

PROPULSION RESEARCH LABORATORY

FINAL ENVIRONMENTAL ASSESSMENT

**NASA CONTRACT NO. NAS8-00149
TASK ORDER NO. FW-102**

Prepared For:

NASA MARSHALL SPACE FLIGHT CENTER

Prepared By:



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FEBRUARY 2002

**ENVIRONMENTAL ASSESSMENT
FOR MARSHALL SPACE FLIGHT CENTER
PROPULSION RESEARCH LABORATORY**

Lead Agency: National Aeronautics and Space Administration (NASA), George C. Marshall Space Flight Center (MSFC)

Proposed Action: To construct and operate the Propulsion Research Laboratory facility at MSFC, located on Redstone Arsenal, near Huntsville, Alabama to support research of sub-scale advanced propulsion technologies.

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Date: February 28, 2002

Abstract: NASA's MSFC proposes to construct and operate the Propulsion Research Laboratory (PRL) facility near Huntsville, Alabama to support research of sub-scale advanced propulsion technologies. The proposed location is a 21-acre site in the Northwest portion of MSFC. Marshall Road North borders the site to the north, Neal Road to the south, and Morris Road to the west. The eastern border is the MSFC and Redstone Arsenal boundary. The size of the initial phase of the PRL would be approximately 107,000 square gross feet and would contain eight laboratories and four core groups of support function. Future phases would contain additional building space with seven additional laboratories.

This Environmental Assessment (EA) assesses the potential impacts of two alternatives. In Alternative A, the No Action Alternative, research activities at MSFC would continue without the benefits of the PRL and the objectives would not be fulfilled. There would be no impacts resulting from the No Action Alternative. In Alternative B, Construction and Operation of the PRL, both the initial and future phases of the PRL would be constructed and operated. The objectives of the project would be met. The impacts of the project would be minimal. All resource areas were analyzed and determined to either have minimal impacts or no impacts.

EXECUTIVE SUMMARY

The action proposed by the National Aeronautics and Space Administration (NASA) George C. Marshall Space Flight Center (MSFC) that is evaluated in this environmental assessment is the construction and operation of the Propulsion Research Laboratory (PRL) to support the research of sub-scale advanced propulsion technologies. As NASA's Center of Excellence for space propulsion, MSFC's goals are to develop and maintain NASA's pre-eminence in space propulsion and to lead the research and development of space transportation technologies and systems.

Implementation Alternatives

Alternative A: No Action

In the No Action alternative, research activities at MSFC would continue without the benefits of the new PRL. Propulsion research would continue in four separate buildings: Building 4203, Building 4649, Building 4566, and Building 4655. These buildings have been modified to function as laboratories and work areas but are not fully adequate in these roles. The proposed location for the new PRL would continue to function as pastureland. The CEQ guidelines for implementing NEPA requirements requires inclusion of the "No Action Alternative" as a baseline against evaluating any proposed action.

Alternative B: Construction and Operation of the PRL at the Preferred Location

In the implementation of this alternative, both the baseline and future phases of the PRL would be constructed and operated at the preferred location. The preferred location is a 21-acre site bordered by Marshall Road North, Neal Road, Morris Road, and the MSFC and Redstone Arsenal boundary. The size of the baseline phase of the PRL would be approximately 107,000 gross square feet (approximately 66,000 usable square feet). The baseline phase would contain eight laboratories, four core groups of support functions, and administrative areas. Future phases will be based on unique requirements determined by successful experiment results.

Purpose and Need

The proposed action is to initiate the research of sub-scale advanced propulsion technologies at MSFC by constructing a centralized facility for all MSFC propulsion research areas. Propulsion technology support for the Advanced Space Transportation Program is comprised of research testing of new and advanced sub-scale engines, devices, and components that promote improved reliability, performance, and cost reduction and providing government facilities to support the program. Current facilities do not meet the current research needs and are limited in their size and functionality. MSFC needs a centralized, state-of-the-art facility to encourage communication and technology transfer among researchers, to provide a synergistic environment where technologies can be explored, sharing expensive test equipment, and to promote the advancement of research areas to their maximum potential.

Environmental Consequences of Alternatives

Table ES-1 summarizes the effects of each alternative on specific resource areas. In general, implementation of Alternative A would present no effects to resources at the PRL site or MSFC. Activities and research at MSFC would continue at the Center with no changes. Implementation of Alternative B would have no impact on cultural resources, the geographical setting, climate, designated land use, biological resources, or sociological environment. It would have a minimal impact on facilities and infrastructure, air quality, water resources, geology, hazardous materials and hazardous waste, and health and safety.

Some additional issues for the construction and operation of the PRL are explosive hazards and radiation hazards. The Chemical Synthesis Laboratory will be built to protect against a worst case explosion equivalent of 1 pound of TNT.

During the operation of the PRL, there are five activities that have potential exposure to ionizing radiation. These are transportation of antimatter; the Antimatter Research Laboratory; the Beamed Energy Research Laboratory; the Central Diagnostics Laboratory; and the operation of Fusion experiments. When antimatter comes in contact with other materials, the antimatter and normal matter are converted to energy. This energy is ultimately in the form of gamma radiation. A worst-case scenario for exposure to this gamma radiation would be an instantaneous failure of the antimatter containment during transportation. However, the amounts to be transported are very small, the planned maximum of 10^{10} antiprotons constitutes only 0.00000000000002 gm, so the radiation dose from such an accident is quite modest. At a distance of 2 meters, this would be 80 mrem and at a distance of 5 meters this would drop to 13 mrem. The inclusion of planned shielding will further reduce these. To place these numbers in context, a single dental x-ray results in a radiation dose of about 50 mrem, and a typical person in the U.S. receives about 300 mrem per year from natural and man-made sources. Federal regulations set the maximum permissible additional dose to members of the general public at 100 mrem per year. The impact of transportation of antimatter is minimal. The potential for gamma radiation exposure from the operation of the Antimatter Research Laboratory is similar to the potential for exposure during transportation and the potential for doses would be the same. The dose to a member of the public, and/or the effect of the radiation exposure on the environment, would be negligible.

No radioactive materials are used in the Beamed Energy Laboratory and none are released to the environment. X-ray machines in this lab would have built-in shielding to protect the workers and there would be no measurable exposure to these x-rays in the hallway. The shielding effect from intervening walls and the distance between the target and the hallway would be sufficient to keep doses in the hallway below conventionally measurable levels.

The Central Diagnostics Laboratory would also have x-ray machines and sealed neutron sources such as an Americium-241 and Beryllium (AmBe) source. Protection from the radiation emitted by a sealed source is accomplished by shielded containers during storage and by portable shielding on a case-by-case basis. The storage shielding, or the temporary shielding employed during use, would be sufficient to ensure that there would be no measurable dose to the public or to the environment.

Direct radiation exposure could occur during operations of the fusion experiments from x-ray, gamma, and neutron radiation released during fusion, or after operations from the activation products from neutron exposure. Strategic shielding within the laboratory, and the distance from the source to the hallway would reduce the dose outside of the laboratory to sub-natural background levels. Since this location occurs inside of the laboratory, the effect on the public and the environment would be minimal.

Public Involvement

Public Participation and access to information regarding the proposed PRL and this EA were achieved through public notices, a public meeting, a request for public comments, and a public comment period.

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ACRONYMS, ABBREVIATIONS, AND TERMS

(Continued)

POC	Point of Contact	SWDA	Solid Waste Disposal Authority
PSD	Prevention of Significant Deterioration	TCE	Trichloroethene
RCRA	Resource Conservation and Recovery Act	TD40	Propulsion Research Department
RI/FS	Remedial Investigation/Feasibility Study	TMDL	Total Maximum Daily Load
RMP	Risk Management Plan	TNT	Trinitrotoluene
ROW	Right of Way	TPQ	Threshold planning quantity
RSA	Redstone Arsenal	TRI	Toxic Chemical Release Inventory
Pb	lead	TSCA	Toxic Substances Control Act
ppm	parts per million	TVA	Tennessee Valley Authority
POTW	publicly owned treatment works	TSDF	Treatment, storage, and disposal facility
PRL	Propulsion Research Laboratory	USDA	U.S. Department of Agriculture
psi	Pounds per Square Inch	USGS	U.S. Geological Survey
SAA	Satellite accumulation area	UST	Underground storage tank
SASZ	Southern Appalachian Seismic Zone	UXO	Unexploded ordnance
SID	State Indirect Discharge	WTP	Water Treatment Plant
SIPs	State Implementation Plans	V	volt
SHPO	State Historic Preservation Office	VOC	volatile organic compound
SO ₂	Sulfur dioxide		

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC) proposes to construct and operate the Propulsion Research Laboratory facility at MSFC near Huntsville, Alabama to support research of sub-scale advanced propulsion technologies. MSFC leads major propulsion programs such as Space Shuttle Propulsion, Space Launch Initiative, Third Generation Systems, and In-space Propulsion. As NASA's Center of Excellence for space propulsion, MSFC's goals are:

- To develop and maintain NASA's pre-eminence in propulsion; and
- To lead the research and development of space transportation technologies and systems.

It is proposed that construction of the facility would begin in 2002 and the operation of the facility would commence in 2004.

This environmental assessment (EA), prepared in accordance with the National Environmental Policy Act (NEPA), presents the results of an environmental analysis of the proposed construction and operation of the Propulsion Research Laboratory.

1.1 PROPOSED ACTION

The proposed action is to initiate research of sub-scale advanced propulsion technologies at MSFC, Alabama by constructing and operating a centralized facility for all MSFC propulsion research areas. Propulsion technology support for the Advanced Space Transportation Program is comprised of development and research testing of new and advanced sub-scale engines, devices, and components that promote improved reliability, performance, and cost reduction. The initial construction and operation of the proposed propulsion research facility, as well as the potential for future capabilities, is covered in this environmental assessment and described in Section 2.3.

1.2 NEED AND OBJECTIVES FOR THE PROPULSION RESEARCH LABORATORY

The needs and the objectives of the Propulsion Research Laboratory (PRL) are:

- To support NASA in advanced propulsion research, the Advanced Space Transportation Program operating at MSFC in the research of alternative methods to access earth orbit, beyond earth orbit, and to promote improved reliability, performance, and cost reduction.
- Current facilities do not meet the current research needs and are limited in their size and functionality. MSFC needs a state-of-the-art facility to foster this advanced research and to facilitate the research reaching its maximum potential.
- The existing laboratories are scattered in several buildings at MSFC. A centralized facility is needed to facilitate communication and technology transfer among researchers, sharing expensive special test equipment, and to provide an environment where synergism among different advanced technologies can be explored and used to expedite development.

- **Energy Requirements** – Potential increase in energy requirements must also be considered. A substation would be constructed at the PRL site with flexibility to add more power in the future.
- **Air Quality** - The potential increase in air emissions due to the consolidation of the research laboratories is assessed.
- **Noise** - The potential increase in noise producing activities is studied.
- **Radiation** – Four proposed research areas would have ionizing radiation sources to address. Some research areas would require shielding for radiation protection. Additionally, the potential transportation of antimatter would have to be addressed.
- **Explosion Hazards** – The potential for explosion hazards from handling of explosives and mixing of chemicals are analyzed.
- **Hazardous Materials and Waste** - Each laboratory and research area is examined to determine if there would be hazardous materials stored or hazardous wastes created. Local sumps are being proposed for the collection of spilled materials for each laboratory.
- **Geology and Soils** – A description of the geologic environment of MSFC including stratigraphy, structure, soils, and mining activities is included. The potential for encountering schedules is addressed.
- **Biological Resources** – The potential impact to the biological environment is assessed, including terrestrial and aquatic systems, wetlands, and threatened and endangered species.
- **Cultural Resources** – The potential impact to archeological and historical cultural resources is evaluated. An archeological survey of the entire 21-acre proposed PRL site was conducted.
- **Health and Safety** – Potential health and safety concerns during construction and operation of the PRL are analyzed, including explosive and radiation safety.
- **Sociological Environment** – The potential for the PRL to impact: the population and employment; economic development; Native American concerns; quality of life; public safety; and environmental justice is assessed.
- **Cumulative Effects** – Effects likely to occur due to the proposed PRL in combination with other past, present, and reasonably foreseeable future actions are analyzed.

1.4 DECISIONS

1.4.1 Siting Decision

MSFC is the lead Center for Space Transportation and the Center of Excellence in Space Propulsion. A major role for MSFC is to lead the Agency in research of advanced earth-to-orbit and in-space propulsion technologies and systems. The facilities proposed for construction

- **Ease of Communications** - The distance from each of the three proposed sites to MSFC's communications building was measured;
- **Ease of Future Expansion** - Each site was studied to determine its' versatility for ease of future expansion by looking at surrounding land availability and land geometry;
- **Hazard Separation (radiation/hazard shielding)** - Each proposed location was also evaluated based on its distance from other facilities from a standpoint of hazard separation;
- **Emergency Response** - Emergency response consisted of determining each sites distance from emergency facilities and ease of site access;
- **Emergency Control** - Ease of site access and control were evaluated for each of the three sites;
- **Proximity to New Bypass** - This screening factor considered the proximity of each site to the proposed Southern Bypass and the associated access ramps;
- **Onsite Accessibility** - Onsite accessibility was considered including site layout and site geometry;
- **Offsite Accessibility** - Road access and distance to main gates of the arsenal were investigated for each of the three sites;
- **Floodplain** - For this screening factor, a map of floodplain locations at MSFC was reviewed to determine if any of the three sites were located within or near a floodplain;
- **Visual Setting** - To determine which of the proposed locations had the best visual setting, the topography, adjacent land, and ease of designing a pleasing layout were rated for each site;
- **Proximity to Existing Lab** - The proximity or distance from each of the three proposed locations to the existing labs was evaluated;
- **Design Cost** - This screening factor was comprised of a qualitative assessment of design difficulties that could be encountered due to site conditions; and
- **Construction Cost** - For this screening factor, a qualitative assessment of construction difficulties that could occur at any of the three locations based on site conditions was conducted.

Site 2 was not selected as the proposed site for the new propulsion laboratory due to its site limitations. Site 2 is confined between two existing MSFC buildings. This limits future expansion capabilities and complicates site preparation as opposed to Sites 1 or 3, which do not have these constraints. Further, Site 2 does not allow for optimal hazard separation relative to Sites 1 or 3.

Site 3 was not selected for the new propulsion laboratory due to its distance from the center of MSFC operations. Of the three candidate sites, Site 3 is located the greatest distance from the central chiller plant, existing water supply and sewerage lines, existing electrical lines, and MSFC's communications building. This requires greater distances of pipe, conduit, and lines to be installed which increases construction costs. Further, Site 3 has the lowest potential for onsite accessibility when compared to Sites 1 or 2. Based upon analysis of the screening factors, Site 1 was proposed as the optimum location for the PRL. Site 1 has expansion capabilities, is close to existing MSFC utilities, and is easily accessible from the 4200 Complex.

2.0 DESCRIPTION OF THE ALTERNATIVES

2.1 INTRODUCTION

This section describes Alternative A: No Action and Alternative B: Construction and Operation of the PRL. Based on the information and analysis presented in Chapter 3, Affected Environment and Environmental Consequences, this section presents the environmental effects of both alternatives in summary form.

2.2 HISTORY AND PROCESS USED TO FORMULATE THE ALTERNATIVES

The Council on Environmental Quality (CEQ) Regulations require consideration of Alternative A: No Action. It provides an essential part of the baseline needed for the comparison of the effects in Section 2.5.

Alternative B: Construction and Operation of the Propulsion Research Laboratory is intended to meet the needs and objectives of the project, as described in Sections 1.2 Need for the Propulsion Research Laboratory and 1.3 Objectives of the Propulsion Research Laboratory.

2.3 DESCRIPTION OF PROPOSED ALTERNATIVES

Two alternatives were considered. These alternatives are described in the following sections.

2.3.1 Alternative A: No Action

In the No Action alternative, research activities at MSFC would continue without the benefits of the new PRL building and the purpose and needs identified in Section 1 would not be fulfilled. No new construction would occur and the current set up for laboratories would be maintained. Propulsion research would continue in four separate buildings (offices in Building 4203, existing Lab A – Building 4549, Lab B – Building 4566, and Lab C – Building 4655). Three buildings have been modified to function as laboratories and work areas but are not fully adequate in these roles. The facilities have minimal floor space, with limited power availability and limited environmental control capability. In addition, they provide no potential for growth. The proposed location for the new PRL would continue to function as pastureland. This alternative is considered feasible and, therefore, implementable and is analyzed in this environmental assessment.

The CEQ guidelines for implementing NEPA requirements recommend inclusion of the "No Action Alternative". The "No Action Alternative" provides a baseline against which the proposed action is evaluated.

2.3.2 Alternative B: Construction and Operation of the PRL at the Preferred Location

In the implementation of this alternative, the baseline phase would be constructed, the PRL operated, and the design would allow for future expansion. The proposed location is a 21-acre site at MSFC. Marshall Road North borders the site to the north, Neal Road to the south, and

Chemical Synthesis Laboratory

This laboratory would be used to synthesize chemicals to develop new propellants for improved propulsion performance. Laboratory space would have blast/overpressure (explosion) considerations.

Simulated Fission Research

This research would involve the non-nuclear testing of simulated nuclear fission thrust generation systems. This research would require up to 5 MW of electrical power to produce the amount of heat expected in small fission reactions.

Plasma Propulsion Research

This research would mainly focus on plasma propulsion technologies. The research areas would include field reverse configuration, fusion experiments, plasma stability and a pulse-type-powered thruster. Some Fusion experiments may also be conducted in this laboratory.

Propulsion Physics

This research would involve experiments to validate advanced physics for propulsion. One example of this research investigates utilizing the earth's magnetic field to move electrodynamic tethers.

Solar Laboratory

This research develops propulsion subsystems that use solar thermal energy to heat a propellant and produce thrust. Solar energy can also heat power conversion systems for propulsion.

Multipurpose Laboratory

The multipurpose laboratory has various dimensions to accommodate a variety of propulsion experiments (e.g. high-pressure combustion).

Core Function Areas

The remaining features of the initial phase are core function areas such as a central workshop area for activities including sawing, grinding, and welding; a central diagnostics laboratory with electric probes, cameras, and diagnostic equipment; an electronics shop for fabrication of circuits and electronics; a computer analysis laboratory; and a communications room.

2.3.2.2 Future PRL Expansion

Future expansion phases added to the baseline PRL design will be based on unique requirements determined by successful experiment results. The results would indicate a great potential to justify an expansion investment. The baseline PRL design accounts for possible future expansions from many locations of PRL, see Figure 2.3-1 PRL Proposed Site Layout Plan.

Table 2.5-2
Summary Comparison of Effects of Alternatives A & B on Resource Areas

Issues	Alternative A	Alternative B
Land Use	No effects	No effects – proposed use consistent with the current designated land use map approved by the MSFC Facility Utilization Review Board.
Water Supply	No effects	Minimal – would require addition of water connections, but capacity available for potable and industrial network.
Wastewater	No effects	Minimal – would require addition of sanitary sewer connections; however, existing network and treatment facility has adequate capacity.
Solid Wastes	No effects	Minimal – MSFC's solid waste generation would slightly increase; however, capacity is available.
Transportation	No effects	Minimal – it is anticipated that the number of trips would slightly increase on Morris Road; a southbound turn lane may be constructed to enhance traffic flow for MSFC personnel and tour buses.
Energy	No effects	Minimal – the electrical power systems have adequate electricity supply; a substation would be constructed on site at edge of floodplain.
Communication Lines	No effects	Minimal – would require the addition of communication lines; however, communication service is adequate.
Permits	No effects	Minimal – the existing NRC license will require amending and the Title V Air Permit will potentially require amending.
Air Quality	No effects	Minimal – would not impact the Title V status, nor NSPS or PSD requirements; dust would be suppressed during construction by water application.
Water Resources	No effects	Minimal – would institute stormwater management due to the increase in impermeable area; no effects would occur to groundwater quantity or quality or to the 100-year floodplain.
Geology	No effects	Minimal – stresses would be minimized on the subsurface; would minimally effect water table recharge and elevation.
Hazardous Materials and Hazardous Waste	No effects	Minimal – existing tracking and disposal procedures would be followed for hazardous materials and hazardous waste; however, the increased quantities would be minimal, existing management and reporting procedures and the Consolidated Environmental Response Plan would be updated.
Biological Resources	No effects	No effects – ecological value may increase due to landscaping undeveloped areas.
Cultural Resources	No effects	No effects - no intact cultural resources were discovered during the archeological survey. Structures in the vicinity of the proposed PRL are not anticipated to be determined eligible to the NRHP based on their architectural qualities. The proposed PRL project would therefore not result in adverse effects to these structures.
Health and Safety	No effects	Minimal – building design and material use limitations should address effects of explosive operations. Sources of radiation that will be in the PRL have been identified. However, impacts would be minimized by shielding, distance, and dose (measuring and monitoring).
Sociological	No effects	No effects – future experiments planned at the PRL will either meet the MSFC noise limits of the site location or be moved to the MSFC test area, which allows higher noise levels. Environmental justice, population, economics, Native American concerns, quality of life, or public safety not impacted.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This section describes the existing natural, cultural, manmade, and socioeconomic environment for the PRL. Baseline conditions are established and used to evaluate anticipated impacts from proposed actions. Potential impacts that could occur as a result of implementation of the proposed alternative are identified and evaluated. The environmental area of influence consists of the proposed project site and the surrounding property.

Information is presented in the following areas:

- Setting, including climate and land use;
- Facilities and Infrastructure, including water supply, wastewater treatment, transportation, utilities, and permits;
- Air Quality;
- Water Resources, including surface water, groundwater, and floodplains;
- Geology and Soils, including topography;
- Hazardous Materials and Hazardous Waste, including Radiation;
- Biological Resources, including Wetlands and Threatened and Endangered species;
- Cultural Resources;
- Health and Safety; and
- Sociological Development, including Population and Employment, Economic Development, Noise, and Environmental Justice.

The information concerning the existing environmental is presented in a brief concise format. For additional details, background, or more in-depth information, reference the Final Environmental Resource Document (Foster Wheeler, 2002).

3.2 SETTING

3.2.1 Affected Environment

This section contains a description of the geographical setting, location, climate, and land use within the proposed MSFC proposed PRL project area.

3.2.1.1 Geographic Setting and Location

MSFC is located in north-central Alabama (Figure 3.2-1) on approximately 1,841 acres of property within Redstone Arsenal (RSA). The irregularly shaped property is roughly 3 miles long on its north-south axis and 2 miles wide on its east-west axis.

Most of the property adjacent to MSFC is under the primary control of the Army. A substantial portion of RSA, including most of the lands to the south and west of MSFC, is a part of the Wheeler National Wildlife Refuge. Approximately 180 acres of the Wheeler National Wildlife Refuge extend onto property controlled by MSFC.

The proposed project site is located approximately 1,700 feet east of Building 4200. Figure 3.2-2 depicts the location of the project site at MSFC. Marshall Road North is on the project site's northern border, the MSFC/RSA boundary is the eastern border, Neal Road forms the southern border, and Morris Road is the western border. The site is approximately 21 acres in size and measures 800 feet (East/West) by 1,150 feet (North/South). The site is an open, grassy pasture and slopes slightly to the south by 1.2 percent. A fence runs along the boundary of the site (NASA, 2000).

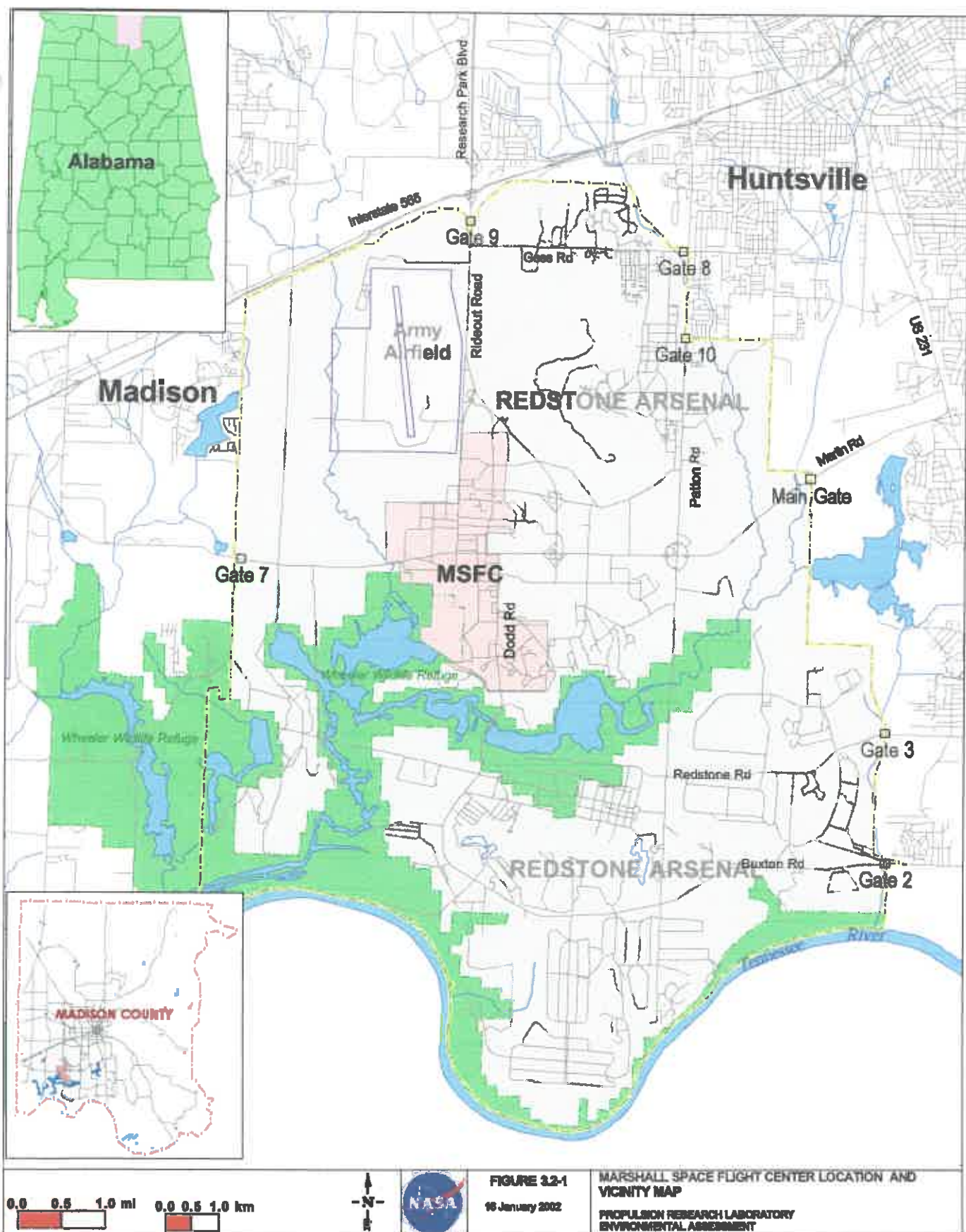
3.2.1.2 Climate

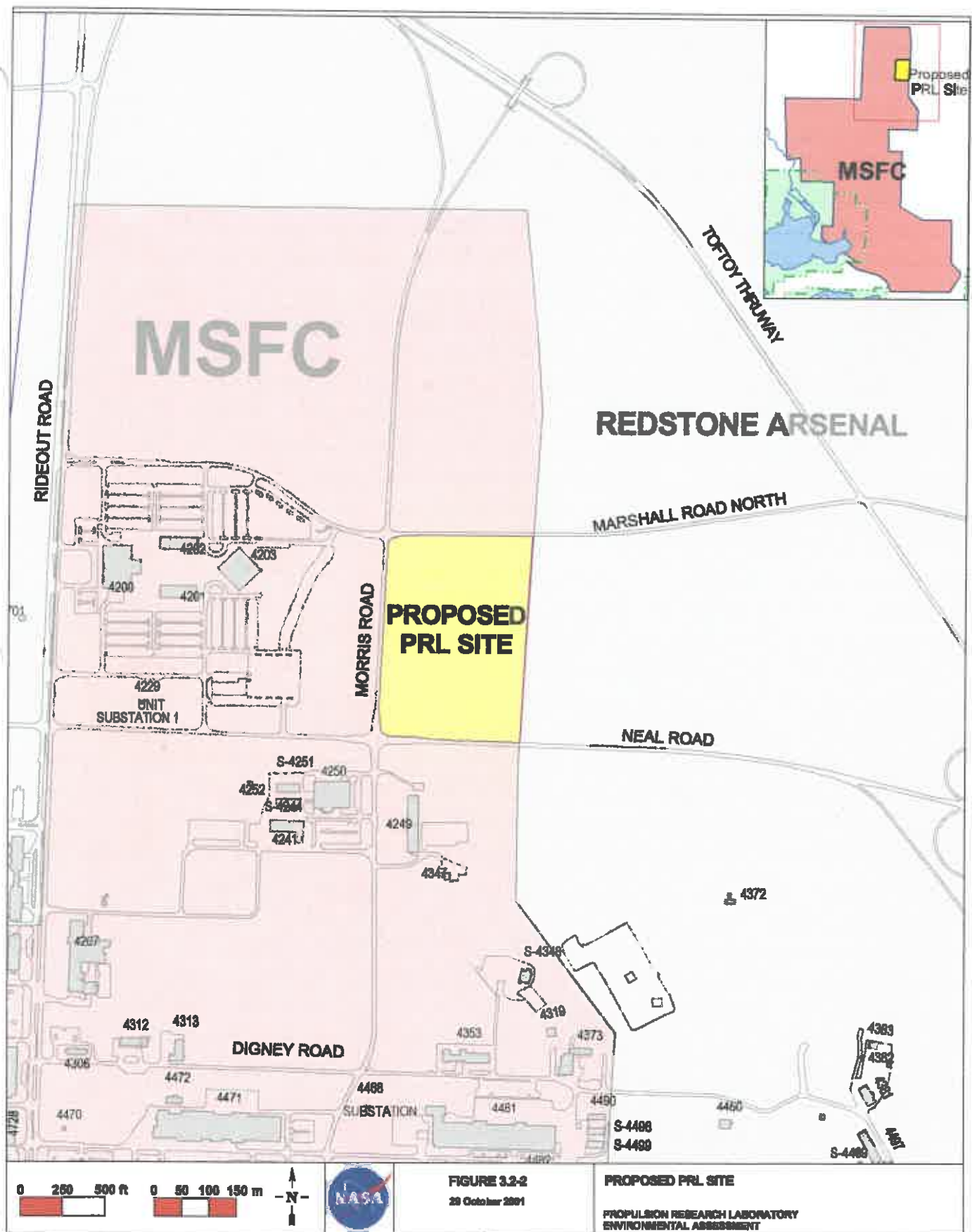
The Huntsville, Alabama area has a temperate climate. Summers are characterized by warm and humid weather, with frequent thunderstorms. Winters are usually cool, but vary considerably from one year to the next. The weather station closest to the City of Huntsville and MSFC is located in Birmingham, which is approximately 90 miles southwest of MSFC.

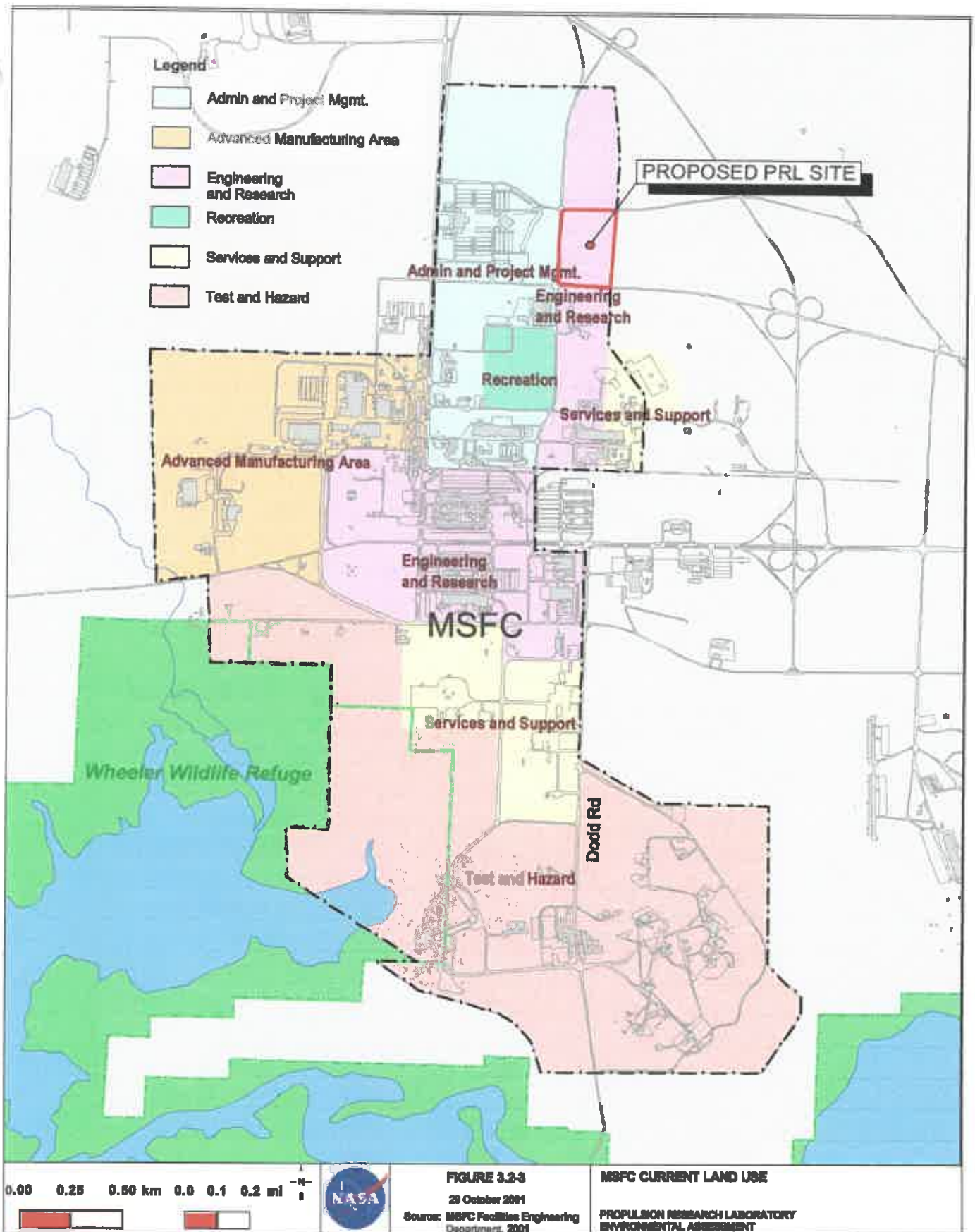
Detailed climatological information can be found in the Environmental Resource Document (Foster Wheeler, 2002)

3.2.1.3 Land Use

MSFC has prepared a new Current Land Use map that has been approved by the MSFC Facility Utilization Review Board (Figure 3.2-3). MSFC is currently in the process of updating the 1992 master plan, which will include the updated current land use map. The expected completion date of the new Master Plan is in 2002.







3.2.1.3.1 Interagency Coordination

MSFC is a tenant of Redstone Arsenal through a 99-year lease from the U.S. Army, dated July 1, 1960. NASA has irrevocable use and occupancy rights of the lands and facilities within MSFC. The U.S. Army, however, retains the right of access to all major utility lines, rail tracks, and main roads for applicable operations and maintenance.

3.2.1.3.2 Existing and Proposed Land Use

Existing and proposed land use for the project site and surrounding area is shown in Figure 3.2-3, which is consistent with the current land use map.

The 21-acre project site is designated as Engineering and Research. Past activity has been pasture for cattle grazing and a borrow pit. The five- to ten-foot drainage ditch that is east of the project site east boundary, and outside the boundary of MSFC, has served as a water source for the pasture.

The proposed PRL has a building footprint area of approximately 107,000 square feet. Features of the project include laboratories, offices and assembly rooms, central workshop and diagnostics room, and storage/mechanical/electrical.

3.2.2 Effects of Alternative A: No Action Alternative on the Setting

Implementation of Alternative A, the No Action Alternative, would not impact the geographical setting, climate, or land use designation.

3.2.3 Effects of Alternative B: Construction and Operation Alternative on the Setting

Implementation of Alternative B, the Construction and Operation Alternative, would not impact the geographical setting or climate.

No changes to the land use designation for the proposed project site, due to construction and operation of the PRL, would be required. As such, land use designation for the project would remain as Engineering and Research. Potential environmental consequences as a result of the development of the proposed project are anticipated to be minimal. Even though the project site is currently being used as pasture, this use is considered a permitted activity within the site's land use designation of Engineering and Research. In addition, Open Area to the east of the project site and MFSC is anticipated to remain the same. Currently, Open Area comprises 35 percent of the total 575 acres, which includes the project site.

The proposed PRL is consistent with master plan projected land use designations. The building footprint of the proposed PRL would comply with right-of-way (ROW) and building setback (BSB) requirements as applicable.

3.2.4 Mitigation

No mitigation is required.

3.3 FACILITIES AND INFRASTRUCTURE

3.3.1 Affected Environment

The following sections contain descriptions of MSFC facilities and infrastructure.

3.3.1.1 Water Supply and Fire Protection

RSA operates separate domestic and industrial water systems for the Arsenal and MSFC uses. The combined water supply system for MSFC is made up of 3 water treatment plants (WTPs No. 1, 2, and 3), 2 wells, 12 storage tanks, 3 booster pump stations, and approximately 237 (182 potable and 55 industrial) miles of piping. Water for MSFC is taken from the Tennessee River (Personal Communication with Jarad Jarvis, July 12, 2001). The total capacity is 9 million gallons of water per day (MGD) of potable water and 34 MGD of industrial water.

The Army provides 24-hour fire protection at MSFC under the Interservice Support Agreement (Department of the Army, 1998). RSA provides firefighting services with three manned fire stations and a fourth unmanned station located on the airfield. One station is located on Rideout Road, a second station is located on Vincent Road, and the third station is located on the intersection of Patton Road and Redstone Road.

Existing industrial water supply lines at the proposed PRL project area are a 14-inch industrial water main that runs along the northern boundary of the site next to Marshall Road North, a 36-inch industrial water line to the east that runs parallel with the MSFC and Redstone boundary, and a 36-inch industrial water line that runs parallel to Neal Road, approximately 280 feet south of the road. There is a 16-inch potable water line to the north of the site that runs along Morris Road across from the PRL site and on Arsenal property.

3.3.1.2 Wastewater Collection and Treatment

The general wastewater generated at MSFC consists of sanitary water, non-contact cooling water, discharge from laboratory sinks, floor drain discharges, cooling tower blowdown, boiler blowdown, photographic wastewaters, plating wastewaters, and oily waters from machining production.

3.3.1.2.1 Domestic Treatment

Domestic Treatment and Collection System 3 serves MSFC and the Aviation and Missile Command (AMCOM) located in the central portion of the Arsenal and will support the PRL. The sewers of System 3 consist of 6-inch to 18-inch-diameter gravity sewers, some of which are at least 40 years old. A manhole is located across from the southwest corner of the project site.

3.3.1.5 Utilities or Energy Resources

3.3.1.5.1 Electrical System

The electrical system at MSFC is supplied by RSA. The RSA electrical power system obtains power from the 161 kilovolts (kV), 3-phase transmission systems of the Tennessee Valley Authority (TVA). The proposed PRL project site does not currently have any electrical supply. However, a 4160 V electrical line is located to the South of the site and runs parallel to Neal Road.

3.3.1.5.2 Heating

The primary heating source for the PRL building will be boilers. Propane will be used for the energy source for the boilers. Two 12, 850-gallon aboveground storage tanks will be installed to store the propane.

3.3.1.6 Communication Lines

There are currently no communication lines serving the proposed PRL project site. The main communication building at MSFC is Building 4207. This building is located on Rideout Road and is one block south of Building 4200.

3.3.1.7 Permits and Regulatory Authorizations

MSFC currently holds several permits and licenses for the operation of facilities. Table 3.3-1 provides information about the existing environmental permits held by MSFC for its activities.

3.3.2 Effects of Alternative A: No Action Alternative on the Facilities and Infrastructure

Alternative A, the No Action Alternative, would not impact the facilities and infrastructure at MSFC. There would be no changes to the water supply, to the wastewater collection system, or solid waste collection and treatment at MSFC if Alternative A is implemented. The demand for water, volume of wastewater discharged, or volume of solid waste collected would not decrease or increase if Alternative A is selected. There would be no changes to roadways, highways, water traffic, utilities, or energy usage if Alternative A is implemented, and none of the current permits or licenses would need to be amended as a result of implementation of the no action alternative.

quantity and residual pressure for the fire protection systems. No more than 4 additional hydrants would be expected to be required, two hydrants in front and two hydrants in back of the building.

The new facility may have a minimal increase in the number of personnel, which could result in a slight increase of wastewater discharges. But, the percentage increase should not substantially affect the overall volume of wastewater discharged to the adjacent sanitary sewer main. The proposed system for the site includes a network of pipe and manholes to convey the wastewater from the building to the sanitary sewer main. The proposed sanitary sewer collection system for the building would be gravity with interior pit pumps only if necessary. The projected sanitary loading from the new building would be based on a sewage flow factor for an office building.

Since the PRL would be a new facility and a minimal increase in personnel at MSFC would occur, there could also be an increase in the volume of solid waste. However, the percentage increase would not substantially affect the overall volume of solid waste recycled, sent to the incinerator, or to the landfill by MSFC.

Some changes to the roads adjacent to the proposed PRL project site would occur if Alternate B were selected. Personnel from several different buildings (the existing laboratories) would be consolidated into one location. Traffic flow would increase along Morris Road since personnel would relocate to the new PRL facility. Public tours of the PRL would also cause an increase in traffic in these areas. There would be no effect on water transportation.

A new substation would be constructed in the southeast portion of the proposed PRL site to supply electricity for the building. It would be located at the edge of the 100-year floodplain. Two overhead electrical lines would cross Neal Road, connecting the proposed substation to a 4160-volt electrical line located south of and running parallel to Neal Road. One 7.5 MVA 46 kV to 12,470-volt transformer would be provided during the initial phase; however, provisions for future transformers and switches would be included in the new substation. The electrical lines connecting the main building to the substation would be run underground.

Propane will be used for the boilers that will heat the building. A communication line would be required at the PRL facility. The communication line would run from Building 4207, one block south of Building 4200, to the new PRL facility.

Construction and operation of the proposed Propulsion Research Laboratory will have little or no effect on the Nuclear Regulatory Commission (NRC) Materials License held by NASA and the George C. Marshall Space Flight Center.

Antimatter is particle-accelerator-produced and is not regulated by the NRC. Transportation of antimatter will comply with DOT requirements for materials that emit ionizing radiation. The NRC also does not regulate the x-rays such as those that will be generated in the Beamed Energy Research Laboratory. However, federal radiation dose limitations and monitoring requirements that do apply will be followed.

Calibration sources to be used will be regulated by the state and the NRC. Amendment of the license might be required if the type and form of the radioactive material to be used is not already listed in sections 6 and 7 of the license, and the sources may also cause the maximums in section 8 to be exceeded. The license also specifies that licensed materials must only be used by

3.4 AIR QUALITY

3.4.1 Affected Environment

3.4.1.1 Regulatory Environment

Air quality for MSFC is regulated under Federal and State regulations. Presented are the air quality regulations applicable for MSFC.

3.4.1.1.1 Federal Regulations:

- Title 40 CFR 50 (National Ambient Air Quality Standards [NAAQS]);
- Title 40 CFR 51 (Implementation Plans);
- Title 40 CFR 52 (Prevention of Significant Deterioration);
- Title 40 CFR 61 and 63 (National Emission Standards for Hazardous Air Pollutants [NESHAPs]);
- Title 40 CFR 70 (Operating Permits); and
- Title 40 CFR 82 (Protection of Stratospheric Ozone).

Section 3.0 of the Environmental Resource Document (Foster Wheeler, 2002) provides a brief description of each of these regulations.

3.4.1.1.2 State Regulations

Under the State of Alabama's SIP, the State of Alabama becomes the regulatory authority and administers NAAQS, NESHAPS and Title V air quality regulations under the ADEM Administrative Code Chapter 335-3 et seq.

3.4.1.2 Affected And/Or Sensitive Populations And Areas

Populations potentially affected by MSFC operations, including the PRL, would be those populations in residential housing located on Redstone Arsenal property and public dwellings located to the west of Redstone Arsenal. These populations are located an average 2.5 miles from MSFC and the proposed activity. Sensitive populations and areas in the area of MSFC include a day care facility located in MSFC boundaries, Sipsey National Wildlife Refuge located 42 miles southwest of MSFC, and Wheeler National Wildlife Refuge located to the south west of MSFC at approximately 4 miles.

3.4.1.3 Title V Permit and Description of Emissions

MSFC is considered a major source under Title V requirements. The existing Title V Application, dated February 1997, was indicated as being current to reflect existing center

Therefore, it would be anticipated that the PRL operations would be considered as "laboratories" under the same definition as existing laboratories on site and would be designated as "insignificant" activities under the Title V permit. The PRL operations, listed as such, would not impact the Title V status of the facility, current facilities emissions nor trigger NSPS or PSD requirements. As long as PRL operations do not produce emissions of the criteria pollutants or any of the 188 hazardous air pollutants above regulatory standards, this assessment of the effect of Alternative B would be accurate.

Currently, there are three planned storage tanks for the site. As long as additional tanks do not contain the chemicals and quantities listed in 40 CFR Part 68, Section 112 of the CAA will not apply and a Risk Management Plan will not be required.

3.4.4 Mitigation

Necessary mitigation measures include addressing fugitive dust emissions from the construction activity. According to the engineering study, dust control would be accomplished through the application of water to all areas subject to dust generation during the construction activity. Other mitigation measures to consider include: limiting chemicals and quantities to those below regulatory thresholds, limiting addition of operations to the PRL that would change the status of the PRL, and avoiding storage tanks of size and content that would require a risk management plan.

3.5 WATER RESOURCES

This section contains a description of the water resources associated with the proposed PRL Project area.

3.5.1 Affected Environment

The environment affected by the proposed PRL project lies in and around the MSFC property within RSA, which is located in Madison County in north-central Alabama. For additional information, please reference Section 4.0 of the Environmental Resource Document (Foster Wheeler, 2002).

3.5.1.1 Physiography and Surface Drainage

MSFC's topography is gently rolling, with elevations ranging from 560 to 650 feet above mean sea level (ft msl). MSFC is mostly covered by soils of the Decatur-Cumberland-Abernathy Association. These soils are generally well-drained, red, fertile, silty clays, silt clay loams, and silt loams that are typically associated with level to gently rolling terrain.

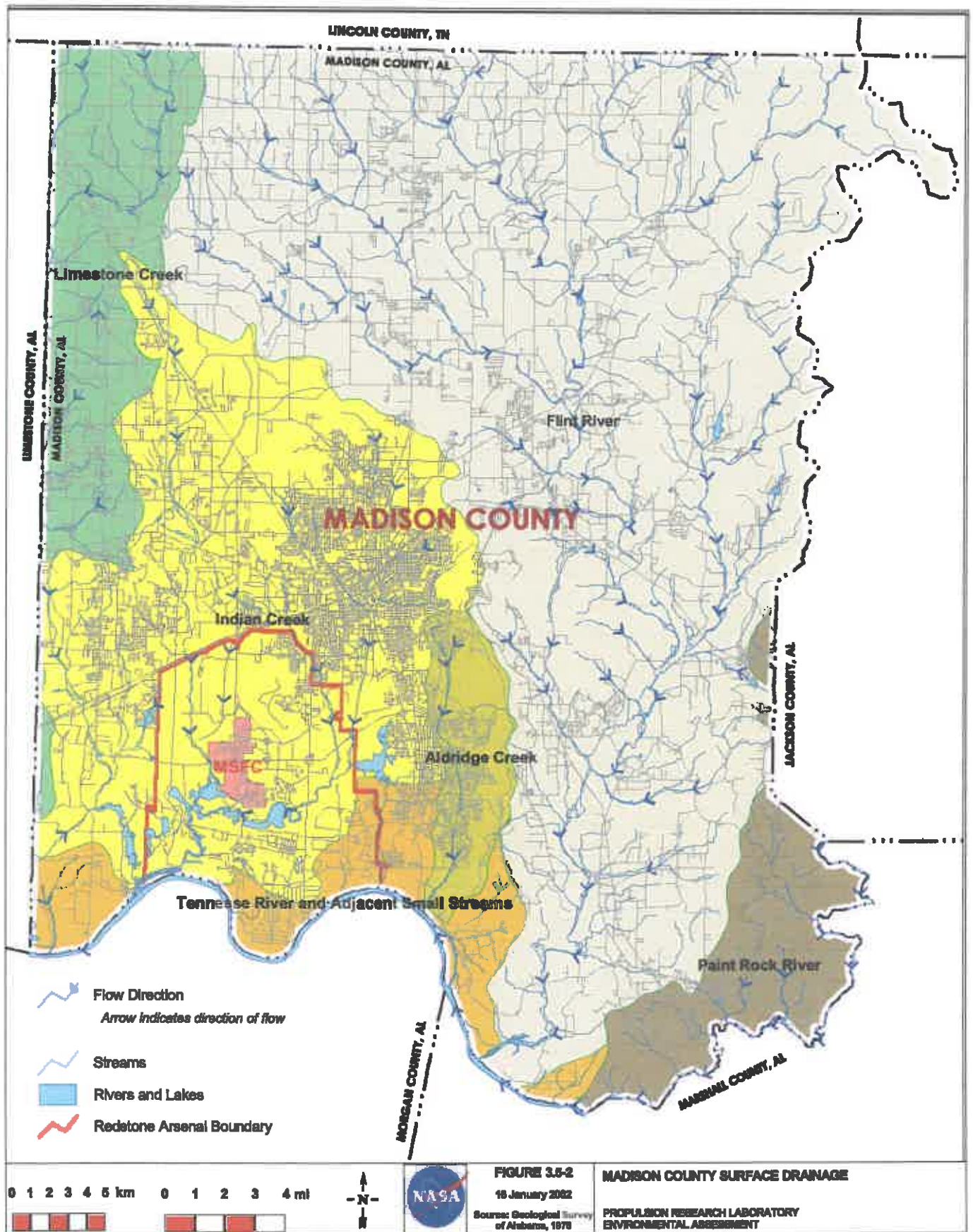
The site is currently open, grassy, pastureland with no adult trees. There is a thick stand of trees running along a natural drainage course on the east boundary of the site. An area indicated as a wetland is located along the tree line. There does not appear to be any wet or marshy land within the designated area. The site topography is generally flat, with a gentle drop of approximately 14 feet from north to south. The natural topography diverts drainage to the southwest area of the proposed site (Figure 3.5-1)

3.5.1.2 Surface Water

MSFC is located in the Wheeler Lake watershed, Hydrologic Unit Code 06030002. MSFC and the PRL site are within the boundaries of the Indian Creek Drainage Basin (Figure 3.5-2 Madison County Surface Drainage). Indian Creek originates in the northwestern portion of Madison County and flows southward across RSA before merging with Huntsville Spring Branch and discharging to the Tennessee River at Wheeler Lake. MSFC discharges approximately 2.5 MGD, primarily non-contact cooling water and storm water, into Indian Creek.

3.5.1.3 Surface Water Quality

The Tennessee River is a 303(d) listed water, but has low priority for development of TMDLs for its parameters of concern: pH and thermal modifications. Huntsville Spring Branch is a 303(d) listed water for metals and priority organics as parameters of concern. However, its priority for TMDL development is also low.



3.5.1.4 Stormwater

In accordance with the Federal Water Pollution Control Act, the Alabama Water Pollution Control Act, and the Alabama Environmental Management Act, MSFC has an NPDES Stormwater Permit (No. AL0000221). This permit application covers 27 outfalls including a permitted outfall from the new PRL facility, DSN-033. Figure 3.5-3 shows the location of the permitted outfall from the PRL site.

3.5.1.5 Floodplains

Most of MSFC is situated above the 100-year floodplain. Only the extreme southeastern portion of the proposed PRL site lies within the 100-year floodplain (½ acre), as shown on Figure 3.5-3 PRL Site Floodplain Map. The area of the site that is within the floodplain will not be developed. The only planned change to the southeastern portion is the addition of the detention basin.

3.5.1.6 Groundwater

Within the Lower Tennessee River Basin, groundwater is an important source of drinking water in rural areas and for small public supply systems, although the City of Huntsville, RSA, and MSFC obtain their water from surface sources.. The Tuscumbia-Fort Payne aquifer is the primary aquifer in the region for water supply. The general direction of groundwater flow is south toward the Tennessee River. Groundwater from the Tuscumbia-Fort Payne aquifer beneath MSFC discharges to several surface water features in the vicinity of RSA and MSFC. Groundwater discharges into Indian Creek on the west side of MSFC and discharges into Huntsville Spring Branch on the south and east sides of MSFC. These surface water features ultimately discharge to Wheeler Lake and the Tennessee River.

3.5.1.7 Groundwater Quality

Five major plumes of groundwater contaminated with chlorinated volatile organic compounds (CVOCs) were identified during the Remedial Investigation (RI) at MSFC. The Northeast Plume (located in the Building 4400 area) is closest to the proposed PRL site. The southernmost edge of the PRL site is approximately 1000 feet north of the northern edge of the Northeast Plume.

In 1996, MSFC performed a multimedia background sampling program in support of the RI/FS effort. Two monitoring wells were located near the northern boundary of the proposed PRL site (on the south side of Marshall Road North). Both wells were tested for numerous organic parameters, all of which were not detected.

3.5.2 Effects of Alternative A: No Action Alternative on Water Resources

If Alternative A is implemented, no effect on water resources would occur. The proposed site would continue to function as pastureland. The natural topography would continue to divert drainage to the southwest area of the site.

3.5.3 Effects of Alternative B: Construction and Operation Alternative on Water Resources

If Alternative B were implemented, the effects on water resources would be minimal. No positive or negative measurable effects would occur to groundwater quantity or quality or to the 100-year floodplain. Minimal effects on surface drainage and surface water would be expected due to an increase in impermeable areas.

Based on the FEMA 100-year floodplain delineation, less than 2% of the proposed PRL site falls within the 100-year floodplain, and this portion does not include any buildings. The only planned change to the southeastern portion is the addition of the detention basin. Therefore, no floodplain-related building restrictions would be expected. If building locations and/or floodplain delineations are updated, the effects would have to be reevaluated.

An NPDES stormwater construction permit would be required for the PRL site prior to beginning construction. During construction of the new PRL facility, the site would have exposed areas of soil that would be susceptible to erosion. To prevent soil and sediment from leaving the site, erosion controls would be used where necessary. The installation of the new facility would require stormwater management due to the increase in impermeable area from the building roof, drives, parking areas, and sidewalks. Curbing would be limited to main travel areas and along the east side of the rear drive to minimize the requirement for stormwater collection structures and handicap ramps, and to control any flows which would spill into adjacent wetland areas. Once construction of the PRL is complete and operation begins, a new stormwater outfall would be required.

MSFC currently operates under National Pollutant Discharge Elimination System (NPDES) permit number AL0000221. The permit covers 21 outfalls, encompassing both process and storm waters. MSFC applied to permit the new outfall at the PRL as part of the permit renewal process in February 2001. No process discharges of any type are planned for this area and it is expected that the drainage pattern would not be significantly altered following construction. Therefore, no treatment was proposed for discharges at the outfall. The monitoring requirements for this new outfall, DSN0033, would be effective only after the termination of the NPDES construction permit. At the time of the application, the site drainage plan was not complete, but it was expected that the drainage pattern would not be significantly altered following construction. Therefore, no changes to the 100-year floodplain would be anticipated.

According to the application, a total basin area of 43.9 acres was anticipated for DSN 033, with 22 acres of onsite basin area. The onsite impervious area was estimated to be 80 percent (35.1 acres). DSN 033 would be located at latitude 34° 39' 31" and longitude 86° 39' 41" and discharge to a tributary to Huntsville Spring Branch (which is a tributary to the Tennessee River).

3.5.4 Mitigation

Stormwater management would be designed to meet the standards of the City of Huntsville's Stormwater Management Manual for site development requirements. The initial concept method of detention would be short term detention. This involves shallow swales and a landscaped holding area that detains excess run-off and discharges it through a designed orifices-controlled

3.6 GEOLOGY AND SOILS

This section presents a general description of the geologic environment of the PRL site including stratigraphy, structure, soils, topography, and mining activities. Subsections describe the potential impacts to the geologic environment from the No Action Alternative, the Construction and Operation Alternative, and proposed mitigation of potential impacts.

3.6.1 Affected Environment

From a geologic perspective the tract of land where the PRL would be constructed, consists of exposed soils and sediments of weathered clay residuum which were derived from the Tusculumbia Limestone Formation deposited in the mid-Mississippian Age.

3.6.1.1 General

The geology of northern Alabama presents several potential hazards to site personnel's activities at MSFC. These hazards include sinkhole development and subsequent subsidence, seismic stresses due to potential earthquakes along ancient faults, and radon gas formed by the decay of naturally occurring radioactive materials present in subsurface rock formations.

A Preliminary Geotechnical Engineering Study of the proposed site was conducted by OMI, Inc. (OMI, 2001). The borings did not encounter any subsurface voids or other evidence of sinkholes. In addition, nine surface resistivity transects were conducted across the proposed site for the PRL and these transects did not reveal any evidence of subsurface void spaces or sinkholes.

MSFC is located in an area of northern Alabama which is within the New Madrid Seismic Zone (NMSZ) and the Southern Appalachian Seismic Zone (SASZ). The Geological Society of Alabama (GSA) reports that there were 118 known earthquakes with epicenters in Alabama as of May 1998 (GSA, 2001). Earthquakes recorded near MSFC had intensities between V and VI and magnitudes between 2.0 and 3.0 (GSA, 2001). According to the United States Geological Survey a magnitude VI earthquake would be "Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight." (USGS, 2001).

"Radon is a radioactive, colorless, odorless, tasteless gas produced by the natural breakdown of uranium in soil and rocks" (GSA, 2001). MSFC is located in a portion of Alabama which is classified as having a high potential for the formation of radon gas. Where the soil is capped by parking lots and building foundations it can accumulate in higher concentrations and migrate laterally along disturbed areas or channels (such as utility ducts) where it may enter building through slab penetrations. Proper building ventilation would usually eliminate the potential for radon gas accumulation inside structures.

3.6.1.2 Soils

The predominant soil associations found at the site of the proposed PRL fall into the Decatur-Cumberland-Abernathy and the Hermitge-Talbot-Colbert associations. Soils in the Decatur-

Although, the PRL facility is not below grade, it is still recommended that adequate ventilation be maintained in the completed buildings to reduce the potential for a buildup of radon gas which can occur in tightly sealed buildings without adequate outside air exchange. The design of the building should include careful inspection to ensure that any slab or foundation penetrations are carefully sealed to prevent pathways for the migration of radon gas from being created during construction. In addition, inexpensive testing mechanisms could be employed after construction of the structures to assess the potential for radon gas within the work areas.

Although, the likelihood is small, the potential for the occurrence of seismic events should be considered. The consideration of seismic stresses in the buildings design would provide a safe work environment and protect the research facilities which would be housed in the completed structure(s).

3.7 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

3.7.1 Affected Environment

3.7.1.1 Hazardous Materials

To support the research mission of the center, a variety of hazardous materials are used at MSFC. Specific materials have been declared hazardous through federal listing such as extremely hazardous substances (EHSs) (listed in 40 CFR 355), those listed as hazardous if released under CERCLA in 40 CFR 302.4, and by definition of hazardous chemicals by Occupational Safety and Health Act (OSHA) (29 CFR 1910.1200). In addition to these chemicals defined as hazardous, pesticides and sources of radiation also are regulated.

So that the appropriate state and local emergency planners are provided with the necessary information, Sections 311 and 312 of Environmental Protection Community Right-to-Know Act (EPCRA) require any user to submit a report, known as a Tier II, annually for any substance that is present onsite at the facility in the following amounts:

- Greater than or equal to 10,000 pounds at any one time for a hazardous chemical; and
- Greater than or equal to 500 pounds or the threshold planning quantity (TPQ), whichever is less, at any time, for EHSs.

Note that any hazardous chemical required to have a Material Safety Data Sheet (MSDS) is included in the threshold calculation.

3.7.1.2 Hazardous Waste

MSFC, through its research and mission support activities, generates a variety of waste streams. Federal regulations addressing hazardous waste are contained in 40 CFR Parts 260 to 279. These regulations are a result of Subtitle C of RCRA. Subtitle C establishes a program to track a hazardous waste from generation to storage to transportation to disposal.

ADEM Administrative Code 334-14 contains regulations regarding state planning and the storage, collection, transportation, separation, processing, recycling, and disposal of solid wastes, including hazardous wastes. The Alabama Administrative Code for ADEM contains rules governing the permitting and operation of resource recovery facilities and for the treatment and disposal of solid wastes. Division 14 of the code contains regulations pertaining to hazardous wastes.

Special wastes are those wastes that require different processing, handling or disposal techniques as determined by ADEM. These wastes do not meet the criteria to be considered and treated as hazardous waste. Special waste generated at MSFC include asbestos, medical waste, soil and water contaminated from the cleanup of spills, and industrial waste. ADEM regulates the management and disposal of special wastes in 335-13-4-.26. Medical waste is specifically addressed in Chapter 335-13-7 of the code.

3.7.2 Effects of Alternative A: No Action Alternative on Hazardous Materials and Hazardous Waste

Selection of Alternative A, the No Action Alternative would have no impact on Hazardous Materials or Hazardous Waste.

3.7.3 Effects of Alternative B: Construction and Operation Alternative on Hazardous Materials and Hazardous Waste

3.7.3.1 Hazardous Materials

If Alternative B is selected, there would be minimal effects on Hazardous Materials at MSFC. During construction of the PRL, hazardous materials expected to be used are those typically associated with construction sites (e.g. gasoline, oil, paint, paint thinner). But, the quantities of hazardous materials that will be used during construction of the PRL are not anticipated to require the addition of any new chemicals to the Tier II Report.

Table 3.7-1 lists the chemicals and their reportable quantities that are expected to be used during operation of the PRL. Those chemicals used at the PRL that meet the Tier II reporting requirements would be added to the annual report. MSFC would continue to follow their procedures currently in place for tracking and reporting these chemicals. Some additional pesticide usage may occur if Alternative B is selected in order to maintain the grounds.

3.7.3.2 Hazardous Waste

If Alternative B is selected, the chemicals listed in Table 3.7-1 may require disposal as a hazardous waste. However, this would have minimal impact since MSFC is already a large quantity generator. MSFC would continue to follow the management and reporting procedures for tracking hazardous waste already in place. The only impact would be the tracking of additional hazardous wastes generated as a result of PRL activities.

3.7.3.2.1 Radioactive Waste Generation

Of the five laboratories proposed for the PRL with potential radiation sources, only two offer any potential for generation of radioactive waste. These laboratories are the Antimatter Research Laboratory and the Plasma Physics Laboratory. Experimental operations conducted in the Antimatter Research Laboratory will result in a small amount of activation of structural components associated with the confinement vessel and other research materials/vessels. However, simulations of radiation yields and comparisons with other facilities indicate that activation will be at a very low level. Therefore, it is assumed that no special provisions need to be made for routine disposal of radioactive waste.

The Plasma Physics Laboratory offers the higher probability for generation of radioactive waste during operations and facility decommissioning. Information that allows for a limited assessment of the generation rate of radioactive waste both during operations and decommissioning can be found in M.H. Chew & Associates, Inc. (Chew 2001), where it was concluded that it is not anticipated that there will be a significant building or activation products and that no special provisions should be required for routine waste management.

Decontamination and decommissioning (D&D) activities offer the greatest potential for generation of radioactive waste. Some factors affecting waste volumes include: fusion vessel size and composition, duration of operations, timing of D&D activities (allowance for in-situ radioactive decay), size and location of support equipment that may be potentially activated during operations, duration of D&D activities, and number of D&D personnel.

Current radioactive waste generation rates at MSFC approximates 37 cubic feet per year, primarily from laboratory wastes such as paper wipes, gloves, and liquid scintillation vials. It is estimated that operations of the Antimatter Research Laboratory and deuterium operations of the Plasma Physics Facility would not significantly add to the current waste generation rate. It is estimated that tritium operations at the Plasma Physics Facility may double or triple the generation rate of radioactive waste. This increase would have little impact on the total amount of radioactive waste shipments from the facility, and would have a negligible impact on radioactive waste inventories currently found at operational radioactive waste landfills.

D&D operations have the greatest potential impact on radioactive waste generation rates. Unfortunately, unknowns associated with facility design and operations preclude estimating a precise volume. However, it can be reasonably assumed that the total waste volume would have a negligible impact on radioactive waste inventories currently found at operational radioactive waste landfills.

Radioactive waste volumes resulting from operations and D&D activities represents an insignificant risk for the environment, off-site personnel, and on-site personnel.

3.7.3.2.2 Special Wastes

Selection of Alternative B would not generate or require additional management of special wastes.

3.7.3.3 Contaminated Areas

The proposed PRL site is located North of all contaminated areas. Selection of Alternative B, would not impact on investigative or remedial activities at MSFC's OUs.

3.7.3.4 Asbestos, PCBs, UXO

Selection of Alternative B would not require the use of asbestos, PCBs, or ordnance.

3.8 BIOLOGICAL RESOURCES

3.8.1 Affected Environment

3.8.1.1 Terrestrial Systems

Setting -The proposed site is situated immediately east of the MSFC 4200 Complex. It is bordered on the north, west, and south sides by two lane service roads and on the east by pastureland associated with Redstone Arsenal. Pastureland also occurs to the south and north of the site. Pastureland occurs to the northwest of the PRL site (Figure 3.8-1).

Vegetation Cover -The site consists of unimproved pasture. There is no canopy, middlestory, or shrub-layer present. The ground cover is dominated by varieties of grasses and other herbaceous plants. The amount of organic litter present is minimal, as is the soil organic layer.

Wildlife Usage - Minimal wildlife usage was noted during site visits during August 2001 by project ecologist staff and minimal usage would be expected because of the disturbance by cattle and limited vegetation ground cover (Figure 3.8-2). During site inspections, the only wildlife noted included the eastern kingbird, song sparrow, eastern bluebird, mourning dove, and barn swallow.

3.8.1.2 Wetland and Aquatic Systems

No wetland or aquatic systems occur on the site. The PRL site is an open pasture with neither active drainage channels, hydrophytic vegetation, nor wetland soils. A site visit was conducted to evaluate the vegetation cover and potential for wetland soils. Neither were seen. Additionally, a portion of the site has been excavated for fill material. Soils in that portion were even more sterile in terms of lack of organic material than the remainder of the site. No wetland hydrological indicators such as periphyton, silted clay sediments, moist to wet soils, etc. were observed. The nearest wetland and aquatic habitat is a pair of narrow intermittent streams located east of the site. These streams have steep slopes and have been impacted by grazing cattle. Minimal wildlife usage was noted in this area during site visits and minimal usage would be expected because of the small size of the stream system and disturbance by cattle.

3.8.1.3 Threatened and Endangered Species

Table 3.8-1 identifies threatened and endangered species that potentially occur in the MSFC area. Species in this list are formally identified as requiring protection by the U.S. Fish and Wildlife Service (FWS) and the State of Alabama. The State of Alabama offers special protection to threatened and endangered animal species but not plant species whereas the FWS provides protected status for both types of organisms. None of these species identified in this exhibit are likely to nest or require ecological resources that exist at the PRL site. Some species may migrate through the PRL site area but their residence time would be minimal because of the limited food and cover resources present.



Description: View from Northwest to Southeast, an overview of the site.
Figure 3.8-1 Overview of Site



Description: Looking South from Marshall Road, vegetation cover around the eastern border.
Figure 3.8-2 Vegetation Cover

Table 3.8-1
Protected Animal and Plant Species Potentially Occurring at MSFC PRL

Common Name	Scientific Name	Habitat	Federal Status	State Rank/ State Status	Site Status
Birds					
merlin	<i>Falco columbarius</i>	requires open deciduous woodland or cliffs for nesting; hunts in open areas		SP	Marginal feeding habitat present
southeastern kestrel	<i>Falco sparverius paulus</i>	open grassy areas; requires boxes or cavities for nesting		S3B, S5N	Marginal feeding habitat present
Plants					
fleshy-fruit glade cress	<i>Leavenworthia crassa</i> var. <i>crassa</i>	dry open places	C	S1	Detection period April.
pasture glade cress	<i>Leavenworthia exigua</i> var. <i>lutea</i>	dry open places		S1	Detection period April.
short-styled glade cress	<i>Leavenworthia alabamica</i> var. <i>brachystyla</i>	dry open places		S2	Detection period April.

Source: *Alabama Natural Heritage Program, 2001.*

Notes: 1 This list will change if species are extirpated or extinct.

2 Highlighted species have the greatest potential to occur on MSFC because of habitat suitability.

Key

FEDERAL – United States Fish and Wildlife Service

E A species that is in danger of extinction throughout all or a significant part of its range, other than a species of the Class Insecta determined by the Secretary (of the Department of Interior) to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to man.

T Any species that is likely to become (threatened) an endangered species within the foreseeable future throughout all or a significant portion of its range.

C Candidate species. Species is ready for proposal.

STATE-Alabama Natural Heritage Program

S1 Critically imperiled in Alabama because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from Alabama.

S2 Imperiled in Alabama because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from Alabama.

S3 Rare or uncommon in Alabama (on the order of 21 to 100 occurrences).

S5 Demonstrably secure in Alabama and essentially "inextinguishable" under present conditions.

SB Regularly occurring, migratory and present only during the breeding season. A rank of S3B indicates a species uncommon during the breeding season (spring/summer) in Alabama.

SN Regularly occurring, usually migratory and typically non-breeding species in Alabama. A rank of S2N or S5N indicates a rare breeder but a common winter resident.

STATE – Alabama Department of Conservation and Natural Resources

SP State Protected. Species with a state protected status are protected by the Nongame Species Regulation (Section 220-2.92, page 73-75) of the *Alabama Regulations for 1999-2000 on Game, Fish, and Fur Bearing Animals*. Copies of these regulations may be obtained from the Division of Wildlife & Freshwater Fisheries, Alabama Department of Conservation & Natural Resources, 64 North Union Street, Montgomery, AL 36104.

site area species populations. No important changes in ecological resource quality nor quantity would likely occur.

3.8.3 Effects of Alternative B: Construction and Operation Alternative on Biological Resources

The effect of PRL development and operation would result in no measurable negative or positive impact changes to site area species populations. No important changes in ecological resource quality nor quantity would likely occur. Minimal landscaping of the undeveloped portion of the site might slightly add to the ecological value of the facility by providing vegetation cover.

3.8.4 Mitigation

No mitigation for ecological resource impacts is needed because no important resources on or adjacent to the site are likely to be affected.

3.9 CULTURAL RESOURCES

The proposed PRL project area has elevations ranging from 612 feet to 624.8 feet above mean sea level. A triangular depression and steep machine-cut bank extend across the southwest corner of the site. A low mound north of the cut bank resulted from fill produced by borrow pit excavation. Most of the northern and eastern portions of the project area appear to have been undisturbed by recent construction of MSFC facilities. The entire project area might have been plowed for agricultural fields during historic times to depths ranging from 6 inches to 24 inches.

3.9.1 Affected Environment

3.9.1.1 Archeological Summary

Archeological resources within Madison County include more than 1100 recorded archeological sites, reflecting material and cultural evidence for prehistoric and historic Native Americans, historic Euro-Americans, African-Americans, and other ethnic groups. A survey of Alabama archeological site files includes records for 258 archeological sites within a 25 square-mile area (5 by 5 Sections surrounding T4S R1W Section 31) around MSFC, including the PRL project area (Office of Archeological Services site files). Archeological sites in this vicinity include 169 prehistoric archeological sites, 117 historical archeological sites and one site with an undetermined association. Note that 29 sites had both prehistoric and historic components. Few systematic archeological surveys have been completed on MSFC. The proposed PRL project area has not been surveyed for prehistoric or historic archeological sites. Archeological sensitivity of the project area, therefore, can only be determined from environmental analyses of reported archeological sites on the Redstone Arsenal and in analogous settings of Madison County in general.

A model for prehistoric site locations for MSFC was completed in 1996 (NASA, 1996). This study indicated that Decatur silt loam and Decatur silty clay loam were preferred locations for prehistoric archeological sites. Most prehistoric sites are located less than 1,200 feet from water sources. These environmental characteristics are similar to conditions at the PRL project area. In addition, University of Alabama Office of Archeological Services site files indicate that twelve prehistoric archeological sites have been identified within one mile of the PRL project area (B. Curry, personal communication, August 17, 2001). Therefore, the PRL project area is sensitive for prehistoric archeological sites.

On January 9-10, 2002, New South Associates conducted a Phase I Archeological Survey of the entire 21-acre proposed PRL Site. The purpose of the survey was to locate and evaluate any cultural resources that might be adversely impacted by the construction and operation of the PRL. The survey was conducted in accordance with, and in partial fulfillment of, the obligations of NASA under the National Historic Preservation Act of 1966 (as amended); the Archeological and Historic Preservation Act of 1975 (as amended); the National Environmental Policy Act of 1969; EO 11593; and the Native American Graves Protection and Repatriation Act of 1990.

The study of the PRL site involved three key components: background/documentary research, fieldwork, and reporting. Background/documentary research was conducted using the online

structures, probably farmsteads, were shown northwest of the highway, near the base of Madkin Mountain. No historic structures were shown in the PRL project area.

A series of Alabama Department of Transportation (ALDOT) maps are available since 1937 that document a great number of historic structures and former roadways on the present MSFC property. Rideout Road, west of the PRL project area, had become intensively settled by 1937. No historic structures occupied the area of the proposed PRL project area (ALDOT, 1937, 1948).

MSFC presently maintains four structures listed on the National Register of Historic Places (NRHP). These are the Redstone Test Stand, listed during 1976, and the Saturn V Dynamic Test Stand, the Neutral Buoyancy Space Simulator, and the Propulsion and Structural Test Facility, all listed during 1985 (National Register Information System 2001). Additionally, most of the other space-related buildings can be evaluated for eligibility to the NRHP, based on their historic and architectural contexts related to space exploration programs at MSFC.

3.9.1.3 Cultural/Historic Resource Management and Section 106 Coordination

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to take into account the effect of a proposed project on any cultural resources that are listed on or eligible for listing on the NRHP. Section 106 also affords the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking.

The proposed PRL project site was studied to evaluate potential effects on historic properties (i.e., cultural resources listed on, nominated to, or eligible for listing on the NRHP). These could include prehistoric or historic archeological sites, districts, buildings, structures, objects, and locations with traditional cultural value to Native Americans or other groups.

The area of potential effect for the proposed PRL project on archeological sites includes the laboratory construction footprint, staging areas, associated improved access roads, landscape grading, and construction areas associated with utility support that would be brought into the site. Background literature review indicated that the PRL project area has undergone some degree of site disturbance. The site has been used as a borrow pit. Most of the northern and eastern portions of the PRL project area might have been plow-disturbed from historic agriculture, although such disturbance would not preclude the potential of the area to contain undisturbed archeological resources. The amount of disturbance has not been documented by archeological testing. Undisturbed areas of the PRL project area have potential to contain prehistoric cultural resources that could be eligible for the NRHP. No historic structures and/or associated historic archeological sites were identified within the PRL project area, based on analyses of historic maps.

The area of potential effect on architectural and/or historic structures could include visual impacts on the landscape settings of adjacent structures. None of the structures surrounding the proposed PRL site have been identified as eligible for the NRHP.

A copy of the Archeological Survey was provided to the Alabama SHPO. MSFC also consulted with 22 Native American tribal groups about the PRL project.

3.10 HEALTH AND SAFETY

3.10.1 Affected Environment

Federal and state laws addressing environmental, worker, and public protection regulate operations at MSFC. Employee protection requirements at MSFC are determined by OSHA and applicable NASA standards. MSFC has an emergency plan (MM 1040.3F and revisions) that details the procedures to be followed in case of natural disasters and other emergencies. MSFC has an ongoing training program to ensure emergency preparedness. The regulations and procedures MSFC follows also address activities with chemical, explosive, and radiation hazards.

3.10.1.1 Chemical Hazards

Regulations and procedures addressing chemical hazards are covered in Section 3.7, Hazardous Materials and Hazardous Waste.

3.10.1.2 Explosive Hazards

MSFC follows agency guidelines, NASA Safety Standards for Explosives, Pyrotechnics, and Propellants (NSS 1740.12), to protect against explosive hazards. In case of explosion, MSFC will additionally initiate the procedures in MSFC's Emergency Plan (MPG 1040.3H).

3.10.1.3 Radiation Hazards

MSFC uses ionizing and non-ionizing radiation for research and other purposes. Table 3.10-1 lists the sources of radiation used currently at MSFC.

3.10.2 Effects of Alternative A: No Action on Health and Safety

Alternative A, the No Action Alternative, would have no measurable positive or negative effect on environmental or public health and safety.

3.10.3 Effects of Alternative B: Construction and Operation Alternative on Health and Safety

Alternative B would have minimal impact on public health and safety. To protect the public and employees during the construction and operation of the PRL, MSFC would conform to the industrial safety standards listed in Table 3.10-2. During construction and operation of the PRL, guarded gates located at the entrances to MSFC limit public access. During operations, visitors would be limited to the gallery. However, some special groups would be allowed beyond the lobby only when hazardous experiments are not operating. In case of an emergency during PRL construction and operation, MSFC's Emergency Plan would be implemented.

Table 3.10-2
Required Industrial Safety Standards

1	International Building Code
2	5 U.S.C. Section 7902, 29 U.S.C. Sections 651 et seq., and 49 Appendix Section 1421, the Occupational Safety and Health Act of 1970 (Public Law (PL) 91-596), as amended
3	10 CFR Part 20, Standard for Protection Against Radiation
4	Executive Order (E.O.) 12196 of February 26, 1980, Occupational Safety and Health Programs for Federal Employees
5	29 CFR Part 1910, Occupational Safety and Health Standards
6	5 U.S.C. Section 7903, Protective Clothing and Equipment
7	40 U.S.C. Section 619, Compliance with Nationally Recognized Codes (Section 6 (a) of P.L. 100-678, November 17, 1988), as amended
8	21 CFR Part 1040, Performance Standards for Light Emitting Products
9	NASA Safety and Health Handbook Occupational Safety and Health Programs
10	NHS/IH- 1 845.5, Occupational Exposure to Hazardous Chemicals in Laboratories
11	NPD 1800. 1, NASA Occupational Health Program Policy
12	NPD 8710.2, NASA Safety and Health Program Policy
13	NPD 8710.5, NASA Policy for Pressure Vessels and Pressurized Systems
14	NPG 1700.6A, NASA Procedures and Guidelines for Pressure Vessels and Pressurized Systems
15	NPG 8060.1, Flammability, Odor, Off-gassing and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion
16	NPG 8820.3, Pollution Prevention
17	NPG 8831.2, Facilities Maintenance and Energy Management Handbook
18	NPG 8580 (pending), NASA Procedures and Guidelines for Implementing the National Environmental Policy Act, and Executive Order 12114
19	NASA-STD-8719.7, Facility System Safety Guidebook
20	NASA-NSS/GO 1740.9, NASA Safety Standard for Lifting Devices and Equipment
21	STD-8719.11, NASA Safety Standard for Fire Protection
22	NASA-NSS 1740.12, NASA Safety Standard for Explosives, Pyrotechnics, and Propellants
23	NASA-NSS 1740.15, NASA Safety Standard for Oxygen and Oxygen Systems
24	NASA-NSS 1740.16, NASA Safety Standard for Hydrogen and Hydrogen Systems
25	29 CFR Part 1926, Occupational Safety and Health Standards
26	All applicable ANSI/AMSE Fire Standards
<i>Source: MSFC Propulsion Research Laboratory Project Requirements Document, June 2000</i>	

3.10.3.3.3 *Assessment of Ionizing Radiation Hazards*

The following sections combine information about the five activities with information about the potential for radiation exposure to evaluate the radiological environmental impact of those activities.

Transportation of Antimatter

Antimatter would be transported to the PRL by truck. The antimatter, typically antiprotons, is stored in a trap that is evacuated to very low pressures. Radiation exposure could occur if the antimatter leaks from the electromagnetic confinement of the trap or if air leaks into the trap. When antimatter comes in contact with regular matter, energy is produced in the form of high energy particles and gamma rays.

The amount of antimatter that will be transported is extremely small. The maximum amount anticipated is 10^{10} antiprotons, which constitutes only 0.00000000000002 gram of material. The total energy content of this amount of antimatter is enough to illuminate a 60 watt light bulb for 1/40th of a second.

According to Howe (1988) the direct radiation dose that would occur if all 10^{10} antiprotons (0.00000000000002 gram) spontaneously annihilated would be a dose 80 mrem at a distance of 2 meters and 13 mrem at 5 meters if no shielding were present. 5 meters is regarded to be the shortest distance between the antimatter transportation truck and a vehicle in another lane of traffic. The inclusion of planned shielding reduces this further. To place these numbers in context, a single dental x-ray results in a radiation dose of about 50 mrem and a typical person in the U.S. receives about 300 mrem per year from natural and manmade sources.

According to Howe (1987), four inches of lead shielding reduces the dose by a factor of two and eight inches of shielding reduces the dose by a factor of five. In perspective, antiproton quantities of 10^{10} or less do not exceed the limiting dose for a member of the public of 100 mrem/year, even without shielding. However, shielding will be constructed.

The radiation exposure that could occur during normal conditions of transportation of the antiprotons is extremely small. The potential dose from a trip by truck of 20 hours would be 0.003 mrem if the person drove alongside of the truck during the entire journey. In actuality, the dose to a passing motorist, or a pedestrian would be insignificant, compared with normal background levels.

Antimatter Research Laboratory

The potential for radiation exposure from the Antimatter Research Laboratory is very similar to the potential for exposure during transportation. As in the transportation case, there would be no emission of radioactive materials to the environment. Some of the equipment adjacent to the facility traps and utilization test stations would become slightly activated because of transmutation caused by the high-energy gamma radiation.

The major potential for exposure is directly from the annihilation reaction that occurs when antimatter leaks from electromagnetic confinement. As in the case for transportation, the greatest doses would occur if the confinement features of the trap fail instantaneously. The doses

that they are not leaking, and to provide additional containment if as much as 0.005 μCi are found on the external surface of the source.

Fusion Research Experiments

The Fusion Research Experiments use high vacuum techniques and magnetic and/or electric fields to contain the charged particles that make up a plasma to accommodate fusion, and then seek to harness the energy generated to provide thrust. Materials expected to be used for producing energy by fusion include H_2 , deuterium (D_2), ^3He , and ^{11}B . None of these materials are radioactive. However, neutrons are one of the products produced by fusion, and they can activate the materials in the test equipment. This resultant radioactivity, however, is inherent to the bulk material present e.g., steel, and is not a threat for release to the environment. Direct radiation exposure can occur during operation because of x-ray, gamma, and neutron radiation released during fusion, and after operation from the activation products created from neutron exposure.

One fusion goal is to achieve a performance of 10^{12} neutrons per pulse. At a distance of 5 meters from the source, with no shield, the radiation dose is 15 mrem per pulse. With 8" of portable shielding, the dose reduces to 2 mrem per pulse. 50 pulses per year, with shielding, meets the 100 mrem requirement and is well below the normal background radiation dose of 300 mrem/year.

3.10.4 Mitigation

Explosives Hazards

To mitigate explosive's hazards, areas of the PRL Building, where explosives hazardous activities will occur, will meet explosive design specifications and the volume of explosive's material allowed in the building will be restricted.

Transportation of Antimatter

To mitigate the effects of radiation exposure, lead shielding and safe distances should be maintained. A minimum distance of 5 meters to the nearest vehicle results in a dose of approximately 13 mrem. The addition of lead shielding of at least 4 inches reduces the exposure by a factor of two.

Antimatter Research Laboratory

Direct radiation exposure is controlled by managing the distance between the trap or station and members of the public, by managing the occupancy time near the equipment, and by using portable shielding.

3.11 SOCIOLOGICAL ENVIRONMENT

3.11.1 Affected Environment

This section contains a description of the sociological environment.

3.11.1.1 Population/Demographics and Employment

The Huntsville Metropolitan Statistical Area (Huntsville MA), which consists of Madison and Limestone counties, makes up the sociological and economic region of influence for this EA. This is the area that MSFC and its employees and contractors most frequently interact with.

3.11.1.1.1 *Population*

The Huntsville MA had a 2000 population of 342,376. Madison County (276,700) accounted for approximately 81 percent of this total, while the City of Huntsville (158,216) accounted for 46 percent. Madison County is relatively densely populated with a 2000 population density of 344 people per square mile compared to 116 persons per square mile in Limestone County and a state average of 88 persons per square mile (US Census Bureau, 2001b).

3.11.1.1.2 *Employment*

Total full- and part-time employment was 221,332 in the Huntsville MA in 2000. Madison County accounted for 87 percent of this total, with the remaining 13 percent located in Limestone County. The Huntsville MA experienced a net employment gain of 28,434 between 1990 and 1999, an increase of 15 percent.

3.11.1.2 Economic Development

The Huntsville MA is the primary economic hub of the north Alabama and south Tennessee region. The aerospace, defense, electronics, and research and technology sectors are major employers in the Huntsville MA. In addition to MSFC, over 90 companies employ more than 11,000 people in the local aerospace industry. The U.S. Army/Redstone Arsenal is the area's largest employer providing 11,393 jobs in November 2000 (Chamber of Commerce, 2001).

3.11.1.3 Native American and Other Ethnic Concerns

According to the 2000 Census, 0.7 percent of the population of the Huntsville MA or 2,542 people identified as American Indian or Alaska Native. The majority of these people (2,214) resided in Madison County. Approximately 2.1 percent of the Huntsville MA population or 7,186 people identified as Hispanic or Latino in the 2000 Census.

The following MSFC activities are identified in the Environmental Justice Plan as having the potential to adversely affect minority and low-income populations based on the level of activity, potential release volumes, and/or potential toxicity of the releases.

- Noise from rocket engine testing;
- Emissions of volatile compounds, particulate matter, or other toxic compounds from engine testing;
- Releases of wastewater to Indian Creek, which joins Huntsville Spring Branch and flows by the Town of Triana to the Tennessee River;
- Contamination from past operations currently being addressed as part of the CERCLA investigation and remediation process; and
- Accidental release of contaminants from onsite storage of hazardous materials.

MSFC has assessed noise levels of large engine test operations and found no significant noise effects outside RSA. Air emissions readily disperse and have minimal effects outside MSFC boundaries. Wastewater releases are within regulatory requirements and are expected to have insignificant local effects on human health and wildlife. MSFC effluents do not include significant levels of bioaccumulative compounds that could affect populations outside of MSFC. Offsite effects from contaminated soil, sediments, and groundwater are unlikely based upon the findings of MSFC's Remedial Investigation/Feasibility Study Work Plan. MSFC's Consolidated Environmental Response Plan and Pollution Prevention Plan identifies mechanisms to reduce or eliminate the risk of releases of hazardous materials to the environment outside MSFC or RSA.

3.11.2 Effects of Alternative A: No Action on Sociological Environment

3.11.2.1 Effects of Alternative A on Population and Employment, Economic Development, Native American Concerns, Quality of Life, and Public Safety

If Alternative A is implemented there would be no positive or negative measurable effects on population, economic development, Native American concerns, quality of life, or public safety. No new construction would occur and the current set up for laboratories would be maintained.

3.11.2.2 Effects on Noise

Alternative A, the No Action Alternative, would not have an impact on noise levels at MSFC or the surrounding community. Activities and research at MSFC would continue at the Center with no changes.

3.11.2.3 Effects on Environmental Justice

Alternative A would not have an impact on Environmental Justice.

operations. Thus low-income and minority populations would not be disproportionately or adversely affected by construction and operation of the proposed PRL at MSFC.

3.11.4 Mitigation

3.11.4.1 Mitigation for Population and Employment, Economic Development, Native American Concerns, Quality of Life, and Public Safety

No significant effects to the sociological environment were identified. Therefore, no mitigation measures are proposed.

3.11.4.2 Mitigation for Noise

MSFC is located in the center of RSA, which provides a buffer zone between noise-producing activities and the nearest civilian population centers. The physical separation between the PRL and public property mitigates or reduces the sound levels. Employee safety programs, that adhere to OSHA guidelines, have been established by prior testing programs and would be used.

3.11.4.3 Mitigation for Environmental Justice

No mitigation would be required.

3.12 DESCRIPTION OF AREAS RELATED TO CUMULATIVE EFFECTS

Cumulative effects are effects likely to occur due to the proposed action or alternatives in combination with other past, present and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. For example, cutting one acre of a 5,000 acre forest to create a home site may have an insignificant effect on the forest. If the remaining forest has been divided into similar one acre home sites, the cumulative effect of clearing all of the lots over time would be great. Four factors are considered in the assessment of cumulative effects:

- Effects that would occur as a result of the proposed action and alternatives;
- Geographic boundaries of the effects;
- Effects that have occurred as a result of past actions; and
- Potential effects of reasonably foreseeable future actions.

The analysis of effects conducted for this EA indicates that the proposed action or alternatives would not result in significant effects on the human or natural environment. Any minor effects would be confined to the immediate vicinity of the PRL within MSFC.

Past actions in the vicinity of the proposed PRL have resulted in effects that are within acceptable levels as defined by environmental regulations, or are being brought into compliance with environmental regulations, as in the case of CERCLA sites. Reasonably foreseeable actions

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5.0 REFERENCES

5.1 AGENCIES/PERSONS CONSULTED

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INDEX OF DEFINITIONS

DEFINITIONS

Activation: The process of inducing radioactivity by irradiation.

Antimatter: Matter composed of the counterparts of ordinary matter (as antiprotons instead of protons, positrons instead of electrons, and antineutrons instead of neutrons).

Antiprotons: A negatively charged proton.

Decommissioning: The process of removing from service.

Decontamination: The process of removing undesired radioactive material.

Deuterium: A heavy isotope of hydrogen having one proton and one neutron.

Fission: Act of splitting an atomic nuclei resulting in the release of large amounts of energy.

Fusion: Act of coalescing two or more atomic nuclei resulting in the release of large amounts of energy.

Ionizing Radiation: Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.

Penetrating Radiation: Any electromagnetic or particulate radiation capable of penetrating through matter, such as gamma, x-ray, or neutron radiation.

Plasma: A highly-ionized gas containing an approximately equal number of positive ions and electronics.

Radioactive Decay: Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles and/or photons.

Radioisotope: An isotope of any element that exhibits the characteristics of being radioactive. Plural form radioisotopes.

Radionuclide: A radioactive nuclide. Plural form radionuclides.

Residual Radiation: Radiation produced from radioactive material that remains following an event that removes some of the radioactive material, i.e., decontamination or radioactive decay.

Thermoluminescent Dosimeter: A device used to measure accumulated radiation exposure. When heated the device gives off light photons that are proportional to the amount of absorbed energy stored in the material.

Tritium: A heavy isotope of hydrogen having one proton and two neutrons.

APPENDIX A
MAILING LIST

Mr. Stuart McGregor, Biologist
Geological Survey of Alabama
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Jaloosa, AL 35486

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AmSouth Center Suite 802
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Honorable Jan Wells,
Mayor of Madison
100 Hughes Rd
Madison, AL 35758

Mr. Arthur Linton
Environmental Protection Agency
Region IV
345 Courtland St
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Alabama State Clearinghouse
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Honorable Loretta Spencer,
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Honorable Mike Gillespie, Chairman
Madison County Commission
Madison County Courthouse
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Mr. Terry Howard
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Mr. Chris Oberholster, Acting Coordinator
Alabama National Heritage Program
Alabama Department of Conservation and
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Montgomery, AL 36130

U.S. Army Corps of Engineers
Mobile District, Redstone Area Office
ATTN: CESAM-CD-ENA
Redstone Arsenal, AL 35808-0162

Representative James Haney
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Representative Patrick Jones
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Huntsville, AL 35811

Senator Zeb Little
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Cullman, AL 35055

Dr. Lee Warner, SHPO
Alabama Historical Commission
468 South Perry St
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APPENDIX B
PUBLIC NOTICES AND PUBLIC MEETING

**NOTICE OF PUBLIC
COMMENT PERIOD AND
PUBLIC MEETING FOR
THE PROPULSION RESEARCH
LABORATORY DRAFT
ENVIRONMENTAL
ASSESSMENT
AND DRAFT FINDING OF NO
SIGNIFICANT IMPACT
January 15, 2002
NATIONAL
AERONAUTICS AND
SPACE ADMINISTRATION
MARSHALL SPACE
FLIGHT CENTER**

The U.S. National Aeronautics and Space Administration, Marshall Space Flight Center (MSFC) announces a public comment period and a public meeting to allow citizens the opportunity to provide comments on the Propulsion Research Laboratory (PRL) Draft Environmental Assessment (EA) and the Draft Finding of No Significant Impact (FONSI). The public is invited to review and comment on the Draft EA and the Draft FONSI during a thirty-day comment period beginning December 23, 2001 and ending January 22, 2002. MSFC proposes to construct and operate the PRL facility near Huntsville, Alabama to support research of sub-scale advanced propulsion technologies. The proposed location is a 21-acre site in the northwest portion of MSFC. The size of the initial phase of the PRL would be approximately 107,000 gross square feet and would contain a variety of laboratories and several core groups of support function. Future phases would contain additional building space with additional laboratories. The EA assesses the potential impacts of two alternatives. The Draft EA and the Draft FONSI will be available for public review at the following information repositories:

NASA Government Community
Relations Department
Huntsville/Madison County
Public Library
Madison Branch
Huntsville/Madison County Public
Library

The Draft FONSI is also
printed in the Legal Section of
the issue of the Huntsville
Times. You may submit written
comments to:

Mr. Allen Elliott, Deputy Manager,
Environmental Engineering
Department
NASA Marshall Space Flight
Center, AD10
Marshall Space Flight Center,
Alabama 35812
(256) 544-0802
allen.elliott@msfc.nasa.gov

Verbal comments can be
made at the public meeting or
by calling the NASA Government
Community Relations
Department at (256) 544-3030
during normal business hours
of 8:00 am to 4:30 pm, Monday
through Friday.

Please come to the public
meeting to learn more about
the PRL and to be involved in
the decision-making process.
The public meeting is designed
to solicit public review and
comments on the Draft EA
as well as to assist the public
in being involved in the
National Environmental Policy
Act process.

What:
Public Meeting
When:
January 15, 2002
8:30 - 4:30 pm
Where:
Auditorium
Huntsville/Madison County
Public Library
818 Monroe Street
Huntsville, Alabama 35894

If you have any questions,
comments, or suggestions,
please call Star Hendrick of
the NASA Government Community
Relations Department
at phone number (256)
544-3030 and email address
star.hendrick
@msfc.nasa.gov.
December 23, 2001



**PROPULSION RESEARCH LABORATORY
DRAFT ENVIRONMENTAL ASSESSMENT
NASA MARSHALL SPACE FLIGHT CENTER**

**AGENDA
JANUARY 15, 2002
6:30 – 8:30 pm**

Moderator Introduction	Dave Drachlis
Technical Presentation	Stephen L. Rodgers
Environmental Presentation	Mike Reynolds
Question and Answer Session	Panel
Refreshments and Informal Discussion	Open

Please use one of the following ways to comment on the Draft EA/Draft FONSI:

1. *Verbal*
 - You may fill out an index card indicating you would like to speak during the question and answer session portion of this meeting.
2. *Written*
 - You may fill out an index card with your question that you would like read and addressed during the question and answer session portion of this meeting.
 - You may fill out the Comment Sheet and place it in the return box at the registration table or mail it to Mr. Allen Elliott, Deputy Manager, Environmental Engineering Department, NASA Marshall Space Flight Center, AD10, Marshall Space Flight Center, Alabama 35812. Written comments should be postmarked by January 22, 2002.
 - You may email comments to Mr. Allen Elliott at allen.elliott@msfc.nasa.gov by January 22, 2002.

COMMENT PERIOD DETAILS

The Draft Environmental Assessment (EA) and Draft Finding of No Significant Impact (FONSI) for the Propulsion Research Laboratory at National Aeronautics and Space Administration (NASA) Marshall Space Flight Center, Alabama has been prepared in compliance with National Environmental Policy Act; Council on Environmental Quality Regulations (40 Code of Federal Regulations Part 1500); NASA Procedures and Guidelines 8580.1; and applicable Federal laws and regulations.

A copy of the Draft EA and the Draft FONSI is available for review at the following information repositories:

- NASA Government Community Relations Department
- Huntsville/Madison County Public Library
- Madison Branch Huntsville/Madison County Public Library

For general information, contact:

Mr. Shar Hendrick, Manager
Government Community Relations Department
NASA Marshall Space Flight Center, CD50
Marshall Space Flight Center, AL 35812
(256) 544-2030

shar.hendrick@msfc.nasa.gov

To receive a copy of the Draft EA and for technical information, contact:

Mr. Allen Elliott, Deputy Manager
Environmental Engineering Department
NASA Marshall Space Flight Center, AD10
Marshall Space Flight Center, AL 35812
(256) 544-0662

allen.elliott@msfc.nasa.gov

Written comments must be postmarked by January 22, 2002. Comments may also be made on this self-addressed flier. Comments will be addressed in the Final EA.

PUBLIC MEETING



to accept formal comments on the

Draft Environmental Assessment

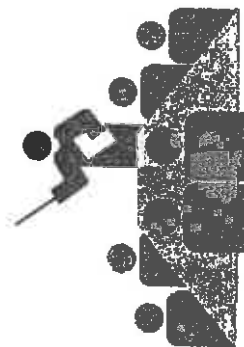
for the

Propulsion Research Laboratory

at

Marshall Space Flight Center, Alabama

**Tuesday, January 15, 2002
Huntsville/Madison County Public Library
6:30 – 8:30 pm**



Fold Here

Please place
stamp here.

PROPULSION RESEARCH LABORATORY
DRAFT ENVIRONMENTAL ASSESSMENT
NASA MARSHALL SPACE FLIGHT CENTER

Held at

HUNTSVILLE/MADISON COUNTY
PUBLIC LIBRARY

on the

15th day of January, 2002

PRESENTERS:

MR. DAVE DRACHLIS

DR. STEPHEN L. RODGERS

MR. MIKE REYNOLDS

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107 N. Side Square
Huntsville, Alabama 35801
256-534-9771

1 Propulsion Research Center at the Marshall Space
2 Flight Center and Mr. Michael Reynolds of the
3 Marshall Center's Environmental Engineering
4 Department.

5 Following the presentations, we will
6 invite your questions. And to make it as easy
7 as possible, there are several ways in which you
8 can ask questions this evening. You can simply
9 raise your hand and I'll call on you and you can
10 ask your question.

11 In addition to that, if you prefer,
12 there are some cards at the desk where you came
13 in, and you can write your questions on those
14 cards and either pass them up to me or give them
15 to the person in the back of the room and
16 they'll get them to me and I'll read your
17 questions and we'll answer them.

18 There are also some self-addressed
19 forms in the back of the room which you can take
20 with you. And if you think of a question after
21 the meeting is over, you can fill that form out
22 and send it in to us, mail it in to us, or there
23 are a couple of E-mail addresses on there where

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1 there -- to give you a feel for what it's going
2 to look like and what kind of work is going to
3 go on there and then answer some of your
4 questions.

5 Marshall -- go ahead. Marshall has
6 for the last couple of years made an effort to
7 increase their research capability on site, in
8 particular the propulsion arena. The Propulsion
9 Research Center has been formed to accomplish
10 that. And it's for that purpose that the
11 Propulsion Research Center Laboratory is being
12 done.

13 And really we have two purposes: One
14 is to work the problems to look at the physics
15 and the chemistry of propulsion systems. But
16 the other, and maybe more exciting part, is to
17 look at advance concepts, look at new ideas, and
18 to look at what's coming down the future and get
19 ready for the kinds of things NASA wants to do
20 as we go out to explore the outer planets and
21 beyond.

22 The next chart talks about a little of
23 what's going to go on at the Propulsion Research

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1 It's a research facility much like you would see
2 in other research activities.

3 And again, we hope to exploit the
4 synergy of the experiments and researchers, and
5 we hope to bring in university folks and
6 industry folks and other NASA folks to come
7 together and work really these breakthroughs at
8 the edges. And, you know, the place to do this
9 is right here in Huntsville because this is,
10 after all, is Rocket City USA, and this is the
11 center of propulsion in this country.

12 Redstone Arsenal is shown here. As
13 you know, Marshall is in the middle of Redstone.
14 You can see in the red site marked in red with
15 PRL is expected to be built.

16 The next slide is a little bit better
17 shot of that. If you are familiar at all with
18 the Marshall site, there's an administrative
19 complex, we're off across the road from that in
20 the cow pasture right now where it's indicating.

21 Okay, this is the artist's rendering
22 of what the building is going to look like. It
23 will have some sixty-six thousands square feet

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1 provide facilities and ideas so the people can
2 come here and do that research to advance
3 propulsion.

4 And Marshall again is a great place to
5 do that because that's where the propulsion
6 office -- the project offices are for the system
7 guys and the engineers support there. The
8 researchers can talk directly with the users.
9 And here in Huntsville, we have the industry
10 partners, industry facilities where we all can
11 communicate and ease that tech transition going
12 on.

13 We also are working with the Army.
14 They are part of our activity going on right now
15 and some of the DOE facilities and partners
16 become part of our whole activity.

17 This chart show some of the scheduled
18 milestones. This, of course, is the public
19 review going on. Right now a design is going on
20 for that -- for the construction, and I think
21 it's at the 60 percent design review-point. And
22 sometime in '03 we hope to be in and doing
23 research.

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1 go, be with us forever. And so we're looking at
2 new propellants, we're looking at combustion,
3 understanding high pressure combustion for the
4 usable systems, and understanding -- trying to
5 understand the materials and ways we can exploit
6 chemical propulsion further and better than
7 we're doing right now.

8 We're also looking at other forms of
9 high energy propulsion. Internal fission is one
10 of the energy sources that we know how to use,
11 and we're looking at doing some simulated
12 fission experiments in our laboratories. We're
13 trying to figure out how to make that a
14 propulsion device.

15 We're looking at fusion, and we're
16 looking at antimatter. Antimatter simply is a
17 matter you think of as oftenly charged as normal
18 matter with positively charged electrons and
19 negatively charged protons. And anitmatter when
20 it comes together with normal matter, produces
21 pure energy from that matter. It's probably the
22 ultimate energy source. So we're trying to
23 figure out if we can use this how it might be

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1 energy in an efficient way then it becomes an
2 attractive in space propulsion.

3 Okay, so that's pretty much all I want
4 to say except to say that we've got to start
5 now. We've got to start doing the research, and
6 that is what we're going to do to make things
7 cheaper and better and to come up with new ways
8 of really getting out there and doing the kinds
9 of things we want to do. Thank you.

10

11 MR. DRACHLIS: Thank you, Dr. Rodgers.
12 And now I'd like to introduce Mr. Mike Reynolds
13 from our Environmental Engineering Department.

14

15 MR. REYNOLDS: Thank you, David. As
16 David said, my name is Mike Reynolds. I'm
17 Environmental Engineer of Marshall Space Flight
18 Center Environmental Engineering Department, and
19 I had the lead role in the preparation of the
20 environmental documentation.

21

22 Before we get in the real meat of this
23 presentation, I'd like to acknowledge several of
the people that have been involved in the

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1 and he'll be in charge of the construction
2 effort with this project. Again he's got a
3 formidable task ahead of him.

4 The Center Operations Director at
5 Marshall, Safety Officer Marshall, and Dr. Brian
6 Ramsey sitting over here to the left of Nelson.
7 Dr. Ramsey is the head of the Marshall Space
8 Flight Center Radiation Safety Board and
9 provided us a lot of good input and review; the
10 Propulsion Research Center; Dr. Rodgers and his
11 staff; Harold Gerrish, sitting here and
12 operating this machine for us tonight; and, of
13 course, all the researchers involved with the
14 PRL without them, without their input, without
15 their knowledge, we couldn't really do a very
16 good pass of doing an analysis of this; the
17 Space Transportation Director, Mr. James
18 Whitehawk, over here sitting on the table by the
19 wall, done a really good job with pulling this
20 all together at times, we really appreciate
21 that; Scott Stevens from Intergraph Corporation;
22 Jacobs Sverdurp, who has been doing the design
23 for this project; MH Chew and Associates, which

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1 invite public comments. That's the purpose of
2 why we're here tonight. We want to get your
3 involvement, we want to get your input, we want
4 to get your comments.

5 And finally, we want to talk about the
6 relevant issues and the resource areas that have
7 been covered in doing this analysis and kind of
8 what that -- what fell out of all that analysis.

9 You've already been given a really
10 good overview of the project by Dr. Rodgers.
11 Again, I invite you to come up after the
12 presentation and take a closer look at these
13 charts. It's going to be a magnificent
14 building.

15 NEPA. What's that mean? NEPA is the
16 acronym for the National Environmental Policy
17 Act. It became official in 1969. And basically
18 it establishes the basic national policy for
19 protecting the human environment.

20 Now with that, it provides a set of
21 requirements and guidelines that ensure
22 compliance by all Federal agencies. It requires
23 agencies to consider environmental values and

1 Assessment, there are sections within this
2 document which will cover a myriad of things;
3 for example, the purpose and need. What's the
4 purpose and need for this facility?

5 Alternatives, affecting the environment, and
6 environmental consequences, things of that
7 nature all covered in the Environmental
8 Assessment.

9 In Alternative A, as you can see from
10 the chart here, the "no action" alternative.
11 Work continues just like it's doing now. The
12 objectives for Propulsion Research Lab are not
13 met, but there is no effect because everything
14 remains status quo.

15 In Alternative B the construction and
16 operation, the PRL objectives are met, but there
17 are minimal impacts. Again I'll go over those
18 in just a minute and try to explain those a
19 little bit better.

20 Refer now to this chart right here,
21 and I didn't make a slide out of it because it's
22 more of an eye chart than anything.

23 This chart kind of summarizes that

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1 supply. It's a new building, has to have water.
2 Redstone Arsenal and Marshall Space Flight
3 Center has capacity within the existing system.
4 Yes, we will be using some more water, but there
5 is existing water there. I mean, we have water
6 supplies that's there. We won't have to go to
7 any water treatment facilities. Therefore,
8 there is minimal impact.

9 Waste water, same thing. Yes, we will
10 be generating some waste water, some sewage.
11 It's a new building, but there is capacity
12 within Redstone Arsenal treatment facility.
13 Therefore, the impact is minimal.

14 Likewise, go on down through there,
15 solid waste, all the rest of them, impacts are
16 minimal.

17 Based on that, we found No Significant
18 Impact associated with the construction and
19 operation of this facility. That's what
20 generates the final document which is the FONSI,
21 the Finding Of No Significant Impact.

22 Steve's gone over these -- Dr. Rodgers
23 has gone over these a little bit. I'd like to

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1 occupancy and actually starting the research
2 will occur in the first quater of 2004.

3 With that, I turn it back over to
4 Dave.

5
6 MR. DRACHLIS: Okay. We're ready to
7 take questions now. I'd like to ask for the
8 purpose of the record that you give us your name
9 and if you are affiliated with an organization
10 that you do that as well when you ask your
11 question. And since I don't have any cards
12 yet -- do I have any cards? No cards. Are
13 there any questions from the floor? Okay. (No
14 audible response.)

15 If there are no questions from the
16 floor, remember you still have an opportunity
17 before the 22nd to give us your questions or
18 your comments and there are a number of ways as
19 I talked about earlier and on that sheet back
20 there, there are the E-mail addresses.

21 With that I'd like to thank everyone
22 for attending. And like I said, we'd like to
23 invite you to join us for refreshments to take a

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1 CERTIFICATE

2
3 STATE OF ALABAMA)
4 COUNTY OF MADISON)
5
6

7 I hereby certify that the above and
8 foregoing proceedings were taken down by me in
9 stenographic shorthand and reduced to
10 typewriting under my supervision and the
11 foregoing represents a true and correct
12 transcript of said proceedings.
13

14 I further certify that I am neither of
15 counsel nor of kin to the parties of the action,
16 nor am I in any wise interested in the results
17 of said cause.
18

19 Angelia Thornton
20 Angelia Thornton
21 Court Reporter.
22
23

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APPENDIX C
PUBLIC COMMENTS AND RESPONSES



"Reynolds, Michael"
<Michael.L.Reynolds@msfc.nasa.gov>

01/16/2002 10:53 AM

To: "rharward@fwenc.com"
<rharward@fwenc.com>,
"Foster, Dennis"
<Dennis.C.Foster@msfc.nasa.gov>,
"Olinger, Nelson"
<Nelson.C.Olinger@msfc.nasa.gov>,
"Wyckoff, James"
<James.E.Wyckoff@msfc.nasa.gov>,
"Gerrish, Harold"
<Harold.P.Gerrish.Jr@msfc.nasa.gov>,
"Ramsey, Brian"
<Brian.Ramsey@msfc.nasa.gov>
>
cc: "Elliott, Allen"
<Allen.Elliott@msfc.nasa.gov>,
"Davis, Farley"
<Farley.Davis@msfc.nasa.gov>
Subject: FW: EA Questions

The following questions came in after last night's presentation. Please send responses back to me. Need to respond asap.

-----Original Message-----

From: Elliott, Allen
Sent: Wednesday, January 16, 2002 9:22 AM
To: Reynolds, Michael
Subject: FW: EA Questions

Please forward these to appropriate folks and pull together responses for the record and me to e-mail back. Thanks.

Allen

-----Original Message-----

From: Schultz [mailto:schultzink@earthlink.net]
Sent: Tuesday, January 15, 2002 10:41 PM
To: Elliott, Allen
Subject: EA Questions

Hello!

I had a few questions following the presentation.

1. How will this structure impact the population of Marshall? (i.e. Will it bring in more daily population (not tourist) and if so about how many? Or will it just shuffle people out of existing labs and offices?)

lot lines of the actual facility.

I enjoyed the presentation this evening and look forward to the responses!

Thank you for your time.

Kurt Schultz
Huntsville, AL

operation and the amount of stock-piling at the facility since it is relatively close to the Von Braun complex and I believe also the day care facility.

Response Schultz-4: The construction and operation of the PRL will have minimal effects on hazardous materials at MSFC. During the construction of the building, hazardous materials expected to be on-site are those typically associated with construction sites such as gasoline, oil, paint, and paint thinner. Further, the quantities of materials that will be present during the construction of the PRL are not anticipated to require any changes to the reporting requirements for MSFC. The chemicals that will be used during the operation of the PRL will be within "laboratory safe small-scale" quantities and MSFC would continue to follow safety procedures already in place. There will not be "stockpiling" of chemicals at the laboratory. Quantities of hazardous materials will be limited to those necessary to conduct research and will be managed by environmental and health and safety guidelines. To summarize, there will be no net increase in the quantities of hazardous materials transported to MSFC or used by MSFC, the purpose of the PRL is to consolidate laboratories and research activities, already in existence, at MSFC into one location.

Comment Schultz-5: In the presentation on the 15th of January at the Downtown library, you mentioned "radiation issues" and the senior Marshall radiation safety person was present. What types of radiation will the lab be generating and/or consuming?

Response Schultz-5: Ionizing radiation will be produced by several of the propulsion research activities as follows:

Antimatter Research Laboratory : Investigation of the use of antimatter as a source of energy for propulsion will require its storage at MSFC. During storage, the antimatter gradually 'leaks' away by annihilating with residual gas atoms in the containment trap. A planned fill of 10^{10} (10,000,000,000) antiprotons will last around 3 months. This may sound like a lot of antiprotons, but it represents only 0.000000000000001 gram of material and has a total energy content of around 3 joules. This would run a 60 Watt light bulb for around 20 sec.

When antiprotons annihilate they generate particles called pions some of which immediately decay into high-energy gamma rays. Both the pions and the gamma rays are forms of ionizing radiation. If there were no shielding around the trap, and you stood next to it (~ 6 feet from the antiprotons) for a period of 3 months, you would receive a radiation dose very roughly 1 ½ times that of a dental x-ray (50 millirem). We plan to place shielding around the equipment though, so that the dose to a worker within the antimatter laboratory would be less than 100 millirem per year. To place these numbers in perspective, the average adult person in the U.S. receives approximately 300 millirem a year through natural radioactivity in the soils and other materials plus medical x-rays.

All our radiation workers at MSFC wear monitor badges to measure any radiation that the workers are subject to over background (background is subtracted out.) Federal and International regulations state that a badged worker should not receive greater than 5 rem of radiation dose in any 1 year. At MSFC we go way beyond this by designing to a maximum dose level of 100 millirem, 50 times smaller than required by regulations.



"Reynolds, Michael"
<Michael.L.Reynolds@
msfc.nasa.gov>

01/31/2002 02:38 PM

To: "rharward@fwenc.com"
<rharward@fwenc.com>,
"schittam@fwenc.com"
<schittam@fwenc.com>

cc:

Subject: FW: Review of EA

FYI

-----Original Message-----

From: Elliott, Allen
Sent: Thursday, January 31, 2002 9:29 AM
To: Reynolds, Michael
Subject: FW: Review of EA

Army comments

-----Original Message-----

From: Dunn, Danny J RASA
[mailto:danny.dunn@redstone.army.mil]
Sent: Wednesday, January 30, 2002 1:43 PM
To: 'Allen.Elliott@msfc.nasa.gov'
Cc: Hazle, Terry W RASA
Subject: Review of EA

Allen,

I had several people in the office look at specific parts of the EA. We had a few comments that may help clarify the EA and also your National Historic Preservation Act compliance requirements, or at least some of the problems we have run into in the recent past. Other than the cultural resource comments, we didn't find any major problems. So good luck.

Daniel J. Dunn
Natural Resources Division Chief
Redstone Environmental Office
AMSAM-RA-DEM-NR
Redstone Arsenal, AL 35898
256-876-4572
256-876-0887 FAX

<<Final Review of NASA EA.doc>>



Final Review of NASA E

3.5.1.6

Comment page 3-19: Groundwater from MSFC does not discharge into McDonald Creek. It discharges into Indian Creek on the west side of MSFC, and into Huntsville Spring Branch on the south and east sides of MSFC.

3.5.3

Comment page 3-21: Essentially the same as 3.5.1.5, please provide detailed information about what is proposed in the 100-year floodplain.

3.8.1.1

Comment page 3-32: In the last line under "Setting", a more appropriate description of "cropland" would be pastureland.

3.8.1.4

Comment page 3-34: We believe that Williams or NASA spring (Williams Spring on the USGS-TVA topographic maps) should be considered a special interest area. We have designated it as an Ecologically Sensitive Area in our Endangered Species Management Plan due to the population of Tuscumbia darter, formerly listed as a candidate for the Endangered Species Act by the U.S. Fish and Wildlife Service. It is now a Federal species of concern.

3.9.1.3

Comment pages 3-38 and 3-39. IAW National Historic Preservation Act regulation, 36 CFR 800.3(f)(2), if any eligible prehistoric archaeological sites are found in the PRL, NASA MSFC must consult with Native American tribes that may be culturally affiliated with lands on RSA. The RSA Directorate of Environmental Management has a list of tribes that are potentially culturally affiliated and with which we have been consulting. Please contact Carolene Wu (876-0211) for the list.

Has an historical architectural inventory of MSFC buildings been conducted? A Section 106 document to determine the eligibility for listing in the National Register of Historic Places (NRHP) of buildings in the vicinity of the project area should be completed and coordinated with the Alabama SHPO for concurrence. There is a strong possibility that building 4200 is eligible.

3.9.3

Comment: Same as for 3.9.1.3. Should evaluate for the NRHP buildings, especially building 4200, to see if it is recommended eligible or not.

3.9.4

Comment page 3-39: Under **Mitigation** you state "An archaeological survey will be completed for the undisturbed portions of the PRL site prior to the issuance of the final EA....". Current Alabama SHPO guidelines require that the entire project area be included in the Phase I archaeological survey. Ground disturbance within the project area will be documented by that survey. The resulting report from that survey should be coordinated with the Alabama State Historic Preservation Office (SHPO) for concurrence

Various Personnel Commenting
AMCOM Environmental Office
Redstone Arsenal, Alabama

Comment AMCOM-1: On page ES-1. Cultural resources consequences should be addressed.

Response AMCOM-1: On page ES-1, under "Environmental Consequences of Alternatives", cultural resources was added as having no impact for Alternative B.

Comment AMCOM-2: On page ES-2, Table ES-1. Under Cultural Resources, address the architectural historical inventory of nearby buildings.

Response AMCOM-2: Under Alternative B – Cultural Resources the following text was added: Structures in the vicinity of the proposed PRL are not anticipated to be determined eligible to the NRHP based on their architectural qualities. The proposed PRL project would therefore not result in adverse effects to these structures.

Comment AMCOM-3: On page 3-2: Document states (a) the project area has soil disturbance in the southwest corner but most northern and eastern areas appear undisturbed by construction activities and (b) a cultural research survey is recommended, "including an archeological investigation of the previously undisturbed portions of the PRL project area." According to current Alabama SHPO guidelines the entire project area must be included in the Phase I archeological survey. Ground disturbance within the project area will be documented by that survey. The report resulting from that survey should be coordinated with the Alabama State Historic Preservation Office (SHPO) for concurrence with the findings. If NRHP eligible archeological sites are recorded as a result of the Phase I archeological survey, they must (1) be avoided and buffered, or, if that is not feasible, (2) undergo further archeological testing to determine their significance.

Response AMCOM-3: The Archeological Survey of the project area covered the entire 21-acres including the area of soil disturbance. The text was updated in the entire document to reflect this. No archeological sites were found. A copy of the report was provided to the Alabama SHPO.

Comment AMCOM-4: On page 3-16: Provide a reference for your information on wetlands (e.g. NWI maps) and also how you came to the conclusion that the site does not support wetlands. You could mention that the area is sloped and does not have hydric soils, nor hydrophytic vegetation. The soils are Cookeville Silt Loam, eroded undulating phase, a well-drained non-hydric soil.

Response AMCOM-4: The PRL site is an open pasture with neither active drainage channels, hydrophytic vegetation, nor wetland soils. A site visit was conducted to evaluate the vegetation cover and potential for wetland soils. Neither were seen.

of potential effect. The text was updated in the entire document to reflect this. A copy of the report was provided to the Alabama SHPO.

Comment AMCOM-13: Section 5.1, page 5-1: Under Agencies/Persons Consulted, Becky *Stinson's* name needs correction.

Response AMCOM-13: Ms. Stinson's name was corrected.