NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

Notice 03-GSFC-01

National Environmental Policy Act (NEPA); Facilities Master Plan for NASA's Goddard Space Flight Center (GSFC), Greenbelt, Maryland, including Soil Conservation Road realignment

AGENCY: NASA's GSFC

ACTION: Finding Of No Significant Impact (FONSI)

SUMMARY: Pursuant to NEPA of 1969, as amended (42 U.S.C. 4321-4347), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 C.F.R. 1500-1508), and NASA regulations (14 C.F.R. Part 1216 Subpart 1216.3), NASA has made a FONSI with respect to the proposed Facilities Master Plan for GSFC, Greenbelt, Maryland, including the realignment of Soil Conservation Road. The Facilities Master Plan is a document that will guide physical site development at GSFC over the next 20 years based on projected operations. Existing Soil Conservation Road splits GSFC into two tracts of nearly equal size. Realignment of the road would allow consolidation of GSFC facilities into a single, geographically unified installation.

The Environmental Assessment that supports this FONSI, prepared for both the Master Plan and for the road realignment, may be reviewed at:

NASA Libraries:
- Homer E. Newell Library, GSFC, Building 21, Room L100, Greenbelt, MD 20771
- Headquarters Library, 1J20, 2 Independence Square, 300 E Street SW, Washington, DC 20024

Public Libraries within the Prince George's County Memorial Library System:
- Greenbelt Branch, 11 Crescent Road, Greenbelt, MD 20770
- New Carrollton Branch, 7414 Riverdale Road, New Carrollton, MD 20784
- Bowie Branch, 15210 Annapolis Road, Bowie, MD 20716

A limited number of copies of the Environmental Assessment are available by contacting Mr. Kim Toufectis at the telephone number indicated herein or by mail at:

Mr. Kim Toufectis
NASA's Goddard Space Flight Center
Facilities Management Division
Building 18, Code 221.0
Greenbelt, MD 20771

FOR FURTHER INFORMATION CONTACT: Kim Toufectis: 301-286-9952

SUPPLEMENTARY INFORMATION: NASA has reviewed the Environmental Assessment prepared for the Facilities Master Plan (including the Soil Conservation Road realignment), and has determined that it represents an accurate and adequate analysis of the scope and level of associated impacts. The Environmental Assessment is hereby incorporated by reference in this FONSI. All relevant comments received as a result of the early coordination process, public meetings, and the public and state clearinghouse notification process have been considered.

The Facilities Master Plan was developed in sequential steps. Five concept or preliminary alternatives for site development, A through E, were created to test various potential configurations for organizing GSFC. Based on a number of factors related to GSFC's efficiency and effectiveness at its mission, Concept D, "Unified Consolidated Campus," was selected as the basis for the Master Plan and developed in more detail to optimize the operational configuration. For the Facilities Master Plan, the alternatives that were evaluated in detail include: (1) No Action, and (2) the Facilities Master Plan. The No Action Alternative assumes that the employee population and overall facility space would remain approximately the same as exists currently. Facilities would be renovated or replaced in kind to meet building, operating, and safety codes. Public thoroughfares and GSFC security perimeters would remain essentially unchanged.

Facilities Master Plan

The Facilities Master Plan will guide and coordinate physical development at GSFC in terms of buildings, utilities, roadways, landscaping, and amenities over the next 20 years. The Facilities Master Plan does not commit NASA to any of the projects proposed. Implementation of any projects depends on funding, and not all projects may be built. The Facilities Master Plan is intended to be flexible to meet changing GSFC needs. GSFC may deviate from the plan in developing individual facilities. Proposed facilities and planning criteria and guidelines are detailed within the Facilities Master Plan document. The Facilities Master Plan is based on a 2022 population of 8,750, including 6,800 individuals within the security perimeter and 1,950 individuals outside the security perimeter. Further environmental review and NEPA documentation will be undertaken as appropriate when specific projects are proposed.

The campus would be conceptually organized into neighborhoods and zones corresponding to GSFC functions. Land now split into east and west campuses by Soil Conservation Road would be consolidated into a single, geographically unified, access-controlled installation within the site without significant expansion into undeveloped areas. Overall, GSFC occupied space would remain at about 310,000 gross square meters (3.3 million gross square feet). Nineteen buildings with approximately 160,000 gross square meters (1.7 million gross square feet) would be retained. They would be augmented by up to 21 new research and support buildings or facilities with an estimated cumulative floor area of 150,000 gross square meters (1.6 million gross square feet).

The principal features of the plan are:

1. A new building to consolidate space science functions in one location.
2. A new central commons area to include support activities such as conferencing and training, a library, a credit union, a post office, and travel and fitness centers.
3. Contingency space in a "New Thrust" Zone for a new mission unforeseen at this time, and infill facilities for moderate expansion of individual programs.
4. Spaces and facilities to promote and improve teaming.
5. A loop road within the installation to create a pedestrian friendly campus core.
6. A Partnering and Outreach Zone for organizations sharing strategic objectives with NASA.
7. The realignment of Soil Conservation Road to the east side of GSFC to create a unified installation.

The Facilities Master Plan would have no substantial impact on land use, regional planning, housing, park and recreation facilities, the terrestrial environment, water resources, wetlands, floodplains, threatened and endangered species, and historic properties. Potential increases in utility demands associated with plan implementation are within the capacity of existing site and public systems. No substantial noise impacts are expected. There will be no air quality impacts. The Master Plan Alternative's emissions will

not have an adverse impact on the region's ability to meet the National Ambient Air Quality Standards. No other issues of environmental concern have come to NASA's attention.

Traffic impacts are minimal as long as the site population remains at or below current levels. Although the Facilities Master Plan provides for a potential increase from 7,600 to 8,750 individuals, it is most likely that the population will remain near current levels. Traffic analysis based on full plan implementation and a site population of 8,750 indicates that there would be no substantial increase in congestion, or decrease in intersection level of service, on the public road network in the vicinity of GSFC as a result of added employee or GSFC supplier trip generation.

A new Transportation Management Plan has been developed in concert with the Facilities Master Plan. It outlines a long-term program for reduction of single occupant vehicle employee trips through increased used of other transportation modes such as car and vanpooling, bus, rail, bicycling, and pedestrian travel. The Transportation Management Plan is available for viewing at the same locations indicated above for the Environmental Assessment.

Based on the Environmental Assessment and other technical, operational, and financial considerations, NASA has decided to select the Facilities Master Plan Alternative.

Implementing the Facilities Master Plan would require realigning Soil Conservation Road.

Soil Conservation Road Realignment

The proposed action is the realignment of Soil Conservation Road through GSFC. Existing Soil Conservation Road splits the main portion of GSFC into two separate tracts, each of with its own security perimeter. One goal in the Facilities Master Plan is consolidating of primary activities within a single, geographically unified installation. The Soil Conservation Road realignment is a key project within the Facilities Master Plan that would initiate the consolidation process. Relocation of the road would make land available for the Space Science Complex at Facilities Master Plan Site A. This, in turn, would permit the consolidation of space science personnel, freeing up other buildings for transfer of personnel and proposed Facilities Master Plan uses. The road realignment would be the first proposed Facilities Master Plan project.

Five alternatives were considered and evaluated in detail: (1) West Alignment Alternative, W-1; (2) East Alignment Alternative, E-1; (3) East Alignment Alternative, E-2; (4) East Alignment Alternative E-2A; and (5) No Action.

West Alignment Alternative W-1 would skirt the western periphery of existing and proposed west campus development. It would generally follow existing campus roads, and connect to Greenbelt Road at GSFC Gate 2 at the existing IUE Road intersection. The total project length would be about 2.1 kilometers (1.26 miles). The road would be four lanes wide between Greenbelt Road and the employee entrance from the Baltimore-Washington Parkway. North of the entrance, it would be two lanes wide.

East Alignment Alternative E-1 would follow an L-shape alignment across the northern sector of the east campus before turning to the south and connecting to Good Luck Road opposite Countryside Apartments. The realigned road across GSFC would be two lanes wide and about 2.33 kilometers (1.45 miles) long. Good Luck Road would be widened to four lanes between the southern end of the realigned road and Greenbelt Road. Widening improvements along Good Luck Road would increase the total project length

to about 2.66 kilometers (1.65 miles). Improvements to the Good Luck/Greenbelt Road intersection would be needed.

East Alignment Alternative E-2 passes to the north and east of most development on the east campus. The Alternative shares the same general design characteristics as Alternative E-1. It is identical to Alternative E-1 in its northern segment, but instead of completing a full 90 degree turn to the south, it would run southeast across a vacant area within GSFC to intersect Good Luck Road on the perpendicular at a point further north. The realigned road across GSFC would be two lanes wide and about 2.06 kilometers (1.28 miles) long. Widening improvements along Good Luck Road would increase the total project length to about 2.72 kilometers (1.69 miles). Improvements to the Good Luck/Greenbelt Road intersection would be needed.

East Alignment Alternative E-2A is a variant of Alignment Alternative E-2. It incorporates changes made in response to comments received during the NEPA public involvement and state clearinghouse processes. It is identical to Alternative E-2 along the northern tier of GSFC's east campus. The alignment is shifted in its midsection to minimize impacts on GSFC operations. Soil Conservation Road would become the through route at the Good Luck Road intersection, the reverse of what would occur on the other eastern alignments. The realigned road across GSFC would be 2.2 kilometers (1.37 miles) long. Widening improvements along Good Luck Road would increase the total project length to 2.82 kilometers (1.75 miles). Improvements to the Good Luck/Greenbelt Road intersection would be needed.

Under the No Action Alternative, Soil Conservation Road would remain in its existing location. The site would remain split into two roughly equal parts. This alternative is incompatible with the Facilities Master Plan.

Realignment of Soil Conservation Road will not generate new traffic volumes. Instead, the realignment, along with a reconfiguration of vehicle entrances to GSFC, will redistribute traffic on the road network in the immediate environs of GSFC. The principal effect of the Alternative E-2A realignment will be to shift Soil Conservation Road user traffic that now passes through GSFC on that road to Good Luck Road north of Greenbelt Road. Peak hour traffic volumes on Good Luck Road will increase by a factor of four to five by 2022 on the section between Greenbelt Road and its new intersection with Soil Conservation Road. Good Luck Road will be widened from two to four lanes in this section to accommodate the traffic increase.

About 80 percent of the general public using Soil Conservation Road is traveling to or from points to the east of GSFC. During public involvement, an even greater proportion of the public and communities in the environs of GSFC expressed preference for an eastern alignment. A majority of these indicated preference for the E-2 or E-2A route. The local government jurisdictions that expressed an opinion among realignment alternates also indicated preference for an eastern alignment.

Alternatives E-1 and E-2 would have greater impact on GSFC operations than Alternate E-2A. The environmental impacts of the three alternatives, within and without the site, are not substantial. The relative differences among them are small.

In response to public comment, NASA indicated that an eastern alignment is preferred. After review of all analysis of potential impacts in the Environmental Assessment and public comment, GSFC has

selected Alternative E-2A for implementation. NASA will incorporate the following measures into Alternative E-2A:

1. County Trail 5A, the South Laurel Trail, runs the length of Soil Conservation Road. Alternative E-2A will include provisions for relocating this trail along the length of the new alignment.

2. Following considerable study to date, no effects have been found on cultural resources within and outside of GSFC in Alternative E-2A. Archeological Site 18PR548, which is located on the east campus, is eligible for inclusion in the National Register of Historic Places. The site is avoided by the alignment. NASA has consulted extensively with the Maryland Historic Trust in these matters, and will continue to do so on the need for further surveys and studies during design.

3. Alternative E-2A will generate storm water runoff impacts. The extent of these impacts will be determined during design. Management and control facilities will be designed at that time, and built to meet applicable Maryland Department of the Environment standards and guidelines.

4. Alternative E-2A will impact about 0.1 hectares (0.2 acres) of wetlands and an estimated 200 linear meters (660 linear feet) of streambed. Further wetland surveys and delineations will be conducted once the alignment is refined during design. NASA will prepare mitigation plans as part of the U.S. Army Corps of Engineers and Maryland Department of the Environment permit processes to compensate for wetland losses on an appropriate replacement acreage basis.

5. Implementation of Alternative E-2A will result in the loss of about 3.0 hectares (7.3 acres) of coniferous forest and 1.3 hectares (3.3 acres) of mixed coniferous/deciduous forest on the east campus, or a total of 4.3 hectares (10.6 acres). GSFC has about 318 hectares (785 acres) of forest. NASA will set aside a suitable portion of the site forest as a Long Term Forest Conservation Area as compensation for forest loss. The location and character of the conservation forest area will be determined in consultation with the Maryland Department of Natural Resources.

Alternative E-2A will require approximately 3.0 hectares (7.3 acres) of Beltsville Agricultural Research Center (BARC) property at the northern end of the project for right-of-way. This property will be needed to convert a portion of existing Soil Conservation Road into a GSFC employee-only entrance. It is anticipated that GSFC occupancy of BARC property will be achieved through an agreement between the agencies.

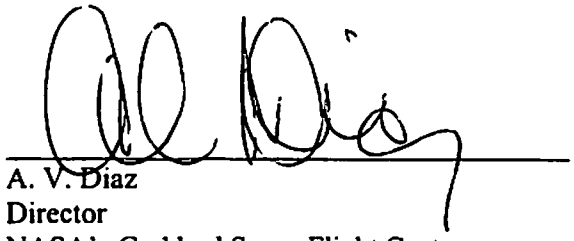
Construction of the new Soil Conservation Road/Good Luck Road intersection will require a partial take of the privately owned FI-CON commercial property on the east side of Good Luck Road. The partial take will have no substantial effect on the overall current use of the property.

GSFC will permit dedication of necessary GSFC property for public right-of-way for the Soil Conservation Road/Good Luck Road intersection.

Alternate E-2A will require relocation of the Goddard Employee Welfare Association (GEWA) recreation center entrance. About 33 of 102 parking spaces at the recreation center will be lost, but replaced at an adjacent location.

No other issues of environmental concern have been identified.

On the basis of the Facilities Master Plan Environmental Assessment, NASA has determined that the environmental impacts associated with the Facilities Master Plan with Soil Conservation Road Realignment Alternative E-2A will not individually or cumulatively have a significant impact on the quality of the human environment. Therefore, an environmental impact statement is not required.



A. V. Diaz
Director
NASA's Goddard Space Flight Center

Jan 9, 2003
Date

GSFC ENVIRONMENTAL ASSESSMENT

A Twenty-year Plan For NASA's Campus In Greenbelt, Maryland
December 2002

National Aeronautics and
Space Administration

Goddard Space Flight Center

ENVIRONMENTAL ASSESSMENT
GSFC FACILITIES MASTER PLAN

including

SOIL CONSERVATION ROAD REALIGNMENT
AT
GREENBELT, MARYLAND

December, 2002

ENVIRONMENTAL ASSESSMENT
for
GSFC FACILITIES MASTER PLAN

including
SOIL CONSERVATION ROAD REALIGNMENT

at
GREENBELT, MARYLAND

FACILITIES MANAGEMENT DIVISION
MANAGEMENT OPERATIONS DIRECTORATE
GODDARD SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

December 2002

Proposed Actions:

GSFC FACILITIES MASTER PLAN

The Facilities Master Plan responds to and translates the requirements for projected future Goddard Space Flight Center (GSFC) operations as indicated by NASA and Goddard planning and programming into a document that will guide physical site development over the next twenty years.

SOIL CONSERVATION ROAD REALIGNMENT

The proposed action would be the realignment of Soil Conservation Road to the east side of GSFC. Soil Conservation Road currently splits GSFC into two tracts of nearly equal size. Realignment would allow consolidation of NASA facilities into one single, unified installation. NASA has selected alignment Aternative E-2A for implementation.

Document No. NP-2002-12-520-GSFC(2/3)

For further information contact:

Kim Toufectis
NASA Goddard Space Flight Center
Facilities Management Division
Building 18, Code 221.0
Greenbelt, Maryland 20771
Telephone: 1-301-286-9952

TABLE OF CONTENTS

GSFC FACILITIES MASTER PLAN
ENVIRONMENTAL ASSESSMENT

LIST OF TABLES

LIST OF FIGURES

LIST OF TABLES

LIST OF FIGURES

Page

APPENDICES

1 EXECUTIVE SUMMARY

1.1 Administrative Action

This is a Final Environmental Assessment (FEA) for the NASA Goddard Space Flight Center Facilities Master Plan (FMP) including the relocation of Soil Conservation Road. The Draft FMP and Draft Environmental Assessment were published and circulated to the public for review on July 3, 2002. The National Environmental Policy Act (NEPA) review and comment period was open until September 5, 2002. A public meeting was held on August 6, 2002 at DuVal High School, where comment and questions were invited.

Two Proposed Actions are under consideration:

- The Goddard Space Flight Center (GSFC) Facilities Master Plan, Greenbelt, Maryland.
- Realignment of Soil Conservation Road at GSFC, Greenbelt, Maryland.

This document is a NASA programmatic Draft Environmental Assessment for the GSFC Facilities Master Plan with the realignment of Soil Conservation Road as a component of the program. The GSFC Facilities Master Plan Environmental Assessment is broad in scope and provides a framework of information for evaluation of component actions as they are implemented. It addresses the potential cumulative effects or impacts should the Facilities Master Plan undergo full implementation. The Facilities Master Plan Environmental Assessment is contained in Sections 2 through 5.

Information on the Soil Conservation Road realignment has been developed in more detail in Section 7, which concentrates on the more specific and relevant concerns and potential impacts of this program component.

A summary of coordination and meetings related to both projects is in Section 6. Early coordination and scoping correspondence is shown in Appendix A. Written comment received during the NEPA review process is shown in Appendix B along with NASA responses to comment and questions.

1.2 Additional Reports

The following documents are an integral part of the environmental documentation and are incorporated by reference:

GSFC Facilities Master Plan, NASA, 2002.
GSFC Transportation Management Plan, NASA, 2002.
Phase I Archeological Survey, NASA GSFC, SCS Road Relocation, AEC/A, 2002.
Wetlands Delineation, Soil Conservation Road Relocation, WSSI, 2002.
Phase II Archeological Investigations at Sites 18PR548, 18PR549, and 18PR551, NASA GSFC, Greenbelt, MD, John Milner Associates, 2002.

1.3 NASA Goddard Space Flight Center

The NASA Goddard Space Flight Center is one of ten NASA centers in the U.S. The Center comprises four facilities, the NASA Goddard Space Flight Center (GSFC) at Greenbelt, Maryland; the Wallops Flight Facility on the Atlantic coast near Chincoteague, Virginia; the Goddard Institute for Space Studies near the Columbia University campus in the City of New York; and the Independent Verification and Validation Facility in Fairmont, West Virginia.

The Draft Facilities Master Plan and Draft Environmental Assessment are for the NASA GSFC Greenbelt campus only, and do not include the other Center facilities. For convenience, the site is also identified as GSFC or Goddard in the documentation with the understanding that it is the Greenbelt campus. The Facilities Master Plan is also identified as the Master Plan Alternative or Master Plan in documentation.

1.4 Existing Conditions Summary

NASA GSFC is a 1,270 acre Federal facility located in Prince George's County, Maryland, in suburban Washington, D.C. near the City of Greenbelt. The site is divided into two large areas, the east and west campuses, which are separated by Soil Conservation Road. Each campus is approximately 420 acres in extent. The remainder of Goddard is divided into four relatively undeveloped satellite areas that are devoted to research activities requiring isolation from outside disturbances.

About 7,600 employees work at the site in approximately 35 major buildings. The primary mission of the GSFC is spacecraft based research in the physical, space, and Earth sciences. Personnel and facilities are closely integrated in organization and infrastructure. A majority of the employees are technical personnel, scientists, engineers, and computer and communications specialists. Activities at the site include management and programming of space oriented research; the management, design, fabrication, testing, and assembly of scientific experiment payloads to be launched into space; and the recovery, interpretation, and dissemination of information retrieved from spacecraft. Bench and laboratory research in support of all these activities is also conducted. Many of the technical facilities are unique, or at the extremes in terms of size or operational capability such as clean rooms, and test spaces that can produce very high or low temperatures, pressures, and magnetic fields that may be encountered on a space mission.

About 80 percent of the site's major buildings were constructed during the 1960's in the initial blossoming of the American space program. Nearly half of the other buildings were built in the 1990's to accommodate the Earth Science research field undergoing rapid development at that time. Earth Science studies the Earth on a global or very large scale using data retrieved from spacecraft. An assessment of site buildings shows that many no longer are suitable for cutting edge, high quality research. Renovation or replacement is needed.

Long term strategic planning by NASA anticipates significant changes in the space program and space oriented research. Until about 1990, research was managed and completed primarily by NASA scientists and engineers with support by American private industry and academia. Over the last decade, outside private and government partners, both domestic and foreign, have had increasing participation, and have become equal players, if not more, on many projects and programs. Scientific space flights now typically carry four to six individual experiments, and many are under the auspices of outside partners. Scientists and engineers from half a dozen nations may be directly involved in a mission program.

NASA long term planning anticipates and encourages further participation by others in space projects. It foresees greater exploitation and commercialization in space. A new operating model similar to those used in the private commercial sector has been proposed in agency strategic planning. NASA and GSFC will have to compete with others worldwide for space research projects and programs to supplement Federal government funded projects and interests.

1.5 GSFC Facilities Master Plan

1.5.1 Summary of Proposed Action

The proposed action is a Facilities Master Plan that would guide and coordinate physical development at Goddard in terms of buildings, utilities, roads and streetscape, landscaping, and amenities over the next 20 years in response to the new operating paradigm (GSFC Facilities Master Plan, Greenbelt, NASA, 2002). The Facilities Master Plan does not commit NASA to any of the projects proposed. Implementation of any projects depends on Congressional funding, and not all projects may be built. It is intended that it be flexible to meet changing NASA needs. NASA may deviate from the plan in siting some specific building or facilities. Proposed facilities and planning criteria and guidelines are detailed within the Facilities Master Plan document. The Facilities Master Plan is shown schematically in Figure 4-1. The principal features of the Facilities Master Plan are:

- Conceptual organization of the campus into neighborhoods and zones corresponding to NASA GSFC administrative and functional directorates.
- The consolidation of NASA facilities now split into east and west campuses by Soil Conservation Road into a single, unified, access controlled NASA installation within Goddard without significant expansion into undeveloped areas of the site.
- Overall, NASA occupied space would remain at about 3.3 million gross square feet (gsf). Nineteen buildings with approximately 1.7 million gsf would be retained. They would be augmented by up to 21 new research and support buildings or facilities with an estimated cumulative floor area of 1.6 million gsf.
- A new Space Science complex, which would permit consolidation of these facilities and personnel that are now dispersed around GSFC.
- In conjunction with the Space Science complex, a new Central Commons area that collects support activities and functions serving all of Goddard at the site. These include a conference center, training center, library, employee credit union, travel, post office, and a fitness center.
- Contingency space in a "New Thrust" Zone for moderate expansion of individual programs or a new mission assignment unforeseen at this time.
- "Teaming" spaces, which can be assigned to individual program or project teams formed by NASA personnel for the duration of the program or project.
- The construction of a Loop Road within the NASA installation to create a pedestrian friendly campus core area.
- Realignment of Soil Conservation Road to the east side of the site.
- The creation of a Partner and Outreach Zone (PAOZ) for domestic and foreign partners from outside NASA. See Section 4.4 of the Facilities Master Plan for details. The PAOZ would have approximately one million gsf of floor space in 10 buildings now occupied by NASA. Much of the space has a current technical or laboratory use. After NASA transferred personnel and equipment, the facilities could be used as is by outside partners, adapted for new use, or replaced with similar facilities within Master Plan guidelines for the zone.

The Facilities Master Plan is based on a 2022 population composed of 6,800 NASA employees plus an employee population of 1,950 in the Partnering and Outreach Zone (PAOZ) for a site total of 8,750. However, there is considerable uncertainty in Goddard employee projections beyond the next few years. The best estimate from master plan programming is that the NASA employee population at Goddard will decline from the current level of 7,600 to 5,800 by 2022 through attrition and retirement. The Facilities Master Plan has added a NASA employee population of 1,000 to this programming estimate to cover the contingency that Goddard could be assigned a new mission unforeseen at this time. About 500 of this contingent NASA employee population would be accommodated in the New Thrust Zone, the remaining 500 in "infill" facilities located within Master Plan NASA neighborhoods.

1.5.2 Alternatives

Two alternatives are under consideration: the Facilities Master Plan Alternative or proposed action, and No Action Alternative. The Facilities Master Plan Alternative was developed through a continuous planning process that progressed through preliminary versions. These preliminary versions were presented to the public and interested government agencies for comment. The Facilities Master Plan Alternative is also identified as the Master Plan or Master Plan Alternative herein.

The No Action Alternative assumes that the NASA employee population and overall facility space would remain approximately the same as exists currently. Facilities would be renovated or replaced with similar facilities to meet building and operating codes. The Partnering and Outreach Zone would not be created.

1.5.3 Summary of Potential Impacts

Analysis of potential Facilities Master Plan Alternative impacts assumed complete build out of all projects delineated in the plan with a site population of 8,750. Future impacts are projected for the year 2022 corresponding to the 20 year planning horizon on which the plan is based. The potential impacts are therefore cumulative impacts. Actual impacts would be less than indicated to the extent that projects shown in the plan are not implemented.

The Master Plan Alternative would meet NASA's requirements for technical, research, and support space at Goddard through the 20 year planning horizon period. It would make administration, operations, and research more efficient. The Partnering and Outreach Zone offers the potential for significant economic benefit to Prince George's County, Maryland and the Washington metropolitan region.

Implementation of the Facilities Master Plan Alternative would require realignment of the southernmost section of Soil Conservation Road through GSFC. The Facilities Master Plan is based on realigning or relocating Soil Conservation Road to the east side of the east campus, and connecting it to Good Luck Road. The potential impacts of the realignment are summarized in Section 1.6.3.

The Master Plan Alternative would have no direct substantive impact on land use, regional planning, housing, park and recreation facilities, the terrestrial environment, water resources, wetlands, floodplains, threatened and endangered species, and historic properties. Potential increases in utility demands associated with plan implementation are within the capacity of existing site and public systems.

No substantive noise impacts are expected. There will be no air quality impacts. Master Plan Alternative air quality will meet the National Ambient Air Quality Standards.

No traffic impacts will occur as long as the GSFC employee population remains at or below current levels. Although the Facility Master Plan provides for a potential increase from 7,600 to 8,750 site employees, it is most likely that the population will remain at or below current levels. Traffic analysis completed on the assumption of full plan implementation and a site population of 8,750 indicates that there would be no substantial increase in congestion, or decrease in intersection level of service, on the public road network in the vicinity of GSFC as a result of added employee trip generation.

A new Transportation Management Plan (TMP) is a component within the Facility Master Plan. The TMP outlines a long-term program for reduction of single occupant vehicle employee trips through increased used of other transportation modes such as car and vanpooling, transit, bicycling, and pedestrian travel.

Facility Master Plan transportation impacts are covered in the Soil Conservation Road realignment section of the Environmental Assessment.

1.5.4 Approvals/Actions Required By Other Government Agencies

Section 5(a) of the National Capital Planning Act of 1952, as amended (40 U.S.C. § 71d(a)), provides that each Federal agency in the National Capital Region shall advise and consult with the National Capital Planning Commission (NCPC) in the preparation of plans and programs which affect the Comprehensive Plan for the National Capital prior to preparation of construction plans. NCPC defines a master plan as an integrated series of documents in graphic, narrative, or tabular form that present a plan for the orderly and long range development of an installation, generally over a period of 20 years. NCPC maintains that a master plan reviewed by the Commission is a required preliminary stage of planning that must be completed prior to preparation of building and site plans for specific projects. When the installation is in the Maryland portion of the National Capital Planning Region, then the Maryland-National Capital Park and Planning Commission (M-NCPPC) acts in an advisory capacity to NCPC. Review of the Master Plan by NCPC does not imply approval of individual projects as they are implemented. It is NCPC policy that Federal developments and projects requiring NCPC review and comment also require the submission of an Environmental Impact Statement or Environmental Assessment using the criteria established by the U.S. Council on Environmental Quality.

While a Master Plan reviewed by NCPC is necessary for construction of a major project proposed in the plan, NCPC Master Plan review does not imply NCPC approval of construction of specific projects. When individual major projects are proposed for construction, project specific environmental documentation and NEPA public involvement will be completed where warranted. NASA would also prepare a new master plan when a major deviation from the proposed Facilities Master Plan occurs, or a cumulative number of individual projects deviations produce a major change in the Plan.

1.6 Soil Conservation Road Realignment

1.6.1 Summary of Proposed Action

The proposed action is the realignment of Soil Conservation Road through Goddard. Existing Soil Conservation Road splits the main portion of Goddard into two separate tracts, each of which has its own security perimeter. One goal in the GSFC Facilities Master Plan is the consolidation of NASA facilities into a unified, single NASA installation. The Soil Conservation Road realignment is a key project within the Facilities Master Plan that would initiate the consolidation process. Relocation of the road would make ground space available for construction of the Space Science Complex at Facilities Master Plan Site A. This, in turn, would permit the consolidation of Space Science directorate personnel, freeing up other campus buildings for transfer of personnel and proposed Facilities Master Plan uses. The road realignment would be the first proposed Facilities Master Plan project that would be implemented.

NASA has selected East Alignment Alternative E-2A for implementation. Alignment alternative E-2A is a variant of Alternative E-2 presented in the Draft EA and at public meetings. It incorporates changes made in response to comment received during the NEPA public involvement process. It is identical to Alternative E-2 along the northern tier of the east campus, and along Good Luck Road. The alignment is shifted further to the east in its midsection as it crosses Goddard to minimize impacts to NASA operations at facilities in the northeast corner of the east campus. Good Luck Road would tee into Soil Conservation Road at their intersection, the reverse of what would occur under the other eastern alignment alternatives.

The realigned two-lane road section across Goddard would be 1.37 miles long. Widening improvements along Good Luck Road would increase the total project length to 1.75 miles. East Alignment Alterative E-2A is shown in Figure 7-11. Details associated with the project in the Good Luck Road corridor are shown in Figure 7-12.

1.6.2 Alternatives Considered

Four other alternatives were considered.

- West Alignment Alternative W-1
- East Alignment Alternative E-1
- East Alignment Alternative E-2
- No Action

See Figures 7-5, 7-7, 7-9, respectively, for schematics of the alignments.

West Alignment Alternative W-1

West Alignment Alternative W-1 would skirt the western periphery of existing and proposed development on the west campus. It would generally follow existing campus roads, and connect to Greenbelt Road at Goddard Gate 2 at the existing Iue Road intersection. The total length between termini would be about 1.26 miles. The road would be four lanes wide between Greenbelt Road and the NASA employee entrance from the Baltimore-Washington Parkway. North of the latter point, it would be two lanes wide.

East Alignment Alternative E-1

This alternative follows an L-shape alignment across the northern sector of the east campus before turning to the south and connecting to Good Luck Road opposite the Countryside Apartments. The realigned road across Goddard would be two lanes wide and about 1.45 miles long. Good Luck Road would be widened to four lanes between the southern end of realigned road and Greenbelt Road.

Widening improvements along Good Luck Road would increase the total project length to about 1.65 miles. Improvements to the Good Luck/Greenbelt Road intersection would be needed.

East Alignment Alternative E-2

The alignment of E-2 passes to the north and east of all NASA development on the east campus. The Alternative shares the same general design characteristics as Alternative E-1. It is identical to Alternative E-1 in its northern sector, but instead of completing a full 90 degree turn to the south, it runs straight across a vacant area within Goddard to intersect Good Luck Road on the perpendicular at a point further north. The section across Goddard would be 1.28 miles long, and Good Luck Road would be widened in the 0.41 mile section between the new Soil Conservation Road intersection and Greenbelt Road. Improvements to the Good Luck/Greenbelt Road intersection would be needed.

No Action Alternative

Consideration of the No Action Alternative is required by Federal regulations implementing the provisions of the National Environmental Policy Act (40 C.F. R. 1502.14(d)). The No Action Alternative serves as a frame of reference for determining potential environmental impacts on a comparative basis.

The realignment of Soil Conservation Road is a necessary condition for implementing the Facilities Master Plan. The Soil Conservation Road No Action Alternative therefore is based on the Facilities Master Plan No Action Alternative in that Goddard would continue with essentially the same amount of building space, personnel, and site configuration as currently exists.

In response to feedback from the public and Goddard employees, NASA has indicated that realignment of Soil Conservation Road to the eastern side of the campus is preferable to the West Alignment Alternative W-1.

1.6.3 Summary of Potential Impacts and Mitigation

Congestion will increase on the road network in the study area by 2022 due to growth in general background traffic from County and Greenbelt Road Corridor development outside of Goddard. This will occur even if the Goddard site population remains the same or declines. The congestion will be such that applicable State and local jurisdictional agencies will have to make improvements to maintain acceptable levels of service, regardless of NASA actions.

Impact assessments for the Soil Conservation Road realignment assume full build out Facility Master Plan conditions in terms of internal Goddard road network and entrances, site personnel levels, and traffic generation. Since Soil Conservation Road is a realignment of an existing road, and not a new one, the overall traffic volumes in the study area are virtually unchanged. For example, comparison of 2022 PM peak hour traffic volumes for the No Action and East Alignment Alternatives, including Alternative E-2A, at the Greenway/MD 193 intersection show a difference of about 20 vehicles.

Realignment of Soil Conservation Road will, however, redistribute traffic on the local road network in the immediate vicinity of Goddard. Existing Soil Conservation Road handles both through public user and NASA employee traffic at the Greenbelt Road intersection. In effect, Alternative E-2A will split this traffic. Existing Soil Conservation Road will be converted to NASA employee only entrance, reducing congestion at this intersection. Public user traffic will be transferred to Good Luck Road. This will increase peak hour traffic volumes three to five fold on the segment of Good Luck road between the new Soil Conservation Road intersection and Greenbelt Road (MD 193).

Future 2022 NASA employee traffic will follow travel patterns similar to existing conditions. Some minor shifts occur in entrance use and route taken for those travelling to and from the north via either the Baltimore-Washington Parkway or Soil Conservation Road. The Partnering and Outreach Zone will have a single entrance on MD 193. Zone employees travelling to and from the north via the Baltimore-Washington Parkway will make a circuit via either Greenbelt Road or the east via Good Luck and the relocated Soil Conservation Road to reach the parkway.

Alternative E-2A will increase the route length between the Powder Mill Road interchange at the Baltimore-Washington Parkway and Greenbelt Road. For those traveling to and from west, the distance from the MD 193/Hanover Parkway intersection to the interchange will increase from 5.22 to 6.91 miles. For those traveling to and from the east, the distance between the MD 564/MD 193 intersection and the interchange will increase from 4.84 to 5.81 miles. About 80 percent of the public Soil Conservation Road commuters are travelling to and from the east on Greenbelt Road.

The Facilities Master Plan proposes relocating warehouse facilities to the east side of Goddard along the realigned Soil Conservation Road. New commercial vehicle inspection facilities would be included. This would have the secondary impact of adding about 50 trucks per day to the Soil Conservation Road traffic on Good Luck Road.

Alternative E-2A would not generate substantive traffic noise or air quality impacts. Leq or equivalent noise levels in the northern sector of the Countryside Apartments facing Good Luck Road would increase from 59 dBA to 62 dBA in 2022. The National Ambient Air Quality Standards would be met.

County Trail 5A, the South Laurel Trail, runs the length of Soil Conservation Road. Alternative E-2A will include provisions for relocating this trail along the length of the new alignment.

Alternative E-2A will have no adverse effect on cultural resources within and outside of Goddard. Archeological Site 18PR548, which is located on the east campus, is eligible for the National Register of Historic Places. The site is avoided by the alignment. NASA will consult with the Maryland Historic Trust about the need for further surveys and studies during the design and construction phases.

Alternative E-2A will generate storm water runoff impacts. The extent of these impacts will be determined during the design phase. Management and control facilities will be designed at that time, and built to meet applicable Maryland Department of the Environment standards and guidelines.

Alternative E-2A will impact about 0.2 acre of delineated non-tidal palustrine wetlands and an estimated 660 linear feet of ephemeral channel. Further wetland surveys and delineations will be conducted once the alignment is fixed during the design phase. NASA will prepare mitigation plans as part of the U.S. Army Corps of Engineers and MDE permit processes to compensate for wetland losses.

Implementation of Alternative E-2A will result in the loss of about 7.3 acres of coniferous forest and 3.3 acres of mixed coniferous/deciduous forest on the east campus. About 0.3 acre of the deciduous forest loss is attributable to replacement parking at the Goddard Employee Welfare Association recreation center. NASA will set aside a suitable portion of the site forest as a Long Term Forest Conservation Area as compensation for forest loss. The location and character of the conservation forest area will be determined in consultation with the Maryland Department of Natural Resources.

Alternative E-2A will require approximately 7.3 acres of BARC property at the northern end of the project for right-of-way. This property would be needed to convert existing Soil Conservation Road into a NASA employee only entrance. It is anticipated that NASA occupancy of BARC property would be achieved through an agreement between the agencies.

Construction of the new Soil Conservation Road/Good Luck Road intersection will require a partial take of the privately owned FI-CON commercial property on the east side of Good Luck Road. It is estimated that about 5,400 sf of the 49,775 sf property along the Good Luck Road frontage will be required for widening the road to four lanes. The partial take would have no substantive effect on the overall current use of the property.

Most of the Soil Conservation Road/Good Luck Road intersection will be situated on NASA property. The intersection will be in the public domain with NASA ownership of Soil Conservation Road beginning to the north of the intersection. Approximately 1.1 acres of NASA will be turned over to Prince George's County for dedication as public right-of-way.

The Goddard Employee Welfare Association (GEWA) Recreation Center is located just to the west of the proposed intersection. Alternative E-2A will impact facilities at the GEWA Recreation Center. Existing access to Recreation Center parking would be closed and shifted to a new entrance at the intersection opposite Good Luck Road. Construction of the intersection will result in the estimated loss of 33 of the 102 parking spaces at the center. The spaces would be replaced by an equivalent number of parking spaces. The ball field on the east side of the Recreation Center will also be impacted. The distance down the right field line to the NASA boundary fence would be reduced from about 300 feet to 250 feet.

1.6.4 Approvals/Actions Required by Other Government Agencies

Realignment of Soil Conservation Road would require the following approvals and actions by others:

- Section 401/404 Permits/Wetland Mitigation

The project will require placement of road embankment fill material in jurisdictional waters of the United States, as defined in the US Army Corps of Engineers regulations. Such an action would require the issuance of a permit under Section 404 of the Clean Water Act. Under Section 401 of the Act, the State of Maryland Water Management Administration is required to issue a Water Quality Certification that certifies the activity does not cause a violation of State water quality standards or limitations. The Federal regulatory program in 33 C.F.R. 320-330. Generally, a joint permit/certification is issued. As a requirement for obtaining a permit, the agencies must approve a wetland replacement or mitigation plan.

- Stormwater Management Plan

The project will require an approved plan for management of storm water runoff meeting the requirements of the Maryland Department of the Environment, Water Management Administration, in accordance with COMAR 26.17.02.00.

- BARC Property Use

The project will require right-of-way on property owned by the Beltsville Agricultural Research Center (BARC). The use of this property by NASA would require an agreement between BARC and NASA on the use of the land.

- Public Space Access Permits

Greenbelt Road and its right-of-way are owned by the State of Maryland. Similarly, Prince George's County owns Good Luck Road. Connection of private or public property entrances or roads to public roads requires the issuance of access permits. The permits ensure that public safety is maintained and proposed work is coordinated with systems and utilities in the right-of-work. The project will require a County permit to connect to Good Luck Road, as well as a State permit if any improvements are needed at the Good Luck/Greenbelt Road intersection.

- Long Term Forest Conservation Area

The Maryland Forest Conservation Act of 1991 requires that prior to approval of any project plan, grading permit, or sediment and control plan, applicants must submit a Forest Stand Delineation (FSD) and a Forest Conservation Plan (FCP) for approval by the Maryland Department of Natural Resources Forest Service. The FSD delineates existing conditions. The FCP details the amount of forest that will be retained, reforested, afforested, or other mitigation measures.

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2 PURPOSE AND NEED

2.1 Purpose

Under the new space program paradigm of wider involvement by others in space programs, NASA GSFC expects much more joint participation or partnering with those outside the Center, including other government agencies, foreign governments, contractors and universities, and other NASA Centers. Terra, a new satellite launched in December 1999, is an example of this model. Terra is the flagship of the Observing System network. It can monitor air, land, and ocean temperatures; sea ice, snow cover, and glaciers; land use and vegetation; and pollution levels and natural disasters. Five instrument packages are on board, but only one of these was developed by NASA GSFC. The others were sponsored by the Japanese Ministry of International Trade and Industry, the Canadian Space Agency, and NASA's Langley Research Center and Jet Propulsion Laboratory. The facilities at NASA GSFC must be reorganized if it is to function effectively under the new paradigm.

The National Aeronautics and Space Act of 1958 which established NASA, lists four broad objectives for the agency:

- Expand knowledge of the Earth, its environment, the solar system, and the universe;
- Develop and promote selected civil applications of space technology;
- Preserve United States leadership in critical aspects of space science, applications, and technology;
- Further United States domestic and foreign policy objectives.

NASA GSFC at Greenbelt is one of the few installations in the world with sufficiently diverse facilities and personnel that can conduct a complete space science program that meets these objectives. Activities range from conceptualization of programs, projects, and experiments, to design, development, fabrication, and testing of required scientific instruments and carrying spacecraft, to acquisition, processing, and analysis of data acquired.

The purpose of the Facilities Master Plan is to furnish guidance for realistic, orderly and comprehensive physical development of NASA Greenbelt facilities so that NASA can continue to perform its mission and meet its mandated objectives, while operating under the new space program of increased partnering activity.

The Facilities Master Plan is one of a series and an update of master plans that have guided development at Greenbelt. Prior master plans were completed in 1964, 1979 and 1988. Recommendations given in the 1964 Master Plan established the basic context and pattern of development. A majority of the recommendations in the subsequent plans, generated to respond to NASA's changing needs, have been implemented, although frequently of lesser scope and at a later date than originally planned, primarily due to budget constraints. Preparation and maintenance of a Facilities Master Plan for all NASA field installations is mandated by Agency policy guidelines.

2.2 Need

The Facilities Master Plan outlines a coordinated long term land use and development strategy for the campus to meet the new NASA planning strategies. It establishes a conceptual integrated framework for physical development that permits NASA to cohesively organize the arrangement of potential future buildings, necessary supporting infrastructure such as roads and utilities, access, and open areas. Potential development sites and natural areas to be protected are identified. Systematic planning leads to minimization of undesirable impacts. General conditions, criteria, and constraints are delineated. An approximate sequence of steps for implementation of the plan and reaching the development objectives is outlined. It is also the intent of the Facilities Master Plan to encourage active dialogue among NASA management, the NASA scientific and support community, and the general public and citizens by fostering a better understanding of the ramifications of proposed policies and plans for facilities at the NASA GSFC site.

Information and recommendations in the Facilities Master Plan will be used by NASA administrators, planners, architects, and engineers when implementing individual projects. Local government jurisdictions and utilities can use this same source to anticipate and plan for the cumulative effects that NASA proposals may potentially have on their infrastructure and systems.

It is important to note that a master plan is a document of broad and general scope. It must be flexible, and is not a fixed blueprint. Variances within the constraints established in the Facilities Master Plan are expected to occur. Small projects needed for immediate ad hoc operations, routine maintenance and repair projects, and other projects that produce no significant permanent impact are not necessarily delineated.

All the growth and projects depicted in the Facilities Master Plan may not occur. On the other hand, NASA must respond to future Congressional and Presidential decisions regarding its mandated mission. These policy decisions, in turn, reflect demands and pressures applied by the American people. Agency history has shown that changes in policy can be expected over the next decade, and within its mission, directives to NASA could change as a result. Although the Facilities Master Plan extends to a planning horizon of 20 years, it is the intent of NASA to review and update the plan at approximately 10 years intervals as it has done in the past.

†††

3 BACKGROUND AND ORIENTATION

3.1 Project Location

The NASA Goddard Space Flight Center (GSFC) at Greenbelt lies within the Washington D.C. metropolitan area. It is located in Prince George's County Maryland, about 7 miles northeast of the District (Figure 3-1). The distance between the western site boundary and the I-95/I-495 Washington Beltway interchange with the Baltimore-Washington Parkway is about one mile. NASA facilities are located in six site areas: the west and east campuses which are separated by Soil Conservation Service Road, and Areas 100, 200, 300 and 400 (Figure 3-2). Soil Conservation Road was previously named Soil Conservation Road Service Road, and is still referred to as SCS Road, colloquially.

The site is bounded on the south side by Greenbelt Road, Maryland Route 193, and it is on the periphery of suburban development. The Town of Greenbelt lies to the west and southwest and abuts NASA GSFC on the west side and a short distance on the south side. The community of Glenn Dale is centered about one mile to the southeast of NASA. A mix of commercial and residential development comprised chiefly of shopping malls, office parks, and low rise apartments and condominiums is found along Greenbelt Road. Remaining areas to the west, south, and east of Goddard are residential. All of the property for a considerable distance to the north of NASA GSFC is government owned. Most of the property abutting NASA is owned by the U.S. Department of Agriculture (USDA). The USDA Beltsville Agricultural Research Center (BARC) is the largest agricultural research facility in the world. Operated by the USDA Agricultural Research Service, it encompasses 6,615 acres equivalent to more than 10 square miles in area. BARC extends about six miles to the west of the Baltimore-Washington Parkway through Beltsville, Maryland, to Interstate Highway 95. BARC is divided into an office complex in Beltsville along US Route 1 and five farms. Each farm is subdivided into areas. The eastern most section of BARC, the East Farm, abuts NASA facilities and completely surrounds NASA Areas 100 and 200. East Farm Area 500 covers all BARC property between the Baltimore-Washington parkway and Springfield Road.

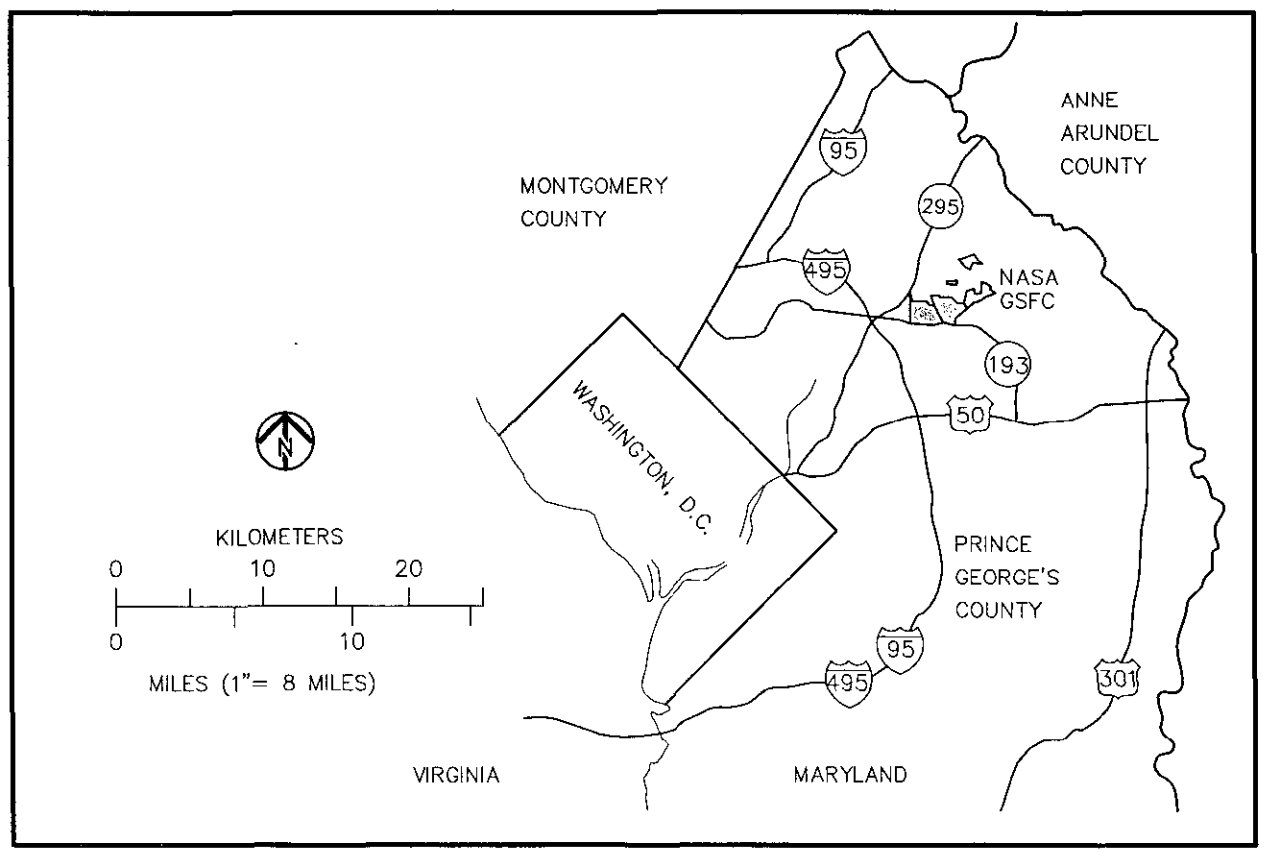


FIGURE 3–1 LOCATION MAP.

BARC conducts research in soil, water, and air conservation; plant and animal sciences; agriculture commodity conversion and delivery; and agricultural systems integration. Except for the office complex, BARC land use is agrarian. The East Farm is primarily forested, but large sections are cleared for cultivation and animal husbandry. Structures are limited to a few clusters of farm buildings, some of which have homes for employee residences. Although BARC had 3,151 employees in 1996, only 17 worked on the East Farm (BARC 1996 Master Plan Update, Bernard Johnson Young, Inc.).

The parcel immediately to the north of the NASA east campus is occupied by the US National Plant

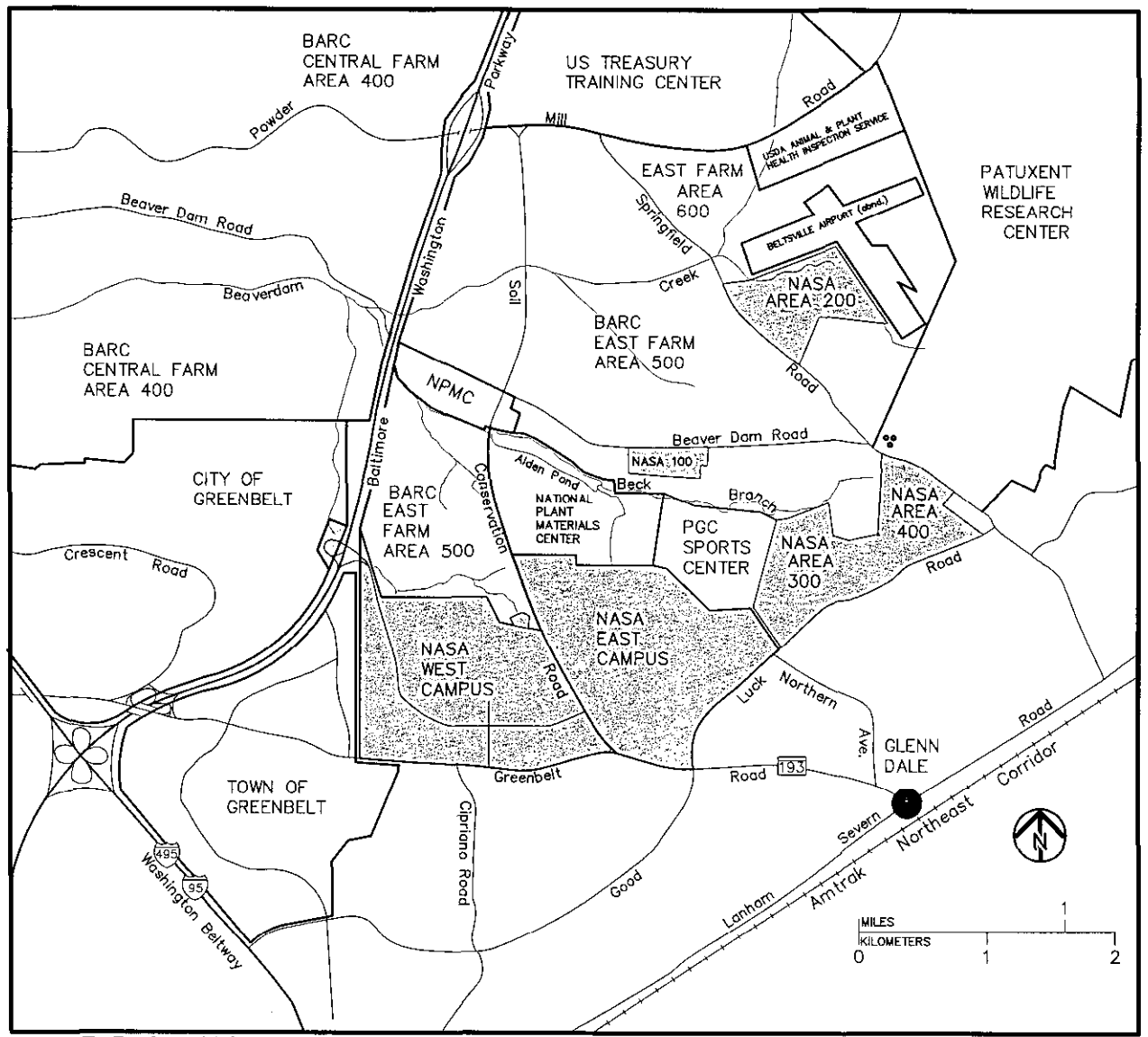


FIGURE 3–2 NASA VICINITY.

Materials Center (NPMC) at Beltsville. The facility is located on several separate tracts within BARC. The largest abuts NASA, totaling 285 acres in extent. Although the property is owned by USDA, it is not a part of BARC. The center is run independently by the US Natural Resources Conservation Service. It is one of 23 regional centers that study local ecosystems with emphasis on resource conservation. Research at the Beltsville NPMC is oriented toward Chesapeake Bay restoration and preservation studies. The parcel adjacent to NASA is completely undeveloped and covered by a prototype Mid-Atlantic pine-oak research forest.

The Prince George's County Sports Center is a skeet and trap shooting range. The firing direction is to the north. A 75-foot wide right-of-way for the range entrance road separates the NASA east campus from Area 300.

The Patuxent Wildlife Research Center (PWRC) is owned and operated by the US Department of the Interior, Fish and Wildlife Service. The center is nearly double (12,750 acres) BARC in size. It extends for more than 10 miles to the north from NASA, across the Patuxent River into Howard County. The center contains the Patuxent Wildlife Refuge, the National Wildlife Visitor Center, and wildlife research facilities. The Visitor Center is the largest wildlife education center operated by the Interior Department. The southernmost section of the Center is adjacent to NASA Area 400 on Springfield Road. This area is used for research on wildlife and habitat relationships, the effects of environmental contamination, and on endangered species and migratory birds.

3.2 Missions and Organization

NASA has the following missions (1998 NASA Strategic Plan, NASA Policy Directive (NPD)-1000.1):

- Advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe.
- Explore, enable, and use the development of space for human enterprise.
- Research, develop, verify, and relate technologies to others.

These missions are carried out by implementation of four strategic enterprises (ibid.):

- Space Science
- Earth Science
- Human Exploration and Development of Space
- Aeronautics Technology

To accomplish its missions, NASA is organizationally divided into ten Centers (Table 3-1). Three facilities and one institute form suborganizations under three of the centers. Three of these suborganizations, the Wallops Flight Facility, the Goddard Institute for Space Studies, and the Independent Verification and Validation (IV&V) Facility are part of the Goddard Space Flight Center. Each of the Centers has been assigned an "area of excellence" and more specific missions within the framework of the NASA wide missions and strategic enterprises.

The primary mission of the Goddard Space Flight Center (GSFC) is scientific research, and it serves as the lead NASA center devoted to this mission. In the 1960's, NASA GSFC concentrated on space science, particularly in the disciplines of physics, astrophysics, and astronomy. This mission is now encompassed within NASA's overall Space Science strategic enterprise. Other NASA Centers are involved in astrobiology, planetary science and exploration, and astromaterials as part of the enterprise.

	CENTER	AREA OF EXCELLENCE	LOCATION
	NASA Headquarters	Agency Management	Washington, D.C.
1.	Goddard Space Flight Center	Scientific Research	Greenbelt, MD
	1a. Wallops Flight Facility	Suborbital Operations	Wallops Island, VA
	1b. Goddard Institute for Space Studies	Earth Sciences	New York, NY
	1c. IV&V Facility	Computer Software	Fairmont, WV
2.	Marshall Space Flight Center	Space Propulsion	Huntsville, AL
3.	Jet Propulsion Laboratory	Deep Space Systems	Pasadena, CA
4.	Dryden Flight Research Center	Atmospheric Flight Operations	Edwards, CA
5.	Johnson Space Center	Human Operations in Space	Houston, TX
6.	Stennis Space Center	Propulsion Testing	Gulf Coast, MS
7.	Kennedy Space Center	Launch and Payload Systems	Cape Canaveral, FL
8.	Ames Research Center	Information Technology	Mountain View, CA
9.	John Glenn Research Center	Turbo machinery	Cleveland, OH
10.	Langley Research Center	Structures and Materials	Hampton, VA

TABLE 3-1 NASA CENTERS.

As part of the Earth Science Strategic Enterprise, NASA GSFC is now at the forefront in pioneering development of the new scientific discipline of Earth System Science, which studies the planet on a global or very large scale. Initial emphasis, in partnership with the US National Oceanic and Atmospheric Administration (NOAA), has been given to global weather and climate and human impact in these areas. Increased awareness over the last decade of the global effects of the El Nino phenomena in the equatorial Pacific Ocean is due to collection and analysis of information gathered in these studies. Research is also devoted to large scale oceanography, continental geology and drift, geodesics, and tropical rainfall measurement. NASA GSFC is expected to continue to serve as NASA's Center of Excellence in space science, earth science, and their technologies.

NASA GSFC at Greenbelt is also involved in many other aspects of the space program and NASA missions. It partners with other NASA Centers that have different specialized areas of expertise in conducting research and operating spacecraft, and testing and evaluating spacecraft components and onboard scientific research instruments. Other GSFC Greenbelt facilities are involved in spacecraft communications and control, retrieval and interpretation of data, and conversion of the data into useable form. Many of the facilities at NASA GSFC in Greenbelt are one of a kind, or are the largest smallest, or capable of producing the most extreme test conditions such as temperature and pressures, among the world's like facilities.

3.3 Facilities

3.3.1 Property

Land now occupied by NASA was acquired between 1929 and 1936 from private owners by the U.S. Department of Agriculture. NASA GSFC is located on five unconnected tracts of land that, with one exception, were subsequently purchased outright or occupied under revocable permit from the USDA in a series of transactions. These tracts correspond to the east and west campuses combined, Area 100, Area 200, Area 300 and 400 combined, and a small parcel on the west side of the Baltimore-Washington Parkway (Table 3-2).

	TITLED	REVOCABLE PERMIT	TOTAL
West Campus Main Parcel	425.60		425.60
Baltimore-Washington Parkway West	4.83		4.83
Baltimore-Washington Parkway East	18.82		18.82
Building 29 Stormwater Pond		2.50	2.50
Subtotal West Campus			451.75
East Campus	422.13		422.13
Area 100		27.59	27.59
Area 200		120.45	120.45
Area 300 – 400	249.51		249.51
Site Total	1120.89	150.54	1,271.43

TABLE 3-2 NASA PROPERTIES (in acres).

The west campus covers the parcels or tracts of land occupied by NASA west of Soil Conservation Road. The main parcel forming the west campus, together with two parcels covering 103.45 acres in the southern third of the east campus, made up the original NASA site purchase in June 1961. This purchase also included 4.03 acres of Soil Conservation Road right-of-way so that the east and west campuses are contiguous in ownership.

Two additional tracts were purchased in 1964 to allow construction of direct road access to the Baltimore-Washington Parkway. These tracts consist of a triangle shaped parcel on the east side of the parkway that was obtained from USDA, and a small isolated rectangular parcel on the west side that was bought from the Town of Greenbelt. NASA owns the bridge connecting the two parcels, but not the parkway right-of-way underneath that has been retained by the U.S. National Park Service.

The northern sector of the east campus, and Areas 300 and 400, were occupied under revocable permit by NASA as early as 1961. NASA ultimately obtained title in 1981. The east campus is separated from Area 300 – 400 by a narrow access strip to the otherwise landlocked Prince George's County Sports Center. No distinct property boundary or internal fence line separates Areas 300 and 400, but Area 300 encompasses approximately 168 acres, and Area 400 the remainder. Areas 100 and 200 are island tracts within the Beltsville Agricultural Research Center. A small parcel held under permit that projects from the north side of the west campus accommodates a stormwater management pond for Building 29.

Verizon Communications, Inc. has a permanent easement for right-of-way granted to its predecessor, the Chesapeake and Potomac Telephone Company, for operation and maintenance of communications lines. Other minor temporary leases for building space facilities, and utility rights-of-way are also in effect, but change with time.

3.3.2 Existing Personnel and Facilities

Operations at NASA Goddard may be most easily explained on a mission or program basis. In the broadest terms, a mission or program involves launching a spacecraft with scientific equipment and devices on board to collect space and earth science data . The data is subsequently analyzed. NASA GSFC has the personnel and facilities to perform all the necessary tasks, in whole or in part, except for the launching of the spacecraft. In practice, NASA performs many of the tasks, but assigns others to outside contractors, partners, or other NASA Centers. Examples of past and ongoing space and Earth science missions conducted by NASA Goddard include the International Ultraviolet Explorer (IUE); the Cosmic Background Explorer (COBE), which provided evidence confirming the Big Bang theory for the origin of the universe; TIROS, which supplied the first data about global cloud cover data which was used in early global warming computer models; and the Hubble Telescope.

The mission process is complex and involves many interrelated tasks. A decade or more can lapse between mission initiation and launch. Retrieval and analysis of data can take years, and archiving of information permits this to be open-ended. A typical launch mission has the following general tasks.

- Planning and Management

  In early mission or program phases, decisions are made as to whether tasks will be completed by NASA GSFC scientists, engineers, and facilities will be used to complete tasks, or assigned to outside partners. Mission Teams are formed based on these decisions. Budgets, schedules, and project concepts are developed. Planning and management continue through subsequent tasks even to scheduling the availability of spacecraft equipment for research such as the Hubble Telescope for observing scientists.

- Design and Development

  The experimental devices and equipment as well as the carrying spacecraft are designed and developed on a one-of-kind, state-of-art basis. Design of experiments emphasizes minimum weight and maximum utility of retrieved data. Generally, several experiments are included to optimize mission results. The spacecraft itself must be designed to protect the experiments in anticipated, generally harsh, operating environment, and the means for control from, and communications with, earth developed. All of the systems are integrated.

- Fabrication and Assembly

  Once designed, the spacecraft and its components must be fabricated and assembled. NASA GSFC has many specialized spaces and facilities to accomplish this task, although individual elements or entire experimented devices may be done by others. Examples of specialized spaces include shops that can fabricate and machine alloys, plastics and ceramics or exotic combinations of these materials; clean rooms, including one of the few Class 100 (100 particles of dust up to 5 microns in diameter per cubic foot) clean rooms in the world; and also one of the largest Class 10,000 clean rooms in the world.

- Testing and Quality Assurance

  Once launched, spacecraft can be accessed for maintenance and repairs only with great difficulty, if at all. High precision and reliability is required for mission success. Testing and checking of designs fabrications, and assemblies are conducted continually through their development. Goddard also has many specialized facilities that can duplicate the low and high extremes of temperature, pressure, and gravitational and magnetic fields to which spacecraft and experiment components can be exposed. Examples are the High Capacity Centrifuge which can simulate gravitational forces many times higher than on earth, and a magnetic heat facility that can either cancel the earth's magnetic field or produce one that would be encountered in the vicinity of Jupiter. More mundane laboratories test for items such as geometric tolerances and material failure points.

- Launch

  NASA GSFC is not directly involved in launches, but it must have the capability of transporting spacecraft and components assembled at Goddard to the launch site.

- Tracking and Control

  The orbital path of spacecraft and on-board experimental instruments are controlled through radar or laser tracking and radioed commands. A worldwide communications network is needed to maintain contact. NASA GSFC is one station in that network.

- Data Processing, Analysis, and Archiving

  Spacecraft signals sent back to earth are processed and analyzed as necessary to convert the signal into useful visual or numeric products. Personnel in Goddard computer facilities and processing laboratories extract useful information in many formats. Photographs, for example, may be in true or false color, or enhanced in a variety of ways to maximize information gained. Raw and analyzed data are archived for future reference, and made available to researchers throughout the world.

At Goddard, many scientists and engineers are on specific mission teams. Other scientists, both theoretical and applied, and engineers and technical personnel are not. They work in general development in space and earth sciences and its associated technology, but are available to mission teams as needed. Facilities and building spaces such as shops, testing and computer facilities, and communications are shared.

The science and technology mission is supported by a wide variety of supporting personnel that operate and maintain utilities, roads, buildings, and grounds, and provide day to day services.

The number of employees at NASA GSFC varies daily. The start up or end of a mission can have a significant effect. At present, about 7,600 employees work at the site. About 40 percent of the these are Federal civil service workers. The remainder are private contractors providing scientific, technical or supporting services, visiting research scientists and engineers, or partnering personnel. Among the Federal employees, about 60 percent are scientists or engineers, and about 25 percent are professional administrators, many of whom have technical background. About 65 percent of the employees work on the west campus, and 35 percent on the east campus.

Most of the employees work in 39 major permanent buildings, but 19 work in satellite areas 100 to 400, and 270 or about 3.6 percent of the campus employee population are located in trailers scattered around the site (Table 3-3) (Figure 3-3). These permanent buildings have a total floor area of approximately 3,300,000 gross square feet (gsf). About 60 additional numbered structures accommodate a wide variety of specialized facilities. These include antennas and their control sheds, small telescope and laser observatories, test facilities, storage sheds and Goddard Employee Welfare Association (GEWA) facilities. Many of the specialized facilities are located in the outlying areas and individually occupy less than 1,000 sf. The 44 remote area buildings have a total combined floor area of about 42,000 gsf.

Buildings on the west campus are arranged in two orthogonal grids. Those in the northeast sector are on a northeast-southwest axis while the remainder are on a east-west axis. With a few exceptions, buildings are one or two stories in height. Except for minor additions, and Buildings 97 (1979), 28 (1980), 90 (1983), 29 (1990), and 30 (1993), west campus buildings were built prior to 1970.

BUILDING	YEAR BUILT	EMPLOYEES	GROSS FLOOR AREA (gsf)	USE
1	1960	171	83,364	Technical/Offices
2	1960	338	92,255	Laboratory/Technical
3	1961	293	113,961	Spacecraft Communications
4	1961	244	42,836	Shops/Support
5	1962	379	152,281	Laboratory/Shops
6	1962	294	105,824	Offices
7	1962	283	162,193	Technical/Offices
8	1963	239	120,633	Administration
9	1961	97	7,084	Main Gate/Security
10	1962	44	52,332	Technical/Shops
11	1963	303	126,399	Technical/Shops
12	1964	268	106,118	Offices
13	1964	77	49,800	Spacecraft/Operations
14	1964	195	148,427	Spacecraft/Operations
15	1965	94	47,971	High Capacity Centrifuge
16 & 16W	1964	391	227,777	Warehouse/Offices
17	1963	203	39,166	Support/Offices
18	1963	182	35,650	Support/Offices
19	1963	45	20,735	Technical
20	1963	50	24,735	Technical
21	1965	239	158,245	Offices/Technical
22	1967	102	167,252	Offices/Technical
23	1965	519	184,864	Offices/Technical
24	1961	58	28,000	West Central Plant
25	1966	75	69,752	Network Training Facility
26	1967	145	53,810	Science Data Center
27	1975	32	13,747	Motor Pool/Waste Storage
28	1980	453	175,521	Office/Technical
29	1990	153	89,800	Technical
30	1993	42	58,800	Technical
31	1994	0	42,500	East Refrigeration Plant
32	1994	504	188,566	EOSDIS Facility
33	1997	861	268,756	Earth System Science
76	1997	3	3,925	Technical
79	1991	57	4,500	Offices
88	1979	10	17,040	Visitor Center
90	1987	29	9,130	Support
92	--	2	6,160	GEWA Recreation Center
97	1979	20	11,331	Health & Fitness Unit
Major Building Total		7,494	3,311,240	
Misc. Small Buildings	--	9	31,505	Varies
Trailers	--	78	38,910	Varies
Area 100 (4 bldgs.)	--	1	3,510	Testing
Area 200 (20 bldgs.)	--	9	9,876	Testing
Area 300 (11 bldgs.)	--	5	20,892	Testing
Area 400 (9 bldgs.)	--	4	7,967	Testing
Small Building Total		106	112,660	
Site Total		7,600	3,423,900	

TABLE 3-3 EXISTING GSFC EMPLOYEE AND BUILDING INVENTORY.

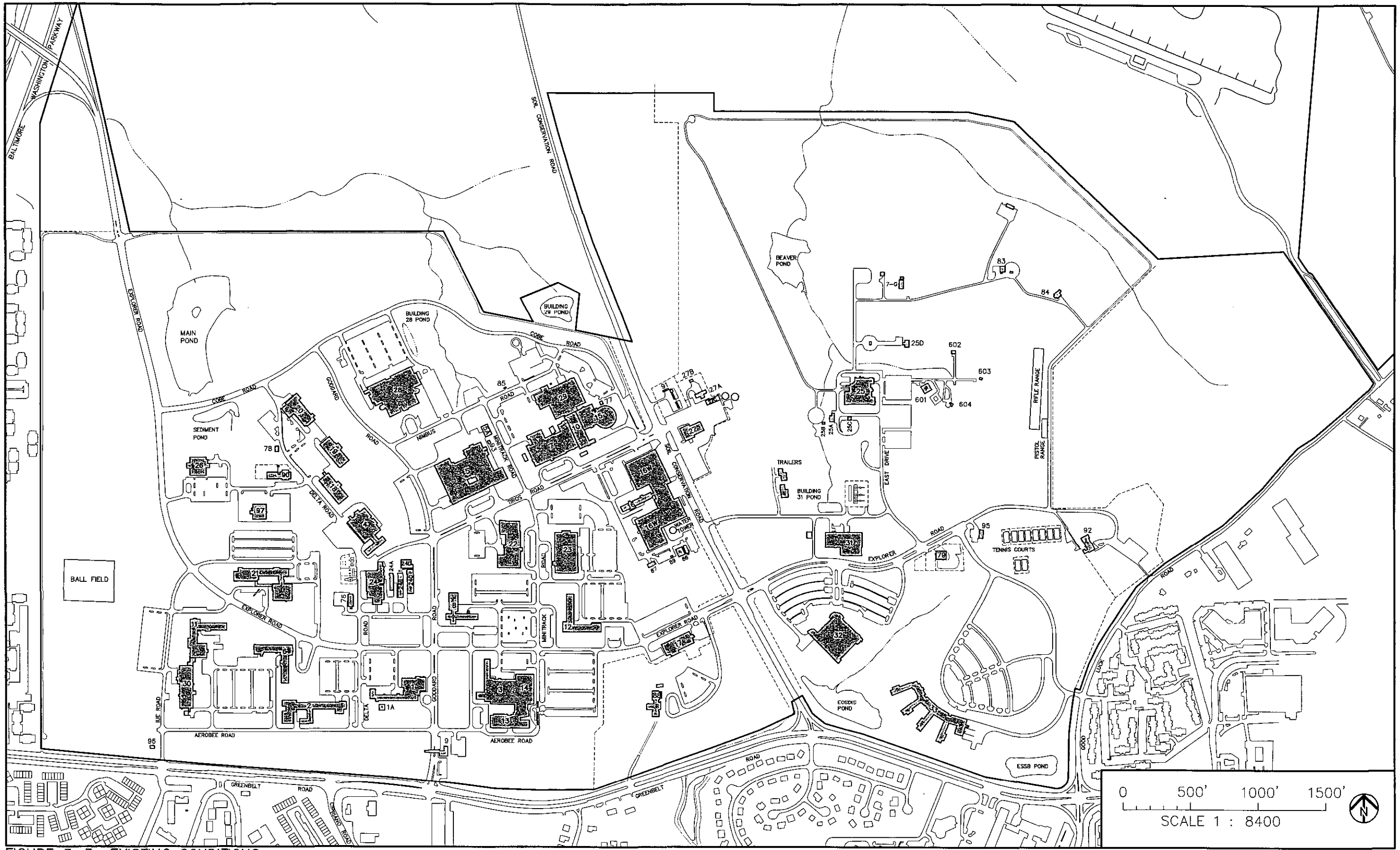


FIGURE 3-3 EXISTING CONDITIONS.

Many of the buildings have a mixed use. Technical space consists of laboratories, shops, test facilities, computer spaces, and specialized areas such as clean rooms. Buildings 3, 13 and 14 combined comprise a spacecraft operations center. Buildings 5, 7, 10, 15, and 29 are engineering and technical spaces primarily devoted to the fabrication, testing, and assembly of spacecraft and their components. Support facilities include Building 16W, a predominately one story warehouse with truck bays facing Soil Conservation Road; and Buildings 24, 90, and 97.

In contrast, the east campus remained comparatively undeveloped until recently. Operational facilities were limited to the Network Testing and Training Facility in the vicinity of Building 25, the area around Building 27 and its associated structures, and a few small isolated facilities. The Building 27 areas provides a number of site wide support functions such as the vehicle motor pool, chemical hazwaste storage, equipment storage, and sand and salt storage for road maintenance.

Earth Science is primarily housed in new modern facilities on the south side of the east campus. Facility configuration is more curvilinear or suburban in this area. Building 32, The Earth Observing System/Data Information System (EOSDIS) Facility, was first occupied in 1994; Building 33, The Earth System Science Building, also known as ESSB, in 1998. Chillers for air conditioning these building are located in the East Refrigeration Plant in Building 31.

GEWA recreation facilities are scattered throughout the site. The GEWA Recreation Center (Building 92) with adjacent tennis courts is located on the east side of the east campus off Good Luck Road. Other facilities on the east campus include the auto club (Building 95), radio and art clubs, rifle and pistol ranges (now permanently closed), and an archery course. North of Explorer Road, site roads have little traffic and are used by runners, joggers, and for quiet walks. West campus GEWA facilities include a picnic pavilion (Building 78) to the north of the child day of Building 90. A rectangular athletic field that is adaptable to many activities is located along the western boundary. Area 100 has softball and baseball fields that are available to GEWA members.

Each campus and remote area is surrounded by security fencing and access is controlled. Visitors generally enter Goddard through the main gate off Greenbelt Road. Employees can also gain access via Gate 3 from the Baltimore-Washington Parkway, and three gates along Soil Conservation Road. Other site gates are always closed, unless exceptional circumstances occur. The NASA Goddard Visitor Center (Building 88) located in the southwest corner of the west campus, is the only site building outside the security perimeter.

The main traffic artery through the site is Explorer Road. Goddard, Cobe, and Tiros Roads serve as important traffic collector and distributor roads on the west campus.

3.3.3 Satellite Areas 100, 200, 300 and 400

NASA GSFC has four research areas that require isolation from the main activities on the east and west campuses (Figure 3-4). The Master Plan proposes continuation of current activities in these areas without change. No Master Plan impacts are, therefore, expected. The following are summary descriptions of each area.

- Area 100 Antenna Test Range

Area 100 is a research, development and test facility for radar and radio antennas used on spacecraft, satellites, and at stations in NASA's worldwide tracking and communications networks. Experiments or tests conducted at ground level are subject to radar and radio reflections off the surface, and a three dimensional free space is needed to measure antenna radiation patterns and impedance characteristics. To achieve free space, two 75 foot high wood towers have been erected exactly 1,000 ft. apart from one another. Each has a 20 foot by 20 foot room at the top where antennas can be mounted, and controls, instruments, and ancillary support equipment can be installed. The farm house, Building 101, which predates NASA occupancy has been converted into offices, laboratories, and a machine shop. Building 104 houses an anechoic chamber that is also used for testing antennas.

The site is flat and treeless in the vicinity of the towers, two conditions necessary to maintain a proper testing environment. The site is also used for recreation when technical work is not underway. Five softball fields, and a miniature airfield for scale model airplanes are distributed around the site. There are two small, one story buildings, one a concession stand, the other housing ground keeping equipment, that support recreational activities.

Operations at the Antenna Test Range are impeded by radio reflections from large moving objects, and other radio and radar sources. It is important that traffic volumes be kept to a minimum on Beaverdam Road. To minimize reflectance, a buffer zone 1,000 meters in radius is needed around the site.

- Area 200 – Optical Tracking and Ground Plane Testing Facility

Area 200 is used for optical and laser research, observation and tracking. Individual facilities are small in scale. Specialized telescope and laser domes, together with their supporting offices, laboratories, and shops are clustered in cleared areas on a knoll near the entrance to the site on Springfield Road. Except for a ground plane strip running along the southeast boundary line, the remainder of the site is forested. The old abandoned Beltsville Airport bounds these same two sides.

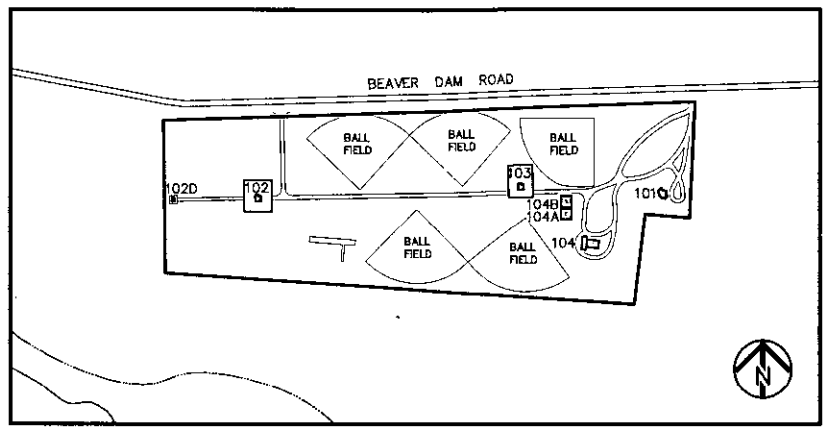
Four organizations share the site: the Optical Research Facility, the Astronomical Research Facility, the Solar Physics Laboratory, and the Ground Plane Test Facility. Site equipment includes a 30-inch computer driven, servocontrolled optical telescope, a 48-inch optical tracking telescope, and a 16-inch astronomical observation telescope. The last unit is available to amateur observers.

The site requires two buffers: optical and laser. When facilities were originally built and installed in the 1960's, the surrounding area was rural. Although effective research is still conducted, encroachment of development with its associated neon signs, household and street lighting, and vehicle headlights, has impinged on some visual operations. The headlights of a single vehicle on Springfield Road can jeopardize some measurements. The accuracy of optical observations can also be affected by acoustical waves from loud noise sources, vibrations from traffic, and dust and particulates suspended in the air by human activities. Minimal development of government properties in the vicinity of Area 200 is important. Maintenance of an unobstructed view down to the horizon is essential.

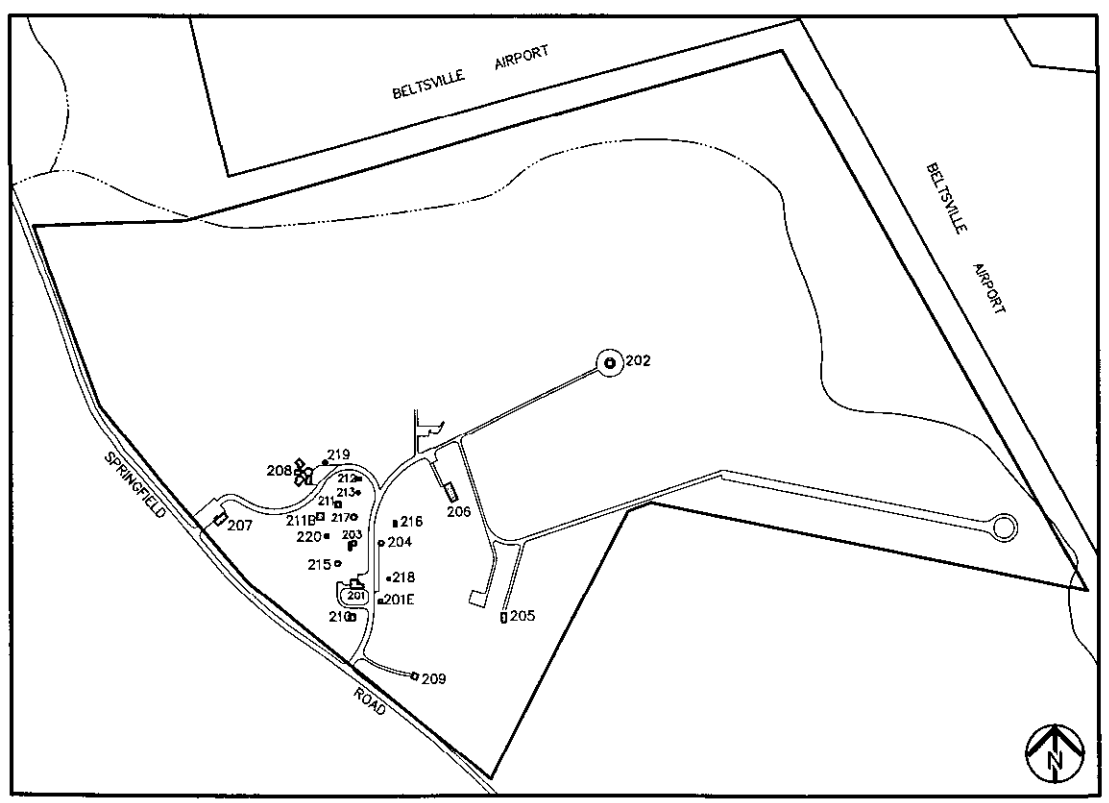
All laser systems at the Optical Test site have full hemispheric coverage with automatic cutoffs at 20 degrees above the horizon, and an unobstructed view above this elevated plane must be maintained. When laser beams are pointed into the sky, radar monitoring is maintained to eliminate the potential for any injury from the beam, and systems are shut down when any aircraft approach into close range where laser beam effects are possible.

- Area 300 – Magnetic Test Facility

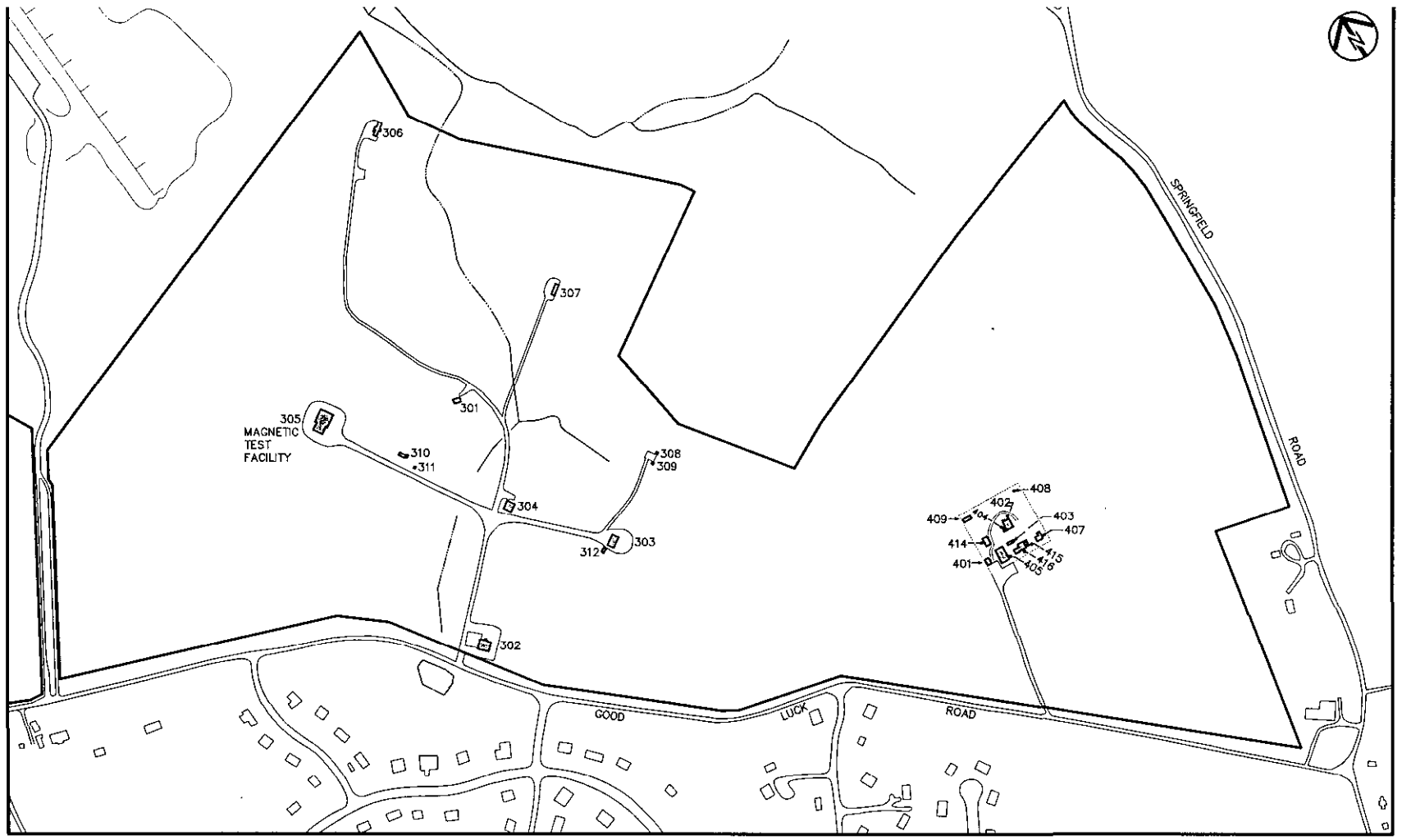
This is a highly specialized facility, unique to NASA, that is used to study the magnetic fields of spacecraft and the environment in which they will travel when in space. The site has two facilities: the Magnetic Field Component Test Facility (MCFTF), and the Spacecraft Magnetic Test Facility



AREA 100



AREA 200



AREAS 300 AND 400

SCALE ALL FIGURES $\frac{1" = 700'}{1 : 8400}$

FIGURE 3–4 SATELLITE AREA EXISTING CONDITIONS.

(SMTF). The MCFTF and SMTF are both in Building 305, which is constructed entirely of nonmagnetic materials.

The MCFTF is capable of simultaneously simulating the magnetic fields, temperature, and vacuum conditions of outer space, or near planets and moons. The facility has a 20-foot diameter triaxial circular magnetic coil that surrounds a demountable 5-foot diameter, 5-foot long cylindrical thermal vacuum chamber. It is capable of canceling the Earth's magnetic field throughout a one meter diameter spherical volume within the chamber.

The SMTF is used to determine the magnetic fields of spacecraft and its component subsystems, parts, and instruments prior to launch. It is composed of a 40-foot diameter magnetic coil system. At the center of the coils, on eight foot diameter power driven turntable and gimbaled support system permit manipulation and orientation of test articles. The coil is capable of generating a 6-foot diameter magnetically free sphere.

Area 300 is completely wooded except for clearings for buildings and one lane roads. The buffer zone around facilities extends to the Area 300 property boundaries. The area must be isolated to minimize or eliminate the magnetic influences of outside sources.

- Area 400 – Propulsion Research Facility

The 11 small buildings at the Propulsion Research Facility are concentrated in a square compound, 300 feet on a side, in the center of Area 400. Facilities include a chemical laboratory, separate laboratories for system assembly and integration, outdoor test pads, hazardous material storage areas, vacuum chambers, cryogenic facilities and a Class 10000 clean room for work on spacecraft.

Work in Area 400 involves the use of hazardous materials, or hazardous experimental or testing processes. Most of the development and testing conducted is in three research areas: propulsion systems and propellants, cryogenics, and very high or low pressure environments. Examples of work include the development and testing of spacecraft propulsion hardware such as attitude or position thrusters and pneumatic valves, and chemical analysis and testing of propellants at the laboratory bench scale. Cryogenic research involves working with materials at extremely low temperatures Typical research involves the testing and evaluation of cryogenic coolers that enclose sensitive spacecraft or testing instruments. Work at extreme pressures includes proof and leak testing of spacecraft systems at high pressures.

The Propulsion Research Facility requires isolation from outside influences such as vibrations and shock waves. A buffer between facilities handling and storing hazardous or explosive materials and public areas is also needed. The buffer area is conservatively defined as the property or fence line around Area 400.

Except for the compound, all of Area 400 is a forested. The area is double fenced, once at the NASA property line, and again at the inner compound. Access into the compound is controlled by security.

†††

4 ALTERNATIVES

4.1 Agency Planning

4.1.1 NASA Strategic Plan

The NASA GSFC Facilities Master Plan is part of a continuing and evolutionary process progressing from broad Agency wide planning to the more detailed in scope. To meet the directives of the Government Performance and Results Act, NASA has prepared an agency-wide strategic plan that defines its mission and goals and general management strategies to meet them (Strategic Plan 2000, NASA Policy Directive (NPD-1000.1B), 2000).

NASA's mission, as given in the Strategic Plan, is:

- To advance, use, and communicate scientific knowledge and understanding of the Earth, the Solar System, and the Universe.
- To advance human exploration, use, and development of space.
- To research, develop, verify, and transfer advanced aeronautics, and space technologies.

The Strategic Plan has established a framework of five "Strategic Enterprises" to accomplish its mission and goals. These are analogous to strategic business units in the private sector. The five Strategic Enterprises are:

- Space Science
- Earth Science
- Biological and Physical Research
- Human Exploration and Development of Space
- Aerospace Technology

Although the GSFC at Greenbelt performs some functions in support of each enterprise, its efforts are concentrated in the first two. NASA GSFC serves each enterprise as a "Center of Excellence" for scientific research. Goddard's primary mission in the Space Science Enterprise is in physics, astronomy, and space science research. In the Earth Science Enterprise, it has been assigned the Agency-wide lead in Earth systems science, a new discipline which studies the Earth's environment on a global scale made possible only through space and satellite technology.

If its goals are to be met, the Strategic Plan notes that greater involvement and participation in its mission by those outside NASA over the next two decades will be necessary. Partnerships will be formed with the private sector, including both commercial companies and academia, as well as with other government agencies, both domestic and foreign.

4.1.2 GSFC Strategic Implementation Plan

The GSFC Strategic Implementation Plan (Implementing NASA's Mission for the 21st Century, NASA, 2001) establishes the future direction of the Center within the framework of the NASA Strategic Plan. It outlines the Center's vision, mission, values, and areas of responsibility. It has set the following six goals for the Center:

- Goal 1 – To serve as a national resource for discovery in Earth systems science, space science and technology.

NASA GSFC will provide customer oriented leadership in implementing the goals of NASA'S Space Science and Earth Science Enterprises. The Center will use its capabilities in roles that it is uniquely able to perform as a Federal laboratory. As a result, it is expected that there will be a greater number of breakthrough discoveries made by NASA partners, or by using NASA data sources, and the number of flight opportunities in which outside partners participate will increase. This is expected to increase the number of resident visiting scientists and engineers, and exchanges of personnel between NASA and its partners.

- Goal 2 – To be an international Center of Excellence for research in Earth systems science, space science, and technology.

The GSFC will create and sustain an outward focused environment that encourages the interchange of ideas and information. It must be ensured that GSFC has the resources, experience, competence, and capabilities to perform world-class science, technology development, and engineering in its core area of responsibility as designated in the NASA Strategic Plan.

Measures of performance include the scope of recognition given to Goddard as a worldwide Center of Excellence for research in Earth and space science and technology, the number of Goddard publications and citations, the amount of and information developed by GSFC that is infused into general science and technology, and the quality and type of work the Center wins through open competition with those outside NASA.

- Goal 3 – To enhance the nation's technical and scientific literacy by sharing information and knowledge resulting from Goddard's mission.

Under this goal, the Center will use the full scope of its capabilities to communicate the content, relevance and excitement of scientific and technology knowledge and discovery to the education community and the general public. This includes faculty, student, and curriculum support.

- Goal 4 – To accomplish the Center's mission through a vital and effective work force.

Employees will be involved in the creation of a work environment conducive to their best performance. They will be provided opportunities and time for appropriate training, improving work processes, and performing outreach activities.

- Goal 5 – To maintain and upgrade Goddard's core infrastructure, laboratory facilities, and equipment to preserve the Center's preeminence as a national resource and Center of Excellence.

Facility resources will be focused on those capabilities that contribute the most toward meeting Goddard's goal as a national resource and Center of Excellence. Where applicable, NASA will acquire resources needed to enhance Goddard's state-of-the-art capabilities, reduce overall infrastructure costs by closing excess facilities or converting them to other uses, and use facilities external to NASA when they are more cost effective.

- Goal 6 – To organize science, technology, flight mission, and business processes to achieve greater productivity.

This goal would create an effective organization for carrying out the Center's science and technology mission, systematically improve its work processes, and reduce infrastructure and overhead costs. Over the last few years, NASA has undergone a reorganization of its work force and directorates to more closely align them with its mission as redefined in the NASA Strategic Plan.

4.1.3 Future Visioning

Projecting the direction of NASA GSFC over a 20-year planning horizon has inherent uncertainties. In general, operations are composed of an ensemble of individual mission assignments such as spacecraft flights. Since NASA GSFC is on the cutting edge of science and technology, changes unforeseen at this time can be expected to occur in the planning period. New technology or mission assignments can require sudden increases in or redistribution of personnel, building space, and operational requirements. The opposite could also occur. Public interest and support for the space program could wane, and Agency funding could decrease. The new planning paradigms of the NASA Strategic Plan and NASA GSFC Strategic Implementation Plan account for each of these possibilities.

To bridge the gap between the general strategies and goals of these plans, and the development of more specific planning criteria applicable to NASA GSFC, Goddard formed a steering committee composed of representatives from each Directorate. The committee conducted a "future visioning" planning analysis that evaluated the driving forces expected to influence future operations, and future personnel and space requirements

The committee determined that Goddard must be able to respond to the following driving forces over the next 20 years:

- The Center will face increasing competition from both other centers within NASA and from outside sources in the private sector and other countries.
- Goddard must be able to respond quickly to personnel, space, and operational requirements generated by new scientific discoveries, technology, and mission assignments in the competitive environment.
- Within the competitive environment, there will be a much greater amount of partnering with groups external to NASA. There will be fewer "All NASA" or "All NASA GSFC" team projects. On future projects or missions, NASA GSFC participation may be limited to project management, while the partner's complete the bulk of project development; or, NASA GSFC may supply a component for a partner's project, or be a member on a partner project team, because of its specialized expertise or facilities.
- Many outside partners will need facilities including offices, laboratories, testing facilities, and shops, at or near NASA GSFC.
- Facilities must be more flexible and adaptable on short notice. It is anticipated that future project teams will be smaller, and projects will be of shorter duration. There will be a greater need to accommodate quickly assembled teams responding to a new assignment in a centralized space.
- NASA GSFC must account for the new emphasis on site security at Federal facilities. The safety of residential and commercial areas surrounding the campus is also paramount.
- The relative proportion of NASA employees by type will change. The proportion of employees involved in management of individual projects, and project science and engineering will increase. The proportion in general management, administration, and "overhead" functions will decrease.

4.2 Concept Alternatives

The relative importance of various factors such as site resources, operations, technology, and the campus environment were evaluated in the visioning process. It was determined that the effectiveness of facilities and personnel was the most important factor. For facilities, the Space Science, Earth Science, and Engineering Directorates must be of the highest quality, if they are to maintain their cutting edge in science and technology. Other campus directorates and functions, such as administration and support services, can operate in more moderately rated spaces. An assessment of existing facilities revealed that several improvements or actions would be needed if the quality of facilities, whether high or moderate, were to be sustained.

First, about 2,400,000 gsf out of a total of approximately 3,300,000 gsf of NASA GSFC major building space was built prior to 1967. Thus, about 75 percent of campus space is more than 35 years old. Most of the old facilities are concentrated on the west campus, where all the buildings except for Buildings 28, 29 and 30 and minor additions were built in the 1960's.

Only the Earth Science Directorate, primarily located in the recently built Buildings 32 and 33 on the east campus, has high quality facilities matching requirements. These two buildings account for more than half of the "new" space at Goddard on floor area basis. The remaining new space is scattered among the other directorates.

In general, older site facilities have declined despite proper maintenance. But, alterations, renovations, maintenance and repairs completed over the years to satisfy urgent ad hoc conditions such as changes in occupancy, science, technology, increased computer use, etc, have taken their toll. A transition from short term tactical to long term strategic thinking about maintenance of facility quality is needed. It was noted further that the Facilities Master Plan should consider the total renovation of salvageable buildings for new uses or reuse as well as new spaces.

Second, new missions, new in-house teaming, shifts in priorities, and other operational changes have led to fragmentation of Directorates and interrelated working groups from one another with passage of time. The Space Science Directorate, for example, is now located in Buildings 1, 2, 21, 26 and 28, which are widely scattered around the west campus. In the Engineering Directorate, facilities and personnel are concentrated in the northeast sector of the west campus, but at least one organizational element of the Directorate is located in 18 separate buildings. And large portions of Building 16W, originally built as a warehouse, have been converted to administration offices. Fragmentation adds to inefficiency. Each Directorate and the various support functions must be consolidated into distinct functional areas. Space science, Earth science, engineering, administration, and support functions, should be located in identifiable areas similar to those for academic disciplines on a college campus.

Each functional area also has operational relationships with the others. Project teams formed for individual missions frequently have representatives from Earth science, space science, and engineering. The team may be assigned a collective or "common" space, or it may not be consolidated. Both situations must be accounted for to maintain efficiency, flexibility and adaptability. To accomplish this, the science and engineering directorates should also be adjacent to one another. Easily adaptable space is needed for the rapid assembly of multidirectorate teams formed on short notice in a competitive environment.

Third, it was determined that facilities will be needed at GSFC to accommodate the increased amount of partnering called for in the NASA Strategic Plan with those outside NASA. For security, this space needs to be distinct, and not intermixed with that of NASA. This, in turn, implies redefinition of the current security perimeter such that NASA facilities can be separated from the partner Facilities. Coupled with this, Goddard is a divided campus. Unifying the west and east campuses is necessary to reduce exposure to security threats and improving operational efficiency.

Agency and GSFC planning documents established general goals and concepts for how NASA will operate in the future. The findings of the Future Visioning process established more site specific goals, direction, and physical and organizational needs to meet these goals. Information from these sources was used to generate general planning criteria that could be used to judge potential conceptual alternatives for site development, and which the Facilities Master Plan must ultimately satisfy to the extent feasible.

Five general concept alternatives for potential site development were generated. Since no changes are proposed for the NASA satellite areas, and activities in these areas require isolation, the concepts were limited to the east and west campus areas. The purpose of the concepts is to determine a more specific direction among many possibilities for site development. They are very broad in scope and more concerned with physical and operational functions and relationships than specific facilities. One alternative is not necessarily selected in toto for further Master Plan development at the expense of the others. The best features of two or more alternatives, as revealed by analysis, may be combined in further planning.

The five concepts are discussed in Chapter 3 of the Facilities Master Plan. Two of the concept alternatives had variations that were considered, but not illustrated. Each was evaluated for its ability to meet the NASA planning criteria given above. A summary of the concept alternatives is given in the following:

- CONCEPT A – CLEAN UP STATUS QUO

The existing physical plant would continue to be used for the most part. Facilities would be renovated or upgraded as needed to improve quality and safety. To the extent feasible, unification would be achieved through relocation of employees. While Concept Alternative A is the most implementable because it has the least associated cost, all of the other planning criteria are compromised.

- CONCEPT B – CONSOLIDATED SPLIT CAMPUS

NASA facilities would be condensed and concentrated along Soil Conservation Road. Soil Conservation Road would become the primary frontage and gateway to the site. Facilities would still be separated by the road. While gains are achievable under most planning criteria, the lack of total unification is a significant disadvantage.

Placement of Soil Conservation Road in a cut and cover tunnel extending from Explorer Road to a point a few hundred feet north of west campus northern boundary was considered as a variation to overcome this disadvantage. The variation was discarded because the cost would be prohibitive. Traffic flow on Soil Conservation Road and at NASA entrances would have to be disrupted for an extensive period during tunnel construction.

- CONCEPT C – CONSOLIDATED WEST CAMPUS

All of NASA's facilities, except for Earth science, would be moved to the west side of Soil Conservation Road. To do so, Soil Conservation Road would have to be realigned eastward over part of its length through Goddard to provide maneuvering room for optimizing unification and adjacencies associated with core competencies. Concept Alternative C satisfies all the planning criteria moderately well, although Earth science would remain isolated from other NASA groups.

Relocation of the southern terminus of Soil Conservation Road to the vicinity of NASA Gate 15 on Good Luck Road was considered as a variation to overcome this disadvantage. The variation was discarded. Although they were not quantified, it had a readily apparent potential for unavoidable, but comparatively high impacts to the on-site natural environment and off-site residential communities to the east and southeast of Goddard.

- CONCEPT D – UNIFIED CONSOLIDATED CAMPUS

This concept alternative unifies and consolidates NASA into a single undivided campus. It ranks high in meeting all planning criteria, but relocation of Soil Conservation Road is necessary to achieve this.

- CONCEPT E – CONSOLIDATED EAST CAMPUS

This concept alternative is the best in meeting all the planning criteria, but one. It has premises similar to Goddard in 1960, starting fresh. Except for the recently built Earth science area, all NASA groups and functions would move into new quarters on the east campus arranged in a layout to meet the criteria. However, this concept has the highest associated cost and is not realistically implementable. It also would spread NASA facilities out further into undeveloped areas to a greater degree than the other concepts.

4.2.1 Unified Consolidated Campus Schemes

Concept study revealed that one large block or zone within GSFC would be needed, if all of NASA's facilities were to be arranged in an optimum operational configuration. It also indicated that the presence of Soil Conservation Road in its current location is a fundamental impediment to achieving a consolidated NASA facility. With the road in its existing location, NASA facilities cannot be located in their entirety to one side or the other. The location of Soil Conservation Road within GSFC is a critical element in determining any potential layout of campus facilities.

Variant schemes based on Concept D were developed. They fleshed out in more detail the potential ways in which a consolidated campus could be achieved. Potential campus organization was refined and given greater definition in relation to possible Soil Conservation Road locations or treatments. Since Soil Conservation Road is a driving force in arranging the campus, the schemes revisited or adapted some of the features or ideas developed in the concept alternative stage for handling Soil Conservation Road.

Four schemes were developed and evaluated (See Facilities Master Plan Chapter 3):

Scheme D1: Bridge/Tunnel

Considered depressing Soil Conservation Road below ground level to create an area above that connects the east and west campuses. A bridge would leave Soil Conservation Road in its existing location but use a road overpass to connect the two campuses.

Scheme D2: Eastern Realignment

Routed Soil Conservation Road to the perimeter of the east campus.

Scheme D3: Central Realignment

Routed Soil Conservation Road to an alignment that follows Cobe and Goddard Roads through GSFC to connect to the Greenbelt Road at the existing Main Gate entrance.

Scheme D4: Western Realignment

Soil Conservation Road was rerouted to the west side of Goddard around the outskirts of development to connect to Greenbelt Road at Iue Road.

4.3 Master Plan Development

Strategic planning, *visioning*, programming, and concept development provide necessary guidance for development of a master plan, but are general in nature. The general *goals* and criteria are translated into more specific planning principles for initial plan development and layout.

Guiding principles for plan development included:

- Provide facilities and supporting amenities for a potential 2022 site population of 8,750, of which 6,800 would be NASA employees, and 1,950 would be outside partners. The 6,800 NASA employees are divided into 5,800 employees as indicated by programming, and 1,000 employees who would be present only if NASA GSFC received a new or expanded mission that is presently undefined.
- Consolidate and unify NASA facilities into a single, more compact, and secure installation within the site.
- Provide buildings, facilities, and a separate area or zone for NASA outside partners.
- Provide for a range of security options that permits isolation of NASA spaces from the general public and other on site spaces, while still allowing for collaboration with outside partners.
- Increase the density of development rather than expand into new areas.
- Provide spaces and facilities that facilitate teaming within the NASA secure area.
- Rearrange or reconfigure NASA facilities so that individual NASA Directorates of similar functions are located in discrete or distinguishable areas.
- Arrange these functional areas on a larger scale to reflect existing and projected operational relationships among them.
- Develop a coherent and perceivable campus, structure, character, and image. Improve the visual organization and definition of Goddard through the clustering and arrangement of buildings, landscaping and reforestation, and creation of distinctive open spaces.
- Place new emphasis on internal site pedestrian access.
- Reduce the number of points where vehicle and pedestrian routes or paths interface.
- Preserve and enhance the *perimeter* buffer and natural areas.

The Draft GSFC Facilities Master Plan Alternative has evolved through a progressive and continuous process. This evolution is recorded in four preliminary stages of development:

1. Unified Campus Framework Plan
2. Illustrative Plan, Version 1
3. Illustrative Plan, Version 2
4. Illustrative Plan, Version 3

The Framework Plan is shown in Chapter 3 and the Illustrative Plans in Appendix 1 of the GSFC Facilities Master Plan. Each is a refinement of previous plans, and based on existing site opportunities and constraints.

4.3.1 Unified Campus Framework Plan

The Unified Campus Framework Plan represents the initial step or stage in translating all previously generated goals, criteria, and guidelines into a Master Plan layout. The plan introduced the concept of "neighborhoods" to organize and arrange facilities. Each neighborhood would have a similar function or be the home for a specific Directorate. The neighborhoods were:

Space Science
Earth Science
Engineering
Administration/Program Management
Support Services
Private Development Area

The Space Science neighborhood is a key concept for resolving a number of planning issues and criteria. Space Science is now the most dispersed organization on the campus. Many of the facilities it occupies date to or near original construction. A new state-of-the-art building or building complex would permit consolidation of the scattered space science functions. Relocation of space science facilities and employees to the new facility would free a maximum amount of space in the buildings they now occupy. These vacated spaces subsequently would become available for reuse, renovation, or adaptation by the other NASA Directorates, or by outside partners if the space is located in the private development area.

Location of the Space Science neighborhood is critical. Space science already has strong operational relationships to Earth science and engineering. Future teaming means that these relationships will become stronger and that program management relationships among the three organizations will increase as well. The Space Science neighborhood should be located adjacent to each of the other three neighborhoods, preferably within walking distances. This implies that the Space Science, Earth Science, Engineering and Administration neighborhoods must be located along the circumference of a circle or at the four corners of a square.

The Space Science neighborhood was therefore generally located in the environs of the Tiros/Soil Conservation Road intersection. This location satisfied two additional criteria. A vacant or relatively unencumbered building site is needed for the first "new" building in order to start the "space freeing" process. However, this site must be within or close to the currently developed area. The chosen location is the optimum one for satisfying all these criteria and constraints.

The creation of a Space Science neighborhood would then allow NASA to define Engineering, Earth Science, and Project Management neighborhoods without excessive construction of new facilities. Most of the buildings in each neighborhood are predominantly occupied by the appropriate function. In each case, neighborhood definition can be achieved to a great degree by shifts of personnel and internal building functions after renovation or adaptation of spaces.

Institutional services common to the campus, such as facilities management, information services, and procurement would be consolidated in a support area in the northwest corner of the west campus. New facilities that replace logistics and transportation functions in Buildings 16W and 27 would be built there as the Space Science neighborhood developed.

A development area for outside NASA partners is needed to enable synergies between NASA and outside public and private partners under the new NASA GSFC operating strategy. The area was located on the west campus along Greenbelt Road to provide independent access to public roads and transit, and allow for isolation or separation from secure NASA areas. Existing buildings, particularly laboratory and technical spaces now occupied by NASA could be used or adapted by NASA partners for their use. If desired, individual replacement facilities of similar size and scope could be built. Displaced NASA facilities and operations would be consolidated within new or adapted spaces within the NASA compound portion of the site.

The siting of the Space Sciences neighborhood would require the realignment of Soil Conservation Road. Access to NASA occupied areas would be from the west, north, and south with the last two using remnants of Soil Conservation Road. Clustering buildings in groups and enhancing natural conditions in wooded areas along the site perimeter, streams, and steep ground slopes would give further definition to neighborhoods. Large portions of the east campus would be left open to evaluation as potential locations for expansion contingencies.

4.3.2 Illustrative Plan, Version 1

Illustrative Plan, Version 1, represents the initial fleshing out of the United Campus Framework Plan. Soil Conservation Road would be realigned to the west side of NASA GSFC to create a unified NASA installation. The road would follow Cobe, Explorer, and Iue Roads to Greenbelt Road. An internal site Loop Road is introduced. It would route internal campus vehicular traffic around a large central core area reserved for pedestrians. Parking would remain within the core area, but there would be no vehicle through routes. The Loop Road would follow existing site roads on the west campus, and follow topography on the east campus.

Access to the secure NASA area would be provided on west, north and south sides with the last two located on remnants of existing Soil Conservation Road. The Main Gate and visitor check in would be moved from Goddard Road to Soil Conservation Road.

Version 1 has a circular open mall centered on the Tiros/Soil Conservation Road intersection. This circular mall would front three neighborhoods; Space Science, Engineering Technology, and Administration/Project Management. A linear extension of the mall would run southwestward along the axis to Tiros Road, which would be removed or eliminated as a roadway. A necessary tie between the circular mall and Earth Science neighborhood is identified, but not defined.

The new Space Science complex is arranged around the east side of the circular mall. New buildings with dimensions derived from programming are interspersed among the Earth Science, Administration and Project Management, and Engineering/Technology neighborhoods.

A "Private Development Zone" was expanded to the north side of Explorer Road to meet programming space requirements for outside partners. The future Goddard development area needed for a new mission not anticipated at this time would be located to the inside or outside of the Loop Road on the east campus.

4.3.3 Illustrative Plan, Version 2

Version 2 revealed the difficulty of tying campus facilities into a cohesive configuration that defined neighborhoods. Buildings in the southwest sector of the west campus generally have an east-west orientation. Those in the northeast sector are rotated and are orthogonal to Tiros and Soil Conservation Roads. The Earth Science neighborhood on the east campus has a third configuration similar to curvilinear development found in suburban environments. The Space Science neighborhood must tie these disparate groups of buildings together to create a cohesive campus arrangement or configuration.

Various options for siting new buildings in each neighborhood were explored. The NASA security perimeter was further defined. The Loop Road was realigned on the east campus to take advantage of existing roadways and reduce impacts. Only the segment between Soil Conservation Road and Building 25 would be on new alignment. The future NASA development zone was reduced to an area now occupied by Building 25 parking lots and antenna test sites.

4.3.4 Illustrative Plan , Version 3

Version 3 is a further refinement of previous Illustrative Plans. The cluster of buildings comprising the Space Science and Central Commons Neighborhood is oriented along a wide pedestrian walkway that connects the Engineering and Technology Neighborhood at one end to the Earth Science neighborhood at the other. It is centered in a core area, defined by a Loop Road. The walkway follows existing surface contours. It widens into a plaza in the Space Science and Central Commons Neighborhood.

Space Science facilities include a new complex for consolidation of space science personnel scattered around the site (Building A) and a site for potential future expansion (Building D). Buildings at Sites B and C would house the relocated Space/Earth Sciences Data Center, and Systems Technology and, Advanced Concepts (STAAC) Media Center, respectively. Both have operations closely related to Space Sciences and the adjacent Engineering and Technology and Earth Science facilities.

Other facilities servicing all of the NASA compound are located to the south of the Space/Commons complex along Explorer Roads: replacements for support services, and the Health and Fitness Center in Building 97 (Site G). A new Education/Outreach facility that would facilitate transfer information about NASA activities and research to the public would be located at Site S.

The remaining NASA neighborhoods contain new spaces for replacement facilities, moderate expansion potential, or project teaming.

4.4 Alternatives Under Consideration

4.4.1 The Draft Facilities Master Plan Alternative

The GSFC Facilities Master Plan is the proposed action. It is a refined and detailed development of prior Illustrative Plan versions. The Draft Facilities Master Plan Alternative is shown in Figure 4-1. More detailed information on the plan, personnel, and building space is given in Chapter 4 of the Facilities Master Plan. The functional areas are renamed and adjusted to reflect changes in proposed use and occupancy to:

- Space Science and Central Commons
- Earth Science
- Engineering and Technology
- Program and Project Management
- Institutional Support
- New Thrust Zone
- Partnering and Outreach Zone

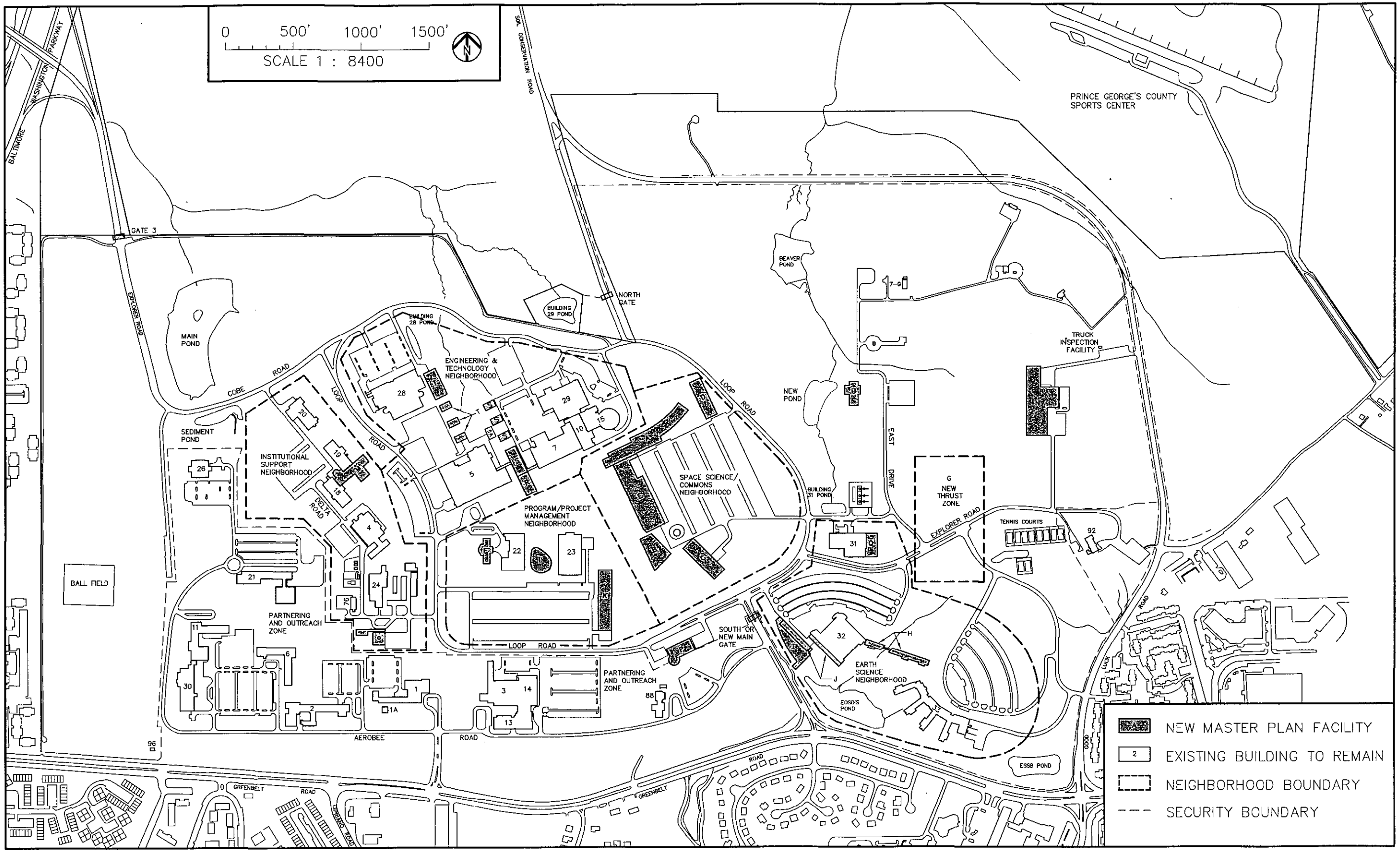


FIGURE 4–1 FACILITIES MASTER PLAN.

The plan is based on programming that estimates future Goddard personnel and space requirements. It gives guidance for site land use, building locations, amenities, vehicle and pedestrian circulation, and supporting infrastructure as future development occurs.

- Personnel

The Master Plan must be adaptable to unexpected requirements that may occur within the 20-year planning horizon. While planning projections for the next five years or over the short term can be made with some assurance, the nature of NASA and Goddard missions and operations makes projections increasingly speculative as greater periods of time are considered.

The site employee population is about 7,600. Under the most likely long term programming scenario, it is estimated that the number of NASA GSFC employees at the site will decline to 5,800 by 2022. The decline is based on expectations for increased partnering with organizations and entities outside NASA over time. The decrease would occur through natural attrition and retirements. For planning purposes, it was assumed that the decline would be at a constant rate over the 20-year planning period.

The Facility Master Plan also accounts for long term uncertainties, where a rapid expansion in facilities and personnel could occur in response to unexpected or unforeseen changes in or new mission assignments. These changes or new needs could be caused by new scientific discoveries, new scientific courses of direction, or the rapid development of a new science or technology. The Master Plan therefore provides facilities for 1,000 employees on a contingency basis. Half of these 1,000 employees would be located in a "New Thrust Zone" to cover situations similar to what has occurred in the Earth System Science area. Of the remainder, 350 and 150 are allocated to unexpected or provisional growth in the Earth systems and space sciences, respectively. The projected total NASA population in 2022 is 6,800 including provisional employees.

A Partnering and Outreach Zone (PAOZ) is proposed in the Facilities Master Plan to facilitate collaborative efforts with those outside NASA. Under the Master Plan Alternative the maximum worker population in the POAZ would be 1,950, although about 2,300 employees now work in the area. The total site employee population under the Master Plan Alternative would therefore be 8,750 but this would occur only if Goddard would receive an unexpected new or change in mission. It is more likely that the site worker population will remain relatively constant with increases in private workers in the PAOZ offsetting decreases on the NASA side.

- Space

Goddard now has 35 major buildings which have a total floor area of 3.3 million gross square feet (gsf) (see Table 3-3). When small miscellaneous buildings, trailers, and the satellite area buildings are added, total site space is about 3.4 million gsf.

The Facilities Master Plan proposes renewal of about one half of NASA occupied space (Table 4-1). Nineteen buildings with a floor area of 1.7 million gsf would be retained. They would be renovated or upgraded to continue existing uses on an as needed basis, or modified and accepted to fit the function assigned to Master Plan neighborhood. Nineteen new buildings with a total floor area of about 1.56 million gsf would be built to meet program requirements and replace demolished facilities. The total space occupied by NASA if all proposals were implemented would be about 3.3 million gsf, and be essentially unchanged from existing levels. Ten buildings (8, 9, 12, 16-16W, 17, 25, 27, 79, 90, and 97) with a combined floor area of 609,238 gsf would be demolished.

The Partnering and Outreach Zone (PAOZ) stretches along the southern and western periphery of the west campus. A NASA Education and Outreach Center (Building P) and the Visitor Center (Building 88) would be located ultimately within the future PAOZ. The ten remaining existing buildings in the PAOZ would form the initial nucleus of facilities occupied by collaborative partners from outside NASA. The ten buildings have a combined floor area of 991,000 gsf. The total site space would increase to about 4.3 million gsf, if all Facilities Master Plan projects were implemented.

Sites within the PAOZ would become available as NASA functions and personnel are relocated to new or adapted facilities within the new NASA secure areas. The Facilities Master Plan anticipates that this conversion to partner use would not begin until Facilities Master Plan Stage 3, or after 2015. Most of the buildings in the Zone are among the oldest at Goddard. Outside partners could use the building directly, but it is anticipated that most would have to be renovated and adapted. Buildings could be replaced with new ones, but overall partner development would remain within a limit of approximately 1,000,000 gsf. New buildings would follow the Facilities Master Plan guidelines set for PAOZ.

- Neighborhoods and Zones

A major feature of the Facilities Master Plan is the amalgamation of NASA facilities into a unified installation within the Goddard site. At a sublevel, it consolidates NASA physical facilities into Neighborhoods and Zones by administrative organization and operational function. These neighborhoods, in turn, are located within the installation according to interrelationships between organizations and functions.

Space Science and Central Commons Neighborhood (Buildings A, B, C, D, E)

This is a mixed use neighborhood which provides facilities for the Space Science Directorate, research facilities that deal with multiple NASA core scientific and technical organizations, and NASA employee support functions. The Neighborhood would be comprised of five new buildings. Total floor area for the new neighborhood would be 627,000 gsf. Buildings 16-16W and 27 would be demolished eventually to clear the site.

Building A – Space Science Complex

Approximately 750 Space Science personnel, who now share portions of six buildings and four trailers into one would be consolidated in one 225,000 gsf state-of-the-art research facility. Building A could be built in phases. It is a key element in the Master Plan. It would give Space Science an identified area. Collection of Space Science organization personnel would be an important step in freeing vacated space for consolidation of other personnel and facilities into their appropriate neighborhoods. Space Science has important relationships with Engineering and Technology and with Space Science.

Building B – Science Data Center

The Science Data Center processes data retrieved from spacecraft for the Earth Science and Space Science Directorates. Building B would replace facilities now located in Building 28 with a state-of-the-art data center. Building 28 would be converted to engineering and technology uses.

Building C – Systems Engineering Facility/Media Center

Building C is planned as a 90,000 gsf facility that would be jointly occupied by systems technology and engineering personnel and by a Multimedia Center. Systems engineering provides a full range of multi-

NASA SPACE

EXISTING TO REMAIN

BUILDING	FLOOR AREA
4	42,836 gsf
5	152,281
7	162,193
10	52,332
15	47,971
18	35,650
19	20,735
20	24,735
22	167,252
23	184,864
24	28,000
28	175,521
29	89,800
31	42,500
32	188,566
33	268,756
76	3,926
88*	17,040
92	6,160
Total Space to Remain	1,711,117 gsf
Miscellaneous + Areas 100 - 400	42,245 gsf
Buildings to Remain Total	1,753,362 gsf

NEW

	BUILDING	FLOOR AREA
A	Space Science Complex	225,000 gsf
B	Science Data Center	85,000
C	Systems Eng./Media Center	90,000
D	Space Science Infill	55,000
E	Campus Commons Facility	172,000
F	Program/PM Infill	9,000
G	New Thrust Facilities	185,000
H	Earth Science Infill	65,000
I	Earth Science Cafeteria	38,000
J	Earth Science Infill	65,000
K	Central Administration	170,000
L	Program/PM Common Facilities	30,000
M	Institutional Support Office	120,000
N	Central Receiving/Warehouse	115,000
O	Construction Contractor Staging	7,000
P*	Education and Outreach Center	20,000
Q	East Central Plant Expansion	25,000
R	Engineering/Tech Cafeteria	38,000
S	Engineering/Tech Infill Facility	25,000
T	Engineering/Tech Infill Facility	25,000
U	Remote Commons Facility	20,000
	Total New Space	1,584,000 gsf
		1,753,362 gsf
	Total NASA Space	3,337,362 gsf

PARTNERING AND OUTREACH ZONE

BUILDING	FLOOR AREA
1	83,364 gsf
2	92,255
3	113,961
6	105,824
11	126,399
13	49,800
14	148,427
21	158,245
26	53,810
30	58,800
Total PAOZ Space	990,885 gsf
	990,885 gsf
Total Site Space	4,328,247 gsf

* NASA space in Partnering and Outreach Zone.

TABLE 4-1 PROJECTED 2022 FACILITIES MASTER PLAN BUILDING SPACE.

disciplined systems engineering for projects and missions from mission conception to delivery of the science product. It has operational and organizational relationships with all of the other core technical and scientific operational organizations. Personnel and facilities are currently housed in six locations. The systems engineering function would occupy about two-thirds of Building C.

The Multimedia Center would contain facilities for: GSFC High Density TV studio, a digital information center, the Goddard Laboratory for Atmospheres, and the GSFC elementary and high school student "Learning Technology" program facilities.

Building D – Space Science Infill Facility

This building would provide contingency space for up to 150 additional Space Science personnel for missions unforeseen at this time.

Building E – Campus Commons Facility

This facility would collect service and employee support facilities that are currently scattered around the campus in 15 individual or shared locations. The intent is to create a center of activity with an identifiable sense of place where accommodations and support can be shared. Location within the neighborhood would encourage pedestrian access.

The Campus Commons Facility would contain the NASA GSFC library, employee financial or credit union and travel services, training facilities and rooms, a fitness center replacing Building 97, GEWA club spaces, and a 450-seat auditorium replacing the existing one in Building 8.

Earth Science Neighborhood (Buildings 31, 32, 33, H, I, J, Q)

Three additional buildings (H, I, and J) could added as needed. Buildings H and J are visualized as three to four story buildings that could accommodate up to 350 additional Earth Science Directorate personnel. They would supplement space in Buildings 32 and 33 on a smaller physical scale. They could be used to house mission teams and contain meeting and conferencing spaces. Building I is proposed as a single story cafeteria, which together with Building R in the Engineering and Technology Neighborhood, would replace existing employee food service facilities in Buildings 1 and 21. The existing facility in Building 21 would be transferred to or replaced in the Partnering and Outreach Zone for employees in that area. The east refrigeration plant in Building 31 would be expanded through Building Q to provide chilled water capacity for full build out of Master Plan facilities.

Engineering and Technology (Buildings 5, 7, 10, 15, 28, 29, R, S, T)

Engineering and Technology Directorate (Code 500) personnel are scattered among 18 locations around GSFC. However, Buildings 5, 7, 10, 15 and 29 are occupied exclusively by Code 500. Programmatic personnel projections for 2022 indicate a 22 percent decline from present levels. The shift of the Science Data Center in Building 28 to the Space Science and Central Commons Neighborhood would make additional space available within the six buildings to accommodate future Code 500 needs and consolidation of personnel and functions. The buildings would be adopted and renovated as needed.

Building R is proposed as a NASA employee cafeteria. Building S and T are single story, potentially high bay, stand alone "pods" or small technical satellite facilities similar to existing Building 5A (See Figure 3-3). Each pod would range from 5,000 to 10,000 gsf in floor area. The pods would not have a permanent assignment. Instead, they would be made available to the entire directorate on a rotating as

needed basis to meet requirements associated with specific missions, experiments, or tasks. Emphasis would be placed on laboratory and technical uses that would require the presence of few or no employees.

Program and Project Management Neighborhood (Buildings 22, 23 F, L, K

Scattered components of the Office of the Director, the Management Operations Directorate and the Flight Programs & Projects Directorate that are responsible for administration and management would be consolidated into this neighborhood. Building K would replace Building 12 which has a low quality level. Building L would be the neighborhood common facility. Building F would be a GEWA facility.

Institutional Support Neighborhood (Buildings 4, 18, 19, 20, 24, M, O)

This neighborhood would house personnel and facilities that provide Goddard wide support to research and technical functions. Most of the existing buildings that would remain already serve in this capacity. Most of the space in Building M would be devoted to offices for the NASA organizations involved in services that support science and engineering functions. These include personnel now housed in Buildings 8, 9, 16, 17, and at the Building 27 complex. Building O would be a replacement for the motor pool facility now located at Building 27, and as a storage location for NASA truck trailers that are now parked either at that building or near Building 25.

New Thrust Zone (Area G)

The New Thrust Zone is a designated general area for potential new unprogrammed development that may be needed on comparatively short notice. The Zone is centered near the intersection of Explorer Road and East Drive on the east campus. The Zone could be developed with one large building or several buildings, on a one time basis or incrementally. The Master Plan has established overall planning values of 500 personnel and 185,000 gsf for the Zone.

Building N and Site U

Building N is a new warehouse and receiving facility that would replace these functions now in Building 16W. The building would be isolated from other facilities to permit security checks of arriving vans and trucks prior to their approach to developed areas. It would also house facilities for marshalling site generated hazwaste prior to shipment to off campus disposal sites. Site U is visualized as location for an unprogrammed non-operational building for NASA use.

- Vehicle/Pedestrian Circulation and Access

The Facilities Master Plan would create a unified NASA installation by relocating Soil Conservation Road from its current location to the east side of GSFC. The new alignment would cross the northern tier of the east campus and then turn to run to Good Luck Road beyond the perimeter of east campus development.

The security perimeter surrounding the NASA installation on the west campus would be redefined and repositioned to separate the Partnering and Outreach Zone (PAOZ) from NASA facilities. Access to the NASA installation would be provided at three new entrances: new main and north gates along the remaining segments of Soil Conservation Road, and existing Gate 3 that provides access to the Baltimore-Washington Parkway in the northwest corner of the site. The "gates" would be simple guard posts. Visitor check-in facilities would be shifted from existing facilities in Building 9 at the existing or Old Main Gate to the Visitor Center in Building 88. Access to the PAOZ would be via Aerobee Road which would be extended to Soil Conservation Road on the south side of the Visitor Center, or via the existing Main Gate. The Baltimore-Washington Parkway entrance would continue to operate as a NASA employee only gate.

A new Loop Road would be built within the NASA installation to route vehicle traffic around a large pedestrian oriented core area encompassing the Space Science and Central Commons, Engineering and Technology, and Program and Project Management Neighborhoods. The Loop Road would be generally two lanes wide with left turn lanes at parking lot entrances. The core area includes a network of walk and bikeways. The Prince George's County South Laurel Trail (Trail 5A), which runs along Soil Conservation Road, would be relocated with the road to the new alignment.

- Buffers and Natural Areas

The Facilities Master Plan confines potential future development to currently developed areas. The perimeter buffer and natural areas north of Explorer Road on the east campus are maintained. No changes in the satellite areas are proposed.

4.4.2 The No Action Alternative

Consideration of the No Action Alternative is required by Federal regulations implementing the provision of the National Environmental Policy Act (40 C.F.R. 1502 14(d)). The No Action Alternative serves as a frame of reference for assessing the affects of the proposed action on a comparative basis.

In the case of the Facilities Master Plan, it would be unrealistic to expect no action whatever for operations and project implementation over the 20 year planning period covered by the Plan. The No Action Alternative posits or assumes a number of conditions.

- Goddard would continue to operate and maintain facilities at or close to existing level in terms of type, size, and location, i.e. approximately 3,300,000 gsf of space in major buildings.

- The site employee population would remain the same at about 7,600.

- Changes required to respond to changes in legislation, regulations, Executive Orders, physical conditions, and assigned mission would occur, but within the constraints of maintaining a relatively constant amount of facility space and number of employees.

- Buildings and facilities would remain, in general, and be renovated or upgraded as needed. Alternatively, buildings could be replaced, but they would be of similar type, size, and function. Replacement buildings would be located at sites currently occupied by buildings, or within existing developed areas west of Soil Conservation Road, or in the vicinity of Buildings 32 and 33 on the east campus.

- Utilities, roads, and infrastructure would remain unchanged in general configuration, but would be maintained, upgraded, or replaced as needed. Ongoing projects and programs would proceed to completion. Goddard, for example, is conducting ongoing programs to upgrade or replace significant portions of the site steam, chilled water, electric power, and communications distribution systems or networks. These implementation projects would occur under the No Action Alternative as well as the Master Plan Alternative.

- Site parking conditions would remain unchanged.

- The Partnering and Outreach Zone would not be created.
- As in the Master Plan Alternative, the satellite areas would remain unchanged.

It is implicit that the No Action Alternative would hinder the ability of NASA GSFC to meet its functions and missions at Greenbelt. Goddard would also be able to accommodate new Agency-wide and GSFC planning and operating paradigms only with the greatest difficulty.

†††

5 AFFECTED ENVIRONMENT/ ENVIRONMENTAL CONSEQUENCES

The existing environment and potential environmental consequences of the Facilities Master Plan are closely interrelated. Information on the affected environment and environmental consequences are merged and presented in subsections by environmental topic to eliminate the repetition of material and for the convenience of the reader.

The proposed action, a Facilities Master Plan is a paper document providing development guidance. As such, it produces no direct impacts. Potential environmental consequences are conditional. They are dependent upon the extent to which individual proposals within the Facilities Master Plan are implemented or built. This Environmental Assessment presents an overview of the potential environmental consequences that would occur, if all proposed Master Plan facilities were built. It therefore estimates the potential maximum cumulative environmental consequences. Actual cumulative impacts would range between those for the No Action Alternative and the Facilities Master Plan Alternative.

5.1 Socioeconomic/Land Use

5.1.1 Overview

The NASA Goddard Space Flight Center is located in Prince George's County, Maryland. The County contains about 488 square miles or 312,300 acres of land area. The County lies within the Baltimore-Washington Consolidated Metropolitan Statistical Area (CMSA), which merges and expands the old Standard Metropolitan Statistical Areas for the two cities. Reflecting urban expansion, travel patterns, and economic relationships between jurisdictions within the CMSA, the CMSA now stretches from the Pennsylvania border to the outskirts of Richmond, Virginia, and includes Queen Anne's County on the eastern shore of the Chesapeake Bay and the two counties, Berkeley and Jefferson, in the eastern panhandle of West Virginia. The new CMSA covers an area of about 9,570 square miles. (Population of Metropolitan Areas and Component Geography: 1980 and 1990, U.S. Bureau of the Census Report CPH-L-145, 1993).

The region within the CMSA is urbanizing rapidly. In 1990, the population was 6.7 million making the Washington-Baltimore CMSA the fourth largest in the nation. Population in the CMSA increased by 16 percent between 1980 and 1990. The Washington Metropolitan Statistical Area within the overall CMSA, which includes the District of Columbia and adjacent counties such as Prince George's had a population of 4.2 million in 1990, an increase of 21.4 percent over 1980.

Prince George's County has undergone rapid urbanization and development over the last few decades, transforming it from a mostly rural jurisdiction to a suburban area. The County experienced slow growth in population between the original census in 1790 and 1900. As late as 1940, there were only 89,500 residents. However, between 1940 and 1970, the population nearly doubled each decade to reach the 1970 count of 660,567. Growth during this period can be attributed to no single factor, but less costly land and housing in comparison to other jurisdictions adjacent to Washington, D.C., the opening of large employee centers such as NASA GSFC and the Suitland Federal Center, expansion of the University of Maryland, and construction of the Washington Beltway, I-495, in the latter half of the period were all important contributing factors.

While growth slowed during the 1970's, it resumed in the 1980's, although at a slower pace. By 1990, the population had increased to 729,268. The County's population represented about 17 percent of the Washington metropolitan-area total and nearly 11 percent of the total CMSA population. Most of the growth in the 1980's is attributable to a local migration of more than 62,000 from the District of Columbia to the County (Prince George's County Statistical Reference/1996, M-NCPPC, 1996. Blacks were the majority race in the 1990 census comprising 50.7 percent of the County population (369,791 out of 729,628). The census also revealed a continuing influx of Asian Americans, who have increased from less than 1,000 in 1960 to more than 35,000 in 1990. Further reflecting urbanization, average household size decreased significantly between 1980 and 1990 from 3.43 to 2.83, although the number of households increased from 224,789 to 258.011 during this period (1980 and 1990 Census of Population, U.S. Bureau of the Census).

5.1.2 Land Use/Zoning

Prince George's County is divided into 36 planning areas. For nearly all of the areas, master plans have been developed through a cooperative government and citizen effort. The County General Plan guides these area master plans. Each plan provides a comprehensive set of guidelines and recommendations for future growth and development, while establishing policies that protect existing land uses, community facilities and needs, and environmental and historic resources. The plans also delineate recommendations for an efficient transportation network within and between each planning area. The GSFC is situated at the juncture of three planning areas: 64, 67, and 70 (Figure 5-1).

The Prince George's County Agricultural Research Center Planning Area (Area 64) extends northward from the GSFC east campus for more than 5 miles to the Patuxent River. Although it covers more than 7,945 acres, it has no master plan, since the Federal government owns all but about 7 acres. Area 64 encompasses all of NASA GSFC except for the west campus, the eastern half of the Beltsville Agricultural Center including properties leased to other Federal agencies, and the Patuxent National Wildlife Refuge, now called the Patuxent Environmental Science Center. In the entire planning area, there are no commercial facilities, only 24 households, and a population of about 70, most of whom are BARC resident employees and their families.

Planning areas 67 and 70 are more conventional. Each has an approved Master Plan with Sectional Map (Adopted and Approved Master Plan for the Langley Park – College Park – Greenbelt Area, Planning Areas 65, 66 and 67, M-NCPPC, 1990) (Approved Master Plan, Glenn Dale, Seabrook, Lanham, & Vicinity, Planning Area 70, M-NCPPC, 1993). In the immediate environs of NASA, Cipriano Road is the boundary between the Greenbelt Planning Area (Area 67) to the west, and the Glenn Dale, Seabrook, Lanham Planning Area (Area 70) to the east. Both areas extend to the south and west for a considerable distance beyond the study area.

The County General Plan establishes a hierarchal system concept of ideal development that recognizes the advantages of concentrating certain types of commercial and related activities. These points of concentration are defined as activity centers and are a means for preventing haphazard and inefficient development along major roads or at crossroads. There are four levels of activity centers defined in ascending order as: (1) Neighborhood, (2) Village, (3) Community, and (4) Major Community Activity Centers.

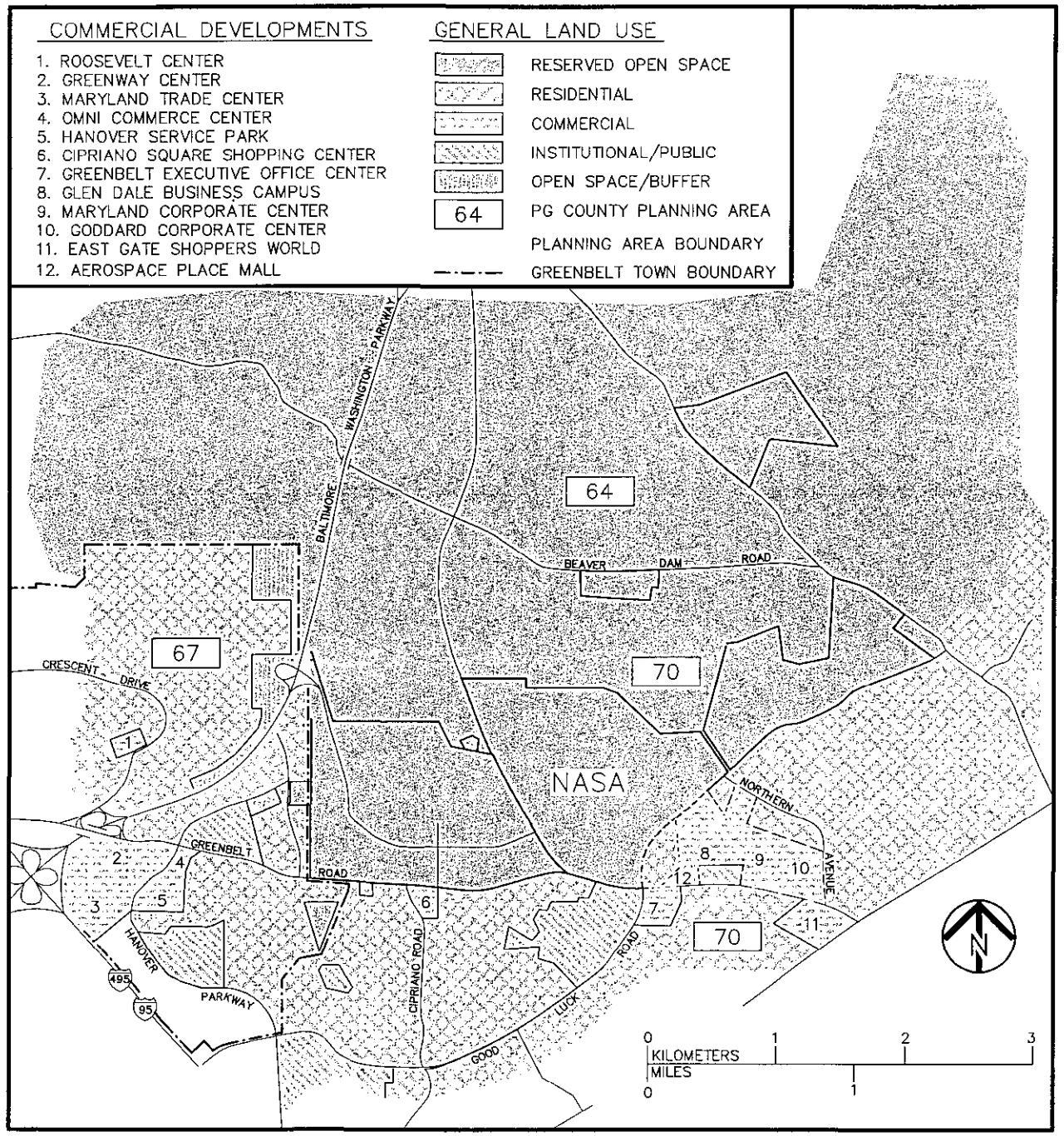


FIGURE 5–1 LAND USE AND ZONING.

In the vicinity of NASA, existing land use closely matches master plan zoning in each area. Commercial development is concentrated along Greenbelt Road. The Roosevelt Center and the Cipriano Square Shopping Center are classified as Village Activity Centers by the County. Village Activity Centers have a generalized defined overall size of 5 to 10 acres of commercial leasable space, and serve an estimated population of 12,000 to 20,000 within an area of 2 to 4 miles radius. Cipriano Square, located on Greenbelt Road opposite the main gate entrance to Goddard has 22 stores, restaurants and a bank, with K-Mart serving as the anchor facility. Aerospace Place Mall, which is anchored by a Merchant Tire Center, is a strip mall that opened in 2001.

The Greenway and East Gate Shopping World are classified as Community Activity Centers, which have 10 to 15 acres of leasable space, serving a population of 20,000 to 30,000 within a radius of 10 minutes driving time. The Greenway Center is the largest shopping center in the study area with 40 stores, restaurants, and banks occupying 85,390 sf of leasable space on a 23 acre site, but it ranked only 18th in size in 1994 in the County as a whole (Prince George's County Statistical Reference -- 1996, M-NCPPC, 1996).

In the Greenbelt Planning Area, residential zoning in the portion of Greenbelt west of the Baltimore-Washington Parkway in the study area is predominantly R-T or residential-townhouse. To the east of the Parkway within the City of Greenbelt limits, all residences are garden apartments and townhouses. The 3-story Greenbriar III and Glen Oaks multifamily units abut the west side of NASA. A 10-acre site reserved for a future Smith-Ewing Elementary School separates them. Continuing eastward to Cipriano Road, multifamily and townhouse developments (Chelsea Wood Condominiums, Brittany Place Apartments, and Green Oak Towers) occupy the area on the south side of Greenbelt Road, opposite the west campus.

In Planning Area 70, the Yorkberry and Greenbelt Woods subdivisions are single family detached housing residential areas between the Cipriano Square Shopping Center and a Prince George's County School complex. A County regional stormwater management dry pond separates the subdivisions. The low rise Countryside Apartments complex is located in the northeast quadrant of the Greenbelt/Good Luck Road intersection, while the similar Woodland Landing development is found on the east side of the town-office Greenbelt Executive Office Center. Individual older residences, set well back from Greenbelt Road, collectively occupy about 40 acres between Woodland Landing and the East Gate Shopping Center in a rural-residential zone. Should these properties be redeveloped, the Area 70 Master Plan recommends future Residential-Suburban zoning, which permits a possible variety of housing types at a density of 2.6 to 3.7 dwelling units per acre for this area.

On the east side of GSFC, to the north and east of Good Luck Road and North Avenue, the Area 70 Master Plan recommends the continuance of Suburban-Estate and Low-Suburban residential zoning for undeveloped properties, matching the existing zoning of the Forestgate and Wingate communities that are located here.

Seven separate office/business complexes located along Greenbelt Road form an area employment center. Some firms such as Boeing, Lockheed-Martin, and Honeywell, that frequently work as NASA contractors, have chosen to locate their regional or Washington area offices in these complexes.

Except as noted above, the Area 67 and 70 Master Plans propose no changes in future land use or zoning in the environs of GSFC.

5.1.2.1 Reserved Open Space Zoning

In 1994, the Prince George's County District Council enacted legislation that creates a new zoning classification, Reserved Open Space (R-O-S). The stated purposes of the R-O-S zone are:

a. To encourage the preservation of large areas of agriculture, trees, and open spaces;
b. To protect scenic and environmentally sensitive areas;
c. To ensure the retention of certain areas for nonintensive active or passive recreation uses; and
d. To provide for a limited range of public, recreational, and agricultural uses.

The use of the R-O-S Zone is intended to facilitate the permanent maintenance of certain areas of the Country, both publicly and privately owned, in an undeveloped state.

The legislation also established a procedure for applying a R-O-S Zone Countywide Map Amendment to private and public lands, including those owned by the Federal and State governments. In May, 1998, the Council approved and adopted the R-O-S Zone Countywide Map Amendment (Approved Countywide Map Amendment for the Reserved Open Space (R-O-S) Zone in Prince George's County, Maryland, M-NCPPC, 1998).

There are 37 Federal properties in Prince George's County, ranging in size up to the 6,615-acre Beltsville Agricultural Research Center. The Federal government owns about 35 percent of the County. Circumstances often arise where property transfers occur between the County and superior jurisdictions in the Federal or State governments through eminent domain, direct sale, or property swaps. Zoning is a major factor in the appraised property values. Prior to 1998, most Federal property, including NASA GSFC, had been given Residential-Rural (R-R), or Open Space (O-S) zoning, those of the lowest market value. The R-O-S zoning permits higher property evaluations where these property transfers occur.

Twenty one of the Federal properties, including GSFC, BARC, the Baltimore-Washington Parkway, and the Patuxent Environmental Science Center were rezoned R-O-S in May 1998. In the case of NASA, the entire Center (Occupant ID No. 16GSFC00) was rezoned. Two general policies and other factors were used in the reclassification. First, public lands should be placed in the R-O-S Zone only if it bears a close resemblance to the primary stated purposes of the zone. The existing zoning classification was retained in all other cases. Secondly, all public land should be placed in the most restrictive or dominant zone, where mixed uses occur. The County noted:

"...there are situations where the character of Federal properties is mixed with areas of intense development combined with large undeveloped or agricultural areas, such as the Beltsville Agricultural Research Center or Goddard Space Flight Center. In these cases, it is recommended that if large portions (greater than 20 acres) of the Federal property conform with the purpose of the R-O-S Zone, the entire property should be shown in the R-O-S Zone classification." (ibid.)

Permitted uses in the R-O-S Zone are limited to public buildings, agriculture, single family dwellings, recreational-uses, and certain temporary uses. Residential density should be no greater than one dwelling unit per 5 acres. While public uses may occur on tracts smaller than 5 acres, private uses may not.

The County recognizes that NASA and other Federal and State agencies are exempt form the Ordinance where Federal and State actions are involved. The R-O-S Zone effects no change from the old zoning in these cases, but it does provide the County a greater measure of protection when the County itself or private parties are involved.

The Master Plan Alternative would conform to the intent of the County R-O-S zoning amendment. Proposed facilities would continue to be concentrated within currently developed areas with many of the facilities replacing existing facilities or interspersed among them. Within the NASA installation, most of the proposed facilities are inside the area formed by the Loop Road. The large area in the northern sector of the east campus would remain undeveloped. Site perimeter buffers are retained, and no changes are proposed for the lightly developed satellite areas.

Land use in the Partnering and Outreach Zone would remain unchanged. NASA would continue to own the area and lease space to outside private or government partners. NASA would control the type, character, and amount of development in the zone, within the overall zone caps of 1,950 employees and one million gsf of building space. Facilities would be renovated, adapted for reuse, or replaced as needed. It is anticipated that this would occur incrementally on a building by building or subzone basis over the planning period.

Future facility uses would be similar or correspond to existing ones: offices, technical spaces, and engineering laboratories that are parallel to NASA spaces in function and current NASA uses in the zone. Building would be clustered and front on shared open public spaces. Amenity functions such as day care or cafeterias may be included, but general retail, residential, or industrial uses would be prohibited.

5.1.3 Housing/Population

1990 U.S. census tracts in the vicinity of NASA GSFC are shown in Figure 5-2. Some modifications and adjustments were made to the base census data to more clearly characterize the Goddard environs.

Tract 67.05 was split into Sections A and B, which are within and outside of the City of Greenbelt, respectively. When data for Tracts 67.05A, 67.04 and 67.08 are combined, the results are indicative of Greenbelt as a whole. Data for Tracts 67.04 and 67.08 characterize the "old", original section of Greenbelt west of the Baltimore-Washington Parkway, while data for Tract 67.05A is representative of the Greenbelt East section to the east of the parkway.

Tract 04.06, one of the largest in the County, extends northward to the Patuxent River, and in the original 1990 census, included the northern portions of the old, original town of Bowie within its boundaries. Census data for the portion of the tract within the Bowie town limits was subtracted from that for the entire tract. Since there are only about 27 households and a population of about 70 in Tract 04.06 in the area to the north of GSFC, the resultant housing and population characteristics are more indicative of conditions that existed in 1990 in the Forestgate and Wingate communities adjacent to NASA.

Census data on housing units in the study reflects the history of area development (Table 5-1). Through the mid-1930's, the area was rural with less than 150 housing units, most of which were clustered around the town of Glenn Dale south of the Greenbelt/Lanham-Severn Road intersection. The original development west of the Parkway is revealed by pre-1940 data for Tracts 67.04 and 67.08. Growth accelerated east of the Parkway in the 1960's and 1970's.

Basic population and housing characteristics for the census tracts in the study area are shown in Tables 5-2, 5-3 and 5-4. The total population in the census tracts around Goddard in 1990 was 29,094. Racial minorities accounted for 31.6 percent of this population. Those of Hispanic origin regardless of race accounted for 3.5 percent of the local population in 1990.

YEAR BUILT	PRINCE GEORGE'S COUNTY	CENSUS TRACT						VINICITY TOTAL
		04.06*	04.07	67.04	67.05A	67.05B	67.08	
1985-1990	27,252	346	246	19	821	91	0	1,523
1980-1984	17,265	34	642	14	420	278	31	1,419
1970-1979	52,196	92	663	67	1,585	496	323	3,226
1960-1969	86,278	450	932	438	487	577	518	3,420
1950-1959	48,905	67	184	165	16	27	223	682
1940-1949	24,278	128	16	409	0	0	310	863
Pre-1940	13,916	74	14	401	0	17	803	1,309
TOTAL	270,090	1,191	2,697	1,513	3,329	1,486	2,208	12,424

*Less City of Bowie Within Tract 04.06
Source: 1990 Census of Population and Housing, 1990 CPH-3-331, US Bureau of Census

TABLE 5-1 AREA HOUSING UNITS.

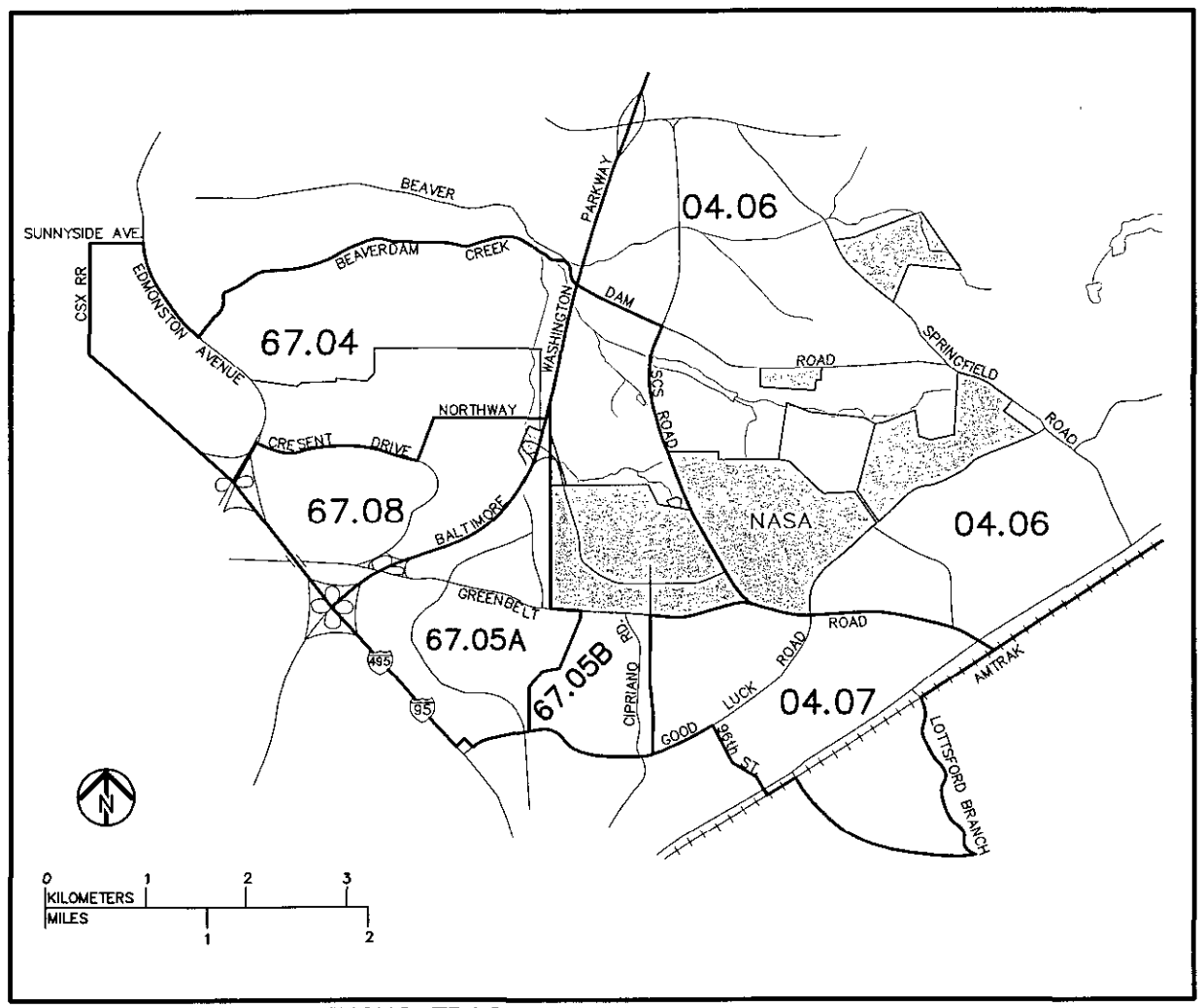


FIGURE 5–2 1990 CENSUS TRACTS.

CENSUS TRACT	TOTAL POPULATION	RACE					
		WHITE	BLACK	AMERICAN INDIAN	ASIAN	OTHER	HISPANIC ORIGIN
Prince George's County	729,628	314,616	369,791	2,339	28,255	12,539	29,983
%		43.1	50.7	0.3	3.9	1.7	4.1
04.06**	3,993	2,263	1,420	7	264	39	118
%		56.7	35.6	0.2	6.6	1.0	3.0
04.07	6,704	3,997	2,004	27	610	66	242
%		59.6	29.9	0.4	9.1	1.0	3.6
67.04***	3,332	3,065	110	5	120	32	122
%		92.0	3.3	0.2	3.6	1.0	3.7
67.05A	7,168	4,649	1,475	13	944	87	284
%		64.9	20.6	0.2	13.2	1.2	4.0
67.05B	3,635	2,209	965	4	413	44	164
%		60.8	26.5	0.1	11.4	1.2	4.3
67.08	4,262	3,721	331	8	171	31	99
%		87.3	7.8	0.2	4.0	0.7	2.3

*Regardless of race.
**Less City of Bowie within Tract 04.06.
***City of Greenbelt within Tract 67.04 only.
Source: 1990 Census of Population and Housing, 1990 CPH-3-331, U.S. Bureau of the Census.

TABLE 5-2 AREA POPULATION CHARACTERISTICS, 1990 CENSUS.

There is a high degree of diversity between area neighborhoods. In the area of old Greenbelt west of the Baltimore-Washington Parkway, the population is comparatively homogenous. Racial minorities comprise only 8 percent of the population in Tract 67.04 and 12.7 percent in Tract 67.08, while they account 35 percent or more elsewhere in the study area, and 56.9 percent in Prince George's County as a whole. The elderly, those 65 and over, make up a much higher proportion of residents in old Greenbelt than elsewhere. The median age of the population in Tracts 67.04 and 67.08 are 34.0 and 34.6 respectively, which is a statistically significant difference from the 30.9 value for Prince George's County. Households in these two tracts are also smaller, with a greater predominance of one and two person households. Tract 67.08 has median of 1.94 persons per household, one of the lowest in the County. The comparatively low household incomes for these two tracts are an indication of a larger proportion of households with single or retirement incomes. The unusual splits in owner and renter occupied units in Tracts 67.04 and 67.08 are probably the result of the original distribution of such housing when Greenbelt was built.

A growing Asian American minority community lives in the study area. Fewer than 100 resided in the entire study area in 1970. Now more than 2,000 Asian Americans live in the study area east of the

CENSUS TRACT	TOTAL POPULATION	AGE			HOUSEHOLD INCOME	
		MEDIAN	UNDER 18	65 & OVER	MEDIAN	MEAN
Prince George's County	729,628	30.9	177,945	50,343	$43,127	$48,606
%			24.4	6.9		
04.06*	3,993	26.1	818	210	$50,631	$53,426
%			20.4	5.3		
04.07	6,704	30.8	1,474	315	$54,327	$57,391
%			22.0	4.7		
67.04**	3,332	34.0	586	315	$37,708	$41,529
%			17.6	9.4		
67.05A	7,168	31.3	1,244	286	$49,817	$55,270
%			17.4	4.0		
67.05B	3,635	31.1	710	226	$48,397	$54,619
%			19.5	6.2		
67.08	4,262	34.6	651	664	$33,668	$39,951
%			15.3	15.5		

*Less City of Bowie within Tract 04.06
**City of Greenbelt with Tract 67.04 only
Source: 1990 US Census of Population and Housing,1990 CHP-3-331, US Bureau of the Census.

TABLE 5-3 POPULATION, AGE, AND HOUSEHOLD INCOME.

Baltimore-Washington Parkway. They are concentrated in Tracts 67.05A and 67.05B, where the proportion of the population that is Asian American is more than three times that of Prince George's County as a whole.

Tract 04.06 differs from others in the study area in that the population is much younger. An unusually high portion, 27.2 percent, of the population is in the 20-29 age bracket. The median age of the population in Tract 04.06 is eight years less than in the section of Greenbelt west of the Baltimore-Washington Parkway (26.1 vs. 34.3), and five years lower than the remainder of the study area.

Housing in Tract 04.06 is predominantly composed of single detached units with a few low rise or garden apartment complexes (10 to 19 units). Townhouses and garden apartments constitute the majority of housing units elsewhere.

Housing and population is projected to grow in the Planning Areas 67 (Greenbelt) and 70 (Glenn Dale, Seabrook, Lanham and vicinity) as follows (Prince George's County Statistical Reference, 1996, M-NCPPC, 1996).

	PRINCE GEORGE'S COUNTY	CENSUS TRACT					
		04.06	04.07	67.04	67.05a	67.05b	67.08
HOUSING UNITS							
Total	270,090	1,191	2,697	1,513	3,329	1,486	2,208
Occupied	258,011	1,139	2,542	1,479	3,202	1,407	2,129
Owner Occupied	151,869	633	1,221	1,161	2,017	723	954
Renter Occupied	106,142	355	1,321	318	1,185	684	1,175
HOUSING UNIT SIZE							
1 Detached	132,777	705	816	395	126	362	143
1 Attached	33,952	8	580	736	1,049	345	843
2 To 4	6,603	3	11	31	32	13	22
5 To 9	23,004	55	69	72	613	302	228
10 To 19	49,797	403	1,129	248	1,244	402	590
20 To 49	7,193	0	83	21	229	53	126
Over 50	14,277	0	0	0	0	0	246
HOUSEHOLD COMP.							
1 Person	55,826	148	502	488	1,025	327	950
2 Person	76,020	407	870	485	1,126	481	658
3	53,058	237	577	262	572	320	289
4	41,613	201	369	164	322	180	169
5	18,778	93	136	55	93	57	54
6+	12,716	53	88	25	64	42	9
Median Pers/Hh	2.69	2.56	2.64	2.25	2.24	2.50	1.94
OWNER OCCUPIED							
Units	$122,600	$189,600	$143,500	$68,300	$143,000	$138,800	$69,100
Median Unit Value	$130,500	$193,100	$151,000	$93,400	$149,700	$136,400	$83,300
Mean Unit Value							
Rental Units							
Monthly Rent	$607	$892	$689	$645	$743	$664	$586
Mean	$610	$889	$725	$641	$779	$708	$557

NOTE: (*) Does not include portion of tract in City of Bowie.
SOURCE: 1990 Census of Population and Housing, 1990 CPH-3-331, U.S. Bureau of the Census.

TABLE 5-4 AREA HOUSEHOLD CHARACTERISTICS.

	Planning Area 67		Planning Area 70	
	Housing Units	Population	Housing Units	Population
2000	13,676	30,542	11,818	33,765
2010	14,950	32,919	13,010	36,601
2020	16,911	37,346	14,113	39,505

Since most of the area around the periphery of NASA GSFC is built out, future growth in housing and population in the immediate environs will be slower or less than in the planning areas as a whole. It is expected that the NASA GSFC Master Plan Alternative will have little or no impact on area housing and population.

The County population increased to 801,515 in 2000 (Maryland Office of Planning 2000 Census Population File).

Growth is expected to continue. The projected population for 2010 and 2020 is 852,000 and 917,000 respectively (Revised Forecasts for Prince George's County, M-NCPPC memorandum, 1998.) Through its Comprehensive Water and Sewer Plans, the County plans to slow growth in the eastern and southern portions of the county.

Per capita income in Prince George's County in 1993 was $21,772, which was slightly less than Maryland as a whole at $23,908, but greater than that for the U.S. ($20,800) (Prince George's County

Statistical Reference/1996, M-NCPPC, 1996). The County has enjoyed a lower unemployment rate than Maryland or the nation in every year since at least 1980 with the rate generally 2 to 3 percentage points less than the national average (ibid.).

5.1.3.1 Census 2000

To date, the US Census Bureau has only released population by race by tract data (Table 5-5). The purpose of the data is only for establishing election district boundaries, and the data is unadjusted. Tracts in the vicinity of NASA have been renumbered or adjusted between 1990 and 2000 as follows:

1990 Tract	2000 Tract	Comment on 2000 Tract
04.06	04.06	Same data not comparable. See below.
04.07	04.07	Same.
67.04	74.08	Same. Renumbered. Data not comparable.
67.05A	67.10	67.10 is 67.05A south of Greenbelt Road.
	67.12	67.12 is 67.05A north of Greenbelt Road
67.05B	67.11	Same. Renumbered.
67.08	67.08	Same.

Data given in this Environmental Assessment for the 1990 Census in Tables 5-2 through 5-4 are for the portions of Tracts 04.06 and 67.04 shown in Figure 5-2. The data for Tract 04.06 excludes the portion of the City of Bowie within the tract. Data for Tract 67.04 is only for the City of Greenbelt within the tract. The 2000 census data for Tracts 04.06 and 74.08 are for the entire tract since no further breakdown is yet available. For simplicity, the data in Table 5-5 is presented using the 1990 census tract designations.

The Prince George's County population grew by ten percent between 1990 and 2000 (729,268 to 801, 515). On a countywide basis, the white population decreased from 43 to 27 percent of the population, while the black population increased from 51 to 63 percent. Similar changes occurred in the tracts in the environs of NASA, where significant increases in minority populations, and reductions in the white population, have been experienced.

5.1.4 Community Facilities

Community facilities in the vicinity of NASA GSFC are shown in Table 5-6 and their location in Figure 5-3.

Eleanor Roosevelt High School is a County science and technical magnet school attracting students on a competitive basis from throughout the County. In terms of enrollment, it is the largest high school in the County system (Prince George's County Statistical Reference, 1996, M-NCPPC, 1996). Duval High School is one of four Prince George's County schools in a complex on the south side of Greenbelt Road near Good Luck Road. The Howard B. Owens Science Center, another member of this complex, serves as a general science and computer learning center for elementary and middle school students who are bussed to the center from throughout the County. It contains a theater-classroom, computer labs, and hands-on exhibits and work areas. Goddard Middle and Catherine T. Reed Elementary are the other two schools within the complex.

The Doctor's Community Hospital is a private not for profit institution licensed for 250 beds. The Green Ridge House is a 100-unit low-rise apartment building for the elderly on Ridge Road in Greenbelt. Built

		RACE						
		WHITE	BLACK	AMERICAN INDIAN	ASIAN	OTHER	TWO OR MORE	HISPANIC* ORIGIN
Prince George's County	801,515	216,729	502,550	2,795	31,032	27,525	20,884	57,057
%		27.0	62.7	0.4	3.9	3.4	2.6	7.1
04.06**	9,300	3,803	4,316	25	825	86	245	302
%		40.9	46.4	0.3	8.9	0.9	2.6	3.2
04.07	7,644	1,884	4,690	29	692	99	250	243
%		24.6	61.4	0.4	9.1	1.3	3.3	3.2
67.04***	5,384	3,380	1,347	20	421	68	148	222
%		62.8	25.0	0.4	7.8	1.3	2.7	4.1
67.05A	7,625	2,152	3,786	19	1,254	155	259	359
%		28.2	50.0	0.2	16.4	2.0	4.7	3.3
67.05B	4,158	1,225	2,330	16	374	78	135	137
%		29.5	56.0	0.4	9.0	1.9	3.2	3.3
67.08	4,126	2,872	694	11	390	59	100	143
%		69.6	16.8	0.3	9.5	1.4	2.4	3.5

*Regardless of race.
**Less City of Bowie within Tract 04.06
***Total Tract
Source: Maryland Office of Planning 2000 Census Population File.

TABLE 5-5 AREA POPULATION CHARACTERISTICS, 2000 CENSUS.

by the City of Greenbelt and opened in 1979, it has a communal dining room, work room, lounges, and a medical clinic staffed by a nurse.

The growing presence of the Asian American community is mirrored in the listing of religious facilities. The Maryland Korean Presbyterian Church was recently constructed on Mallery Drive off Good Luck Road, as was the Shri Siva Vishnu Temple on Cipriano Road. The New Hope Korean Church shares the Mowatt Memorial United Methodist Church in Greenbelt, while Jonah Korean Church has a similar arrangement with the Seabrook Seventh Day Adventist Church on Good Luck Road.

NASA maintains its own security force, but also relies on the National Park Service Police for some policing functions. The Greenbelt Police jurisdiction is limited to the City. The study area to the west of Cipriano Road is covered by Prince George's County Police District VI, while the area to the east of Cipriano Road is in District II.

Fire and emergency vehicle service is provided from either the West Lanham Hills Fire Station Company 48 or the Glenn Dale Fire Station Company 18. Fire and ambulance response times from the West Lanham Hills Fire Station are 3.98 and 4.25 minutes, respectively. Paramedic and ladder truck service response times from the Glenn Dale Fire Station are 6.77 and 4.31 minutes, respectively.

Public parks in the study area are as follows:

EDUCATIONAL

33. Catherine T. Reed Elementary School
35. Duval High School
16. Eleanor Roosevelt High School
37. Gaywood Elementary School
1. Greenbelt Elementary School
34. Howard B. Owens Science Center
22. Magnolia Elementary School
32. Robert Goddard Middle School
3. St. Hugh's Parochial School

EMERGENCY SERVICES

5. Greenbelt Fire Co. 35
9. Greenbelt Police Main Station
18. Greenbelt Police East Substation
45. West Lanham Hills Fire Company 48
46. Glenn Dale Company Fire Company 18

HEALTH CARE

23. Doctor's Community Hospital

COMMUNITY ORGANIZATIONS

26. American Legion Post 172
11. Greenbelt Community Center
15. Greenbelt Family Center
14. Green Ridge House
36. Veterans Of Foreign Wars Post 8950

COUNTY LIBRARY

10. Greenbelt Branch

RELIGIOUS

47. Amistad St. Paul United Church of Christ
41. Dorsey Methodist Chapel
44. Glenn Dale United Methodist Church
40. Good Samaritan Lutheran Church
25. Grace Bretheren Church
2. Greenbelt Baptist Church
6. Greenbelt United Church Of Christ
24. Jonah Korean Church
29. Maryland Korean Presbyterian Church
13. Mishkan Torah Congregation
7. Mowatt Memorial United Methodist Church
8. New Hope Korean Church
43. Perkins Methodist Episcopal Church
30. Seabrook Seventh Day Adventist Church
28. Shri Siva Vishnu Temple
4. St. Hugh's Catholic Church
27. St. Theodore Greek Orthodox Church
20. Trinity Assembly Of God

PARKS AND RECREATION

38. Gaywood Neighborhood Park
12. Greenbelt Aquatic & Fitness Center
17. Greenbrook/Windsor Green Rec Center
31. Presley Manor Neighborhood Park
42. Prince George's County Sports Center
19. Schrom Hill Community Park
21. Windsor Greenfield Park
39. Woodstream Park

TABLE 5-6 COMMUNITY FACILITIES.

Park	Owner	Type	Area (acres)
Gaywood	M-NCPPC	Neighborhood	9
Presley Manor	M-NCPPC	Neighborhood	16
Prince George's Sports Center	M-NCPPC	Countywide	117
Schron Hills	M-NCPPC	Community	62
Windsor Greenfield	PG County	City	16
Woodstream	M-NCPPC	Neighborhood	13

All the above parks are partially developed with active recreation facilities. Neighborhood parks are less than 20 acres in size, frequently associated with schools, and intended to serve residents in the immediate vicinity. Community parks range from 20 to 200 acres in area, and generally include a community or recreation center building. Both park types have an assortment of tennis and basketball courts, playing fields, and trails and other passive features. Greenbelt operates its own park and recreation system, which included 308 acres of parkland in 1990, and an array of recreation facilities. The Greenbrook/Windsor Green Recreation Center is a privately owned facility with tennis courts and swimming pool.

The Prince George's Sports Center is a specialized park facility devoted to skeet and trap shooting. It is bordered on two sides by GSFC. The firing range faces north and is well buffered. Tournaments are occasionally held at the facility.

5.1.5 Employment/Economic

NASA has significant direct and indirect beneficial impact on the Maryland and Prince George's County economics. NASA GSFC was the seventh largest direct employer in the County in 1996. (Prince George's County Statistical Reference).

Employer	Jobs	Activity
Prince George's County Board of Education	13,743	Education
University of Maryland – College Park	10,307	Education
Giant Food, Inc.	6,031	Retail Grocery
Prince George's County Government	5,996	Local Government
U.S. Postal Services	4,000	Federal Government
U.S. Bureau of the Census	3,800	Federal Government
NASA Goddard Space Flight Center	3,575	Federal Government

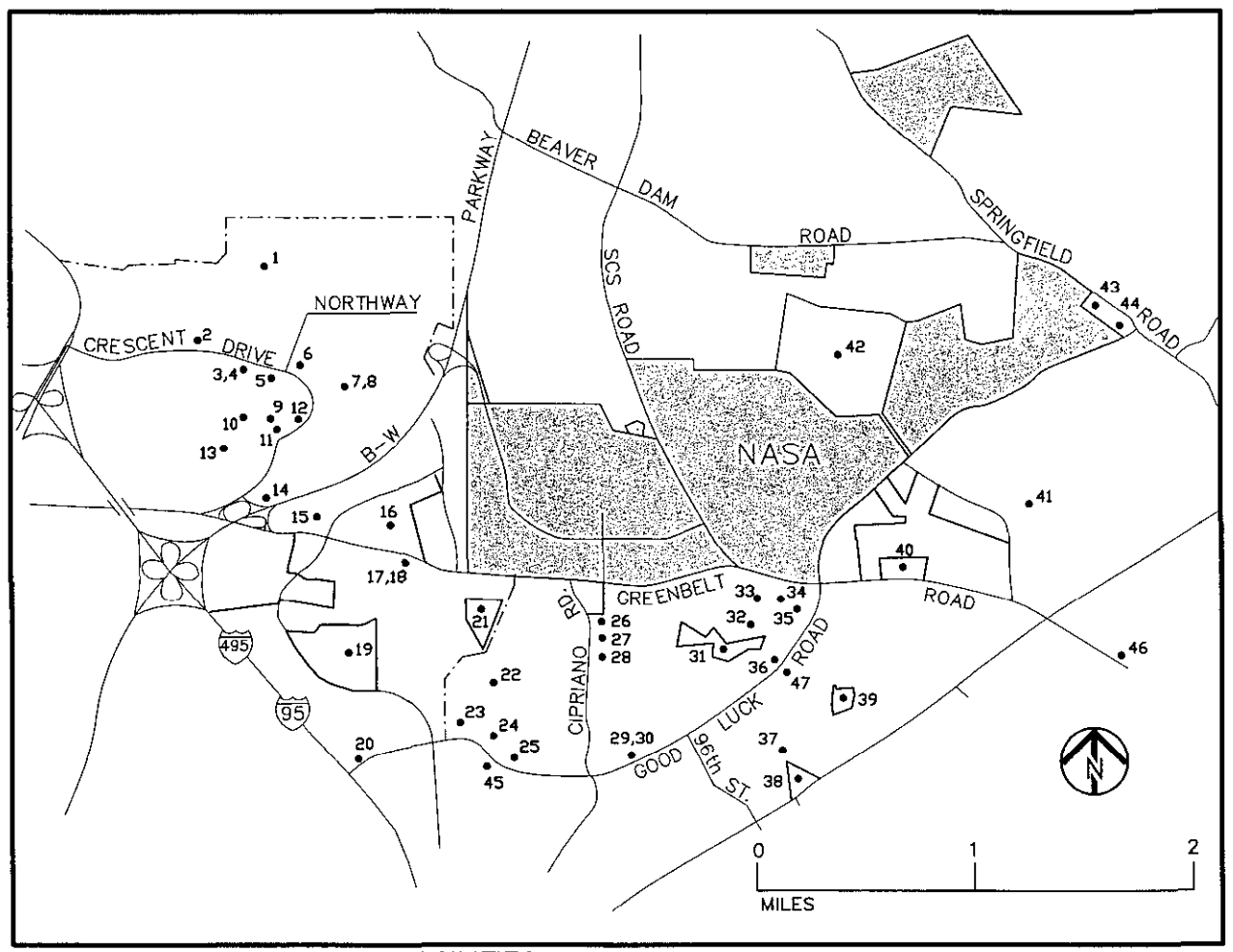


FIGURE 5-3 COMMUNITY FACILITIES.

The number of jobs given above for Federal facilities includes only Federal employees. When the number of on-site private contractor employees is added, NASA GSFC becomes the second largest job center in the County behind the Maryland College Park campus with approximately 7,600 employees.

In Fiscal Year 1997, the Goddard Space Flight Center, including facilities at Greenbelt, Wallops Island, Virginia, and in New York City, had a total funding budget of $3.073 billion. Of the amount, $2.499 billion was spent on contractual obligations in the private sector, and $1.23 billion or 40 percent of the obligated amount was allocated to contractors in Maryland.

A recent study gives an indication of NASA's local economic impact (Economic Impact of Goddard Space Flight Center in Maryland, Maryland Department of Economic & Employment Development, 1994). Although the study analyzed Fiscal Year 1991 data, the magnitude of estimated impacts are still indicative of, and comparable to, current conditions. Study estimates were made on a deliberately conservative basis.

For direct impacts, Goddard's expenditures were divided in the study into two broad categories: on-site operations and direct contractual obligations (Table 5-7). On-site expenditures included employee salaries and benefits, utility costs, and small purchases of less than $25,000 for immediate supplies and services. Only the campus employees who were Maryland residents were considered in the analysis. Contractual obligations included only the direct expenditures to the 450 prime contractors that were performing the work in Maryland. The contractors provided a wide variety of goods and services.

The breakdown of contractual expenditures by Standard Industrial Classification (SIC) code reveals the breadth of the business arena affected by NASA. Maintenance and repair expenditures are for general site construction such as painting, plumbing, heating, roofing, electrical and carpentry work. The space and missile industry is involved in research, development, and manufacture of space vehicles, satellites, rocket engines, and all related equipment. The special machinery and computer industry is primarily involved in the manufacture of high technology and electronic equipment, including computer hardware. Communications includes not only voice and data transmission equipment, but also radar, tracking, and telemetry equipment development and manufacture. Computer services include programming, data processing, and software development, professional industrial, civil, electrical, mechanical, chemical, engineering firms offer a wide variety of services in research and design. And finally, "other contracts" represents a group of 25 different industries such as fabricated metal parts, electronic and semiconductor component, aircraft engines, scientific instruments, commercial photography, health, security, and food services that are necessary for the efficient operation of NASA

NASA GSFC contributes over a billion dollars each year directly to the Maryland economy. About 70 percent of the total direct expenditures are made to space and missile and engineering service industries. To the additional benefit of Maryland, the expenditures predominately go to environmentally "clean" industries. In terms of employment, the study estimated that NASA GSFC was directly accountable for 4,046 on-site Maryland resident jobs when workers in the transportation, utility, and small contract categories were added to NASA employees. GSFC also accounted for an estimated 9,891 additional jobs at primary contractor locations elsewhere in the state.

The study also estimated indirect and secondary impacts through the IMPLAN economic computer model that is used by Maryland for statewide analyses. Secondary effects were limited to expenditures of salaries and benefits by NASA and primary contractors for household goods and services, and to contractor expenditures for subcontractors in supplying specialized services, and to contractor expenditures for subcontractors in supplying specialized services, parts, and goods. It was estimated that the total direct and indirect economic impact of the NASA GSFC leads to annual gross sales to $2.156 billion, annual employee income of $905 million, and maintenance of 26,690 full time equivalent jobs.

	EXPENDITURES (millions)
Direct On-Site	
Salary & Benefits	$193.8*
Transportation	2.3
Utilities	8.3
Small Contracts	17.6
	$222.0
Direct Contractual Obligations**	
Maintenance and Repair (SIC 15-17)	73.51
Space and Missile (SIC 324.72)	324.72
Special Machinery and Computer (SIC 3559, 3571)	10.08
Communications (SIC 48 except 483)	51.23
Computer Services (SIC 737)	82.07
Engineering Services (SIC 8711)	264.55
Other Contracts	46.76
	$852.92

*for Maryland Resident employees only
**for performance in Maryland work only
Source: Economic Impact of the Goddard Space Flight Center in Maryland, MDEED, 1994.

TABLE 5-7 NASA GSFC DIRECT ECONOMIC IMPACTS (for FY 1991).

According to the study, this, in turn, leads conservatively to the annual generation of an estimated $36 million in Maryland personal income taxes, and $8.5 million in retail sales tax revenue. Since about one-third of NASA employees live in Prince George's County, about $14 million is paid annually in County income taxes.

Quantification of the magnitude and extent of potential economic and employment impacts associated with the Master Plan Alternative is difficult because there are inherent uncertainties. Any impacts that would occur, however, are expected to be gradual over the planning period.

NASA strategic planning envisions much greater participation in the space program by those outside NASA over the next 20 years. NASA and its contractors would no longer be solely responsible for missions and programs. These would be competitively bid in terms of expertise and cost. Those outside NASA may initiate projects. NASA may have only a component of a mission, or be responsible for overall project management. To this end, NASA has reorganized through its Strategic Enterprise program, which is analogous to strategic business units in the private sector, so that it can work or team more effectively with a wide assortment of outside partners such as universities, corporations, and other government agencies, both domestic and foreign.

The Terra satellite, which was launched on December 18, 1999, serves as an example for this concept. It carries 5 instrument packages capable of monitoring more than 15 climate and environmental parameters on a worldwide basis (Monitoring Earth's Vital Signs, M.D. King and D.D. Herring, in Scientic American, Vol. 282, No. 4, April, 2000). Project sponsors and participants included not only NASA GSFC, but also the NASA Jet Propulsion Laboratory, the NASA Langley Research Center, the Japanese Ministry of International Trade and Industry, and the Canadian Space Agency in a coordinated effort. Contractors for these and other countries were involved.

Proximity to NASA GSFC itself is often essential, if the expected synergies between NASA and its future partners are to be realized. The Draft Goddard Facilities Master Plan has established a Partnering and

Outreach Zone within the site to accommodate some of these partners in facilities that can be readily adapted to technical or specialized users.

The types of building space and facilities needed by the partners would be similar to those currently at NASA. These include, for example, physics and hard science laboratories, fabrication shops, testing facilities, communications and computer spaces. Office space, where it occurs, is related to the management and coordination of these facilities. In general, these types of space require specialized mechanical, electrical, and utility support systems, and are not readily available in the private real estate sector. If such facilities are privately built, they are for a permanent occupant, and not for a space mission lasting a few years.

NASA has no specific plan or schedule for development of individual sites within the Partnering and Outreach Zone. About 2;370 NASA employees in 991,000 gsf of building space now occupy the zone. Under the Master Plan Alternative, the overall zone employee population would be capped at 1,950 employees in one million gsf of space.

NASA would continue to own the zone, and lease space to partners. Buildings would be used directly by, or adapted or replaced for, tenant partners as circumstances warrant. Since NASA employees now occupying the area must be transferred or relocated, and new or adapted space within the NASA installation must be available, the transition to a partner occupied zone will be incremental or gradual. NASA employee transfers will be contingent on funding to prepare building space for them. Site availability within the Partnering and Outreach Zone will probably be on a building by building, or block by block basis as defined by access roads and parking lots. The size of the buildings limits the individual development steps to a few hundred employees. Several partners could occupy a single site. NASA would exclude retail and residential development within the zone.

In terms of employee population, NASA GSFC has already undergone a work force restructuring over the last decade without apparent significant effect on Prince George's County and the region. In 1999, NASA had 18,000 Federal civil servants agency wide, but this represented a 30 percent reduction from the authorized level of about 25,000 who worked for NASA in 1992. Similarly, NASA GSFC experienced a 22 percent reduction in Federal employees during this period.

Employee projections for Goddard that extend beyond the next few years can be made only tentatively. Under the best estimates generated by current programming, NASA anticipates a further reduction in GSFC employee counts over the 20 year planning period, although at a slower pace as the work force is further streamlined due to computer technology and outside partners taking on an increasing share of the space program.

The current employee population of approximately 7,600 at NASA GSFC is projected to slowly and steadily decline to about 5,800 by 2020. This decline would be offset by up to 1,950 employees who would work for NASA partners on site. The overall site employee population is then expected to be relatively constant; the most probable number of employees would be around 7,750. This assumes that there would be no radical change in Center missions. A "New Thrust" mission, or significant expansion of the space or Earth science programs could result in an additional 1,000 NASA employees at Goddard, so that the total number of NASA and site employees would be 6,800 and 8,750, respectively. The Draft Facilities Master Plan includes provision for this contingency.

From the above, it is assumed that there will be no great change in the overall size and function of NASA GSFC, although 20 to 25 percent of the facilities and total amount of work may be transferred to partners. The general direct and indirect, and on and off site economic and employment benefits outlined by the Maryland Department of Economic and Employment Development should continue with the same order of magnitude through the planning period.

In general, the types of space needed by partners in the Partnering and Outreach Zone are not necessarily directly competitive with the existing office space in the Greenbelt Road corridor near Goddard. Private space in the vicinity of GSFC will continue to be needed by Goddard suppliers, service providers, and contractors. NASA envisions the partnering zone as a potential incubator or growth engine for the development of space/Earth science technology corridor in the private sector, one which would be parallel to the biotechnology corridor along I-270 in adjacent Montgomery County, or the information technology in the Dulles Corridor in Fairfax County in suburban Virginia.

5.1.6 Environmental Justice

Presidential Executive Order 12898, issued on February 11, 1994, requires Federal agencies to achieve environmental justice as part of their overall mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental effects of its activities on minority or low income populations to the greatest extent practicable. Analysis of the study area reveals the presence of minorities and those with low incomes, but they are dispersed throughout the area. No known NASA GSFC Master Plan Alternative potential impacts are directional in nature, or produce disproportionately high adverse human health or environmental effects on minority or low income populations.

5.2 TRANSPORTATION

5.2.1 Regional Transportation Planning

On a regional scale, transportation planning is making a sharp change in course as a result of recent Federal legislation. The legislation requires tighter fiscal accountability for transportation proposals. Federal financing of transportation for a region not in conformity with the National Ambient Air Quality Standard (NAAQS) can be obtained only if there are specific plans for achieving conformity, and measures to reduce the growth in the number of vehicle trips are implemented.

Under the Transportation Equity Act for the 21st Century (TEA-21), all urbanized areas with a population of 200,000 or greater are designated as Transportation Management Areas (TMA). A Congestion Management System (CMS) must be established in each TMA by 1995 that provides for effective management of new and existing transportation facilities through the use of travel demand reduction and operational management strategies. In TMAs that contain areas classified as nonattainment for ozone or carbon monoxide, highway projects which substantially increase single occupancy vehicle (SOV) capacity must be part of an approved CMS (23 U.S.C. § 134 (1)). Such projects are eligible for Federal funding only if the TMA has an active program for reducing travel demand and there is evidence of its effectiveness.

The Financially Constrained Long-Range Plan for National Capital Region (CLRP), (Nation Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 2000) outlines improvements, actions, strategies, and studies needed by the region to comply with the CAA and ISTEA regulations. It covers a 25-year planning period and is updated every three years. The plan conforms to the CAA requirements in that ozone, VOC, and nitrogen oxide regional emissions will be lower than they would be if the plan were not implemented. The plan includes a regional CMS and takes into account the seven "planning factors" identified in TEA-21.

Maryland DOT and WMATA are conducting a joint Capital Beltway Transportation Study for the 42-mile section in Maryland. The complex study involves a four step process: (1) establish purpose and need; (2) develop preliminary alternatives; (3) detailed study, and (4) final recommendations. Step 2, which is completed has evaluated 17 alternative strategies involving highway, transportation systems management, transportation demand management, high occupancy vehicle facilities (HOV), and transit alternatives. Seven transit options were tested for feasibility and cost effectiveness. These involved bus, heavy rail (Metro) and light rail, and potential routings inside, within, and outside the Beltway. The purpose of the preliminary transit alternatives was to test the relative ridership potential, cost effectiveness in meeting transit needs, and environmental impacts.

Only one corridor transit light rail outside the Beltway (Option P4) was routed in the vicinity of NASA GSFC. The P4 study alignment proceeds eastward along Greenbelt Road to the vicinity of the GSFC main gate, and then turns southward to pass down the east side of the Cipriano Square shopping center, continuing southward parallel to St. Anne's Avenue. The option has the advantage of high ridership and cost effectiveness in the vicinity of Goddard, but the opposite occurs for the option when Prince George's County is considered as a whole.

One or two transit options will be developed for Step 3 detailed study. They may be one of the original ones or made up of composite or sections of the preliminary alternates. Considering the time involved for further study, funding, design, and construction, it is estimated that corridor transit would not be available until the last phase of the NASA GSFC master plan planning period at the earliest.

On a more local basis, prospective transportation projects, including those not involving construction, are developed through the State Transportation Plan and local planning. Transportation plans and land use are meshed and coordinated in Prince George's County planning areas master plans. Projects become eligible for funding and construction when they are drawn from these plans and listed in the Transportation Improvement Program for the Washington Metropolitan Area (TIP) prepared by the National Capital Region Transportation Planning Board. The TIP, published annually, covers a rolling six year horizon.

The FY2001-2006 TIP lists the following projects in the vicinity of NASA:

- Cipriano Road – widen from 2 to 4 lanes from Greenbelt Road to MD 564.
- Springfield Road – widen from 2 to 4 lanes from MD 564 to Good Luck Road
- Good Luck Road – widen from 2 to 4 lanes from MD 201 to Greenbelt Road
- Forbes Boulevard – Extend from Greenbelt Road to MD 564
- Baltimore-Washington Parkway/Greenbelt Road Interchange – add eastbound lane on Greenbelt Road to southbound Parkway ramp.

All are scheduled for in-place implementation prior to 2010.

In addition, the County Planning Area 70 Master Plan lists two other projects

- Greenbelt Road/Glenn Dale Boulevard – widen from 4 to 6 lanes east of Cipriano Road. This is identified as an "intermediate initiative" indicating the improvement is in the evaluation phase.

- Good Luck Road – widen from 2 to 4 lanes between Greenbelt Road and Springfield Road. This is a "later initiative " which will occur only when and if additional land use development generates a significant increase in traffic on this road.

- Lanham-Severn Road – Convert to a 4 lane divided highway between Annapolis Road and Forbes Boulevard. Widen from 2 to 4 or 6 lanes between Forbes Boulevard and Springfield Road. This improvement is also a "later initiative."

5.2.2 NASA Access and Gates

NASA GSFC is a security controlled facility, and with the exception of two tracts on the east campus, it has fencing around the perimeter of each subarea. Interior site fencing further isolates some comparatively small areas. Areas 100 through 400 each have one or more unnumbered access gates on their perimeters.

There are 13 numbered gates along the east and west boundaries, but only six are open for normal workday egress (Figure 5-4). Employees access the site through the Main Gate (Gate 1) on Greenbelt Road, via Gate 3 from the Baltimore-Washington Parkway, or through Gates 5, 9 and 16 on Soil Conservation Road. Except for Gate 9, all of these gates provide general site egress and have individual security checkpoints. Gate 9 accesses only the Building 27 compound. The Main Gate and Gate 16 are open at all times; Gate 3 opens at 6:00 AM on work days, and closes at 7:00 PM. Gate 5 is open from 6:00 AM to 8:30 PM, but is closed on Sundays.

The remaining perimeter gates (2, 4, 6, 7, 8, 10, 13 and 15) are normally closed. Gate 2, the "west gate" is in the southwest corner of NASA on Iue Road. Gate 4, which had been opened to employees previously, was closed in response of events to September 11, 2001. The abandoned roadway though Gate 6 on Greenbelt Road dead ends on the south side of the Visitor Center. Gate 7, on the east side of Soil Conservation Road, was the principal entrance to the east campus before more extensive development occurred in the 1990's. Gates 8 and 10 provide alternative egress to the Building 27 area. The last two gates, 13 and 15 are located along Good Luck Road. Gate 13 accesses the Goddard Employee Welfare Association (GEWA) recreation center and facilities.

Gates 2, 7, 13 and 15 are opened infrequently for individual vehicle movements. They are also points for emergency or alternative access should any of the employee access gates be blocked by accidents or for other reasons. Gates 11, 12 and 14 are internal site gates.

All visitors to secure areas must obtain passes in Building 9 at the Main Gate before site entry. The Visitor Center which is in the southeast corner of the west campus is outside the security perimeter and openly accessible to the general public during operating hours. Visitors reach the Center via Soil Conservation Road and the entrance, which is just outside Gate 5 on Explorer Road.

Under the No Action Alternative no changes in site egress would occur. The Master Plan Alternative, however, would realign Soil Conservation Road to the west side of the site, and sever the existing roadway. This would introduce a new internal site security perimeter separating NASA facilities from a proposed Partnering and Outreach Zone in the southwest sector of the site. Site access would be altered to reflect the new conditions.

Changes to access and gates associated with the Facilities Master Plan are dependent on the route selected for realignment of Soil Conservation Road.

Under the West Alignment Alternative, W-1, Soil Conservation Road would intersect Greenbelt Road outside of Gate 2. Gate 2 would be removed to provide full 24-hour public egress to areas within GSFC outside of the secured NASA installation. NASA employee egress to the NASA area would occur at three new gates: a relocated or "new" Main or "South" Gate located on the truncated segment of existing

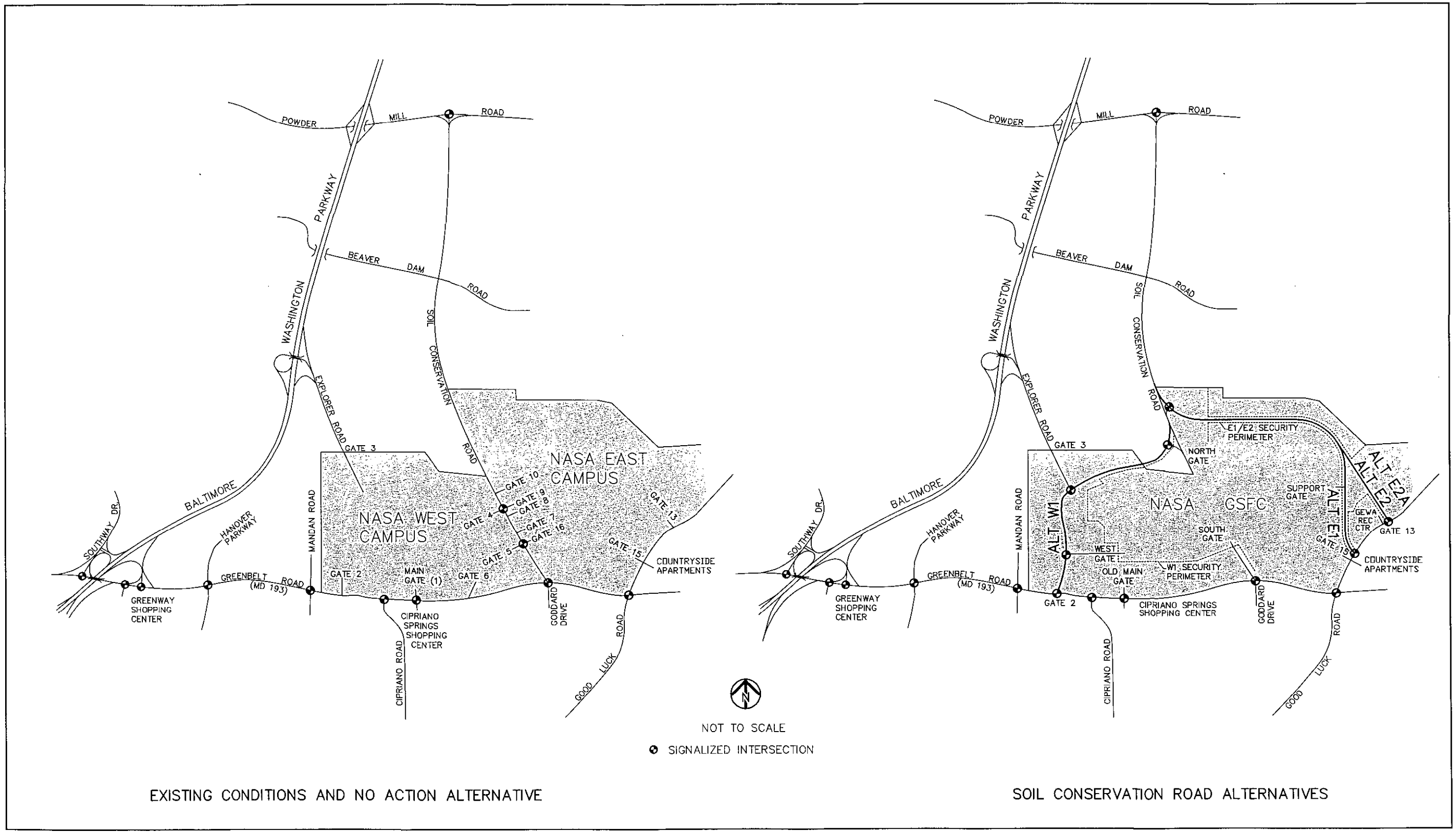


FIGURE 5–4 EXISTING AND PROPOSED SITE ACCESS.

Soil Conservation Road that would remain to the north of Greenbelt Road, a "West Gate" on Explorer Road in the vicinity of the Delta Road intersection, and a "North Gate" on the north side of the site where the shifted Soil Conservation Road merges with the existing roadway (See Figure 5-4). These three gates would be manned by security personnel. A new Institutional Support Neighborhood Gate to warehouse and receiving would be located on realigned Soil Conservation Road between the Gate 3 and North Gate intersections. Trucks would be inspected at a location near the north gate intersection before proceeding to the Institutional Support area. It would provide access to warehousing, motor pool, equipment storage, and hazardous waste storage relocated to this area. This entrance would normally be closed to general GSFC employee traffic.

Gates 13 and 15 would remain for emergency or special circumstance access, but normally be closed for everyday use. Access at the existing or "old" Main Gate would be limited to the Partnering and Outreach Zone, and not used by NASA employees to reach NASA facilities. Gate 6 and all of the gates along Soil Conservation Road would be eliminated. Access to the Visitor Center would be maintained by constructing a new entrance road connecting the center to the South Gate entrance road. Visitors would check in at new facilities in the Visitor Center.

Gate 3 would continue as a NASA employee only access point to the Baltimore-Washington Parkway in conformance with Congressional legislation that authorized construction of the NASA interchange on this provisional basis. Traffic control would be maintained by signage and retention of the Gate 3 security checkpoint. Employees using Gate 3 would have to pass through subsequent security check points at the North, West, or New Main Gates. As is done now, Gate 3 would be closed between 7:00 PM and 6:00 AM.

The west alignment alternative would have security fencing on both sides of the roadway throughout its passage through GSFC. The Gate 3 connection to the realigned road would be treated similarly. This would eliminate free internal access to the undeveloped tracts encompassing the north and west buffers on the west campus. Both areas are used for employee recreation. The perimeter security trail in both areas is used for walking and exercising. The northern area encompasses the Main Pond; the western area contains a GEWA soccer/athletic field and employee vegetable garden plots.

Vehicle and pedestrian access to these areas would be maintained through side gates on either side of the Gate 3 entrance where a few parking spaces would be located. A second pedestrian entrance to the western area would be located at the Soil Conservation Road/West Gate entrance intersection.

If Soil Conservation Road were realigned to the east NASA employees would access the NASA installation at three locations, and Gate 3 would continue to operate as NASA employee only access to the Baltimore-Washington Parkway. The remaining two gates would be the North and South or New Main Gates on the remaining segments of existing Soil Conservation Road. Access to the Partnering and Outreach Zone would be maintained via Goddard Road (the existing Main Gate), and a connection between Aerobee Road and existing Soil Conservation Road to the south of the Visitor Center. A gate in NASA security perimeter near Facilities Master Plan Building O would provide pedestrian, and possibly emergency vehicle, access between the partnering and Outreach Zone and the secure NASA installation.

The right-of-way of both Soil Conservation Road eastern alignments would be fenced throughout the length within GSFC. A staffed gate for access to relocated warehouse and storage facilities at Site N would be limited to truck and van deliveries, and not open to NASA employees and the general public. The fencing would create an isolated tract along the northern periphery of the east campus. Access to this area would be maintained at new card or electronically controlled gates.

Eastern alignment alternative E-1 would sever direct access between the GEWA Recreation Center and the remainder of the east campus via Explorer Road. Gate 13 would be used to provide access to the Recreation Center (Building 92).

5.2.3 Traffic

Projected traffic conditions and intersection congestion impacts associated with the GSFC Facilities master Plan are dependent on the alternative selected for realignment of Soil Conservation Road. Realignment alternatives under consideration include relocating the road to the west side of Goddard (Alternative W-1), to the eastern side of the east campus (Alternatives E-1 and E-2), or the No Action Alternative. Existing conditions, and projected traffic and intersection congestion impacts are discussed in the Soil Conservation Road Realignment Environmental Assessment (See Section 7.4).

5.2.4 Parking

GSFC currently has an estimated 8,316 spaces on the east and west campuses as determined from an aerial survey (Table 5-8). Parking for the employees in Areas 100 through 400 is informal and there are no delineated spaces. Assignment of space type was determined by ground level verification, or by deducting non-employee spaces from a lot where dual parking functions occur (e.g. Visitor Center spaces).

Although NASA GSFC does not have a general employee parking sticker or permit program, many of the site spaces are unavailable to employees. There are 7,392 general employee spaces with the remaining 924 set aside for special or site visitor use. Employees may be ticketed if they park in these latter two areas. And, many of the employee spaces are now covered by trailers housing personnel that cannot be accommodated in adjacent buildings. Handicapped (196) and reserved (146) parking spaces are included in the general employee total. Rear view mirror tags are issued for handicapped spaces or those reserved for persons with disabilities. Reserved spaces are those set aside for high ranking administrative and technical personnel whose jobs require immediate space availability throughout the work day.

Timed spaces are unmetered but reserved for courier and express service use. They also include designated general public visitor spaces scattered throughout the site. Signed parking terms range from 10 minutes to two hours. Government vehicle spaces are used to store a vehicle fleet reserved for employees conducting off-site business. Facilities Management Division (FMD) spaces are those set aside to ensure access for building operations, maintenance, and repairs. The Other category comprises a wide assortment of spaces. They include one or more security/emergency vehicle spaces at each principal building or building cluster; security vehicle storage at the Main Gate; warehouse, cafeteria, and building truck bays; and spaces used for service vehicle and equipment, storage. The parking lot at Building 27 accommodates the NASA GSFC motor pool vehicle fleet, as well as short and long term tractor trailer parking.

Different types of parking spaces are allocated to specific site visitor groups. General public visitor lots are located at the Main Gate, where those going to secured site areas check in and obtain passes, and at the NASA Visitor Center. NASA has space satellite communications, tracking, and control facilities worldwide. Personnel operating these facilities, as well as those who are involved in similar activities but are not NASA employees, receive training at the Network Technical Training Facility in Building 25. Spaces for students are located in three lots on the opposite side of East Drive near the facility.

			SPACES
EXISTING			
NASA EMPLOYEE (Including Handicapped And Reserved)			7392
NON-EMPLOYEE			
Timed Spaces		190	
Government Vehicle		25	
Facilities Management Division		32	
Other (See Text)		89	
Building 27 – Motor Pool/Hazwaste		140	
		Subtotal	476
VISITOR			
Building 9 Main Gate		25	
Building 25 Network Training Students		145	
Building 88 Visitor Center General Public		69	
Building 92 GEWA Recreation Center		102	
Building 97 Health Center Patients		107	
		Subtotal	448
	Total		8316
PROJECTED 2022			
NASA EMPLOYEE (Including Handicapped and Reserved) (at 0.70 spaces per employee)			4760
NON-EMPLOYEE			
Timed Spaces		190	
Government Vehicle		25	
Facilities Management Division		32	
Other		89	
Motor Pool/Hazwaste		65	
		Subtotal	401
VISITOR			
NASA Visitor Check In		25	
Visitor Center General Public		86	
GEWA Recreation Center		102	
Health Center Patients		30	
Central Commons Conference Center		200	
		Subtotal	443
NASA	Total		5604
PARTNER AND OUTREACH ZONE (at 0.7) ratio)	Total		1365
SITE TOTAL	Total		6833

TABLE 5-8 EXISTING AND PROJECTED FACILITIES MASTER PLAN PARKING.

The NASA Government Employee Welfare Association recreation center (Building 92) is an isolated facility on the east campus off Good Luck Road. The center is periodically used by members to host functions such as meetings, receptions, or parties. Building 97, the health unit, has spaces for employees and those using the fitness center.

The current NASA GSFC employee parking space per employee ratio is estimated to be 7392/7600 or 0.97. About 85 percent of the site facilities and parking, which include all but a few facilities on the west campus, was built in the 1960's. The area was rural at that time, except for the City of Greenbelt and the crossroad community of Glenn Dale. Transportation demand management was unneeded, and parking was installed at a one to one space per employee ratio. More recent projects such as Building 33 on the east campus have been constructed with lower ratios. As a result, the west campus has a 0.99 (6356/6449) space per employee ratio, while the east campus ratio is 0.91 (1036/1134).

The general standard for parking at Federal facilities in the Washington suburbs where no Metro subway stations are present is two spaces for every three employees, which is equivalent to an 0.67 ratio (Comprehensive Plan for National Capital, Federal Facilities Element, (NCP, 1989). Parking for agency visitors, government vehicles, loading, security, and emergency vehicles, and other special uses is not included in the computation.

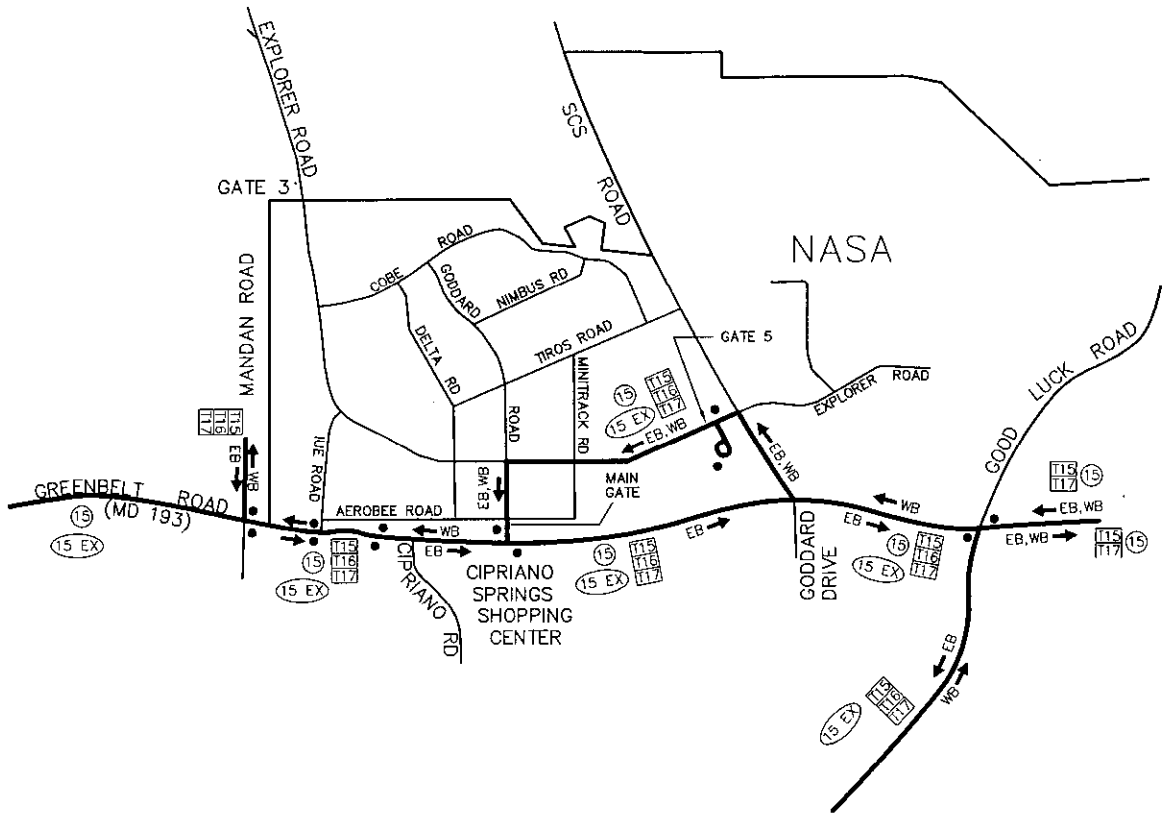
NASA recognizes the 0.67 standard as a long term goal. Practical constraints beyond NASA's control preclude achieving this goal in the short term, and will make it difficult to do so in the future. Taking all the factors into consideration, NASA believes that a 0.70 parking space per employee ratio is a realistic and achievable long term Facilities Master Plan goal for the year 2022. The Master Plan Alternative is based on this ratio, which would be applied to employee spaces within the NASA installation (4760 employee spaces/6800 employees), and to all spaces within the Partnering and Outreach Zone (1365 spaces/1950 employees).

5.2.5 Transit

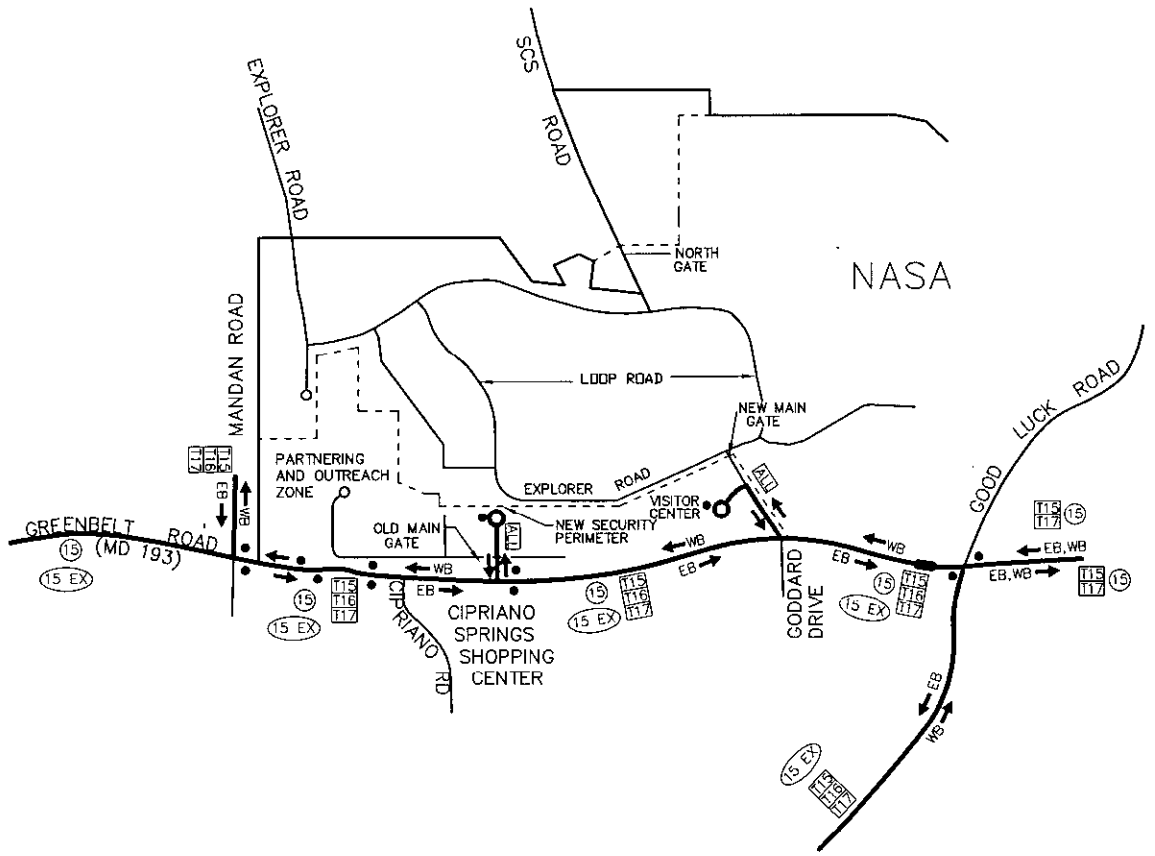
NASA GSFC is on the extreme periphery of the regional transit system. Transit service at NASA GSFC is limited to two general bus routes, the Greenbelt line (Route T-15, T-16, T-17) operated by the Washington Metropolitan Area Transit Authority (WMATA), and the Prince George's County "The Bus" Route No. 15 (Figure 5-5).

The Greenbelt line shuttles between the Greenbelt and New Carrollton WMATA METRO stations, which are located about 3 miles to the west and south of NASA respectively. The Greenbelt station is the terminus for the METRO Green line and is a station on the MARC Camden line between Baltimore and Washington. New Carrollton is the terminal station for the METRO Orange line and a stop on the MARC Penn railroad line.

The WMATA Greenbelt bus line operates from 5:30 AM to 8:30 PM on work weekdays. Service intervals are every half hour from 5:30 AM to 9:00 AM and from 4:00 PM to 7:00 PM and one hour at other times. Route T-15 and T-16 are identical with the designations differentiating only rush hour and base midday services, respectively. Routing is not direct to either metro station. To the west of Goddard, the Greenbelt line meanders through Greenbelt outside of the Washington Beltway, and the Town of Berwyn Heights inside the Beltway, before reaching the Greenbelt Station. Route T-17 follows a variant route within Greenbelt. The trip to the New Carrollton station is extended by two out and back route diversions, each about two miles in length to the Goddard Corporate Park east of NASA, and the Doctor's Community Hospital to the southwest of NASA. Goddard is at the exact midpoint of the line by



CONDITIONS PRIOR TO 2002



FACILITIES MASTER PLAN AND NO ACTION ALTERNATIVES

T15 AND T17 LOOP THROUGH GODDARD CORPORATE PARK TO THE EAST AND RETURN TO GOOD LUCK ROAD UNDER ALL ALTERNATIVES.

- • BUS STOP
- T15 METRO BUS ROUTE
- 15 COUNTY BUS ROUTE

0 2000 4000

SCALE 1" = 2000'

FIGURE 5–5 TRANSIT ROUTES AND IMPACTS.

schedule. Although it is only three miles, in a straight line to each METRO station, it is 25 minutes by schedule to both stations.

All three Greenbelt line routes are identical in the vicinity of GSFC. However, GSFC is a controlled access facility and eastbound and westbound buses follow different paths to allow service to both NASA and the adjacent commercial and residential communities along Greenbelt Road. Up to September 2001, eastbound buses proceeded along Greenbelt Road to Soil Conservation Road. They then looped back through GSFC via Soil Conservation and Explorer Roads and the Main Gate in a counterclockwise direction. All three lines stopped at Goddard on the north side of Explorer Road at Gate 5, at the Visitor

Center, and on the west side of Goddard Road outside the NASA security perimeter. Westbound buses followed the same counterclockwise path through GSFC, using the same stops, but did not loop back on Greenbelt Road. When the routes passed through the Goddard security perimeter, all stops were outside site gates.

The County "The Bus" Route 15 runs between the Greenbelt METRO station and the Maryland Corporate Park east of GSFC. Smaller buses service the route, and follow the same paths as the Greenbelt line buses in the environs of NASA. Route 15 operates from 6:10 AM to 6:40 PM on work weekdays. Headway between buses is 30 minutes before 10:10 AM and after 3:10 PM, and one hour at other times.

Routes have been changed in response to heightened security levels. Buses no longer travel inside the security perimeter. Buses continue to stop outside Gate 5 and at the Visitor Center, but they return to Greenbelt Road via Soil Conservation Road. They remain on Greenbelt Road to the Main Gate stop.

Under the No Action alternative, this revised routing would continue. The Facilities Master Plan Alternative routing would be similar regardless of Soil Conservation Road realignment alternative. The routes would penetrate the site to turn around circles at the Visitor Center and in the Partnering and Outreach Zone. The Visitor Center circle would be accessed from existing Soil Conservation Road, making the connection more direct than via Explorer Road. Campus shuttles would transport employees between the public stops and internal locations with the Partnering and Outreach Zone and the NASA compound. No significant impacts to transit schedules are expected.

5.2.6 Pedestrian/Bicycle

Prince's George's County and M-NCPPC have plans to create a countywide continuous and integrated trail system or network to serve recreational and commuter needs (Countywide Trails Plan, M-NCPPC, 1975 As Amended By Equestrian Addendum To The Countywide Trails Plans, M-NCPPC, 1984). Three County trails pass through the environs of NASA.

The trails would be developed to interconnect residential neighborhoods; recreation, commercial, and employment areas, and transportation facilities. The trail system would be built as the local road system is developed and expanded. Where feasible, trails should be included in planning for public and private development and designed to connect to the County system.

- TRAIL 1E, GREENBELT ROAD COMMUTER TRAIL

Trail 1E is a trail element in the Northeast Branch Park and related trail system. It is a Class I Bikeway on exclusive right-of-way. It runs for 3.6 miles alongside Greenbelt Road between Indian Creek and GSFC in the vicinity of Cipriano Road. An extension of the trail to the southeast from Goddard along Maryland Route 193 to US Route 50 is proposed (Glen Dale, Seabrook, Lanham and Vicinity Master Plan, M-NCPPC, 1993).

- TRAIL 5A, SOUTH LAUREL TRAIL

Trail 5A is the main trail in the South Laurel Trail system. It traverses six miles between the town of Laurel to the north of Goddard, and the Soil Conservation/Greenbelt Road intersection, following Soil Conservation Road in the southern half of its route. Most of the trail is located within BARC. It is a Class III Bikeway as it crosses BARC. Class III Bikeways share the road and shoulder with vehicular traffic. Trail 5A is a commuter/recreational trail.

- GOOD LUCK ROAD TRAIL

This is a proposed multiuse trail that would follow Good Luck Road between the Capital Beltway and Springfield Road (Approved Master Plan and Sectional Map Amendment for Glenn Dale – Seabrook-Lanham and Vicinity, Planning Area 70, M-NCPPC, 1993). The trail would serve as a link between park and school facilities, and for horseback riders between the Glenn Dale Stables and the open areas of the Beltsville Agricultural Research Center.

Soil Conservation Road could be realigned to the west or east side of the campus. The South Laurel Trail, which follows Soil Conservation Road, would be relocated along with the road. If Soil Conservation Road were realigned to the west, the South Laurel Trail connection to the Greenbelt Road Commuter Trail, would shift from existing Soil Conservation Road to Goddard and Gate 2. If the road shift were to the east, the South Laurel Trail would connect to the Good Luck Road Trail.

The South Laurel Trail could either be located on the shoulder of Soil Conservation Road, as it does now, or located on an independent alignment adjacent to the roadway in the section crossing Goddard. Under the west Soil Conservation Road realignment, the trail would be located on a path separate from the roadway between Greenbelt Road and the West employee gate. Under the east Soil Conservation Road realignments, the trail would follow new sidewalk on the west side of Good Luck Road.

The Master Plan Alternative emphasizes making a large portion of the campus inside the Loop Road more pedestrian/biker friendly. Site access, however, would be limited by security constraints. Pedestrian and bicycle access would be restricted to vehicle access gates.

5.2.7 Transportation Demand Management

Goddard has an active TDM program. Current initiatives include:

- In October 2000, Goddard joined the Metrocheck program through implementation of the NASA Transportation Fringe Benefit Program. Participating employees receive up to $100.00 per month towards transit fares on the WMATA system, or as cash equivalents for bus and train tickets on some other transit systems.
- Employees qualifying for Metrocheck also automatically enter the MWCOG Guaranteed Ride Home Program.
- Alternate Work Schedule and Flexible Working Hour programs.
- A telecommuting program

- Bike rack installation upon employee request. Showers are available in several facilities.

- Promotion of the Prince George's County Ride Match program, vanpools, and the Guaranteed Ride Home Program. Information on these programs, transit availability, and the Metrocheck program is distributed at center employee events.

- Periodic surveys on employee commuting patterns, modal choice for trips, and parking utilization.

- Participation on the MD SHA Greenbelt Road Task Force.

- Goddard has been running a free internal site shuttle service since November, 2000. The shuttle provides on-call service throughout the east and west campuses.

- NASA also operates scheduled shuttle service between Goddard and NASA Headquarters in downtown Washington, D.C.

- A fleet of cars, minivans, and vans is maintained for official business travel within the region.

Campus employee support facilities further reduce the need for off campus travel during the day. These include the Goddard Child Development Center, two cafeterias and a snack bar, two small convenience shops, the NASA Federal Credit Union, Goddard fitness center and health unit, and GEWA recreational, cultural, and social club facilities.

The NASA GSFC home-work travel modes are:

• Single Occupant Vehicle	88.5%
• High Occupant Vehicle (2 or more)	8.0%
• Transit, Bike, Walking	2.3%
• Telecommuting	1.1%

Transportation Demand Management (TDM) measures that reduce Single Occupant Vehicle (SOV) use have limited potential at Goddard. The majority of employees live to the north and east of GSFC beyond the limits of the Washington regional network or in the interstitial areas between major transit corridors. The highest concentrations of NASA employee residences occur in and around Laurel, Bowie, Crofton, and more closely, Greenbelt and Lanham. Other significant concentrations of 120 employee residences or more per zip code occur around Annapolis, Anne Arundel County, and in the US Route 29 corridor from Silver Spring through Burtonsville to Columbia in Howard County. The number of employees who live in the City of Baltimore and its northern and eastern suburbs is similar to those who live within Washington, D.C.

Transit service and its growth potential are limited by Goddard's location and surroundings. There is no commercial or residential development to the north and northeast of Goddard. These areas are occupied by the research fields and farms of BARC, and the woodlands of the Patuxent Wildlife Research Center. The former extends for miles to the Patuxent River and County boundary, the latter beyond into Howard County. The virtual zero development density will remain in the foreseeable future. In effect, these open areas halve the potential overall ridership demand of any transit route in the vicinity of GSFC. Goddard therefore will always be on the outer fringe of the Washington regional transit network.

Existing WMATA and County bus transit serving Goddard is oriented to serve as a collector-distributor system for the Metro subway network. The routes connect to and end at the Greenbelt (Green Line) and New Carrolton (Orange Line) stations. In terms of schedule, Goddard is exactly half way between the stations. Schedule times to both are 25 minutes. Directional Metro bus service is on half hour headways; the County "The bus" service is at 40-minute intervals. The estimated total seat capacity available at Goddard is about 560 during the peak rush period. This capacity includes all buses provided by both services in both directions along Greenbelt Road. Westbound "The Bus" Route 15 capacity is excluded from the estimate, however, because the route begins only two blocks to the east of Goddard in the Maryland Corporate Center. The capacity is what is available between 7:00 and 9:00 AM in the morning and 4:00 and 6:00 PM in he evening. Based on surveys on modal split, it is estimated that 165-175 NASA employees now use these buses.

The scheduled headways are established by the time it takes to drive the routes. For example, it takes WMATA buses 50 minutes to travel between the termini at the Greenbelt and New Carrollton stations. Five-minute layovers are scheduled at each station. Thus two buses cover the route during the peak period. The County routes operate similarly. Any increase in service frequency would require additional buses.

Transit at each Metro station also emphasizes service in the radial direction toward the center of Washington, D.C. and not the circumferential. A comparatively small proportion of employees live in this direction. Bus routes are oriented toward collecting and distributing subway ridership as on the routes serving Goddard. Once the stations are reached, one or more additional transfers between routes are needed by Goddard employees to reach regional areas not on the subway system. For example, only one bus route that runs between the Greenbelt and Silver Spring Metro stations connects the former to Montgomery County.

The great majority of commuters who walk or bicycle to work live within a few miles of the place of employment. The vast open areas to the north of Goddard virtually halve the potential "market" for shifting employees to these modes of travel. Foot access to points further west are constrained by the few paths of travel across or under the limited access Beltway and Baltimore-Washington Parkway.

NASA has prepared an enhanced Transportation Management Plan (TMP) as a part of the Facilities Master Plan that details conditions, goals, and strategies for further Transportation Demand Management. Measures given in the TMP will apply to both NASA and Partnering and Outreach Zone employees.

The NASA TMP has set the following goals:

- Minimize the percentage of employees who commute to and from the campus in single occupant vehicles (SOV), i.e. by driving alone, be maximizing use of the alternative modes such as high occupancy vehicles, ridesharing, transit, bicycling, and pedestrian.

- Reduce on site parking to a two spaces per three employees or 0.67 ratio as indicated in the NCPC Federal facility guidelines for sites outside the Beltway.

- Enhance the quality of work life for employees to help the Center attract and retain a workforce that best meets mission commitments.

The initiatives and strategies for achieving these goals are divided into phases for potential implementation: immediate or near term, mid-term, and long term. The immediate or near term strategies will be initiated at once. Strategies in subsequent phases will be implemented as the TMP progresses, and as circumstances and constraints within and without Goddard permit. For example, one constraint is the Goddard budget and what Congress will fund. Enhancement of transit service to the site is dependent on not only the GSFC transit demand, but also that of the area surrounding GSFC, and the Greenbelt Road corridor in particular.

Some of the initiatives in the TMP in addition to current TDM measures are:

1. Immediate and Near Term

   - Reduce the current space per employee parking ratio from 0.97 to 0.90.
   - Expand current TDM into a full fledged Transportation Management Program.
   - Develop a Goddard transportation management website that provides information on transit routes and schedules, ridesharing opportunities, and other transportation information for employees.
   - Develop a physical office where transportation information and assistance are available.
   - Explore demand management initiatives such as Donor Day, Flex-Car, and Live Where You Work programs.
   - Participate in the planning for additional public transportation opportunities with State, regional, and local public agencies.

2. Mid Term through 2012

   - Reduce the employee parking ratio to 0.80 spaces per employee as circumstances permit.
   - Expand internal campus shuttle operations to a scheduled service.
   - Explore opportunities for remote telecommuting centers.
   - Increase transit subsidies as funded by Congress.
   - Explore and develop opportunities for enhanced transit service to the site, or express bus service between the campus and remote sites.

3. Long-term through 2022

   - Reduce the employee parking ratio to 0.70 spaces per employee as circumstances permit.
   - Continued enhancement of TRANSHARE, rideshare, vanpool, carpool and other TDM measures.
   - Adopt additional TDM measures that developed by NASA, or by outside jurisdictions that are applicable to Federal agencies.

5.3 Utilities

5.3.1 Central Heating and Cooling

5.3.1.1 Buildings 24 and 31

When there is a sufficient density of buildings, central heating using steam and cooling using chilled water from production facilities in a single plant are more economical, energy efficient, and reliable in service than individual building systems. Larger equipment units are more energy efficient, fewer operators are needed, and a single reserve unit can serve as backup for many buildings when other units are out of service for maintenance or repair. For these reasons, many large government installations and university campuses use central heating and cooling.

A high degree of reliability in controlling in building temperatures and humidity is essential at NASA GSFC in computer, laboratory, and satellite assembly areas. Central heating and cooling systems have been installed to increase the level of reliability. Steam is generated in Building 24, and chilled water in Building 24 and 31, and circulated to most of the major buildings. Small ancillary buildings, and those in outlying areas, have individual building heating and air conditioning units that run on gas or electricity.

Buildings 24 and 31 are high bay, single story structures. Building 24 occupies 28,000 gsf and is centrally located on the west campus. Cooling towers and emergency diesel generators are located to the east of Building 24. Building 24 was built in 1961. Building 31, erected in 1994 and located to the north of Explorer Road on the east campus, has an area of 42,500 gsf.

Two capacity definitions are applied to steam and chilled water plants. Total capacity is the sum of the nominal or name plate operating capacity of the individual equipment units in the plant. Capacity is also defined as "firm" or "reliable" capacity. Firm capacity is the total capacity less the capacity of the largest boiler, chiller, or supporting related equipment unit. Firm capacity accounts for one boiler or chiller that may be out of service for maintenance or repairs at any given time. To ensure that there is sufficient firm or reliable capacity, heating and cooling plants are designed with N+1 or N+2 redundancy, where N equipment units can meet peak user demands, and one or two units are still held in reserve, respectively.

NASA operates the steam plant under the provisions in permits issued by the Maryland Department of the Environment (MDE). The permits cover boiler operations for natural gas or fuel oil firing, fuel oil storage, and boiler stack emissions. Each boiler is rated at 49.5 million British Thermal Units (MMBTU) per hour. The total annual heat or energy input is limited to 750,000 MMBTU in any rolling twelve month period. The annual average Goddard natural gas and oil consumption at the plant has an energy input equivalent to about 470,000 MMBTU.

5.3.1.2 Steam

The central heating plant in Building 24 is composed of five Nebraska Boiler Company boilers, and auxiliary equipment for pumping steam into the distribution system and collection of steam condensate returning to the plant. Each boiler has a nominal capacity of 40,000 lb/hr at 100 psi and 335°F. Total plant capacity is 200,000 lb/hr. NASA operates the plant with N+2 redundancy to meet high reliability requirements, and the firm capacity is 120,000 lb/hr. Firm capacity is also established by matching auxiliary equipment capacity. To maximize operating efficiency, an additional boiler is fired up only when demands reach about 90 percent of the nominal capacity of on-line operating units. Production is monitored by a computerized Energy Management Control System. Plant equipment was overhauled in 1994 and 1995.

Since NASA is classified as an interruptible Washington Gas customer, all five boilers are equipped for dual natural gas and No. 2 fuel oil feed. Natural gas is now the primary fuel, and the boilers operate on this fuel about 92 to 95 percent of the time. Generally, the individual boilers are run on fuel oil only to meet periodic operational checks required by regulations. All the boilers were retrofitted with low nitrogen oxide emission fuel burners when the plant was overhauled in 1994. NASA plans to switch to landfill gas (LFG) as the primary fuel source in the near future when two boilers will be converted to

triple feed. Natural gas and fuel oil will then be used only during peak steam periods when more than two boilers are needed to satisfy site demands. The operating capacity of the boilers when using landfill gas boilers is derated to 36,000 lb/hr due to the lower heat content of this fuel.

Fuel oil is stored in three above ground carbon steel tanks, each having a 50,000 gallon capacity. The tanks have leak detectors, and are placed in a concrete containment pit capable of holding the entire contents of one tank.

Steam is used throughout the year for hot water, laboratory and cleaning processes, building humidity control, and in the cafeteria in Building 21 (Table 5-9). About 12 percent of the steam produced is used to operate steam driven equipment within Building 24. Base process demand during the summer months was about 34,000 lb/hr in 2001. When NASA uses steam for humidity control, building heating adds approximately 35,000 additional pounds per hour during the coldest months. The peak recorded steam demand for a single hour, which occurred on March 4, 1996, was 90,980 lb/hr, but this did not include Building 33, and Building 32 was only partially occupied. The estimated existing peak hour demand is 94,155 lb/hr (Table 5-10).

Generated steam is sent to a common header and pumped into the distribution system that supplies steam to all major buildings on the west and east campuses, except for the GEWA Recreation Center. This distribution system is composed of high pressure steam lines, low pressure condensate return lines between manholes. Distribution system piping ranges from 4 to 14 inches in diameter. A few individual building services lines are as small as one inch. Interconnecting mains form a grid so that most buildings can be served from two directions and maintain service reliability. Except where a utility tunnel interconnects Buildings 31, 32, and 33, all pipe is directly buried. Design steam distribution and low condensate return pressures are 100 and 30 psig, respectively.

Most of the distribution system on the west campus was installed in the 1960's with only a few minor sections and building service extensions built afterwards. Over time, many of the links deteriorated, or became undersized as individual building demands increased. NASA is currently implementing a six phase program to replace the older distribution and return lines. This will comprise about 85 percent of the west campus network. Comparison of steam production in 1997 to that in 2001 indicates that the distribution system upgrade has already improved system efficiency by about 15 percent. Work is scheduled for completion in 2005. The replacement program would be completed under both the Master Plan and No Action Alternatives.

Individual building rates of demand vary widely ranging from 4 to 33.6 gsf per lb/hr. Under the Master Plan Alternative, site peak hour steam demand would increase to an estimated 126,000 lb/hr in 2022. The major buildings served would be as indicated in Table 5-10. Some smaller or ancillary buildings, whether remaining or new, would be heated by individual building units, either because they have a small demand or are relatively isolated. Facilities Master Plan buildings N and U are relatively isolated from the remainder of site buildings. They would be heated by individual building units because it would be relatively inefficient and uneconomical to service them from the central plant.

The projected Master Plan peak hour steam demand is at or slightly above the firm plant capacity of 120,000 lb/hr at N+2 redundancy, or with two boilers off line and out of service. However, no increase in plant capacity is proposed for several reasons.

Peak system demands are short term lasting for a few hours under very low temperature weather conditions i.e., less tan 15 degrees Fahrenheit. The plant would still have full N+1 redundancy capacity. And the projected Facilities Master Plan peak demands would occur only if all the proposed major buildings were built and connected to Building 24 for steam supply. Other options are available. New

MONTH	PEAK DAY AVERAGE (lb/hr)	AVERAGE PRODUCTION lb/hr)
January	63,722	56,826
February	70,730	58,769
March	66,005	57,260
April	57,934	45,879
May	42,153	37,188
June	37,396	33,110
July	33,921	31,718
August	34,665	32,142
September	34,618	32,592
October	49,489	38,423
November	51,033	42,457
December	66,374	51,757

TABLE 5-9 BUILDING 24 MONTHLY STEAM PRODUCTION IN 2001.

Thrust Zone facilities could be served by individual building heating systems instead of connection to the central steam distribution system. And, if buildings in the Partnering and Outreach Zone are replaced during the course of that area's development, then they can also be optionally heated by individual building units.

5.3.1.3 Chilled Water

NASA uses central refrigeration to cool or air condition major buildings and for laboratory processes. Water is cooled by chillers and cooling towers in two central plants, and then pumped and circulated to buildings through a distribution system. After capturing heat from the buildings in air handling units, the water is returned to the plant through parallel piping. At the plant, chillers cool the water and transfer the heat to cooling towers, which release the heat to the atmosphere. NASA GSFC has two central refrigeration plants: the West Plant in Building 24, 24A, and 24B, and the East Plant in Building 31. Each supplies chilled water to separate distribution systems.

Much of the chilled water equipment in Building 24 was replaced or underwent a thorough overhaul in 1994 (Table 5-11). It contains six chillers and two heat exchangers. The plant is divided into two distinct operating halves, the north and south chiller rooms. The north room houses two 1,500 ton Trane chillers and two 1,160 ton heat exchangers. These units are coupled operationally with the cooling towers in Building 24A. The remaining four chiller units which have a total capacity of 11,000 tons, are in the south chiller room and use the towers in Building 24B. All six chillers are electrically driven centrifugal units. About 0.6 kW of electric power is needed to generate a ton of refrigeration.

NASA Goddard operations need chilled water throughout the year. Cold outdoor winter temperatures can be used to advantage through "free cooling". In conventional operations, electricity is needed to drive chiller compressors. When outdoor temperatures drop to or below about 48° F, exchange of heat between the chilled water return and condenser water becomes thermodynamically efficient. Based on recorded average Washington area weather data, free cooling can be used theoretically up to 2,830 hours per year. At NASA, free cooling is achieved by using flat plate heat exchangers

AREA/BUILDING	PEAK HOUR STEAM DEMAND (lb/hr)			
	2001 EXISTING	2022 REMAINING	MASTER PLAN 2022 NEW	MASTER PLAN 2022 TOTAL
PARTNERING/OUTREACH				
1	1311	1311		1311
2	2490	2490		2490
3-13-14	4554	4554		4554
6	1382	1382		1382
11	2383	2383		2383
21	3710	3710		3710
26	1092	1092		1092
30	1958	1958		1958
Subtotal	18730	18730	0	18730
INSTITUTIONAL SUPPORT				
4	1575	1575		1575
18	443	443		443
19	443	443		443
20	443	443		443
24	2450	2450		2450
M. Institutional Support Office			3489	3489
O. Construction Contractor Staging			227	227
Subtotal	5354	5354	3716	9070
PROJECT/PROGRAM MANAGEMENT				
8	2935			
12	2626			
22	2332	2332		2332
23	4800	4800		4800
F Day Care Center			237	237
K+L New Administration			4000	4000
Subtotal	12693	7132	4237	11369
ENGINEERING TECHNOLOGY				
5+5A	4563	4563		4563
7	6137	6137		6137
10	3587	3587		3587
15	1323	1323		1323
28	3662	3662		3662
29	7726	7726		7726
R Cafeteria			1900	1900
S+T Infill Facilities			3077	3077
Subtotal	26998	26998	4977	31975

AREA/BUILDING	PEAK HOUR STEAM DEMAND (lb\hr)			
	2001 EXISTING	2022 REMAINING	MASTER PLAN 2022 NEW	MASTER PLAN 2022 TOTAL
SPACE SCIENCE/COMMONS				
16	2374			
17	443			
27	579			
A Space Science Complex			5357	5357
B Science Data Center			1771	1771
C STAAC/Media			1200	1200
D Space Science Infill			1309	1309
E Campus Commons			4724	4724
P Education/Outreach			539	539
Subtotal	3396	0	14900	14900
EARTH SCIENCE				
31	579	579		579
33	5656	5656		5656
H+J Science Infill			3693	3693
Q 31 Addition			173	173
Subtotal	3396	14458	5766	20224
NEW THRUST				
25	2438			
G New Thrust			4987	4987
Subtotal	2438	0	4987	4987
BUILDING TOTAL	84067	72672	39662	112334
24 Plant use at 12%	10088			13481
TOTAL SITE	94155			125815

*Notes: Buildings 9, 88, 92, 97,N (new central receiving/warehouse), not serviced.
Buildings N and U serviced independently.

TABLE 5-10 ESTIMATED EXISTING AND PROJECTED MASTER PLAN PEAK HOUR STEAM DEMANDS (in lb/hr).

LOCATION AND UNIT	MANUFACTURER	YEAR INSTALLED	NAMEPLATE CAPACITY (ton)[1]
BUILDING 24 – WEST PLANT			
Chiller 3	Trane	1985	1500
Chiller 4	Trane	1985	1500
Chiller 5	York	1994	3000
Chiller 6	York	1994	3000
Chiller 7	York	1994	2000
Chiller 8	York	1994	3000
HX-1	(Carbate-Vicarb)	1985	1160
HX-2	(Carbate-Vicarb)	1985	1160
Tower A	---	1985	3336[3]
Tower B	---	1987[2]	9650[3]
BULDING 31 – EAST PLANT			
Chiller 1	York	1993	1200
Chiller 2	York	1993	1200
Chiller 3	York	1995	1200
HX-1	(Tranter)	1993	600
HX-2	(Tranter)	1993	600
HX-3	(Tranter)	1995	600
Towers	(Ceramic CT Co.)	1994	3600[4]

Notes: (1) See text for operational limit.
(2) Rebuilt 1987 and renovated in 1995.
(3) Sum of listed cell capacities.
(4) For 12 units combined.

TABLE 5-11 CHILLED WATER PLANT DATA.

Total chiller capacity at Building 24 is 14,000 tons and firm N+1 chiller capacity is 11,000 tons with the largest unit out of service. The heat exchangers each have a 1,160 ton nameplate capacity. However, operating constraints limit the effective unit exchanger capacity to about 750 tons and they are no longer able to handle the Building 24 service area winter load. The heat exchangers share the same cooling towers as Chillers 3 and 4, but run with different operational characteristics and cannot be operated simultaneously with those chiller units. Thus, they are not included in the determination of total and firm capacities.

On the east campus, chilled water is produced in Building 31, the East Chiller plant, which was built in conjunction with the EOSDIS facility in Building 32. The plant has three 1,200 ton chillers that were installed in 1993 and 1995. There are also three 600 ton flat plate heat exchangers that are run on a water side economizer cycle for winter cooling. Unlike Building 24, they can be run simultaneously with the chillers. A spare bay provides room for the installation of a fourth chiller and heat exchanger. The present total plant capacity is 3,600 tons, and the firm capacity with N+1 redundancy is 2,400 tons.

Chilled water produced in Building 31 is distributed and returned in a pair of parallel mains located in a utility tunnel that interconnects Building 31, 32, and 33. The diameter of the lines between Building 31 and 32 is 30 inches. Lines in the extension between Building 32 and 33 are 24 inches in diameter.

The 30-inch line was designed to carry a peak load of 16,000 tons at a chilled water flow volume of 315 gpm and flow speed of 8 ft/sec.

Chilled water produced in Building 24 is circulated to and returned from major buildings on the main campus through a multi-loop pipe network with service line extensions radiating to individual buildings. Primary mains in the loops range from 12 to 30 inches in diameter with the largest size found at the

Building 24 header. Secondary and most building service lines range from 4 to 12 inch diameter in 2-inch increments. A 2,000 ft. long 12-inch line extends from the main campus at Tiros Road to Building 25 on the east campus. Building 27 is not connected to this line. Pipe is insulated and buried directly. The system design Delta T, or temperature differential, is 10° F with chilled water supplied at 42° F to the system, and returned at 52° F after it collects heat from the buildings. Buildings 3/14, 7, 10/15, 13, 23, 28, 29, and 30 are critical demand or service buildings in that temperature control is essential for operations. The highest requirement is at the Building 29 Clean Room.

The distribution system is now in a transition state. In 1994, it was found to be in poor condition. Much of the system was installed prior to 1964 and was beyond the expected life associated with heavy use. Many links were undersized due to higher demands in existing buildings created by increased use of electronics and computers, and by incremental building additions, that were unanticipated by the original designers. Leaks and damage had occurred from construction and grounds maintenance, and from loads applied by traffic, buildings, trailers, retaining walls, etc. Certain critical links on the main and individual building service lines had no valves permitting isolation for repair and maintenance. (Restoration of Chilled Water Distribution Master Plan, NASA, 1995).

NASA is in the process of upgrading virtually the entire system though a six phase construction program that implements the concepts of Option 2 in the distribution system master plan. Option 2 provides a multi-loop system with the goal of full redundancy of service at each building. It was selected because less pipe replacement was needed, service continuity could be maintained more easily, less overall disruption would occur, and the resultant system would be simpler and easier to operate and maintain.

Under the Option 2 program, NASA is replacing 26,750 ft of the existing mix of transite, steel, cast iron, and ductile iron pipe with insulated ductile iron pipe to eliminate bottlenecks and increase overall distribution pipe capacity, while maintaining a system minimum 15 psi pressure differential at design flow and temperature conditions. And where proved to be effective by analysis, pipe loops are being extended around buildings on the periphery of the network to increase service reliability through flow path redundancy. Flow and energy meters will be installed on individual building service lines. Monitoring will permit customizing service in response to demands, increasing operational, energy, and cost efficiencies. Although subject to change and funding availability, the program is scheduled for completion around 2007.

A computerized Energy Management Control System monitors the chilled water systems on both campuses.

System distribution flows and temperatures were measured at most of the buildings connected to Building 24 in September and August 1993 (Master Plan, Restoration of Chilled Water Distribution System, NASA, 1995). The maximum load or demand observed was 8,630 tons at a 21,600 gpm circulation flow rate. At the time, the temperature was 90° F and the relative humidity at 53 percent. Building 30 and the east wing of Building 28 were not occupied at the time of the observations.

For the Facilities Master Plan, existing and projected peak demands were estimated using a composite method. A computer model of the chilled water circulation system hydraulics was developed as part of Distribution System Master Plan (ibid.). Flows in the model were assigned to individual buildings based on test measurements or by assuming a diversity factor of 70 percent of the connected equipment load. Estimated existing peak demands for Building 24 were derived by applying a factor of one ton per 2.4 gpm of modeled flow. The peak demands for those existing buildings (28, 30, 31, 32 and 33) not included in the model were estimated by using the average GSFC peak demand factor (317 gsf/ton).

Projected 2020 Master Plan peak demands were estimated in three ways to fit circumstances:

1. If a Building remains and its general function is unchanged, the existing peak demand is continued.
2. New buildings with undetermined or general function (e.g. New Thrust, campus commons facilities) were estimated to have a demand factor of 317 gsf/ton.
3. If the building housed a function which was transferred from an existing building (e.g. Building 16W to Building N (Warehouse) or Building 26 to Building B (Science Data Center), the existing building demand factor (gsf/ton) was applied to the replacement facility.

The estimated existing peak demand is 10,807 tons with the West Plant in Building 24 supplying chilled water for about 85 percent of the total demand (Table 5-12). Under the Master Plan Alternative site demands would increase by about 32 percent to about 14,100 tons in 2022.

The center of demand shifts eastward with development of the Space Science Central/Commons Neighborhood and New Trust Zone. Therefore, the Master Plan proposes most of the increase in demand be satisfied by the East Plant in Building 31. Building 24 would continue to supply its existing service area, which covers the Partnering and Outreach Zone, and the Institutional Support, Engineering and Technology, and Program/Project Management Neighborhoods. Building 31 would service buildings in the Space Sciences and Central Commons Neighborhood and on the east campus.

The resultant peak demand load split would be 9,398 tons at Building 24 (existing 9,252 tons), and 4,711 tons at Building 31 (existing 1,575 tons). It is estimated that the East Plant is capable of handling about 260,000 gsf of new buildings using the existing three chiller/tower sets (firm capacity 2,400 tons). The plant total capacity would then be 3,600 tons. Installation of a fourth chiller/tower set in the existing spare bays would permit the further addition of about 380,000 gsf of building space, or a total amount of 640,000 gsf without expansion of the building. Accommodation of 2022 Master Plan full buildout would require construction of an additional bay, Master Plan Building Q, on the east side of the plant for a fifth chiller/tower set.

Demands would remain unchanged under the No Action Alternative.

Chillers 3 and 4 and heat exchangers 1 and 2 replaced original equipment installed in the early 1960's in Building 24. They subsequently will approach their normal operational life expectancy around 2010. Their replacement with similarly sized units would occur under both the Master Plan and No Action Alternatives.

5.3.2 Electric Power

NASA GSFC requires electric power with a high level of service reliability. Electrically powered equipment on the campus must operate with minimum disruption. Redundancy and backup have been incorporated throughout the power distribution system to hold downtimes to a minimum should outages or failures occur, particularly in the case of mission critical electric loads.

Power is supplied to GSFC by the Potomac Electric Power Company (PEPCO) via three 34.5 kilovolt (kV) feeder lines. The PEPCO line designations are 34026, 34027, and 34028. A separate switchgear bus at the substation serves each feeder. All three follow separate routings between the PEPCO substation and the GSFC. Each feeder has a 27.5 million volt-amp (MVA) capacity. The firm capacity of the PEPCO supply to Goddard is 55 MVA, based on the loss of one line, or N+1 redundancy.

NASA GSFC has two main power substations. PEPCO lines enter the campus and terminate at 34.5 kV vacuum circuit breakers (VCB) in the Central Substation located near Building 24. The Central Substation has three 34.5/13.8 kV step-down transformers, each with a capacity of 15 MVA, and three 34.5/4.16 kV step-down transformers of 3.75 MVA capacity. The firm capacities of the two systems with N+1 redundancy, i.e. one transformer out of service, are 30 MVA and 7.5 MVA, respectively. Subsequent power distribution around Goddard is made through a system owned and operated by NASA. All three 34.5 kV feeders are tapped on the load or NASA side of the Central Substation VCB's and extend via three lines in underground duct banks to the second substation, the East Switchyard, on the east campus. The Central Substation supplies power to all facilities on the main campus west of Soil Conservation Road.

At the East Switchyard, there are three 13.8 kV transformers, each with a nominal rating of 15 MVA, but the transformers have a forced air rating of 133 percent, which translates into an effective capacity of 20 MVA per unit. Facility firm capacity is 40 MVA. The East Switchyard serves all of the east campus and Areas 100, 200, 300 and 400. Primary feeders also run between the East Switchyard and the smaller North Substation, located north of Building 25, from which power is subsequently distributed to buildings in the Network Training Area.

Power is distributed from the substations to buildings via 13.8 kV feeders in underground duct banks, except for the 13.8 kV feeders running from the East Switchyard to Building 31, 32 and 33, which are located on cable trays located in a utility tunnel. On the main campus, a separate 4.16 kV distribution system primarily supplies power to buildings housing mission critical operations. Most of the 27 major buildings on the west campus have double-ended load centers supplied by two separate 13.8 kV feeders.

Voltages are further reduced at the secondary unit substations to 120/208 and 277/480 volts through separate double-ended load centers. In general, the 208 volt service is used to satisfy technical and standard outlet needs, while the 480 volt service meets the heavier requirements for utilities, machinery, and lighting systems. The design of new buildings at GSFC will employ these design criteria.

Electrical service to the satellite areas is provided by an underground, directly buried, loop feed distribution system originating at the East Switchyard. Areas 100 and 200 are served by Feeder 54, and Areas 300 and 400 by Feeder 80. The latter feeder is extended to a switching station in Area 200, where it is tied to Feeder 54, completing the loop.

Recent Fiscal year electric power consumption, with 1994 given as a long term reference, is shown below:

EXISTING PEAK DEMAND BUILDING 24 SERVICE AREA BUILDING	TONS
1	146
2	327
3,13,14	1670
4	210
5	338
6	293
7	518
8	315
9	16
10,15	271
11	391
12	239
16, 16W	390
17	58
18	68
19	79
20	83
21	576
22	469
23	838
24	88
25	224
26	154
28	703
29	370
30	382
97	16
TOTAL BUILDING 24	9232

SERVICE AREA BUILDING 31 BUILDING	TONS
31	134
32	594
33	847
TOTAL BUILDING 31	1575
TOTAL EXISTING SITE	10807

PROJECTED 2022 MASTER PLAN PEAK DEMAND BUILDING		BUILDING 24 SERVICE AREA TONS	BUILDING 31 SERVICE AREA TONS
PARTNERING/OUTREACH			
1		146	
2		327	
3-13-14 (replacement function)		986	
6		293	
11		391	
21		576	
26		154	
30		382	
	Subtotal	3255	
INSTITUTIONAL SUPPORT			
4		210	
18		68	
19		79	
20		83	
24		88	
M Institutional Support Office		362	
O. Construction Contractor Staging		47	
	Subtotal	937	
PROJECT/PROGRAM MANAGEMENT			
22		469	
23		838	
F Day Care Center		28	
K+L New Administration		1146	
	Subtotal	2481	
ENGINEERING TECHNOLOGY			
5		338	
7		518	
10-15		271	
28		703	
29		370	
R Cafeteria		120	
S+T Eng/Tech In fill and Commons		279	
	Subtotal	2599	
SPACE SCIENCE/COMMONS			
A Space Science Complex			709
B Science Data Center			268
C STAAC/Media Center			284
D Space Infill			173
E Campus Commons			550
P Education Outreach		126	
	Subtotal	192	1984
EARTH SCIENCE			
31 + Addition Q			173
33			847
H+J Earth Infill			410
I Cafeteria			120
	Subtotal		2144
NEW TRUST			
G New Thrust			583
	Subtotal		583
TOTAL SERVICE AREA		9398	4711
TOTAL 2022MASTER PLAN			14109

TABLE 5-12 ESTIMATED EXISTING AND PROJECTED MASTER PLAN CHILLED WATER PEAK DEMANDS.

Fiscal Year	Total Consumption Kilowatt-Hours
1994	143,991,000
1997	155,372,000
1998	152,416,000
1999	156,637,000
2000	152,334,000
2001	158,128,000

Most of the increase since 1994 is attributable to Buildings 28, 30, 32 and 33 coming on line. Table 5-13 shows typical maximum demands experienced each month as indicated from billings. A maximum demand of 27.0 MW for the entire Goddard facility was recorded in June 1998.

Full build out of the Master Plan Alternative would increase the site maximum demand to about 40.766 MW (Table 5-14). Maximum demands occur on hot summer days when the central refrigeration plants are operating at peak levels. Projected demand was based on a factor of 7 watts per gsf for general building usage, and 0.6 kW per ton of refrigeration generated in Building 24 and 31.

The projected demands are within the existing PEPCO and GSFC distribution system capacities. Roughly, two-thirds of the future load would be handled by the Central Substation. The East Substation assumes nearly all of the net increase in site demand. Proposed service areas for each substation are generally defined by the Master Plan Neighborhood and Zone boundaries. The Central Substation would also continue to supply power to the Partnering and Outreach Zone through the existing distribution system in this area. Facilities in this area would be metered on a building by building basis, when they are leased.

Over the last decade, GSFC has implemented a sitewide program to replace or upgrade the power distribution system, including the Central Substation 13.8 and 4.16 kV feeders, and building load centers. One major project remains, replacement of two of the three 34.5 kV/13.8 kV power transformers at the Central Substation. These 40 year old transformers, which were installed when GSFC was originally developed, would be replace with units rated for forced air cooling, similar to those at the East

Switchyard, increasing the Central Substation firm capacity to 40 MVA. This would occur under both the Facilities Master Plan and No Action Alternatives.

If the Facilities Master Plan Alternative is implemented, development of the Space Science and Central Commons Neighborhood and New Thrust Zone would require concomitant installation of new dual feeder service through these areas. Other facilities would be handled by extensions on a building by building basis.

5.3.2.1 Emergency Power

Most of the emergency back up power at Goddard is provided by two emergency power plants. Some mission essential loads are serviced by stand alone diesel engine generators.

The first central plant, the Main Campus Emergency Power Plant, is located on the west campus. It houses five 1,000 kW capacity diesel generators, for a total capacity of 5,000 kW at 4.16 kV. The plant provides back up power for critical mission loads in Buildings 3, 13, and 14, and for chilled water

MONTH	DEMAND (KW)
Jan	19,375
Feb	19,872
Mar	20,736
Apr	20,250
May	22,723
Jun	22,810
Jul	25,639
Aug	25,110
Sep	25,531
Oct	23,306
Nov	19,426
Dec	20,102

TABLE 5-13 MAXIMUM MONTHLY ELECTRICAL POWER DEMAND FOR 2001.

MASTER PLAN AREA	CENTRAL SERVICE ZONE	EAST SERVICE ZONE
Institutional Support	2.261 MW	
Project Management	4.119	
Engineering/Technical	5.234	
Space Science/Commons	0.686	5.012 MW
Earth Science		4.550
New Thrust		2.318
Satellite Areas		0.311
Building 24	5.905	
Building 31		2.960
NASA Subtotal	18.311MW	15.151 MW
Partnering/Outreach	7.304	
Service Area Total	25.615MW	15.151 MW
Site Total	40.766 MW	

TABLE 5-14 PROJECTED 2022 MASTER PLAN MAXIMUM ELECTRIC POWER DEMAND.

production in Building 24. This central system is supplemented by a permanent stand alone diesel generator at Building 16, and by portable generators located at Building 1 and Building 9, the main gate guardhouse.

The second central plant, the East Campus Emergency Power Plant has five 1,450 kW, 13.8 kV diesel generators with associated switchgear and controls. The plant provides emergency power for mission critical loads in Buildings 25 and 32, and selected chilled water and utility loads in Building 31. The combined existing emergency power load at these two buildings is 7,175 kW. The plant was designed to accommodate future growth. Space is provided for a sixth 1,450 kW unit, and Building 31 incorporates features which readily permit expansion through a building addition that could house an additional six generators for a total potential capacity of 17,400 kW.

Portable generators, some as small as 100 kW, may be used throughout NASA GSFC to meet temporary critical load functions. All emergency power plant and a select number of stand alone generators start up automatically should there be an outage or failure in the regular system servicing the load. Acceptance of loads is sequenced through an Emergency Management Control System that automatically restarts critical mechanical equipment in order of importance. All generators are run on No. 2 fuel oil, which is stored in nearby above ground fuel tanks.

Although the location of emergency power users may change, it is anticipated that future requirements will be within the capacity of current fixed and portable equipment under both Alternatives.

5.3.3 Regional Water and Sewer Planning

Maryland law, in response to the Federal Clean Water Act, Federal Water Pollution Control Act, and Federal Safe Drinking Water Act, requires that each County adopt a comprehensive water and sewerage plan. The major ramification of the requirement is that water and sewerage planning and service is no longer merely a process of extending water and sewer lines in response to growth, development, or user requests. Each County must now consider the following before providing water and sewer service:

- Water resources
- Water supply
- Water quality standards
- Methods of sewage treatment and disposal
- Cost effectiveness
- Fulfillment of County plans and goals

Prince George's County has prepared a comprehensive plan that is updated biannually as required by Maryland regulations and the Clean Water Act (Adopted 1994 Comprehensive Ten Year Water and Sewerage Plan, Prince George's County). As plan policy, the County considers applicable Federal, State, and local land use and master plans, when it reviews requests for new and expanded service. The County also considers zoning, environmental factors, engineering constraints, economic and fiscal conditions, availability and adequacy of other public utilities, water and sewer facility plans, and the need to eliminate public heath problems.

County water and sewer planning is integrated with other jurisdictions. An independent utility, the Washington Suburban Sanitary Commission (WSSC) provides water and sewer service to both Prince George's County and neighboring Montgomery County. Management and operations of facilities are governed by legal agreements between the three parties. WSSC water resources and treatment capacity are allocated between the two counties. All three parties are cosigners of the 1985 Inter-municipal Agreement, along with the District of Columbia and two Virginia counties, that governs management and allocation of capacity of the Blue Plains Waste water Treatment Plant, which serves all of the jurisdictions. WSSC is also a party to regional agreements on water conservation, Potomac River low flow conditions, and other issues.

The plan defines and delineates water and sewer service category areas, of which two are applicable in the environs of NASA GSFC. Category 3 or Community Systems areas are those that must connect to a community or municipal system. WSSC is the "community water and sewer system" in the vicinity of Goddard. Individual water supply or sewage disposal systems are not generally allowed in Category 3

areas. Category 6 areas are the opposite. These areas will not be permitted to hook up to public water and sewer service. Individual water supplies must be obtained from groundwater wells, and sewer service must be provided by user owned and operated collection systems, treatment plants, or septic tanks.

The boundaries between Category 3 and Category 6 water and sewer service areas pass through NASA GSFC (Figure 5-6) In the vicinity of the west and east campuses, they are identical. All of the main campus, and the southern portion of the east campus lie within Category 3 water and sewer service areas. In the outlying or remote areas of Goddard, there are small differences. All remote areas lie within the Category 6 sewer service area. Area 200, the Optical Test Facility, along with the Glenn Dale United Methodist Church property, however, is within the Category 3 water service area. Although nominally in the Category 6 sanitary service area, Area 300 is supplied by the WSSC system. This connection predates the comprehensive plan.

Assignment to category area is not permanent, but a change in designation requires a formal amendment to the comprehensive plan by the County Council. Another plan provision is that any treated wastewater discharge to the WSSC Sanitary System exceeding 5,000 gallons per day must be included within the comprehensive plan. A new discharge would require a plan amendment.

NASA GSFC also lies at the juncture of other WSSC water and sewer service zones (See Figure 5-6). The west campus an the western portion of the east campus are in the WSSC Prince George's main water pressure zone, which has a nominal hydraulic gradient of 320 feet. Water is supplied to the zone from both the Potomac and Patuxent Rivers via the Potomac and Patuxent Water Treatment Plants.

The remainder of Goddard is in the Patuxent water pressure zone (nominal hydraulic gradient at 415 feet), while the area to the east of Good Luck Road is in the Bowie zone (hydraulic gradient 366 feet). The Patuxent Water Filtration Plant supplies water to these two zones by gravity flow.

WSSC system capacity is sufficient to meet planned demands through 2015 (ibid.). In 1995, WSSC constructed three new elevated water storage tanks just to the east of the Springfield/Beaver Dam Road intersection and south of NASA Area 200. Each of the tanks can store 1.5 million gallons of water at a nominal hydraulic gradient of 350 feet. The tanks, identified as the "Patuxent Wildlife" facility by WSSC, provide additional storage for the growing demand in the Bowie zone.

Sanitary sewer collection areas are generally established by natural drainage sheds that permit gravity flow. The nominal boundary between the Blue Plains and WSSC Western Branch Treatment Plants passes through the southern periphery of NASA GSFC with the Blue Plains service area to the north and the Western Branch service area to the south (See Figure 5-6). In practice, no Blue Plains sanitary sewer collection system is available in the vicinity of GSFC, and all site sanitary wastes go the Western Branch facility.

The Western Branch Wastewater Treatment Plant is located near Upper Marlboro on the Patuxent River. It serves an area of approximately 113 square miles. The sanitary outfall from NASA GSFC is the uppermost effluent source on the Bald Hill sewer main in the Western Branch network. The plant has a 30 MGD treatment capacity. In 1994, the normalized flow through the plant was 14.3 MGD.

As many as four of the facilities proposed in the Master Plan Alternative would be built within the WSSC Category 6 water and sewer service area. They are the Space Science Infill Building (Building D), Remote Commons Facility (Building U), Warehouse and Receiving (Building N), and portions of the New Thrust Zone.

The Space Science Infill Building would be located just to the east of Soil Conservation Road at a site now occupied by Building 27 and related facilities. Similarly, Building U would replace Building 25, the Network Training Facility near the center of the east campus. Buildings 25 and 27, built in 1966 and 1975, respectively, are connected to the campus water and sewer systems, which are in turn connected to WSSC. Service to these buildings predates the County comprehensive plan. Water and sewer service to Building O and U would involve reconnection to the existing systems.

Warehousing and receiving functions are now located in Building 16W along Soil Conservation Road. Direct access to the public road network without passing other operational facilities and separation from general employee entrances is needed. The function would move with Soil Conservation Road. If the road is realigned to the west side of GSFC, warehousing and receiving would be moved to the Institutional Support Neighborhood with gated access to Soil Conservation Road at Delta Road. All of the west campus is in WSSC service area 3.

If Soil Conservation Road were realigned to the east, warehousing and receiving would be relocated to Site N. The boundary between WSSC Service Areas 3 and 6 roughly follows Explorer Road on the east campus. Site N is north of the road and in Service Area 6. There is no specific program or building arrangement proposed for the New Thrust Zone. About half of the area allocated for the zone would be north of the road. Water service to the north of the road can be provided through extension of the campus system. Sanitary service would require pumping through a force main to the south side of Explorer Road and existing GSFC connections to a WSSC main in Good Luck Road.

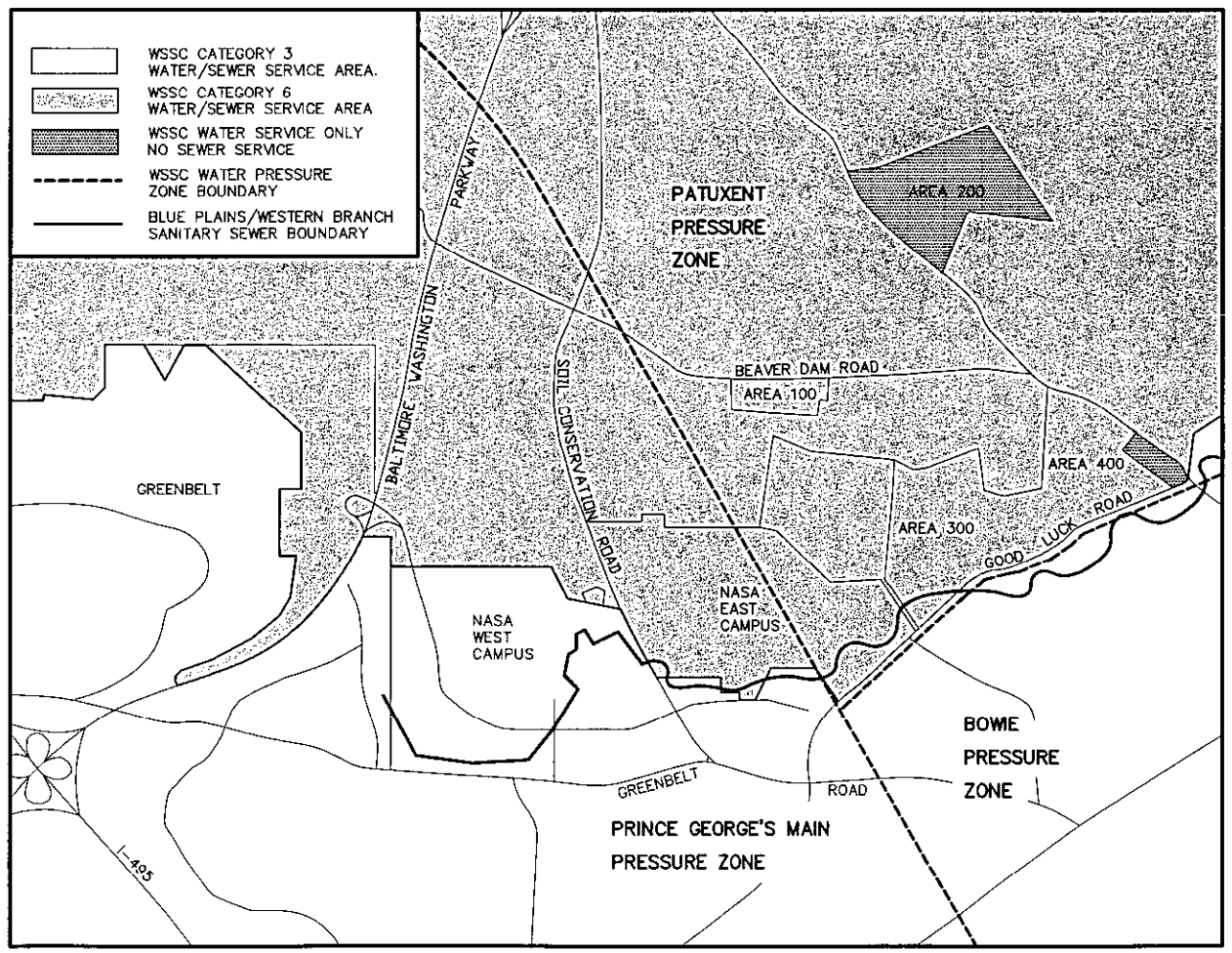


FIGURE 5–6 WSSC SERVICE AREAS.

NASA considers Sites D and U to be grandfathered for water and sewer availability although they nominally lie within the Category 6 Service Area. NASA would request an amendment to the County Comprehensive Water and Sewer Plan prior to development of other Category 6 sites north of Explorer Road on the east campus.

5.3.4 Water

NASA GSFC utilizes water from WSSC and groundwater wells on the property to meet facility needs A WSSC main under Greenbelt Road approaches Goddard from the west. At the west end of the campus, it is 24 inches in diameter, but reduces to 12 inches diameter in the vicinity of the main gate. Eight and twelve inch service connections are made to GSFC. Each connection passes through WSSC meters, backflow preventers, and pumping stations. WSSC maintains the lines up to the backflow preventers, and NASA is responsible beyond this point (NASA GSFC Main Campus Fire Protection/Domestic Water Supply System Utilities Master Plan, R&R International, Inc., 1998).

An elevated steel storage tank is centrally located within the NASA site water distribution system on the south side of Building 16W. It has a 300,000 gallons capacity. The elevation of the water line at the base of the tank standpipe is 233 feet above mean sea level. Tank water levels are controlled by a pressure sensor and microprocessor system. Charts recording tank levels indicate pumping starts when the level is at elevation 349.0 feet. Pumping stops when water reaches an elevation of 351 feet. Those elevations correspond to tank water depths of 26 and 28 feet, respectively, and a net fill volume of 22,700 gallons per pumping cycle (ibid.). The tank was flushed, cleaned, and upgraded in 1997. Life expectancy is estimated to be 15 to 20 years.

WSSC supplied water is distributed throughout the west campus via a network of mains ranging from 6 to 12 inches in diameter. A few smaller buildings have 3 to 4-inch service extensions. Except for a few buildings on the periphery, such as Building 9, 20, and 78, all buildings on the west campus are served by a grid or loop network permitting alternate flow paths to any building and isolation of individual links for repair.

Two GSFC water mains extend from the main campus across Soil Conservation Road to the core area of the east campus. Each is 10 inches in diameter. Extensions continue on to supply other buildings in the Network Training Area and Buildings 83 and 84. A 6-inch extension runs to the recreation center in Building 92. Cross mains running along Soil Conservation Road and between Buildings 25 and 31 create loops around all the major buildings on the east campus. Most of the pipe on campus is cast iron, with some ductile iron, and a small amount of transite pipe. Most of the west campus pipe network and the extension to the Network Training Area was installed between 1959 and 1976. NASA is in the process of upgrading or replacing deteriorated sections. Most of the pipe system in the southern half of the east campus was installed in 1992 in support of Buildings 31, 32, and 33, although the extension to Building 92 dates to 1970.

Area 100 is supplied by water received from the BARC distribution system. A 10-inch main was recently constructed along Springfield Road from the WSSC main on Good Luck Road to Area 200, the Optical Testing Facility to satisfy fire code requirements for that area. A parallel 2-inch line provides potable water. Area 300 is supplied by the WSSC main in Good Luck Road; an extension runs between Areas 300 and 400 within Goddard to service the latter area.

The average water consumption at NASA Goddard is about 380,000 gallons per day (Table 5-15). WSSC submeters measure the portion of water used for steam and cooling tower make up at the Building 24. A meter for the WSSC system feed to Building 31 was installed in June, 2001. WSSC meter readings were analytically adjusted to account for non-coincidence between the reading date and the first or last day of the month. Table 5-15 does not include water usage at Areas 100 through 400, which have separate connections. The combined usage of all four areas is less than 1,000 gallons per day.

The amount of water consumed at Goddard varies with the season. Building 24 is by far the largest demand center (Table 5-16). Cooling towers release the heat collected from building by the chilled water system to the atmosphere through evaporation of water passing through the tower. Makeup water is needed to replace evaporation losses. Cooling tower makeup demand accounts for more than half the average annual site consumption, and as much as 70 percent of the demand on hot summer days when building cooling requirements are high. Makeup water for steam generation accounts for about one-sixth of site demand.

Domestic demand is defined as all those uses (lavatory, laboratory, cafeteria, etc.) other than that for operating the central steam and chilled water plants. Nearly all the domestic demand occurs over a ten hour period on work days, and the average domestic demand approaches a 400,000 gpd rate at these times.

In June 2001, NASA switched to site groundwater wells as the primary source of water for the Building 24 and 31 cooling tower systems. Separate wells supply each building, and both wells are metered. Although there is monthly variance, the average withdrawals at the Building 31 well are about 18 percent of those at Building 24, closely matching the corresponding estimated cooling loads at each plant (See Table 5-12).

Average daily site demands would increase from 380,000 to an estimated 479,000 gallons per day under the Master Plan Alternative (Table 5-17). It is assumed that domestic demand would increase in proportion to campus population, and that the Partnering and Outreach Zone would have the overall demand characteristics equivalent to that used by NASA buildings in the area. Steam and chilled water makeup water demands would increase in proportion to their respective increases in Master Plan loads. Although overall site water demand would increase, demands on the WSSC system would decline with the switch to campus wells, for cooling tower supply. Under the No Action Alternative, average demands on the WSSC system would decrease by more than half. Under full build out conditions, Facilities Master Plan average WSSC consumption would drop from about 380,000 to 232,000 gallons per day.

Peak demand occurs over the short term over a period or an hour or two. Domestic site water consumption falls to very low levels outside of the normal work day hours when employees are not present. Work period consumption is much higher than the average usage. The peak domestic usage in Table 5-16 is based on a modified WSSC peak rate per building square foot factor. Values shown for cooling towers are for the estimated peak hour demand expected in a given year. Steam make up water usage is at its lowest level because the peak cooling hour will occur on the hottest day of the year.

The campus water distribution system is sized for the fire protection flows, which are much greater than normal peak usage. Except for the area on the east campus to the north of Building 25, it has sufficient capacity to handle Facilities Master Plan growth and fire protection requirements (Main Campus Fire Protection/Domestic Water Supply System Utilities Master Plan, R&R International, 1998). The onsite water storage requirement would continue to be 300,000 gallons.

5.3.5 Sanitary Sewer

Sanitary sewage collection at NASA Goddard is handled by a combination of three separate sewer pipe

MONTH	(1) TOTAL WSSC avg gpd	(2) BLDG 24 STEAM MAKEUP avg gpd	(3) TOTAL CW MAKEUP avg gpd	(4) DOMESTIC ESTIMATED avg gpd	(5) TOTAL SITE ESITMATED avg gpd
January	307,097	83,323	98,591	125,813	307,097
February	312,749	73,821	111,579	127,349	312,749
March	331,355	74,097	131,491	125,767	331,355
April	466,267	76,500	290,095	99,672	466,267
May	452,871	72,129	298,511	82,231	452,871
June	382,933	51,930	305,328	111,836	469,094
July	362,260	36,667	274,704	114,413	425,784
August	202,517	55,258	264,876	118,969	439,103
September	196,245	58,033	214,827	126,959	399,819
October	201,129	57,935	140,743	131,968	330,646
November	182,413	60,022	132,210	119,480	311,712
December	194,419	73,354	108,077	120,162	301,593
Avg Annual		64,422	197,586	117,000	379,008

NOTES: (1) WSSC Main Site Meter.
(2) WSSC Meter 14.
(3) From Table 5-16.
(4) Estimated total site usage less Buildings 24 and 31 usage.
(5) Sum of WSSC and well meters.

TABLE 5-15 AVERAGE GODDARD WATER USAGE ON A MONTHLY BASIS FOR 2001 (in gal/day).

networks that out fall to the WSSC system, and in the outlying remote areas, by septic tanks or fields at individual buildings or areas.

The first collection system covers the west campus and the Network Training Area on the east campus (NASA GSFC main Sewer System Study, Alphatec, P.C.). It is by far the largest on campus system, collecting wastes from all but four of the NASA buildings connected to the WSSC. Since Goddard is located on the crest of the drainage divide between the Potomac and Patuxent Rivers, this system has both gravity flow and forced or pressure mains. The system forks into four principal branches, each serving, roughly, one quadrant or sector of the west campus (Table 5-18). Three of the four branches combine in the vicinity of the Goddard/Explorer Road intersection and then run in a 10-inch main running south toward the main outfall. The southwest branch joins the 10-inch main at Aerobee Road, and a 12-inch outfall line continues southward from this point to Greenbelt Road.

There are no WSSC sanitary lines running the length of Greenbelt Road adjacent to NASA. Instead, commercial and residential properties on the south side drain to the rear or southward. NASA connects to the uppermost segment of the WSSC Bald Hill Branch interceptor at WSSC manhole 39054. A short 60-foot length of 8-inch sanitary line on a 9.25% slope connects WSSC manholes 39054 to 39053. The interceptor runs southward from WSSC manhole 39053 in two parallel 8-inch lines with a combined capacity of 983 gallons per minute (gpm). One of the lines increases to 10-inches in diameter on the south side of the Cipriano Square shopping center. An 8-inch segment at the terminal end of the Goddard system is the limiting capacity segment at 739 gpm.

MONTH	(1) BLDG 24 WSSC avg gpd	(2) BLDG 24 WELL avg gpd	(3) BLDG 31 WSSC avg gpd	(4) BLDG 31 WELL avg gpd	(5) TOTAL CW MAKEUP avg gpd
January	84,194	0	14,397	0	98,591
February	95,286	0	16,293	0	111,579
March	112,290	0	19,201	0	131,491
April	247,733	0	42,362	0	290,095
May	254,920	0	43,591	0	298,511
June	208,567	52,237	10,600	33,924	305,328
July	200,180	34,462	11,000	29,062	274,704
August	28,290	195,524	0	41,062	264,876
September	11,433	167,397	0	35,997	214,827
October	11,226	109,754	0	19,763	140,743
November	2,911	106,319	0	22,980	132,210
December	903	86,604	0	20,570	108,077

NOTES: (1) NASA WSSC meter 10.
(2) Adjusted Building 24 well meter data.
(3) Estimated at 17.1% of Building 24.
(4) Adjusted Building 31 well meter data.
(5) Sum of Columns 1 to 4.

TABLE 5-16 COOLING TOWER MAKEUP WATER USAGE IN 2001. (in gallons/day).

All the buildings that are to the northwest of Goddard and Explorer Roads on the west campus that have sanitary service require pumping of sewage over the drainage divide to the south side of the campus. Five buildings requiring pumping are on the southwest, branch, and six are on the northwest branch. While links between manholes on each branch have gravity flow, seven pumping stations are needed (Table 5-19). Each station has two pumps, one in operation and one in standby mode. Flows from some buildings pass through two stations.

Sanitary flows from Building 21 are pumped to a manhole in Explorer Road to the south of the building on the southwest branch. Gravity flow begins at this manhole. On the northwest branch, gravity flow begins at a manhole to the southeast of Building 24.

The northeast branch is the only one that extends beyond the west campus. Sewage collected from Building 25 and 25A in the Network Training Area is pumped to a manhole on the north side of Building 27. All buildings on the west campus between Goddard Road and Soil Conservation Road are served by gravity flow. Except for the main stem section between the Goddard Road/Explorer Road intersection and the WSSC connection, all gravity flow mains are 8-inch in diameter. Most of the pipe is transite with rubber ring gasket joints. Service lines from Buildings 17, 18, 19, 20 and 28 are vitreous clay. Nearly all of system, including the pumping stations, dates to the 1960's.

In comparison, the other two Goddard collection systems are straightforward. One collects waste from Buildings 32 and 33 on the east campus. The other is a simple service connection to Building 92, the

	AVERAGE DAILY DEMANDS (in gallons/day)		
	EXISTING (Year 2000)	YEAR 2022 NO ACTION ALTERNATIVE	YEAR 2022 MASTER PLAN ALTERNATIVE
DOMESTIC	117,000	117,000	135,000
BUILDING 24 STEAM MAKEUP	64,422	64,422	86,000
BUIDING 24 COOLING TOWER	167,519	167,519	172,000
BUILDING 31 COOLING TOWER	30,067	30,067	86,000
TOTAL SITE DEMAND	379,008	379,008	479,000
NASA WELL WITHDRAWAL	0	197,580	247,000
WSSC SYSTEM SITE DEMAND	379,008	181,422	232,000
	PEAK DEMANDS (in gallons/minute)		
	EXISTING	YEAR 2022 NO ACTION ALTERNATIVE	YEAR 2022 MASTER PLAN ALTERNATIVE
DOMESTIC	692	692	915
BUILDING 24 STEAM MAKEUP	12	12	15
BUIDING 24 COOLING TOWER	230	230	234
BUILDING 31 COOLING TOWER	42	42	120
TOTAL SITE DEMAND	976	976	1,284
WSSC SYSTEM SITE DEMAND	976	704	930

TABLE 5-17 ESTIMATED EXISTING AND PROJECTED AVERAGE AND PEAK WATER DEMANDS.

SANITARY BRANCH	FLOW TYPE	BUILDING ON BRANCH
Southwest	Gravity Forced Main	1, 2, 6, 11, 30 21, 26, 78, 90, 97
Northwest	Forced Main	4, 18, 19, 20, 24, 76
Northeast	Gravity Forced Main	5, 7, 10, 15, 16, 16W, 27, 28, 29 25, 25A, 601, 602, 603, 604
Southeast	Gravity Forced Main	3, 8, 12, 13, 14, 17, 22, 23, 86, 88 none

Note: Building 9 connects to campus outfall main just prior to campus exit.

TABLE 5-18 WEST CAMPUS SANITARY SYSTEM.

PUMPING STATION	LOCATION	FORCED MAIN DIAMETER INCHES	BUILDINGS SERVED	CAPACITY (GPM)
PS-1	South of Bldg 97	4	78, 90, 97	50
PS-2	Basement of Bldg 26	4	26	295
PS-3	West of Bldg 26	8	26, 78, 90, 97	250
PS-4	South of Bldg 21	6	21	250
PS-5	Southeast of Bldg 18	4	18, 19, 20	250
PS-6 (1)	Basement of Bldg 24	8	4, 18, 19, 20, 24	360
PS-7 (1)	Basement of Bldg 24	8	24	75
PS-8	West of Bldg 25	8	25, 25A	250

(1) PS-6 and PS-7 use same forced main.
Source: NASA GSFC Main Sewer System Study, Alphatec, P.C., 1993

TABLE 5-19 SANITARY PUMPING STATION DATA.

PARAMETER	DAILY MAXIMUM LIMIT[1]	PARAMETER	DAILY MAXIMUM LIMIT[1]
Inorganics		Conventionals	
Cadmium(T)	1.30	Dissolved Solids	1,500
Chromium (T)	7.00	Suspended Solids	400
Copper (T)	4.50	Total Solids	1,900
Cyanide (T)	1.30	Biological Oxygen Demand (5-day, 20° C)	300
Lead (T)	0.70	Chemical Oxygen Demand	500
Nickel (T)	4.10	Fats, oil, grease	100
Silver (T)	1.20		
Zinc (T)	4.20	PH	6.0-10.0 units
		Temperature	150° F
Organics			
Total Toxic Organics	2.13		

(1) Values in milligrams per liter (mg/L) unless otherwise indicated

TABLE 5-20 GODDARD SANITARY DISCHARGE AUTHORIZATION PERMIT LIMITS.

GEWA recreation center. Both outfall to a WSSC main in Good Luck Road by gravity flow through 8-inch diameter pipes.

Sanitary effluent releases from the west campus collection system are subject to the conditions in WSSC Industrial User Discharge Authorization Permit No. 00449 (Table 5-20). The permit is renewed on a three year cycle. Monitoring for conformance is conducted on at least four days every six months. Samples are taken at the GSFC Industrial Waste Monitoring Point (IWMP) just outside the main gate. Waste flows in the two east campus systems are principally domestic from Buildings 32 and 33. The east campus systems have no monitoring requirements.

The west campus collection system has adequate capacity to handle all of the buildings proposed in the Master Plan Alternative that are west of the axis of existing Soil Conservation Road. New buildings in the Institutional Support Neighborhood would be connected to the southwest branch force main via a force main extension to Pumping Stations 1 or 2. Buildings in the core area of the Space Science and Central Commons complex, the Earth Science Neighborhood, and New Thrust Zone would be connected to the east outfall now serving Buildings 32 and 33 and draining to the WSSC Good Luck Road main. The estimated resultant existing and projected sanitary flows at outfalls to WSSC are shown in Table 5-21.

5.3.6 Storm Water Drainage And Management

The State of Maryland adopted rules and regulations establishing criteria and procedures for Storm Water Management (SWM) given in the Code of Maryland 26.17.02. The Maryland Department of the Environment (MDE) has issued guidelines that supplement the Code of Maryland provisions.

In response to these requirements, NASA has developed a storm water management plan that adapts the State regulations and guidelines to Goddard conditions (NASA GSFC Stormwater Management and Sediment and Erosion Control Master Plan, NASA, 1999). For quantity control NASA uses 1980 campus conditions as a reference or baseline point for predevelopment hydrologic analysis. Any development after 1980 is considered to be post development requiring storm water management (SWM). NASA prepares and executes individual project SWM plans as construction occurs. On the east campus and satellite areas, 1980 hydrologic conditions are essentially natural, i.e. nearly 100 percent woods. Prior to 1980, east campus development was limited to areas around Buildings 25 and 27. Impervious coverage in the satellite areas is essentially the same as that existing in 1980, amounting to less than two percent of the total area. Qualitative control is further achieved through implementation of procedures and provisions for pollution prevention that cover vehicle maintenance, hazardous material storage, salt storage, landscape maintenance, and other activities (NASA GSFC Storm Water Pollution Prevention Plan, NASA, 1999).

Drainage is unusually complex at NASA Goddard because the site is located on the Anacostia-Patuxent river drainage divide at the apex of five separate tributary stream basins. Within GSFC, topography and storm drains form twelve drainage subareas on the west campus and six on the east campus. Runoff travels to twelve separate outfalls or general discharge locations at the west and east campus boundaries (Figure 5-7, Table 5-22). More detailed mapping and information is available in the Storm Water Management Master Plan. On the east campus, SWM Master Plan subarea definitions reflect changes created by recent construction associated with Buildings 32 and 33 in Subareas EC1 and EC2 (East Campus Master Plan, 1996, Parsons Facilities Service Company, 1997).

On the west campus, storm drains are confined to the developed area inside the perimeter buffer. There are five separate networks (Subareas D, E, H, J, K). Collection systems define most of the drainage boundaries in these areas rather than surface topography. Some building roofs drain to three separate systems. Storm drains on the east campus are limited to the environs of Buildings 25, 31, 32 and 33. Practically all runoff from impervious areas is collected where collection systems are present. Once collected, runoff is directed to natural swales or the utmost reaches of streams that arise on the campus and course through the perimeter buffer. Subareas on the west campus perimeter and the area north of Explorer Road on the east campus, drain overland or through natural swales to streams.

Outfalls 3, 5, 8, and 9 on the south side of Goddard discharge to three separate drainages. Runoff from Subarea C flows overland down side hill slopes to a roadside drainage ditch along Greenbelt Road. Stormwater in this ditch eventually drains toward the Brier Ditch. Outfalls 5 and 8 discharge to the Bald Hill drainage basin; the downstream watercourses combine about a half a mile south of Greenbelt Road. Stormwater runoff from Subareas M and EC1 passes through Outfall 8, and under Greenbelt Road to the Prince George's County Bald Hill No. 2 Stormwater management (SWM) facility on the opposite side of the road. A proposed County SWM Facility for the Outfall 5 branch is included in the County Planning Area 70 Master Plan. Identified as the Bald Hill No. 1 dry pond, it would be located in the vicinity of Brae Brook Road. Area EC2 debouches through Outfall 9 to County storm drains to the Holly Branch basin.

The northern portion of the west campus drains at five points to a small stream that runs parallel to and just beyond the NASA boundary. The stream is a Beaverdam Creek tributary, joining it just downstream from the latter creek's confluence with Beck Branch. Subareas EC4, EC5, and EC6 cover nearly all of the east campus north of Explorer Road. They drain to a Beck Branch tributary. The 150-acre Alder Pond, which is owned by the US NRCS National Plant Materials Center, is located on Beck Branch about 2,500 feet downstream from Outfall 11.

Structural stormwater management of Goddard is composed of eight SWM ponds, four on each campus (Table 5-23). All stream outfalls receiving runoff from developed areas have SWM protection, except for Outfall 5 draining Subarea H. Unmanaged areas have little or no development.

The existing drainage and stormwater management systems were evaluated in the Storm Water

	CAPACITY	EXISTING AND NO ACTION ALTERNATIVE	MASTER PLAN ALTERNATIVE
AVERAGE DAILY FLOW			
West Campus Outfall		104,000 gpd	129,000 gpd
East Campus Outfall		17,000 gpd	31,000 gpd
Total Site Average Daily Flow		121,000 gpd	160,000 gpd
PEAK FLOW			
West Campus Outfall	739 gpm	552 gpm	669 gpm
East Campus Outfall	389 gpm	91 gpm	182 gpm
Total Site Peak Flow		643 gpm	857 gpm

gpd = gallons/day gpm = gallons/minute

TABLE 5-21 EXISTING AND PROJECTED SANITARY FLOWS.

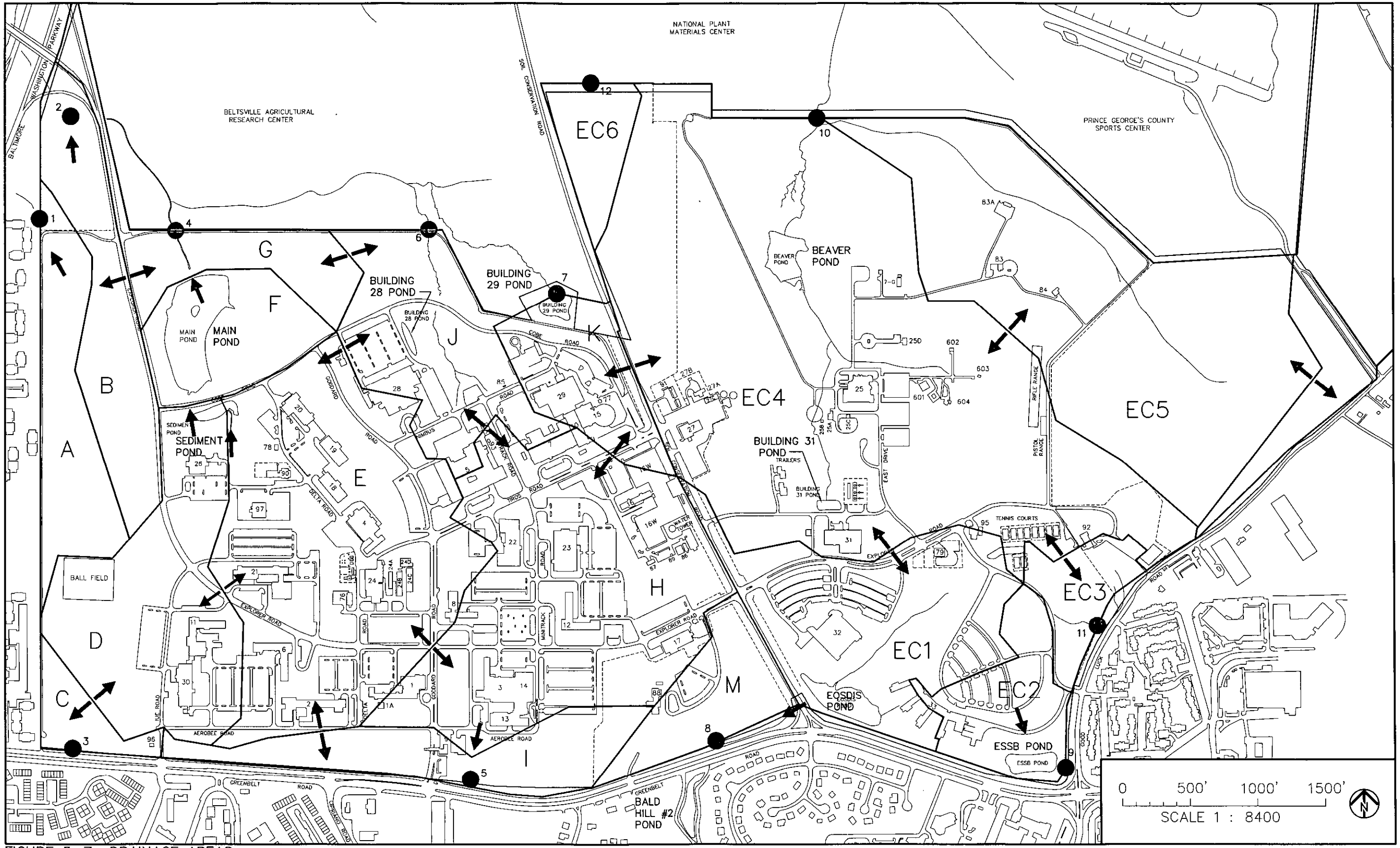


FIGURE 5–7 DRAINAGE AREAS.

Management Plan using the TR-20 computer model. Pond names are as identified in the Storm Water Management Plan. It was determined that four of the ponds have excess capacity, and that overall, peak storm water flows at the facility outfalls have been maintained at or below 1980 or predevelopment rates.

Built in 1966, the Main Pond is the largest SWM facility at Goddard. With the Sediment Pond, it forms a two tier quality and quantity control system. The Main Pond is capable of handling the 100-year storm. The design high-water elevation is 131.0 feet; the 100-year flood elevation is 130.28 ft. The crest of the Sediment pond is at 136.0 ft, and the 100-year flood elevations is 135.5 feet. The Sediment Pond would overflow Cobe Road at some intermediate recurrence interval. The Main Pond still has 4.10 acre-feet of excess capacity under Sediment Pond overflow conditions.

The Building 29 and Building 28 Ponds were designed to physically handle the peak discharges of the 100-year storm. Under 100-year conditions, the crest of Building 29 dam is at 176 ft and water reaches 175.75 feet, while peak discharges are still 70 cfs less than predevelopment rates. The pond at Building 28 is a dry pond capturing runoff from an approximately 5-acre area around that building, nearly all of which is impervious. The pond was designed with approximately 0.6 acre-feet of excess capacity above that required for the construction with which it is associated.

The EOSDIS Pond was designed and constructed on the premise that it would handle all of the increase in storm water runoff that would be generated by three prospective large development projects in the southern portion of the east campus: Buildings 32 and 33, and one future building. Storm water from the ESSB Building site within drainageshed EC2 eventually was handled separately, and the third building was not built. The EOSDIS Pond therefore has considerable excess capacity even though it receives runoff from about half the Building 33 site. It is estimated that this pond could accommodate up to 12 acres of additional impervious area, while still maintaining release discharges below 1980 hydrologic conditions. It is classified as a quantitative detention and qualitative retention pond.

The recently completed ESSB Pond also has been designed as a quantitative detention and qualitative infiltration facility. If necessary, this pond could be modified to accommodate more impervious area. Currently, the water elevation under 100-year storage conditions is 184.76 ft., corresponding to approximately 3.0 acre-feet of detention storage. About 5.6 acre-feet of runoff can be stored with one foot of freeboard.

EC-4 is the largest drainage area on the east campus. At some time in the 1960's, and probably associated with the development of the Network Training Area, a low Earth dam was constructed across the small stream coursing northward forming Beaver Pond. There is a small pool of open water behind the dam, but the remainder is covered by water only a few centimeters deep and a dense growth of hydrophilic plants from shore to shore. Facility design and operating characteristics are unknown. Quantitative control is limited by the low dam height, but excellent qualitative management characteristics are obtained. The site is a favorable location for creation of a formal SWM structure, which may be achieved by alteration or replacement of the dam.

There are no storm drain systems or SWM facilities in Areas 100, 200, 300, and 400. Impervious surfaces, including buildings, roads, and parking, occupy less than two percent of the total area. Only one building, Building 305, among those at all four sites, has a footprint larger than 5,000 sf. Roads are generally only one lane wide. Swales and channels in the immediate vicinity of buildings handle drainage. In general, it is 700 feet or more between developed areas and the nearest continuous all weather flow stream.

DRAINAGE BASIN	DRAINAGE AREA (ac)	IMPREVIOUS AREA (ac)	OUTFALL	STREAM	RIVER BASIN
West Campus					
A	24.44	0.00	1	Beaverdam	Anacostia
B	31.53	0.00	2	Beaverdam	Anacostia
C	8.37	0.17	3	Brier Ditch	Anacostia
D	47.33	13.86	4	Beaverdam	Anacostia
E	95.19	42.38	4	Beaverdam	Anacostia
F	20.18	2.32	4	Beaverdam	Anacostia
G	21.56	0.50	4	Beaverdam	Anacostia
H	86.71	52.62	5	Bald Hill	Patuxent
I	33.28	5.35	5	Bald Hill	Patuxent
J	35.90	11.78	6	Beaverdam	Anacostia
K	21.16	13.90	7	Beaverdam	Anacostia
M	25.10	4.85	8	Bald Hill	Patuxent
Total	450.75	197.73			
East Campus					
EC1	52.78	11.64	8	Bald Hill	Patuxent
EC2	20.11	5.41	9	Folly	Patuxent
EC3	11.34	0.89	11	Folly	Patuxent
EC4	199.43	16.28	10	Beck	Anacostia
EC5	106.75	0.84	10	Beck	Anacostia
EC6	11.43	0.00	12	Beck	Anacostia
Total	402.34	35.06			
Satellite Areas					
100	27.6	0.37	-	Beck	Anacostia
200	120.5	3.04	-	Beaverdam	Anacostia
300-400*	254.4	4.47	-	Beck	Anacostia
Total	402.5	7.88			

Notes: *includes 12.37 acre area on east campus draining to Area 300.
Sources: GSFC Stormwater Management Plan, NASA, 1994
East Campus Master Plan 1996, Existing Conditions Summary, Parsons Facilities Services Company, 1977

TABLE 5-22 GSFC DRAINAGE SUBAREAS.

Stormwater management can be achieved on a site wide or subarea basis, by constructing facilities for each project as it is implemented, or by a combination of these methods. In general, management facilities serving larger areas are preferable technically and economically, but they may be more difficult to place and fund. Despite its size, Goddard has relatively few potential large stormwater management sites due to the density of development, topography, presence of existing wetlands, or adjacency to sensitive natural habitat.

PONDS	TYPE	AREA (ac)	STORAGE VOLUME (acre-feet)	EXCESS CAPACITY (acre-feet)
Main	Wet	6.20	14.80	4.10
Sediment	Wet	0.49	2.24	0
Building 29	Wet	0.95	4.90	0.24
Building 28	Dry	1.51	3.94	0.60
EOSDIS	Wet	2.79	6.91	4.80
ESSB	Wet	1.06	5.60	2.60
Building 31	Wet	0.07	2.12	0
Beaver	Wet	1.83	(1)	

(1) No data. Pond not designed as management facility.

TABLE 5-23 NASA GSFC POND DATA.

Quantity control entails storage of excess stormwater runoff generated by development, but MDE is placing greater emphasis on quality control or removing nutrients, pollutants, and sediment washed off impervious surfaces by the first flush of passing runoff. New sizing and performance criteria for water quality control facilities, based on statewide experience over the last 15 years, have been proposed (Draft 2000 Maryland Stormwater Design Manual, MDE et al., 2000). Quality control includes consideration of water quality, groundwater recharge, channel protection, and nutrient removal. A variety of Best Management Practices (BMP) such as ponds, artificial wetlands, micropools, infiltration, filtering systems, and vegetated drainage ways or channels, can be adapted to project conditions during the design phase.

It is estimated that full Master Plan implementation would convert about 32-acres of pervious lawns, fields, and forest to impervious surfaces covered by buildings, roads, parking lots, and other hard surfaces. Conversely, about 24-acres of existing impervious surface would be converted back to natural pervious ground cover with emphasis on reforestation. The net change is estimated to be a gain of about eight acres of impervious surface. For comparison, about 233 of the existing 853 drainageshed acres on the east and west campuses are impervious. About half, or four acres, of the net impervious area increase is attributable to the Space Science and Central Commons Neighborhood core area, and half to potential facilities in the new Thrust Zone. Elsewhere, impervious surface increases and decreases occur locally, but the change on a subarea or drainageshed basis is small, and the overall net change outside of the two areas noted above are estimated to be less than an acre.

The Space Science and Central Commons core area lies at the apex of four subarea drainagesheds. However, the drainageshed boundaries in this area are artificial in that they are defined for the most part by existing storm drain systems. For simplicity of concept in stormwater management, it is convenient to assign all of the core area development to the EC4 drainageshed. Then, all of the net eight acre increase in impervious surface attributable to full Master Plan development would occur in the EC4 subarea drainageshed. Existing Goddard SWM ponds elsewhere would have adequate capacity to meet Master Plan related quantity control requirements in all other drainagesheds, since there is little change in net imperviousness in these areas.

Specific SWM requirements for Master Plan facilities proposed for the EC4 drainageshed cannot be given definition until the implementation phase. They will depend on whether projects are implemented or not, and if built, the sequencing of project implementation. Buildings 16, 16W, 27, their associated parking and storage lots, and Soil Conservation Road itself create a large impervious area. Removal of these facilities results in significant temporary gains that can compensate in whole or in part for individual new projects in the Space Science and Central Commons core area.

Conceptually, several larger scale SWM options are available for handling EC4 drainage basin quantity control requirements. It is estimated that about 11 acre-feet of storage is needed to handle the 24-hour, 10-year excess storm runoff created by proposed Master Plan facilities in the Space Science and Central Commons core area and New Thrust Zone. Estimates for the New Thrust Zone were based on an assumed three story building with a 62,000 gsf footprint, and parking for 500 employees at a 0.9 space per employee ratio, and 400 sf of area per space.

The Master Plan has established a 1.8-acre area to the west of Building 25 as a potential quantity control pond site. The area is adjacent to, but not on, the small stream coursing northward. It is now covered by meadow and small facilities related to operations in Building 25. Ground elevation differentials across the site are about 10 feet.

Alternatively, the EOSDIS Pond south of Building 32 could be used to accommodate significant portions of the quantity control requirements generated by the Space Science and Central Commons core area development. It is estimated that the pond has sufficient capacity to handle an additional 12-acre conversion of forested area to impervious surface. This is much more than required by Facilities Master Plan proposals for the Earth Science Neighborhood and Subarea EC1. Existing ground levels in the vicinity of the core area plaza are more than 50 feet above the normal pool level in the EOSDIS Pond. If this option is selected, then some of the 1.8 acre area designated for SWM facilities may be used for qualitative BMP facilities for the remaining portions of runoff routed in that direction.

For the remainder of the site, appropriate quality control measures would be selected and adapted to fit the situation as individual projects are implemented.

The State Stormwater management regulations have undergone recent revision (Maryland Stormwater Guidelines for State and Federal Projects, MDE, 2001. The guidelines stipulate that "no State or Federal agency shall develop any land without having provided Stormwater management measures that control or manage runoff from such development". The MDE guidelines differ from those in the past. As before, development at new project sites must control runoff to levels equivalent to natural conditions prior to the development. What is new is that redevelopment at currently developed sites must reduce impervious site areas by 20 percent, or provide treatment for 20 percent of the runoff, or achieve the equivalent effect by a combination of these measures. For example, if a site is redeveloped and the impervious area is unchanged, then 20 percent of the site runoff must be controlled and managed. Previously, management was unnecessary.

An agency may apply for an exception to these requirements as provided within Section 3.0 of the guidelines. To do so, an Institutional Stormwater Management Plan (ISMP) covering facilitywide conditions must be prepared and approved by MDE. According to Section 3.3.A.3 of the Guidelines, individual projects that lie within an area covered by an ISMP are eligible for waivers to Stormwater management quantity and quality control requirements. Management is conducted on a sitewide basis under the ISMP.

5.3.7 Communications

NASA GSFC has complex communications requirements that use both land lines and wireless transmissions across the electromagnetic spectrum. It is a primary switch center in NASA Communications Network, which links all NASA mission related facilities worldwide. GSFC is also a base in the Institutional Telecommunications Network that connects NASA to outside institutions, scientists, and outside researchers.

Telephone lines in the environs of Goddard are owned by Verizon Communications. MCI-WorldCom installed fiber optic lines in the area in 1998 as part of the regional network. NASA owns the on-site telephone system. The main exchange and switching facility is on the west campus. Remote areas are serviced via a secondary switching facility on the east campus. NASA GSFC also has other signal and communication lines that monitor or operate utility, fire alarm, and security systems.

Over the last decade, demands and loadings have increased sharply. Many hard copy information transfers are now completed electronically. Communications between entities within the site have grown along with those between NASA GSFC and the outside world. Rapid advances in the development of communications systems, hardware, and information technology needed to be incorporated into the site communications network.

NASA is in the process of planning for a significant upgrade of internal campus facilities. Planning concepts include nodal centers serving subareas around the site. Communication system improvements would occur under both the Master Plan and No Action Alternatives.

5.3.8 Natural Gas

The Washington Gas Company (WGC) – Maryland Division distribution system, delivers natural gas to NASA GSFC. NASA purchases gas from WGC, or when economic savings can be realized, from the Defense Energy Supply Center (DESC). The DESC is a Department of the Defense agency, which makes gas purchased at fixed rates available to other Federal agencies around the country.

NASA GSFC has four separate on-campus natural gas distribution systems. The first of these, which is on the west campus, distributes gas to Building 24, the Central Heating and Refrigeration Plant, and to Buildings 21, 76, and 97, each of which are submetered. The remaining three systems are comparatively short service drops to Building 9 on the west campus, to the NASA Employee Recreation Center, Building 92, on the east campus, and to Building 302 in the Magnetic Testing Facility Area. The last two are supplied via the WGC Good Luck Road main. Each system is metered, and Buildings 24 and 97 are submetered. Gas lines on the Center are owned and operated by NASA.

About 98 percent of all the natural gas delivered to NASA GSFC is used as a fuel supply for the boilers in Building 24 that produce steam for campus heating and research processes. Over 4.4 million therms of natural gas were consumed at Building 24 in 2001 (Table 5-24). The heating value of gas varies by a few percentage points depending on the well source. Natural gas delivered to NASA GSFC has an average heating value of 1024 BTU/CF. One therm equals 100,000 BTU. The peak recorded natural gas usage day at Building 24 was 21,049 therms on February 17, 2001.

Natural gas use at Building 24 fluctuates with the season as heating demands are superimposed on the relatively constant base demand needed to generate steam for scientific, technical, and space humidity control purposes. Washington Gas classifies building 24 gas service as interruptible. Supply can be cut

MONTH	GAS USAGE (therms x 10^{5})
January	5.077
February	4.891
March	5.283
April	4.096
May	3.431
June	3.055
July	2.926
August	2.965
September	2.910
October	3.545
November	3.791
December	4.775
Annual Total	44.327

TABLE 5-24 BUILDING 24 MONTHLY NATURAL GAS CONSUMPTION IN 2001.

or reduced during periods of shortages, or when user demands approach or exceed Washington Gas distribution system capacity. At such times, NASA switches to No. 2 fuel oil to produce steam.

TORO Energy of Dallas, Texas, has signed an agreement with Prince George's County to capture, process, and deliver gas produced at the County-owned Sandy Hill Landfill. The landfill is located on Old Laurel-Bowie Road about 1.5 miles to the east of the Area 400. Proximity and demand make NASA GSFC a natural potential customer. NASA GSFC has signed a contract with TORO to deliver land fill gas as an alternative fuel supply for the Building 24 boilers.

Analysis of the landfill gas indicates that it is composed of 50 percent methane, 45 percent carbon dioxide, and 5 percent higher hydrocarbons such as ethane and propane. Natural gas composition varies by well source, but typically has 90-percent methane, 5 percent ethane, and 2 percent propane as the hydrocarbon constituents. Nitrogen occurs as impurity in natural gas. Landfill gas burns cooler, but has the advantages of lower cost and nitrogen oxides emissions. Conceptually, the landfill gas would be carried between the landfill and NASA in a pipe like that used by WGC in public right-of-way. Once the pipe reached NASA in the vicinity of the Springfield/Beaverdam Road intersection, it would be routed on NASA property to Building 24.

Full implementation of the Master Plan Alternative would increase the average gas demand to an energy equivalent estimated at 15,500 therms per day. Total annual consumption would increase to about 56.515 x 10^{5} therms.

5.4 NOISE

5.4.1 Guidelines

The standard measurement unit for noise is the A-weighted decibel (dBA). It corresponds to the sensitivity of the human ear across the spectrum of audible frequencies. Decibels are measured on a logarithmic scale to account for the several millionfold difference in noise intensity or loudness that the

ear can hear. A 3 dBA increase is therefore equivalent to a doubling of sound pressure levels or loudness. However, since the scale is logarithmic, a 1 or 2 dBA increase is barely perceptible to the human ear.

Noise levels vary with time so that a meter reading oscillates continuously. Noise is therefore characterized by assembling measurements or noise levels over time in several ways to account for this variance. Leq, or the equivalent noise level, is the average mean square sound level measured in dBA over a time period under consideration, usually one hour. Ldn is the average of 24 hourly Leqs for the period from midnight to midnight that is obtained after adding a 10 decibel penalty to sound levels recorded or computed for the period from midnight to 7 AM, and from 10 PM to midnight.

Noise criteria have been established by different agencies depending on noise source and land use. Traffic noise impact criteria have been established by the Federal Highway Administration (Federal Aid Policy Guide, (FHWA). Impacts are expected to occur if the peak hour Leq exterior noise level exceeds 67 dBA for activity areas such as residences, schools, churches, libraries, hospitals, hotels, motels, parks, playgrounds, and recreation areas, or if there is an increase of 5 dBA or more. Other Federal agencies define noise criteria in terms of Ldn (Guidelines for Considering Noise in Land Use Planning and Control, Federal Interagency Committee on Urban Noise, 1980).

The Committee Guidelines indicate proposed activities are compatible with the following land uses provided the indicated Ldn does not exceed:

Residential	65 dBA	Churches	65 dBA
Hospitals	65	Government Services	70
Schools	65	Parks, Recreational Areas	75

The State of Maryland has established standards as goals for noise levels as measured at property lines abutting the property with the noise source (Table 5-25).

5.4.2 Site Noise

Development at GSFC is surrounded by a perimeter buffer, which is forested for the most part. NASA operations are conducted indoors and produce negligible exterior noise levels. Many laboratory, testing, and communications functions are extremely sensitive to noise and vibrations. The shortest distance between any NASA building (Building 33) and an outside residence is about 300 feet. No noise impacts from NASA operations are expected.

Construction noise is episodic, and not continuous. Most proposed projects in the Facilities Master Plan are located in the central core of the campus and away from residential areas. Building I, near existing Building 32 would be located nearest residential areas. The distance to the closest residence, which is on the south side of the Greenbelt Road intersection, would be about 550 to 600 feet. It is estimated that construction noise levels would conform to State guidelines at the residence due to distance attenuation. Noise impacts attributable to traffic are given in Section 7.4.5.

5.5 AIR QUALITY

5.5.1 Regional Conditions

The Clean Air Act, as amended (42 U.S.C. 7401) requires that air quality in designated Air Quality Control Areas (AQCA) meet the National Ambient Air Quality Standards (NAAQS) for criteria pollutants (Table 5-26).

The National Capital Interstate (NCI) AQCA encompasses the Washington Metropolitan area. Maryland, Virginia, and the District of Columbia each have jurisdictional AQCA's within the NCI AQCA. Air quality planning and coordination for the NCI AQCA is conducted by the Metropolitan Washington Air Quality Committee, which is composed of members from each jurisdiction.

Within the NCI AQCA, NASA GSFC is located in Maryland AQCA IV, which encompasses Montgomery and Prince George's Counties. The Maryland Department of the Environment (MDE) is the controlling agency within AQCA IV.

Air Quality concentrations are recorded at four State monitoring stations in AQCR IV (Maryland Air Quality Data Report, MD Air and Radiation Management Administration, 1999). Data for the monitoring stations nearest NASA GSFC are summarized in Table 5-26. Ground level ozone concentrations are measured at the MDE station in NASA Area 200. No stations in AQCA IV record sulfur dioxide or lead concentrations because prior monitoring indicated that concentrations are far below the NAAQS criteria.

If the NAAQS criteria are not met, then the AQCA is in "nonattainment" of the standards. Nonattainment areas are further classified by US EPA depending on the degree of nonattainment as marginal, moderate, serious, severe, and extreme. The NCI AQCA is in attainment for all the NAAQS criteria, except for ground level ozone, where the AQCA is classified as being in "serious" non-attainment. In 2001, the one hour ground level ozone health standard was exceeded three times in the AQCA. The eight hour standard, which is more difficult to met, was exceeded on 24 occasions.

ZONING DISTRICT	ENVIRONMENTAL NOISE STANDARDS	MAXIMUM ALLOWABLE Ld/Ln NOISE LEVELS
Industrial	70 $L_{eq}(24)$	75/75
Commercial	64 L_{dn}	67/62
Residential	55 L_{dn}	65/55

$L_{eq}(24)$ = The time-weighted average for 24 hours.
L_{dn} = The day-night average sound level.

TABLE 5-25 MARYLAND NOISE STANDARDS. (in dBA)

	AMBIENT STANDARD***		1999 MONITORING DATA	
	PRIMARY ($\mu g/m^3$)	SECONDARY ($\mu g/m^3$)	MAXIMUM CONCENTRATION ($\mu g/m^3$)	LOCATION Distance/Direction**
CARBON MONOXIDE				
1-Hour*	40,000	---	9,000	Bladensburg 3.5 mi/SW
8-Hour*	10,000	---	5,000	Bladensburg 3.5 mi/SW
SULFUR DIOXIDE (SO_2)				
3-Hour*	---	1,300	---	Not Monitored
24-Hour*	365	---	---	Not Monitored
Annual	80	---	---	Not Monitored
NITROGEN DIOXIDE (NO_2)				Ft. Meade
Annual Mean	100	100	20	9.5 mi/NE
GROUND LEVEL OZONE (O_3)				
1-Hour*	235	235	276	Greenbelt NASA Area 200
8-Hour	157	157	218	Greenbelt NASA Area 200
PARTICULATE (PM10)				
24-Hour*	150	150	64	Suitland 11 mi/SSW
Annual Mean	50	50	24	Suitland 11 mi/SSW
PARTICULATE (PM25)				
24-Hour*	65	65	---	Not Monitored
Annual Mean	15	15	---	Not Monitored
LEAD (Pb)				
Quarterly	1.50	1.50	---	Not Monitored

Note: * Short-term (1 hour, 3-hour, 8-hour and 24-hour) standards are not to be exceeded more than once per year. Therefore, second-highest short-term values are compared to the standards rather than the highest short-term values.

** Approximate distance and direction from GSFC.

*** The State of Maryland has adopted the National Ambient Air Quality Standards (NAAQS) as the state standard.

($\mu g/m^3$) micrograms per cubic meter.

Source: Maryland Air Quality Data Report, Maryland Department of the Environment, 1999.

TABLE 5-26 NATIONAL AMBIENT AIR QUALITY STANDARDS AND EXISTING AIR QUALITY DATA.

Ground level ozone is not produced or emitted directly. It is generated when nitrogen oxides combine with volatile organic compounds (VOC) in a photochemical reaction. The reaction is catalyzed by high temperatures, abundant sunshine, and prolonged periods of air stagnation. Ground level ozone concentrations are therefore controlled indirectly by control of emissions of nitrogen oxides or VOC.

Directives issued by the US EPA require that the National Capital Interstate AQCA prepare a plan to achieve ground level ozone attainment through control of nitrogen oxides and VOC. It is projected that attainment will be achieved by 2005 by implementing measures in the State Implementation Plan Phase II, Attainment Plan Revisions, Metropolitan Washington Council of Governments, 2000.

5.5.2 Mobile Sources

5.5.2.1 Traffic Air Quality

Traffic related air quality impacts associated with the Facilities Master Plan are those for the proposed realignment of Soil Conservation Road. These are presented and discussed in Section 7.4.6.

5.5.2.2 Parking Air Quality

No air quality impacts from vehicle start up in Goddard parking lots are expected under either Alternative. A natural, undeveloped buffer surrounds NASA GSFC. The shortest distance between any NASA parking lot (east side of Building 30), and a sensitive receptor (residence in Chelsea Woods) is 650 feet. Pollutant concentrations decrease exponentially with distance; the maximum effect of vehicle start up is less than 0.1 ppm.

5.5.3 Stationary Sources

All of Goddard's fossil fuel driven stationary sources are regulated by a Maryland Department of the Environment (MDE) Clean Air Act, Title V, Part 70, Operating Permit. Stationary sources include the five boilers in the Central Plant, fixed emergency power generators, and two portable 500 KW power generators. The permit authorizes NASA to use natural gas as the primary fuel, and No. 2 fuel oil as a backup fuel for boiler firing and No. 2 fuel oil in the generators.

5.5.3.1 Central Steam Plant Air Quality

The principal criteria pollutant emission sources at GSFC are the stacks for the five 49.5 million British Thermal Unit per hour (MMBTU/HR) boilers at the Central Heating Plant in Building 24. All the boilers have dual oil and natural gas feed burners, and it is the intent of NASA to ultimately convert all the boilers for triple feed to allow use of landfill gas as a third alternative fuel. When burning natural gas, nitrogen oxide emissions are limited to a 24-hour average emission rate of 0.1 lb per MMBTU of fuel heat content. Washington Gas typically supplies natural gas at 1024 BTU per cubic foot. The 0.1 lb of nitrogen oxides emission rate has been confirmed by exhaust stack emission monitoring. (NASA GSFC Steam Boiler System, NO_x Emission Compliance Test Report, Air Nova, Inc., 1996). Monitoring also indicated that the burners produce nitrogen oxides at a rate of 0.17 lb/MMBTU when the boilers are operated using oil at 50 percent capacity, and 0.13 lb/MMBTU when running similarly at 90 percent capacity.

The central steam plant in Building 24 consists of five 40,000 lb/hr boilers. Each shares the same physical and operating parameters, e.g. emission rates, stack dimensions, etc. from the viewpoint of air quality analysis.

Annual emissions of criteria pollutants at the central plant were estimated for existing and projected No Action and 2022 Master Plan Alternative conditions. Table 5-27 shows short term (24 hours or less), and seasonal boiler scenarios that would meet existing and projected steam demands. The existing short term demand is based on an estimated maximum demand. Seasonal demands are derived from plant fuel usage records for 2001. Future No Action Alternative conditions are equivalent to existing ones. Projection for future short term and seasonal are based on an estimated of the increase in campus loads under full build out of Facilities Master Plan projects.

It was assumed that operations on an annual basis would follow the scenarios indicated in Table 5-27. The boilers would run ten percent of the year (876 out of 8,760 hours) on No. 2 fuel oil, and either natural or landfill gas for the remainder of the year. Pollutant emission factors used in the analysis were derived from those given for No. 2 fuel, natural gas, and landfill gas in Compilation of Air pollutant Emission Factors, 5th edition, EPA Report AP-42. The sulfur dioxides (SOX) emission factor was computed by a mass balance calculation. The emission factors were converted to pounds of pollutant emissions per million British Thermal Units per hour (lbs/MMBTU) (Table 5-28). The factors used were 140,000 BTU per gallon for oil, 1,000 BTU per cubic foot of natural gas, and 1,240 BTU per pound of steam produced (equivalent to 80 percent efficiency).

NASA plans to start using gas produced at the Sandy Hill landfill as an alternative fuel source in 2003. The composition of the landfill gas is reported to be 45 percent methane, and 55 percent carbon dioxide. The estimated heating value of the landfill gas is 472.5 BTU per cubic foot.

Estimated annual emissions are shown in Table 5-29. Estimates are for existing and anticipated 2022 Master Plan Alternative steam production needed to meet site demands. It is assumed that 10 micron Particulate Matter (PM-10) emissions have the same value as PM. These levels correspond to annual fuel energy consumption at 470,000 and 630,000 mmBTU, respectively. The No Action Alternative assumes no growth in facilities or steam demand, but use of landfill gas instead of natural gas.

Since each fuel type has different individual pollutant emission rates, triple fuel feed provides NASA with some flexibility in controlling annual emissions. For example, fuel oil accounts for more than 95 percent of the annual sulfur dioxide emissions when natural gas is the only alternative fuel. The addition of landfill gas as a third alternative lessens the dependence on oil. Reductions in the use of oil as a backup fuel source would significantly reduce SO2 emissions. The data in Table 5-29 for 2022 Master Plan conditions assume exclusive use of either natural gas or landfill gas for 7,884 hours with No. 2 fuel oil consumed for the remainder of the time. If both gases are used during the year, annual pollutant tonnage would be at some intermediate value between those listed for natural gas and landfill gas proportionate to the amount of heat consumed while operating under each type of gas.

NASA will apply for appropriate permits to construct and operate facilities to account for landfill gas use and growth proposed in the Facilities Master Plan.

A screening level approach was used to determine potential local ambient air quality impacts. The US EPA recommended computer model SCREEN3 was used with conservative assumptions and a potential worst case scenario to estimate pollutant concentrations attributable to Building 24 stack emissions. These were added to background concentrations.

SCENARIO	FUEL	DEMAND (PPH)	NO. OF BOILERS	AT PPH	TOTAL MMBTU/ HR	HOURS	APPROX. % BOILER CAPACITY
EXIST&NO ACTION							
1-3-8-24 HR	Oil	94155	3	35185	116.75	--	80
Winter Average	Oil	55785	2	27895	69.18	876	70
Winter Average	NG	55785	2	27895	69.18	1284	70
Spring Average	NG	46775	2	23388	58.00	2208	60
Summer Average	NG	32323	1	32323	40.08	2208	80
Fall Average	NG	37824	1	37824	46.90	2184	94
MASTER PLAN 2022							
1-3-8-24 HR	Oil	125815	4	31454	156.01	--	80
Winter Average	Oil	74543	2	37271	92.43	876	94
Winter Average	Gas	74543	2	37271	92.43	1284	94
Spring Average	Gas	62503	2	31252	77.50	2208	80
Summer Average	Gas	43191	2	21596	53.56	2208	60
Fall Average	Gas	50542	2	25271	62.67	2184	60

NG = Natural gas.
PPH = Pounds of Steam Per Hour. MMBTU/HR = Million British Thermal Units Per Hour.

TABLE 5-27 BOILER SCENARIOS FOR AIR QUALITY ANALYSIS.

CRITERIA POLLUTANT	OIL	NATURAL GAS	LANDFILL GAS
Nitrogen Oxides (NOX)	0.2000	0.1000	0.0726
Volatile Organic Compounds (VOC)	0.001413	0.0055	0.02
Particulate Matter (PM)	0.0142	0.0076	0.019
Sulfur Oxides (SOX)	0.3043	0.0006	0.0564
Carbon Monoxide (CO)	0.0357	0.084	0.0152

TABLE 5-28 CRITERIA POLLUTANT EMISSION FACTORS (in lbs of pollutant per million BTU).

CRITERIA POLLUTANT	EXISTING	2022 NO ACTION LANDFILL GAS	2022 MASTER PLAN	
			NATURAL GAS	LANDFILL GAS
NOX	26.5	20.9	35.3	27.9
VOC	1.2	4.1	1.6	5.5
PM	2.0	4.3	2.6	5.8
SO_2	9.3	20.7	12.5	27.7
CO	18.2	4.2	24.3	5.6

TABLE 5-29 ESTIMATED CENTRAL HEATING PLANT EMISSIONS (in tons per year).

The central plant in Building 24 has five boilers. Each boiler has a separate stack 42 feet high above ground level and 40 inches in diameter. The stacks are aligned in a row over a distance of about 100 feet.

For analytical purposes, the stacks were combined into one equivalent stack in accordance, with Screening Procedures for Estimating the Air Quality Impact at Stationary Sources, Revised, USEPA, 1992.

National Ambient Air Quality Standards (NAAQS) pollutant criteria are measured or averaged over short term periods, 24 hours or less, or on an annual average basis. For short term conditions, it was assumed that the plant was generating steam at the maximum potential load (94, 155 PPH of steam) using No. 2 fuel oil firing (See Table 5-27). Calculations were based on the lowest exhaust temperature and flow rate applicable for each boiler scenario. Maximum annual emissions were based on 438 hours of oil fired operations, as indicated in the existing operating permit, with the balance of the year on natural or landfill gas.

The SCREEN3 model was applied using US EPA default options for general input. The program utilizes an internal set of meteorological parameters that test 44 combinations of wind speed and atmospheric stability to identify worst case dispersion scenarios. The 44 combinations cover the gamut of conditions that may be experienced at any geographical location, and in some cases they represent conditions, which are very infrequent or not applicable to a specific location. This leads to further conservatism in the model. The model also accounts for aerodynamic wake effects created by buildings (also identified as building downwash) in the vicinity of the stack source. Downwash limits the dispersion of emitted pollutants by causing the stack plume to reach ground level closer to the source. The regulatory downwash option was used in the model with Building 24 parameters (200 feet long, 130 feet wide, 28 feet high).

The model was run with a unit emission rate of one gram per second to obtain a normalized concentration factor. The normalization factors for existing and projected 2022 Master Plan Alternative short term conditions as determined by the Screen3 program were 142.6 and 190.2 micrograms per cubic meter/gram per second, respectively. Pollutant specific emission rates in grams per second were computed. These were multiplied by the appropriate normalization and scaling factors to obtain estimated concentrations.

The SCEEN3 model estimates maximum one hour average plume concentrations. To estimate concentrations for longer averaging periods, US EPA specified scaling factors were used. The 3-hour, 8-hour, and 24-hour average concentrations were obtained by multiplying the one hour modeled concentrations by 0.9, 0.7, and 0.4, respectively. The average annual concentrations were determined by multiplying the annual maximum one hour modeled concentration by the US EPA factor of 0.1.

Analysis results are summarized in Table 5-30. Values were computed for a receptor site located at a residence on the south side of Greenbelt Road that is the closest to the plant. The distance to the residence is about 1,620 feet. All estimated existing and projected total pollutant concentrations are less than NAAQS criteria. Except for sulfur dioxide, plant plume contributions to the total concentrations are relatively small

5.5.3.2 Emergency Power Generator Air Quality

NASA has two central Emergency Power Plants, one located in Building 24C on the west campus, and one in Building 31 on the east campus. The plants assume mission critical electric power loads around NASA GSFC when public utility service is lost or interrupted, and continue operating until normal

	BUIDLING 24 PREDICTED	GENERAL BACKGROUND	TOTAL	NAAQS
Existing				
Carbon Monoxide (CO)				
1 hour	25	6900	6925	40000
2 hours	18	4000	4018	10000
Sulfur Dioxide (SO_2)				
3 hours	192	170	362	1300
24 hours	85	67	152	365
Particulate Matter (PM)				
24 hours	2	64	66	150
Annual Sulfur Dioxide	0.7	17	18	80
Annual PM	0.4	24	24	50
Annual Nitrogen Oxides (NO_x)	3	53	56	100
2022 Master Plan				
Carbon Monoxide (CO)				
1 hour	33	4600	4633	40000
8 hours	23	2700	2723	10000
Sulfur Dioxide (SO_2)				
3 hours	256	170	426	1300
24 hours	114	67	181	365
Particulate Matter (PM)				
24 hours	3	64	67	150
w/Natural Gas				
Annual Sulfur Dioxide	1.0	17	18	80
Annual PM	0.5	24	25	50
Annual Nitrogen Oxides (NO_x)	4.4	31	35	100
w/Landfill Gas				
Annual Sulfur Dioxide	2.4	17	19	80
Annual PM	0.7	24	25	50
Annual Nitrogen Oxides (NO_x)	3.6	31	35	100

TABLE 5-30 ESTIMATED CENTRAL BOILER PLANT EMISSION CONCENTRATIONS (in micrograms/cubic meter).

service is returned. The plant in Building 24C has five 1,000 kW and three 500 kW generators, while five 1,450 kW units are located in Building 31. NASA also operates portable generators ranging up to 500 KW in size to meet temporary increases in power demands at individual buildings. All the generators run on No. 2 fuel oil, exclusively.

Nitrogen oxides emissions produced by the emergency diesel generators were assessed based on the emission factors given in EPA AP-42. Table 3.4.1 for large stationary diesel engines. If the generators

are operated to the permit limits, then the annual nitrogen oxides emissions are estimated to be 16.05 tons. In general, actual emissions are far less as the units are run only as needed or in runs required by testing and maintenance schedules.

5.5.4 Ozone Depleting Substances

Chlorofluorocarbons (CFC) and hydrochlorofluorocarbons (HCFC) have been used ubiquitously for decades as the refrigerant of choice in large capacity industrial, commercial, and institutional air conditioning equipment. They possess excellent heat transfer properties, are nontoxic, nonflammable, safe to handle and use, and they do not break down physically or chemically when used as a refrigerant. In refrigeration and air conditioning units, they are contained within sealed chambers and piping. Releases only occur from occasional leaks, or when material is not captured during unit repair or discard. However, CFC's have been indicted as one of the primary contributors to ozone destruction in the upper atmosphere, particularly around the Earth's poles. The US EPA has defined the Ozone Depletion Potential (ODP) as the ratio of the impact on ozone that a chemical has when compared to the impact of a similar mass of CFC-11. Refrigerant R-11 is CFC-11, and R-12 also has an ODP of 1.0. Refrigerant R-22 (HCFC) has an ODP of 0.05.

The Clean Air Act Amendments of 1990, and the International Montreal Protocol of 1992 call for the gradual phase out of ozone deleting substances. Subsequent EPA regulations have accelerated phase out. Production of R-11 and R-12 refrigerants ceased on December 31, 1995, and foreign import is prohibited. Units using these refrigerants may continue to do so pending availability of existing stock and reclamation or recycling. EPA estimates that R-12 will be available from these sources without shortages at least through 2005.

R-22 has a much lower ODP than R-11 or R-12, and is acceptable for continued use. Phase out will begin in 2010, when it will be made available only to equipment using R-22 that was installed prior to January 1, 2010. All production of R-22 will cease in 2020.

Chiller units in the NASA central refrigeration plants use CFC and HCFC refrigerants. Chillers 3 and 4, the oldest at Building 24, use R-11 refrigerant. Units 7 and 8 use R-12, and the newest units, 5 and 6 along with all the chillers in the east plant in Building 31, use R-22. NASA would replace chillers 3 and 4 with similarly sized units within the next ten years. They will reach their average 25-year life expectancy in 2010. The replacement chillers would have non-CFC refrigerant. These replacements would occur under both the Master Plan and No Action Alternatives.

5.5.5 Air Quality Conformity

The NCI AQCA is in serious nonattainment for ground level ozone. The State Implementation Plan, Phase II Attainment Plan, outlines programs and policies for achieving attainment. Attainment will be gained by satisfying the NAAQS one-hour ozone criteria for three consecutive years. Computer modeling of the Phase II Attainment Plan program indicates that this likely to occur in 2003-2005.

Transportation related conformity is determined regionally by the Metropolitan Washington Council of Governments through computer modeling of emissions from vehicles on the regional road network within the NCI AQCA. General conformity is considered on a more local scale.

Ozone is not generated directly, but is created through a photochemical reaction between nitrogen oxides and volatile organic compounds (VOC). Control of ozone is achieved through control of emission criteria applicable to nitrogen oxides and VOC emissions. At GSFC, all of the nontransportation sources combined produce less than the annual 50 ton nitrogen oxides or VOC.

The Facilities Master Plan Alternative has a 20-year planning horizon. It is expected that the NCI AQCA will reach attainment by 2022 Implementation of proposed Facilities Master Plan projects will be spread out over this period. It is anticipated that the GSFC will still produce less than 50 tons of nitrogen oxides and VOC, even if all proposals are implemented. Nevertheless, individual projects will be reviewed for conformity to the State Implementation Plan, as they are implemented.

5.6 WASTE

5.6.1 Solid Waste

Solid waste is general or municipal waste composed of trash, garbage, and refuse including paper, glass, ashes, plastics, and newspapers. In 1980, about seven million tons of solid waste were generated annually in Maryland. About 85 percent of this material was sent to sanitary landfills. In response to Federal and State regulations, Maryland adopted a Statewide Solid Waste Management Plan. While sanitary landfills are one of the least preferable alternatives, they are the backbone of the public solid waste disposal system. The plan called for maximization of existing landfill life through implementation of integrated waste management, while protecting the natural environment and quality of life. Measures within the management system included reduction of waste generation at the source; separation, recovery, and recycling of materials; incineration, where appropriate; and more efficient use of landfills.

Maryland jurisdictions with populations greater than 150,000 such as Prince George's County, were directed by the Maryland Recycling Act of 1988 and COMAR 26.03 to prepare specific solid waste management plans detailing facilities and management measures that would lead to reductions in solid waste generation, and disposal at landfills on a per capita basis. These jurisdictions had to demonstrate a 20 percent reduction in the waste stream by 1994.

In 1989, Prince George's County passed the County Solid Waste Recycling Act (CB-58-1989), which formed the County Office of Recycling, and established goals for recycling. The goals were:

July 1, 1991	10% of solid waste
July 1, 1995	25% of solid waste
July 1, 1997	30% of solid waste
July 1, 1999	35% of solid waste

Further, the legislation established the concept that recycling would be voluntary as long as the County is able to achieve these goals (Ten Year Solid Waste Management Program, P.G. County, 1998).

Solid waste is collected across the County by a mix of County and municipal trucks as well as private contractors. The great bulk of disposal, less recycled and recovered items, occurs at the Brown Station Road sanitary landfill in Upper Marlboro.

Solid waste at NASA GSFC consists of office waste, plastics, glass, wood, trash, and cafeteria waste. Waste is collected by custodial staff and placed in dumpsters located around the facility. A private contractor then picks up the waste and hauls it to the County sanitary landfill.

Recycling is separation and recovery of materials before they enter the waste stream and diversion of these materials to special treatment, reuse, or the manufacture of new products. Goddard recycles "standard items" such as white and mixed paper, cardboard, aluminum soda cans, ferrous and nonferrous

metals, and glass and plastic containers (Table 5-31). Materials are collected by several contractors. Since 1990, efforts have been concentrated through several programs to reduce generation and disposal volumes through increased recycling under the auspices of the Facilities Management Division. In addition to the above recycled materials, Goddard also separates a number of other items, identified as additional recycled materials in Table 5-31, from the solid waste stream.

The volume of waste generated at Goddard varies irregularly from year to year, depending on active NASA missions. Waste generation has been relatively constant over the last three years. The annual percentage of recycled standard item material, considering only standard items, has been consistently around 20 to 25 percent since Fiscal Year 1991, although a 27 percent rate was achieved in Fiscal year 1998.

Long term projections for solid waste generation and recycling at GSFC are difficult to make. It is estimated that solid waste generation will remain between 1,550 and 1,600 tons per year under both the Master Plan and No Action Alternatives. After the initial stages of waste minimization and recycling programs, incremental gains in waste reduction and recycled material amounts are more difficult to achieve and smaller in scope. Realistically, it is estimated that GSFC will be able to continue recycling about 25 percent of solid wastes in the form of white paper, cardboard, aluminum cans, metal scrap, glass and plastics under both the Master Plan and No Action Alternatives.

5.6.2 Hazardous Waste

Hazardous waste consists of discarded nonradioactive materials and chemicals defined as Hazardous Waste (40 C.F.R. 261), Hazardous Substances (40 C.F. R. 302.4), Hazardous Materials (49 C.F.R. 171.8), and Controlled Hazardous Substances (COMAR 26.13.02). Management and disposal regulations for hazardous waste are found in 40 C.F.R. 260-270 and COMAR 26.13.

Since the amounts of hazardous material waste can exceed 1,000 kilograms (Kg) per month, GSFC is classified by EPA as a large quantity hazardous waste generator. GSFC has been assigned US EPA hazardous Waste Generator Identification Numbers MD 9800013865 (Main Site), MD0001145895 (Area 200) and MD0001145911 (Area 400).

Handling, use, and storage of hazardous materials and wastes are overseen by the Safety and Environmental Branch (SEB). The SEB has professionals in safety, health, fire protection, radiological safety, hazardous waste management and environmental compliance. It provides oversight through inspection, monitoring, training and management for a "less than 90 day" hazardous waste staging facility. Materials Safety Data Sheets are maintained for all chemicals kept at the site and containers are labeled in accordance with regulatory requirements. Personnel working with hazardous materials and hazardous waste are trained in hazards, safety, waste minimization and emergency response procedures.

Hazardous wastes generated at NASA Greenbelt are accumulated in secured areas within the building of origin throughout the facility. Each generator identifies the waste with the assistance of Environmental Branch personnel. Pickups are then scheduled, and the waste is transported to Building 27A on the east side of Soil Conservation Road for consolidation, packaging, labeling, and preparation of transport manifests, all in accordance with Federal regulation procedures. The waste may be stored up to 90 days after the date of original accumulation or generation at Building 27A. Waste is transported off site to treatment or ultimate disposal sites by one of a group of licensed private contractors. Each contractor specializes in specific types of hazardous waste. NASA audits Contractor performance to ensure compliance with Federal and state regulations. Records and manifests pertaining to shipment and disposal are retained on file.

	FISCAL YEAR 1998	FISCAL YEAR 1999	FISCAL YEAR 2000
SOLID WASTE TO DISPOSAL	1,557 tons	1,593 tons	1,595 tons
STANDARD ITEMS			
White Paper	297 tons	262 tons	144 tons
Mixed Paper	16	29	15
Baled Cardboard	84	49	32
Aluminum Cans	3	4	3
Scrap Metal	153	141	108
Glass/Plastic	2.4	4.1	3.1
SUBTOTAL	555 tons	489 tons	305 tons
ADDITIONAL RECYCLED MATERIALS			
Toner Cartridges (units)	1,559	2,880	3,690
Fluorescent Light Tubes (units)	7,110	9,673	17,096
Batteries (units)	411*	7,055	7,251
Oil Filters (units)	604	307	30
Tires (units)	97	93	0
Antifreeze (gal.)	62	62	50
Refrigerant (lbs)	140	---	20
Waste Oil (gal.)	1,130	498	500

* Measured in pounds.
Source: NASA Annual Solid Waste and Recycling Reports.

TABLE 5-31 NASA GSFC SOLID WASTE AND RECYCLING.

NASA Greenbelt generated 26,083 lbs of hazardous waste in 1999. Waste types include acidic solutions from laboratories, flammable waste, heavy metal solution waste from the electroplating shop, mercury from thermometers, and solvent and paint waste from spacecraft and component fabrication.

About 70 percent of the waste is transported offsite in mixed "lab packs" with the remainder in bulk form. The laboratory packs generally contain small quantities, less than 5 gallons, of specific types of waste accumulated since the last transport shipment.

Projection of future hazardous waste generation is uncertain. It is estimated that generation would be similar under the Master Plan and No Action Alternatives, and within 10 to 15 percent of existing levels. The Master Plan Alternative proposes relocation of the site storage facility to Building N on the east campus. No substantial change in the site collection, handling and storage, or shipment of the waste is expected.

Procedures for control and minimization of hazardous waste are covered in the GSFC Storm Water Pollution Prevention Plan (SWP3 Plan), and the GSFC Integrated Contingency Plan. The latter document combines the Hazardous Materials Contingency Plan and the Spill Prevention, Control, and Counter Measures Plan. Employees involved with hazardous materials and waste attend annually held training classes.

Goddard evaluates pollution prevention opportunities on a continuing basis. Measures include source elimination, reduction of materials used and waste produced, and reuse and recycling of waste to reduce hazardous waste disposal volumes. Pollution prevention and control programs would continue under both alternatives.

5.6.3 Radioactive Waste

Activities involving byproduct radioactive material are strictly controlled by the Nuclear Regulatory Commission (NRC) through regulations that are in 10 C.F.R. parts 19, 20, 30 and 35, the U.S. Department of Transportation (49 C.F.R. Part 171), and the U.S. EPA (40 C.F.R. part 60).

Radioactive materials are controlled at Goddard through a comprehensive radiation safety and protection program. The program is managed by SEB and implemented by the Radiation Safety Officer and is overseen by the Radiation Safety Committee (RSC).

NASA Greenbelt is permitted by the NRC to use and store radioactive and radioactive contaminated materials under NRC license 19-05748-02, a Type A Broadscope License. NRC issues these licenses to facilities that have comprehensive radiological protection programs. They authorize possession of a wide variety of radionuclides, eliminating the need for separate permitting or licensing each time a new radionuclide is introduced to the facility. The license, however, sets limits on the overall amount of radioactive material, and the amount of individual radionuclides that may be held at any one time in terms of radiation units (curies). Conditions, as defined in 10 C.F.R. 36, governing use, storage, and disposal are also set. Possessors of Type A Broadscope licenses are required to have a strong and systematic management program including a Radiation Safety Officer and a Radiation Safety committee to assure that day to day operations are conducted in a safe and sound manner. The current license will remain in effect until the NRC issues and renewal.

NASA has a second NRC license (19-05748-03), which authorizes NASA GSFC to store and operate three Cobalt-60 irradiator units. They are located in the Radiation Effects Facility in Building 22. The units are used for studies of radiation effects on spacecraft, spacecraft components.

Goddard possesses a number of generally licensed radioactive materials that are naturally occurring or accelerator generated. It also has electric power driven ionizing radiation sources that are licensed. All sources of ionizing radiation are managed by the Radiation Safety Committee. Three particle accelerators are housed in Building 22. They include 1 MeV (million electron volt) and 2 MeV Van de Graaf linear accelerators, and a 100 thousand electron volt simplex linear accelerator. All three are used for testing and integration of spacecraft hardware. About 15 X-ray generating machines are housed in various buildings around the west campus. These machines are used in research, and in testing or examining spacecraft components for internal hidden flaws.

Goddard generally possesses only a small fraction of the quantity radioactive material allowed by the NRC general research and development license at any one time. An average of less than one 55-gallon drum of low level radioactive waste is generated each year and shipped offsite for disposal. Since NASA has so little radioactive waste, off site transport and disposal is handled by a private contractor under a general U.S. Army contract serving several Federal agencies in the Washington area. Pick up occurs on an as needed basis.

No substantive changes in the character and amount of radioactive material and waste handled at NASA GSFC are anticipated for the foreseeable future under either the Master Plan or No Action Alternatives.

5.7 Historic Properties

Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the US Department of the Interior. The term includes artifacts, records, and remains that are related to and located within such properties (36 C.F.R. 800.16). Historic properties are identified as cultural resources within NASA policies (Implementing the National Environmental Policy Act and Executive Order 12114, NPG8580.1). The Master Plan is not an "undertaking" for purposes of Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. § 470 f), since it is conceptual. Potential effects on historic resources would occur only if and when Proposed Master Plan Actions were implemented. NASA acknowledges that Section 106 responsibilities may be triggered when this occurs during individual project development.

Directives of the National Capital Planning Commission require that impact assessments for Federal facility Master Plans include review of effects on historic properties. To assess these effects, the regulations of the Advisory Council on Historic Preservation (36 C.F.R. Part 800) were followed.

Under the relevant Criteria of Adverse Effect an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, settings, materials, workmanship, feeling or association. Adverse effects may include reasonable foreseeable effects caused by the undertaking that may occur later in time, be farther in distance or be cumulative (36 C.F.R. 800.5(a)(1)).

The NASA GSFC Facilities Master Plan proposes no actions that would have direct adverse effects on known historic resources. The most likely potential effect would be the indirect introduction of visual, atmospheric, or audible elements that would diminish the historic property's setting.

For Facilities Master Plan evaluations, the area of potential effect is defined as all NASA property, and an area extending 0.5 mile (about 1 km) beyond the property boundaries. The area of potential effect means the geographic and or areas within, which an undertaking may directly or indirectly cause these alterations in the character of the historic property (36 C.F.R. 800.16(d)).

To meet its past obligations under Section106 and 110 of the NHPA, as amended, and the Archeological Resources Protection Act, NASA has had a number of studies prepared. These studies provide background information on cultural context and identify existing resources on NASA property and its immediate environs. These studies are:

1. Phase I Archeological Survey of the NASA Earth Science Building Site, Prince George's County, Maryland, N.J. Kassner, et al, 1999
2. Architectural and Archeological Cultural Resource Inventory of NASA GSFC, Greenbelt, Maryland, O. Miller, et al, 1992.
3. Historic Preservation Plan, Spacecraft Magnetic Test Facility, Building 305, NASA GSFC, Greenbelt, Maryland, S.P. Dixon, 1996.

4. Phase I Archeological Reconnaissance Survey Strategy, NASA GSFC, Greenbelt, Maryland, R.A. Geidel, 1996.
5. Determination of Eligibility, Historic Standing Structures, NASA GSFC, Greenbelt, Maryland, S.P. Dixon, 1997.
6. Phase I Archeological Reconnaissance Survey, NASA, GSFC, Greenbelt, Maryland, KCI Technologies, 1999.
7. Phase I Archeological Survey, NASA GSFC, Soil Conservation Road Relocation, Greenbelt, Maryland, EAC/A, 2002.
8. Phase II Archeological Investigations at Sites 18PR548, 18PR549, and 18PR551, NASA GSFC, Greenbelt, Maryland, John Milner Associates, 2002.

The following sections summarize information for these reports.

5.7.1 Historic and Architectural Resources

5.7.1.1 Identified Historic Resources Located Outside GFSC

Five historic resources have been identified in the area of potential effect outside of the NASA boundaries (Historic Sites and Districts Plan, Prince George's County, Maryland, M-NCPPC, 1992). They are:

- Baltimore-Washington Parkway Historic District (Site 69/26)
- City of Greenbelt Historic District (67-4)
- Perkins Chapel and Cemetery (Site 64-5) – 8500 Springfield Road
- Hayden Farm (Site 64-4) – Beaverdam Road
- Dorsey Chapel (Site 70-28) – 10704 Brookland Road

The Baltimore-Washington Parkway Historic District is listed on the National Register of Historic Places. It covers 1,353 acres consisting of right-of-way in a 19-mile long section between the city limits of the District of Columbia and Baltimore. It was promoted as early as 1920 to alleviate traffic congestion on US Highway 1 between the two cities. Authorization was given in 1930 to the National Capital Park and Planning Commission (now NCPC) to acquire land for right-of-way. Funding for design and construction was not made available until 1950. It opened to traffic in 1954.

The Parkway was designed as a defense highway to be used as an alternative commuter route in a parkway landscape architecture setting. Stylistically, it presents the culmination of a 50-year continuum of parkway construction, and is one of several parkways such as the Mount Vernon Memorial Parkway, the Suitland Parkway, the George Washington Memorial Parkway, and the Rock Creek and Potomac Parkway, that were intended as access for the Nation's capital in a park setting. The Baltimore-Washington Parkway is unique in using a design that coupled preservation of the natural topography and vegetation for scenic purposes with the high speed elements of modern freeway design. Its design speed is 75 mph while the other parkways had considerably lower design speed. Landscaping was designed by protégés of Federick Law Olmsted, Jr. a noted early 20th century landscape architect. In 1982, it was dedicated to Gladys Noon Spellman, a Maryland Congresswoman.

The Baltimore-Washington Parkway Historic District includes many contributing elements of landscape architecture. The dual 4-lane roadway has a variable width median and is flanked throughout by natural forest. These are also approximately 125 contributing structures including 18 bridges and numerous decorative culverts and retaining walls.

The important features that should be preserved as indicated in the National Register nomination are:

- Right-of-way with heavy vegetation.
- Opposing roadways separated by a variable median.
- Curvilinear road alignment
- Stone faced bridge abutments.
- Contour grading to fit topography.

GSFC abuts the Baltimore-Washington Parkway at the far northwest corner of an extension of the west campus, where an interchange provides access to Gate 3 via Explorer Road. Parkway right-of-way is relatively narrow at this point. On the east side, it extends outward about 65 feet from the edge of the northbound lanes. Parkway right-of-way in the vicinity of the interchange is forested on both sides. Except for Explorer Road, all of the NASA property in this area is forested so that GFSC facilities are screened from the Parkway. Bridges, culverts, and walls at the interchange are not contributing elements within the Historic District.

The City of Greenbelt Historic District is also listed in the National Register of Historic Places. It is located on the west side of the Baltimore-Washington Parkway sharing a common boundary with the Parkway between Greenbelt Road and the Beltsville Agricultural Research Center to the north of the NASA interchange. The district encompasses the area covered by the original "greentown" plan as developed by the U.S. Resettlement Administration, and designed and built between 1935 and 1941. Greenbelt is considered to be the most successful and intact example of the "greentown" concept in the U.S.

The city was conceived as a model for redressing the nation's shortage of housing for those of low and moderate income, and as a format demonstrating a self sufficient community in terms of utilities, basic shopping services, open spaces, and recreation. The historic district area retains its original layout plan, and the minimally ornamented, International style buildings have undergone few additions and alterations.

Contributing elements within the District include the Greenbelt Center School at 15 Crescent Road (Site 67-4-1), and three cemeteries (Hamilton, Turner and Walker families) (Site 67-4-3), which predate the development of Greenbelt. Built in 1937, the school is an L-shaped, white concrete block building that is an outstanding example of the streamline Art Deco style. It served as a cultural center and visual landmark in the early stages of Greenbelt development.

NASA is separated from the Greenbelt Historic District by the Washington-Baltimore Parkway, and by intervening residential development within the city, but outside the historic district in the triangular area between the GSFC west campus and the Parkway. The point of closest approach between GFSC and District occurs in the vicinity of the NASA/Parkway interchange. The sector of Greenbelt in this area is forested, remaining lightly developed as in the original plan.

The Perkins Chapel and Cemetery are situated on a 5.5 acre tract at the Springfield/Good Luck Road intersection. The tract forms a salient projection into Goddard Area 400, which borders it on the northwest and southwest sides. The chapel is a 4-bay, one and a half story, gable roofed frame meeting house with dimensions of 37 by 26 feet. The chapel was built in the 1860's on one acre of land during a period when there was a division in the Methodist Episcopal Church over the slavery issue. James Turner Perkins, who donated the land, lived just northwest of Area 400. The deed transferring the property to the church was executed in 1869. Remaining portions of the tract were purchased from BARC in 1958. A cemetery with stones dating to 1871 surrounds the chapel on all but the east side.

The chapel and cemetery are of local historical significance, because the chapel is one of only a few rural chapels surviving from the mid-nineteenth century. It is closely associated with three other small churches, none of which survive. Goddard is undeveloped in the vicinity of the chapel. The site is screened from the nearest facilities in the center of Area 400 by 1,000 feet or more of intervening forest.

The Hayden Farm is a complex of five buildings located on the north side of Beaver Dam Road between NASA Areas 100 and 200. It comprises a two and a half story, cross-gabled frame dwelling, small and large barns, and two water pump houses. It has been incorporated into the Beltsville Agricultural Center Research Center. Newer structures have been added to the site, and on the opposite side of Beaverdam Road.

The site is of local significance because it is a fine example of a large early twentieth century dairy farm, which is somewhat unusual in a county oriented toward tobacco and grass crops. The site is located on a tract known as Forest Manor that was first farmed in the late nineteenth century. The tract was purchased in 1911 by Ernest Jenkins, who bought up other adjoining properties to create a dairy farm that covered over 1,000 acres, a size comparable to Goddard today. Buildings date to 1912. The property was sold by James Hayden, a subsequent owner, to the Federal government in 1933. BARC agricultural research fields and woods extend outward in all directions from the site. Antenna test towers in Areas 100 are the only Goddard features seen from the site.

The Dorsey Chapel (Brookland M.E. Church) is a one-story, frame, meeting house chapel with Gothic arch windows, a turned finial, and an ornamental shingle-covered front entrance gable. It is located about one half mile southeast of the east campus. The chapel was a focal point for the rural black community of Brookland. Built in 1900, it is the most highly ornamented of the County's black Methodist chapels dating from the turn of the century. The intervening area between NASA and the chapel is now being converted from woodland to residential use.

5.7.1.2 Identified Historic Resources Located on GSFC

The Spacecraft Magnetic Testing Facility, Building 305, is used for testing and research on the magnetic field effects on spacecraft and individual equipment components. The facility also evaluates spacecraft magnetic field control systems, and calibrates precision flight magnetometers that measure magnetic forces.

Nominated in 1984, the Spacecraft Magnetic Testing Facility is listed in the National Register of Historic Places. It has also been designated as a National Historic Landmark as part of the "Man in Space" theme program undertaken by the National Park Service and applied to military and NASA facilities. As such, it is one of 20 NASA sites that are in the program at various locations throughout the U.S., although it is the only one at Greenbelt (S.P. Dixon, 1996).

Built in 1966, it is one and a half stories high on a square footprint about 60 feet on a side. The exterior framing and enclosure, and interior building components are constructed, entirely of nonmagnetic materials. The National Register nomination for the facility describes nine significant elements that contribute to the mission and operation, and without which, the facility would be hampered or unable to convey or illustrate aspects of its historic use (ibid.). These elements are:

a) The 44-foot diameter, 3-axis, Braunbek magnetic coil system. The system generates magnetic fields including one that cancels the Earth's field. Earth field cancellation can be achieved over a 6-foot diameter spherical space at the coil center. Magnetic field intensity can be varied from zero to 60,000 nanotesla in steps of 0.1 nanotesla, and hold values with a uniformity or stability of 0.001 percent.
b) The 8-foot diameter power driven, gimbaled turntable at the center of the coil test area. The turntable permits variance in the orientation of the test object. It can be rotated around any axis at rates ranging from zero to 100 radians per second.
c) The nonmagnetic track and dolly system used to move items in and out of test areas. Items weighing up to 5,000 lb can be handled.
d) The 9-foot, 5-inch diameter Helmholtz coil system providing AC and DC field exposure, and used for magnetizing or demagnetizing test items.
e) The nonmagnetic torquemeter used to measure magnetic torques.
f) The truck lock with 14 by 15 foot doors.
g) The 3-ton capacity hoist in the truck lock.
h) The 2.5-ton capacity fixed location hoists at the Braunbek coil.
i) The building air conditioning system with high-efficiency particulate (HEP) air filters capable of maintaining Class 10,000 clean room conditions.

Building 305 is located in satellite Area 300. It is the largest of a group of small buildings sited in clearings near the center of the area. Proper operation requires isolation from all outside manmade magnetic sources. All facilities in Area 300, except for the control building (302) near the perimeter gate, are surrounded by a forest buffer extending to the area perimeter. Perimeter fencing further protects the building, and access is limited to a portal through a guarded gate, since items such as metal objects, radios, or cell phones can affect equipment and instrumentation.

NASA continues to use the facility actively. Management and operation of the facility is performed in accordance with a Programmatic Agreement executed in 1989 between NASA, the National Conference of State Historic Preservation Officers, and the Advisory Council for Historic Preservation (see S.P. Dixon, 1996). Further, NASA has prepared a Historic Preservation Plan that delineates requirements when changes, alterations, or demolition of the facility or its historically significant components may occur (ibid.). The plan delineates these types of activities into three general categories of undertakings: (A) those which require consultation with the Maryland Historical Trust and Advisory Council for Historic Preservation before proceeding, (B) those which require the development and implementation of mitigation measures, and (C) those that may be undertaken directly. The programmatic agreement and preservation plan permit NASA to make changes in operational and research requirements, while still honoring the intent of preservation regulations.

- Other Resources

Only one structure at NASA GSFC predates 1961. Building 101 (Site 64-9) is found in Area 100, the Antenna Test Range, on Beaverdam Road. It is a farm house dating from the late 19th or early 20th century. It has been determined to be ineligible for listing in the National Register because it does not possess integrity or historic significance (S.P. Dixon, 1997).

5.7.2 Archeological Resources

GSFC lies within Maryland Archeological Research Unit 11, Riverine Potomac Drainage. NASA has completed a number of investigations to determine the cultural resources at GSFC. A preliminary study, intended as a tool for prioritizing further work and consultations with review agencies, defines the research area, provides historic and cultural overviews to establish a context for encountered resources, and inventories known or identified resources within and around Goddard (O. Miller, et al., 1992). No field

work was completed, but NASA real property records, including plans for alterations and remodeling of facilities, the general literature, and archival records at the Maryland Historical Trust and other pertinent organizations were reviewed.

The most important outcome of this preliminary study was the development of a predictive archeological model for the Goddard site. Research of archival files revealed documentation for 28 archeological sites outside of Goddard, but within 4 miles of GSFC boundaries on the US Geological Survey Beltsville, Laurel, and Lanham topographic quadrangle maps. Ten of the 28 sites were archeologically sterile. Within the 18 identified sites where material was recovered, 14 were identified as prehistoric sites and four were historic. Of the 14 prehistoric sites, five possessed Archaic Period components, three possessed both Archaic and Woodland Period components, and six could not be dated. The four historic sites consisted of foundations for an 18th century plantation, and three sites occupied during the 19th century.

Detailed analysis of the sites revealed that 17 of 18 of them were located within 850 feet of water sources. Prehistoric sites were particularly associated with water. Six of the eight sites with an Archaic component were located within 200 feet of a stream, and all three Woodland sites were within 230 feet of a water course. Fifteen of the 18 sites were located in stream floodplains, or on terraces adjacent to the floodplain. All the prehistoric sites were found at elevations between 80 and 120 feet above sea level (ibid.). Using this data, Miller's predictive model divided NASA GSFC into areas of relative sensitivity or potential for prehistoric archeological sites. More than half of Goddard has a low potential for such sites.

The potential for historic sites was determined through analysis of the Hopkins Atlas of 1878, which revealed that about ten habitation sites were present within the confines of Goddard or close to its property boundaries. Seven of the ten sites conform to the parameters in the predictive model for potential historic sites in terms of proximity to water sources and site ground elevation.

Field investigations have determined that the predictive model is a good one. Kassner investigated about 105 acres of area with low potential for prehistoric sites, as indicated by Miller, in the southern portion of the east campus and encountered no evidence of prehistoric or historic activity (Kassner, et al., 1991). A more recent Phase I reconnaissance survey covered the remainder of GSFC, excepting only Areas 100 and 200 which are occupied by NASA under permit from BARC (KCI Technologies, Inc., 1999). The Phase I investigation was completed by using a written research and field work protocol or strategy that was found suitable for Goddard conditions by the Maryland Historical Trust (MHT).

The Phase I reconnaissance survey revealed the presence of two prehistoric and two historic period sites on Goddard property. Phase II investigations of three of the sites were conducted in the summer of 2002. The results are summarized in the following sections.

5.7.2.1 Prehistoric Archeological Resources

The prehistoric period archeological sites are located on the east campus.

- Site 18PR548

Phase I investigations identified this 0.94 acre prehistoric site on the north side of an unnamed stream. No diagnostic artifacts were identified during the Phase I investigation, but a possible buried soil horizon was noted. Phase II investigations at site 18PR548 included the excavation of seven test units placed at locations where Phase I shovel tests found artifacts.

Phase II excavations conducted by John Milner Associates in 2002 exposed a soil profile that contains a plow zone or disturbed surface stratum over a truncated buried soil horizon from which prehistoric artifacts were recovered and a platform hearth feature was found. Examination of the soil profile indicates that the majority of the prehistoric occupation is contained within the intact portion of the soil horizon. The plow zone is shallow. This stratum may reflect timbering of the site or the use of the site for pasture rather than plowing.

One diagnostic artifact and several tools were recovered from the site. A diagnostic quartzite projectile-point base (Bare Island) provide evidence that the site was occupied between 3000 and 2000 BC. Bare Island projectile points have been recovered from several other sites in Prince George's County. During the Bare Island stage of the Late Archaic Period, the local population probably maintained a sylvan adaptation to the eastern deciduous forest, focusing on nut-bearing trees; deer and turkey probably provided most of the meat in their diet. Later in the Late Archaic settlement and subsistence activities shifted toward riverine settings.

Preliminary examination of the lithic debitage and tools from the site, indicates that the sites inhabitants obtained local quartzite cobbles exposed in the nearby stream and manufactured tools at the site. This interpretation is based on the types of quartzite waste flakes recovered in the test units. Other less common raw materials include rhyolite and quartz. In addition to the projectile point, tools included bifacially flaked knives and bifaces. A fragment of possible ryolite body adornment or drill was also found.

An intact platform hearth was found. The hearth measured approximately 20 inches in diameter and consisted of one layer of fire-cracked-rock. No organic material has survived within the hearth. The hearth was constructed on the ground surface and no associated pit or depression was identified.

The significance of site 18PR548 lies in the fact that the single-component prehistoric Late Archaic occupation is contained in a stratigraphic context that has retained integrity. The site has the potential to contain significant information in the form of additional features, artifacts, and artifact concentrations. Therefore, site 18PR548 is eligible for inclusion in the NRHP.

- Site 18PR550

Materials recovered from this site during the KCI Phase I survey include chipping debitage similar to that found at Site 18PR548, but at a much reduced density. A quartz sided-notched projectile point from the Late Archaic Halifax Period was found in isolation from the other material. The Phase I survey determined that the site was not eligible for listing on the National Register of Historic Places.

5.7.2.2 Historic Archeological Resources

Analysis of the 1878 Hopkins Atlas map for the area in the vicinity of Goddard indicates that there are ten potential historic sites or habitations that are within or immediately adjacent to property now occupied by GSFC (O. Miller, et al., 1992) (Table 5-32). These sites have been given names corresponding to those given in the atlas as occupants. Eight of the ten sites were investigated in the Phase I Reconnaissance Survey.

SITE	LOCATION	INVESTIGATED	DISPOSITION
Linthicum	West Campus	Yes – STP(1)	No trace
Smith	West Campus	No	Site occupied by NASA facilities
Cross	East Campus	Yes – STP(1)	No trace, but see 18PR549
Brashears	East Campus	Yes – STP(2)	No trace, site now stormwater pond
Hall	Area 300	Yes – STP(1)	No trace
Talbert(3)	Area 300	Yes-visual(1)	No trace, no STP necessary
Talbert(4)	Area 300	No	May be present
Jones	Area 200	Yes-STP(1)	Potentially eligible NRHP
18PR549	East Campus	Yes-STP(1)	Potentially eligible NRHP
18PR551	East Campus	No	Possibly on NASA property
Dugan	Outside Area 200	Yes-visual(1)	No trace on NASA property
Perkins	Outside Area 400	Yes-visual(1)	No trace on NASA property

(1) by KCI Technologies (1999)
(2) by Kassner (1991)
(3) Wheelwright shop
(4) Blacksmith shop
STP = shovel test pits were dug.
NHRP = National Register of Historic Places

TABLE 5-32 POTENTIAL HISTORIC ARCHEOLOGICAL SITES ON OR NEAR GODDARD.

One site, the Smith property, was apparently located near the center of the west campus in the vicinity of the Goddard Road/Explorer Road intersection. This site, and its archeological context, is presumed to be demolished by the earliest construction at Goddard in the early 1960's. No trace of five additional sites was uncovered in the locations suggested by 1878 mapping, despite close visual inspection, and the digging of shovel test pits by both Kassner and KCI Technologies. Two of the sites, Jones and Dugan, are within or just outside of the NASA Area 200 boundary. They were not investigated and may be present. The Perkins site is just beyond the Area 400 boundary. The adjacent area within GFSC was visually inspected, but no evidence of the Perkins site was found.

Two historic sites that do not correspond to 1879 Hopkins Atlas potential sites, were explored in the Phase I reconnaissance survey. One (18PR549) was a new discovery, while the other (18PR550) was known previously by NASA employees. Both sites were in locations with a moderate to low historic archeological sensitivity as indicated by Miller.

The sites were investigated further by a Phase II investigation conducted by John Milner Associates.

- Site 18PR549

Site 18PR549 was identified during Phase I investigations completed by KCI Technologies of survey block 10 Phase I investigations identified a pile of cut stone mounded against a chimney foundation. Artifacts were recovered from shovel tests adjacent to this stone pile. The site was interpreted as a nineteenth-century farmstead, possibly associated with the Cross property.
Phase II investigation at site 18PR549 included the excavation of 36 shovel tests and five test units. Shovel tests were dug along four transects positioned at right angels to the pile of architectural materials. Based on interpretation of the soil stratigraphy exposed in the shovel tests, a plowzone is present on the north and east sides of the pile. The soils within the site appear eroded, deflated, and are not stratified.

The largest pile included building material composed of cut stone and hand-made bricks mounded over a chimney base. There is no evidence for the building footprint. It is likely that the foundation to the building was demolished and piled around the chimney base. It is clear that post-abandonment activities at the site included disturbance to the ground surface.

Artifact density is low. The majority of artifacts are architectural debris. A small amount of early nineteenth century ceramics was recovered from the area adjacent to the foundation pile. A twentieth century sheet midden was identified on a cut-bank on the north side of the site. Preliminary examination of the artifacts suggests that the site dates from the nineteenth through early twentieth centuries.

A posthole was found in one test unit. This feature was dug into subsoil and contained no artifacts. It is not known what the post was used for. No evidence of outbuildings was identified. Shovel tests were excavated at a location where investigators thought an outbuilding might be present, but no evidence of an occupation was found at this location.

Historical research failed to identify the occupants of the site. The site is probably the Cross property depicted on the 1878 Hopkins map. The specific individuals who occupied the site are not known.

Site 18PR549 lacks integrity. The site is not stratified and clear indications of ground disturbance are present at the site. The absence of stratified deposits and significant features, low artifact density, and poor historical documentation of the occupants does not allow for the development of research questions that could address rural lifeways in the nineteenth through early-twentieth centuries. Therefore, the preliminary recommendation is that site 18PR549 is not eligible for listing on the National Register of Historic Places and no further work is recommended.

- Site 18PR551

Site 18PR551 was initially discovered by Goddard Space Flight Center staff, who informed archeologists of a stone chimney and foundation north of Building 84. Phase I investigations completed by KCI Technologies at this .67-acre site included eight shovel tests that recovered artifacts from disturbed contexts. The site occupation was interpreted as dating from the second half of the nineteenth century through the early twentieth century. The site could not be correlated with any buildings depicted on historic maps showing the area. Based on the Phase I findings site, 18PR551 was recommended as potentially eligible for listing on the National Register.

Phase II field investigation conducted by John Milner Associates consisted of excavation of 30 shovel tests and five test units. Shovel tests were dug along four transects positioned at right angles to the extant foundation ruin. Based on interpretation of the stratigraphy exposed in the shovel tests, it is clear that the location had been plowed prior to a structure being built on the site.

Test units were placed within the interior of the foundation, abutting the exterior side of the foundation and in locations where shovel tests found artifacts in the yard area. Test unit excavations did not identify any intact preserved stratigraphy at the site. Further, with the exception of a deposit of early twentieth-

century trash against the exterior side of the foundation, the artifact density was low. No features, other than the foundation were identified. A probe was used to test for features such as root cellar, piers, or pits within the interior of the buildings footprint. None were found.

Preliminary examination of the artifacts suggests that the site dates to the late nineteenth through early twentieth centuries. Machine-made container glass in common. Other twentieth century artifacts included a fragment of a phonograph record. None of the artifacts display attributes that would indicate a date of occupation earlier than the late nineteenth century. Further, the foundation and chimney are constructed using Portland cement, an architectural material not common until the late nineteenth century.

The occupation history of the site is not known. Historic research failed to identify when the site was occupied and by whom. It is likely that the occupants of the site were tenant farmers, but in absence of any documentation this is not clear.

The Phase II investigation concluded that the site lacks integrity. As noted in the Phase I, the site is disturbed and any artifacts present are contained within disturbed contexts. The site is not stratified and artifacts do not appear to cluster in specific locations. The absence of stratified deposits and features, low artifact density, and poor historical documentation on the occupants does not allow for the development of research questions that could address rural lifeways in the late nineteenth through twentieth centuries. Therefore, the preliminary recommendation is that site 18PR551 is not eligible for listing on the National Register and no further work was recommended.

5.7.3 Potential Adverse Effects

See Section 7.4.8 of the Soil Conservation Road Realignment Environment Assessment for a discussion of potential effects related to that project.

Buildings and facilities proposed in the Master Plan would have no direct or indirect adverse effect on identified historic or archeological resources within the Area of Potential Effect outside of Goddard. In all cases, the resources are visually screened by intervening forest around the perimeter of Goddard from development and facilities within Goddard. The Master Plan does not propose any new facilities that would be viewable from the resources. Master Plan building and improvement proposals would not effect the sites indirectly in terms of access, traffic, noise, or air quality.

The Baltimore-Washington Parkway/NASA entrance interchange dates from 1966. It is anticipated that reconditioning of the ramps and bridge, which are owned by NASA, will be needed within the next 20 years, regardless of the Alternative selected. The NASA bridge over the Parkway is a six span steel plate girder structure with wide flange beams. It is not a contributing element for Parkway eligibility. The important applicable features for Parkway preservation are: (1) right-of-way vegetation on steep slopes, (2) contour grading to fit natural topography, and (3) stone faced bridge abutments. NASA will consult with the National Park Service and the Maryland Historical Trust in accordance with 36 C.F.R. 800. during the planning and design process for reconditioning the interchange.

The Master Plan and No Action Alternatives both avoid known campus historic and archeological resources and no direct effects are expected. Neither proposes any changes or new facilities in Area 300.

The operations and historic elements of the Spacecraft Magnetic Test Facility are not anticipated to change, and the forest buffer around the building will remain in place.

The oldest buildings at NASA GSFC date from the 1960 to 1965 period. The eligibility of structures and facilities for National Register status would be reviewed periodically over the 20-year planning period in consultation with the Maryland Historical Trust.

5.8 Natural Conditions

5.8.1 Topography and Steep Slopes

GSFC is located on the drainage divided between the Anacostia and Patuxent River basins. The Anacostia River is a major Potomac River tributary. In the vicinity of GFSC, the Anacostia drainage shed lies to the north and west, and the Patuxent basin to the south and east. On the west campus, the divide follows Aerobee Road to Delta Road before coursing northeastward through or near Buildings 1, 8, 22 and 16W. On the east campus, it follows Explorer Road before proceeding along Good Luck Road (See Figure 5-7 for site drainage divides). The Beltsville Airport, which also lies on the divide, is a broad, naturally flat area with only a few feet of relief across the property.

The uppermost tributaries of Beck Branch and Beaverdam Creek drain most of Goddard. Beck Branch rises in NASA Area 400 and flows from east to west about one half mile to the north of the east and west campuses. Tributary stream channels crossing Goddard to Beck Branch or Beaverdam Creek have channel slopes averaging about three percent.

Topography at GSFC can be characterized generally as gently undulating and typical of the upper Coastal Plain. Elevations along the drainage divide are generally uniform. Streams form valleys broader and shallower than would be expected for their size. Slopes are generally moderate; no slopes exceed 20 percent at the site.

The west campus has three high points of nearly equal elevation. The highest elevation, 232 feet, is located near the western boundary about 400 feet south of the athletic field. The other two points with elevations of 231 feet and 227 feet are located at the intersection of Tiros and Cobe Roads, and at the Visitor Center, respectively. The lowest point at Goddard occurs where the Main Pond outfall crosses the northern property boundary at 118 feet.

On the west campus, steep slopes, defined as those in excess of 15 percent, are man made for the most part (Figure 5-8). They comprise cuts and embankments associated with road construction or the level terraces created as building or parking lot sites. Most of the naturally steep slopes on the west campus occur on stream side slopes in the northern buffer area, and along a ravine on the east side of Building 28. On the east campus, the peak ground elevation of 230 feet is located at Building 79 on Explorer Road. This point is the apex of three drainage sheds: Beck's Branch, to the north, and the Bald Hill and Folly Branches of the Patuxent River to the south. Other high points occur near Building 27, 226 feet, and on a knob just to the east of Building 7-G (212 feet) in the north central area. The low point is located on the northern boundary where two Beck Branch tributaries combine. In contrast to west campus conditions, most steep slopes on the east campus are natural with minor exceptions occurring around recently constructed facilities. Slopes in the area of Explorer Road are uniformly gentle.

The topography in Area 300 and 400 has more gradual slopes. Stream valleys are 650 to 1,000 feet across and typically 20 to 30 feet deep. The highest point at Goddard, 235 feet, occurs in a corner of Area 400 where NASA abuts the Perkins Chapel property along Springfield Road. Steep slopes are the most pronounced between Springfield Road and the uppermost section of Beck Branch in Area 400 (Figure 5-9).

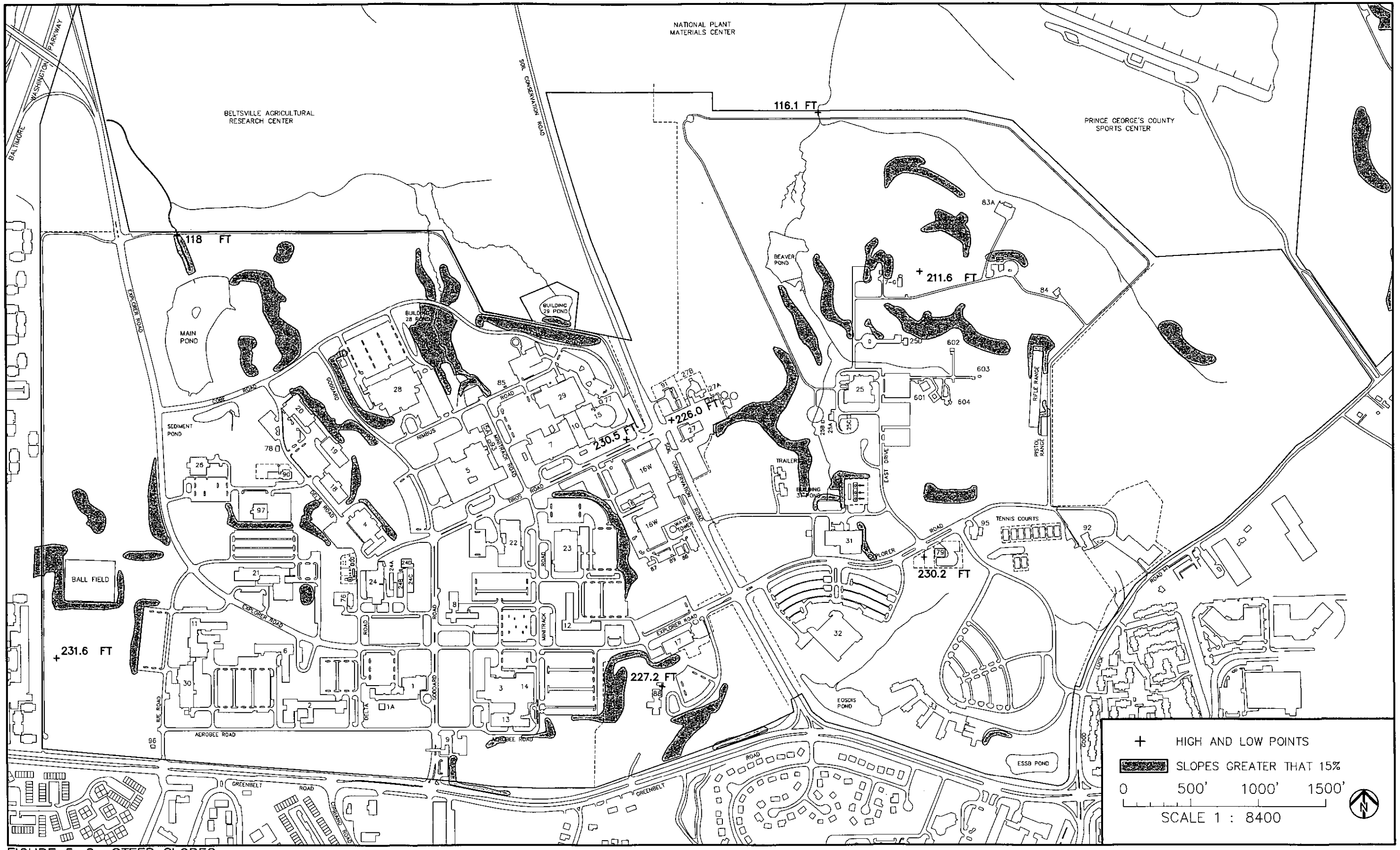
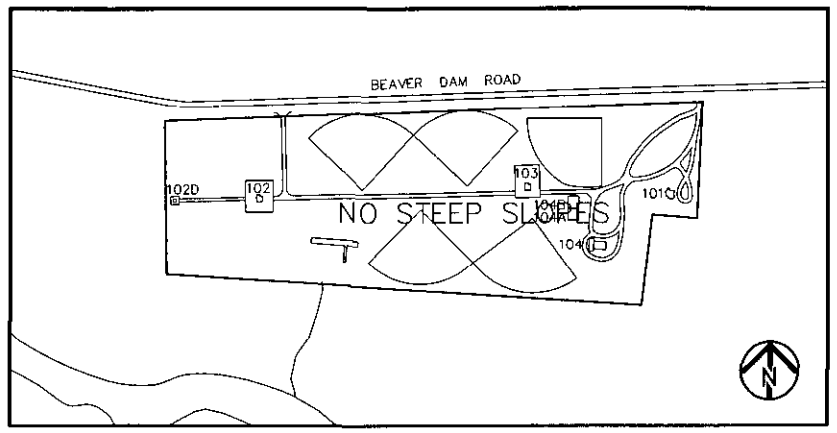
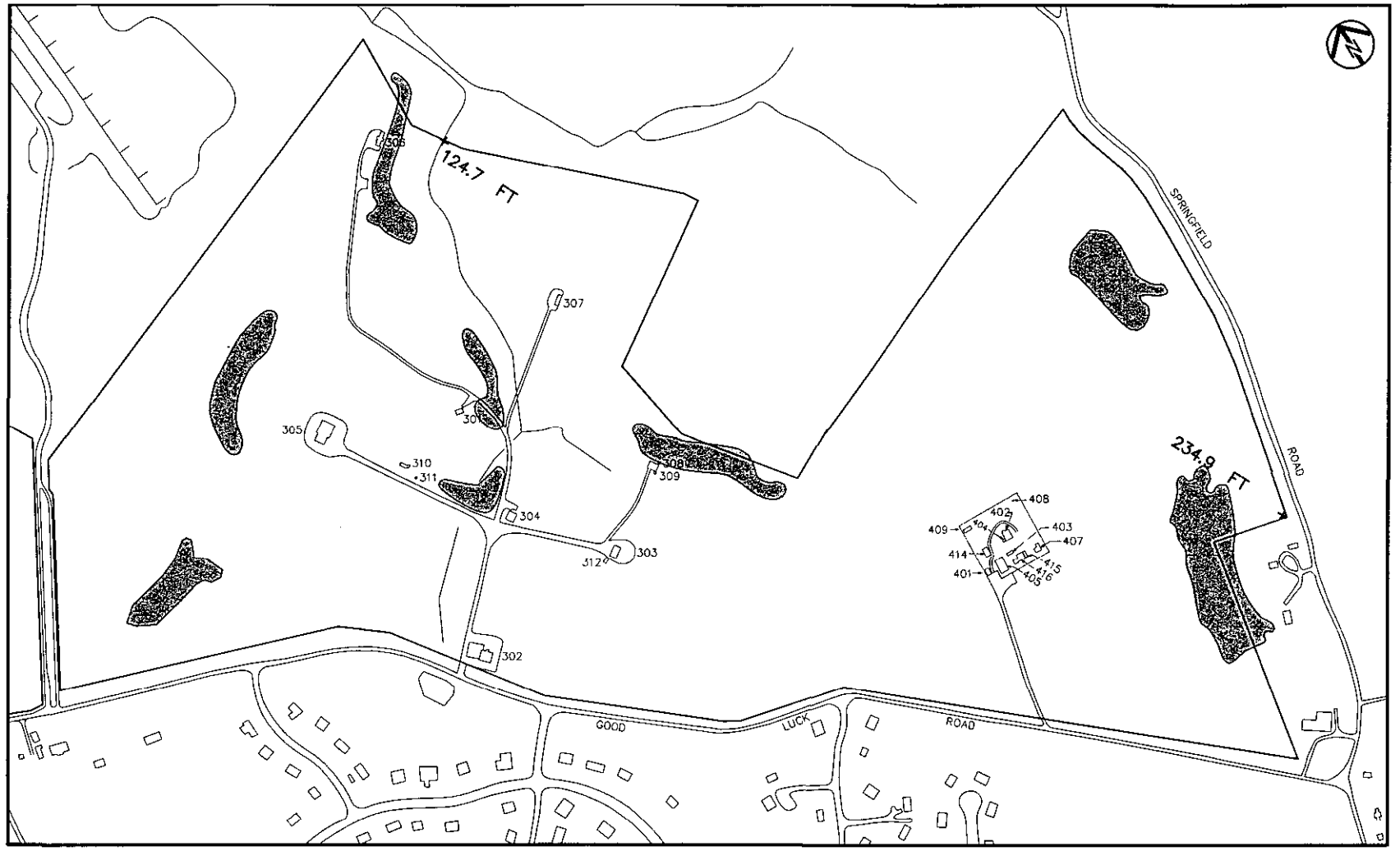


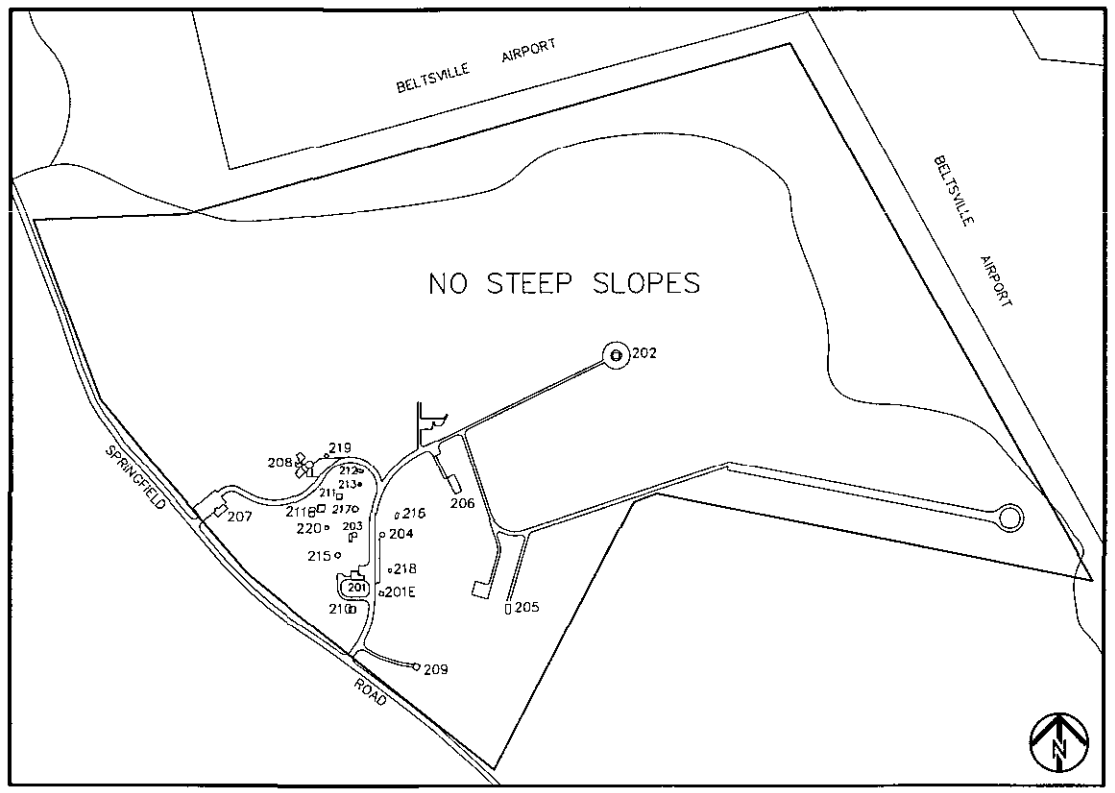
FIGURE 5-8 STEEP SLOPES.



AREA 100



AREAS 300 AND 400



AREA 200

SLOPES GREATER THAT 15%

SCALE ALL FIGURES $\frac{1" = 700'}{1 : 8400}$

FIGURE 5-9 SATELLITE AREA STEEP SLOPES.

The Antenna Test Range and Astronomical Observatory, Areas 100 and 200, have even lower relief. Level ball fields cover much of the Antenna Range. Elevations are highest near Building 101, the old farmhouse, at 145 feet while the bulk of the site is at an elevation of 125 feet.

Buildings in Area 200 are located on a small hill or rise near Springfield Road. The peak area elevation is 175 feet at Building 203. The lowest elevation, approximately 100 feet is in the northwest corner where the southern fork of Beaverdam Creek leaves the property. The stream courses around the northern and eastern periphery of the area. The eastern two-thirds of the area is relatively flat with only 15 feet of elevation difference occurring in 1,500 feet between the road to Building 205 and the eastern property line. Areas 100 and 200 have no steep slopes.

Neither the Facilities Master Plan nor the No Action Alternative would impact topography or steep slopes.

5.8.2 Soils

Information about site soils is given in Figures 5-10 and 5-11, and Table 5-33. The boundaries shown for soil series areas were mapped prior to development. Excavation, fill, and mixing of soils generated by construction in the developed areas of Goddard may have created local conditions different than shown.

Multiple symbols for a given soil series indicate that minor differences in soil type occur within the series, e.g. (Be) Beltsville fine sand loam and (Bl) Beltsville silt loam, but the data in Table 5-33 are applicable to each type. Locations refer to the occurrence or presence of a soil series within the boundaries of each campus or remote area. Other soils series may be present outside the boundaries.

Hydric soils are generally saturated with the water table at or near the ground surface. They are one of three indicators for potential wetlands. Hydric soils may be disturbed and intermixed with other soils in developed campus areas, reducing or eliminating its value as a wetland indicator in these areas. Soil group data refers to the hydrologic soil grouping, which is used in hydrological, storm drainage, and stormwater management studies. When two hydrologic group designations are listed for a soil series, (e.g. C/D), they apply to drained/undrained conditions, respectively.

Areas that have soil with low seepage rates are suitable for locating ponds or lakes. Those with medium to high rates are the best locations for infiltration or dry pond facilities. Profile/permeability data are based on average conditions throughout Prince George's County, and local conditions may differ. The bottom elevation given is the typical depth to the substratum beneath the soil horizon.

A soil association is a landscape that has a distinctive proportional pattern of soil types. All of the project area lies in the Christiana-Sunnyside-Beltsville Association zone. Soils in this association are generally deep, well drained and compacted. Red clays predominate. All soils in the vicinity of GSFC are acidic with a pH ranging from 4 to 5.5. All site soils have a low shrink-swell potential, except for the Christian, Elkton, Keyport, and Shrewsbury series, which have a moderate potential. The following soils series are structurally unstable, particularly when wet, and are not recommended for use in pond dams, road fills, or embankments: Bibb, Christiana, Elkton, Iuka, Johnston, Muikirk, Ochlochnee, and Sandy Clay.

In response to Federal regulations, NASA conducted a sitewide investigation of potential soil and groundwater contamination in 1990. The investigation revealed four sites contaminated by organic carbon compounds with trichloroethene, a degreasing solvent, being the primary pollutant. A system of 55 shallow groundwater wells was subsequently established to monitor conditions. Trichloroethene degrades naturally. Sampling over the last seven years indicates a continuous reduction in all pollutant

	SOIL SERIES	LOCATION	HYDRIC	EROSION HAZARD	SOIL GROUP	SEEPAGE	PROFILE [2] (inches)	PERMEABILITY (in/hr)
Bo, Bn	Bibb	W, E, 1, 3, 4	Yes	Moderate	C	Varies	35 35-54	0.6-6.0 <0.2
Be, Bl	Beltsville	W, E, 4	No (4)	High	C	Low	0-14 14-50 50-72	0.6-2.0 <0.2 0.2-2.0
Cd, Ce	Christiana	W, E, 1, 2	No	Very High	C	Low	0-7 7-120	0.2-0.6 <0.2
Ek	Elkton	W, E, 1	Yes	Moderate	C/D	Low	0-10 10-96	0.2-0.6 <0.2
Fs	Falsington	W, E	Yes	Moderate	B/D	Low	0-12 12-34 34-48	0.2-0.6 0.6-2.0 0.6-6.0
Ge	Galestown	All	No	Low	A	Very High	0-120	6.0+
Io, Im	Iuka	W, E	No (4)	High	C	Medium	0-30 30-34	0.2-2.0 0.6-2.0
Jo	Johnston	W, 2	Yes	Moderate	D	Medium	0-38 38-48	0.6-2.0 2.0-6.0
Ke, Kp	Keyport	All	No(4)	High	C	Low	0-9 9-50	0.2-2.0 <0.2
Le	Leonardtown	W, E	Yes	Low	D	Very Low	0-12 49-70	0.2-0.6 <0.2 0.2-0.6
Mn	Matapeake	W, 1, 4	No	Moderate	B	High	0-7 7-34 34-60	0.6-6.0 0.2-0.6 0.6-6.0
Mz	Muikirk	E, W	No	Low	B	Varies	0-28 28-36 36-60	2.0-6.0 0.6-2.0 <0.2
Oc	Ochlocknee	E, 2, 4	No	High	B	Medium	0-45	0.6-2.0
Rd	Rumford	1, 2, 3, 4	No	Low	B	Medium	0-17 17-31 31-54	2.0-6.0 0.6-2.0 2.0-6.0
Sc	Sandy Clay	W, E, 2, 3	No	Moderate	C	Medium	Varies	2.0-6.0
Sg, Sh, Sk	Sassafras	W, E, 1, 2, 4	No	Moderate	B	Medium	0-10 10-40 100-122	2.0-6.0 0.6-2.0 2.0-6.0
Sm	Shrewsberry	W	Yes	Moderate	C/D	Medium	0-14 14-36 36-42	0.6-2.0 0.2-2.0 <0.2
St, Su	Sunnyside	W, E, 2, 3, 4	No	Moderate	B	Medium	0-48 48-60	0.6-2.0 2.0-6.0
Wo	Woodstown	E	No (4)	Moderate	C	Medium	0-12 12-36 36-54	0.6-6.0 0.6-2.0 2.0-6.0

Notes: (1) W = west campus
E = east campus
1, 2, 3, 4 = remote areas 100, 200, 300, 400
(2) depth from surface
(3) see text for limits
(4) Hydric soil inclusions possible along drainage ways and stream channels

Source: Prince George's County Soil Survey, U.S. Soil Conservation Service, 1967 (out of print)
Urban Hydrology for Small Watersheds, U.S. Soil Conservation Service, 1986

TABLE 5-33 SOIL DATA.

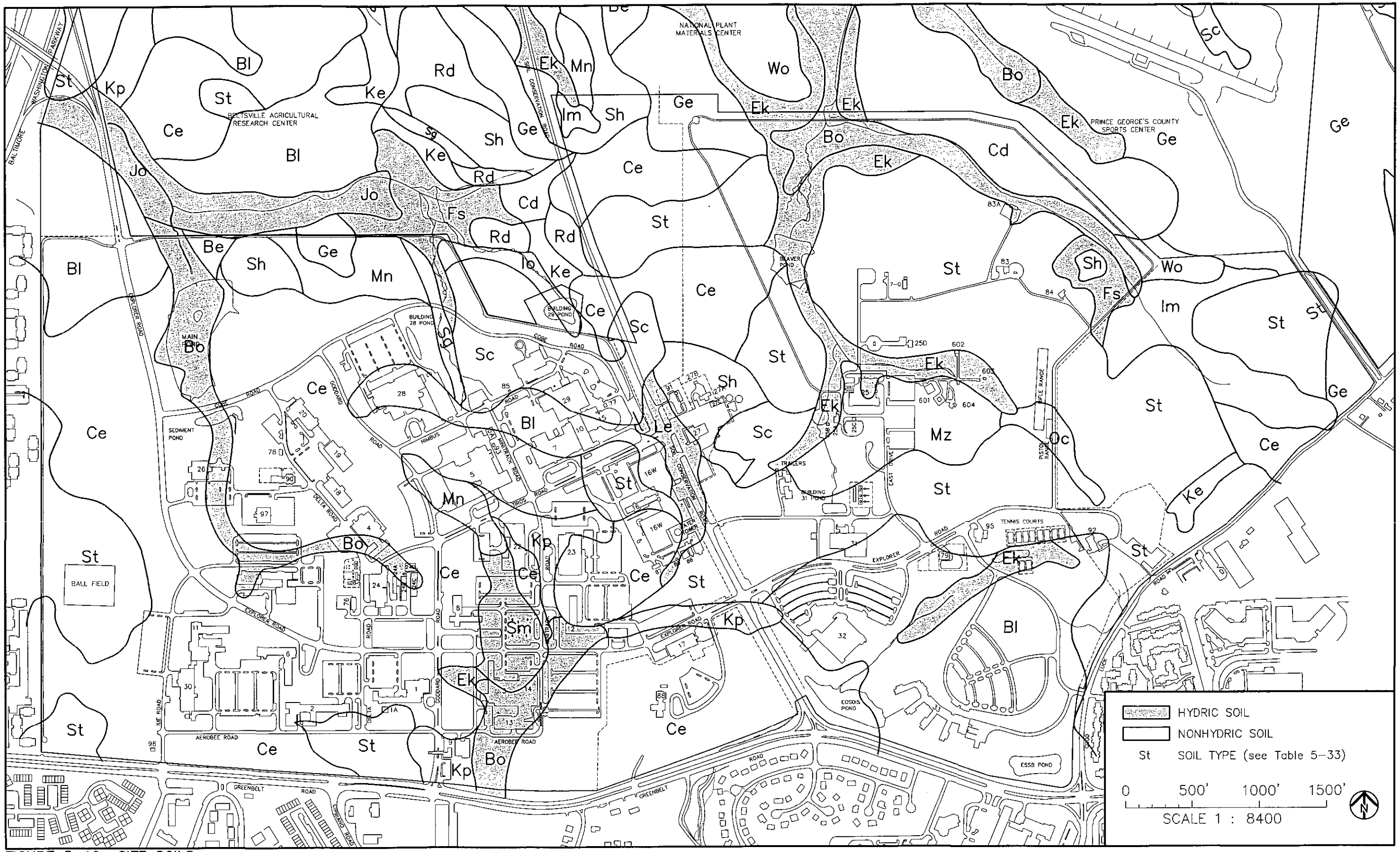
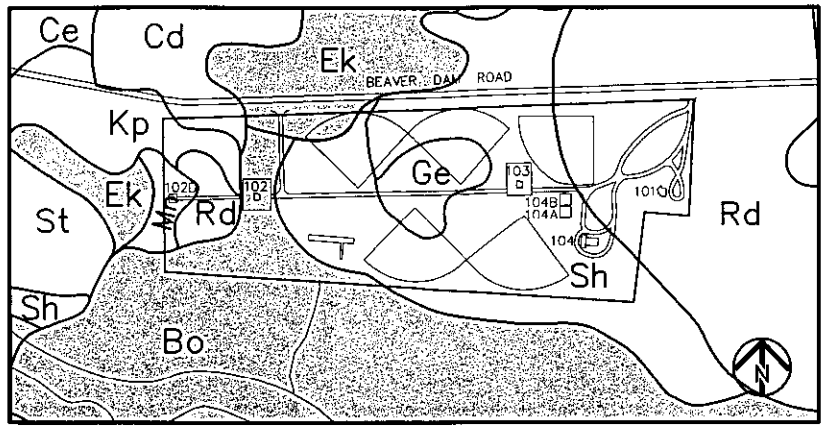
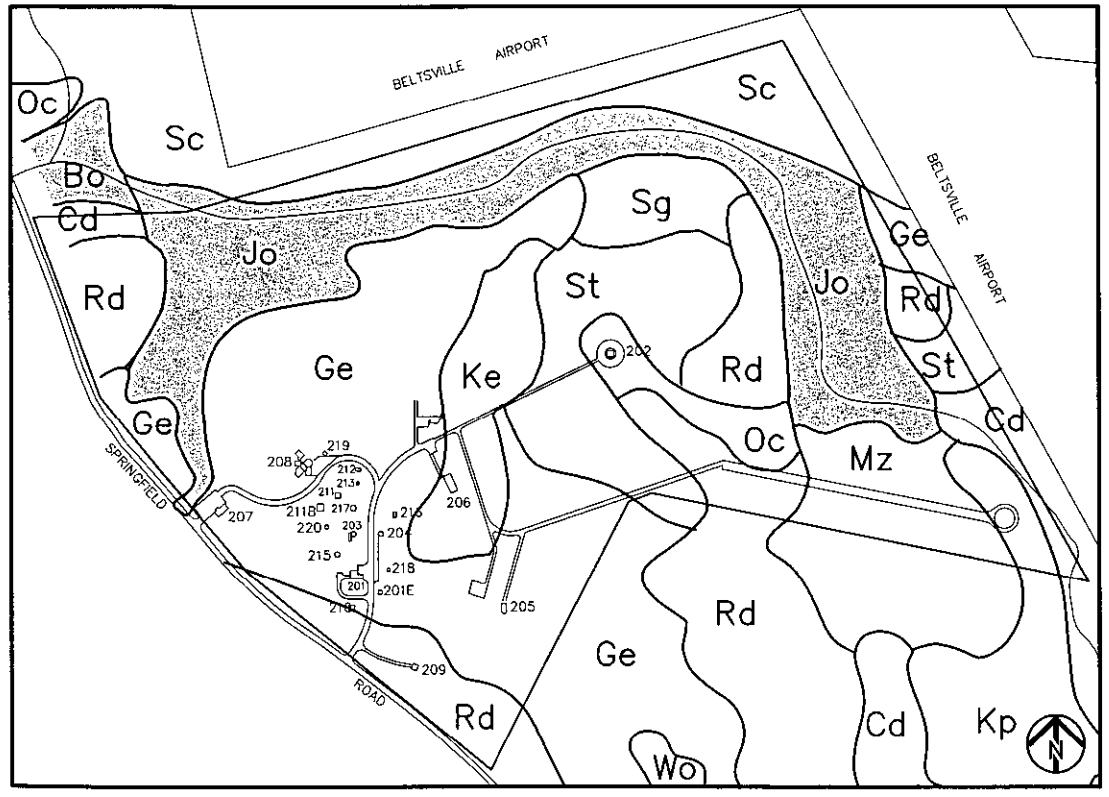


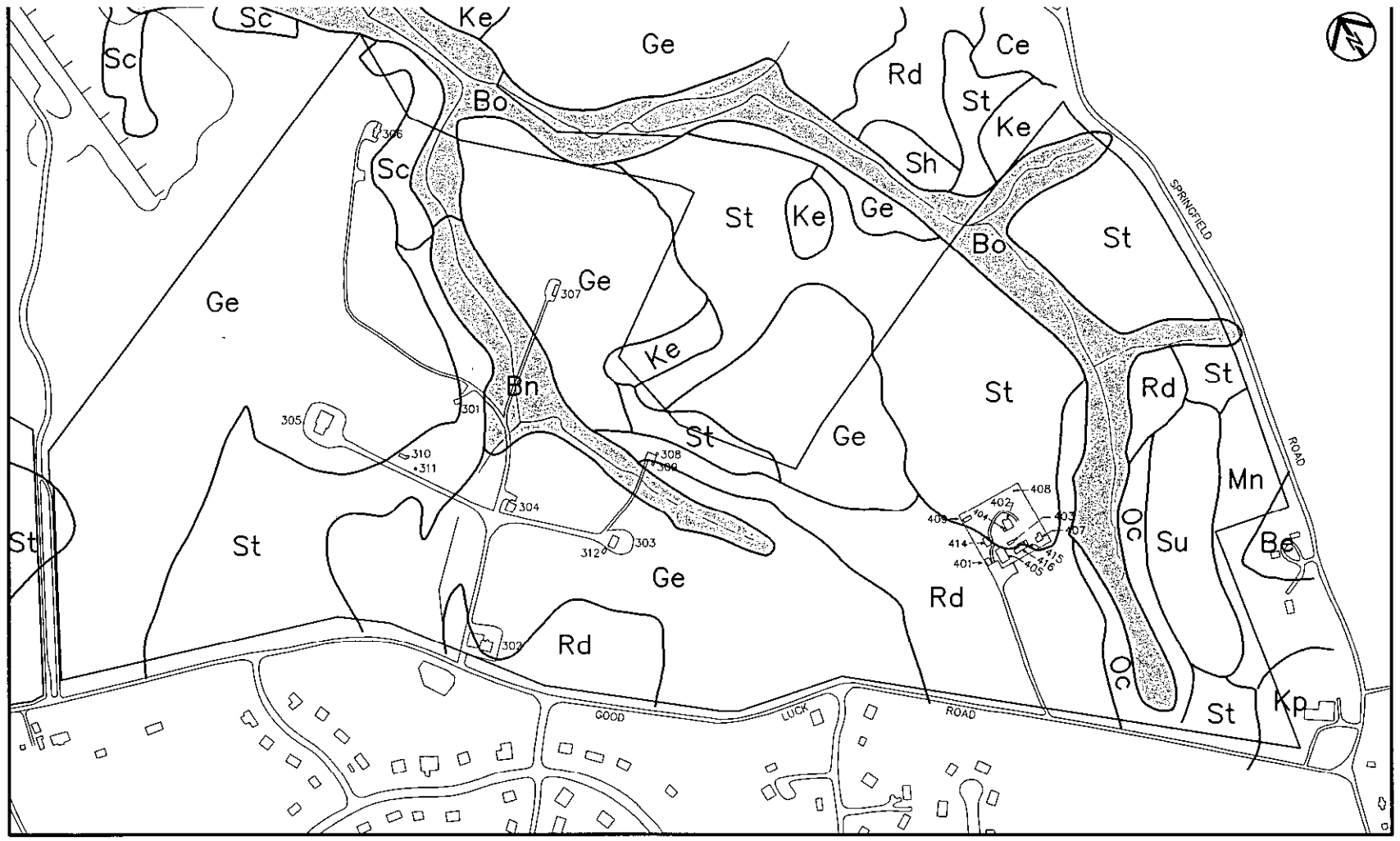
FIGURE 5-10 SITE SOILS.



AREA 100



AREA 200



AREAS 300 AND 400

HYDRIC SOIL

NONHYDRIC SOIL

St SOIL TYPE (see Table 5–33)

SCALE ALL FIGURES $\frac{1" = 700'}{1 : 8400}$

FIGURE 5–11 SATELLITE AREA SOILS

concentrations. NASA and the Maryland Department of Environment (MDE) have concluded that, when GSFC is considered as a whole, no human health and ecological risk factors associated with the trichloroethene contaminated soils exceed the benchmark of significance.

The Master Plan Alternative would disturb one of the four sites. It is in the vicinity of Building C in the Space Science and Central Commons Neighborhood. The area, now an open field, was used as a METRO subway construction spoil disposal area. Portions of the Space Science and Central Commons Neighborhood parking lot would also overlie this site. Prior to any construction that will impact any of the landfills, appropriate studies and design considerations will be implemented and NASA will complete all appropriate coordination with MDE.

5.8.3 Geology and Groundwater

Prince George's County is underlain by a mass of unconsolidated sedimentary deposits that form a huge wedge that overlies older, crystalline bedrock of Precambrian or Early Paleozoic Age. The arkosic or sandstone crystalline rock outcrops just to the west of the Prince George's Montgomery County line. The top surface dips or slopes downward in a southeasterly direction across the County at 60 to 110 feet per mile, reaching a depth of 1,400 to 1,500 feet below sea level at Brandywine, and 2,000 to 3,000 feet below sea level at Chalk Point, at the southeast corners of the County (Groundwater in Prince George's County, MD. Geological Survey Bulletin 29, F.K. Mack 1966).

In northwest Prince George's County, three members of the Potomac Group: the Patuxent Formation, and Arundel Clay, and Patapsco Formation comprise the sedimentary material. Conditions are illustrated schematically in Figure 5-12. All three members are composed of stratified layers of sand, gravel, silt and clay interbedded in a complex and heterogeneous manner. Where sand and gravel predominate, prolific amounts of groundwater of very good to excellent quality may be available; where clay predominates, little or no water is available.

The Patuxent Formation outcrops along an irregular band some 3 to 4 miles in width. It extends from Laurel, Maryland to Georgetown in Washington, DC. The western outcrop boundary roughly follows the County line, while the eastern boundary runs closely parallel to US Route 1. The total outcrop area in Prince George's County is approximately 40 square miles. The formation dates to the early or lower Cretaceous Age, and is the oldest sedimentary deposit in the Maryland geological coastal region (ibid.).

It ranges from 150 to 300 feet in total thickness overlying bedrock. Top surface elevations of the formation shown in Figure 5-12 are based on the first good water bearing sand encountered in a zone approximately 250 feet thick lying above the crystalline bedrock as indicated by well drilling logs. Structure contour mapping in Bulletin 29 indicates the Patuxent Formation top surface is about 180 to 200 feet below sea level in the vicinity of GSFC.

The Patuxent Formation is composed of sand, sand and gravel, sandy clay, and clay. Sandy, and sand and gravel layers, the water bearing parts of the formation, occur in one or two large sheets that are widespread across the formation. Evidence exists that these aquifer layers are interconnected and continuous (ibid.). Individual water bearing sands and sand and gravel layers range from 8 to 110 feet in thickness (Geology and Water Resources of Prince George's County, Md. Geological Survey Bulletin 10, Cooke, et al, 1952). In general, the thickness of water bearing strata increases from west to east. The effective thickness of water bearing sand at well (BE22) located on the Patuxent Wildlife Research Center about 2 miles northeast of Area 200 is reported at 42 feet, while the thickness at Bowie-Belair about 5.5 miles east of the Goddard is estimated to be between 75 to 125 feet (Mack, 1966).

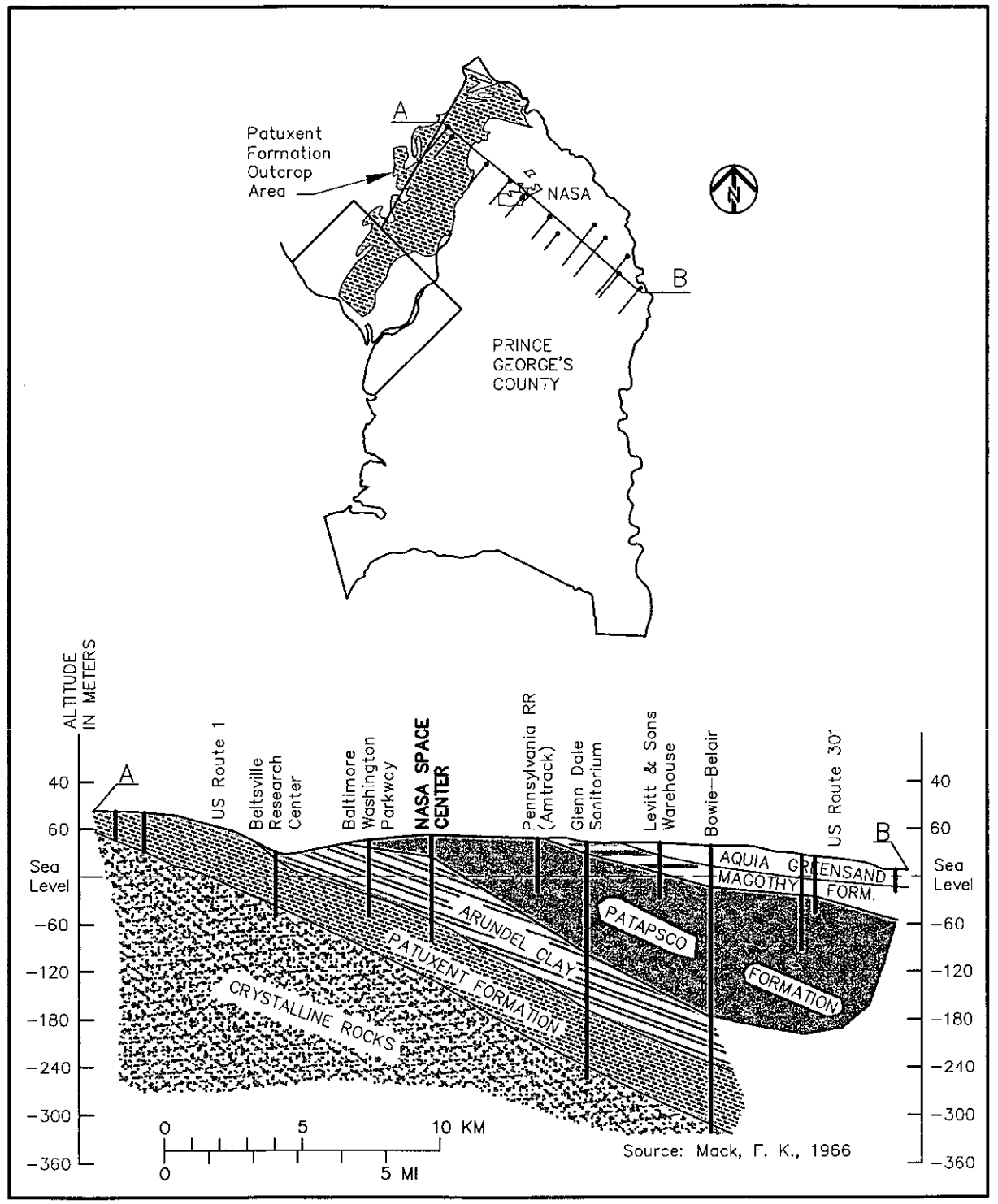


FIGURE 5–12 HYDROGEOLOGY IN THE VICINTY OF NASA GSFC.

The Arundel Formation is composed of a series of large and small lenses of hard to very hard red and brown clay that occupy depressions in the underlying surface of the Patuxent Formation. In the northern part of the County, these lenses interconnect to form a continuous strata that is sufficiently lithographically distinctive to permit differentiation between the three Potomac Group formations. The total thickness of the Arundel Clay ranges from 0 to 200 feet with the greater thicknesses occurring in the northern half of the County. The top and bottom surfaces undulate irregularly. In the vicinity of GSFC, the thickness is close to its maximum (Cooke, 1952).

The Arundel Clay is an aquiclude that blocks percolation of groundwater to the underlying Patuxent Formation. It contains little or no water, and records for the several hundred wells in the northern sector of the County indicate that no one uses it as a source of water.

The Patapsco Formation is the surface formation at Goddard. Its outcrop area is about 7 miles wide, extending from just west of the Baltimore-Washington Parkway to the Pennsylvania Railroad main line between Baltimore and Washington. The Patapsco ranges from 200 to 500 feet in total thickness with the greater thicknesses occurring to the east and south of GSFC. The basal part of the formations is clay and may not be easily differentiated from the underlying Arundel Clay, while the upper part contains clay with more sand lenses. The lower clay is commonly maroon or red in color, while the upper clay trends to white (Cook, 1952). The overall character of the Patapsco Formation is similar to the Patuxent, but water bearing layers cover smaller areas and are not interconnected.

5.8.3.1 Groundwater Quantities

Groundwater is water beneath the surface in a zone of saturation identified as an aquifer. Water enters an aquifer by recharge through precipitation or seepage from surface water bodies that percolates downward, or enters the aquifer formation where it outcrops. Over a long period of time under undisturbed conditions, groundwater in storage reaches equilibrium with its surroundings, and the volume stored remains constant. The top of the saturated zone is defined as the piezometric surface. At or near the land surface, piezometric elevations generally closely follow land contours, while at depth they are more level. When wells are drilled to tap the aquifer, they affect natural conditions. The piezometric surface is lowered at the well producing an inverted cone or depression around the well. If the aquifer is locally unconfined, the slope of the cones is parabolic, steepest adjacent to the well, but feathering asymmetrically to the natural piezometric levels at a distance.

Ground water availability is characterized by several parameters. The yield of an aquifer can be measured directly at the wellhead in units of gallons per minute. Determination of the specific capacity of a well is a more reliable measurement of well productivity than yield, as specific capacity is less dependent on the test method selected. The specific capacity of a well is defined as the yield per unit of drawdown of the water table level or piezometric surface at the well, i.e. conditions when pumping are compared to the natural state. Generally, drawdown increases with increased time of pumping, both in the short term over weeks if pumping is constant, and in the long term over years if withdrawals exceed recharge. At a constant yield rate, well drawdown slowly increases with time; hence, its specific capacity decreases. This will occur until the expanding cone of influence over the piezometric surface intercepts a source of recharge sufficient to balance well withdrawals.

Transmissivity is the capacity of an aquifer to transmit water through its entire thickness or cross-sectional area. It is usually estimated in terms of a coefficient of transmissibility, which is defined as the flow of water in gallons per day at 60° F through a one square foot cross-sectional area under a unit gradient multiplied by the saturated height or thickness of the aquifer in feet.

Since the Arundel Clay is impermeable, it prevents groundwater replenishment of the underlying Patuxent Formation by percolation from surface water sources. Recharge of the Patuxent Formation is limited to precipitation falling on the outcrop area. The outcrop area directly upslope from Goddard is about 3 miles wide. In 1966, Mack estimated that the aquifer recharge rate was roughly 500,000 gallons per day per square mile of outcrop exposure. Since then, development around Beltsville and Calverton, on the outcrop area upslope from GSFC, has reduced the percentage of pervious area. Conservatively, about 1.0 million gallons per day is still recharged over a one-mile section of outcrop above Goddard. All of this water may not be available at a single well or aquifer strata.

Patuxent Formation coefficients of storage range from 0.0001 to 0.006 and are in the range of artesian values. Results of aquifer tests show that coefficients of transmissibility of water bearing sands are generally low, ranging from 600 gallons per day per square foot (gpd/sf) near Muikirk to 10,000 gallons per day per square foot near Bladensburg. Transmissibility coefficients of 7,000 gpd/sf were recorded at a Patuxent Wildlife Research Center well, and 9,000 and 11,000 gpd/sf at two wells owned by the City of Bowie that are located about 5 miles to the east of NASA (Mack, 1966). Conservatively, it is estimated that the coefficient of transmissibility for water bearing sands underlying Goddard is about 5,000 gdp/sf.

Data for wells tapping the Patuxent Formation in the vicinity of GSFC is shown in Table 5-34 and the well locations in Figure 5-13. Throughout the area, wells drilled in to the formation to a depth of about 75 below sea level invariably strike an aquifer yielding abundant water.

Patuxent Formation aquifers are reported as "brimful" in many locations (Mack, 1966), and this appears to be true in the vicinity of NASA. Static or undisturbed water levels recorded in wells generally fit the piezometric contours developed by Mack, which estimate the piezometric surface at 82 to 88 feet northwest and north of NASA, and at 55 to 65 feet to the south. An exception is directly beneath Goddard, where the piezometric surface appears to rise 25 to 30 feet. This may correspond with a natural undulation in the aquifer that parallels the land surface. Mack's contours imply that the Patuxent Formation groundwater moves locally from north to south in the vicinity of Goddard.

The comparatively small range in static water level for wells tapping the two aquifers, one shallow, one deep, is an indication that they are interconnected hydraulically. Water is present under a significant pressure or hydraulic head created by confinement by the Arundel Clay. This static water level or piezometric surface for Patuxent Formation groundwater rises up through and nearly to the top of the Arundel Clay when it is free to rise in open wells

Data for a selected set of 34 wells owned by the Beltsville Agricultural Research Center, the Patuxent Wildlife Research Center, and Goddard that penetrate the Patuxent Formation were analyzed to determine more typical yields in cases of large demand beyond those of an individual household. Average yields were 102 gpm, and average specific yields 5.0 gpm/ft. Median yields and specific yields were 80 gpm and 3.1 gpm/ft), respectively. Newer wells drilled after 1970 had greater yields, probably because of increases in hydrogeologic knowledge. Five wells drilled on BARC (BD60 through BD64) between 1977 and 1981in the area immediately to the north of the City of Greenbelt all had yields between 100 and 200 gpm, and an average specific yield of 6.5 gpm/ft.

Drawdown is the elevation difference between the static or undisturbed groundwater level and the level when groundwater is pumped. Drawdown at wells tapping the Patuxent Formation in the vicinity of Goddard generally ranges from 30 to 35 feet. Wells BE5 and BE25 have good yields with an unusually low drawdown, indicating high local transmissivity. Tests conducted at a well on the Patuxent Environmental Science Center showed that withdrawals at 50 gpm produced a drawdown of 23 feet with a radius of 480 feet.

WELL	OWNER	WELL ELEVATION (ft)[1] Surface	Bottom	STATIC WATER LEVEL (ft)	YIELD (gpm)	DRAWDOWN (ft)[2]	SPECIFIC YIELD[3] (gpm/ft)
BD4	Greenbelt	155	-239	85	250	79	3.1
BD18	BARC	125	-238	80	47	90	0.4
BD19	BARC	125	-72	90	100	135	0.7
BD30	BARC	155	-155	88	125	---	---
BD63	BARC	90	-215	2	100	76	1.3
BE5	BARC	174	-243	94	55	12	5.0
BE6	BARC	177	-253	84	80	122	0.7
BE25	NASA	166	-60	109	23	3	7.7
BE32	BARC	160	-306	96	160	44	3.6
BE33	NASA	160	-55	109	65	39	1.7
BE34	NASA	140	-28	117	25	131	0.2
CD16	Private	190	-274	56	20	34	0.6
CD23	NASA	180	-249	77	162	129	1.2
CD24	NASA	215	-46	110	20	135	0.2

(1) Feet above or below sea level.
(2) Drawdown from static level at yield rate shown.
(3) Gallons per minute per foot of drawdown.
(4) See Figure 5-23 for well locations.

Source: Prince George's County Groundwater Information, Md. Geological Survey Basic Water Resources Data Resources Data Report No. 13, M.D. Tompkins, 1983.

TABLE 5-34 DATA FOR WELLS TAPPING PATUXENT FORMATION IN GSFC VICINITY.

The Patapsco Formation outcrops at GSFC. The estimated Patapsco Formation recharge rate is roughly 500,000 gallons per day (Mack, 1966). The specific capacity of water bearing sands range from 0.5 to 4.0 gpm/ft with a mean of 1.6 gpm/ft. The coefficient of transmissivity ranges from 40 to 1,604 square feet per minute with a mean of 652. (Evaluation of Water Supper Potential of Aquifers in Anne Arundel County, Md. Geological Survey Report of Water Resources Investigation No. 46, F.K. Mack, 1986). Values obtained from monitoring wells at GFSC are many orders of magnitude less than this, 0.17 square feet/day maximum, as measured in 1992. More recent studies indicate that many of the wells tested are drilled to small, perched aquifers at shallow depths rather than the main water bearing sands. Hydraulic conductivities measured at 8 on-site wells at GSFC produced a maximum value of 0.35 cm/day, a very low value as far as aquifers are concerned.

Over many years, about 60 wells have been drilled to the Patapsco Formation at Goddard to monitor ground water levels and flow patterns. A one year study of the wells has revealed a complex hydrogeology beneath the east and west campuses (Resolution of GSFC Ground Water Flow, Final Report, Computer Science Corporation, 1998). At least four water bearing lenses or aquifers are present (Figure 5-14).

The main Patapsco water bearing aquifer beneath the site is encountered at an average elevation of about 130 feet. It is slightly higher in the northwest sector of the west campus and lower to the east. The dip or slope is to the southeast as they are generally for the Patapsco Formation. Water bearing sands are reported to range up to 40 feet in thickness. Typically, it is about 60 feet below the surface, but the piezometric surface is only about 7 feet below the ground surface in the ravine to the north of Building 28 and Cobe Road.

The other three aquifers are perched or elevated above the main aquifer. No evidence was uncovered in the study to indicate they are connected to the main aquifer. Each appears to be lenticular or pancake in shape. The largest, identified as the Main Campus Aquifer, has piezometric or water table levels at elevations ranging from 173 to 186 feet. All wells on the west campus southwest of a line drawn from Building 29 through Building 5 and then down Goddard Road to the main gate encounter the aquifer. It extends along the western periphery of the east campus, and crosses Greenbelt Road to the south.

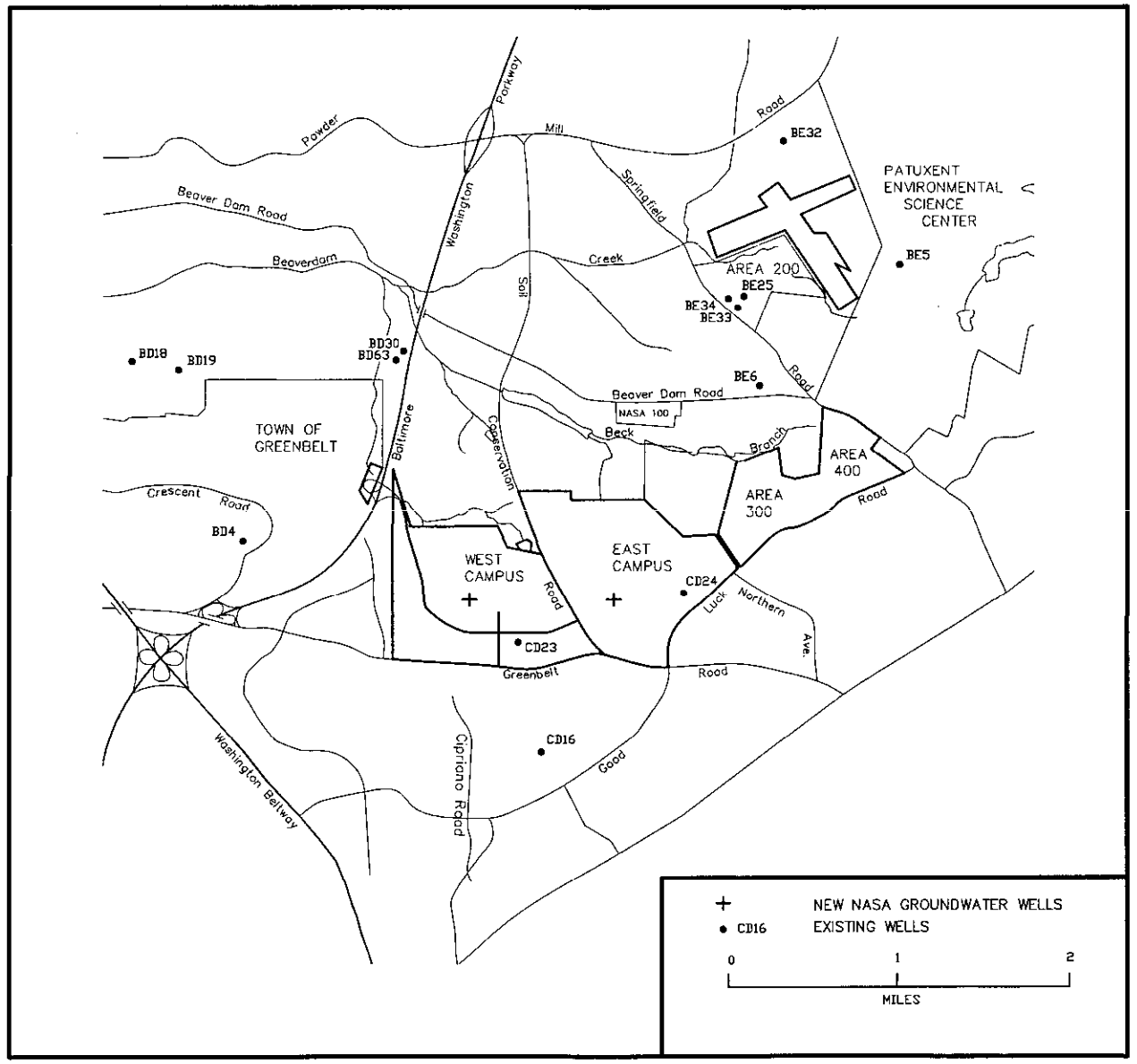


FIGURE 5–13 WELLS IN THE VICINITY OF NASA GSFC.

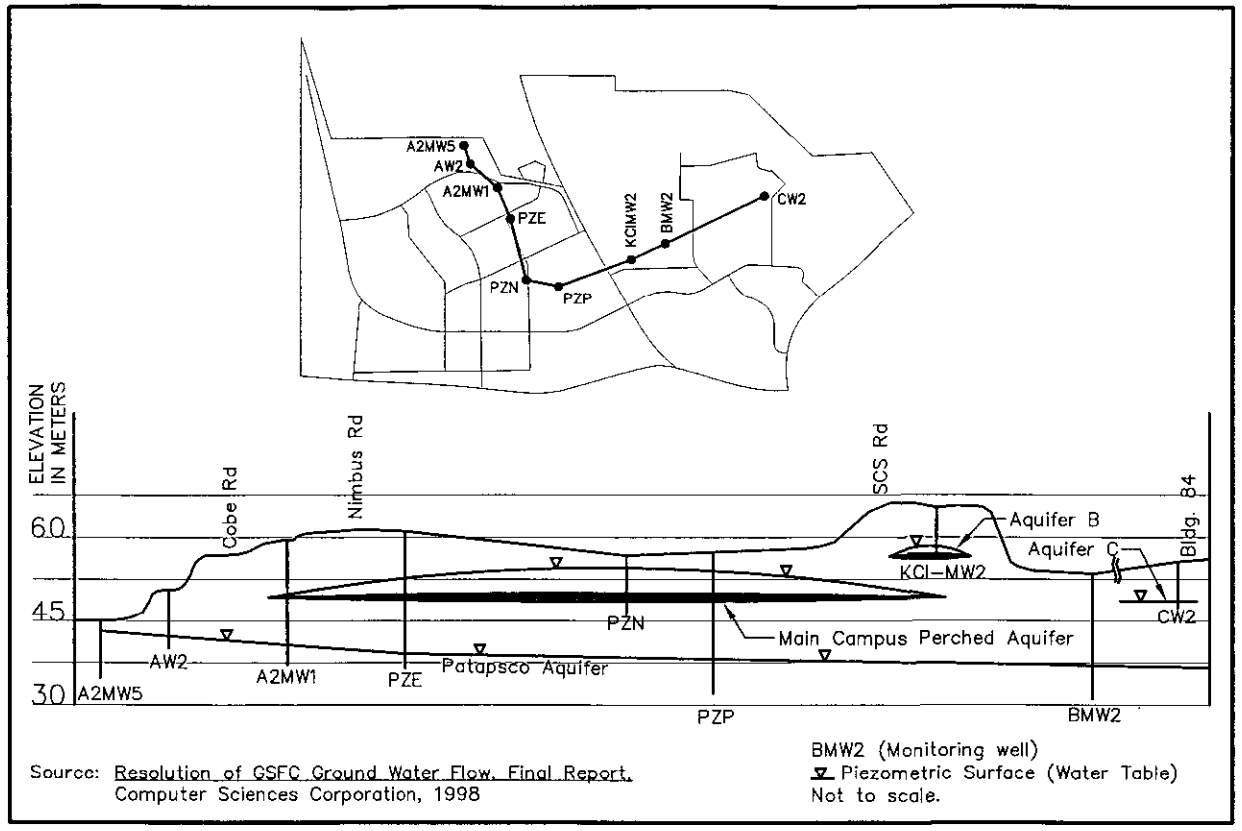


FIGURE 5–14 PERCHED AQUIFERS AT NASA.

Aquifer B is an apparently small water bearing sand encountered by wells drilled in the natural area to the southeast of Building 27 on the east campus. It is limited topographically to the east and does not appear at a well located on the west side of Building 16W. The east-west dimension is no greater than about 650 feet. It is not present at Building 32 to the south. It is uncertain how far it extends to the north on the ridge along the western east campus boundary. The piezometric level is consistently around 190 feet.

Aquifer C is a very thin water bearing lens on the east campus with a piezometric elevation of 165 feet. Its boundaries are unknown. It is encountered at wells drilled in the area around and between Buildings 84 and 92, the GEWA Recreation Center. It does not appear in the area around Building 25. It could extend through the easternmost section of the east campus and Area 300, provided that the aquiclude layer confining it at known points continues in that direction. Most of the potential aquifer area is covered by the Galestown soil at the surface, a soil that drains excessively fast with a permeability greater that 6 inches per hour.

None of the studied aquifers manifested variance in piezometric levels seasonally, or by precipitation events. The maximum fluctuation in the piezometric levels in the 60 wells over a one year period was about 2 feet. NASA does not withdraw water from any of the wells, so the levels recorded present static conditions. Groundwater flows in the soil horizon and first few feet of the Patuxent Formation appear to follow the ground surface slopes. Flows in the main Patapsco and Main Campus aquifers are to the southeast. No directional movement was indicated for Aquifers B and C.

NASA has drilled two production wells, one on the west campus, and the other on the east campus to supply water to the cooling towers in the refrigeration plants in Buildings 24 and 31, respectively. The wells tap the Patuxent Formation. Withdrawals are made under Maryland Department of the Environment Water Appropriations and Use Permit PG98G023(0), which is effective until 2011. The agency determines safe and acceptable withdrawal rates. The permit allows NASA to withdraw an average of 247,000 gallons per day on a yearly basis, and an average of 375,000 gallons per day for the month of maximum use.

Groundwater withdrawals will fluctuate with campus cooling demand and be higher during the summer months. Groundwater would be withdrawn under both the Facilities Master Plan and No Action Alternatives. The latter withdrawal rates would be the same as existing levels.

In 2001, the average daily cooling water use at Goddard was about 197,000 gallons on an annual basis. On the average, it is estimated that about 116,000 gallons per day of makeup water are required to meet process or non-cooling water productions. The remainder, averaging about 81,000 gallons per day maintains interior building temperatures doing the cooling season, which generally ranges from mid-April to mid-October.

Cooling tower water use varies from year to year depending on the annual total of cooling degree days. In 2001, the total number of annual cooling degree days, 1111, was about 10 percent less than the normal annual total 1220 as recorded at the BWI Airport weather station. Correcting for this, it is estimated that the existing normal total tower demand is about 206,000 gallons per day on an annual basis. For the hottest year of record, 1988, with 1490 cooling degree days, the estimated tower demand under existing conditions would be about 250,000 gallons per day on an annual basis.

Under the Master Plan Alternative full build out conditions, the normal tower demand would increase to an estimated 268,000 gallons per day on an annual basis, and the maximum annual usage would average about 328,000 gallons per day.

July is the hottest month over the long term. The normal number of July degree days as recorded at BWI Airport is 372. July 2001 was unusually cool. The average monthly July 2001 temperature was the same as that for June, but the number of cooling degree days were less (255 in July vs. 318 in June). Normalizing, it is estimated that the existing normal July cooling tower water or peak monthly withdrawal demand is about 345,000 gallons per day. The highest recorded number of monthly degree cooling days at the airport, 485, occurred in July, 1988. Under existing campus development conditions, withdrawals would reach an estimated average 414,000 gallons per day for the month, if the monthly number of degree days reached 485.

Under the No Action Alternative, these existing levels of demand would continue. All values would increase by about 30 percent under full Facilities Master Plan buildout conditions.

The above indicates that existing and No Action Alternative cooling tower makeup water demands can exceed the existing permit annual and peak month groundwater withdrawal rates, provided that an usually hot year or peak month are experienced. Under such circumstances, NASA would switch back to WSSC as a source to supplement the well water and remain within well water withdrawal permit limits. Under the Facilities Master Plan Alternative, an additional well or wells could be drilled if and when it became apparent that it was necessary to do so. These wells would be spaced around Goddard to maintain acceptable aquifer withdrawal rates.

No impact on other wells is expected under either Alternative. The only two wells that are located within 5,000 feet of the NASA Building 24 and 31 wells that tap the Patuxent Formation are wells CD23 and CD24 (See Figure 5-13). Both are NASA site wells that are no longer used as an active source of water.

5.8.3.2 Groundwater Quality

Groundwater extracted from the Patuxent and Patapsco Formations generally has very good to excellent water quality. Chemical analysis of 21 samples from wells supplying water from the Patuxent Formation reveal that the groundwater has very low mineral content and is soft. Total dissolved Solids (TDS) concentrations range from 20 to 180 mg/1. Hardness (Calcium and Magnesium) concentrations range from 3 to 80 mg/l (as Calcium Carbonate), but hardness is generally less than 10 mg/l in the northern half of the County. The average pH of Patuxent Formation withdrawals in the northern half of the County was 5.4. Similarly, the average pH of 8 wells tapping the Patuxent Formation in the Beaverdam stream valley was 5.5, and for 7 wells in the vicinity of Goddard, 5.7 (Cooke, 1952).

The overlying Arundel Clay has a high ferrous content that can affect the iron concentration of water in wells that pierce only the upper half of the Patuxent Formation. The iron content of 20 samples range from 0 to 15 mg/l, and averaged 2.8 mg/1, but 45 percent of the samples had less than 0.3 mg/l. Eight samples from wells in the Beaverdam Creek valley ranged from 0 to 10 mg/l with a median value of 0.5 mg/l (ibid.). An exceptionally high iron concentration, 58 mg/l, was measured at well BE6, which is located on the BARC farm facilities on Beaver Dam Road just to the west of Springfield Road. The high concentration was attributed to probable corrosion in the well system (Tompkins, 1983).

Two other wells tapping the Patuxent Formation in the vicinity of NASA also recorded high iron concentrations. Well BE11 is located on the east side of Springfield Road about 0.3 mile south of the Good Luck Road intersection. The well was drilled to a shallow depth within the Patuxent Formation to supply a residence. Excessive iron concentrations were reported (Tomkins, 1983). Well BD4 was drilled in 1947 for the City of Greenbelt. High iron oxide concentrations encountered at elevations between 120 to 145 feet below sea level prevented its use as a municipal supply (ibid.).

Neither the Master Plan nor the No Action Alternative would impact groundwater quality.

5.8.4 Terrestrial Ecosystem

5.8.4.1 Regional Ecosystem

The northern boundary of GSFC east and west campuses and its satellite areas are contiguous to a large tract that has no commercial or residential development. The tract extends to the north and northeast across northern Prince George's County, the Patuxent River, and into Anne Arundel County to Fort George Meade. Amtrak northeast corridor railroad tracks and the Baltimore-Washington Parkway roughly define the eastern and western tract limits, respectively. Almost all of the tract is owned and occupied by Federal agencies. The natural environment in this tract extends into the northern sector of the GSFC east campus and satellite areas.

The tract is in Maryland Coastal Plain Ecosystem Province. The topography can be characterized as gently undulating or rolling, and the divides formed by the dendritic stream pattern can be difficult to discern in the field. Physical institutional facilities such as buildings and roads occupy less than two percent of the tract. The USDA properties within the tract have a roughly equal mix of agricultural and forested land cover. Other Federal properties are more than 90 percent forested. These woodlands can be characterized as a Pine-Oak Association Forest (Vegetation and Vertebrates of the Patuxent Wildlife Research Center: Outline of Ecology and Annotated List, N. Hotchkiss and R.E. Stewart, Patuxent Wildlife Research Center, 1979).

The BARC East Farm, National Plant Material Center, and southernmost sector of the Patuxent Wildlife Research Center are NASA's immediate neighbors to the north. East Farm land use patterns are a patchwork quilt of farmland and forest. Farm fields and pastures are concentrated along Soil Conservation, Beaverdam and Springfield Roads. The open area at the abandoned Beltsville Airport has been converted to research fields and orchard plots. Forested and unmowed grassed areas are used for direct research and as buffers around research fields to control insects and cross pollination, etc. Although they may be several hundred feet in width, the woodland buffers do not form large solid blocks of forest, but rather ring the fields. Only about ten percent of BARC's forest has not been manipulated for research purposes (ibid.).

Agricultural and forested research areas, combined with undisturbed forested wetlands along streams, create a rich diversity in vegetation and habitat. BARC plant taxonomists have recorded 655 vascular plants at the site. Most of the species occur in the forested and wetland areas. The rich structural floral diversity contributes to a rich avifauna. Knowledge about birds at BARC has been gathered through numerous professional studies as well as annual National Audubon Society surveys. About 88 species have nested at BARC. The exact number is uncertain because some species, once present, now appear to be absent (Birds of Beltsville Agricultural Research Center, BARC Ecology Committee, 1995).

Surprisingly, more bird species have been recorded at BARC during the winter than the summer. The winter pool has 124 species despite the apparent disappearance of 30 other recorded migratory species. The high count is primarily attributable to a greater diversity in waterfowl, raptors, sparrows and finches. Many of the species in the winter pool are transients or uncommon, and in any given year, the number of recorded species is close to the summer nesters (ibid.). Wild mammals found on the East Farm include the typical species found in the mid-Atlantic upland coastal plain region.

More than 90 percent of the land in the National Plant Materials Center and the Patuxent Wildlife Research Center (PWRC) is forested. The forests share the same characteristics as those at BARC. Forests within that portion of the PWRC manifest distinct patterns reflecting overgrowth of old farm fields. Studies at the center are oriented toward relationships between wildlife and habitat, habitat improvement, endangered species, and migratory birds. Reddington and Cash Lakes, and three small ponds form a complex about 1 to 2 miles northeast of NASA Area 400.

5.8.4.2 Heritage and Biodiversity Conservation Areas

The Maryland Heritage and Biodiversity Conservation Program (HBCP) was established under a predecessor program in 1979. The mission of the program is to provide long term conservation of the full array of native ecosystems, natural communities, and species that comprise the biological integrity of Maryland. HBCP protection areas have been established throughout the state. Three of the 12 protection areas in Prince George's County are found adjacent to Goddard, and a fourth, when combined with these three, forms a contiguous protected ecosystem along Beaverdam Creek (Figure 5-15).

- Beck Woods

Beck Woods has been designated as a protection area because the pine-oak forests are consistently the location of one of the highest densities of Neotropical migrants in the breeding bird censuses conducted in the mid-Atlantic region. Many of these species are forest interior breeding birds that require large tracts of mature, well-stratified, unfragmented forest for breeding success. This site is important because it is

one component of a relatively contiguous forest. Agriculture and residential and commercial development have made such large forest systems rare in the Piedmont and Coastal Plain of the Mid-Atlantic States. The upland forest in this protection area has been designated by the NPMC as a research forest. Although it was logged earlier in the century, the soil is well developed because it has never been plowed. Maintenance of the area in a natural state is important for the protection of forest interior breeding birds and other wildlife that require large tracts of forest. The success of ongoing ecological studies in the research forest depends upon the absence of artificial disturbances (ibid.).

The wetlands around Alter Pond and along Beck Branch are of high quality. One herbaceous plant on the Watch List, Green Spikebush, grows in the water drawdown of Alter Pond. From herbarium records, two additional rare wetland species are known to have occurred in the general vicinity of Beck Woods; the

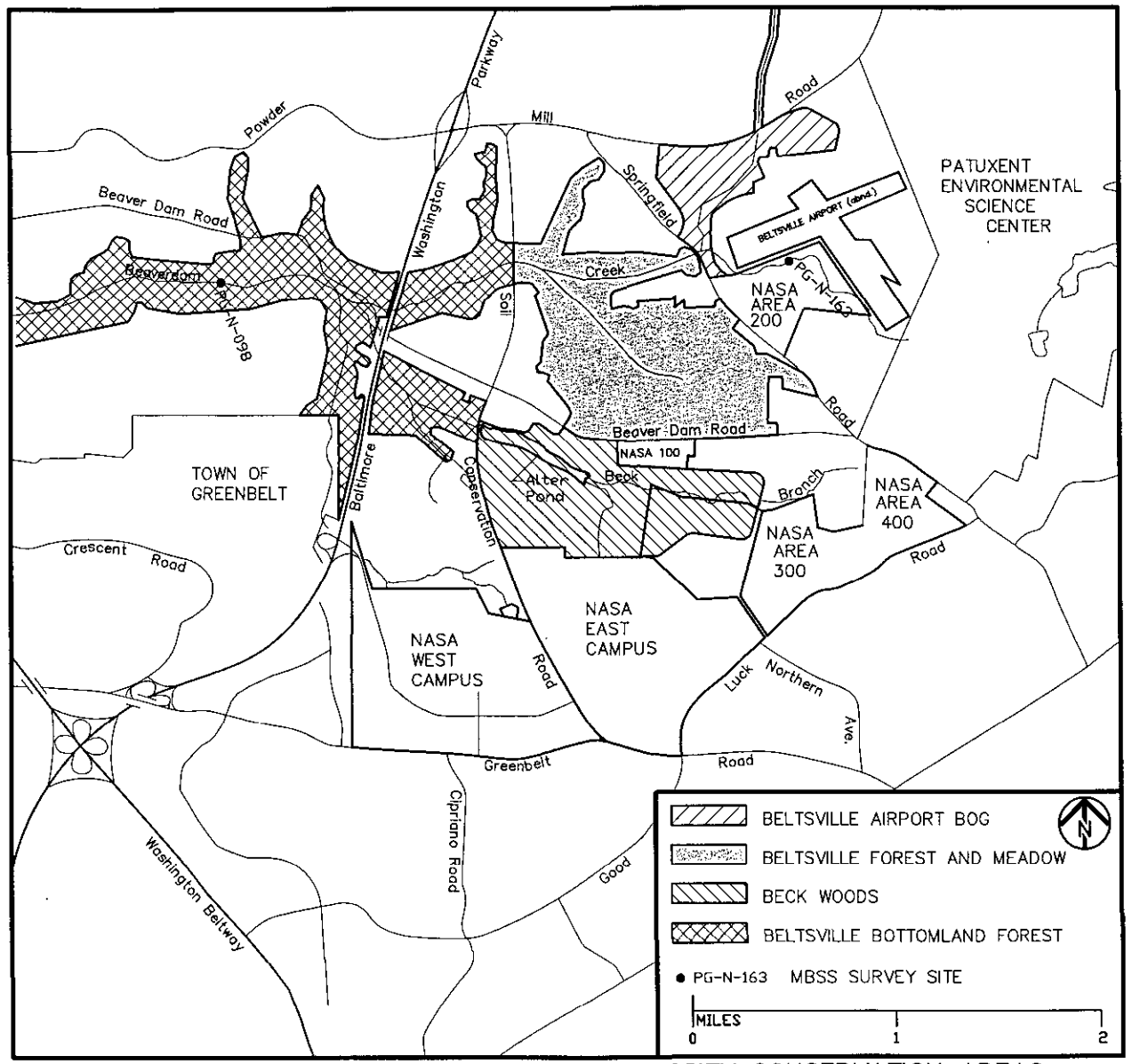


FIGURE 5–15 MARYLAND HERITAGE AND BIODIVERSITY CONSERVATION AREAS.

protection area is a potential transplant or relocation site when these species may be threatened with extirpation elsewhere.

- Beltsville Forest and Meadow

This protection area is located to the north of NASA Area 100 on the opposite side of Beaver Dam Road. Two branches of Beaver Creek flow through it. The major forested portion of the 1,472 acre site is situated around the southern branch. Adjacent to the creek, the bottomland forest is composed of Red

Maple with large patches of New York and Cinnamon Ferns on the forest floor. Black Gum, Spicebush, Sweet Pepperbush, and greenbrier are also common. Downstream, the latter two species form large, dense thickets along the stream, and the canopy is relatively open. American Holly is common on the stream valley side slopes and , pines and oaks increase in abundance. The upland forest is dominated by mixed oaks, especially Red and Black Oaks, with Virginia and Pitch Pines common in some stands. Highbush Blueberry dominates the understory.

Several factors make the protection area significant. It is one of the largest blocks of forest within BARC. It is unusual in that it contains a large stand of pure upland deciduous forest. Such lands are desirable as farm and development sites, and remaining forests in Central Maryland near Baltimore and Washington tend to be located along stream bottoms or in wetlands.

Most of the protection area has been designated as a research forest by BARC. The site has been used for a number of significant and long term ecological research projects. The forest has been censused, has served as a baseline survey area for migrant bird species, and is a site for long term gypsy moth research (ibid.).

- Beltsville Airport Bog

Beaverdam Creek splits into its two uppermost branches on the west side of the Beltsville Airport. The southern branch courses around the northern and eastern perimeters of NASA Area 200. The northern branch passes through BARC East Farm Area 600. The 163-acre Beltsville Airport Bog protection area is located along the northern branch. Its southernmost boundary abuts NASA Area 200 over a short distance.

The protection area contains two wetland complexes. The first is a 100 by 200 foot freshwater marsh that floods in the spring to form a large pond. It is located in a beech-oak forest, and is dominated by a wide variety of grasses and sedges. Wetland trees and shrubs grow on the borders and Southern Pond Lily is found in water channels. Downstream in the southern section of the protection area, a second wetland complex consists of wooded swamps, mesic woods, and impenetrable thickets surrounding a large shrub swamp with numerous sphagous boggy areas around its fringes (ibid.).

The central feature of the wetland complexes is an open canopy. Most non-tidal wetlands near the Piedmont Coastal Plain interface are forested. Two plant species, Button Sedge and Twining Bartonia, which are rare in Maryland, are found in the bog complex. Two additional rare plant species that were reported historically from the vicinity of the Beltsville Airport Bog may show at this site. A wet meadow in this protection area is the only known location in Maryland where the Eastern Sedge Barrens Planthopper is found.

- Beltsville Bottomland Forest

This 600 acre protection area encompasses enough bottomland deciduous forest to support the entire natural array of native bottomland bird species expected in this habitat. Red Maple is the dominant tree species in the wettest areas bordering Beaverdam Creek. A large portion of this protection area is a designated BARC research forest. Its value is enhanced in that it is connected to and extends to other protection areas. Several bird species that breed at the site such as the Kentucky Warbler, Louisiana Waterbrush, and Barred Owl are forest interior breeding birds requiring large tracts of forest, and in some cases mature stands of trees to breed successfully. Numerous Neotropical migrants use this forest during spring migration for feeding.

The Master Plan and No Action Alternative would not impact the Heritage and Biodiversity Conservation Areas. Goddard abuts the Conservation areas along the northern boundary of the east campus and at Areas 100 and 200. Both alternatives avoid development in the northern half of the east campus, and the satellite areas remain unchanged in each case. Existing natural buffers between campus development and the Conservation areas would be retained under both alternatives.

5.8.4.3 Goddard Ecosystem

NASA is surrounded on three sides extending from the Baltimore-Washington Parkway at the northwest corner around to the Good Luck/Springfield Road intersection by commercial and residential development. NASA can be considered as a transition zone between the more natural areas on government properties to the north, and the surrounding suburban development.

About 785 of the 1,271-acre GSFC is forested. Aerial photography dating to 1938 and 1943 shows much of the site that is forested today was still under cultivation or open fields at that time. All of it can be classified as Virginia pine, loblolly pine, and southern red oak forest. The forests, as are most in northern Prince Georges' County, are secondary and tertiary growth remnants of the forest encountered by the colonists. Arial photography dating to 1938 and 1943 indicates that much of the forest on the east and west campuses was not present at that time. At least 840 known plant species have been identified in the vicinity of GSFC based on surveys completed by professionals for the Beltsville Agricultural Research Center and the Patuxent Wildlife Research Center, and by review of the Maryland database for Prince George's county, and pertinent literature. (Greenbelt Campus Environmental Resource Document, Appendix H, Metcalf & Eddy, 1993).

A biological survey of GSFC was conducted in June 1992 to generally characterize the flora and fauna. (Greenbelt Campus Environmental Resources Document Section 4.2 and Appendices A and H through M, Metcalf & Eddy, 1993). The survey was based on a combination of aerial photography and field verification. Measurements of tree density, height, canopy cover, and scrub and ground cover typing were made at 20 sampling stations. The following is a summary of the survey.

West Campus

Solid forest cover is mainly confined to the buffer, which extends around the periphery of the north, west and south sides of the west campus with the width of the forest decreasing in that order (Figure 5-16). The central sector inside Explorer and Cobe Roads unencumbered with buildings, roads, and parking lots is primarily mowed lawn with scattered ornamental and landscape tree species. Isolated stands of deciduous and mixed forest averaging 15,000 sf in extent occur.

The peripheral forest consists of well interspersed deciduous, coniferous, and mixed stands. Most stands are relatively mature with canopy heights ranging from 60 to 100 feet. Canopy cover ranges from 70 to nearly 100 percent with the latter value applying to most of the area. Stand densities, including standing dead trees or snags, range between 360 and 560 trees/acre, and the total base bole area to ground area is between 135 and 150 sf/acre.

Oaks (Quercus sp.) dominate the deciduous forest overstory and Virginia pine (Pinus virginiana) in the coniferous forest. These species are equally predominate in the mixed forest sectors. Deciduous species dominate the subcanopy and shrub layers in all forest types. Dominant species in the subcanopy included sweet gum, red maple, and black tupelo. These species and oak seedlings dominate the shrub layer. Shrubs are almost entirely absent, due to foraging deer. The ground layer is sparse in most locations, although a well developed ground layer is present in a few locations. Shrubby areas and open field habitats are relatively uncommon and mostly confined to the vicinity of the pond system in the northwestern corner of the west campus.

East Campus

Much of the east campus is forested. Stands are deciduous or mixed with coniferous stands limited to two areas just north of Explorer Road. Scattered shrub habitats are mainly associated with drainage swales, road and utility rights-of-way, and are also found in the area south of Building 84. Areas of mowed lawn generally are associated with road borders and landscaped areas around buildings and antennas.

East campus forested areas are structurally similar to the deciduous and mixed stands on the west campus, but each forest type covers larger blocks of area. Most of the forest is relatively mature indicating that they have been undisturbed during NASA ownership. Canopy heights range from 65 to 100 feet, and canopy cover from 65 to 90 percent. Stand density, including snags, was 360 trees/acre with a total base area of 100 sf/acre . Large diameter snags are fairly common, especially in the wetland areas in the northwest sector of the campus.

Dominant overstory species include several species of oak, sweetgum, and Virginia pine. Sweetgum, red maple, and black tupelo dominate the understory. Vegetation in the ground layer is more developed than on the west campus.

Area 100 Antenna Test Range

Most of the site is mowed lawn and covered by ball fields (Figure 5-17). Conifer forest is found along and beyond the southern boundary, and a deciduous forest occupies the southwest corner of the site. Growth in this area consists of a variety of species with no clear dominance. The most frequently occurring species include silver maple, red maple, tulip poplar, quaking aspen, bigtooth aspen, paper birch, Virginia pine, American holly, and sweetgum. Shrubs are dominated by grape (Vitis sp.), and Japanese honeysuckle.

Area 200 Optical Testing Facility

A solid coniferous forest covers about half of this site. Areas around development are mowed lawns, old field, or deciduous shrub land.

Area 300-400 Magnetic Test/Propulsion Research Facilities

More than 95 percent of these sites are forested. Clearings are confined to the road edges and the periphery of buildings. Old field habitants are absent. The forest stands are relatively mature, with tree

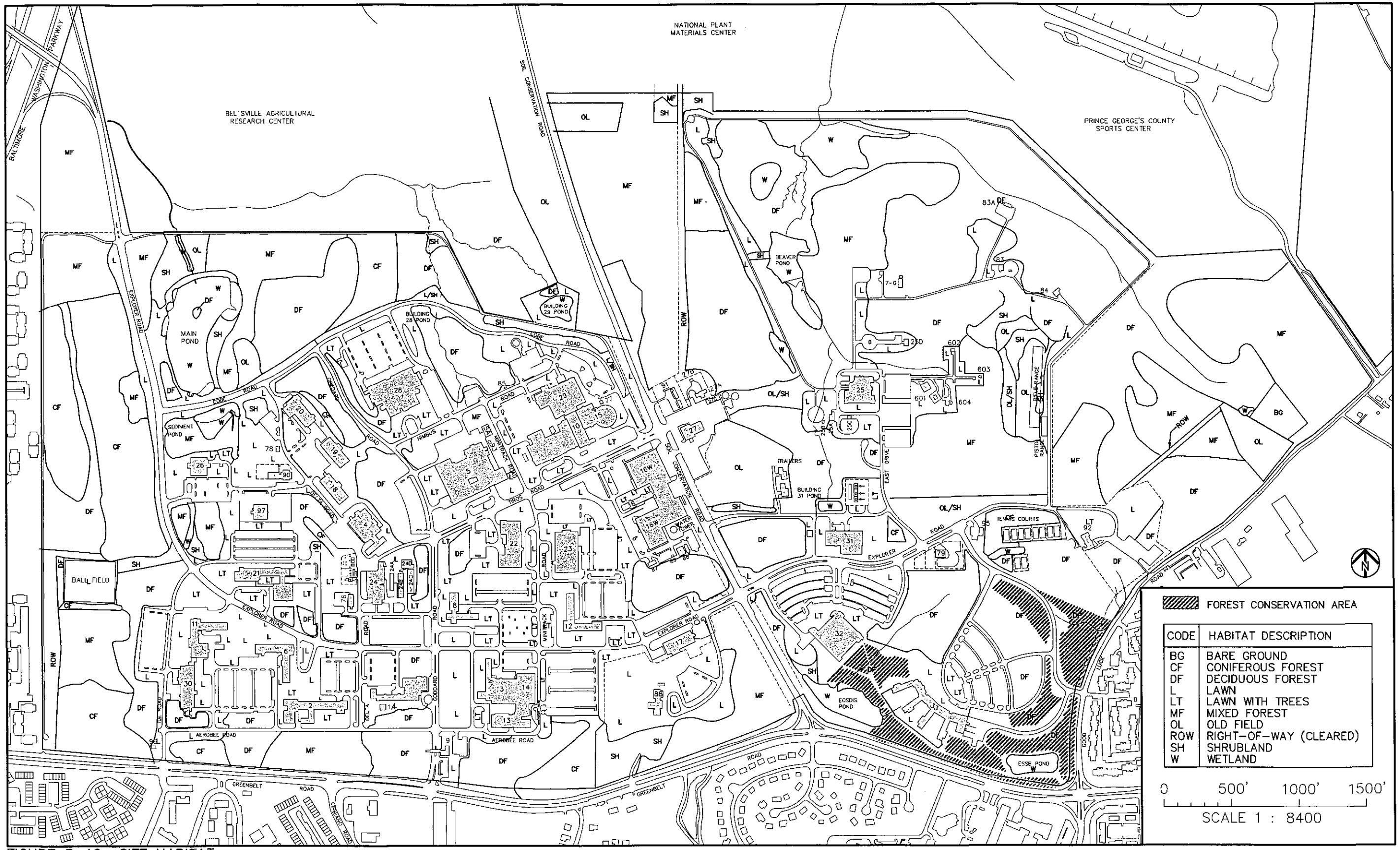
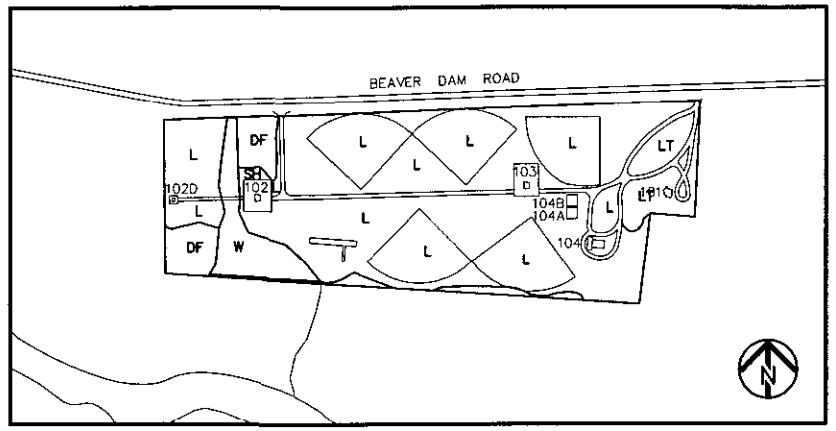
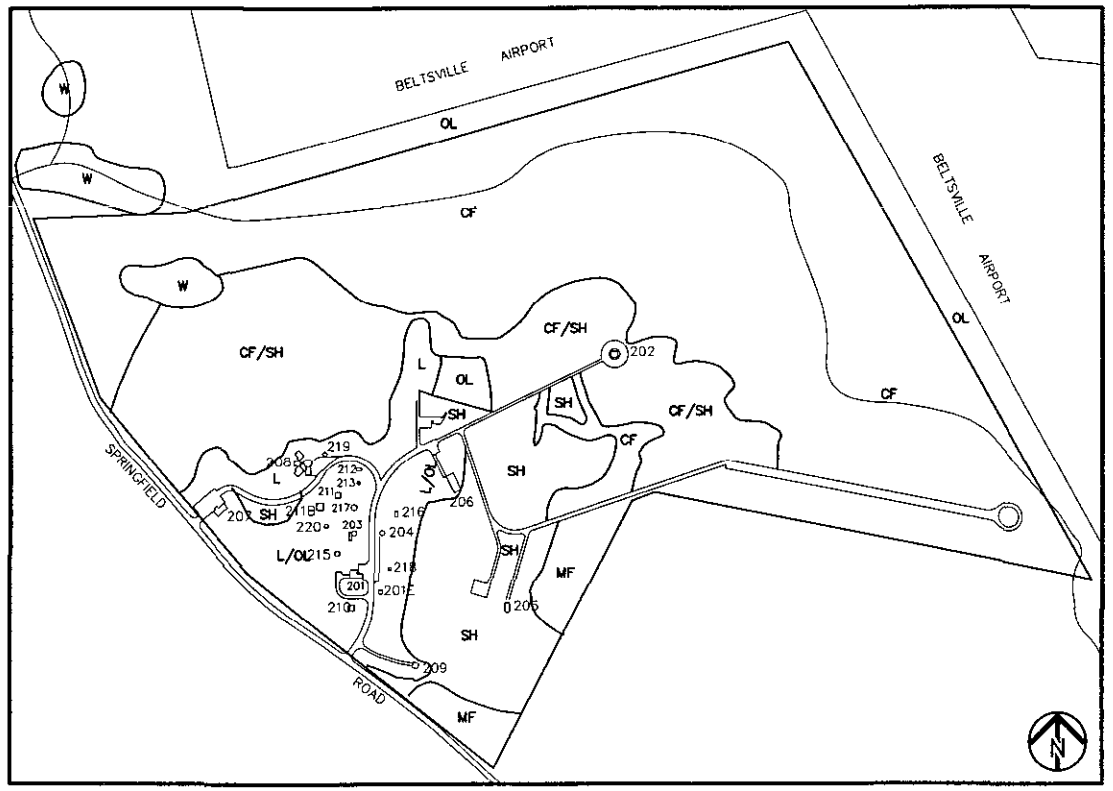


FIGURE 5-16 SITE HABITAT.



AREA 100



AREA 200

AREAS 300 AND 400

CODE	HABITAT DESCRIPTION
BG	BARE GROUND
CF	CONIFEROUS FOREST
DF	DECIDUOUS FOREST
L	LAWN
LT	LAWN WITH TREES
MF	MIXED FOREST
OL	OLD FIELD
ROW	RIGHT-OF-WAY (CLEARED)
SH	SHRUBLAND
W	WETLAND

SCALE ALL FIGURES $\frac{1" = 700'}{1 : 8400}$

FIGURE 5-17 SATELLITE AREA HABITAT.

heights and species dominance structurally similar to that occurring on the east campus. The canopy is more open (50 to 75 percent), leading to greater development of the understory, which is dominated by blueberry. Stand density at a sampling plot was 545 trees/ac., with a total basal area of 175 sf/acre. Sassafras and American beech occur at a higher frequency in this sector of Goddard than elsewhere.

GSFC contains no known critical habitat.

The large undeveloped Beltsville Agricultural Research Center and Patuxent Wildlife Research Center tracts are contiguous to Goddard. It can be assumed that most of the commonly occurring mammal species found in the Piedmont sector of the Maryland Coastal Plain Province are present or are transients in the vicinity of Goddard. Raccoon, striped skunk, red and gray squirrels, red and gray fox, woodchucks, and rabbits were observed casually at GSFC during a qualitative survey made in June 1992 (Appendix J, ibid.).

Sixty five bird species were visually or auditorily observed during this survey, although no concerted effort was made toward comprehensiveness. A majority of the observed species were forest passerines. The survey was taken late in the breeding season, and observation was limited by forest growth. Additional species would be expected during migratory and winter periods.

Studies completed at BARC and the Patuxent Wildlife Research Center counted 49 species of mammals and 57 species of reptiles and amphibians in the area to the north of Goddard. A total of 139 species of birds that either winter or breed during the spring and summer in the area were identified in the surveys. (Greenbelt Campus Environmental Resources Document, Appendix I, Metcalf & Eddy, 1993).

Two species, white-tailed deer and Canada goose, are present in such overabundance at Goddard that they contribute to significant ecological imbalances, and raise concern about public health and safety. The Goddard site deer population is estimated to be five times as great as that expected in a normal natural environment similar to Goddard. The average number of vehicle collisions with deer within the campus is four per year. NASA is also concerned about tick species that use deer as carrier hosts.

The Canada goose population has also grown beyond nuisance levels. Attracted by the campus stormwater management ponds, particularly the Main Pond, many geese have become permanent residents, rather than seasonal migrants, a phenomenon experienced throughout the Mid-Atlantic area. Nesting geese have attacked employees. Droppings over large portions of the developed campus have reached levels that raise health concerns, and grazing geese have denuded the ground cover in many areas in the vicinity of the ponds. Beaver are also attracted to Goddard by the stormwater ponds. GSFC has an active research and management program for site ecological systems, biodiversity, and wildlife. (See Environmental Assessment for Wildlife Management at GSFC, NASA, 2000).

This principal value of Goddard forest and habitat in undeveloped site areas is its continuity with the large natural tracts within BARC and the Patuxent Wildlife Center to the north and northeast of Goddard. However, the value has been severely diminished in the short term by virtual elimination of the campus woodland understory by deer up to the browse line. This in turn has had a substantial effect on campus understory fauna, i.e. birds and small vertebrates.

5.8.4.4 Terrestrial Habitat Impacts

One of the principles in Master Plan development was minimization of impact to site ecological systems and loss of forest. Proposals are oriented toward currently developed areas to the extent feasible. A wide natural buffer has been maintained between proposed development and the northern boundary of the east campus that abuts the Beck Woods Heritage and Biodiversity Conservation Area. Proposals include maintenance and enhancement of wooded buffers around developed areas along the campus periphery. No changes or actions are proposed for the relatively undeveloped Areas 100 through 400.

The Master Plan Alternative will therefore have minimal impact on the site natural terrestrial environment. Implementation of Master Plan Alternative buildings, parking lots, and roads would result in the following estimated losses in natural areas greater than half an acre in extent:

AREA	HABITAT	CHANGE
New Thrust Zone	Old Field/Shrub	3 acre loss
Space Science/Central Commons	Unmowed Field	6 acre loss
New Thrust Zone	Deciduous Forest	3 acre loss
New Thrust Zone	Mixed Forest	3 acre loss
Earth Science	Deciduous Forest	2 acre loss
Space Science/Central Commons	Deciduous Forest	1.5 acre loss
Engineering & Technology	Deciduous Forest	0.5 acre loss

The Facilities Master Plan would convert about nine acres of site field and shrub habitat to developement. Most of the conversion would be attributable to the parking lot on the east side of the Space Science and Central Commons neighborhood.

GSFC is covered by an estimated 785 acres of forest or about 62 percent of the site. Exclusive of the Soil Conservation Road realignment, the potential total loss associated with full implementation of the Facilities Master Plan is estimated to be about ten acres. Most of the projected forest loss would be in the New Thrust Zone, which would be developed only if NASA GSFC were assigned a major mission that couldn't be accommodated in other facilities.

All of the Soil Conservation Road realignment alternatives would lead to unavoidable forest loss. The estimated loss would be about four to five acres for the West Alignment Alternative, W-1, and about nine to 10.6 acres for either of the eastern alternatives. More detail is given in Section 7.4.9.

The total potential forest loss from Master Plan proposals and Soil Conservation Road realignment alternatives could range up to about 20-acres, or about two and a half percent of the site forest cover. The Facilities Master Plan notes that the maintenance of the extensive existing lawn and landscaped areas is costly. Many of the areas now occupied by buildings and parking lots that are proposed for demolition or removal would be forested. It is estimated that about 60-acres of new forest could be created. This would compensate for potential losses.

Continuing current practice, NASA will develop Forest Conservation Plans for submittal to the Maryland Department of Natural Resources. These plans are prepared during the design phase on a project by project basis, and include Forest Stand Delineations, note specific tree losses and new plantings, and identify protection measures for trees that remain within the project area. If required, an area of suitable location, size, and forest character is set aside on the site as a long term forest conservation area.

5.8.5 Water Resources

5.8.5.1 Stream Flows and Water Quality

The drainage divide between the Anacostia and Patuxent Rivers meanders through NASA GSFC. Site branches or streams therefore spring up within the facility or just beyond its boundaries. Since they are in their uppermost reaches, site streams are small. Under dry weather conditions, they are only a few feet wide and an inch or less deep, and can be crossed with a single stride in many locations. In general, where exposed, site branches rise in seeps in natural, broad, shallow swales. The uppermost sections of the swales may have no flow during dry weather for several hundred feet in the uppermost section. Stream substrates are sandy or clayey with few stones. Where gradients are steeper and soils erodable, natural incised channels three to five feet deep form. In general, all the branches flowing northward across NASA debouch into flat areas where wetlands occur just within or beyond site boundaries. On the west campus, branch sources are hidden within the storm drain collection system, and the streams are revealed only when they emerge from pipes to cross the buffer area around the periphery (See Figure 5-7). Most of the west campus drains to an unnamed tributary of Beaverdam Creek, which flows along the northern NASA property line. Three branches of the tributary extend into NASA. Beaverdam Creek and its tributaries, including Beck Branch, are in the Anacostia River basin (Basin Code 02.14.02.05).

The southeast sector of the west campus and Drainage Area EC1 on the east campus drain to the Bald Hill Branch of the Patuxent River (Basin Code 02.13.11.02). Branches rising on the east campus north of Explorer Road, and in Areas 100, 300, and 400 form the headwaters of Beck Branch, a Beaverdam Creek tributary. Area 200 is drained by a headwater branch of Beaverdam Creek that originates on the south side of the Beltsville Airport.

All of the streams with in NASA are Class I Maryland waters (Water Contact Recreation and Protection of Wildlife). All are shown on US Geological Survey topographic mapping as intermittent.

There are no flow gauging stations in the Beaverdam Creek basin. Relatively accurate spot measurements were made on two occasions in the spring and summer of 1997 on Beaverdam Creek about one mile to the west of the Baltimore-Washington Parkway as part of the Maryland Biological Stream Survey (Maryland Biological Stream Survey, Ecological Assessment of Non-Tidal Streams, MDNR, 1998). The average of the two measurements was 2.61 cfs. It is not known whether the values are typical of dry weather conditions. The upstream drainage area at this point was estimated to be 7,729 acres. This includes about 1,037 acres within NASA GSFC. A similar flow measurement was made during the stream survey along the branch of Beaverdam Creek within NASA Area 200 in the summer of 1997 indicated a flow of 0.17 cfs.

Normal dry weather flows for other site branches are probably of similar magnitude, i.e. tenths of a cubic foot per second. Flows leaving the site are altered by passage through the site stormwater management ponds. Flows in the branch leaving the Main Pond are augmented by steam condensate and non-contact cooling water discharges from the Central Heating and Chilled Water Plant in Building 24. Estimated discharges range from 0.06 to 0.16 cfs.

Data on stream water quality in the upper Beaverdam Creek watershed appears to be limited to a few spot samples taken at two locations during the Maryland Biological Stream Survey in 1977 (See Appendix B). NASA Building 24 steam condensate and cooling water are released in accordance with NPDES Permit 95-DP-3156A. NASA takes samples at the Sediment Pond outfall 001 on a monthly basis as a permit condition. Measurements for Fiscal Year 2001 indicate that the temperature ranged from 40 to 86° F, pH ranged from 6.73 to 8.88, and dissolved and total copper ion from and 16 to 88 micrograms per liter, respectively. The average dissolved copper concentration was 19.5 micrograms per liter.

No stream flow and water quality impacts are expected under the Master Plan and No Action Alternatives. A 25-foot buffer on either side of site streams would be maintained. Runoff and flows from streams in the developed areas of the east and west streams in the developed areas of the east and west campuses are routed to stormwater management quantity and quality control ponds before release from the site.

5.8.5.2 Aquatic Habitat

The Maryland Biological Stream Survey evaluated 955 randomly selected non-tidal stream segments across the state. Each segment was a uniform 75 meters in length. Two of the sites, PG-N-089 and PG-N-163 were in the vicinity of Goddard (See Figure 5-15). Both are on Beaverdam Creek, PG-N-089 is located about a mile west of the Baltimore-Washington Parkway, the other near the headwaters of the creek and within NASA Area 200. Data extracted from MDNR files for each site provide a snapshot of aquatic habitat conditions.

Site PG-N-098 exhibited a much higher habitat value as indicated by biological index criteria:

	PG-N-089	PG-N-163
Physical Habitat Index (Phi)	88.44 (good)	7.79 (very poor)
Benthic Index (Bibi)	4.14 (good)	1.86 (very poor)
Hilsenoff Biotic Index (Hbi)	6.33 (fair)	6.02 (fair)

At site PG-N-098, 231 fish of 17 different species were captured during the survey, while only seven fish of three species were counted at Site PG-N-163. No andromodous or trout species were found at either location. Three amphibians or reptiles were observed at the former site, and four at the latter. The diversity of the benthic microinvertebrates was determined qualitatively at each site. A small sample of approximately 100 individuals was isolated in the laboratory and separated by genus or lowest practical taxon. The sample from Site PG-N-083 had 33 taxon represented by 96 individuals. Values for Site PG-N-163 were 15 and 107, respectively.

The higher habitat assessment at Site PG-N-098 is expected. The site is located within the Beltsville Bottomland Forest Biodiversity Conservation Area (See Section 5.8.4.2). Beaverdam Creek flows through other conservation areas for several miles upstream of the monitoring point. The habitat surrounding Site PG-N-163, in contrast, is uniform coniferous forest. The forest probably dates only to the period when the Satellite Area 200 was occupied by NASA. It should not be assumed that habitat quality improves uniformly as one proceeds down Beaverdam Creek. Site PG-N-163, although rated as very poor to poor habitat, is only about 1,300 feet upstream from the Beltsville Airport Bog, a natural heritage and biodiversity conservation area. In general, high quality aquatic habitat runs along the full length of Beaverdam Creek and Beck Branch.

The Master Plan should have minimal impact on the aquatic environment. It maintains existing natural buffer zones between developed areas and the northern periphery of the site. The Master Plan maintains a 25-foot wide buffer on each side of all streams. No substantial changes in the amount or character of discharges or stormwater runoff are expected.

5.9 Wetlands

Wetlands at and in the vicinity of NASA Goddard are shown in Figures 5-18 and 5-19. Areas shown are derived from a composite of information resources. The wetland areas shown in the Figures that are outside NASA property were extracted from Federal and State mapping (National Wetland Inventory, Laurel and Lanham Quadrangles, USFWS, 1981) (Maryland Non-Tidal Wetland Guidance Maps, Laurel and Lanham Quadrangles, Maryland DNR). With the exception of the area south of Explorer Road on the East campus, wetland areas on NASA property were field surveyed over a four day period in June 1992 (Final Environmental Resource Document, Greenbelt Campus, Vol. I, Metcalf & Eddy, 1993). The survey determined the character and approximate extent of these wetlands. Formal delineations were not made, although delineation forms were completed to standardized data collection, and the wetland boundaries were sketched on large scale site mapping.

Wetlands were classified according to Cowardin's system (Classification of Wetlands and Deepwater Habitats of the United States, Cowardin, 1979). In general, wetland habitat areas determined in the surveys were larger than the corresponding ones in National Wetland Inventory and Maryland mapping. Wetlands south of Explorer Road on the east campus were determined by separate wetland delineation completed as part of the Building 32 and 33 development in this area (East Campus Master Plan Existing Conditions Summary, Parsons Facilities Services Company, 1997).

Maryland Wetlands of Special State Concern are defined as those with habitat or ecologically important buffers for animal or plant species listed as threatened or endangered by the US Fish and Wildlife Service or the Maryland Department of Natural Resources, or as wetlands that contain ecologically unique or unusual areas. (COMAR 26.23.01.01). Any construction disturbance within 25 feet of a non-tidal wetland, or within 100 feet of wetlands of Special State Concern may require a State wetland permit in addition to a Federal permit from the U.S. Army Corps of Engineers.

Downstream from Goddard, Beaverdam Creek, the Beck Branch of Beaverdam Creek, and the unnamed tributary of Beaverdam Creek that drains most of the west campus are bordered by wetlands throughout their reaches within the Laurel quadrangle. All of these downstream wetlands have a special State concern classification except for the one immediately to the north of the west campus. Most are classified as the broad-leaved deciduous forest type (PF01A).

Master Plan and No Action Alternatives are expected to have no substantive impact on these downstream wetlands. No projects are proposed in the northern sector of the east campus, and the natural perimeter buffer on the east campus would be retained.

5.9.1 NASA Site Wetlands

Details on NASA site wetlands are given in the 1993 GSFC Environmental Resources Document. With the exception of two riverine wetlands on the east campus, all wetlands within NASA are within the non-tidal palustrine ecological system classification, differing only by class and subclass.

On the east campus, two forks of an unnamed Beck Branch tributary diverge near the NASA property line, with one fork running southward to the Building 31 stormwater management pond, and the other coursing eastward parallel to the property boundary. Both stream channels are underlain by Hydric soils, Bibb and Elkton silt loams, for most of their lengths.

A PF10A wetland, larger than that indicated on National Wetland Inventory mapping, as surveyed in the area where the two forks merge at the property line. This wetland is dominated by blackgum, sweetgum, and red maple in the tree layer. The shrub layer is dominated by American holly (Ilex opaca) and arrow wood (Vibernum dentatum), and the herb layer by the obligate wetland plant, skunk cabbage (Symplocarpus foetidus).

This wetland is the only one within the immediate vicinity of Goddard listed as a wetland of Special State Concern. The Maryland Natural Heritage Program Beck Woods protection area abuts the entire north side of the east campus. It contains high quality wetlands bordering Beck Branch which flows from east to west parallel to the NASA property line about 2,000 feet downstream from the confluence of the tributary forks. The Beck Woods are a known habitat for the Green spikerush (Elocharis olivacea), which is on the Maryland Watch List for threatened and endangered species.

The western fork is impounded by an old low dam about 2,900 feet upstream from the property boundary. The stream passes through three successive classes of wetlands behind the dam. The first is open pool of water, although the field survey found evidence that it occasionally dries up. The pool area vegetation is characterized by floating-leaved plants such as water lilies (Nuphar luteum), and spikerush (Eleocharis sp.). The pool area transitions into a PEM5 community dominated by common cattail (Typha latifolia), sedges (Carex sp.), and arrowhead (Sagittaria latifolia). Further upstream, south of the emergent wetland, the broad stream channel is bordered by a broad-leaved, deciduous, forested wetland that is dominated by red maple, black gum sweetgum, and arrowwood. Further upstream, the channel narrows and no wetlands were found until the Building 31 stormwater management pond is reached.

The eastern fork has no wetlands upstream from the PF01A at its confluence with the southern fork.

Two other wetlands that are not shown on NWI or State mapping were found in the northern undeveloped section of the east campus. A PF01 wetland is located to the southwest of the larger wetland at the confluence of the branch forks. This wetland is located at the northern end of a minor intermittent tributary stream where it debouches into the western for channel area. The vegetative community is similar to the longer wetland. The second newly identified wetland is an emergent wetland located in a shallow depression on the west side of an access road to the west of Building 25.

In Area 100, the Antenna Test Range, wetlands extend across the western sector in a narrow band that broadens in the vicinity of the southern boundary. These wetlands are classified PEM5 in NWI mapping, but were determined by the field survey to be a broad-leaved deciduous forested wetland dominated by red maple trees with a segment of broad-leaved deciduous scrub/shrub wetland (PSS1A) in the central area near the radar tower. Japanese honeysuckle (Lonicera japonica) covers most of the scrub/shrub portion of the wetland.

Area 100 is bounded on all but the east side by Maryland Natural Heritage Program protection areas. The Beck Woods lie to the south and west. The Beltsville Forest and Meadow protection area covers the area on the north side of Beaver Dam Road. Wetlands in this area are designated as wetlands of special state concern because this protection area is used as a site for long term ecological studies and the known presence of a rare carnivorous plant.

Wetlands were found beyond the Area 200 boundary in the vicinity of the confluence of the two Beaverdam Creek forks by the survey. These wetlands lie within Beltsville Airport Bog Natural Heritage Program protection area, which supports habitat for four rare plant species and one rare insect species.

In terms of function and value, site wetlands can be rated qualitatively as moderately high to high. Wetlands comprising the site storm water management ponds were designed to function as mechanisms for flood storage and desynchronization and sediment trapping. Monitoring of site groundwater at shallow depths indicates that they also serve as locations for groundwater recharge. Runoff capture

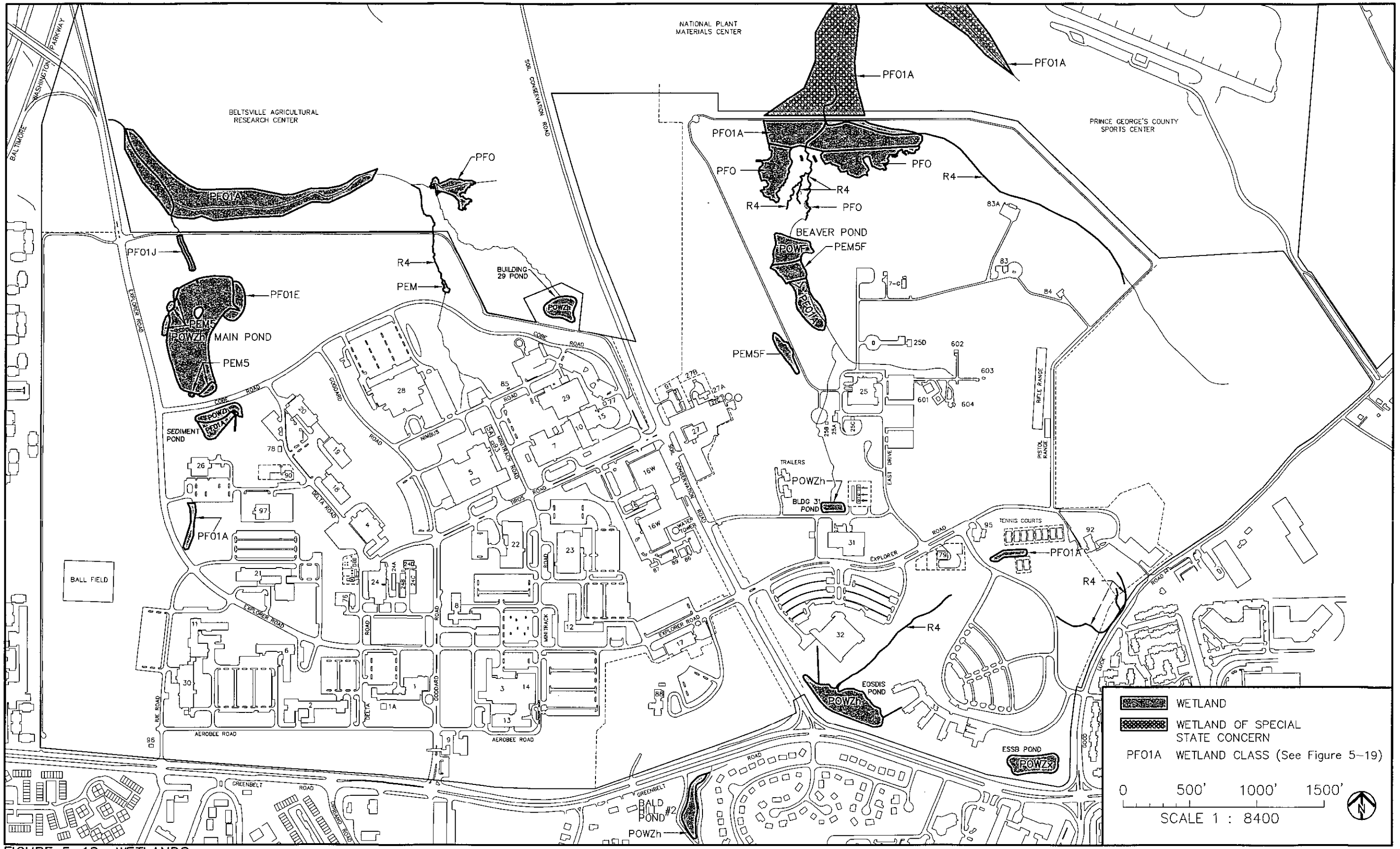
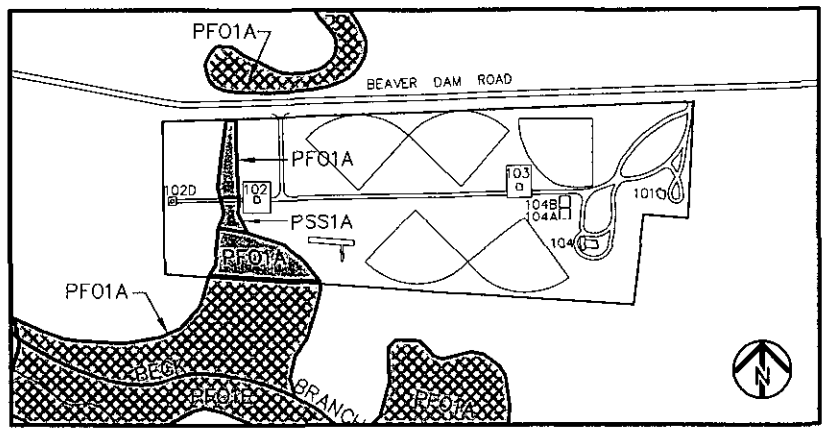
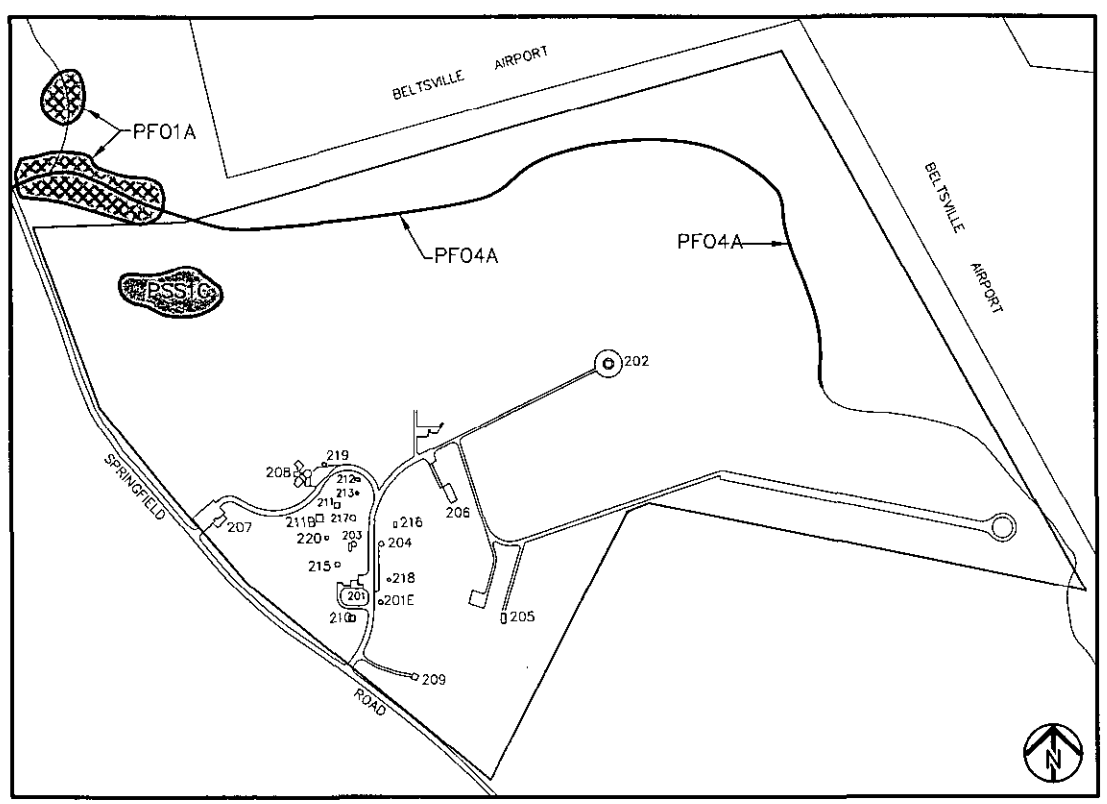


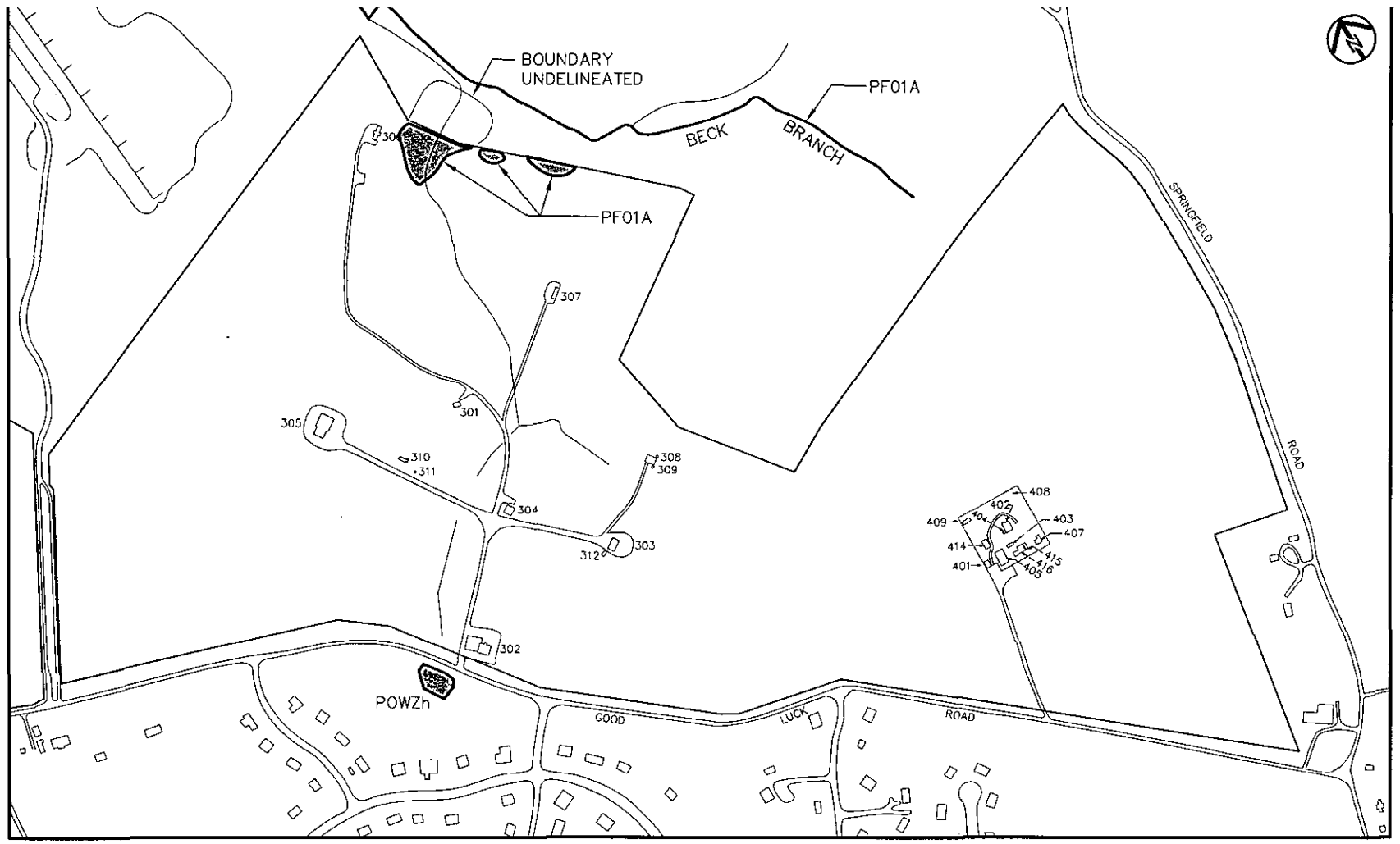
FIGURE 5-18 WETLANDS.



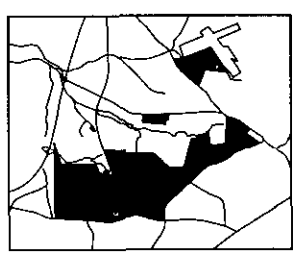
AREA 100



AREA 200



AREAS 300 AND 400



WETLAND

WETLAND OF SPECIAL STATE CONCERN

PF01A WETLAND CLASS

Note: All site area wetlands are non-tidal. All site area wetlands are palustrine except for the R4SB5 class.

SCALE ALL FIGURES $\frac{1" = 700'}{1 : 8400}$

WETLAND CLASS	
PEM	Emergent
PEM5	Emergent, narrow-leaved persistent
PEM5F	Emergent, narrow-leaved persistent, semipermanent
PFO	Forested
PF01A	Forested, broad-leaved deciduous, temporary
PF01E	Forested, broad-leaved deciduous, seasonally saturated
PF01J	Forested, broad-leaved deciduous, intermittently flooded
PF04A	Forested, needle-leaved evergreen, temporary
POWF	Open water, semipermanent
POWZh	Open water, intermittently exposed/permanent, impounded
POWZx	Open water, intermittently exposed/permanent, excavated
PSS1A	Scrub/shrub, broad-leaved deciduous, temporary
PSS1C	Scrub/shrub, broad-leaved deciduous, seasonal
R4	Riverine, intermittent streambed

FIGURE 5-19 SATELLITE AREA WETLANDS.

provides retention and removal of excess nutrients. Although Beaver Pond was not designed for stormwater retention wetland growth at this location functions effectively for flood storage, sediment trapping, and nutrient removal. Natural wetlands on NASA have similar high values for these functions.

Wetlands north of Cobe Road on the west campus, north of the network training area around Building 25 on the east campus, and on outlying Areas 100, 200, and 300 have a high value in flood chain support, and as fish and wildlife habitat. They are contiguous to or near off site wetlands that continuously border Beaverdam Creek and its tributaries, including Beck Branch. The value is increased by the continuity and overall size of these wetland areas. Some of the off-site wetlands are known habitats for threatened faunal and floral species.

Wetlands in the southern half of the east and west campuses possess more limited value as habitat or as areas of food chain support. They are generally located adjacent to development or well-traveled roads, are isolated from one another, and in some cases, the up and downstream water courses are encased in drainpipe.

Recreational activities at NASA mesh compatibly with site wetland natural and ecological values. Public access is prevented by site security fencing, reducing the potential for human disturbance. Active recreational use is limited to the occasional fisherman at the Main Pond. Lunch time and after work joggers and strollers frequently use the perimeter woods on the north sides of the east and west campuses. Passive observation of wildlife in the adjacent wetlands is available. Wetlands in Area 100 are located to the west of active recreational areas.

The Facilities Master Plan and No Action Alternatives make no proposals for locating buildings, internal site roads, or other facilities in known on-site wetland areas. Buffer zones of 25 feet are established around all on-site and adjacent property wetlands, and 100 feet around wetlands of Special State Concern on abutting properties under both alternatives. Neither alternative would have substantive wetland impacts. Minor impacts could occur at the individual project scale pending further delineation of project site conditions at the time of project delineation. If wetland losses occur, they would be mitigated in accordance with US Army Corps of Engineers and State regulations and procedures effective at the time of project implementation.

The realignment of Soil Conservation Road would create minor wetland losses regardless of the alignment alternative selected. These losses are unavoidable. The wetland impacts associated with the road realignment are discussed in Section 7.4.10.

5.10 THREATENED AND ENDANGERED SPECIES

No Federal threatened, endangered, or rare species are known to be established as resident species on NASA properties (See early coordination correspondence in Appendix A). No known critical habitat is located on GSFC.

5.11 FLOODPLAINS

There are no 100-year floodplains as defined by the US Federal Emergency Management Agency flood insurance mapping within NASA GSFC.

†††

6 PUBLIC INVOLVEMENT

6.1 Meetings

NASA has conducted an active public involvement program and consultation with government agencies in developing the Facilities Master Plan. The program has followed the requirements of the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, U.S. Council on Environmental Quality, 1978, as amended; Environmental Policy and Procedures, NCPC, 1979 as amended; and Implementing the National Environmental Policy Act and Executive Order 12114 (NASA NPG 8580.1), NASA, 2001.

Through this program, NASA has provided information on programming, concepts, preliminary alternatives, and proposed facilities and elements of the Facilities Master Plan to government agencies, NASA management, and employees, and citizens in the environs of Goddard. NASA has sought out and given these groups the opportunity to express opinions, ask questions, and identify issues and concerns.

Many informal meetings and presentations have been held with government agencies, local jurisdictions, citizen associations, and individuals during the course of Facilities Master Plan development. The following summarizes these meetings and coordination activities.

- SCOPING/NOTIFICATION LETTER
  April 28, 1999

NASA circulated a scoping letter to appropriate Federal, State, and local government review agencies and jurisdictions, and elected officials notifying them that NASA had initiated the master planning process. Site location, site facility, and site aerial mapping were enclosed. The letter requested information and comment on potential issues.

- NCPC/M-NCPPC EARLY COORDINATION MEETINGS
  December 6, 1999/December 7, 1999
  NCPC offices, Washington, D.C./M-NCPPC offices, Upper Marlboro, MD

NASA representatives and the master planning consultant team established initial contract with counterpart NCPC and M-NCPPC staff members. NASA expressed its intent to prepare a Facilities Master Plan and provided information on the proposed project schedule. A brief presentation was made outlining the results of the internal NASA GSFC visioning process. The NCPC and M-NCPPC review process and protocols were outlined. Staff members of both agencies identified what they considered to be potentially important issues.

- M-NCPPC STAFF INFORMATION MEETING/NCPC STAFF INFORMATION MEETING
  March 24, 2000 (AM)/March 24, 2000 (PM)
  M-NCPPC offices, Upper Marlboro, MD/NCPC offices, Washington, D.C.

The same presentation, less commission review protocols, was made to M-NCPPC and NCPC staffs in the morning and afternoon. Both commission staffs identified the proposed private development zone and Soil Conservation Service Road relocation as important issues. They reserved judgment pending development of more specific information. Both were interested in the potential phasing or scheduling of plan proposals, and they noted that concepts for traffic management needed to be developed as part of the Facilities Management Plan.

- CITY OF GREENBELT MEETING
  April 14, 2000
  City office, Greenbelt, MD

The presentation was made to the Mayor and staff. They recognized that Goddard would need to change in response to new NASA operating strategies. They expressed interest in the SCS Road relocation and the Private Development Zone. They were concerned about the potential impacts and effects that these plan features could have on Greenbelt, particularly among the residences along the western Goddard boundary, and along Greenbelt Road west of Cipriano Road in the vicinity of where the realigned SCS Road would reconnect to Greenbelt Road.

- US NATIONAL PARK SERVICE MEETING
  May 15, 2000
  NASA GSFC, Building 8, Greenbelt, MD

Goddard representatives met with National Park Service (NPS) representatives to brief them on Facilities Master Plan progress to date. NPS representatives noted that the Baltimore-Washington Parkway was listed on the National Register of Historic Places. The condition and appearance of the NASA interchange bridge were discussed. NPS representatives noted that authorization for construction of the Goddard/Parkway interchange was achieved through special US Congressional legislation with the provision that interchange would be for NASA employee use only.

- NCPC BELTSVILLE AREA INTERAGENCY TASK FORCE MEETING
  June 12, 2000
  NASA GSFC, Building 8, Greenbelt, MD

Goddard planners met with NCPC staff and representatives of Federal agencies that have facilities in the environs of Goddard. These included the USDA Agricultural Research Service, the Patuxent Environmental Science Center, the US Secret Service, and the Food and Drug Administration. Discussed Master Plan development, Goddard population projections, traffic and transportation issues, the Soil Conservation Service Road realignment, and the Private Development Zone.

- NCPC AND NATIONAL PARK SERVICE MEETING
  July 20, 2000
  NCPC offices, Washington, D.C.

Discussion concentrated on traffic issues. The feasibility for a new interchange on the Baltimore-Washington Parkway at any location between the I-95/I-495 Beltway and the Powder Mill Road interchange was discussed. It was determined that Park Service national policy, existing Congressional legislation, and the listing of the Parkway on the National Register precluded any new interchanges.

- NCPC TRANSPORTATION MANAGEMENT COORDINATION MEETING
  July 27, 2000
  NCPC offices, Washington, D.C.

Technical session with NCPC staff discussed Goddard's situation within regional transportation system, existing employee parking ratio, and potential future target ratios. Transportation demand measures and the feasibility of their application to the GSFC site were discussed.

- MARYLAND U.S. CONGRESSIONAL STAFF BRIEFING
  August 11, 2000
  Rayburn Office Building, Washington, D.C.

Staff for Maryland U.S. Senators and Congressmen was briefed on the Facilities Master Plan development. Questions and comment were principally oriented toward how NASA was interfacing with the general public and surrounding communities and neighborhoods, and addressing the issues and concerns of the public.

- NASA EMPLOYEE COLOQUIUM
  August 25, 2000
  NASA GSFC, Building 3, Greenbelt, MD

A presentation on general site planning and Illustrative Plan development was made to approximately 175 Goddard employees in two sessions. Questions and comments were oriented toward connections between the Center mission and the rationale for the plan, the implications of realigning SCS Road on operations, and proposed site amenities.

- GREENBELT CITY COUNCIL MEETING
  September 6, 2000
  Greenbelt Community Building, Greenbelt, MD

A presentation on the Illustrative Plan, Version 3, was made at the September City Council meeting. About 30 Greenbelt residents attended. Questions and comments were primarily directed toward the Private Development Zone and the realignment of SCS Road. The importance of having a hiker/biker trail along realigned SCS Road was stressed by the Council and citizens.

- GODDARD CONTRACTOR ASSOCIATION MEETING
  October 18, 2000
  Goddard Corporate Park, Greenbelt, MD

The same presentation made to GCS representatives. Questions and comments focused on understanding the nature of changes at Goddard, and the potential effects on private business sector and relocation of SCS Road, and effects on traffic patterns.

- LOCAL ELECTED OFFICALS MEETING
  November 2, 2000
  NASA GSFC, Building 8, Greenbelt, MD

The Illustrative Plan, Version 3, was discussed with local State and County elected officials and representatives from the Baltimore/Washington Chamber of Commerce. The officials asked about potential traffic and commuter impacts, access to the GSFC or NASA secure area. Inquiries were also made about the status of coordination with Federal agencies, and information available to the surrounding community.

- GODDARD RETIREES AND ALUMNI ASSOCIATION
  November 14, 2000
  NASA GSFC, Building 92, Greenbelt, MD

The Illustrative Plan was presented to the GRAA. The response was focused on the nature of change at Goddard and its effects on employees and the ramifications of the relocation of SCS Road.

- PUBLIC INVOLVEMENT MEETING
  December 5, 2000
  NASA GSFC Visitor Center, Greenbelt, MD

A public involvement meeting was held at the NASA Visitor Center for the communities surrounding Goddard. Notice for the meeting was published in local newspapers serving Prince George's County, and by fliers sent to the local community organizations, and to the organizations on the Draft Environmental Assessment distribution list. Goddard's mission goals and security requirements were outlined, and the Illustrative Plan, Version 3 was presented. Comment and questions received emphasized potential traffic impacts, and changes in travel patterns and trip times that may be created by the SCS Road realignment, the new SCS Road intersection at Greenbelt Road opposite Greenbelt Woods, and the need for a hiker/biker trail alongside the realigned SCS Road.

- PUBLIC INVOLVEMENT MEETING
  February 5, 2001
  NASA GSFC Visitor Center, Greenbelt, MD

A second Public Involvement Meeting was attended by approximately 150 people including staff from the offices of locally elected officials. Notice for the meeting was published in local newspapers serving Prince George's County and by fliers sent to local community organizations. SCS Road realignment issues predominated during the question and comment period. Inquiries were also made about the extent of NASA coordination with local, State, and Federal government agencies, ownership of and safety considerations for the realigned SCS Road, NASA employee access, and NASA's intentions for the satellite areas. Comments were made that the realigned SCS Road should be biker friendly.

- GREENBRIAR CONDOMINIUM ASSOCIATION MEETING
  March 6, 2001
  Greenbriar Community Center, Greenbelt, MD

The Illustrative Plan was presented to the association board and members. Approximately 40 persons attended. Members asked for clarification on a number of issues regarding traffic, traffic noise, Baltimore-Washington Parkway access, and NASA security requirements.

- GODDARD ALLIANCE BOARD MEETING
  March 15, 2001
  Greenbelt Marriott, Greenbelt, MD

The Board and other neighborhood business owners and representatives were briefed on the Facilities Master Plan. Interest was directed toward the nature of changes in the GSFC mission, response of the public community, and funding for implementation of the plan.

- MASTER PLAN PUBLIC FORUMS
  July 24, 2001, Greenbelt Municipal Building,
  July 25, 2001, New Carrollton Elementary School
  July 26, 2001, Glenn Dale Fire Station

Three public involvement meeting were held in locations sponsored by community leaders, each using the same materials, summarizing Plan development. The three successive meetings were attended by about 20, 40, and 60 people, respectively. Attendees included elected officials or their staff. Soil Conservation Road realignment issues predominated during the question and comment period. At New Carrollton and Glenn Dale, questions also were raised about the adequacy of technical analysis upon which Plan development was based, especially regarding traffic projections for area roadways. At the Glenn Dale meeting, NASA representatives indicated that:

1. GSFC would delay formal community review until technical analysis could be confirmed or revised.
2. GSFC would further evaluate alternative options, including re-examining an eastern route.
3. GSFC would expand public access to ensure greater involvement and to best inform the public about Plan progress, including holding meetings and developing a project website

- MASTER PLAN FORUM FOR GSFC EMPLOYEES
  July 25, 2001
  Building 8 Auditorium

This meeting for the Center workforce was sponsored by GSFC Director Diaz, and matched the Forums held for the external community during the same week. Soil Conservation Road realignment issues predominated during the question and comment period, particularly with respect to employee access to natural areas of the West Campus, particularly the Main Pond, and perimeter road. Comments also included concerns about traffic projections for area roadways.

- NASA GSFC EMPLOYEE INVOLVEMENT WORKSHOP
  October 16, 2001
  NASA GSFC Building 8

An informal workshop on the Facilities Master Plan and Soil Conservation Road alternatives under consideration was held. A short presentation was made to explain the workshop format. Representatives of NASA and the planning team were separated into four groups, each with its own information boards about the project. They were:

1. The public involvement and participation program for the Facilities Master Plan.
2. The Facilities Master Plan and the concomitant Soil Conservation Road alternatives under consideration.
3. Transportation, traffic, and environmental issues.
4. Direct dialogue with GSFC Director A.V. Diaz.

Employees were free to move among the four work sessions. Emphasis was placed on one-on-one involvement where employees could make specific comments and ask specific questions. Questions and comments were recorded.

- COMMUNITY INVOLVEMENT WORKSHOP
  October 18, 2001
  Du Val High School, Glenn Dale, MD

The workshop was repeated using the same format for the local community. General questions and comments were received from citizens as a whole before break out into the individual work sessions. Primary concerns expressed were the rerouting of Soil Conservation Road and opportunities for further community involvement and input. As a result of the workshop, a Community Council was formed to facilitate the dissemination of information and focus on issues of concern. Each local community organization was contacted and invited to participate. Representatives were sent from various civic associations, apartment and condominium associations, and residential neighborhoods. NASA also created a project website for submittal of questions and comment.

- COMMUNITY COUNCIL MEETING
  November 15, 2001
  Glenn Dale Country Club, Glenn Dale, MD

The agenda focused on the identity of State and County agency stakeholder views of the Facilities Master Plan, traffic data, Soil Conservation Road alternatives, the Facilities Master Plan website, and comments received to the date from the public on the website.

- M-NCPPC SOIL CONSERVATION ROAD COORDINATION MEETING
  January 22, 2002
  M-NCPPC Offices, Upper Marlboro, MD

Representatives of the planning team presented the potential routes for realignment of Soil Conservation Road through the NASA GSFC campus. Requirements for tieing Soil Conservation Road to the County system were discussed. Technical issues regarding traffic projections were discussed.

- COMMUNITY COUNCIL MEETING
  January 29, 2002
  Glenn Dale Country club, Glenn Dale, MD

Information was presented on existing traffic counts and the Soil Conservation Road commuter survey. Traffic projections for the east and west alignments and future background conditions were discussed.

- PRINCE GEORGE'S COUNTY DPW&T COORDINATING MEETING
  January 30, 2002
  County Office, Largo, MD

The potential routes for realignment of Soil Conservation Road through Goddard were discussed with emphasis on intersection ties to and improvements needed on Good Luck Road.

- BELTSVILLE AGRICULTURAL RESEARCH CENTER COORDINATION MEETING
  January 30, 2002
  BARC Building 3, Beltsville, MD

The potential routes for realigning Soil Conservation Road were presented for comment and questions. BARC representatives indicated a preference for an eastern alignment, but they would acquiesce to the general public's choice. The potential need for BARC land was discussed.

- MARYLAND STATE HIGHWAY ADMINISTRATION COORDINATION MEETING
  February 13, 2002
  MD State Highway Administration Offices, Greenbelt, MD

Planning team representatives met with MD SHA officials to discuss the Soil Conservation Road preliminary route alternatives and tie requirements to Greenbelt Road or at the Good Luck/Greenbelt Road intersection.

- COMMUNITY COUNCIL MEETING
  February 27, 2002
  Glenn Dale Country Club, Glenn Dale, MD

A presentation was made on the development of Soil Conservation Road Alternatives W-1, E-1and E-2. The rationale and design parameters for the alignments across Goddard were explained, and the potential improvements to Greenbelt and Good Luck Roads associated with the project were identified. Summaries of wetland, forest, traffic noise, and traffic air quality impacts were presented.

- GREENBELT CITY COUNCIL MEETING
  March 13, 2002
  Greenbelt Community Center, Greenbelt, MD

The same presentation was given at a City Council work session. In addition, information on traffic counts and projections was distributed and discussed.

- GREENBELT CITY ADVISORY PLANNING BOARD MEETING
  April 24, 2002
  Greenbelt Community Center, Greenbelt, MD

An informal forum was conducted to present information on the Draft FMP and proposed Soil Conservation Road relocation, and respond to questions and issues raised by employees.

The presentation given to the City Council was repeated for the Advisory Planning Board.

- COMMUNITY COUNCIL MEETING
  July 16, 2002
  Glenn Dale Gulf Club, Glenn Dale, MD

A meeting was held to discuss the Soil Conservation Road realignment alternatives. Representatives of M-NCPPC and the Prince George's County DPW&T as well as elected officials were present. Discussion centered on the eastern alignments, and making Soil Conservation Road the through road at the Good Luck Road intersection. It was agreed that this configuration would be considered in future project development.

Community Council meetings were subsequently held on a monthly basis to keep the community informed of project developments. The main topics of discussion were the proposed relocation of the warehouse to the east side of the campus and consequent truck traffic, features of the Facility Master Plan, changes in the Soil Conservation Road alternatives, and Goddard transportation management.

- FACILITIES MASTER PLAN/SOIL CONSERVATION ROAD REALIGNMENT FORUM FOR GSFC EMPLOYEES
  July 23, 2002
  GSFC Building 8 Auditorium

An informal forum was conducted to present information on the Draft FMP and proposed Soil Conservation Road relocation, and respond to questions and issues raised by employees.

- FACILITIES MASTER PLAN/SOIL CONSERVATION ROAD RELOCATION PUBLIC MEETING
  July 6, 2002
  DuVal High School Auditorium, Glenn Dale, MD

A presentation was made giving summaries of the Facilities Master Plan and Soil Conservation Road relocation project. The processes for public review of the Draft FMP and Environmental Assessment, and submittal or written or oral comment were explained. Informal workshop areas were established after the presentation to allow one on one contact between members of the public and NASA representatives.

- NCPC COMMISSION MEETING
  September 5, 2002
  NCPC Office, Washington, D.C.

NCPC staff made a presentation to the Commissioners on the major features of the Draft Facilities Master Plan. Staff comment received is given in Appendix B.

6.2 Coordination and Correspondence

Scoping letters were sent to appropriate Federal, State and local jurisdictions, review agencies, and elected officials in April 1999. The letter informed the adressees that NASA intended to prepare a Facilities Master Plan for GSFC, and requested any early comment or identification of issues. The letter included a vicinity map, site map showing existing conditions, and a site aerial photograph.

Responses received are in Appendix A. Only a portion of the recipients of the scoping letter chose to respond at that time.

NASA published the Draft Facilities Master Plan and Environmental Assessment on July 5, 2002. The Draft Environmental Assessment covered both the Facilities Master Plan and the Soil Conservation Road realignment project. Comment and questions were received through September 5 and are shown in Appendix B. Where appropriate, the NASA gives responses, or identifies where more information may be found within the Facilities Master Plan or the Environmental Assessment.

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7. SOIL CONSERVATION ROAD REALIGNMENT DRAFT ENVIRONMENTAL ASSESSMENT

7.1 Purpose and Need

The general future direction of NASA and GSFC are envisioned in NASA and GSFC strategic planning documents. GSFC is to continue to serve as a world class Earth and space science research facility with an expanding interface with outside partners from industry, academic institutions, and other governments. These partners will be both domestic and foreign.

The Facilities Master Plan has coalesced the broad goals and objectives of strategic planning into more specific and applicable plans for GSFC through an evolving continuous process. An evaluation of space and personnel was conducted through a programming process called "Future Visioning". The evaluation determined that, with the exception of Earth Science facilities built on the east campus since 1994, many facilities can no longer serve for world class research. Most were built in the 1960's, and they must be replaced or upgraded to accommodate changes in technology and science. Personnel within individual GSFC organizations or Directorates, particularly Space Science, have been dispersed around the campus through daily exigencies, and the Directorates need to be drawn together into more coherent units if maximum operational efficiency is to be obtained.

In response to these requirements, the Facilities Master Plan consolidates and unifies NASA facilities into a single, more compact installation within the Goddard site. They are further organized or arranged into areas and zones by individual functions and Directorates to provide coherence, and these areas and zones are sited in relation to one another in recognition of operational relationship, and to maximize operational and organization efficiency. Proposed development emphasizes increasing the density of development in established areas rather than expansion into new ones to minimize potential impact on natural areas and resources, and to conform to the intent of the Prince George's County Reserved Open Space Zoning Program. NASA activities require securable property boundaries and a separate and distinct area or zone for outside partners must be provided.

The purpose of the Soil Conservation Road realignment is to fulfill the goals of NASA strategic planning for GSFC by creating a consolidated, more efficient NASA installation through implementation of the Facilities Master Plan. It is essential that the road be realigned since a consolidated NASA installation cannot be achieved otherwise.

The need to consolidate facilities at GSFC has been long established. The 1979 GSFC Master Plan Update introduced the concept of a single campus encompassing the land west and east of Soil Conservation Road to meet long term NASA growth. It envisioned a loop road as the major unifying element for uniting the east and west campuses and the severance of Soil Conservation Road. The 1988 GSFC Facilities Master Plan also noted in its long range planning section that:

"More important for the long term is the fact that, increased usage of Federally owned roads (in the area), Soil Conservation Road in particular, may tend to work against Goddard's need to unify its holdings on either side of Soil Conservation Road. This may be required in the future, when the center will have the maximum need for the few remaining property resources left to its disposal. Other Federal agencies in the area are also concerned about the growth in traffic on Federally-owned roads....".

Over the last decade, NASA has built the Earth Science complex on the east side of Soil Conservation Road. A new Space Science complex is proposed for construction in the first 5-year implementation phase of the Facilities Master Plan. The Space Science facility is organizationally and operationally related to the Earth Science complex and to Engineering and Technology on the west side of Soil Conservation Road. It is very important from an operational standpoint that the Space Science complex be located in the intervening area straddling Soil Conservation Road. Realignment of Soil Conservation Road is necessary to make room for the facility.

7.2 Existing Road Network

Soil Conservation Road is a north-south 2-lane road. It terminates at Powder Mill Road at its northern end and Greenbelt Road at its southern end (Figure 7-1). Each lane is 14 feet wide and has a 3-foot wide paved shoulder. Channelized lanes are provided at the Greenbelt Road intersection for right turn traffic movements. The entrance to Greenbelt Woods, Goddard Road, continues to the south from the Greenbelt Road intersection.

The total length of Soil Conservation Road is about 3 miles. NASA owns and maintains the southernmost 0.56 mile long section where it passes through Goddard. The Department of Agriculture owns and is responsible for the remainder. The Soil Conservation Road section passing through Goddard divides the main portion of the site into nearly equal halves, a 426-acre west campus and a 422-acre east campus. The right-of-way is defined by security fencing throughout the NASA segment. Employee access gate 9 at Tiros Road, and gates 5 and 16 at Explorer Road, provide employee access to Goddard. Gate 16 is open on a 24-hour basis and is the only point of general access to most of the east campus under normal operating circumstances. The intersections at Tiros and Explorer Roads have left turn bays, and right turn deceleration lanes along Soil Conservation Road and are signalized. Truck bays for Goddard's receiving and shipping facilities and warehouse in Building 16W front directly onto the west side of Soil Conservation Road between Tiros and Explorer Roads.

Soil Conservation Road is open to and used by the general public as a commuter and general travel route. It serves as a short cut for those traveling between points to the east of Goddard and the Powder Mill Road interchange on the Baltimore-Washington Parkway. The speed limit on Soil Conservation Road is 25 mph through the Goddard section, and 40 mph through the BARC section.

Greenbelt Road (Maryland Route 193) is a primary route for public and visitor access to Goddard and an important employee route to and from the site. In the vicinity of GSFC, Greenbelt Road is an east-west arterial. Owned and maintained by the State, it is six lanes wide west of Mandan Road, five lanes wide (three eastbound, two westbound) between Mandan and Cipriano Road, and four lanes wide to the east of Cipriano Road. The lanes are separated by a grassed median throughout. Additional turning lanes are provided at nearly all major intersections. In the vicinity of Goddard, some of the traffic signals permit through traffic to pass through intersections in vehicle platoons on the green signal, westbound in the morning rush hours, eastbound in the evening rush hours. To the east of Goddard, MD 193 turns southward along a broad arc to MD 214, changing its road name to Glenn Dale Boulevard about one mile to the east of GSFC at Lanham-Severn Road.

NASA GSFC is located about one mile to the northeast of the I-95/I-495 Washington Beltway, an 8-lane circumferential Interstate arterial highway around the city. Access to Greenbelt Road from the Beltway is indirect via Beltway interchanges at Kenilworth Avenue and the Baltimore-Washington Parkway.

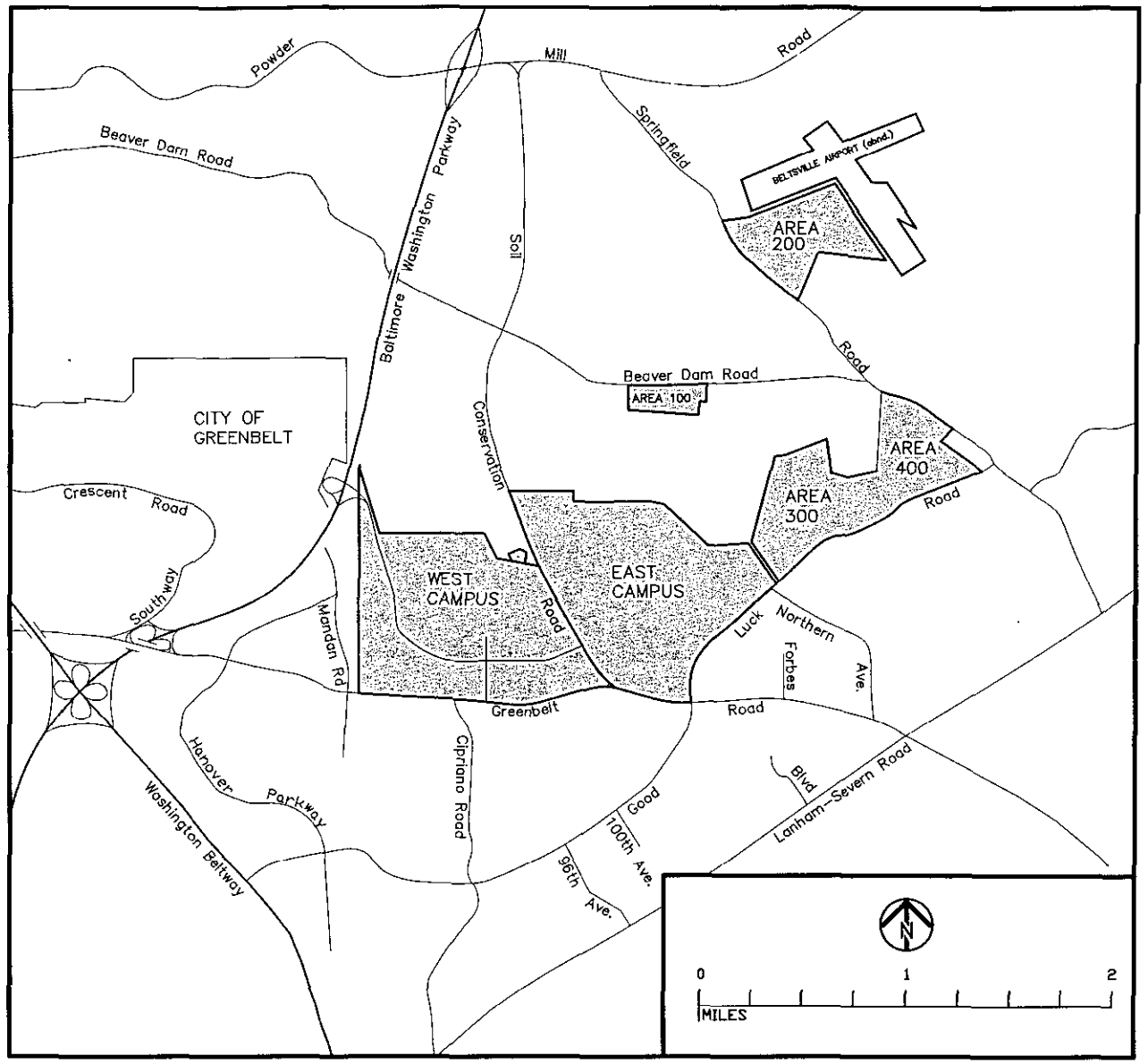


FIGURE 7–1 ROAD NETWORK.

The Baltimore-Washington Parkway, also known as the Gladys Noon Spellman Parkway, is a 4-lane, divided, limited access arterial highway connecting the two namesake cities. All of the sections of the Parkway in the study area are owned and operated by the U.S. National Park Service. The Parkway is identified as Route 295, but is not within the Interstate or State road system. All of the facility between the namesake city limits is a designated or listed National Register of Historic Places property. The parkway is the principal NASA employee access route between the site and points north and an alternative to Greenbelt Road for points to the west.

Good Luck Road is classified as a County collector road and defines the eastern boundary of NASA GSFC. To the south of Greenbelt Road, it curves westward and runs parallel to Greenbelt before passing under the Washington Beltway. Good Luck Road is generally two lanes wide in this section, but it widens to four lanes in the segment between Greenbelt Road and 100th Avenue.

Good Luck Road is four lanes wide on the approaches to the Greenbelt Road intersection. Separate channelized lanes accommodate all four right turns. Good Luck Road has been widened to three lanes in the 1,500 foot long section north of Greenbelt Road adjacent to the Countryside Apartments when these units were built. The configuration in this section is two lanes northbound, one southbound. Apartment tenants use the second northbound lane for parking. Further to the north, Good Luck Road again widens to four lanes in two separate short sections along the frontage of recently built commercial facilities.

The two lane wide Southway is one of two entrances to the City of Greenbelt sector lying west of the Baltimore-Washington Parkway. The other entrance is on Crescent Road at Kenilworth Avenue on the opposite side of the sector. The Southway has a second function in the section immediately to the north of Greenbelt Road as access to the southbound Baltimore-Washington Parkway off and on ramps. Access to the Capital Beltway from Greenbelt Road and The City of Greenbelt is via the Parkway.

Hanover Parkway is a four lane collector road that runs between the north side of Eleanor Roosevelt High School to Good Luck Road, where it continues southward as Princess Garden Parkway. It is six lanes wide in the section passing through commercial development on the south side of Greenbelt Road.

Mandan Road is a four lane local road extending several blocks to the north and south of Greenbelt Road. It provides access to residential areas in eastern Greenbelt.

Cipriano Road is also classified as a County collector road. It provides direct access between Goddard and points to the south, intersecting Lanham-Severn Road (Maryland Route 564) near the road's Beltway interchange. Cipriano Road is two lanes wide throughout its length, except for the section adjacent to the Cipriano Square Shopping Center south of the Greenbelt Road intersection.

Springfield and Beaver Dam Roads are lightly traveled two lane collector roads. Springfield Road is part of the County road system to the south of the Good Luck Road intersection. To the north of this intersection, Springfield Road as well as all of Beaver Dam Road serve as BARC site roads that are open to the public for through access.

Soil Conservation and Springfield Roads intersect with Powder Mill Road at their north end. Powder Mill Road is a two lane east-west collector road that passes about two miles to the north of Goddard and it has an interchange with the Baltimore-Washington Parkway. Many GSFC employees use Soil Conservation and Powder Mill Roads as an alternative to the Parkway as a means of traveling between Goddard and points to the north. This route is also used by the general public as a short cut between the Parkway and points to the east via Greenbelt Road.

With the exception of the Prince George's County Sports Center, all of the property to the north and northeast of Goddard is owned by various Federal government agencies. Federal ownership extends for up to 15 miles to the north through the Patuxent Wildlife Research Center and Fort Meade. All of the area immediately to the north of GSFC is owned by the U.S. Department of Agriculture and the Beltsville Agricultural Research Center (BARC) occupies most of this property. All the roads on Federal properties in this area, including Soil Conservation Service Road, and Powder Mill, Beaver Dam, and Springfield Roads are owned and maintain by Federal agency through which they pass. Powder Mill Road is a County road west of the Baltimore-Parkway interchange.
Northern Avenue follows an L-shaped alignment between Greenbelt Road and Good Luck Road intersecting the latter at the easternmost corner of the east campus near the entrance to the Prince George's County Sports Center. The east-west segment of this two-lane road passes through a pocket

area that has not undergone modern development and has received the special classification of "rural residential road" in the County Planning Area 70 Master Plan. The north-south segment of extending to Greenbelt Road passes through an office park.
Lanham-Severn Road (MD Route 564) is a two-lane arterial that runs along a southwest-northeast axis between the Capital Beltway and northernmost Bowie, Maryland.

Within GSFC, Explorer Road is the main east-west road. It serves as a through route between the Baltimore-Washington Parkway and the east campus as well as a distributor of campus traffic. It is four lanes wide between the Parkway and Delta Road on the west campus and two lanes wide from that point to the entrance to the Visitor Center in Building 88 near Gate 5. It extends into the east campus as a four-lane roadway with a median strip.

Goddard Road is the main north-south campus roadway, running from Greenbelt Road through the main gate to Cobe Road. It is a four lane divided roadway south of Tiros Road and two lanes wide to the north of that intersection. Tiros Road is a four lane divided roadway that is primary traffic distributor in the northeast sector of the west campus. Cobe Road is a two-lane road that runs along the northern perimeter of the west campus and serves as a collector-distributor of traffic. All of the remaining campus roads are minor two lane roads.

7.3 Alternatives

7.3.1 Soil Conservation Road/Facilities Master Plan Relationships

Soil Conservation Road is an integral element in site planning at Goddard. The location of the road not only has effects beyond GSFC, but also within the campus itself. A mutual relationship exists between the location of the road, and the arrangement and configuration of facilities. Facility configuration consequently affects operations, efficiency, and security. The relationship between the road and other facilities is so interwoven that different Soil Conservation Road alignments generate unavoidable modifications to the Facility Master Plan.

Each alignment alternative must be able to meet or satisfy the basic or fundamental premises and planning criteria developed in the Goddard Facilities Master Plan. They are:

- Consolidated NASA Installation

Programming and planning completed for the GSFC Facilities Master Plan indicate that it is essential that NASA have compact, unified facilities at Goddard, if it is to continue as a world class research facility.

- NASA Neighborhoods and Zones

It is also essential that NASA consolidate its work force and facilities at GSFC at a further sublevel into discrete and coherent groupings within the installation to achieve maximum operating and management efficiency. Each group of personnel and facilities has a common function and organization. The Facilities Master Plan does this by collecting these grouped facilities into conceptual neighborhoods and zones as follows:

a. Earth Science Neighborhood
b. Space Science/Central Commons Neighborhood
c. Engineering/Technology Neighborhood
d. Programming and Project Management Neighborhood
e. Institutional Support Neighborhood
f. New Thrust Zone

- Neighborhood Relationships

If NASA is to achieve maximum operational and management efficiency, it is essential that the quality of neighborhoods composed of Earth Science, Space Science, Engineering and Technology, and Program and Project Management be arranged in such a manner that they are adjacent to one another.

- Partnering and Outreach Zone

A separate area, distinct from the NASA installation, for housing outside partners is also needed to accommodate an anticipated increase in joint or multiple research and space flight operations over the next two decades as indicated by Agency strategic planning.

- Site Population/Space

The current site employee population of 7,600 would increase to an overall maximum site employee population of 8,750 by 2022. In 2022, about 6,800 would work within the NASA installation with GSFC, and 1,950 in the private development zone.

- Site Security and Access

The NASA installation must have a securable perimeter. The number of entrances into the NASA installation preferably would be a maximum of three. Access between the Baltimore-Washington Parkway and GSFC through Gate 3 on Explorer Road would continue to be a NASA employee only entrance. Other existing and future service gates would normally be closed to general site employee access.

- Loop Road

An internal NASA installation Loop Road is essential. It has two purposes: the distribution of traffic and the formation of a pedestrian oriented core area.

- Perimeter Buffers/Natural and Undeveloped Areas

The Facilities Master Plan calls for increasing the density of development and concentrating it in areas of the campus that are already developed. Infringements or expansion into the site perimeter buffers and undeveloped natural areas should be minimized.

7.3.2 Preliminary Alternatives No Longer Under Consideration

Six preliminary alternatives for treatment of Soil Conservation Road were considered:

- West – realign road to west side of campus

- Central – realign road to center of west campus
- Tunnel – on existing Soil Conservation Road
- Bridge – convert the existing Soil Conservation/Tiros Road intersection to a Tiros Road overpass
- East – realign road to east side of campus
- No Action – do nothing

Evaluation of the preliminary alternatives indicated that the Central, Tunnel, and Bridge alternatives had significant disadvantages in meeting Facilities Master Plan premises and criteria. They have been dropped from further consideration, but are discussed below and shown in Figures 7-2 through 7-4 The east and west preliminary alternatives have undergone further refinement and development and are discussed in Section 7.3.3.

7.3.2.1 Central Alignment Alternative

The central alignment alternative would connect to Greenbelt Road at the Goddard main gate intersection entrance. It would be 1.13 miles in length between termini.

The central alignment diverges from Soil Conservation Road at its northern end on a broad sweeping curve to the west while passing over BARC property. After crossing into Goddard, the alignment converges with Cobe Road and follows it to the Goddard Road intersection. Existing Soil Conservation Road would be converted to a NASA employee entrance through a North Gate. At the North Gate entrance intersection, Southbound Soil Conservation Road would have an exclusive left turn lane, and deceleration and acceleration lanes would be built in the northbound direction.

The Cobe/Goddard intersection would be modified to make Soil Conservation Road the through route. Cobe Road would be connected either in a simple "T" intersection configuration, or the remnants of Cobe and Goddard Roads would be used to form the legs of a "Y" connection.

South of the intersection, the central alignment would follow Goddard Road across the campus to Greenbelt Road as a four lane roadway. Access to Nimbus and Tiros Roads to the east would be closed to NASA employee traffic. The Explorer Road intersection would be heavily modified. Exclusive left turn lanes, and deceleration and channelized right turn lanes would be added on all four roadway approaches. The Aerobee Road intersection would remain, but turning movements would be limited to right turns only in all four directions.

The Greenbelt Road intersection is a four way intersection with one of the entrances to the Cipriano Square Shopping Center coming from south. There are two existing exclusive left turn lanes on eastbound Greenbelt Road. Improvements at the intersection would be limited to the addition of a westbound deceleration and right turn lane on Greenbelt Road.

The central alignment would have be designed for speed limit of 40 mph north of the Cobe/Goddard Road intersection, and 25 mph to the south of that point.

The central alignment would allow for the creation of a private development zone separated from the consolidated NASA installation. However, the private development zone would have to be reoriented to the west side of the alignment. This would displace the Institutional Support Neighborhood to the east campus. The area occupied by the Institutional Support Neighborhood would be in a lightly developed or undeveloped area. Direct access between warehousing, receiving, and waste handling facilities in the neighborhood and public roads would be eliminated. The security perimeter around NASA facilities would be moved to the east side of the alignment. The most serious drawback of the central alignment would be isolation of the central power plant and main electric power substation from the remainder of the NASA installation. Both would be outside the general security perimeter. While they could be fenced, they would be surrounded on all four sides by areas accessible to the general public. Acceptable levels of security for these essential support operations would not be feasible.

General NASA employee access points into the NASA compound would be similar to the west alternative. The Loop Road would function similarly to the Facilities Master Plan or west alignment proposal, but be located further to the east. Perimeter buffer infringements would be the same as for the west alignment alternative, but there would be a higher potential for development in natural areas on the east campus.

The estimated construction cost for the Central Alignment Alternative would be approximately 6.0 million dollars

7.3.2.2 Tunnel Alignment Alternative

This alternative would retain the existing Soil Conservation Road alignment and connect to Greenbelt Road at the existing intersection. It would be 0.93 miles long.

The principle feature of this alternative is a tunnel. The length of the tunnel would have to be a minimum of 1,200 feet to provide sufficient room for a Space Science and Central Commons Neighborhood located above. It is assumed that the existing ground level would be maintained and that the tunnel would be constructed using cut and cover or open construction with the north and southbound Soil Conservation Road lanes diverted to either side within the right-of-way. The tunnel approaches, or descent ramps would add a further 400 feet in both directions, so the total facility would be approximately 2,000 feet long.

The north entrance to the tunnel would be about 450 feet to the north of the Tiros Road intersection, and the south entrance near the campus water tower. The approaches would extend beyond the northern property boundary and to within about 300 feet of Explorer Road.

The tunnel would be about 50-feet wide to accommodate two 12-foot travel lanes, two paved 10-foot shoulders, and six foot wide bike path for Prince George's County South Laurel Trail. Vertical clearance would be 16 feet.

Soil Conservation Road would be widened to four lanes south of the tunnel. Other improvements include lengthening or doubling the left turn lane on eastbound Greenbelt Road at the Soil Conservation Road intersection.

The tunnel alternative would not fully satisfy all of the Facilities Master Plan principles and guidelines. The tunnel and its approaches would create a physical structure which could in effect permanently divide the east and west campuses. Potential egress between the two campuses would be limited to the narrow areas on top of the tunnel and at Explorer Road.

There would be insufficient area for development of a unified Space Science and Central Commons Neighborhood. It would either have to straddle the Loop Road or be configured in an inverted U-shape to either side of Soil Conservation Road. The perimeter buffer would not be affected.

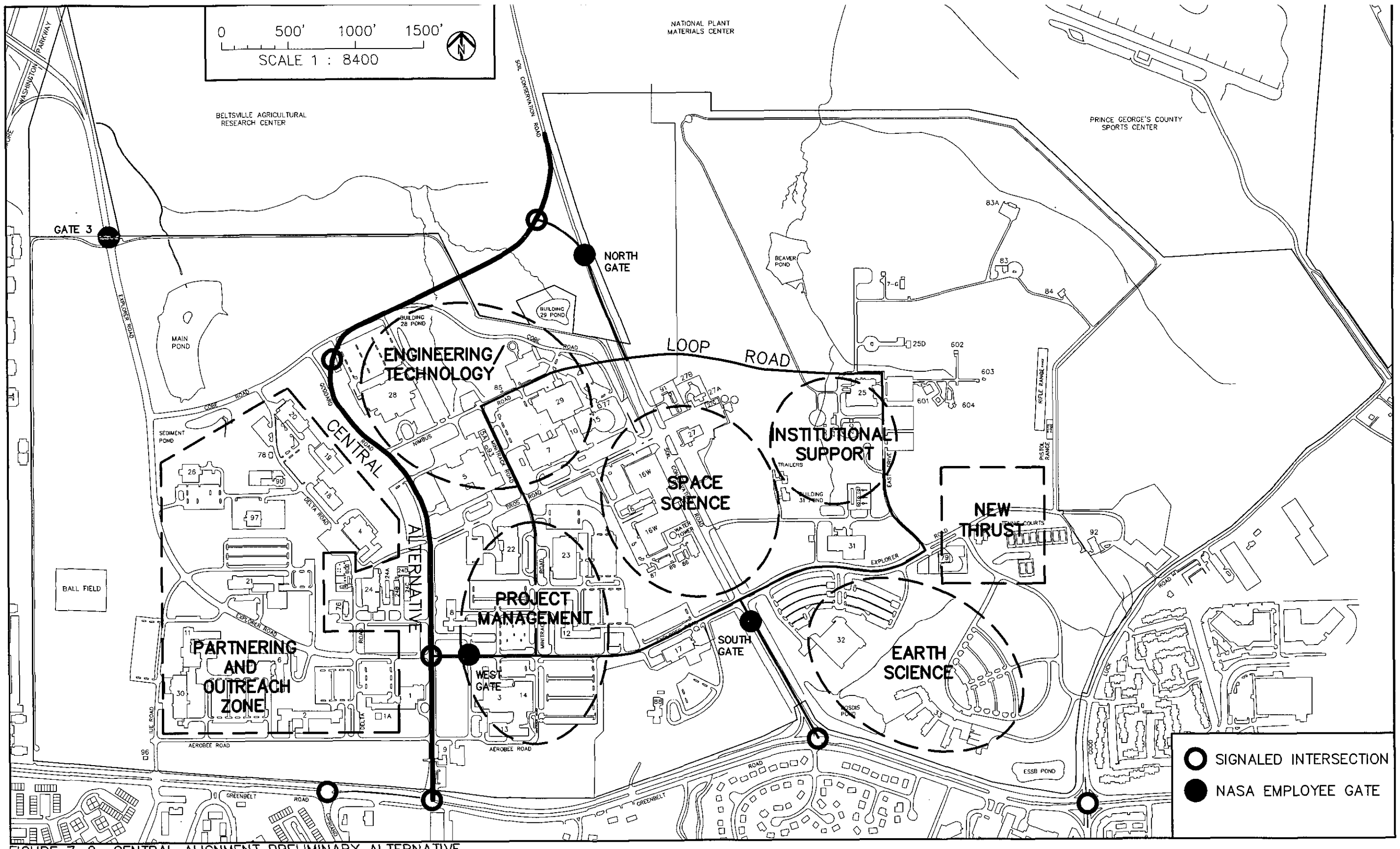


FIGURE 7-2 CENTRAL ALIGNMENT PRELIMINARY ALTERNATIVE.

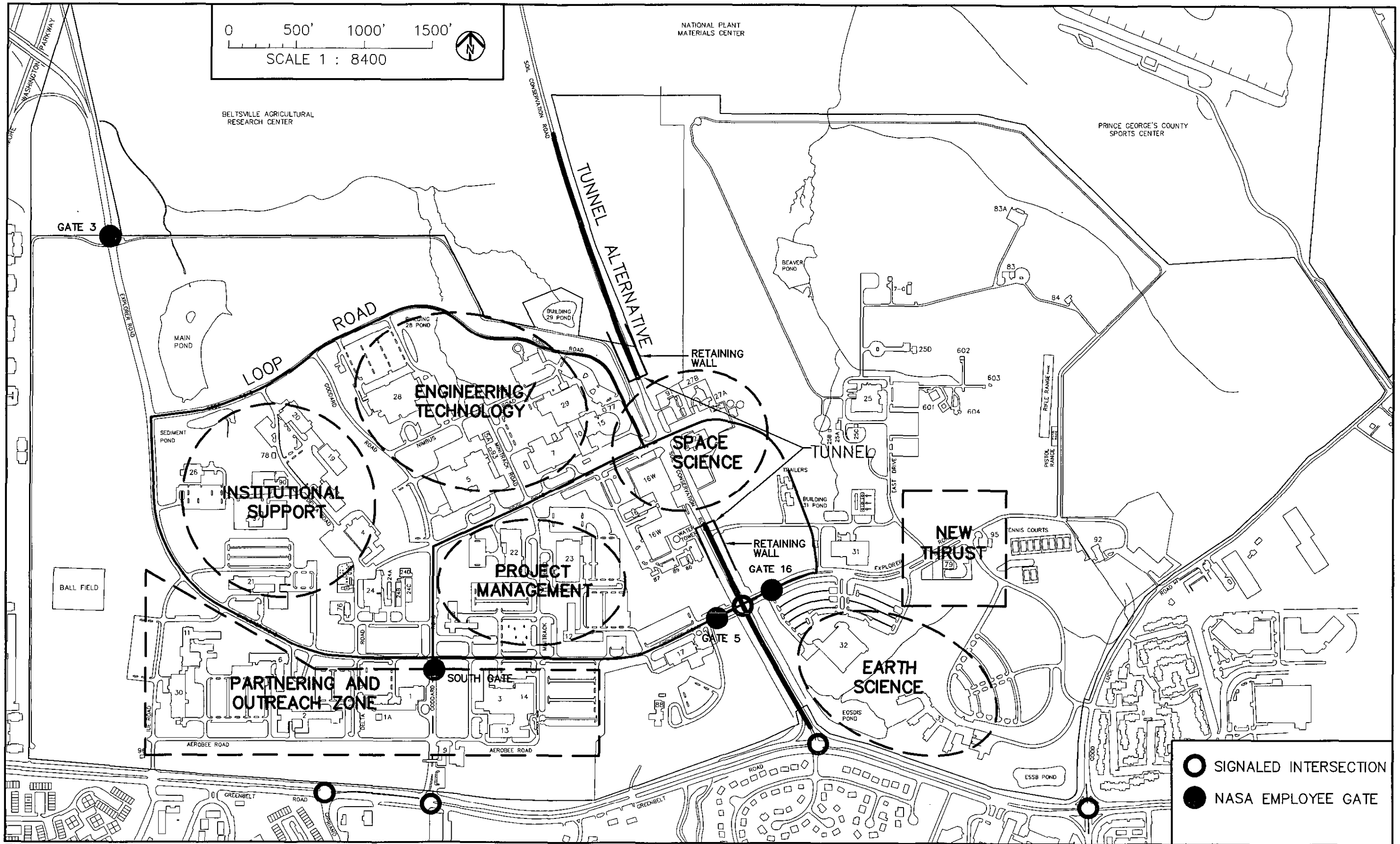


FIGURE 7-3 TUNNEL ALIGNMENT PRELIMINARY ALTERNATIVE.

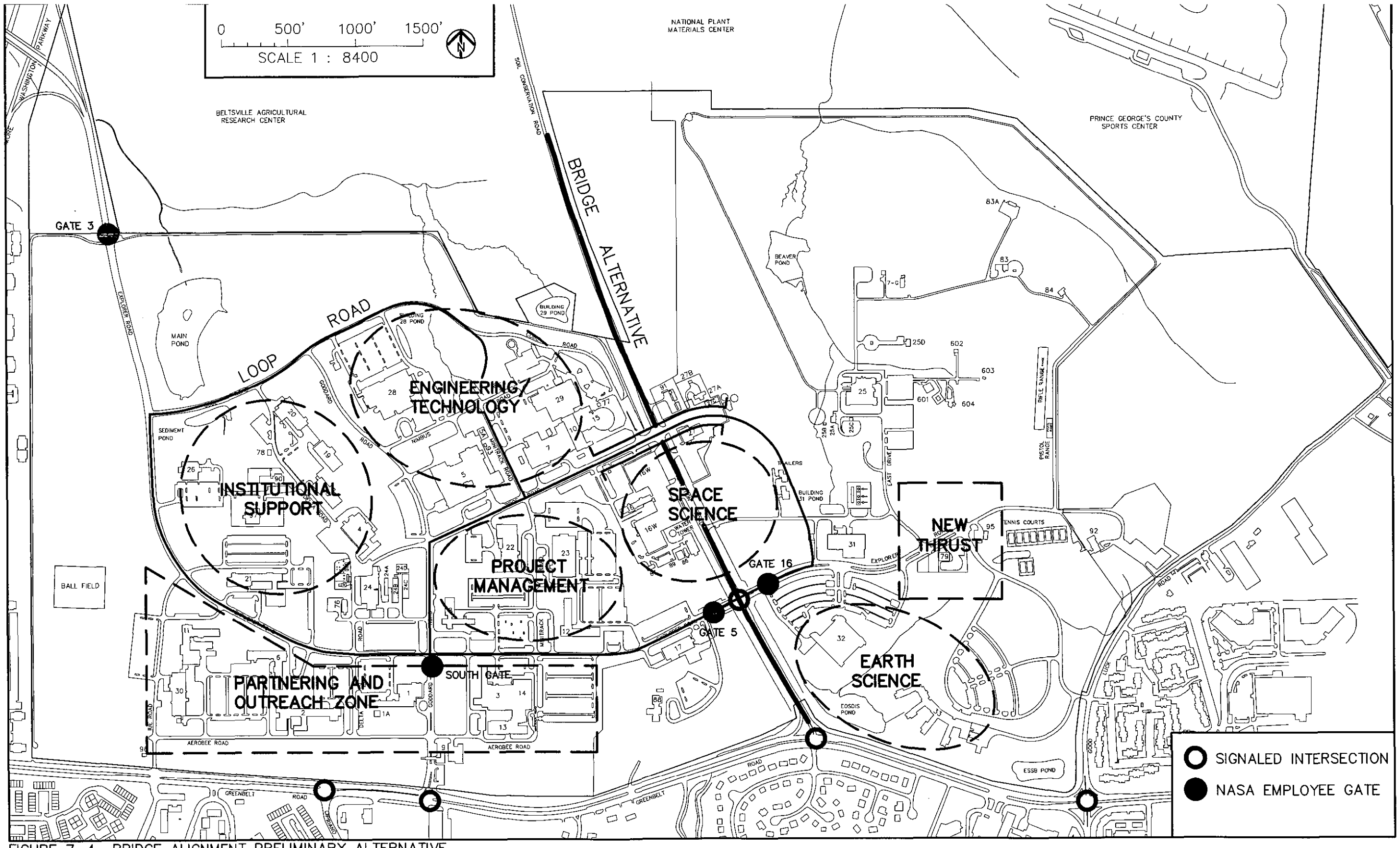


FIGURE 7-4 BRIDGE ALIGNMENT PRELIMINARY ALTERNATIVE.

The security boundaries along Soil Conservation Road would essentially remain unchanged from existing conditions, paralleling both sides of Soil Conservation Road. Elimination of the Tiros Road intersection would concentrate NASA traffic at the Explorer Road intersection and Gates 5 and 16. The third NASA employee gate would be on the north side of the private development zone. Site access points would be close to one another along Explorer Road between Goddard and Soil Conservation Road. The main access entryway to the private development zone would be shared with NASA employee traffic using the south gate. Access to shipping and receiving facilities in Building 16 would be severely limited during construction.

The most significant drawback for the tunnel alternative is the construction cost, which is estimated at approximately 11 million dollars. It would be necessary to either close Soil Conservation Road during construction, or build separate lanes for traffic during construction on either side of the tunnel at an additional cost of about 2.8 million dollars.

7.3.2.3 Bridge Alternative

Under this alternative, a bridge over Soil Conservation Road at Tiros Road would connect the east and west campuses As a result, Tiros Road would be extended to Explorer Road and become part of a future Loop Road. The total length of the Tiros Road extension from the west side of the bridge to Explorer Road would be 0.46 mile.

The bridge would be a two-lane single span with abutments 60 feet apart. The approaches would have a five percent grade and be located on fill. They would extend approximately 350 feet in each direction from the span, and the total bridge length would be approximately 760 feet.

Other improvements include widening Soil Conservation Road between Explorer and Greenbelt Roads, and extending or doubling the eastbound Greenbelt Road left turn land at the Soil Conservation Road intersection. It would also be necessary to improve Tiros Road between the west end of the bridge and Minitrack Road, and to relocate or modify the campus steam, chilled water, potable water, and electric power distribution systems, and the sanitary sewer collection system. The bridge Alternative would produce the greatest disruption to existing utilities among the preliminary alternatives considered.

The bridge alternative would have attendant difficulties similar to the tunnel alternative in meeting planning principles and guidelines. The east and west campuses would continue to be separated. Egress between them would be limited to two roadways. Existing security boundaries between the two campuses would remain unchanged. The Space Science Neighborhood would either be split into two areas, or have to be located to the outside of the Loop Road. Construction of the bridge on the Loop Road would require temporary relocation of all or large portions of the facilities in the Building 27 area. The estimated construction cost for the bridge alternative is 9.65 million dollars.

7.3.3 Alternatives Under Consideration

Five alternative alignments for Soil Conservation Road, the Proposed Action, are under consideration:

- West Alignment W-1
- East Alignment E-1
- East Alignment E-2
- East Alignment E-2A
- No Action

The first four are "build" alternatives and share some common parameters. They would be designed and built to accepted public highway standards and specifications including the American Association and Highway and Transportation Officials (AASHTO), the Maryland State Highway Administration, and where applicable, the Prince George's County Department of Public Works. All share a common Northern terminus on Soil Conservation Road near the GSFC east campus property boundary with BARC.

In general, the realigned Soil Conservation Road would be two lanes wide and have a 45 mph design speed. The typical cross section would be composed of two 12-foot wide travel lanes with 10-foot shoulders to the outside for a total width of 44 feet. About 6.5 feet of shoulder would be paved so that the total paved width would be about 35 feet. The southern half of West Alternative W-1 would be four lanes wide to accommodate both through commuter traffic and NASA employees crossing between Gate 3 and a new West Gate. The four lane section would add two 12-foot lanes for a total of 68 feet. The design speed limit in the four-lane section would be 35 mph.

The alignments, cross section, and intersection configurations have been developed on a preliminary basis at a level sufficient to assess potential impacts to NASA operations, the community outside, and the environment. They are subject to refinement during the design process and further project development.

The estimated costs of the alignments are roughly equal at the level of concept development, ranging from 7.0 to 8.0 million dollars. Costs for construction of realigned Soil Conservation Road itself increase from east to west with E-2 the least expensive, W-1 the most costly. However, costs for concomitant improvements in public space beyond Goddard boundaries increase from west to east, and the overall costs of the alignments are equivalent within the error of the estimate.

Realignment of Soil Conservation Road, either to the east or, west would require reconfiguration of Goddard's security perimeter within NASA's perimeter boundaries. Redefinition of the internal security perimeter would require new site access and gates. This work includes severance of existing Soil Conservation Road as a through route for public travel. The north and south stub ends of the road would be converted to NASA employee only entrances with gates and guardhouses. Access to the Visitor Center would be switched from Explorer Road just outside existing Gate 5 to existing Soil Conservation Road to the south of the new main or south gate. And finally, the east end of Cobe Road would be shifted from a connection at Tiros Road to the north entrance roadway formed by the remnant of Soil Conservation Road. Each alternative also has other related or ancillary work applicable to that alternative only as indicated under the discussion for each alternative. Additional construction includes replacement of parking, tennis courts, and other modifications to site roads and sidewalks. The costs for construction of new access and this ancillary work are included in the estimated alternative costs

Under all the relocation alternatives, existing Soil Conservation Road would remain open until the new alignment was ready for service.

All of the build Alternatives would also include installation of new north and south employee access gates on existing Soil Conservation Road, new access to the Visitor Center, and minor modifications to the internal Goddard road network.

7.3.3.1 West Alignment Alternative W-1

West Alignment Alternative W-1 skirts the western periphery of existing and proposed Facilities Master Plan development on the west campus (Figures 7-5 and 7-6). It would connect to Greenbelt

Road at Goddard Gate 2 at the existing Iue Road intersection opposite the entrance to the Chelsea Woods condominiums. The total length between termini would be 1.26 miles. At the minimum new security fence would run along the east side of the road for its full length between the BARC property line and Greenbelt Road.

At its northern end, it turns to the west on a sweeping curve about 1,300 feet in length with a radius of about 900 feet on a new alignment crossing BARC property. A new "Tee" intersection would be built on the curve to connect to the north gate entrance for NASA employees. An exclusive left turn lane would be provided in the southbound direction at the intersection. The northbound lanes would have acceleration and deceleration lanes. The northbound entrance road would have exclusive left and right lanes.

After crossing into Goddard, the alignment follows Cobe Road to Explorer Road. It would pass through a cut to the north of the Building 28 parking lot and be located on fill between Goddard and Delta Roads to maintain grades at seven percent or less. The Cobe/Goddard Road intersection would be eliminated and the north end of Goddard Road converted to an entrance to the Building 28 parking lot. A service access gate would be provided on Delta Road.

Cobe Road tees into Explorer Road, which is four lanes wide to the west of Delta Road. The intersection would be modified to make Soil Conservation Road the through route with Explorer Road teeing into it. Soil Conservation Road transitions from two to four lanes as it passes the Main Pond, and all three legs of the intersection would be four lanes wide. The curve on Soil Conservation Road would be about 650 feet long and have a radius of about 500 feet.

The alignment would continue southward generally following Explorer and Iue Roads. After leaving the Gate 3 intersection the alignment shifts to the west to maximize the offset distance to Buildings 11 and 30 and reduce the potential impact on operations occurring in these buildings. The broad curve on Explorer Road would be demolished. It would be replaced by a new four lane west entrance for employees that would tee into Soil Conservation Road. The intersection would have exclusive lanes for each turning or through traffic movement.

The north, Baltimore-Washington, and west entrance intersections would be signalized.

Adjustments to internal NASA access and parking would be required. Access to Building 26 would be maintained by a road connection between the Building 21 and 26 parking lots. The west end of Aerobee Road would be shifted to the south end of the Building 11 parking lot. The westward shift in the Soil Conservation Road would eliminate 120 of the 240 parking spaces in the Building 11 Lot. These would be replaced by spaces in a new lot on the east side of the building. A new sidewalk/bikepath would connect the west gate to Greenbelt Road.

Greenbelt Road is three lanes wide eastbound and two lanes wide westbound at the existing Gate 2 intersection. The entrance to the Chelsea Woods condominiums comes in from the south at this point. There are left turn bays on Greenbelt Road in each direction. Alternative W-1 would tie to Greenbelt Road at the intersection. Exclusive left and right turn lanes would be provided in the southbound intersection. Improvements in public space would include new acceleration and deceleration lanes on westbound Greenbelt Road for right turns in and out of Soil Conservation Road. The existing Greenbelt Road eastbound left turn lane would be extended, and the intersection would be signalized.

Greenbelt Road is on the crest of a drainage divide in the vicinity of the intersection. Existing drainage is limited to ditches on the north side of the road and in the median. Small undersized culverts connect the ditches to storm drains running to the south. Improvements would be made to coordinate project drainage with the existing system.

7.3.3.2 East Alignment Alternative E-1

East Alignment Alternative E-1 has also been informally identified as the east "low" alignment. East Alternative E-1 follows an L-shaped alignment through the east campus connecting to Good Luck Road between the two entrances to the Countryside Apartments (Figures 7-7 and 7-8). It would be two lanes wide and about 1.45 miles long between its north end and Good Luck Road. Improvements would be made to the section of Good Luck Road between the new Soil Conservation connection and Greenbelt Road to bring the total length to 1.65 miles.

At its northern end, the alignment diverges from Soil Conservation Road near the northern east campus property boundary shared with the National Plant Materials Center. It turns on a broad sweeping curve with a radius of 985 feet and proceeds due east. Existing Soil Conservation Road would be converted into the north NASA employee entrance. The entrance intersection configuration would be a mirror image of the west alternative north gate intersection.

The alignment across the top of the east campus is established by NASA operational constraints. Space communication antennas are sensitive to traffic vibrations, particularly from trucks, and to electromagnetic interference from radios and cell phones. NASA has an antenna field in the vicinity of Building 25. NASA has established desirable radial buffer boundaries at 1,000 feet around the antenna. The route selected minimizes the infringement to the extreme periphery of the buffer area. Small lateral shifts in the alignment may still be possible. Shifting the alignment to the north, however, would increase wetland impacts and potentially impact an archeological site, 18PR548 that is eligible for the National Register.

The road would then turn 90 degrees on another 985 foot radius curve. The alignment would require demolition of NASA Buildings 83A and 84 and relocation o operations in these buildings elsewhere. It would then proceed due south passing just to the east of the closed GEWA pistol/rifle range and through the GEWA tennis courts. Normally closed gates would be located on either side of the road at Explorer Road. It would have a tee intersection with Good Luck Road after traversing a 500-foot radius curve to approach Good Luck Road on the perpendicular.

At the north end, after leaving Soil Conservation Road, the alignment would descend through a cut on an approximately six percent downgrade to the stream crossing north of Beaver Pond. It would then begin a long three percent, upgrade to a point in the vicinity of the tennis courts before descending again to Good Luck Road.

There would be no access for general NASA employee or public use between the north entrance and Good Luck Road. Access would be limited to gated entrances to security roads and on the extension of Explorer Road to the north of the tennis courts. These gates would be closed under routine circumstances. The Facilities Master Plan calls for a new shipping and receiving facility on the east campus isolated from other NASA facilities. A gate for this future facility would be located to the south of the rifle range.

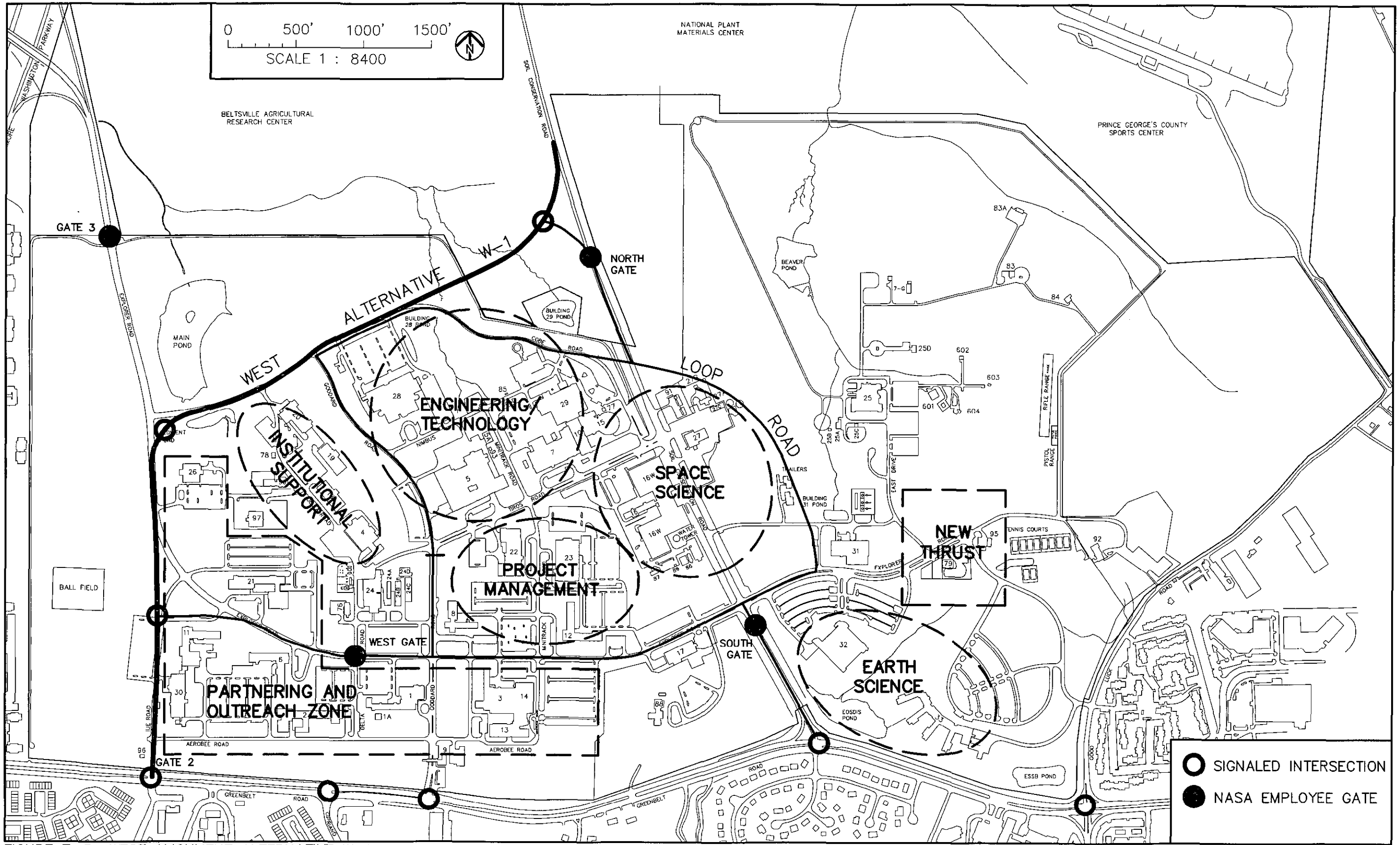


FIGURE 7-5 WEST ALIGNMENT ALTERNATIVE W-1.

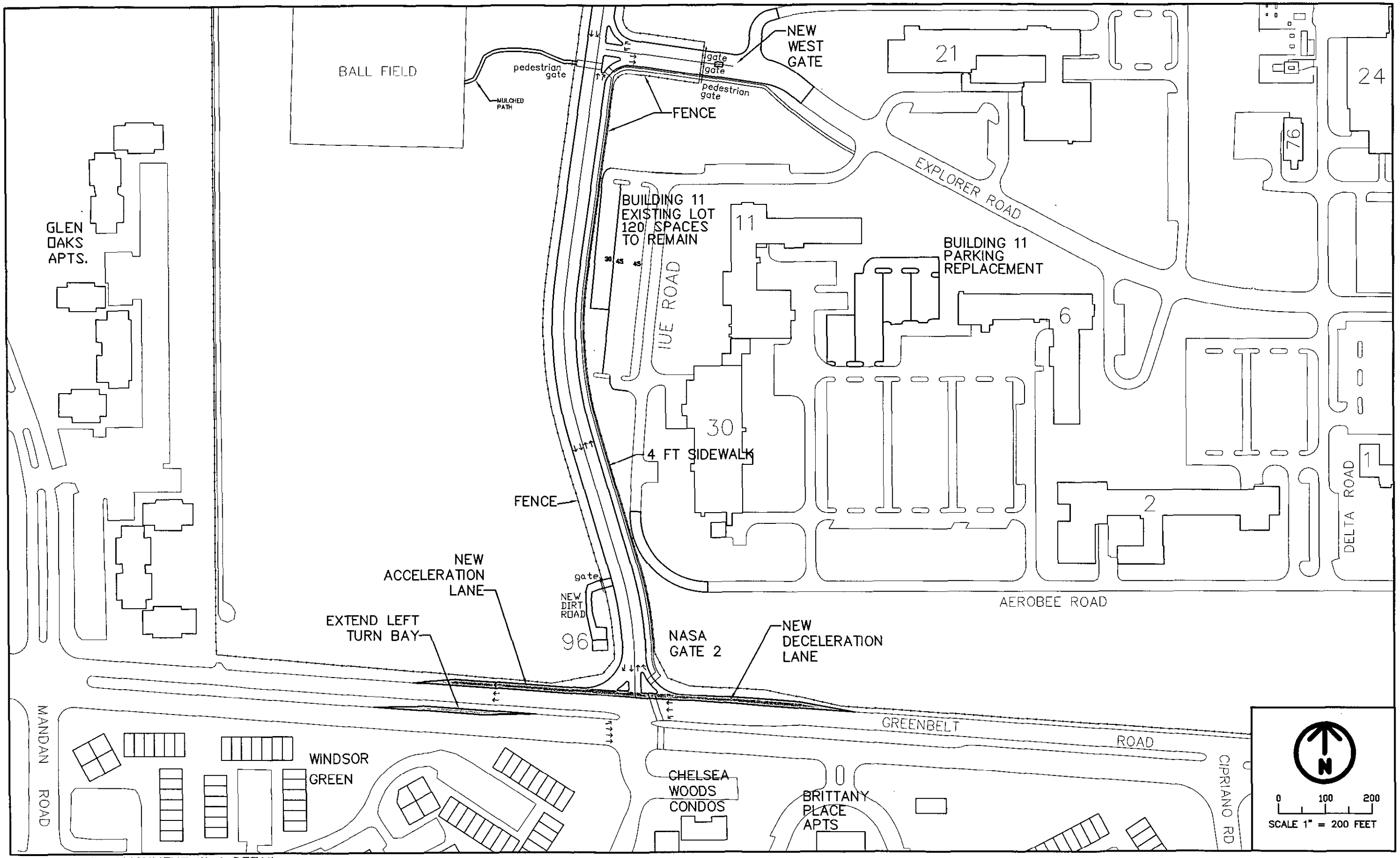


FIGURE 7-6 ALIGNMENT W-1 DETAIL

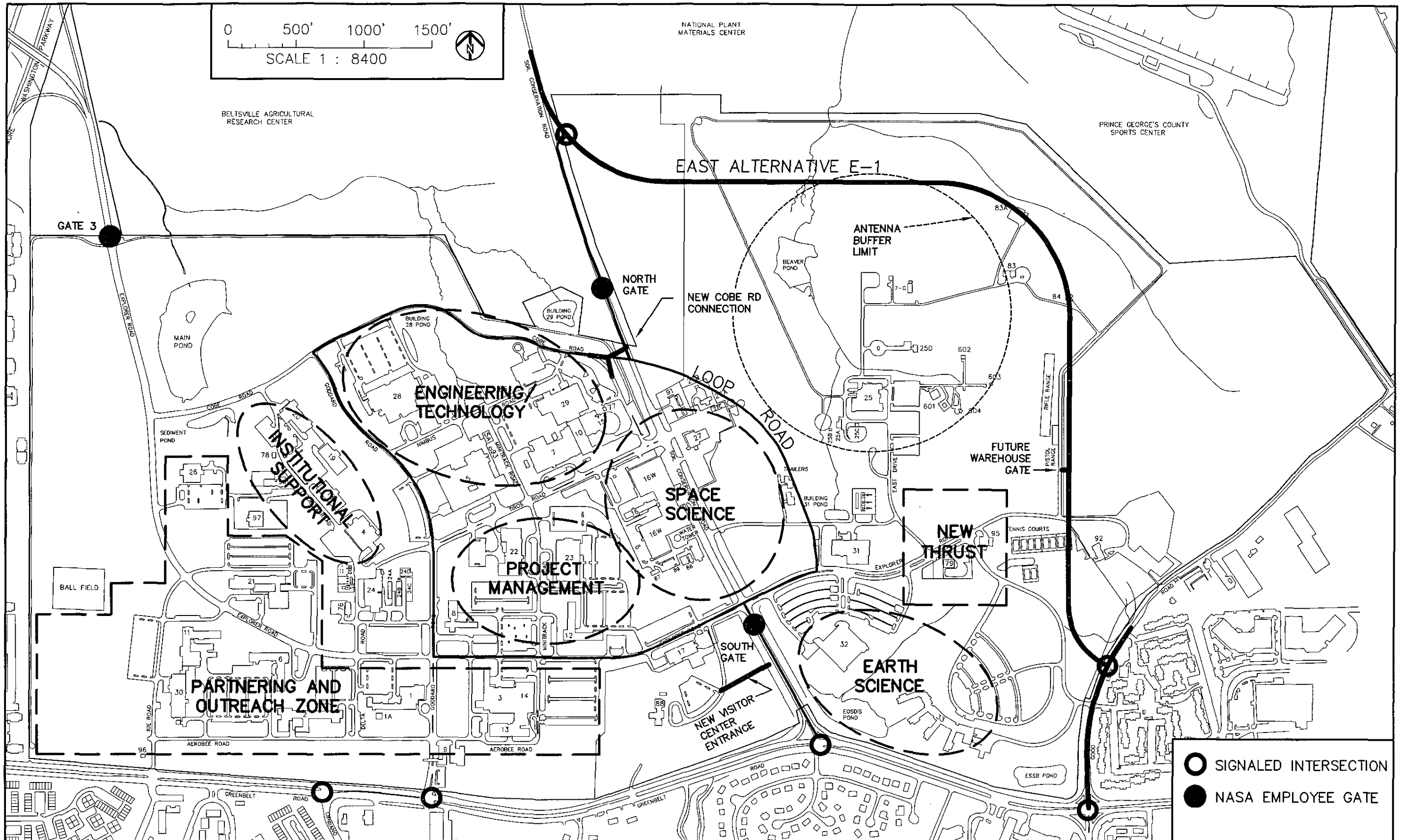
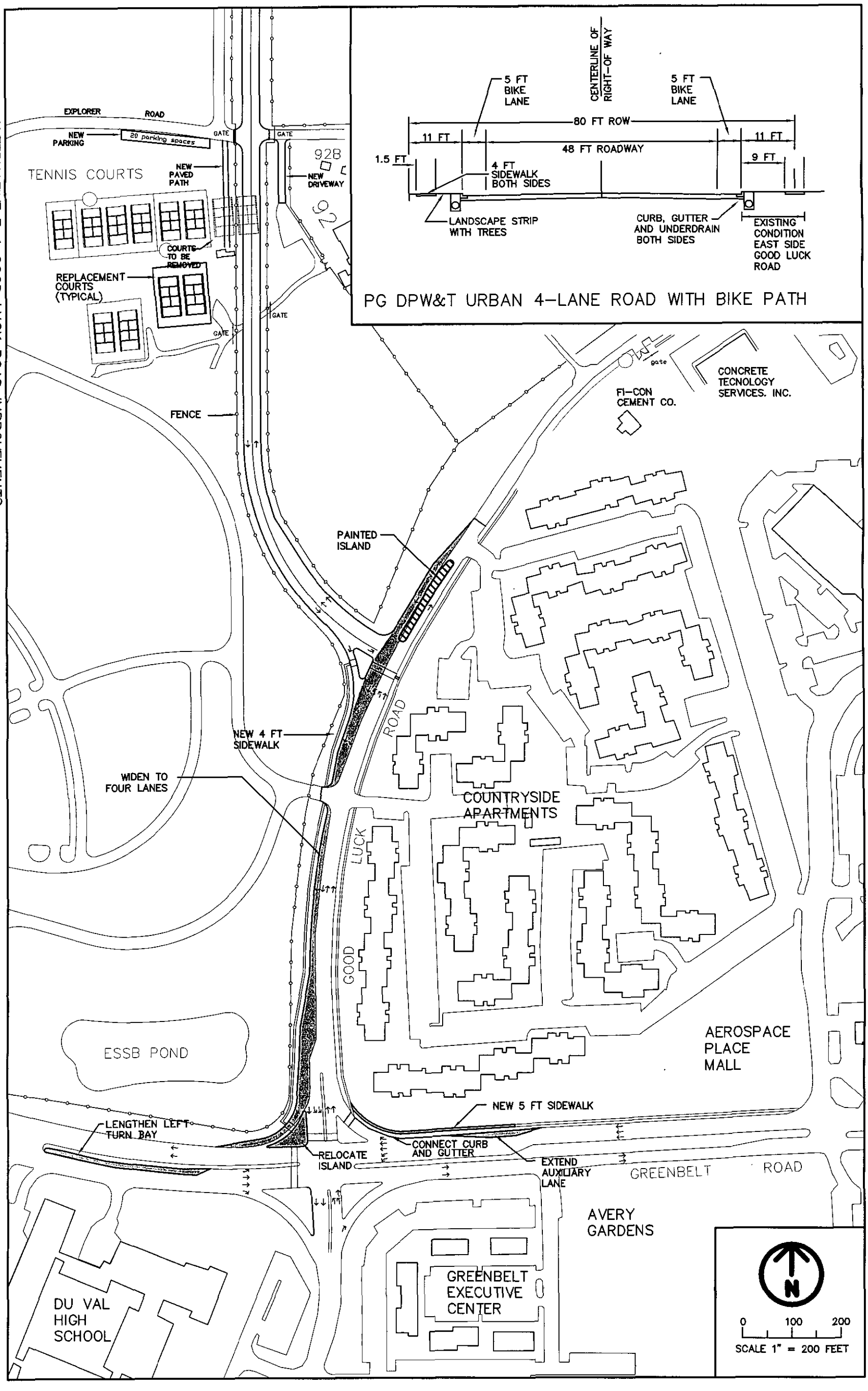


FIGURE 7-7 EAST ALIGNMENT ALTERNATIVE E-1.

FIGURE 7-8 ALTERNATIVE E-1 GOOD LUCK ROAD IMPROVEMENTS.



Prince George's County owns and maintains Good Luck Road. The County Area 70 Master Plan calls for widening the road from two to four lanes between Greenbelt and Springfield Roads. (Approved Master Plan, Glenn Dale-Seabrook-Lanham and Vicinity, M-NCPPC, 1993). Partial widening has already occurred in discrete sections on the east side of the roadway. A second northbound lane and sidewalk has been added along the frontage of the Countryside Apartments and two recently built commercial facilities north of FI-CON Cement Company. Improvements have also been added in the northernmost section of Good Luck Road in the vicinity of the entrance roads to the Forestgate and Wingate residential communities. Sidewalk, landscaping and lighting were added to the east side, but the road was not widened in this area.

The alternative would include widening Good Luck Road to four lanes between the new Soil Conservation Road intersection and Greenbelt Road. The width and right-of-way would conform to County Department of Public Works and Transportation standards and criteria for urban, four lane collector roads (see Figure 7-8). Widening would be to the NASA side holding the east curb along the apartment frontage. The project would include two five-foot bike lanes inside the curb, sidewalk, curb and gutter, storm drains, landscaping, trees, and street lighting to match the existing east side. All work would conform to County standards and criteria.

Alternative E-1 would intersect Good Luck Road about half way between two entrances to the Countryside Apartments. The entrances do not have a direct connection on the west side of the property, but a third entrance on Aerospace Road on the opposite or east side of the apartment complex provides access to all site parking lots. The intersection would be signalized. The predominant traffic movement accounting for 75 percent or more of total intersection traffic would be generated by Soil Conservation Road user turns to and from the south. Peak hour left turns from southbound Soil Conservation Road to northbound Good Luck Road are projected to be one every four minutes or less. Southbound Soil Conservation Road would therefore have a channelized free right turn lane. This lane would continue southward to Greenbelt Road as the outside southbound lane.

Northbound double left turn lanes would be provided on Good Luck to handle the anticipated heavy left turn movement onto Soil Conservation Road during the PM peak period. The dual lanes would be extended 250 to 300 feet on Soil Conservation Road north of the intersection before merging into a single northbound lane. An alternate arrangement could be an exclusive northbound left turn lane and a dual left-through lane.

The Maryland State Highway Administration owns and maintains Greenbelt Road and controls access to it. Extension of four lanes on Good Luck Road would require improvements to the intersection at Greenbelt Road. The southbound Good Luck Road approach to the intersection would widen to four lanes to provide two exclusive left turn lanes, a through lane to cross Greenbelt Road, and a channelized right turn lane onto westbound Greenbelt Road. Other improvements would include lengthening the eastbound Greenbelt Road left turn bay, connecting a short section of the westbound Greenbelt Road outside lane between the Aerospace Place Mall and the existing right turn deceleration lane onto Good Luck Road to make this section three lanes westbound, connecting the existing sidewalk on the east side of Good Luck Road to the sidewalk along the Mall frontage, and improvements to the cross walks within the intersection.

Necessary drainage improvements would also be included. The intersection is at a high point, and Good Luck Road itself forms a drainage divide. Runoff flows southward on Good Luck Road, but the top of the drainage shed is near the south entrance to the Countryside Apartments. Drainage at the intersection flows to the west, east and south.

North of Greenbelt Road, precipitation falling on the west side of Good Luck Road flows to a drainage ditch that begins in the northwest corner of the intersection. The ditch drains to the west along the NASA property line to existing Soil Conservation Road. Runoff on the east side of Good Luck Road follows the gutter to a drainage ditch in the northeast corner of the intersection. This ditch courses eastward and subsequently enters a recently built 21-inch concrete storm drain that runs along the Aerospace Mall frontage. The south half of the intersection drains to the south via surface flow.

Drainage improvements would consist of installing curb and gutter on the west side of Good Luck Road, relocation of the ditching in the northwest corner, and connection of the east side gutter drainage to an extension of the 21-inch drain.

7.3.3.3 East Alignment Alternative E-2

East Alignment Alternative E-2 also has been informally identified as the east "high" alignment. Like East Alternative E-1, East Alignment Alternative E-2 would be two lanes wide between its northern end and Good Luck Road (Figure 7-9). It would be 1.28 miles long in this section. The alignment strikes Good Luck Road further to the north so that the total length would be 1.69 miles.

The alignment along the northern tier of the east campus is identical to Alternative E-1. Instead of completing a full 90 degree turn to the south, Alternative E-2 turns only about 60 degrees, and runs straight across a vacant Goddard area to intersect God Luck Road on the perpendicular. The alignment would require demolition of Building 83A and 84, and relocation of NASA operations in these buildings elsewhere.

Good Luck Road would be widened to four lanes between the new Soil Conservation Road intersection and Greenbelt Road (Figure 7-10). The intersection at Good Luck Road would have the same configuration as that for Alternative E-1 with Soil Conservation road teeing into Good Luck Road.

The improvements along Good Luck Road would be the same as that four Alternative E-1. Alternative E-2 would require widening of Good Luck Road along commercial property frontage to the north of the Countryside Apartments.

7.3.3.4 East Alignment Alternative E-2A

East Alignment Alternative E-2A is a variant or revision of Alternative E-2 that accounts for internal NASA and public comment received during the Draft Environmental Assessment NEPA review process.

Alternative E-2A would be 1.37 miles along in the two lane section across Goddard between its northern end and Good Luck Road (Figures 7-11 and 7-12). The total length of the alignment between termini would be 1.75 miles.

Alternative E-2A is identical to Alignments E-1 and E-2 across the northern tier of the east campus. The alignment avoids Buildings 83A and 84. Building 83A operations include communications via antennas near the building to geostationary satellites located over the equator. A radio frequency quiet zone or buffer limit of 500 feet is required to the south of the site antennas in the direction of the satellites. Reductions in the buffer limit could require expensive radio frequency shielding.

The E-2A alignment therefore passes to the north of Building 83A on a 300 meter radius curve to minimize potential operation impacts. The alignment approaches within about 100 feet of the Goddard boundary with the Prince George's County Sports Complex along this section.

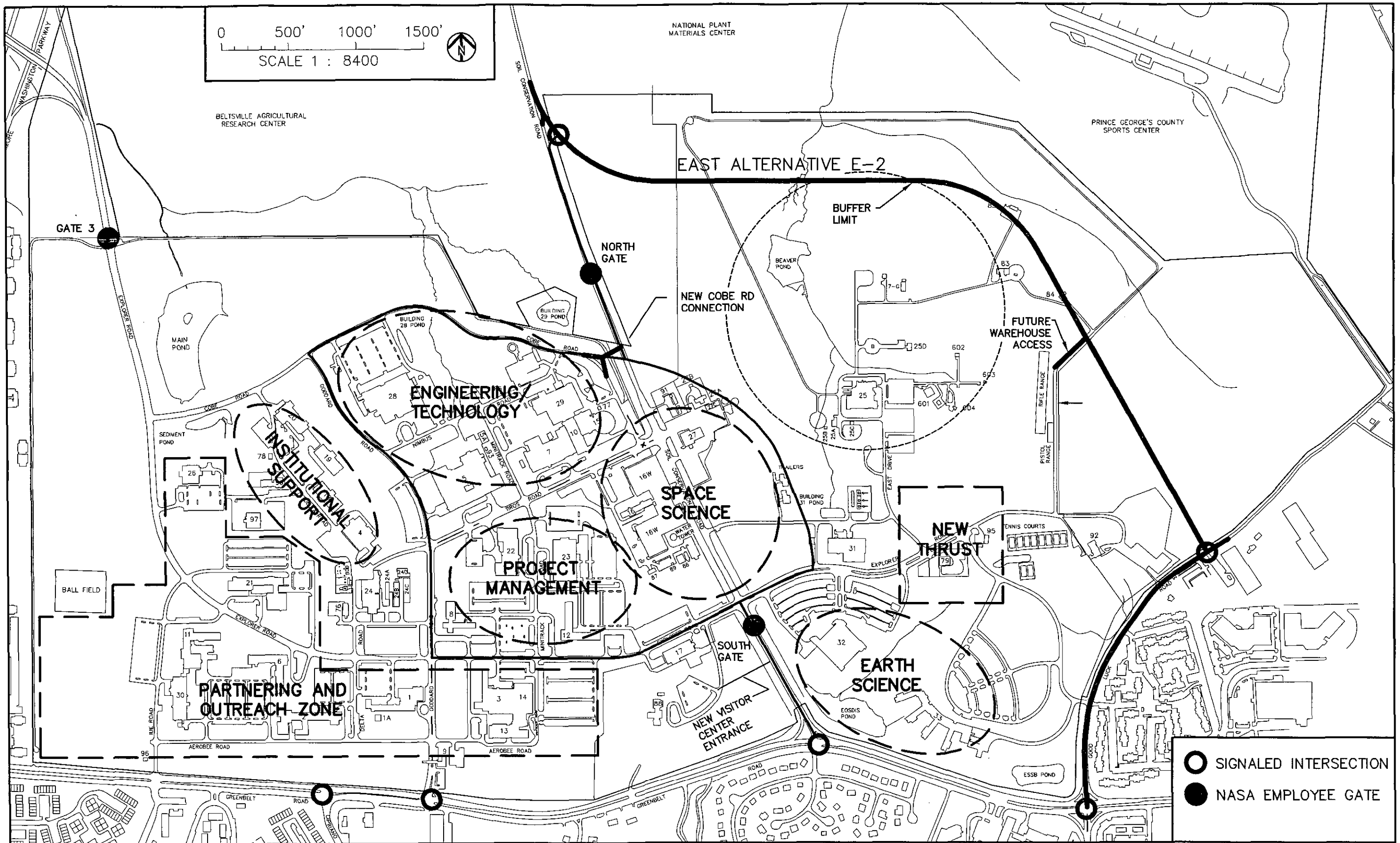


FIGURE 7-9 EAST ALIGNMENT ALTERNATIVE E-2.

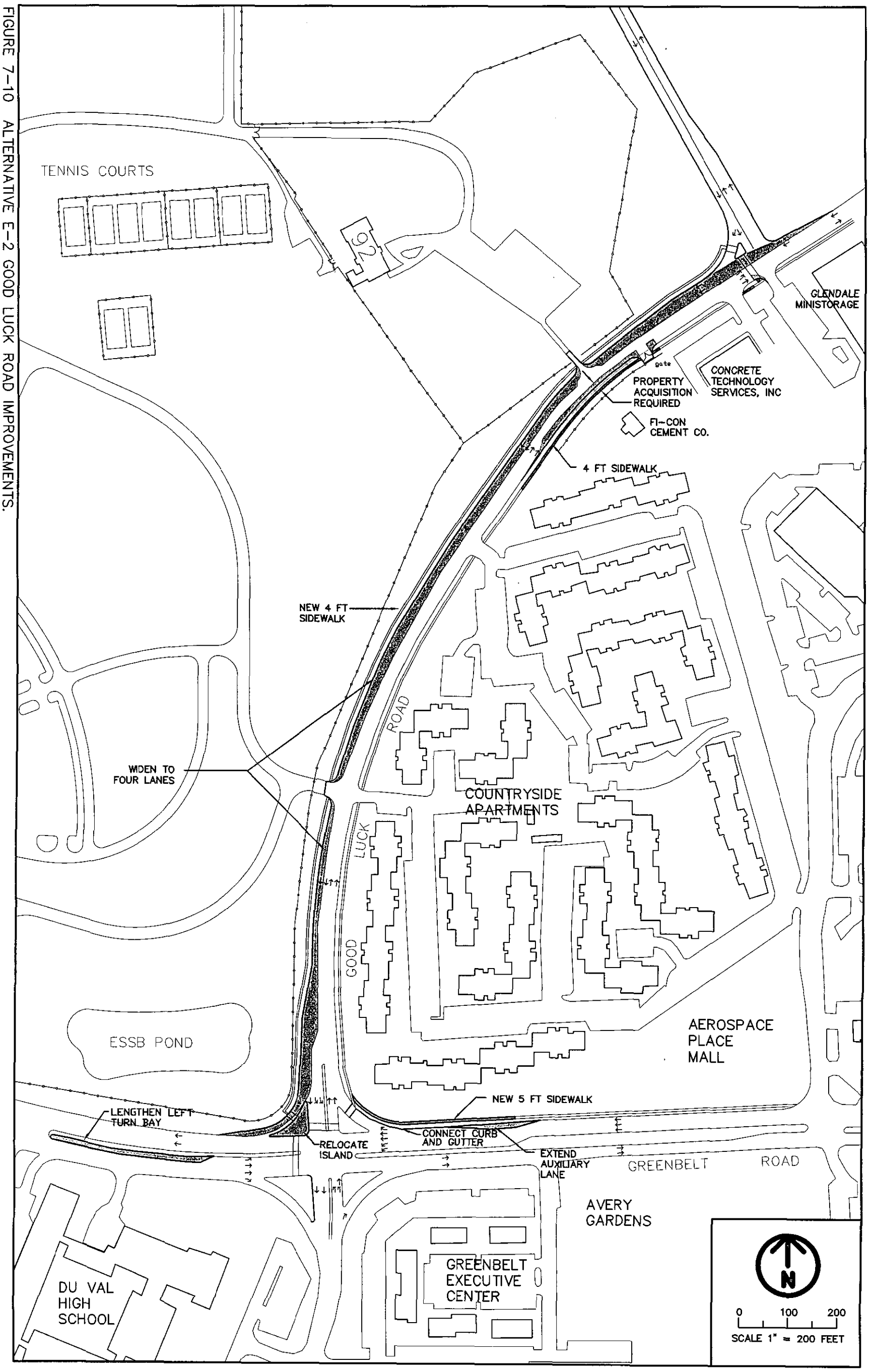


FIGURE 7-10 ALTERNATIVE E-2 GOOD LUCK ROAD IMPROVEMENTS.

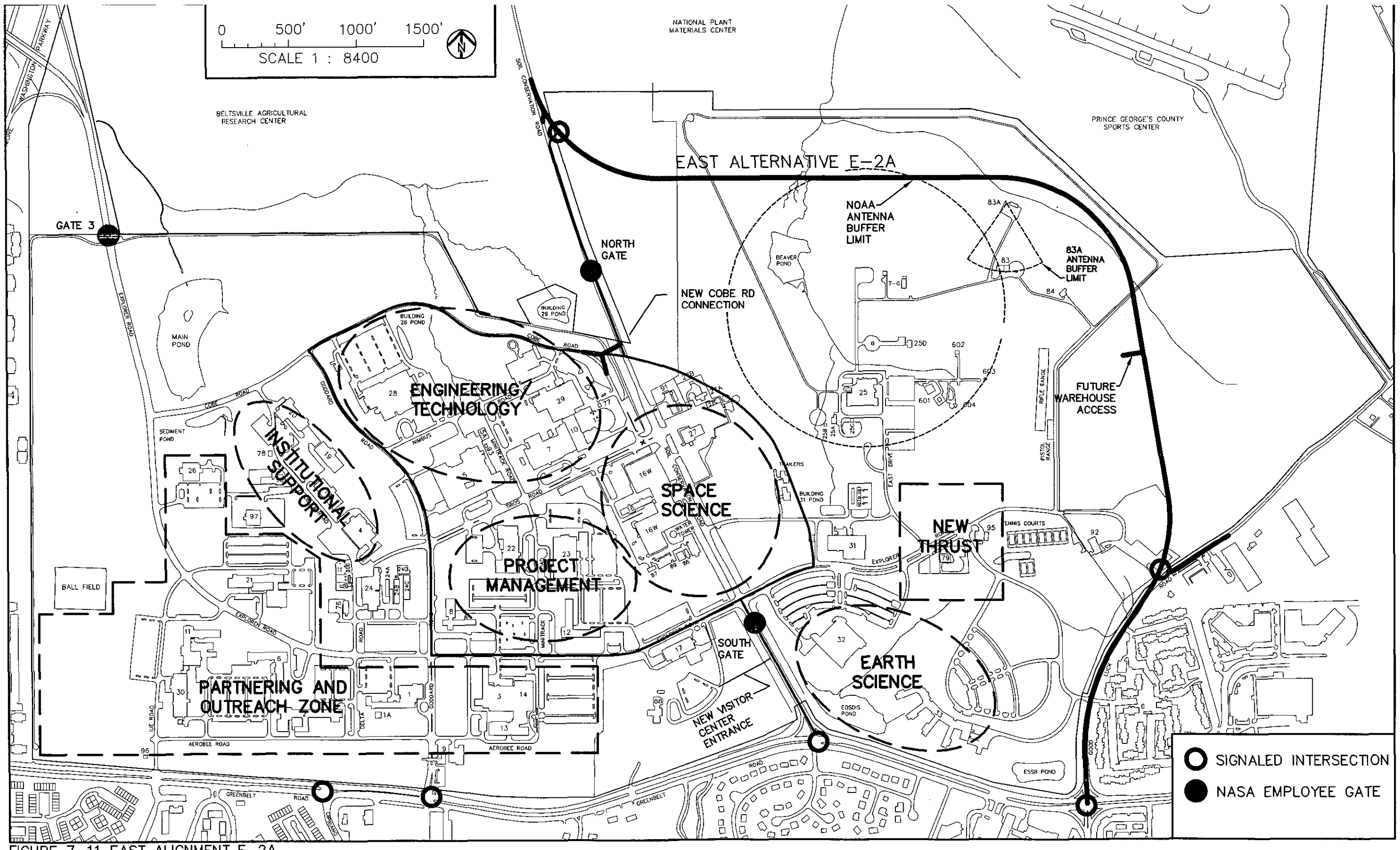


FIGURE 7-11 EAST ALIGNMENT E-2A.

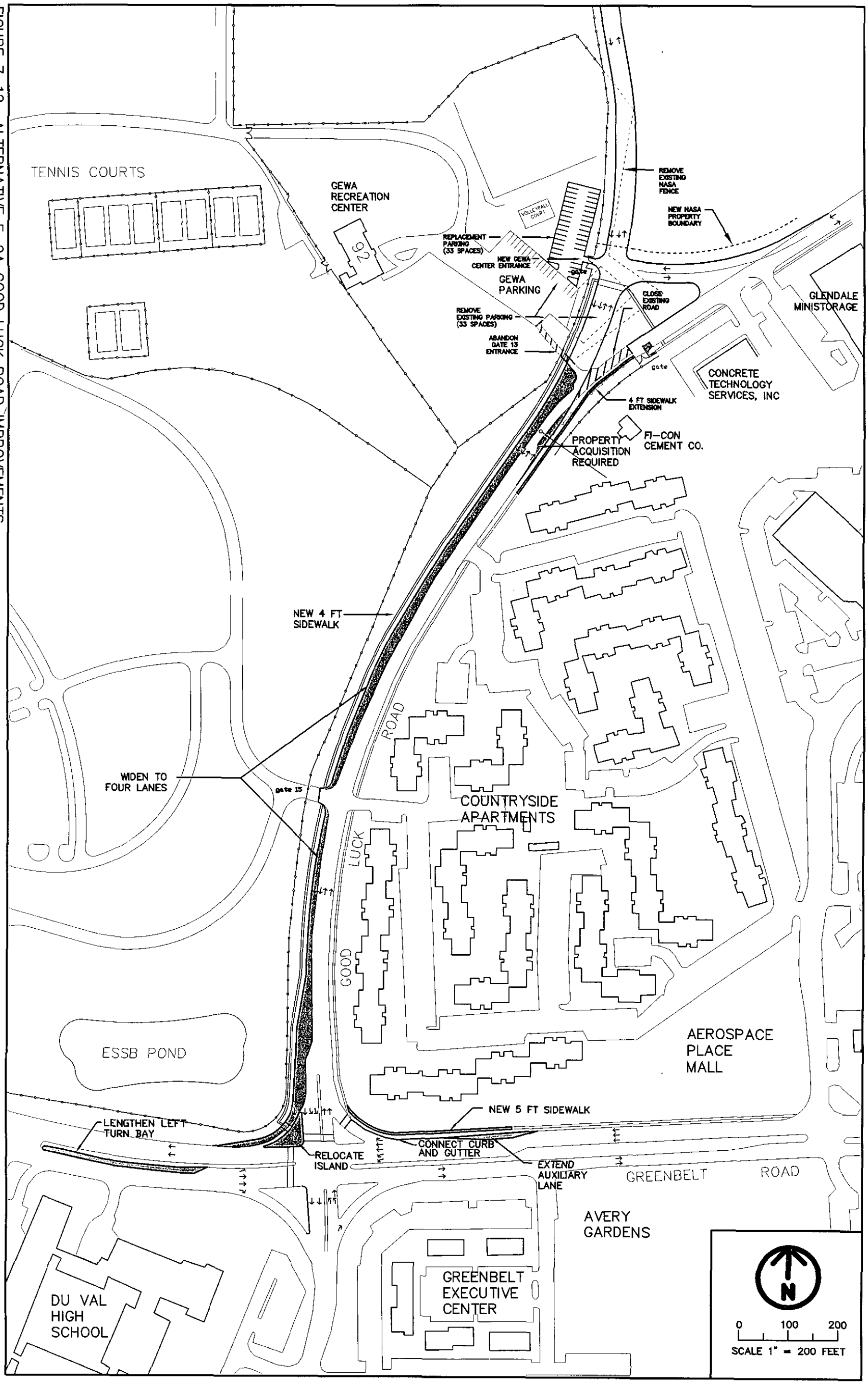


FIGURE 7-12 ALTERNATIVE E-2A GOOD LUCK ROAD IMPROVEMENTS.

The alignment then proceeds south-southeastward across an undeveloped area on the east campus. A future connection to a commercial vehicle inspection facility and warehouse would be made on the tangent or straight section to meet driver sight line distance standards.

The intersection with Good Luck Road would be located to the east of the GEWA Recreation Center. Soil Conservation Road would be the through route with Good Luck Road teeing into it. The intersection would be signalized. Good Luck Road would be severed as a through route but a portion of the road would be retained to maintain access to the commercial properties just to the east of the intersection. The entrance to the NASA GEWA Recreation Center at Gate 13 would be shifted northward to connect to Soil Conservation Road at the Good Luck Road intersection.

The intersection would require dedication of NASA property for public right-of-way. The right-of-way dedication of NASA property for pubic right-of-way. The right-of-way dedication would require taking 33 parking spaces at the GEWA Recreation Center. These spaces would be replaced by an equivalent number of spaces. Property along the right field line at the GEWA ball field would also be needed.

Improvements along Good Luck Road south of the intersection would be identical to those of Alternate E-2.

7.3.3.5 No Action Alternative

Under the No Action Alternative, existing Soil Conservation Road would continue to be used, and non NASA initiated changes to the road network would occur. The No Action Alternative does include improvements by others indicated in regional transportation planning, or as necessary to accommodate growth in background or non-NASA traffic over the next 20 years. These include widening Greenbelt Road to six lanes east of Mandan Road and signalization and turning lane improvements at several intersections (See Table 7-9). The No Action Alternative would not meet Goddard Facilities Master Plan planning guidelines and criteria.

7.4 Affected Environment/Environmental Consequences

7.4.1 Traffic

7.4.1.1 Existing Conditions

Existing traffic volumes were determined by observing vehicle movements and turns over an extended period during the morning and afternoon rush hours. Volumes were counted at 21 intersections and locations in the environs of Goddard on work week days in October, 2001. Observed counts at each intersection were accrued into successive 15 minute totals. The highest intersection volume over any four successive 15 minute periods then determined the peak hourly traffic volume for that intersection.

The resultant existing AM and PM peak hour traffic volumes are shown in Figures 7-13 and 7-14, respectively, for the principal intersections in the study area. Volumes shown in each intersection traffic balloon for road links connecting adjacent intersections may differ, because either the intersection peak hours are not coincident in time, or there are intervening minor roads, and residential and commercial development entrances that contribute to traffic conditions. The data show the dominance of the Baltimore-Washington Parkway and Greenbelt Road as the principal arterials in the area. Peak traffic flows on the Parkway are southbound in the morning and northbound in the afternoon. Volumes are higher north of the Powder Mill Road interchange than in the immediate vicinity of NASA, particularly during the peak PM hour.

The higher directional traffic flows on Greenbelt Road are westbound in the morning and eastbound in the evening. The peak directional flows are approximately double those in the opposite direction (65%-35% directional split). NASA generated traffic adds to the peak directional flow east of Goddard, but is countercurrent to it to the west of the campus. Traffic signals between Hanover Parkway and Good Luck Road are synchronized to favor the peak directional flow, and have sufficient green cycles (100 seconds) so that platoons of through traffic can generally travel between the two points without stopping. Traffic volumes on Greenbelt Road generally increase from east to west.

The predominant directional flows on Good Luck Road north of Greenbelt Road are southbound in the morning and northbound in the afternoon. Peak directional flows are approximately four times those in the opposite direction. About 50 to 60 percent of the traffic is traveling to and from the Countryside Apartments and residential areas south of Springfield Road.

Goddard generated AM and PM peak hour traffic volumes through site gates are shown in Figures 7-13 and 7-14 and summarized in Table 7-1. The respective gate traffic peak hours begin at 7:30 AM and 5:00 PM. Morning traffic volumes are more condensed, while afternoon departures are dispersed over a longer time period resulting in a reduced PM peak hour. The field counts at Gates 5 and 16 on Soil Conservation Road include NASA employees who pass through both gates. Both gates have guardhouses and site visitors usually enter only one or the other. Nearly all of the employee traffic crossing Soil Conservation Road is traveling between Gate 3 and the east campus. These employees therefore travel through three gates on each inbound or outbound trip. After correcting for these multiple gate trips, the number of Goddard generated AM peak hour inbound and PM peak hour outbound trips are 1,844 and 1,646, respectively. The concomitant peak hour trip generation per employee is slightly less than one trip for every four employees in the morning, and slightly more than one trip for every five employees in the afternoon.

NASA employee home zip code information indicates that about 60 percent of them live to the north and east of Goddard. Higher concentrations exist in Columbia, southwest Baltimore suburbs, Anne Arundel County, Bowie, and Annapolis. The majority of NASA employees travel to the north and east on their home-work trips (Table 7-2). The counts and direction of travel are derived directly from the vehicle turning movements counted at NASA gates during the field survey. The direction of travel for vehicles proceeding to and from the NASA gates on Soil Conservation Road via Greenbelt Road are based on turning movement data at the Greenbelt Road/Soil Conservation Road intersection and an origin-destination survey

Morning and afternoon travel patterns differ in the roughly triangular area formed by the Baltimore-Washington Parkway, Greenbelt Road, and Soil Conservation Road. PM peak period traffic routes are influenced by two back ups that nearly always occur and are well known to drivers familiar with the area road network. The first of these backups occurs on the northbound lanes of the Baltimore-Washington Parkway in the vicinity of the Powder Mill Road interchange. The second occurs in the southbound left turn-through lane on Soil Conservation Road at the Greenbelt Road intersection.

NASA employees traveling to and from the north via the Baltimore-Washington Parkway have a choice of routes between Goddard and the Powder Mill Road interchange. They can either use the Parkway and Goddard Gate 3, or they can travel on Soil Conservation Road and use the NASA gates along that road. In the morning peak hour, the majority of these drivers, 379 out of 643 or nearly 60 percent, choose the Parkway – Gate 3 route. During the PM rush period, the northbound Parkway backups reverse the route preferences; 291 out of 509 NASA drivers or nearly 60 percent use Soil Conservation Road to reach the Parkway.

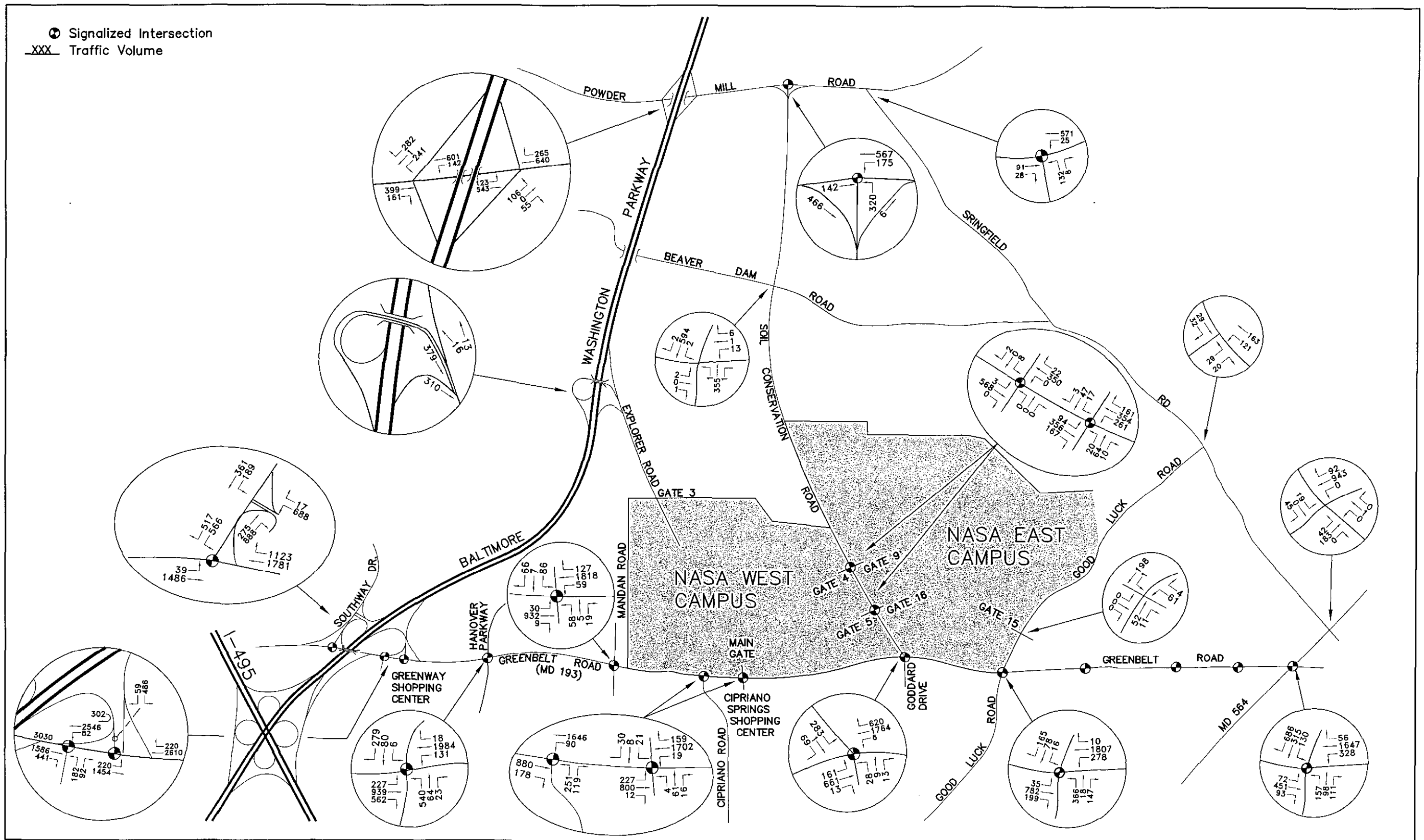


FIGURE 7-13 EXISTING AM PEAK HOUR TRAFFIC.

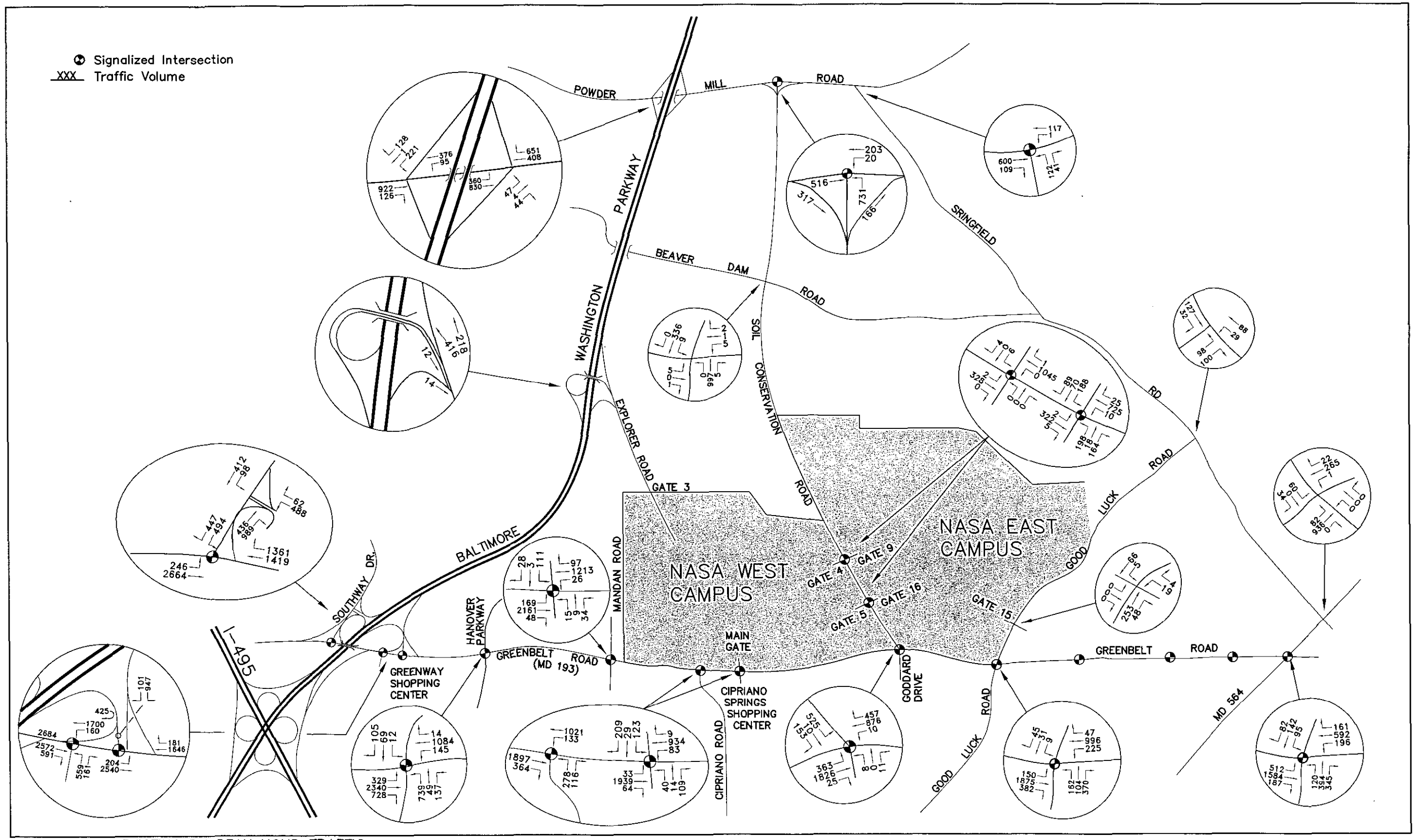


FIGURE 7-14 EXISTING PM PEAK HOUR TRAFFIC.

	AM PEAK HOUR		PM PEAK HOUR	
	Inbound	Outbound	Inbound	Outbound
Baltimore-Washington Parkway				
Gate 3	689	29	26	634
Soil Conservation Road				
Gate 9	25	10	3	10
Gate 5	428	30	15	364
Through*	47	64	70	18
Gate 16	255	20	27	277
Through*	64	47	18	70
Subtotal	819	171	133	739
Greenbelt Road				
Main Gate	477	59	56	361
Total	1,955	259	215	1,734
Less Gate 5/16 Crossings	111	111	88	88
NASA GSFC Trips	1,844	148	127	1,646
Trip Generation per Employee	0.242	0.019	0.015	0.217

*NASA employees crossing Soil Conservation Road between Gates 5 and 16.

TABLE 7-1 EXISTING GODDARD AM/PM PEAK HOUR VEHICLE TRIP GENERATION.

The Gate 3/Parkway interchange, therefore, operates differently during the morning and evening rush hours. In the AM peak hour, the majority of arrivals at Gate 3, or 55 percent, approach from the north. During the PM peak period, however, only 218 out of 634 departing vehicles, or 33 percent, are proceeding to the north on the Parkway.

The traffic count survey was supplemented by a vehicle origin-destination survey directed toward Soil Conservation Road users. Drivers who stopped at the Gate 5/16 intersection traffic signal were asked the direction they were coming from on either Greenbelt or Powder Mill Roads, and the intended direction they were taking when they reached the opposite end of Soil Conservation Road. The survey was conducted during the AM and PM peak traffic periods. General public drivers were distinguished from NASA employee users.

The survey results for general public commuters are summarized in Table 7-3. The number of vehicles in each category is not indicative of overall traffic volumes, but only reflect the opportunities to interview drivers. More northbound vehicles stopped at the intersection due to traffic signal sequencing at Greenbelt Road. The southbound vehicles arrived more randomly, and more passed through on the green cycle than in the northbound direction. The data, however, represent a random sample of all public user vehicles, and the percentage of vehicles making the selected movements is what is important.

Peak hour public user traffic volumes on Soil Conservation Road were estimated by subtracting NASA generated traffic volumes turning into or out of gates along the road. The results of the origin-destination

	AM PEAK HOUR INBOUND	PM PEAK HOUR OUTBOUND
TO OR FROM NORTH		
Baltimore-Washington Parkway		
Gate 3	379	218
Soil Conservation Road		
Gate 9	3	4
Gate 5	167	198
Gate 16	94	89
Sub-total	264	291
TOTAL NORTH	643	509
TO OR FROM EAST		
Greenbelt Road		
Main Gate	159	123
Soil Conservation Road		
Gates 9, 5, 16*	318	308
TOTAL EAST	477	431
TOTAL NORTH AND EAST	1,120	940
Total GSFC Trips	1,844	1,636
% To or From North and East	61%	57%

*via Greenbelt Road

TABLE 7-2 ESTIMATED EXISTING GODDARD PEAK HOUR TRIPS TO AND FROM THE NORTH AND EAST.

survey were then applied to these estimates to determine the number of vehicles turning to and from the east or west at the Greenbelt Road intersection (Table 7-4).

There are two dominant public user movements on Soil Conservation Road. The most dominant are those who use Soil Conservation Road as a short cut between the Powder Mill Road interchange on the Parkway and points east of Goddard. A secondary, but significant, traffic movement exists between the interchange and points to the west of Soil Conservation Road on Greenbelt Road.

More than 4 out of 5 public users traveling northbound on Soil Conservation Road in the morning peak traffic period are coming from the east on Greenbelt Road, and then proceeding west on Powder Mill Road. About 92 percent of all northbound AM peak period public users turn left at Powder Mill Road. The proportion of southbound vehicles coming from the west on Powder mill Road is less, with over 30 percent of the vehicles approaching the north end of Soil Conservation Road from the east. In the southbound direction, about 3 out of 4 turn left at Greenbelt Road to travel east. The Soil Conservation Road public user AM peak period directional split is approximately 50-50 with 340 to 350 such vehicles travelling in each direction.

SOIL CONSERVATION ROAD VEHICLES		AM PERIOD NUMBER	% TOTAL	PM PERIOD NUMBER	% TOTAL
NORTHBOUND					
FROM	TO				
WB Greenbelt Rd	WB Powder Mill Rd	128	84.2	123	55.4
WB Greenbelt Rd	EB Powder Mill Rd	3	2.0	12	5.4
WB Greenbelt Rd	Beaver Dam Rd	2	1.3	0	0.0
	Subtotal	133	87.5	135	60.8
EB Greenbelt Rd	WB Powder Mill Rd	12	7.9	68	30.6
EB Greenbelt Rd	EB Powder Mill Rd	4	2.6	19	8.6
EB Greenbelt Rd	Beaver Dam Rd	3	2.0	0	0.0
	Subtotal	19	12.5	87	39.2
Total Northbound		152		222	
SOUTHBOUND					
FROM	TO				
EB Powder Mill Rd	EB Greenbelt Rd	44	53.7	56	65.1
WB Powder Mill Rd	EB Greenbelt Rd	18	21.9	3	3.5
Beaver Dam Rd	EB Greenbelt Rd	0	0.0	0	0.0
	Subtotal	62	75.6	59	68.6
EB Powder Mill Rd	WB Greenbelt Rd	11	13.4	14	16.3
WB Powder Mill Rd	WB Greenbelt Rd	9	11.0	13	15.1
Beaver Dam Rd	WB Greenbelt Rd	0	0.0	0	0.0
	Subtotal	20	24.4	27	31.4
Total Southbound		82		86	

EB = Eastbound
WB = Westbound

TABLE 7-3 ORIGIN/DESTINATION SURVEY DATA FOR GENERAL PUBLIC SOIL CONSERVATION ROAD USERS.

The proportion of southbound vehicles coming from the west on Powder Mill Road is less, with over 30 percent of the vehicles approaching the north end of Soil Conservation The PM peak period exhibits a sharply different pattern. The proportion of northbound vehicles approach Soil Conservation Road from the west on Greenbelt Road increases to 40 percent of the public user volumes. This increase could be attributable to the northbound Parkway backups. More than 3 out 4 of the vehicles approaching Soil

	AM PEAK HOUR
NORTHBOUND	
From Eastbound Greenbelt Road	302
From Westbound Greenbelt Road	43
	345
SOUTHBOUND	
To Eastbound Greenbelt Road	279
To Westbound Greenbelt Road	69
	348
	PM PEAK HOUR
NORTHBOUND	
From Eastbound Greenbelt Road	458
From Westbound Greenbelt Road	296
	754
SOUTHBOUND	
To Eastbound Greenbelt Road	217
To Westbound Greenbelt Road	99
	316

TABLE 7-4 ESTIMATED EXISTING PEAK HOUR PUBLIC TRAFFIC VOLUMES USING SOIL CONSERVATION ROAD.

Conservation Road from the west subsequently turn left or back to the west at Powder Mill Road. It can be inferred that many commuters are using Soil Conservation Road northbound as a bypass in preference to direct travel up the Baltimore-Washington Parkway.

In terms of absolute numbers, the PM peak hour public user northbound traffic on Soil Conservation Road is more than double reverse southbound AM peak hour volume in the morning, increasing to an estimated 754 vehicles. The increase is partially explained by a roughly estimated 230 vehicles that have trip origins and destinations along Greenbelt Road between the Parkway and Soil Conservation Road. They use the Parkway to travel southbound in the morning, but shift to Soil Conservation Road for the return trip northward in the PM peak period.

The number of public users approaching Soil Conservation Road from the east on Greenbelt Road also increases substantially during the PM peak period. The reason for this increase is not evident from study area survey data.

In the southbound direction, about 7 in 10 public users turn left at Greenbelt Road and continue on to the east. Among those turning to the west, about half approach Soil Conservation Road at Powder Mill Road from the west and half from the east. Subtraction of southbound public user traffic from the total southbound turning movements at Greenbelt Road reveals that about 85 percent of the NASA employee PM peak hour traffic is turning left at the intersection.

The average daily traffic volume on Soil Conservation Road is 8,980 as recorded by 24-hour automatic counters during a 1998 traffic survey. Late night traffic volumes on Soil Conservation Road are low.

The following includes traffic in both directions between 10:00PM and 6:00AM.

Time	Vehicles	Time	Vehicles
10:00 – 10:59 PM	157	2:00 – 2:59 AM	23
11:00 – 11:59 PM	102	3:00 – 3:59 AM	17
12:00 – 12:59 AM	52	4:00 – 4:49 AM	45
1:00 – 1:59 AM	20	5:00 – 5:59 AM	203

No data on the contribution of Goddard to these late night and early morning hour volumes are available, but it estimated to be negligible or very small. All the gates except the Main Gate and Gate 16 are closed during the evening hours. Gate 3, which is accessible only to Goddard employees, is open from 6:00 AM to 7:00 PM. A 24-hour traffic count at the Gate indicated that comparatively few employees arrive prior to 7:00 AM or depart after 6:15 PM.

7.4.1.2 Projected Traffic

Traffic on the road network around Goddard was projected for the year 2022 for the No Action Alternative, and the "build" alternatives for realignment of Soil Conservation Road to the west or east.

Background or non-NASA traffic will increase over the next 20 years due to general regional development as well as growth in the vicinity of Goddard (Figures 7-15 and 7-16). The No Action Alternative accounts for this growth in traffic. It assumes that there would be no change in personnel and access at Goddard and subsequently no change in Goddard generated traffic or vehicle trips. Traffic projections for the east and west Soil Conservation Road alternatives are superimposed on the background projections.

Comparison of the 2022 No Action Alternative traffic data to existing traffic indicates the impacts of growth by development other than Goddard. Comparison of the 2022 Soil Conservation Road realignment alternatives and No Action Alternative traffic indicates the maximum potential impact that would occur if the Facilities Master Plan were fully implemented, and the site population increased from 7,600 to 8,750.

The estimated 8,750 Master Plan site employee projections would be divided into 6,800 NASA employees and 1,950 workers in a separate Partnering and Outreach Zone. Each group would have its own entrances or site access. However, the twenty year projections of NASA employee strength have considerable attached uncertainty. The current best estimate is 5,800. As a planning contingency, 1,000 have been added to this best estimate to provide for large mission assignments unforeseen at this time. Since the realignment alternative cases are based on a projected site population of 8,750, they represent a "worst case" estimate of future Goddard traffic impacts. It is just as likely that the future site population will be 7,750 (contingency doesn't occur), or only 150 above the existing site population. If this occurs, Goddard trip generation would remain virtually unchanged.

Estimates for growth in background traffic were made in consultation with M-NCPPC. Growth was based on two factors, one covering regional conditions, the other study area development. It was estimated that background traffic volumes on the roads in the study area would increase at an overall average rate of 0.25 percent per year due to regional and County development. The cumulative increase in this traffic over 20 years will be 5.1 percent. This factor was applied to all the major study area roads except for the Baltimore-Washington Parkway. In addition to this annual percentage growth, a further fixed number of vehicles were added to the roadways to account for local private development that is underway or expected to be in place in the short term. Traffic from seventeen of these commercial and residential developments was distributed over the road network. The developments ranged as far as Laurel and the Doctor's Community Hospital, but most were in the Greenbelt Road corridor between the Baltimore-Washington Parkway and Lanham-Severn Road.

As a result, Greenbelt Road is expected to experience the largest increases in background traffic over the next 20 years. Growth varies from link to link between intersections and by direction of traffic flow, but in general, ranges from 30 to 55 percent with the larger values occurring east of Mandan Road. In the AM peak hour, the eastbound traffic volume is projected to increase by roughly 900 vehicles per hour east of the Baltimore-Washington Parkway. Westbound AM peak hour traffic would increase by about 450 vehicles. During the PM peak hour, projected increase is about 900 to 1,000 westbound, and 750 to 800 eastbound east of the parkway. The current dominant or higher traffic flow direction on Greenbelt Road is westbound in the morning and eastbound in the evening. The larger projected increases in the countercurrent direction will tend to equalize the directional flows.

On Soil Conservation Road, southbound background or public traffic is expected to increase by about 50 percent during both peak hours, while northbound non-NASA traffic would increase by 25 percent. These phenomena would also tend to equalize peak period directional flows.

Traffic projections for Soil Conservation Road realigned to the west (Soil Conservation Road Alternative W-1) or east (Soil Conservation Road Alternatives E-1, E-2 and E-2A) are shown in Figures 7-17 to 7-20. Traffic volumes for Soil Conservation Road Alternatives E-1, E-2 and E-2A are identical on all road links.

The Facilities Master Plan Alternative will increase traffic over 2022 background traffic levels. However, with some exceptions, the increases on individual road links are generally less than the differences between the projected 2022 No Action Alternative and existing traffic volumes. In other words, growth in non-NASA background traffic is greater than the maximum potential growth in Goddard traffic.

The realignment of Soil Conservation Road will change future traffic patterns in a complex way due to a number of factors. These factors would change the routes used by NASA and Partnering and Outreach Zone (PAOZ) employees, and the general public on their home-work trips. Each driver group would have different effects. As a result, traffic volume impacts created by each group on individual road links can either augment or cancel one another, or change the predominant direction of traffic flow. The chief factors include:

- The realignment of Soil Conservation Road and the lengthening or shortening of user trips.
- Severance of existing Soil Conservation Road and conversion of its use to NASA employee only entrances.
- Continuance of Gate 3 at the Baltimore-Washington Parkway as a NASA employee only entrance.
- Creation of the PAOZ with separate access or entrances for these employees. It has been assumed that the PAOZ employees will have the same home distribution pattern as current site employees.
- The choice of using the Baltimore-Washington Parkway or Soil Conservation Road as a route between Greenbelt Road or Goddard and Powder Mill Road.

The primary changes to Greenbelt Road traffic occur in the sections between the existing Soil Conservation Road intersection and the new points where Soil Conservation Road traffic reaches Greenbelt Road. If Soil Conservation Road is realigned to the west, Soil Conservation Road traffic travelling to and from the east on Greenbelt Road is added to the section of Greenbelt Road between existing Soil Conservation Road and the new relocated Soil Conservation Road intersection at Goddard Gate 2. On the other hand, Soil Conservation Road traffic travelling to and from the west

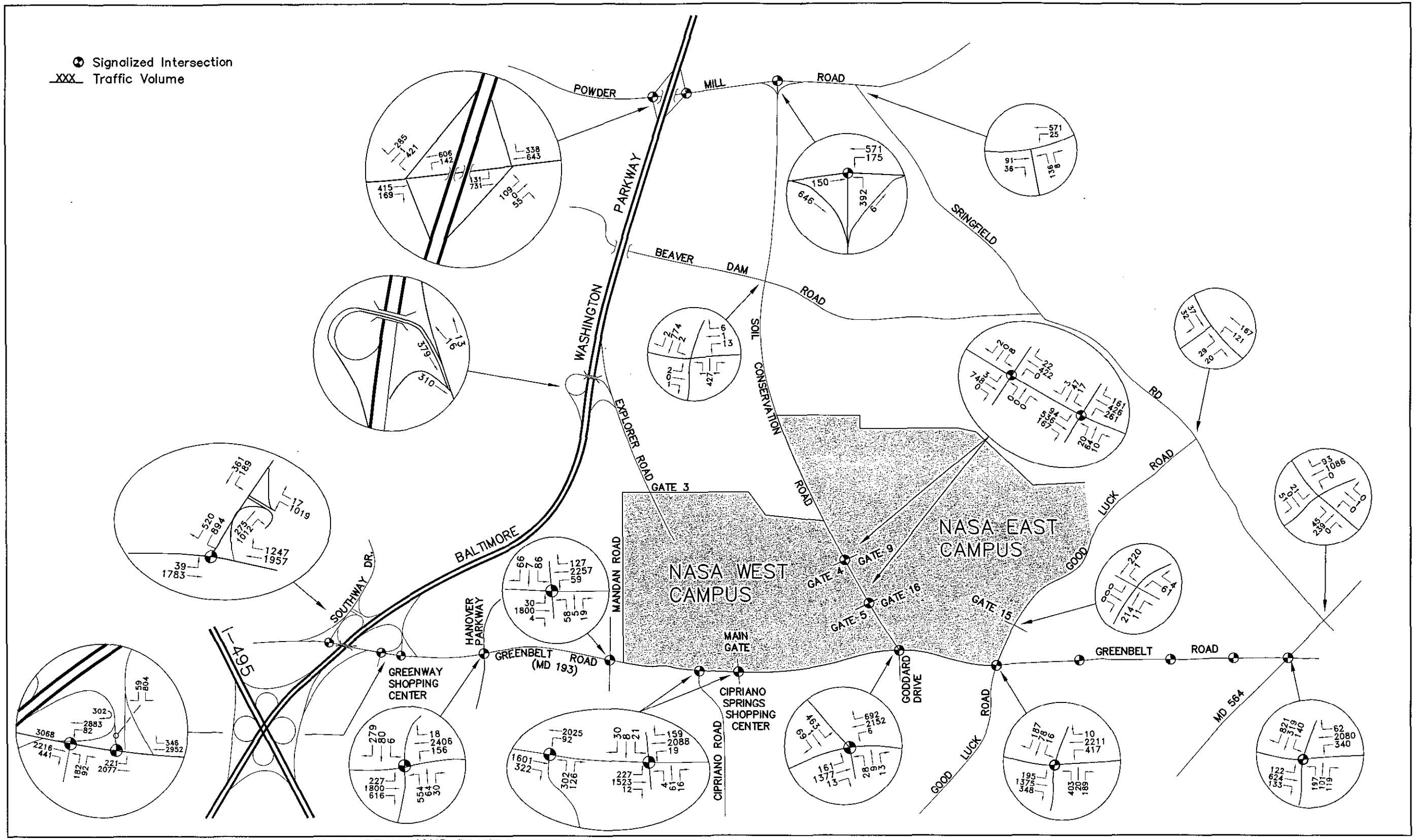


FIGURE 7-15 PROJECTED 2022 NO ACTION AM PEAK HOUR TRAFFIC.

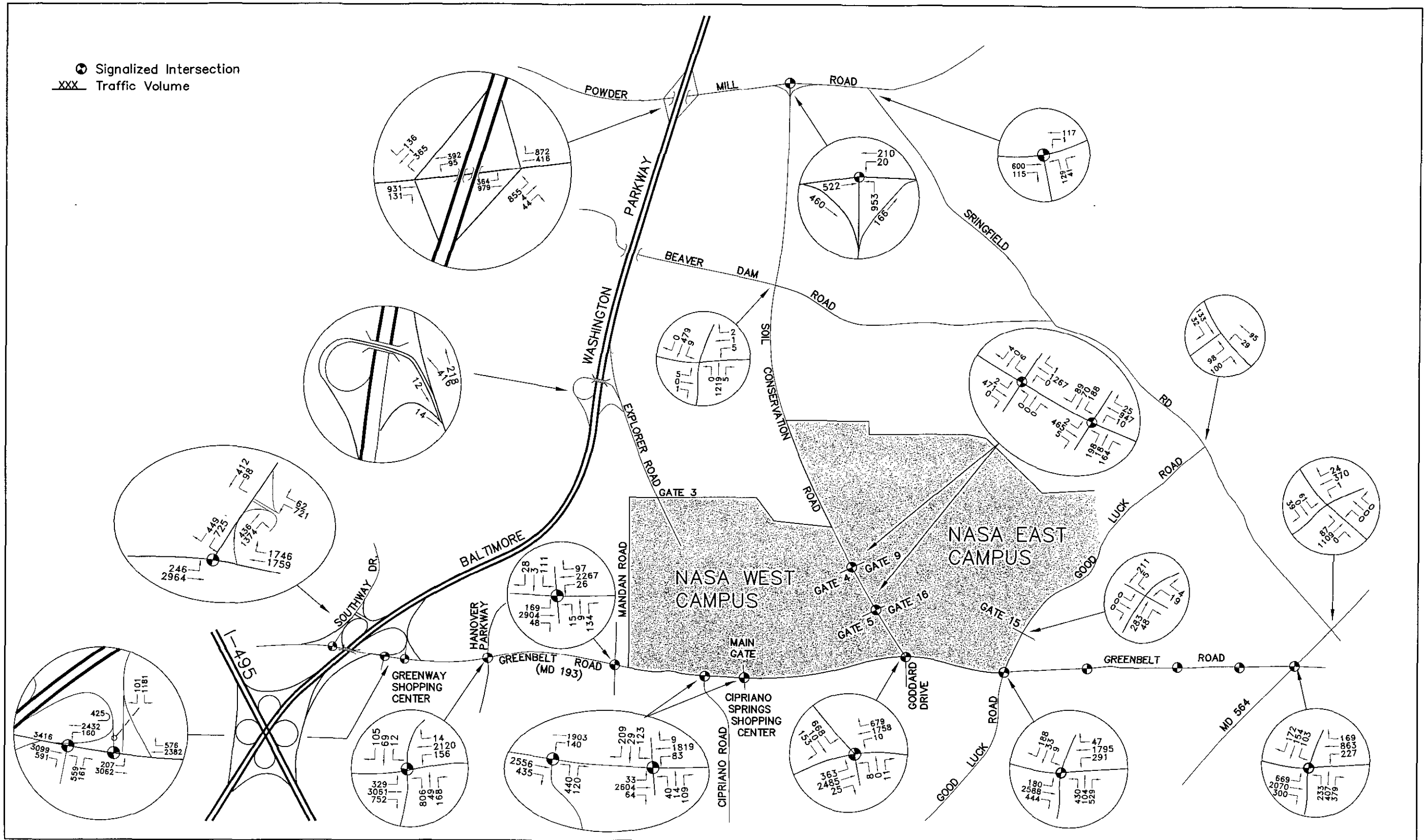


FIGURE 7-16 PROJECTED 2022 NO ACTION PM PEAK HOUR TRAFFIC.

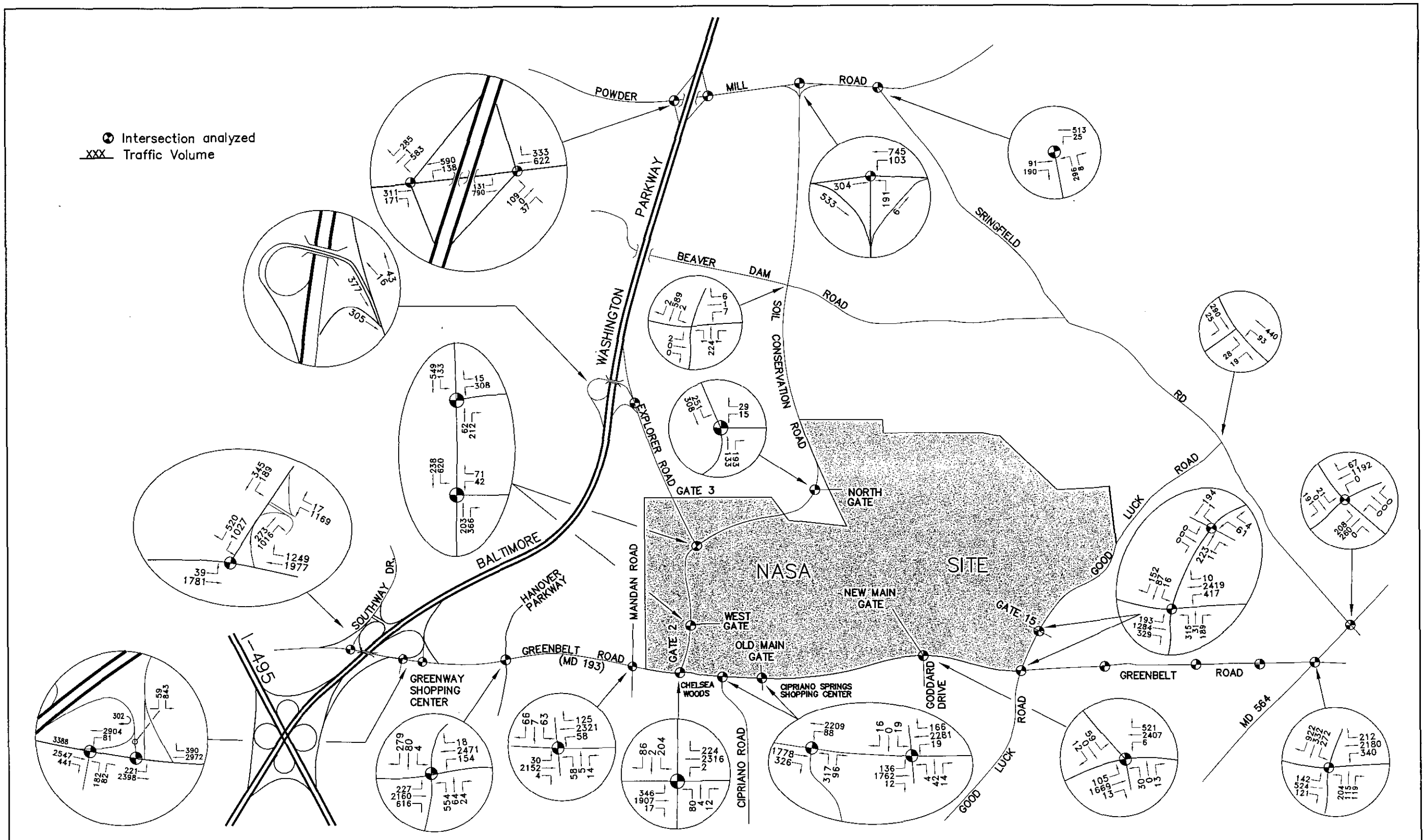


FIGURE 7-17 PROJECTED 2022 WEST ALIGNMENT ALTERNATIVE AM PEAK HOUR TRAFFIC.

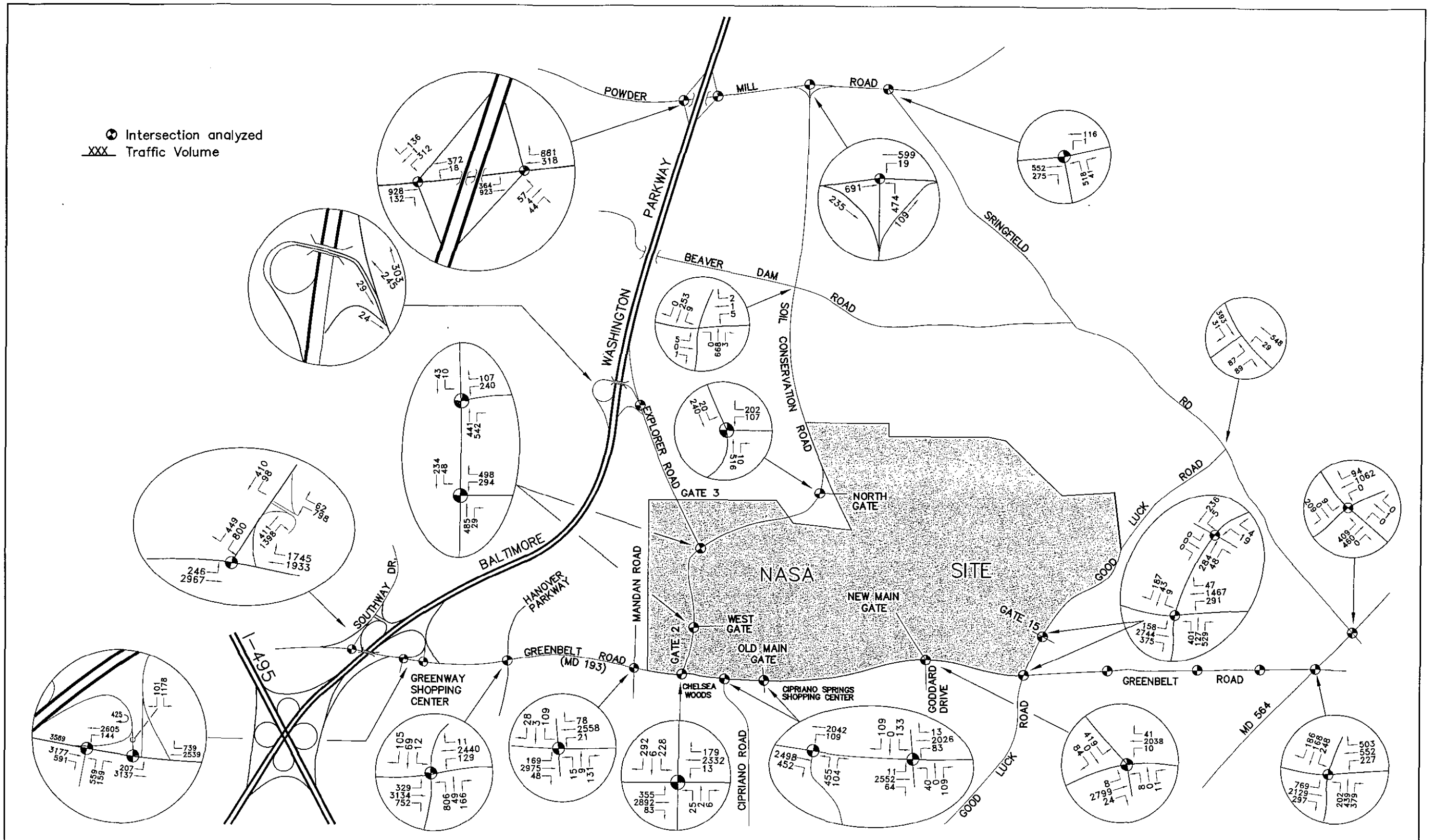


FIGURE 7–18 PROJECTED 2022 WEST ALIGNMENT ALTERNATIVE PM PEAK HOUR TRAFFIC.

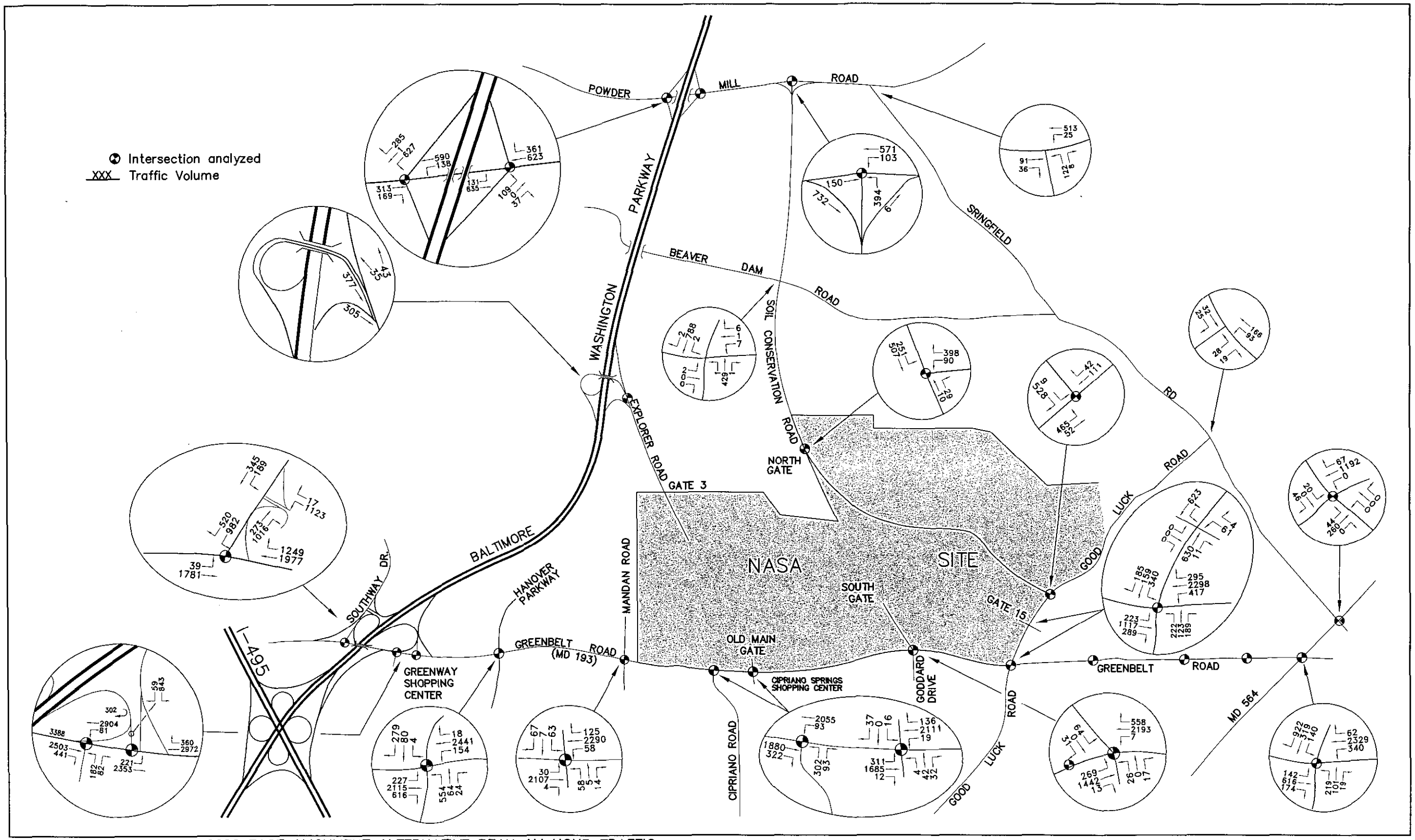


FIGURE 7-19 PROJECTED 2022 EAST ALIGNMENT ALTERNATIVE PEAK AM HOUR TRAFFIC.

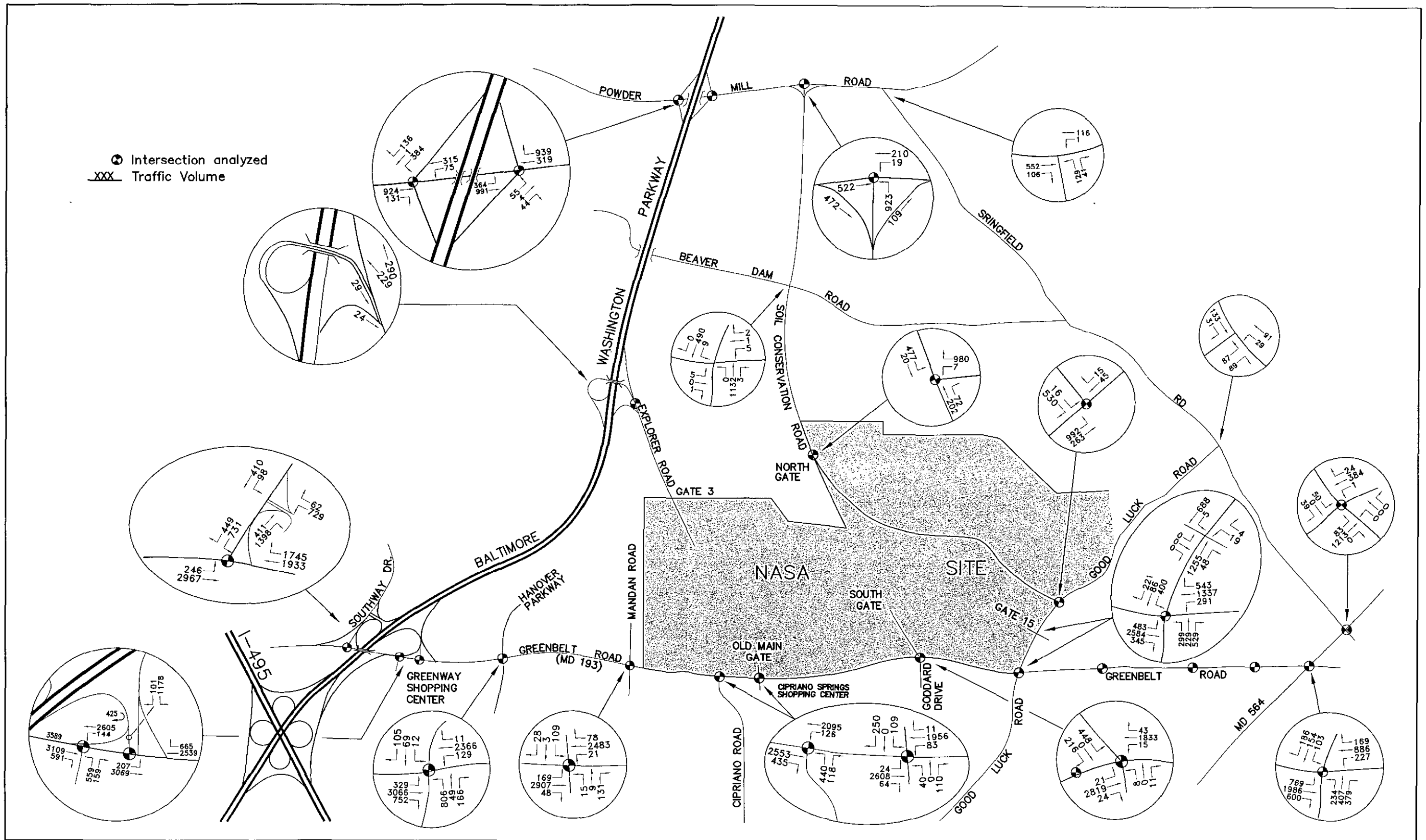


FIGURE 7-20 PROJECTED 2022 EAST ALIGNMENT ALTERNATIVE PEAK PM HOUR TRAFFIC.

is deleted from this section of Greenbelt Road, since it turns at Gate 2 rather than continue on to existing Soil Conservation Road. As a result, the difference among the east, west, and No Action alternative traffic volumes are generally less than 20 percent of the total Greenbelt traffic flow on any given Greenbelt Road Link.

NASA employee traffic volumes would increase at the new main or south gate on existing Soil Conservation Road intersection at Greenbelt Road under all three realignment alternatives. But the conversion of the road from a through public route to a NASA employee and visitor entrance would eliminate Soil Conservation Road commuter traffic, producing an overall decrease under Master Plan conditions on the road section between the south or new main gate and Greenbelt Road.

Good Luck Road currently has comparatively low traffic volumes. It functions primarily as a collector-distributor of traffic to the residential areas on the east side of GSFC. The eastern alignments would substantively increase peak hour traffic volumes on Good Luck Road in the section between the Soil Conservation Road intersection and Greenbelt Road (Table 7-5).

7.4.2 Intersection Congestion

7.4.2.1 Congestion Criteria

Intersections have traffic capacities that are related to a number of variables. Congestion increases as the traffic volumes approaches capacity. One methodology for estimating relative congestion at signalized intersections is the Critical Lane Volume (CLV) method (Highway Capacity Manual, US DOT Transportation Research Board Special Report 209, 2000). In the CLV method, AM and PM peak hour traffic volumes are determined for each roadway approach to an intersection. One of these approach movements controls the setting of green time allocation for traffic signal phasing to produce the most efficient intersection operation. This approach lane, or group of lanes, is identified as the critical lane. If there is more than one lane, traffic is proportioned among the lanes, but not necessarily equally. Left and right turns influence computed CLV values. The intersection Level of Service (LOS) is then determined by comparing the resultant CLV to pre-established values in the Highway Capacity Manual defining LOS (Table 7-6). Level of Service at signalized intersections is an indicator of congestion ranging from

ALTERNATIVE	AM PEAK HOUR SOUTHBOUND	AM PEAK HOUR NORTHBOUND	PM PEAK HOUR SOUTHBOUND	PM PEAK HOUR NORTHBOUND
Existing	259	63	85	301
2022 No Action	281	225	230	331
2022 East (E-1,E-2, E-2A)	684	641	707	1,225
2022 West (W-1)	255	234	239	332

TABLE 7-5 EXISTING AND PROJECTED 2022 GOOD LUCK ROAD PEAK HOUR TRAFFIC.

"A" to "F" in order of increasing congesting as follows:

Level of Service	Average Vehicle Delay
A	less than 5 seconds
B	less than 15 seconds
C	less than 25 seconds
D	less than 40 seconds
E	less than 60 seconds
F	more than one minute

Level of Service at unsignalized intersections, those controlled by stop signs, is determined by the average vehicle delay on each approach that has stop signs. Signalized intersections that operate at LOS A through D are considered adequate or acceptable by Prince George's County. Similarly, unsignalized intersections with LOS E or better are considered as operating adequately.

7.4.2.2 Existing Conditions

Existing intersection congestion was characterized by computing Levels of Service using traffic counts and turning movements obtained in the October 2001 traffic survey. All signalized intersections in the study area currently operate at LOS D or better under normal circumstances. An exception is the Greenbelt Road/existing Soil Conservation Road intersection. This intersection operates at LOS E during the PM peak period or hour. Greenbelt Road traffic flows relatively freely during the PM peak period, but the southbound traffic on Soil Conservation Road forms queues that can extend back to the vicinity of the Goddard gates. Vehicles in this queue may need several signal cycles to clear the intersection.

With one exception unsignalized intersections in the study area operate at LOS D or better with average vehicle delays less than 40 seconds. The exception occurs at the Baltimore-Washington parkway off ramp intersections with Powder Mill Road. Traffic on the Parkway north and southbound off ramps experiences LOS F during both the AM and PM peak period. As noted in the next section, installation of traffic signals at both ramp intersections would markedly reduce congestion and raise the Level of Service

7.4.2.3 Projected 2022 Conditions

Future 2022 intersection congestion was analyzed using the projected traffic data and intersection turning movements shown in Figures 7-15 to 7-20. Four cases were evaluated: the No Action Alternative, the No Action Alternative "with improvements", and the east and west Soil Conservation Road realignment alternatives (Tables 7-7 and 7-8).

Intersection congestion will increase over the next 20 years throughout the study area due to the growth in background or non-NASA traffic alone. The No Action Alternative assumes that there would be no change from existing counts in Goddard generated traffic volumes or employee travel patterns, so the deterioration in LOS from existing conditions shown under this alternative is due solely to background traffic. The No Action Alternative also assumes that the existing roads and intersections would remain status quo, i.e. no public improvements would be made in response to increased congestion. Under such circumstances, the general Level of Service at most intersections would deteriorate from LOS D or better to LOS E or F, particularly in the Greenbelt Road corridor.

SIGNALIZED INTERSECTION	
LEVEL OF SERVICE	DESCRIPTION
A	Free and unobstructed flow, no delays and all signal phases sufficient in duration to clear all approaching vehicles.
B	Stable flow , very little delay, a few phases re unable to handle all approaching vehicles.
C	Stable flow, delays are low to moderate, full use of peak direction signal phases(s) is experienced.
D	Approaching unstable flow, delays are moderate to heavy, significant signal time deficiencies are experienced for short duration during the peak traffic period.
E	Unstable flow, delays are significant, signal phase timing is generally insufficient, and congestion exists for an extended duration throughout the peak period.
F	Forced flow, in urban areas flow may cease or approach gridlock, approaching vehicles are required to wait through several signal cycles.

UNSIGNALIZED INTERSECTION	
LEVEL OF SERVICE	STOP SIGN DELAY
A	Little or no delay
B	Side street traffic delays
C	Average traffic delays
D	Long traffic delays
E	Very long traffic delays
F	When vehicle volume exceeds the movement capacity , extreme delays will be encountered with long vehicle queues forming. This may cause severe congestion affecting other traffic movements in the intersection.

TABLE 7-6 INTERSECTION LEVEL OF SERVICE.

The No Action Alternative with improvements case continues with the assumption that there is no change in GSFC generated traffic. However, it is based on the premise that road improvements necessary to keep intersection congestion at Levels of Service considered adequate by Prince George's County, i.e. LOS D or better at signalized intersections, LOS E or better at unsignalized intersections, would be made in response to general non-NASA traffic growth. Potential improvements used in the analysis to achieve these conditions are shown in Table 7-9. Congestion returns to acceptable levels with the improvements. Alternative improvements are possible. Some of the improvements, such as widening Greenbelt Road to six lanes east of Mandan Road, and widening Springfield Road to four lanes between Good Luck and Lanham Severn Roads are listed for future implementation in regional and County transportation plans (see Section 5.2.2).

The Soil Conservation Road east and west alternative analysis uses the No Action Alternative with improvements intersection configuration as a base condition. It is assumed that these improvements would be made over the next 20 years either in response to traffic growth that is not attributable to Goddard, or because they appear in public planning documents as future projects. In addition, all features associated with the construction of Soil Conservation Road itself under each build alternative as indicated in the alternative descriptions in Section 7.3.3 are incorporated as well as the improvements to Greenbelt and Good Luck Roads shown in Figures 7-6, 7-8, 7-10 or 7-12. Facilities Master Plan generated traffic under each Soil Conservation Road alternative was then superimposed on the 2022 background traffic on the study area road network.

The current Goddard site population is 7,600. the Facilities Master Plan proposes a site population limit of 8,750. This population was used to project 2022 Goddard generated traffic assuming existing trips per employee would continue. The population limit would be reached only if GSFC received mission assignments, unforeseen at this time, that would add 1,000 NASA employees to the site. The most likely 2022 scenario is that the site population would be 7,750, or virtually the same as existing levels. It must also be noted that the site generated traffic projections make no allowance or adjustment for Transportation Demand Management. Measures such as increased transit use or carpooling would reduce the trips generated per employee rate.

The actual number of vehicle trips generated by Goddard is therefore expected to remain relatively constant or to decline if demand management is effective. The estimated projected intersection congestion shown in Tables 7-7 and 7-8 are for 2022 conditions. Data for the No Action Alternative cases assume no change in Goddard site population or relocation of Soil Conservation Road. Nearly all of the MD 193 corridor intersections will go to Level of Service E or F due to growth in non-NASA traffic by 2022. Table 7-9 shows improvements that would be needed to maintain Levels of Service considered as adequate or acceptable by the County as indicated in the No Action With Improvements column in Tables 7-7 and 7-8. These improvements were assumed in the traffic analysis as occurring. If not, traffic impact comparisons with and without the Soil Conservation Road realignment would involve only the degree of LOS E or F congestion.

Since the congestion will occur even if NASA does nothing, the improvements shown in Table 7-9 would be completed by the appropriate State or County highway agency that owned the intersection. An exception would be the Soil Conservation Road/Beaver Dam Road intersection which is owned by BARC.

The above is based on the premise that Goddard generated traffic will remain relatively constant or possibly decline over the next 20 years. Traffic studies are required for each major building project as part of jurisdictional and environmental review process for the project. If a major project adds a substantial number of employees to GSFC, the traffic impacts will be assessed. Mitigation measures and organization responsible for implementation would be evaluated on a case by case basis at the time of project implementation.

INTERSECTION		EXISTING		2022 ALTERNATIVES							
				NO ACTION		NO ACTION WITH IMPROVEMENTS		WEST		EAST	
		LOS	CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS	CLV
Southway Drive @ BW Parkway Ramps	AM	B	1077	D	1351	D	1351	E	1500	E	1454
	PM	B	1091	E	1476	B	1050	B	1114	B	1045
MD 193 @ Southway Drive	AM	A	996	C	1232	C	1234	D	1310	C	1287
	PM	C	1243	E	1474	D	1313	D	1416	D	1380
MD 193 @ Greenway Center	AM	B	1037	C	1162	C	1162	C	1170	C	1170
	PM	D	1421	F	1616	D	1368	D	1372	D	1353
MD 193 @ BW Parkway Ramps	AM	D	1341	F	1633	C	1281	D	1302	D	1302
	PM	D	1432	F	1747	C	1575	D	1346	D	1326
MD 193 @ Hanover Parkway	AM	C	1278	D	1437	C	1251	C	1268	C	1259
	PM	C	1295	E	1593	D	1370	E	1464	D	1442
MD 193 @ Mandan Road	AM	B	1135	D	1363	B	1025	B	1023	B	1011
	PM	A	984	E	1504	C	1259	C	1277	C	1252
MD 193 @ Soil Conservation Road Alt W-1	AM							C	1239		
	PM							D	1407		
MD 193 @ Cipriano Road	AM	A	987	C	1210	A	906	A	983	A	956
	PM	C	1269	F	1704	D	1330	D	1282	D	1314
MD 193 @ GSFC Main Gate	AM	B	1109	D	1310	B	1003	A	993	B	1042
	PM	D	1370	F	1716	D	1329	C	1277	C	1279
MD 193 @ Existing Soil Conservation Road	AM	D	1424	F	1824	C	1255	B	1038	B	1142
	PM	E	1555	F	2055	D	1399	D	1264	D	1291
MD 193 @ Good Luck Road	AM	C	1243	F	1641	D	1310	D	1347	D	1409
	PM	D	1379	F	1869	C	1274	D	1303	D	1441
MD 193 @ Lanham Severn Road	AM	C	1250	E	1567	C	1255	D	1326	D	1389
	PM	D	1320	F	1622	D	1355	E	1511	E	1476
Powder Mill Road @ BW Parkway SB Ramps	AM					B	1027	C	1173	C	1217
	PM					B	1012	A	881	B	1008
Powder Mill Road @ BW Parkway NB Ramps	AM					A	831	A	847	A	892
	PM					D	1424	A	967	B	1035
Soil Conservation Road @ Powder Mill Road	AM	A	466	A	646	A	654	A	537	A	740
	PM	C	1247	E	1475	B	1018	A	937	B	1002
Soil Conservation Road @ Gates 4/9	AM	A	576	A	756						
	PM	B	1053	C	1275						
Soil Conservation Road @ Gates 5/16	AM	B	1073	D	1406						
	PM	C	1222	D	1444						
Soil Conservation Road @ North Gate	AM							A	459	A	636
	PM							A	718	C	1254
Soil Conservation Road @ Gate 3	AM							A	712		
	PM							A	673		
Soil Conservation Road @ West Gate	AM							B	1028		
	PM							A	792		
Soil Conservation Road @ Good Luck Road	AM									A	649
	PM									A	595

Notes: LOS = Level of Service CLV = Critical Lane Volume

TABLE 7-7 EXISTING AND PROJECTED PEAK HOUR CONGESTION AT SIGNALIZED INTERSECTIONS.

INTERSECTION		EXISTING		2022 ALTERNATIVES							
				NO ACTION		NO ACTION WITH IMPROVEMENTS		WEST[4]		EAST[4]	
		AVG DELAY (SEC)	LOS	AVG DELAY (SEC)	LOS	AVG DELAY (SEC)	LOS	AVG DELAY (SEC)	LOS	AVG DELAY (SEC)	LOS
POWDER MILL ROAD @ BW PARKWAY SB RAMPS											
POWDER MILL WB LEFT	AM	9	A	9	A						
	PM	11	B	11	B	(1)		(1)		(1)	
BWP SB OFF RAMP	AM	198	F	615	F						
	PM	367	F	881	F						
POWDER MILL ROAD @ BW PARKWAY NB RAMPS											
POWDER MILL EB LEFT	AM	11	B	11	B						
	PM	17	C	24	C	(1)		(1)		(1)	
BWP NB OFF RAMP	AM	114	F	263	F						
	PM	643	F	(note 5)	F						
POWDER MILL ROAD @ SPRINGFIELD ROAD											
POWDER MILL WB LEFT	AM	8	A	8	A			8	A	8	A
	PM	9	A	9	A	(6)		9	A	9	A
SPRINGFIELD ROAD NB	AM	19	C	19	C			43	E	17	C
	PM	21	C	21	C			291	F	20	C
SCS ROAD @ BEAVER DAM ROAD											
BEAVER DAM EB	AM	18	C	24	C	19	C[1]	18	C	24	C
	PM	31	D	53	F	25	C	21	C	24	C
BEAVER DAM WB	AM	29	D	24	C	20	C	15	B	16	C
	PM	30	D	51	F	40	E	30	D	36	E
SCS NB LEFT	AM	11	B	9	A	9	A	9	A	9	A
	PM	8	A	8	A	8	A	8	A	8	A
SCS SB LEFT	AM	7	A	8	A	8	A	8	A	8	A
	PM	10	B	11	B	11	B	11	B	11	B
SPRINGFIELD ROAD @ GOOD LUCK ROAD											
SPRINGFIELD LEFT	AM	8	A	8	A			8	A	8	A
	PM	8	A	8	A	(6)		8	A	8	A
GOODLUCK NB	AM	11	B	11	B			16	C	11	B
	PM	11	B	11	B			23	C	11	B
SPRINGFIELD ROAD @ MD ROUTE 564											
	AM	22	C	29	C	32	D[2]	34	D	26	D
SPRINGFIELD EB	PM	44	D	99	D	29	D	38	E	29	D
	AM	11	B	11	B	11	B	15	C	12	B
MD 564 NB LEFT	PM	8	A	8	A	8	A	22	C	8	A

NOTES:
(1) Intersection signalized. See Table 7-7.
(2) Widen Springfield Road to 4 lanes at intersection.
(3) Add second MD 564 NB thru lane.
(4) Data assumes No Action improvements in place.
(5) Greater than 15 minutes.
(6) No improvement required
LOS = Level of Service Avg Delay = Average vehicle delay

TABLE 7-8 EXISTING AND PROJECTED PEAK HOUR DELAYS AND LOS AT UNSIGNALIZED INTERSECTIONS.

Realignment of Soil Conservation Road redistributes traffic on the study area road network, but does not add or generate traffic. Realignment of the road to the east will increase traffic volumes on Good Luck Road north of MD 193, and impact the intersection of the two roads. Improvements to the intersection are a part of the realignment project and will be funded by NASA.

Realignment of Soil Conservation Road would eliminate the need for one No Action improvement. Existing Soil Conservation Road traffic consists of general public users as well as Goddard employees travelling to and from the site gates along the road. Realignment of Soil Conservation Road will convert existing Soil Conservation Road at the MD 193 intersection into an employee entrance eliminating through public traffic. Southbound, or Goddard outbound, traffic on Soil Conservation Road will be tens of vehicles per hour rather than several hundred during the AM peak hour. Similarly, north or inbound traffic during the evening hours will significantly reduce conflicting turning movements. The reduced volumes on Soil Conservation Road at the intersection would raise Levels of Service to acceptable levels without further improvements.

Two other intersections could conditionally be impacted by Soil Conservation Road realignment to the east. They are the Southway at the Baltimore-Washington Parkway ramp, and the MD 193/Lanham-Severn Road intersection.

In the short term, no impacts due to the realignment of Soil Conservation Road are expected. Both intersections are distant from the existing Soil Conservation Road and the Greenbelt Road intersections on Greenbelt Road. Drivers would be resuming their normal travel route at these points regardless of whether they have taken the existing or new east alignment, and no changes in the traffic volumes or congestion level would occur.

Both intersections will need improvements in the future due to growth in non-Goddard traffic as indicated in Table 7-9. These improvements would produce LOS D service or better.

The Soil Conservation Road realignment may not impact the intersections in the long term. Signalized intersections are acceptable if they operate at LOS D, which is equivalent to a Critical Lane Volume (CLV) or 1,450. If Soil Conservation Road is realigned, the 2022 CLV at the Southway during the AM peak hour is estimated to be 1,454, and the 2022 CLV at the MD 193/Lanham-Severn Road during the PM peak hour is 1,476.

Both impacts would occur only if the Goddard employee population increased to the proposed site limit of 8,750. If it is assumed that the site population increased linearly from 7,600 to 8,750 over the next 20 years, the Southway/BWP ramp and MD 193/Greenbelt Road intersection impacts would occur during the years 2021 and 2016, respectively.

7.4.2.4 Trucks and Central Receiving

New post-9/11 security requirements have been set for all Federal facilities throughout the region. One of the requirements is all delivery vehicles must be inspected before entering a Federal facility. The entrance to the inspection area must be separate from gates or entrances used by the general public or employee vehicles, and the inspection area itself must be located 200 to 300 feet from occupied buildings or public thoroughfares depending on their construction and use.

The requirement for independent or separate access to public roads limits inspection facilities locations to Goddard's perimeter. There are no suitable locations along Greenbelt or Good Luck Roads that meet the

1. SOUTHWAY/BALTIMORE WASHINGTON PARKWAY (BWP) INTERSECTION
   - Change exclusive northbound Southway right turn lane to a free flow right turn.
2. GREENBELT ROAD – SOUTHWAY TO HANOVER ROAD
   - Add a 4th eastbound lane.
3. GREENBELT ROAD/BWP INTERCHANGE/GREENWAY
   - Add a 4th westbound lane to Greenbelt Road between ramp to BWP northbound, and ramp to BWP Southbound.
   - Add a 3rd left turn lane to BWP northbound off ramp to Greenbelt Road.
4. GREENBELT ROAD- MANDAN ROAD TO LANHAM-SEVERN ROAD
   - Widen to six lanes in both directions.
5. SOIL CONSERVATION ROAD/GREENBELT ROAD INTERSECTION
   - Extend existing right turn lane and a 3rd lane to southbound Soil Conservation Road. Operate as two exclusive left turn lanes, one shared right and through lane.
6. SOIL CONSERVATION ROAD/POWDER MILL ROAD INTERSECTION
   - Add 2nd Soil Conservation Road northbound left turn lane.
7. POWDER MILL ROAD/BWP INTERCHANGE
   - Signalize Parkway north and southbound ramps.
   - Add 2nd eastbound lane on Powder Mill between BWP ramps.
   - Convert westbound Powder Mill Road approach to BWP northbound ramps from through/shared through-right operation to exclusive through and right turn lanes.
8. SOIL CONSERVATION ROAD/BEAVER DAM ROAD INTERSECTION
   - Add left turn lanes to north and south Soil Conservation Road.
9. LANHAM-SEVERN ROAD/SPRINGFIELD ROAD INTERSECTION
   - Add a northbound bypass through lane to Lanham-Severn Road.
   - Widen Springfield Road eastbound to two lanes

Note: Analysis for 2022 assumes these improvements are in place, and built by others.

TABLE 7-9 ASSUMED 2022 NO ACTION ALTERNATIVE TRAFFIC ANAYLSIS IMPROVEMENTS.

distance to occupied NASA buildings, or residences and commercial facilities beyond the site boundaries. Under Soil Conservation Road realignment Alternative W-1 and No Action Alternative, the inspection facility would have been located in the northernmost sector of the east campus adjacent to Soil Conservation Road.

The Facilities Master Plan, with the realignment of Soil Conservation Road to the east, proposes relocating the Goddard receiving and warehouse facilities to Site N (See Figure 4-1). This is necessary to make room for the Space Science Center and Central Commons facilities. The truck inspection facilities would be sited to just inside the security perimeter off Soil Conservation Road. In the vicinity of Site N.

Goddard is an active research facility with 7,600 employees. Truck traffic to and from the site is essential for research operations as well as employee support. Trucks perform a wide variety of services. These include delivery of laboratory materials and equipment, office supplies, and cafeteria food; repair and maintenance services, courier and messenger services, and removal of trash and solid waste, recycled materials, and hazardous and radioactive waste. Virtually all arriving trucks would use Greenbelt Road to approach Goddard, and then travel north on Greenbelt Road to reach the inspection facility.

The number of trucks entering and leaving Goddard varies from day to day. A survey conducted over several days in August 2002 resulted in the following average daily arrivals:

Heavy 3-axle trucks	8	
Medium 2-axle trucks	28	
Small vans and panel trucks	15	
Total	51	average per work day.

For comparison, trucks were counted over a total of three hours at various intersections along Greenbelt Road to determine their percentage within the total traffic flow. The results served as input into computer models that predict traffic noise and air quality impacts. Heavy (3-axle) and medium (2-axle) trucks were differentiated. Small panel trucks were not included as they share the same potential impact characteristics as cars. Applying these truck percentages to recent Average Daily Traffic count data for Greenbelt Road, it is estimated that the 24-hour heavy and medium truck counts on Greenbelt Road are 60 and 550, respectively.

Nearly all truck arrivals and departures at Goddard occur on week days during normal work hours. Trucks departing from NASA can now and will be able to use any suitable gate, except that trucks are prohibited from travelling on the Baltimore-Washington Parkway. Trucks serving the future Partnering and Outreach Zone will not have to be inspected. No increase in NASA generated truck traffic is anticipated.

7.4.3 Trip Lengths and Times

Changes in trip length and number of traffic signals associated with each Soil Conservation Road alternative route are shown in Tables 7-10 and 7-11. The trip lengths or route distances were measured from the Baltimore-Washington Parkway northbound ramp intersection on Powder Mill Road to the three intersection locations along Greenbelt Road indicated in Table 7-10. Alternative E-2A has the longest route length among the alternatives considered. The difference in route length between Soil Conservation Road Alternatives E-1 and E-2 is negligible, amounting to a few hundred feet. Route lengths using Springfield Road as an alternate to Soil Conservation Road were also estimated. The route to the Lanham-Severn Road/Greenbelt Road intersection followed Springfield and Lanham-Severn Roads. The Springfield Road routes to Hanover Parkway and Cipriano Road were via Good Luck Road.

Realignment of Soil Conservation Road increases or decreases trip length depending on where the trip origin or destination is along Greenbelt Road. If the West Soil Conservation Road Alignment (W-1) were implemented, then the distance from Powder Mill Road to Lanham-Severn Road would be increased by 1.2 miles. However, trip length to points west of Mandan Road would be reduced by about 0.65 mile from the existing Soil Conservation Road route. The west alternative is the shortest, most direct, route between Cipriano Road or the Main Gate at Goddard, and the Baltimore Washington Parkway, even when the existing route is included.

Trip lengths would be increased by the east alternatives regardless of the starting or end point along Greenbelt Road. All of the realignment alternatives increase the trip length between the Parkway and the Lanham-Severn Greenbelt Road intersection.

The number of traffic signals compared to existing conditions along the Soil Conservation Road route also varies by starting point along Greenbelt Road. The signal counts given in Table 7-11 include those at the end point intersections on Greenbelt Road (e.g. Hanover Parkway signal at Greenbelt Road is included in the Hanover route. The signal locations are shown in peak hour traffic exhibits (see Figures 7-11 to 7-18). The three signals on Greenbelt Road between Good Luck Road and Maryland Route 564 are at the entrance roads to office parks and the East Gate Shopper's World Mall. The future No Action and Soil Conservation Road realignment alternatives assume that a future signal will be installed at the Baltimore-Washington Parkway northbound ramp/Powder Mill Road intersection.

The number of signals on each route varies by time and day of the week. NASA closes gates during the nighttime hours and on weekends and holidays. Currently only the Main Gate and Gate 16 remain open

ROUTE VIA	DISTANCE FROM POWDER MILL AT B-W PARKWAY TO GREENBELT ROAD		
	HANOVER PARKWAY	MD 564	CIPRIANO ROAD
Existing-No Action	5.22 mile	4.84 mile	4.19 mile
West Alternative W-1	4.57	6.05	4.02
East Alternative E-1	6.83	5.69	5.80
East Alternative E-2	6.87	5.73	5.84
East Alternative E-2A	6.95	5.81	5.92
Springfield Road – MD 564	7.94	4.96	6.91

TABLE 7-10 SOIL CONSERVATION ROAD ALTERNATIVE DISTANCES.

ROUTE VIA	SIGNALS BETWEEN B-W PARKWAY AND		
	HANDOVER PARKWAY	MD 564	CIPRIANO ROAD
Existing Soil Conservation Road	8 (6)	9 (7)	6 (4)
No Action With Improvements	9 (7)	10 (8)	7 (7)
West Alternative W-1	8 (5)	13 (10)	7 (4)
Alternatives E-1, E-2, E-2A	9 (8)	8 (7)	8 (7)

x Work day signals (7AM to 9 PM)
(x) Signals at other times

TABLE 7-11 SOIL CONSERVATION ROAD ALTERNATIVE TRAFFIC SIGNALS.

at these times. Signals at Goddard entrance intersections along Soil Conservation Road go to flashing yellow operation when the gates are closed. This would continue in the future. Under the Facilities Master Plan, only two gates would be open during the evening hours and on weekends, the existing Main Gate as access to the Partnering and Outreach Zone, and the South or New Main Gate on existing Soil Conservation Road for access to the NASA installation. Both of these entrances to Greenbelt Road are already signalized. In the case of Alternative W-1, the signals at the West Gate, Gate 3, and North Gate intersections would go to flashing yellow operation in the evening hours.

The effects of changes in trip length or number of signals passed on overall Soil Conservation Road user trip times and driver choice of route cannot be estimated with certainty. The factors involved are complex and involve unscientific driver perceptions.

For any given route, at a fixed time, the trip time varies by direction of travel, as well as the time of day. In general, for a given route, Soil Conservation Road user trips involving left turns along Greenbelt Road are slower than those in the reverse direction. For example, Soil Conservation Road users coming from the east on Greenbelt Road during the AM Peak Hour have a relatively unimpeded trip. As noted in the section on existing traffic, signals on Greenbelt Road are coordinated to favor through route drivers in the dominant traffic volume direction during the rush hours. In the morning, westbound traffic from the east is favored. The driver also has a virtually free right turn at Soil Conservation Road, slowing only if necessary to yield to eastbound Greenbelt Road vehicles making the left turn, onto Soil Conservation Road.

On the reverse movement, those southbound Soil Conservation Road making a left onto Greenbelt Road generally must stop and queue at the light. The signal cycle at the intersection is 150 seconds, or two and a half minutes in length. Greenbelt Road has the green signal for 120 seconds. During the PM peak hour, southbound Soil Conservation Road vehicles may have to wait through several cycles before clearing the intersection. Once through the intersection, they may have to stop at Good Luck Road since they are not in the Greenbelt Road through driver platoon of vehicles. The net result is the PM peak hour trip can take five minutes more than the reverse morning movement.

These phenomena would be applicable to the realigned Soil Conservation Road alternatives, although it would be transferred to the new Greenbelt Road tie-in intersections, and be reduced by doubling the number of left turn lanes in some cases. In general, for a given route, trips requiring left turns at Greenbelt Road intersections will take longer than the reverse movement.

Overall travel times resulting from trip distance, traffic signals, and congestion would be expected to influence route selection, but analysis of existing traffic counts reveals that other factors are just as, if not more, important.

For instance, those traveling between the Lanham-Severn/Greenbelt Road intersection and the Powder Mill Road interchange on the Parkway can follow any one of three routes: Soil Conservation Road, Springfield Road via Lanham-Severn Road, or Springfield Road via Greenbelt and Good Luck Roads. Springfield Road has undergone recent resurfacing and lane marking improvements north of Good Luck Road.

The difference in route length via Soil Conservation and Springfield Roads is negligible, 4.84 and 4.96 miles, respectively. The Good Luck Road route is longer at 5.56 miles. If the signal at the starting point at Lanham-Severn Road is ignored, the Springfield Road route has only one traffic signal along the route. In contrast, there are eight traffic signals along the Soil Conservation Road route under the same circumstances. Further, Soil Conservation Road has much higher congestion and longer travel times as noted previously, particularly in the PM rush hour when long queues form on the northbound approach to Powder Mill Road and the southbound approach to Greenbelt Road.

Considering trip length alone, a roughly even split of traffic among the routes would be expected. Considering all factors, it would be expected that drivers would tend to distribute themselves proportionately among the routes. But they do not do so.

The estimated number of public users on the three routes was extracted from the existing traffic counts. The results are:

	Soil Conservation Road		Springfield Road		Good Luck Road	
	NB	SB	NB	SB	NB	SB
AM	256	232	51	20	5	2
PM	380	187	69	34	15	3
TOTAL	636	419	120	54	20	5

The data indicate that about 84 percent of the general public, or nearly five in six, use Soil Conservation Road as the preferred route, despite the traffic signals and congestion, and alternate route availability. The choice is apparently due to perceptions. Soil Conservation Road appears to be the most direct route on road maps. It is wider, straighter, and has longer sight lines than Springfield Road, and is probably perceived as more safe by drivers than Springfield Road.

The above indicates that realignment of Soil Conservation Road to the east or west would not result in massive shifts in general public commuter route selection. Some shifts can be expected as future traffic volumes continue to increase on the Baltimore-Washington Parkway, and Greenbelt and Soil Conservation Roads. However, if improvements are made to maintain intersections at adequate Levels of Service, trip times on most routes will not change substantively.

If the Soil Conservation Road west alignment alternative is implemented, some public commuters would likely shift to Springfield Road. Route shifts cannot be predicted with assurance by analytical methods, since unquantifiable factors noted above are involved. After consultation with the County, it was estimated that up to 60 percent of the commuters using Soil Conservation Road to and from points to the east of Goddard could shift to Springfield. This value represents the "worst case" or maximum potential shift. It has been used to develop the west alternative traffic projections and congestion analysis. It is most likely, however, that the shift would be far less.

The conversion of existing Soil Conservation Road to employee entrances under the Facilities Master Plan Alternative would require the relocation of central receiving and warehouse facilities now in Building 16W to Building N. Under Alternative W-1, Building N would be located on the west campus in the institutional support area. If either of the Eastern Road Alignment Alternatives are selected, Building N would be located on the east campus near the realigned road.

Under "Post 9/11" security, all delivery vehicles arriving at Federal facilities will undergo inspection and security checks. The best location for this function is in the vicinity of central receiving. The number of delivery vehicles, arriving at GSFC is estimated to be about 50 per day. These include USPS, US mail, courier, food, office supply, and other service trucks. Most of the vehicles are vans and panel trucks. This light truck traffic would be transferred from existing entrances and Soil Conservation Road to Good Luck Road under all the eastern alignment alternatives.

7.4.4 Pedestrian/Bicycle

Three Prince George's County pedestrian/bike trails pass through the environs of Goddard. The Greenbelt Road Commuter Trail, IE, is a Class I bikeway that runs parallel to Greenbelt Road. The South Laurel Trail, 5A, runs alongside SCS Road. It is a Class III bikeway that shares the road and shoulder with vehicle traffic. The third trail parallels Good Luck Road.

Trail 5A would be retained under all of the Soil Conservation Road alternatives. It would be relocated along with the road, and connected to Trail 1E along Greenbelt Road. The Good Luck Road trail would be incorporated into the Good Luck Road sections of the eastern alignments.

7.4.5 Traffic Noise

The standard measurement unit for noise is the decibel (dB). Generally, the A-weighted decibel (dBA) is used. It corresponds to the sensitivity of the human ear across the spectrum of audible frequencies. Decibels are measured on a logarithmic scale to account for the several millionfold difference in noise intensity or loudness, which the ear can hear. A 3 dBA increase is therefore equivalent to a doubling of sound pressure levels or loudness. However, since the scale is logarithmic, a 1 or 2 dBA increase is barely perceptible to the human ear. Noise levels vary with time so that a meter reading oscillates continuously. Noise is therefore characterized by assembling measurements or noise levels over time in several ways to account for this variance. Leq, or the equivalent noise level, is the average mean square sound level measured in dBA over a time period under consideration, usually one hour.

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM), Version 1B, computer model was used to assess traffic noise impacts. The model computes noise levels based on traffic volumes, vehicle mix (cars, medium trucks, heavy trucks, buses, motorcycles), road and noise receiver geometry, ground topography and cover, and weather input data. It also accounts for the effects of traffic deceleration and acceleration at traffic signals or stop signs.

The peak hourly Leq noise levels, or maximum potential noise levels generated by traffic were computed using existing and projected peak hour traffic. Vehicle mix and speeds were determined by field observation. Traffic was the superimposed on a model of the road network in the vicinity of eleven receptor sites (Figure 7-21). These sites represent the maximum potential impact points in their neighborhood, condominium, or apartment complex since they are closest sites within the community to traffic sources influenced by traffic. Points at a greater distance or screened by intervening buildings will experience lower levels, generally 5 to 7 dBA less.

Four cases were evaluated: existing conditions; the 2022 No Action Alternative which assumes there would be no change in trip generation at Goddard, although background traffic would increase due to outside development; and the east and west alternative for realigning Soil Conservation Road. The analysis completed for the "east" alternative is applicable to both Soil Conservation Road Alternative E-1 and E-2.

Existing and predicted noise levels around Goddard are typical of conditions in an urban or suburban environment near an arterial road. Values at sites along Greenbelt Road are representative of those experienced at residences or buildings fronting streets at 80 to 100 foot setbacks from the edge of urban or suburban roads. Greenbelt Road is the dominant or governing noise source along the southern tier of NASA GSFC, because the volume of traffic is much higher than that on the other roads. The Baltimore-Washington Parkway becomes dominant in the northwest sector of the west campus, as indicated by the data at Site 6, Greenbriar Manor.

Existing and projected 2022 Soil Conservation Road Alternative peak hour Leq noise levels for the eleven receptor sites are shown in Table 7-12. Growth in background, or non-Goddard generated, traffic volumes will generally increase peak noise levels by one or two dBA at all the sites by 2022. This situation is illustrated by the data for the No Action Alternative case, which assumes no change in trip generation at existing at Goddard. An exception is Site 5 at the Glenn Oaks Apartments The distances to nearby roadways is so large that existing general non-traffic noise will continue to be the determining factor in noise levels experienced at this location, and no increase in peak noise levels will occur under any of the alternatives.

None of the Soil Conservation Road alternatives would produce noise impacts, which occur when the noise levels increase by 5 dBA are more. The overall traffic volumes are the similar for the entire east and west alternatives. As a result, the projected 2022 peak noise levels at each of the sites along Greenbelt Road are virtually the same, regardless of the alignment alternative selected. The peak noise level difference between any "Build" alternative and the No Action Alternative, or among the build alternatives themselves, is one dBA, which is not discernable to the human ear, or less. The only exception occurs at Sites 10 and 11 in the Countryside Apartment complex, where the sharp increase in Good Luck Road traffic volumes under the east alignment alternative would increase the peak hour Leq noise level by three dBA.

Computer modeling indicates that the 2022 peak hour noise level at Site 4, Chelsea Woods, would be the same for the West Alternative as the other alternatives. Noise generated by vehicles increases with vehicle speed. For all alternatives but the West Alternative, traffic passes Site 4 in uninterrupted flow at 45 mph. Under the West Alternative, noise from vehicles passing at speed is replaced by noise produced by vehicles decelerating and accelerating at the simulated Greenbelt Road/Realigned Soil Conservation Road intersection. In this case, however, the noise 63 dBA peak hour level produced by stop and go traffic under the West Alternative is the same as through traffic travelling at 45 mph.

7.4.6 Air Quality

7.4.6.1 Traffic Air Quality

Traffic related air quality impacts are considered on two scales: the mesoscale or regional level, and the microscale or local level. Regional impacts are generally assessed in terms of total regional vehicle miles of travel producing tons of pollutants per year. In urban areas, traffic generated by individual projects has little or no influence at the regional level. Projects are therefore evaluated at the microscale level, and an analysis of carbon monoxide (CO) is typically made to assess whether local violations of the NAAQS will occur. CO is used as the reference criteria pollutant for traffic air quality analysis because it is the standard that will always is exceeded first as result of vehicle emissions. To assess the potential traffic related air quality impacts associated with the Soil Conservation Road alignment alternatives a "worst case" microscale analysis was conducted using US EPA approved methodology and computer programs. Data inputs for determining vehicle CO emission rates in terms of grams per vehicle-mile were generally those used by the Metropolitan Washington Council of Governments for Prince George's County in regional analysis.

Modifications were made to account for the local traffic mix by type as observed in the field. PM peak hour conditions were modeled to account for 84 percent of Goddard vehicles leaving the site during the evening hours in the "cold start" mode, after being parked for more than four hours. The estimate of 84 percent was derived from 24-hour gate traffic counts made in 1998. Vehicles in the cold start mode have higher emission rates for about 8.4 minutes after start up.

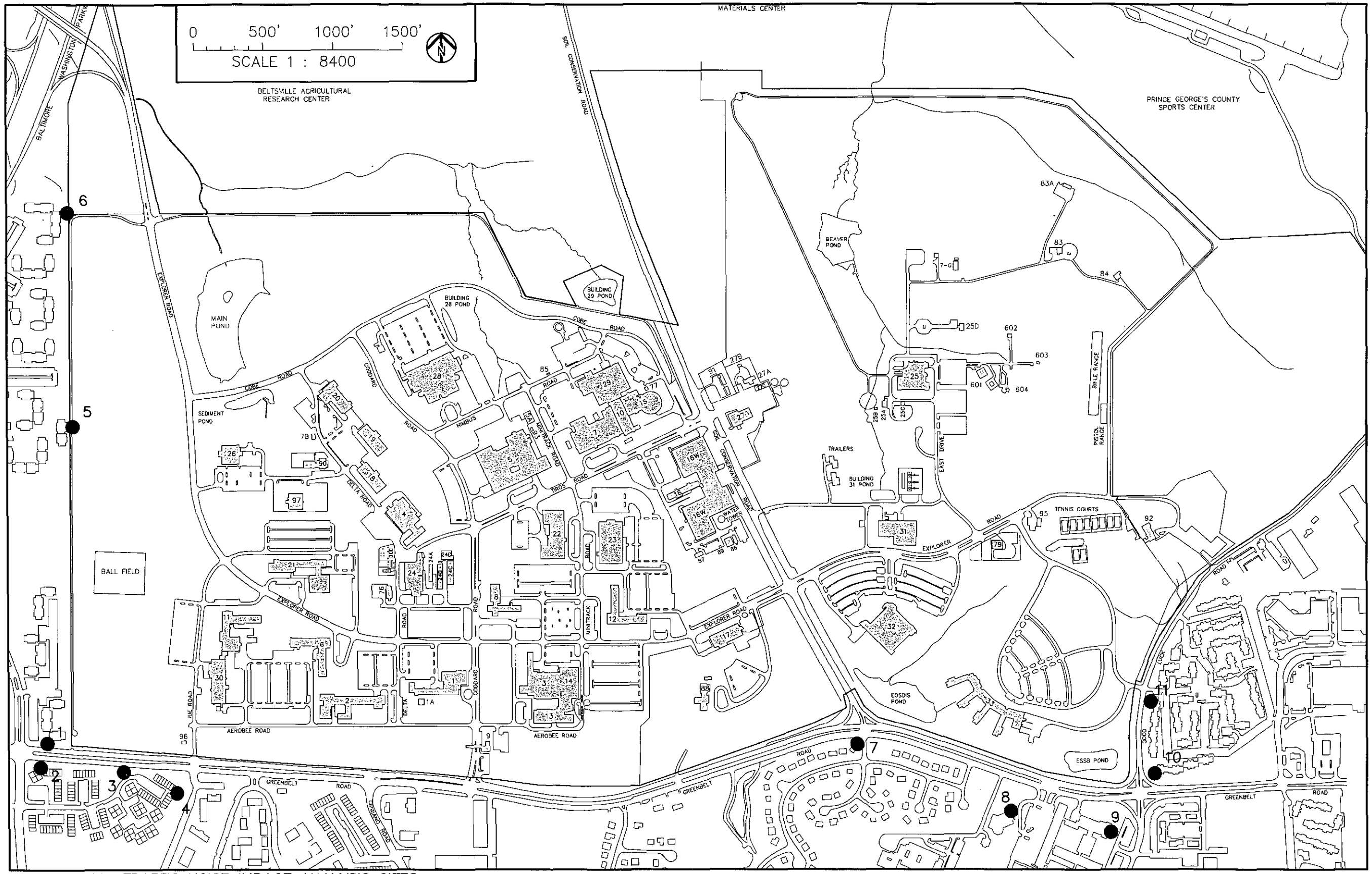


FIGURE 7–21 TRAFFIC NOISE IMPACT ANALYSIS SITES.

SITE DESCRIPTION	EXISTING	2022 ALTERNATIVES		
		WEST	EAST	NO ACTION
1. Glen Oaks Apartments	70	73	73	72
2. Windsor Green Condos	67	69	69	68
3. Windsor Green Condos	65	66	66	66
4. Chelsea Woods	62	63	63	63
5. Glen Oaks Apartments	58	58	58	58
6. Greenbriar II Condos	63	65	65	65
7. Greenbelt Woods	69	71	71	71
8. Owens Science Center	60	62	62	61
9. Duval High School	59	60	63	60
10. Countryside Apts 1	66	67	67	67
11. Countryside Apts 2	58	59	62	59

TABLE 7-12 ESTIMATED PEAK HOUR Leq NOISE LEVELS. (in dBA)

Physical conditions were modeled using the EPA CAL3QHC (Modelling Methodology For Predicting Pollutant Concentrations Near Roadway Intersections) computer program. Input into the program includes geometric data for modeled roads and receivers or test points. PM peak hour traffic data as shown in Section 7.4.1 was modeled on each roadway. Vehicles idling in queues at traffic signals were simulated by applying the emissions factors for vehicles operating at 2.5 mph in accordance with US EPA directives. (Technology Transfer Network Mobile 5 Information Sheet 2, EPA, 1999). Ten receptor sites were evaluated. From these, the four sites exhibiting the highest traffic generated CO concentrations or greatest changes by Soil Conservation Road Alternative were selected for presentation (Figure 7-22). Site 1 is the Glen Oaks Apartment complex unit nearest to the Greenbelt/Mandan Road intersection. Site 2 is a condominium in the Chelsea Woods community, which analysis revealed as the residence that has the greatest potential for air quality impact potential from the proposed Greenbelt Road/Soil Conservation Road West Alignment Alternative intersection. Site 3 is a residence in Greenbelt Woods in the southeast quadrant of the existing Greenbelt/Soil Conservation Road intersection. Site 4 is the corner unit in the Countryside Apartment complex closest to the Greenbelt Road/Good Luck Road intersection.

Computed existing and project 2022 CO concentrations for each Soil Conservation Road alternative are shown in Table 7-13. The values in the table include background CO concentrations from sources other than local traffic. The existing one and eight hour average background CO concentrations are 9.0 and 5.0 parts per million (ppm), respectively. The projected 2022 one and eight hour average CO concentrations, as determined by the roll back technique, are 10.3 and 5.7 parts per million (ppm), respectively. The contribution of local traffic ranges from 0.1 to 1.5 ppm, so it is a minor component to the overall or total CO concentration at each receptor site in all cases.

The "worst case" CO concentrations at each receptor are generally established by emissions from idling vehicles in traffic signal queues, particularly those queues that contain a large number of Goddard vehicles departing the site in the cold start mode. The worst case wind vector or direction varies by about 10 degrees among the alternative cases, and the average direction is shown in Figure 7-20. The distance between Site 2 and Greenbelt Road is such that worst case conditions still occur with a wind perpendicular to Greenbelt Road under free flowing traffic conditions, i.e. no intersection is present.

The principal local traffic component or contributor to CO concentrations at Site 3 is vehicles queuing in the southbound Soil Conservation Road lane at the Greenbelt Road intersection traffic signal. Values fluctuate by Soil Conservation Road alignment alternative. They are higher if Soil Conservation Road is a through public route, less if it is to serve only as an employee entrance. The eastbound Greenbelt Road queue at the Good Luck Road is the primary contributor to CO concentrations at Site 4.

Air quality impacts occur if the NAAQS criteria for carbon monoxide concentrations are exceeded. The CO criteria are 35 ppm for the one hour average concentration, and 9 ppm for the eight hour average concentration. The one and eight hour average concentrations for all the Soil Conservation Road realignment alternatives are less than the NAAQS criteria and no air quality impacts are expected.

7.4.6.2 Air Quality Conformity

NASA GSFC is located in the National Capital Interstate Air Quality Control Area (AQCA). The AQCA is in serious non-attainment for ozone. Control of ozone generation is achieved indirectly through control nitrogen oxides (NOX) and volatile organic compound (VOC) emissions. For Federal actions, a conformity determination is required for each non-attainment pollutant where the total direct or indirect emissions would exceed or equal amounts established in the Federal regulations. For AQCA's in serious non-attainment for ozone, detailed conformity analysis is required if project NOX or VOC emissions exceed 50 tons per year.

Traffic pollutant emissions are determined by three factors:

- Number of vehicles
- Vehicle emission rates in grams per vehicle-mile
- Vehicle distance travelled.

Soil Conservation Road alternatives involve only realignment of the roadway. No additional vehicle trips are generated. The difference in net total vehicle mileage travelled under each alternative is also relatively small. Using the existing Soil Conservation Road average daily traffic volume of 8,980, and an NOX emission factor of 1.84 gm/vehicle-mile for 2001 as determined from the EPA MOBILE 5b computer program, it is estimated that NOX emissions would increase by no morethan three tons per year under any of the alternatives, far less than the 50 ton per year value. The project would be in conformity with the regional AQCA state implementation plan.

The Metropolitan Washington Council of Government projects that the National Capital Interstate AQCA will be in ozone attainment by 2005 through measures proposed in the Air Quality Implementation Plan. The area would then go into maintenance status.

7.4.7 Stormwater Management

The west alignment alternative W-1 is located on top of existing pavement for much of its length. Since it follows Iue, Explorer and Cobe Roads, it produces a relatively small increase in impervious area. Most of the Stormwater management would be handled by 4.1 acre-foot capacity available in the Main Pond. A small pond located near the north entrance to capture runoff generated east of BARC property line would supplement this.

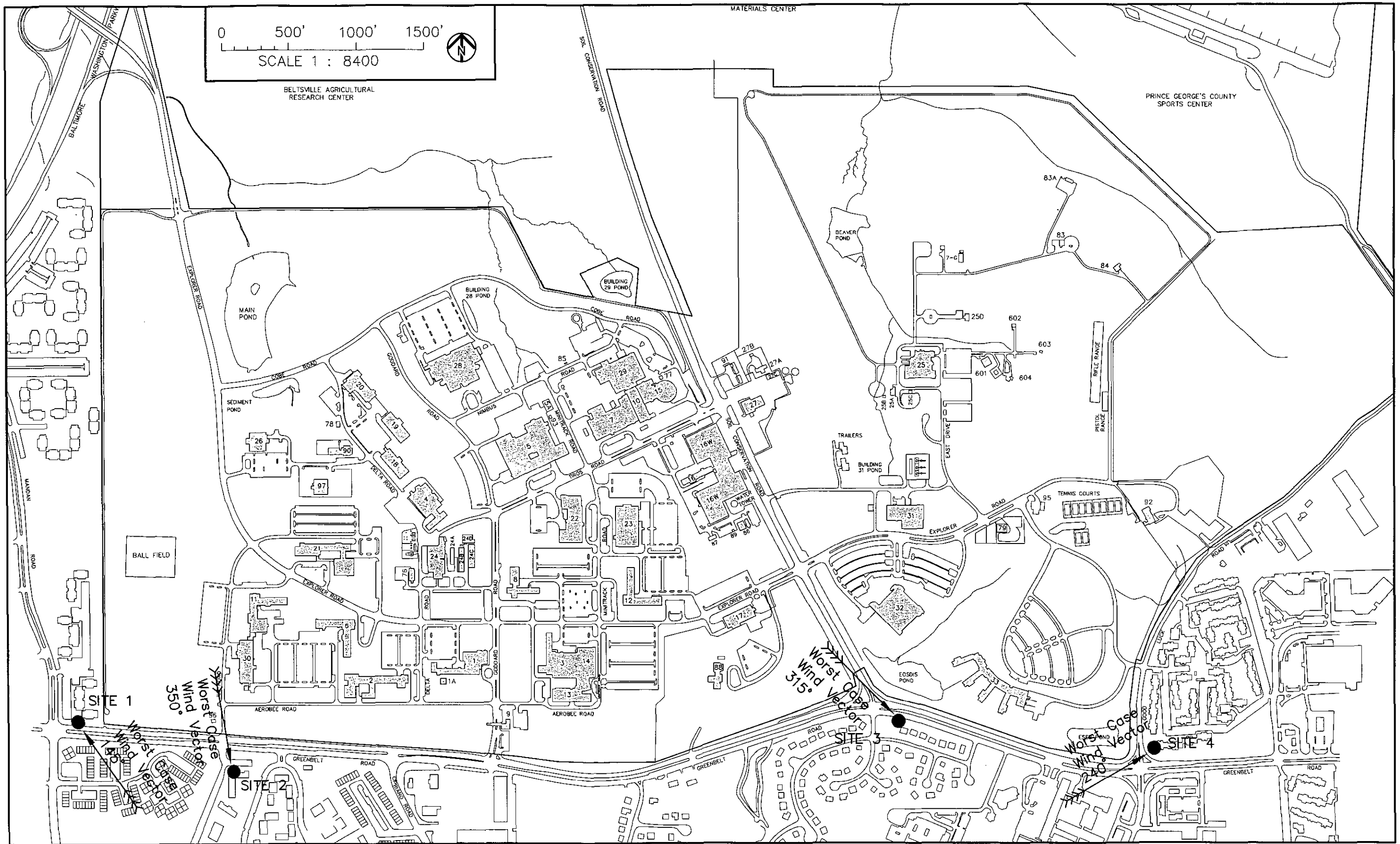


FIGURE 7-22 TRAFFIC AIR QUALITY ANALYSIS SITES.

LOCATION	EXISTING	2022 ALTERNATIVES NO ACTION	WEST	EAST
One Hour Average CO Concentrations				
Site 1	10.2	10.6	10.6	10.6
Site 2	10.2	10.6	10.6	11.0
Site 3	10.7	12.2	12.0	12.0
Site 4	10.1	11.9	12.2	11.7
Eight Hour CO Concentrations				
Site 1	6.1	6.9	6.9	6.9
Site 2	5.8	6.9	6.5	6.5
Site 3	6.2	7.2	6.5	6.6
Site 4	5.8	6.6	6.6	6.5

Note: 1 – Hour Average CO NAAQS Criteria is 35 ppm.
8 – Hour Average CO Criteria is 9 ppm.

TABLE 7-13 ESTIMATED ALTERNATIVE WORST CASE CO CONCENTRATION (in ppm).

Treatment of runoff for the east alignment alternatives would be determined during the design phase, if one were selected for implementation. The vertical profile of Alternative E-1 rises to a high point after leaving the north entrance intersection. It then goes downgrade to cross the valley of the stream draining Beaver Pond. From that point, it climbs steadily to the tennis court area before descending to Good Luck Road. The general arrangement for runoff storage facilities would be small facilities of about 0.5 acre-feet capacity near each end, and a large management structure in the stream valley to treat runoff from most of the road. Alternatives E-2 and E-2A are similar, except that they climb continuously from the valley to Good Luck Road, and a small facility at the south end is not needed.

Several options are available for stream valley storage. The location of facilities could be up or downstream from the roadway, although the former is preferable as it would be outside wetland areas. The Space Science Building would be built in the first Facilities Master Plan phase. A single large pond could be built in the valley to meet requirements for these buildings and other short term development on the east campus as well as the road. Or, a smaller pond for the road only could be built. In the latter case, a second option is the construction of two smaller storage facilities at the base of side slopes on either side of the valley.

7.4.8 Historic Properties

Information on historic properties within the NASA GSFC area of potential effect is given in Section 5.7 of the Facilities Master Plan Environmental Assessment.

None of the alignment alternatives would directly affect known historic properties outside of NASA GSFC. With one possible exception, no indirect or direct impacts are expected. The road will not be visible from any historic property outside Goddard. There will be no change in historic property access, and no substantive change in traffic volumes, and consequent traffic related noise levels or air quality.

Within Goddard, none of the alternatives would affect Building 305, the Spacecraft Magnetic Test Facility. Alternative E-2A has the closest point of approach to the building, about 2,400 feet. Building 305 is surrounded by forest within Area 300.

There are no known historic properties or archeological sites along the western alternative alignment, W-1, as revealed by previous field surveys. Within Goddard, this route is superimposed on existing roadways (Iue, Explore, and Cobe Roads) for most of its length, or in areas immediately adjacent to roads and parking lots that have been graded or extensively disturbed either for road construction or site landscaping associated with building development.

The northernmost 1,800 feet of the alignment does pass over natural ground. Much of this section would be on property owned by BARC. NASA would make arrangements with BARC to occupy the property if Alternative W-1 were implemented. Since the disposition of any historic properties found in the area would involve BARC, an archeological reconnaissance survey of the proposed alignment between Cobe and existing Soil Conservation Roads was conducted in January, 2002 (Phase I Archeological Survey, NASA GSFC, SCS Road Relocation, AEC/A, 2002).

The eastern half of the BARC property under consideration is actively planted in crops by BARC, the western portion by a mixed forest. Aerial photography from 1938 shows the entire area, as well as the northern section of the GSFC west campus under cultivation. Most of the cultivated area was divided into distinct one acre plots. Photographs taken in 1943 show continuing cultivation, although the one acre plots were replaced by contoured strip farming. Soil Conservation Road appears for the first time. Photographs dating from 1952 show the existing field/forest pattern.

Shovel test pits were dug at 50-foot (15 meter) intervals along the Soil Conservation Road W-1 realignment and north entrance connection. Items recovered included three modern glass fragments and a single, historic period, stoneware chard. No historic or prehistoric materials of relevance were found. In the absence of an archeological site, the Phase I survey recommended no further archeological investigation.

The three Soil Conservation Road eastern alternative alignments, E-1, E-2, and E-2A pass through the east campus. A preliminary reconnaissance of archeological resources on the 579-acre east campus was recently completed (Phase I Archeological Reconnaissance Survey, NASA, GSFC, Greenbelt, Maryland, KCI Technologies, 1999).

The KCI Phase I survey determined that there were seven potential historic archeological sites from 19th century mapping. Previous investigators had examined two of these sites. The remaining five sites were found and examined by the KCI team.

For prehistoric archeological sites, a search protocol was developed based on a prediction model for Goddard (Resource Inventory of NASA GSFC, Greenbelt, Maryland, O. Miller et al., 1992). The model predicted that areas near streams and below 120 feet in elevation had the highest sensitivity for potential sites. Elsewhere on the campus, sensitivity was low to moderate. The KCI Phase I survey examined all 11 acres on the east campus that met the definition for high sensitivity as indicated by the model. The remainder of the campus was overlain by a grid composed of five acre blocks. A random sample of twelve of these blocks (60 acres total) was selected for full Phase I reconnaissance.

The KCI found four new sites, two prehistoric and two historic, within the sample blocks investigated. Sites 18PR549 and 18PR551 were comprised of debris from domestic occupation during the late 19th and early 20th centuries. Investigations concentrated on the areas where there apparently were building foundations and occupations were concentrated. Prehistoric Sites 18PR548 and 18PR550 were also discovered, no attempt was made to establish the ultimate site perimeters. The survey indicated that all of the sites except 18PR550 were potentially eligible for the National Register of Historic Places.

The eastern Soil Conservation Road alternative alignments are located in the vicinity of these sites. In the summer of 2002, a Phase II investigation of Sites 18PR548, 18PR549, and 18PR551 was conducted to establish site limits and National Register eligibility (See Section 5.7.2). The Phase II investigation determined that Site 18PR548 contains significant information on historic occupation during the Bare Island Late Archaic Period, and that it is eligible for the National Register. Sites 18PR549 and 18PR551 were determined to be not eligible.

The eastern alignments avoid Site 18PR548 and no impact on archeological resources is expected. If required, NASA will consult with the Maryland Historic Trust on issues that may be revealed during the design or construction phase.

7.4.9 Forest Areas

Goddard has about 785 acres of forest. Aerial photography taken in 1938 and 1943 shows significant portions of the Goddard still under cultivation, and much of the forest dates only to BARC ownership.

The amount of forest lost to construction of the Soil Conservation Road realignment alternatives was estimated by assuming clearance across the complete right-of-way. The estimated losses are:

	Deciduous Forest	Coniferous Forest	Mixed Forest	Total
Alternative W-1	2.8 acres	0.5 acres	0.9 acres	4.2 acres
Alternative E-1	5.8 acres	0.1 acres	3.6 acres	9.5 acres
Alternative E-2	5.7 acres	0.0 acres	3.3 acres	9.0 acres
Alternative E-2A	7.3 acres	0.0 acres	3.3 acres	10.6 acres

About half the loss under Alternative W-1 occurs at the north end after the alignment diverges from Cobe Road. The remaining half is located along the south leg where the alignment runs to the west of Explorer and Iue Roads. The alignment in this section maximizes the distance to Buildings 11 and 30 to minimize the potential impact of traffic vibrations on operations in these buildings.

The eastern alignments pass through forest for nearly their entire length. Forest losses for these alignments is generally proportionate to their length across Goddard. While the forest loss is more than double that for the west alternative, overall losses would be only a little more than one percent of the site total.

Alternative E-1 passes through a NASA long term forest conservation area at its southern end in the vicinity of Gate 15. This would result in the loss of about 0.75 acre of forest within the conservation area. Continuing current practice, NASA will develop a Forest Conservation Plan for submittal to the Maryland Department of Natural Resources. The plan will be prepared during the design phase for Soil Conservation Road, and include a Forest Stand Delineation, note specific tree losses and new plantings, and identify protection measures for trees that remain within the project area. If required, an area of suitable location, size, and forest character will be set aside as a long term forest conservation area.

7.4.10 Wetlands

Wetlands on Goddard were surveyed site wide in 1993 (see Section 5.9). The surveys determined the character and extent of these wetlands, but did not undertake formal delineations. Prior surveys were used to determine locations where wetlands may be encountered by realignment alternatives. The two most likely locations were surveyed and wetlands formally delineated in January, and verified in March 2002. (Wetland Delineation, Soil Conservation Road Relocation, Wetland Studies and Solutions, Inc., 2002). These locations were on the BARC property that would be needed for the west alternative alignment W-1, and along the potential right-of-way on the northern tier of the east campus that would be used by any of the eastern alternatives. The 2002 delineations were completed in accordance with the (US Army Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1, USCOE, 1987). The routine on-site wetland determination method for sites more than five acres in extent was utilized. The US Army of Corps of Engineers issued a jurisdictional determination and verification of the delineation in June, 2002.

The west alternative would impact wetlands at two locations. The first occurs where the proposed alignment passes between the Main and Sediment Ponds following Cobe Road (See Figures 5-18 and 7-4). Cobe Road tees into Explorer Road to the west of the ponds. A curve is introduced on the Western alignment to maintain a 35 to 45 mph operating speed for through Soil Conservation Road traffic. The curve would extend to the pond area, shifting the roadway southwards. The new road would be on fill as it passes between the ponds. The fill would extend into the Sediment Pond, requiring its relocation southward. Reconstruction of the pond would impact about 0.5 acre of palustrine emergent wetlands located along the south bank. It may be feasible to incorporate this wetland into the relocated pond.

The second wetland location is on the section of the alignment between its north end and where it joins Cobe Road. Two channels course through this area, one in a deep ravine north of Minitrack Road, the other emanating from the Building 29 Pond. Although both have recognizable banks, beds, and ordinary high water marks, these features are very poorly defined along some reaches. None are located on hydric soil. Channel flows are ephemeral and storm event driven. All the channels are classified R4, riverine.

An exception is a short segment of the ravine channel immediately downstream from the Cobe Road culvert outfall that is classified as palustrine emergent. This wetland dates to the construction of Cobe Road. It is the remnant of a Cobe Road construction period sediment trap that was left in place.

The west alternative would impact an estimated 120 linear feet of R4 channel, and about 30 linear feet of the palustrine emergent wetland.

On the east campus, the wetlands at the Goddard northern boundary are at the head of a large downstream system. The streamlet flowing northward joins Beck Branch at the head of Alter Pond about 2,000 feet beyond the property line. Alter Pond is located to the southeast of the Soil Conservation Road/Beaver Dam Road crossing. Beck Branch is flanked continuously by wetlands throughout most of its length before it joins Beaver Dam Creek near the Baltimore-Washington Parkway.

The contiguous wetland just beyond the Goddard boundary is classified as a Maryland Wetland of Special State Concern. These wetlands are defined as ones with habitat and buffers important to threatened and endangered species, or containing ecologically unique or unusual areas.

All of the area immediately to the north of the east campus lies within Beck Woods, a designated Maryland Heritage and Biodiversity Conservation Area. Beck Woods is an important component in unfragmented pine-oak forests located on BARC, and rare and State Watch List plant species have been known to occur in the general vicinity of Alter Pond within the Conservation Area.

East Alignments E-1, E-2, and E-2A share the same alignment across the northern tier of the east campus. The alignment is set in this area by buffers around NASA antennas to the north and south. The roadway would be on fill as it crosses the stream valley. Wetlands in the alignment corridor were delineated in January, 2002. Delineated boundaries were in close agreement with those determined by prior surveys.

All the eastern alignments pass through the periphery or edges of the wetlands extending into Goddard from the north, but avoid wetlands around Beaver Pond to the south. The alignments would impact about 0.3 acre of palustrine forested wetlands and about 160 linear feet of R4 ephemeral stream channel in this area.

Alternative E-1 crosses a swale between the GEWA tennis courts. The 1993 surveys classified the swale as riverine wetland with intermittent flow. About 60 linear feet of this wetland could be impacted. The southern legs of east alternative alignment E-2 and E-2A follow a ridgeline to Good Luck Road, and no further wetland impacts along the route are anticipated.

A small streamlet runs parallel to the northern east campus property boundary. Alternative E-2A would cross this streamlet twice, once to the north of Building 83A, and once to the east of Building 84. These stream crossings would generate an estimated additional 500 linear feet of stream channel impact.

7.4.10.1 Wetland Finding and Mitigation

Presidential Executive Order 11990 Protection of Wetlands, establishes a national policy to avoid, to the extent possible, long and short term adverse impacts associated with the destruction or modifications of wetlands unless there is no practicable alternative.

There are no practicable alternatives for avoiding wetlands on the west or east alternative alignments. West Alternative W-1 alignment curves at the Sediment Pond and in the area crossing BARC property at the northern end must be of sufficient radius to safely maintain proposed operating speeds within the physical constraints of existing west campus facilities and roads. The required curves place the alignment in wetland areas.

The eastern alternative alignments are fixed within a narrow corridor that is about 150 feet wide across the northern tier of the east campus. The alignment in the corridor maximizes the available area on the east campus for a consolidated NASA facility. The alignment is fixed by an antenna buffer to the south (See Figure 7-11). Any shift of the alignment to the north would impact archeological Site 18PR548 (See Section 5.7.2.2).

Wetlands are present along the entire length of stream, flowing northward through Beaver Pond (See Figure 5-18). A substantive shift in the alignment to either the north or the south would result in greater wetland losses. The restriction of potential alignments to a narrow corridor in this sector makes wetland impacts unavoidable.

To the extent practicable within road safety and NASA operational constraints, NASA will minimize impacts to wetlands and their buffers. Greater definition of losses will occur during design development. Specific mitigation plans will be developed at that time as part of the U.S. Army Corps of Engineers and State permit processes.

Compensation for loss in the plan would be achieved through creation, restoration, or enhancement of wetlands at the appropriate acre for acre ratio for nontidal wetlands (COMAR 26.23.04.03). Compensation may be achieved directly on or off site, or by participation in a State approved wetland banking program. NASA prefers achieving mitigation on site. Onsite mitigation could be incorporated as a component of project or east campus stormwater management facilities.

The following compensation ratios apply to regulated activities for the nontidal site wetlands that may be affected by the project:

Wetland Class	Direct Ratio	Mitigation Bank Ratio
Emergent	1:1	1.5:1
Forested	2:1	3:1
Forested of Special Concern	3:1	4.5:1

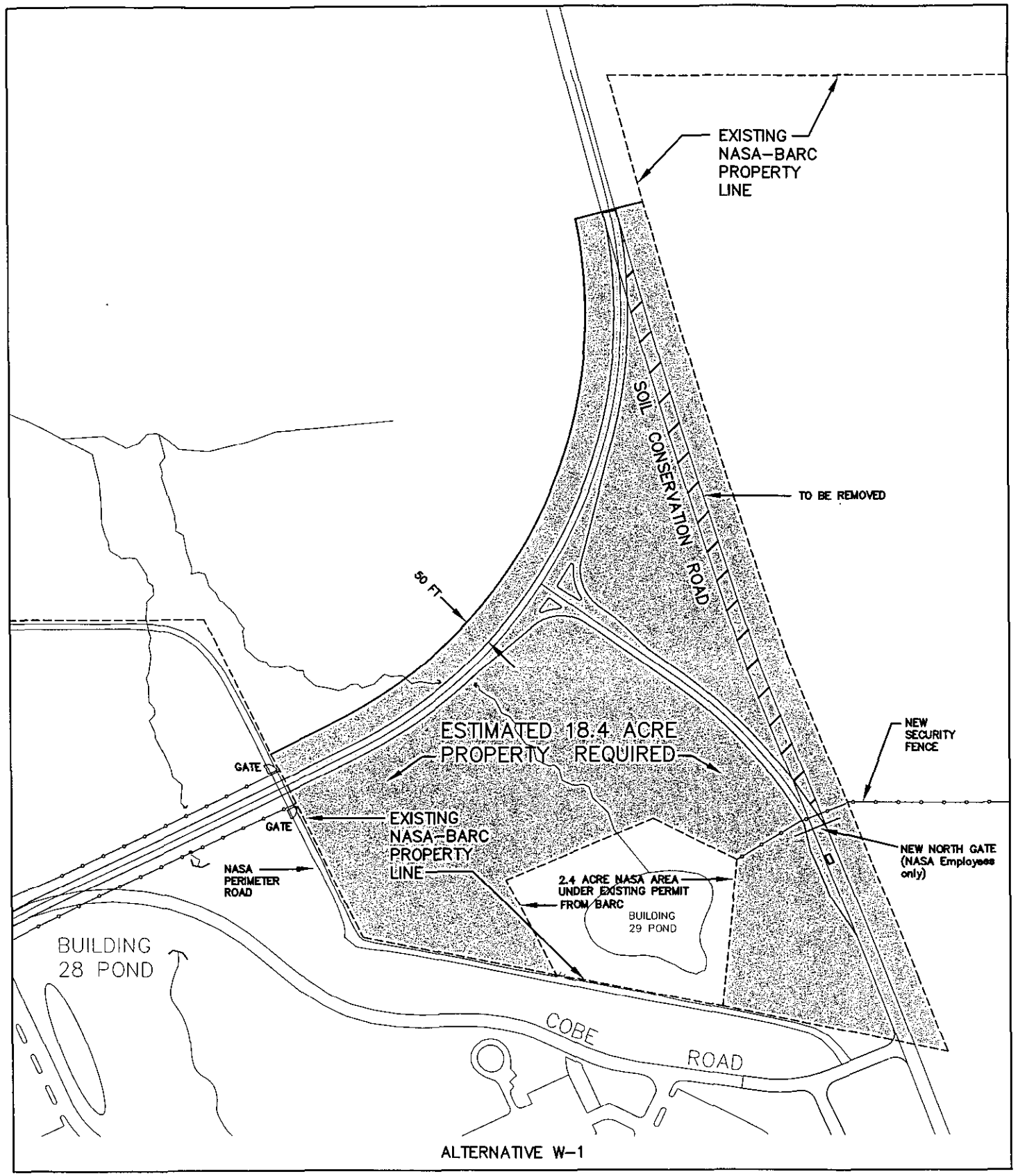
7.4.11 Property Acquisition and Dedication

Most of Goddard is owned by NASA, but some parcels such as island Areas 100 and 200 are still owned by BARC, and occupied by NASA under revocable permit. This arrangement is also used for a 2.5-acre parcel surrounding the Building 29 Pond on the northern boundary of the west campus.

NASA owns existing Soil Conservation Road where it crosses NASA property, or south of the west campus NASA/BARC property line (Figure 7-23). BARC owns and maintains the road to the north and the property to the west of the road. NASA owns the property to the east of the road right-of-way, with the property line offset about 50 feet from the edge of the road.

All the Soil Conservation Road realignment alternatives would be located on BARC property at their northern end. Under each alternative, existing Soil Conservation Road would be converted to an employee entrance. It is assumed that NASA would be responsible for future improvements, maintenance, upkeep, and snow removal on the new, realigned section of roadway. The limits establishing the boundary of responsibility would move northward. One possibility would be to issue a revocable occupancy permit defining the area affected.

To estimate the potential property size, it was assumed that the current 50-foot offset from the road edge of pavement would be applicable to new conditions. For West Alternative W-1, the permit boundary would follow the curve of the mainline road. The affected area would encompass the NASA employee north entrance intersection and an estimated 18.4 acres. About half the area is forested. The remainder is under cultivation, planted in corn in 2001.



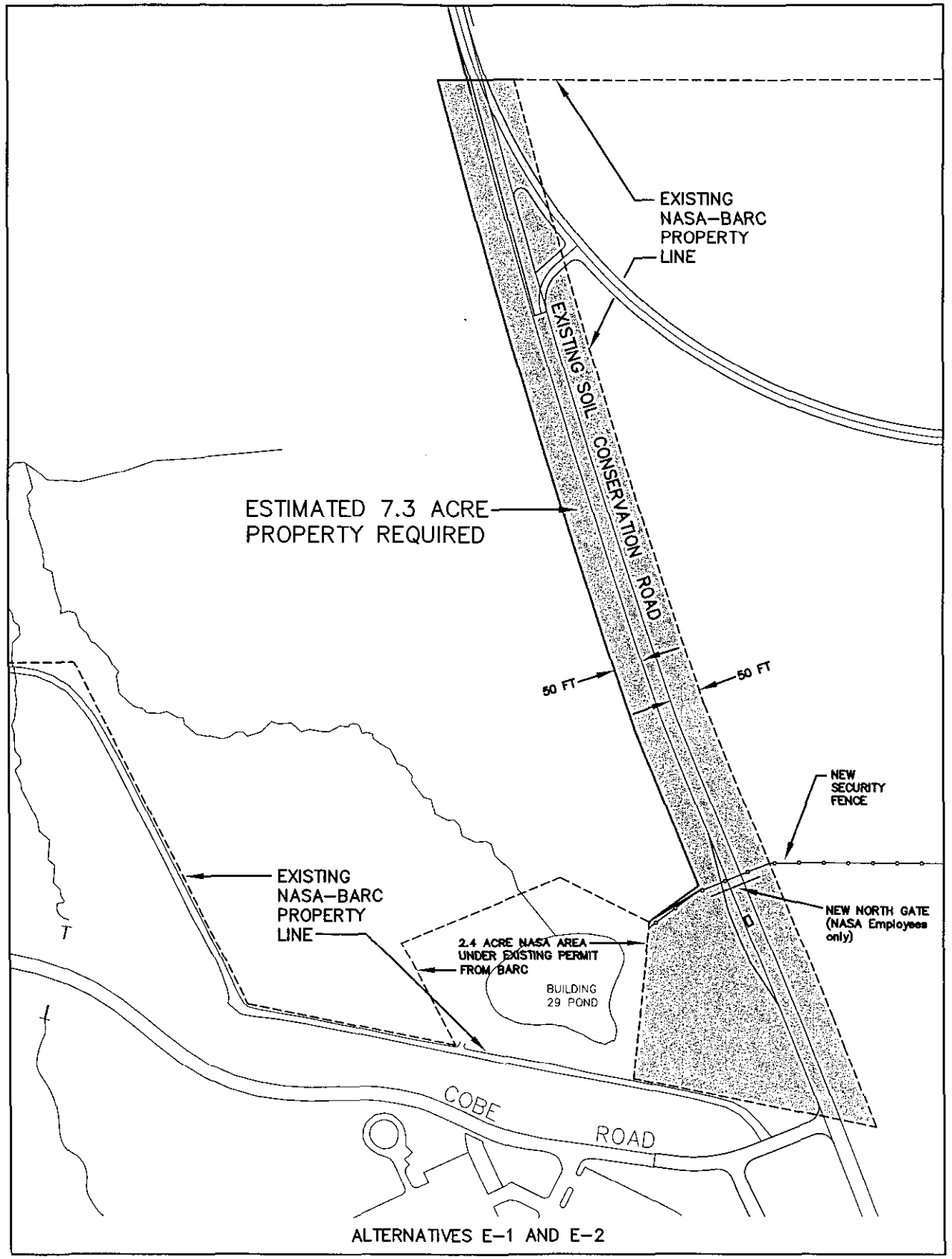


FIGURE 7–23 ESTIMATED BARC PROPERTY NEEDED FOR RIGHT–OF–WAY.

Under the East Alternatives including Alignment E-2A, the boundary line would switch to the opposite side of the road, or mirrored along the axis of the road centerline. An estimated 7.3 acres, most of which would be Soil Conservation Road right-of-way, would be covered under the permit.

Widening of Good Luck Road to four lanes with two five foot wide bike paths under Alternatives E-2 and E-2A would require acquisition of private property at one location on the east side of Good Luck Road. The property line at the FI-CON Cement Company along the Good Luck Road frontage is a remnant boundary based on the original two lane 30-foot wide road right-of-way. The right-of-way line has been adjusted on either side of FI-CON to accommodate a four lane Good Luck Road. These adjustments were made along the Countryside Apartment and Concrete Technology Services properties when they underwent redevelopment. The right-of-way line was offset or moved back about 25 feet in each case.

The FI-CON property has an area of about 1.14 acre or 49,775 sf. Company offices are located in a former residence that is set back about 100 feet from the existing road. The remainder of the property is used to park vehicles and construction equipment.

Alternative E-2 would require widening of the right-of-way along the full length of the frontage. An estimated 15,800 sf of property would be needed. Alternative E-2A would require less, about 5,400 sf that is located along the southern end of the property. The partial property takes in either case would not substantively impact the serviceability of the remaining property.

Alternatives W-1, E-1, and E-2 would not require any substantive redefinition of the Goddard property boundaries abutting public rights-of-way owned by the State and County. However, under Alternative E-2A, most of the Good Luck Road intersection would be located on GSFC property. The intersection itself would be turned over to the County for continuous dedicated public right-of-way along Good Luck Road. The estimated property transfer area is about 46,000 sf or approximately 1.1 acre. The amount of area transferred could increase or decrease depending on the final design configuration for the intersection.

7.4.12 NASA Facilities

West Alignment Alternative W-1 would impact NASA facilities on the west side of Goddard. Operations in Building 11 and 30 are very sensitive to vibrations. The distance between the road and buildings has been maximized to minimize potential vibration impacts from Soil Conservation Road traffic. But modifications to equipment within the buildings would still be necessary. The alignment would also require the taking of 120 parking spaces within the Building 11 employee lot as a result of the shift to maximize the offset from the buildings. These spaces would be replaced by an equivalent number on the east side of Building 11 (See Figure 7-6).

Wooded tracts serving as buffer around site development cover the northern and western periphery of the west campus. These tracts now have free internal site access. The tract north of Cobe Road contains the Main Pond. Its primary function is Stormwater management, but it is also used for fishing and passive recreation by NASA employees. The west tract contains a Government Employee Welfare Association (GEWA) rectangular ball field, and an unpaved perimeter road used by cyclists, joggers, and walkers.

Under West Alignment Alternative W-1, access to these areas would be limited to gates on either side of Explorer Road in the vicinity of the Baltimore-Washington Parkway entrance. The ball field and garden plots would also be accessible via a pedestrian only gate at the West Entrance/Soil Conservation Road intersection.

Similarly, the northern periphery of the east campus is accessible by walking through the woods or using one of the access roads in the area. An antenna tower is the only feature present. The eastern alignments would isolate this area. Access would be reduced to gates that would be installed along Soil Conservation Road for security vehicles.

East Alignment Alternatives E-1 and E-2 would infringe upon the desirable operational buffer limits around antennas on the east campus and in Area 100. The infringement is unavoidable since the buffers overlap. Conditions under both alignments are identical in the affected area. The road would extend up to 60 feet into a 1,000-foot radius buffer around a NOAA antenna on the east campus, and up to about 150 feet into a 1,000 meter or 3,300 foot buffer around antennas in Area 100. These infringements are expected to have minimal effect on operations.

East Alignments E-1 and E-2 would require demolition of Buildings 83A and 84, and relocation of NASA activities in these structures elsewhere.

East Alignment E-1 would pass between the GEWA Recreation Center in Building 92 and the GEWA tennis courts. The alignment would take two of the 10 courts and isolate the remaining courts from the recreation center. Road noise and increased exposure to the wind would lower the quality of the setting at the courts. Vehicle and pedestrian access and parking would also be impacted. As mitigation, the two tennis courts lost would be replaced, and new vehicle and pedestrian access provided on the west side of the alignment. About 20 new parking spaces would be installed to the north of the courts. Primary access to the Recreation Center would be shifted to Good Luck Road.

East Alternative Alignment E-2A would impact GEWA Recreation Center facilities in the vicinity of the Good Luck Road intersection. If Soil Conservation Road is the through route at the intersection, then the alignment must be shifted to the west or toward the GEWA facilities to maintain driver sight lines approaching the intersection. Construction would require relocation of the recreation center entrance at Gate 13 about 230 feet to the north. The relocated entrance would connect to Soil Conservation Road at the new intersection.

The main line of Soil Conservation Road would pass through southern section of the Recreation Center parking lot. It is estimated that about 33 of the 102 spaces would be lost on the east side of the lot. These spaces would be replaced by an equivalent number of spaces to the north on the east side of the ball field. (See Figure 7-12). Right-of-way for the alignment would also clip 35 to 50 feet off the outermost extremities of the GEWA ball field in the right field sector. The distance down the right field line would be shortened from about 300 to 250 feet. The volleyball court would be unaffected.

†††

APPENDIX A

SCOPING CORRESPONDENCE

WASHINGTON SUBURBAN
SANITARY COMMISSION

COMMISSIONERS
Duane W. Oates, Chairman
W. Gregory Wims, Vice Chairman
Robert G. Berger
Marita B. Brown
Kevin P. Maloney
Juanita D. Miller

GENERAL MANAGER
Conez A. White

14501 Sweitzer Lane • Laurel, Maryland 20707-5902 (301)206-8000 • 1(800)828-6439 • TTY:(301)206-8345

May 11, 1999

Mr. Mark Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, MD 20771

RE: NASA Goddard Space Flight Center

Dear Mr. Daly:

We have received your request for a point of contact for your work on the Goddard Space Flight Center's Facilities Master Plan.

Ms. Hansa Desai, a Planning Manager in the Water Resources Planning Section, should be your WSSC point of contact for the project. In the past, she has served in this capacity for the National Institute of Health's master planning process and has worked on a number federal government agency facility siting projects. She can be reached by telephone at 301-206-8816 and faxed at 301-206-8867. Her e-mail address is HDesai@wssc.dst.md.us.

Sincerely,

David M. Coe, P.E.
Section Head
Water Resources Planning Section

EAF/

cc: Hansa Desai

Historic
Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

MAY 12 1999

Mr. Mark M. Daly, P.E.
National Aeronautics and Space Administration
Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, MD 20771

REF: Preparation of Facilities Master Plan for Greenbelt Site of the Goddard Space Flight Center, Prince George's County, Maryland

Dear Mr. Daly:

We appreciate receiving information on the development of the Facilities Master Plan, along with your request for preliminary comments on its scope. We have had a close working relationship with NASA for many years, and look forward to assisting your office in this endeavor.

As the primary policy advisor to the President and Congress in the field of historic preservation, the Council works with other Federal agencies to integrate consideration of historic resources into agency planning activities. Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended (NHPA), are pertinent in this case. The Council's regulations ("Protection of Historic Properties," 36 CFR Part 800) implement Section 106, which requires Federal agencies to "take into account" the effects of their projects and programs on properties included in or eligible for inclusion to the National Register of Historic Places, and afford the Council a reasonable opportunity to comment on the undertaking. Section 110 of the NHPA sets forth the broad affirmative Federal agency responsibilities with respect to their programs for balancing mission requirements with historic values; its intent is to ensure that historic preservation is fully integrated into the programs of Federal agencies.

The Facilities Master Plan can assist NASA in meeting its responsibilities under the NHPA through integrating the consideration of historic properties into the daily operation of the Goddard Space Flight Center. The Plan could describe known historic properties Goddard is responsible for, and provide for the identification of other, currently unknown, historic properties that could be affected by project activities. It would also set out a framework for ensuring full consideration of a property's historic values in the management of the facility. This

consideration would be carried out in consultation with the Maryland State Historic Preservation Officer and other interested parties.

At this time Goddard has one nationally significant National Historic Landmark property, the Spacecraft Magnetic Test Facility. Consideration of the historic qualities of this specific property, and of NASA's other National Historic Landmark facilities, is governed by a process set out in a Programmatic Agreement currently in force between NASA, the Council, and the National Conference of State Historic Preservation Officers. A copy of this Programmatic Agreement is included in the enclosure with this letter (in Appendix 3). This enclosure, a Congressional study prepared by the Council with input from NASA and the scientific and preservation communities, is entitled "Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities." It reviews various ways in which our Country's rich scientific heritage can be preserved for future generations. For your reference I am also enclosing some additional information about the Council.

I will be your point of contact with the Council, and can be reached at the following address:

Dr. Tom McCulloch
Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Ave. NW
Washington DC 20004
ph: 202-606-8554
fax: 202-606-8672
email: tmcculloch@achp.gov

I look forward to working with your office on the Facilities Master Plan. If you have any questions, do not hesitate to contact me.

Sincerely,

Tom McCulloch

Tom McCulloch, Ph.D.
Office of Planning and Review

Enclosures

MDE
MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore Maryland 21224
(410) 631-3000 • 1-800-633-6101 • http:// www. mde. state. md. us

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

May 13, 1999

Mr. Mark M. Daly, P.E
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, Maryland 20771

Dear Mr. Daly:

Thank you for sending the Maryland Department of the Environment (MDE) your letter dated, April 28, 1999; notifying the Department of NASA's preparation of a *Facilities Master Plan* for the Greenbelt site of the Goddard Space Flight Center. In response to your requests, the following comments are offered for your consideration:

Two review processes are normally utilized by the MDE for review of environmental documents:

1. A large portion of formal reviews of environmental documents by the MDE are coordinated with the State Clearinghouse for Intergovernmental Assistance, a unit of the Maryland Office of Planning. The State Clearinghouse is the State of Maryland's designated single point of contact, with regard to coordinating formal reviews of federally sponsored projects among state agencies. Ms. Linda Janey is the Manager of the State Clearinghouse and can further explain this process. She can be reached at (410) 767-4490.

   Mr. Steve Bieber, in MDE's Technical and Regulatory Services Administration, is the Department's Clearinghouse Coordinator. When notifications about projects and associated documents are forwarded to the Department from the State Clearinghouse, Steve ensures that those documents are internally distributed for review within appropriate administrations in the Department. If you have additional questions about this process, Steve can be reached at (410) 631-3656.

2. The MDE also reviews environmental documents, via direct written requests to the Department; distributed through the Office of the Secretary. *This particular avenue* of review provides a formal examination from a single state agency; without the added benefit of coordinated and concurrent reviews from other state agencies.

Preliminary comments on this project, based on the materials supplied which did not fully support an environmental review of this study, cautions the applicant to consider potential impacts to air quality and water quality resulting from the renovation/demolition/construction activities associated with this project. In addition, the applicant should consider issues associated with disposal and handling of waste materials, potential pollutants or contaminants to the environment. If it is determined that these and other environmental hazards may be present, refer to the enclosed Business Guide to Environmental Permits and Approvals, June 1998 and contact the appropriate individuals identified; if additional information is required. Thank you.

Sincerely,

Mr. Nathaniel K. Brown
Technical and Regulatory Services Administration

Enclosure

Cc: Rich Eskin, MDE
Steve Bieber, MDE
Visty Dalal, MDE
Joanne Mueller, MDE

Research, Education, and Economics
Agricultural Research Service

May 20, 1999

Mr. Mark M. Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, Maryland 20771

Dear Mr. Daly:

This is in response to Mr. John E. Hodge's request dated April 28, 1999, for information on Beltsville Agricultural Research Center (BARC) environmental issues pertinent to the drafting of the Facilities Master Plan, Goddard Space Flight Center (GSFC).

The BARC is a Resource Conservation and Recovery Act (RCRA) large quantity hazardous waste generator. We have two less-than-90-day storage areas where waste from the research and maintenance activities is packed and manifested to either recycling, permitted disposal, or permitted treatment facilities.

Also, as you are probably aware, BARC is on the EPA's National Priorities List, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as "Superfund"). Even before signing a Federal Facilities Agreement with EPA in 1998, BARC has been identifying and addressing Areas of Concern (AOC) since 1990, starting with a Preliminary Assessment and Site Investigation. Of the 166 AOC's investigated, 59 have been recommended for further CERCLA action. Enclosed are six fact sheets that provide the locations and details on our AOC's. Enclosure 7 is a map that complements the fact sheets.

The BARC 1996 Master Plan Update may be of interest to the GSFC in the preparation of its Facility Master Plan. The Real Property Section can be contacted at (301) 504-5187 to arrange for a review.

Questions about the environmental information should be directed to Mr. Mark Schoppet, Senior Remedial Project Manager, at (301) 504-5557. Thank you for contacting us early in your scoping process. If I can of further assistance, my number is (301) 504-5664.

Sincerely,

JOHN N. VAN DE VAARST
Deputy Area Director
Facilities Management and Operations Division

7 Enclosures

THE PRINCE GEORGE'S COUNTY GOVERNMENT

DEPARTMENT OF ENVIRONMENTAL RESOURCES

DEVELOPMENT SERVICES BRANCH
PROGRAMS AND PLANNING DIVISION

May 27, 1999

Mr. Mark M. Daly, P.E.
NASA Goddard Space Fight Center
Facilities Management Division
Building 17, Code 2243
Greenbelt, Maryland 20771

Dear Mr. Daly:

This is in response to the April 28, 1999 correspondence to Samuel E. Wynkoop, Jr. concerning the Facilities Master Plan for the Greenbelt site of the Goddard Space Flight Center. In your letter the following information was requested:

1. To the best of my knowledge, The Department of Environmental Resources is aware of no significant environmental issues at this site;

2. I will serve as the point of contact for this study. My telephone number is (301) 883-5839; and

3. I will also be the person who should receive the Draft Environmental Assessment.

Should you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

Larry S. Coffman
Associate Director

IN REPLY REFER TO:
NCPC File No. MP50

MAY 28 1999

Mr. Mark M. Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17 Code 224.3
Greenbelt, Maryland 20771

Dear Mr. Daly:

Thank you for the letter of April 28, 1999 requesting comments regarding the scoping information for the proposed Environmental Assessment (EA) for the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) in Prince George's County, Maryland. We hope our comments will assist you in preparing the EA and its potential resulting Finding. These comments on the scoping information for the EA are limited to the Commission's role as the central planning agency for the federal government in the National Capital Region and only express our general views on planning and environmental issues.

The Commission staff notes that the proposed EA should address the following issues:

National Capital Comprehensive Plan

- Given that the project is a federal effort in the region, a comparison of the master plan with the goals and objectives of several elements of the National Capital Comprehensive Plan should be identified and discussed. These would include location criteria, federal planning policies, and federal transportation policies under the federal facilities element of the plan.

Floodplains

- Locating new facilities in floodplains in the Greenbelt area should be discouraged, and sensitive facilities, which may store permanent records, should be prohibited from locating in the 100-year floodplain unless major floodproofing measures are undertaken, including mitigation of any adverse effects. When development within

a floodplain must occur, uses should be carefully regulated to minimize flood hazards by preservation of the natural resources to reduce the adverse effects on the floodplain. If construction in a floodplain is unavoidable, grading should be minimized, natural drainage conditions should be maintained and the site should be returned as closely as possible to its natural conditions.

Noise

- In the Greenbelt area, noise-producing activities should not be located close to sensitive or natural resource areas, such as major wildlife habitats. Avoiding such features forestalls serious disruption to the sensitive biological/ecological systems in the federal installation areas. The location of noise generators should be evaluated as to the potential effect of noise on nearby natural, historic, and cultural resources, with the goal of protecting these resources from excessive noise. Construction activities should comply with all applicable Maryland and M-NCPPC noise regulations and low noise emission products, methods, and equipment should be used.

- Federally supported road improvements in the GSFC master plan should be sensitive to the existing and proposed land uses and employ adequate pre-design evaluation, alignment design, and contextual screening where necessary. Vehicles that expect to frequent the installations within the area should abide by all Maryland and EPA vehicle emission regulations. Any potential air traffic, such as helicopter activities within and adjacent to the federal agency sites, are recommended to observe adequate noise attenuation procedures during flight operations. Management of project activities should also minimize the noise levels adjacent to sensitive land use areas such as State and local recreational, wildlife, and educational facilities.

Air Quality

- In the GSFC area, efforts should be made to reduce or minimize the levels of air pollutants, particularly ozone producing agents. Adherence to the Maryland State Implementation Plan developed under the Clean Air Act requirements should be achieved along with EPA regional objectives. A concerted effort toward reducing the number of individual-use vehicles is required for the vicinity area. A comprehensive Transportation Management Program should be implemented to reduce vehicle exhaust emissions. On a project level, using new technology that would contribute to reducing pollutant levels should be encouraged when necessary and utilizing non-pollutant sources of energy should be considered

where possible. Installation master plans and capital improvement plans should encourage the utilization of alternative energy sources where their use is feasible, and use alternative building materials to reduce impacts to the environment.

Stormwater Management

- Development at federal facilities within the Greenbelt area should be planned to allow for an adequate balance between constructed impervious areas and open space for adequate stormwater run-off and retention. Site development should utilize best management procedures/practices to reduce the amount of cut and fill and disturbance within natural drainage areas. Existing sub-surface aquifers should be identified in the master planning process and accommodated with the objective toward restoring the site hydrologic regime. Striving toward this goal helps to mimic the natural or predevelopment condition, thereby maintaining surface water and groundwater quality, and minimizing the generation and off-site transport of pollutants.

- Development should provide for positive drainage around buildings and throughout the site. Stormwater ponds and collection areas should be carefully located to take advantage of the natural area conditions and should blend in with the surrounding vegetation and natural features where possible. Minimizing disturbance of riparian habitat also helps preserve terrestrial habitat and maximizes conservation of woodland and vegetative cover.

Forest Corridors and Buffers

- The landscape and park-like open space setting of the GSFC area that is provided by trees and natural buffers should be protected and enhanced. The natural wooded buffer areas, which also serve to separate individual sites and installations as natural barriers, should be maintained and additional wooded buffers should be included to aesthetically and physically augment development. Particular care should be taken to use a variety of trees and plants (particularly evergreens) that are appropriate to the region and which can provide year-round natural screening. Care should be taken to maintain large preserves of wooded countryside and natural greenery as part of future development. Abundant and well maintained groves of trees provide shade and mitigate the building development and surface paving as well as reduce effects of heat and wind conditions and provide a positive setting for development. Evergreens should be introduced into natural buffer areas and areas between federal facilities where strong screening effects are required. Tree masses and building forms should be related and reflect the overall design

setting of the area. Tree-lined vehicular corridors should be maintained and enhanced.

- The streamside forest functions as a critical element when it provides energy to streams in the form of dissolved carbon compounds and organic detritus. These materials are important to processes within the stream itself. In small, well-shaded upland streams, as much as 75% of the organic food base may be supplied by dissolved organic compounds or detritus such as fruit, limbs, leaves and insects that fall from the forest canopy. Benthic detritivores (the stream bottom bacteria, fungi and invertebrates that feed on the detritus) form the basis of the aquatic food chain. They pass on this energy when they are, in turn, consumed by larger benthic fauna and eventually by fish. Thus the streamside forest functions as an important energy source for the entire watershed from headwaters to the Chesapeake Bay.

- Simple removal of nonpoint pollutants is not enough to improve the quality of water resources. A balanced, integrated, adaptive community of riparian and aquatic organisms comparable to the natural systems of the region with stability and capacity for self-repair must be reestablished. The restoration of a healthy aquatic ecosystem from the headwaters to the Chesapeake Bay is dependent on the reestablishment of significant amounts of riparian forest. Control of nonpoint pollutants and repair of the aquatic ecosystem through reestablishment of the streamside forest is a logical next step in improving the quality of the GSFC water resources.

Wildlife Management

- Environmental analysis and social research by the Maryland DNR suggests that current deer populations are too high in many sections of the state, including Prince George's County, and increased control will be necessary to avert even greater negative impacts than those already being experienced.

  Presently deer harvest management in Maryland is established primarily at the county level, with the exception of area specific regulations applicable to managed hunts. Because Maryland's diverse landscape is undergoing changes in deer habitat quality as well as significant variances in human demographics, deer population level objectives must be determined in many instances at the sub-county or community level. GSFC and Maryland's Department of Natural Resources should examine the Greenbelt area harvest trends to evaluate the extent of deer populations and land use conflicts. DNR is planning to increase

support and analysis of any potential options, and will support or conduct Maryland-based research to evaluate further the potential application of deer fertility control in the state, along with other non-lethal control options.

We appreciate your consideration of our comments and your consultation with us at this stage of the master planning. If you have any questions about our comments, please contact Susan Hinton of my staff at (202) 482-7231, who will coordinate this agency's review of the Master Plan, or Eugene Keller at (202) 482-7251, our Environmental Officer.

Sincerely,

Reginald W. Griffith

Reginald W. Griffith
Executive Director

FISH AND WILDLIFE SERVICE
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401

U.S. Department of the Interior
1849•1999

June 4, 1999

Mr. Mark M. Daly
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, MD 20771

RE: NASA Goddard Space Flight Center-
Greenbelt Site; Prince George's County, MD

Dear Mr. Daly:

This responds to your May 5, 1999, request for information pertaining to the preparation of a Facilities Master Plan for the Goddard Space Flight Center-Greenbelt site. We have reviewed the information you enclosed and are providing comments in accordance with Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

The federally threatened bald eagle *(Haliaeetus leucocephalus)* is present in vicinity of the Goddard Space Flight Center. Approximately 3 miles northeast from the Space Flight Center boundary, nest AA-90-01 is located in the Patuxent Research Refuge, North Tract. For further information regarding activity at this nest Glenn Therres of the Maryland Wildlife and Heritage Division should be contacted at (410) 260-8572.

Except for occasional transient individuals, no other federally proposed or listed endangered or threatened species are known to exist within the area. Should additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered. This response relates only to federally protected threatened or endangered species under our jurisdiction. For information on the presence of other rare species, you should contact Lori Byrne of the Maryland Wildlife and Heritage Division at (410) 260-8573.

An additional concern of the Service is wetlands protection. National Wetlands Inventory maps produced by the U.S. Fish and Wildlife Service, indicate the presence of several wetlands occurring on the Goddard Space Flight Center. Palustrine emergent, scrub-shrub, forested, and open-water classed wetlands have been identified on the Center. Efforts should be made to avoid adversely impacting these important resources. If possible, projects to restore or enhance

wetlands should be considered in keeping with the Chesapeake Bay Program's goal of net gains in wetland area and functions.

We appreciate the opportunity to provide information relative to fish and wildlife issues, and thank you for your interest in these resources. If you have any questions or need further assistance, please contact Andy Moser at (410) 573-4537.

Sincerely,

Robert J. Pennington
Assistant Field Supervisor
Div. of Habitat Evaluation and Protection

cc:
Maryland Wildlife and Heritage Division, Annapolis, MD
(ATTN: Glenn Therres)
Patuxent Research Refuge, Laurel, MD
(ATTN: Sue McMahon)

Parris N. Glendening
Governor

Kathleen Kennedy Townsend
Lt. Governor

Maryland Department of Natural Resources
ENVIRONMENTAL REVIEW
Tawes State Office Building
Annapolis, Maryland 21401

John R. Griffin
Secretary

Stanley K. Arthur
Deputy Secretary

June 11, 1999

Mr. Mark M. Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, MD 20771

Re: State Clearinghouse Project Review - MD990511-0444
Scoping Process: Facilities Master Plane - Greenbelt Site, Goddard Space Flight Center
Prince George's County

Dear Mr. Daly:

This letter is in response to your request for information on natural resources that could be impacted by activities at the Goddard Space Flight Center, Greenbelt Site. The facilities map includes portions of the Patuxent River and Anacostia watersheds. Lists of finfish that have been collected in the Patuxent and the Anacostia drainage areas are attached. Aquatic information for specific tributaries and sections of rivers within the study area is indicated below.

Patuxent River

The study area includes headwater tributaries to the Patuxent River draining to Redington Lake(east of Fairlane/ Springfield Road), and draining under Greenbelt Road to Bald Hill Branch and Folly Branch of the Western Branch of the Patuxent River. These streams could be impacted by activities that occur at the Goddard Space Flight Center. All of these streams are classified as Use I waters (Water Contact Recreation and Protection of Aquatic Life).

Anadromous fish

Anadromous fish species, including white perch (Morone americana), yellow perch (Perca

Telephone: (410) 260-8330
DNR TTY for the Deaf: (410) 260-8835

flavescens), and herring (Alosa sp.) have been documented spawning in the main stem and tributaries of the Patuxent River. All of these waters are considered to be sensitive habitats because of potential anadromous fish spawning.

Anacostia River

Headwater tributaries to Beaverdam Creek, which drain to Northeast Branch of the Anacostia River, could be impacted by activities that occur at the Goddard Space Flight Center. Northeast Branch and its tributary, Beaverdam Creek, are classified as Use I waters.

Anadromous Fish

The Northeast Branch and Indian Creek, downstream of Beaverdam Creek, are accessible to anadromous fish and are considered to be sensitive habitats because of potential anadromous fish spawning in this area. During the past several years, barriers to fish passage located in College Park and downstream areas have been removed as part of stream restoration efforts in the Anacostia watershed. Surveys are planned in the future to assess and track anadromous fish spawning in this area. At this time, it is expected that both anadromous river herring (Alosa sp.) and white perch (Morone americana) could spawn in Northeast Branch.

Other Natural Resources Issues

1. Forest Conservation Act - Requirements of the Forest Conservation Act and methods to assure project compliance should be addressed in the Facilities Plan. Much of the information that will be necessary for forest conservation plan review could be presented and discussed. This includes items such as description and mapping of environmental features and existing conditions of forest areas, sensitive areas, topography, soils, historic sites, and approximate limits of proposed disturbance and field verified forest boundaries. The description of existing forest and potential areas for retention should include an assessment of contiguous forest area, sensitive areas, trees more than 30 inches in diameter, rare plants, and any large trees associated with historic sites. Marion Honeczy, the Southern Regional Forest Conservation Coordinator, should be contacted at 410-260-8511 for additional information.

2. Terrestrial Wildlife Resources - The large wooded area in the study area is likely to have importance to forest interior dwelling species (FIDS). Existing habitat and proposed development should be evaluated in relation to these species. Discussion of landscaping and reforestation should address the goal of utilizing native plant species wherever possible. An updated guide to the conservation of FIDS habitat is available. For further information please contact Jim McCann at the Wye Mills Field Office 410-827-8612.

3. Deer Population- We are aware that there has been a large deer population on federal

installations in the past. An assessment of the deer population should be made and an evaluation of the potential for displacement of deer into adjoining properties and residential areas during development should be considered. Please contact Paul Peditto at 410-260-8595 for further information in this regard.

4. Threatened and Endangered Species - Habitat of threatened and endangered species occurs on the Goddard Space Flight Center property. For specific information on the occurrence of these species, please contact Katherine McCarthy 410-260-8569.

If you have any questions concerning this review, please contact Kate Meade of my staff at 410-260-8336.

Sincerely,

Ray C. Dintaman, Jr.

Ray C. Dintaman, Jr., Director
Environmental Review Unit

cc: Katherine McCarthy, FWHS
Paul Peditto, FWHS
Marion Honeczy, FWHS
Bob Rosenbush, MOP

RCD:CDM

MEMO — THE PRINCE GEORGE'S COUNTY PLANNING DEPARTMENT

June 11, 1999

Memorandum:

To: Tom Tyson, Countywide Planning Section, Community Planning Division

Via: Nick Motta, Chief, Natural Resources Division

From: Stacy Miller, Environmental Planner, Natural Resources Division

Re: Scoping process for Environmental Assessment, Goddard Space Flight Center (GSPC)

In the process of fabricating a Facilities Master Plan for the GSPC, NASA is required to prepare an environmental Assessment (EA). In its standard review of development projects, the Natural Resources Division of M-NCPPC evaluates the impacts of the development on the following environmental features. The EA should include an inventory and evaluation of the items as well. These features would be most effectively displayed for evaluation on Natural Resources Inventory (NRI) maps of a scale 1":50 feet or less.

- existing woodlands, forest stands and specimen trees
- streams and wetlands and minimal 50-foot and 25-foot buffers
- 100-year floodplain
- soil types and geology
- topography, and slope categories 15%-25% (steep) and greater than 25% (severe)
- noise corridors
- hazardous waste sites
- discussion of wildlife elements

In our cursory review of the area encompassed by GSFC, there are several environmentally sensitive issues that need consideration, as discussed below.

1) *Woodlands:* This part of the county contains a large regional woodland that should remain intact as much as possible. Minimization of disturbance through the use of structured parking and clustering of manmade features is recommended. This regional woodland, with its upland hardwood forest, is providing unique habitat, such as for forest interior dwelling birds. We request that forest stand delineation and forest conservation plan be prepared in conjunction with the site plans.

2) *Streams, Wetland, and Floodplain*: These features exist on the site and should be preserved with adequate buffers, such as those commonly used to protect the Patuxent River Primary Management Area. A portion of the site is, in fact, within the Patuxent River watershed. The other portion drains to Indian Creek. Both of these watersheds warrant special protection.

3) *Stormwater Management*: We recommend a referral to the Prince George's County Department of Environmental Resources. There are flooding problems associated with the Indian Creek watershed, and water quality issues for both Indian Creek and the Patuxent River.

4) *Soils:* There are problematic soils within the property that will need evaluation for stability, erosional hazard, and drainage problems. In particular the soils groups include soils that are highly erodible, hydric, and some that have shrink/swell characteristics.

5) *Wildlife*: The property contains wildlife habitat that warrant's discussion and protection.

G:\REFERRAL\NRDREF\GODDARD.SM

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore Maryland 21224
(410) 631-4120

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

June 15, 1999

Mr. Mark M. Daly, P.E.
Goddard Space Flight Center
National Aeronautics and Space Administration (NASA)
Facilities Management Division, Building 17, Code 224.3
Greenbelt MD 20771

RE: State Application Identifier: MD990511-0444
Project: Impact Baltimore

Dear Mr. Daly:

Thank you for the opportunity to review the above referenced project. The document was circulated throughout the Maryland Department of the Environment (MDE) for review, and the following comments are offered for your consideration:

The Facilities Master Plan and the Environmental Assessment should include information regarding the historic and current management and handling of petroleum products, hazardous and solid wastes, and surfaces with lead based paint at the facility. Future activities at the facility that could impact these management and handling systems should be detailed. Any efforts involving waste minimization, pollution prevention, and recycling should be included, as well as descriptions of contingency planning and emergency response to hazardous materials and oil spills.

For #2 and #3, the contact would be: Ms. Hilary Miller, Central/Southern Maryland Regional Manager, Office of Planning and Outreach Services, Waste Management Administration, Maryland Department of the Environment, 2500 Broening Highway, Baltimore MD 21224,
410-631-3336.

Again, thank you for giving MDE the opportunity to review this project. If you have any questions, please feel free to call me at (410) 631-3656.

Sincerely,

Susan Douglas for

Steven Bieber
Clearinghouse Coordinator

cc: Bob Rosenbush

Parris N. Glendening
Governor

Maryland Department of Natural Resources
Forest, Wildlife and Heritage Service
Tawes State Office Building
Annapolis, Maryland 21401

John R. Griffin
Secretary

Carolyn D. Davis
Deputy Secretary

June 16, 1999

Mr. Mark M. Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, MD 20771

Re: Facilities Master Plan for the Greenbelt Site of the NASA Goddard Space Flight Center (GSFC), Prince George's County, Maryland

Dear Mr. Daly:

The Wildlife and Heritage Division has no records for Federal or State rare, threatened or endangered plants or animals within this project site. This statement should not be interpreted as meaning that no rare, threatened or endangered species are present. Such species could be present but have not been documented because an adequate survey has not been conducted or because survey results have not been reported to us.

However, the Wildlife and Heritage Division's Natural Heritage database indicates that there are recent or historical records for species of concern known to occur within the study area or within the vicinity of the study area that could potentially occur on the site itself. They are:

Scientific Name	Common Name	State Status
Aimophila aestivalis	Bachman's Sparrow	Endangered Extirpated
Gomphus rogersi	Sable Clubtail	Endangered
Amelanchier obovalis	Coastal Juneberry	Endangered
Carex emoryi	Emory's Sedge	Highly Rare
Aeshna mutata	Spring Blue Darner	Endangered
Spenopholis pensylvanica	Swamp-oats	Threatened

Also, the forested areas on the project site contain Forest Interior Dwelling Bird habitat. Populations of many Forest Interior Dwelling Bird species (FIDS) are declining in Maryland and throughout the eastern United States. The conservation of this habitat is strongly encouraged by the Department of Natural Resources. The following guidelines will help minimize the project's impacts on FIDS and other native forest plants and wildlife:

1. Concentrate development to nonforested areas.

2. If forest loss or disturbance is absolutely unavoidable, concentrate or restrict development to the perimeter of the forest (i.e., within 300

Telephone: (410) 260-8540
DNR TTY for the Deaf: 410-974-3683

feet of the existing forest edge), particularly in narrow peninsulas of upland forest less than 300 feet wide.

3. Limit forest removal to the "footprint" of houses and to that which is absolutely necessary for the placement of roads and driveways.

4. Wherever possible, minimize the number and length of driveways and roads.

5. Roads and driveways should be as narrow and short as possible; preferably less than 25 feet and 15 feet, respectively.

6. Maintain forest canopy closure over roads and driveways.

7. Maintain forest habitat up to the edges of roads and driveways; do not create or maintain mowed grassy berms.

8. Maintain or create wildlife corridors (for details, see Critical Area Commission's Guidance Paper on Wildlife Corridors).

9. Do not remove or disturb forest habitat during May-August, the breeding season for most FIDS. This seasonal restriction may be expanded to February-August if certain early nesting FIDS (e.g., Barred Owl) are present.

10. Afforestation efforts should target (1) riparian or streamside areas that lack woody vegetation, (2) forested riparian areas less than 300 feet, and (3) gaps or peninsulas of nonforested habitat within or adjacent to existing FIDS habitat.

If you should have any further questions regarding conservation of these species, please contact Katharine McCarthy, Southern Regional Ecologist for the Wildlife and Heritage Division, at (410) 260-8569 or at the above address.

Sincerely,

Michael E. Slattery
MEB for

Michael E. Slattery,
Director,
Wildlife and Heritage Division

ER# 99.0772.pg

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
14741 Governor Oden Bowie Drive
Upper Marlboro, Maryland 20772
TTY: (301) 952-3796

June 18, 1999

MEMORANDUM

TO: Tom Tyson, Planning Coordinator, Countywide Planning Section

VIA: Tom Masog, Planning Coordinator, Transportation Planning Section

FROM: Fred Shaffer, Senior Planner, Transportation Planning Section

SUBJECT: Bicycle Recommendations for the update of the Goddard Space Flight Center Master Plan

The following trails/bikeways recommendations impacting the Goddard Space Flight Center are included in the Adopted and Approved Langley Park-College Park-Greenbelt Master Plan and the Adopted and Approved 1985 Equestrian Addendum:

1. An asphalt Class II hiker-biker trail is recommended along the center's entire frontage of MD 193 (Greenbelt Road). This recommended improvement is a top on-road trail priority of the Prince George's County Bicycle and Trails Advisory Group.

2. It is also recommended that Soil Conservation Road be designated as a Class III bikeway with appropriate signage.

In addition, it is also suggested that recommendations for bike racks, bike lockers, and bikeway signage and/or striped bike lanes(along all interior roads) be considered for inclusion in the update of the Goddard Space Flight Center Master Plan to encourage and facilitate bicycle access to and through the facility.

cc: Stacy Miller, Natural Resources
Eileen Nivera, Parks Department

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
14741 Governor Oden Bowie Drive
Upper Marlboro, Maryland 20772
TTY: (301) 952-3796

Prince George's County Planning Department
Office of the Planning Director

301-952-3595
D9-050703

JUN 23 1999

Mr. Mark M. Daly
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, Maryland 20771

Dear Mr. Daly:

This is in response to a letter dated April 28, 1999 concerning NASA's intention to update the Facilities Master Plan for the Greenbelt site of the Goddard Space Flight Center. The Center is an asset to Prince George's County and we applaud your efforts to keep your plan up to date.

When the Prince George's County Planning Department reviews your master plan, we will be most interested in impacts on transportation, environment and the surrounding area. I understand that your consultants have already been in contact with our Transportation Section as to our traffic study guidelines. Further, I am enclosing a memo concerning desired trails connections in the area. I am also enclosing a memo from our Natural Resources Division which outlines environmental considerations. Finally, we will want to assure that the views of the facility from Greenbelt Road remain compatible with the surrounding area.

The point of contact for the Prince George's County Planning Department is:

Tom Tyson
M-NCPPC
14741 Governor Oden Bowie Drive
Upper Marlboro, Maryland 20772
301-952-4712

When the draft environmental assessment is completed, please send six copies.

Sincerely,

Fern Piret

Fern V. Piret
Planning Director

Enclosures

John Hanson Business Center
339 Busch's Frontage Road, Suite 301
Annapolis, MD 21401

Phone 410-757-0861
Fax 410-757-0687

Mr. Mark E. Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, MD 20771

Subject: NASA Facilities Master Plan

Dear Mr. Daly:

In am responding to the letter from John Hodge dated April 28, 1999, regarding the NASA Facilities Master Plan. The letter was addressed to Robert Klumpe, who has retired.

Future correspondence related to facilities management or planning should be directed to:

John Englert, Manager
USDA-NRCS National Plant Materials Center
Bldg. 509, BARC-East
East Beaver Dam Rd.
Beltsville, MD 20705
Phone: 301-504-8175
Fax: 301-504-8741

Mr. Englert will serve as the point of contact for NRCS activities in the area of the NASA Goddard Space Flight facility. The Draft Environmental Assessment should be directed to him as well.

The only environmental issue we see at this point is the fact that part of the NASA facility (indicated on the map as "Network Training Test Facility") lies in the headwaters of the Beck Creek/Beck Lake water system. The National Plant Materials Center, located on Beaver Dam Rd., is currently considering use of Beck Lake for irrigation water. We would ask that any activities at NASA which may generate contaminants be looked at to minimize any potential contamination into this system.

Thank you for the opportunity to respond. Please feel free to contact Mr. Englert if you have any other questions.

Sincerely,

David Doss

David Doss
State Conservationist, Maryland

cc: Mark Waggoner, State Resource Conservationist, Annapolis, MD
John Englert, NPMC, Beltsville, MD

Maryland
Department of
Housing and
Community
Development

Division of Historical and Cultural Programs

100 Community Place
Crownsville, Maryland 21032

410-514-7600
1-800-756-0119
Fax: 410-987-4071
Maryland Relay for the Deaf:
1-800-735-2258

http://www.dhcd.state.md.us

Parris N. Glendening
Governor

Raymond A. Skinner
Secretary

Marge Wolf
Deputy Secretary

September 24, 1999

Mr. Mark M. Daly, P.E.
NASA Goddard Space Flight Center
Facilities Management Division
Building 17, Code 224.3
Greenbelt, Maryland 20771

Re: Facilities Master Plan
NASA Goddard Space Flight Center (GSFC) – Greenbelt Site
Prince George's County, Maryland

Dear Mr. Daly:

Thank you for your recent letter informing the Trust of NASA's initiation of preparations of a facilities master plan for the above-referenced property. Your correspondence requests information regarding four issues as part of the scoping process. Our comments in response to these issues are presented below.

Significant issues: The master plan should acknowledge and address NASA's responsibilities for cultural resources, pursuant to Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended. The property contains known and anticipated cultural resources, including a listed National Historic Landmark. NASA's planning efforts should address the long term preservation and reuse of significant historic properties as well as consider the impacts of future projects on cultural resources.

Agency contacts: The following staff handle the review of NASA's Goddard Space Flight Center projects:

Beth Cole, Administrator, Archeological Services (archeology)
Lauren Bowlin, Preservation Officer (historic structures)
Office of Preservation Services/Maryland Historical Trust
100 Community Place
Crownsville, MD 21032
410-514-7631 (Beth Cole)
410-514-7637. (Lauren Bowlin)

Recipient of Draft EA: Same as above agency contacts. You only need to send one copy of the document or any submittals for review, since we internally coordinate our agency response.

Cultural Resources Information: The Maryland Inventory of Historic Properties records several known archeological sites and historic structures on the NASA property. The enclosed maps from the Trust's GIS system illustrate the locations of inventoried sites, structures, and prior survey areas. The blue shaded area with dashed lines was archeologically surveyed in 1991 (Kassner et al. 1991); the survey did not identify any sites in the area examined. NASA prepared a draft cultural resources overview for the property in 1992 (Miller 1992) which summarized existing data for the property. The Inventory includes four archeological sites, illustrated on the enclosure with solid blue lines, in the northwest corner of the property: 18PR548, 18PR549, 18PR550, and 18PR551. The sites were recorded by KCI in 1997, but the Trust has no accompanying survey report documenting the survey results and recommendations. We do not know the nature and extent of the 1997 archeological survey efforts. We ask NASA to please provide us with a copy of the report for review and comment. The property may contain additional archeological sites which have not yet been identified.

As you are aware, the Spacecraft Magnetic Test Facility (PG:64-6) is a listed National Historic Landmark. Adjacent to the Goddard facility is the Baltimore Washington Parkway (PG:69-26). The Maryland Inventory also notes the existence of the c.1860s Perkins Chapel (PG:64-5).

If you have questions or require additional information, please call Ms. Lauren Bowlin (for structures) at (410) 514-7637 or me (for archeology) at (410) 514-7631. Thank you for your cooperation and assistance.

Sincerely,

Elizabeth J. Cole
Administrator, Archeological Services

EJC/LLB/
199901281

APPENDIX B

DRAFT FMP AND EA REVIEW COMMENTS

APPENDIX B
TABLE OF CONTENTS

Bob Rosenbush - Transportation Comments: NASA Greenbelt - Facilities Master Plan

MD 20020625-0582

From: David Whitaker
To: Bob Rosenbush
Date: 7/16/02 5:34PM
Subject: Transportation Comments: NASA Greenbelt - Facilities Master Plan

Bob,

These are Transportation Comments for the NASA Greenbelt - Facilities Master Plan:

The analysis portion appears to focus on qualitative constraints and does not contain a quantitative analysis of transportation trends and modes for the NASA site and the plan does not directly address goals for numerical benchmarks. As such the Transportation Management Plan is incomplete.

The transportation demand management strategies proposed for the site appear to be diffuse and have not brought together into a coherent short term set of strategies.

(1) Maryland Department of Planning (MDP) highly recommends that strict adherence to the two (2) *persons* per vehicle parking standard as indicated in the National Capital Planning Commission Federal Transportation Policies, Federal Parking Policies, be adopted for the NASA Greenbelt site.

To support these additional TDM strategies, MDP encourages NCPC to fully promote transportation demand management to the proposed NASA site by incorporating TDM recommendations related to carpool, vanpool and bicycle commuting options. Both short term and long term goals should be set for the site. In addition, a transportation management coordinator position should be established to coordinate demand strategies for the NASA site and meet established SOV reduction goals through carpooling and use of other modes. Transit access should be improved to the site, including WMATA bus, METRO and MARC shuttle services.

(2) Additionally, the focus on building "meandering paths for cyclists and pedestrians" (page 4-12) should be reconsidered. While this may be a suitable on-site landscape design issue, meandering paths are usually ineffective for bicycle commuting transportation purposes. Instead, we recommend that bicycle paths and on-road bicycle lanes be part of the facility redesign. This should also include the use of secure bicycle racks/lockers and on-site shower facilities at building sites. We recommend supplementing the proposed TDM strategies with language indicating the following:

- Provide secure bicycle racks/lockers to accommodate up to 5% of the employees at the site.
- Provide on-site shower facilities for commuter cyclists.
- Consider budgeting funds for bicycle commuter subsidies per employee that use this commuter option.

****

Please do not hesitate to contact me regarding these comments. It is clear the the Transportation Management Plan is inadequate and does not effectively manage transportation infrastructure or future demand at the NASA Greenbelt site.

David

CC: Bihui Xu; Linda Janey

(1) NASA GSFC is located outside the I-495 Washington Beltway, where NCPC has established a Federal parking policy of 0.67 or two spaces for each three employees.

(2) NASA employees currently use an informal network of trails and, the site perimeter security roads for biking, walking, and jogging during the lunch hour after work. The Facilities Master Plan proposes three types of pedestrian paths: inter-neighborhood connections, intra-neighborhood connections, and recreational paths. The first two types would interconnect with the County trail system for bicycle commuting by employees. The recreational paths would be located in the undeveloped areas, as now, and are not intended as internal site connecting routes, or commuter routes.

In D20020625-0682

From: David Whitaker
To: Bob Rosenbush
Date: 7/17/02 12:39PM
Subject: Fwd: Addendum - Transportation Comments: NASA Greenbelt - Facilities Master Plan

The transportation analysis for the NASA Greenbelt Facility should include the following.

(1)
* Peak Hour Vehicle Trips
* Travel Mode Split
* Average Passenger Occupancy
* Intersection Level of Service
* County Bicycle, Pedestrian, and Multi Use Trail network
* Peak Parking Utilization

Enhanced Transportation Demand strategies should reduce the impact of SOV trips generated by the NASA Greenbelt complex on the local and regional road network and maximize the use of public transportation to the site.

(2) Proposed TDM Strategies for the NASA Greenbelt Complex:

* Create a Transportation Management Coordinator to Develop New Programs and Enhance Existing TDM Programs
* $100 Transit Subsidy
* One Parking Space per Two Employees Ratio (1:2)
* Preferred Parking for Carpool/Vanpool Vehicles
* Pilot Telecommuting (Establish telecommuting centers at locations throughout the Region)
* Develop Alternative Work Schedules to Promote Off Peak Commuting and Four Day Work Week
* Coordination with WMATA and other Transit Providers to Enhance Service to the NASA Facility
* Establish an Incentive Program to Reward Employees Who Use an Alternative Transportation Mode (other than SOV) At Least Once a Week

(1) Traffic related topics for the Facilities Master Plan are covered in Section 7.4. For travel mode split, see Section 5.2.7. For pedestrian and bicycle conditions, see Section 5.2.6, and Facilities Master Plan Section 4, Figure 11. For parking, see Section 5.2.4. The estimated existing Average Passenger Occupancy is 1.09 based on the employee travel mode split and two occupants per car or vanpool.

(2) NASA has prepared a more definitive Transportation Management Plan which is summarized in Section 5.2.7. It includes these items.

MD 20020710-0787

From: "Fatimah Hasan" <fhasan@mdot.state.md.us>
To: <BRosenbush@mdp.state.md.us>
Date: 8/8/02 4:29PM
Subject: Comments on Goddard Space Flight Center Facilities Master Plan

Bob,

Regarding this A-95 Clearinghouse review request, this Plan is consistent with our plans, programs and objectives. I would like to suggest in one instance, in the transportation write-up starting on p. 6-7, that the Plan refer to the Transportation Efficiency Act for the 21st Century (TEA-21), in addition or instead of ISTEA.

This will bring the Plan more up-to-date, and will clarify that there are now 7 "planning factors" as indicated in TEA-21, not 15, as was identified in ISTEA. The Financially Constrained Long-Range Plan for the National Capital Region (CLRP), 2000, that is mentioned in the Plan, refers to TEA-21 as well. Thanks

Fatimah

Fatimah Al-Amin Hasan, AICP
Office of Planning and Capital Programming
Maryland Department of Transportation
10 Elm Rd., P.O. Box 8755
BWI Airport, MD 21240
410 865 1270 (phone)
410-850-9263 (fax)
fhasan@mdot.state.md.us

CC: "Carl Bartlebaugh" <cbartlebaugh@mdot.state.md.us>, "Ron Spalding" <rspalding@mdot.state.md.us>

Comment: of the Four possible New Alignments for Soil Conservation Rd. -

I prefer the ALTERNATIVE E2 (EAST - High) Variant.

ON Page 5-44 of the Facilities Master Plan.

Top Right Corner - Prince Geo. Co. Sports Ctr

- IS There ANY PLAN To Place A BERM between The Sports Center AND The DRAINAGE Creek To STOP ANY STRAY Shotgun Pellets Resulting from TARGET PRACTICE in The Wood Armed South-South Westerly?

(1)

I feel This Needs to be examined To ENSURE THAT CARS ARE NOT Struck while TRAVERSING The Newly Aligned Soil Conservation Rd.

L. H. Wentz, SR
8101 Willowgate Pl.
Glenn Dale, MD 20769

(1) Firing at the range is to the north-northeast in the opposite direction from NASA and relocated Soil Conservation Road. Shooter stations, which are separated by walls, are shown in Figure 3-3. Firing guns at locations other than the range stations is prohibited. The nearest approach of Soil Conservation Road Alignment Alternative E-2A to the firing range would be about 450 yards, well beyond the range of shotguns.

Aug 6 02

The high cost of staffing guard posts on each

(1) entrance along Soil Conservation Road are assumed to be an important, (unstated high cost consideration).

This could be

(2) resolved by a ramped overpass between the East and West installations,

L. Keller
9412 Eldorck Pl,
Lanham MD 20706

(1) Goddard currently has four principal gates for employee access: The Main Gate on Greenbelt Road, the Baltimore-Washington Parkway access (Gate 3), and Gates 5 and 16 on Soil Conservation Road (see Figure 5-4).

Relocation of Soil Conservation Road to the east side of the east campus, would in effect replace Gates 5 and 16 by new North and South Gates located directly on old Soil Conservation Road, so that the number of manned or guarded gates would remain the same. When the Partnering and Outreach Zone is eventually implemented, the Main Gate will be converted to exclusive use by NASA partners. It will have free public access with no checkpoint. The number of guarded gates will then return to three.

(2) An overpass or bridge between the two campuses was considered as a preliminary alternative (See Figure 7-4 and Section 7.3.2.3). The bridge alternative was rejected for the reasons given in Section 7.3.2.3.

COMMENT RECEIVED
AT AUG. 10, 2002 COMMUNITY MEETING

"UNSIGNED"

SUNDAY 10

(1) Why not build an underpass from the east campus to the west campus that passes under Observation Road?

This would not disturb the existing traffic pattern and would connect both campuses.

(1) See Sections 7.3.2.2 and 7.3.2.3

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, MD 20771

August 6, 2002

Facilities Master Plan and Soil Conservation Road Realignment Project

Comment Form

GSFC welcomes written comments on this plan and its contents until 3 September 2002, using this sheet or any other written form. This form, with your comments, can be placed in the designated box at this meeting or mailed to:

Mr. Kim Toufectis
Project Manager
Facilities Management Division Planning Office
Code 221
Goddard Space Flight Center
Greenbelt, MD 20771

If you have comments or questions about the Draft Facilities Master Plan or the Soil Conservation Road realignment or on the review process, please contact Mr. Kim Toufectis at (301) 286-9952.

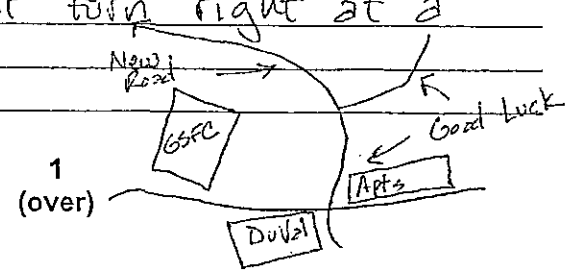
Your name: (please print) Patricia Lyles

Your mailing address (with zip code) 10506 Forestgate Place
Glenn Dale MD 20769

Comment:

I support & encourage the realignment of SCS Service Road such that ~~[illegible]~~ traffic on SCS Service Road is the continuous flow and traffic wishing to continue North on Good Luck must turn right at a stop light.

(1)



1
(over)

(1) The proposed alignment of Soil Conservation Road has been revised to make it the through route at the Good Luck Road intersection.

10021 Good Luck Road
P.O. Box 690
Glenn Dale, Maryland 20769

August 9, 2002

NASA/Goddard Space Flight Center
Greenbelt, MD 20771

Attention: Mr. Kim Toufectis
Code 221

Dear Mr. Toufectis,

I appreciate you taking the time to talk to my husband and me on August 6th and returning my call on August 7th. In our discussion on the 7th I gave you several reasons why I didn't think concept #4 was a good idea. I also told you that my husband and I would like to be included in any discussion that you may have concerning the Soil Conversation Road (SCR) bypass. (1)

In talking to the neighbors South of us, they were unaware of any road changes. They would also like to be included in any discussions since their business will be effected.

After some very serious thinking, I have come up with the following reasons for not going with concept #4.

They are:

Traffic on Northern Avenue will be increased because you have given others a short cut to SCR bypass. The County has an agreement with the folks on Northern Avenue that their road will remain as is. Two lanes and no trucks with at least a 40 foot buffer on industrial side of road..

Inconvenience of getting in and out of properties located on service road onto SCR bypass.

Making a "U" turn at North end of service road to go South.

Back tracking

Dumping along service road --- trash, abandoned cars, stolen cars, discarded furniture etc.

Hang out for teen (and other who want to party)

Increase in vandalism

Haven for drug dealings

Except for the drug dealings, We have been thru this. We would like to keep the clean and safe environment that we have worked for.

People presently using Good Luck Road have other destinations besides SCR. I would say that the majority of them because, there is a shorter and better route from the North end of Good Luck Road to Soil Conservation Road.

(1) Alternative E-2 was presented as Concept 4 at the meeting.

The people will have to use the bypass going South but, I will bet you that when they go North ,they will use the service road because it will be more convenient.

Traffic on Soil Conservation Road is only heavy during rush hour and a lot of that is Goddard employees going to or leaving work. Usually when I use SCR, I'm the only one on the road except for the joggers, bicyclist and sometimes, walkers.

(2) Using the concept of a right yield off Rt 193 onto Good Luck Rd and a left hand turn onto SCR bypass, with a light at this intersection (Good Luck and Soil Conversation bypass), will cause the least disruption to the flow of traffic on Good Luck Road and impact on the surrounding community.

If it is found that people are using Northern Ave. for a short cut, you put in a few quite zones like they have in Seabrook.

Actually, I think you will find most people will continue to use Rt 193. Although you have more lights on Rt 193, the traffic flows smoothly and you have the right yield off Rt 193 onto Good Luck Road.

Thanks for your interest in what we think. We look forward to hearing from you.

Sincerely Yours,

Donna and Erich Fronck

Donna and Erich Fronck
301-794-6027

(2) The Soil Conservation Road Intersection with Good Luck Road has been revised to make Soil Conservation Road the through route. Commuters who now use Soil Conservation Road do so even though it is a longer route with many more traffic signals than Springfield Road. Short cut traffic on Northern Avenue is not anticipated.

Maryland Department of Housing and Community Development

Division of Historical and Cultural Programs

100 Community Place
Crownsville, Maryland 21032

410-514-7600
1-800-756-0119
Fax: 410-987-4071
Maryland Relay for the Deaf:
711 or 1-800-735-2258

http://www.dhcd.state.md.us

Parris N. Glendening
Governor

Raymond A. Skinner
Secretary

Marge Wolf
Deputy Secretary

August 12, 2002

Mr. Kim Toufectis
NASA Goddard Space Flight Center
Facilities Management Division
Building 18, Code 221.0
Greenbelt, MD 20771

Re: Draft EA for the Draft GSFC Facilities Master Plan including Soil Conservation Road Realignment (MD20020710-0787);
Prefinal Draft of the GSFC Facilities Master Plan and Transportation Management Plan (MD20020625-0682);
Greenbelt, Prince George's County, MD (Section 106 Review – NASA)

Dear Mr. Toufectis:

Through the Maryland State Clearinghouse, the Maryland Historical Trust (Trust) received the following two draft documents: *GSFC Facilities Master Plan* and *Draft Environmental Assessment for the Draft GSFC Facilities Master Plan including Soil Conservation Road Realignment at Greenbelt, Maryland* (EA). The Trust reviewed the documents to assess the potential effects of proposed undertakings on historic properties, including archeological sites and historic structures (pursuant to Section 106 of the National Historic Preservation Act of 1966).

Based on the submitted materials, he Trust agrees that the activities described in the Master Plan and the EA, with the exception of the Soil Conservation Road Realignment, will have **no effect to historic properties.** We understand that NASA is currently conducting Phase II archeological investigations to determine the National Register eligibility of three archeological sites that may be impacted by the proposed road realignment. We await the results of those investigations. Further consultation with the Trust will be necessary to conclude the Section 106 review of the Soil Conservation Road Realignment, as planning proceeds for that project.

(1)

(1) The understanding is correct. Phase II investigations for Sites 18PR548, 18PR549, and 18PR551, were completed in September 2002 and submitted to the Trust for review. NASA will consult with the Trust as necessary to conclude the Section 106 process as design and construction proceed.

Regarding the historic built environment, as suggested in our prior review, the EA recommends that National Register eligibility is reviewed periodically as buildings and structures become fifty years old. We also agree that consultation on the reconditioning of the Baltimore-Washington Parkway/NASA interchange occur when appropriate. The Trust understands that no changes to the National Historic Landmark Spacecraft Magnetic Test Facility are proposed at this time.

Finally, we offer the following editorial comments on the two draft volumes. For the document containing the Master Plan we offer this suggestion:

- On page 2-13 in the paragraph beginning with Context:, sentence 2, it should read "Resources over 50 years old *may* be eligible for the National Register of Historic Places," not *are*.

We appreciate this opportunity to review the Goddard documents. If you have any questions or require further information, please contact Ms. Tania Tully (historic built environment), 410-514-7636) or me at 410-514-7631 (archeology).

Sincerely,

Elizabeth J. Cole
Administrator
Project Review and Compliance

EJC/TGT
200202640/789
cc: Mr. Paul DiMinco (NASA)
Mr. Don Creveling (M-NCPPC)
Ms. Nancy Witherell (NCPC)
Mr. Bob Rosenbush (MDP)

Your name: Sanford Hinkal
Your mailing address: 9618 Wellington St., Seabrook, MD 20706-3654
Comment:
The GSFC Facilities Master Plan unnecessarily isolates the NASA facility from the surrounding community, to the detriment of the community, GSFC, and the broader society.
Goddard is part of the problem of traffic congestion, air pollution, and negative impact on quality of life. That is because most NASA employees and their contractors choose not to live in or near the community where they work.

(1) There is a need for more leadership and innovative thinking that could look toward creating and leading toward a trend in the opposite direction. Within a short walk from the present GSFC entrance there is much housing and many attractions for quality living. Encouraging employees to be a part of this community would strengthen NASA's position in the community, contribute to quality of life in the region, and serve as an example for others from within Prince George's County, which is in need of good examples and this type of leadership and innovation.

(2) Within an even shorter walk from a gate near the present intersection of Soil Conservation Road and Greenbelt Road (route 193) there are schools from elementary through high, and an outstanding community science center and planetarium. From where I live in Seabrook several houses away from Gaywood Elementary, where my children attended until busing carried them from the community, it is a 30-minute walk to the present Soil Conservation Road entrance to GSFC. I know, I've walked it enough times that I know the time required well. It's a dangerous walk, without provision for pedestrians, but if you can do it at all that's the time it takes. Even less by bicycle, although I never dared that in my over 30-year career at Goddard. From my house, it is also just a short walk to community buses, and only 15 minutes to the MARC train station in Seabrook, from which a train can be caught to downtown DC to connect by subway to, for example, NASA Headquarters. Trains can be caught to Baltimore or beyond. But there is no friendly pedestrian access. (Walkways and a safe crossing and walk from the north side to and at this train station are needed for a broader community plan.)

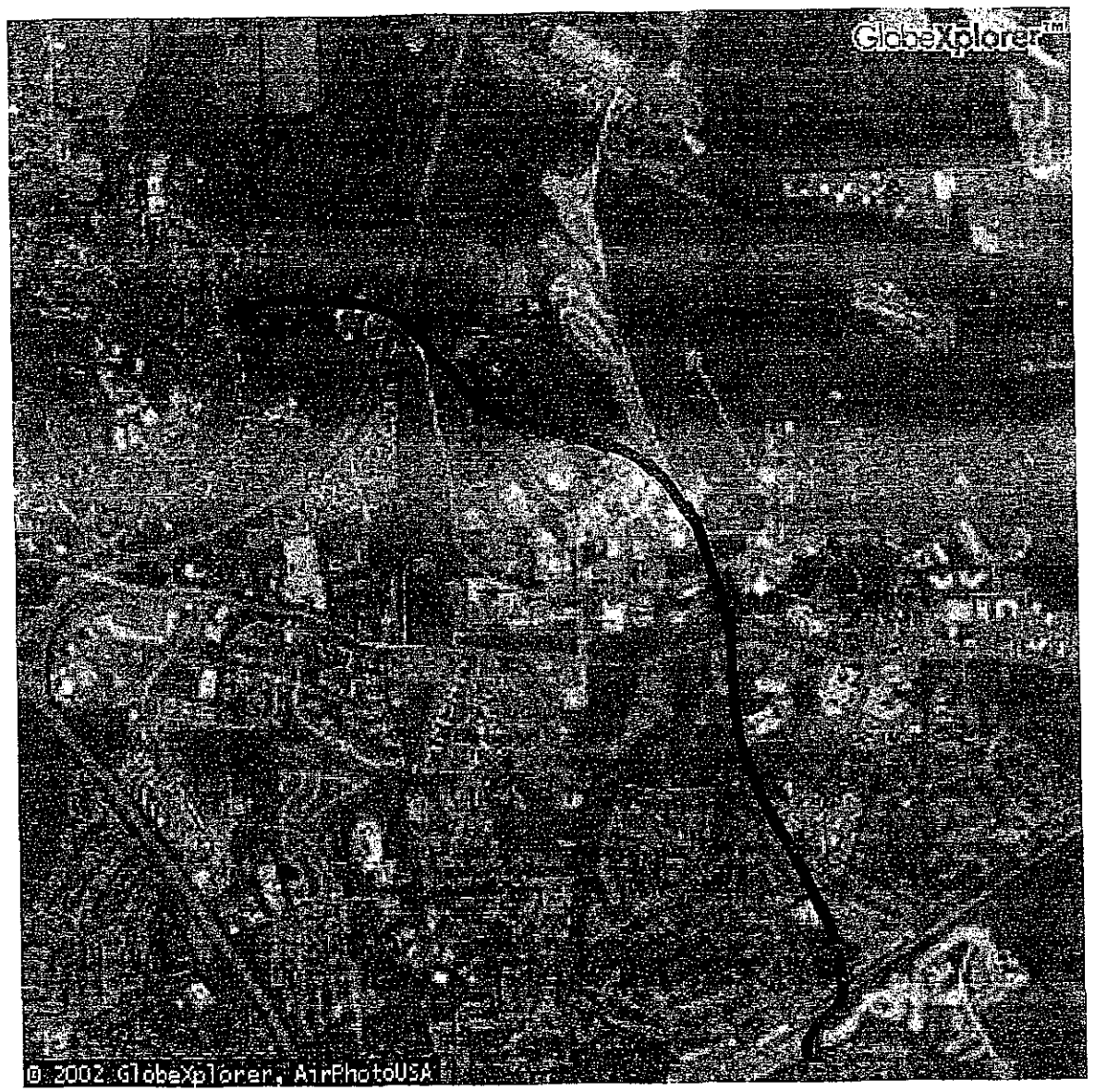
What is needed is some forward thinking that integrates access and encourages living in and walking and biking from the nearby apartments and single family dwellings to Goddard. The planned bike paths can be connected with paths into, not bypassing, the community in order to do this. This means creating paths away from traffic with safe crossings into Seabrook and Greenbelt, not just along route 193.

(1) The greatest density of NASA employee residences does occur in the immediate environs of GSFC.

(2) Trails and sidewalks beyond Goddard boundaries are the responsibility of The Maryland Department of Transportation and Prince George's County. The Facility Master Plan connects the proposed internal campus pedestrian/bicycle system to these agency's trail system. The County's South Laurel Trail follows Soil Conservation Road. This trail will be relocated along with the road realignment so that it will follow Soil Conservation Road and Good Luck Road.

Integrated Community Commuting Bike Path Concept

(3)



Seabrook Train Station (MARC) to GSFC and GSFC to Greenbelt with connecting path within GSFC secure area. Connections to Rte 193 Bike/Walk Path & safe crossings along 193.

Sanford Hinkal
August 19, 2002

(3) The Facilities Master Plan relocates the section Soil Conservation Road through Goddard to a connection with Good Luck Road to consolidate campus facilities, and improve operational efficiency and meet site security requirements. Soil Conservation Road Alignment Alternative E-2A will implement this concept. Existing Soil Conservation Road will be severed, and converted to NASA employee only entrances. Public access through the site, now available on existing Soil Conservation Road, will be eliminated. The route shown here which follows existing Soil Conservation Road is not feasible under these conditions.

10021 Good Luck Road
P.O. Box 690
Glenn Dale, MD 20769

Dear Mr. Toufectis:

At the August 15th meeting I learned that not only would we have commuters to Powder Mill Road using Good Luck Road (GLR) and the new entrance to Soil Conservation Road (SCR) but, we would also have the trucks that pick-up and deliver to Goddard Space Center.

That bit of news was distrubing but, it got worse. When asked about how many
(1) trucks they were talking about, at least 75 a day was mentioned. That means at least 150 trucks a day using GLR/SCR. These are not all small trucks. We are talking 18 wheelers along with various other size trucks. The time frame given was between 7am - 3pm, an 8 hour period. That means an average of 18 per hour with a few left over. There are also times when equipment is moved at night. (At least in the past) Does anyone know what
(2) these trucks are hauling? Is it hazardous material? Also, the sound of air brakes or the truck down shifting would be very startling.

The intersection at Rt 193 and Good Luck Road is already dangerous and adding truck traffic will make it worse. There are **children** crossing the street at any
(3) given time to reach the bus stop, basketball & tennis courts, football field and to attend school. Children do not always look before crossing a street or feel that they can beat the traffic. Also, the truck traffic would impede the ability to enter and exit the Apartment complex, making it difficult for the people who live there to get in and out. I know the apartments are not single family dwellings but, it is home to many people and part of our community.

(4) The trucks will cause vibration, create a noisy environment and pollute the air. That many trucks will also cause a wagon train effect. I was also told many years ago
(5) that GLR was not built to handle heavy vehicles.

It seems that Goddard wants to remove their heavy traffic from their campus and put it into the community. Why can't they use one of their entrances off Rt. 193, as they
(6) are doing now, to route their deliveries and pick-up to their depot? (Both present and future) If they don't want to use one of those, let them use the unused gate at the west side of their campus and route it to their facility internally. That way, they are going off Rt. 193 onto their property and not into the community.

Thanks for letting me express my concerns.

Sincerely yours,
Donna Lee Fronck
Donna Fronck
301-794-6027
8-19-2002

(1) See new Section 7.4.2.2 for discussion of trucks. There will about 50 arrivals per day and most will arrive during the normal work hours between 8:00 AM and 5:00 PM. The average number per hour will be about 5.6 per hour. Once on site, the trucks may leave by any exit except for Gate 3 to the Baltimore Parkway, where trucks are prohibited.

(2) Site generated Hazardous and radioactive wastes are handled and transported from the site by contractors licensed by the Federal and State governments. Most of the hazardous waste is handled in "lab pack" containers that are five gallons or less in size and transported by small panel trucks. Service is provided as needed, but is generally not more than once a week. An average of less than one 55-gallon drum of low level radioactive waste is generated each year and shipped off site for disposal.

(3) All roads, sidewalk, and crosswalk facilities associated with the project, including the Greenbelt/Good Luck Road intersection, will be designed and built in accordance with Maryland State Highway Administration standards, specifications, and criteria. Any effects on access to the Countryside Apartments would be less than those existing at the many condominium, apartment, and commercial facilities along Greenbelt Road.

(4) Virtually no change in noise levels will occur in the southern half of the Countryside Apartment complex. Noise levels is this section are dominated by Greenbelt Road traffic. The one hour equivalent noise levels will only increase from 66 to 67 dBA.

In the northern section, and only within about 200 feet of Good Luck Road, the existing noise levels will increase from 58 dBA to 62 dBA by 2022. Values are lower because of greater distance to Greenbelt Road. Since there are only about 5 to 6 trucks per hour, or one every 10 to 12 minutes, the one hour equivalent noise levels are determined by overall traffic volume increases and not the occasional truck.

(5) See response 3.

(6) See Section 7.4.2.4.

State Application Identifier: MD20020625-0682

Comments from the Maryland Department of the Environment's Water Management Administration:

This project is consistent with our plans, programs, and objectives.

(1) **Comments from the Maryland Department of the Environment's Air and Radiation Management Administration:**

1. If the applicant suspects that asbestos is present in any portion of the structure that will be renovated/demolished, then the applicant should contact Mr. Frank Whitehead, Community Environmental Services Program, Air and Radiation Management Administration at (410) 631-3215 to learn about the State's requirements for asbestos handling.

2. Construction, renovation and/or demolition of buildings and roadways must be performed in conformance with State regulations pertaining to "Particulate Matter from Materials-Handling and Construction" (COMAR 26.11.06.03D), requiring that during any construction and/or demolition work, reasonable precaution must be taken to prevent particulate matter, such as fugitive dust, from becoming airborne.

3. If boilers or other equipment capable of producing emissions are installed as a result of this project, the applicant is requested to obtain a permit to construct from MDE's Air and Radiation Management Administration for this equipment, unless the applicant determines that a permit for this equipment is not required under State regulations pertaining to "Permits, Approvals, and Registration" (COMAR 26.11.02.). A review for toxic air pollutants should be performed. Please contact Dr. Justin Hsu, Ph.D., P.E., New Source Permits Division, Air and Radiation Management Administration at (410) 631-3230 to learn about the State's requirements and the permitting processes for such devices.

(2) 4. The applicant is encouraged to plan for the maximum utilization of carpools and public transit by employees providing preferential carpool/vanpool parking and bus shelters for commuters that use these methods of transportation. This will minimize the adverse impact of additional traffic generated by the proposed project. Please contact the Mobile Sources Program, Air and Radiation Management Administration at (410) 631-3270 for additional information.

(3) 5. If a project receives federal funding, approvals and/or permits, and will be located in a nonattainment area or maintenance area for ozone or carbon monoxide, the applicant should determine whether emissions from the project will exceed the thresholds identified in the federal rule on general conformity. If the project emissions will be greater than 25 tons per year, contact James Wilkinson, Air and Radiation Management Administration, at (410) 631-3245 for further information regarding threshold limits.

(1) These are standard requirements of the Maryland Department of the Environment which NASA has already met, complies with, or will comply with if applicable in the future.

(2) NASA has prepared a more formal Transportation Management Plan as part of the Facilities Master Plan documentation. The TMP includes these Transportation Demand Measures among others. See Section 5.2.7.

(3) The Facilities Master Plan as a development guidance document does not produce emissions and the conformity analysis is not required. The total VOC and NOx budgets for transportation related emissions for the Washington Metropolitan region are 102 and 162 tons/day, respectively. The Soil Conservation Road realignment emissions are inconsequential in comparison.

6. Fossil fuel fired power plants emit large quantities of sulfur oxide and nitrogen oxides, which cause acid rain. In addition, nitrogen oxide emissions contribute to the problem of global warming and also combine with volatile organic compounds to form smog. The MDE supports energy conservation, which reduces the demand for electricity and therefore, reduces overall emissions of harmful air pollutants. For these reasons, MDE recommends that the builders use energy efficient lighting, computers, insulation and any other energy efficient equipment. Contact the U.S. EPA at (202) 233-9120 to learn more about the voluntary Green Lights Program which encourages businesses to install energy-efficient lighting systems.

7. Project should support resource conservation and pollution prevention through land use and transportation designs that provide alternatives to single occupant vehicle use.

Comments from the Maryland Department of the Environment's Waste Management Administration:

8. Any above ground or underground petroleum storage tanks that may be utilized must be installed and maintained in accordance with applicable State and federal laws and regulations. Contact the Oil Control Program at (410) 631-3442 for additional information.

9. Any solid waste including construction, demolition and land clearing debris, generated from the subject project, must be properly disposed of at a permitted solid waste acceptance facility, or recycled if possible. Contact the Solid Waste Program at (410) 631-3318 for additional information.

10. The Hazardous Waste Program should be contacted directly at (410) 631-3343 by those facilities which generate or propose to generate or handle hazardous wastes to ensure these activities are being conducted in compliance with applicable State and federal laws and regulations.

11. If it is suspected that lead paint may be encountered during the proposed rehabilitation project, proper lead abatement remediation procedures must be implemented. Lead paint abatement services including engaging in risk assessment, inspection, or abatement of lead-containing substances, in residences, commercial buildings, public buildings and steel structures, may not be provided without accreditation by MDE. Contact the Lead Compliance Division at (410) 631-3827 for additional information.

12. MDE requests that efforts be made to prevent contamination of the surface and ground water of the State of Maryland during the construction and renovation activities. In the event that spills or other releases of petroleum or hazardous materials occurs from the proposed operations which may potentially impact State waters, MDE requests prompt notification at (410) 974-3551.

CITY OF GREENBELT, MARYLAND

25 CRESCENT ROAD, GREENBELT, MD. 20770 - 1886

August 22, 2002

Mr. Kim Toufectis
National Aeronautics and Space Administration
Facilities Management Division Planning Office
Attention: Facilities Master Plan
Code 221
Goddard Space Flight Center
Greenbelt, MD 20771

RE: National Aeronautics and Space Administration Goddard Space Flight Center
Draft Facilities Master Plan and Draft Environmental Assessment

Dear Mr. Kim Toufectis:

The Greenbelt City Council has carefully reviewed the National Aeronautics and Space Administration Goddard Space Flight Center (NASA GSFC) Draft Facilities Master Plan and Draft Environmental Assessment that proposes to reconfigure the campus to create "neighborhoods" of similar research interests, consolidate security gates, upgrade facilities, demolish some buildings and construct new ones, create a more pedestrian friendly environment, and reconfigure Soil Conservation Service (SCS) Road, while still serving the needs of the public to travel through the area.

On August 12, 2002, the Greenbelt City Council voted unanimously to submit the staff report on the NASA GSFC Draft Facilities Master Plan and Draft Environmental Assessment to NASA and the Maryland Department of Planning with the following conditions/findings:

(1) 1. The City be informed of alterations to the facilities master plan that would have a significant impact on the City and its environs in the event that this plan or its proposed implementation is altered, or reevaluated before the 2022 time period that it covers.

(2) 2. NASA GSFC provide adequate on-site wetland mitigation and reforestation and not pursue wetland banking or off-site mitigation options. The City should also receive a copy of the mitigation plan and accompanying route survey when a definite reconfiguration of Soil Conservation Service Road is chosen.

3. NASA GSFC develop a plan to actively reforest areas where buildings are demolished, instead of letting these areas grow back over time. The plan should

A NATIONAL HISTORIC LANDMARK
(301) 474-8000 FAX: (301) 441-8248 TTY: (301) 474-2046
www.ci.greenbelt.md.us

(1) NASA agrees.

(2) See new Section 7.4.10.1 It is most likely that mitigation will occur on-site as this is generally much less expensive. Off site options are being retained only to cover this contingency. NASA will forward a copy of the mitigation plan to the City.

(3) clarify which areas that are scheduled for demolition will be reforested and which are not planned to be reforested. The plan should at least replace the quantity of forest that will be lost due to implementation of the Facilities Master Plan, and, when possible, the reforestation should occur in large, continuous sections, rather than in a piecemeal fashion. NASA GFSC should furnish a copy of the reforestation plan to the City.

(4) 4. NASA GSFC work closely with the City and County to establish better transit connections to the site and coordinate with the City when exploring specific short or long term transportation management options, such as HOV lanes and park-and-ride facilities as to the appropriateness of such measures.

(5) 5. NASA GSFC provide the City with a definitive plan for improving the area roadway system that details mitigation actions to be taken along with an implementation schedule. The plan and environmental assessment indicate that all intersections but one would be at a level of service "D" or above if mitigation steps are taken. The plan does not make clear if these steps will be taken, who will pay for them, or when they may be implemented. The City should not support the facilities master plan if improvements are not made to the area roadway system, as congestion is predicted to be at unacceptable levels.

(6) 6. NASA GSFC refer the chosen alignment of Soil Conservation Service Road to the City for review when a definitive decision is made.

(7) 7. The City wants to continue to discuss the acquisition of the eighty-acre buffer area on the western side of the site with NASA GSFC.

8. NASA GSFC should formally delineate an improved bicycle/pedestrian access point to the campus from the end of Northway in Greenbelt to the NASA GSFC employee entrance gate.

(8) 9. NASA GSFC create a specific and certain parking reduction plan that includes implementation measures and a time frame for when the stated parking reduction goals in the Facilities Master Plan will occur. It is hoped that reductions can occur within a short time frame.

10. Soil Conservation Service Road should not be realigned, but rather engineered in its current location so that it meets the transportation goals of the public and NASA as well as NASA's campus integration objectives.

(9) 11. The City be enabled to review in detail the plans for the Partnering and Outreach Zone as they develop. If this proposal develops, there should be no tax impact to local governments due to businesses vacating nearby private office space to locate on-site.

(3) A Master Plan is conceptual in nature, and precise determination of impacts are not always possible. It is estimated that about 10 acres of forest will be lost when proposed Master Plan facilities are implemented, and a similar amount through construction of relocated Soil Conservation Road. Reforestation could amount to 60 acres. Forest loss mitigation will be determined on a building by building basis.

By mutual agreement, NASA has submitted Forest Conservation Plans to the Maryland Department of Natural Resources on a project by project basis in the past. Past conservation areas are shown in Facilities Master Plan Figure 13 in Chapter 4. These plans set aside areas of mature existing forest for permanent conservation (See Figure 5-16). This procedure will continue in the future. NASA will furnish a copy of the plan for Soil Conservation Road to the City.

(4) NASA has prepared a more definitive Transportation Management Plan as part of the Facilities Master Plan documentation, although it is under separate cover. See new Section 5.2.7 for a summary. Strategies in the plan call for exploration of alternatives to single occupancy vehicle travel for employee commuting, including cooperative efforts with others.

(5) All the roads in the area will become increasingly congested over the next 20 years. This will be due to growth in traffic from private development throughout the region, the County, and the MD 193 corridor. These traffic impacts will occur even if NASA does nothing, or if its employee population remains the same or declines. The traffic analysis for 2022 assumes that the necessary public improvements to maintain traffic levels of service will be completed when the circumstances dictate this be done over the next 20 years. They are shown in Table 7-9 as No Action Alternative improvements, i.e. NASA will make no changes in its facilities or personnel.

NASA is not responsible for congestion created by others. NASA GSFC will not generate traffic impacts unless the site employee population increase. All traffic impacts given in Section 7 would occur only if some mission requiring added 1,000 employees to Goddard. Based on current projections, it is much more likely that site population, and subsequent traffic generation, will remain at or close to current levels.

Responsibility for these improvements therefore rests with the State and County transportation agencies. NASA, however, will make all improvements necessary for and directly related to realigning Soil Conservation Road. These include widening Good Luck Road to four lanes along with streetscaping, and improvements to the Good Luck Road/ MD 193 intersection.

(6) NASA will continue to involve the City and the public in project development.

(7) NASA is willing to discuss points 7 and 8 with the City.

(8) See Section 5.2.7. The new Transportation Manage Plan has a goal of lowering employee parking to 0.7 spaces per employees.

(9) The Zone most likely will not be developed until Facility Master Plan Stage 2 or after 2008 (see FMP Chapter 4, Figures 14 and 15). NASA will involve all interested parties at the State, County, and local level, including the general public, in the development of zone proposals.

The City of Greenbelt would like to thank NASA Goddard Space Flight Center and the Maryland Department of Planning for the opportunity to review and comment on the Facilities Master Plan and Environmental Assessment.

If you have any questions regarding the City's position on this matter, please contact Kristen Ward, Planner at (301) 474-6125. Thank you for the opportunity to comment on this plan.

Sincerely yours,

Judith F. Davis

Judith F. Davis
Mayor

cc: Senator Paul S. Sarbanes
Senator Barbara Mikulski
Congressman Steny H. Hoyer
County Executive Wayne K. Curry
County Councilmember Peter A. Shapiro
County Councilmember Audrey E. Scott
County Councilmember Thomas E. Dernoga
County Councilmember Thomas R. Hendershot
Greenbelt City Council
Al V. Diaz, NASA GSFC Director
State Senator Leo E. Green
State Senator Paul G. Pinsky
State Delegate Joan B. Pitkin
State Delegate Mary A. Conroy
State Delegate James W. Hubbard
State Delegate Anne Healey
State Delegate Tawanna P. Gaines

GLENN DALE CITIZENS' ASSOCIATION

P.O. Box 235
Glenn Dale, MD 20769
August 26, 2002

National Capital Planning Commission
Office of the Secretariat
401 9th Street, NW
North Lobby, Suite 500
Washington, DC 20576

RE: Draft Environmental Assessment for the Draft GSFC Facilities Master Plan and Soil Conservation Service Road Realignment for NASA's Goddard Space Flight Center, Greenbelt, Maryland

Dear Chairman:

The Glenn Dale Citizens' Association is writing to comment on the realignment of Soil Conservation Service Road. Soil Conservation Service Road has been used by the surrounding communities for many years prior to and since the founding of NASA's Goddard Space Flight Center. The neighbors would prefer to see Soil Conservation Service Road remain just as it exists. However, NASA feels that it needs to be relocated for its security and smooth operation. The neighboring communities would like this relocation to take place in a way that has the smallest impact and that produces the safest possible road for commuters, pedestrians and residents.

After a period in which the concerns of communities, especially those to the east, were not being heard, communication improved with the establishment of the Coordinating Council of Community Organizations (CCCO), a citizens' advisory council representing the surrounding communities. This council had meetings with NASA representatives moderated by David Julyan. New traffic and engineering studies were done and community input was considered. NASA presented three alignments for the rerouted road. The community advisory board supported an Eastern Alignment.

However, there is a problem due to additional truck traffic on the new Good Luck Road/Soil Conservation Service Road, because of the proposed placement of a new shipping/receiving facility (Building N) on the new portion of Soil Conservation Road.

The Environmental Assessment states on page 7-34 that the number of vehicles arriving at GSFC is estimated to be 50 each day. We need to know if that is 50 trucks at central receiving (Building16W) or 50 trucks at all gates. At the present time, some trucks are being badged and searched at the Main Gate as well as at central receiving. However, it also states on page 7-34 that under "Post 9/11" security, all delivery vehicles arriving at Federal facilities will undergo inspection and security checks and that the best location for this function is in the vicinity of central receiving. Therefore, if all trucks arriving at Goddard will be processed at the new receiving facility at Building N, we need to know the total number of trucks arriving at Goddard each day at all gates and the distribution of the types of trucks. This is necessary to gauge the impact of truck traffic on the new road and the immediate neighbors. A thorough study should be made of the safety of this truck traffic passing along the Good Luck Road /Soil Conservation Service Road corridor, through a residential neighborhood. In addition, other possible locations for the central receiving building should be identified and considered. In summary, we have eight specific questions:

(1)

1. How many trucks are expected at the new central receiving building each day (including those now coming to Building 16W and the other gates)?
2. What kind and size are these trucks?

(2)

3. Does NASA expect any increase in the amount of truck traffic? If so, how much?
4. What will be the hours of operation of the new central receiving building?
5. Will any hazardous materials be transported?

(3)

6. What is the impact of the truck traffic on safety, noise, and air quality?
7. What other locations are possible for the new central receiving building that

(4)

don't require trucks to travel along the new Good Luck Road/Soil Conservation Service Road?

(5)

8. How many additional trucks with destinations other than NASA are expected to use the new Good Luck Road/Soil Conservation Service Road?

Concerns also remain as to the route and design of the new road. We prefer an Eastern Alternative road design that has Soil Conservation Road as the main road and Good Luck Road making a T-Intersection into it. This would funnel commuter traffic down Soil Conservation Road, discourage commuter traffic from the northern end of Good Luck Road and possibly reduce the stacking of traffic making left-hand turns from Good Luck Road to Soil Conservation Service Road. We feel that there are advantages and disadvantages for both the E-1 and E-2 East Alignment Alternatives. The answers concerning the amount and type of truck traffic accessing the proposed Building N and the ultimate location of this central receiving building will influence our preference.

(1) See Section 7.4.2.4 and responses to Fronck letter on page B-14.

(2) No increases are anticipated at this time. If it is assumed that truck traffic is generally proportional to site population, it is more likely that future truck volumes may decrease. The current Goddard employee population is about 7,600. The projected 2022 NASA employee population is estimated to be about 5,800. This could be increased to as much as 6,800 if a "New Thrust" mission were assigned. Trucks travelling to and from the Partnering and Outreach Zone would not be inspected.

(3) Traffic noise and air quality impacts criteria are established on a one-hour average basis. Truck traffic is included in the computer modelling to determine the respective peak hour noise and air quality impacts shown in Section 7.4.5 and 7.4.6.1. Individual truck noise and carbon monoxide emissions are higher than those total for cars. However, trucks will comprise less than one percent of the traffic flow on Good Luck Road. As a result, the total number of cars or total vehicle volume determine noise and air quality levels, not trucks. The noise impacts along Good Luck Road are typified by Site 11 in the Section 7.4.5 analysis. Peak hour noise levels would increase by about 3 dBA. Area pollutant concentrations are driven or determined by regional emissions. The contribution of local traffic ranges from 0.1 to 1.5 parts per million to overall carbon monoxide concentrations, which range from 6.9 to 12.2 ppm.

(4) Locations other than along relocated Soil Conservation Road do not meet the security criteria and site natural environment constraints.

(5) Very few would be expected. BARC is located to the north of Goddard, and there is no commercial and industrial development. Most of the general public travelling on Soil Conservation Road is using it as a short cut between the Powder Mill Road interchange on the Baltimore-Washington Parkway and points east of Goddard. Trucks are prohibited on the Parkway.

(6) We hope that a great deal of consideration will go into the redesign of the Good Luck Road/ Greenbelt Road (MD193) intersection. Special consideration should be given to the safety of the large number of pedestrians crossing between the apartments in the northeast corner to Duval High School in the southwest corner and to the pedestrians crossing to the bus stop in the northwest corner.

We look forward to receiving definitive answers to our questions and concerns

Sincerely,

Mary F. Vondrak

Mary F. Vondrak
President, Glenn Dale Citizens Association

Cc. Mr.Kim Toufectis
Councilwoman Audrey E. Scott
Ms. Elizabeth Hewlett

(6) The intersection will be designed to MDSHA standards and specifications. It is anticipated that the designs will be presented to the public for review.

Coordinating Council of Community Organizations

Forestgate, Four Seasons, Glenn Dale, Glenn Dale Estates, Greenbelt Woods, Highbridge, Hillmeade Manor, Hillmeade Station, Wingate, Wood Pointe, Woodstream, Woodstream East, Yorkberry

August 28,2002

Mr. Kim Toufectis
Facilities Management Division Planning Office
Attention: Facilities Master Plan
Code 221
Goddard Space Flight Center
Greenbelt, MD 20771

Dear Mr. Toufectis:

The Coordinating Council of Community Organizations (CCCO) is a volunteer organization specifically founded to provide the National Aeronautics and Space Administration (NASA), Goddard Space Flight Center (GSFC) our view on the proposed Facilities Master Plan (FMP) and potential impacts the changes may have on our communities. The CCCO is comprised of representatives from the following communities which are the immediate neighbors of GSFC: Forestgate, Four Seasons, Glenn Dale, Glen Dale Estates, Greenbelt Woods, Highbridge, Hillmeade Manor, Hillmeade Station, Wingate, Wood Pointe, Woodstream, Woodstream East, and Yorkberry.

The CCCO commends GSFC for the thorough job it has done in preparing detailed documentation for this FMP. The communities have spent many hours studying the details of this 20 year plan and providing verbal comments about selecting an option for the realigned Soil Conservation Road that will have the least disruptive impact on the citizens. Everyone in these communities appreciates the value of having GSFC as our neighbor and wishes to work closely with GSFC in achieving the objective of having a modern and efficient operating facility.

The CCCO would like to offer comments on the reconfiguration of Soil Conservation Service (SCS) Road, which is the first phase in the FMP implementation. SCS Road is an important thoroughfare for the communities living south and east of GSFC. It is important that any changes made in this road do not add to traffic congestion or create delays in this important corridor.

The CCCO would prefer no change from the present configuration of SCS Road. However, we recognize that this is not preferred by GSFC and that the Center considers that this option would not allow it to meet other pressing needs for optimum operation of its program.

The SCS Road Western By-Pass around GSFC would create significantly increased traffic volumes on Good Luck Road and Springfield Road. This view is confirmed by the traffic analysis which states that at least 60% of the current traffic using SCS Road would divert to these secondary roads in order to avoid using a Western By-Pass route. Good Luck and Springfield Roads are unimproved county roads that would be unable to safely handle the tripling of the number of cars projected to occur. These county roads would become through-traffic commuter routes rather than simply serving the immediate neighborhoods as feeder routes. Therefore, the CCCO strongly urges GSFC not to select a Western By-Pass because it

would greatly increase the traffic hazards on less developed county roads.

An Eastern By-Pass would avoid the problems associated with the Western By-Pass option. However, great care must be used in selecting an appropriate configuration to avoid traffic "stacking" back onto Greenbelt Road. The neighboring communities of GSFC strongly urge selection of East Alternative E-2. This option would mitigate any traffic backups onto to Greenbelt Road, avoid disruption of Goddard employee recreation areas, and also lessen traffic congestion at the entrance to Countryside Apartments.

(1) The Projected 2002 East Alignment Alternative Peak Traffic drawings (see EA Figures 7-17 and 7-18 on pages 7-27 and 7-28) clearly show that 90% of the traffic turning North at the intersection of Greenbelt and Good Luck Roads would be turning onto Soil Conservation Road. Since a heavy volume of traffic would need to turn left at this "T" intersection, traffic backups are sure to occur at this light and may create an unsafe situation. The CCCO strongly encourages that GSFC reconsider its intended alignment to avoid adding a new traffic hazard and provide an alternative that would make SCS Road intersect with Greenbelt Road, with Good Luck Road making a "T" off SCS Road. This modification to the E-2 alternative would minimize many of the adverse impacts on GSFC's neighboring communities that use SCS Road on a daily basis.

(2) The CCCO would also like GSFC to consider more options for the future location of the shipping and receiving building. Specifically, the citizens in the community feel that the increased volume of trucks on the relocated SCS Road would present an unnecessary hazard to residents in the Countryside Apartments. The Environmental Assessment needs to be amended to consider placing the shipping and receiving area so that access is provided through the old main gate and through the Partnering and Outreach Zone.

The Coordinating Council of Community Organizations appreciates your interest in the listening to the views of the citizens living in the GSFC neighborhood and desires to continue to work with you for the full implementation of the entire 20 year plan.

Sincerely,

Richard M. Parry

Richard M. Parry
CCCO Coordinator
9301 Copernicus Drive
Lanham, MD 20706

(1) East Alternative E-2A has been developed with the revised intersection configuration noted here, i.e. Soil Conservation Road serving as the through route with Good Luck Road teeing into it.

(2) See Section 7.4.2.4

THE PRINCE GEORGE'S COUNTY GOVERNMENT
OFFICE OF THE COUNTY EXECUTIVE

Wayne K. Curry
County Executive

August 29, 2002

Mr. Kim Toufectis
Facilities Management Division Planning Office
Attention: Facilities Master Plan
Code 221
Goddard Space Flight Center
Greenbelt, Maryland 20771

Dear Mr. Toufectis:

Thank you for forwarding to me and several members of the Curry administration a draft of the Goddard Space Flight Center Facilities Master Plan for the Greenbelt site. Let me take this opportunity to commend you and your staff for the excellent planning done to enhance Goddard Space Flight Center's mission.

Even though the Goddard Space Flight Center is not regulated by the County, and the Plan clearly states that all improvements will comply with all applicable State and Federal codes and regulations; it is the County's desire to be integrated in all issues that may directly affect the County (roadways, stormwater, ground water and air pollution) as the Master Plan is implemented. We have reviewed the above referenced Master Plan and have the following comments.

Department of Environmental Resources

(1) The proposed improvement that would or could impact County residents is the rerouting of Soil Conservation Road outside the proposed security perimeter. This would prevent non-GSFC traffic from traveling across the campus from Powder Mill Road to Route 193. Instead, the new Soil Conservation Road would connect to Good Luck Road. This would inconvenience some local residents by adding five to ten minutes driving time to circle around the campus to get to Route 193. However, this will not create any real hardships and will improve internal security of the campus.

14741 Governor Oden Bowie Drive, Upper Marlboro, Maryland 20772
(301) 952-4131
TDD (301) 985-3894

(1) General public Soil Conservation Road traffic will still be able to travel between Powder Mill Road and Route 193, although it will be via Good Luck Road rather than a direct connection.

Department of Public Works and Transportation

The Prince George's County Department of Public Works and Transportation (DPW&T) has reviewed the four alternatives proposed for the intersection of Good Luck Road and the easterly realignment of Soil Conservation Road. Upon further analysis of the alternatives, the E2 (East/High) Variant Alignment most favorably serves existing and projected traffic on Soil Conservation Service Road while also consolidating the GSFC campus.

This alternative will include widening Good Luck Road to four lanes between the new Soil Conservation Road intersection and Greenbelt Road. The improvements to Good Luck Road require the following:

(2)

1. Right-of-way dedication and frontage improvements, along Good Luck Road, in accordance with DPW&T's Standard for Collector Roadways (cnclosed).
2. All improvements within the public right-of-way, as dedicated to the County, are to be in accordance with the County Road Ordinance, DPW&T's Specifications and Standards and the Americans with Disabilities Act.
3. Sidewalks arc required along Good Luck Road, within the project limits.
4. Conformance with street tree and street lighting standards is required.
5. All storm drainage systems and storm drainage facilities are to be in accordance with DPW&T's and the Department of Environmental Resources' requirements.
6. A soils investigation report, which includes subsurface exploration and a geotechnical engineering evaluation for public streets, is required.
7. A review of the Traffic Impact Study to determine the adequacy of the access point and the need for acceleration/deceleration and turn lanes on Good Luck Road is required.
8. Existing utilities may require relocation and/or adjustments. Coordination with the various utility companies is required.
9. Installation of a traffic signal at the intersection of the proposed Soil Conservation Road and realigned Good Luck Road will be required.

(3) Additionally, we would like to bring to your attention the need for a traffic signal at the intersection of Powder Mill Road and the exit ramp off southbound Baltimore-Washington Parkway (Route 295). As you know, this hazardous intersection is a primary approach to southbound Soil Conservation Road. Motorists making a left turn into eastbound Powder Mill Road from this exit ramp are experiencing congestion and unsafe conditions. As you are aware, many GSFC employees and the general public use Soil Conservation and Powder Mill Roads as an alternative route to the Parkway. Therefore, we request your careful consideration to improve safety for your employees and the travelling public by installing a traffic signal at this intersection.

(2) NASA will complete work in coordination with the County agencies and public utility companies.

(3) NASA believes this issue is separate from the Facilities Master Plan and road realignment. The Goddard population is lower now than it has been in the past and no increase is expected in the near future. Congestion at the interchange has been created by significant growth in background traffic.

Economic Development Corporation

(4) The County urges Goddard to place development controls on its proposed Partnering and Outreach Zone, so as to make sure that activities on that site do not directly compete with the private investments that Goddard is seeking to soon attract to the Visitor's Center site.

In closing, thank you for the opportunity to be of assistance. Please be assured that proposals that improve environmental conditions in Prince George's County are most welcomed. If you have any questions or require any additional information regarding this matter, please feel free to contact me.

Again, thank you for your continued consideration.

Sincerely,

Kenneth E. Glover
Chief Administrative Officer

cc: Diane Williams, Director of Management Operations
Samuel E. Wynkoop, Jr., Director, Department of Environmental Resources
Betty Hager Francis, Director, Department of Public Works & Transportation
Joseph J. James, President & CEO, Economic Development Corporation

(4) NASA will involve the County, the city of Greenbelt, and the general public in planning and development of the Zone as it occurs. At this time, the Facilities Master Plan indicates that implementation of the initial project is not expected to occur until after 2009. (See Figure 14 and 15 in FMP Chapter 4).

PRO SHOP PHONE
301-464-0804

CLUB PHONE
301-262-1166

Glenn Dale Golf Club
11501 OLD PROSPECT HILL ROAD
GLENN DALE, MARYLAND 20769

NCPC
File No. MP50
Primary Stat. OA
Due Date

Copies:
CHAIRMAN ASST. EXEC. DIR. (PROGRAMS)
EXEC. DIR. ASST. EXEC. DIR. (MGMT)
PUB. AF. LONG RANGE PLNG.
GEN COUNSEL PLANS REVIEW
SECRETARIAT TDA SUPPORT
ADMIN

August 29, 2002

National Capital Planning Commission
Office of the Secretariat
401 9th St. NW
North Lobby, Suite 500
Washington, DC 20576

RE: MP50, Draft Environmental Assessment for Draft Master Plan and Soil Conservation Road Realignment, for **NASA's Goddard Space Fight Center.**

To the Planning Board:
For over two years we (Glenn Dale Golf Club) and the surrounding communities have worked to convince NASA to plan and chose an eastern route for Soil Conservation Rd.(SCSR). We don't believe a western by-pass would be functional or address the needs of the surrounding communities. Further more a western route would add to traffic problems in the area and create more detriments to the environment by decreasing air quality and increasing noise pollution.

We also believe SCSR should become the primary road all the way to Route 193, and Good luck Rd. should "T" into SCSR. This would create a more direct route reducing the risk of collisions and traffic backups. We will leave to others which eastern route is better between the high or low.

The last concern we and the community have is the issue of the relocation of the shipping and receiving area. The master plan

originally assume a western bypass and had located this facility accordingly. Now with the eastern route being the preferred route. (1) NASA is contemplating moving this facility to the eastern route. This would introduce truck traffic to an area which is residential in nature. We believe the noise from the trucks will be disturbing to the apartment complex reducing the quality of life for those who live there. Truck traffic will also add an additional hazard to the children in the community as they commute by foot to and from the three schools on the other side of Rt.#193.

We hope the commission takes our concerns and those of the community into consideration went reviewing this plan.

Thank you.

R. John Shields

R.John Shields
President

(1) See responses to Fronck letter on page B-14.

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
Prince George's County Planning Department
Office of the Planning Director
301-952-3595

August 29, 2002

Ms. Diane Williams
Director, Management Operations
NASA
Goddard Space Flight Center
Greenbelt, MD 20771

Dear Ms. Williams:

Thank you for the opportunity to review the *Draft Environmental Assessment for the Draft GSFC Facilities Master Plan including Soil Conservation Road Realignment at Greenbelt, Maryland*, July 2002. As you know, the Prince George's County Planning Board reviewed the *Pre-Final Draft GSFC Facilities Master Plan* in July of this year. It is our understanding that the Planning Board will have another opportunity to review the plan prior to National Capital Planning Commission action anticipated for November. This further review will be important given the additional information recently provided concerning the preferred alignment for Soil Conservation Road and traffic impacts.

When the Planning Board reviewed the pre-draft plan in July, we included recommendations that would help implement proposals of the county's recently approved General Plan. We also identified transportation and environmental concerns. Based on review of the draft environmental assessment, we are submitting the following additional recommendations and comments:

The East Alignment, E-2, is the optimum alignment for the relocation of Soil Conservation Road. Although we recognize that the western alignment has fewer environmental impacts, we nevertheless favor an eastern alignment. An eastern alignment will better serve traffic that is now using existing Soil Conservation Road and will minimize adverse traffic impacts on Good Luck Road and Springfield Road, a substandard county road facility. This is the preferred alignment identified in the Environmental Assessment and is also the alternative preferred by the county Department of Public Works and Transportation.

Further, the design of relocated Soil Conservation Road should provide for Good Luck Road from the south continuing directly into Soil Conservation Road with Good Luck Road from the east forming the "T" of the intersection as illustrated in the attached figure. The design should provide for bike usage with wider outside lanes in accordance with the county's Department of Public Works and Transportation's standards.

The Master Plan should identify environmental mitigation measures. As we noted above, there will be environmental impacts associated with the preferred alignment of Soil Conservation Road as well as other proposals included in the master plan. The following mitigation measures should be provided or identified:

(1)

1. Remediation or alternative locations should be identified for buildings proposed on soils contaminated by organic carbon compounds with trichloroethene.

(2)

2. All necessary steps should be taken to locate adequate groundwater sources and ensure the availability of groundwater needed to accommodate the proposed increase in development.

(3)

3. Reforestation details should be identified for impacts due to the realignment of Soil Conservation Road and other development within the center.

(4)

4. Mitigation strategies should be identified for wetland impacts.

(5) Further, the Environmental Planning Section of the Prince George's County Planning Department and the county's Department of Environmental Resources should review the stormwater management plan cited in the draft environmental assessment; low impact development techniques should be an integral element of the redevelopment proposals. The stormwater management plan should be provided prior to finalizing the facility master plan.

(6) **Traffic impacts need to be addressed.** The master plan proposes a potential increase of more than 1,000 employees (page 1-2 of the draft environmental assessment). Current and potential future road inadequacies should be addressed. The Planning Board's comments on the pre-draft plan included recommendations that in the long-term would reinforce future provision of transit along MD 193. Other measures should be taken to improve transportation within the area:

(7)

1. The plan should be revised to show a near-term parking ratio of 0.84 for the site (instead of the proposed 0.90). This level represents a zero increase in parking on the site, and should be achieved with greater usage of telecommuting and ridesharing. Staff fully supports the long-term goal of a 0.67 parking ratio.

(8)

2. Relocated Soil Conservation Road should be constructed (as described above) prior to the closing of existing Soil Conservation Road.

(1) Only one site (Building C) is sited in an area contaminated with trichloroethylene (TCE). TCE degrades naturally and eventually vanishes. Since conditions change with time, NASA and the Maryland Department of Environment have agreed that if construction will disturb contaminated soils, appropriate studies, design considerations and remediation measures will be conducted in coordination with MDE when development is imminent. It is possible that no measures will be necessary by the time the Building C is developed (after 2009).

(2) Studies to ensure adequacy of supply were done prior to drilling the campus wells.

(3) See new text last paragraph Section 5.8.4.4

(4) Maryland has a goal of no net loss of nontidal wetlands. If wetlands are lost, they are to be replaced at a given area ratio as indicated in Section 7.4.10. If wetlands are temporarily disturbed, they are to be restored. In both cases, a mitigation plan must be prepared for approval by the Army Corps of Engineers and the State. Monitoring of implemented mitigation measures to ensure that the wetland is functioning properly is required. Each wetland impacted is different and the review agencies recognize that mitigation strategies must be developed on a case by case basis. These strategies are judged for their effectiveness in replacing the impacted wetland's functions such as flood storage and desynchronization, groundwater discharge and recharge, fish and wildlife habitat, sediment rapping, fish and wildlife habitat, food chain support, and active and passive recreation.

(5) As a Federal facility, NASA must satisfy State requirements. The Goddard Stormwater Management Plan was prepared in accordance with State requirements. A copy can be provided to the County.

(6) See Section 7.4.2.3 for projected 2022 road conditions.

(7) See Section 5.2.7. NASA has prepared a more definitive Transportation Management plan that has the long term goal of an 0.70 employee parking ratio.

(8) Maintenance of existing traffic routes during construction of the realigned Soil Conservation Road will be done.

(9)

3. There should be a funding commitment to improving intersections in the study area that experience operational problems due to Goddard and its potential expansion under this master plan. Improvements in accordance with the needs identified in the July 2002 Draft Environmental Assessment should be made to the following intersections:

   a. Southway Drive/Baltimore-Washington Parkway off-ramp
   b. MD 193/Good Luck Road
   c. MD 193/MD 564
   d. Powder Mill Road/Baltimore-Washington Parkway interchange.

The recommendations described above and the recommendations included in the Planning Board's July review of the pre-draft plan should be considered as the Goddard master plan is finalized. If you have any questions, please contact me or Tom Tyson of our staff at 301-952-4712.

Sincerely,

Fern Piret

Fern Piret
Planning Director

Attachment

c: Al Dobbins, Chief, Community Planning Division
Nick Motta, Chief, Countywide Planning Division
John Funk, Supervisor, Strategic Planning Section
Cecilia Lammers, Supervisor, Environmental Planning Section
Eric Foster, Supervisor, Transportation Planning Section
Tom Tyson, Planner Coordinator, Strategic Planning Section
Kim Toufectis, Goddard Space Flight Center
Cicero Salles, Department of Public Works and Transportation

(9) See revised Section 7.4.2.3. The Goddard site employee population would increase only if a "New Thrust" assignment, unforeseen at this time, would occur in the future. The traffic impact analysis was completed on the "worst case" basis. It is more likely that the site population will remain the same or decline in the future. Comparison of the No Action Alternative to existing condition traffic indicates that growth in background or non-NASA traffic is by far the greatest contributor to future congestion in the project area.

Lynne D. Larkin
10601 Forestgate Place
Glenn Dale, Maryland 20769
301-464-0048

30 August 2002

Mr. Kim Toufectis
NASA/Goddard Space Flight Center
GSFC Mail Code #221
Greenbelt, Maryland 20771

Dear Mr. Toufectis,

As a federal employee (retired) I can sympathize with your efforts to close the GSFC campus and reroute Soil Conservation Road. I think for security reasons it should be closed as soon as possible, regardless of what alternatives may or may not be in place.

However, I am not unaware of the current concern over the choice of location for the new Soil Conservation realignment.

(1) Has any attempt been made to actually close the road to all but employees for a finite period of time (say, a week or two) and with adequate notice to the public? I think this would be the best way to determine the immediate impact on our local roads.

Thank you.

Sincerely,

Lynne D. Larkin

(1) The impact of such a trial closure of the road would be significant and unacceptable to local jurisdictions and the public.

August 30, 2002

To Whom It may Concern:

We support the Goddard Space Flight Center proposal to re-route Soil Conservation Road so that it intersects Good Luck Road East of the Intersection of that road and Greenbelt Road (Route 193). From a safety standpoint, we support locating the point where Soil Conservation Road intersects Good Luck Road to the east of the area where the Countryside Apartment complex is located. We live in the Forestgate development and believe this re-routing would be beneficial to us (as well as to most residents who use Good Luck Road).

Thank You

Frederick V. Linse

Dee A. Linse

Fred & Dee Linse
10903 Forestgate Place
Glenn Dale, MD 20769

NCPC

File No. 7865C

Primary Stat. CTZ

Due Date

Copies:

CHAIRMAN	ASST. EXEC. DIR. (PROGRMS)
EXEC. DIR.	ASST. EXEC. DIR. (MGMT)
PUB. AF.	LONG RANGE PLNG.
GEN. COUNSEL	PLANS REVIEW
SECRETARIAT	TDA SUPPORT
	ADMIN

August 30, 2002
9618 Wellington St.
Seabrook, MD 20706

NCPC
File No. 6052
Primary Stat. OIP
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GEN COUNSEL / PLANS REVIEW
SECRETARIAT / TDM SUPPORT

National Capital Planning Commission
Office of the Secretariat
401 9th Street, NW
North Lobby, Suite #500
Washington, DC 20576
Attention: Ms. Debra Young

I support the basic idea of relocating Soil Conservation Service Road (SCSR) to the East side of Goddard Space Flight Center (GSFC). That is, if the present configuration cannot be maintained. Since much traffic has developed an accustomed flow from the East of Goddard to the Baltimore-Washington Parkway and points west via Powder Mill Road, relocating SCSR to the West side of GSFC would lengthen the route and add to congestion in front of GSFC and up to its new location. This would affect travelers like myself who have reason to travel this route.

Viewed in a larger perspective of county plans to beautify route 193 in this area and incorporate bike and walking paths, however, overall county and regional planning could take a broader view to the benefit of the local and wider community. This rerouting could include the start of an innovative approach to reduce overall commuting and congestion, by incorporating it into a plan for integrated local travel and making the local community better along with GSFC, as a major employer and part of that community.

Within a short walk from the present GSFC entrance there is much housing and many attractions for quality living. Among these is the Countryside Apartments and my neighborhood of Seabrook Acres. Encouraging employees to be a part of this community would strengthen NASA's position in the community, contribute to quality of life in the region, and serve as an example for others from within Prince George's County, which is in need of good examples and this type of leadership and innovation. I have read that The Coordinating Council of Community Organizations (CCCO) has concerns about adverse effects on the Countryside Apartments. What about beneficial effects? For those living in the Countryside Apartments, wouldn't it be a boon to be able to walk or ride a bicycle to work? A small minority might, but for those who want to, if walking/bike paths away from traffic and with safe crossings were incorporated into the plans, those who wish to could see Countryside Apartments, Seabrook Acres, Greenbelt, or other nearby areas as attractive.

(1)

Of course, schools need to be improved to make this an attractive community. Otherwise, however, it has much to offer and attract the Goddard employee, who typically chooses to live a distant commute away. Yet, from my house, for example, were it possible to walk safely I could have spent my 25+ years at Goddard and living in Seabrook Acres walking the 30-minute walk or biking. 15 minutes in the other direction, a train takes passengers to DC and Baltimore and access to destinations such as NASA HQ. I've already been rebuffed at a meeting that "few people walk more than 5 minutes", but we should seek to serve and increase the community that does or would.

Include in the plans connecting paths that go into the surrounding communities, not just bypass them for recreation. Imagine a path connecting access to Goddard, through Seabrook Acres to near my house (next to Gaywood Elementary) and to the Seabrook Marc train station, and connecting to a path along route 193 (but hopefully not adjacent to dangerous car traffic) .

(2)

Sanford W. Hinkal

Sanford Hinkal

(1) The Soil Conservation Road realignment along Good Luck Road will include the relocated South Laurel Bike Trail.

(2) Improvements in public spaces beyond the boundaries of NASA property are the responsibility of State and County agencies, and the City of Greenbelt.

Stephen O. Walter
8110 Maplegate Place
Glenn Dale, Maryland 20769-2048
[SteveWalter@Bigfoot.com]
H: (301) 352-3677 / W: (301) 286-7971

NASA/Goddard Space Flight Center
c/o Mr. Kim Toufectis
GSFC Mail Code #221
Greenbelt, Maryland 20771

Saturday, 31 August 2002

Dear Kim:

This letter is in regards to the NASA/Goddard Space Flight Center (GSFC) Facility Master Plan (FMP) and associated documents that are undergoing NCPC review.

I have been employed at GSFC for over 20 years, I've been a resident of Prince George's County, Maryland, for most of the past 40+ years, and I currently reside very close to the Eastern border of GSFC (in the Forestgate community, just off of Good Luck Road). Since December 2000, I have also been actively working with you and other officials of the GSFC, many local community residents, the MNCPPC, the Prince George's County DPW&T and others, to make the FMP acceptable to all of us.

With these qualifications, it is my belief that ...

a). GSFC officials should be highly commended and thanked for hearing the public objections to your 2001 version of the FMP prior to its intended submittal last year, and applauded for your reaching out to work with the public -- making changes to the FMP that are significantly wiser and safer. The community understands that GSFC did not have to work as closely with the community as you have in the past year, but your effort has been very much appreciated with all sides better understanding each other; and

b). the communities surrounding GSFC, probably with a 100% certainty, would prefer that Soil Conservation Service Road (SCSR) stay in its current configuration, thereby allowing commuters to maintain the most direct access to and from points North of GSFC; and

c). GSFC officials have many reasons important to the facility to re-route SCSRoad; and

d). GSFC employees and local residents would suffer in several different ways if the original Western re-routing of SCSRoad were to be approved; and

e). the best, safest re-routing of SCSRoad will be in an Easterly-direction, to an intersection with Good Luck Road, as close as possible to the East-High (Deviant) proposal drawn up by GSFC officials; and

f). GSFC needs to give serious re-consideration to the future location of a new warehouse ("MOD–C") building, such that it does NOT add more truck traffic to Good Luck Road and its proposed intersection with a re-routed SCSRoad; and

... continued ...

(1) g). proposed reductions in automobile parking spaces on-site at GSFC are ridiculous; while this intention may be part of an overall mandate for many agencies, it is completely contrary to adequately supporting a work environment that requires multiple, overlapping shifts, 24 hours/day and 7 days/week coverage -- especially when many of the existing parking lots are already jammed full; and

h). the intentions of the 20-year FMP, if respecting the above concerns, will be a wonderful benefit to GSFC employees and the local communities -- and the FMP should be approved and implemented as quickly as the process allows.

=======

The above views are based upon numerous discussions, overall safety, common sense sanity-checks, personally travelling the affected routes on a daily basis, understanding the concerns of residents along Good Luck Road that will be the most affected by such changes, updated traffic studies supported by GSFC, reviewing the various road options drawn up by GSFC, and:

1. the stated intentions by GSFC that an SCSR/Good Luck Road intersection also requires and includes funding for major improvements to the existing Good Luck/Greenbelt Road (Md Route #193) intersection **along with** the existing Good Luck Road surface and shoulders between Greenbelt Road and the new intersection with SCSRoad undergoing significant widening; and

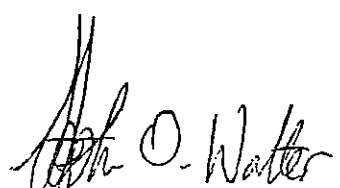
(2) 2. the East-High (Deviant) intersection with SCSR/Good Luck Road will be about 1/2-mile "up" from Greenbelt Road -- which then minimizes impacts to the Countryside Apartments, minimizes any possible traffic backups into the Greenbelt Road vicinity, and minimizes inconveniences to residents of Glenn Dale and other areas who live North of the new, proposed intersection; and

3. the belief that SCSRoad will bear most of the traffic flow, and hence should be the major thoroughfare up to Greenbelt Road; this philosophy requires the existing Good Luck Road to "T" into SCSRoad at the new intersection, while not impeding residential traffic any more than is necessary.

=======

Please feel free to contact me if there are any questions or concerns about any of these issues.

Thank you for your time and troubles on this matter.



Stephen O. Walter
8110 Maplegate Place
Glenn Dale, Maryland 20769-2048
H: (301) 352-3677
W: (301) 286-7971

(1) Regional traffic congestion is increasing, and is expected to roughly double on many of the arterial roadways. Agencies responsible for transportation planning are applying many measures to both government facilities and the private sector to reduce single occupant vehicle use. One of these measures is controlled parking.

(2) The "East High" alignment is Alternative E-2 or Alternative E-2A.

Maryland Department of Transportation
The Secretary's Office

September 3, 2002

Mr. Kim Toufectis
Facilities Management Division Planning Office
Code 221
Goddard Space Flight Center
Greenbelt, MD 20771

Attention: Facilities Master Plan

Dear Mr. Toufectis:

Thank you for the opportunity to provide comments on the draft Goddard Space Flight Center Facilities Master Plan. Maryland Department of Transportation (MDOT), State Highway Administration (SHA), and Maryland Transit Administration (MTA) planners have reviewed this Plan and at this time are offering the attached comments.

As the Plan advances to adoption and as various elements are implemented, NASA should contact various planners in MDOT. Ms. Kelly Tyler is the Regional Planner for the Maryland Transit Administration, her number is 410-767-3794. Mr. James Dooley is the Regional Planner for the State Highway Administration, his number is 410-545-5675. Should you have questions or need additional assistance, please do not hesitate to contact me at 410-865-1307 or estrocko@mdot.state.md.us.

Sincerely,

Edward Strocko
Land Use and Transportation Planning
Office of Planning and Capital Programming

Attachment

cc: Mr. Jim Dooley, Regional Planner, Regional and Intermodal Planning Division, Office of Planning and Preliminary Engineering, State Highway Administration
Ms. Kelly Tyler, Regional Planner, Office of Statewide Planning, Maryland Transit Administration

My telephone number is (410)-_____
Toll Free Number 1-888-713-1414 TTY For the Deaf: (410) 865-1342
Post Office Box 8755, Baltimore/Washington International Airport, Maryland 21240-0755

MDOT Comments on the Draft Goddard Space Flight Center Facilities Master Plan

General

- We are encouraged by the plan's emphasis on land use and circulation/access and the interrelation between the two.
- We are supportive of the proposed strategy to renew and reuse facilities and focus building within developed areas of the site. We would encourage infill development.
- The Department strongly supports the proposed continued close coordination with the external community for this project.
- The Plan anticipates a growth of the NASA employee population at the Goddard facilities to 8,750 by 2022 - up 1,000 from the current population. This is based on increased space missions in the future. However, the plan also states that employment could decline to 5,800 through retirement and attrition. The plan proposes to develop total floor area of 4.3 million gross square feet (gsf) – an additional 1 million gsf compared to the existing total floor area.

Transportation

(1)
- The plan lists coordination with neighbors and transit authorities to promote transportation system improvements. We are supportive of this approach and would recommend that NASA consider coordinating with other existing federal government shuttle services that may already be in place, such as service from the adjacent USDA facilities.
- We are pleased to see the plan's emphasis on improving bicycle and pedestrian circulation and comfort. In particular, efforts to connect the campus spine via sidewalks, bikeways, and bus stops.
- The plan proposes several strategies to deal with the current parking situation. We are pleased to see recommendations to lower the parking ratio as well as facility designs for more walkable and environmentally friendly lots.
- We would encourage NASA to continue developing plans and polices to encourage transit use, tele-working, and ride-sharing for employees.
- The plan notes a wide dispersion of employees in the area, making transit and ride sharing difficult. We would encourage investigation of the State's Live Near Your Work Program that provides financial incentives to employees who chose to purchase a house in close proximity to the place of work. The State's Department of

(1) Most BARC employees are concentrated in facilities to the west of the Baltimore-Washington Parkway along US Route 1 in Beltsville about four miles to the of Goddard. The areas to the east of the Parkway are principally research fields and forest. Facilities with employees at the Patuxent Wildlife Research Center are concentrated between MD 197 and the Patuxent River, five miles or more from NASA.

Housing and Community Development can provide more information on the program and can be reached at 410.209.5800.

(2)
- The plan also notes that one reason employees chose to drive alone is the desire to occasionally run errands during the day. NASA may want to investigate the feasibility of a car sharing or station car program for the campus in which employees pay a small fee for use of a car several hours per month. This could allow employees the flexibility of running errands if they ride-share or take transit. Flexcar and Zipcar are two private companies operating such programs in the Washington region.

- We are pleased to see consideration given to minimizing impacts on offsite roadways.

- The subject facilities lie partially outside the County's certified Priority Funding Area (PFA). Close coordination with the Maryland Department of Planning would be required to improve state owned roadways outside of the PFA. Generally, promoting growth in areas outside the PFA would not be consistent with the 1997 Smart Growth & Neighborhood Conservation Act.

- The Plan proposes relocating Soil Conservation Road either to an eastern alignment to connect to a county road, Good Luck Road, or a western alignment to connect to a state road, MD 193 (Greenbelt Road) at Goddard Gate 2. The eastern alignment option requires widening of Good Luck Road and improvement of the Good Luck Road and MD 193 intersection

(3)
- The State Highway Administration's (SHA) Highway Needs Inventory includes a six-lane divided highway reconstruct for MD 193 from the Baltimore-Washington Parkway to Good Luck Road, but no such improvements are programmed in the current Consolidated Transportation Program.

- If the Plan is approved, any development of the Goddard facilities requiring access to state roads, like MD 193, would have to be coordinated through the SHA's Engineering Access Permits Division (EAPD). Mr. Mike Bailey is the Area Engineer for Prince George's County for EAPD and he may be reached at 410-545-5593.

(4)
- Although the Plan does not discuss the implementation of the proposed road improvements, it is our expectation that the Federal Government will be responsible for any costs associated with required roadway improvements on the State highway system.

(2) See update on NASA TMP in Section 5.2.7.

(3) Widening to six lanes east of Mandan is in the County transportation plans. Analysis completed for the Goddard FMP indicates that this will be needed by 2022 even if Goddard's employee population remains at 7,600.

(4) Greenbelt Road (MD Route 193) is the only State highway that would be directly impacted by the Soil Conservation Road relocation. Improvements would be necessary at the Good Luck Road intersection (see Section 7.3.3.4 and Figure 7-12), and NASA would pay these costs.

September 3, 2002

To Whom It May Concern:

This letter is in regards to the NASA/Goddard Space Flight Center (GSFC) Facility Master Plan (FMP) and associated documents that are under your review.

I've been a resident of Prince George's County, Maryland, for most of the past 55 years, and I currently reside in the Northridge Section of Bowie. My family frequently uses Soil Conservation Road to points north of Goddard Space Flight Center.

I have been regularly receiving the emails distributed by the Coordinating Council of Community Organizations (CCCO) and have become familiar with the various proposals to close Soil Conservation Road to reroute the traffic around the Goddard Space Flight Center.

I would like to go on record as supporting what I feel is the best, safest re-routing of SCS Road, which is an Easterly-direction, to an intersection with Good Luck Road, as close as possible to the East-High (Deviant) proposal drawn up by GSFC officials.

Also, I agree with the stated intentions by GSFC that an SCSR/Good Luck Road intersection also requires and includes funding for major improvements to the existing Good Luck/Greenbelt Road (Md Route #193) intersection along with the existing Good Luck Road surface and shoulders between Greenbelt Road and the new intersection with SCSRoad undergoing significant widening.

Thank you for providing me with an opportunity to present my thoughts on the rerouting of Soil Conservation Road.

Sincerely,

Diane M. Polowczuk

Diane M. Polowczuk
12115 Quick Fox Lane
Bowie, Maryland 20720

NCPC
File No. MPOSD
Primary Act. CF
Due Date

Copies:

CHAIRMAN — ASST. EXEC. DIR. — EXEC. DIR. — ASST. EXEC. DIR. — PUB. AF. — LONG RANGE PLNG. — GEN. COUNSEL — PLANS REVIEW — SECRETARIAT — TDA SUPPORT — ADMIN —

NCPC
Attention: Ms. Debra Young
FAX: 202-482-7272

September 3, 2002

To Whom It May Concern:

This letter is in regards to the NASA/Goddard Space Flight Center (GSFC) Facility Master Plan (FMP) and associated documents that are under your review.

I've been a resident of Prince George's County, Maryland, since I was 8 months old, and I currently reside very close to the Eastern border of GSFC (in the Forestgate community, just off of Good Luck Road). I have been keeping up with information on the proposed closing of soil conservation road through my community home owners association. I appreciate that NASA is taking input from the surrounding communities that will be most affected by the closure.

(1) It is my preference that the road not be closed but, having many friends at NASA on both campuses, I understand the desire to join the two. Given the seeming inevitability of the closure, I would like to state my preference for the East-High rerouting.

From our community association, I understand that

1. It is the intent of NASA to make sure the needed improvements to 193-Good Luck Road intersection and roads are made.
2. The East-High (Deviant) intersection with SCSR/Good Luck Road will be about 1/2-mile "up" from Greenbelt Road -- which then minimizes impacts to the Countryside Apartments, minimizes any possible traffic backups into the Greenbelt Road vicinity, and minimizes inconveniences to residents of Glenn Dale and other areas who live North of the new, proposed intersection.

(2) It also seems to make sense, since most traffic will follow SCSRoad and not Good Luck Road, that the existing Good Luck Road to "T" into SCSRoad at the new intersection (as opposed to SCSRoad "T"ing into Good Luck Road). I believe that allowing continuous flow of traffic on SCSRoad, i.e., without an added turn, will result in the best traffic flow possible.

Thank you for taking the time to hear the opinions of the surrounding communities on this issue.

Sincerely,

Carole A Teolis

Dr. Carole A. Teolis
8101 Hollygate Drive
Glenn Dale, Maryland 20769
carole@technosci.com

NCPC
File No. MFCST
Primary Stat. TM
Due Date

Copies:

CHAIRMAN
EXEC. DIR.
PUB. AF.
GEN. COUNSEL
SECRETARIAT
ASST. EXEC. DIR. (PROGRAMS)
ASST. EXEC. DIR. (MGMT)
LONG RANGE PLNG
PLANNING
TRANSPORTATION
OTHER

(1) East high routing is equivalent to Alternative E-2 and E-2A.

(2) Alternative E-2A has been developed with this configuration.

James & Maria Hammill
10910 Forestgate Place
Glenn Dale, Maryland 20769
301- 464- 6469
September 3, 2002

NCPC
Debra Young

Dear Ms. Young:

This letter is in regards to the NASA/Goddard Space Flight Center (GSFC Facility Master Plan (FMP) and associated documents that are under your review. My main interest in this matter relates to the rerouting of Soil Conservation Service road (SCSRoad).

I have been a resident of Prince George County, Maryland, for over 10 years most of this period I have resided very close to the Eastern border of GSFC (in the Forestgate community, just off of Good Luck Road).

Our preference in this matter would be for SCSRoad to stay in its current configuration, thereby allowing the commuters to maintain the most direct access to and from points North of GSFC. This is the best for both commuters and people living in and around GSFC.

If the status quo cannot be maintained then the Eastern rerouting is much preferred over the Western proposal. It is our firm belief that GSFC employees and residents would suffer greatly in many ways if the Western re-routing of SCSRoad were to be approved.

(1) The best and safest re-routing of SCSRoad would be an Easterly-direction, to an intersection with Good Luck Road as close as possible to the (east High (Deviant) proposal drawn up by GSFC officials. It will be about ½ mile up from Greenbelt Road, which minimizes the impact to Countryside Apartments, minimizes any possible traffic backups into the Greenbelt Road vicinity and minimizes inconveniences to residents of Glenn Dale and other areas who live north of the new proposed intersection.

Please take our input into consideration when deciding on the GSFC Master Facility Plan. The right outcome is imperative to the well being of hundreds of residential homes and families living in and around this area.

Sincerely,
Jim & Maria Hammill

(1) The "east High Deviant proposal was a variant of East Alternative Alignment E-2 that was presented at a public meeting.

Tuesday, 4 September 2002

Dear Sirs:

This letter refers to the NASA/Goddard Space Flight Center (GSFC) Facility Master Plan (FMP) and associated documents that are under your review.

I am a resident of Prince Georges County, Md., for 15 years, and currently reside very close to the Eastern border of GSFC (in the Forestgate Community, just off Good Luck Road).

I am not in favor of Goddard's proposed idea of moving the SCSR to the East, to intersect with Good
(1) Luck Road.

I would prefer that SCSR stay in its current configuration, thereby allowing commuters to maintain the most direct access to and from points North of GSFC.

Thank you for your consideration on this matter.

Respectfully yours,

Gloria J. Bouris
Resident of Forestgate Community

(1) See Section 7.1 for reasons for realignment of Soil Conservation Road to the east side of Goddard.

File No. 41050
Primary Stat. OPL
Due Date

Copies:
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EXEC DIR. ✓ ASST. EXEC DIR (MGMT) ✓
PUB. AF. ✓ LONG RANGE PLNG ✓
GEN COUNSEL ✓ PLANS REVIEW ✓
SECRETARIAT ✓ TDA SUPPORT ✓
ADMIN. ✓

PRESLEY MANOR CIVIC ASSOCIATION
P.O. Box 507, Lanham, Maryland 20703

To: Ms. Debra Young
National Capital Planning Commission

The PRESLEY MANOR CIVIC ASSOCIATION (PMCA), composed of about 400 single-family residences directly south of the main driveway to the Goddard Space Flight Center (GSFC), met September 3, 2002. Discussion concentrated on the activity surrounding GSFC's 20-year Master Development Plan, particularly that part involving the relocation of the Soil Consevation Service Road (SCSR).

As an Association, we have viewed from a distance the varioius metamorphoses through which this planning instrument has gone. At this point we have some specific observations to hopefully add to the rapidly--closing public record concerning this major proposal:

Our primary concern is the rather cavalier manner in which the West Alignment Alternative (W-1) has been purged from existing consciousness in your planning document's syntax. It is an alternative which orignially earned high praise, but which recently---without any real justifcation---has dropped off the radar screen.

(1) **We feel there are many advantages to the W-1 Alternative. Among them are the following:**

Any internal road development would be mainly under Goddard control, and there would be no reliance on other State or Federal agencies with which to contend.

It would be easy to provide accelleration/decelleration lanes for Gate 2, to be reopened on Greenbelt Road (MD 193), as part of W-1.

(2) **Incredible congestion at MD 193 and Good Luck Road (currently a service level of "D") could be prevented from getting any worse.**

(3) **Residents of the Four Seasons Apartments need assurance they can get in and out of their parking lots easily. With the added influx of Goddard main traffic along Good Luck Road, entering and exiting for them would become a perpetual game of Russian roulette.**

Alernative W-1 would provide the desired surface security for an enlarged and combined GSFC campus by utilizing essentially unused space for an internal road. At the same time, ease of access for GSFC employees would be maintained while disruption to all the neighboring communities would be minimized.

By a unannimous vote, it was requested these sentiments be forwarded to the NCPC/Goddard file on the Goddard 20-Year Plan.

Charles H. Dickson Jr., Zoning Committee, PMCA Charles H. Dickson Jr. 09/04/02

(1) The West Alignment Alternative, W-1, did have inherent advantages for site development and NASA operations. It also has less impacts to wetlands and forest than the eastern alignments. But it has been determined that about 80 percent of the public that uses Soil Conservation Road is travelling to and from the east of Goddard, and an eastern alignment functions better from a traffic standpoint.

(2) The road alignment project will include improvements to the intersection to maintain a Level of Service D, which the County considers as an acceptable level of congestion. See Figure 7-12 for improvements proposed.

(3) The Four Seasons Apartments are located on Seasons Way off Cipriano Road. The following is extrapolated from the Figures indicated. They show existing traffic on Cipriano Road at the Greenbelt Road intersection for the peak traffic hour in the morning, and projections made for three cases.

Case	EA Figure	AM Peak Hour Southbound	AM Peak Hour Northbound
Existing Count	Figure 7-13	268	370
2022 No Action	Figure 7-15	414	428
2022 Alternate W-1	Figure 7-17	414	413
2022 East Alternatives	Figure 7-19	415	395

The data show peak AM hour traffic will increase on Cipriano Road even if NASA does nothing (the No Action case). This increase is due to regional growth and projected development in the MD 193 corridor. Relocating Soil Conservation Road to the east or west has little effect on Cipriano Road traffic. Southbound traffic is the same because Goddard employees would not be travelling away from the site during the morning peak hour. Minor differences occur in the northbound direction as NASA and general public drives change routes to reach site entrances or Soil; Conservation Road. The reverse pattern occurs during the evening peak hour.

Edwin H. Fung
9330 Copernicus Drive
Lanham, MD 20706

NCPC
File No. MD50
Primary Stat. all
Due Date

September 4, 2002

National Capital Planning Commission
Office of the Secretariat
401 9th Street, NW
North Lobby, Suite #500
Washington, D.C. 20576

Copies:

CHAIRMAN ___	ASST. EXEC. DIR. (PROGRMS) ✓
EXEC. DIR. ✓	ASST. EXEC. DIR. (MGMT) ✓
PUB. AF. ✓	LONG RANGE PLNG ✓
GEN. COUNSEL ✓	PLANS REVIEW ___
SECRETARIAT ___	TDA SUPPORT ___
	ADMIN ___

Dear Sirs/Madams:

I am writing with regards to the NASA/Goddard Space Flight Center (GSFC) Facilities Master Plan (FMP), which are currently under your review.

I have been a Goddard employee for more than 24 years. For the last 13 years I am also a resident of the neighborhood around Goddard. In fact, I live right across the street from Goddard with the entrance to our community at the intersection of Route 193 and Soil Conservation Road (SCS).

(1) I would like to express my opposition to the Goddard FMP. While the re-routing of SCS will be inconvenient to us, I am more concerned about the relocation of the Goddard Main Gate from the current location (right across the Cipriano Square Shopping Center with a K-Mart) to the intersection of SCS and Route 193, because the new NASA Main Gate will be directly opposite to the entrance to our residential community.

(2) I also object to Goddard's FMP for another reason, and that is the cost of implementing the plan and the dubious and uncertain benefit of the "partnership" aspects of the FMP. In the FMP, Goddard is going to redraw its security (fenced) parameter to a smaller and compact area than the current one. As a result of this, as many as 10 existing Goddard buildings – Bldg 1, 2, 3, 6, 11, 13, 14, 21, 26, 30 – will be outside the new Goddard security parameter. The FMP calls for these 10 buildings to become the "partnership zone" where they will be run by "partners" in private industry. All of the Goddard employees in these buildings will have to be relocated to buildings yet to be built, some of which have been identified in the FMP. I am questioning the responsible use of taxpayers' money to construct these new buildings when these 10 buildings are still in good working conditions. I further doubt that Goddard should be in the office real estate business, as some of those 10 buildings will be converted to office buildings for Goddard's "partners" in private industry. It could well be that the beneficiaries of making these existing buildings for private industry are the partners themselves, instead of Goddard or the U.S. taxpayer.

I am hoping that you take into account the points I raised in this letter in making your decision to consider the Goddard Facilities Master Plan.

Thank you for your time.

Sincerely,

Edwin Fung

Edwin H. Fung

(1) Traffic conditions would improve at this intersection. Soil Conservation Road now serves as a combined commuter route and route for NASA employees to reach Gates 5 and 16 along the road. Under the Facilities Master Plan (FMP) and relocation of Soil Conservation Road to the east, commuter traffic would shift to Good Luck Road. The long queues on the southbound lanes of Soil Conservation Road would be significantly reduced.

(2) Many factors were involved in decisions regarding the disposition of buildings during the programming phase of the FMP. The FMP looks not only at current conditions, but also a 20-year planning horizon. It is based on anticipated changes in Goddard mission assignments, developments in science and engineering, and operational efficiency. The suitability of buildings must be assessed for anticipated retrofit, renovations, maintenance and repair costs over the next 20 years compared to new construction costs for replacement to meet these changes. Many of the existing buildings are not longer suitable for cutting edge, high quality research and engineering, and most of the buildings will be close to 60 years old in 2022. Except for Earth Sciences, the personnel of various Goddard Directorates are scattered throughout the site. The new Space Science Center, which is proposed for implementation in the first phase of the FMP, will be the first step in consolidating Directorates. It will draw personnel from many locations and subsequently permit further unification of Directorates and operational and administrative functions to occur.

Details on the Partnering and Outreach Zone will be worked out over the next five to seven years. For security reasons, this Zone must be accessible from public roads without going through NASA operational areas. In general terms, on an overall zone basis, buildings may be renovated or retrofitted, or they may be replaced by similar new buildings. It is anticipated that future building uses will be similar to what is currently present, a mix of office, research, laboratory, and engineering spaces.

Comment Form

Attn: Mr. Kim Toufectis
Project Manager
Facilities Managment Division Planning Office
Code 221
Goddard Space Flight Center
Greenbelt, MD 20771

Name: Bob Romaniuk / Teresa La Forgia

Address: 11424 Kedleston Road
Glenn Dale, MD 20769

Comment:

(1) Initially, when talk of the closing of Soil Conservation Road began, it was our understanding that Springfield Road would be expanded to accommodate the re-routed traffic to and from the B/W Parkway to Goddard Space Flight Center (GSFC). We were very concerned about the increased amount of traffic going through and around the housing developments that are located just off of Springfield Road. More importantly, we were very concerned about the potential disruption to the local wildlife and plant growth that is located adjacent to that road. It is our understanding (as a result of the meeting we attended on August 6) that those plans have since changed and that Springfield Road is no longer considered an option for expansion, and for that, we are grateful.

Our review of the drawings presented at that meeting, although a bit confusing to us, provided us with better insight as to GSFC's plans for future expansion. In particular, none of the drawings included information on the proposed length of expansion that would occur at Good Luck Road. This was compounded by the lack of description of businesses, intersecting roads, etc., to assist us in identifying where Good Luck Road would now meet up with the "new" Soil Conservation Road. From what we could surmise, the apartment complex located at Route 193 and Greenbelt Road would undoubtedly be affected by increased traffic and road expansion, regardless of the final drawing selected.

In spite of this, our recommendation for the expansion of the Good Luck Road / Soil Conservation Project is the "Alternative E1 (East / Low)" design, which appears to be the least intrusive to the local community surrounding GSFC, although we strongly encourage any and all roadway construction to be relegated to the agency's property.

Finally, our review of the Facilities Master Plan does reflect that NASA has given consideration to creating a more environmentally sound workplace. As the effects of global warming seem to be

(1) Expansion or improvements to Springfield Road were never under consideration. Many citizens, however, contended that a significant portion of Soil Conservation Road commuter traffic would shift to Springfield Road if the West Alternative W-1 alignment were implemented, and that improvements to Springfield Road would be necessary as a result. Under the eastern alignments, including Alternative E-2A, no physical changes to, or increases in traffic on Springfield Road are expected.

parking lots, and roads beyond what is already planned. All buildings should be designed to reduce drain on the local natural resources. The destruction of trees should be strictly limited to only those that are absolutely necessary. And, although reforestation is planned, the animal life that would be affected by the damage done would seem to be great. Financial incentives for staff to participate in car and van pools, use of the Metro and MARC service (shuttles to and from the stations) would surely help reduce some of the traffic volume in and around GSFC.

Thank you for the opportunity to comment on GSFC's proposed Master Plan.

Teresa La Forgia

Bob Romaniuk

September 4, 2002

SSechrist

NCPC File No. MP 50

NCPC
NATIONAL CAPITAL PLANNING COMMISSION

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE NASA GODDARD DRAFT MASTER PLAN AND SOIL CONSERVATION SERVICE ROAD REALIGNMENT

Greenbelt, Prince George's County, Maryland

September 5, 2002

Abstract

The National Aeronautical Space Administration (NASA), Goddard Space Flight Center (GSFC), has prepared and distributed, for public review and comment, a two-part Draft Environmental Assessment for the (1) Draft Master Plan (DMP) and the (2) Soil Conservation Service (SCS) Road Realignment. GSFC is a federal campus located in Greenbelt, Prince George's County, Maryland. For the past few years, the agency has been evaluating its future mission goals and identifying ways to modify the campus to realize those goals. The result is the 2002 Draft Master Plan and accompanying environmental document, the Draft Environmental Assessment (DEA). The DEA addresses the environmental impact of the master plan itself, as well as the first major project under the master plan, the realignment of SCS Road. The DEA describes the environmental impacts of all of the alternatives considered with respect to the physical/biological environment, land use, community facilities, employee population, economics, cultural and visual resources, transportation, and utilities. The Commission is providing GSFC with comments on the DEA, as well as the DMP, in order to give the agency constructive feedback as they finalize these documents.

Authority

Comments pursuant to the National Environmental Policy Act (NEPA), CFR, Part 1503.

Executive Director's Recommendation

The Commission:

Authorizes the transmittal of this report to NASA Goddard Space Flight Center, which raises issues and requests additional information in the final EA and 2002 Draft Master Plan. The primary issues relate to:

- Excessive parking proposed at the site and a parking ratio of nearly one space for every employee, which exceeds the recommended Comprehensive Plan parking ratio of one space for every 1.5 employees.

- The need for a Transportation Management Plan that thoroughly justifies the proposed parking ratio and/or commits to aggressive strategies to reduce the number of employees driving to the site in single occupancy vehicles.
- Potentially adverse environmental effects to wetlands and forest stands associated with the preferred (E-2) SCS Road realignment.

* * *

BACKGROUND AND STAFF EVALUATION

DESCRIPTION OF PROPOSAL

NASA has prepared and distributed, for public review and comment, a Draft Environmental Assessment (DEA) for the 2002 Draft Master Plan and for the Soil Conservation Service Road Realignment for Goddard Space Flight Center, Greenbelt, Prince George's County, Maryland. The DEA evaluates the two separate actions and the environmental impacts associated with each of the identified alternatives. In accordance with NEPA, GSFC must complete an environmental evaluation prior to selection of an alternative for the SCS Road realignment, as well as for the campus master plan. As the public comment period concludes for the DEA, the Commission is offering comments on the report that will ultimately provide public officials and citizens with accurate information and analysis before decisions are made. When the EA is finalized, it will fulfill the agency obligations under NEPA for the master plan and the road realignment projects. Following the completion of NEPA responsibilities, the Commission must approve the 2002 Master Plan, as well as any future projects at GSFC, including the road realignment.

Site

GSFC is a 1,270-acre federal employment center housing NASA's Goddard Space Flight Center, one of nine NASA centers that studies earth and space science. GSFC is located in Prince George's County, Maryland, north of Greenbelt Road, east of the Baltimore-Washington Parkway, south of the Beltsville Agricultural Research Center (BARC), and west of Good Luck Road. GSFC includes the main campus area on either side of SCS Road, as well as four off-site facilities in the vicinity of the main campus. The off-site facilities consist of the Antenna Test Range, the Geophysical and Astronomical Observatory, the Spacecraft Magnetic Test Facility and the Propulsion Research Facility. Residential development is situated to the west, south and east of GSFC and a shopping center is located immediately across from the campus's main gate on Greenbelt Road. The City of Greenbelt is located to the west of GSFC's boundary. The vast majority of the campus population is located on the main campus, which is divided by SCS Road to create east campus and west campus. The majority of the facilities are located on the west campus and the more modern facilities are located on the east campus. This main portion of the campus encompasses approximately 850 acres. The July 2002 Draft Master Plan addresses the existing east and west main campuses; no changes are proposed to the outlying sites. The proposed master plan would replace GSFC's existing 1991 Commission-approved master plan.

GSFC was created in 1958, shortly after the Soviet Union launched Sputnik, when the federal government redefined America's commitment to space exploration. The majority of

development occurred in the time period between 1962 and 1969, with some new development in the late 1980s and early 1990s, primarily on the east campus. Today there are roughly 37 buildings making up the main GSFC campus. GSFC has a campus-like atmosphere in a suburban setting, with green, buffered areas surrounding the majority of the campus. The main campus contains the primary administrative, support, and research functions of the installation.

Access to the main site is through four primary gates: the employee-only gate at the Baltimore-Washington Parkway interchange; the main gate off of Greenbelt Road which serves visitors and employees; and, the gates on either side of SCS Road. There are a number of other gates that are currently unused. Within the site there is an abundance of surface parking associated with each building and a network of roads connecting the various facilities.

Summary of GSFC Statistics

Total employment:	7,600
Total parking spaces:	7,392 spaces
Total square footage:	3.4 million

Summary of Draft EA Alternatives – 2002 Draft Master Plan

Although most of the buildings at GSFC were constructed during the 1960s when the space program got underway, in the 1990s the campus expanded across SCS Road into the eastern part of the campus, where the Earth science buildings are now located. Over the next 20 years NASA Goddard anticipates significant long-term planning changes in the space program and space-oriented research. In recent years, there has been a trend to partner with other governments and private companies to become equal partners on projects. For example, scientists and engineers from a half dozen nations may be directly involved in a mission program. NASA anticipates and encourages further participation by others in space projects and envisions the campus accommodating these future relationships.

Today, many of the existing buildings are no longer suitable for the cutting edge, high quality scientific research done at GSFC. Because of the need to upgrade and or replace existing facilities, and envisioning a future working closely with outside partners, GSFC has evaluated how the campus can guide and coordinate physical development at GSFC over the next 20 years. The agency's current master plan, approved in 1991, does not meet these needs.

The EA document considers two alternatives, the 2002 Draft Master Plan and a no-action alternative. The DMP was developed though a detailed planning evaluative process that began in 1999.

Draft Master Plan Alternative

The principle features of the 2002 Master Plan include:

Create neighborhoods for each NASA group (Earth Science, Space Science, Engineering/Technology, Project Management and Institutional Support.)

Currently, these groups are scattered throughout the campus. Consolidating and co-locating similar uses will provide for better functional and administrative control.

Realign SCS road (federal road with public access)

This would be the first project associated with the GSFC Master Plan and only after the road is realigned could the master plan be realized. The road would remain accessible to the public.

Consolidate campus

The main campus is physically divided by SCS Road, creating functional inefficiencies for employees working on multi-disciplinary projects. To access the other campus, employees must go through two secure gates on either side of SCS Road. Relocating the road would allow for a single, unified campus with controlled access and little expansion into undeveloped areas.

Contingency space & employees (new programs)

This would be called the "new thrust zone" and would accommodate an additional 1,000 employees should the mission of the agency change or should new, unanticipated programs be created. It will also allow for moderate expansion of individual programs or new mission assignments.

Retain approximately same amount of occupied space

The existing square footage would increase only slightly if the contingency space and employees are not needed. Nineteen of the existing buildings (encompassing 1.7 million square feet) would be retained and over 20 additional research and support facilities would be added with approximately 1.6 million square feet.

New Space Science complex

The Space Science division is the most physically spread out on the GSFC campus, and the group housed in the most inefficient buildings. A new Space Science neighborhood would be constructed in the central area of the new campus after the rerouting of SCS Road.

New central commons area

In conjunction with the new Space Science division, a commons area would be created where support services and functions serving all of GSFC would be housed. The services would include: conference center, training center, library, credit union, travel, post office, fitness center and food services.

Teaming spaces

Teaming spaces would be located throughout the campus where NASA staff could meet on shared projects.

Loop road

After the removal of SCS Road, a loop road would be provided within the campus to create a more pedestrian-friendly core campus.

Create partner and outreach zone on GSFC property

The Partner and Outreach Zone (PAOZ) would be created for domestic and foreign partners. The PAOZ would be located along Greenbelt Road on land that is currently within the boundaries of GSFC. The PAOZ could accommodate up to 1.0 million gross square feet in 10 existing buildings currently occupied by NASA. The buildings are currently used for technical or laboratory uses and could be adapted or replaced for Goddard's partners.

No Action Alternative

Under this scenario, the existing employee population and facility space would remain as it currently exists. Facilities would be renovated or replaced in kind, and neither the PAOZ nor the New Thrust Zone would be created.

The following table summarizes the employment, parking and square footage for both the no-action alternative and the draft master plan:

	Existing (no-action)	DMP* =	w/out contingency	w/contingency**
Employees	7,600		7,750	8,750
Parking	7,392		6,975	7,875
Sq.Ft. (millions)	3.4		3.9	4.3

* Includes PAOZ square footage, parking and employees
** Includes an additional 1,000 employees, 900 parking spaces, and 500,000 square feet

The DEA concludes that the DMP would have no substantive impact on land use, regional planning, housing, park and recreation facilities, the terrestrial environment, noise, water resources, wetlands, floodplains, threatened and endangered species and historic properties. In addition, there would be no air quality impacts and potential increases in utility demand are within the capacity of the existing public systems. However, a major component of the DMP is the realignment of SCS Road, which would have potential environmental impacts as discussed below.

Summary of Draft EA Alternatives – SCS Road Realignment

Four alternatives were considered for the realignment of SCS Road, a federal road open to the public. Goddard employees, as well as commuters use SCS Road. Approximately 80 percent of the public users on SCS Road are actually traveling to or from the east on Greenbelt Road. Each of the four alternatives is described below (also see attachment entitled SCS Road Alignment Alternatives):

West Alignment Alternative (W-1)

This realignment would skirt the western periphery of existing development on the west campus and would generally follow existing campus roads (primarily Explorer Road), connecting with Greenbelt Road at Gate 2. The road would be a combination of two and four lanes.

East Alignment Alternative (E-1)

This would be an L-shaped alignment across the northern sector of the east campus, which then turns 90 degrees south and connects to Good Luck Road opposite the Countryside Apartments. The realigned portion of the road would be two lanes and Good Luck Road would have to be widened to four lanes between the intersection with SCS Road and Greenbelt Road.

East Alignment Alternative (E-2)

This alignment passes to the north and east of all NASA development on the east campus. It is similar to the E-1 alignment on the northern portion, but instead of making a 90-degree turn to the south, the road would gradually turn south to intersect further up with Good Luck Road. Good Luck Road would need to be widened to four lanes from the new SCS Road intersection to Greenbelt Road. Improvements to the Good Luck Road/Greenbelt Road intersection would also be necessary. This action would also require the acquisition of property from Concrete Technology Services, Inc. GSFC identifies this as the preferred alignment in the DMP. (1)

(1) A partial take of property will be required from FI-CON Cement Company which is adjacent to Concrete Technology Services, Inc., but none is required from Concrete Technology Services, Inc.

No-Action Alternative

The road would not be realigned under this alternative. However, the DMP could not be implemented under this scenario.

The primary effect among the alternatives is the redistribution of traffic in the study area. Generally, the net effect will be to add traffic in one direction and reduce it in another along Greenbelt Road. Both of the eastern alignments would result in a significant increase of cars on Good Luck Road between where the new SCS Road intersects Good Luck Road to the intersection with Greenbelt Road. The DEA found that none of the alternatives would produce substantive traffic noise or air quality impacts; however, the eastern alignments may impact two historic archaeological sites and have minor impacts on wetlands and forest cover. The eastern alignments would also isolate NASA's recreation center from the remainder of the campus and require the relocation/replacement of two tennis courts. The western realignment would

potentially cause vibration impacts to some of NASA's activities. In all alternatives, right-of-way would have to be acquired from the Beltsville Agricultural Research Center (BARC).

PREVIOUS COMMISSION ACTION

On September 5, 1991, the Commission approved a revised master plan for GSFC, *except* for the proposed parking program, and provided preliminary approval to the Earth Observing System Data Information System Building (EOSDIS) on the east campus. The Commission's approval of the master plan established an employment ceiling of 8,750 employees, and requested that GSFC, prior to the implementation of major master plan development proposals:

a. Prepare and submit for Commission review a Transportation Management Program that emphasizes trip reduction rather than increased road capacity; establishes clear goals for reducing GSFC-related vehicle work trips and increasing vehicle occupancy rates and public transit usage; and details how transportation goals will be met and monitored in conjunction with federal, state, and local agencies;

b. Prepare a long-range installation parking program that clearly indicates the number of visitor and employee parking spaces and reduces the extent of paved employee surface parking area while providing structured parking as an alternative to surface parking, where possible; and,

c. Coordinate closely with the Prince George's County Planning Board and the City of Greenbelt regarding their recommendations on the revised master plan, including those items related to needed transportation and roadway improvements.

After the Commission approved the Earth science building in 1992, no additional changes were submitted under the revised master plan and no further action was taken on the Transportation Management Program (TMP) or the parking program as requested by the Commission.

The Executive Director also responded to GSFS's request for comments on scoping information for the proposed EA in May 28, 1999, as well as provided comments on the pre-draft EA for the GSFC Master Plan and the realignment of SCS Road in September of 2001. The scoping comments outlined the issues the document should address, from conformance with the Comprehensive Plan for the National Capital to maintaining forest corridors and buffers. The Executive Director's comments on the pre-draft EA focused primarily on NASA making a more concerted effort to adhere to the transportation and parking goals of the federal government in the National Capital Region, and recommendations that NASA consider establishing programs to make building occupants aware of opportunities to reduce energy use.

EVALUATION

After fully evaluating the analysis and conclusions of the DEA, staff believes that the general findings regarding the future development of GSFC and its impact on the environment are reasonable. The goal of reconfiguring the campus into a single, unified campus will allow for consolidated functions and provide a better setting for scientific research within NASA and with

outside partners. However, there are two areas where staff has raised questions and concerns, including:

(1) Traffic impacts and parking;
(2) Environmental impacts from the eastern road realignment.

In some cases, it may be more appropriate to provide revised information in the Draft Master Plan; other information may be more appropriately included in the EA document.

Traffic Impacts and Parking

Traffic impacts from the master plan will likely be similar to existing impacts if the New Thrust Zone and contingency employees are unnecessary – and somewhat greater if the contingency plan if the 1,000 contingency employees are hired. The maximum proposed employment level at GSFC in the 20-year planning time frame would be 8,750 employees, of which 6,800 would be NASA employees and 1,950 would be non-federal (but counted) employees in the PAOZ. Because the Partnering and Outreach Zone is proposed on federal land, and will potentially use existing federal facilities, those employees are counted as if they were GSFC employees. Regardless of the number of future employees at the site, existing traffic congestion in the area around Goddard and in the region has reached critical levels, and the Washington area has recently been classified by U.S. Environmental Protection Agency as a non-attainment area for ground level ozone under the Clean Air Act Amendments of 1990. It is essential for federal agencies to take aggressive steps to help reduce the regional traffic problems.

Parking/Transportation Management Plan

(2) The existing parking ratio and the proposed parking ratio under the 2002 DMP both exceed the Comprehensive Plan recommended ratio of 1 space for every 1.5 employees (the 1991 master plan considered a Comprehensive Plan parking ratio of one space for every two employees because the document's graphic incorrectly shows Goddard within that ratio.) The following table outlines the existing and proposed parking ratios at GSFC:

	No-Action	DMP Alternative*
Employee	7,600	8,750
Parking**	7,392	7,875
Parking Ratio	1 : 1.03 (Space : Employee)	1:1.11

* The numbers include the 1,000 contingency employees as well as their associated square footage and parking. If the 1,000 employees and their associated parking are removed from the calculation the ratio remains the same.
** Does not separate out visitor parking from employee parking.

(2) A breakout of existing and DMP parking by type was provided in DEA Table 5-8. NASA has prepared a new Transportation Management Plan which has a goal parking ratio of 1.43.

As the table shows, the parking ratio would be slightly improved over the 20-year planning time frame, but does not reach the goal of 1 space for every 1.5 employees. In 1991, when the Commission approved the most recent GSFC Master Plan, they *excepted out* the amount of parking at the site and requested that GSFC provide a TMP emphasizing trip reduction rather than increased road capacity; establishing clear goals for reducing GSFC-related vehicle work trips; increasing vehicle occupancy rates and public transit usage; and detailing how transportation goals would be met and monitored. They also requested that GSFC propagate a long-range installation parking program that clearly indicated the number of visitor and employee parking spaces, reduced the extent of paved employee surface parking, and provided structured parking as an alternative to surface parking. At the time the Commission took this action, the employee to parking space ratio was 1 space for every 1.28 employees. With the addition of the EOSDIS facility, as well as a second Earth science building—which was never submitted to the Commission for approval—the parking ratio at GSFC has reached a nearly one-to-one ratio, which is, more than ever before, incongruous with the Comprehensive Plan recommended parking ratio.

In the opinion of staff, the TMP submitted with the DMP is insufficient – the data does not support the relatively minor reduction in the amount of parking at the site and the concerns stated by the Commission in 1991 have not been addressed. The document acknowledges the distant
(3) location of the site from transit, but establishes a relatively minor reduction in parking supply, nor does it identify ways to aggressively reduce parking demand. Although GSFC has acknowledged a long-term goal of meeting the Comprehensive Plan parking ratio, it is beyond the 20-year planning time frame of the DMP and no concrete steps are outlined to achieve this goal. Certain strategies, such as the taxi-on demand and educating employees about alternatives, are positive first steps; however, it appears that more could be done. There are a number of items that should be clarified in the document as it is revised, including:

(4) - Provide a breakdown of employee versus visitor parking (visitor parking does not count toward an agency's parking ratio; however, visitor parking must be used exclusively for visitors).
(5) - Describe or show preferential parking for carpools and vanpools.
- Address how the DMP would alleviate or reduce the excess surface parking.
- Justify why and how the transportation and parking goals were reached (such as why a transit usage goal of 2.8 percent was selected and why ridesharing was increased by only .5 percent).
- Revise the two zip code maps to include transit information (bus, MARC and metro, as well as any nearby HOV).
- Clarify the differences between the two zip code maps (certain zip code zones are included in one map, but not on the other).
- Begin discussions with WMATA and Prince George's County on potential direct busses from Metro/MARC to the site immediately to start managing demand, instead of waiting until the employee transportation habits change at GSFC.
- Address conflicting information regarding express bus service (it is discussed in the EA, but not in the TMP).
- If data is available, address average distances driven.

(3) As part of Facilities Master Plan process, NASA is developing a more definitive proactive Goddard Transportation Management Plan (TMP) that outlines strategies and initiatives to reduce single occupancy vehicle (SOV) employee commuting (See Section 5.2.7). Development includes NCPC review. The new TMP sets a long term goal of 0.70 spaces per employee (a 1:1.43 inverse ratio), with intermediate ratios in the interim. The TMP will include these items.

(4) Existing and projected 2022 FMP employee and visitor parking is shown in Table 5-8.

(5) The items are clarified in the new Goddard Transportation Management Plan.

Express bus service between Goddard and the Greenbelt and New Carrollton Metro stations (The Bus Express Route 15) was established in cooperation with Prince George's County on a trial basis just prior to publication of the Draft FMP and EA. It was noted in the EA, but not in the FMP or TMP.

The open areas of BARC and the Patuxent Wildlife Research Center essentially cuts the close in employee population at Goddard in half, lengthening the overall average distance travelled. No data is readily available on the average distance driven. But it can be deduced that the average distance travelled by NASA is longer than typical for a Federal facility located in the suburbs and surrounded by residential development. Under these circumstances, the employee home locations normally assume a bell shape distribution centered on the facility with the highest concentrations occurring in the immediate vicinity of the site.

- Encourage greater accessibility to bike commuters by providing facilities for those employees who bike to work.
- Consider employing an Employee Transportation Coordinator.
- Many of the long-term goals – improving pedestrian and bicyclist linkages, and the use of a shuttle system – should be reevaluated as short-term goals.

GSFC should also address the transportation issues raised by the State of Maryland Planning and Environmental Agencies, the City of Greenbelt, as well as the comments of the Prince George's County Planning Board summarized below prior to submitting the master plan document for Commission approval.

Environmental Impacts Issue

While the EA document identifies potential impacts associated with each of the proposed road realignments, it does not provide sufficient detail for overall conclusions. In fact, it is Goddard's preferred SCS Road realignment, E-2, that could result in the most significant disruption of wetland habitat, forest fragmentation and adverse soil slope and sedimentation impact, and may add to stormwater runoff and sedimentation into tributary waters. Staff offers the following recommendations in finalizing the GSFC EA, which relate primarily to wetlands and forest and tree impacts.

(6) In the final EA, GSFC should demonstrate compliance with Executive Order (EO) 11990: Protection of Wetlands, dated 1977. In addition, GSFC should work with the Maryland Department of Environment and the Maryland Department of Natural Resources in its compliance with EO 11990. GSFC should also demonstrate compliance with the Comprehensive Plan in regards to wetland compensation for the loss or alteration to any nontidal wetlands within the watershed areas located at GSFC.

(7) The E-2 alignment also results in potentially adverse forest and tree impacts. GSFC should demonstrate coordination and review of the alignment with state resource agencies in regards to forest and tree impacts and identify mitigation to offset these impacts. GSFC should also address NCPC's Comprehensive Plan policies that encourage the protection of environmental quality functions afforded by woodlands and vegetation areas, and encouraging the road realignment to incorporate existing vegetation. Additional information should include:

- Clear delineation of the extent of forest removal.
- Analysis and identification of where forest canopy closure can occur over the proposed realignment.
- Analysis and identification of potential forest habitat that can occur up to the edges of the road alignment.
- Identification of, or potential for, development of terrestrial wildlife crossings beneath the road alignment.

(8) The documents should also address the comments raised by the Prince George's County Planning Board as they pertain to stormwater runoff and the loss of woodland with the preferred

(6) See new text in Section 7.4.10.1

(7) See new text Section 7.4.9. It is premature to resolve forest loss and conservation issues at this time. This will be done during the design phase for the road, when detailed information on both issues will be developed. Estimates of tree loss are based on complete clearance within the road right-of-way, and beyond new security fencing bordering the road. The right-of-way width will be 80-feet to meet County road cross-section standards with a bike path, plus that which may be necessary for cuts and fills. Soil Conservation Road is and will be a public thoroughfare. Driver and vehicle safety take precedence over environmental issues. Trees within the right-of-way are a collision or safety hazard. Canopy closure may occur along Good Luck Road depending on species selected during design.

The habitat adjacent to the cleared and fenced right-of-way Goddard has no critical habitat. The existing site forest is in poor condition because browsing deer have virtually eliminated the understory. (See last paragraph Section 5.4.3).

Existing Soil Conservation Road is fenced throughout its passage of Goddard, and site perimeter and internal fencing have no apparent constraint on wildlife movements. Vehicles now collide with deer about four times per year at Goddard. The new road is expected to have no greater constraint on wildlife movements than the existing one. Cuts and fills will be minimized and crossings beneath the road will be limited to storm drain culverts and pipes with a maximum dimension of about four feet.

(8) See responses to County letter on Page B-30ff.

(9) road realignment. The City of Greenbelt has also provided recommendations in regards to wetlands and reforestation that Goddard should respond to.

COORDINATION

State of Maryland Department of Planning

The Department of the Environment's Water Management Administration and Waste Management Administration provided boilerplate comments regarding compliance with state environmental procedures and permitting.

The Department of the Environment's Air and Radiation Management Administration encouraged GSFC to plan for the maximum utilization of carpools and public transit use by employees and provide alternatives to single occupancy vehicle use in order to minimize the impact of traffic generated by the proposed project.

(10) The Department of Planning transportation comments can be summarized as follows:

- The TMP is incomplete because it lacks analysis of transportation trends and goals for GSFC.
- Coherent, short-term strategies are needed in the TMP.
- GSFC should meet NCPC's Comprehensive Plan parking ratio.
- The TMP should set short-term and long-term strategies for the site, including carpool, vanpool and bicycle commuting options.
- A transportation management coordinator position should be created.
- Transit access to the site should be improved.
- The meandering paths in the plan should be reconsidered to provide for more effective bicycle commuting.
- Facilities should be provided for bicycle commuters.
- The transportation analysis should include: peak hour vehicle trips, travel mode split, average passenger occupancy, intersection level of service, county bicycle, pedestrian and multi-use trail network, and peak parking utilization.
- The State planning agency also proposed some potential strategies GSFC could utilize, including an employee incentive program for using alternative transportation modes and preferred parking for carpools and vanpools.

Prince George's County Planning Board

The Prince George's County Planning Board reviewed and approved comments to NCPC on the GSFC DMP on July 18, 2002. The comments are summarized below:

(11)

- Transit plazas should be provided on MD 193 to enhance and link future bus or transit service along Greenbelt Road.
- Pedestrian connections should be provided to the transit plazas, including on the south side of Greenbelt Road across from the main gate.
- An internal bus system should connect to the transit plazas.

(9) See responses on pages B-17ff.

(10) See responses 1 and 2.

(11) The Facilities Master Plan has been revised to include provision for transit plazas, and the new TMP proposes regularly scheduled internal campus shuttle service as soon as ridership demand dictates.

(12)
- More intensive development should be considered in the Partnering and Outreach Zone.
- Fire suppression should be installed in all structures.
- The master plan considered expansion of uses without considering improvements to the area transportation system.

(13)
- GSFC should consider improvements to the area transportation system to offset impacts to the B-W Parkway and provide adequate service levels at Greenbelt Road and Good Luck Road, and the B-W Parkway ramp junctions with Powder Mill Road.
- In regards to the SCS Road realignment, consideration should be given to (1) its intersection with Good Luck Road, (2) the Good Luck Road/Greenbelt Road intersection, and landscaping, buffering and trails along the alignment. In addition, GSFC should continue coordination with the Planning Department, Department of Public Works and Transportation, and possibly state highway officials.
- The E-2 alignment proposes the greatest loss of woodland area and generally reforestation cannot account for the benefits of the current woodland area.
- Impervious surfaces should be minimized if possible and stormwater runoff should be treated to improve its quality. Low-Impact Development techniques should be utilized.
- Any alterations to the Spacecraft Magnetic Test Facility building must comply with Section 106 of the National Historic Preservation Act.

The Prince George's County Planning Department provided additional draft comments on the DEA that indicated the County's preference for the E-2 SCS Road realignment, even with the potential environmental impacts associated with this realignment. The County went on to recommend that the document should identify environmental mitigation measures and address traffic impacts, with the goal of getting to a near term parking goal of .84 or 1 space for every 1.19 employees.

City of Greenbelt

On August 12, 2002, the City of Greenbelt City Council approved a number of conditions/findings on the GSFC Draft EA and Draft Master Plan, including a recommendation that SCS Road *not* be realigned because of the environmental and traffic impacts associated with the realignment. The City also provided a number of other comments which are summarized below, requesting that GSFC:

(14)
- Consult with the City if any modification or alterations to the plan would impact the City.
- Provide adequate on-site wetland mitigation and reforestation and not pursue wetland barking or of-site mitigation options.
- Develop a plan to actively reforest areas where buildings are demolished.
- Work with the City to establish better transit connections and explore specific short or long-term transportation management options.
- Provide the City with a plan for improving the area roadways systems that details mitigation actions.
- Should SCS Road be realigned, refer the chosen alignment to the City for review.
- Continue to discuss the acquisition of the 80-acre buffer area on the western side of the campus.

(12) Development in the Partnering and Outreach Zone is not expected to occur before 2009. More detailed studies of the zone will be competed before this occurs. Development intensity is limited by environmental and transportation factors.

(13) See Section 7.4.2.3. As noted elsewhere, the Goddard employee population will remain at or below current levels, unless some "New Thrust" mission is assigned to the facility. No traffic or transportation impacts are generated by Goddard unless this is the case. Impacts shown on Section 7 are for this "worst case" situation.

Congestion will increase significantly on nearly all roads in the vicinity of GSFC by 2022. This congestion is due to growth in background or non-NASA traffic that is created by development projected for the MD 193 corridor and the County. NASA is not responsible for the impacts generated by this outside growth

Each major building project proposed in the Facilities Master Plan is subject to NCPC review at the time of implementation. The review includes assessment of environmental and transportation impacts associated with the facility. This would occur if a "New Thrust" facility is built. The traffic impacts and necessary mitigation measures would be determined at that time.

NASA will continue will continue coordination with these jurisdictions as the realignment undergoes design and construction.

(14) See responses page B-17ff.

- Delineate an improved bicycle/pedestrian access point to the campus from the end of Northway in Greenbelt to the employee entrance gate.
- Create a specific parking reduction plan that includes implementation measures and a time frame for meeting the goals of the plan.
- Provide the City with detailed plans on the PAOZ.

CONFORMANCE

Comprehensive Plan

Several policies contained in the Comprehensive Plan for the National Capital apply to the proposed alternatives, including the following policy in the Federal Employment and Federal Facilities Element:

> Agencies or activities with common or complementary functions should be consolidated in common or adjacent space to improve administration, employee management and productivity.
>
> Innovative energy conserving techniques should be used in the design, construction, operation, location and orientation of federal facilities.

Wetlands are located just off the site and will be potentially impacted if the preferred (E-2) SCS Road realignment is selected. An applicable policy in the Environment Element states:

> When development in a Wetland is deemed to be the only practicable alternative, development should be restricted to minimal recreational and agricultural activities or other similar uses and should utilize the best engineering practices available to minimize adverse impacts.

The Parks, Open Space and Natural Features Element also establishes policies for Gateways and Parkways:

> The Baltimore-Washington Parkway should be maintained as a significant historic landscape park and open space feature of the National Capital Open Space System.....The roadway should not be widened, utilized for other modes of transportation or additional interchanges provided which would detract from its landscaped quality or character.

The Comprehensive Plan's employee parking standard for the GSFC is one parking space for every one-and-one-half (1.5) employees. As proposed, the amount of parking is in excess of that permitted by the Comprehensive Plan parking standard. The following policies in the Transportation Element are relevant:

> Parking at Federal Facilities for Federal Employees and Visitors should be provided and managed at a level that assumes the maximum use of public transportation and high-occupancy vehicles (vanpools and carpools).

Allocation of employee parking spaces at all Federal Facilities should be according to the number of vehicle occupants, with priority given to van and car pools...

In the interest of efficient use of land and improvements the appearance of Federal properties, parking at Federal Facilities should be locate in structures, to the extent possible.

National Environmental Policy Act

Pursuant to the National Environmental Policy Act, the National Aeronautics and Space Administration (NASA) has prepared an Environmental Assessment (EA) of the Proposed Goddard Space Flight Center (GSFC) Master Plan, including realignment of Soil Conservation Road, in Greenbelt, Prince George's County, Maryland.

Alternatives to the proposed master plan, as presented in the EA, are two: the planned action and the "No Action" alternative. The proposed master plan would consolidate the existing east and west campus into a more condensed campus. The No Action alternative would assume the NASA employee population and total facility space would remain approximately the same as what currently exists.

Review of the draft EA by staff has found the document is well prepared. The analysis in the EA assumes complete build out of all facilities in the master plan with a projected GSFC worker population of 8,750 as a maximum impact scenario. Issues of importance in the potential environmental effects of the master plan include:

- Traffic impacts from the Plan, which appear to be small, requiring reprogramming of traffic signals and the necessary widening of various nearby major intersections. These changes should not be adverse to the streetscape or the urban design fabric currently contemplated for the Greenbelt area or the City of Greenbelt.

- A stronger commitment to Transportation Demand Management to meet the National Capital Comprehensive Plan Policy of 1 parking space for every 1.5 employees versus the stated master plan goal of 1 parking space for every 1.11 employees; or a better defined concept plan to encourage greater use of telecommuting beyond the potential of 1.5 percent of the employee base.

- A net increase of eight additional acres of impervious surface would be introduced into the GSFC by the full build-out of the master plan. This is an approximate increase of one percent of the total sub watershed of the campus. Existing GSFC stormwater management basins would have adequate capacity to address the master plan quantity and quality control requirements. This characteristic, however, does not apply to the sub drainage area of the relocated Soil Conservation Road and the vicinity of Buildings 16, 16W and 27 with their associated parking areas.

The evaluation also considers the relocation and realignment of Soil Conservation Road to the west, east and outer northeast perimeter of the GSFC, as well as a no build alternative. All of the alternatives would change traffic patterns along Greenbelt Road. Of the issues identified, the most problematic is the eastern Soil Conservation Service Road realignment. SCS Road is open to and used by the general public as a commuter and general travel route. It serves as a connection for those traveling between points on the east side of GSFC and Powder Mill Road interchange on the Baltimore-Washington Parkway.

The GSFC preferred alignment of the Soil Conservation Road relocation (Alternative E-2) would envision a two-lane road traveling in a corridor trending east along the northern tier of the east campus, turning south about 60 degrees to run straight across vacant but heavily forested sections of GSFC, to intersect with Good Luck Road on a perpendicular alignment. The length of the road would be just over one mile. Level of Service on the road intersections, projected to 2022 is very good, at level A, with a critical lane volume of between 595 to 649 vehicles per hour.

(15) However, staff believes the improvements of the road relocation come at the risk of significant disruption of wetland habitat, forest fragmentation, and adverse soil slope and sedimentation impacts. The road realignment is proposed within the headwater areas of Beaverdam Creek in Prince George's County. While populations of aquatic biota in the middle reaches of Beaverdam Creek are healthy and diverse, water quality problems occur in the tributary and may be the cause of the impaired aquatic communities downstream of the Beltsville Agricultural Research Center property. Also, casual stream surveys conducted by Metropolitan Washington Council of Governments staff has revealed that several smaller feeder tributaries are experiencing moderate-to-severe channel erosion from uncontrolled stormwater runoff. The Soil Conservation Road realignment potentially would add to stormwater runoff and sedimentation of tributary waters.

It is evident that wetland impacts are also going to occur with the preferred east route realignment. The contiguous wetland just north of the GSFC is classified as a Maryland Wetland of Special State Concern. Wetland fringes within GSFC feed into this area. In the context of that fact, the requirements of Executive Order (EO) 11990: Protection of Wetlands, dated 1977, must be
(16) demonstrated by GSFC. The purpose of Executive Order 11990 is to "minimize the destruction, loss or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, the Order requires federal agencies in their planning actions to consider alternatives to wetland development and limit potential damage if an activity affecting a wetland cannot be avoided. The Order applies to acquisition, management, and
(17) disposition of federal lands and facilities and to construction and improvement projects that are undertaken or financed by federal agencies. The Commission staff at this juncture does not see compliance with the Executive Order demonstrated by the EA. The staff believes the GSFC should demonstrate compliance with the Executive Order. Additionally, staff requests the GSFC, in its review of the wetland impact issue, obtain and demonstrate consultation and comment from the Maryland Department of Environment and the Maryland Department of Natural Resources. Moreover, in conformance with the objectives of the Comprehensive Plan for the National Capital, the staff believes the compensation for any loss or altering of nontidal wetlands should occur only directly within the watershed areas located at GSFC.

(15) As noted elsewhere, wetland losses will be mitigated by measures that must satisfy U.S. Army Corps of Engineers and Maryland criteria. In the context of the whole, the wetlands and forest on the east campus to the north of the Eastern alignments will continue as a unit with those on BARC property to the north to Beaverdam Road. Forest and wetland losses are not substantive when viewed on an east campus or broader area basis. Wetland losses are only slightly higher than the amounts that would meet mitigation exemption criteria. Forest losses are little more than one percent of the site total. NASA will set aside a Long Term Forest Conservation Area within the campus to mitigate losses. The location and character of this areas will be established during the design phase. Stormwater Management and sediment and erosion control must meet the criteria of the Maryland Department of the Environment.

(16) See Section 7.4.10.1 for Wetland Finding.

(17) Copies of the Draft Environmental Assessment were sent to these agencies. They had no comment on wetland issues at this time.

It should be noted that resolution of wetland issues and compensation normally occur during the process for obtaining a permit to construct in a wetland area from the Corps of Engineers and Maryland DNR. Impacts and compensation are based on final engineering plans. NASA will compensate for losses at an appropriate replacement ratio. It is most likely that this will occur within GSFC.

(18) With regard to forest and tree impacts of the road relocation, the staff again finds limited demonstration of coordination with state resource agencies and requests that GSFC coordinate the identification and further design location of the road alignment with Maryland Department of Natural Resources in the context of forest impact assessment. Additionally, staff requests the GSFC to identify compensating or mitigation actions it would implement to offset forest impacts. Particularly, staff requires the GSFC to respond to the Comprehensive Plan for the National Capital issues of:

- Protecting the environmental quality functions afforded by woodlands and vegetation areas, such as soil stability, temperature moderation, erosion control, and the protection of wildlife habitats.

- Encouraging the road alignment to incorporate existing vegetation; extensive use of additional indigenous plant species; and preserve the connectivity of the woodlands to help maintain wildlife habitats.

Furthermore, staff believes the forest impact issues that require further discussion and consideration by GSFC to the Commission include:

(19)
- Clearly delineating the extent of forest removal in additional data provided.

- Analyze and identify areas where any forest canopy closure can occur over the proposed road realignment.

(20)
- Analyze and identify potential forest habitat that can occur up to the edges of the road realignment without the implementation of mowed or grass shoulder areas.

- Identifying use of or potential development for terrestrial wildlife crossings beneath the road alignment throughout the GSFC east area.

<u>National Historic Preservation Act</u>

The earliest buildings at Goddard were built in the 1960s. Goddard has one historic property listed in the National Register of Historic Places: the Spacecraft Magnetic Testing Facility, Building 305, which has also been designated a National Historic Landmark for its national significance to the space program. (See below for further information about this unique resource.)

Goddard has been consulting with the Maryland Historical Trust (MD SHPO) in the identification of archeological sites on the campus. Based on research, and given Goddard's location near water sources, NASA has produced a predictive archaeological model for sites on and around the campus. As a result of the 1999 Phase I reconnaissance survey, one prehistoric and two historic period sites on Goddard property are potentially eligible for listing in the National Register of Historic Places.

(18) The Draft EA was sent to the appropriate agencies. No comment was received because issues related to losses and mitigation are considered to be minor and resolvable during the design phase.

(19) Forest loss will occur virtually along the entire length of any of the eastern alignments. Forest locations and types are shown in Figure 5-16. The road will be designed to AASHTO and State standards. These standards set minimum driver sight lines and elimination of collision hazards within the right-of-way. The minimum right-of-way will be cut to maintain the safety standards.

(20) See responses Page B-58.

Neither the Master Plan nor the No Action Alternative would directly affect the known historic and archaeological resources on the campus. Neither alternative proposes any changes in Area 300, the location of the Spacecraft Magnetic Testing Facility.

The western road alignment would not affect known historic or archaeological resources. The two eastern (E-1 and E-2) Soil Conservation Road alternatives pass close to sites potentially eligible for listing in the National Register of Historic Places. NASA acknowledges both that the alignment routes are preliminary and that further archaeological investigation is needed. NASA will conduct a Phase II investigation to further delineate the extent and content of the two sites. NASA will consult with the MD SHPO as this work proceeds. NASA's stated intention is to avoid the sites if practicable. If warranted, Phase III recovery of materials would be conducted in consultation with the MD SHPO.

Outside the Goddard campus, two National Register-listed properties are in the Area of Potential Effect: the Baltimore-Washington Parkway Historic District and the City of Greenbelt Historic District. NASA has determined that buildings and facilities proposed in the master plan would have no direct or indirect adverse effect on identified historic or archeological resources outside Goddard. The B-W Parkway/NASA interchange was built in 1966 and is not an original or contributing feature of the Parkway. NASA anticipates that reconditioning of the ramps and bridges will be needed within 20 years, regardless of the alternative selected. NASA, which owns these features, will consult with NPS and the MD SHPO during the planning and design of the interchange, preserving the significant design and landscape qualities of the Parkway.

The Spacecraft Magnetic Testing Facility (Building 305), constructed entirely of nonmagnetic materials, was built in 1966. It houses the Braunbek magnetic coil system, which generates magnetic fields, including one that cancels the Earth's field over a six-foot diameter spherical space at the coil center. Other physical features of the building and equipment that support the coil, including the gimbaled turntable at the center of the coil test area, the track and dolly system, the nonmagnetic torquemeter used to measure magnetic torques, various hoists, and the air conditioning system with HEP air filters, are all part of the landmark designation. The only facility of its type in NASA's inventory, the system makes it possible for scientists to determine and minimize the magnetic movement of even the largest unmanned spacecraft and thus to maintain satellites in orbit.

Building 305 is located in satellite Area 300, north of Good Luck Road and east of the center of the campus. It is the largest of a group of small buildings sited in clearings near the center of the area. Isolation from all outside manmade magnetic sources is required; a forest buffer surrounds the buildings and the area is further protected by a perimeter fence and limited, monitored access of personnel. Alterations to the facility are managed through a 1996 Programmatic Agreement (PA) among NASA, the National Conference of State Historic Preservation Officers, and the Advisory Council on Historic Preservation. The PA allows NASA to make changes in operational and research requirements while still honoring the intent of the National Historic Landmark designation.

GLENN DALE CITIZENS' ASSOCIATION

P.O. Box 235
Glenn Dale, MD 20769
September 8, 2005

Mr. Kim Toufectis
Project Manager
Facilities Management Division Planning Office
Code 221
Goddard Space Flight Center
Greenbelt, MD 20771

Dear Mr.Toufectis,

(1)

As you requested I've made a summary of my remarks to NCPC on September 5:

"Mr. Chairman, Members of the Commission,

My name is Mary Vondrak. I am President of the Glenn Dale Citizens' Association. Glenn Dale is a community that is adjacent to and east of NASA Goddard.

I am here to speak about the realignment of Soil Conservation Service Road. Soil Conservation Service Road has been used by the surrounding communities for many years prior to and since the establishment of NASA Goddard. Our first preference would be that Soil Conservation Service Road remains just as it is. However, NASA feels that it needs to realign the road for increased security and to improve its operation. Any realignment should have the smallest impact on the surrounding communities and it should be the safest road possible for commuters, pedestrians and residents.

If the realignment is necessary, we prefer the Eastern Alignment.

However, there are a few problems to consider, which impact the choice between the E1 Low and the E2 High Alternatives:

1. NASA proposes to build a central receiving building (N) on the Eastern Alignment of Soil Conservation Service Road. This will result in truck traffic, including 18 wheel vehicles, traveling through a residential neighborhood. This is unsafe. In my letter to NCPC, I have asked NASA eight questions

(1) This is a summary of comments made to the Commissioners at the National capital PlanningCommission Draft FMP and realigned Soil Conservation Road review meeting on September 5, 2002.

concerning this truck traffic. I hope that we will receive very exact answers. I would like to ask that NASA pick a different location for the central receiving building that is not on the Eastern Alignment.

2. Road Design: We prefer a design of the Eastern Alternative that is different from that shown in the Draft Environmental Assessment. We favor a variant of the road design that would have Soil Conservation Service Road as the main road intersecting with MD 193 (Greenbelt Road). Good Luck Road would then join Soil Conservation Road at a T- intersection.
3. Both the Low E1 and the High E2 Eastern Alternatives should be reviewed carefully to choose a road design that has the least impact on the apartments and businesses presently situated on the affected portion of Good Luck Road. The entry and exit of vehicles from the apartments and businesses to the new road should be considered. Safety should be paramount. Poorly designed access could result in accidents and the need for additional stoplights. This would impede traffic flow.

Finally, special consideration should be given to the redesign of the intersection of the new road with MD 193 (Greenbelt Road). In addition to the large amount of vehicular traffic through this intersection, there is a large amount of pedestrian traffic due to the fact that the Countryside Apartments lie in the Northeast corner, Duval High School lies in the Southwest corner and there is a bus stop in the Northwest corner.

In conclusion, I'd like to thank NASA for ordering new traffic and engineering studies. We appreciate their improved communications with their unincorporated neighbors to the east and south, represented by the Coordinating Council of Community Organizations. We hope to continue this close communication with NASA in the future."

Sincerely,

Mary Vondrak

Mary Vondrak
President, Glenn Dale Citizens' Association

APPENDIX C
ABBREVIATIONS AND ACRONYMS

A	
AASHTO	American Association of State Highway and Transportation Officials
AC	Acre
APHIS	US Animal Plant Health Inspection Service
AQCA	Air Quality Control Areas
AWS	Alternative Work Schedule
B	
BARC	Beltsville Agricultural Research Center
BTU	British Thermal Units
BWP	Baltimore-Washington Parkway
C	
CAA	Clean Air Act
CF	Cubic feet
CFC	Chlorofluorocarbons
CFR	Code of Federal regulations
CFS	Cubic feet per second
CLRP	Constrained Long Range Plan for National Capital Region
CLV	Critical Lane Volume
CMS	Congestion Management System
CMSA	Consolidated Metropolitan Statistical Area
CO	Carbon Monoxide
COBE	Cosmic Background Explorer
COMAR	Code of Maryland
D	
dBA	A-weighted decibel
DC	Direct Current
DEA	Draft Environmental Assessment
DESC	U.S. Defense Energy Supply Center
DOT	Department of Transportation
DPW&T	(Prince George's County) Department of Public Works and Transportation
E	
EB	Eastbound
EIS	Environmental Impact Statement
EOSDIS	Earth Observing System/Data Information System

E (cont'd)	
EPA	US Environmental Protection Agency
ESSB	Earth Systems Science Building
F	
FHWA	Federal Highway Administration
FL	Florida
FMD	Facilities Management Division
G	
GEWA	Goddard Employee Welfare Association
GPD	Gallons per Day
GPM	Gallons per Minute
GSF	Gross Square Feet
GSFC	Goddard Space Flight Center
GWP	Global Warning Potential
H	
HBCP	Heritage and Biodiversity Conservation Program
HCFC	Hydrochlorofluorocarbons
HOV	High Occupancy Vehicle
I	
ISTEA	Intermodal Surface Transportation Efficiency Act
IUE	International Ultraviolet Explorer
IWMP	Industrial Waste Monitoring Point
K	
KM	Kilometers
KV	Kilovolts
L	
LB/HR	Pounds per Hour
Leq	Equivalent noise level
LOS	Level of Service
M	
MARC	Maryland Rail Commuter

M (cont'd)	
MDE	Maryland Department of the Environment
MGD	Millions Gallons per Day
MG/L	Milligrams per Liter
MFCTC	Magnetic Field Component Test Facility
MGD	Million Gallons per Day
MHT	Maryland Historic Trust
MMBTU	Million British Thermal Units
MMBTU/HR	Million British Thermal Units per Hour
M-NCPPC	Maryland-National Capital Park and Planning Commission
MPH	Miles per hour
MPO	Metropolitan Planning Organization
MSHA	Maryland State Highway Administration
MVA	Million Volt Amps
MW	Megawatts
N	
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NB	Northbound
NCPC	National Capital Planning Commission
NEPA	National Environmental Policy Act
NHB	NASA Handbook
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOX	Nitrogen Oxides
NO2	Nitrogen Dioxide
NPS	US National Park Service
NPDES	National Pollution Discharge EliminationSystem
NPMC	US National Plant Materials Center
NRC	US Nuclear Regulatory Commission
NRCS	US National Resources Conservation Service
NRHP	National Register of Historic Places
O	
ODP	Ozone Depletion Potential
OS	Open Space

P	
PAOZ	Partnering and Outreach Zone
PEPCO	Potomac Electric Power Company
PM	Particulate Matter
PPH	Pounds per Hour
PPM	Parts per million
PSI	Pounds per square inch
PWRC	Patuxent Wildlife Research Center
R	
R-O-S	Reserved Open Space
RR	Residential Rural
RT	Residential Townhouse
S	
SB	Southbound
SEB	Safety Environmental Branch
SF	Square Feet
SIC	Standard Industrial Classification
SMTF	Spacecraft Magnetic Test Facility
SOV	Single Occupant Vehicle
STAAC	Systems, Technology, and Advanced Concepts
SWM	Storm Water Management
T	
TDM	Transportation Demand Management
TDS	Total Dissolved Solids
TMA	Transportation Management Area
TMP	Transportation Management Plan
TNM	Traffic Noise Model
TTO	Total Toxic Organics
U	
USC	United States Code
USDA	United States Department of Agriculture
V	
VOC	Volatile Organic Compounds
VRE	Virginia Rail Express
W	
WB	Westbound
WGC	Washington Gas Company
WMATA	Washington Metropolitan Area Transit Authority
WSSC	Washington Sanitary Suburban Commission