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Since 1984 – Environmental Excellence

July 31, 2006

Mr. Charles Noel
JSC Project Management Office
Johnson Space Center
1201 NASA Parkway, JA
Houston, TX 77058-3696

Subject: Final Report: Proposed Office Building Construction, Johnson Space Center,
Houston, Texas

Reference: Contract Number NNJ05JX01C, Project Number 05100.

Dear Mr. Noel:

In fulfillment of the referenced contract NNJ05JX01C, attached please find the subject deliverable, Environmental Assessment - Proposed Office Building Construction, Johnson Space Center, Houston, Texas, generated by ENTRIX, Inc..

Please contact me at 713-662-1920 or Mr. Ramsey Redman 713-662-1928 if you have any questions or need additional information regarding this deliverable.

Best regards,

A handwritten signature in black ink, appearing to read "J. Minton", written over a light blue horizontal line.

Jonathan Minton

EXECUTIVE SUMMARY

Type of report

This report is an Environmental Assessment (EA) Report.

Name of proposed action

The name of the proposed action is Proposed Office Building Construction, Lyndon B. Johnson Space Center (JSC), Houston, Texas.

Description of proposed action

This project is being proposed to provide transitional office space near the main campus for 400 employees that will be relocated to the facility on a temporary basis to support the effort to refurbish existing office space at JSC. This refurbishment program is an estimated 20-year process. Additionally, the facility will provide for the permanent relocation of approximately 120 employees from Building T-585, which is slated for demolition. Once the refurbishment effort is complete, the building will house 520 permanent employees.

Description of no action alternative

Alternatives that were considered include the proposed action and the no-action alternative. The no-action alternative would have negative consequences for JSC. The no-action alternative would negatively affect available office space and the ability to refurbish existing office facilities. In addition the no-action alternative would result in the continued use of temporary office facilities currently designated for demolition. Therefore, the no action alternative does not meet the current or future facility plans for JSC.

Physical resources

Construction of Proposed Office Building on the preferred site at NASA's Lyndon B. Johnson Space Center (JSC) would impact approximately 1.10 hectares (2.73 acres) of asphalt parking lot. Due to the location, the proposed facility would be constructed to effectively drain excess water from the site into existing storm drains.

Construction activities may cause short-term air emissions and dust. Construction noise may exceed normal ambient noise levels, but normal levels are expected after construction activity ceases. Traffic flow is not anticipated to be affected during the construction phase. No hazardous materials would be generated as a result of the construction or operation of the proposed building and preventive measures should be incorporated to reduce potential spills from construction equipment.

The topography of the proposed site would not be altered substantially. Some fill material may be placed under the proposed building. 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 ditches may occur during construction of the proposed

facility. However, with appropriate storm water pollution prevention controls and practices, the impact would be minimal.

Biological resources

The preferred site is an asphalt parking lot. The landscaping around the proposed building would create new pockets habitat for some wildlife species. 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 preferred site on the National Wetland Inventory maps. No wetlands indicators were observed within the boundaries of the site during a site reconnaissance.

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.

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 Proposed Office Building were identified. The no-action alternative would not provide the resources for meeting the project objectives.

**ENVIRONMENTAL ASSESSMENT
PROPOSED OFFICE BUILDING CONSTRUCTION
LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS**

Prepared for:

**National Aeronautics and Space Administration
Johnson Space Center
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Prepared by:

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July 2006

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1. PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

NASA proposes to construct a 100,000 square-foot (ft²) office building at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas. ENTRIX Inc. evaluated seven potential construction sites for the proposed office building. A preferred site and two alternate sites were chosen for the proposed office building and the additional four sites were eliminated from consideration. Site A, the preferred construction site, is currently an asphalt parking lot directly to the west of Building 45 across 2nd Street. Site B, an alternate site, is also an asphalt parking lot and maintained grass lot on the southwest corner of the intersection of 2nd Street and Avenue C. Site C, also an alternate site, is a grass lot with trees on the north, east, and west boundaries that lies south of Building 13 across Avenue D. Site C includes adjacent parking lots on the east and west sides and has an open field adjacent to the site on the south side.

1.2 Need for Proposed Action

This project is being proposed to provide transitional office space near the main campus for 400 employees that will be relocated to the facility on a temporary basis to support the effort to refurbish existing office space at JSC. This refurbishment program is an estimated 20-year process. Additionally, the facility will provide for the permanent relocation of approximately 120 employees from Building T-585, which is slated for demolition. Once the refurbishment effort is complete, the building will house 520 permanent employees.

1.3 Applicable Regulatory Requirements and Required Coordination

NASA is required to comply with all applicable federal, state and local regulations. Detailed below are some of environmental laws, regulations, and coordination activities that require compliance for the proposed office building 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) is responsible for determining if there would be 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 sites (NASA 2004). 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 implement to assist in protection of prime farmland throughout the United States. The proposed sites are designated as “farmland already in urban development” and are 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. PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

The proposed office building would be located at JSC in Harris County, Texas. JSC is located 35.40 kilometers (22 miles) southeast of downtown Houston, near Clear Lake (Figure 1). The preferred construction site, Site A, for the proposed building is directly to the west of Building 45 across 2nd Street. The site is an asphalt parking lot and is approximately 2.43 hectares (6.00 acres). There are two alternate construction sites designated as Site B and Site C. Site B is an asphalt parking lot with a maintained grass lot to the west that is located on the southwest corner of the intersection of 2nd Street and Avenue C. Site C is a maintained grass lot with trees along the north, east, and west boundaries and asphalt parking lots on the east and west sides. It lies south of Building 13 across Avenue D. Site B and Site C are approximately 2.34 hectares (5.78 acres) and 2.64 hectares (6.53 acres) respectively.

A three story, 100,000-ft² office building of concrete frame structure with a LEED certification is proposed for construction. The building would provide transitional office space for 400 employees that will be relocated to the facility on a temporary basis to support the effort to refurbish existing office space at JSC. This refurbishment program is an estimated 20-year process. Once the refurbishment effort is complete the facility will provide for the permanent relocation of 120 employees from Building T-585 which is slated for destruction. Once the refurbishment effort is complete, the building will house 520 permanent employees.

2.2 No-Action Alternative

The no-action alternative would result in no measurable impacts to the environment. However, the no-action alternative would have negative consequences for JSC. The no-action alternative would negatively affect available office space and the ability to refurbish existing office facilities. In addition the no-action alternative would result in the continued use of temporary office facilities currently designated for demolition. Therefore, the no action alternative does not meet the current or future facility plans for JSC.

2.3 Alternatives Considered but Eliminated From Further Discussion

Under the National Environmental Policy Act (NEPA), Federal agencies are required to consider reasonable alternatives to a proposed action. After making the decision to locate the proposed office building in the vicinity of the main campus rather than elsewhere on the JSC, potential site possibilities were focused to within or on the edges of the existing campus in areas not already designated for future use.

Seven potential sites for the office building were evaluated (see Figure 2 and Figure 3). In general, there were few environmental impacts at the potential sites. It was determined that

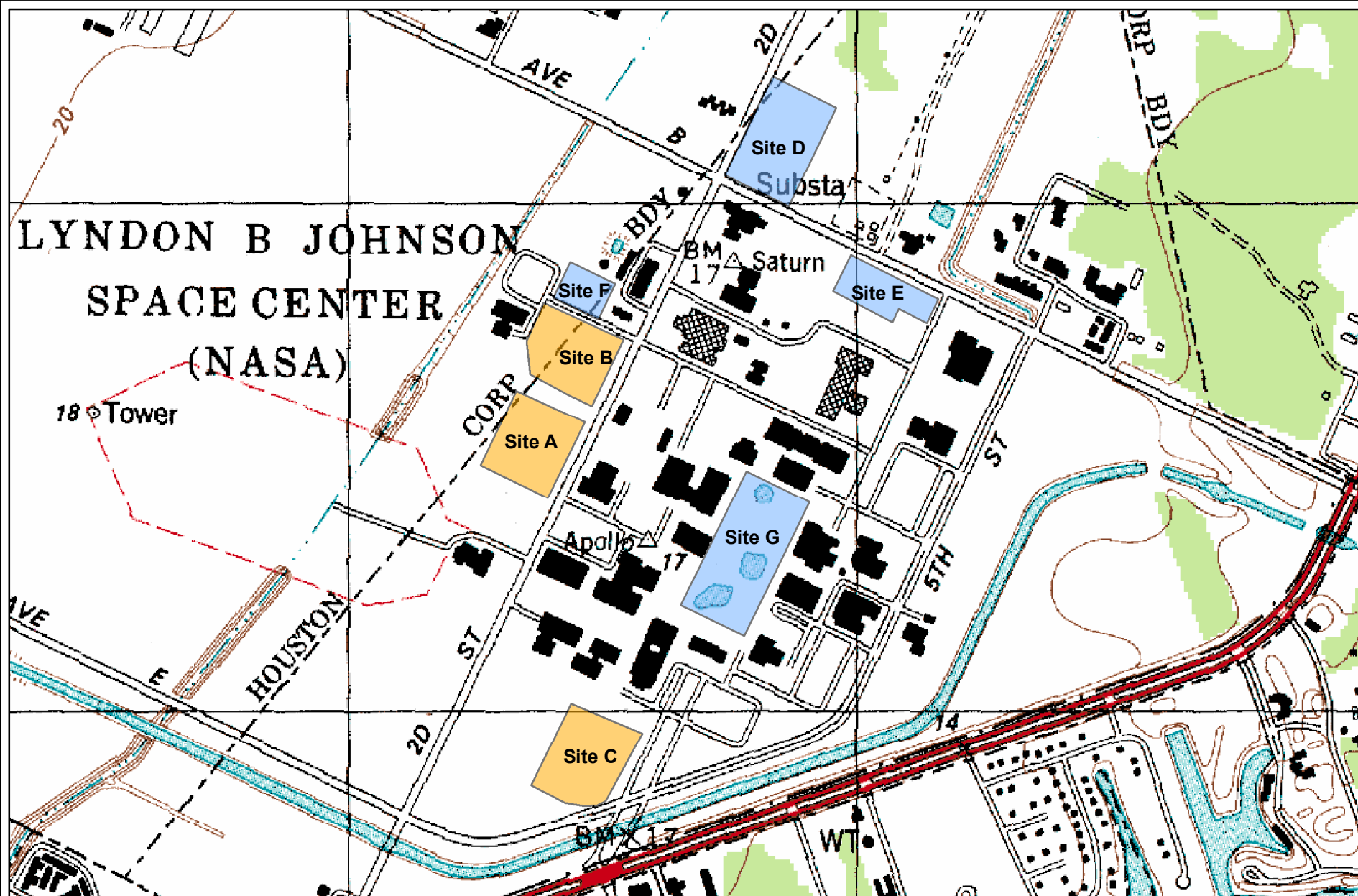
fewer environmental impacts would occur if the proposed building was (1) close to existing parking facilities and (2) located away from sites with existing environmental issues or the potential to result in environmental issues. Suitable sites were also considered and rejected due to the proximity to the campus and the potential loss of green space and detrimental aesthetic effects. Table 2.3-1 presents a comparison of primary factors considered in evaluations of potential sites for the proposed office building.

Table 2.3-1. Comparison of Potential Sites for the JSC Office Building

Site	Location	Current Use	Criterion for Rejection or Selection
Site A *	West of Building 45 across 2 nd Street	Asphalt Parking Lot	Chosen based on proximity to main campus, availability of additional parking, potentially limited loss of green space.
Site B **	Southwest Corner of Avenue C and 2 nd Street Intersection	Asphalt Parking Lot and Maintained Grass Lot	Chosen based on proximity to main campus, availability of additional parking, and limited loss of significant green space.
Site C **	South of Building 13 across Avenue D	Asphalt Parking Lots and Maintained Grass Lot	Chosen based on proximity to main campus and limited loss of significant green space.
Site D	Northwest Corner of Avenue B and 2 nd Street Intersection	Grass Lot	Rejected due to ground water contamination and the presence of monitoring wells.
Site E	Between the North Side of Building 9 and Avenue B	Maintained Grass Lot	Rejected due to ground water contamination and the presence of monitoring wells.
Site F	West of Building 25 and North of Avenue C	Maintained Grass Lot	Rejected due to proximity to fuel storage and pumping facilities.
Site G	In the Center of the Campus Between Buildings 8, 7, 4, 4S, 3, 1, 2, 12, and 30	Maintained area with trees, grass and ponds	Rejected due to loss of green space, detrimental aesthetic effects, and National Wetland Inventory areas located on the site.

* -- Preferred site

** -- Alternate site



Legend

- Possible Site Locations
- Considered but Eliminated Site

0 0.125 0.25 Miles



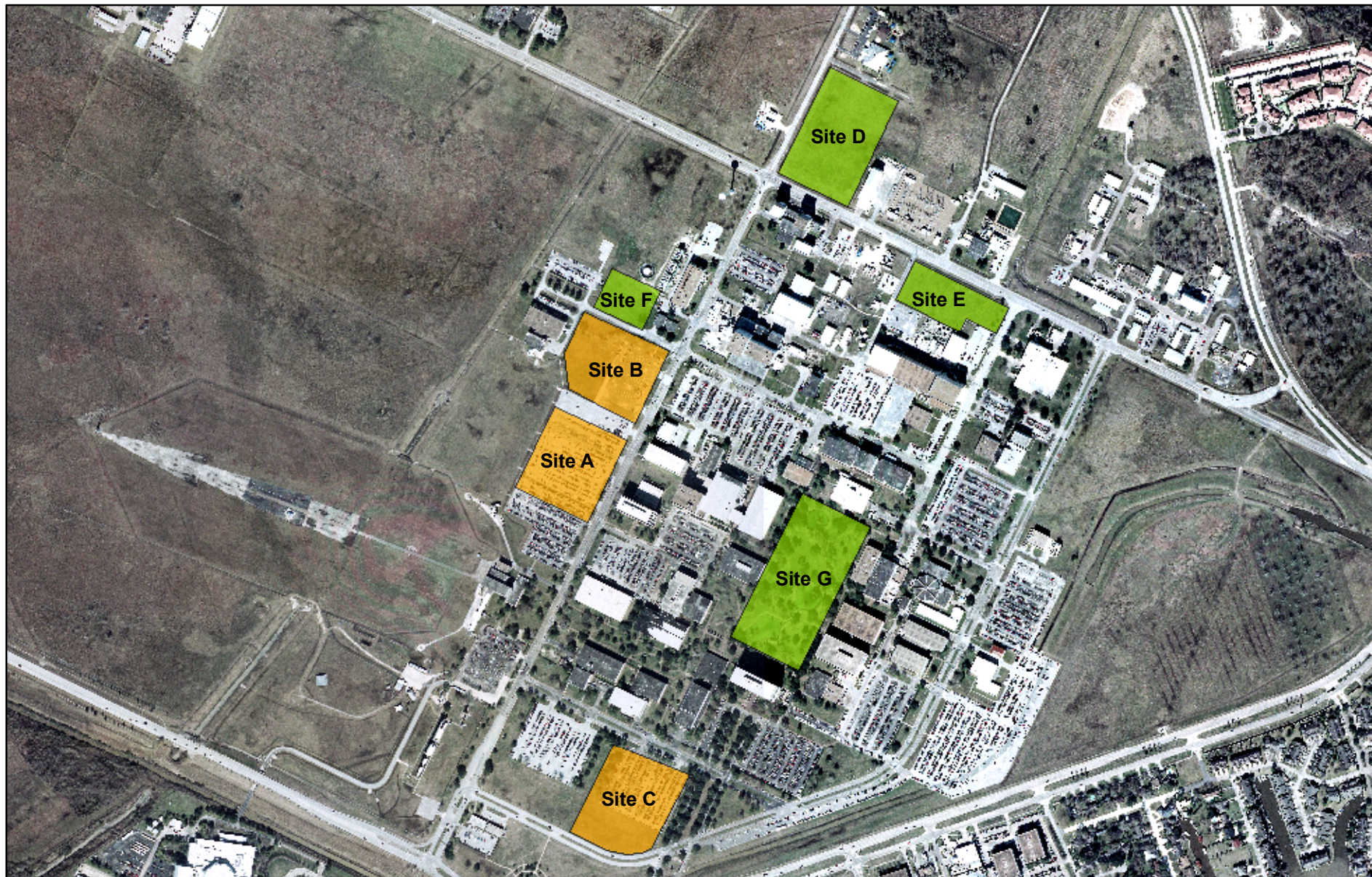
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Figure 2
Topographic Site Location Map
New Office Building Project
Lyndon B. Johnson Space Center
Harris County, Texas

Proj #: 1074102

Date: 07/2006

Base from the following USGS 7.5 minute quadrangle: Leage City, 1982



Map Document: (J:\Arcview\1074102-HOK\Figure 3.mxd)

Legend

- Possible Site Locations
- Considered but Eliminated Site

0 0.125 0.25 Miles



E N T R I X

Figure 3
Aerial Site Location Map
New Office Building Project
Lyndon B. Johnson Space Center
Harris County, Texas

Proj #: 1074102

Date: 07/2006

Base from the following USGS digital ortho quadrangle: Leage City, 2002

3. AFFECTED ENVIRONMENT

3.1 Introduction

The affected environment describes the relevant resources of the areas that would affect or that would be affected by the construction of the proposed office building. In conjunction with the description of the no-action alternative in Section 2 and with the predicted effects of the no-action alternative in Section 4, this section establishes the scientific baselines against which the effects of the action alternative can be compared.

3.2 Climate, Air, and Earth Movements

3.2.1 Hurricanes and Tidal Surge

Hurricanes and tropical storms with sustained heavy rain and strong winds typically strike the Gulf Coast from June to November. Flooding may occur in coastal areas, such as the JSC, due to storm surge (extremely high tides caused by wind action) and receding waters. A review of available Light Detection and Ranging (LIDAR) data made available by the Tropical Storm Allison Project (TSARP) indicates that the preferred, Site A, and alternate Site B are approximately 17 feet above mean sea level (msl). Alternate Site C is approximately 16 feet above mean sea level.

3.2.2 Rainfall

Rainfall is evenly distributed throughout the year. Average annual rainfall is about 117 centimeters (47 inches) (NOAA 2005). Thunderstorms are common in summer months and showers and thunderstorms also occur when weather fronts pass through the area.

3.2.3 Air Resources

Air quality at JSC is affected by local weather and by pollution. Temperature inversions caused by radiative cooling of the ground on clear nights create a stagnant air mass near the ground, trapping pollutants. Winds bring pollutants to the Clear Lake area from Houston, to the north, and Texas City, to the south. Pollutants are also emitted by activities at the JSC and by autos in the area.

The air pollutants that endanger public health are "criteria" pollutants. Each criteria pollutant has a National Ambient Air Quality Standard for air quality assigned by the U.S. Environmental Protection Agency. Standards exist for volatile organic compounds (which can produce harmful ozone on release), nitrogen oxides, particles smaller than 10 microns, sulfur dioxide and lead. Air in the Houston area, including the JSC, often has more ozone than the national standard.

Table 3.3.1-1. Background Air Quality Summary from Harris County Monitors (2004)

Monitor Identification Number (Distance from Proposed Sites)	CO (ppm)		NO ₂ (ppm)	O ₃ (ppm)		SO ₂ (ppm)			PM _{2.5} (µg/m ³)		PM ₁₀ (µg/m ³)	
	2 nd Max 1-hr	2 th Max 8-hr	Annual Mean	2 nd Max 1-hr	4 th Max 8-hr	2 nd Max 3-hr	2 nd Max 24-hr	Annual Mean	2 nd Max 24-hr	Annual Mean	2 nd Max 24-hr	Annual Mean
482011050 (11km)	--	--	0.007	0.134	0.097 (8)	0.012	0.006	0.002	--	--	--	--
482010071 (25 km)	--	--	--	--	--	--	--	--	--	--	42	20
482011039 (18 km)	2.4	1.7	0.011	0.146	0.097 (10)	--	--	--	--	--	36	16
482010026 (34 km)	--	--	0.012	0.133	0.085 (5)	--	--	--	31	11.5	--	--

Notes:

-- -- No data were collected. (Not all stations collect data for all the criteria pollutants.)

µg/m³ – micrograms per cubic meter.

CO – Carbon monoxide.

NO₂ – Nitrogen dioxide.

O₃ – Ozone.

SO₂ – Sulfur dioxide.

PM_{2.5} – Particulate matter equal to or less than 2.5 microns in diameter.

PM₁₀ – Particulate matter equal to or less than 10 microns in diameter.

ppm – parts per million.

8-hour ozone parenthetical values are the larger of the number of exceedances in 2004.

2nd max values are listed because two exceedances of the NAAQS constitute a violation of the NAAQS. For the 8-hr O₃ standard, four exceedances (4th max) constitute a violation of the NAAQS.

Sources: USEPA 2004

3.3 Construction Impacts

3.3.1 Air Resources

Site A is an asphalt parking lot that is surrounded by roads, maintained grass lots, and adjacent buildings. Site B is an asphalt parking and maintained grass lot that is surrounded by roads, maintained grass lots, and adjacent buildings. Site C is a maintained grass lot and asphalt parking lot that is surround by maintained grass lots and roads. There are no discernable air impacts at the preferred site or the alternate sites.

3.3.2 Noise Environment

Most of the land immediately surrounding the preferred site hosts buildings and parking lots. There is an open field adjacent to the west of Site A and an asphalt parking lot adjacent to the north. Site A is bordered by 2nd Street on the east side and Building 45 lies east on the

opposite side of 2nd Street. Building 18 and 14 are adjacent Site A on the south side. The alternate sites are also immediately surrounded by land that hosts buildings and parking lots. Avenue C and 2nd Street are adjacent to Site B on the north and east sides respectively. Building 25 lies north of Site B across Avenue C; Building 47 and a parking lot lie east on the opposite side east of 2nd Street. Building 44 and an asphalt parking lot are adjacent to Site B on the west and south sides respectively. Maintained grass lots are adjacent to Site C on the east and south sides and 3rd Street and Avenue D border the west and north sides respectively. Buildings 15, 13, and 2 lie north of Site C on the opposite side of Avenue D.

A fence marks the perimeter of JSC area, 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. Noise levels do not appear to exceed normal background levels typically associated with such areas.

3.3.3 Spills and Hazardous Materials

The preferred construction site, Site A, is currently an asphalt parking lot that has not been associated with any known activities or past uses that involved the generation, storage, or disposal of hazardous materials. The alternate construction sites, Site B and Site C, are maintained grass lots and asphalt parking lots that have not been associated with any known activities or past uses that 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 at Site B and C. Residual concentrations of these chemicals are not expected to be present at either of the alternate sites. There are no records of spills having occurred at the preferred site or the alternate sites.

3.3.4 Transportation

The preferred site, Site A, is located directly to the west of Building 45 across 2nd Street. Site B, an alternate site, is located on the southwest corner of the intersection of 2nd Street and Avenue C and Site C, also an alternate site, lies south of Building 13 across Avenue D. Vehicles currently travel on all three roads when going to and from surrounding buildings. Access to the preferred site and alternate Site B would be along the 2nd Street through Gate 1 on Saturn Lane to the south of the installation. Access to Site C would be along the Avenue D off of 2nd Street through Gate 1 on Saturn Lane to the south of the installation. In general, there is moderate traffic on the roads adjacent to the preferred site and alternate sites. Due to JSC being a secure site, there is no normal “thru-traffic” along any of the roads within the campus.

3.4 Water Resources

3.4.1 Surface Water and Drainage

Site A, the preferred site, is an asphalt parking lot and Site B is an asphalt parking lot and maintained grass lot. The slope of the parking lots indicates that surface runoff flows from Site A and Site B to the east toward 2nd Street and into storm water inlets adjacent to the street. There are linear depressions (drainage ditches) located on the eastern and western

boundaries of Site C. The gentle slope of the land toward the east and west from the center of the site indicates runoff would flow into the drainage ditches and then flow north via the ditches into a storm water inlets along Avenue D on the northern boundary of the site. No water was observed in the drainage ditches during the time of the site visit but it can be assumed these areas do shunt surface water off the site at certain times. Stormwater is channeled off of JSC and eventually empties into Clear Lake.

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.

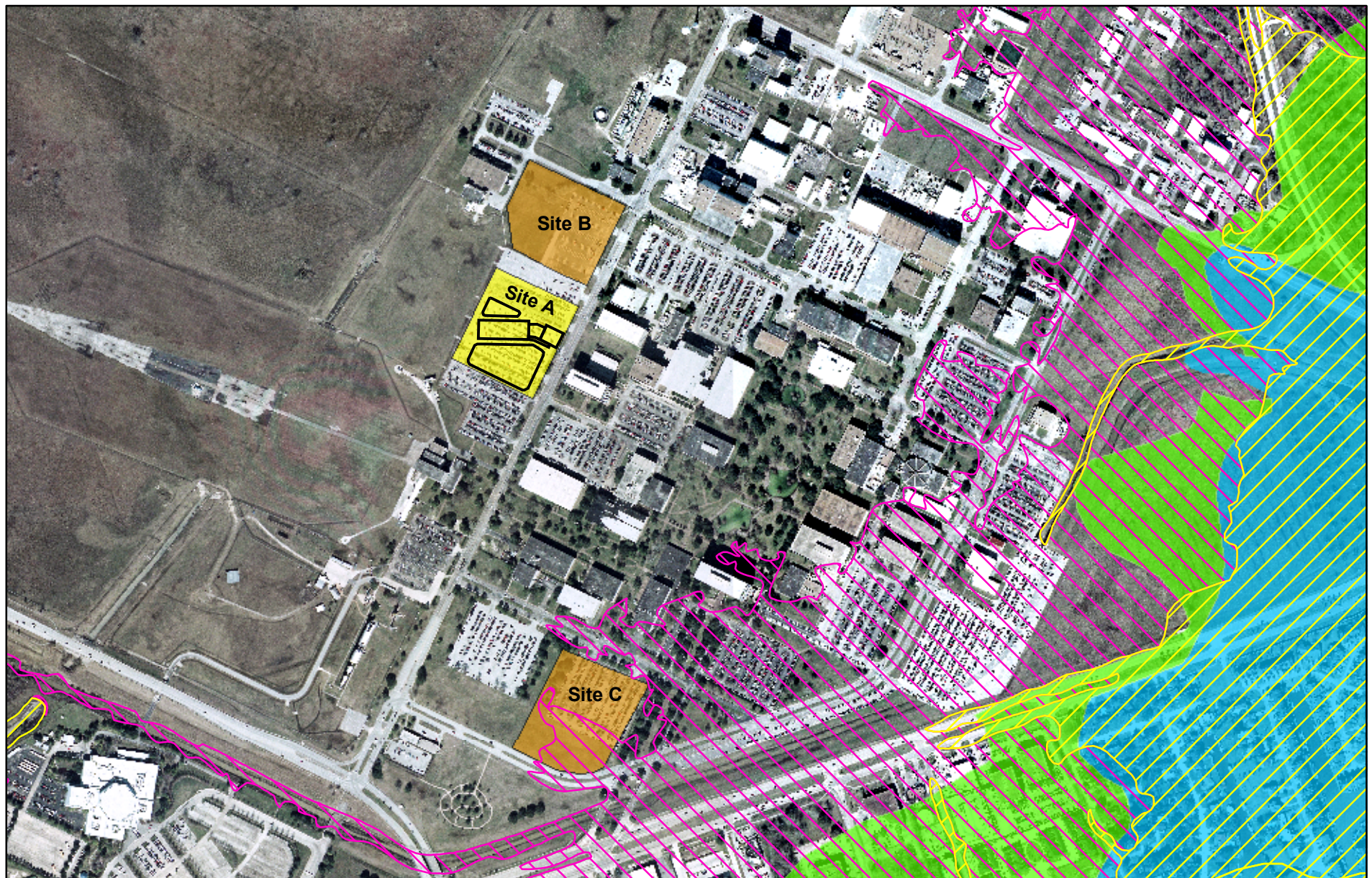
The Federal Emergency Management Agency (FEMA) publishes flood maps for insurance ratings. This data has been made available in a digital form as a georeferenced Geographic Information System (GIS) layer. This layer was placed atop an aerial photograph and is included in Figure 4. No portions of Sites A, B, or C are located within the current 100-year or 500-year floodplain.

However, digital data obtained from TSARP, which is a joint study effort by FEMA and the Harris County Flood Control District reveals that small portions of Site C fall within the proposed 500-year floodplain. Although still proposed, this new data is in a 90-day appeals and protest period and is expected to become official late next year.

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 office sites. 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 (TDWR 1990). 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.



Map Document: (J:\Arcview\1074102-HOK\Figure 4.mxd)

Legend

 Preferred Site	Floodplain	Proposed Floodplain
 Alternate Site	 FEMA 100 Yr	 Proposed 100 Yr
 Building Layout (2.73 acres)	 FEMA 500 Yr	 Proposed 500 Yr

0 0.125 0.25 Miles



Base from the following digital ortho quadrangle: Leage City, 2002

100 Yr floodplain source: FEMA 1998.
Proposed 100 Yr floodplain Source: TSARP 2005.

E N T R I X

Figure 4
Harris County Floodplain Map
New Office Building Project
Lyndon B. Johnson Space Center
Harris County, Texas

Proj #: 1074102

Date: 07/2006

3.5 Biological Resources

3.5.1 Vegetation

JSC is in the Gulf Prairies and Marshes area of Texas, a 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.

Grasslands of the Upper Coastal Prairie were once dominated by tall grasses such as little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), brownseed paspalum (*Paspalum plicatulum*), and low panic (*Dichanthelium sp.*). Agriculture, grazing, fire suppression and urbanization have affected plant communities at JSC. The preferred site is currently an asphalt parking lot with no vegetation. The alternate sites are currently asphalt parking lots and maintained grass lots. The dominant vegetation at Sites B and C is St. Augustine grass (*Stenotaphrum secundatum*) but also includes Bermuda grass (*Cynodon dactylon*), Dallisgrass (*Paspalum dilatatum*), and Johnson grass (*Sorghum halapense*). Several species of native and non-native trees are planted along the perimeter of Sites B and C.

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, administrative, test facility buildings and storage buildings surround the proposed sites.

Mammals that may be found at JSC include white-tailed deer (*Odocoileus virginianus*), domestic and feral dogs and cats (*Canis familiaris*, *Felis domesticus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), nine-banded armadillo (*Dasypus novemcinctus*), nutria (*Myocastor coypus*), eastern cottontail (*Sylvilagus floridanus*), fox squirrel (*Sciurus niger*), and various bats, rats, and mice (NASA 2004).

Birds using uplands include red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), barred owl (*Strix varia*), Eastern screech owl (*Otus asio*), common crow (*Corvus brachyrhynchos*), killdeer (*Charadrius vociferus*), eastern meadowlark (*Sturnella magna*), mourning dove (*Zenaida macroura*), loggerhead shrike (*Lanius ludovicianus*), mockingbird (*Mimus polyglottos*), American robin (*Turdus migratorius*), blue jay (*Cyanocitta cristata*), cardinal (*Cardinalis cardinalis*), common grackle (*Quiscalus quiscula*), rock dove or pigeon (*Columba livia*), starling (*Sturnus vulgaris*), and sparrows. Birds using the waters of JSC include egrets and herons (e.g., *Casmerodius albus*, *Ardea herodias*, *Nycticorax violacea*, *Nycticorax nycticorax*), mottled ducks (*Anas fulvigula*), and belted kingfisher (*Megasceryle alcyon*). Osprey (*Pandion haliaetus*) have also been sighted near the JSC and are reported to nest in coastal areas of the region (NASA 2004).

Reptiles and amphibians that are native to the Gulf Coast are present at JSC. Although snakes, turtles, lizards, and skinks occur throughout the site, they are most abundant in undeveloped areas. Alligators (*Alligator mississippiensis*) have been seen in the ditches. The small extent of aquatic habitat limits many amphibians, but suitable habitat for frogs and toads is available at the Texas Genco (formerly HL&P) cooling water canal, the Central Mall ponds and in drainage ditches (NASA 2004).

3.5.2.1 Threatened and Endangered Species

There are 27 species within Harris County, Texas, that are listed as threatened or endangered. Two of these species are federally listed (USFWS 2005), and 25 species are state listed (Gillespie 2005). According to the US Fish and Wildlife Service, “neither threatened or endangered species nor critical habitat for threatened or endangered species are believed to exist at JSC” (NASA 2004). However, one of the federally-listed species as well as 7 of the state-listed species may occur in the vicinity of JSC.

Federally Listed – Harris County

Bald Eagle (*Haliaeetus leucocephalus*) – The bald eagle was federally listed as threatened in 1967 for the lower 48 states (USFWS 2005). It is the second largest bird of prey in North America, with an average wingspan of seven feet. This species mates for life and is especially common in areas with large expanses of aquatic habitat (Buehler 2000).

State Listed - Harris County

Houston Toad (*Bufo houstonensis*) – This terrestrial amphibian is associated with deep, predominantly sandy soils within east central Texas. The Houston toad has a life span of two to three years and is considered endangered by the state of Texas (TPWD 2005a).

Arctic Peregrine Falcon (*Falco peregrinus tundrius*) – One of the three subspecies of the North American peregrines, the Arctic peregrine is a potential migrant to Texas. The subspecies suffered up to an 80 percent decline due to exposure to the pesticide DDT. It has since recovered slightly but is still listed as threatened in Texas (USFWS 1999).

Bald Eagle (*Haliaeetus leucocephalus*) – Refer to the federally listed section.

Brown Pelican (*Pelecanus occidentalis*) – This large bird is found along the Texas coast where it nests mostly on small, coastal islands. The brown pelican can live 30 years or more and has been listed as endangered in Texas since 1970 due to the continuing loss of nesting habitats and human disturbance (TPWD 2005b).

Swallow-tailed Kite (*Elanoides forficatus*) – The swallow-tailed kite requires an area with tall trees for nesting, near open country for feeding on lizards, frogs, insects, and other birds. Today it is found mainly in Florida and the deep south, and is listed as threatened in Texas (Kaufman 1996).

White-faced Ibis (Plegadis chihi) – The white-faced Ibis frequents marshes, swamps, ponds and rivers. In Texas it breeds and winters along the Gulf Coast. Throughout North America, the populations are declining due to the draining of wetlands and use of pesticides. This species is listed as threatened in Texas (TPWD 2005c).

White-tailed Hawk (Buteo albicaudatus) – The white-tailed hawk utilizes habitats of dry grasslands and coastal prairies where it feeds on a variety of animals. There was a decline in the Texas population from the 1950's to the 1970's and it is now listed as threatened (Kaufman 1996).

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 all three of the possible site locations are mapped as Urban land and Midland – Urban land complex (Figure 5). Urban land is made of extensively built-up areas where 75-100 percent of each mapped area is either covered by structures or disturbed by cutting, filling or grading. Midland – Urban land complex is made up of 20-75 percent Midland soils and 10 to 75 percent Urban land. Midland soils are a firm, strongly acidic dark grayish brown silty clay loam. Midland soils are nearly level, sloping between 0-1 percent, and are poorly drained (Soil Conservation Service, Harris County Soil Survey, 1976).

The Environmental Resources Document of Lyndon B. Johnson Space Center (NASA 2004) lists U.S. Department of the Interior, Fish and Wildlife Service published National Wetland Inventory (NWI) for JSC (Figure 6) as well as several site-specific wetland surveys. None of the areas designated as wetlands occur at the three potential sites. During site reconnaissance of the proposed sites, no wetland indicators were observed within the boundaries of any site.

Harris County Soils

- An = Aldine - Urban land complex
- As = Aris - Urban land complex
- Bg = Bernard - Urban land complex
- LcA = Lake Charles clay, 0-1% slopes
- Lu = Lake Charles - Urban land complex
- Md = Midland silty clay loam
- Mu = Midland - Urban land complex
- Ur = Urban land



Legend

- Preferred Site
- Alternate Site
- Building Layout (2.73 acres)

0 0.125 0.25 Miles



Harris County soils data source:
USDA, 2005.

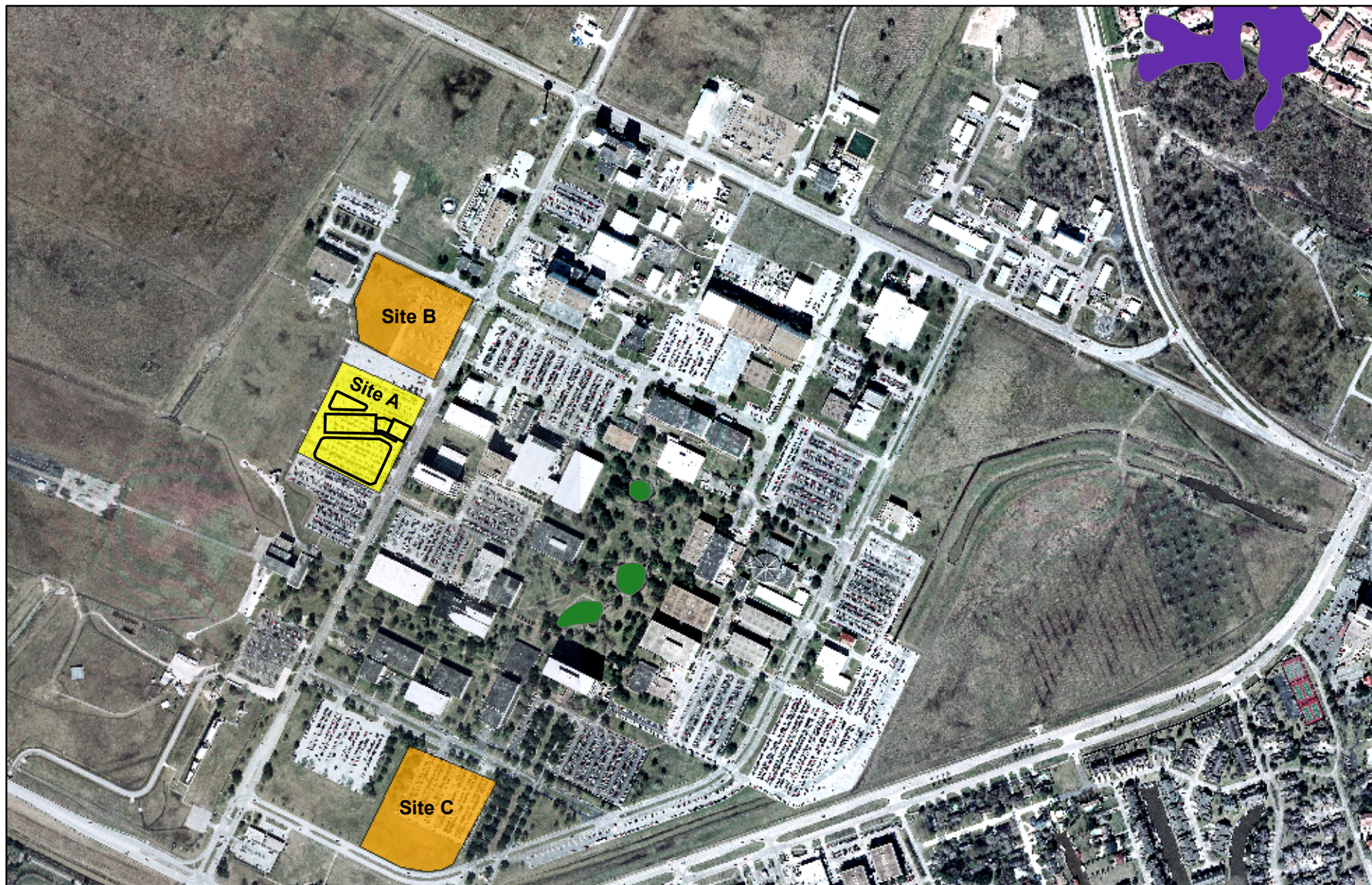
E N T R I X

Figure 5
Harris County Soils Map
New Office Building Project
Lyndon B. Johnson Space Center
Harris County, Texas

Proj #: 1074102

Date: 07/2006

Base from the following digital ortho quadrangle: Leage City, 2002



Map Document: (J:\Arcview\1074102-HOK\Figure 6 NWI.mxd)

Legend

- | | |
|---|--|
| Preferred Site | NWI 1992-1993 |
| Alternate Site | PEM1A - Palustrine Marsh |
| Building Layout (2.73 acres) | PUBHx - Open Water (Excavated) |

0 0.125 0.25 Miles



E N T R I X

Figure 6
National Wetlands Inventory Map
New Office Building Project
Lyndon B. Johnson Space Center
Harris County, Texas

Proj #: 1074102

Date: 07/2006

Base from the following digital ortho quadrangle: Leage City, 2002

Wetland data source: GLO 1992-93

3.6 Socioeconomic and Cultural Resources

3.6.1 Demographics and Economic Activity

The preferred site is located on JSC in the Clear Lake area. The Clear Lake area is midway between downtown Houston and Galveston and includes the cities of Clear Lake City, Clear Lake Shores, El Lago, Kemah, League City, Nassau Bay, Seabrook, Webster, Taylor Lake Village, Friendswood, and parts of Houston and Pasadena (Bay Area Houston Economic Partnership, 2004). The 2000 population estimate for the Clear Lake area is approximately 195,000 persons (US Census, 2000).

The proposed sites are located within one census tract composed of four block groups, mapped and designated by the U.S. Department of Commerce, Bureau of the Census. The proposed sites are located in the 2000 census tract, 3413, surrounding JSC, in Houston, Harris County, Texas. Table 3.6.1 lists the population, ethnicity, housing and economic characteristics for tract 3413 and the surrounding tracts in the Clear Lake Area (US Census, 2000).

Table 3.6.1-1. Census Tract 3413 and Surrounding Tracts in the Clear Lake Area.

	<u>Number</u>	<u>Percent</u>
Population		
Total Population	194,009	100
Population 18 years and over	141,193	72.78
Ethnicity		
White	153,621	79.18
African American	10,898	5.62
American Indian / Alaska Native	886	0.46
Asian	10,191	5.25
Native Hawaiian / Pacific Islander	120	0.06
Other	18,293	9.43
Hispanic or Latino of any Race	33,423	17.23
Housing Units		
Total Housing Units	79,818	100
Occupied Housing Units	74,757	93.66
Vacant Housing Units	5,061	6.34
Economic Characteristics		
Population 16 Years and Older in Labor Force	106,486	54.89
Median Household Income (Dollars)	58,005	
Median Family Income (Dollars)	66,996	
Per Capita Income (Dollars)	27,842	
Individuals Below Poverty Level	11,991	6.18

Source: US Census 2000.

The aerospace industry, petrochemical industry, tourism, and boating and recreation dominate the Clear Lake area economy. Additional area businesses include the service, wholesale, and retail sectors (Bay Area Houston Economic Partnership, 2004).

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 site within or immediately adjacent to the preferred and alternate sites. Based on a review of these records, no archeological sites have been recorded within the immediate vicinity of these sites. 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. ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Environmental consequence is the scientific and analytic basis for the summary comparison of effects. This chapter describes the consequences of implementing the three potential sites as well as a No Action alternative. Issues discussed include:

- Climate and Earth Movements
- Construction Impacts
- Water Resources
- Biological Resources
- Socioeconomic and Cultural Resources
- Cumulative Impacts

4.2 Climate, Air, and Earth Movements

4.2.1 Hurricanes and Tidal Surge

4.2.1.1 Effect of the Proposed Action

The proposed office building should 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 office building. Site A, as well as the two alternates, Sites B and C, fall outside of the 100-year floodplain. There are no discernable differences in hurricane or tidal surge impacts between the preferred site and the alternate sites. If tidal surge or receding floodwaters were to reach the proposed office building, possible structural damage could occur.

4.2.1.2 Effect of the No Action Alternative

The no action alternative would result in no hurricane and tidal surge damage related to the project as there would be no new structure to damage.

4.2.2 Rainfall

4.2.2.1 Effect of the Proposed Action

Heavy rain events could result in flooding around the proposed office building at Site A. The proposed office building should be constructed to effectively drain any excess water in a manner not to cause additional flooding upstream or downstream of the proposed sites or to other JSC property. The preferred site and the alternate sites fall outside of the 100-year floodplain. There are no discernable differences in rainfall impacts between the three sites.

4.2.2.2 Effect of the No Action Alternative

Flow levels and patterns would not be changed from the current conditions unless modifications occurred elsewhere on JSC property. Heavy rains should not cause additional flooding problems upstream or downstream of the proposed sites with the no action alternative.

4.2.3 Air Resources

4.2.3.1 Effect of the Proposed Action

The proposed office building 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.

There are no discernable differences in air resource impacts between the preferred site and the alternate sites.

4.2.3.2 Effect of the Proposed Action

If the no action alternative were implemented, there would be no changes in air quality.

4.3 Construction Impacts

4.3.1 Air Resources

4.3.1.1 Effect of the Proposed Action

The construction of the proposed office building would produce some air emissions. 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.

There are no discernable differences in air resource impacts between the preferred site and the alternate sites.

4.3.1.2 Effect of the No Action Alternative

If the no action alternative were implemented, there would be no changes in air quality as 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 office building on the construction site and to surrounding buildings. The temporary noise increase would not be likely to pose a threat to individuals at adjacent sites, 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 shall require all safety standards be followed including wearing personal protection equipment (PPE) at all times during construction.

There are no discernable differences in noise impacts between the preferred site and the alternate sites.

4.3.2.2 Effect of the No Action Alternative

The current noise environment would not be altered 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 into JSC during construction would have the potential to result in some spills of hydraulic fluid and other petrochemicals at the construction site. JSC should take precautions at the proposed office building 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 are anticipated when managed in compliance with environmental regulations.

There are no discernable differences in the impact of a hazardous material spill occurring on the preferred site and the alternate sites.

4.3.3.2 Effect of the No Action Alternative

If the no action alternative were implemented the existing conditions would remain unchanged

4.3.4 Transportation

4.3.4.1 Effect of the Proposed Action

Transportation impacts are expected at JSC during the construction of the proposed office building. Steps should be taken to ensure safe roadway conditions and access to all facilities. Traffic volume through Gate 1 on Saturn Lane 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. There are no discernable differences in transportation impacts between the three sites.

4.3.4.2 Effect of the No Action Alternative

Alterations in the traffic flow patterns are not anticipated with the no action alternative.

4.4 Water Resources

4.4.1 Surface Water and Drainage

4.4.1.1 Effect of the Proposed Action

The construction of the proposed office building may alter the storm water drainage and flow at the proposed sites. Alternate surface water drainage routes should be evaluated prior to construction. Construction of the building at Site A may result in the construction of additional parking to offset the loss of existing parking. Runoff from the additional parking lots may result in an increase of the non-point source discharge into the drainage system.

New construction could increase amount of impermeable surfaces at the alternate sites due to the potential construction of replacement parking and may result in an increase of the non-point source discharge. In addition, Construction at Site C may result in the loss of drainage ditches on the eastern and western boundaries adjacent to existing parking lots. There may be temporary erosion causing sedimentation and turbid waters within the drainage swale. Contractors should create and implement sedimentation and erosion control 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.

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 office building. The preferred site and the alternate sites are greater than one acre and would require the development of a Storm Water Pollution Prevention Plan and a the completion of signed Notice of Intent (NOI) in accordance with the new storm water regulations promulgated March 10, 2003.

The topography of the preferred site would not be altered substantially. Some fill material may be placed under the proposed building 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

There are no anticipated increases in surface drainage and non-point source discharges with the no action alternative. The preferred site would remain a parking lot and the alternate sites would remain asphalt parking lots with adjacent maintained lots with general maintenance continuing in its current manner. The no action alternative would result in no effect.

4.4.2 Floodplains

4.4.2.1 Effect of the Proposed Action

The preferred site and alternate sites are not located in the current 100 or 500 year floodplains, however, digital data obtained from the TSARP reveals that a portion of Site C is in the proposed 500 year flood plain which is expected to be approved late next year. The proposed office building would not affect any Harris County Flood Control District (HCFCD) infrastructure. The design engineer would be responsible for incorporating a design mechanism that would adequately address the local hydraulic conditions due to increased runoff. NASA should provide information to the City of Houston from hydraulic studies and impact analysis to allow for determination of impacts; however, the City of Houston 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 – Floodplain Management, which cover development in Special Flood Hazard Areas.

4.4.2.2 Effect of the No Action Alternative

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

4.4.3 Groundwater

4.4.3.1 Effect of the Proposed Action

No known groundwater contamination exists in the immediate area of the preferred construction site or the two alternate sites. A known groundwater plume does exist in the Energy Systems Test Area (ESTA) at JSC, north of Avenue B. The plume is emanating from a spill around Building 356 and is moving with groundwater flow in a northeasterly direction and away from the proposed construction sites. It is not anticipated that contaminated groundwater would be encountered during the construction phase at any of the proposed sites.

Groundwater is not currently, nor a proposed source of service water for JSC or this project. The Clear Lake City Water Authority (CLCWA) would supply potable water at the proposed sites. The CLCWA draws most of its drinking water from Houston's Southeast Surface Water Treatment Plant near Ellington. The raw surface water comes from the Trinity River through Lake Livingston (CLCWA 2005).

4.4.3.2 Effect of the No Action Alternative

No anticipated effects on the groundwater would occur if the no-action alternative was adopted and current monitoring activities continue.

4.5 Biological Resources

4.5.1 Vegetation

4.5.1.1 Effect of the Proposed Action

Site A, the preferred site, is an asphalt parking lot and will not result in the removal of any vegetation. However, additional parking may be required which could impact adjacent maintained vegetated areas. Site B is an asphalt parking lot and the adjacent maintained grass lot. The maintained lot is dominated by grasses, primarily St. Augustine, and has oak trees on the north boundary. Partial or complete removal vegetation and trees may be required if the office building were constructed on the alternate Site B. Site C is a maintained grass lot with asphalt parking lots on the east and west sides. The maintained lot is dominated by grasses, primarily St Augustine, and has oak and pine trees on the north, east, and west borders. The native and non-native trees and vegetation would have to be cleared if the office building were constructed on Site C.

4.5.1.2 Effect of the No Action Alternative

The absence of vegetation would persist at Site A with the no action alternative.

The present vegetative community at Sites B and C would persist in its current stage due to maintenance mowing with the no action alternative.

4.5.2 Wildlife

4.5.2.1 Effect of the Proposed Action

Construction of an office building at the preferred site and alternate sites would not support habitat areas suitable for most wildlife. However, construction activities would result in net gain of small pockets of habitat for adaptive species at Site A that currently provides no habitat due to the existing parking structures. Construction at the alternate sites would result in the destruction of habitat (maintained grass lots and native and non-native trees); however, landscaped areas may replace some of this loss with small pockets of habitat. Construction activities are not anticipated to adversely impact the habit areas adjacent to the preferred site or the alternate sites. Therefore, the localized habit areas are not expected to be adversely affected and should be suitable for the current species. Substantial displacement of wildlife is not anticipated at the preferred site as the site currently does not provide any habitat. Adjacent habitat near the alternate sites will be able to accommodate any displaced wildlife. No significant wildlife habitat impacts would occur at the preferred or alternate sites.

4.5.2.2 Effect of the No Action Alternative

The absence of suitable habitat would persist at Site A with the no action alternative. Despite the presence of non-native vegetation on the Site B and C, the existing vegetation does offer some protective cover and food resources for wildlife such as deer. Maintenance mowing would periodically remove this vegetation, which may have a negative impact for some species, but a positive impact for others.

4.5.3 Wetlands

4.5.3.1 Effect of the Proposed Action

No known wetlands are present at Site A or the alternate Sites B and C. 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.

Soils on preferred site and the alternate sites are not listed as prime farmland and would not be subject to Farmland Protection Policy Act.

4.5.3.2 Effect of the No Action Alternative

There would be no changes in wetlands inventory at JSC 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 office building would house civil service and contract personnel currently holding positions in other facilities at JSC.

Executive Order 12898 - Federal Actions To Address Environmental Justice In Minority Populations and Low-Income Populations, 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.

There will not be any disproportionate impacts to low-income or minority populations. No displacements will be required and no impact to the community is anticipated since the

proposed project sites are currently parking lots or undeveloped lots on JSC property. No environmental justice issues have been identified for the proposed project because no residential households will be displaced, and no minority populations or low-income populations will be divided or isolated by the proposed building.

4.6.1.2 Effect of the No Action Alternative

The implementation of the no action alternative would have a negative effect on available office space at JSC.

4.6.2 Cultural Resources

4.6.2.1 Effect of the Proposed Action

Impact to cultural or archaeological resources is not anticipated, as there are no records of cultural resources for the preferred site or the alternate sites. In the event that archeological deposits or features are encountered during construction activities, all construction operations should cease within the immediate area and the Archeological Division of the Historical Commission and NASA should be immediately contacted for further consultation. Work should cease at the construction site until the requirements of Section 106 of the National Historic Preservation Act were met.

4.6.2.2 Effect of the No Action Alternative

The no action alternative would result in no land alterations and any unknown archeological deposits or features would remain undisturbed.

4.7 Cumulative Effects

The proposed construction is not anticipated to have any measurable affect on local resources and facilities at the preferred site. Construction at the alternate sites would result in minimal loss of green space and viable habitat for local wildlife. With this exception, there is no appreciable difference between the three proposed construction sites with respect to impacts on Climate and Earth Movements, Water Resources, Biological Resources, or Socioeconomic and Cultural Resources. There is little expected demand for land resources or other resources in any the areas surrounding the proposed facility with the exception of probable increased parking demands due to the loss of existing parking infrastructure. Implementation of this action would provide the necessary facilities for supporting the remodeling and renovation initiatives of existing facilities and help in meeting NASA's future office space demands.

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6. AGENCIES CONTACTED

6.1 Federal Agencies

- ◆ Fish and Wildlife Service
T&E Species Information from a website
- ◆ United States Department of Agriculture/Natural Resource Conservation District
Harris County Soil Survey
- ◆ Federal Emergency Management Agency
Harris County Flood Insurance Map

6.2 State Agencies

- ◆ Texas Parks And Wildlife
Nancy Gillespie - T&E Species Information
- ◆ Texas Historic Commission
Archeological Records
- ◆ Texas General Land Office
National Wetlands Inventory Data from website

6.3 Local Agencies

- ◆ Harris County Flood Control District
Tropical Storm Allison Recovery Project Preliminary Flood Insurance Maps

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Appendix A

Photolog

Site A

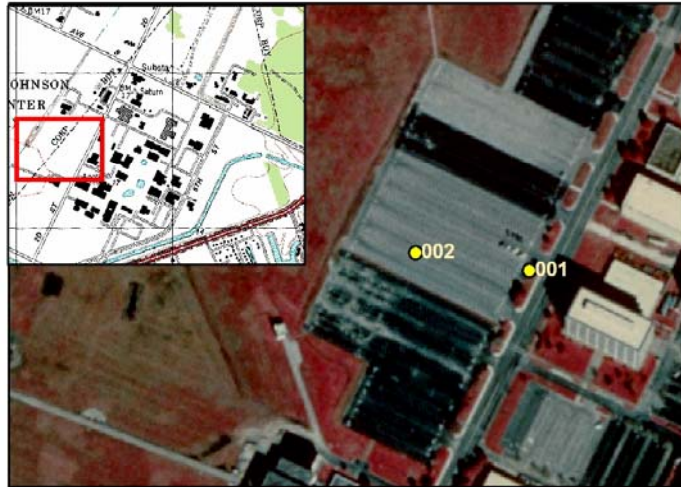


Photo facing North West
from Point 001



Photo facing North
from Point 001



Photo facing North
from Point 002

Site B



Photo facing South West from
Point 020



Photo of drainage facing West
from point 020



Photo of unknown structure
taken at point 021

Site B

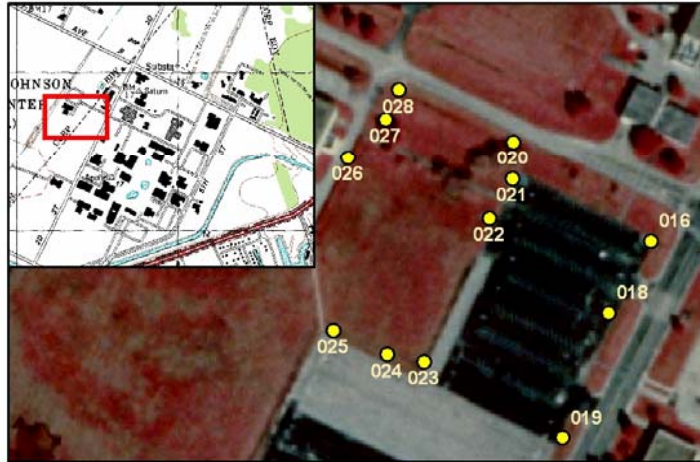


Photo of unknown structure
taken from Point 022



Photo facing North West
from point 023



Photo of small culvert
taken at point 024

Site B



Photo facing North West
from Point 025



Photo facing North
from point 026



Photo facing North of small drain
taken at point 027

Site B

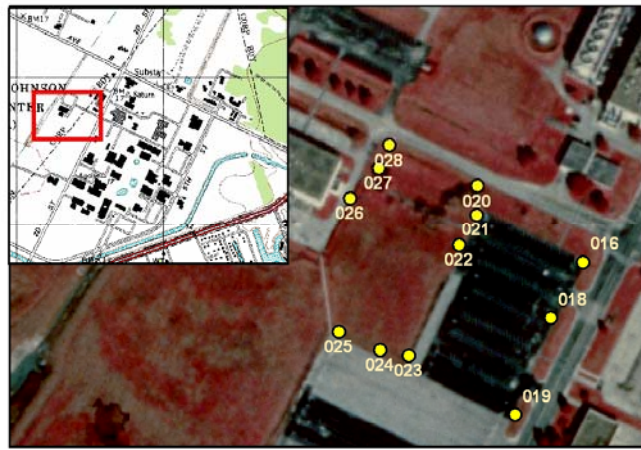


Photo facing West from
Point 016

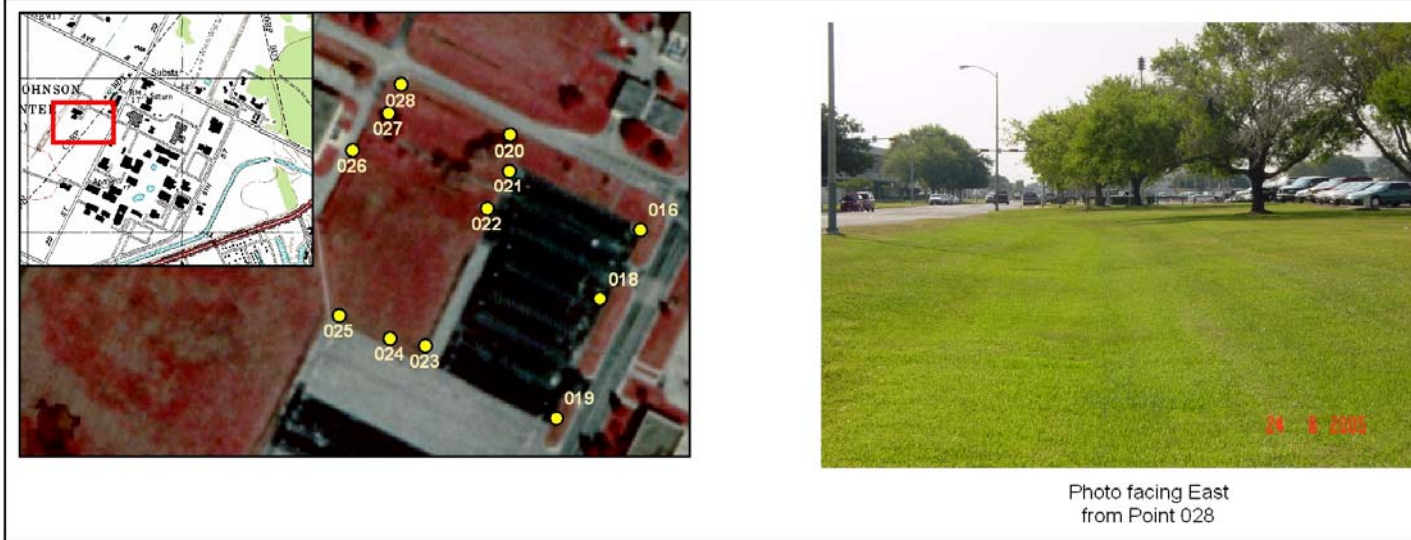


Photo facing West from
Point 018



Photo facing North from
Point 019

Site B



Site C

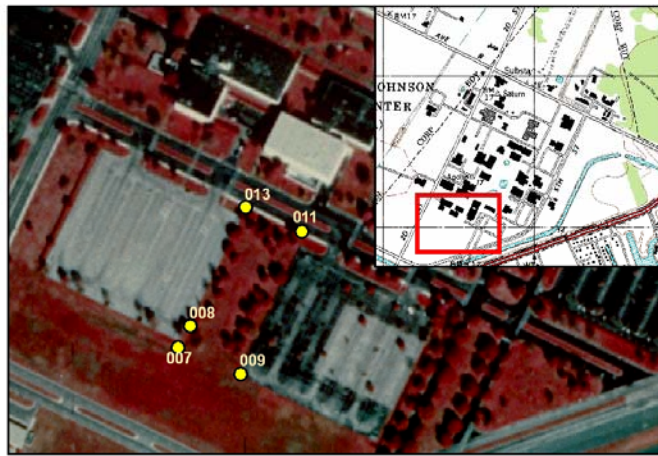


Photo facing North from
Point 008



Photo facing North from
Point 007



Photo facing North from
Point 009

Site C

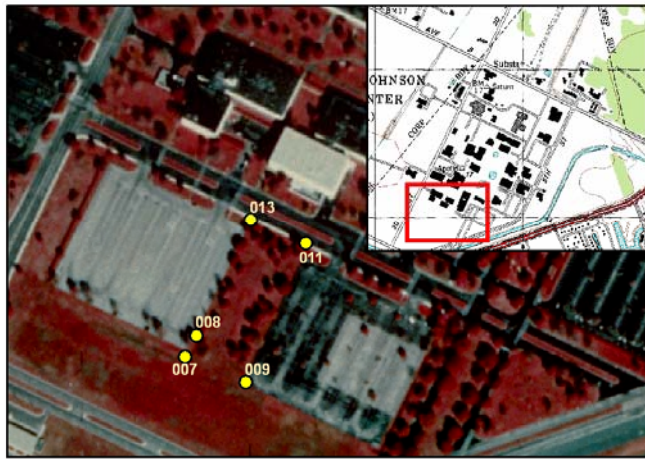


Photo facing South from
Point 011



Photo facing West from
Point 011



Photo facing South from
Point 013