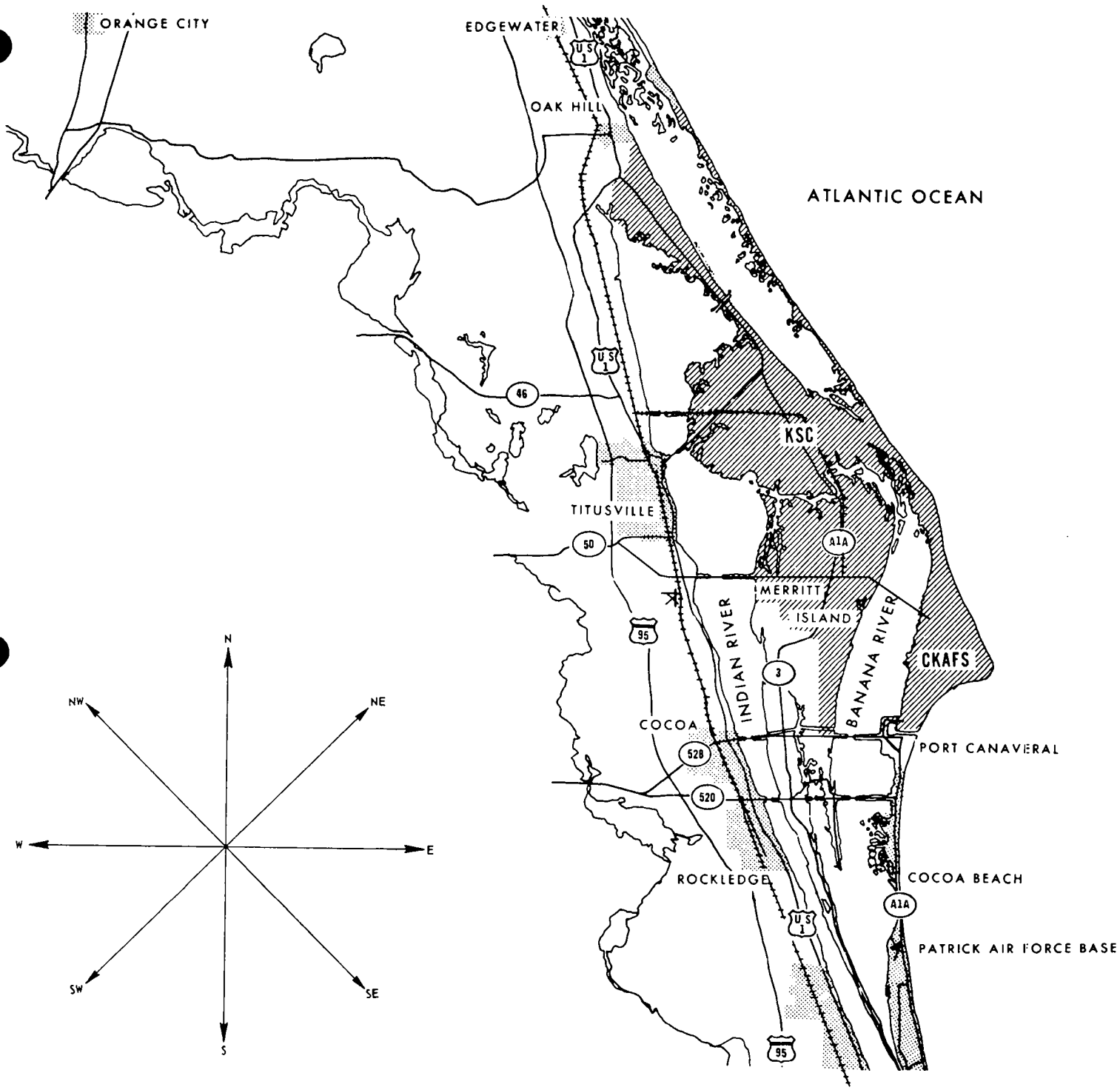

Figure 2-20. KSC Rail, Road and Water Access

Commercial airports in the vicinity provide through service to all major cities.

Airports are:

City	Distance
Melbourne (Cape Kennedy Regional)	38 miles
Orlando (McCoy)	46 miles
Titusville-Cocoa (Ti-Co)	12 miles

The Intracoastal Waterway and locks at Canaveral Harbor provide direct access to the site by barge.

Logistics systems have been developed and are functioning for existing programs at the Space Center and Cape Kennedy. This site has the advantage of being accessible by barge, which permits shipping larger assemblies to and from the site than is possible with other transportation modes.

The Brevard story was one of unprecedented growth from 1963 until 1969. During those years the Brevard Sentinel carried a banner line which read "Fastest Growing County in the USA". However, as NASA's manpower grew, employment in the AFETR began dropping in 1967 from 16 710 to 14 881 in 1971.

KSC employment reached its high mark in September 1968 as the Apollo program entered its operational phase. Other competing national priorities forced a reassessment at the highest level of Government and space budgets thereafter declined. Even as the Apollo 11 crew returned from the Moon, KSC began separating 5 600 contractor employees. The Center budget dropped $90 000 000 that year and the pace of Apollo launches slowed from five to two per year.

More belt tightening in 1970 reduced the work force to 15 000 by July 1. The County's unemployment rate climbed to 7.2 percent. Public school enrollment dipped from 59 120 to 57 342. Mortgage foreclosures rose sharply.

Other economic indices pointed to a general slowdown in the immediate vicinity. The community realized the urgent need to diversify its economic base.

Brevard County has pursued three avenues for the purpose of reducing unemployment, shoring up business activity, and building for the long-range future-inducing non-space related employers to locate in the County, opening up a housing market for retired persons, and increasing tourism. NASA's daily bus tours and Visitor Information Center play a key role in the community's hopes for slower but sounder growth.

As 1971 passed the midway mark, the economic situation reflected the end of the leveling off period and began climbing again. Retirees found Brevard attractive and housing in good supply. Space employment stood at 14 500 and the military payrolls held firm. Both time and demand deposits in Brevard banks reflected substantial gains from the June 1970 figures. The Federal Housing Administration reported 120 homes had been resold in the first eight months of the year. New construction could be seen in the South Brevard and Central Brevard areas. Community leaders firmly believed the tide had turned and looked confidently to the future.

With the Space Shuttle at KSC, a real stabilizing factor has taken over in the County and the uncertainty of the future has been relieved to an extent. The program will provide the capability to maintain at a high level of proficiency the expertise distributed throughout the Center's highly tehcnical personnel which will enhance the nation's capability to progress economically in the space field. Without the Space Shuttle program, this individual expertise will not be available as a team for future space needs. Shuttle employment at the Center is not expected to reach the Apollo program employment peak, but is expected to level off at the 10 000 level.

(3) Land Use

Large areas of land surrounding the launch and landing facilities are required for supporting activities and to serve as a buffer between these activities and the surrounding community. At KSC maintenance of environmental stability and planned

multiple land use have been stressed. For instance, under an agreement with the Bureau of Sport Fisheries and Wildlife, the boundaries of the Merritt Island Wildlife Refuge and KSC are now co-extensive. This agreement provides that the Bureau, subject to certain conditions, exercise primary administration over all property (except the Space Program facilities) for all purposes unrelated to the Space Program. These purposes include the conservation of wildlife, fish and game; recreation and education; the outleasing of orange groves, fish camps, and aviaries and the management of Playalinda Beach. Legislation has also been introduced which, if enacted, would allow the joint use of the KSC area north of the Haulover Canal by the National Park Service as a National Seashore Park (rather than as a part of the present Wildlife Refuge). The multiple land use was considered in the evaluation of candidate Space Shuttle launch and landing sites, and activation of the selected building sites will continue to stress land-use patterns compatible with the use of the area as a Wildlife Refuge and/or a National Seashore Park.

The land to be used for construction of these facilities is typical of the higher grounds at KSC and throughout the State. It is covered with palmetto shrubs, a few scattered sabal palms and species of southern pine, along the undergrowth of weeds and other shrubs native to the area. The wildlife species native to this geographical area inhabit the planned facilities sites. The land will be cleared and graded which will cause the wildlife to move to the surrounding area. Construction activities will be controlled to the extent possible to prevent damage to any wildlife found in the area. Grading, ditching, landscaping, and seeding will be done to preserve the area in its natural state as closely as possible. In fact, from observations during construction periods, the landscaping, seeding, sodding, planting of other trees and shrubs along with the maintenance of drainage ditches seem to enhance the growth of wildlife. Most life forms native to the KSC area will thrive in and around the drainage ditches and shallow water borrow lakes to be created by construction of the Landing, Deservicing, and Safing Facilities.

SECTION 3

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

3. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Although construction and operations of the Space Shuttle facilities are not expected to have a significant effect on the environment, there will be some highly localized, environmental effects of short duration. These were treated in detail in the foregoing section and are summarized as follows:

a. Air Quality

Emissions of HCl from the solid boosters may create potentially hazardous conditions in the immediate vicinity of the launch site for a short period of time. Extensive theoretical calculations and some measurements made of solid rocket launches indicate that concentrations at ground level beneath the exhaust cloud are well below the maximum allowable 10-minute concentrations for man, and that the principal concern in the case of normal launches is the possibility of rain scrubbing out the HCl from the exhaust cloud in concentrations sufficient to have an adverse effect, mainly by spotting of leaves on vegetation, and by short term uses of the air and possibly water should an abort or a spill of orbiter propellants occur. Current safety policies and requirements for the ascent phase are defined in AFETR Manual 127-1. Similar operational constraints will be imposed on Space Shuttle launches to eliminate the possibility of unacceptable HCl concentrations in the air or on the surface. Furthermore, the launch site evaluation included full consideration of HCl emissions; the launch facilities for Shuttle will be laid out and controlled to ensure that any hazard potential is minimized.

In the event of on-pad fire or low-level abort of the booster with the solid propellants consumed in the resulting fires, concentrations would be higher than for normal launches, but still within the allowable limits. Based on the demonstrated reliability of man-rated launch vehicles to date, and considering the Space Shuttle design, inspections, and quality control requirements, such an abnormal event is considered very unlikely.

b. Sonic Boom[3]

As in other space launches, the Shuttle launch imposes a focused sonic boom. It will be limited to a narrow area about 60 kilometers (33 nautical miles) downrange from the launch site which may result in possible overpressures as high as about 1400 newtons per square meter (N/m^2) (30 pounds per square foot, or psf). As this gets into the range of overpressures that could possible damage structures, the launch site and mission trajectories have been chosen so that the boom will occur over the ocean. There will be some constraints on the economic or recreational use of that limited ocean area during a launch period. As in the case of current launches, warning notices to mariners will be issued prior to Shuttle operations.

Further downrange over the open ocean, the reentering spent SRBs will cause a small sonic boom not to exceed 144 N/m^2 (3 psf). This boom affords no hazard and further, will occur over an ocean area already identified in advance of each Shuttle operation as the recovery and return area.

Orbiter reentry sonic boom will not reach levels greater than about 48 N/m^2 (1 psf) except for a very small region where it will be well under 96 N/m^2 (2 psf). Return trajectories will be controlled to avoid increases or focusing above this level over land. Based on the infrequent Shuttle flight schedule and the low upper limit of this overpressure, the Orbiter reentry sonic boom will not present a hazard.

c. Solid Rocket Booster and Orbiter Tank Reentry

Both the spent SRBs and Orbiter propellant tank will reenter the atmosphere during the course of each Shuttle mission. The spent SRBs will be designed to be reused, and will thus be parachuted to a landing in the ocean at sufficiently low impact velocities to ensure survival and recovery.

Orbiter abort situations introduce the possibility of Orbiter tank explosion and fire should propellants still be present. During the early phase of launch, when large amounts of propellants remain, the affected area would be the normal downrange area already treated as hazardous because of booster reentry. At later stages of the launch, much fuel would have been consumed and any abort-induced reentry would be like that of the normal mission.

d. Land Use

Changed land use due to the construction of the Landing, Deservicing, and Safing Facility, and the SRB Facility will be minimal in comparison with overall land availability (approximately 140 000 acres) that make up the Kennedy Space Center. The major portion of the area planned for these facilities is on dry land. The changed land usage (1350 acres) will require wildlife presently inhabiting these areas to move to the surrounding area. Construction activities will be controlled to the extent possible to prevent damage beyond immediate construction sites. Past experience has shown that the wildlife displaced by a facility program seems to remain in nearby areas and no ill effects have been noted. Wildlife will be displaced and natural vegetation will be destroyed in the areas of the LDS facilities and in the areas used to borrow fill materials. Experience and research have shown that these borrow areas will usually recover viability within five years provided the water depths are less than 10 feet. The result will be areas more vitally alive with natural vegetation and wildlife than presently exist.

e. Recreational Access Impact

KSC areas currently used for recreational purposes will continue to be accessible to the general public in a manner comparable with the past history of Saturn Apollo operation. Complex 39A is the currently designated primary launch location, which will only preclude recreational access to Wildlife Refuge areas and beach areas, when the Shuttle becomes operational, for a relatively short period immediately prior to launch when the vehicle is on the pad. During the launch countdown and for the duration of the launch period, safety exclusion areas (Figure 2-14) will be established as in previous programs. The prelaunch areas exclusion time necessary for Shuttle operations is

expected to be considerably less than that previously required for the Apollo program (which extended from 3 weeks to several months). At this time Complex 39B is programmed to support the Shuttle schedule in CY 79 for two flight readiness firings. During the planned duration, thirty days each, when the Shuttle is located at Complex 39B, Playlinda Beach would be closed to the public. This is necessary to provide the three mile safety distances for the protection of the Shuttle vehicle and the public itself. Complex 39B thereafter would continue to support the higher Shuttle launch rates projected for the operational Shuttle.

SECTION 4

ALTERNATIVES TO THE PROPOSED ACTION

4. ALTERNATIVES TO THE PROPOSED ACTION

a. Selection of KSC for a Launch and Landing Site

The original Shuttle concept was a two-stage fully reusable system consisting of piloted booster and piloted Orbiter stages, both propelled by hydrogen/oxygen-fueled rocket motors. The booster of that concept would have taken off like a rocket and landed like an airplane; the new operational methods for this concept opened the possibility of a new launch and landing site for Shuttle operations.

NASA convened a Launch and Landing Site Review Board in April 1971 to carry out an extensive evaluation of candidate launch and landing sites. Spokesmen from 40 states requested that the launch and landing site be located within their state. These suggestions, when added to areas identified by NASA, resulted in a total field of some 150 contending sites. The Board considered technical, economic, demographic, and environmental factors in their evaluation of these sites.

Additional Shuttle studies led to evolution in the Shuttle concept to the system now planned, which employs water-recoverable (unpiloted) solid rocket boosters, piloted maneuverable Orbiter, and separate expendable Orbiter propellant tank. The considerations governing launch and landing site evolved accordingly. In particular, the selection on March 15, 1972, of a ballistic (i.e., unguided), water-recoverable SRB stage limited the feasible candidate sites to coastal areas. This decision also implied methods of operation and site requirements very similar to those currently in effect at existing launch sites.

A number of alternative coastal sites were considered, but most would have required major acquisition of property and moving of existing population. Of those sites not requiring mass shifting of population, the pair of existing east/west coastal sites (KSC/VAFB) and a single, now virgin, area as a principal alternative were considered. Because of current launch azimuth constraints no single site presently in use could satisfy total program requirements.

Detailed analyses were made to determine the total cost to establish Shuttle launch and landing operations at these two candidate options. The analyses included Booster/Orbiter and payload processing requirements, the configuration of range instrumentation and personnel required to accomplish the entire launch and landing operation. Results indicated that there was no clear economic advantage to establishing a new single launch site with the capability to handle all Shuttle launches as compared to continued national utilization of the two existing launch sites. The main reason for this result is that the ultimate reduction in annual operation cost for a single, new site is not sufficient in magnitude and is too far distant in time to overcome the large initial costs.

The selection of the two existing sites also offered advantages in mission performance and operational capability over those of the single site alternative. In addition, the new single site could have been subject to greater constraints in its adaptability to meet the requirements of future programs.

Finally, environmental factors associated with air quality, noise and sonic boom, and booster recovery would have been about the same for the new single site as for the two existing sites. However, environmental effects associated with the new site construction and the phasing out of the existing sites (e.g., land acquisition; effects of clearing and construction on local land use, water quality, and overall ecology; and demographic and socio-economic effects) would have been far greater than if the two existing sites were employed for the Shuttle.

Based upon the foregoing considerations, KSC, Florida, and Vandenberg Air Force Base, California, were selected as launch and landing sites for the Space Shuttle.

b. Alternatives Concerning Facility Locations

Within KSC, several alternative actions were investigated for possible siting of candidate facilities. Facilities which were already in existence were chosen for modifications where appropriate. When a new use or an existing facility could not be accommodated, studies were initiated to determine the best site, weighing equally the concerns of environment, cost, and operations flexibility.

A number of potential landing sites were considered. Only three sites will be discussed herein but are representative of the tradeoffs conducted to establish the baseline landing site described in paragraph 1.d.(3). The siting of the runway required detailed examination of the following criteria for each site proposed:

- Terrain in the approach zone should be flat with minimal airspace encroachment by buildings, towers or other obstructions as stipulated by Federal Aviation Regulations (FAR Part 77) affecting navigable airspace.
- Runway orientation must minimize overflight hazards to populated areas.
- Runway orientation must minimize cross wind components.
- Interference with existing civil air routes should be minimized.
- Runway orientation and location should permit landing of the Orbiter from mission aborts during launch and the early phases of flight.
- The runway, towway, and associated facilities should be located on the highest available ground to minimize excavation for removal of organic material, fill to provide desired elevations, and disruption of natural water drainage.
- The location should have minimal impact to the ecology of the area.

The existing "skid strip" located on Cape Kennedy Air Force Station was investigated first because it was already in existence. It was found lacking in length, lighting and landing aids and due to its remoteness from the LC-39, VAB area it was deemed to be both operationally and economically unattractive.

The "skid strip" runway would require a 5000 foot extension plus 2000 feet of overruns (1000 feet at each end) and extensive upgrading of the lighting system. The skid strip would also require the addition of instrument landing aids, a flight operations building, control tower, parking aprons, taxiway and safing and deservicing facilities identical to those required at a new landing site. A means of returning the Orbiter to the LC-39 maintenance, checkout and launch area after landing at the skid strip presents a

highly undesirable situation. Either a ten (10) mile towway to the VAB or barging the Orbiter is required for the return trip. Present baseline configuration of the Orbiter would require widening of the bridge span over the Banana River waterway to accommodate the barge and the Orbiter's approximately 90 foot wing span. The ten (10) mile towway is considered both ecologically undesirable and economically prohibitive.

Operationally, utilization of the skid strip presents lower landing site availability due to less than optimum siting for cross winds, higher operating costs due to a longer vehicle processing time and periodic barge transportation delays due to weather. An increased risk is also incurred in that overflight of the KSC industrial area and possibly Titusville (11 miles) is necessary to assure a bidirectional landing capability. Water movement of the Orbiter with the necessary loading and unloading operations are inherently more risky than the towing operations envisioned at the proposed KSC location. Additionally the skid strip siting will present a probable interference with the existing Victor 3 low altitude, main, north-south coastal flyway which borders Merritt Island along the Indian River and would necessitate a periodic closing of the airway or relocating it to a more westerly non-interfering location.

The search for a suitable new site was conducted with various locations considered within the confines of KSC. Site number 5 shown on Figure 4-1, Vicinity Map, Scheme A is representative of most sites considered. This layout results in a shorter towway than for the baseline site; however, it has the following disadvantages:

- The airspace encroachment of the VAB would be 262 feet, as against 131 feet for the site selected.
- The 90 percent runway availability based upon a 10 knot maximum cross wind vector compared with 92 percent for Preferred Site.
- A greater populated area would be overflown on northerly approaches.
- The runway and towway positions place them on low marshy ground, increasing cost of construction and presenting potential restrictions to the natural drainage of the area.

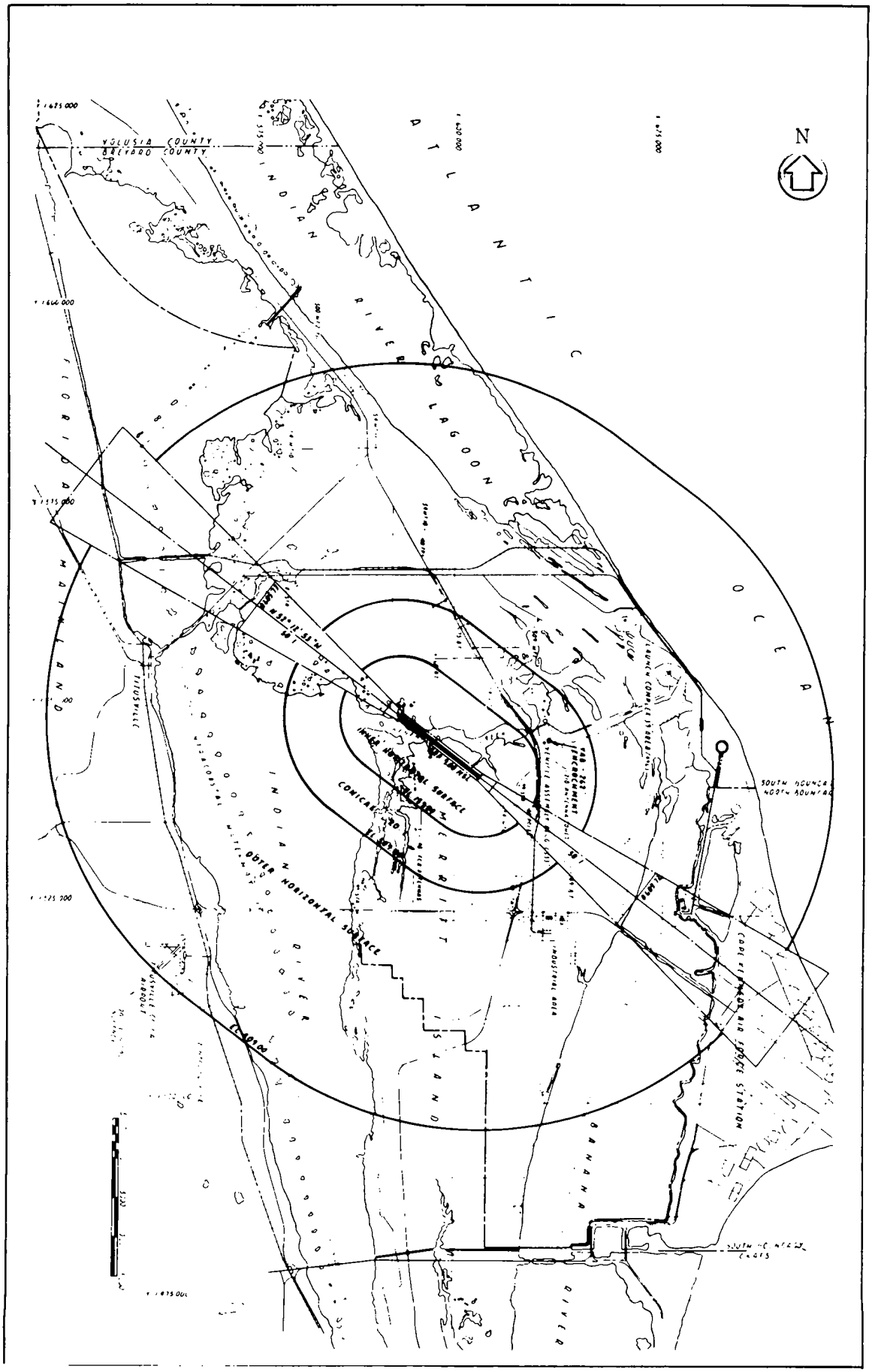

Figure 4-1. Vicinity Map, Scheme A

- Potential of displacement of larger area of marine life.
- A comparison of this location with the selected site indicates that it would cost more for the additional earthwork.

The preferred site (Baseline Site, Figure 1-4) was chosen because it rated highest against previous defined criteria:

- The arrangement has the least cost of construction of the available virgin site options.
- The orientation represents the least overflight hazard to populated areas. Normal low level approaches would be entirely over water or within government controlled area.
- The runway orientation minimizes cross wind components. Runway availability is in excess of 92 percent based on 10 knot maximum cross wind vector.
- Interference with existing civil air routes would be minimized.
- The runway, towway, and associated facilities would be located on the highest available ground, which would minimize the excavation necessary for removal of organic material, as well as minimize the amount of fill to provide the desired elevations.

Four other facilities, the siting of which required offer of options as to location, are the SRB Facility, SRB Disassembly Facility, Hypergolic Pod Processing and Storage Facility, and the Parachute Facility.

The SRB Facility will require approximately 17 acres. Additional considerations for siting this facility were:

(1) Safety clearances must be maintained. The Bureau of Explosives classifies SRB propellants as Explosive, Solid, Class B and by tests the military classification was determined to be Class 2 (Fire Hazard) for quantity-distance purposes.

(2) The location should be near the VAB.

(3) Minimized additional roads, rail, and utilities.

(4) Acceptable environmental effects.

Three sites were investigated:

(1) Existing Titan III Facilities. These facilities were designed for the 120 inch diameter SRBs and thus required extensive modifications not justified when traded against the operational inconvenience due to remoteness from VAB. Environmental effects at this location would not have been different from that experienced by its present operation.

(2) Mobile Launcher Construction Site. This site was close to VAB, near existing rail spur and on previously stabilized soil thus minimizing site preparation; but, site was discarded due to unacceptable safety clearances.

(3) Site Adjacent to VAB Turnaround Basin. This site which is at the southwest corner of the VAB barge turning basin meets the required safety clearances, provides the most economical utility, road and railroad access, has minimal environmal environmental effect and joint use of land with SRB Disassembly activities reduces construction and operating costs.

The SRB Disassembly Facility will require use of approximately four acres of stabilized fill that will require some clearing of grass. The impact at this area will be very minimal if discernible. The requirement for this facility at the launch and landing site is dependent upon the NASA selection of a SRB manufacturing and refurbishment contractor. Should the contractor plant be located on the Southeast Atlantic coast, the SRBs may be retrieved and returned directly to the manufacturer, eliminating a facility at KSC. This decision would be made later based on economics and operational considerations. Environmental considerations would most likely be the same at all locations.

Alternatives to the siting of this facility were limited since it must be located adjacent to a navigable waterway. The site chosen is at existing dockage facilities at the VAB which were used throughout the Apollo Program to offload Saturn V rockets and components from sea-going barges. Other factors influencing the site selection are:

(1) Location is shortest possible distance from the railroad system.

(2) Use of this land presents the minimum disturbance of land and no disturbance of new land and swamp.

The use of existing facilities in the Industrial Area is under consideration as a Parachute Facility. The Pyrotechnic Installation Building, M7-1469, would be adequate with extensive modifications, however, this facility is committed to the Viking Program for spacecraft assembly and encapsulation. Further siting studies for a new facility are unlikely to reveal a location which requires less or different type of site work.

Present siting of the Hypergolic Pod Processing Facility is tentative and potential changes are dependent upon operational advantages to be gained in terms of manpower required and processing time. Two other sites are under active consideration for this facility. They are:

(1) East of the intersection of Contractor Road and Schwartz Road.

(2) A presently designated hazardous fluids trailer park site north of the Converter Compressor Facility (CCF).

These sites and the preparations required are similar in nature and will not affect the operation of the facility. It is anticipated that a location change will not alter the environmental impact of the total proposed project as has been stated.

c. Alternate LDS Construction Methods

An estimated 2.175 million cubic yards of suitable fill material is required to raise the LDS facility to an elevation approximately 9 feet above mean sea level. Two sources of fill material have been identified: borrowing from terrestial areas adjacent to the LDS area and use of acceptable material brought in from off-site, or external areas.

Obtaining borrow from locations external to KSC was reviewed and because of (1) cost of material; (2) cost of hauling; and (3) damage to haulways was deemed unsuitable. On-base borrow outside the general area of the work was also unsuitable by reason of (2) and (3) above. The remaining alternative was to obtain fill from borrow areas near the runway. Several approaches were investigated for obtaining this borrow (i.e. scrapers, portable dredges and large water borne dredge).

The first approach was to accomplish all of the fill transfer by use of scrapers. The second was to use portable dredges for transfer of all of the fill material. The environmental impact was determined to be the same for either of these approaches. The third approach was to move large waterborne dredges to the site via one of two possible access routes. One route involved dredging a channel (approximately 7 feet deep by 100 feet wide) from the intracoastal waterway in the Indian River up the Banana Creek to the south end of the runway. At this point the dredge would cut through the mosquito control dike into the borrow areas. The other route would be for the dredge to cut through the mosquito control dike near the mouth of the Banana Creek and then make a channel to the borrow areas. In either route, mixing of the brackish Indian River and Banana Creek waters with the fresh water inside the impoundment could be minimized by preparing earthen diking. Spoil areas, for the materials removed from the channel, could be established on existing land areas to minimize impact to the aquatic environment. The third method was ruled out when it became obvious that the cost of this method to satisfy environmental concerns was more than either methods one or two. Fill therefore, will be obtained by means of bottom loading type mobile scrapers and/or portable dredges. The percentage of scraper versus dredge usage will be determined by comparative cost studies.

A "Study of Lagoonal and Estuarine Process in the Area of Merritt Island Encompassing the Space Center" is being accomplished by the Florida Institute of Technology (FIT)/Melbourne, in an effort to develop a deeper understanding of the aquatic environment around the KSC area. The results of their studies will indicate the sensitivity of this eco-system to sedimentation. Information obtained from this study and other ecological studies being conducted by the Florida Technological University (FTU)/Orlando on the KSC land areas, will be utilized along with cost and technical engineering data to determine the best construction methods and to monitor construction as it progresses to assure maximum protection of the environment.

SECTION 5

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

5. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The land resources committed to the Shuttle Program at this Center have already been removed from the local tax base by Government ownership. In return, the local economy has been stimulated, not only by the payrolls and purchases generated by the Agency, but also by the flow of visitors who are attracted here by the space program activities. Continued Government control of the area will assure the preservation of its character as a wildlife refuge, and keep it available to the public in its relatively natural state. With the advent of the Shuttle, the Agency expects a long term viable and stable economic stimulant to the area economy. The development of a low cost delivery system of payloads to earth orbit is expected to expand commercial participation and interest in the technology of space attributes.

The proposed action should have no long term effects on the environment. Although animal life will be disturbed in the immediate area, adequate similar areas exist nearby for their relocation. The site is in a National Wildlife Refuge which is abundant in bird life, reptiles and mammals. Fear of man or machines and the resultant noise does not seem to disturb those creatures living near Launch Complex 39. Information supplied by the resident National Wildlife Service indicates the Merritt Island National Refuge has highly active population, and appears to be unaffected by past and current aerospace operations.

Additionally, as stated in the program's Environmental Impact Statement, the environmental effects are localized and of short duration. The Space Shuttle is expected to enhance space flight's contribution to the earth's environment through the measuring, monitoring, and managing of earth's conditions and natural resources. The future generations of satellites that will be designed for multi-spectral scanning and other forms of earth observations will undoubtedly be heavily dependent upon the Shuttle system. This dependence will include the satellite's transportation from the earth's surface to its operating position in earth orbit, repairs to satellites in place, removal and replacement of expended units and data storage modules, replacement of entire satellites and return to earth. The Shuttle system will also serve the same role for such special purpose satellites as communications and weather satellites.

Any short term use of the local environment near and about KSC that is necessary to achieve the benefits of understanding or enhancing the world environment through Shuttle payloads are considered to be far surpassed by the benefits.

Construction of facilities to accommodate the Shuttle operations will involve an earth moving operation and drainage plan, and will also involve disposal actions for construction materials. KSC recognizes the necessity to minimize short term uses of the environment, and also the relationship between short term and long term productivity. In this connection, KSC will utilize information from the ecology study now being made by the Florida Technology University and the Florida Institute of Technology under KSC research grants. The changed land use represents only one percent (approximately 1350 acres) of the extensive land and water area of the refuge. The lake areas created by borrowing fill materials will be ideally suited for conducting ecological studies under controlled conditions.

For the purpose of monitoring changes to the KSC environment, the Center, in addition to ground based surveillance, has the assistance of aircraft-mounted remote sensing systems including radiometers and aerial cameras (B&W, color, IR). These systems will enable early symptoms of degradation to be discovered, such as algae concentrations in water bodies and abnormal stress to vegetation, which may be caused by environmental anomalies. Satellites, equipped in a similar fashion, will also provide similar future support.

Horticulture, insect and pest control which will result from the Shuttle facility activity will be handled in a manner consistent with present practice. Short term uses of chemicals will be dispensed only on an as-required basis and only when absolutely required. The Center's program of dispensing chemicals is reviewed by the President's Working Group on pesticides.

SECTION 6

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

6. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

a. General

The operations at KSC to support Shuttle activities will generally follow established Apollo and other program procedures that will be adapted for Shuttle activities. The effort will be one of support, test, checkout, launch and refurbishment of some hardware and will not involve manufacturing of flight hardware. Only relatively little manufacturing of components for ground support equipment will occur. Construction of Shuttle facilities will not involve direct use of natural resources (except land previously identified), but some undeterminable depletion will occur because of use of resources such as fuel oil required for on-going daily activities. This is not a new resources requirement; the Shuttle flights will replace those performed by current expendable boosters.

Center on-going installations such as heating plants will continue to be operated within the parameters of state and federal regulations at best attainable efficiency. The Center energy conservation program will be continued to minimize use of this kind of irretrievable resource, whether purchased by the Center as a fuel, or by the purchase of electric power which is generated off-site by the Florida Power & Light Company. Other hydrocarbons used in the daily operation of the Center will continue to be either burned in the local heating plants as a conservation measure or, as in the case of the small quantities of used hydraulic oils, sold because of its relative value.

b. Helium

Under operational Shuttle conditions, present technology indicates that 1 500 000 scf of helium will be required for a launch. With a schedule of 40 KSC launches per year, approximately 60 000 000 scf will, therefore, be required. It should be recognized that flights of the Space Shuttle will replace those performed by the current stable of expendable boosters. So, the amount of helium indicated above does not represent a new requirement.

c. Solvents and Chemicals

Solvents and chemicals (which indirectly have caused the use of natural resources in their manufacture) will be required for a variety of purposes in the Space Shuttle Program. It is anticipated that Shuttle usage will not change significantly from that experienced in the Apollo Program. The major use for these materials will be associated with obtaining and maintaining the stringent hardware cleanliness requirements utilized for spaceflight activities.

Conservation efforts such as the reclamation and reuse of trichlorotrifluorethane solvent which was instituted at KSC during the Apollo Program will continue.

d. Liquid Hydrogen

To support the liquid hydrogen consumption identified in the draft of the Space Shuttle Program Environmental Statement, dated April 1972, institutional liquid hydrogen system usage will also be required. An estimated 12 500 gallons of liquid hydrogen per launch will be required to compensate for transfer and tank boil-off losses.

SECTION 7

COMMENTS ON ENVIRONMENTAL STATEMENT FOR SPACE SHUTTLE DEVELOPMENT AND OPERATIONS AT JOHN F. KENNEDY SPACE CENTER

7. COMMENTS ON ENVIRONMENTAL STATEMENT FOR SPACE SHUTTLE DEVELOPMENT AND OPERATIONS AT JOHN F. KENNEDY SPACE CENTER

Comments on the draft to the Institutional Environmental Impact Statement for the Space Shuttle Program at KSC were requested from EPA, DOD, DOI, HUD, DOT, DOC, OMB, AEC, and the State of Florida.

Responses were received from AEC, DOC, DOD, DOI, DOT, EPA, and from several departments of the State of Florida. These are included in Appendix B.

NOTE

Following each comment (of the responses in Appendix B) the paragraph/page reference has been added. This reference will aid in locating the comment answer in the text herein.

Suggestions for general revision of phrases and sentences (for greater completeness, clarity, and accuracy) was accomplished as required.

Specific subjects addressed by responding agencies are condensed in a thru e below.

a. Environmental Resources

The United States Department of the Interior and State of Florida urged further assessment and evaluation of the protection and enhancement of the cultural environment and resources.

In compliance with the historic preservation of non-renewable elements of our common heritage, the State of Florida, Department of State, will conduct professional archaeological and historical inventory of the proposed Shuttle LDS area. Any significant cultural resources site, if located in the project area, will be preserved or removed as conditions warrant.

b. Short Term Uses vs. Long Term Productivity

The Department of Commerce recommended inclusion of a discussion on NASA plans for insuring a viable and stable future for the area. As mentioned in Section 2, the predominant economic factor for the area has been the NASA and USAF programs at KSC. These activities have been of a cyclic nature. However, the Space Shuttle Program, as currently planned, will be one of the more stable of such activities. Frequent operational launches and landings at KSC, nominally 40 per year, will require a sizable community to support both transportation system and payload operations. The program, expected to reach full operations in the 1980 time period, is expected to extend through that decade and beyond. The area's economy is somewhat more diversified than in the early 1960's, and the addition of a stable Space Shuttle Program should complement the existing economy. It is NASA's intent to contribute to ensuring a viable and stable community to the maximum extent possible, subject to the decisions of this and future administrations and Congresses.

c. Second Operational Site

The United States Air Force suggested inclusion of the planned second operational site to be phased in at Vandenberg Air Force Base, California for Shuttle flights requiring high inclination orbits. Also, that the basic Shuttle facilities required at Vandenberg are planned to be provided by DOD on a time schedule compatible with progress in the Shuttle development program.

This information has been included in Section 1.

d. Waste Management

The U.S. Environmental Protection Agency expressed concern on the management of waste generated during modifications and construction of new and existing facilities, and demolition of some existing facilities.

The performance specifications and description of method for all solid waste collection, landfill disposal, and storage of wastes generated at KSC are described in KSC GP-998 (October 16, 1972). The sanitary landfill, in use at KSC, does comply with the proposed OSWMP Sanitary Landfill Guidelines, and with Chapter 10D-12, State of Florida, Rules of the Department of Air and Water Pollution Control.

Correspondence received from US EPA dated March 13, 1973 states that the disposal of overburden collected by land-clearing operations is classified as agricultural and is not subject to the mandatory conditions of these Guidelines, provided they are not mixed with municipal-type wastes. The overburden disposal from the area to accommodate the LDS Facilities has been classified by EPA (Letter dated March 13, 1973) as agricultural without restriction, and by the State of Florida within Department of Pollution Control Chapter 17-5, Subject: Open Burning and Frost Protection Fires, Section 17-5.07 Land Clearing. The State of Florida restrictions specify assurance that road traffic visibility is not obscured, and that the Division of Forestry is notified and consulted prior to burning. Final actions to dispose of overburden will be in compliance with the EPA recommendations and State of Florida rules. This can be accomplished well within present considerations for area preparation.

The hardware utilized on Complexes 34 and 37 have been relocated for further use (where appropriate), steel from launch structures has been salvaged, concrete broken up for road ballast or fill, and degradable refuse placed into established landfills. The total area has been cleared and backfilled to remove hazardous conditions.

The Department of Pollution Control, State of Florida, considers the proposed concepts for Shuttle facilities activities compatible with current program objectives of their department.

e. Interference to Civil Air Routes

The Department of Transportation (DOT, US) requested information and comment on the magnitude of interference to civil air routes created by the Space Shuttle Landing Facility approach patterns.

The information on operational profiles associated with Orbiter flight operations, and other pertinent information, have been provided to DOT by MSC (Reference letter MO-13-76, to J.S. Beasley, FAA, Atlanta, from R.F. Thompson, Manager Space Shuttle Program, MSC, dated 28 Mar 1973):

Answers to the specific question posed by DOT are as follows:

- The Shuttle ascent characteristics for any launch azimuth will result in a 5-nautical mile or less downrange position when reaching an altitude of 50 000 feet, and a 50-nautical mile downrange position when reaching an altitude of about 220 000 feet.

- The Orbiter, during the approach and landing phase, will reach an altitude of 50 000 feet less than 50 nautical miles from the landing runway and will normally be making a circular approach for landing. The time from 50 000 feet to touchdown is approximately 6 minutes.

- The Orbiter cannot level off and sustain level flight at any altitude during the reentry and landing operation.

- The Orbiter normally should not be radar vectored to avoid other traffic because it should utilize its energy in accordance with the landing guidance solution.

- The Orbiter airspeed will normally be about 250 knots - indicated below 50 000 feet altitude.

- The Orbiter is maneuvered like a high speed, low L/D glider, rather than a conventional powered aircraft.

f. Toxicological Impact

Research on the toxicological impact to the flora and fauna of the KSC environment from solid rocket motor (SRM) exhaust has been established within NASA

Grant to Florida Technological University (FTU-Orlando). This research will go into tolerances and environmental fate of the exhaust components.

g. Banana Creek Damming

The State of Florida Internal Improvement Trust Fund expressed concern about damming Banana River. There is no requirement to cross the Banana River as was done when Complex 39 was constructed. Where the towway crosses Banana Creek, similar structures for the crossing (as were used in the Kennedy Parkway), will be used for the towway, so as not to restrict the flow of Banana Creek.

h. Public Access to LC-39 A/B

LC-39 A/B has been identified to the State of Florida as an historical entity for recording as a line item in the national inventory of significant landmarks. With this entity, it is identified and classified as limited for public access. No committment is made by the Government (NASA) to transfer title to State of Florida, or that KSC is to maintain the present configuration or refrain from any modification necessary to accommodate future programs.

APPENDIX A

APPENDIX A

REFERENCES

1. Environmental Demographic Data Summary for Cape Kennedy, Florida Vicinity SNS-NUS-793, dated June 1971, prepared for U.S. Atomic Energy Commission.

2. Procedure for Evaluating Environmental Impact, Geological Survey Circular 645, Washington, 1971.

3. National Aeronautics and Space Administration Environmental Statement for Space Shuttle Program, Final, July 1972.

4. Smith, J.R., "Overview of Titan III Solid Rocket Motor Toxic Hazard," Aerospace Corporation, El Segundo, California, February 1972.

5. Smyth, Henry F., Jr., "Military and Space Short-Term Inhalation Standards," Archives of Environmental Health, Volume 12, April 1966, pages 488-490.

6. Dumbauld, R.K., and Bjorklund, J.R., "Hazard Estimates for Selected Rocket Fuel Components at Kennedy Space Center," NASA CR 61358, May 5, 1971.

7. Pasquill, F., "Atmospheric Diffusion," Van Nostrand, Lond, 1962.

8. Craig, R.A., "The Upper Atmosphere - Meteorology and Physics," Academic Press, New York, 1965.

9. Valley, S.L. (Editor), "Handbook of Geophysics and Space Environments," Air Force Cambridge Research Laboratories, Office of Aerospace Research, 1965.

10. Dumbauld, R.K., Bjorklund, J.R., Cramer, H.E., and Record, F.A., "Handbook for Estimating Toxic Fuel Hazards," NASA CR 61326, April 1970.

11. Cramer, H.E., Dumbauld, R.K., Tingle, A.G., and Bjorklund, J.R., "Quantitative Assessment of the Environmental Effects of Rocket Engine Emissions During Space Shuttle Operations at Kennedy Space Center," Report No. GCA TR-72-8-G, GCA Corporation, February 7, 1972.

12. "Guides for Short Term Exposures of the Public to Air Pollutants, II. Guide for Hydrogen Chloride," Committee on Toxicology of the National Academy of Sciences - National Research Council, Washington, D.C., August 1971.

13. Bumpus, D.F., "Preliminary Report on Non-Tidal Drift Experiment Off Cape Canaveral," Woods Hole Oceanographic Institution, June 22, 1962.

14. Carter, H.H., and A. Okubo, "A Study of the Physical Processes of Movement and Dispersion in the Cape Kennedy Area, Chesapeake Bay Institute, the John Hopkins University, Report No. NYO-2973-1 March 1965.

15. Brown, D.W., W.E. Kenner, J.W. Cooke and J.B. Foster, "Water Resources of Brevard County, Florida. Report of Investigation No. 28," U.S. Geological Survey, Tallahassee, Florida (1970).

16. Snell, L.J., and W. Anderson, "Water Resources of Northeast Florida - Report of Investigation No. 54," U.S. Geological Survey, Tallahassee, Florida (1970).

17. Report of the Sonic Boom Panel of the International Civil Aviation Association (ICAO), October 1970.

18. Chemical Rocket/Propellant Hazards, Vol. 1, General Safety Engineering Design Criteria, CPIA Publication 194, October 1971, Chapter 7, "Acoustic Energy Hazards."

19. Census Bureau, U.S. Department of Commerce, 1970.

APPENDIX B

RESPONSES TO DRAFT ENVIRONMENTAL STATEMENT

APPENDIX B

RESPONSES TO DRAFT ENVIRONMENTAL STATEMENT

This Appendix contains the responses from all agencies received to date, and are listed in the following order herein.

Agency	Page
United States Environmental Protection Agency (EPA)	B-1
EPA Office of Solid Waste Management Programs	B-3
Department of Commerce (DOC)	B-5
Department of Defense (DOD)	B-7
Department of the Interior (DOI)	B-9
Atomic Energy Commission (AEC)	B-13
Federal Aviation Administration (FAA), Department of Transportation	B-15
State of Florida-	
Department of Administration	B-17
Board of Trustees of the Internal Improvement Trust Fund	B-19
Department of State	B-21
Department of Health and Rehabilitative Services	B-23
Department of Natural Resources	B-25
Department of Pollution Control	B-27

NOTE

Following each comment (of the responses included in this Appendix) the paragraph/page/figure/table reference has been added. This reference will aid in locating the comment answer in the text.

OFFICE OF WATER PROGRAMS OPERATIONS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

29 JAN 1973

Mr. Ralph C. Cushman
Special Assistant
Office of Administrator
National Aeronautics & Space Administration
Washington, D.C. 20546

Dear Mr. Cushman:

The Environmental Protection Agency has reviewed the draft environmental impact statement for Amendment Number 1 to the Institutional Environmental Impact Statement, Space Shuttle Development and Operations, John F. Kennedy Space Center, Florida. Our detailed comments are as follows. From the standpoint of Air, Water and Radiation we believe that NASA has done an outstanding job of assessing the environmental impact and presenting the precautionary measures taken or planned to minimize these impacts.

However, in the area of solid waste management there are several problems that should be assessed and discussed in the final statement. They are:

Page 1-2, line 4 - "Facilities for all Shuttle users at KSC will be provided by NASA, through modifications of existing facilities built for the Apollo and other programs, and by construction of new facilities..." These modifications and construction activities will generate a certain quantity of construction waste. Although this is briefly mentioned on page 5-2, the statement does not adequately describe how this waste will be handled. (Ref para 7 d)

Page 1-4, line 16 - "Complexes 34 and 37 were formerly used to launch Saturn IB manned vehicles and are now being razed." How will this demolition waste be disposed? (Ref para 7 d)

Page 1-9 - It is suggested that open burning will be employed to dispose of land clearing waste. This method does not comply with the proposed OSWMP Sanitary Landfill Guidelines, and an acceptable method which does comply must be selected. (Ref para 7 d)

Page 2-1, line 7 - "Solid waste generated by KSC activity will be disposed of in an existing landfill that is controlled by a KSC procedure in accordance with the rules of the Florida State Board of Health, Chapter 170C-10." This disposal site must be a sanitary landfill which complies with the proposed OSWMP Sanitary Landfill guidelines.

(Ref para 7 d)

We will be pleased to discuss our comments with you or members of your staff.

Sincerely yours,

Sheldon Meyers

Sheldon Meyers
Director
Office of Federal Activities

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Your TELECON of March 9

DATE: MAR 13 1973

FROM: Senior Staff Officer
Office of Solid Waste Management Programs

TO: Colonel W. H. Lee
IS-Bioscience
J. F. Kennedy Space Center

The latest revision of the draft Guidelines for the Land Disposal of Solid Wastes (formerly titled Sanitary Landfill Guidelines) is attached for your information. They should be published in the Federal Register in a matter of weeks.

As we discussed by telephone on March 9, the disposal of the overburden collected in your land-clearing operations in the current space project will not be subject to the mandatory conditions of these Guidelines, provided they are not mixed with municipal-type wastes. The Guidelines are not applicable to agricultural wastes, and the overburden you will be collecting may be considered as an agricultural-type waste. However, it is still the responsibility of any Federal agency to dispose of any type of waste in a manner having least impact on the environment. Therefore, the applicable Recommended Procedures of the Guidelines may be of some value to you in carrying out your disposal operations. Also, I suggest you check the State and local laws relating to open burning, should you be considering burning the wastes.

I hope the above will be of some assistance to you. Should you require additional technical assistance, our Solid Waste Management Representative, Mr. Elmer Cleveland, in our Regional Office in Atlanta may be contacted. His phone is (404)526-3016. He would be most familiar with the conditions in the State of Florida.

Val Grey

Attachment

EPA Form 1320-6 (Rev. 6-72)

Rec'd 1/2/72

THE ASSISTANT SECRETARY OF COMMERCE
Washington, D.C. 20230

December 21, 1972

Mr. Ralph E. Cushman
Special Assistant
Office of Administration
National Aeronautics and Space
Administration
Washington, D. C. 20546

Dear Mr. Cushman:

The draft environmental impact statement "Amendment #1 for Kennedy Space Center" which accompanied your letter of November 20, 1972 has been received by the Department of Commerce for review and comment.

The Department of Commerce has reviewed the draft environmental statement and has the following comments to offer for your consideration.

The subject draft environmental impact statement proposes modifications of the Kennedy Space Center's (KSC) facilities, structures, etc., for the Space Shuttle operations. From this new construction and alterations, no weather modification impact of any significance can be identified on the project.

The meteorology and climatology presented in the draft environmental impact statement are quite adequate and certainly are the result of the extensive studies and data gathering that have been made at this country's space launch center.

The additional propellant venting to be performed at the KSC is about the only atmospheric impact mentioned in the project draft environmental impact statement, and, as usual, the related dispersion calculations, etc., will be reviewed by the Air Resources Laboratories.

In the discussion of "short term uses vs. long term productivity", (Sec 5.0) the draft environmental impact statement, amendment #1 has overlooked any discussion of the areas post 10 years program Socio/Economic long term productivity. As mentioned in Section 2 (pg 2-61 thru pg 2-65) the predominant source of economic stability are the NASA and Airforce programs at KSC. With the cyclic nature of such activities and the public deemphasis on space related programs a discussion should be included on NASA plans for insuring a viable and stable future (more than 10 years hence) for this area. (Ref para 7 b)

We hope these comments will be of assistance to you in the preparation of the final statement.

Sincerely,

Sidney R Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

HEALTH AND
ENVIRONMENT

12 JAN 1973

Mr. Ralph E. Cushman
Special Assistant
Office of Administration
National Aeronautics and Space
Administration
Washington, D. C. 20546

Dear Mr. Cushman:

The Draft Amendment Number 1 (Space Shuttle Development and Operations) Environmental Statement has been reviewed.

Detailed comments suggested by the Department of the Air Force are attached.

Sincerely,

Herbert E. Bell
Colonel, USAF BSC
Acting Deputy Assistant (Environmental Quality)

Attachment
a/s

1-17-73 Copies made & sent to:
Al Bass
Pat Cohen
Ed Andrews
Marvin Redfield

AIR FORCE SUGGESTED CHANGES
TO
AMENDMENT #1 DRAFT (SPACE SHUTTLE DEVELOPMENT AND OPERATIONS) ENVIRONMENTAL STATEMENT

1. Page 1-2:

The following wording to replace the second paragraph on this page is suggested:

> "It is planned that a second operational site will be phased in at Vandenberg Air Force Base, California, for Shuttle Flights requiring high inclination orbits. The basic Shuttle facilities required at Vandenberg are planned to be provided by the Department of Defense on a time schedule compatible with progress in the Shuttle development program." (Ref page 1-2)

2. Page 1-3:

A statement to the effect that the Air Force is performing the necessary environmental assessment for the preparation of an environmental impact statement on the Vandenberg facilities should be included. (Ref page 1-3)

3. Page 2-6, Table 3:

It is suggested that the title of this table be changed to indicate that the contents of the table refer to a 10-minute emergency exposure to industrial workers. (Ref page 2-5, table 2-2)

4. Page 2-23 - Page 2-29, Figures 12-16:

The Maximum Allowable concentration . . . should be specifically annotated to reflect an emergency exposure concentration to industrial workers. (Ref figures 2-7 thru 12)

5. Page 2-30:

In the second paragraph of this page it is stated that 10 and 60 minute exposure may be exceeded instantaneously. It is difficult for one to imagine atmospheric processes happening so quickly. We suggest that the word instantaneously is inappropriate and indeed unnecessary. (Ref page 2-28)

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-72/1462

FEB 5 1973

Dear Mr. Cushman:

Thank you for providing us with the opportunity to comment on the institutional environmental statement and amendment number 1 for the John F. Kennedy Space Center, Brevard County, Florida (ER-72/1462).

General Comments (Ref para 3 e and 7 a)

Based upon the information presented in the documents, plus our general knowledge of the environmental resources in and around the Space Center, we do not feel that the impact on outdoor recreation has been adequately addressed. For example, Table 2 - Space Shuttle Environmental Impact Evaluation Summary, discusses the impact on outdoor recreation without presenting any qualitative or quantitative descriptive information on the existing environment of the project area. We urge that the final environmental statement contain such descriptive information as called for in Section 6(i) of the Council of Environmental Guidelines: "A description of the proposed action including information and technical data adequate to permit a careful assessment of environmental impact by commenting agencies."

The needed descriptive information is available in a special seashore analysis made about 1965 or 1966 by the National Park Service. We urge that the report or information extracted from it be utilized in the preparation of the final environmental statement.

We feel the discussion of environmental resources in the subject statement is incomplete. Environmental resources, the evaluation of which is an integral part of all environmental impact statements, include cultural (historical, archeological, architectural) as well as natural resources.

Executive Order 11593 of May 13, 1971 directs that Federal plans and programs contribute to the preservation and enhancement of those sites, structures, and objects which are of historical, architectural, or archeological significance. Importantly, this order is not limited to a consideration of sites listed on the National Register of Historic Places (see 16 U.S.C. 470 and 37F.R. 24126) although a consultation of that Register would be a prerequisite to the initiation of any Federal action. A subsequent step would be a consultation with the State Liaison Officer for Historic Preservation to determine if the properties

scheduled for nomination to the National Register or other sites, structures, and objects of significance might be affected by the proposed action. A professional archeological survey should also be made to establish the presence or absence of archeological resources within the affected area. The results and recommendations from such a survey should be included in an evaluation of impacts upon cultural resources.

As the proposed action would affect properties of the United States Government, Section 2(b) of Executive Order 11593 requires certain cautionary steps to assure that cultural resources worthy of preservation are not inadvertently threatened or damaged by development. The statement should develop procedures to be followed to locate, identify, and preserve or salvage such resources in advance of construction activity.

We recommend that the final environmental impact statement contain assurances that the recommended consultations have been performed and that it describe measures to be taken to mitigate impacts on any cultural resources affected.

The State Liaison Officer for Florida is the Director, Division of Archives, History and Records Management, Department of State, The Capitol, Tallahassee, Florida 32304.

Archeological counsel may be obtained from Mr. L. Ross Morrell of the above office.

Specific Comments

There are a number of phrases and sentences that should be revised for greater completeness and accuracy:

Page 2-35 amendment #1, the last sentence of the third paragraph should read: "The Floridan aquifer, through which most of the ground water flows, is made up of several hydraulically connected permeable limestone beds." (Ref page 2-34)

Page 2-4. We suggest that wording for "Ecological Relationships" be changed to read: (a) can be enhanced by conservation practices on KSC, and (a) Definite change-- conservation practice can mitigate somewhat... (Ref table 2-1)

Pages 2-44, 2-45, 2-46, Section d. Noise (1) Source and Nature page 4-58, last paragraph under Section d., we note that no mention is made of the probable effect of noise on wildlife. Noise pollution is of particular concern where nesting eagles are present. (Ref page 2-51)

Page 2-58. We suggest that the third sentence in the last paragraph in Section d., be changed to read as follows, "no environmental effect to people, structural and natural condition of significance results." (Ref page 2-51)

We further suggest that an additional paragraph be added to this section as follows: Disturbance to wildlife on the Merritt Island National Wildlife Refuge by the projected proposal has not been evaluated. Some disturbance to eagles, ospreys and other summer resident wildlife may occur. The degree of disturbance should be evaluated when Space Shuttle launchings begin.

(Ref page 2-51)

Page 2-66. We note in the last paragraph: "Past experience has shown that wildlife displaced by a facility program seems to remain in the nearby areas and no ill effects have been noted." We believe that this statement has no basis in fact and suggest deletion. A formal study would have to be made to determine to what degree is wildlife displaced or harmed. (Ref page 2-51)

Page 2-67/68, second sentence. We suggest the substitution of "may" for "seems to". (Ref page 2-60)

It is requested that NASA coordinate the selection of borrow areas and their design and construction with the Bureau of Sport Fisheries and Wildlife of the Department of the Interior. These borrow pits should be designed to preserve fresh water pools capable of manipulation and management by the Bureau of sport fish, waterfowl and other wildlife. (Ref page 2-2)

The Department is opposed to dredging of spoil from the Indian River, Banana Creek or other water areas adjacent to the proposed runway. By taking of fill material on the highland areas of the KSC, manageable water areas can be created that will compensate for other wildlife habitat destroyed by the paved runway. This is considered to be a most important mitigating measure.

(Ref page 4-9)

Page 3-4. There is no factual information available to indicate that the wildlife population has expanded since NASA procured the lands on Merritt Island. We suggest the deletion of the last sentence on this page. (Ref page 3-3)

Page 5-2. The final sentence on this page states, "The changed land use represents only a very small portion of the extensive land and water area of the refuge and should have no detrimental impact on the environment." This is not correct. As noted on page 1-4, the KSC is located on approximately 140,000 acres of Merritt Island and the full range of environmental impacts have not been analyzed.

(Ref page 3-3)

The construction of a 15,000-foot paved runway would have some impact on the environment and this should be so stated. Also the moving of the fill material required for this construction if not properly planned could affect even a much larger area.

The Bureau of Sport Fisheries and Wildlife of the Department of the Interior should be consulted in planning the location of the borrow sites.

Sincerely yours,

Deputy Assistant Secretary of the Interior

Mr. Ralph E. Cushman
Special Assistant
Office of Administration
National Aeronautics and
Space Administration
Washington, D.C. 20546

Rec'd 1/2/72

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

DEC 27 1972

Mr. Ralph E. Cushman
Special Assistant
Office of Administration
National Aeronautics and Space
Administration
Washington, D. C. 20546

Dear Mr. Cushman:

This is in response to your letter of November 20, 1972, transmitting a copy of a draft of Amendment No. 1 to your Institutional Environmental Impact Statement for review and comment. We have reviewed the statement and have no comments to offer.

Thank you for the opportunity to review the statement.

Sincerely,

Robert J. Catlin, Director
Division of Environmental Affairs

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SOUTHERN REGION
P. O. BOX 20636
ATLANTA, GEORGIA 30320

8 FEB 1973

Mr. Ralph E. Cushman
Special Assistant
Office of Administration
National Aeronautics & Space Administration
Washington, D. C. 20546

Dear Mr. Cushman:

We have reviewed the copy of the Kennedy Space Center, Amendment #1 draft environmental impact statement submitted to Mr. DeSimone, Assistant Secretary for Environment and Urban Systems on 8 December 1972.

Our review is limited to the effects this project will have on the existing or planned air transportation system. A determination was made on 5 December 1972 that the establishment of the Space Shuttle Landing Facility for private use is not objectionable from an airspace utilization standpoint. Mr. B. R. McCullar, NASA Kennedy Space Center, Florida, was advised on 5 December 1972 of this determination.

On page 1-15/16 interference to civil air routes is recognized but no information is furnished to determine the magnitude of this interference. To study the effects, we need the following information:

1. Launch azimuths with altitudes at approximately 50-mile intervals along the launch trails.

2. On recovery, the point where Flight Level 500 is reached and altitudes at 50-mile intervals from the point to landing area.

3. Can orbiter be requested to level off at any given altitude below Flight Level 500?

4. Can orbiter be radar vectored to avoid other traffic?

5. Speed of vehicle below Flight Level 500?

6. Can the vehicle be controlled like a conventional aircraft? (Ref para 7 e)

We appreciated the opportunity afforded us to review the environmental impact statement.

Sincerely,

James S. Beasley

JAMES S. BEASLEY
Chief, Planning Staff

STATE OF FLORIDA

Department of Administration

Division of State Planning

725 SOUTH BRONOUGH

TALLAHASSEE

32304

(904) 488-2401

Earl M. Starnes
STATE PLANNING DIRECTOR

Reubin O'D. Askew
GOVERNOR

L. K. Ireland, Jr.
SECRETARY OF ADMINISTRATION

March 12, 1973

Mr. William H. Lee, Environmental
Pollution Control Officer
National Aeronautics and Space
Administration
John F. Kennedy Space Center
Kennedy Space Center, Florida 32899

Dear Mr. Lee:

Functioning as the state planning and development clearinghouse contemplated in U. S. Office of Management and Budget Circular A-95, we have reviewed the following draft environmental impact statement:

National Aeronautics and Space Administration: Amendment Number 1 to the Institutional Environmental Impact Statement. SAI No. 73-0838-E

During our review we referred the environmental impact statement to the following agencies, which we identified as interested in the project: Board of Trustees of the Internal Improvement Trust Fund; Department of Community Affairs; Game and Fresh Water Fish Commission; Department of Health and Rehabilitative Services - Division of Health; Department of Natural Resources; Department of Pollution Control; Department of State - Division of Archives, History and Records Management; and to the Environmental Information Center.

Agencies were requested to review the statement and comment on possible effects that actions contemplated could have on matters on their concern. Letters of comment on the statement are enclosed from the Board of Trustees of the Internal Improvement Trust Fund; Department of Health and Rehabilitative Services - Division of Health; Department of Natural Resources; Department of Pollution Control; and Department of State - Division of Archives, History and Records Management. The Department of Community Affairs and Game and Fresh Water Fish Commission reported "no adverse comments" on the statement by telephone. No comments were received through the Environmental Information Center.

In accordance with the Council on Environmental Quality guidelines concerning statements on proposed federal actions affecting the environment, as required by the National Policy Act of 1969, and U. S. Office of Management and Budget Circular A-95, this letter, with attachments, should be appended to the final environmental impact statement on this project. Comments regarding this statement and project contained in the enclosed letters should be addressed in the statement. (Ref Section 7 & Appendix B)

We request to be forwarded one copy of the final environmental statement prepared on this project.

Sincerely,

Don L. Spicer
Chief
Bureau of Intergovernmental Relations

DLS/W/bp
Enclosures

cc: Mr. Randolph Hodges
Mr. Joel Kuperberg
Mr. Bill Partington
Mr. David H. Scott
Mr. Charles Shepherd
Dr. Wade Stephens
Mr. H. E. Wallace
Mr. Robert Williams

STATE OF FLORIDA
BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND
ELLIOT BUILDING — TALLAHASSEE, FLORIDA 32304

Joel Kuperberg
Executive Director

TELEPHONE 488-8123

March 5, 1973

DIVISION OF STATE PLANNING,
Bureau Of
Intergovernmental Relations
MAR 6 1973
RECEIVED
SAI NO. 73-0838E

Mr. Don L. Spicer, Chief
Bureau of Intergovernmental Relations
Department of Administration
Division of State Planning
725 South Bronough Street
Tallahassee, Florida, 32304

Dear Mr. Spicer:

National Aeronautics and Space Administration
John F. Kennedy Space Center Draft Amendment
Number 1 to the Institutional Environmental
Impact Statement. SAI Project Number 73-0838

The Trustees' staff has reviewed the draft amendment to the institutional environmental impact statement regarding the Space Shuttle Program proposed by the National Aeronautics and Space Administration at the John F. Kennedy Space Center. The following comments are submitted:

(1) A study of effects upon the territorial limits of wildlife in the vicinity of the proposed runway within the Merritt Island National Wildlife Refuge should be included in the final environmental statement. (Ref pages 2-2, 4-10, 5-1)

(2) On Pages 2-3 the statement claims that "rocket exhaust emissions are adequately dispersed well below acceptable levels at the Kennedy Space Center boundaries". An assessment should be made of environmental damage within the Kennedy Space Center boundaries which are the same as the wildlife refuge, as a result of rocket exhaust emissions which appear to be highly increased if a weekly flight is proposed. (Ref para 7 f)

(3) Precautions should be taken to insure that situations similar to that which caused the Banana River to be dammed for the Apollo Program will not occur with this project. Specialized equipment designed to move the shuttle vehicle from the runway to launch pad 39 A (or 39 B) should be constructed so that no obstruction to the remaining flow of the Banana River will be realized. (Ref para 7 g)

Reubin O'D. Askew, Governor
Richard (Dick) Stone, Secretary of State
Robert L. Shevin, Attorney General
Fred O. Dickinson, Jr., Comptroller
Thomas D. O'Malley, Treasurer
Floyd T. Christian, Commissioner of Education
Doyle Conner, Commissioner of Agriculture

(4) The statement refers to minimum filling in the construction of the project. This agency should be notified of any dredging, filling or structures contemplated in the nagivable waters of the State of Florida. (Ref para 7 g)

We would like to review the final environmental impact statement when completed.

Sincerely,

Joel Kuperberg

Joel Kuperberg,
Executive Director

JK/wpm

STATE OF FLORIDA

Department of State

THE CAPITOL
TALLAHASSEE 32304

DIVISION OF STATE PLANNING,
Bureau of
Intergovernmental Relations
MAR 1 1973
RECEIVED
SAI NO. 73-0838E

RICHARD (DICK) STONE
SECRETARY OF STATE

ROBERT WILLIAMS, DIRECTOR
DIVISION OF ARCHIVES, HISTORY, AND
RECORDS MANAGEMENT
(904) 488-1480

February 21, 1973

Mr. Don L. Spicer, Chief
Bureau of Intergovernmental Relations
Division of State Planning
Department of Administration
725 South Bronough
Tallahassee, Florida 32304

Re: SAI #73-0838 (Space Shuttle Project)

Dear Mr. Spicer:

In reference to the above project, our agency identifies two areas of concern. Our primary concern is the fact that Launch Complex Number 39 is being processed for inclusion on the National Register of Historic Places. We have received notification from Washington that the processing procedure is underway. Project effects upon this property must be considered in light of the Historic Preservation Act of 1966 and subsequent provisions of the National Environmental Policy Act of 1969; Section 101 (b)(4). We are enclosing, for information, a copy of Protection of Properties, Procedures for Compliance of the Advisory Council on Historic Preservation. These procedures are directly applicable to those properties involved with the National Register of Historic Places. (Ref para 7 h)

Our second recommendation is that the sponsoring agency arrange for a complete inventory of archaeological and historical sites within those areas not previously subjected to intensive land modification. This will allow an accurate assessment of project effects on these non-regenerative resources. (Ref para 7 a)

Sincerely,

Robert Williams

Robert Williams
State Liaison Officer

RW:Pgl
Enclosures a/s

DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES • • • • • • • • STATE OF FLORIDA
Emmett S. Roberts, Secretary
Reubin O'D Askew, Governor
STATE OF HEALTH
POST OFFICE BOX 210 • JACKSONVILLE, FLORIDA 32201 • PHONE (904) 354-3961
Wilson T. Sowder, M.D., M.P.H., Director

February 16, 1973

DIVISION OF STATE PLANNING
Bureau Of
Intergovernmental Relations
FEB 20 1973
RECEIVED
SAI NO. 73-0838-E

SAI No. 73-0838-E /70

Mr. Don L. Spicer, Chief
Bureau of Intergovernmental Relations
Division of State Planning
725 S. Bronough
Tallahassee, Florida 32304

Dear Mr. Spicer:

In response to your letter of February 1, 1973, above referenced project, there will be no adverse impact upon areas of concern to this office.

Very truly yours,

S. A. Berkowitz, Chief
Bureau of Sanitary Engineering

SAB:ja

State of Florida

DEPARTMENT OF NATURAL RESOURCES

RANDOLPH HODGES
Executive Director

LARSON BUILDING / TALLAHASSEE 32304 / TELEPHONE 224-7141

REUBIN O'D. ASKEW
Governor
RICHARD (DICK) STONE
Secretary of State
ROBERT L. SHEVIN
Attorney General
FRED O. DICKINSON, JR.
Comptroller
THOMAS D. O'MALLEY
Treasurer
DOYLE CONNER
Commissioner of Agriculture
FLOYD T. CHRISTIAN
Commissioner of Education

February 28, 1973

DIVISION OF STATE PLANNING
Bureau Of
Intergovernmental Relations
MAR 2 1973
RECEIVED
SAI NO. 73-0838-E

Mr. Don L. Spicer, Chief
Bureau of Intergovernmental
Relations
Division of State Planning
725 South Bronough Street
Tallahassee, Florida 32304

Dear Mr. Spicer:

This will respond to your letter of February 1, 1973, pertaining to SAI No. 73-0838-E.

Pursuant to your request, subject project has been reviewed by the Department staff and the following comments are provided:

Coastal Coordinating Council Staff

1. It appears that certain marsh areas will be physically damaged by a portion of the project. The Council has included such areas in its preservation category and urges that adequate efforts be taken so that no or very little marsh area will be disturbed as a result of this project. (Ref pages 1-16, 2-60-3-3)

2. The proposed landing facility should be designed so that runoff resulting from rainfall will not flow directly into surrounding water or marsh areas. Such runoff should be filtered by use of settling ponds. (Ref pages 2-30, 2-38 thru 2-41)

3. The Federal Housing Administration has certain regulations preventing them from handling or approving home mortgages in areas affected by loud noise from aircraft in the vicinity of airports. Will these regulations prevent the development of suitable lands north, east and south of the landing site, outside of the federal property? (Ref para 2 d (3))

Mr. Spicer
Page Two
February 28, 1973

4. The Council has also classified Atlantic beaches and dunes as preservation. Any proposed structures which would interfere with the natural vegetation or disturb the dune line or longshore current should be deleted from the project or altered sufficiently to avoid any detrimental effects.
(Ref page 2-60)

Sincerely,

Randolph Hodges
Executive Director

RH/jsw

DIVISION OF ADMINISTRATIVE SERVICES • DIVISION OF CORRECTIONS • DIVISION OF FAMILY SERVICES • DIVISION OF HEALTH • DIVISION OF MENTAL HEALTH
DIVISION OF PLANNING AND EVALUATION • DIVISION OF RETARDATION • DIVISION OF VOCATIONAL REHABILITATION • DIVISION OF YOUTH SERVICES

STATE OF FLORIDA
DEPARTMENT OF POLLUTION CONTROL
2562 EXECUTIVE CENTER CIRCLE, EAST
MONTGOMERY BUILDING, TALLAHASSEE, FLORIDA 32301

VINCENT D. PATTON
EXECUTIVE DIRECTOR

DAVID H. LEVIN
CHAIRMAN

DIVISION OF STATE PLANNING,
Intergovernmental Relations
FEB 14 1973
RECEIVED
SAI NO. 73-0838

February 6, 1973

Federal Agencies

73-0838

Mr. William H. Lee
Environmental Pollution Control Officer
National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, Florida 32899

Dear Mr. Lee:

The report entitled Draft, Amendment #1 to the Institutional Environmental Impact Statement prepared by the Shuttle Project Office, NASA has been reviewed for environmental impact of concern to the Department of Pollution Control. The environmental factors of air, water and noise pollution are considered to be adequately covered under both standard and abortive operating conditions. Accordingly the activities are considered to be compatible with current program objectives of the department.

Very truly yours,

David H. Scott

David H. Scott, Director
Division of Planning, Technical
Assistance and Grants

DHS:sdt

cc: Mr. Alex Senkevich
cc: Department of Administration

B-27/28

JOHN R. MIDDLEMAS
BOARD MEMBER

GEORGE RUPPEL
BOARD MEMBER

JAMES F. REDFORD, JR.
BOARD MEMBER

A. D. VINCENT
BOARD MEMBER