NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NASA CONTRACT NO. NASW-4598
NASA TASK ASSIGNMENT NO. 93

ENVIRONMENTAL ASSESSMENT (Revised)
NATIONAL TRANSONIC FACILITY (NTF)
PRODUCTIVITY ENHANCEMENT PROJECT
LANGLEY RESEARCH CENTER
HAMPTON, VIRGINIA

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OCTOBER 1996

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ACRONYMS AND ABBREVIATIONS

16-Ft. TT	16-foot Transonic Tunnel
ACHP	Advisory Council on Historic Preservation
ACOE	U.S. Army Corps of Engineers
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRMP	Coastal Resources Management Program
dBA	Decibels, A-Weighted Scale
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ft	feet, foot
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GN_2	Gaseous Nitrogen
HCRMP	Historic Cultural Resources Management Plan
hp	horsepower
HRPDC	Hampton Roads Planning District Commission
HRSD	Hampton Roads Sanitation District
ICUZ	Installation Compatibility Use Zone
kV	kilovolt
LAFB	Langley Air Force Base
LaRC	Langley Research Center
LHB	Langley Handbook
LN_2	Liquid Nitrogen
m	meter, meters
MSA	Metropolitan Statistical Area
msl	mean sea level
MVA	Mega Voltampere
NASA	National Aeronautics and Space Administration
NCSHPO	National Conference of State Historic Preservation Officers
NEPA	National Environmental Policy Act
NHB	NASA Handbook
NHL	National Historic Landmark
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTF	National Transonic Facility
OSHA	Occupational Safety and Health Administration
PLC	Programmable Logic Controllers
psia	pounds per square inch, absolute
RFSGF	Refuse-Fired Steam Generating Facility
rpm	revolutions per minute
SIP	State Implementation Plan

ACRONYMS AND ABBREVIATIONS
(Continued)

TBT	Tributyltin
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
VOCEC	Volatile Organic Compound Emission Control

1.0 SUMMARY AND CONCLUSIONS

The proposed action is intended to support the National Aeronautics and Space Administration's (NASA) commitment to increase the productivity, reliability, and efficiency of the Langley Research Center's (LaRC) National Transonic Facility (NTF) in Hampton, Virginia. The NTF is a research facility providing state-of-the-art cryogenic wind tunnel testing capabilities. The NTF is the only facility of its kind in the United States providing high Reynolds number testing of high-performance military and commercial aircraft. The facility requires a number of upgrades and modifications to meet the projected national demand for its services and to maintain U.S. cryogenic testing capability at the forefront of research.

The proposed action requires a number of work items grouped into six enhancement areas. These include: installing a new liquid nitrogen (LN_2) tank to provide additional storage; vent stack modifications to eliminate potential fogging from cold gaseous nitrogen (GN_2) emission, modifications to the drive system to reduce limitations on the testing capability of the NTF; integration of control and interlock systems to refine the accuracy and improve efficiency of the facility; model equipment upgrades that will reduce model preparation and turn around time; and facility upgrades to increase overall productivity, reliability, and efficiency of the NTF.

NASA LaRC addressed the environmental impacts of all the above actions except the proposed vent stack modifications in an Environmental Assessment (EA) in 1995. Based on that EA (1995 EA), NASA LaRC published a Finding of No Significant Impact (FONSI) for the action in April 1995. There were no comments from Federal, state, or local agencies or the public for that action. Several components of that action are currently under construction/implementation. Refined engineering studies conducted by NASA LaRC, since April 1995, had identified the option for vent stack modifications at the NTF. Potential environmental impacts of the proposed vent stack modifications have been evaluated and presented in this revised EA. For completeness, this revised EA addresses all the components of the proposed action including components under construction/implementation.

The proposed action, the No-Action Alternative, alternative sites for locating the LN_2 storage system, alternatives to vent stack modifications, the drive control systems, and the electrical substation were considered in this Environmental Assessment (EA). The No-Action Alternative entails operating the NTF with the current equipment and infrastructure. This alternative would not provide the needed capabilities for future cryogenic testing at the NTF.

Alternatives to vent stack modifications, which consisted of non-heat addition concepts, would not likely eliminate potential fogging from cold GN_2 emissions. The alternative sites for the LN_2 storage tank by Building 1244 and across from Building 1194, the alternate location for the drive system in Building 1235 and the alternative location for a new substation south of the NTF to meet the project needs were all considered feasible and environmentally comparable to the proposed action but would be more costly.

The environmental analysis indicates that the proposed action will not have a significant impact on local natural, cultural, and socioeconomic resources. Any potential hazardous and toxic wastes resulting from facility upgrades would be disposed of in accordance with applicable Federal, state, and local regulations.

Modifications to the NTF stack would make operations during the late-night third shift feasible. The current maximum noise levels produced by the NTF occur during venting of GN_2 at a level of about 68 dBA at the mobile home trailer park area outside NASA LaRC to the south. The existing stack fans produce a noise level of about 61 dBA and the proposed new fans and heaters would operate at a slightly higher level of about 64 dBA at the same location. This small increase in fan noise may increase the maximum level from 68 dBA to about 69 dBA. This level is still less than the current maximum noise level of 70-71 dBA experienced from operation of the 16-Foot Transonic Tunnel (16 Ft. TT) at night at the trailer park. If the NTF and the 16-Ft. TT operated at the same time at their respective maximum noise levels, there would be an increase of about 2 dBA in the local noise level. Such simultaneous tunnel operations occur currently during daytime and hence, no significant impact is expected during daytime with the proposed action. The potential impact from the proposed action would be in the increased frequency of simultaneous operation of the two tunnels during nighttime. Such simultaneous operations would be infrequent since neither facility produces maximum noise levels for extended periods of time. Nighttime operation would not be significant to residences which have acoustical insulation required by the local noise ordinance. NASA LaRC will review tunnel operations after completion of the proposed project to determine if any additional noise controls are appropriate.

Based on the evaluation presented in this EA, it does not appear that the potential environmental impacts associated with the proposed enhancement of the NTF will individually or cumulatively have a significant impact on the quality of the environment. A Finding of No Significant Impact (FONSI) is recommended.

2.0 PURPOSE AND NEED

2.1 FACILITY BACKGROUND

NASA LaRC is located in the city of Hampton in southeastern Virginia (Figure 1). LaRC encompasses approximately 327 hectares (807 acres) and consists of numerous facilities providing specialty support to aerospace research and testing.

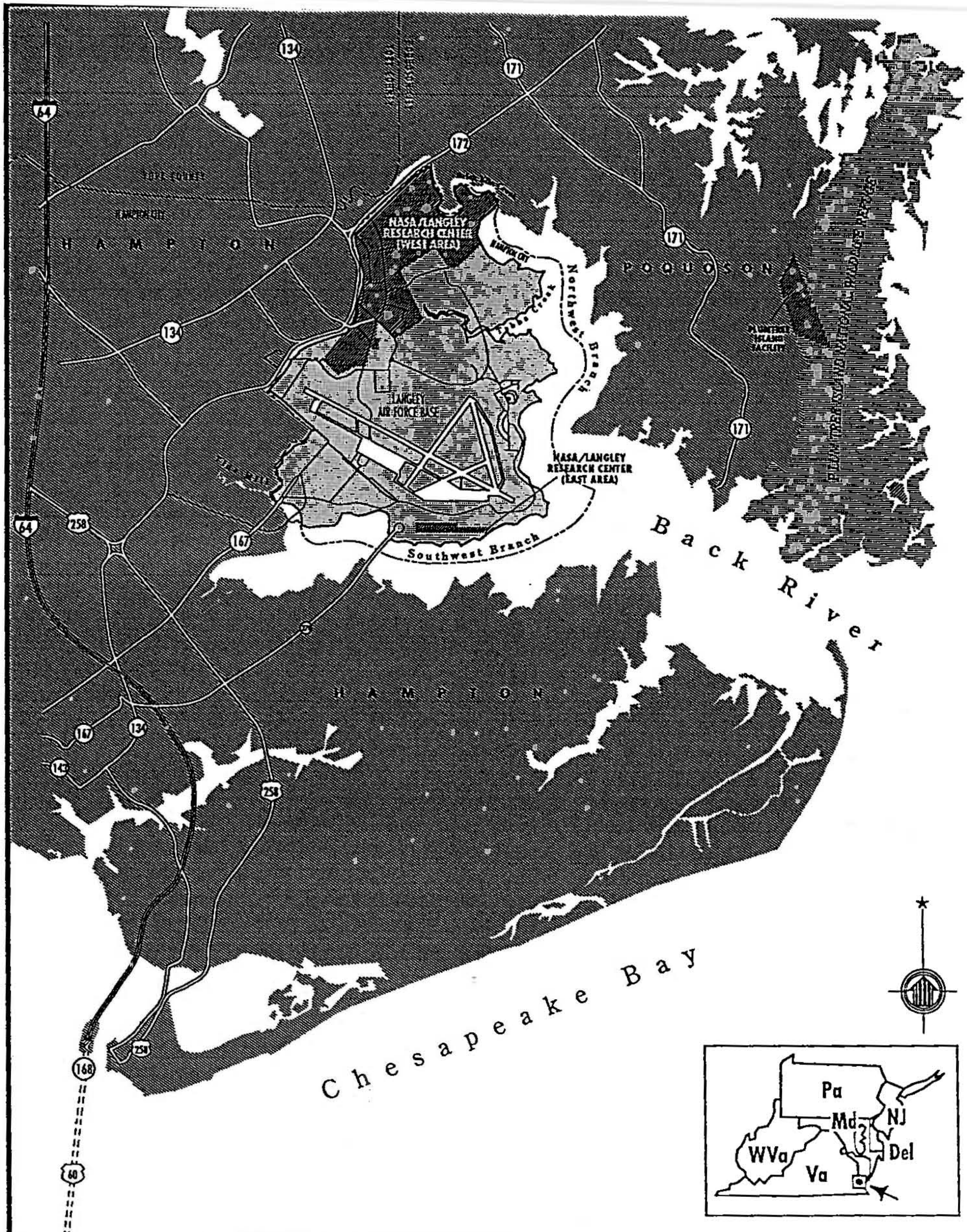
The NTF is located in Building 1236 along State Route 172 just north of the main gate in the densely developed West Area of LaRC (Figure 2). The NTF provides high Reynolds number testing for models of high-performance military and commercial aircraft under cryogenic (cold) conditions. The NTF is a closed-circuit, continuous flow, pressurized, internally insulated wind tunnel, capable of operating through a Mach number range of 0.2 to 1.2. The NTF became operational in August 1984.

The NTF uses air and gaseous nitrogen (GN_2) as the test media. With an air medium, testing is carried out at temperatures ranging from ambient to 150°F and at pressures between 1 and 5 atmospheres (15 to 80 pounds per square inch, gage); with GN_2, testing is carried out at temperatures between -320°F and less-than-ambient temperatures at similar pressures. For the elevated-temperature mode of operation, temperature control is effected by means of a water-cooled heat exchanger. For the cryogenic mode of operation, cooling of the tunnel is achieved by evaporating liquid nitrogen (LN_2) (NASA, 1981).

The NTF is the only facility of its kind in the U.S. This facility is used by NASA, the U.S. Department of Defense, and private industry (e.g., Grumman, Boeing, General Dynamics) for aerodynamic testing of scale models of aerospace vehicles and has a high demand for use which cannot be satisfied due to current productivity limitations. The NTF operates two shifts per day, Monday through Friday, for a total of approximately 3,600 hours per year. The nominal test run time is 1.5 hours. Number of personnel currently assigned to the NTF is 35.

2.2 PROJECT PURPOSE

The primary objective of the proposed action is to increase the productivity of the NTF. The U.S. aircraft manufacturers currently conduct much of their developmental testing in European wind tunnel facilities because of the shortage of high productivity test facilities in the U.S. The NTF is basically a research facility and at the time of its construction provided state-of-the-art cryogenic wind tunnel testing capabilities. In order for the U.S. to be self-sufficient and to competitively support the need of the aircraft industry, production capability of the NTF, as measured by the number of test units that can be performed (each unit termed test polar), needs to be increased from 500 to 1,200 test polars, annually. NASA LaRC has identified 17 work items to achieve improved productivity, reliability and efficiency of the NTF. These work items are grouped into six enhancement areas consisting of LN_2 storage system modifications, vent stack modifications, drive system modifications, controls upgrades, model equipment upgrades and facility upgrades. These enhancements contribute either directly to increased productivity or indirectly by increased reliability, efficiency, and capability of operation.



EBASCO ENVIRONMENTAL	LOCATION OF NASA LANGLEY RESEARCH CENTER Hampton, Virginia	Figure 1

2.3 PROJECT NEED

The following sections provide an overview of existing components of the NTF (NASA LaRC, 1986) and describe the need for the proposed upgrades, additions, and modifications required to achieve the project objective. A general layout of the NTF is shown on Figure 3. Components of the NTF tunnel circuit are shown on Figure 4.

2.3.1 Liquid Nitrogen (LN_2) Storage System Modifications

The NTF uses LN_2 to cool the tunnel circuit to facilitate cryogenic testing. LN_2 is obtained from a plant owned and operated by PRAXAIR located south of the NTF across from NASA LaRC property. LN_2 is transported via a 3-inch vacuum-jacketed, insulated pipeline with a delivery capacity of 50-55 tons per hour, to an existing 840-ton LN_2 storage tank at the NTF (Figure 3). The capacity of the LN_2 storage tank, as well as the pipeline delivery, is typically utilized in one shift operation without completing a full test series. Refilling the NTF storage tank from PRAXAIR's 2,700-ton plant storage tank takes about 12 hours. PRAXAIR's LN_2 generation capacity is 12.5 tons per hour. When the two storage tanks are full, PRAXAIR curtails production of LN_2. These restrictions in LN_2 supply limit the NTF operations. Increased availability of LN_2 is essential to improve NTF's productivity.

2.3.2 Vent Stack Modifications

During testing operations, cold gaseous nitrogen (GN_2) is exhausted through the facility's vent stack. Under certain atmospheric conditions of relatively high humidity and low wind speeds, an opaque plume of condensation tends to descend to the ground causing a surface fog which could obscure vision on state route (SR) 172 which is a major local route that runs along NASA LaRC property line on the southwest. As a safety precaution, operation of the NTF is curtailed during such weather conditions which occur approximately 20 days annually. Modifications to the vent stack are needed to eliminate fogging conditions which would result in reducing facility down time.

2.3.3 Drive System Modifications

The NTF drive system, which operates the fan and the compressor units, consists of one synchronous motor and two wound-rotor induction motors. The synchronous motor operates at a constant, low speed (360 revolutions per minute [rpm]) and is rated at 42,000 horsepower (hp). The motor cannot deliver power at higher speeds and thus limits operation of the NTF under certain test conditions. The induction motors operate at two speeds, 360 and 600 rpm, through a gear box/speed control system and are rated at 23,500 hp each. The induction motors and their speed control system were built in the 1940s and experience frequent failures. The motors are located in Building 1236. The speed control system, located in Building 1241 is shared with the 16-Foot Transonic Tunnel (16-Ft. TT) and limits the NTF's operational flexibility. An independent drive system is needed for the NTF to improve its reliability and capability. The new drive system would require an independent electrical power supply system because the existing system, shared with the 16-Ft.TT, precludes simultaneous operation of the two facilities at full capacity.

2.3.4 Controls Upgrades

Controls Integration

Performance of a model is evaluated by testing a series of model angle-of-attack positions. Each repositioning of the model induces a disturbance in the test medium (air or nitrogen) in the immediate vicinity of the model. Test measurements cannot be taken until the disturbance is attenuated and the gas flow past the model is fully re-established. Modifications are needed to the existing model pitch, angle-of-attack, and roll control systems as well as the mass flow, pressure, temperature, and speed control systems to reduce the time it takes to re-establish the flow after each model repositioning.

Interlock System Integration and Programmable Logic Controllers (PLC)

The interlock system consists of automatic features to prevent unsafe operating conditions such as overheating of equipment, low levels of oxygen, and conditions affecting personnel safety. The existing (obsolete) interlock control system would need to be upgraded to current technology. The new interlock system would need to incorporate into its logic, controls for the new LN_2 storage tank, changes required for the new drive control system, and eliminate duplication of controls. Upgrades would also be needed to centralize the operation to reduce time and manpower requirement for tunnel entries and exits.

2.3.5 Model Equipment Upgrades

Model Filler System Modification

Wind tunnel models must have a smooth aerodynamic surface for testing. Uneven surfaces and surface depressions are treated with fillers and smoothed prior to testing. The filler materials should withstand the harsh testing environment and temperature cycles. The model filler system currently used for the cryogenic models requires the model to be heated for at least one hour prior to application. The model filler material then requires several hours curing time. Such time requirements reduce productive testing time and increase LN_2 requirements to recondition the tunnel. An improved filler system with ease of application and a short curing time would improve NTF's productivity.

Model Heating System Modifications

Prior to changing a model configuration, models are heated by four heat guns to eliminate moisture and to prevent frost formation on the model and its instrumentation, and to achieve model and balance conditioning prior to any work being performed. The current system requires 90 to 180 minutes to complete the heating process. The longer the time for heating, the greater is the amount of LN_2 needed to recondition the tunnel circuit for testing. A more-efficient model heating system would improve the NTF performance.

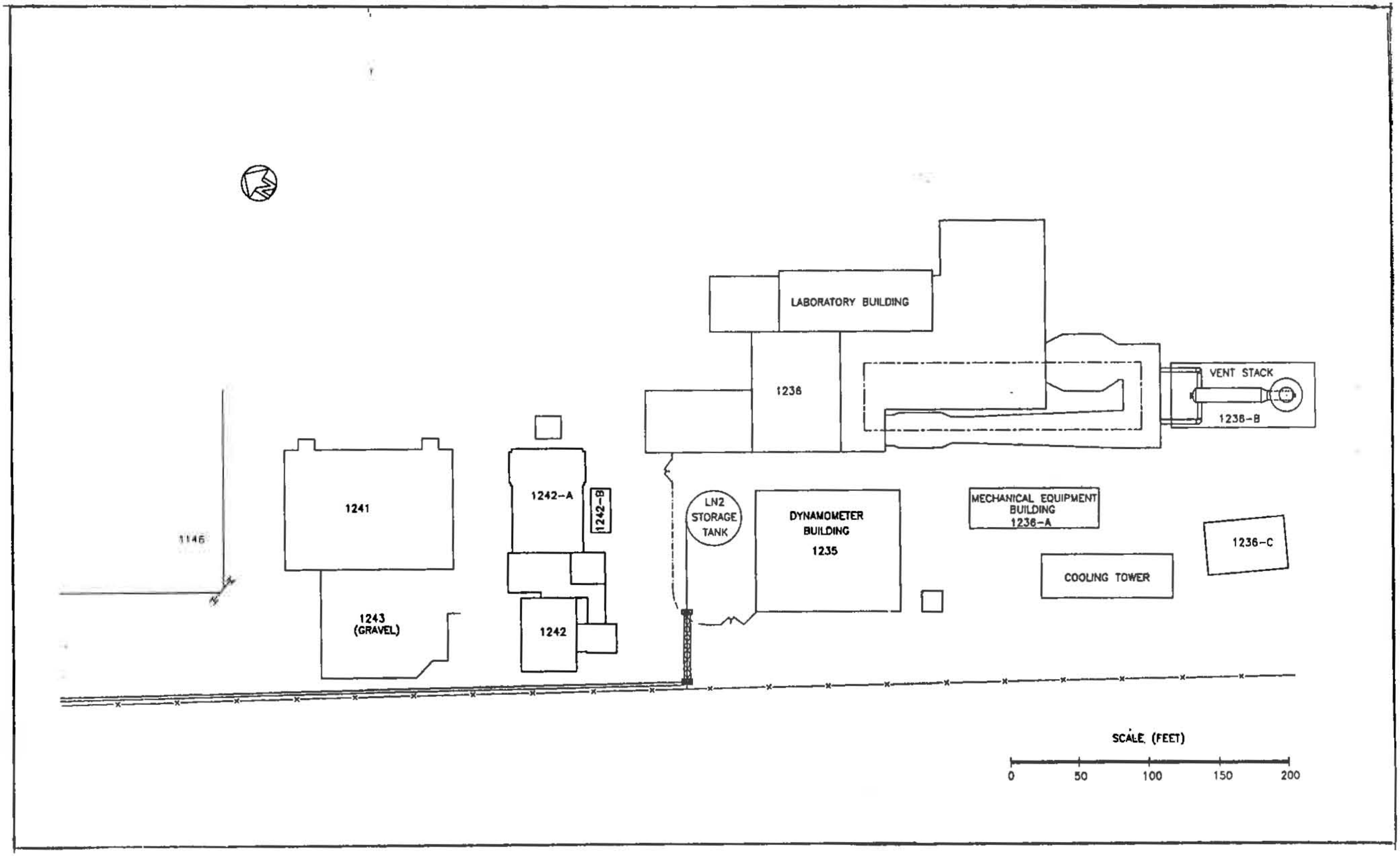


Figure 3 GENERAL LAYOUT OF NTF

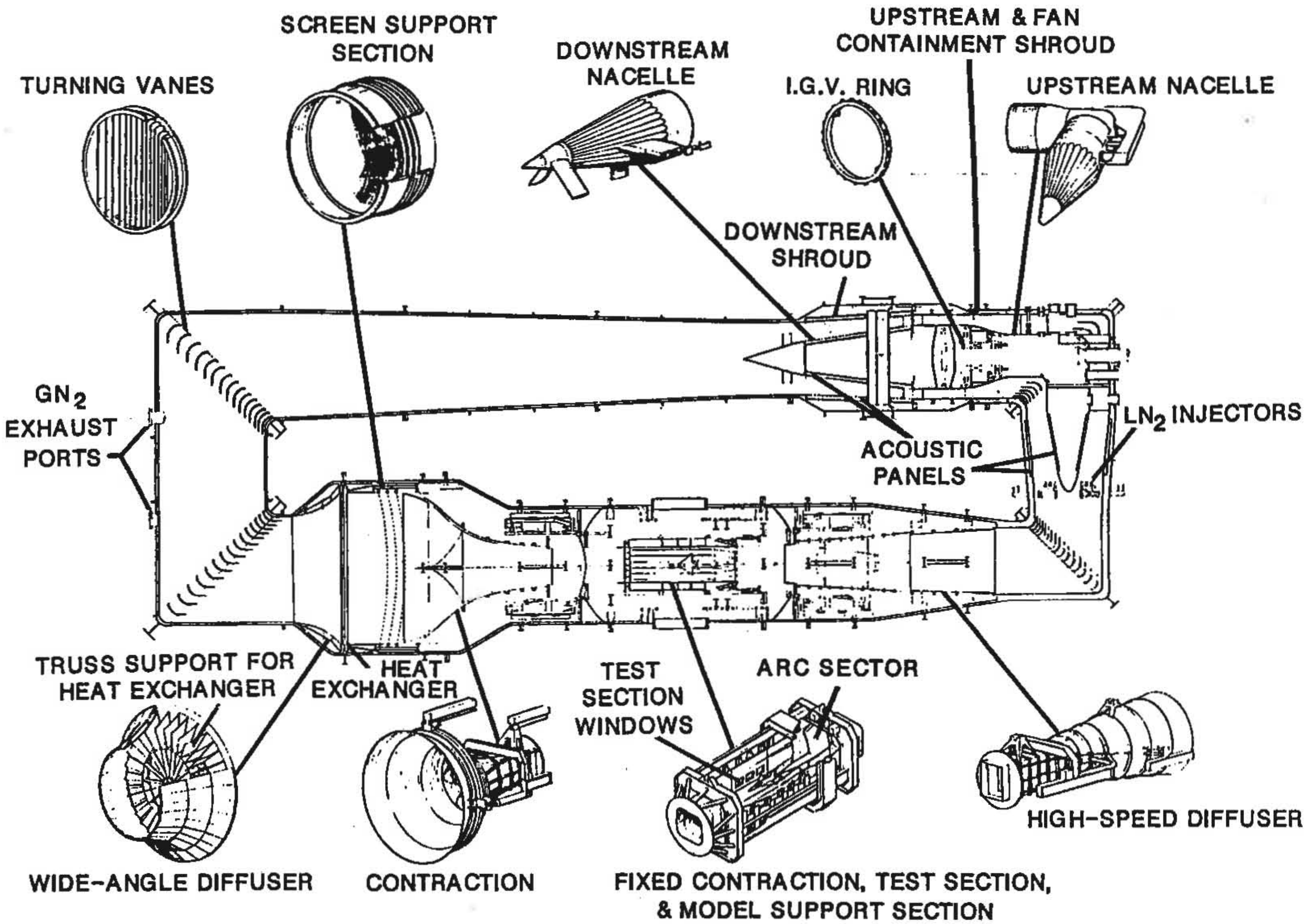


Figure 4 NTF TUNNEL CIRCUIT - INTERNAL STRUCTURES

Sidewall Model Access System

To make changes on sidewall mounted models during testing, the tunnel must be purged of nitrogen and warmed to ambient conditions for model access. The tunnel must then be cooled with LN_2. This procedure is time consuming and requires significant amounts of LN_2 to return the tunnel to test conditions. A sidewall model access system would allow the tunnel to retain its nitrogen environment during model changes and increase the tunnel availability for testing.

Model Attitude Measurement System

Currently the model attitude, or the angle of attack, is estimated by measuring the angle of the model support assembly. This introduces the potential for inaccuracies in the test data. A system to measure the model attitude directly would improve the accuracy of model analysis.

Cryogenic Test Chamber for Model Preparation Bay 2

The NTF currently has one cryogenic bay and two non-cryogenic bays for model preparation. All models undergoing cryogenic testing must be prepared in the only available cryogenic model preparation bay. This limits the number of cryogenic models that can be prepared for testing. A second bay would facilitate increased model testing at NTF.

2.3.6 Facility Upgrades

Arc Sector Upgrades

Upgrades are needed to the current model support system to minimize lateral vibration of the system during cryogenic testing. Decreased vibration minimizes the influence of the supporting structure on the model dynamics and will improve the accuracy of test data.

Moisture Control System Modifications

Presence of moisture in the tunnel during cryogenic testing causes water or ice to accumulate on the model surfaces resulting in erroneous test data and sometimes test failures. The current moisture control technique requires purging of the tunnel with GN_2 prior to cooling down the tunnel and after every change in model test configuration. This results in test delays and increased LN_2 usage. Dry air purging is used when testing is carried out at higher temperatures (ambient to 150°F). The tunnel is kept at a pressure slightly higher than atmospheric pressure during downtime such as weekends to minimize moisture entry into the tunnel circuit, incurring additional operating costs. An improved moisture control system would increase operating efficiency of the NTF.

The dry air purge system generates high noise levels (85 to 100 decibels A-weighted scale [dBA] depending on location in tunnel) for personnel while working in the tunnel during certain operating conditions. At LaRC, hearing conservation is required for an employee exposed to 80 dBA or more, as a time-weighted average (NASA LaRC, June 1991). LaRC's standard is more stringent (by 5 dBA) than the requirements of the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure (29 CFR 1910.95). Modification to the purge air system is required to lower the velocity of the purge air flow and attenuate the noise levels. The dry air purge system is a critical part of the operation because maintaining tunnel low dew point levels (less than -40°F) minimizes frost effects on the model, tunnel components, and model data. Currently the dry air system is non-operational due to prohibitive noise levels for personnel who are working in the back leg of the tunnel or in the test section. It is highly desirable to get the noise level below 75 dBA to allow personnel to work in the tunnel for extended periods of time.

Increased Tunnel Cool-down/Warm-up Rate

During the original facility design, the tunnel performance was mathematically modeled to develop a tunnel cooling/heating rate to prevent structural damage to the model from rapid temperature changes. This rate of cooling/heating requires considerable time between testing different configurations. An increased cooling/heating rate, consistent with structural safety, would reduce the total time required for each test.

Upstream Drive Housing (Nacelle) Heating Improvement

The upstream housing of the drive mechanism (termed nacelle) accommodates the drive bearings and sensitive instrumentation and controls. The housing is exposed to extreme cold from the LN_2 spray injectors. The bearings must be kept above a certain temperature to remain functional. Presently the nacelle has distinct cold spots which affect performance and need to be eliminated.

Improve Test Section Actuator Reliability

Problems arise with the tunnel actuators during certain cryogenic test conditions. When the temperature is -250°F and the pressure is above 30 pounds per square inch absolute (psia), the enclosed heated actuators become supercooled and this condition prohibits the mechanisms from being operated. This condition also depends on Mach number and time of running. The corrective action is to depressurize the tunnel and wait until the actuator temperature is above 0°F. This condition results in operational delays from 1 to 8 hours depending on how long the tunnel has been cold-soaked. Modifications to the mechanical actuators are required to improve actuator reliability.

Kirk Key Changes for Model Changes

LaRC's Standard Operating Procedure (SOP) for model accessibility and tunnel accessibility is a critical component of the total NTF operation. By procedure, it is required that all components of the NTF be physically locked to prevent exposure of personnel to such conditions as high pressure air, mechanical systems, high voltage, low oxygen content, and extreme temperatures. The kirk key system provides this level of safety and must be performed each time the tunnel is secured for personnel access to the model and/or internal tunnel space. Currently it takes a skilled technician knowledgeable of the kirk system to run the key matrices (stations and/or locking positions) over a physical distance of about one-quarter of a mile. This activity takes up to 30 minutes. Modifications to the kirk key system and the SOP are required to reduce the length of time to complete the task.

Procedural Changes for Model Change

The NTF has developed matrices of SOPs and Integrated Operating Procedures for the safe operation of the facility. Over the years, these procedures have been modified and refined to correctly complete a particular task. The procedures for model access are incorporated into the procedural matrices in a similar manner; however, the criteria for all procedures was for safety and proper sequence. It is now required that the procedures be modified to include timeliness as criteria for the improved productivity of the tunnel operation.

2.3.7 Facility Operation

The NTF currently operates a two-shift schedule. A 3rd shift is being planned to enhance the productivity capabilities of the tunnel.

2.4 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

NASA LaRC addressed the environmental impacts of all the above actions except the proposed vent stack modifications in an Environmental Assessment (EA) in 1995. Based on that EA (1995 EA), NASA LaRC published a Finding of No Significant Impact (FONSI) for the action in April 1995. There were no comments from Federal, state, or local agencies or the public for that action. Refined engineering studies conducted by NASA LaRC, since April 1995, had identified the option for vent stack modifications at the NTF. Potential environmental impacts of the proposed vent stack modifications have been evaluated and presented in this revised EA. This revised EA addresses all the components of the proposed action.

This revised EA was prepared in accordance with the following regulations:

Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) (40 CFR Parts 1500-1508);

NASA's regulations implementing the provisions of NEPA (14 CFR Subpart 1216.3) as addressed in Implementing the Provisions of the National Environmental Policy Act (NHB 8800.11); and

LaRC Environmental Program Manual (LHB 8800.1).

3.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

3.1 PROPOSED ACTION

In order to meet the projected demand for the NTF testing capabilities, NASA LaRC has proposed several additions and modifications to the facility to improve its productivity. The proposed work items are described in the following sections (Sverdrup Technologies Inc., 1993).

3.1.1 Liquid Nitrogen (LN_2) Storage System Modifications

NASA LaRC proposes to construct a new 3,400 cubic meter (m^3) (900,000 gallon) tank to store approximately 3,000 tons of LN_2 at the NTF, bringing the total on-site LN_2 storage to approximately 3,840 tons. A transfer line between the new tank and the existing tank would deliver LN_2 to the NTF at the rate of 260 tons per hour. The two on-site storage tanks will be appropriately connected to ensure uninterrupted flow of LN_2 to meet the projected increase in demand for cryogenic testing. The proposed action will increase the NTF sustained run time from 1.5 to 3.0 hours to provide for uninterrupted testing for a typical test program. The proposed LN_2 storage will enable the NTF to use PRAXAIR's full production capacity of 100,000 tons LN_2 annually and will permit NASA LaRC to obtain LN_2 from other sources, if available, on a competitive basis.

The new LN_2 storage tank will be a 16.5 meter (m) (54 foot [ft]) diameter, 26.3 m (85 ft) high, flat-bottomed, cylindrical, double-walled, double-domed, insulated shell with a stainless steel inner vessel and a carbon steel outer vessel, and will be constructed on a pile foundation. The new storage tank will tie into the existing fill lines, vent stack, and control systems of the existing on-site LN_2 storage tank. The new tank will be provided with safety features and controls to contain any accidental spill. The proposed location for the new LN_2 storage tank is a grassy area immediately south of the existing NTF vent stack (see Figure 5).

3.1.2 Vent Stack Modifications

The proposed vent stack modifications consist of installing 4 separate fan/burner systems to heat the cold GN_2 discharge above ambient temperature to prevent a fog touchdown. The fans will have the capacity to draw 240,000 cubic feet per minute (CFM) of atmospheric air. The burners with a total capacity of 200 million British thermal units (BTU) per hour will be capable of raising the air temperature from 60°F to 750°F and will use natural gas as fuel. Natural gas supply to the burners will be made from existing facility connection. The local natural gas supplier to NASA LaRC has sufficient capacity to meet the NTF requirements; hence, no gas storage facilities will be constructed. Figure 6 shows a conceptual arrangement of the fan burner system. Based on an analysis of historical operations and atmospheric conditions, it is anticipated that the burners will operate approximately for 60 hours per year. The fans, however, will run whenever the NTF is operational.

3.1.3 Drive System Modifications

NASA LaRC proposes to replace the existing three-motor system with a single 135,000 hp motor. A new independent drive control system will be provided for the new motor to allow full-power operation of the NTF independent of the 16-Ft.TT operation. The new drive system will be located in Building 1236 in an area currently occupied by two liquid rheostats which are scheduled for disposal. The existing drive control system located in Building 1241 will continue to provide controls for the 16-Ft.TT.

A new independent electrical power distribution system will be provided for the NTF as part of the drive system modifications. A new 130 mega voltampere (MVA) transformer will be added at the existing Yorktown Road substation (Building 1243) (Figure 5). A new duct bank and 115 kilovolt (kV) cables will be provided to connect the new transformer with the existing 115 kV Stratton substation (Building 1233). Preliminary routing of the cables is shown on Figure 7. Increased NTF power requirements will be within the capability of existing supply from Virginia Power, which supplies electrical power to NASA LaRC.

3.1.4 Controls Upgrades

Controls Integration

The existing NTF controls system will be modified to facilitate quicker flow stabilization around the model after each model repositioning for testing. The proposed action would consist of: installation of new instruments software, cables, and support equipment; modification to existing instruments and control panels; and miscellaneous minor hardware changes. This work will be carried out inside existing buildings.

Interlock System Integration and Programmable Logic Controllers (PLC)

Additions and modifications will be made to the existing system safety control and interlock systems to incorporate drive modifications and the new LN_2 storage system. This work item would include installation of alarms and sensors and development of procedures to incorporate the operation of new equipment.

3.1.5 Model Equipment Upgrades

Model Filler System Modification

NASA LaRC is testing several commercially available filler materials for use in cryogenic testing to meet its criteria for material finishing, adhesion to the model, thermal cycling capability, and matching thermal expansion coefficient to parent (model) material. A key parameter for selection of the appropriate filler material or a group of filler materials will be the curing time and temperature. While studies are on-going, NASA LaRC does not anticipate use of materials significantly different from currently used materials or use of materials which are hazardous or toxic. No facility modifications are anticipated for this work element.

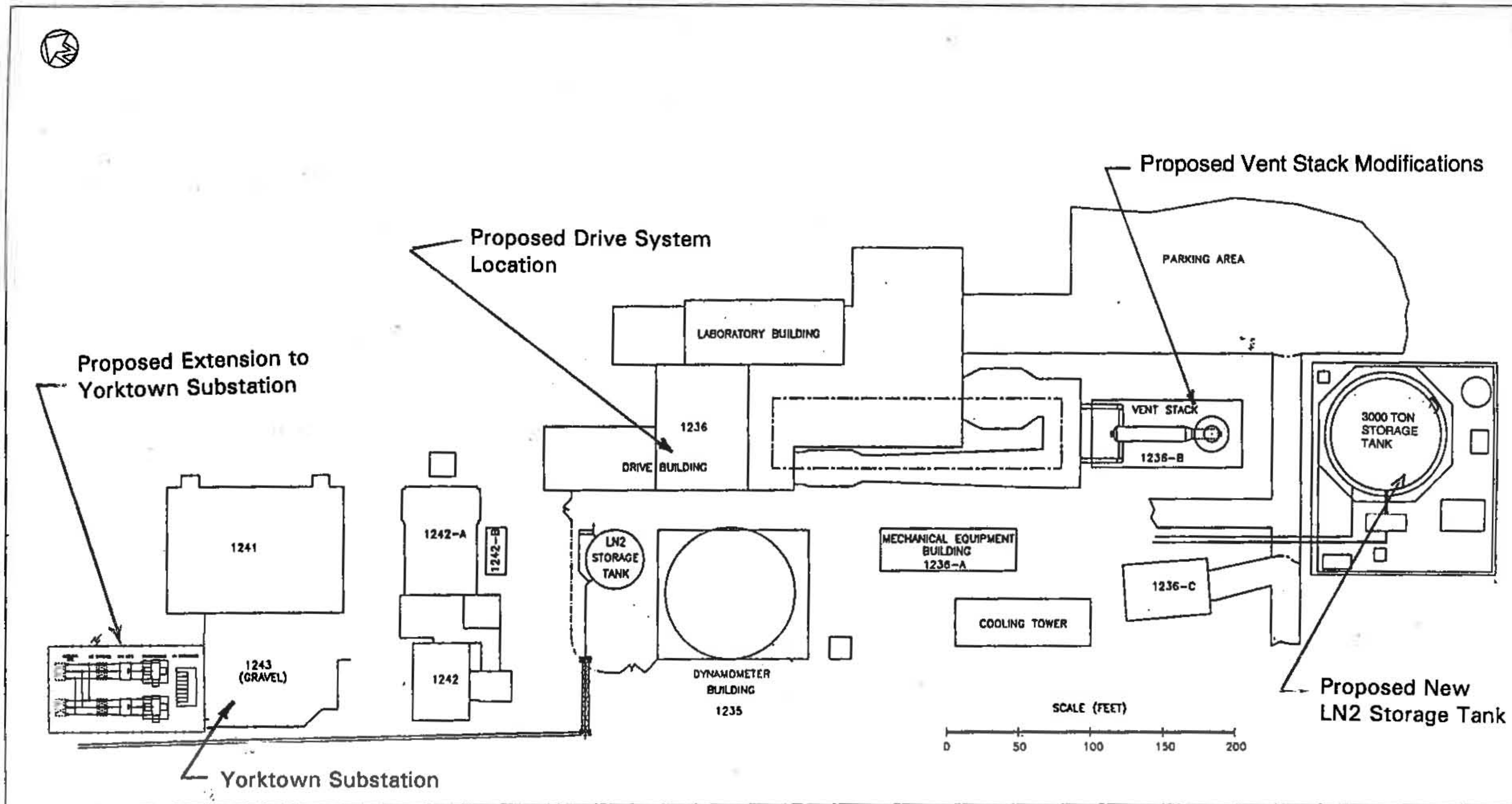


Figure 5 PROPOSED LAYOUT OF MAJOR ADDITIONS

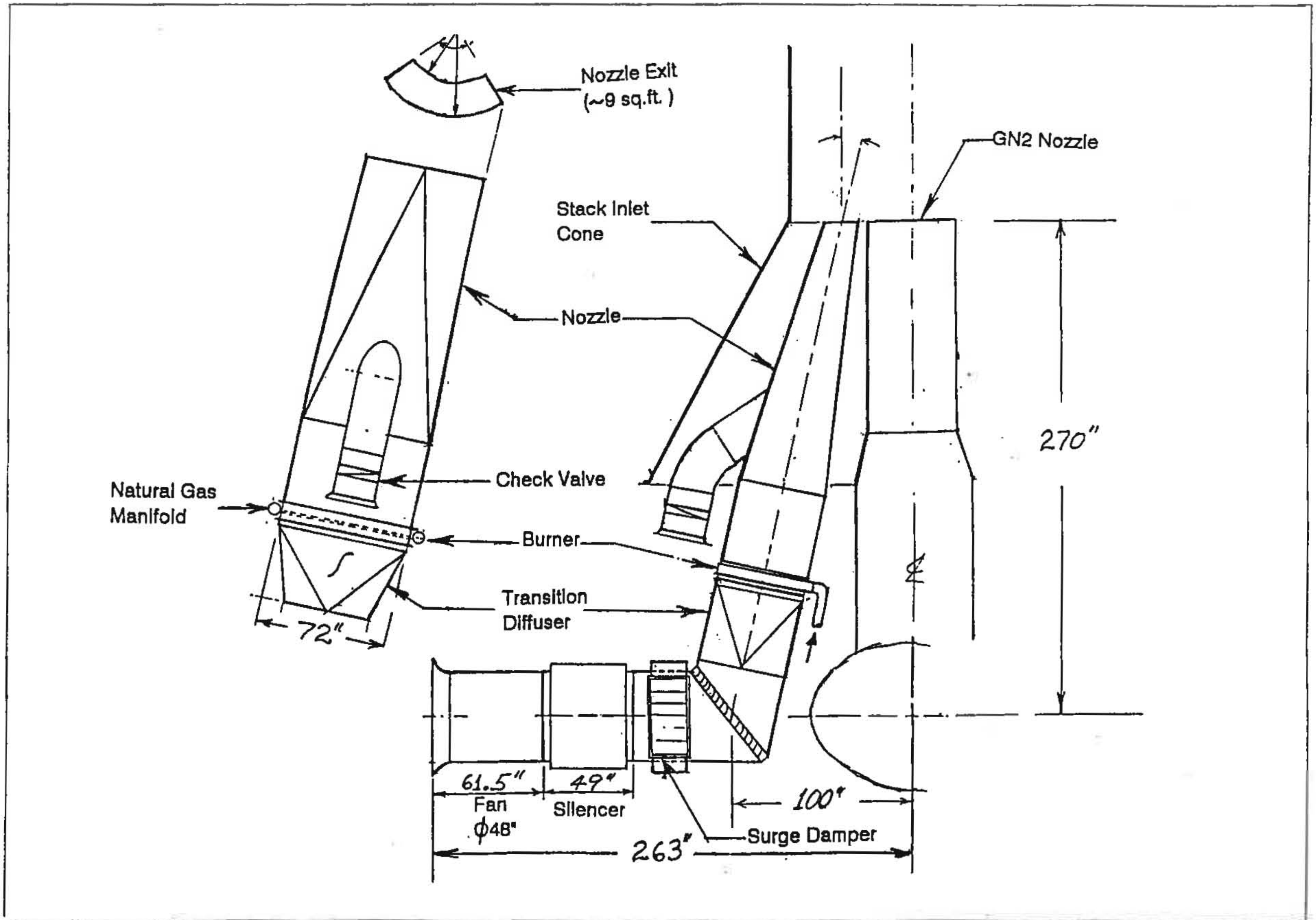


Figure 6 CONCEPTUAL DESIGN FOR VENT STACK MODIFICATIONS

Model Heating System Modifications

NASA LaRC proposes to use eight additional heat guns in order to accelerate heating of a model/balance test setup. The proposed heat guns would be similar to the existing heat guns. Additional mechanical and electrical hangars/hookups will be required to mount these guns.

Sidewall Model Access System

NASA LaRC proposes to use a one piece housing assembly to access both sidewall model support and the rear sting support. The framed aluminum assembly will be inserted from the near-side of the test section to meet the far side and will provide passageway for up to five persons to maneuver and position the model.

Model Attitude Measurement System

A new measurement system will be added to the NTF to enable direct measurement of model attitude. A mechanical or an optical system will be installed.

Cryogenic Test Chamber for Model Preparation Bay 2

A new cryogenic test chamber will be constructed in the Model Preparation Bay 2. This test chamber will be identical (with minor modifications) to the existing cryogenic test chamber and will share utilities, LN_2 supply, and venting facilities. The new test chamber will be capable of operating independently from, or simultaneously with, the existing cryogenic test chamber. All construction for the new bay will be inside Building 1236.

3.1.6 Facility Upgrades

Arc Sector Upgrades

The existing tunnel hardware will be modified using dynamic or mechanical damping to reduce model vibration. The work item would require local hardware modifications.

Moisture Control System Modifications

In order to minimize moisture content in the tunnel circuit, NASA LaRC plans to install a moisture scavenging system in the model access area, modify the dry air purge system to reduce noise generated at low speed operation, and install infiltration barriers on potential leakage paths such as passageways, access doors, etc.

Increased Tunnel Cooldown/Warmup Rate

The proposed action involves a study of the tunnel operating data and the original design assumptions to determine whether the cooldown/warmup rate can be increased without compromising structural integrity. The study will also assess the potential impact of any change in the cooldown/warmup rates on data quality. If an increased rate is considered feasible, NASA LaRC will develop/modify procedures to incorporate these changes. No facility modifications are anticipated.

Upstream Drive Housing (Nacelle) Heating Improvement

The existing heating system will be modified by addition of heating elements or thermo-couples to improve heating within the nacelle. This will allow the inlet guide vanes, test section door locks, fillets, as well as the vent/system isolation valves to remain operational after extended operation at low temperatures (e.g., -250°F) and elevated pressure. All modifications will be interior to the tunnel.

Improved Test Section Actuator Reliability

Improvements to the test section actuator reliability will include items such as providing additional heating directly to the actuator motor and gearbox assembly; reducing the tolerance requirements for the gearbox and ballscrew components; and replacing the gearbox grease with a more suitable material that will not freeze at the low temperatures and high pressures.

Kirk Key Changes for Model Changes

Improvements to the kirk key system will include relocating locking components as necessary to improve routing efficiency and automating the locking process for remote access. The latter may require a change in the mechanical locking philosophy from a safety standpoint.

Procedural Changes for Model Change

Improvements to the model change procedures will incorporate rewriting the procedures to streamline the process while maintaining safety and correct sequencing.

3.1.7 Facility Operation

NASA LaRC may establish a 3rd shift operation based on the demand for the facility. The shift would run nominally from 11 p.m. to 7 a.m., five days a week. It is expected that actual testing at the facility would last approximately 3 hours per shift. The remainder of the shift hours would be taken up in model preparation and set-up.

3.2 CONSTRUCTION SCHEDULE

Construction/installation activities for the NTF productivity enhancements addressed in the 1995 EA began in mid 1995. Construction of the proposed vent stack modifications are expected to begin early in 1997. All construction activities are expected to be completed by 1999. The re-commissioning of the NTF after the modifications is scheduled for late-1999. The estimated cost of the proposed enhancements is in the range of $40-45 million.

3.3 ALTERNATIVES

3.3.1 Alternative Actions

The alternative actions considered in this EA are the proposed action described in Section 3.2, the No-Action Alternative, and alternative sites for locating the LN_2 storage system, the drive control systems, and the electrical substation. The No-Action Alternative provides the benchmark against which the proposed action is evaluated. Under the No-Action Alternative, there will be no modification to the NTF to improve its productivity and a status-quo will be maintained.

3.3.2 Alternative Locations for New NTF Structures

NASA LaRC has identified alternate locations for the construction of the new LN_2 storage system by Building 1244 and across from Building 1194 (Figure 8). Both of these sites are grassy areas on NASA LaRC's property.

A new substation located to the south of the NTF (Figure 9) was considered as an alternative to the proposed extension of the existing Yorktown Road substation (Building 1243).

Originally, NASA LaRC considered locating independent drive system hardware for the existing 3-motor drive at Building 1235. After additional engineering studies, NASA LaRC concluded that providing a single motor in place of the three motors for the NTF would be cost effective due to maintenance, reliability, and productivity margins. The new motor and its control systems will be located in Building 1236 (Figure 5) without affecting Building 1235.

3.3.3 Alternatives to Vent Stack Modifications

Alternatives to the proposed vent stack modifications included non-heat addition concepts including increasing stack height, modification to the stack geometry, and the use of larger fans (Sverdrup, 1993). None of these alternatives would eliminate potential fogging completely during cold GN_2 exhaust leading to potential curtailment of NTF operations.

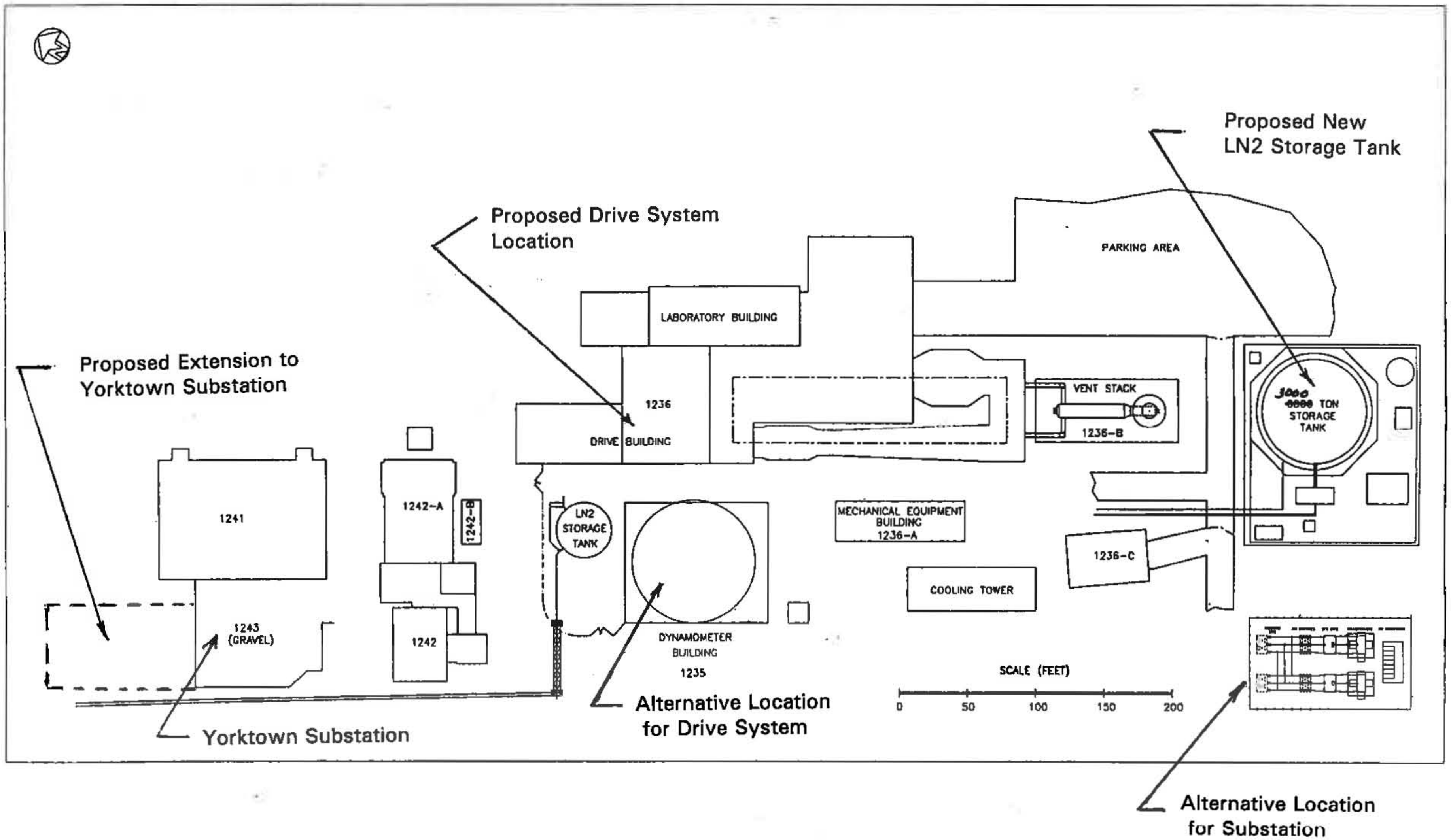


Figure 9 ALTERNATIVE LOCATIONS FOR SUBSTATION AND DRIVE SYSTEM

4.0 ENVIRONMENTAL IMPACTS

4.1 PROPOSED ACTION

The following subsections describe anticipated impacts of the proposed action on existing natural, cultural, and sociological resources in the local area.

4.1.1 Land Use

The NTF is located in the highly developed, industrial section of NASA LaRC's West Area. The proposed land use is similar to and compatible with existing land use in the area. Less than one acre of existing lawns will be cleared for the construction of the new LN_2 storage tank, vent stack modifications, and extension of the existing electrical substation. Construction of vent stack modifications will require demolition and replacement of existing duct foundations and supports. The existing acoustic enclosure will need to be removed to gain access for construction of the modifications. The enclosure will be reinstated after construction is completed. Additionally, approximately 915 m (3,000 ft) of trench construction for the cable duct bank will require excavation of existing pavements and lawns approximating 0.2 hectares (0.5 acres). This area will be restored to its present condition after construction is completed. Therefore, no significant impact to land use pattern in the local area is anticipated from the proposed action.

4.1.2 Water Quality

Construction of the proposed NTF enhancements will not impact water quality in the local area. The construction contractor will be required to develop a sediment and erosion control plan approved by the local authority for the project construction and implement the same to ensure no impact to surface water systems. The area disturbed by construction will not exceed 5 acres; therefore, a National Pollutant Discharge Elimination System (NPDES) stormwater construction permit will not be required.

Operations at the NTF will not generate process wastewater. Domestic wastewater from the proposed enhancements will be discharged through sanitary sewers to the Hampton Roads Sanitation District (HRSD) under the existing NASA LaRC permit for disposal. Approximately 10 persons will be needed for the 3rd shift operations. LaRC does not anticipate new hires for the shift. Personnel will be relocated from other shifts. There will be a slight increase in sanitary wastewater associated with the 3rd shift operation but no net increase for the Center.

Stormwater discharge from the new LN_2 tank area and extension of the Yorktown substation will be incorporated into the existing stormwater drainage system of Building 1236. NASA LaRC will appropriately incorporate any additional storm water discharge from the area in the Facility Stormwater Discharge Pollution Prevention Plan. There will be a minor increase (less than one acre) in impervious surface at the NTF with construction of the new LN_2 tank and the extension to the substation. However, this increase is not expected to significantly increase stormwater runoff from the LaRC West area (estimated at less than 0.1 percent) and will not require any increase in the capacity of existing storm sewers.

4.1.3 Air Quality

Construction of the proposed facility enhancements will result in minor and temporary fugitive dust emissions during earthwork operations. Construction contractors will comply with Virginia Rule 5-1, Fugitive Dust Emissions, by implementing standard construction dust control measures, such as spraying disturbed areas with water, to minimize any dust emissions.

Construction and maintenance activities (e.g., welding, painting) may generate secondary emissions of particulates, volatile organic compounds, and toxic air pollutants. These secondary emissions are expected to be insignificant and are not subject to stationary source permitting.

In accordance with §176 of the Clean Air Act (CAA), each State must modify its State Implementation Plan (SIP) to establish criteria and procedures for demonstrating that all Federal actions, which would occur in or impact on non-attainment areas, conform to the requirements of the SIP. Such revisions to SIPs have not yet been finalized and approved by the U.S. Environmental Protection Agency (EPA). Therefore, Federal actions must be reviewed in accordance with the requirements of 40 CFR Parts 6, 51, and 93 "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" dated November 30, 1993. The Federal agency responsible for the action must determine if its actions conform to the applicable SIP.

LaRC is located within a State-designated ozone non-attainment area (marginal) and Volatile Organic Compound Emission Control (VOCEC) area. Total emissions of nitrous oxides (NO_x) and carbon monoxide (CO) from the 4 burners are estimated at 7.2 pounds (lbs)/hour and 60 lbs/hour respectively. The facility is expected to operate, on the average, for approximately 60 hours per year. NASA LaRC proposes to obtain a permit from the Virginia Department of Environmental Quality (VDEQ) for the installation and operation for up to 200 hours annually, of the burners. The annual emissions of NO_x and CO are estimated at less than 1,500 lbs and 12,000 lbs respectively. These increased emissions are minor and are anticipated to cause insignificant impacts to local air quality.

The proposed action also involves the relocation of 10 personnel from other shifts within NASA LaRC to the NTF for the 3rd shift operation. There will be no additional traffic generated by the 3rd shift operation. No additional emission of ozone precursors such as oxides of nitrogen or volatile organic compounds (VOCs) are anticipated from the proposed enhancements and hence, operation of the NTF is below the EPA *de minimis* threshold and will not violate any provisions adopted in the Virginia SIP for maintaining air quality.

No toxic pollutants or VOCs are expected to be released to the atmosphere. Space heating will be provided by the existing LaRC steam system which is supplied by the refuse-fired steam generating facility (RFSGF) in Building 1288 and the oil- and gas- fired boilers in the central heat plant in Building 1215. Both of these facilities are permitted by the VDEQ. No additional capacity to the existing steam system will be required for the proposed action. The new electrical transformer will provide electrical power to the NTF, and this power will be supplied through the existing Stratton substation. No increase in the electrical load on the local utility (Virginia Power) system is anticipated from the new connection. No emergency back-up system (e.g., diesel generator) is proposed for the NTF. Therefore, no significant impact to local air quality is anticipated.

4.1.4 Noise

The nearest residential development is at the mobile home park located directly south of the NTF across State Route 172. This area is within the 65 dBA day/night noise contour of the Installation Compatibility Use Zone (ICUZ) of the Langley Air Force Base (LAFB). The Code of the city of Hampton, Noise Ordinance adopted December 9, 1992, requires that these residences have adequate acoustical insulation to achieve a maximum interior noise level of 45 dBA and to guard against any adverse human health effects or disturbances due to excessive noise.

Construction of the proposed enhancements will produce minor and temporary increases in noise levels in the immediate vicinity. Construction equipment such as compressors, generators, welders, cranes and trucks will operate intermittently during daytime hours. Operation of such equipment will be governed by the city of Hampton Noise Ordinance. Hence, construction noise would not result in any significant impact on the local area.

A recent noise survey of LaRC operations (Ebasco, 1995) indicated that the highest noise level of approximately 68 dBA occurs at the trailer park from current NTF operation while venting GN_2 to the atmosphere through the vent stack at maximum flow rates. This activity can last approximately 2 hours per day. The average noise level for NTF operation during stack fan operation without GN_2 venting is estimated at 61 dBA at the trailer park. Thus, maximum noise levels are produced by GN_2 venting and not the stack fans.

Proposed modifications to the stack which could affect noise levels are replacement of four existing fans at the base of the stack with slightly larger fans and installation of four burners in the duct between the fans and the stack. These two changes are expected to increase current fan noise levels by less than 3 dBA from about 61 dBA up to 64 dBA at the trailer park. Maximum noise levels produced during GN_2 venting would increase less than 1 dBA.

Currently, the NTF only operates during the day between 7 a.m. and approximately 11 p.m. The proposed stack modifications make nighttime operations feasible by greatly reducing the potential for fog formation on SR 172. In the future, the NTF is projected to operate 3 times per day (once each shift), 15 days per month, with a typical run time of 3 hours per shift. This compares with the neighboring 16-Foot Transonic Tunnel (16-Ft. TT) which historically has operated during the late-night hours with 3 runs from 12:00 a.m. to 12:00 p.m., 15 days per month, with a typical run time of 2.5 hours. If the NTF is used as projected, the total hours of 3rd shift operation of the two tunnels will be increased by a maximum of 38 percent.

Operation of the nearby 16-Ft. TT contributes significantly to the current noise environment at the mobile home park. The highest noise levels from this tunnel were measured at 70 to 71 dBA at the trailer park during transonic operations (Ebasco, 1995). The background noise levels at the trailer park with no wind tunnel or aircraft operations were measured at about 50 dBA during the day and at 40 to 43 dBA during the 3rd shift (between 11 p.m. and 7 a.m.) (Ebasco, 1995).

Daytime Noise Level

Future maximum noise levels of the NTF during venting with the larger fans and new burners operating is expected to be about 1 dBA higher at 69 dBA at the nearest residence. This noise level is less than the maximum level currently produced by the 16 Ft. TT at the same location in the trailer park. Simultaneous operation of the NTF and the 16 Ft. TT could increase the noise level at the trailer park by a further 2 dBA. Such simultaneous tunnel operations occur currently. During the day time, such noise level is not likely to be significant.

Nighttime Noise Level

The greatest potential noise impact of the proposed NTF stack modifications lie in making third shift operations feasible. The highest current nighttime noise levels in the trailer park result from operation of the 16 Ft. TT at a maximum level of 71 dBA and from operation of military aircraft from LAFB at higher noise levels but for shorter durations (Ebasco, 1995). Noise levels during potential future operations of the NTF during nighttime would still be less than current levels produced by the 16-Ft. TT. If the NTF and the 16 Ft. TT operate together at maximum noise levels, the combined noise level is expected to increase by about 2 dBA to a total of 73 dBA. Such occurrences would be infrequent since neither facility produces maximum noise levels for extended periods of time. NTF operations at night would not represent a new or unfamiliar source of noise to the residents. They would appear as an increase in the frequency and duration of wind tunnel noise at night, and at a lower level than currently produced by the 16 Ft. TT.

Noise control features already in place on the NTF vent stack include a muffler for the GN_2 flow from the tunnel to the vent stack, discharge silencers on the air fans and an acoustical barrier wall around the base of the stack. These features will remain in place with the proposed stack modifications. The expected impact of the proposed modifications is insignificant during the day and at night, depending upon the number and duration of simultaneous nighttime tunnel operations. Nearby residences constructed with the acoustical insulation required by the City of Hampton Noise Ordinance should experience no noise impact as a result of the NTF modifications. NASA LaRC will review tunnel operations after completion of the proposed project to determine if additional noise controls are appropriate.

4.1.5 Waste Generation, Treatment, Storage, and Disposal

Non-hazardous solid waste generated at LaRC is disposed of by burning in the RFSGF or by disposal to an off-site permitted landfill. Construction debris from the proposed action will be disposed of in an off-site permitted landfill. The proposed action will not increase the quantity of solid waste generated at the NTF.

LN_2 is considered a hazardous material because of the potential danger to personnel from accidental contact with the cold liquid. NASA LaRC's SOPs provide adequate protection from such accidental contacts with LN_2 or LN_2 spills. The NTF does not use any other hazardous materials in its operation and the proposed action will not result in the generation of any hazardous waste. Installing the new drive control system in Building 1236 is expected to require dismantling and disposal of two liquid rheostats currently located in the building. NASA LaRC will sample the liquid inside these rheostats and if found hazardous, will dispose of them in accordance with applicable Federal, State, and local regulations.

4.1.6 Toxic Substances

No asbestos or asbestos containing materials in Buildings 1235, 1236, and 1241 are expected to be disturbed by the proposed modifications. Any toxic substances encountered during the proposed enhancements will be managed in accordance with appropriate Federal, State, and local regulations, and with the Langley Facility Safety Requirements (LHB 1740.2), and LaRC Environmental Program Manual (LHB 8800.1).

4.1.7 Radioactive Materials and Non-ionizing Radiation

Operation after completion of the proposed action will not require the use of and will not produce radioactive materials or non-ionizing radiation. During construction, x-ray examination of piping welds will be performed in accordance with the Langley Facility Safety Requirements, Ionizing Radiation (LHB 1710.5). This is a standard quality assurance procedure for non-destructive examination of welds.

4.1.8 Biological Resources

The biological resources of LaRC are described in the facility Environmental Resources Document (Foster Wheeler Environmental, 1996). The NTF is located in a heavily developed area of LaRC with little natural habitat in the vicinity. Proposed clearing of less than one acre of lawn area is not anticipated to significantly impact any biological resources at LaRC since it does not provide any significant habitat.

4.1.9 Endangered and Threatened Species

A comprehensive biological field survey has been initiated at LaRC; preliminary results are anticipated in Fiscal Year (FY) 1995. A review of the Virginia Natural Heritage Program database indicates that no Federal or State-listed endangered or threatened species are known to occur at LaRC (Letter from the Virginia Department of Conservation and Recreation's Division of Natural Heritage dated June 17, 1994 - Appendix A). The proposed action will occur in an industrial area of LaRC devoid of suitable natural habitat and will not affect any listed or proposed endangered or threatened species or their critical habitat.

4.1.10 Wetlands and Floodplains

LaRC has large areas of tidal wetlands associated with Brick Kiln Creek and Tabbs Creek, and small, scattered areas of forested wetlands. No wetlands occur in the vicinity of Building 1236. The proposed action does not involve construction within wetlands or a redirection of stormwater in the area; no wetlands will be affected by the proposed action.

The 100-year floodplain elevation at LaRC is at 2.6 m (8.5 ft) above mean sea level (msl), and the 500-year floodplain is at 3 m (9.8 ft) above msl. The NTF facilities are located above the 500-year floodplain elevation.

4.1.11 Coastal Resources Management

The city of Hampton is a tidewater jurisdiction under the Commonwealth of Virginia's approved Coastal Resources Management Program (CRMP). The Virginia CRMP is an integrated program based upon existing State licenses, permits, and approval requirements (Table 4-1). In implementing the CRMP, the VDEQ Division of Public and Intergovernmental Affairs considers an activity to affect the coastal zone if it requires a permit or approval under any of the listed programs and considers the activity to be consistent with the CRMP if it is consistent with all applicable programs (i.e., receives all applicable state licenses, permits, and approvals). The only programs applicable to the proposed NTF modifications are the non-point source pollution control, the point source pollution control (the NPDES permit program), and the air pollution control program. No change in air emissions or wastewater effluents are anticipated with the proposed action. Consequently the proposed action is consistent with the Virginia CRMP.

4.1.12 Historic, Archeological, and Cultural Factors

NASA has a Programmatic Agreement signed September 20, 1989, among the National Conference of State Historic Preservation Officers (NCSHPO) and the Advisory Council on Historic Preservation (ACHP) which addresses agency consultation and mitigative measures for projects which through demolition, alteration, or new construction affect facilities designated as National Historic Landmarks (NHLs). LaRC has been inventoried under the congressional-mandated thematic study "Man in Space" which produced 5 NHLs. A comprehensive inventory of the remainder of the Center is on-going, and under contract with the National Park Service.

LaRC is developing a Historic Cultural Resources Management Plan (HCRMP) under the direction of its Facility Preservation Officer. This plan will be based upon information obtained from the previous archeological surveys and building inventories within LaRC as well as from the current Center-wide archeological Phase I and Phase II surveys under contract with the Army Corps of Engineers (ACOE). The plan will specify zones of cultural resources potential and will probably establish a Historic District within LaRC (Foster Wheeler Environmental, 1996).

NASA LaRC conducted a Phase I archeological and cultural resources survey of the area which will be disturbed by proposed construction. The survey found no artifacts of any significance in the proposed LN_2 tank or the substation location. The survey found minor artifacts along the cable trench which are not considered of any historical significance according to the Programmatic Agreement with the ACHP. Buildings 1235 and 1236 were constructed in 1947 and Building 1241 was constructed in 1950. These buildings are likely to possess historic or architectural significance in a proposed historic district currently being studied by the National Parks Service. These buildings may eventually be considered for listing on the National Register of Historic Places (NRHP). The proposed action does not involve any change to the exterior of the buildings; therefore, the action is not expected to affect any property listed or eligible for listing on the NRHP.

TABLE 4-1 PROGRAMS COMPRISING VIRGINIA'S COASTAL RESOURCES MANAGEMENT PROGRAM	
Program	Administering Agency
Fisheries Management	Marine Resources Commission Department of Game and Inland Fisheries
State Tributyltin (TBT) Regulatory Program	Marine Resources Commission Department of Game and Inland Fisheries Department of Agriculture and Consumer Services
Subaqueous Lands Management	Marine Resources Commission
Wetlands Management	Marine Resources Commission
Dunes Management	Marine Resources Commission
Non-point Source Pollution Control	Department of Conservation and Recreation
Point Source Pollution Control NPDES Permit Program Water Quality Certification Under Section 401 of Clean Water Act	Department of Environmental Quality-Water Division
Shoreline Sanitation	Department of Health
Air Pollution Control	Department of Environmental Quality-Air Division

4.1.13 Economic, Population, and Employment Factors

LaRC is located in the northern portion of the city of Hampton in the southern Peninsula Area of southeastern Virginia and lies in the Hampton Roads Metropolitan Statistical Area (MSA). The MSA consists of the Virginia cities of Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg; the Virginia counties of Gloucester, Isle of Wight, James City, Matthews, and York; and Currituck County, North Carolina.

The population of the city of Hampton was about 135,000 in 1991, while the entire Hampton Roads MSA had a population of 1,431,088. The 1980 population for this area was 1,187,846, which represents a 19.4 percent increase in population in ten years. The Hampton Roads MSA workforce consisted of 656,869 civilian and 148,000 active duty military in 1993 (Hampton Roads Planning District Commission, 1993).

LaRC presently employs approximately 2,500 civil service and 1,700 contractors, with an annual payroll of $153 million. LaRC contracts about $409 million annually in goods and services both locally and nationally, thus performing an important role in the local economy.

The NTF has a present staff compliment of 35 which is anticipated to increase to 45 with a third shift operation. NASA LaRC proposes to reallocate existing staff to meet the needs of NTF operations. A capital expenditure of $40-45 million over a 4 year period for NTF modification and upgrade is expected to have a minor positive effect on the local economy.

4.1.14 Traffic and Parking

The proposed action will not displace existing parking near Building 1236. There may be minor traffic restriction near the building during construction of the LN_2 storage tank, but it is not expected to cause any significant traffic or parking impacts.

4.1.15 Aesthetic Resources

The NTF is visible to local residences located outside the NASA LaRC property line across State Route 172. The existing LN_2 storage tank extends approximately 15 m (50 ft.) above ground level. Liquid nitrogen is vented through a stack that extends approximately 35 m (120 ft.) above ground level. These structures are part of the viewshed for the local residences.

As with any construction site, construction of the NTF structures would have a minor and temporary effect on local aesthetics. The proposed LN_2 storage tank would be located adjacent to the existing vent stack and would extend approximately 27 m (90 ft.) above ground level. Because of the industrial nature of NASA LaRC near the NTF location, the additional LN_2 storage tank at the proposed site is not expected to significantly affect the aesthetic value of the viewshed.

4.1.16 Energy

The NTF is a major electricity user, and is covered by the LaRC-wide energy management program for energy conservation and efficient usage. The proposed action will increase electricity usage at the facility by approximately 25 percent due to increased hours of operation. However, no new additional capacity will be required for such increase in electricity usage.

4.1.17 Safety

The new LN_2 storage tank will be provided with safety features and controls to contain any accidental spill. During cryogenic testing, cold GN_2 is exhausted through the facility's vent stack. The cold GN_2 mixing with the ambient air may cause condensation of vapor in the air forming a dense, opaque fog. Under certain conditions of high relative humidity and low wind speeds, the fog may touch the ground causing low visibility conditions on SR 172. The proposed fan burner system would prevent such fogging conditions.

4.1.18 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires Federal agencies to identify and address the potential for their programs, policies, and actions to have disproportionately high and adverse human health effects or environmental effects on minority populations or low-income populations. The companion Presidential Memorandum, signed February 11, 1994, directs Federal agencies to include in their NEPA documents an analysis of the effects of their actions on minority communities and low-income communities, along with mitigation measures for significant and adverse effects.

The area west of NASA LaRC is one of the least developed areas of the city of Hampton, Virginia. This area comprises the trailer parks, an apartment complex, and an auto racing track. The trailer park area and the apartment complex are subject to significant noise sources other than the LaRC wind tunnels. These sources include jet aircraft at LAFB and the automotive race track located directly across from NASA LaRC property. These sources often generate high noise that drowns out the wind tunnel noise. NASA LaRC has developed comprehensive community relations program under the Center's Superfund program and an Environmental Justice Implementation Plan. Both these plans outline the Center's community outreach strategies, which help ensure that outreach efforts continue to target groups that constitute a representative cross-section of the local population (Foster Wheeler Environmental, 1996).

As addressed in the previous sections, the proposed actions will comply with all applicable environmental statutes and regulations. In so far as the proposed NTF modifications and upgrades are not anticipated to have significant environmental or socioeconomic effects, the proposed action will not have disproportionately high or adverse human health effects or environmental effects on minority or low-income populations.

4.2 NO-ACTION ALTERNATIVE

Modernization and upgrading of the facility is needed for the United States to maintain a world-class cryogenic wind tunnel facility that will provide model testing to accurately reflect the full-scale vehicle performance. Without such testing capability, the U.S. would continue to lose its edge on cryogenic wind tunnel research which would compromise commercial viability of U.S. aircraft manufacturers and result in overseas testing.

4.3 ALTERNATIVE LOCATIONS FOR NEW NTF STRUCTURES

4.3.1 LN_2 Storage Tank

NASA LaRC has identified two alternate locations for the construction of the new LN_2 storage system by Building 1244 and across from Building 1194 (Figure 7). The two sites are grassy areas on NASA LaRC property and will not affect any wetlands. If the location across from Building 1194 is chosen, a Phase I archeological and cultural resources survey would be conducted prior to LN_2 tank construction. A Phase I survey has been conducted at the area by Building 1244 with no discovery of significant resources. No significant impact to local environmental resources is anticipated by locating the tank at either site.

4.3.2 Electrical Substation

NASA LaRC studied the feasibility of constructing a new substation for the NTF to the south of the facility near Building 1236 (Figure 8) as an alternative to extending the existing Yorktown Road substation near Building 1243. Both sites would require clearing of lawns. There would be comparable and insignificant impacts at the two sites on water quality and biological resources. Cost of construction may be higher than at the alternative site.

4.3.3 Drive System Modifications

Providing a single motor to replace existing motors will increase the overall flexibility and reliability of the NTF and marginally decrease its energy consumption. Locating the drive control at Building 1236 is expected to result in a slight reduction in support equipment installation and cost compared to the alternative location in Building 1235. Locating the drive control system in either Building 1235 or Building 1236 is likely to have comparable, insignificant impact to local environmental resources.

4.3.4 Vent Stack Modifications

Alternative vent stack modifications would not eliminate potential curtailment of NTF operation due to fogging, resulting in lower productivity. Increasing the stack height required to adequately eliminate fogging conditions would interfere with traffic in the area. Modification to the stack geometry may slightly increase construction time; however, environmental impacts from such action would likely be comparable to the those of the proposed action. However, all these alternatives would raise the noise levels somewhat less than the proposed action in the local area.

5.0 REFERENCES

Ebasco, 1995. Comprehensive Environmental Noise Survey of Langley Research Center Operations (Draft).

Foster Wheeler Environmental Corporation, 1996. Environmental Resources Document, Langley Research Center.

Hampton Roads Planning District Commission, 1993. HRPDC Economic Outlook.

NASA Langley Research Center, April 1995. Finding of No Significant Impacts for The National Transonic Facility Productivity Enhancement Project

NASA Langley Research Center, March 1995. Environmental Assessment, The National Transonic Facility Productivity Enhancement Project

NASA Langley Research Center, November 1991. Langley Research Center Environmental Program Manual, LHB 8800.1.

NASA Langley Research Center, June 1991. Langley Research Center Noise Control and Hearing Conservation Program, LHB 2710.1.

NASA Langley Research Center, November 1986. National Transonic Facility. Facility Description Document.

NASA, July 1981. Guide for Users of the National Transonic Facility. Technical Memorandum 83124.

NASA, April 1980. Implementing the Provisions of the National Environmental Policy Act. NHB 8800.11.

Sverdrup Technologies, Inc., November 1993. National Transonic Facility (NTF) Productivity Enhancements (Various Task Reports)

6.0 LIST OF AGENCIES CONSULTED

During preparation of this EA, the following agencies were consulted:

U.S. Fish & Wildlife Service
Commonwealth of Virginia Department of Environmental Quality
Commonwealth of Virginia Department of Conservation and Recreation
Commonwealth of Virginia Department of Historic Resources
City of Hampton

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APPENDIX A

NATURAL HERITAGE RESOURCES WITHIN LaRC REGION

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Becky Norton Dunlop
Secretary of Natural
Resources

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COMMONWEALTH of VIRGINIA

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July 1, 1996

Amy Braccia
Foster Wheeler Environmental Corporation
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Re: Information Update for NASA Langley Research Facility

Dear Ms. Braccia:

The Department of Conservation and Recreation (DCR) has processed your recent request for natural heritage information update. DCR's Division of Natural Heritage functions to identify, preserve, and protect the natural heritage resources of the Commonwealth. Natural heritage resources (NHR's) are defined by the Virginia Natural Area Preserves Act as the habitat of rare, threatened, or endangered plant and animal species, unique or state significant natural communities or geologic sites, and similar features of scientific interest.

I have enclosed updated lists of natural heritage resources that have been documented on the Poquoson West, Newport News North, and Hampton USGS Quadrangle Maps. The Eastern bloodleaf (*Iresine rhizomatosa*, G5/S2S3/NF/NS), a state rare plant species was recently documented in the Tabbs Creek Wetlands on Langley Air Force Base. Natural heritage resources have not been documented on the Poquoson East Quadrangle.

No fee has been assessed for providing this information update. DCR's Biological and Conservation Data System is constantly growing and being revised. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

An explanation of species rarity ranks and legal status abbreviations is included for your reference. Thank you for the opportunity to provide this updated information.

Sincerely,

Lesa S. Berlinghoff
Project Review Coordinator

Natural Heritage Resources
of the Poquoson West Quadrangle

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
AMBYSTOMA TIGRINUM	TIGER SALAMANDER	G5	S1	NF	LE
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S1S2	NF	LT
HYLA GRATIOSA	BARKING TREEFROG	G5	S1	NF	LT
IXOBRYCHUS EXILIS	LEAST BITTERN	G5	S2	NF	NS
ESTUARINE HERBACEOUS VEGETATION					
ESTUARINE SCRUB					
LOW HERBACEOUS WETLAND					
OLIGOTROPHIC SEASONALLY FLOODED WOODLAND					
OLIGOTROPHIC SEMIPERMANENTLY FLOODED WOODLAND					
SUBMESOTROPHIC FOREST					
FIMBRISTYLIS PERPUSILLA	HARPER'S FIMBRISTYLIS	G2G3	S1	SOC	LE
SPHAGNUM MACROPHYLLUM VAR MACROPHYLLUM	LARGE-LEAF PEATMOSS	G3T3	S2	NF	NS
BOLTONIA CAROLINIANA	CAROLINA BOLTONIA	G4?	S2	NF	NS
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?	NF	NS
SABATIA CAMPANULATA	SLENDER MARSH PINK	G5	S2	NF	NS
LYTHRUM LANCEOLATUM	LANCE-LEAVED LOOSESTRIFE	G?	SH	NF	NS
HOTTONIA INFLATA	FEATHERFOIL	G4	S2	NF	NS
TILLANDSIA USNEOIDES	SPANISH MOSS	G5	S2	NF	NS

Natural Heritage Resources
of the Newport News North Quadrangle

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
FALCO PEREGRINUS	PEREGRINE FALCON	G4	S1	LE	LE
CROTALUS HORRIDUS ATRICAUDATUS	CANEBRAKE RATTLESNAKE	G5TUQ	S1	NF	LE
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S1S2	NF	LT
TRILLIUM PUSILLUM VAR VIRGINIANUM	VIRGINIA LEAST TRILLIUM	G3T2	S2	SOC	NS
CAREX LUPULIFORMIS	FALSE HOP SEDGE	G3?	S1	NF	NS
CYPERUS DIANDRUS	UMBRELLA FLATSEDGE	G5	SH	NF	NS

Natural Heritage Resources of the Hampton Quadrangle

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
CHARADRIUS MELODUS	PIPING PLOVER	G3	S2	LT	LT
CICINDELA DORSALIS DORSALIS	NORTHEASTERN BEACH TIGER BEETLE	G4T2	S2	LT	NS
CASMERODIUS ALBUS	GREAT EGRET	G5	S2B,S4	NF	SC
STERNA ANTILLARUM	LEAST TERN	G4	S2	NF	SC
RYNCHOPS NIGER	BLACK SKIMMER	G5	S2	NF	NS
IRESINE RHIZOMATOSA	EASTERN BLOODLEAF	G5	S2S3	NF	NS
ERIGERON VERNUS	WHITE-TOP FLEABANE	G5	S2	NF	NS
IVA IMBRICATA	SEA-COAST MARSH-ELDER	G5?	S1S2	NF	NS
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?	NF	NS
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL	G4	S2	NF	NS
DESMODIUM TENUIFOLIUM	SLIM-LEAF TICK-TREFOIL	G3G4	S1	NF	NS
QUERCUS INCANA	BLUE JACK OAK	G5	S2	NF	NS

Definition of Abbreviations Used on Natural Heritage Resource Lists
of the
Virginia Department of Conservation and Recreation

Natural Heritage Ranks

The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources, or "NHR's," are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The primary criterion for ranking NHR's is the number of populations or occurrences, i.e. the number of known distinct localities. Also of great importance is the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals. Other considerations may include the quality of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of populations or occurrences such that ranks will be an index of known biological rarity.

S1 Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare; usually between 5 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.

S3 Rare to uncommon; usually between 20 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

S4 Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

S5 Very common; demonstrably secure under present conditions.

SA Accidental in the state.

S#B Breeding status of an organism within the state.

SH Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.

S#N Non-breeding status within the state. Usually applied to winter resident species.

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SX Apparently extirpated from the state.

SZ Long distance migrant whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.

Global ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means apparently extinct. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species' known rarity.

These ranks should not be interpreted as legal designations.

Federal Legal Status

The Division of Natural Heritage uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

LE - Listed Endangered
LT - Listed Threatened
PE - Proposed Endangered
PT - Proposed Threatened
C - Candidate (formerly C1-Candidate, category 1)
SOC - Species of concern (formerly C2-Candidate, category 2)
NF - no federal legal status

State Legal Status

The Division of Natural Heritage uses similar abbreviations for State endangerment.

LE - Listed Endangered
LT - Listed Threatened
C - Candidate
PE - Proposed Endangered
PT - Proposed Threatened
NS - no state legal status

For information on the laws pertaining to threatened or endangered species, contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species
Department of Agriculture and Consumer Services Plant Protection Bureau for STATE listed plants and insects
Department of Game and Inland Fisheries for all other STATE listed animals

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