

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**NOTICE: JA 131-03-05-01****National Environmental Policy Act; Proposed Construction of the Crew Quarantine Facility****AGENCY: National Aeronautics and Space Administration (NASA)****ACTION: Notice of Finding of No Significant Impact (FONSI)**

SUMMARY: Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, et seq.), the Council on Environmental Quality (CEQ) regulations for implementing the Procedural Provisions of NEPA (40CFR 1500-1508), and the NASA policy and procedures (14 CFR part 1216 subpart 1216.3), NASA announces the availability of the Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) that addresses the environmental impacts expected to result from the construction of a Crew Quarantine Facility at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas. The facility would accommodate approximately 1,109 square meters (11,939 square feet) of space, consist of a single story, and be constructed in the northeast portion of JSC.

FOR FURTHER INFORMATION CONTACT: Written requests for copies of the EA and FONSI, or requests for information, should be directed to Ms. Sandy Parker, Environmental Specialist, Environmental Office, NASA, Johnson Space Center, Mail Code JA131, 2101 NASA Road 1, Houston, Texas 77058, FAX (281)-483-3048, or by calling (281) 483-3119.

SUPPLEMENTAL INFORMATION: NASA has reviewed the EA prepared for the construction of the Crew Quarantine Facility and has determined that it represents an accurate and adequate analysis of the scope and level of associated environmental impacts. The EA is hereby incorporated by reference in this final FONSI.

Two alternatives have been considered: the proposed action and the no-action alternative. The no-action alternative would result in a continued reduction of workspace for future and current employees and would not provide the necessary facilities to meet the International Space Station initiatives.

The potential physical, biological, socioeconomic, and cultural impacts of the construction and operation of the Crew Quarantine Facility have been assessed and evaluated. No significant impacts, related to any of these issues, were identified. As a result of this assessment and evaluation, a Finding of No Significant Impact is declared.

Physical and biological resources considered included climate and earth movements, water, air, and noise resources, hazardous materials, transportation, floodplains, wetlands,

wildlife, and vegetation. The Crew Quarantine Facility would have no substantial impact on any of these resources.

Socioeconomic evaluation included effects on land use, demographics, and economic activity. The Crew Quarantine Facility would have no substantial impact on any of these resources.

Cultural resources considered archeological site records on file with the Texas Archeological Research Laboratory (TARL) at the University of Texas at Austin. Based on a review of these records, no archeological sites have been recorded within the project limits. Therefore, the Crew Quarantine Facility is not anticipated to have any known cultural impacts. In the event that archeological resources are encountered during construction, the construction operations shall cease in the vicinity until the requirements of Section 106 of the National Historic Preservation Act are met.

Cumulative Impacts: The EA reviewed cumulative impacts that could result from the incremental impact proposed activities when added to other past, present, and reasonably foreseeable future actions. No other actions have been identified within, or adjacent to, the proposed site for the Crew Quarantine Facility that would contribute to cumulative impacts.

Mitigation: Standard construction practices would be implemented to reduce erosion potential during ground disturbing activities.

On the basis of the EA, NASA has determined that the physical, biological, socioeconomic, and cultural impacts associated with the construction of the Crew Quarantine Facility would not individually or cumulatively have a significant impact on the quality of the human environment. Therefore, NASA has determined that an Environmental Impact Statement need not be prepared. NASA took no final action prior to the expiration of the 30-day comment period.

Jefferson D. Howell, Jr.
NASA, Johnson Space Center
Center Director

EXECUTIVE SUMMARY

Type of report

This report is an Environmental Assessment (EA) Report.

Name of proposed action

The name of the proposed action is construction of a Crew Quarantine Facility (CQF), Lyndon B. Johnson Space Center (JSC), Houston, Texas.

Description of proposed action

The proposed action discussed in this document is the construction of a CQF to be used by crew members for health stabilization and quarantine protection and allow for circadian rhythm shifting prior to launch. The proposed site is located in the northeast corner of JSC and would host an approximately 1,109 square meter (11,939 square foot), single story building. This document provides an environmental assessment of the proposed action.

Description of no action alternative

Alternatives that were considered include the proposed action and the no-action alternative. The no-action alternative would result in a continued reduction of workspace for future and current employees and would not provide the necessary facilities to meet International Space Station initiatives. This alternative would not meet the purpose and need for the proposed project. The no-action alternative would have several negative consequences for JSC. JSC has responsibilities to certify tours of Astronaut duty, to support Space Station missions and other exploration ventures, to determine physiological consequences of extended - duration missions, and to develop measures to safeguard the crewmembers health throughout their duty.

Physical resources

Construction of the Crew Quarantine Facility (CQF) on the proposed site at NASA's Lyndon B. Johnson Space Center (JSC) would impact approximately 0.53 hectares (1.3 acres) of undeveloped field. Due to the location, the proposed facility would be constructed to effectively drain excess water from the site.

Construction activities may cause short-term air emissions and dust. These can be mitigated with proper dust control methods. Construction noise may exceed normal ambient noise levels, but normal levels are expected after construction activity ceases. Traffic flow may be temporarily affected during the construction phase. No hazardous materials would be generated as a result of the construction or operation of the proposed facility and preventive measures would be incorporated to reduce potential spills from

construction equipment. Operation of the facility may result in some air emissions, but are not anticipated to be substantial.

The topography of the proposed site would not be altered substantially. Some fill material may be placed under the proposed building and parking lot for leveling and stability. Impacts to topography relating to occupancy and maintenance of the proposed facility are not expected. Some short-term erosion of soil and turbidity in drainage swales may occur during construction of the proposed facility; however, with appropriate storm water pollution prevention controls and practices, the impact would be minimal, and implemented in accordance with Best Management Practices as required by the Texas Pollutant Discharge Elimination System (TPDES) General Permit No. TXR040000.

Biological resources

The proposed site is undeveloped field, dominated by grasses. The proposed site was been used as a fill deposit site approximately 20 years ago; therefore, the native vegetative community was altered many years ago. Planted native and non-native trees along the perimeter of the property should not have to be cleared due to the size of the proposed site. The established vegetation on site and in the drainage swale provides protective cover and food resources for some wildlife species; however, no substantial displacement of wildlife is expected as a result of the proposed action. No impacts to threatened and endangered species or designated critical habitat would result from the proposed action.

No wetlands were shown on or immediately adjacent to the proposed site on the National Wetland Inventory maps. No wetlands indicators were observed within the boundary of the site during site reconnaissance. Drainage ditches constructed in uplands are not considered waters of the United States.

Socioeconomic and cultural resources

Construction and operation of the proposed facility would not adversely impact minority or low-income populations. Some jobs and potential learning opportunities would be created. No known archeological sites would be impacted as a result from the proposed action. National Historic Landmarks (NHL) identified at JSC would not be impacted. Impacts to the Child Care Facility or its operations are not anticipated from the proposed project.

Conclusions

Short- and long-term effects on the quality of the human environment would be minimal if the proposed action were implemented. Other potential impacts to the physical and biological resources would be temporary and no impacts to socioeconomic and cultural resources would occur. No reasonable foreseeable cumulative effects associated with the construction of the Crew Quarantine Facility were identified. The no-action alternative would not provide the resources for meeting the project objectives.

ABSTRACT
ENVIRONMENTAL ASSESSMENT
For
THE CREW QUARANTINE FACILITY
LYNDON B. JOHNSON SPACE CENTER
Houston, Texas

Lead Agency: NASA – Lyndon B. Johnson Space Center

Proposed Action: Construction of a Crew Quarantine Facility

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Date: May 2003

Abstract:

The proposed action discussed in this document is the construction of a Crew Quarantine Facility (CQF), which will enable the Lyndon B. Johnson Space Center (JSC) to perform health stabilization and quarantine protection and allow for circadian rhythm shifting prior to launch. The CQF is a key element in meeting NASA's long range manned space flight goals. This document provides an environmental assessment of the proposed CQF site.

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Glossary: Abbreviations, Acronyms, and Terms

Alternative	Plan, option, choice (this EA analyzes two alternatives)
Baseline conditions	Existing condition of a resource issue
BDCF	Baseline Data Collection Facility
CEQ	Council on Environmental Quality
BMP	Best management practices
CEQ Regulations	Regulations that tell how to implement NEPA
CFR	Code of Federal Regulation
COH	City of Houston
CQF	Crew Quarantine Facility
Cumulative effects	Past, present, and reasonably foreseeable effects added together (regardless of who or what has caused, is causing, and might cause these effects)
Decision maker	JSC Management, with review from NASA Headquarters Environmental Management Code JE
EA	Environmental Assessment
EDCO	Extended Duration Crew Operations
EHS	Space Station Environmental Health Subsystem
EIS	Environmental Impact Statement
FONSI	Finding of No Significant Impact (on the human environment, as defined in CEQ Regulations 1508.14)
FPPA	Farmland Protection Policy Act
FMC	Flight Medicine Clinic
HCFCDD	Harris County Flood Control District
HMF	Remote Health Care / Health Maintenance Facility
Issue	An environmental resource about which someone has a concern; identified in NEPA, § 102 (2) (E) as an unresolved conflict
JSC	Lyndon B. Johnson Space Center, Houston, Texas
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969
NHL	National Historic Landmark

No action	Continue present management, but do not do the proposed project
Objective	A subset of the project's goal
OMC	Occupational Medicine Clinic
Preferred Alternative	The alternative (option/plan) that the Decision maker plans to select near the end of the analysis process
PPE	Personal protection equipment
ROD	Record of Decision
S&TC	Science and Technology Center
Selected Alternative	The alternative (option/plan) that the Decision maker selects to implement
TARL	Texas Archeological Research Laboratory
THC	Texas Historical Commission
USACE	United States Army Corp of Engineers

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

NASA proposes to construct a Crew Quarantine Facility (CQF) at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas beginning in 2003.

The functional requirements of the CQF will be used by crew members for health stabilization, quarantine protection and to provide circadian rhythm shifting prior to launch. The facility is designed to pre-adapt crews to altered sensory conditions which in turn, should prevent or mitigate space motion sickness and neurosensory disturbance. In the future, advanced programs may require quarantine after space flight.

In the future, NASA may incorporate the additional functionality into the proposed facility such as rehabilitation facility that will help to counteract the affects of long duration-manned space flights. Growth needs dictate additional operating space for future programs, which would be incorporated into the CQF and be subject to environmental review in accordance with NASA policy and guidelines.

1.2 Need for the Crew Quarantine Facility

Certified tours of Astronaut duty on an operational basis of 180 days, and support for exploration initiatives for the Space Station and future moon or Mars endeavors are formally accepted responsibilities of the JSC Director of Space and Life Sciences and the Directors of Life Sciences at NASA Headquarters. JSC is the lead NASA Center for STS Orbiter and medical operations support. JSC is responsible for determining consequences of extended duration STS missions. Monitoring physiological functions and development of countermeasures for potential physiological problems incurred during reentry, landing, and post-landing egress are additional responsibilities of JSC. The manned space flight-oriented biomedical research and operational support capabilities for the planned life sciences research can only be met at JSC. Existing facilities at JSC could not meet the needs of the program. The proposed facility would represent one key element in achieving NASA's long range manned space flight goals.

1.3 Applicable Regulatory Requirements and Required Coordination

Based on initial environmental review, compliance with the following environmental laws, regulations, and coordination activities are required for the proposed Crew Quarantine Facility project to proceed.

- Clean Air Act
This act establishes standards for particulate matter in the air. This project meets these standards as described in 4.3.1.
- Migratory Bird Treaty Act

This act provides for the protection of migratory birds. Under this act it is unlawful “by any means or manner, to pursue, hunt, take, capture, [or} kill” any migratory birds except permitted by regulation. Unintentional take constitutes a violation. While modifications of habitat possibly used by migratory species may occur at the site, habitat modification is not considered a “take”.

- **National Historic Preservation Act**
This act establishes a requirement for consideration of potential impacts to historic properties. The Texas Historical Commission (THC) determined that there would be no adverse effects to historic properties if the proposed action were implemented.
- **Endangered Species Act**
This act was established to protect Federally listed threatened and endangered species. The U. S. Fish and Wildlife Service determined that no federally listed threatened or endangered species are known to occur at the proposed site. In addition, there was no officially designated critical habitat at this site. The proposed action would be constructed in accordance with the law.
- **Farmland Protection Policy Act**
This act was implemented to assist in protection of prime farmland throughout the United States. The proposed site is designated as “farmland already in urban development” and is exempt from further review under the policy.

Additional guidelines to be followed:

- Federal Emergency Management Agency guidelines concerning floodplains.
- National Pollution Discharge Elimination System general permit conditions as outlined in the NASA Storm Water Pollution Prevention Plan.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Construction of the Crew Quarantine Facility

The CQF would be located at JSC in Harris County, Texas. JSC is located 35.40 kilometers (22 miles) southeast of downtown Houston, near Clear Lake (*Section 8.0, Figure 1*). The proposed site is located in the northeast portion of JSC, north of Building 28 and east of Building 37 at the southeast corner of the intersection of Avenue B and Fifth Street. The site is approximately 0.53 hectares (1.3 acres) of an undeveloped field, dominated by grasses.

A precast tilt-up and composite steel frame building, approximately 1,109 square meters (11,939 square feet) in size, comprised of a single story is proposed for construction. The building would house bedrooms, kitchen, dining area, exercise room, offices and conference space (*Section 8.0, Figure 2*). The entire site will be impacted by the proposed facilities.

2.2 No-Action Alternative: Maintenance of site in the undeveloped condition

The no-action alternative would have several consequences for JSC. JSC has responsibilities to certify tours of Astronaut duty, to support Space Station missions and other exploration ventures, to determine physiological consequences of extended - duration missions, and to develop measures to safeguard the crewmembers health throughout their duty. Lack of space and a centralized location for medical operations and research facilities are critically limiting the implementation of JSC initiatives and no-action would result in JSC's inability to execute programs.

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

The affected environment succinctly describes the relevant resources of the areas that would affect or that would be affected by the alternatives if they were implemented. In conjunction with the description of the no action alternative in Chapter 2 and with the predicted effects of the no action alternative in Chapter 4, this chapter establishes the scientific baselines against which the decision maker and the public can compare the effects of the action alternative.

3.2 Climate and Earth Movements

3.2.1 Hurricanes and Tidal Surge

From June to November, the Gulf Coast may be struck by hurricanes and tropical storms with sustained heavy rain and strong winds. Flooding may occur in coastal areas due to storm surge (extremely high tides caused by wind) and receding waters. A review of the U.S. Geological Survey (USGS) Topographic Map (League City Quadrangle) contained within MapTech Terrain Navigator indicates the proposed site is located within JSC has an elevation of approximately 4.57 meters (15 feet) above mean sea level (USGS, 1995) (*Section 8.0, Figure 3*). An orthogonal view illustrates the generally flat conditions at JSC with several notable drainage ditches crossing the installation from the southwest to the northeast (*Section 8.0, Figure 3a*). The proposed site and the land surrounding the site are generally flat, with a gentle slope to the northeast.

3.2.2 Rainfall

Rainfall is evenly distributed throughout the year, with an annual average of about 116.84 centimeters (46 inches) (WeatherPost 2000). Thunderstorms are common in summer months when the sun warms the air near the surface, causing it to rise and cool, resulting in clouds and rain. Showers and thunderstorms also occur when weather fronts pass through the area.

3.3 Construction Impacts

3.3.1 Air Resources

The U. S. Environmental Protection Agency established National Ambient Air Quality Standards (NAAQS) for ozone, lead, carbon monoxide, sulfur dioxide, nitrogen dioxide, and respirable particulate matter. The Texas Commission on Environmental Quality (TCEQ), formerly Texas Natural Resources Conservation Commission (TNRCC) has adopted the NAAQS standards presented in Table 3.3.1 for each of the six pollutants.

The TCEQ classifies the air quality status of each county with respect to NAAQS as attainment, nonattainment, or unclassified. Attainment indicates that the air quality is

within the NAAQS. Nonattainment indicates that the air quality exceeds NAAQS for a specified pollutant or pollutants. Unclassified indicates insufficient data to categorize a particular county. Harris County is classified as a "severe nonattainment" area for ozone.

It is in attainment for all other NAAQS. Ozone is not emitted directly into the air. It is formed through chemical reactions between natural and man-made emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. Ozone pollution is the periodic increase in the concentration of ozone in the ambient air. When temperatures are high, sunshine is strong, and winds are weak, ozone can accumulate at ground level to unhealthful levels (TNRCC 1995).

Table 3.3.1 - National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	Primary NAAQS	Secondary NAAQS
Ozone	1 hour ^a	125 ppb	125 ppb
	8 hour ^b	85 ppb	85 ppb
Carbon Monoxide	1 hour ^c	35.5 ppm	35.5 ppm
	8 hour ^c	9.5 ppm	9.5 ppm
Sulfur Dioxide	3 hour ^c	-	550 ppb
	24 hour ^c	145 ppb	-
Nitrogen Dioxide	Annual ^d	35 ppb	-
	Annual ^d	54 ppb	54 ppb
Respirable Particulate Matter (10 microns or less) (PM ₁₀)	24 hour ^e	155 µg/m ³	155 µg/m ³
	Annual ^f	51 µg/m ³	51 µg/m ³
Respirable Particulate Matter (2.5 microns or less) (PM _{2.5})	24 hour ^g	66 µg/m ³	66 µg/m ³
	Annual ^h	15.1 µg/m ³	15.1 µg/m ³
Lead	Quarter ^d	1.55 µg/m ³	1.55 µg/m ³

Source: TNRCC June 2000; www.tnrc.state.tx.us/air/monops/naaqs.html

Primary NAAQS: The levels of air quality that the EPA judges necessary, with an adequate margin of safety, to protect the public health.

Secondary NAAQS: The levels of air quality that the EPA judges necessary to protect the public welfare from any known or anticipated adverse effects.

ppb = parts per billion, ppm = parts per million, µg/m³ = micrograms per cubic meter

a – Not to be at or above this level on more than three days over three years.

b – Not to be at or above the average of the annual fourth highest daily 8-hour maximum over a three year period.

c – Not to be at or above this level more than once per calendar year.

d – Not to be at or above this level.

e – Not to be at or above the three year average of the annual 99th percentile for each monitor within an area.

f – Not to be at or above the three year average of annual arithmetic mean concentrations at each monitor within an area.

g – Not to be at or above the three year average of the annual 98th percentile for each population-oriented monitor within an area.

h – Not to be at or above the three year average of annual arithmetic mean concentrations from single or multiple community-oriented monitors.

3.3.2 Noise Environment

Most of the land immediately surrounding the proposed site hosts buildings and parking lots. Adjacent to the southwest of the proposed site, there is the Auxiliary Chiller Facility. Adjacent to the northwest, there are the Planetary and Earth Sciences Laboratory, the Life Sciences Laboratory, and parking lots. Adjacent to the northeast, there are the Environmental Support Facility, a Gate House, and the Administrative Support Facility. Adjacent to the southeast, there are several drainage ditches, the drainage swale, the HL&P canal, a pecan grove, open field, a pipeline corridor, and eventually Clear Lake. A fence marks the perimeter of JSC, and there are public roadways to the north, east and southwest of JSC. There is also a residential development located to the northwest of JSC.

JSC complies with the City of Houston Noise Ordinance, 93-77, Paragraph 2. This ordinance identifies a maximum permissible sound level for non-residential property at 68 dBA (day or night) at the property line where sound is being received.

JSC identified sensitive receptors are the Child Care Facility (Building 210); the Gilruth Recreation Facility (Building 207); the Visitor Center; and homes, stores and offices outside the property line. The Central Heating and Cooling Plant (Building 24), on Second Street southwest of Avenue B, has boilers, compressors and chillers that generate noise levels inside the building up to 95 dB(A). The Child Care Facility (Building 210), 600 meters (2,000 feet) away, is the closest sensitive receptor. Estimates indicate that 36 dB(A) of noise are received from this source. The nearest noise receptor outside JSC is a store 1,100 meters (3,700 feet) to the southeast, across NASA Road 1, estimates indicate that the noise from this source is 29 dB(A).

Noise levels do not appear to exceeded normal background levels typically associated with such areas.

3.3.3 Spills and Hazardous Materials

The proposed site is undeveloped and has not been associated with any known activities or past uses, which involved the generation, storage, or disposal of hazardous materials. The application of herbicides and insecticides is presumed to have occurred as part of normal pest control procedures. There are no records of spills having occurred at the proposed site.

3.3.4 Transportation

The proposed site is located on the corner of Avenue B and Fifth Street. Vehicles currently travel on both roads when going to and from surrounding buildings. There is a side entrance from Space Center Boulevard into JSC located to the northeast of the proposed site.

In general, there is little traffic at the proposed site on JSC.

3.4 Water Resources

3.4.1 Surface Water and Drainage

A canal, maintained by the Houston Lighting and Power Company (HL&P), traverses the southeastern boundary of the proposed site. Based on historical aerial photographs, the canal was constructed between 1944 and 1957. A storm water drainage ditch (herein called the “drainage swale”) parallels the HL&P canal along its northern boundary. Based on historical aerial photographs and USGS topographic maps, the drainage swale was created in the late 1960’s. Both structures have outlets into Clear Lake.

There is a linear depression (drain ditch) located on the southern portion of the site. The gentle slope of the land toward the northeast indicates runoff would flow into the drainage swale and eventually into Clear Lake. The HL&P canal and the drainage swale typically hold water. Water was not observed in the ditch during the time of the study, but it can be assumed these areas do drain surface water off the site at certain times.

3.4.2 Floodplains

Floodplains are low areas adjoining inland and coastal waters. Those that have a one percent chance or greater for flooding in any given year are considered to be in a 100-year floodplain. Activities in floodplains should be compatible with the natural propensity for flooding. Structures in the floodplain may further exacerbate flooding upstream or downstream.

The Federal Emergency Management Agency (FEMA) publishes flood maps for insurance ratings. A floodplain map of JSC was obtained from FEMA and is included in Section 8.0, Figure 4 (Map number 48201C1090 K, revised April 20, 2000). No portion of the proposed site is located within the 500-year floodplain. Note: the proposed site is in close proximity to areas of 100-year flood with average depths of less than 1 foot. Slight elevation of the proposed site might be necessary.

3.4.3 Groundwater

The Beaumont Formation, along with the underlying Montgomery, Bentley, and Wouldis Sand Formations, comprise the Chicot Aquifer, which extends approximately 700 feet below surface in the area of the proposed CQF site. The Evangeline Aquifer is approximately 670.56 meters (2,200 feet) thick and extends from the base of the Chicot Aquifer to approximately 883.92 meters (2,900 feet) below surface (*Digital Models for Simulation of Groundwater Hydrology of the Chicot and Evangeline Aquifers Along the Gulf Coast of Texas*, 1985, Texas Department of Water Resources). Shallow groundwater can typically be encountered at a depth of 3.05 to 6.10 meters (10 to 20 feet) below the surface at JSC. The Chicot and Evangeline Aquifers are the principal sources of groundwater in the Houston area.

Harris County has restricted the pumping of groundwater due to the subsidence in the area. The main source of water supply for JSC and the surrounding vicinity is treated surface water. According to the Joint Groundwater Monitoring and Contamination Report prepared by the Texas Groundwater Protection Committee in 1998, JSC is not located in a groundwater protection or recharge zone.

3.5 Biological Resources

3.5.1 Vegetation

The proposed site is in the Gulf Prairies and Marshes area of Texas, with nearly level coastal prairie, slowly drained by many slow-moving rivers, streams, and sloughs surrounded by low woodlands (Hatch et al. 1990). Fresh water marshes are located in low-lying remnant prairies, while salt marshes are located in areas adjacent to coastal waters.

Tall prairie grasses are the dominant vegetation in coastal prairies. Natural fires and grazing have prevented trees and shrubs from dominating the landscape. Development has affected plant communities at and surrounding the proposed site. The proposed site was used for agriculture prior to 1969. Many species of natural vegetation were removed during agricultural practices. In addition, the proposed site was used for fill deposit approximately 20 years ago. Dominant vegetation now includes Bermuda grass (*Cynodon dactylon*), Dallisgrass (*Paspalum dilatatum*), and Johnson grass (*Sorghum halapense*). Ten different species of native and non-native trees are planted along the perimeter of the property.

3.5.2 Wildlife

The Upper Texas Gulf Coast is home to many species of birds, mammals, reptiles, and amphibians. However, agriculture and urban development have fragmented and altered wildlife habitat. Open fields, a pecan grove, administrative and operation buildings, a gatehouse, roadways, and parking lots surround the proposed site.

The open land and pecan grove near the proposed site provide habitat for deer, small mammals, birds, reptiles, and amphibians that are adapted to suburban and rural environments. The HL&P canal and the drainage swale also provide habitat for a variety of species. During the field reconnaissance, species observed included green heron, (*Butorides striatus*), great egret (*Casmerodius albus*), grackle (*Quiscalus sp.*), barn swallow (*Hirundo rustica*), mottled duck (*Anus fulvigula*), red-winged blackbird (*Agelaius phoeniceus*), Eastern meadowlark (*Sturnella magna*), loggerhead shrike (*Lanius ludovicianus*), purple martin (*Progne subis*), snowy egret (*Egretta thula*), doublecrested cormorant (*Phalacrocorax auritus*), killdeer (*Charadrius vociferus*), American crow (*Corvus brachyrhynchos*), crawfish, and several snakes. Owl pellets consisting primarily of crawfish were found on site, indicating this may be a foraging area for some wildlife.

Birds such as mourning doves (*Zenaida macroura*), European starling (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), Northern mockingbird (*Mimus polyglottos*), Northern cardinal (*Cardinalis cardinalis*), and blue jay (*Cyanocitta cristata*) may also be found at and surrounding the proposed site. Small mammals such as raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and rodents are found in undeveloped areas on and adjacent to the proposed site. Whitetail deer (*Odocoileus virginianus*) are frequently observed on JSC property. The fence surrounding JSC typically would prevent large animals from entering the property, however, deer on the property may be able to penetrate the boundary.

3.5.3 Wetlands

The U.S. Army Corps of Engineers (USACE) is responsible for administering and enforcing Section 404 of the Clean Water Act. Wetlands are defined in Title 33, Code of Federal Regulations (CFR) Part 328, Section 3(b), as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. A jurisdictional wetland, as defined by the 1987 *Corps of Engineers Wetland Delineation Manual*, must meet three mandatory criteria: hydric soils, wetland hydrology, and hydrophytic vegetation.

Soils at the proposed site are mapped as Lake Charles-Urban land complexes (*Section 8.0, Figure 5*). Lake Charles soils are very firm, mildly alkaline at depths below 55.8 centimeters (22 inches), and consist of clay ranging in color from black (top 55.8 cm (22 inches)) to gray with mottles (187.96 cm (74 inches)). Soils are nearly level, sloping between 0 - 3% (usually 0 – 1%). These soils are somewhat poorly drained, and very slowly permeable. (Soil Conservation Service, Harris County Soil Survey, 1976).

The U.S. Department of the Interior, Fish and Wildlife Service has published National Wetland Inventory maps that identify wetland areas. No wetlands were shown on or immediately adjacent to the proposed site, although wetlands are mapped on other portions of the JSC property (*Section 8.0, Figure 6*). During site reconnaissance of the proposed site, no wetlands indicators were observed within the boundaries of the site. The drainage swale adjacent to the east of the proposed site does support hydrophytic vegetation, but it is a manmade structure created from uplands and is not considered waters of the United States. USACE has the discretion to determine on a case-by-case basis whether or not a particular waterbody is a water of the United States (51 FR 41217). Federal Register 51 FR 41217, dated states that drainage ditches constructed entirely in upland areas generally are not considered to be waters of the United States. The term "waters of the United States" is defined at 33 CFR 328.3 and refers to the USACE Section 404 jurisdiction.

3.5.4 Prime Farmlands

In accordance with the 1981 Act, farmland includes all land that is defined as prime, unique, or statewide or locally important. Farmland does not have to be used currently for

cropland. It can include cropland, pastureland, forestland, or other land. Water or water storage areas are not considered farmland, nor urban land as outlined in Section 523.10(B). This act was implemented to assist in protection of prime farmland throughout the United States. The proposed site is designated as “farmland already in urban development” and is exempt from further review under the policy.

3.6 Socioeconomic and Cultural Resources

3.6.1 Demographics and Economic Activity

The proposed site is located in the Clear Lake area. The Clear Lake area includes the cities of Friendswood, Kemah, League City, Nassau Bay, Seabrook, Webster, Clear Lake Shores, El Lago, Taylor Lake Village, and parts of Houston and Pasadena. The 2000 population estimate for the Clear Lake area is about 200,000 persons (Clear Lake Economic Development Foundation 2000).

The proposed site is located within one census tract composed of five block groups, mapped and designated by the U.S. Department of Commerce, Bureau of the Census. The proposed site is located in the 1990 census tract, 373.03, surrounding NASA Johnson Space Center, in Houston, Harris County, Texas. Table 3.6.1 lists the race, ethnicity, the number of persons of voting age, the number of persons in the workforce, the average household income, and the number of housing units and their occupancy status for all block groups in tract 373.03.

The aerospace industry, specialty chemical industry, tourism, and boating and recreation dominate the Clear Lake area economy. Additional area businesses include the service, wholesale, and retail sectors (Clear Lake Area Economic Development Foundation 2000).

Table 3.6.1 Demographics of Census Tract 373.03 (including all blocks)

Census Tract 373.03		
Persons:	White	6,916
	Black	592
	Native American	53
	Asian	691
	Hispanic	2,095
Total Persons:		10,347
Persons of Voting Age:	White	6,224
	Black	562
	Native American	52
	Asian	606
	Hispanic	1,988
Total Persons of Voting Age:		9,432
Persons in Work Force:		7,243
Average Household Income:		50,752

Housing Units:	Owned	1,250
	Rented	2,695
	Vacant	553
Total Housing Units:		4,498

Source: Clear Lake Area Economic Development Foundation 2000 Census Data

In between the proposed site and the Child Care Facility (Building 210) there are open fields, administrative and operation buildings, roadways, and parking lots. The proposed site is approximately 600 meters (2,000 feet) to the southeast from the Child Care Facility. In accordance with Executive Order 13045, Children's Health and Environmental Risk policy and based on a historical review of operations at JSC, the potential impacts from increase traffic, noise, air pollution, (dust) or chemical use, does not appear to impact the Child Care Facility or its operations.

3.6.2 Cultural Resources

Archeological site records on file with the Texas Archeological Research Laboratory (TARL) at the University of Texas at Austin were reviewed to determine the presence of recorded sites within or immediately adjacent to the project area. Based on a review of these records, no archeological sites have been recorded within the project limits. However, numerous sites in the immediate vicinity of Clear Lake are on record with the state files at TARL suggesting a favored location for habitation during the prehistoric period.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Environmental consequences is the scientific and analytic basis for the summary comparison of effects. This chapter presents in detail and by resource the following effects:

- Direct, indirect, and cumulative effects of all alternatives
- Relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity
- Irreversible and irretrievable commitment of resources that would be involved if any of the alternatives were implemented
- Adverse effects that cannot be avoided

4.2 Climate and Earth Movements

4.2.1 Hurricanes and Tidal Surge

4.2.1.1 Effect of the Proposed Action

The proposed CQF would be constructed to comply with all required hurricane construction codes. JSC has an emergency plan outlining hurricane procedures that would be adopted and applied to the CQF. If tidal surge or receding floodwaters were to reach the CQF, possible structural damage could occur.

4.2.1.2 Effect of the No Action Alternative

Hurricane and tidal surge damage would be minimal on the proposed site as there would be no new structures to damage. Some damage to the land surface including erosion of soils due to tidal surge and/or receding floodwaters. Deposition of foreign materials may also result if these climatic events were to occur.

4.2.2 Rainfall

4.2.2.1 Effect of the Proposed Action

Heavy rain events could result in flooding around the CQF if topography would be altered as such. The CQF would be constructed to effectively drain any excess water in a manner not to cause additional flooding upstream or downstream of the proposed site along HL&P canal or to other JSC property.

4.2.2.2 Effect of the No Action Alternative

Heavy rains should not cause flooding problems upstream or downstream of the undeveloped site outside of existing conditions. Flow levels would not be changed from the current conditions unless modifications occurred elsewhere on JSC property.

4.3 Construction Impacts

4.3.1 Air Resources

4.3.1.1 Effect of the Proposed Action

The construction of the CQF would produce some air emissions. If the proposed project resulted in an increase of 22,679.62 Kg (25 tons) per year for VOCs or NOx, thus a general conformity analysis would be triggered. Emissions from the CQF are not expected to reach this significance level; consequently, a general conformity analysis should not be required.

Heavy machinery and trucks emit carbon monoxide, particulate matter, nitrogen oxides, hydrocarbons, and sulfur oxides. Steps should be taken to minimize emissions and control any dust created during construction. Air quality effects from construction equipment and associated vehicular traffic would be localized and temporary. These actions should pose no substantial impact upon air quality standards.

The CQF would primarily utilize equipment already in operation at JSC. Additional equipment may be necessary and vehicle use would occur, but normal operation and use of the proposed facility indicate there would be no effect on ambient air quality.

4.3.1.2 Effect of the No Action Alternative

There would be no changes in air quality if the no action alternative were implemented. Construction equipment would not be necessary and general maintenance activities would continue.

4.3.2 Noise Environment

4.3.2.1 Effect of the Proposed Action

Operation of heavy machinery and increased vehicular traffic would temporarily increase noise levels during the construction of the proposed facility on-site and to surrounding buildings. The temporary noise increase would not be likely to pose a threat to occupants, but the potential for hearing loss in construction workers at the site would exist during most construction phases.

Best management practices (BMP) shall be incorporated to minimize the impact of construction related noise to surrounding areas. JSC would require all safety standards be followed including wearing personal protection equipment (PPE) at all times during the construction of the CQF.

The closest on-site and off-site receptors to the proposed facility are the Child Day Care facility approximately 1,100 meters (3,600 feet) to the northwest and a residential area approximately 550 meters (1,800 feet) to the southeast, respectively. Based on the

preliminary data provided, a significant increase in impacts to sensitive receptors from noise generated by proposed facility operations are not anticipated.

4.3.2.2 Effect of the No Action Alternative

The noise environment would remain unaltered if the no action alternative were implemented.

4.3.3 Spills and Hazardous Materials

4.3.3.1 Effect of the Proposed Action

Heavy construction equipment brought from outside JSC has resulted in spills of hydraulic fluid and other petrochemicals at other construction sites. JSC would take precautions at the CQF site to prevent potential spills by requiring construction equipment be adequately maintained and serviced.

Based on the preliminary data provided, the generation of hazardous materials is not anticipated as a result of construction. No effects from hazardous materials, when managed in compliance with environmental regulations, are anticipated.

4.3.3.2 Effect of the No Action Alternative

Existing conditions should remain unchanged if the no action alternative were implemented.

4.3.4 Transportation

4.3.4.1 Effect of the Proposed Action

The CQF would be designed to allow vehicle circulation by reducing the mixing of truck and automobile traffic by the user. Separate parking areas would be created for the Astronaut population. At the proposed site, a truck entrance would be created off of 5th Street.

No transportation impacts are expected at JSC. Street parking along Fifth Street may be reduced as a result of the facility, but sufficient parking for the proposed facility would be created. Some traffic congestion may occur during construction, but steps should be taken to ensure safe roadway conditions and access to all facilities. Traffic volume through the JSC Space Center Boulevard entrance may increase, but the entrance already uses a traffic signal and alterations in traffic flow outside JSC are not anticipated. Long term effects on transportation are not anticipated.

4.3.4.2 Effect of the No Action Alternative

Alterations in the traffic flow patterns are not anticipated with the no action alternative. Any changes in traffic flow or volume would be a result of changes occurring elsewhere at JSC. Street parking would remain a viable option for employees working in surrounding buildings, but new parking lots would not be constructed.

4.4 Water Resources

4.4.1 Surface Water and Drainage

4.4.1.1 Effect of the Proposed Action

The filling and reconstruction of the drainage structures may alter the storm water drainage and flow at the proposed site. Alternate surface water drainage routes should be considered prior to construction.

Runoff from the additional parking lots may increase the non-point source discharge into the system. Adequate drainage, flow attenuation structures, and a detention area may be items of consideration for reducing non-point source discharges and additional flow associated construction of the CQF. The proposed site is greater than 1 acre and would require the development of a Storm Water Pollution Prevention Plan and a the completion of signed Site Notice in accordance with the new storm water regulations promulgated March 10, 2003 by TCEQ.

Construction impacts may not result in any alteration of the drainage swale or canal. However, the diagonal drainage ditch will be impacted due to the location of the construction site. There may be temporary erosion causing sedimentation and turbid waters within the drainage swale. Contractors shall create and implement a storm water pollution prevention plan in accordance with JSC and regulatory guidelines before construction begins. These sedimentation and erosion control procedures shall be carried out for the duration of construction and implemented in accordance with Best Management Practices as required by the Texas Pollutant Discharge Elimination System (TPDES) General Permit No. TXR040000.

The topography of the proposed site would not be altered substantially. Some fill material may be placed under the proposed building and parking lot for leveling and stability. Impacts to topography relating to occupancy and maintenance of the proposed facility are not expected.

4.4.1.2 Effect of the No Action Alternative

Increases in surface drainage and non-point source discharges are not anticipated with the no action alternative. The site would remain undeveloped with general maintenance continuing in its current manner. The no action alternative should have no effect.

4.4.2 Floodplains

4.4.2.1 Effect of the Proposed Action

The proposed project would not affect any Harris County Flood Control District (HCFCD) infrastructure; consequently, there would be no detention requirement. The design engineer would be responsible for incorporating a stormwater detention design mechanism that would adequately address the local hydraulic conditions due to increased runoff. NASA should provide information to the City of Houston (COH) from hydraulic studies and impact analysis to allow for determination of impacts; however, the COH does not evaluate the effects of development on the floodplain. Federal facilities not falling under the jurisdiction of the County or City must comply with requirements of Executive Order 11988 and NASA regulations at 14 CFR 1216.2, which cover development in Special Flood Hazard Areas. No portion of the proposed facility will be constructed in a designated floodplain.

4.4.2.2 Effect of the No Action Alternative

The no action alternative should not alter the surface elevation of the designated floodplain.

4.4.3 Groundwater

4.4.3.1 Effect of the Proposed Action

Shallow groundwater contamination has been noted in the vicinity of 4th Street where typical groundwater flow is to the northeast. At this time, it is not known if groundwater at the proposed site, along 5th Street and Avenue B, is contaminated. Sampling the groundwater at the proposed site would determine whether construction and normal operations of the proposed facility would impact groundwater.

Potable water at the proposed site would be supplied by the Clear Lake City Water Authority, which draws its supply from surface water and not from the shallow groundwater.

4.4.3.2 Effect of the No Action Alternative

No anticipated effects on the groundwater would occur if current maintenance activities continue. The existing groundwater wells should still be monitored in order to determine background levels.

4.5 Biological Resources

4.5.1 Vegetation

4.5.1.1 Effect of the Proposed Action

The proposed site is an undeveloped field, dominated by grasses. The proposed site was used as a fill deposit site approximately 20 years ago; therefore, the native vegetative community was altered many years ago. Planted native and non-native trees along the perimeter of the property should not have to be cleared due to the size of the proposed site.

4.5.1.2 Effect of the No Action Alternative

The present vegetative community would persist in its early successional stages because maintenance mowing would continue with the no action alternative.

4.5.2 Wildlife

4.5.2.1 Effect of the Proposed Action

Proposed improvements at the proposed site would not support habitat areas suitable for most wildlife; however, landscaped areas may provide small pockets of habitat for adaptive species. Construction activities are not anticipated to adversely impact the canal and swale adjacent to the proposed site. Therefore, that habitat is not anticipated to be adversely affected and should be suitable for the current species. Substantial displacement of wildlife is not anticipated. Remaining fields near the proposed site will accommodate any displaced wildlife.

4.5.2.2 Effect of the No Action Alternative

Despite the absence of natural vegetation on the proposed site, the existing vegetation does offer some protective cover and food resources for wildlife. Maintenance mowing would periodically remove this vegetation, which may have a negative impact for some species, but a positive impact for others. The drainage swale and canal should continue to provide suitable habitat for some species, if vegetation removal is limited.

4.5.3 Wetlands

4.5.3.1 Effect of the Proposed Action

No known wetlands are present at the proposed site. Drainage ditches constructed in uplands are not considered waters of the United States and, thus, no permit from the USACE is required for re-alignment of the ditches. USACE has the discretion to determine on a case-by-case basis whether or not a particular waterbody is a water of the United States (51 FR 41217). Federal Register 51 FR 41217, states that drainage ditches constructed entirely in upland areas generally are not considered to be waters of the United States. The term "waters of the United States" is defined at 33 CFR 328.3 and refers to the USACE Section 404 jurisdiction.

4.5.3.2 Effect of the No Action Alternative

There would be no changes in wetlands inventory if the no action alternative were implemented.

4.5.4 Prime Farmlands

4.5.4.1 Effect of the Proposed Action

The proposed site is designated as “farmland already in urban development” and is exempt from further review under the policy. Soils on the proposed site are not subject to Farmland Protection Policy Act.

4.5.4.2 Effect of the No Action Alternative

Existing conditions should remain unchanged if the no action alternative were implemented.

4.6 Socioeconomic and Cultural Resources

4.6.1 Demographics and Economic Activity

4.6.1.1 Effect of the Proposed Action

The CQF would employ civil service and contract personnel. Current employees hold most positions that would be associated with the CQF.

Executive Order 12898, dated February 11, 1994, requires the preparation of an environmental justice strategy that follows the framework of the National Environmental Policy Act (NEPA) and Title VI of the Civil Rights Act. The Executive Order prohibits disproportionately adverse human health or environmental impacts within minority and low-income populations.

Studies conducted for this project indicate that there will not be any disproportionate impacts to low-income or minority populations. No displacements will be required, and no impact to community cohesion is anticipated now or in the future, since the project area is largely undeveloped land and confined to JSC property. Because no residential households will be displaced, and no minority populations or low income populations will be divided or isolated by the proposed project, no environmental justice issues have been identified for the proposed project.

Executive Order 13045, Children's Health and Environmental Risk policy, requires that sensitive receptors be evaluated for impacts from a proposed action. The impacts to the Child Care Facility, from increase traffic, noise, air pollution, (dust) or chemical use are not anticipated during the construction or operational phases of the proposed project.

4.6.1.2 Effect of the No Action Alternative

The implementation of the no action alternative would have a slight negative effect on employment opportunities.

4.6.2 Cultural Resources

4.6.2.1 Effect of the Proposed Action

Impact to cultural or archaeological resources is not anticipated at the proposed site. In the event that archeological deposits or features are encountered during construction, the construction operations shall cease within the immediate area and the Archeological Division of the THC and NASA shall be immediately contacted for further consultation.

Work would cease in the vicinity until the requirements of Section 106 of the National Historic Preservation Act were met.

4.6.2.1 Effect of the No Action Alternative

The no action alternative would not result in land alterations; consequently, any unknown archeological deposits or features would not be disturbed. There are no records of cultural resources for this site.

4.7 Cumulative Effects

The proposed action at the proposed site is not anticipated to have any measurable affect on local resources and facilities. Little, if any, new demand is expected for land resources, recreational space, or other resources in any other areas surrounding the proposed facility. Implementation of this action would provide the necessary facilities for supporting the International Space Station initiatives and help in meeting NASA's long range manned space flight goals.

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