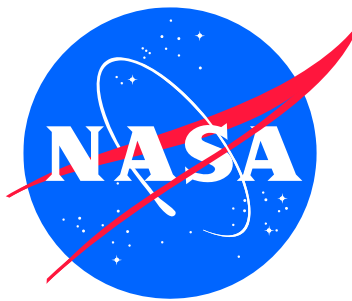


FINAL Supplemental
ENVIRONMENTAL ASSESSMENT
FOR
PLANETARY ANALOG TEST SITE FACILITY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER



June 2009

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NOTICE: National Environmental Policy Act; Proposed Development of the Planetary Analog Test Site Facility (PATSF).

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 Supplemental Environmental Assessment (SEA) and a revised Finding of No Significant Impact (FONSI) that address the environmental impacts expected to result from the proposed development of the Planetary Analog Test Site Facility (PATSF) at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas located in the northeastern portion of JSC. The area would convert approximately nine (9) acres of a primarily unimproved area to an outdoor area simulating extraterrestrial surfaces, such as Mars and lunar surfaces. The PATSF will support lunar/Mars surface asset research, development, and evaluation activities for surface elements such as unpressurized and pressurized rovers, extravehicular activity system spacesuits and ancillary hardware, landers and habitats, surface robotic systems, surface construction systems, and surface payload unloading systems

FOR FURTHER INFORMATION CONTACT: Written requests for copies of the SEA and FONSI, or requests for information, should be directed to Mr. David Hickens, Chief, NASA-JSC Environmental Office (Mail Code JE); 2101 NASA Parkway; Houston, TX 77058.

SUPPLEMENTAL INFORMATION: As announced by President George W. Bush on January 14, 2004, NASA has embarked on a "New Vision for Space Exploration" program for exploration of the Moon, Mars and beyond (NASA, 2004). The completion of the International Space Station (ISS) and retirement of the Space Shuttle fleet by 2010 necessitate an innovative plan and program to fulfill the goals of human space exploration as established by the President and expressly endorsed by Congress in the

NASA Authorization Act of 2005 (Public Law [P. L.] 109-155). NASA's Constellation Program will include a family of new spacecraft, launchers and associated hardware. The program will meet Presidential and Congressional directives and facilitate a variety of human and robotic missions, from ISS re-supply to lunar and planetary landings. In compliance with the NEPA, NASA prepared the Constellation Programmatic Environmental Impact Statement (PEIS) to address impacts associated with the Constellation Program. The PEIS concluded with a Record of Decision that was fully executed on February 28, 2008. As such, this SEA addresses potential impacts from development of a Planetary Analog Test Site Facility (PATSF) at JSC for research, development, and related activities and is tiered to the PEIS in accordance with NASA and Council on Environmental Quality Policy, Rules, and Regulations.

In November 2008, NASA proposed a two-phase development of the PATSF. Upon further analysis and in conformance with the recently revised JSC Master Plan, NASA is now planning to withdraw the Phase 2 Expansion, and is thereby deleting this area from consideration within the description of the proposed project. NASA has reviewed the SEA prepared for the development of the PATSF and has determined that it represents an accurate and adequate analysis of the scope and level of associated environmental impacts. The SEA is hereby incorporated by reference in this final Finding of No Significant Impact (FONSI).

The PATSF will support lunar/Mars surface asset research, development, and evaluation activities for surface elements such as unpressurized and pressurized rovers, extravehicular activity system spacesuits and ancillary hardware, landers and habitats, surface robotic systems, surface construction systems, and surface payload unloading systems.

Alternatives: Three alternatives have been considered: the proposed action of development of PATSF at two differing sites: Site A (East side of Ditch 13), Site B (south of Building 350), and the no-action alternative. The no-action alternative would not provide the necessary landscape to meet the current and future initiatives of the NASA research and exploration program.

Impacts Analysis: The potential physical, biological, socioeconomic, and cultural impacts of the development and operation of the PATSF have been assessed and

evaluated. No significant impacts, related to any of these environmental issues, were identified. As a result of this assessment and evaluation, a FONSI has been made. Physical and biological resources considered included, but were not necessarily limited to, climate and earth movements, water, air, and noise resources, hazardous materials, transportation, floodplains, wetlands, wildlife, and vegetation. The PATSF would have no significant adverse impact on any of these resources. Socioeconomics, including, but not necessarily limited to, land use, demographics, economic activity, and cultural resources were analyzed. The proposed PATSF would have no significant adverse impact on any of these resources.

Cumulative Impacts: The SEA 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 the area of the proposed site for the PATSF or its area of influence that would contribute to cumulative impacts.

Mitigation: Standard construction practices would be implemented to reduce erosion potential during ground disturbing activities and compliance with applicable storm water pollution prevention permit requirements would ensure appropriate storm water runoff control. NASA-JSC intends to preclude overland sheet storm water flow from entering the nearby ditch from the impervious surface being developed by enforcing the maintenance of a minimum of a 20-foot vegetative buffer between any disturbed areas associated with the development of the PATSF and the top of the slope of Ditch 13. To ensure this requirement is achieved, a mitigative measure has been inserted into the SEA to construct a temporary construction fence at the perimeter of the 20-foot vegetative buffer zone so that delivery trucks will not encroach upon the buffer, and soil and rock stockpiles do not encroach upon this vegetative buffer.

On the basis of the SEA, NASA has determined that the physical, biological, socioeconomic, and cultural impacts associated with the development of the Planetary Analog Test Site 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 will take no final action prior to the expiration of the 30-day comment period.

Date: Comments in response to this notice should be addressed to David Hickens, Chief, Environmental Office (Mail Code JE) within 30 days of the publication date of the public notice. The SEA that supports this FONSI may be reviewed at:

- (a) NASA, Johnson Space Center, Bldg. 111, Industry Assistance Office, 2101 NASA Parkway, Houston, Texas 77058, between the hours of 7:30 a.m. and 4:00 p.m.
- (b) NASA Headquarters, Library, Room 1J20, 300 E Street SW, Washington D.C. 20546.
- (c) Clear Lake City-County Freeman Branch Library, 16616 Diana Lane, Houston, Texas, 77062.

Michael L. Coats, Director
Johnson Space Center

EXECUTIVE SUMMARY

Type of report

This report is a Supplemental Environmental Assessment (SEA) Report.

Name of proposed action

The name of the proposed action is development of a Planetary Analog Test Site Facility (PATSF), Lyndon B. Johnson Space Center (JSC), Houston, Texas.

Description of proposed action

The proposed action discussed in this document is the development of a PATSF to be used by scientists, researchers, and technicians for research, development, and data acquisition in meeting NASA's long range research goals in support of the Constellation Program, associated with development of all-terrain vehicle rovers. The PATSF will support lunar/Mars surface asset research, development, and evaluation activities for surface elements such as unpressurized and pressurized rovers, extravehicular activity system spacesuits and ancillary hardware, landers and habitats, surface robotic systems, surface construction systems, and surface payload unloading systems. The proposed site (Site A) is located in the northeastern portion of JSC and would host approximately nine (9) acres of a variety of simulated lunar and planetary surface features. A 15-foot wide corridor from B220 and including a bridge across Ditch 13 is included within the scope. This document provides an analysis of environmental impacts associated with the proposed action to develop and utilize this facility at NASA-JSC.

Description of alternative action

The alternative action discussed in this document is the building of the PATSF in a different location (Site B). This proposed site consists of 23 acres located southwest of Site A on Avenue B.

Description of no-action alternative

The no-action alternative would result in inadequate facilities for research, data acquisition, and development to meet NASA's space exploration initiatives. JSC is the lead NASA center for human space flight operations support. As such, JSC has responsibilities to provide appropriate research and development facilities in order to simulate conditions that would likely be encountered while in outer space. The no-action alternative would result in JSC's inability to produce research results for adequate preparation before utilizing rovers for human space exploration while on extraterrestrial surfaces.

Physical resources

Development of the PATSF on the proposed site at NASA's JSC would impact approximately nine (9) acres of cleared, partially developed land, and a narrow strip of land from B220 to the area east of Ditch 13, including construction of a bridge across Ditch 13.

Development activities may cause short-term air emissions and dust. This can be mitigated with proper dust control methods. Construction noise associated with the delivery and placement of materials (e.g., trucks, earth moving equipment) may exceed normal ambient noise levels, but normal levels are expected after construction activity ceases. Hours of PATSF development will be limited to daylight hours of 7 a.m. – 7 p.m. to minimize potential noise levels to surrounding communities. Traffic flow may be temporarily affected along Space Center Boulevard and other arterial streets during materials delivery. No hazardous materials would be generated as a result of the development or operation of the proposed facility, and preventive measures would be incorporated to reduce potential spills from associated equipment.

Normal operations of the proposed facility will not generate hazardous materials. Operation of the facility will not result in air emissions.

The topography on the site is relatively flat and slopes towards the east. There is a drainage ditch (Ditch 13) along the western boundary of the proposed site. Some short-term erosion of soil and turbidity in drainage swales may occur during placement of the materials for the proposed facility; however, with appropriate storm water pollution

prevention controls and practices, the impact would be minimal. JSC has a Municipal Separate Storm Sewer System (MS4) permit, including a sedimentation and erosion control program that would be utilized during the development of this project to minimize surface water impacts. As appropriate, NASA will submit a Notice of Intent to discharge potentially contaminated storm water during development of the PATSF.

Much of the site is not located within the 100-year flood plain, however the actual drainage ditch located on the property does lie within the 100-year floodplain. A 15 ft wide ditch crossing is proposed as part of the overall development of the proposed site.

Biological resources

The proposed site is in the Gulf Prairies and Marshes area. The footprint of the proposed PATSF is currently dominated by tall prairie grasses that are regularly mowed.

The proposed site is part of a larger undeveloped area that includes open land that provides habitat for deer, small mammals, birds, reptiles, and amphibians that are adapted to suburban and rural environments. Some 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.

The most recent wetland delineation within the general area of the proposed facility occurred approximately eight (8) years ago in 2000. The delineation concluded that no wetlands were present due to a lack of wetland hydrology present. No significant changes in the land have occurred since this time. A field reconnaissance survey in August 2008 confirmed a lack of wetland characteristics over most of the site. A narrow, three-foot wide wetland fringe dominated by herbaceous vegetation (smartweed) and shrubs exists along the perennially flowing drainage ditch (Ditch 13). This area will be spanned, and any impacts will either be totally avoided or fall within nationwide permit criteria. NASA-JSC would obtain all necessary permits before proceeding with construction of the ditch crossing.

Socioeconomic and cultural resources

Development and operation of the proposed facility would not adversely impact minority or low-income populations. Some temporary materials delivery and placement jobs along with those associated with research and development and other potential learning

opportunities would be created. National Historic Landmarks (NHLs) located at JSC would not be impacted.

Conclusions

Short- and long-term effects on the quality of the human environment would be minimal if the proposed action were implemented. The only potential impacts to the physical and biological resources would be temporary, primarily related to construction and delivery of suitable fill material, and no impacts to socioeconomic and cultural resources would occur. However, a significant percentage of the total development will be devegetated and will remain devegetated during the life of the facility, in order to effectively simulate extraterrestrial surfaces. No reasonable foreseeable cumulative effects associated with the construction of the proposed PATSF were identified. Installation of a new extraterrestrial landscape would have only minor impacts to the environment, and would primarily occur during the development of the facility. The no-action alternative would not provide the resources for meeting the project objectives.

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT (SEA)

For

PLANETARY ANALOG TEST SITE FACILITY

LYNDON B. JOHNSON SPACE CENTER

Houston, Texas

Lead Agency: NASA – Lyndon B. Johnson Space Center

Proposed Action: Planetary Analog Test Site Facility

For Further Information: Mr. David Hickens
Chief, Environmental Office, (Mail Code: JE)
2101 NASA Parkway
Houston, TX 77058
(281) 483-3120

Date: June 2009

Abstract:

The proposed action discussed in this document is for the development of a Planetary Analog Test Site Facility (PATSF), which will enable the Lyndon B. Johnson Space Center (JSC) to provide simulated Lunar/Mars surface landscapes for research and development. The PATSF will support lunar/Mars surface asset research, development, and evaluation activities for surface elements such as unpressurized and pressurized rovers, extravehicular activity system spacesuits and ancillary hardware, landers and habitats, surface robotic systems, surface construction systems, and surface payload unloading systems. The PATSF is a key element in meeting NASA's long-range space exploration goals. This document provides an analysis of environmental impacts associated with the proposed PATSF and reasonable alternatives. This document was prepared as a supplemental environmental assessment for a similar action that was proposed in November 2008; the primary difference between the two documents is the deletion of the Phase 2 development west of Ditch 13 and its associated reduction in potentially impacted land surface area from 26.2 acres to nine (9) acres.

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Glossary: Abbreviations, Acronyms, and Terms

Alternative	Plan, option, choice (this SEA analyzes three alternatives)
Baseline conditions	Existing condition of a resource issue
BDCF	Baseline Data Collection Facility
BMP	Best Management Practices, associated with control of storm water runoff containing pollutants
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COH	City of Houston
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
SEA	Supplemental Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact (on the human environment), as defined in CEQ Regulations 1508.14
FPPA	Farmland Protection Policy Act
HCFCDD	Harris County Flood Control District
ISS	International Space Station
JSC	Lyndon B. Johnson Space Center, Houston, Texas
MS4	Municipal Separate Storm Sewer System
NAAQS	National Ambient Air Quality Standards

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 implement the proposed project(s)
NOx	Nitrogen Oxide compounds
OSHA	Occupational Safety and Health Administration
PATSF	Planetary Analog Test Site Facility
PEIS	Programmatic Environmental Impact Statement
PM	Program Manager
Preferred Alternative	The alternative (option/plan) that the decision-maker plans to select at or near the end of the analysis process
ppb	Parts per billion
ppm	Parts per million
PPE	Personal protection equipment
ROD	Record of Decision
SWPPP	Storm Water Pollution Prevention Plan
TARL	Texas Archeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
USACE	United States Army Corp of Engineers
USGS	U.S. Geological Survey
VOCs	Volatile Organic Compounds

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

As announced by President George W. Bush on January 14, 2004, NASA has embarked on a “New Vision for Space Exploration” program for exploration of the Moon, Mars and beyond (NASA, 2004). The completion of the International Space Station (ISS) and retirement of the Space Shuttle fleet by 2010 necessitate an innovative plan and program to fulfill the goals of human space exploration as established by the President and expressly endorsed by Congress in the NASA Authorization Act of 2005 (Public Law [P. L.] 109-155). NASA's Constellation Program will include a family of new spacecraft, launchers and associated hardware. The program will meet Presidential and Congressional directives and facilitate a variety of human and robotic missions, from ISS re-supply to lunar and planetary landings. In compliance with the National Environmental Policy Act (NEPA), NASA prepared the Constellation Programmatic Environmental Impact Statement (PEIS) to address impacts associated with the Constellation Program. The PEIS concluded with a Record of Decision (ROD) that was fully executed on February 28, 2008. As such, this SEA addresses potential impacts from development of a Planetary Analog Test Site Facility (PATSF) at the Lyndon B Johnson Space Center (JSC) for research, development, and crew training activities and is tiered to the PEIS in accordance with NASA and Council on Environmental Policy Rules and Regulations.

NASA proposes to construct a PATSF at the JSC in Houston, Texas beginning in 2009. The functional requirement of the PATSF would be to provide a facility for research and development in an area that simulates expected surface conditions on the Moon, Mars, and beyond. The PATSF will support lunar/Mars surface asset research, development, and evaluation activities for surface elements such as unpressurized and pressurized rovers, extravehicular activity system spacesuits and ancillary hardware, landers and habitats, surface robotic systems, surface construction systems, and surface payload unloading systems.

1.2 Need for the PATSF

The PATSF is required to enable JSC to conduct research and development of all terrain extraterrestrial rovers and other equipment on simulated Lunar/Mars landscapes. This facility will support data acquisition activities associated with research/engineering capabilities for various equipment designs, so that personnel can understand where improvements can be made. The PATSF will support lunar/Mars surface asset research, development, and evaluation activities for surface elements such as unpressurized and pressurized rovers, extravehicular activity system spacesuits and ancillary hardware, landers and habitats, surface robotic systems, surface construction systems, and surface payload unloading systems. The PATSF is a key element in accomplishing the Constellation Program's goals.

1.3 Decisions That Must Be Made

JSC management must decide:

- Whether to construct a PATSF Site A, Site B, or choose the no-action alternative.
- Determine whether the proposed action would or would not be a major federal action significantly affecting the quality of the human environment.

If JSC management determines that there will or may be a significant effect on the quality of the human environment, then an Environmental Impact Statement (EIS) must be prepared and a ROD signed in order for the PATSF project to proceed.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Development of Planetary Analog Test Site Facility (Preferred Site A)

The PATSF would be located at JSC in Harris County, Texas (Figure 2.1). The proposed site contains approximately nine (9) acres of cleared, partially developed land east of Ditch 13. The PATSF would be a landscape with multiple types of surfaces and terrain to simulate lunar, Mars and other planetary landscapes so that research teams can develop extraterrestrial rover devices. Approximately 5,000 truckloads (100,000 cubic yards) of differing gravel and rock constituents may be utilized to complete the development and expansion of the test site. Because Site A is bordered by a narrow, tidally influenced ditch, a small (15-foot) bridge is planned to allow crossing of the rover and personnel, thereby avoiding the need to traverse across Avenue B or Second Street from Building 220, where the rover prototype is planned to be developed and stored.



Figure 2.1 - Vicinity Map



Figure 2.2 Site A (East of Ditch 13), is the preferred site for the PATSF. (Phase 2 has been deleted from the description of the proposed action)

Development of the eastern portion of Site A, east of Ditch 13, would occur in mid to late 2009.

It should be noted that some minor development (less than two acres) has occurred within the project area, as shown in Figure 2.2, prior to the completion of this SEA (in the late 1990's). This development was performed under a Categorical Exclusion and was performed prior to finalizing the Constellation PEIS. Consequently, Phase I can be considered an “expansion” of the previously disturbed area.

2.2 Proposed PATSF Alternative Location (Alternative Site B)

The alternative action discussed in this document is the development of the PATSF on a different section of land located on the NASA grounds. This site is approximately 23 acres and is a cleared, maintained grassy area. It is located on the south side of Avenue B, west of the intersection of Avenue B with Second Street, east of the General Supply Warehouse, and north of Saturn Lane. This site is sufficient in area to develop a landscape with multiple types of surfaces and terrain to simulate lunar and Mars landscapes so that research teams can conduct research and development of rovers on simulated extraterrestrial surfaces. Site B is located along Avenue B which is a more heavily traveled road than Site A, therefore introducing much more vehicular traffic around the area, and operational activities would necessitate the frequent traversing and crossing of Avenue B and Second Street in order to transport the test vehicle to the proposed testing and simulation area. Site A is more secluded with fewer buildings surrounding the area and exhibits much less vehicular and pedestrian traffic than Site B. Site A also has more direct access to Space Center Boulevard, thereby reducing the potential for onsite congestion of roadways during development. Site B is also closer to the Atwater Prairie Chicken captive breeding area, which is located along the western edge of the facility; although vehicle and equipment noise should be minimal and of no significant consequence, Site A nevertheless avoids any potential adverse noise impacts to this area.

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

The no-action alternative would have several consequences for JSC and NASA. JSC has responsibilities to support NASA's long-range research goals in support of development of the Constellation Program, and to support space exploration and research associated with development of extraterrestrial surface rovers. Lack of adequate simulation facilities would adversely affect and limit the implementation of JSC initiatives and no-action would result in JSC's inability to properly execute research and development programs and acquire the necessary data to support the goals of the Constellation program.

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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 alternatives.

The two action alternatives of development on Site A or Site B would both be located at JSC in Harris County, Texas. JSC is located 35.4 kilometers (22 miles) southeast of downtown Houston, near Clear Lake. Both proposed sites are located in the northern portion of JSC. Since the two proposed sites are in relatively close proximity, the following discussions will consider them in unison. Any differences in the two sites will be described as necessary.

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) indicates the proposed site for the PATSF has an elevation of approximately 4.57 meters (15 feet) above mean sea level (USGS, 1995) (Figure 3.1). The proposed sites and the land surrounding the site are generally flat, with a gentle slope to the east. The northeastern portion of the site is topographically lower than the rest of the site. The vast majority of the proposed site for the PATSF is just outside the 100-year floodplain. Only the excavated ditch located on the site is a part of the 100-year floodplain of Clear Lake, as shown in the flood plain map updated in 2007 (Figure 3.1) obtained from the Tropical Storm Allison Recovery Project (TSARP) Flood Insurance Rate Maps prepared for the Federal Emergency Management Agency (FEMA).



FEMA Floodplains Effective June 18, 2007

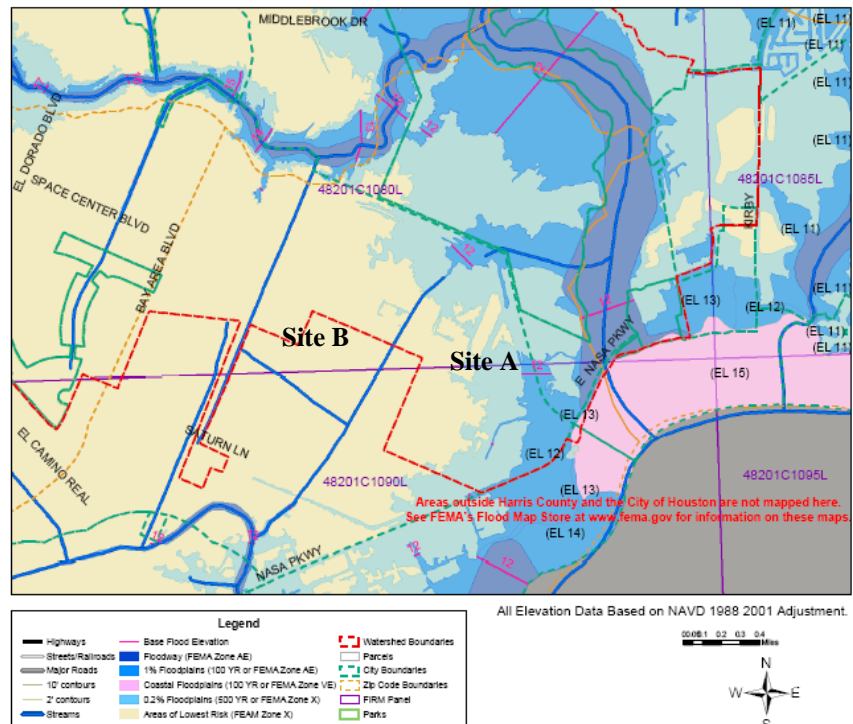


Figure 3.1 - Floodplain Map

3.2.2 Rainfall

Rainfall is evenly distributed throughout the year, with an annual average of about 121.9 centimeters (48 inches) (WeatherBase). Thunderstorms are common in summer months when the sun warms the air near the surface, causing it to rise and cool, thus resulting in clouds and rain. Showers and thunderstorms also occur when weather fronts pass through the area.

3.3 Development 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) has adopted the NAAQS standards presented in Table 3.3.1 for each of the six pollutants.

Table 3.1 - National Ambient Air Quality Standards (NAAQS)

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

Notes: Source: TCEQ 2007; <http://www.tceq.state.tx.us/compliance/monitoring/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 – The average of the annual fourth highest daily eight-hour maximum over a three-year period is not to be at or above this level.
- b – Not to be at or above this level more than once per calendar year.
- c – Not to be at or above this level.
- d – Not to be at or above this level on more than three days over three years with daily sampling.
- e – The three-year average of annual arithmetic mean concentrations at each monitor within an area is not to be at or above this level.
- f – The three year average of the annual 98th percentile for each population-oriented monitor within an area is not to be at or above this level.
- g– The three year average of annual arithmetic mean concentrations from single or multiple community-oriented monitors is not to be at or above this level.

The TCEQ classifies the air quality status of each county with respect to NAAQS as attainment, non-attainment, maintenance, or unclassified. Attainment indicates that the air quality is within the NAAQS. Non-attainment 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 non-attainment" 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 and nitrogen oxides 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 (TCEQ, 2007).

3.3.2 Sound Environment

Most of the land immediately surrounding the proposed site for the PATSF contains buildings, parking lots, or open fields. The proposed project area is located at the northeast corner of JSC. Adjacent and to the south of the site are the Area 200 buildings. Adjacent to the north and west are the boundaries of JSC. Adjacent to the bisecting the site of the PATSF is a man-made drainage ditch, Ditch 13, and an open, maintained (mowed) field. A fence marking the perimeter of JSC, a public roadway (NASA Parkway), and Clear Lake are located further to the east. Noise levels are very low and do not appear to exceed normal background levels typically associated with such areas.

3.3.3 Spills and Hazardous Materials

The proposed site for the PATSF 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. Residual concentrations of these chemicals are not expected to be present on the proposed site. There are no records of spills having occurred at this site.

3.3.4 Transportation

The proposed PATSF site is located northeast of the intersection of Second (2nd) street and Avenue B. The field location is at the very end of a side street, near the Area 200

buildings. In general, there is very light vehicular traffic in this area of JSC. A monitored security fence separates the proposed site from Space Center Boulevard.

3.4 Water Resources

3.4.1 Surface Water and Drainage

A man-made storm water drainage ditch (Ditch 13) is within and transects the proposed PATSF site. Based on historical aerial photographs and USGS topographic maps, the drainage ditch was constructed in the late 1960's. The drainage ditch discharges offsite and eventually into Armand Bayou. The drainage ditch typically holds water.

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 the site was obtained from FEMA and is included as Figure 3.1 (TSARP, 2007). Areas of the proposed site for the PATSF are just outside the 100-year floodplain; however, the ditch located on the site is a part of the 100-year floodplain of Clear Lake, as shown in the flood plain map updated in 2007 (Figure 3.1) obtained from the TSARP Flood Insurance Rate Maps. During Hurricane Ike in September 2008, no significant flooding due to storm surge was noted in the proposed project site location.

3.4.3 Groundwater

The Beaumont Formation, along with the underlying Montgomery, Bentley, and Willis Sand Formations, comprise the Chicot Aquifer, which extends approximately 210 meters (700 feet) below surface in the area of the proposed PATSF site. The Evangeline Aquifer is approximately 671 meters (2,200 feet) thick and extends from the base of the Chicot Aquifer to approximately 884 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). An annual report is

prepared by the U.S. Geological Survey that records the water level measurements and trends in these aquifers, which includes the general proximity of JSC. (See Kasmeric and Lanning-Rush, <http://pubs.usgs.gov/of/2002/ofr02-377/>). 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. Although the Chicot and Evangeline Aquifers are the principal sources of groundwater for public water supply in the Houston area, the Harris County Subsidence District has restricted the pumping of groundwater due to the effects of 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 PATSF site is in an undeveloped portion of JSC. The general area is in the Gulf Prairies and Marshes area of Texas, with nearly level coastal prairie, slowly drained by many slow-moving streams, surrounded by low woodlands (Hatch et al. 1990). 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 (Site A) was used for dredge fill deposits from construction of a barge dock in the 1960's and additional maintenance dredging in the vicinity of the barge dock in the 1980's. The dominant vegetation now consists of Bermuda grass (*Cynodon dactylon*), Dallisgrass (*Paspalum dilatatum*) and Johnson grass (*Sorghum halapense*).

The Endangered Species List maintained by the U.S. Fish and Wildlife Service was reviewed. The only plant species listed for Harris County is the Texas prairie dawn-flower (*Hymenoxys texana*). A plant and wildlife survey of JSC in 2005 concluded that the Texas prairie dawn-flower was not observed.

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 and operation buildings, roadways, and parking lots surround the proposed site.

The open land near the proposed sites provide habitat for deer, small mammals, birds, reptiles, and amphibians that are adapted to suburban and rural environments. During previous field reconnaissance, species observed in nearby open areas 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*), scissor-tailed flycatcher (*Tyrannus forficatus*), snowy egret (*Egretta thula*), doublecrested cormorant (*Phalacrocorax auritus*), killdeer (*Charadrius vociferus*), American crow (*Corvus brachyrhynchos*), crawfish, and several snakes.

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 in nearby open areas. Small mammals such as raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and rodents are found in nearby open areas. Whitetail deer (*Odocoileus virginianus*) that are frequently observed on JSC property are considered a captive population due to the high security fencing that surrounds the site. Due to overpopulation concerns, Texas A&M University is conducting a population control program for the Whitetail deer herd at JSC.

The Endangered Species List maintained by the U.S. Fish and Wildlife Service was reviewed. The only wildlife species listed for Harris County is the bald eagle (*Haliaeetus leucocephalus*) which was delisted in August 2007. No nesting pairs of bald eagles have been observed at JSC.

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 of 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 wetland, as defined by the 1987 Corps of Engineers Wetland Delineation Manual, must meet three mandatory criteria: hydric soils, wetland hydrology, and hydrophytic vegetation. A jurisdictional wetland must have a nexus to interstate commerce, commensurate with recent EPA/USACE guidance.

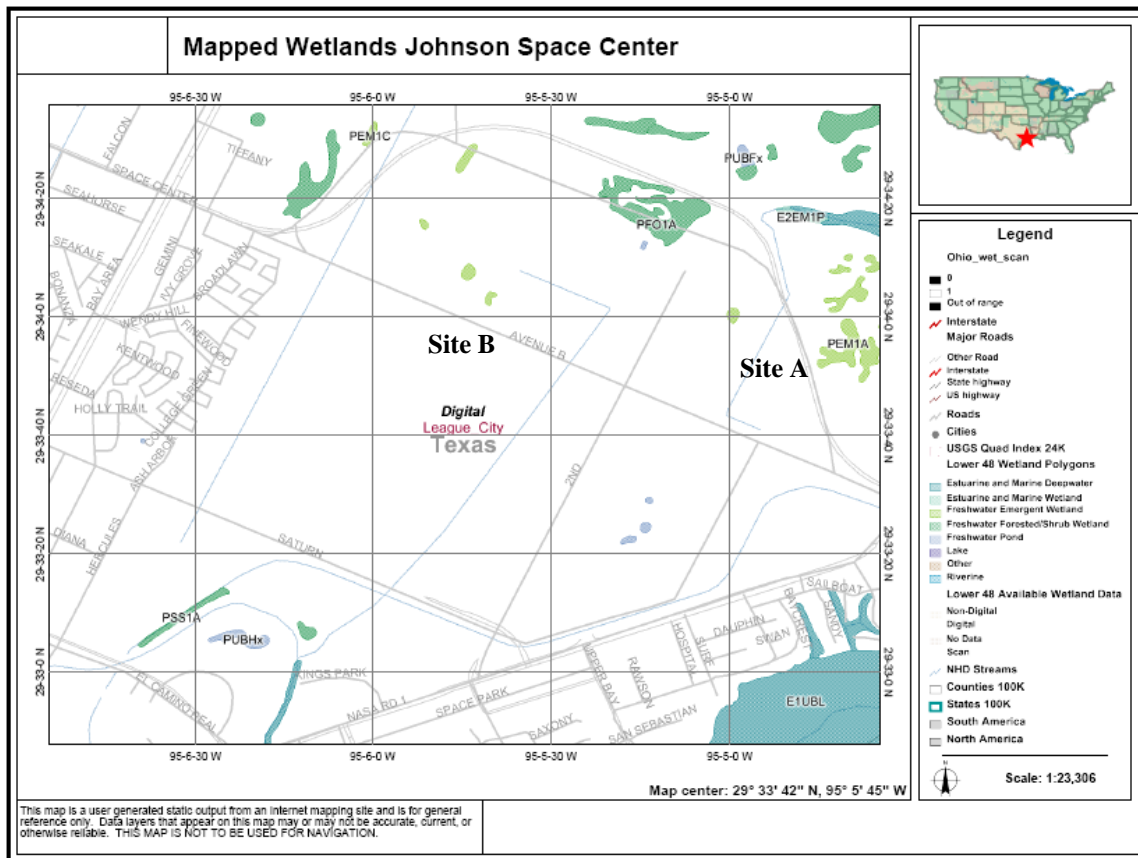


Figure 3.2 - Wetlands Map

(Please refer to http://wetlandsfws.er.usgs.gov/status_trends/national_reports/trends_2005_report.pdf for a complete description of wetland types and groups, as defined within the National Wetlands Inventory.

The U.S. Department of the Interior, Fish and Wildlife Service has published National Wetland Inventory maps that identify wetland areas. These "wetlands" are not defined the same as USACE, but are a useful planning tool. No wetlands were shown on or directly adjacent to the proposed sites, although wetlands are mapped on other portions

of the JSC property (Figure 3.2). During site reconnaissance, no wetland indicators were observed. The drainage ditch (Ditch 13) within the immediate area of the proposed site for the PATSF supports hydrophytic vegetation, but they are both manmade structures created from uplands. The most recent wetland delineation of this area took place approximately eight (8) years ago in 2000. It was determined that no wetlands were present due to a lack of wetland hydrology present. There have been no significant changes in the land use that have occurred since that time.

A narrow, one-meter (3-ft) wide wetland fringe dominated by herbaceous vegetation (*Polygonum sp.*) and shrubs (*Iva frutescens*) exists along the perennially flowing drainage ditch. This area will be spanned, and impacts will either be totally avoided or minimized in order to comply with nationwide permit criteria. As stipulated in Appendix C, JSC would obtain and/or comply with any applicable dredge and fill permits before proceeding with construction of the bridge.

3.5.4 Soils

Soils at the proposed PATSF site are mapped as mostly urban land with some Midland-Urban land complex (Figure 3.3). The Urban land complex soils are about 36 inches thick. In the upper 55 cm (22 in) it is very firm, neutral, black clay. In the lower 35 cm (14 in) it is very firm, mildly alkaline, very dark gray clay. The layer below that is about 40 cm (16 in) thick and is very firm, mildly alkaline, dark gray clay that has intersection slickensides. Slickensides are polished, grooved surfaces that occur along shear planes within the soil. These shear planes result from the shrink-swell action of smectite clays that accompanies cycles of wetting and drying. When wetted, the soil volume increases; the volume then decreases as the soils dries. Slickensides form along the internal shear planes as soil aggregates move past one another in response to these volume changes. Soils are nearly level, sloping between 0 - 3% (usually 0 – 1%). These soils are somewhat poorly drained, and very slowly permeable.

The Urban complex includes soils that have been altered or covered by buildings and structures. Fill material often covers natural soils (Soil Conservation Service, Harris County Soil Survey, 1976). Soils on the proposed site are not subject to Farmland Protection Policy Act.



Figure 3.3 - Soils Map

Legend

Ur - Urban Soil Complex

Md – Midland-Urban land complex

3.6 Socioeconomic and Cultural Resources

3.6.1 Demographics and Economic Activity

The proposed sites are located in the Clear Lake area, which lies within Houston city limits and is included in Harris County. 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).

Table 3.2 Demographics of Harris County, TX

Harris County, TX		
Persons:	White	42.1%
	Black	18.5%
	Other race	14.2%
	Chinese	1.0%
	Vietnamese	1.6%
	Asian Indian	1.1%
Total Persons:		3,693,050
Types of Workers:	Government	11%
	Private Wage/Salary	83%
	Self Employed, not incorporated	6%
Persons in Work Force:		1,827,239
Average Household Income:		\$44,002
Average Household Size:		
	Harris County	2.8
	Texas	2.7
Median Monthly Rent:		\$590
Median Resident Age:		31.2
Texas Median Age:		32.3

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 (Bay Area Houston Economic Partnership website).

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 previously reviewed to determine the presence of recorded sites around the project area. Based on a review of these records, no archeological sites have been recorded around the project area.

Two buildings at JSC house National Historic Landmarks (NHL), including the large vacuum chamber in building 32 and the old mission control room in building 30. These two facilities are approximately 610 meters (2,000 feet) southwest of the proposed PATSF site.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Per NEPA, the term “*Environmental consequences*” is defined as the scientific and analytic basis for the summary comparison of effects. This chapter presents, in detail and by resource, the direct, indirect, and cumulative effects of each alternative considered.

4.2 Climate and Earth Movements

4.2.1 Hurricanes and Tidal Surge

4.2.1.1 Effect of the Proposed Action

The proposed PATSF 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 PATSF. If tidal surge or receding floodwaters were to reach the PATSF, possible landscape damage could occur.

4.2.1.2 Effect of Site B Development

JSC has an emergency plan outlining hurricane procedures that would be adopted and applied to the facility. If tidal surge or receding floodwaters were to reach the renovated facility, possible landscape damage could occur. Site B is not as likely to be inundated by tidal surge as the proposed site (Site A).

4.2.1.3 Effect of the No-action Alternative

Hurricane and tidal surge damage would be minimal on the site as there would be no new structures to damage. Some damage to the land surface including deposition of foreign materials may result if these climatic events were to occur.

4.2.2 Rainfall

4.2.2.1 Effect of the Proposed Action

Heavy rain events would not result in significantly worse flooding around the PATSF due to implementation of runoff control measures. The PATSF would be constructed to effectively drain any excess water in a manner not to cause additional flooding upstream or downstream of the proposed site or to other JSC property.

4.2.2.2 Effect of Site B Development

Heavy rain events could result in flooding around the facility if topography was altered without adequate drainage. However, the renovations at the facility would be constructed to effectively drain any excess water in a manner not to cause additional flooding upstream or downstream of the proposed site or to other JSC property.

4.2.2.3 Effect of the No-action Alternative

Heavy rains should not cause flooding 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 Development and Operational Impacts

4.3.1 Air Resources

4.3.1.1 Effect of the Proposed Action

The development of the proposed landscape is not expected to introduce any harmful substances into the atmosphere. Heavy machinery and trucks emit carbon monoxide, particulate matter, nitrogen oxides, hydrocarbons, and sulfur oxides. Steps will be taken to mitigate emissions and control any dust created during development.

- Vehicles will be inspected before entry to verify that all safety and emission control systems are performing adequately; vehicles with excessive exhaust emissions will be rejected;
- While materials are being deposited, the contractor will be required to maintain a dust suppression system (such as misting with water) to mitigate excessive dust.

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. The proposed landscape will not consume electrical power.

Research and development operational activities associated with all-terrain rovers will primarily utilize solar cells and batteries, rather than combustion sources, and consequently will not result in adverse effects to air resources. It is not anticipated that all terrain vehicles being tested will generate excessive dust.

4.3.1.2 Effect of Site B Development

Potential impacts for development at Site B are identical to those of the proposed site (Site A). The development of the proposed landscape is not expected to introduce any harmful substances into the atmosphere. Heavy machinery and trucks emit carbon monoxide, particulate matter, nitrogen oxides, hydrocarbons, and sulfur oxides. Steps (as detailed above in the previous section) will be taken to mitigate 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. The proposed landscape will not consume electrical power.

Research and development operational activities associated with all-terrain rovers will primarily utilize solar cells and batteries, rather than combustion sources, and consequently will not result in adverse effects to air resources. It is not anticipated that all terrain vehicles being tested will generate excessive dust.

4.3.1.3 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 Sound 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 development of the landscape 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) must be incorporated to minimize the impact of construction related noise to surrounding areas. JSC would require Occupational Safety and Health (OSHA) safety standards be followed including wearing personal protection equipment (PPE) at all times during the development of the PATSF.

Research and development activities associated with operation of all terrain rovers is not expected to result in adverse noise effects. The motors of these vehicles are anticipated to be muffled or otherwise extremely low in noise generation.

4.3.2.2 Effect of Site B Development

Because Site B is more remote from the fence line, offsite receptors would detect less noise during construction activities than for the proposed site (Site A). Operation of heavy machinery and increased vehicular traffic would temporarily increase noise levels during the development of the landscape 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. BMPs must be incorporated to minimize the impact of construction related noise to surrounding areas. JSC would require OSHA safety standards be followed including wearing PPE at all times during the development of the PATSF.

Research and development activities associated with operation of all terrain rovers is not expected to result in adverse noise effects. The motors of these vehicles are anticipated to be muffled or otherwise extremely low in noise generation.

4.3.2.3 Effect of the No-action Alternative

The sound 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 PATSF 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. Normal operations of the proposed facility should not generate hazardous materials or wastes. No effects from hazardous materials, when managed in compliance with environmental regulations, are anticipated.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant volume or use of hazardous materials. Incidental oil spills, associated with cooling and hydraulic systems could occur; however, JSC retains a spill response team with adequate capabilities to respond should an incident occur.

4.3.3.2 Effect of Site B Development

The potential impacts for development at Site B are identical to those at the proposed site (Site A). 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 PATSF 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. Normal operations of the proposed facility should not generate hazardous materials or wastes. No effects from hazardous materials, when managed in compliance with environmental regulations, are anticipated.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant volume or use of hazardous materials. Incidental oil spills, associated with cooling and hydraulic systems could occur; however, JSC retains a spill response team with adequate capabilities to respond should an incident occur.

4.3.3.3 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

No significant adverse transportation impacts are expected at JSC. Traffic congestion will likely occur during construction, but steps should be taken to ensure safe roadway conditions and access to all facilities. Long-term effects on transportation are not anticipated. A planned temporary entrance off of Space Center Boulevard for delivery of soil and landscaping materials will dramatically reduce potential onsite transportation impacts.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to onsite or offsite transportation.

4.3.4.2 Effect of Site B Development

Development activities at Site B may cause temporary adverse onsite transportation and circulation impacts. However, no significant adverse transportation impacts are expected at JSC. Traffic congestion will likely occur during construction, but steps should

be taken to ensure safe roadway conditions and access to all facilities. Long-term effects on transportation are not anticipated.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to onsite or offsite transportation. However, because it will be necessary to cross two major thoroughfares to access the Site, (both Avenue B and Second Street) with the test article, security escorts or other means may be needed to temporarily control onsite traffic, but these impacts should be of relatively short duration.

4.3.4.3 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.

4.4 Water Resources

4.4.1 Surface Water and Drainage

4.4.1.1 Effect of the Proposed Action

The PATSF will require little alteration of the existing grade so a minimal impact to surface water drainage patterns is expected. There may be temporary erosion during construction causing sedimentation and turbid waters in drainage structures. A Storm Water Pollution Prevention Plan (SWPPP) must be provided for this site in accordance with JSC and regulatory guidelines before construction begins. The SWPPP requires implementation of erosion control measure to minimize impacts. These sedimentation and erosion control procedures must be carried out for the duration of construction.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to storm water runoff. Some minimal soil disturbance may be expected during testing. Direct discharges into Ditch 13 will be controlled by designed sedimentation and erosion controls. A 20-foot wide vegetative buffer will be required and will be marked between the active portion and the top slope of the ditch in order to preclude sheet storm water flow from directly entering the ditch.

4.4.1.2 Effect of Site B Development

Potential effects are similar for development at the proposed site (Site A). Existing drainage patterns may require re-engineering in order to account for runoff. During

construction there may be temporary erosion causing sedimentation and turbid waters within the roadside drainage ditches. Contractors would be required to create and implement a SWPPP in accordance with JSC and regulatory guidelines before construction begins. These sedimentation and erosion control procedures must be carried out for the duration of construction.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to storm water runoff. Runoff into local swales will be controlled by designed sedimentation and erosion controls.

4.4.1.3 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 PATSF would not affect any Harris County Flood Control District (HCFCD) infrastructure; consequently, there would be no detention requirement. Harris County is a participating member of the National Flood Insurance Program, which is administered by the Federal Emergency Management Agency (FEMA). 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 (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, which cover development in Special Flood Hazard Areas. Most of the proposed site for the PATSF is just outside the 100-year floodplain. Only the ditch located on the site is a part of the 100-year floodplain of Clear Lake, as shown in the floodplain map updated in 2007 (Figure 3.2) obtained from the TSARP Flood Insurance Rate Maps. The project would be coordinated with the local floodplain administrator to assure compliance with the NFIP program.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to floodplains.

4.4.2.2 Effect of Site B Development

All of Site B is considered outside of the 100-year floodplain. The PATSF would not affect any HCFCF infrastructure; consequently, there would be no detention requirement. 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 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, which cover development in Special Flood Hazard Areas.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to floodplains.

4.4.2.3 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

Development of the PATSF site will only include minimal grading, thus no encounters with shallow groundwater are expected. Potable water at the proposed site would be supplied by the Clear Lake City Water Authority, which draws its supply from surface water.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to groundwater. No hazardous materials capable of contaminating the groundwater would be stored or used at the site. Although spill of motor oil and hydraulic oil could occur from all terrain vehicles, JSC maintains a spill response team capable of quickly responding and avoiding any adverse impact to groundwater.

4.4.3.2 Effect of Site B Development

Development of the PATSF site will only include minimal grading, thus no encounters with shallow groundwater are expected. Potable water at the proposed site would be

supplied by the Clear Lake City Water Authority, which draws its supply from surface water.

Research and development activities associated with operation of all terrain rovers is not expected to result in a significant impact to groundwater. No hazardous materials capable of contaminating the groundwater would be stored or used at the site. Although spill of motor oil and hydraulic oil could occur from all terrain vehicles, JSC maintains a spill response team capable of quickly responding and avoiding any adverse impact to groundwater.

4.4.3.3 Effect of the No-action Alternative

No anticipated effects on the groundwater would occur if current maintenance activities continue. The existing groundwater wells at the site should still be sampled in order to monitor contaminant levels.

4.5 Biological Resources

4.5.1 Vegetation

4.5.1.1 Effect of the Proposed Action

The proposed site is in a developed area with frequently maintained native grasses. Because existing grass would be removed during development of the proposed facility, some short-term erosion may occur.

Research and development activities associated with operation of all terrain rovers is expected to result in complete devegetation in the PATSF. The use of herbicides (e.g., Roundup™) will be minimal, and, as necessary, will be strictly applied in accordance with label directions and any associated regulatory restrictions.

4.5.1.2 Effect of Site B Development

The impacts for development at Site B are identical to those of the proposed site (Site A). The proposed site is in a developed area with frequently maintained native grasses. Because existing grass would be removed during development of the proposed facility, some short-term erosion may occur.

Research and development activities associated with operation of all terrain rovers is expected to result in complete devegetation in the PATSF. The use of herbicides (e.g.,

Roundup™) will be minimal, and, as necessary, will be strictly applied in accordance with label directions and any associated regulatory restrictions.

4.5.1.3 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 to the site would not support habitat areas suitable for most wildlife; however, landscaped areas may provide small pockets of habitat for adaptive species. Substantial displacement of wildlife is not anticipated, although a minor amount of habitat would be lost. Remaining fields at or near the site would easily accommodate displaced wildlife.

Research and development activities associated with operation of all terrain rovers is expected to result in complete devegetation in the PATSF. Consequently wildlife is not expected to remain in the area for extended periods. Any wildlife in the area during rover testing will likely be mobile enough to avoid being impacted by operational activities. No impacts to the Atwater Prairie Chicken breeding area are expected to occur as a result of activities in this area.

4.5.2.2 Effect of Site B Development

The impacts for development at Site B are identical to those of the proposed site (Site A). Proposed improvements to the site would not support habitat areas suitable for most wildlife; however, landscaped areas may provide small pockets of habitat for adaptive species. Substantial displacement of wildlife is not anticipated, although a minor amount of habitat would be lost. Remaining fields at or near the site would easily accommodate displaced wildlife.

Research and development activities associated with operation of all terrain rovers is expected to result in complete devegetation in the PATSF. Consequently, wildlife is not expected to remain in the area for extended periods. Any wildlife in the area during rover testing will likely be mobile enough to avoid being impacted by operational activities. With the potential exception of limited noise impacts during development

associated with delivery of materials, no impacts to the Atwater Prairie Chicken breeding area are expected to occur as a result of activities in this area.

4.5.2.3 Effect of the No-action Alternative

The existing vegetation at the proposed site for the PATSF does offer some protective cover and food resources for wildlife. The no-action alternative would involve continued maintenance mowing of this area and this would result in the periodic removal of this vegetation.

4.5.3 Wetlands

4.5.3.1 Effect of the Proposed Action

Executive Order 11990 calls for the avoidance and minimization of wetland impacts wherever there is a practicable alternative. No formal wetland determination has been made for the proposed development area. However, with the area immediately adjacent to the man-made drainage ditch (Ditch 13), a preliminary assessment did not reveal any indicators of soil or vegetation conducive to wetlands, and any localized depressions would be considered isolated.

Research and development activities associated with operation of all terrain rovers is expected to have no adverse impacts to wetlands, except those associated with runoff, as noted above.

4.5.3.2 Effect of Site B Development

The impacts for development at Site B are identical to those of the proposed site (Site A). No formal wetland determination has been made for the Site B development area. However, a preliminary assessment did not reveal any indicators of soil or vegetation conducive to wetlands, and any localized depressions would be considered isolated.

Research and development activities associated with operation of all terrain rovers is expected to have no adverse impacts to wetlands, except those associated with runoff, as noted above.

4.5.3.3 Effect of the No-action Alternative

Since wetlands are not believed to be present in this portion of the site with the exception of the area immediately adjacent to Ditch 13, no effects are anticipated.

4.6 Socioeconomic and Cultural Resources

4.6.1 Demographics and Economic Activity

4.6.1.1 Effect of the Proposed Action

The PATSF would not employ any new civil service and/or contract personnel. Researchers and technicians will visit the facility on a periodic basis for data acquisition purposes. Some temporary jobs may be created during construction. 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 requires identifying and addressing disproportionately adverse human health or environmental impacts within minority populations and low-income populations.

Studies conducted for this project indicate that there will not be any disproportionate impacts to low-income populations or minority populations from the proposed action or any of the alternatives. No displacements will be required, and no impact to community cohesion is anticipated now or in the future, as the project area is confined to JSC property. Because no residential households will be displaced, no minority populations or low income populations will be divided or isolated by the proposed project, and no adverse effects from noise or air emissions will be created, no environmental justice issues have been identified for the proposed project.

4.6.1.2 Effect of Site B Development

The impacts for development at Site B are identical to those of the proposed site (Site A). The PATSF would not employ any new civil service and/or contract personnel. Researchers and technicians will visit the facility on a periodic basis for data acquisition purposes. Some temporary jobs may be created during the development of the PATSF. 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 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.

4.6.1.3 Effect of the No-action Alternative

The implementation of the no-action alternative would have no effect on employment. If the PATSF were not developed, new jobs consisting of temporary materials delivery and placement work would not be created and potential learning opportunities would cease to exist.

4.6.2 Cultural Resources

4.6.2.1 Effect of the Proposed Action

Based upon previous archaeological surveys performed in the vicinity of the proposed project, impact to cultural or archaeological resources is not anticipated at the proposed site. JSC properties classified as National Historic Landmarks (i.e.; vacuum chamber in building 32 and the first mission control room in building 30) will not be affected by the proposed action. In the event that archeological deposits or features are encountered during development of the PATSF, the operations must cease within the immediate area and NASA's Contracting Officer must be immediately contacted for further consultation. Work would cease in the vicinity until NASA's Planning and Integration Office verifies the requirements of Section 106 of the National Historic Preservation Act are met.

Research and development activities associated with operation of all terrain rovers is not expected to have any adverse impacts to cultural resources.

4.6.2.2 Effect of Site B Development

The potential impacts to cultural or archeological resources associated with development at Site B are identical to those of the proposed site (Site A). Impact to cultural or archaeological resources is not anticipated at the proposed site. JSC properties classified as National Historic Landmarks (i.e.; vacuum chamber in building 32 and mission control in building 30) will not be affected by the proposed action. In the event that archeological deposits or features are encountered during development of the PATSF, the operations would cease within the immediate area and NASA's Contracting Officer must be immediately contacted for further consultation. Work would cease in the

vicinity until NASA's Planning and Integration Office verifies the requirements of Section 106 of the National Historic Preservation Act are met.

Research and development activities associated with operation of all terrain rovers is not expected to have any adverse impacts to cultural resources.

4.6.2.3 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.

4.7 Cumulative Effects

The proposed action and alternatives considered are not anticipated to have any measurable adverse effects 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 facilities. Implementation of these actions would provide the necessary facilities for supporting the NASA's space terrain research goals without any reasonably foreseeable physical, biological, social, or economic effects on the quality of the human environment.

The PEIS prepared for the Constellation Program was reviewed in conjunction with the development of this Environmental Assessment. Although the proposed project was not explicitly listed within the PEIS, it is reasonable to assume that a facility similar to the proposed PATSF was anticipated to be a requirement for human space exploration. Consequently, NASA anticipates that this SEA will be considered a tiered EA in conjunction with the previous ROD for the Constellation PEIS, which was approved and published in the *Federal Register* in February 2008.

The following facility projects are being planned or are currently under construction at JSC. Additional information regarding these projects may be obtained by contacting the Director, Center Operations. Based upon its scope and complexity, the scope of the proposed project does not result in any significant additional cumulative impacts to resources at JSC.

Table 4-1 Planned and/or Ongoing Facility Projects (JSC), 2009

Location	Project Description
B.1	Upgrade Lobby
B.1	Upgrade 8th Flr. Center Operations Suite
B.1	Upgrade 9th Flr. Center Director's Suite
B.2N	Renovate Public Affairs – LEED Project
B.2N & B.2S	Replace Roof
B.3	Cafeteria Serving Line Renovation
B.4	Loggia
B.5D	Install Visitor's Elevator
B.5S	Partially refurbish B. 5S to move PTT's from B. 4S
B.7 HB	Re-Roof
B.7D and B.7E	Re-Roofs
B.8	Consolidate Wet Film Process Equipment
B.8	Partially Refurbish 1st Floor to Consolidate IRD Personnel
B.8	Partially Refurbish 2nd Floor to House Flight Physicians
B.9	Tank Closure/Remediation
B.9N	Re-Roof
B.9NW and B.9NE	Re-Roofs
B.12	Renovations - LEED project
B.13	HVAC Additions
B.13	Re-Roof
B.13	Re-Roof
B.13	Re-Roof
B.13 HB	Re-Roof
B.15	Re-Roof
B.15	Re-Roof
B.16	Switchgear Replacement
B.17	Lobby Remodel
B.20	Construct New Office Building – LEED Project
B.24	Upgrade Central Heating and Cooling Plant
B.26	Astronaut Strength, Conditioning, & Rehabilitation (ASCR) Facility
B.28	Upgrade Auxiliary Chiller Plant
B.29	CAIL - CEV Avionics Integration Lab - LEEDS project
B.32	Upgrade Cranes for Critical Lifts
B.32	Upgrade Helium Support System
B.32	Rehabilitate & Modernize HVAC Systems (32) Phase 2
B.32	Clean Air Sys. for Chamber A, JWST Program Support
B.32	Upgrade LN2 System, JWST Prog. Support
B.32A & B.36	Site Stairwell Doors & Replace Sprinkler & Fire Alarm Systems

Location	Project Description
B.33	Re-Roof
B.35	Partially Refurbish to Relocate IRD Media Personnel from B. 8
B.46	UPS 1, 2, 3, & 4 Replacement
B.48	Upgrade Electrical System (48) Replaces D 1 & B4 SWG, Installs T3 with 2nd Flr. Addition
B.90G	Rocket Park Upgrades & Astronaut Memorial Grove (Phase 2) - Gazebo, Pathways, Plaque Stands)
B.90G	Little Joe Rocket Structural Support System Rehabilitation
B.100+	100 Area Revitalization
B.110	Remodel Customer Service Area
B.265	Source Board Bldg. - Addition
B.300+	300 Area Facilities Revitalization
B.350	Re-Roof
B.351	Re-Roof
B.352	Re-Roof
B.353	Re-Roof
B.400+	400 Area Revitalization
B.417	Replace E-85 Fuel Tank With New 10,000-Gal. E-85 Fuel Tank
B.420 & B.422	Re-Roofs
B.424	Re-Roof
PATSF	PH I & II Development
Various	Utility Tunnel Flood Mitigation
Various	Replace Potable Water Piping Distribution System, JSC
Various	Upgrade Site Electrical Distribution System at JSC
Various	Rehabilitate Fire Alarm & Detection System
Various	Replace Halon System - Bldgs. 7A, 5N, 207, & 11 Fire Protection Sys., & Bldgs. 37, 48, 422, & E135
Various	Replace Natural Gas Lines

5.0 AGENCIES AND INDIVIDUALS CONTACTED

5.1 Federal Agencies

Federal Emergency Management Agency, Region VI
800 North Loop 288
Denton, Texas 76201-3698

Regional Environmental Review Coordinator
United States Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

National Park Service, IMDE-PE
P.O. Box 25287
Denver, Colorado 80225

United States Department of Agriculture, Natural Resource Conservation Service
101 South Main
Temple, Texas 76501-7682

United States Fish and Wildlife Service
Division of Ecological Services
17629 El Camino Real, Suite 211
Houston, Texas 77058

5.2 State Agencies

NEPA State Single Point of Contact
Texas Governor's Office of Budget and Planning
State Insurance Building
1100 San Jacinto, Room 2.114
P.O. Box 12428
Austin, TX 78711

Texas Commission on Environmental Quality
Office of Policy and Regulatory Development
P.O. Box 13087 - MC-205
Austin, Texas 78711-3087

Texas Parks and Wildlife Department
Wildlife Habitat Assessment Program
4200 Smith School Road
Austin, Texas 78744

Deputy State Historic Preservation Officer
Texas Historic Commission
P.O. Box 12276
Austin, Texas 78711-2276

Texas General Land Office
1700 North Congress Avenue
Austin, Texas 78701-1495

5.3 Local Agencies

Harris County Flood Control District
9900 Northwest Freeway
Houston, Texas 77092

Regional Director
Texas Archeological Society
414 Pebblebrook
Seabrook, Texas 77586

Harris County Historical Commission
929 Waxmyrtle
Houston, Texas 77079

MPO Director
Houston-Galveston Area Council
P.O. Box 22777
Houston, Texas 77227-2777

Houston-Galveston Area Council
P.O. Box 22777
Houston, Texas 77227-2777

City of Houston Public Works and Engineering
Attn: Floodplain Administrator
611 Walker Street
Houston, Texas 77002

Harris County Flood Control District
Attn: Floodplain Administrator
9900 Northwest Freeway
Houston, Texas 77092

6.0 REFERENCES

NASA Programmatic Environmental Impact Statement (PEIS) for Constellation
(http://www.nasa.gov/mission_pages/constellation/main/peis.html)

NASA Vision for Space Exploration.
(<http://employeeorientation.nasa.gov/about/VisionSpaceExploration.pdf>)

Bay Area Houston Economic Partnership website, Economic Impact -JSC NASA
(<http://www.bayareahouston.com/Home/NASA-JohnsonSpaceCenter/EconomicImpact/>)

Federal Emergency Management Agency, National Flood Insurance Program; Flood Insurance Rate Map, Harris County and Incorporated Areas, Map Number 48201C1090K, Panel 1090 of 1135, 2000.

Hatch, S.L., K.N. Gandhi and L.E. Brown. 1990. Checklist of the Vascular Plants of Texas. Publication MP-1655. Texas Agricultural Experiment Station. College Station, Texas.

Preliminary Engineering Report, NASA Source Board Facility Addition; Shah Smith & Associates, Inc., January 2000.

National Ambient Air Quality Standards, Source: TCEQ 2007;
<http://www.tceq.state.tx.us/compliance/monitoring/air/monops/naaqs.html>

Soil Conservation Service, United States Department of Agriculture; Soil Survey of Harris County, Texas, 1976.

Texas Department of Water Resources; Digital models for simulation of ground-water hydrology of the Chicot and Evangeline aquifers along the Gulf coast of Texas, 1985.

United States Department of Commerce, Bureau of the Census; Census of Population and Housing. Harris County, Texas, Census Tract Number 373.03, 2000.

US Army Corps of Engineers Wetland Delineation Manual, 1987
<http://el.erdc.usace.army.mil/wetlands/wlpubs.html>

U.S. Fish & Wildlife Service Endangered Species List
(<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm>)

United States Geological Survey, United States Department of the Interior; League City, Texas, 7.5 Minute Topographic Quadrangle, 1995.

Vision 2020, Facilities Master Plan, Lyndon B. Johnson Space Center, Houston, Texas, October 2000, revised October 2002.

WeatherBase – National Climatic Data Center; Canty and Associates LLC, Great Falls, VA (<http://www.weatherbase.com/weather/weather.php3?s=34227&refer=&units=us>)

Endangered Species Wildlife and Vegetation Survey; performed by Jill Seed, URS, 2005

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APPENDIX A
Selected Site Photographs

1. Proposed location for Site A Development (view from northwest to southeast)



APPENDIX A
Selected Site Photographs

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APPENDIX A

Selected Site Photographs

2. Proposed Planetary Analog Test Site Facility landscape, looking south southeast toward Building 222.



APPENDIX A
Selected Site Photographs

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APPENDIX A

Selected Site Photographs

3. Proposed rock choices for PATSF.



APPENDIX A
Selected Site Photographs

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APPENDIX A

Selected Site Photographs

4. Ditch 13, located west of the proposed project area that would have a 15-foot wide bridge built to cross – view looking north (toward Space Center Boulevard).



APPENDIX A
Selected Site Photographs

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APPENDIX B
Storm Water Pollution Prevention

NASA-JSC operates under a Municipal Separate Storm Sewer System (MS4) permit. The NASA-JSC Environmental Office will ensure that for each phase of the development of the proposed site, the PATSF development contractor complies with all applicable storm water pollution prevention requirements, including, but not limited to, appropriate notifications and associated sedimentation and erosion control requirements.

APPENDIX B
Storm Water Pollution Prevention

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APPENDIX C
Compliance with Section 404 of the Clean Water Act

NASA-JSC recognizes that the crossing of Ditch 13, which shows evidence of being considered tidally influenced, may fall under the jurisdiction of the U.S. Army Corps of Engineers. The NASA Environmental Office will ensure that all stipulated requirements of the applicable nationwide permit(s) will be strictly adhered to. Because there will be no change to the drainage capacity or flow patterns within Ditch 13 from the proposed crossing, formal consultation or permitting from the U.S. Army Corps of Engineers will not be required.

APPENDIX C
Compliance with Section 404 of the Clean Water Act

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APPENDIX D

Comments Received during Public Review of the Draft Environmental Assessment (Public Notice issued in November 2008) and Draft Supplemental Environmental Assessment (Public Notice issued in April 2009) and their respective Dispositions

Comments Received on the Draft EA

Summary

During the public review and comment period, which began on Thursday, November 13, 2008 and ended on Monday December 15, 2008, JSC received four comments from interested parties. The comments have been analyzed and responses are provided as Appendix D to the Final Environmental Assessment. Based upon the comments received, NASA intends to proceed with a Finding of No Significant Impact (FONSI) associated with further development of the Planetary Analog Test Site Facility. However, additional mitigative measures have been developed in order to ensure that the proposed facility will not adversely impact the nearby drainage ditch (Ditch 13). These mitigative measures will be enforced during the development and operation of the PATSF.

Commenter: U.S. Fish and Wildlife Service.

The commenter requested clarification regarding the distance between the proposed site and the location of the Atwater Prairie Chicken Captive Breeding Area.

Response:

Attachment D-1 is a scaled map showing the locations of the Atwater Prairie Chicken (APC) Captive Breeding Area and the proposed location of the PATSF (Site A) and the alternative location (Site B). The distance from the APC to Site A is approximately one mile. No noise or other impacts are expected to occur that would adversely affect the ongoing APC captive breeding program.

Commenter: Texas Historical Commission, State Historic Preservation Officer
The commenter agreed that no adverse affects to currently listed National Historic Landmarks at JSC will occur. However, the commenter suggested that JSC carefully consider future projects which could adversely affect facilities or structures that may be eligible for listing. Specifically mentioned within the comment was the Atmospheric Re-entry Materials and Structural Evaluation Facility (ARMSEF), which is located in Building 222.

APPENDIX D

Comments Received during Public Review of the Draft Environmental Assessment (Public Notice issued in November 2008) and Draft Supplemental Environmental Assessment (Public Notice issued in April 2009) and their respective Dispositions

Response:

NASA-JSC acknowledges this concern. We intend to work closely with the SHPO over the next few years in evaluating the listing of any eligible facilities and structures; until final determinations are made on the listing of any eligible facilities, future documents developed under the authority of the National Environmental Policy Act will address nearby eligible facilities or structures that could be adversely affected. In the case of the proposed PATSF, since there will be no modifications to any other structures associated with its development, no effects on any eligible landmarks, facilities, or structures are anticipated.

Commenter: Texas Archeological Stewardship Network

The commenter agreed that there are no known historical, archeological, or paleontological sites which have been observed at the site of the proposed PATSF. However, the commenter cautioned that significant findings could be uncovered during the development of the PATSF. Should an unusual circumstance occur or unusual conditions be observed, the commenter requested prompt notification and committed to promptly responding to avoid any delays in the development of the PATSF.

Response:

NASA-JSC acknowledges this concern. Civil service and contractor project managers within the Center Operations Directorate routinely provide strict oversight of all construction and development activities, and will stop work if unusual conditions are encountered which could have historical, archeological, or paleontological ramifications.

The development of the PATSF will involve very little subsurface excavation, and instead will be primarily associated with the placement and contouring of imported rocks and soil on top of the existing ground surface in order to simulate extraterrestrial landscapes. Consequently, we believe that the potential to disturb or encounter such a finding of significance is extremely remote.

APPENDIX D

Comments Received during Public Review of the Draft Environmental Assessment (Public Notice issued in November 2008) and Draft Supplemental Environmental Assessment (Public Notice issued in April 2009) and their respective Dispositions

Commenter: Harris County Flood Control District

The commenter requested clarification and justification for NASA-JSC's assertion on page 4-6, section 4.4.1.1 that "the PATSF will require little alteration of the existing grade so a minimal impact to the surface drainage patterns is expected." The primary concern was associated with alterations to the existing grade of the nearby ditch (Ditch 13).

Response:

NASA-JSC acknowledges this concern. No changes are proposed to the grade of the existing Ditch 13. The proposed 15-foot bridge that would span the ditch will be constructed in a manner to preclude any changes to flow patterns within the ditch.

NASA-JSC intends to preclude overland sheet storm water flow from entering the ditch from the impervious surface being developed by enforcing the maintenance of a minimum of a 20-foot vegetative buffer between any disturbed areas associated with the development of the PATSF and the top of the slope of Ditch 13. To ensure this requirement is achieved, a mitigative measure has been inserted into the Final SEA to construct a temporary construction fence at the perimeter of the 20-foot vegetative buffer zone so that delivery trucks will not encroach upon the buffer, and soil and rock stockpiles do not encroach upon this vegetative buffer. Additional best management practices may be required for sedimentation and erosion control if the vegetative buffer is found to be inadequate to control siltation within the ditch.

APPENDIX D

Comments Received during Public Review of the Draft Environmental Assessment
(Public Notice issued in November 2008) and Draft Supplemental Environmental
Assessment (Public Notice issued in April 2009) and their respective Dispositions

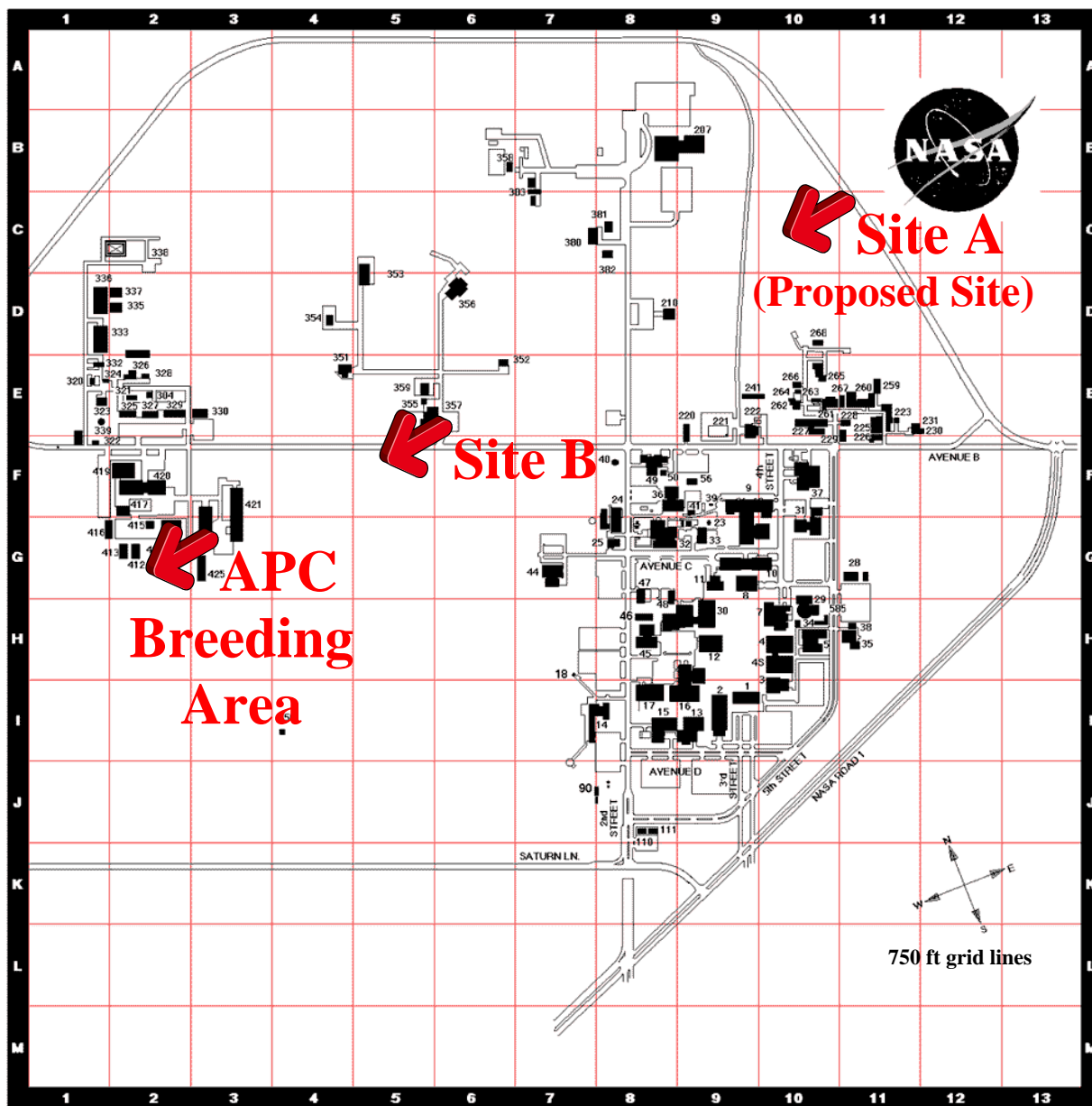


Figure D-1 - JSC Scaled Site Map
Showing respective locations of the proposed site and alternative to the location
of the Atwater Prairie Chicken (APC) Captive Breeding Area

APPENDIX D

Comments Received during Public Review of the Draft Environmental Assessment (Public Notice issued in November 2008) and Draft Supplemental Environmental Assessment (Public Notice issued in April 2009) and their respective Dispositions

Comments Received on the Draft Supplemental EA

Summary

During the public review and comment period, which began on Thursday, April 23, 2009 and ended on Tuesday, May 26, 2009, JSC received one comment from interested parties. The comment has been analyzed and the response is included within Appendix D to the Final Supplemental Environmental Assessment. Based upon the comment received, NASA intends to proceed with a Finding of No Significant Impact (FONSI) associated with further development of the Planetary Analog Test Site Facility. The additional mitigative measures that were incorporated in response to previous comments have been retained and will be enforced during the development and operation of the PATSF.

Commenter: Federal Emergency Management Agency (FEMA)

On May 13, 2009, Ms. Mayra Diaz with FEMA submitted the following comment: "We would request that the Local Floodplain Administrator be Contacted for the Review and Possible Permit Requirements for this Project."

Response:

On May 28 and 29, 2009 NASA contacted the City of Houston Public Works and Engineering Department (Local Floodplain Administrator, Ms. Jamila Johnson, PE) and the Harris County Flood Control District (Local Floodplain Administrator, Mr. Ray Anderson, PE), respectively, to request comments or concerns regarding the proposed action. Neither agency identified any additional concerns or permitting issues.