NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NOTICE 95-JSC-SCTC NBL

National Environmental Policy Act; Finding of No Significant Impact; Neutral Buoyancy Laboratory (NBL) construction within the Assembly and Testing Building (ATB)

AGENCY: NASA

ACTION: Finding of No Significant Impact

SUMMARY: Pursuant to the National Environmental Policy Act of 1969, as amended (NEPA) 42 U.S.C. 4321 et seq.), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions on NEPA (40CFR Parts 1500 -1508), and NASA's Procedures for Implementing NEPA (14CFR Subpart 1216.3), NASA has made a Finding of No Significant Impact (FONSI) with respect to the construction of a Neutral Buoyancy Laboratory (NBL) within the Assembly and Testing Building (ATB). The proposed action consists of construction of the NBL at the Sonny Carter Training Facility (SCTF) in Houston, Texas. The NBL is comprised of a large pool containing approximately 6 million gallons of water and associated equipment as well as additional space required to accommodate the test personnel and equipment. This facility will provide the required capacity for simulation of Space Transportation System (STS) and space station associated extravehicular activity (EVA) tasks. It is proposed to construct the NBL within the existing ATB located at 13000 Space Center Boulevard. This site is currently under lease/purchase arrangement between the NASA and its current owner, the McDonnell Douglas Corporation.

DATE: Comments in response to this notice must be received in writing by July __, 1995.

ADDRESS: Comments should be addressed to David Hickens, Environmental Services Office, NASA Lyndon B. Johnson Space Center, MS JJ12, 2101 NASA Road 1, Houston, Texas 77058.

The Environmental Assessment (EA) prepared for the construction of the NBL within the ATB at Houston, Texas, which supports this FONSI may be reviewed at:

> Harris County Public Library, Freeman Memorial Branch, Reference Department, 16602 Diana Lane, Houston, Tx 77062
>
> NASA Information Center, Johnson Space Center, Houston, Tx

A limited number of copies of the EA are available by contacting David Hickens, Environmental Services Office, in writing at the address indicated.

FOR FURTHER INFORMATION CONTACT: David Hickens, Environmental Services Office, NASA Johnson Space Center, MS JJ12, 2101 NASA Road 1, Houston, Tx 77058, Telephone (713) 483-3120.

SUPPLEMENTAL INFORMATION:

NASA has reviewed the EA prepared for this project and has determined that it represents an accurate and adequate analysis of the scope and level of associated environmental impacts. The EA is incorporated by reference in this FONSI.

project are found to be minimal and without significant individual or cumulative effect upon the quality of the environment. Therefore, an Environmental Impact Statement (EIS) is NOT required.

David B. Hickens, Chief
Environmental Services Office
NASA Johnson Space Center

6/21/95
Date

Concurrence:

William C. Roeh, Chief
Plant Engineering Division
NASA Johnson Space Center

6/21/95
Date

James A. Hickmon, Director
Center Operations
NASA Johnson Space Center

6/21/95
Date

APPENDIX "A" - SCOPE

The Scope of this project is to provide a complete design and construction package that will provide the following facilities which are to be located on approximately 2 ½ acres next to Johnson Space Center's Sonny Carter Training Facility (SCTF):

1. The Neutral Buoyancy Laboratory (NBL) Mock-Up Storage Building
2. The Neutral Buoyancy Laboratory (NBL) Mock-Up Laydown Area
3. The Super Guppy Shipping Fixture (SGSF) Storage Building.

The contractor shall design and construct these facilities in accordance with all City of Houston Codes and the government specifications issued with this Invitation for Bid. The contractor may offer alternate means and methods to the Government specifications with the approval of the Contracting Officer. The land on which this project is being constructed is being leased by the Government. The contractor will be responsible for obtaining any and all necessary City of Houston building permits and inspections.

The following are requirements that the contractor must provide as part of this project:

NBL Mock-Up Storage Building

The NBL Mock-Up Storage Building shall be a 100 foot x 200 foot metal building with a minimum overhead clearance inside and through the entry doors of 22 Feet. The building may contain one row of interior columns. Columns should be spaced on 25 foot centers. The building siding shall extend from 10 feet above the fixed floor to the roof. The building is meant to be open sided on all sides from 0 to 10 feet elevation. The building shall have a monovent approximately the full length of the building per manufactures standard. On one side of the building (facing the roadway between SCTF and Ellington Field, see sketch SK-920-1), there shall be four full bay openings with a minimum overhead clearance of 20 Feet and a minimum width of 20 feet. (the wider the better, full column to column width is preferred). The location of these openings shall be as shown on sketch SK-920-2. The building shall be designed for wind loading base on ANSI/ASCE 7-88, Basic Wind Speed 95mph, Importance Factor I 1.03, and Exposure C. . Gutters and down spouts shall be provided. The building slab shall contain embedded tie downs located on 15 foot centers both directions. Tie downs are shown on sketch SK-920-3 and shall be NEENAH Foundry Company Catalog No. R-3490 or equal (12 inch reinforcing rods shall be installed in the holes). . If a center column is used the grid will be 45 feet by 195 on each side of the center column. The contractor is asked to provide an additive alternate cost of providing a building without a center column. In that case the grid would be 90 x 195 (fewer tie downs are needed for this case).

SGSF Storage Building

The SGSF Storage Building shall be a 40 foot x 120 foot metal building. The building must have a minimum internal clearance width of 32 feet at the floor and vertically to the bridge crane. The height of the building shall be determined by the

design of the gantry cranes located in this building. The building shall contain two – six ton critical lift gantry cranes which run on the same set of rails. The distance from the fixed floor to the bottom of the crane hooks shall no less than 30 feet. The two gantry cranes shall be designed and fabricated to meet the requirements for **critical** lifts in accordance with NASA Standard NSS/GO 1740.9B. Applicable sections of this Standard are included in this specification. Canes shall be designed and fabricated for Class B service. Bridge speed shall be 100 fpm. Trolley speed shall be 50 fpm. Hoist speed shall be 10 fpm.

The SGSF Storage Building shall have a 25 foot x 25 foot insulated electric operated coiling roll-up door on one end of the building. Two personnel exit doors are required, one on each end of the building (or sides at either end).

The building shall be fully air conditioned and heated. The air conditioning requirement is to maintain an inside air temperature of 78 degrees F with an outside air temperature of 100 degrees F. The heating shall be by natural gas and shall be capable of maintaining a 65 degree temperature with an outside air temperature of 25 degrees F. The furnace section must be indirect heating and located exterior to the building. Building insulation shall be a minimum of 6 inch fiberglass with heavy duty vapor barrier.

The building shall be designed for wind loading base on ANSI/ASCE 7-88, Basic Wind Speed 95mph, Importance Factor I 1.03, and Exposure C. Gutters and downspouts shall be provided.

NBL Mock-Up Laydown Area

The NBL Mock-Up Laydown area shall be 25,000 sq. ft. and is shown on SK-920-1. The contractor shall lay out this area for the most cost effective installation in relationship to the building locations. The contractor shall place ring type tie downs on 15 ft. enters both ways throughout the laydown area. The ring opening shall be 5 in. in diameter and shall have a pull out resistance of approximately 4,000 psi. or as commercially available with the contracting officers approval. The laydown area shall be a minimum 5 in concrete (3000 lb.) placed over either 6 inches of lime stabilized soil or 4 inches of compacted sand. (contractor option). The reinforcing shall be No. 4 bars placed on 16 inch center both ways. The slab shall have 12" x 24" perimeter beams with 6 No. 5 bars tied with stirrups at 3'0" centers. Expansion Joints should be on 30ft centers both ways.

Driveways, NBL Mock-Up Storage Building Slab, and SGSF Storage Building Slab shall be a minimum of 6 inches of concrete (3000 lb.) placed over either 6 inches of lime stabilized soil or 4 inches of compacted sand. (contractor option). The reinforcing shall be No. 4 bars placed on 16 inch center both ways. The slabs and driveways shall have 12" x 24" perimeter beams with 6 No. 5 bars tied with stirrups at 3'0" centers. The driveway

for the SGSF Storage Building shall be 60 Ft. wide, centered on the building and shall be 7" thick concrete verses the 6" for other driveways. Driveways shall be installed such that the slope to the existing SCTF laydown and the roadway to Ellington Field is no more than 1:10. The appropriate length of gutter at the SCTF laydown area will have to be demolished to place the new driveways. The SGSF Storage Building shall be placed at a minimum distance from the existing SCTF laydown area and still maintain proper drainage and slopes. The NBL Mock-Up Storage Building shall be set back 30 feet from the edge of the existing road way and shall have a drive way along the full length of the building (200 ft.).

Storm Drainage

The contractor shall design and install storm drainage in compliance with City of Houston and Harris County regulations. The contractor shall tie in all storm drains to the existing SCTF storm drainage system (shown on drawing C-920-1). The contractor shall evaluate the capacity of the SCTF system to assure adequate capacity. It is anticipated that a retention pond may be required to meter flow into this system. The location of the metering pond if needed is shown on sketch SK-920-1. It is the contractor's responsibility to determine if a retention pond is needed and to size it accordingly.

Electric Power

The contractor shall bring to the site sufficient power to provide for the facility requirements and the cable, transformers and main distribution panel shall be sized for at a 200% capacity of the installed loads. Power shall be brought in from the Houston Lighting and Power easement shown on drawing C-920-1and must be coordinated with HL&P. Power shall be run underground from this easement to the buildings. This includes being placed underground below the existing roadway between Ellington Field and SCTF. Underground conduits at a minimum shall be rigid polyvinyl chloride and shall conform to Type II. The underground conduits shall be encased in concrete. Power shall be distributed though a main distribution panel with individual panels in each building for service to that building. Lighting Panels shall be separate from other loads and designated for lighting only. There shall be at least 30% spare breakers in each panel of the size and type installed in that panel. There shall be at least 50% spare capacity in the NBL Storage Building lighting panel and in the main distribution panel. The gantry crane power shall have a separate fused disconnect switch fed from the main distribution panel. The contractor shall provide an electrical one line drawing for complete system as part of his drawing package.

Panel Boards shall be labeled with permanent labels. After the design is complete the government will provide the contractor with the nomenclature to be placed on the panel labels.

Lighting

Lighting in the buildings shall be industrial grade metal haylide or high pressure sodium fixtures with protective wire guards. The lighting levels for the NBL Mock-Up Storage Building shall be 30 foot-candles and for the SGSF Storage Building shall be 75 foot-candles at 4 feet above the finished floor respectively.

Perimeter exterior H.I.D. lighting shall consist of six 1000 watt high pressure sodium vapor fixtures conforming to ANSI C78.1352.. These lights shall be operated from photocell located at each light. All (6) of the lights will be mounted on the buildings, one on the SGSF Storage Building above the roll up door and five on the NBL Mock-Up Storage Building, two on the drive way side and three on the end over looking the mock-up storage area. The lighting fixtures shall be mounted on bases to allow both vertical and horizontal directional adjustment.

The SGSF Storage Building shall have two battery operated two lamp emergency lights, normally being charged by 110v, one located at each end of the building in opposite corners. Exit lights shall be provide above each of the personnel doors in SGSF Storage Building.

Receptacles

The NBL Mock-Up Storage Building shall have ten equally space 120v, 20 amp. weather proof duplex receptacles around the perimeter of the building located at the columns. (4 per side and one centered on each end). The SGSF Storage Building shall have four quad 120v. 20 amp receptacles located on one side of the building, equally spaced, one 100amp 480v three phase receptacle located in the middle of one side of the building, and two 80 amp 208v three phase receptacles (special receptacles to be provided by the government), one located in the center of the building and the other located in the front of the building (roll up door end).

Building Grounds

Steel framework of the building shall be grounded with a driven ground rod at the base of every corner column and intermediate exterior columns at distances not greater than 60 feet apart. Grounding conductor shall electrically connected to each ground rod and to each steel column and shall extend around the perimeter of the building. Grounding-conductor loop around the perimeter of the building shall be not less than No. 4/0 AWG. Tap connections from the ground loop to the building steel shall be not less than No. 4/0.

Building ground shall be buried not less than 18 inches below ground 2 feet from the building foundation. Interconnecting grounding conductor between ground grid and building grounds shall be not less than No. 4/0 AWG.

Fencing

A new perimeter fence and gate for the roadway to Ellington Field shall be installed along the property line ad indicated on sketch SK-920-1. The fence shall match the existing . The existing fence and gate inside the old property line shall be demolished and may be reused by the contractor. The Contractor shall either install the new fence or shall install a temporary construction fence prior to removal of the existing fence. The fence shall be grounded with 10 foot ¾ inch dia. ground rods attached to the fence posts at no greater than 100 foot intervals.

Hydomulch and site restoration

All turfed areas either newly constructed or disturbed during construction shall receive a minimum of 4 inches of topsoil. At completion of construction, the site shall be graded level to meet the storm drainage requirements and hydomulched with a bermuda/rye mixture.

Site Layout

When the contractor has developed a preliminary site layout, it must be presented to NASA for approval.

Geotechnical Data

The contractor is responsible for the development of any geotechnical data required to determine the proper design for his foundations.

Potable Water

A 1 ½ inch potable water line shall be run underground from the potable water line feeding the NBL boiler room (NBL make up water, location shown on drawing M-920-N-55) to both buildings. The SGSF Storage Building shall have installed two hose bibs internal to the building and two hose bibs on either end of the building. The SGSF Storage Building shall have installed one deep (min. 18in.) janitors sink and one drinking fountain (electric cooler). The NBL Mock-up Storage Building shall have installed two hose bibs equally space on the 200 ft. wall and one drinking fountain (electric cooler).

Natural Gas Service

Natural gas service shall be obtained down stream of the metering station located at the NBL boiler room (see Drawing M-920-N-54 for location). Line size shall be a minimum of 1 ½ inches.

Sanitary Sewer

The SCSF Storage Building shall be equipped with two drains located in the middle and equally space in the slab of the building connected to a gravity sanitary sewer line. Slab shall be sloped to drain to these two locations. The water cooler and the janitors sink shall also be connected to the gravity sanitary sewer line. The gravity lines shall drain to a sump located on the exterior of the building. The sump shall be equipped with a sump pump which shall provide a forced sanitary sewer flow to the SCTF gravity sewer (shown on drawing C-920-1). The size of the this sump/effluent pump shall be 50 gallons per minute and the forced line shall be a sized to meet the flow and head requirements, but shall be a minimum of 1 ½ inches in dia. The capacity of the sump shall be minimum of 100 gallons.

Installation of Conduits from SCTF

The contractor shall install 5 one inch conduits underground from the exterior corner on the SCTF (SE)(shown on drawing C-920-1) to the interior of the SCSF Storage Building (stubbed out 12" above the finished floor and 5 one inch conduits underground from the exterior corner on the SCTF (SE) to the interior of the NBL Mock-Up Storage Building (stubbed out 12" above the finished floor. Stub outs shall be located near an exterior wall. The contractor shall install appropriate pull boxes and pull strings in all conduits.

Marking of Underground Utilities

Underground utilities shall be marked with warning tapes per JSC Facility Design Standard STD-C-02225-001.

CAD drawings

CAD drawing of the completed facility shall be submitted per Section 01330, Paragraph 1.7.

Submittals

Submittals shall be for information only, except for the gantry cranes which must be submitted for approval. Submittals for the gantry crane shall be SD-01, SD-04, SD-09, SD-13 and SD-19 as described in Section 01330.

ENVIRONMENTAL ASSESSMENT

FOR

NEUTRAL BUOYANCY LABORATORY

AT

SONNY CARTER TRAINING FACILITY
Houston, Texas

FOR

NASA

NATIONAL AERONAUTICS SPACE ADMINISTRATION

FINAL

June 30, 1995

GROUND TECHNOLOGY, INC.
Geotechnical • Materials • Environmental
Engineering Consultants

June 30, 1995

Transportation Officer, Building 420
NASA Johnson Space Center
Houston, Texas 77058

Attention: Mr. David Hickens

Subject: Environmental Impact Assessment
Neutral Buoyancy Laboratory
Clear Lake, Texas
Purchase Order T-6585-T
GTI Job No. 94026

Dear Mr. Hickens:

Ground Technology, Inc. is pleased to submit this report of Environmental Impact Assessment for the construction of the NBL at the Sonny Carter Training Facility located in Clear Lake, Texas. The work was authorized by C. Gemar on March 21, 1995.

We have enjoyed working with you on this project and look forward to a continuing business relationship. If you have any questions or comments concerning this report, please contact us.

Sincerely,
GROUND TECHNOLOGY, INC.

Reddy M. Donthi, CES, EIT
Project Manager

Dr. Ruma Acharya, MBA
President

Copies Submitted: 10

NSPE
ASCE
ASTM

5904 Jessamine, Suite A-5 • Houston, Texas 77081
Tel: (713) 664-0226 Fax: (713) 664-0898

CCRL

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

The proposed action consists of construction of the Neutral Buoyancy laboratory (NBL) at the Sonny Carter Training Facility (SCTF) in Houston, Texas. The NBL is comprised of a large pool containing approximately 6 million gallons of water and associated equipment as well as additional space required to accommodate the test personnel and equipment. This facility will provide the required capacity for simulation of Space Transportation System (STS) and space station associated extravehicular activity (EVA) tasks. It is proposed to construct the NBL within the existing Assembly and Testing Building (ATB) located at 13000 Space Center Blvd. This site is currently under lease/purchase arrangement between the National Aeronautics and Space Administration (NASA) and its current owner, the McDonnell Douglas Corporation.

Two alternatives to the proposed action have been considered . One proposed action is construction of a completely new facility, including the building(s), at the Johnson Space Center (JSC) which would require more construction activities and longer completion period associated with higher cost. The other, is a no action alternative which would force NASA to continue training activities at scattered facilities which are too small to accommodate larger structural assemblies of the STS and the space station.

The potential cultural, socio-economic, biological, and ecological impacts anticipated from the construction and operation of the proposed NBL have been assessed and evaluated. Evaluation of each one of these issues did not reveal any significant impacts due to the proposed action hence a finding of no significant impact (FONSI) is determined. Cultural impacts were evaluated from the standpoint of land use, wild and scenic rivers, historical sites and cultural resources. In the case of land use a FONSI has been made as the only anticipated change will be enhanced utilization of an existing building at the site. Also, no significant increase of the number of employees to operate the facility is anticipated. No evidence of historical sites, paleontological resources, artifacts, fossils, prehistoric settlement, wild and scenic rivers were observed at or in the vicinity of the site.

Socio-economic impacts from the standpoint of economic, population growth, and constructed facilities and activities again presented no significant impact to the

surrounding areas and human environment. The only significant impact would be on NASA as this action will increase confidence that NBL will be constructed on schedule and important astronaut training can begin sooner. Also, additional savings from the early shutdown of JSC's existing underwater facility can be realized.

Evaluation of the biological and ecological impacts indicated no impact on biotic resources, wetlands or endangered species as the site is already developed and does not contain any critical habitats of plant and animal communities or wetlands. Liquid wastes consisting of backwash from the pool filtration system will be introduced into SCTF's sanitary sewer system. The anticipated waste water flow will not pose any problem from the standpoint of handling and treatment. Any potential contamination associated with the waste water will be mitigated by treating the water at Clear Lake Water Authority's waste water treatment facility. Temporary and permanent dewatering system flow will be discharged into the storm water drainage system running along the east boundary of the subject site. No impact is anticipated from this action as no detectable levels of contaminants were found in the groundwater.

The proposed action was found to not have any adverse effects on the air emissions dispersion pattern near the proposed facility. The boiler for the proposed action will use natural gas as fuel and has a heat input rate of less than 25 million BTU's per hour. This boiler is therefore exempted from permitting requirements by the TNRCC since such equipment will not make a significant contribution to atmospheric pollution. Also, the normal operations of the NBL was found to generate relatively low noise levels as compared to average noise levels at the subject site generated by Ellington Field flight operations. Existing Ellington Field operations will have the dominant impact on noise levels in the site vicinity, consequently, the proposed facility will not increase noise levels considerably at the subject and the surrounding areas.

During the construction period of approximately one year and six months, increased vehicle traffic will be experienced along the Clear Lake City Boulevard. An increase in noise caused by the construction traffic will be the primary negative impact on the community. However, the anticipated impact on the nearby residential areas should be short-term and minimal. These short-term construction effects are offset by the relative

long-term gains of providing a much needed facility for JSC program s to accommodate larger structural assemblies required for the development of a manned space station.

2.0 PURPOSE AND NEED

2.1 Project Setting and Statement of Proposed Action

The proposed project consists of construction of Neutral Buoyancy Laboratory (NBL) at the Sonny Carter Training Facility (SCTF) in Houston, Texas. This facility is to provide the required capacity for simulation of Space Transportation System (STS) and space station associated extravehicular activity (EVA) tasks. The NBL is comprised of a large pool containing approximately 6 million gallons of water and associated equipment as well as additional space required to accommodate the test personnel and equipment. The NBL will be constructed in the existing high-bay ATB at the STCF. This property is currently under lease/purchase arrangement between the NASA and the McDonnell Douglas Corporation.

2.2 Purpose and Need

EVA training under simulated zero-gravity conditions has been successfully developed and performed utilizing neutral buoyancy techniques in large water tank facilities. Such techniques allow space-suited astronauts to practice space-related EVA tasks on the ground. The successful completion of past space mission EVA tasks is directly attributable to zero-g simulations by the water tank operations and the use of full-scale mockups of space hardware.

Current demands of the STS in-orbit EVA operations and future needs of the space station program cannot be met by existing water tank facilities which have been sized for the past program spacecraft size. These facilities are too small to accommodate the larger structural assemblies of the current STS, space station, and future space program requirements.

The initial space station assembly operations rely heavily on the EVA's being successful. Because these operations are critical to the success of the space station mission, the EVA training facility needs to be operational well in advance of the first launch for astronaut crew procedures development and training.

Once the NBL is available, the current JSC neutral buoyancy simulation facility, the WETF, will be closed. Due to its close proximity to existing buildings and disruption of ongoing training programs, expansion of the WETF is not practical.

3.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

3.1 Proposed Action Description

NASA proposes to construct the NBL at the SCTF currently under lease/purchase agreement with McDonnell Douglas Corporation. The NBL is to be built within the existing ATB located at 13000 Space Center Blvd. by McDonnell Douglas.

The NBL will consist of a rectangular pool 101-feet wide by 202-feet long and 40-feet deep containing approximately 6 million gallons of water, and associated piping and equipment as well as additional space required to accommodate test personnel and equipment. The bottom of the pool slab will be located approximately 26 feet below the building floor level.

It is proposed to construct the pool with a six feet thick concrete foundation mat and walls which are 5 feet thick at their base and 2-1/2 feet thick above grade. The foundation mat will be placed on a waterproofing system, over a mud slab, with a topping slab to improve quality control of the finished slab. It is designed to resist forces developed under both full and empty conditions of the pool. Upper pool walls are thickened at the corners to account for local stresses. Walls below grade are placed against a drainage/waterproofing system. Walls are designed to cantilever approximately 40 feet from the mat foundation to resist hydrostatic pressure exerted by the water and for approximately 20 feet from the mat foundation to resist external soil pressures developed during construction or emptying of the pool. Pool walls will partially support the Deck Level and Mezzanine Two Level deck slabs.

Excavation of the pool foundation will rusullt in removal of approximately 23,000 cu. yd. of soil to be disposed off site. In addition, about 24,000 sq. ft. of concrete building slab will have to be broken up and removed. Since the excavation slopes must be vertical, braced excavation is required. A bracing system consisting of H-piles and wood lagging with hollow stem augured tie-backs has been proposed.

A ground water control system is necessary to effect safe pool excavation and construction. A temporary dewatering system consisting of 54 shallow and 6 deep wells producing an average of approximately 120 gpm of water for a period of about one year

has been proposed. In addition, a permanent dewatering system producing an average of 10 gpm over the life of the facility will be installed. When the pool is analyzed under empty conditions the combined effects of lateral water pressure from the grade level to the foundation base and the uplift pressure from deep sand are very severe. Without provisions for a permanent perimeter and under floor drainage system, damage to the pool's structure may result.

To provide an optimal training environment a high level of pool water clarity will have to be continuously maintained. Water treatment will consist of filtration, chlorination with sodium hypochlorite, algae control with algaecide, and pH maintenance with muriatic acid. Pool water will be recirculated once every 12 hours. A vacuum system and surface skimmer will be provided to remove sediment and dirt accumulations. Constant water temperature will be maintained at about 83°F with a natural gas fired boiler.

3.2 No Action Alternative

The no action alternative would force NASA to continue training activities at the JSC WETF as well as at other scattered NASA and private contractor facilities. These facilities are too small to accommodate the larger structural assemblies of the STS and space station, and severely hamper the ability to fully test this hardware. Only partial and incomplete testing could be accomplished at these facilities.

As a result, the critical dependence of initial space station assembly and operational success on orbital EVA operations could be compromised. In addition, current STS program requirements cannot be met due to pool size limitations. Coordination of training and mockup development would also be very difficult since mockups would be dispersed to the different training locations rather than being readily available at a single location. An additional consideration is the enhanced ability to coordinate training activities by having a single facility located where the astronauts are based.

3.3 Summary of Other Proposed Alternatives

Certain issues related to NBL design and siting potentially have some environmental consequences. These issues can be resolved by evaluating and rating the various relative merits of each alternative on the basis of environmental considerations.

3.3.1 Site Location

The alternative of constructing the NBL facility on JSC property has been studied and thoroughly evaluated previously. The environmental consequences of the JSC siting would marginally exceed those for SCTF due to some wetlands impact and the somewhat greater amount of excavation and construction activities required. Since the facility would have to be constructed from the ground up, its cost will be higher and completion schedule lengthened with potential impact on space mission schedules.

Upgrading of the existing WETF at JSC is not practical or economically feasible, due to inadequate expansion space. Furthermore, it would require shutdown of current training operations with resulting adverse impact on current and planned STS missions.

Geotechnical conditions at the JSC site are quite similar to the SCTF site from the standpoint of soil stratigraphy and groundwater conditions.

3.3.2 Pool Structure Design Alternatives

Pool struction design is the main consideration for the NBL facility. Since the construction will be occurring within an existing building, the objective is to evaluate pool configurations that would minimize the potential impact on the existing building foundations. Due to space constraints and the existing building foundation configuration, the pool design as described in Sect. 3.1 is the only viable alternative.

3.3.3 Pool Foundation Depth Alternatives

A 40 feet deep pool is required to accommodate current and future NASA training and development needs. The alternatives range from constructing the pool above ground to placing it completely below grade.

3.3.3.1 Foundation at Grade. Placement of the pool fully above ground would require more complex design and construction with higher attendant costs than the below ground option. This would still hold true even though a minimal amount of excavation and no dewatering system would be required. Furthermore, the height of the existing building may

not be sufficient to provide required clearances for NBL operations. Also, access to the pool would be more complicated and operations more time consuming. This alternative was eliminated from consideration early in the preliminary design phase.

3.3.3.2 Pool Bottom at 40 Feet Depth. Construction of the pool completely below grade would require a considerable amount of additional soil removal with the attendant problems of soil disposal and excavation bracing. The excavation will penetrate deeper below the static water table and require larger temporary as well as active permanent dewatering systems than pool construction at shallower depths.

3.3.3.3 Pool Bottom at 20 Feet Depth. At this depth the top of the pool would be 20 feet above the existing building slab. This represents a reasonable balance between the problems inherent with deeper excavation and additional stiffening and wall thickness requirement should the pool be constructed at higher elevated.

At this depth there is still some concern about the hydrostatic forces due to the static water table and uplift pressures from the deeper sand aquifer. Consequently, the Geotechnical Consultant has recommended a modest passive permanent drainage system for groundwater control purposes.

3.3.4. Dewatering System Requirements Alternatives

3.3.4.1 Temporary Dewatering. A temporary dewatering system will be necessary for site construction of the NBL pool. The static water table would have to be lowered below the depth of the excavation as well as lowering of the pressure in the sand aquifer affected.

It is estimated that the temporary dewatering system will be in operation for approximately one year, will result in average water discharge of approximately 120 gpm.

3.3.4.2 Permanent Dewatering System. An under slab drainage system will reduce external pressures, improve effectiveness of waterproofing, and reduce buoyancy of the pool when empty. This system is designed to dewater at a rate of approximately 10 gpm.

3.3.5. Disposal of Excavated Soil Alternatives

Final disposition of the excavated soil, so as not to produce harm to public health or adverse effects to the environment, will be resolved by adherence to appropriate local, State and Federal rules, ordinances and regulations governing disposal of such materials. Current plans call for the excavated soil to be disposed at the Ellington Field area. Ellington Field, which is controlled by the City of Houston Aviation Department, is a fenced, controlled area with limited access to the general public. The McDonnel Douglas Corporation has obtained permission from the City of Houston to dispose the excavated soil at the Ellington Field. A gate with a roadway leading directly to the Ellington Field is present at the back of the SCTF property, and will be utilized to haul the excavated material. An alternative would be to haul the soil to a waste dump facility which would require additional transportation associated with higher cost.

4.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

4.1 Proposed Action

The potential Cultural, Socio Economic as well as Biological and Ecological impacts anticipated from the operation of the proposed NBL are discussed below.

4.1.1 Cultural Impacts

4.1.1.1 Land Use. The NBL is to be located at the SCTF. The SCTF consists of approximately 251,600 gross square feet; of which, 101,800 gross square feet is occupied by the ATB; 98,200 gross square feet by the Light Manufacturing Facility (LMF); and approximately 51,600 gross square feet by Avionics Development Facility (ADF). The SCTF is developed and operated by a private contractor. The NBL is planned to be constructed in the ATB, which is a high bay steel-framed structure with metal siding. The SCTF is surrounded by Ellington Field to the

north and west, and by residential areas to the south and east.

There should not be any adverse effect on the land use of adjacent properties since the only anticipated change will be the enhanced utilization of the specific building (ATB) in the proposed action. No new developments or changes to land use outside the STCF are anticipated as no significant increase in the number of employees over and above the present employment level will be required for the proposed NBL operations.

4.1.1.2 **Wild and Scenic Rivers.** Wild and Scenic Rivers are those designated or proposed under the Wild and Scenic Rivers Act, including Study Rivers. There are no official scenic or wild waterways on or adjacent to the subject property.

4.1.1.3 **Historical Sites.** No landmark notifications such as plaques, markers or ground plates were observed at or near the site. There are no historic buildings or structures present.

4.1.1.4 **Cultural Resources.** The subject site is fully developed with buildings and paved areas. No evidence of standing historic structures, paleonthological resources, artifacts, fossils or pre-historic settlements were observed on the site. The National Natural Landmark Program (NNLP) under authority of the Historic Sites Act, identifies and encourages the preservation of the full range of geological and ecological features that are determined to represent nationally significant examples of the nation's natural heritage. The subject and adjacent properties are not listed in the National Registry of Natural Landmarks.

4.1.2 **Socio Economic Impacts**

4.1.2.1 **Economic.** Development of the proposed NBL will provide the capacity for simulation of larger structural assemblies of the STS, space station, and future space program missions, which can not be achieved

within the capacity of the present facility. This action will increase confidence that the NBL will be constructed on schedule and that important training can begin sooner. Also, additional savings from early shutdown of JSC's existing underwater facility can be realized.

The economy of the Clear Lake City is supported by the growth of aerospace industry, and petrochemical, tourism, and recreation industries. For the duration of construction of approximately two years, the contractor work force will vary from 20 to 100 people averaging 30 to 40 people on the site at a given time. For the long term no significant increase in the current work force is expected.

4.1.2.2 Population. Vicinity of Ellington Field is among the fastest growing areas in the Southwest Houston area. The proposed NBL construction will not result in any substantial changes to the population within the Ellington Field area, since the operation of NBL will not require a significant increase to the current workforce.

4.1.2.3 Constructed Facilities and Activities. The subject site was undeveloped and has been primarily used for farming/grazing operations until 1990. During the past 5 years the site has been developed by a private contractor with 149,802 sq. ft. LMF and ADF buildings, 101,777 sq. ft. ATB building, and other paved areas. Currently, the SCTF facility is operated by the McDonnell-Douglas Corporation who provides engineering support for the space station program.

Ellington Field is located just to the west of the property. It was established during World War I as a U.S. aviation training facility. Presently, the majority of the field is owned by the City of Houston along with several smaller parcels owned by government agencies which includes NASA. The airport serves the Texas Air National Guard, the Coast Guard, NASA, general aviation, and commercial air lines.

4.1.3 Biological and Ecological Impacts

4.1.3.1 Biotic Resources. The private development at the subject site has removed native plants and replaced these with buildings and paved areas. No natural or unique plant communities are present at the subject site.

4.1.3.2 Endangered Species. According to the U.S. Fish and Wildlife Service and the Texas Parks and Wild Life Department, no threatened or endangered species exists on Ellington Field, and no critical habitat for these species exist there. The threatened and endangered birds that may visit Ellington Field include the following: bald eagle (Haliaeetus leucocephalus), Attwater's Prairie-Chicken (Tympaunuchus Cupido attwari), Houston Machaeranthera (Machaeranthara aurea), Coastal Grayfeather (Liatris bracteata), and artic peregrine falcon (Falco Peragrinus trundries). None of these species were observed during field visits and no evidence of their presence has been discovered at the subject site. The subject site does not contain critical habitat for threatened or endangered species, therefore, the development of the proposed NBL should not affect any of these species.

Because of the previous indications of elevated levels of lead and mercury in the groundwater, Griffin Dewatering Corporation had collected groundwater samples from the two existing monitoring wells located within the area to be dewatered. These laboratory test results indicated that lead and mercury levels are below the detectable limits of the test method and thus, currently, there are no indications of groundwater contamination. Griffin Dewatering Corporation has been contracted by the current owner of the property to install and operate the temporary dewatering system at the NBL construction site. The current property owner is responsible for ensuring that any potential environmental impacts due to construction site dewatering are mitigated by adherence to applicable local, State and Federal rules, ordinances, and regulations.

4.1.3.3 Water Resources

Waste water: The proposed facility will have an effect on SCTF's sanitary sewer system. Liquid wastes consisting of backwash from the filtration system, skimmer flow, and vacuum system flow will be collected into a 34,000 gallon wastewater holding tank. The NBL waste water flow will be approximately 10,000 gallons per day. The wastewater collected in the holding tank will flow by gravity into the SCTF's sanitary sewer system. The Clear Lake Water Authority indicated they would not have problems with the handling and treatment of the anticipated waste water flow, hence any contamination potential will be mitigated by treating the water at the Clear Lake Water Authority's wastewater treatment facilities.

Groundwater: Three piezometers were installed on the site in December, 1989, by Wooodward-Clyde Consultants at the direction of a private site developer. The Woodward-Clyde Consultant's reportissued in January, 1990, indicated that, in some of the ground watersamples lead and mercury were found at concentrations above Primary Drinking Water Standards Maximum Contaminat Levels (MCL's).

4.1.3.4 Wetlands. The subject site is developed and does not contain any jurisdictional wetlands.

4.1.3.5 Air. The site is located in a warm, subtropical climate with characteristically hot summers and mild winters. Warm tropical winds from the Gulf of Mexico control the climate during spring, summer, and fall. Winds in the area are predominantly from the south and southeast. The proposed action will not have any adverse effect on the air emissions dispersion pattern near the proposed facility.

The stationary and mobile sources of air pollutants at the subject site include aircraft operations at Ellington Field and automobile emissions.

Paint spray operations at SCTF facility are controlled under Standard Exemption from the TNRCC to the current owner of the site.

Air quality in Harris County, including the subject site area, often has more ozone than the national standards. As such, Harris County, in which the subject site is located, is in attainment for all the criteria pollutants except ozone.

The boiler for the proposed action will use natural gas as fuel and has a heat input rate of less than the standard exemption limit of 25 million BTU's per hour. This type of boiler is listed in the Standard Exemption list, dated January 16, 1993, and is exempt from the requirements of TCAA 382.0518, since such equipment will not make a significant contribution to the atmospheric pollution.

4.1.3.6 **Noise.** The noise generated by the Ellington Field causes significant noise impact to the nearby community. Aircraft operations at the Ellington Field generate an average noise levels of 70dB(A) at the subject site.

Normal operation of the NBL will generate relatively low noise levels when compared to Ellington Field flight operations, which will have the dominant impact on noise levels in the site vicinity. Consequently, the proposed facility will not increase the noise level at either the subject site or the surrounding areas. Most of the land immediately surrounding the site is undeveloped with no sensitive noise receptors. During the construction, a significant amount of heavy equipments and trucks will be utilized and will provide an increased noise level in the general vicinity of the site, the closest sensitive receptor being a residential subdivision to the east.

4.1.3.7 **Spill Control and Counter Measures.** All current operations at the SCTF are properly permitted by the current owner as required by

the City of Houston and Texas Natural Resources Conservation Commission (TNRCC). The hazardous materials procurement and hazardous waste disposal is tracked to assure balance.

All the hazardous material and hazardous waste required for pool operations conducted by NASA will be stored in DOT certified containers and chemical storage buildings will have adequate secondary containment to prevent a release or spills. The chemicals used for water treatment will be stored in a chemical storage building where the potential for a release or spill will be very minimal.

4.2 No Action Alterative

The potential socio-economic and ecological impacts of the no action alternative are identified and discussed below.

4.2.1 Socio Economic Impacts

The primary impact of the no action alternative would be economic. If the NBL is not built, the additional costs of conducting testing in scattered facilities would have to be borne by NASA, as well as added risks and uncertainty associated with the space-operations that have not been completely tested with full scale hardware mock ups. This may require transferring parts of the space training program and personnel out of JSC which could negatively affect economic development of the Clear Lake area.

4.2.2 Ecological Impacts

The ecological impact of no action alternative is no change to the current ecological status of the property. It is possible that the property might be sold or converted to other uses in the future with greater overall ecological impact than the proposed NBL facility. However, no discharges from the groundwater control systems will occur if the pool will not be constructed.

5.0 CONSTRUCTION IMPACT OF THE PROPOSED ACTION

5.1 Proposed Action Impacts

Potential environmental and socio-economic impacts expected due to the activities associated with NBL facility construction are discussed below. The following items have been identified as having potential for environmental or socio-economic impact.

5.1.1 Cultural Impacts

5.1.1.1 Land Use. Development of additional housing and infrastructure to support construction and operation of the NBL facility will not be required. The only significant increase in the employment is related to temporary construction activities.

5.1.2 Socio Economic Impacts

5.1.2.1 Economic. No significant economic benefit to the Clear Lake area during the construction phase of the project due to increased spending by the construction workers is anticipated. Furthermore, it is expected that the permanent work force to operate the facility will be recruited primarily from a local labor pool, consequently there will not be any appreciable additional economic activity due to the housing construction and employee relocation.

5.1.2.2 Traffic. Increased vehicle traffic is anticipated along Clear Lake City Blvd. and Space Center Blvd. during the project construction phase. The traffic will be composed of construction workers vehicles as well as trucks bringing in construction materials and equipment. The anticipated impact on the nearby residential areas should be short-term and minimal.

5.1.3 Biological and Ecological Impacts

5.1.3.1 Water Resources. Temporary dewatering system will be installed and operated prior to and during the pool construction. The proposed system consists of 54 shallow wells and 6 deep wells and will be in operation for approximately one year. It is anticipated that, on the average, the system flow

will be about 120 gpm. This flow will be discharged to a storm water drainage ditch running north of the property boundary. Although, currently, there are no indications of any groundwater contamination at the site, the current property owner and his dewatering contractor are responsible for ensuring that the potential environmental impacts due to the site dewatering are mitigated by the adherence to applicable rules and regulations. It is anticipated that 10 gpm flow from the permanent groundwater control system will also be discharged to the same storm water drainage ditch.

5.1.3.2 <u>**Air.**</u> Air emission effects during the construction should be minimal and will not violate any national or state standards. Carbon monoxide (CO) will be produced by the construction equipments and vehicles. Some dust might be generated during transportation of the excavated soil and dumping at the disposal site. All movement of the excavated material will occur within fenced and controlled access areas. Any fugitive particulate matter emissions due to this operation will not have any impact outside these areas. The natural gas fired boiler for heating the pool water will not require any air pollution controls and is exempt from the TNRCC requirements.

5.1.3.3 <u>**Noise.**</u> Most of the noise will be generated by the equipments during the construction phase of the project. Noise due to the excavation equipments should be contained within the ATB. Trucks travelling to and from the construction site will be the most significant source of noise that could impact the surrounding areas. It should be noted that, most likely, the noise levels associated with the construction and the operation of the NBL facility will be exceeded by the flight.

5.2 <u>No Action Impacts</u>

The environmental effect of the no action alternative is that none of the above-listed environmental impacts will occur and the site might be utilized for some other commercial or industrial activity. The impact on the area will be primarily economic as the local construction firms and businesses will not realize some added revenues from the NBL construction activities.

6.0 MITIGATIVE/ADMINISTRATIVE MEASURES

6.1 Site DewateringSystem

During the Phase II environmental site assessment, previously performed for the private site owner in 1990, low to moderately elevated levels of lead and mercury were found in the groundwater samples. Subsequently, a recent investigation was conducted by the private contractor by collecting samples from on-site monitoring wells and analyzing for lead and mercury levels. The results revealed lead and mercury levels to be below the detection limit of the test method and indicated that there is no groundwater contamination. However, the current property owner and his dewatering contractor are be responsible for ensuring that any potential environmental impacts due to the discharge of dewatering system flow to the storm water drainage ditch are mitigated by adhering to the applicable rules and regulations.

6.2 Traffic

A significant amount of additional traffic will be generated during the construction phase of the project, which may require some form of traffic control. It is anticipated that this will require the staggering of heavy equipment movements and deliveries of large quantities of construction materials so as to avoid the peak traffic load periods. The contractor(s) are also required to maintain clean and passable streets in the construction site vicinity as mandated by the standard construction practices.

6.3 Air

Because SCTF is located in a nonattainment area for ozone, the State Implementation Plan will have to be revised to include an Employee Trip Reduction (ETR) Plan requirement for employers of 100 people or more. If the construction contractor employs 100 or more people, an ETR Plan will be required.

6.4 Concrete Waste Management

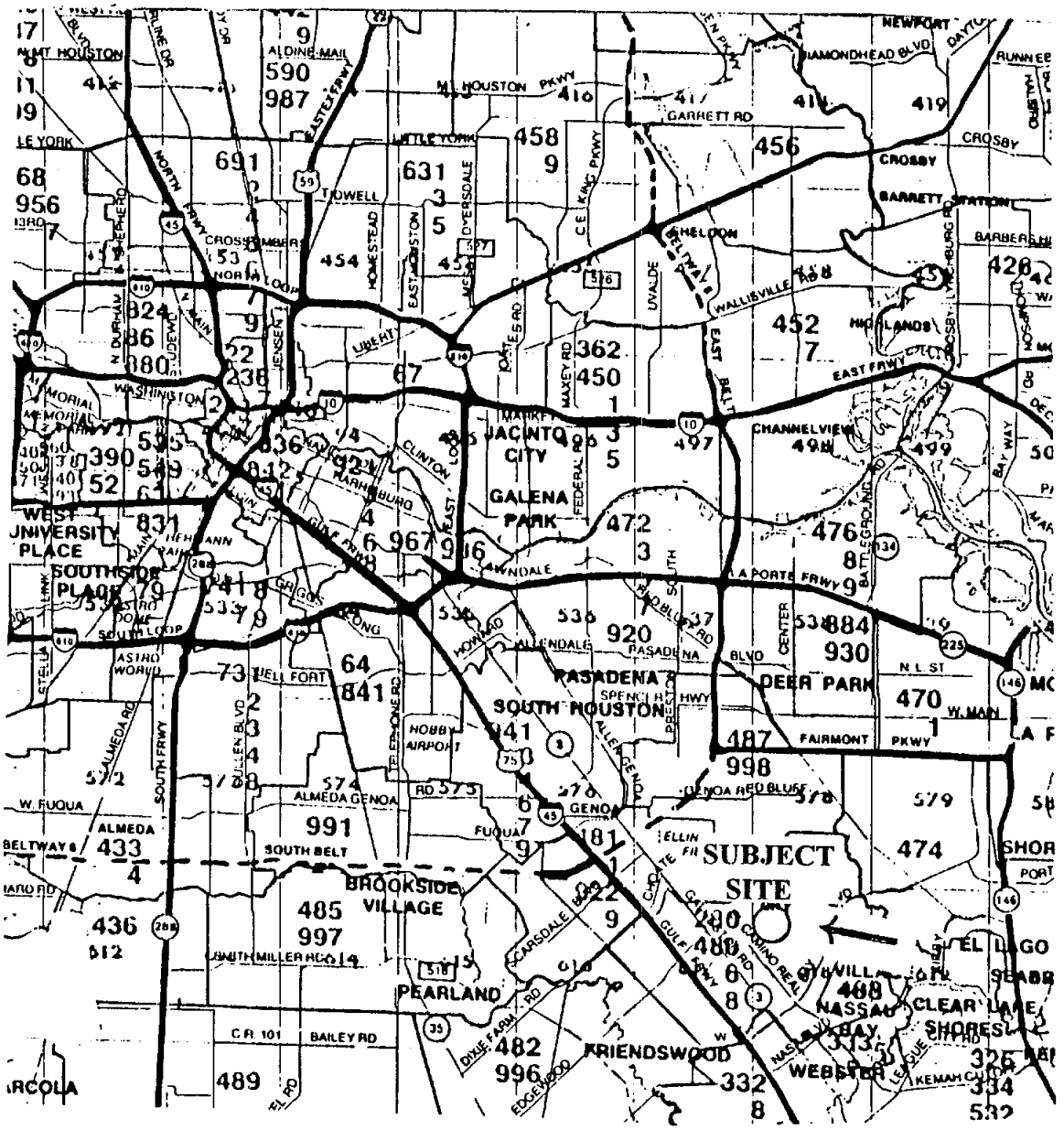
A concrete management plan should be implemented to handle the rinse-water from cleaning of the interior of the concrete trucks. This plan will prevent contaminants from reaching the local storm water drainage system.

7.0 LIST OF INDIVIDUALS AND AGENCIES CONSULTED

Agencies Contacted:

Texas Natural Resources Conservation Commission
United States Fish and Wildlife Service
Texas Parks and Wildlife Department
Clear Lake Water Authority
Harris-Galveston Coastal Subsidence District

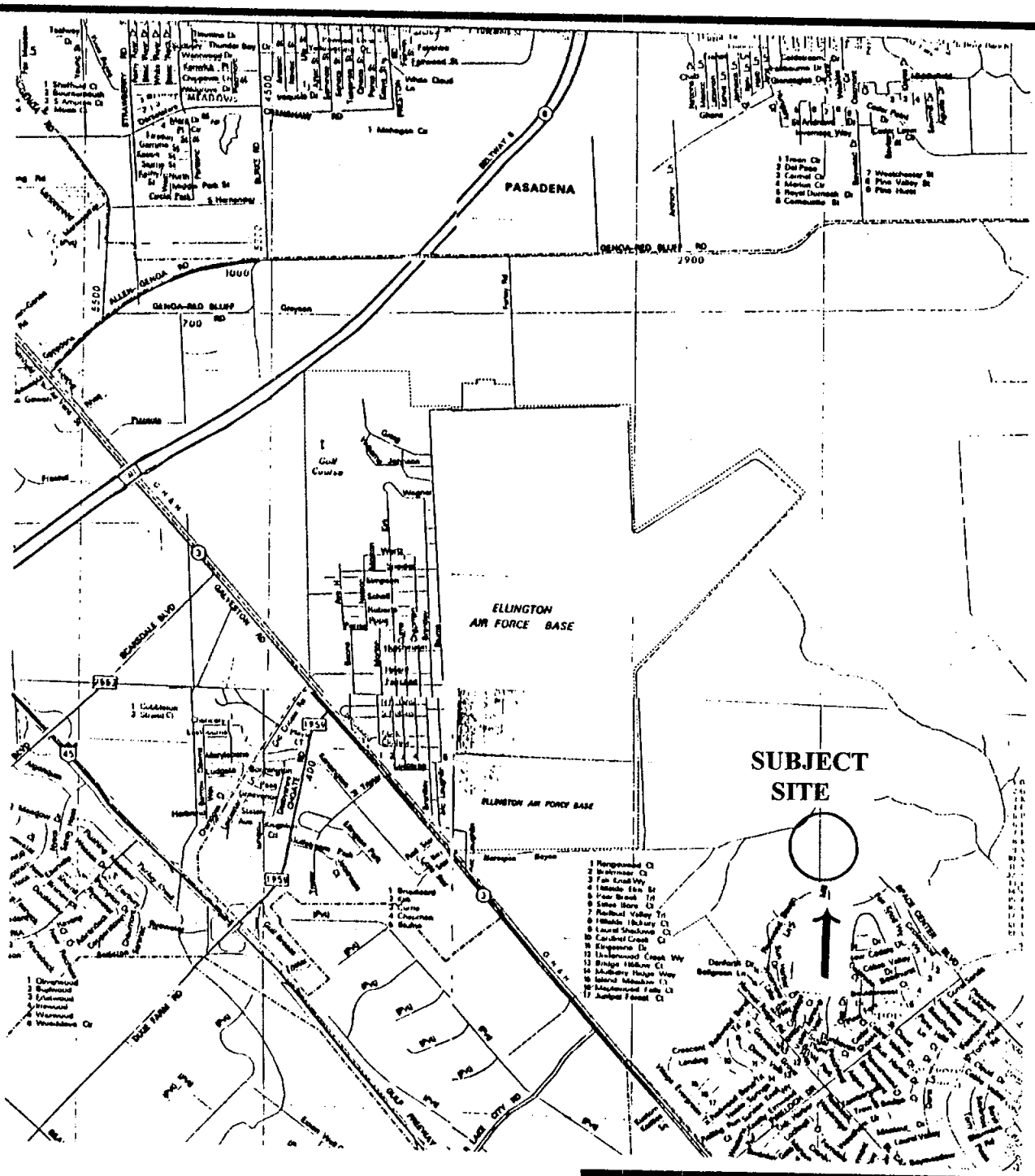
APPENDIX A



GROUND TECHNOLOGY, Inc.
HOUSTON, TEXAS

VICINITY MAP
NEUTRAL BUOYANCY LAB
13000 SPACE CENTER BLVD., HOUSTON, TEXAS

Date: 06/28/95	Drawn: RTM Approved: RTM	Scale: NTS
Project Number: 95026	Drwg. No.: 95026-1	



GROUND TECHNOLOGY, Inc.
HOUSTON, TEXAS

SITE MAP
NEUTRAL BUOYANCY LAB
13000 SPACE CENTER BLVD., HOUSTON, TEXAS

Date: 06/28/95	Drawn: RTM Approved: RTM	Scale: NTS
Project Number: 95026	Drwg. No.: 95026-2	

APPENDIX B

APPENDIX B

REFERENCES

McDonnell Douglas, Preliminary Construction Drawings for Neutral Buoyancy Laboratory at MDSSC, Clear Lake City, March 1995

Kenneth E. Tang & Associates, Inc., Geotechnical Investigation for Plant Expansion, MDSSC, Clear Lake Facility, Texas, December 1, 1989

Woodward-Clyde Consultants, Site Assessment Reports, Phase-II Study, Clear Point Site, Harris County, Texas, January, 1990

Brown & Root, Environmental Resources of Ellington Field for NASA, February, 1993

Brown & Root, Environmental Impact Assessment for the Neutral Buoyancy Laboratory, November, 1994

NASA, NEPA Regulations, 40 CFR 1216.3, et. seq.

NASA, NEPA Guidance

Council on Environmental Quality Regulation, 40 CPR 1500-1508

DoD, Environmental Impact Analysis Process (EIAP), Federal Register Vol. 60, No. 15, January 24, 1995