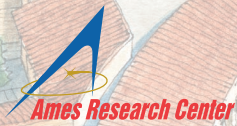
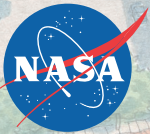
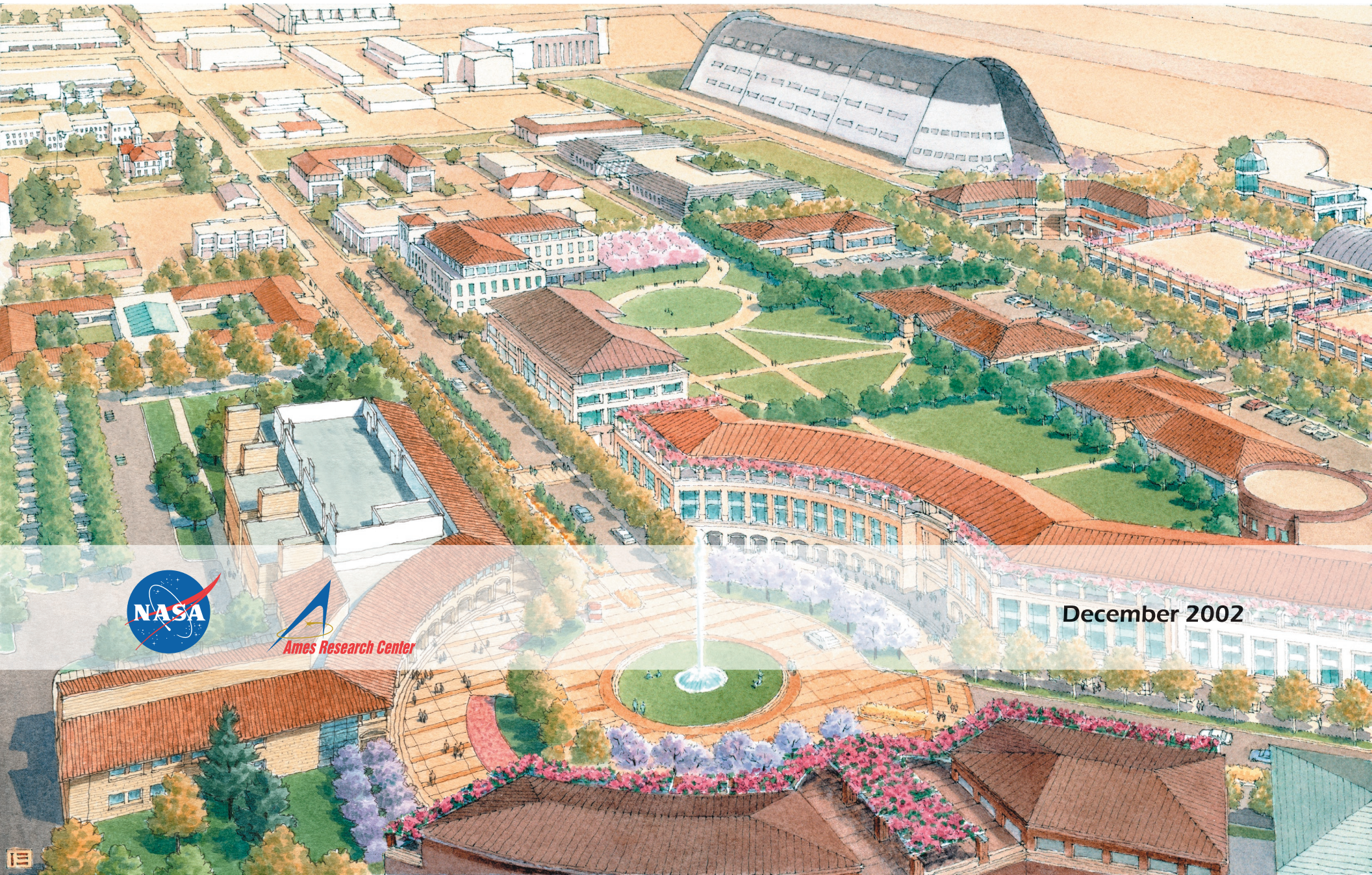


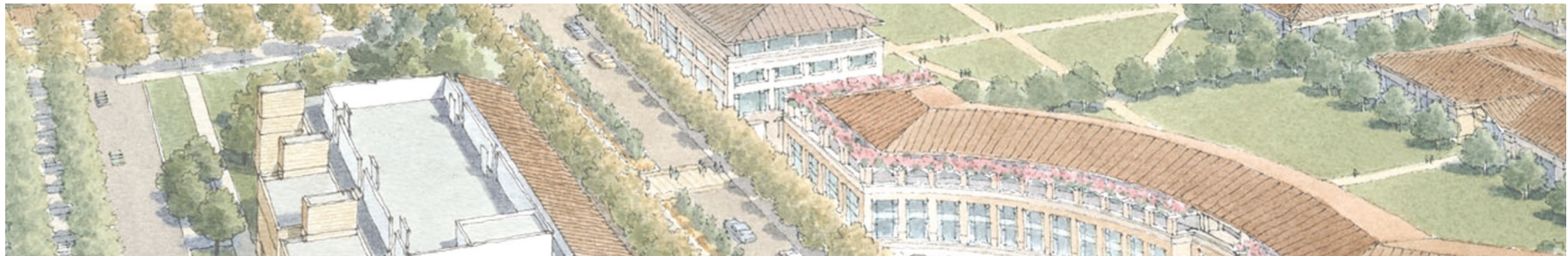
# NASA Ames Development Plan



December 2002

*Cover Illustration: Artist's Concept of NASA Research Park*

# NASA Ames Development Plan



**December 2002**

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*Sunrise at Ames Research Center*



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*Aerial view of NASA Ames Research Center*

# INTRODUCTION



*Artist's concept of NASA Research Park town center.*

The NASA Ames Development Plan (NADP) details the transformation of the original 200-hectare (500-acre) campus of NASA Ames Research Center and the 600 hectares (1,500 acres) of the former Naval Air Station Moffett Field into an integrated, dynamic research and education community in the heart of Silicon Valley. This transformation will be led by the establishment of the NASA Research Park, a 86-hectare (213-acre) research and development campus for partners from academia, industry and non-profit corporations with shared goals in support of NASA's mission.

The foundation of the NADP is the recognition that innovation in science and research depends on the cross-fertilization of ideas across related disciplines, public and private enterprises, and many levels of academia.

Innovation requires both focused, individual research and interaction between researchers in formal and informal settings. The NADP is designed to foster and encourage these modes of working through high-quality offices and research space as well as an environment that promotes interaction.

The NADP describes NASA's preferred plan for development. It is intended to be a companion document to the Final Programmatic Environmental Impact Statement, which analyzes the impacts of this and other development scenarios. The NADP is intended to serve as a departure point for subsequent specific development planning, business plans and implementation activities. The NADP will first provide a general description of the development project and its guiding planning principles, followed by a detailed discussion of each development district. Each district plan will discuss existing facilities, land use, infrastructure, housing, open space and transportation. Specific objectives, maps and diagrams are included for each district. The NADP concludes with an implementation strategy.

"It has always been NASA's business to inspire and manage innovation. Partnering with academia and industry, we will revolutionize the future, here, today. Our goal is to forge lasting alliances to do cutting-edge research and develop unique educational outreach tools and venues for teachers, students and the general public. What better place to bring these partners together than at the NASA Research Park, nestled in the birthplace of 'America's high-tech revolution'— the Silicon Valley.

Further advances in technology will come to fruition in the NASA Research Park in support of our nation's long-term space exploration objectives. Later, we will transfer those technologies for use in commercial ventures that will have an unlimited potential to provide a range of benefits here on Earth. While making these technology leaps, young minds will be educated and trained at the NASA Research Park to become the next generation of scientists and engineers."

**Dr. G. Scott Hubbard**

*Director, NASA Ames Research Center*





## NASA AMES DEVELOPMENT PLAN GOAL

NASA's goal is to develop a world-class, shared-use research and development campus in association with government entities, academia, industry and non-profit organizations. The NADP provides a framework to guide the use, renovation, management and development of facilities at Ames Research Center over the next 15 years to achieve that goal. The NADP supports NASA's overall mission in three areas: advancing NASA's research leadership; facilitating science and technology education; and creating a unique community of researchers, students and educators.

Not from NASA alone, not from industry alone and not from universities alone will tomorrow's innovations emerge. They will come from the integration of these different segments, each making the most of their unique attributes—NASA's focus on high-risk, long-term research; industry's ability to react quickly with applied technologies; and the universities' expertise in educating and providing a vibrant workforce for the future.

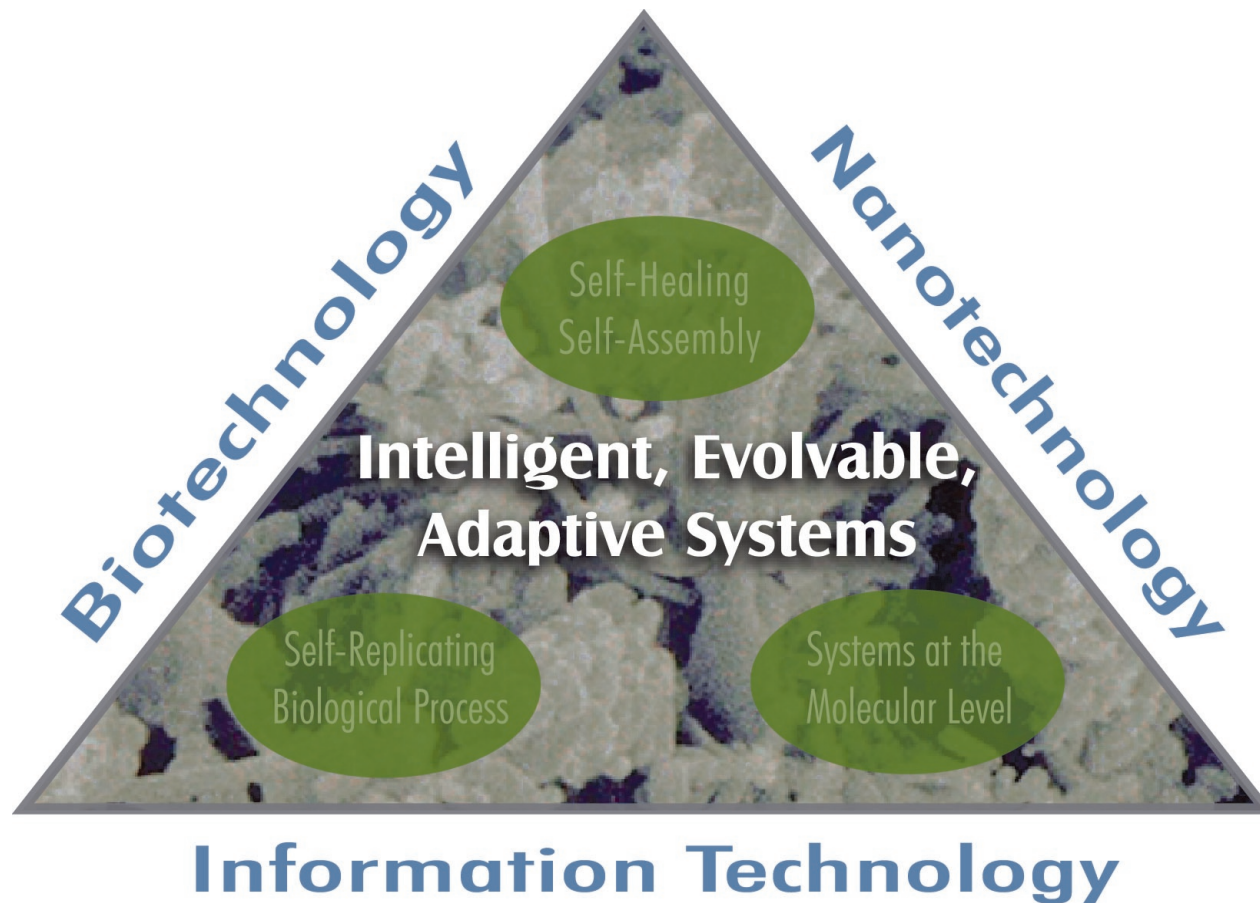
Through the interaction of academia, industry and nonprofit organizations at a robust federal laboratory, a unique community of researchers, students and educators with a shared mission to advance human knowledge will be created. This is the goal of the NADP.

## NASA AMES DEVELOPMENT PLAN OBJECTIVES

The NADP's primary objective is to extend and deepen the research and development capabilities of NASA Ames Research Center through R&D partnerships in key research areas. R&D partnerships in the NASA Research Park will benefit Ames Research Center and NADP partners by creating a new research and education infrastructure that leverages existing budgets and other resources. Collaborative partners will build new research and education facilities that support NADP goals at Ames Research Center.

NASA will benefit by the close proximity of, and ready interaction with researchers and students. NADP partners will provide a fair value for their presence, including reimbursement of costs to NASA. Partners will also generate an endowment to support research that is aligned with NASA's mission. This endowment, the Research Investment Fund, will be managed by a non-profit organization.

Key objectives of the NADP are to create unique facilities for collaborations, and to develop workforce enhancement programs that include joint appointments and internships and provide increased access to graduate students, post-doctoral and future employees. Education will have a special place at the NASA Research Park with more than 15 hectares (38 acres) set aside for university partners. By creating a sustainable development that catalyzes human potential through education and collaborative opportunities, Ames Research Center will open frontiers of space and knowledge.



# NASA AMES RESEARCH CENTER MISSION

NASA's mission is to invest in America's future. As explorers, pioneers and innovators, NASA boldly expands frontiers in air and space to inspire and serve America and to enrich the quality of life on Earth.

NASA achieves its mission by:

- Advancing and communicating scientific knowledge and understanding of the earth, the solar system and the universe
- Exploring, using and enabling the development of space for human enterprise
- Researching, developing, verifying and transferring advanced aeronautics, space and related technologies

Ames Research Center pursues these missions as NASA's lead center for information technology with the responsibility to strategically maintain and increase NASA's position in this field. Ames Research Center has full management responsibility for key programs such as Intelligent Systems, High-Performance Computing and Communication, Engineering for Complex Systems and Nanotechnology.

Ames Research Center is additionally responsible for building human expertise and physical infrastructure in direct support of center missions in astrobiology and aerospace operations.

NASA Ames fulfills this mission through the development and operation of unique national facilities. Ames Research Center also fulfills its mission through the conduct and management of diverse leading-edge research and technology programs from the fundamental biology program to the thermal protection system research and the aviation system capacity program.

NADP partnerships will be formed primarily in research areas where Ames Research Center leads the agency: information technology, nanotechnology, biotechnology and astrobiology. NADP partners at Ames Research Center must conduct research and education activities that support these programs. Partners' research programs may include use of NASA's unique facilities on a cost-reimbursable basis.

By establishing the NASA Research Park, Ames Research Center will leverage NASA resources for greater mission benefit, enhance scientific research, technology advancement and transfer of knowledge, improve NASA's education and outreach programs, provide workforce development for high-tech careers and increase public involvement in science, technology and exploration.

For additional information about Ames Research Center research programs and facilities, see the Ames Campus section (page 33).

## THE REGION

Ames Research Center is located in the heart of Silicon Valley in the San Francisco Bay Area, one of the most innovative and prosperous regions in the world. Silicon Valley produces a quarter of the nation's high-technology exports, which ranks it first in the nation. More than half of the world's venture capital firms are located in Silicon Valley, as are a fifth of the 100 fastest growing international companies. There are approximately 25 office/R&D parks in the vicinity of Ames Research Center. Sun Microsystems, Microsoft, Intel, Cisco Systems, Alza Corporation and Advanced Micro Devices are just a few of the high-tech companies within a few miles of Ames Research Center.

Bay Area residents are one of the most highly educated populations in the country, featuring such prestigious institutions as Stanford University, University of California at Berkeley, University of California at Santa Cruz, Santa Clara University, San Jose State University and numerous other universities, colleges and training institutions.

The Bay Area is also home to other world-class research institutions: Lawrence Livermore National Laboratory, Sandia National Laboratories, Stanford Linear Accelerator Center and Ernest Orlando Lawrence Berkeley National Laboratory. These research institutions continue to work together as a powerful economic engine that drives the Bay Area's competitive position in knowledge-based industries.

In the year 2000, more than \$26 billion in venture capital was invested. Forty-one percent of the total dollars invested in the United States

were invested in Bay Area companies — more than four times the capital invested in any other region of the country.

In recent years the San Francisco Bay Area has experienced an unprecedented economic growth. While this growth has slowed, economic experts predict strong, continued growth in the long run. Ames Research Center, including NASA Research Park, is perfectly located to form partnerships with entities engaged in cutting-edge information technology and biotechnology research.



*Ames Research Center- located in the heart of Silicon Valley*

## REGIONAL ROLE

With an annual budget of more than \$700 million and 4,000 civil service and contractor employees, Ames Research Center is a major contributor to the regional economy. Through the implementation of the NADP, NASA has the opportunity to become more integrated into this vibrant region. Traditionally a fenced, stand-alone enclave, Ames Research Center will open its gates to the Silicon Valley community and work cooperatively to address mutual concerns.

NASA's education partners will offer classes for the training and professional development of the region's workforce. The NADP also addresses the critical housing shortage in the Bay Area by including provisions for housing for on-site students, teachers and researchers. The NADP responds to transportation concerns of the surrounding communities. Ames Research Center has granted the Santa Clara County Transit District an easement for a new light rail terminal built at the southern tip of NASA Research Park. The light rail connects NASA Ames' commuters to downtown San Jose and downtown Mountain View, including the Mountain View CalTrain station. Ames Research Center has signed a Memorandum of Understanding with the Association of Bay Area Governments for planning the Bay Trail, a walking trail that will encircle the San Francisco Bay when completed.

As an environmental steward, NASA Ames will ensure its development activities are consistent with efforts to preserve the extensive wetlands on the Center. The NADP is committed to protecting the burrowing owl, a California Species of Special Concern that is located at Ames Research Center. The NADP sets aside 33 hectares (81 acres) as preserve for the burrowing owl.

The NADP contributes to the preservation of historically significant buildings at Ames Research Center in accordance with the Historic Resources Protection Plan.

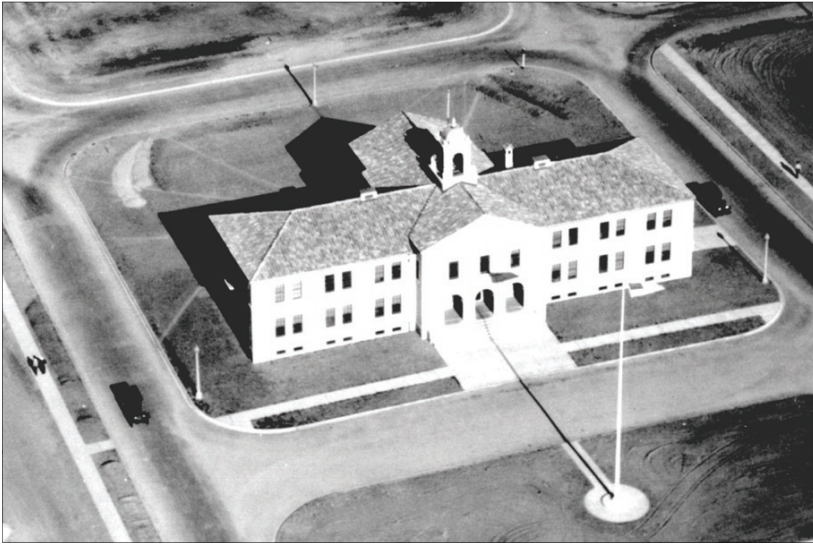
Finally, NASA Ames officials have met with local economic development groups including the Silicon Valley Manufacturing Group, the Bay Area Economic Forum and Joint Venture Silicon Valley, to discuss the regional effects of the NADP. These discussions have been incorporated into the planning process. NASA's use of its federal land at Ames will be both appropriate to NASA's missions and responsive to the surrounding region. The NADP recognizes NASA's role as a member of the San Francisco Bay Area community, and addresses regional problems related to economic development, housing, education, transportation, quality of life and the environment.



*Artist's concept of NASA Research Park*



*Santa Clara Valley Transportation Authority (VTA) Light Rail Stop*



*Building 17 (top left), Army Air Corps planes parked in Hangar One in 1935 (right), Building 19 barracks under construction (above).*

## BACKGROUND

Congress originally established Ames Research Center in 1939 as the Ames Aeronautical Laboratory under the National Advisory Committee for Aeronautics. Ames eventually grew to occupy approximately 500 acres at Moffett Field adjacent to the Naval Air Station Moffett Field. In 1958, Congress created NASA with the National Aeronautics and Space Act of 1958, 42 U.S.C. § 2451 et seq. The Ames Aeronautical Laboratory was renamed Ames Research Center and became a NASA field center.

With the enactment of the Base Realignment and Closure Act in 1991, Congress directed the Navy to close and vacate the Naval Air Station at Moffett Field. Under the framework of the Federal Property Administrative Services Act of 1949, 40 U.S.C. §471, NASA successfully negotiated custody of most of the Navy property. The Department of Defense decided to retain control of 57 hectares (140 acres) of military housing at Moffett Field. In 1994 the Department of the Navy transferred approximately 600 hectares (1,500 acres) to NASA. This transfer created a unique opportunity for NASA to provide stewardship for the entire 800-hectare (2,000-acre) site, except the military housing.

Prior to obtaining control of Moffett Field, NASA prepared the Moffett Field Comprehensive Use Plan (CUP) to implement its management program for the newly expanded Ames. The plan was accompanied by an Environmental Assessment and Finding of No Significant Impact. The Environmental Assessment adopted Future Concept One of the CUP, which allowed for the development of up to approximately 102,000 square meters (1.1 million square feet) of new construction. Land-use activities had to be consistent with the uses presented in the CUP and the environmental impacts analyzed in the Environmental Assessment, including traffic and air emissions.

In November 1996, the neighboring cities of Mountain View and Sunnyvale formed the Community Advisory Committee to study and provide input to NASA about the best reuses of Moffett Field. Ames Research Center developed a six-point initiative, which outlined program goals and reuse concepts for the development of the former Navy base. After extensive public outreach and public meetings, the Final Report of the Community Advisory Committee endorsed NASA's six-point initiative.

Ames Research Center continued to work with the neighboring communities in preparing its preferred development plan. On December 8, 1998, NASA unveiled its visionary concept for a shared-use R&D and education campus for collaborations among government, industry, academia and non-profit organizations. In 1999 this vision was outlined in an Economic Development Concept Workbook. The NADP is a result of the subsequent refinement of this vision. The NADP is consistent with NASA's six-point initiative and also reflects the recommendations of the Community Advisory Committee. In 2000, the development plan was positively reviewed by the National Research Council. That report, "A Review of the New Initiatives at the NASA Ames Research Center," was published in April 2001.

The Final Programmatic Environmental Impact Statement analyzes the environmental impacts of the NADP, and establishes required mitigations. Public scoping meetings for the study were held in July 2000. Public hearings were held on the draft plan in December 2001. In November 2002, the Record of Decision for the Final Programmatic Environmental Impact Statement was signed.



*The International Space Station (ISS), as photographed from the Space Shuttle Discovery (March 2001)*



## LEGISLATIVE FRAMEWORK

Ames Research Center's partnership strategy is based on its legislative mandate, the National Aeronautics and Space Act of 1958, as amended, 42 U.S.C. § 2451 et seq. (the Space Act). The Space Act permits NASA to enter into "contracts, leases, cooperative agreements, or other transactions as may be necessary in the conduct of its work and on such terms as it may deem appropriate, ...with any person, firm, association, corporation, or educational institution." (42 U.S.C. § 2473) NASA will use a "Reimbursable Space Act Agreement, Lease or Permit" for certain building construction and occupancy transactions involving nonfederal partners engaged in activities in furtherance of NASA's mission. The Space Act also delineates this mission:

- *Devote space activities to peaceful purpose for the benefit of all mankind.*
  - *Undertake aeronautical and space activities for the nation's welfare and security and expand human knowledge of the Earth and of phenomena in the atmosphere and space.*
  - *Seek and encourage, to the maximum extent possible, the fullest commercial use of space and to make available discoveries that have military value of significance to agencies directly concerned with national defense.*
  - *Improve the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles.*
  - *Develop and operate vehicles capable of carrying instruments, equipment, supplies and living organisms through space.*
- *Preserve the role of the United States as a leader in aeronautical and space science and technology.*
  - *Use engineering and research resources of the United States effectively.*
  - *Develop ground propulsion, advanced automobile propulsion, and bioengineering research, development and demonstration programs.*
  - *Establish an Earth observing system to address the highest priority international climate change research goals.*
  - *Expand human knowledge of physiological and other human factors necessary to determine the human capacity to adopt to and perform effectively in a space environment.*
  - *Provide for the widest practicable appropriate dissemination of information concerning its activities.*

Reimbursable Space Act Agreements will include provisions for the use of constructed premises, mission-related programming, subletting, fair market value rent, insurance and timing of construction. NASA also utilizes the leasing authority granted to federal agencies under the National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470) to enter into "historic leases" for certain qualified buildings in the Shenandoah Plaza Historic District.

## COLLABORATIVE PARTNER SELECTION STRATEGY

NASA seeks partners who are compatible with NASA's mission at Ames Research Center and that possess the financial capacity and experience to implement their proposed occupancy. Ames Research Center has established the Research Collaboration Working Group to work with potential partners to identify and evaluate possible areas of collaboration. The Research Collaboration Working Group will help establish NASA Ames' priorities among potential partners. Headed by the Ames Chief Scientist, the working group is comprised of scientists representing the research groups at Ames Research Center.

Initial planning partners have been identified and the following non-binding agreements have been signed:

### \* **University of California at Santa Cruz**

- Memorandum of Understanding, December 1998
- Letter of Intent, October 2000

### \* **Carnegie Mellon University**

- Memorandum of Understanding, January 2000
- Letter of Intent, December 2000

### \* **San Jose State University**

- Memorandum of Understanding, October 1999
- Letter of Intent, November 2001

### \* **Foothill-DeAnza Community College District**

- Memorandum of Understanding, July 1999

### \* **National Association for Equal Opportunity in Higher Education**

- Memorandum of Understanding, November 2000

### \* **The Lockheed Martin Corporation**

- Memorandum of Understanding, January 2000
- Space Act Agreement, March 2001

### \* **The Computer History Museum**

- Letter of Intent, June 1997

### \* **California Air and Space Educational Foundation**

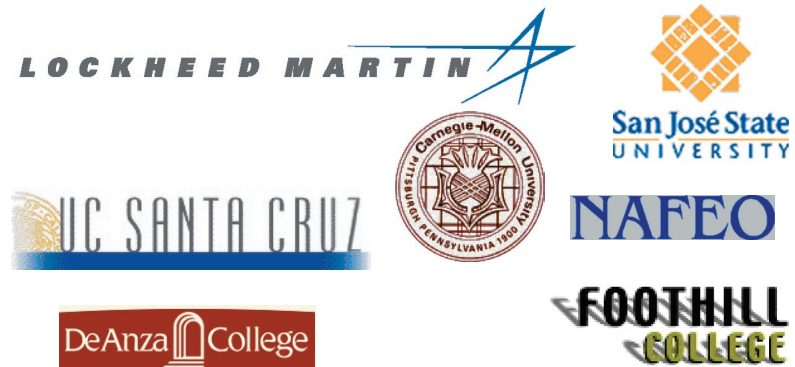
- Memorandum of Understanding, January 2002

### \* **National Center for Women in Science, Technology, Engineering and Mathematics**

- Memorandum of Understanding, March 2002

### \* **Girvan Institute**

- Cooperative Agreement, March 2002
- Space Act Agreement, May 2002



These partners were selected based on:

- Engagement in ongoing and active collaborative research with NASA.
- Provision of educational and learning programs directly in support of NASA's mission.
- Focus on information technology commercialization and small business incubation.
- Operation of active research and development programs in areas with collaborative potential for NASA.
- Provision of educational and learning programs emphasizing science, math and information technology.

University and industry leaders expressed their enthusiasm for on-site collaborations:

“UC and NASA scientists will work together on advances in science and technology that will drive new industries and provide new products benefiting California's economy.”

**UC President Richard Atkinson** *at an October 25, 2000 news conference announcing the partnership.*

“This partnership will foster a world-class center for education and for research and development. Our plans include the creation and testing of new models for delivering education and conducting research that capitalize on Silicon Valley technology and the rich math and science environment at NASA Ames Research Center.”

**UC Santa Cruz Chancellor M.R.C. Greenwood** *in an October 23, 2000 news release.*

“The NASA Research Park will provide the optimal environment for collaboration. Through these collaborative

programs, we look forward to building world-class facilities that will house teaching, research and economic development programs for the Silicon Valley and the State of California.”

**San Jose State University President Robert Caret** *at a September 5, 2000 press conference.*

“Developing a presence in Silicon Valley is important to our mission...[t]his research partnership with Ames at the NASA Research Park is an outstanding opportunity to bring faculty and students from our 118-member minority institutions to where the action is for the New Economy.”

**NAFEO CEO and President Dr. Henry Ponder** *in a November 1, 2000 news release.* (The National Association for Equal Opportunity in Higher Education (NAFEO) is the national umbrella for 118 of the nation's historically and predominately Black colleges and universities.)

“Our relationship with NASA Ames is an important strategic alliance and an exciting step toward achieving our goals for women in STEM. NASA exemplifies the excitement and challenge that careers in science, technology, engineering and mathematics can provide. And the opportunity to be located in the proposed NASA Research Park is an exceptional benefit that will enable us to actively participate in stimulating collaborations with NASA and its other partners.”

**Board President of the National Center for Women in Science, Technology, Engineering and Mathematics (STEM) Lisa Duncan** *in a March 6, 2002 news release.*

Ames will continue to identify new partners that implement the vision of the NADP. NASA encourages minority and women-owned organizations to participate in NASA's collaborative partnership program.



*Illustration of Ellis Street, looking toward the Carl Sagan Center*

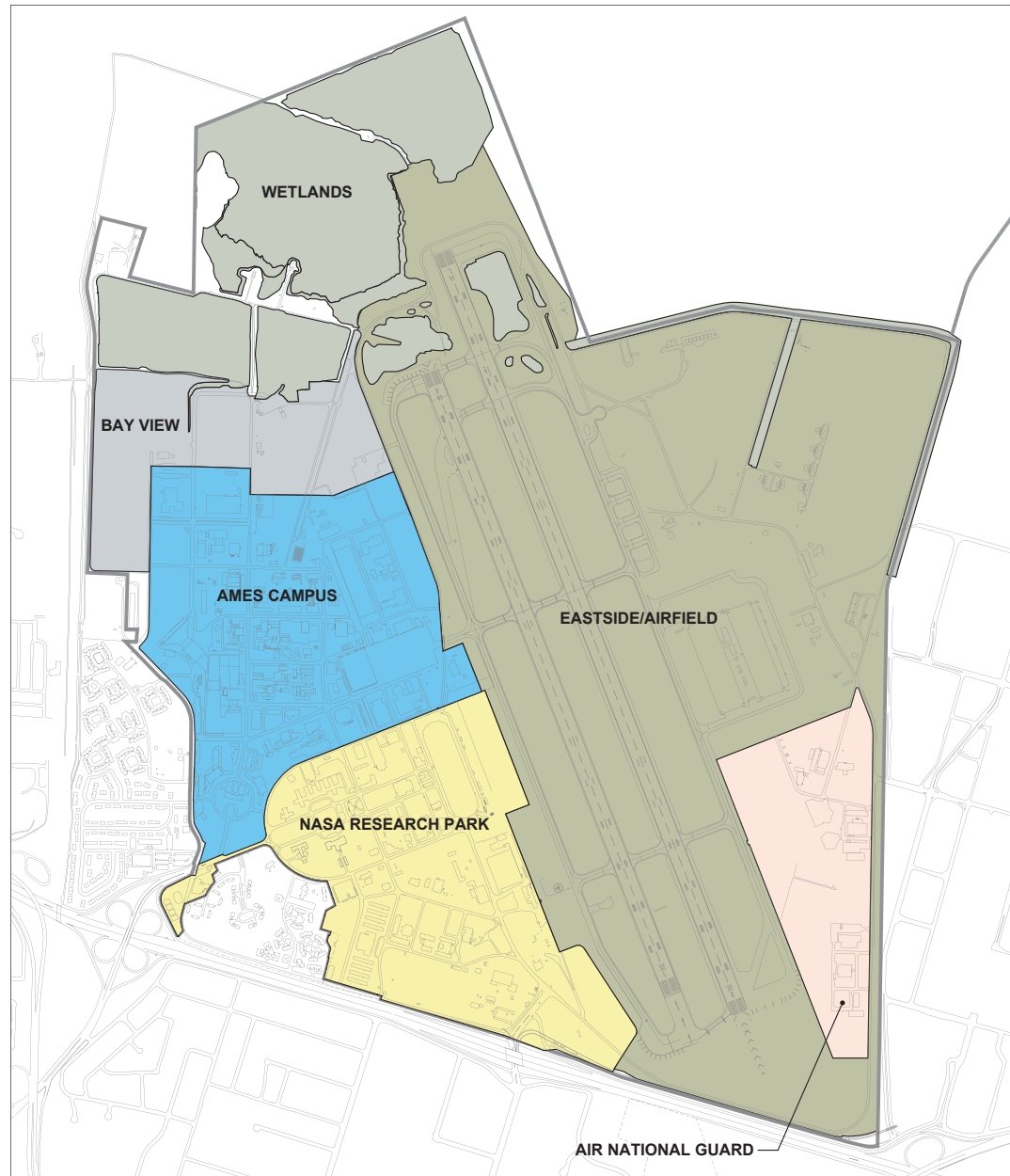
# NASA AMES DEVELOPMENT PLAN

Through strategic collaborative research partnerships, NASA Ames Research Center will provide research leadership forward in the 21<sup>st</sup> century. By creating strong and enduring partnerships with national, state and local learning centers, NASA Ames will serve as a model of scientific education,

outreach and advocacy. Through implementation of the NADP, Ames will expand its contributions to maintain the economic health of the region by providing new housing, minimizing traffic impacts and enhancing environmental resource protections.



*Conceptual illustration of NASA Research Park.*



NASA Ames Planning Districts

## PRINCIPLES AND CONCEPTS

This section provides an overview of the NASA Ames Development Plan, including a presentation of planning districts and their associated land use as well as guiding planning principles for issues that affect the entire site. It is followed by detailed information about each of the four districts. This section will also discuss specific improvements and infrastructure that will support the entire community at Ames Research Center.

### Planning Districts and Land Use Concepts

For planning purposes, Moffett Field has been divided into several smaller areas or districts, each with its own identity and function. The idea of expressing separate districts is a way to organize NASA Ames' large, diverse environment into a set of smaller parts that are coherent and manageable. The districts are

#### NASA Ames Research Center Campus (Ames Campus)

Consisting of 95-hectares (234-acres) within the original Ames campus, these facilities comprise the physical heart of the site. These unique federal research facilities include laboratories, wind tunnels, flight simulators, numerous test facilities and advanced computing systems. Most of Ames Research Center's civil servants and contractors work in this campus.

#### Bay View

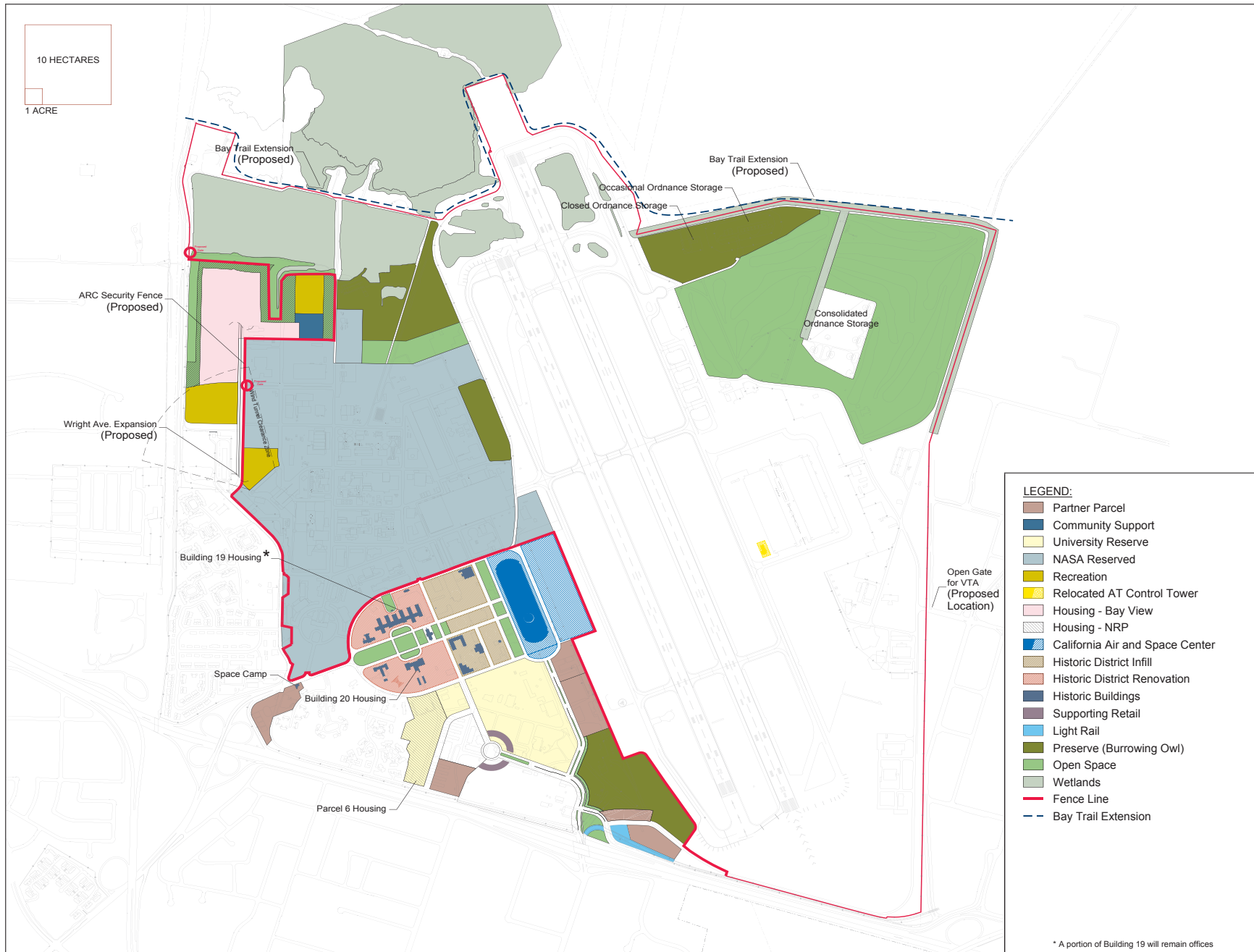
The Bay View district is a 38-hectares (95-acres) parcel bordered by wetlands to the north, Eastside/Airfield to the east and the Ames Campus to the south. Planning for this area includes a mixed-density housing community with recreational facilities.

#### Eastside/Airfield

The airfield, airfield-support areas and the California Air National Guard subarea make up the Eastside/Airfield, which consists of approximately 385-hectares (952-acres). The airfield spans from the wetlands in the north to Highway 101 in the south. The airfield is essential to NASA's continuing aerospace research and development activities and the rescue mission of the largest tenant user, the California Air National Guard.

#### NASA Research Park

NASA Research Park sits on approximately 86-hectares (213-acres) of land bordered by the Eastside/Airfield, the Ames Campus, military housing controlled by the Department of Defense and U.S. Highway 101. This area, the focus of the NADP, will contain a variety of uses including laboratories, office space, classrooms, auditoriums, museums, a conference center, open space, burrowing owl preserve, parking and limited retail facilities.



NASA Ames Research Center Land Use Plan



# PLANNING PRINCIPLES

The proposed Land Use Plan for NASA Ames Research Center appears on page 18. This Plan will be discussed in greater detail in following sections of the NADP. There are, however, unifying principles that guided planning for the entire site. These principles are:

- Creation of a Community
- Resource Conservation
- Provision of On-site Housing
- Environmental Issues Management
- Transportation Demand Management
- Wildlife Preservation
- Public Accessibility
- Wetland Preservation
- Sustainability
- Historic Resource Protection

## Creation of a Community

The NADP seeks to create a unique community of researchers, students and educators living and working in an environment that encourages collaboration and discovery. NASA currently provides critical public safety services and other services typically furnished by municipal governments to support all the operations at Ames Research Center. NASA Ames also provides a full range of support services to help the community and the research at the site flourish. Under the NADP, Ames Research Center will continue to provide critical municipal-type functions to the entire site, including the NASA Research Park. These mandatory services provided by NASA

include: public safety, land use planning, code compliance and permitting, and safety, health and environmental risk management program oversight. Partners will reimburse NASA for the costs of providing these services.

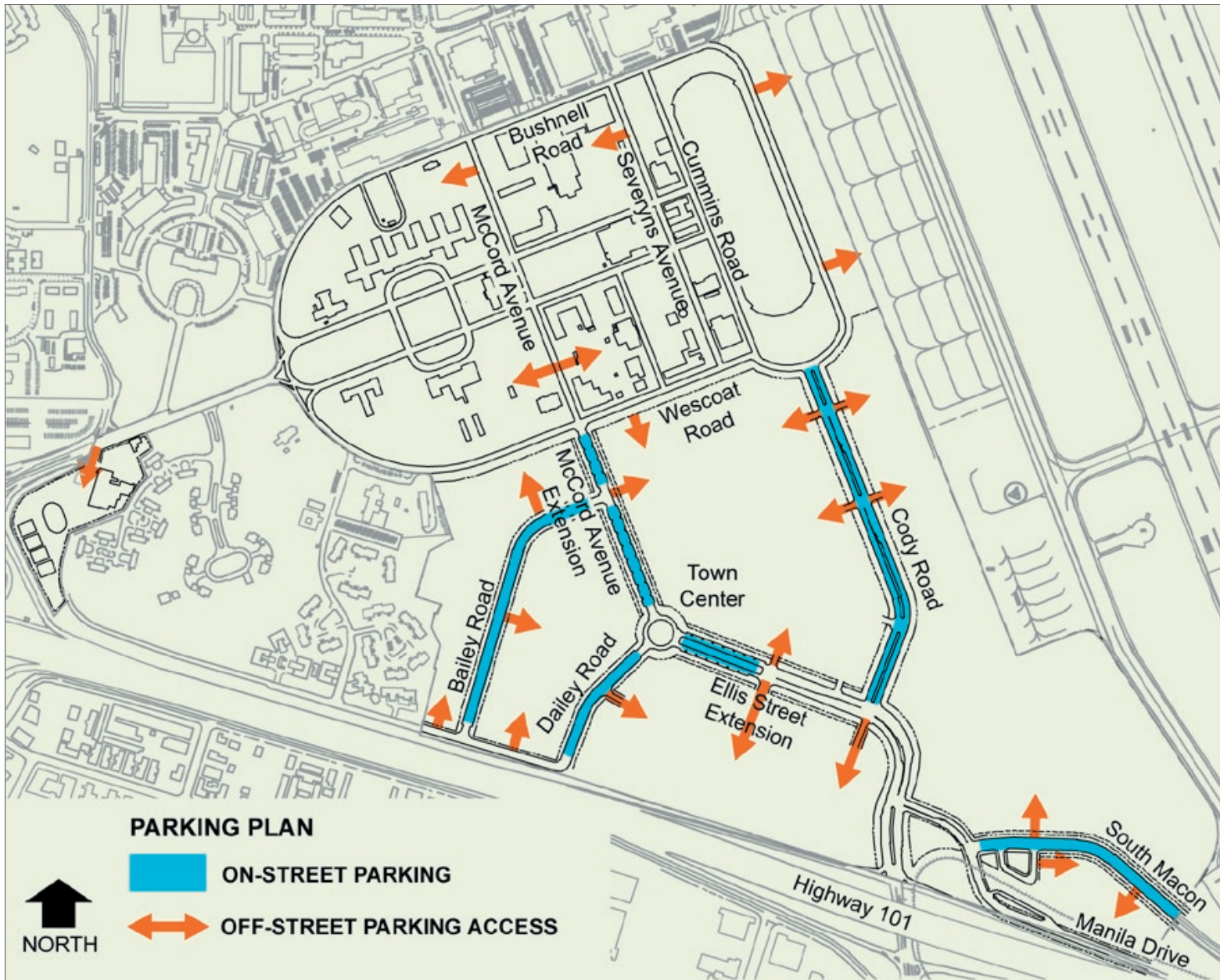
Public safety includes police emergency response, law enforcement, structural fire response, fire marshal services, medical emergency response and hazardous materials first response.

NASA maintains and provides:

- Mutual aid agreements with surrounding cities and fire districts to supplement structural fire protection service.
- Basic law enforcement services 24 hours per day, including crime prevention and investigation, records services and dispatch.
- Perimeter security, traffic control and general physical security.

NASA has established its own building permit process and architectural review board. Ames Research Center has adopted the Uniform Building Code and California Building Code. All developments at Ames Research Center will need to comply with these codes and receive NASA-issued permits prior to construction.

In addition to these mandatory services, NASA Ames will continue to provide other services to support the dynamic community that will be created under the NADP. These community services include childcare, housing, and retail goods, meeting spaces, overnight accommodations and recreational opportunities.



NASA Research Park Preliminary Parking Plan

## Provision of On-Site Housing

A critical component that enables the NASA Ames Development Plan is housing. The provision of on-site housing will contribute to a campus-like environment and allow partners at NASA Ames to maximize the opportunity for interaction. The provision of on-site housing will allow some students, educators and researchers an opportunity to come to Silicon Valley who might not otherwise be able, because of the region's very high cost of living.

For further description of the proposed housing see the Bay View (page 79) and NASA Research Park (page 55) sections.

## Transportation Demand Management

Silicon Valley traffic has become a major regional concern. More than four million trip ends are generated in Santa Clara County each day.

NASA Ames' traffic only accounts for about two percent of the total county traffic volume. Ames Research Center employee, service and visitor traffic accounts for 30,000 automobile trip ends per day, according to traffic counts and work force data. These vehicles primarily enter and leave Ames Research Center through either the main or Ellis Street gates.

With the closure of Moffett Field as a military base, most roadways within Ames Research Center carry low volumes of traffic. Currently no capacity issues exist on internal roads at NASA Ames (Klim, 2000).

Nevertheless, Ames Research Center is committed to aggressive transportation demand management and currently offers incentives to encourage alternative commuting. These programs include:

- Free direct shuttle between the Ames Campus and the CalTrain Station in downtown Mountain View

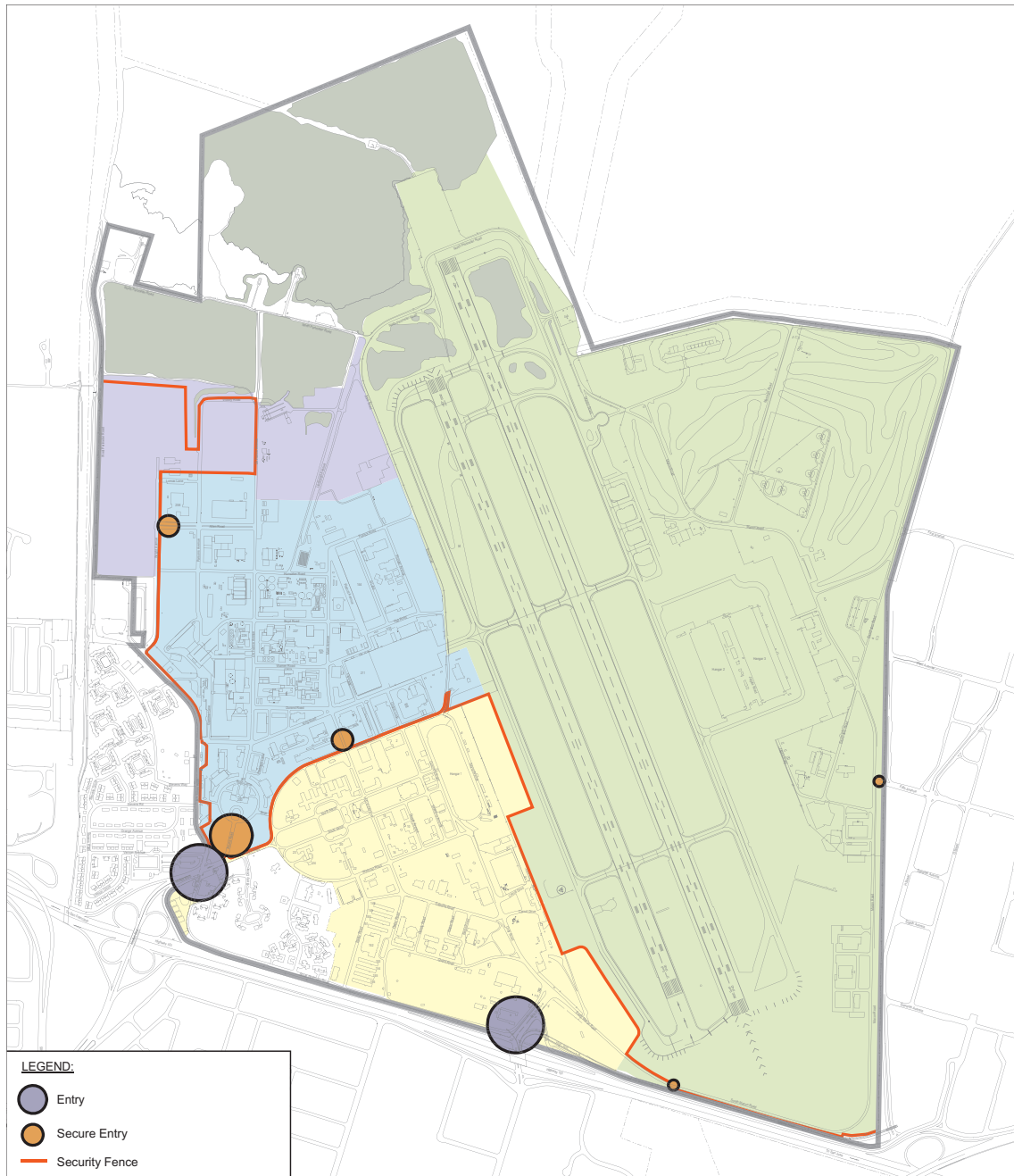
- Transit pass subsidies for civil servants
- Preferred parking for carpoolers
- Management support of flexible work schedules
- Telecommuting
- Bicycle paths, lockers, showers and changing facilities

Planning under the NADP reflects this commitment to alternative commuting. A specific transportation demand management plan has been developed for the NRP. Several existing local bicycle trails provide a high level of bicycle access to Moffett Field. However, currently there are gaps in the bicycle path system. Under the NADP, Ames Research Center plans to correct these deficiencies. In addition, the NRP includes an extensive network of new bicycle and pedestrian paths. Bicycle lockers are provided at several locations throughout the Ames Campus and will also be provided within the NRP.

Parking lots in the interior portion of the Ames Campus are relatively small and scattered and tend to be centralized near highly populated buildings. Parking also occurs on the internal road system at the facility and on adjacent areas.

Parking in the NRP will be kept to a minimum to encourage the use of public transportation. However, due to the proposed densities in the NADP, future parking will require a mixture of surface and structured garages to handle the demand. The NASA Ames Design Guide will ensure minimal visual impact of the parking areas from the street and adjacent buildings. New parking structures will be for the shared use of all partners at the NRP.

A more detailed description of the proposed transportation demand management plan can be found in the NASA Research Park section (page 55).



*Site entrances and new security perimeter*

## Public Accessibility

The NADP envisions an environment in which people and ideas flow freely throughout the site. To allow greater public access to many parts of the site, NASA Ames has redesigned its security perimeter. The new design will allow for public access to the NRP, including Hangar One. See figure on page 22.

## Sustainability

Sustainability is a term used to describe humanity's desire to sustain economic growth and environmental health for the long term. Sustainable developments are those that manage natural, economic and social systems to "meet present needs without compromising the ability of future generations to meet their needs" (World Commission on Environment and Development, 1987).

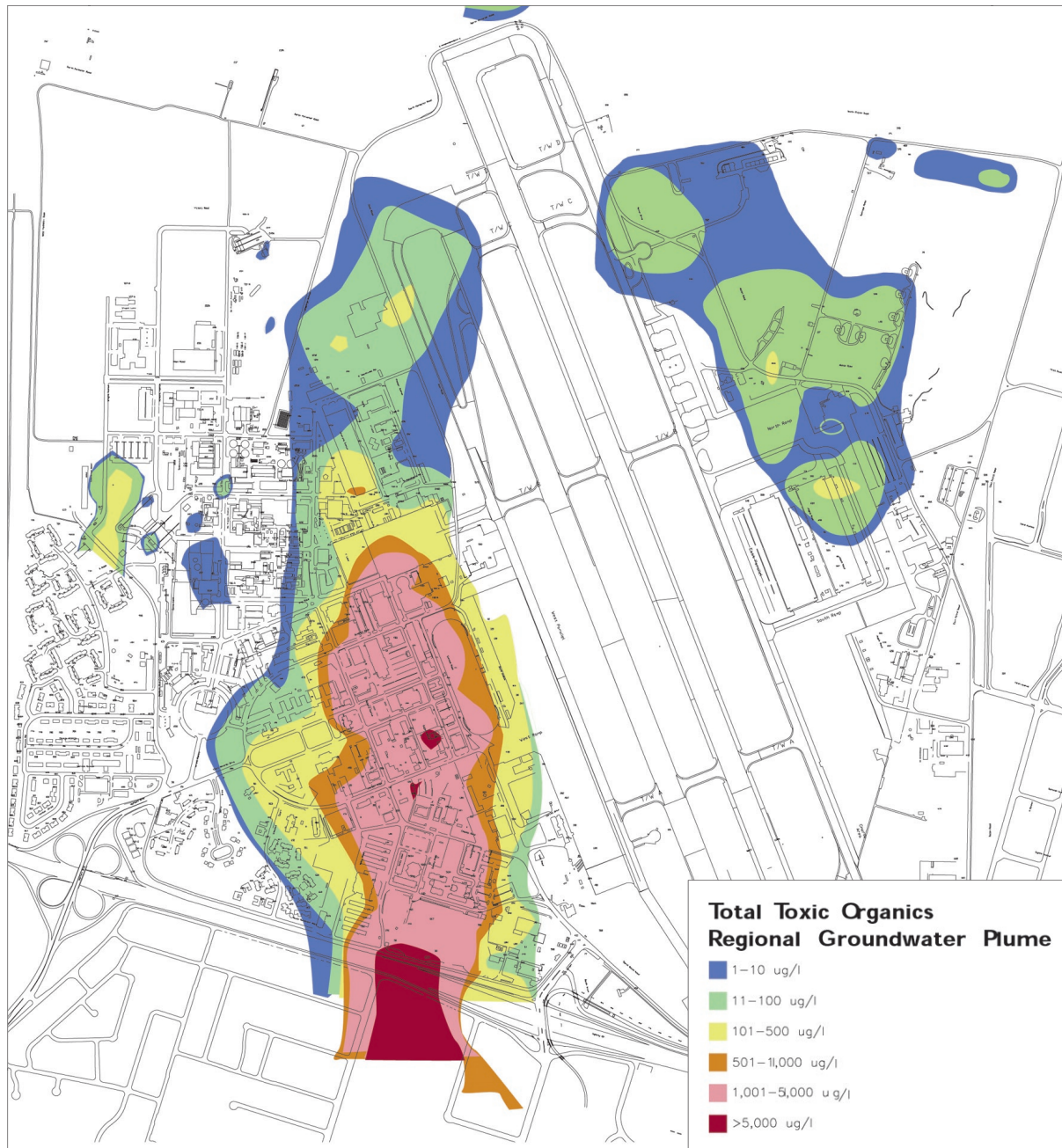
An integral component of sustainable development is 'sustainable design' or 'green construction,' which refers to the design, construction, renovation, operation and reuse of facilities in a resource and energy efficient manner. Ames Research Center plans to incorporate sustainable design concepts into the NADP by encouraging its partners to design, construct and operate structures according to the Leadership in Energy and Environmental Design Green Building Rating System (LEED). Developed by the U.S. Green Building Council, LEED evaluates a building's environmental performance over its life cycle and assigns credits to projects that meet certain criteria. The system also provides a definitive standard for what constitutes a "green building" by awarding different levels of certification. Ames Research Center will encourage its partners to strive for the highest possible LEED rating in their building design and at least meet the minimum required score to achieve LEED Certification

## Resource Conservation

Ames Research Center is committed to energy conservation and all development projects will include appropriate conservation measures such as energy-efficient lighting. Examples of how NASA Ames currently promotes energy conservation include: annual testing and adjustment of space-heating boilers for maximum combustion efficiency and minimum harmful exhaust emissions, testing and cleaning of all chilled water plants and heat exchangers for scale build-up that might interfere with heat transfer, and ongoing replacement of existing heating and cooling systems with more efficient systems. Replacement equipment must meet the State of California Title 24 energy standards. Smaller units are specified where new building load calculations warrant, and multiple smaller cooling units have replaced large single plants. These smaller units have increased energy efficiency by more accurately matching the cooling load.

Roof replacements are designed to meet Title 24 insulation standards, and roof materials are designed to protect the insulation from moisture damage.

These are just some of the energy conservation measures that NASA has funded at the Ames Campus. Through its design guidelines and construction requirements, the NADP will promote further conservation, including passive solar design, solar water heating and photovoltaic arrays. Irrigation will occur using reclaimed water. NASA's sustainable design guidelines will also require the use of low-flow plumbing fixtures in all new construction.



Regional Groundwater Plume Map

## Environmental Issues Management

The former Naval Air Station Moffett Field has been designated a Superfund site by the U.S. Environmental Protection Agency (U.S. EPA). Twenty-six individual sites have been identified by the U.S. Navy as potential hazardous waste disposal or spill locations. The U.S. Navy is the party responsible for their cleanup. A variety of contaminants are present, including solvents, polychlorinated biphenyls, oils and greases and fuels. The 26 sites were originally grouped into six operable units. Besides these sites, a large groundwater plume has migrated onto Ames from the Middlefield Ellis Whisman (MEW) Superfund site, located to the south of Highway 101. The MEW plume combined with the U.S. Navy plume is known as the Regional Plume. As shown on page 24, the majority of this plume is located on the former Navy base and is concentrated in the NRP district. Contamination on this portion of Ames Research Center is under the jurisdiction of the U.S. EPA and the California Environmental Protection Agency's Regional Water Quality Control Board. The status of the cleanup ranges from investigation phase to treatment to clean closure. The cleanup is proceeding on schedule.

Contamination is also present on the Ames campus. Thirteen Areas of Investigation have been established for these contaminated sites. The sites that overlie the Regional Plume are under the jurisdiction of the U.S. EPA and those that do not overlie the Regional Plume are under the jurisdiction of the California EPA's Department of Toxic Substances Control. The status of cleanup ranges from ongoing investigation to clean closure.

These contaminated sites introduce a variety of issues that increase the complexity of development under the NADP. NASA prepared an Environmental Issues Management Plan to address these matters, including protection of construction workers and the remediation systems in contaminated areas, and the disposal of contaminated soils and groundwater

encountered during construction. All partners will be required to comply with the Environmental Issues Management Plan (Harding, 2001).

Additionally, Ames Research Center uses a variety of hazardous materials and generates hazardous wastes in its operations and research. Typical hazardous materials include toxic gases, acids, fuels and solvents. NASA Ames has a comprehensive Environmental Compliance Program designed to ensure these materials are managed in compliance with numerous Federal, state, and local laws. All partners will be required to comply with this Environmental Compliance Program, as described in the Ames Procedures and Guidelines (APG 8800.3).

Overall, current environmental management programs at Ames Research Center ensure that past contamination is being effectively remedied. Ongoing operations prevent or minimize pollution, and reduce emissions to the environment by complying with all environmental requirements.



*A burrowing owl in front of Hangar One.*



## Wildlife Preservation

Because NASA Ames has retained relatively large areas of open spaces and habitats, it supports a wide range of common, declining, rare and endangered species. One of its most prominent species is the western burrowing owl, a California Species of Special Concern. Depending on the year, approximately two dozen breeding owl pairs reside at Ames Research Center. This comprises the largest subpopulation of owls in the South San Francisco Bay area and approximately 25 percent of all burrowing owls in the region.

Since its lands are considered critical to the survival of the region's burrowing owls, NASA Ames prepared a *Burrowing Owl Habitat Management Plan* (Trulio, 2001) as part of the planning process. The most important element of the plan is avoidance of most of the long-term owl breeding sites at Ames Research Center through the establishment of several owl preserves, comprising a total of approximately 33 hectares (81 acres). Establishment of these preserves, avoidance of impacts to other owl habitats and supplementary mitigation measures are expected to minimize the significant, long-term impacts from development and thus ensure protection of the owl colony at Ames Research Center (Trulio, 2001).

To evaluate the impact of development on federal threatened and endangered species, NASA Ames has prepared a Biological Assessment (Staab, 2001). This assessment has been submitted to the U.S. Fish and Wildlife Service (USFWS) as part of NASA's required consultation with USFWS pursuant to Section 7 of the Endangered Species Act. USFWS requires the Biological Assessment to describe mitigation measures to prevent impacts to protected species. These include a "no pets" policy for on-site housing.

## Wetland Preservation

There are approximately 120-hectares (300-acres) of non-tidal wetlands at Ames Research Center, most of which are located north of the Bay View district. These wetlands are classified as coastal salt marsh; seasonal salt marsh and transition areas; and fresh and brackish water marshes. They comprise one of the most important habitats at Ames Research Center. They support numerous birds, mammals, reptiles and amphibians. These include threatened and endangered species such as the California Clapper Rail, Salt Marsh Harvest Mouse, Western Snowy Plover and the California Least Tern. NASA Ames will avoid construction in these areas to reduce potential impacts to these sensitive habitats and the species that they sustain. Development plans will ensure no net loss of wetland functions, values or acreage.



*An avocet (above) and a burrowing owl (opposite page), two species supported at Ames Research Center.*

## Historic Resource Preservation

The National Historic Preservation Act defines a “historic property” or “historic resource” as any prehistoric or historic district, site, building, structure or object included on or eligible for inclusion on the National Register of Historic Places.

Currently, one district and four individual buildings at Ames Research Center are included or eligible for inclusion on the National Register of Historic Places: the Shenandoah Plaza Historic District, the Unitary Plan Wind Tunnel (Building 227),

the NASA Administration Building (Building 200), the 40-by-80 Foot Wind Tunnel (Building 221) and the 6-by-6 Foot Supersonic Wind Tunnel (Building 226).

In 1985, the Unitary Plan Wind Tunnel was designated as a National Historic Landmark, because of its significant association with the development of the American space program.

On February 24, 1994, the Shenandoah Plaza Historic District (Shenandoah Plaza) was officially added to the National



*Shenandoah Plaza Building 17*

Register of Historic Places. Shenandoah Plaza includes Hangars One, Two and Three, their ancillary buildings and the buildings, roads and plaza encompassed in the oval formed by Wescoat and Bushnell Roads.

NASA is committed to protecting and preserving its historic resources at Ames Research Center. Ames Research Center has developed a Historic Resources Protection Plan (HRPP) for the NRP. The primary purpose of the HRPP is to establish procedures to integrate the planning, preservation and use of historic properties in the NRP. The HRPP

provides a comprehensive inventory of archeological and historical resources, establishes design guidelines for new construction within the Plaza and establishes guidelines for the rehabilitation, reuse and leasing of historic structures in the NRP.

For further description of the Historic District, see the NASA Research Park section (page 55).



*Shenandoah Historic District*

## EXISTING INFRASTRUCTURE

All of the utility distribution systems at Ames Research Center are owned and maintained by NASA. As part of the planning for the NADP, Ames Research Center completed an assessment of existing infrastructure. Under the NADP, many of the utility systems will be upgraded or replaced and a new roadway system will better support the site. Existing utilities are briefly described below. Specific infrastructure improvements for each district will be discussed in the corresponding section of the NADP.

### Electrical System

Pacific Gas and Electric Company (PG&E) distributes electric power to Ames Research Center. The U.S. Bureau of Reclamation Western Area Power Administration generates the power primarily used at Ames Research Center under an agreement with NASA. Ames Research Center has historically owned and maintained two separate electrical distribution systems, one serving the Ames Campus and a second serving the former Navy installation at Moffett Field. A cross-connection for emergency use exists between the two systems; however, the Moffett Federal Airfield system must be shut down before this connection can be accomplished. NASA's heavy demand for electricity to support research activities requires close proximity to PG&E's high-voltage distribution facilities and the scheduling of experimental operations during off-peak hours to keep power demand as steady as possible.

### Natural Gas

Within Ames Research Center, natural gas is used primarily for steam generation, hot water and space heating. PG&E transmits natural gas to Ames Research Center from two

points of connection. There are connections to PG&E distribution lines on both sides of the airfield which feed approximately 6,700 lineal meters (22,000 lineal feet) of natural gas lines within Ames Research Center.

### Telecommunications

Telephone service to Ames Research Center is routed through underground ducts serving all existing facilities. NASA provides service to most facilities through its own network. Some non-NASA entities receive service directly from Pacific Bell Telephone Company.

Ames Research Center offers direct connection to MAE-WEST, a national connection point located on-site for Internet Service Providers. MAE-WEST carries some 40 percent of the nation's Internet traffic. Connection to MAE-WEST offers the maximum Internet data transmission rates available.

### Water Supply and Distribution

The San Francisco Water Department provides water to Ames Research Center from three different connection points. These connections include 500-millimeter (18-inch) and larger pipes, and a relatively new pipe from the 4550-millimeter (180-inch) Hetch-Hetchy Aqueduct to supply additional water for Hangars 2 and 3. The cooling towers for the wind tunnels consume the most water at Ames Research Center, averaging 2250 liters (600 gallons) a minute during wind tunnel operations. Water that is distributed through NASA facilities is tested for quality on a regular basis to ensure that it meets or exceeds drinking water standards.



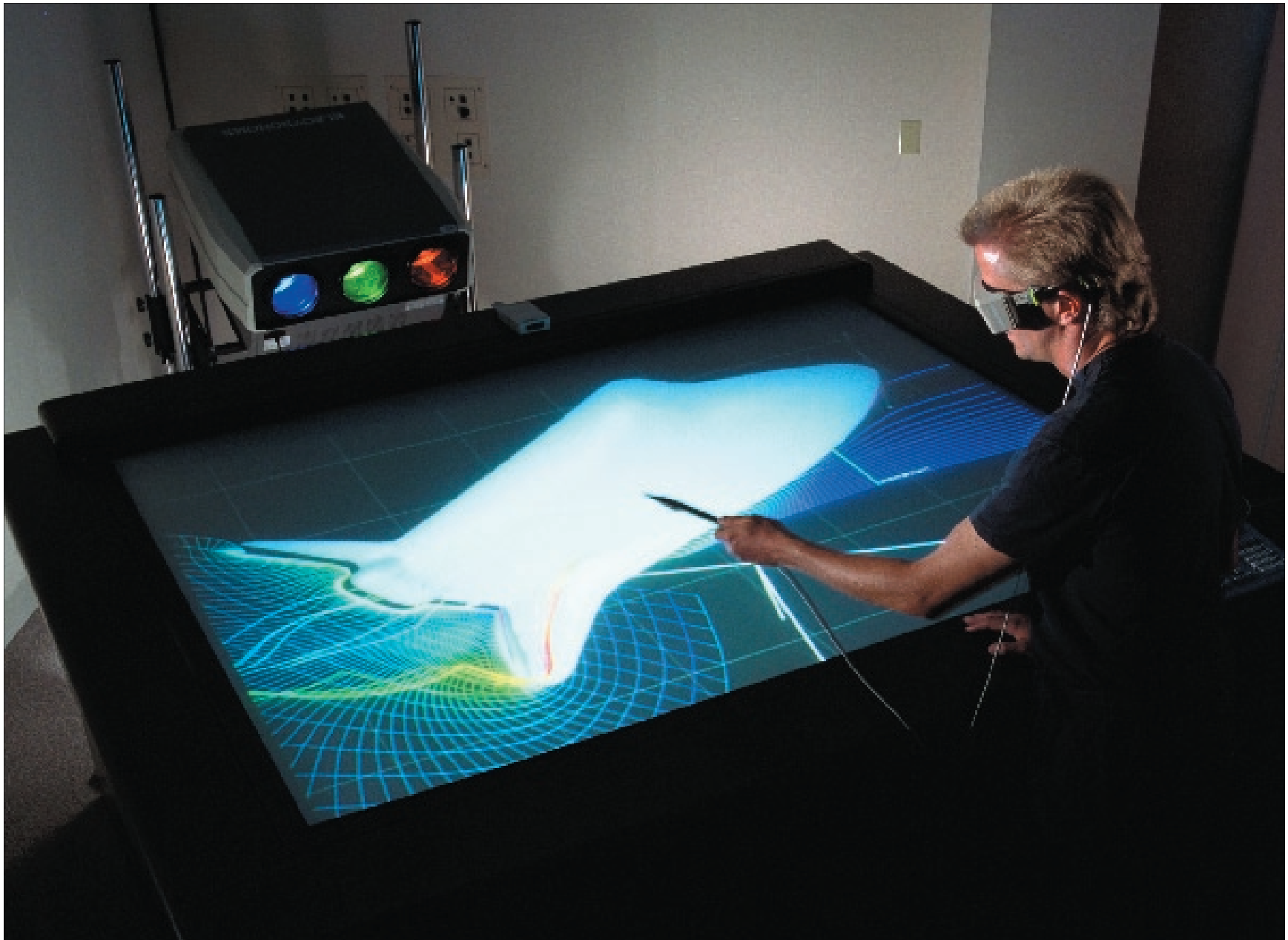
*Ames Research Center Substation North*

## Sanitary Sewer

Like most of the existing infrastructure throughout Ames Research Center, the sanitary sewer system was originally installed in the 1930s. Sanitary sewer effluent generated at Ames Research Center flows through two separate collection systems to the cities of Palo Alto and Sunnyvale wastewater treatment facilities.

## Storm Water Drainage System

Like the sanitary sewer system, the storm water drainage system is divided into two separate systems. Most of the storm water that accumulates at the Ames Campus and the NASA Research Park flows north to diked, non-tidal, evaporation ponds north of the Bay View District. During high runoff periods when the storage capacity of the ponds may be insufficient, storm water within the holding ponds is discharged through Stevens Creek to the San Francisco Bay. Storm water accumulation in the eastern portion of the NASA Research Park and Ames campus and the entire Eastside/ Airfield flows northeast to a pump station near the Moffett Golf Course. From this station, storm water is pumped into a channel that ultimately is pumped into Guadalupe Slough and the San Francisco Bay.



*Virtual wind tunnel with computer-generated images of Space Shuttle wind flows- three dimensional display with stereo glasses*

# AMES CAMPUS



Having generally introduced the objectives and guiding principles of the NADP, a detailed discussion of each development district follows. Each district plan will discuss existing structures, land use, infrastructure, housing, open space and transportation. The specific objectives of each district along with maps and diagrams are included.

NASA research programs are primarily conducted at the Ames Campus, a 94-hectare (234-acre) district that is located north of the NASA Research Park. Ames Campus facilities comprise the physical heart of the entire site. Under the NADP, the Ames Campus will have nearly 279,000 square meters (3 million square feet) of developed space. This is a net increase of 9,300 square meters (100,000 square feet) from existing conditions.

## CONCEPT: A NATIONAL RESOURCE FOR RESEARCH AND DEVELOPMENT

Ames Research Center is among the most active research and development centers in the United States and is home to many important and unique research facilities such as advanced computing systems, flight simulators, test facilities and wind tunnels. The center's Fiscal Year 2002 budget is over \$700 million.

NASA Ames has a staff of 1442 civil servant employees (2002). Advance degrees are held by 48 percent of the staff and 70 percent of the scientists and engineers (2002). There are also hundreds of scientists working at Ames Research Center under various R&D contracts.

Under the NADP, Ames Research Center will continue to excel in its role as a preeminent national resource dedicated to research and scientific discovery. NASA Ames' activities focus on new scientific discoveries in ten major areas:

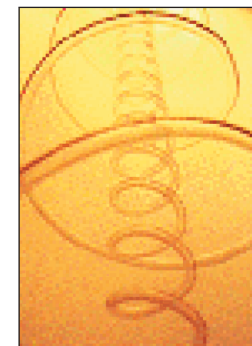
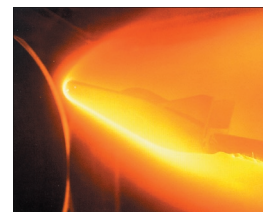
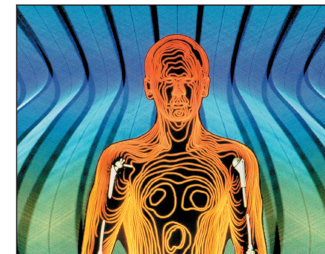
- Intelligent Systems
- High-Performance Computing
- Astrobiology
- Nanotechnology
- Aviation Operation Systems
- Human Factors
- Runway Independent Aircraft
- Applied Aerospace Information Technology
- Space Transportation Technology/Thermal Protection Systems
- Life and Biological Sciences

NASA Ames has developed unique research capabilities in each of these areas, and has key research facilities

that support these activities. Ames Research Center also manages several national assets, major research facilities of critical importance to NASA's mission and the nation's aeronautics and space communities that are made available to industry and government partners. These facilities include the National Full-Scale Aerodynamics Complex, the ArcJet Complex and the Vertical Motion Simulator Complex.

Ames Research Center also has very robust educational programs that offer a variety of activities for both students and teachers. Ames Research Center provides educational programs and services to public and private schools, colleges and universities in the 11 western states.

To achieve its mission, Ames Research Center will continue to establish NASA partnerships with other NASA centers and form external partnerships with industry, academia and other government agencies. Partner research programs may include use of NASA's unique facilities on a cost-reimbursable basis. Organizations that are active research and education partners with NASA Ames will be given first priority to occupy space in facilities at Ames Research Center.





## EXISTING FACILITIES AND PROGRAMS

Including approximately 228 buildings, the Ames Campus has an estimated replacement value of more than \$2 billion (May 2001). In general the Ames Campus' physical plant comprises many specialized and unique research facilities. There are two major functional types of buildings: program-oriented and institutional-support.

Support facilities essential to the operation of the site include office buildings, warehouses, maintenance facilities and recreational facilities. Program-oriented structures include motion-based flight simulators, advanced computational systems, a variety of wind tunnels and a wide-range of laboratories. The Ames Campus has approximately 130,000 square meters (1.4 million square feet) of research and development space. The majority of R&D space at the Ames Campus was constructed in the 1940s (38,800 square meters [418,000 square feet]), while an expansion phase occurred during the 1960s (26,400 square meters [284,000 square feet]). Since the 1980s, Ames Research Center has added 21,500 square meters (231,000 square feet) of R&D facilities. There is an additional 65,700 square meters (707,000 square feet) of laboratory space in the Ames Campus. The majority of this space was constructed in the 1960s (43,700 square meters [470,000 square feet]). Since the 1980s, Ames Research Center has added 8,200 square meters (88,000 square feet) of laboratory space.

NASA seeks partners that support the R&D and education programs at Ames Research Center. The following are brief descriptions of existing facilities and capabilities for the ten key research areas:



*NASA Advanced Supercomputing (NASA) building*

## Intelligent Systems

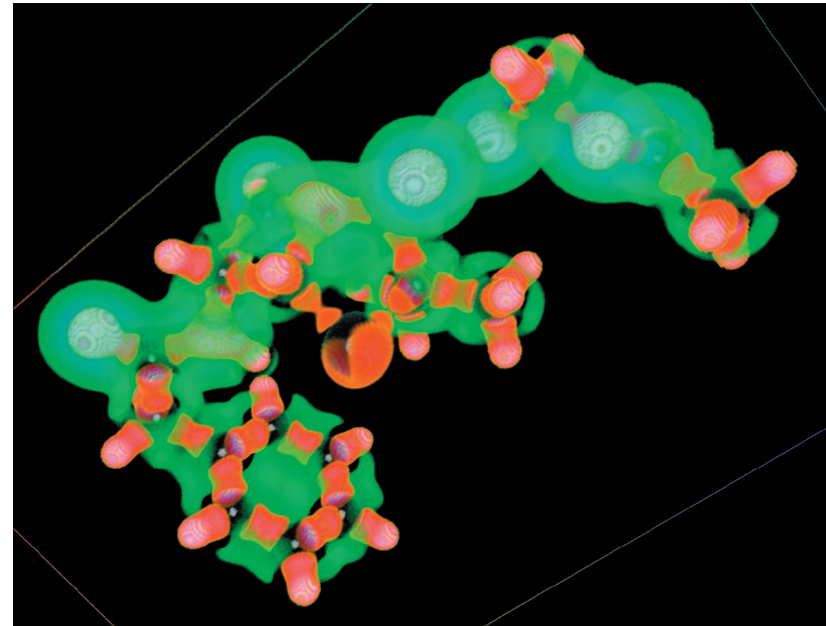
Ames Research Center's pioneering work in the field of artificial intelligence applications for spacecraft and operations is the foundation for its core competency in intelligent systems today. Examples of intelligent systems-related technical capabilities include: autonomous reasoning; human-centered computing; intelligent data management; and integrated validation and verification for software products. Ongoing development of these capabilities will lead to the advancement of technologies that allow automated software development, automated planning and scheduling, collaborative reasoning, data mining and data management analysis and visualization.

### Research Capabilities

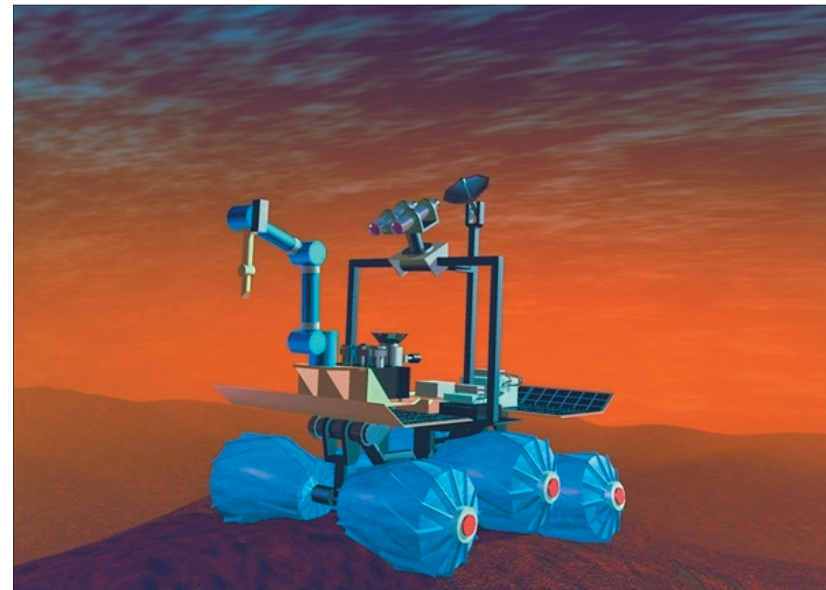
- Automated Software Synthesis and Analysis
- Automated Learning and Development
- Intelligent Execution and Adaptive Control
- Integrated Validation and Verification

### Key Research Facilities

- Automation Sciences Research Laboratories (*robotics and simulator*)
- Human-Performance Research Laboratories



*A molecule of penicillin, a semisynthetic antibiotic related to penicillin*



*Russian Rover Marsokhod on martian surface*



512-processor SGI Origin 2000 (Lomax)

## High-Performance Computing

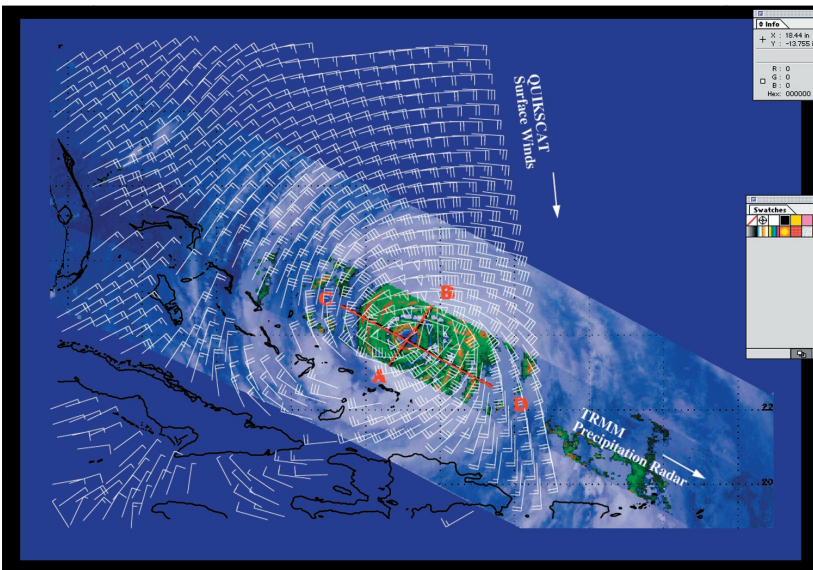
Ames Research Center is one of the leading developers of supercomputing systems for aeronautical applications in the world. All NASA Centers across the United States depend on Ames Research Center for management of supercomputing resources. High-performance computing encompasses a variety of technologies ranging from parallel computing, mass storage systems and wide area networking to data analysis, simulation algorithm development and device modeling. Ames Research Center's high-performance computing capabilities have extended beyond aeronautics to fields like weather prediction and computational chemistry.

### Research Capabilities

- Parallel Computing
- Mass Storage Systems
- Numerical Simulation and Modeling Methods
- Supercomputing and Storage Services

### Key Research Facilities

- Numerical Aerospace Simulation Building
- Aeronautical Consolidated Supercomputer Facility
- Parallel and Clustered Testbed Facility
- Next Generation Internet Testbed Facility
- Aeronet



The U.S.-Japan Tropical Rainfall Measuring Mission satellite passing over hurricane Floyd on September 13, 1999

## Astrobiology

NASA has designated Ames Research Center as the Lead Center for Astrobiology. Astrobiology is the study of the origin, evolution, distribution and destiny of life in the universe. The NASA Astrobiology program has four elements: basic scientific research; technology and mission development; education and public outreach; and the NASA Astrobiology Institute. The Institute, with 11 lead member institutions and numerous affiliated consortiums, is conducting and integrating multidisciplinary investigations fundamental to the field of astrobiology. Institute members are distributed across the United States and bound together through advanced telecommunications and electronic networking. As NASA's lead center for Astrobiology, the primary administrative offices of the Institute are located at the Ames Campus.



*The Eagle nebula*

## Research Capabilities

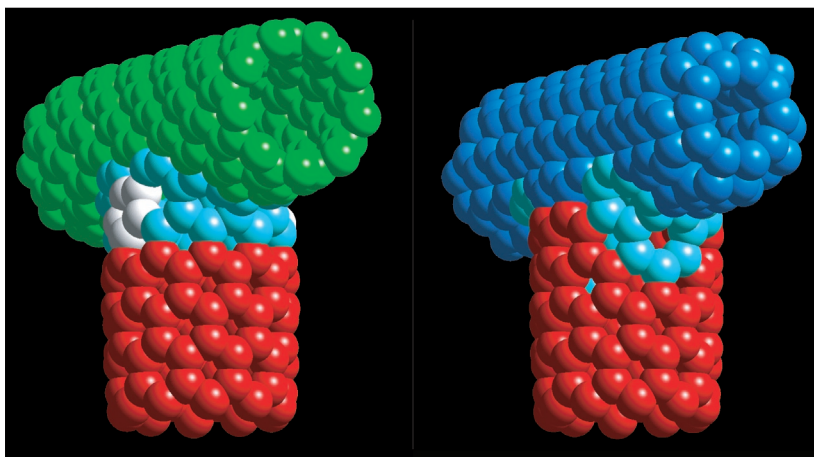
- Exbiology
- Astrophysics
- Planetary Systems
- Cell and Molecular Biology
- Evolutionary Biology
- Ecological Modeling
- Ecosystems Science
- Atmospheric Chemistry
- Atmospheric Physics

## Key Research Facilities

- Cryogenic Laboratory
- Earth Science Instrument Integration Laboratory
- Image Processing Laboratory
- High-Resolution Spectroscopy Facility (*compound analysis*)
- Center for Bioinformatics
- Central Chemical Laboratory
- Electron Microscope Laboratory

## Nanotechnology

Nanotechnology is the creation of functional materials, devices and systems through control of matter on the nanometer length scale and exploitation of novel phenomena (physical, chemical, biological) at that length scale. Advanced miniaturization is a key area to enable new science and exploration missions for which ultra-small sensors, power sources, communication, navigation, and propulsion systems are needed. Researchers at NASA Ames have grown nanotubes directly on an Atomic Force Microscope cantilever, designed a nanogear based on a carbon nanotube, and developed a holographic data storage based on bacteriorhodopsin films.



Simulated T-junction created out of carbon nanotubes

## Research Capabilities

- Carbon Nanotubes
- Computational Nanotechnology
- Biosensors
- Protein Nanotubes
- Computational Electronics and Optoelectronics

## Key Facilities/Equipment

- Two Chemical Vapor Deposition Reactors for Nanotube Growth
- Plasma CVD Reactor for Nanotube Growth
- Surface Characterization (SEM, TEM, HRTEM)
- Two Atomic Force Microscopes
- Scanning Tunnel Microscope
- Biology Support Facilities
- Parametric Analyzer, 4-Point Probe Systems
- Raman Spectroscopy, Fourier Transform Infrared Spectroscopy
- Sputtering, Lithography Facilities
- Cleanroom (*under construction*)
- Genetic Microsystems Microarrayer, Scanner
- Pyrosequencer
- Nanopore Genesequencing Setup

## Aviation Operation Systems

Aviation operation systems research at Ames Research Center has a long history of contributions to the improvement of air traffic control, the human behaviors that affect flight performance and flight vehicle guidance, navigation, and control. This program studies those ground, satellite, flight vehicle systems and human characteristics that affect the national airspace, and focuses on improving the safety, efficiency, flexibility, capacity, and environmental quality of the national airspace. The goal of the research program is to significantly reduce aircraft accidents as well as to triple the capacity of the national airspace system by 2010.

Elements of the aviation operation systems research include: the automation of both airborne and ground systems that are integrated with the human operator, the development of technologies to enhance human information processing, and the identification of environmental hazards.

### Research Capabilities

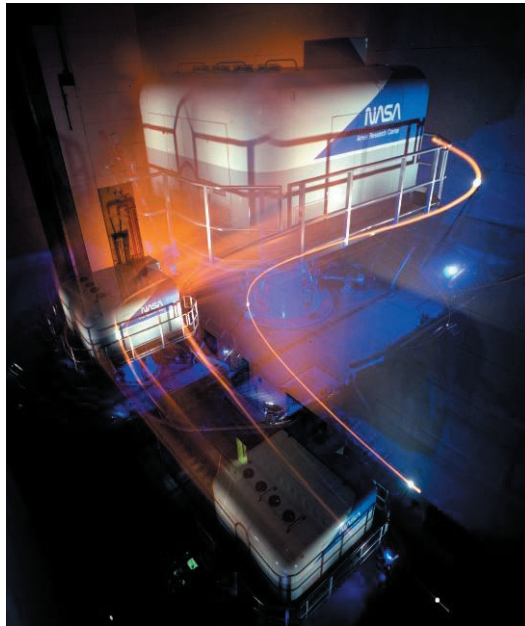
- Human Cognition and Performance
- Flight Vehicle Guidance, Navigation and Control
- Flight Vehicle Performance and Handling Characteristics
- Air Traffic Control
- Surveillance
- Weather
- Avionics
- Air Carrier Economics
- Noise & Emissions Prediction and Measurement

### Key Research Facilities

- Future Flight Central (*virtual control tower*)



NASA's "FutureFlight Central," the world's first full-scale virtual airport control tower



Vertical Motion Simulator in motion



Boeing 747-400 Simulator Cockpit

## Human Factors

Ames Research Center is NASA's lead center in research relating to aeronautical human factors. It plays a critical role in improving aviation safety and efficiency by focusing on human behavior and is closely related to NASA's aviation operation systems research. Human factors research models human behavior — alone, in groups, and in systems — to study human cognition and fatigue. Researchers also focus on cognition and 'expert behavior,' fatigue and circadian rhythm, perception and psychophysics and system safety monitoring and analysis.

### Research Capabilities

- Perception and Psychophysics
- Cognition and Expert Behavior
- Fatigue and Circadian Rhythm
- System Safety Monitoring and Analysis

### Key Research Facilities

- Aviation Operations Laboratory
- Crew Vehicle Systems Research Facility (*cockpit simulator*)
- Vertical Motion Simulator Complex (*flight simulator*)

## Runway Independent Aircraft

Ames Research Center has been at the forefront of runway independent aircraft (RIA) research for four decades. It is NASA's lead center for Rotorcraft and Powered Lift Technology. RIA includes helicopters, tilt rotorcraft and other advanced rotary-wing aircraft. RIA research spans the set of disciplines necessary for rotorcraft and power lift vehicle research, design and development. It draws on Ames Research Center's vast capabilities in computational science, simulator facilities and wind tunnels. Ames Research Center's RIA flight research program conducts many in-flight tests, such as measuring the effects of "slung loads" (cargo suspended below aircraft) on stabilization and measuring the effect of vibrations from basic maneuvers on the engine and transmission.

### Research Capabilities

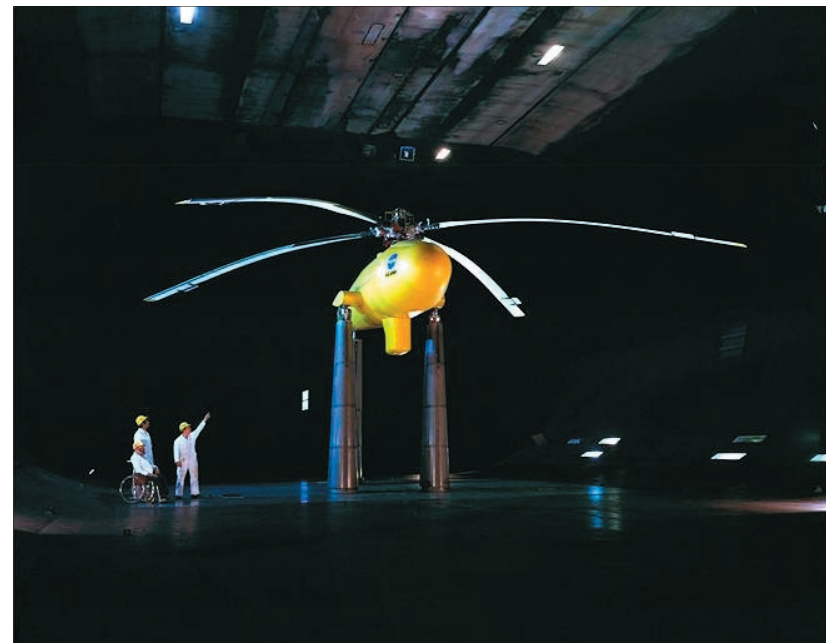
- RIA Aeromechanics and Aerodynamics
- RIA Human Factors
- RIA Computational Design & Analysis Tools
- Piloted Simulation of RIA

### Key Research Facilities

- 7x10 Foot Wind Tunnel
- National Full-Scale Aerodynamics Complex
- Vertical Motion Simulator

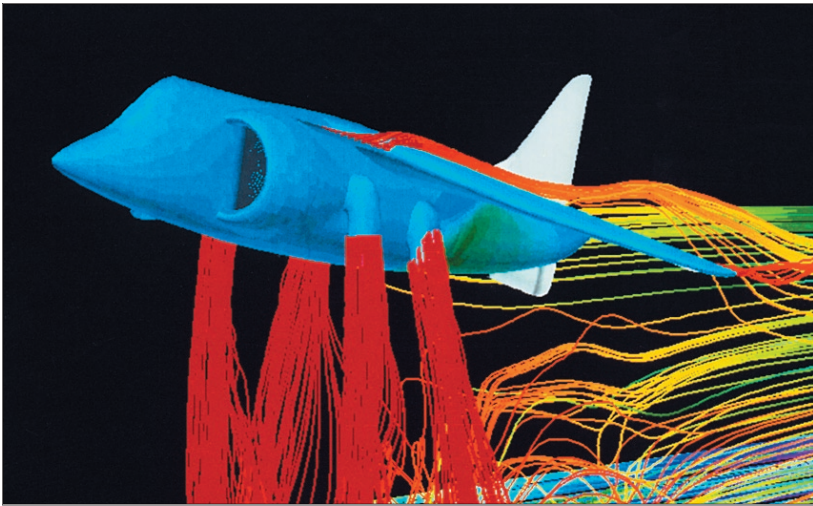


*Bell Boeing 609 Civil Tiltrotor Aircraft*



*Controllable Twist Rotor test*





*CFD image of AV-8 Harrier jet with instantaneous streamlines*



*Virtual Environment Reality workstation helmet and gloves*

## Applied Aerospace Information Technology

Applied aerospace information technology activities at Ames Research Center are a product of the convergence of aerospace research and information technologies that support the development of new aviation and space flight products. Research includes integration of intelligent information analysis, computational simulation and unified instrumentation to reduce the design-cycle time for aerospace vehicles. Researchers are also working on the advancement of neural-based adaptive flight control technology capable of handling off-nominal flight conditions and system failure.

### Research Capabilities

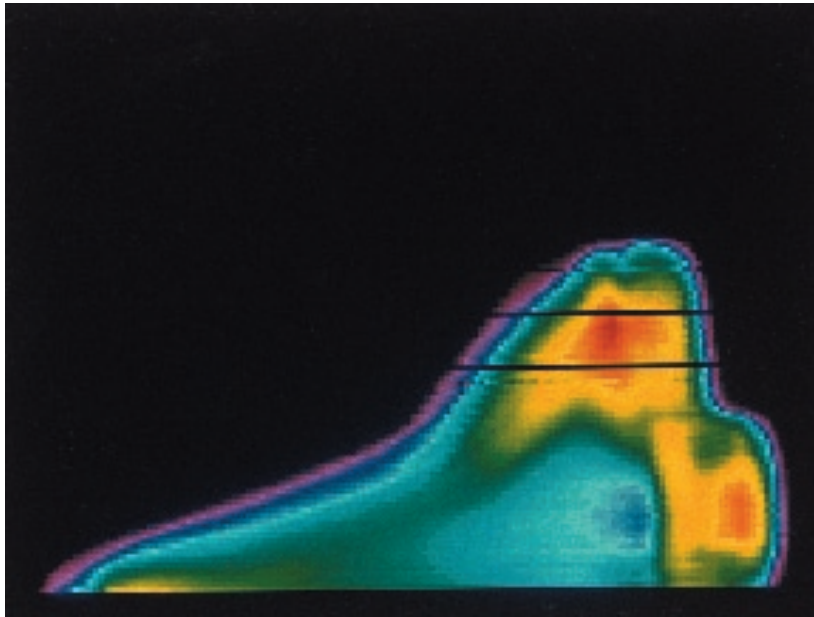
- Flight Simulation
- Aerospace Design Process Development
- Aerospace Data Fusion
- Subsonic & Hypersonic Vehicle Technology
- Advanced Measurement and Visualization Techniques

### Key Research Facilities

- Fluid Mechanics Lab
- Flight Systems Research Lab
- Virtual Reality Lab
- Vertical Motion Simulator

## Space Transportation Technology / Thermal Protection Systems

Space transportation technology research at Ames Research Center focuses on the critical area of thermal protection systems, materials that insulate spacecraft from heat (temperatures approaching those of the sun) due to extremely high rates of speed, trans-atmospheric travel and re-entry. Ames Research Center established itself as the premiere center for thermal protection systems research with the development of the 'Blunt Body Concept' in the 1950s, which enabled the development of spacecraft that could withstand the rigors of re-entry into the atmosphere. Today Ames Research Center is at the forefront of new ultra-high temperature ceramic material for future spacecraft, affordable reusable launch vehicles and atmospheric transit vehicles.



Heating pattern of the Space Shuttle

### Research Capabilities

- Computational Chemistry
- Materials Research
- Ultra High Temperature Ceramics
- Heat Shield Research
- Sensors for Integrated Vehicle Health/Management
- Arc Jet Development, Operation, and Photo Diagnostics

### Key Research Facilities

- Arc Jet Complex (*aerothermodynamic material test facility*)
- Ballistic Range Complex

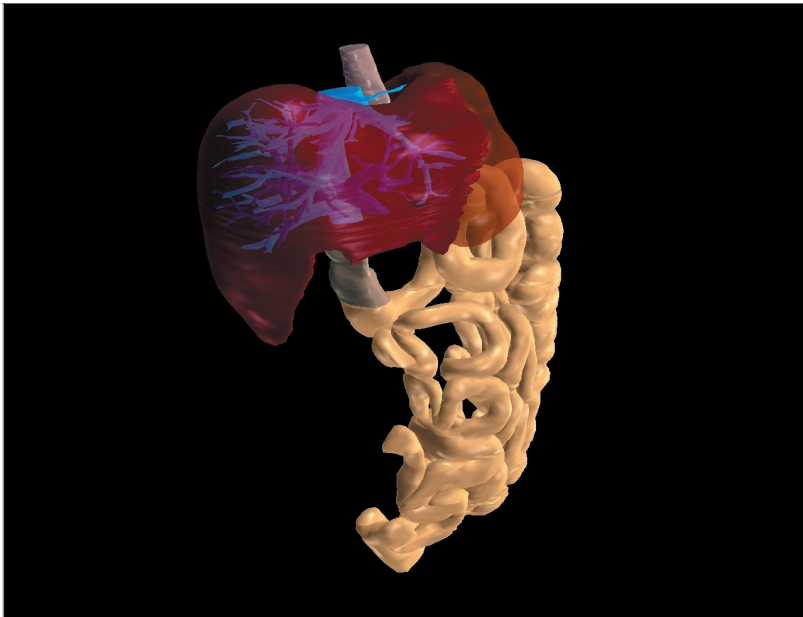


Lightweight ceramic ablator testing in Ames 60 MW Arc Jet Facility

## Life and Biological Sciences

Ames Research Center's life science research programs focus on gravity responses in a wide variety of living organisms and identify biological processes that are specifically affected by gravity. They include research in cellular, molecular, developmental, organismal and comparative biology.

Since the early 1960s, Ames Research Center has played a major role in life sciences research and missions, including the first unmanned, retrievable biosatellite; the Viking missions to Mars; the joint Soviet/NASA Cosmos series; the Space Shuttle; dedicated Space Laboratories; and the MIR/NASA Life Sciences Research Program. Currently, Ames Research Center plays a major role in the development of facilities for biological research for the International Space Station. Ames Research Center has carried out its mission in basic biological research by developing unique state-of-the-art laboratories and facilities in centrifuges and bioinformatics.



3D reconstruction of a heart

## Research Capabilities

- Molecular & Animal Physiology
- Plant Biology
- Ecology and Controlled Environment Life Support
- Endocrinology
- Evolutionary & Development Biology
- Neurosciences
- Biocomputation and Bioinformatics
- Genetics and Genomics
- Biotechnology

## Key Research Facilities

- Centrifuges for Gravitational Research
- Vestibular Research Facility (*includes acceleration sleds*)
- Central Clinical Laboratory
- Electron Microscope Laboratory



Vestibular Research Facility centrifuge

## Commercial Technology Office

Each of NASA's ten field centers, including Ames Research Center, has a Commercial Technology Office to help NASA transfer its research and development to commercial applications. The Ames Commercial Technology Office manages the transfer and commercialization of NASA technologies, the creation of technology partnerships, and the infusion of external technologies and expertise to advance NASA programs.

The Commercial Technology Office provides a range of services including: development of public-private partnerships such as dual-use technology partnerships and strategic alliances; selection and execution of the optimal partnership framework; mining Ames R&D programs, contracts, grants and cooperative agreements for new technologies and innovations with assessments of commercial potential; intellectual property protection and patenting assistance; licensing of NASA-developed intellectual property; and management of the Small Business Innovative Research and Small Business Technology Transfer programs. In addition, the Commercial Technology Office targets NASA technologies for business creation and accelerated commercial development through its management of the Ames Technology Commercialization Center dedicated to launching small businesses based on NASA mission-related technologies.



## Education

There are many educational programs at Ames Research Center that support teachers and students. A few of the programs are highlighted below:

### Teacher/Faculty Preparation and Enhancement

- **The Aerospace Education Services Program** is a national program of services offered by NASA to teachers, students, and the general public. The goal is to increase awareness and understanding of scientific research and technological development and their place in the world in which we live. The program provides schools and educational organizations a specialist in aerospace education. The specialist typically spends an entire day at a single school giving auditorium and classroom presentations. Program specialists also conduct Professional Development Workshops for teachers. In 2000, Ames' specialists visited 510 schools, conducted workshops for 4,658 teachers and presented programs for 112,347 students in classrooms and in assemblies for 11 western states.
- **The Educator Resource Center** features a wealth of print and visual materials that are available to students, teachers and educational organizations. The Resource Center serves nearly 12,000 educators a year.
- **NASA Educational Workshops** at Ames Research Center are two-week residential workshops for teachers and are intended to support systemic educational reform initiatives. The 2000 workshops included one session for teachers of American Indian students in rural areas of the country. The workshops include a variety of presentations by NASA experts. The workshops are made possible through partnerships with local resources such as the U.S. Geological Survey, James Lick Observatory, U.S. Air National Guard, Monterey Bay Aquarium and the California State Parks system.



Students in the Summer High School Apprenticeship Program and the NASA Scholars Program work with NASA Ames scientists

- **Global Learning and Observations to Benefit the Environment (GLOBE)** is a worldwide science and education program that coordinates the work of students, teachers and scientists to study and understand the global environment. Through the GLOBE program, students collect data that is used by scientists around the world. Ames' GLOBE program has developed collaborations with other programs at the University of California at Santa Cruz and Fresno State University.

### Student Support

- **Summer High School Apprenticeship Research Program** offers a select group of approximately 200 students nationwide the opportunity to participate in an intensive science and engineering program. Students are selected on the basis of having shown an aptitude for and interest in science and engineering careers. The eight week program operates during the summer at selected NASA centers.

- **NASA Scholars** Each year Ames Research Center hosts students from Historically Black Colleges and Universities and Other Minority Universities who participate in NASA's Undergraduate Student Researcher's Program. The program targets socially and economically disadvantaged students and students with disabilities. Its goals are to attract disadvantaged students at the beginning of their undergraduate studies to career paths in areas of science and engineering relevant to NASA's mission, retain these students in their field of study and increase the number of these students who pursue graduate degrees. Students participate in 10-week, paid internships. Interns contribute to ongoing research programs and participate in a myriad of enriching activities.

- **The Aeronautics Education Laboratory** is a state-of-the-art classroom that provides new technologies to excite students about science and math. In 10 unique workstations, visitors can explore these technologies through 'hands

on/minds on' activities that model real-world challenges in aviation. An aeronautics theme ties the stations together as participants gather essential data necessary for the completion of a cross-country flight.

- **The Ames Aerospace Encounter** is a hands-on field trip for fourth, fifth & sixth grade classes. It has interactive, hands-on activities in four areas: aeronautics, space science, space station and mission control/earth science. During 2000, 258 classes for 7,030 students and 2,097 adults were held. Since its opening, more than 75,000 students have experienced the Ames Aerospace Encounter.

- **The JASON Project** is a yearly scientific expedition conducted by the JASON Foundation. In 2000, the JASON XI expedition, "Going to Extremes," looked at the sea and space through the eyes of modern-day explorers by comparing the National Oceanic and Atmospheric Administration's Aquarius Underwater Laboratory in Florida with NASA's International Space Station. More than 13,000 students and teachers became active participants in broadcasts of live scientific research from Ames during the annual two-week program. Following the broadcasts, these participants became explorers in their own research activities at Hangar One.

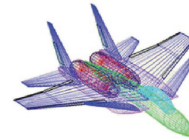
## Multimedia Productions

The Ames Educational Technology Team has produced award-winning software. The CD-ROM *Mars Virtual Exploration* helps students understand basic concepts of space exploration and the search for life in the universe. The *Exploring Aeronautics* CD-ROM was the first software to be enclosed in the National Science Teachers Association Publication, which reaches 16,000 middle school science teachers.

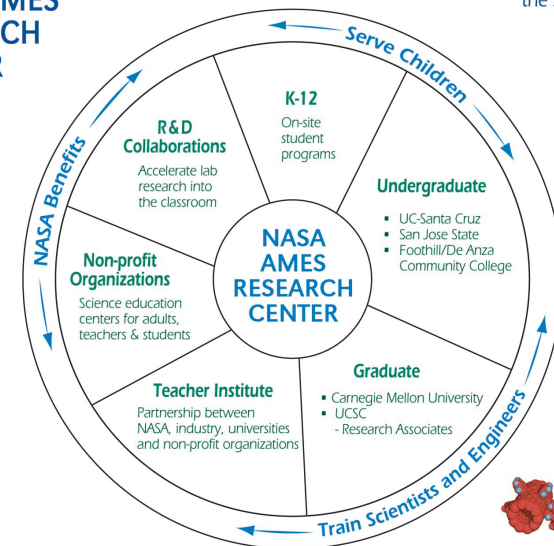
The collaborative NASA/Federal Aviation Administration *Gate to Gate* CD-ROM guides users on a flight through the US air traffic control system and takes them behind the scenes to

## EDUCATION

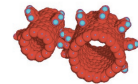
and  
**NASA AMES  
RESEARCH  
CENTER**



A unique learning center  
combining research and education  
for the science and technology needs of  
the 21st century

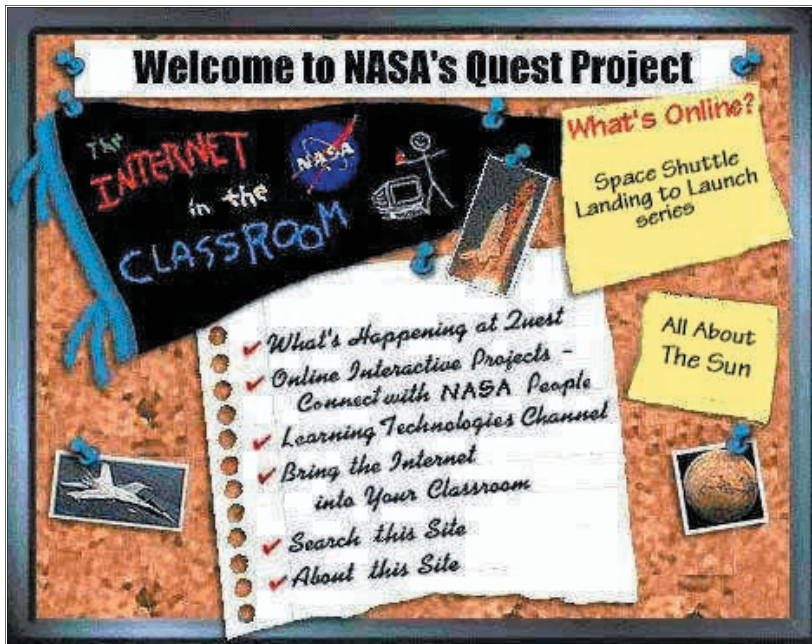


Establishes a pipeline  
for future American pioneers and innovators



meet the people who manage air traffic. The *Gate to Gate* CD-ROM allows users to see the sophisticated software tools and procedures that assist controllers in managing air traffic more efficiently throughout all phases of flight, preflight, takeoff, departure, en route, descent, approach and landing.

The NASA Ames Educational Technology Team produced a pilot version of an exciting new educational, multimedia Web environment focusing on NASA occupations and astrobiology. In *AstroVenture*, students in grades 5-8 are transported to the future where they role-play NASA occupations and use scientific inquiry to build a planet with the necessary characteristics for human habitation. Supporting activities include chats with NASA scientists, online collaborations, classroom lessons, a student publishing area, and occupation fact sheets and trading cards.



NASA Quest Web page

Finally, *Virtual Skies* is an interactive, multimedia Web site that uses air traffic management as a metaphor to engage 9th-12th grade students in the study of geography, weather and the mathematics of navigation. Students use collaborative and decision-making skills to find solutions to various aviation scenarios.

### NASA Quest Web Site

NASA Quest is dedicated to bringing NASA people, missions and science to classrooms through the Internet. Quest offers ongoing live Web events through live Webcasts (live streaming audio and video), chats, debate forums, biographies, journals and supporting lesson plans. Quest events included Black History Month, featuring a month-long series of chats and Webcasts with African-American NASA employees and a Virtual Take Our Daughters to Work Day, which included a series of events with female NASA employees.



Award-winning software from Ames Educational Technology Team







## LAND USE PLAN

The primary planning goal for the Ames Campus is to identify facility and land requirements and to provide sufficient flexibility to permit the shifting of research focus as new discoveries and research strategies arise. When the Ames Campus was initially constructed, most research was focused on aeronautics to improve the nation's air transportation capabilities. The facilities built in these early years were designed to meet the ever-increasing goals of air transportation and aeronautic research. Over time, additional facilities were built in support of space transportation and planetary exploration.

Over the last ten years, Ames Research Center's mission has shifted from aeronautic research to information sciences. The great advances in information technology, biotechnology and nanotechnology require an enhanced new infrastructure within the Ames Campus that will be designed to support these technologies. As a result of these changes, Ames is assessing its current facilities and planning to replace old, obsolete facilities with new, energy-efficient, technologically capable buildings to meet the demands of the 21<sup>st</sup> century.

The 95-hectare (234-acre) Ames Campus is divided into three basic uses. Research and development activities comprise the largest use. The Ames Campus development area has 278,000 developable square meters (3,000,000 developable square feet), which yields a 0.30 floor area ratio (FAR). Under the NADP, 46,000 square meters (500,000 square feet) of new construction will take place in this parcel. However, 37,000 square meters (400,000 square feet) of existing space is proposed for demolition, resulting in a net increase of only 9,300 square meters (100,000 square feet).

Depicted on the facing page is a conceptual development plan for the Ames Campus. The first building planned will be approximately 5,600 square meters (60,000 square feet) for

institutional support. It will be located west of building N269. The concept plan also includes demolition of a closed test facility, the 14-foot wind tunnel, and construction of a new office building, approximately 4,650 square meters (50,000 square feet), in its place to house the existing engineering and manufacturing groups.

A modern childcare facility is proposed on the southwestern edge of the campus. This will move children from the trailers where they are currently located to a new permanent facility. The initial phase of this project should be completed in 2003.

Looking ahead past year 2010, additional buildings will be demolished to make way for newer facilities. The specific size and function of these buildings will depend on future NASA programs and budgets.

The Ames Campus also contains an 3-hectare (8-acre) burrowing owl preserve along the eastern edge of the site, adjacent to the airfield. Some of the protective measures taken in the preserve include no new construction, and no parking. Limited pedestrian trails will be allowed adjacent to the preserve.

A 1.5-hectare (4-acre) recreational zone is dedicated within the Ames Campus adjacent to the air intake for the 80-by-120-foot wind tunnel. This parcel will contain grassy fields and recreational equipment such as goal posts and a backstop. There will be no new building construction in this area.

## PLANNING GOALS

There are several planning goals that underlie the Land Use Plan for the Ames Campus. Ames Research Center seeks to consolidate facilities of the same research directorates in unified areas. Ames Research Center will evaluate the re-use potential of existing facilities in lieu of new construction. Where new construction is required, energy-conscious design and orientation of facilities will be encouraged. A consistent architectural vocabulary will be developed to unify the site. This unity will be achieved through controlled use of surface materials, color, and a comprehensive signage system.

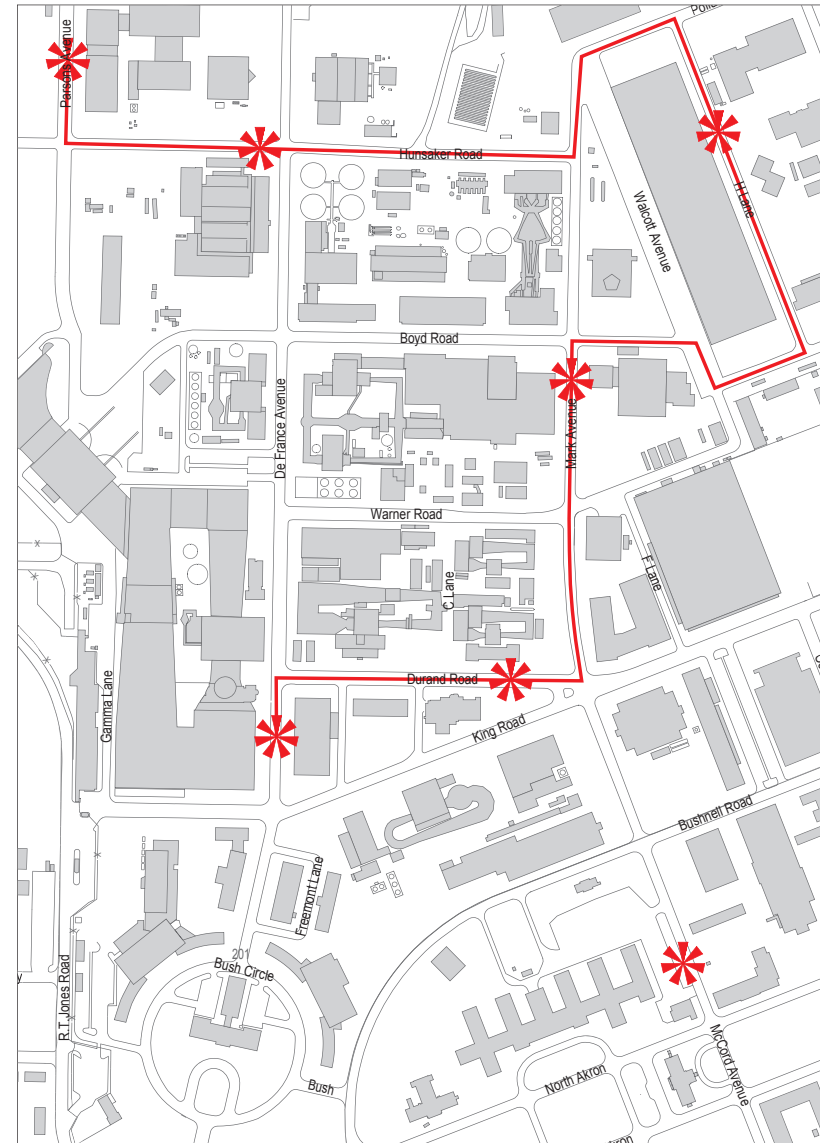
## OPEN SPACE

Open space is an important part of the Ames Campus. In addition to the recreation space reserved in front of the 80-foot by 120-foot wind tunnel, there are numerous other open spaces for formal and informal interactions. A buffer adjacent to Stevens Creek, along with the clearance zone around the Vertical Takeoff and Landing Pad, provide open areas in the north of the campus. Several miles of pedestrian and bicycle paths are available to Ames' staff. Plazas and courtyards in many existing buildings provide venues for outdoor displays and informal meetings.

## TRANSPORTATION

The existing road network for the Ames Campus will not change significantly under the NADP.

Ames Research Center has instituted a comprehensive transportation demand management program aimed at increasing alternative commuting to and within the site. The Ames Commute Alternatives Program (ACAP) became effective in 1996 and will continue under the NADP.



NASA Ames shuttle map

ACAP has proven very successful at reducing on-site traffic. With its existing programs, Ames has reduced its employee drive-alone rate to 63 percent from the Santa Clara County average of 77.8 percent (1990 Census Bay Area Journey to Work data). Bicycle usage is nearly three times the county average. Carpooling rates are nearly double.

An important component of ACAP is a free shuttle service that runs between the CalTrain station in Mountain View and six stops within the Ames Campus. Ames Research Center runs a transit subsidy program that offers reduced transit tickets to civil service employees. To reduce the number of single occupancy vehicles entering the Center, Ames Research Center has a carpool program that reserves prime parking spots for registered carpools. A network of bicycle routes runs throughout the Ames Campus. Showering facilities and secure bike lockers are available for frequent riders.



*The NASA Ames shuttle*

## HOUSING

There is no housing planned in the Ames Campus under the NADP. However, those working in the Ames Campus are eligible to use housing in the Bay View or NASA Research Park district. For information about proposed short-term housing, see the NASA Research Park (page 55) and Bay View (page 79) sections.

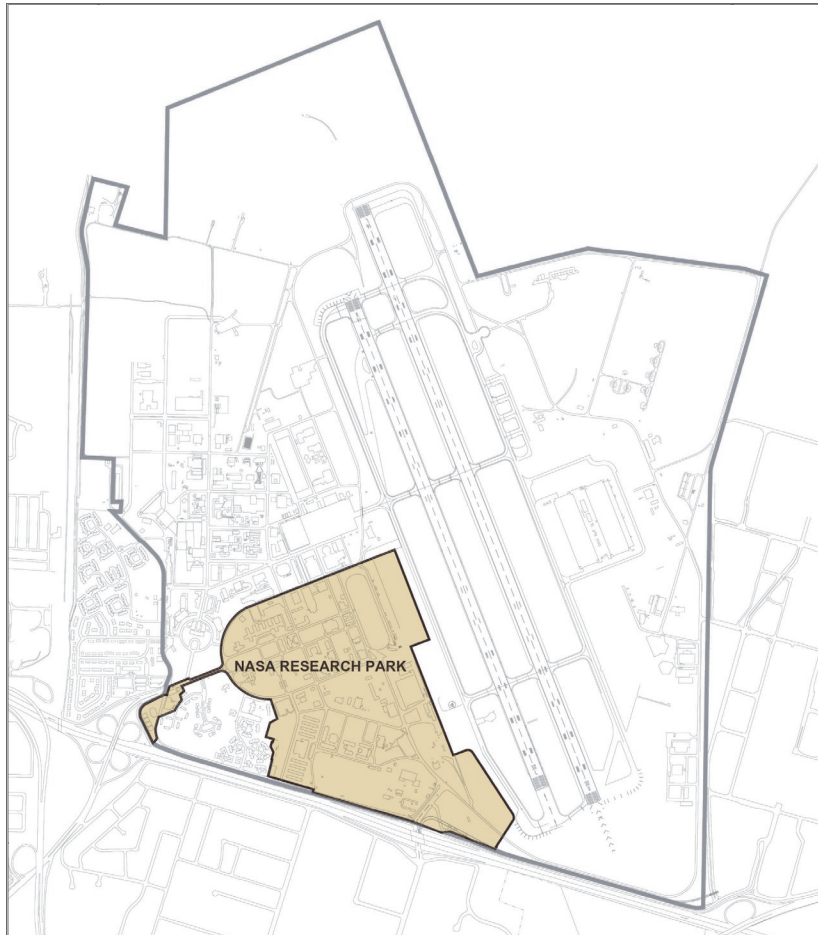
## INFRASTRUCTURE

Routine infrastructure maintenance and improvements are planned for the existing systems within the Ames Campus. Ames Research Center has developed a five-year Capital Improvement Plan. A major project under this Plan is a rehabilitation of the electrical distribution system. The rehabilitation includes the replacement of the medium-voltage switchgear and transformers, expansion of the Ames Campus power-monitoring system and installation of an uninterruptible power supply to certain facilities. Other utility systems will be upgraded as needed. A limited amount of reclaimed water from wind tunnel cooling tower operations is treated on-site and pumped back into use. NASA has recently constructed an Industrial Wastewater Treatment Facility and plans to use this reclaimed water in research facility operations. Additional reclaimed water will be used from an on-going environmental remediation program.



*Illustration of NASA Research Park concept*

# NASA RESEARCH PARK



Most new development under the NADP is planned to occur in the NASA Research Park. The NASA Research Park will occupy approximately 86-hectares (213-acres) of land bordered by the Eastside/Airfield, the Ames Campus, military housing controlled by the Department of Defense and U.S. Highway 101. At full build out, the NASA Research Park will contain 350,000 square meters (3.7 million square feet) of developed space. Approximately 217,000 square meters (2.3 million square feet) will be the result of new construction under the NADP. Existing buildings comprise the remaining 133,000 (1.4 million square feet.) Overall, the density of development within the NRP is approximately a 0.60 floor area ratio (FAR), although density may vary widely by specific location within the NRP.

## CONCEPT: A CENTER FOR RESEARCH, EDUCATION AND LEARNING

NASA Research Park is designed to be a world-class center for research and learning shared by government, academia, industry and nonprofit organizations in partnership with NASA.

The NADP envisions research laboratories, first-class office space, classrooms, lecture halls and public facilities such as museums, exhibit halls and a conference center. With its robust federal research programs, rich military history, prominent architecture, ideal location and availability of land, NASA Research Park is an ideal place where NASA, its collaborative partners and the public can come together to understand, explore and expand human understanding of science and technology. Sensitive master planning, coupled with creative design, will physically transform the NRP into a unique and stimulating area that promotes both formal and

informal interactions between researchers, teachers, students and visitors.

By integrating public and private research and development efforts, the NASA Research Park will also serve as a hub of technology transfer, keeping NASA at the forefront of cutting-edge technology advances that occur in Silicon Valley and promoting commercial applications of basic scientific research performed at Ames Research Center.

## EXISTING STRUCTURES

The historic development of Moffett Field evolved with the changing requirements of U.S. Navy operations. Nevertheless, NASA Research Park contains much of the fabric of the Navy's original development of Shenandoah Plaza.

Currently, the NRP contains an inventory of approximately 140 buildings totaling more than 145,000 square meters (1.5



*Artist's concept of the Carl Sagan Center for the Study of Life in the Cosmos*



*Shenandoah Plaza Buildings 20 (top) and 25 (above)*

million square feet). It includes areas that were previously used by the military for airfield support, barracks, maintenance support, motor pools and storage. Included in this total are the 71 existing structures located west of McCord Avenue in Shenandoah Plaza. Twenty-two of the existing buildings in Shenandoah Plaza are historically significant, 49 are non-contributing buildings.

The majority of the NRP's existing structures will be removed for several reasons. Overall, most of the buildings outside Shenandoah Plaza lack a distinct identity, were not designed for uses that would benefit NASA Research Park and are not suitable for occupancy due to functional obsolescence. However, demolition of historic buildings will not be permitted unless the structure is physically beyond rehabilitation.

Several tenants occupy space in the NRP under existing land use agreements. These tenants are: the 63<sup>rd</sup> Army Regional Support Command, occupying Buildings 152–155; the Army 787th Explosives Ordnance Detachment, occupying Building 156; the Air National Guard, 129<sup>th</sup> Air Rescue Wing, occupying a motor pool and associated structures; Golden Bay Federal Credit Union located in Building 556; and the U.S. Department of the Air Force, 750<sup>th</sup> Space Group. The Air Force is the military sponsor for several buildings that are operated for military morale, welfare and recreation: Building 476 (Exchange Store), Building 503 (gas station), Building 543 (Craft Hobby Shop), Building 554 (Exchange Garden Shop) and Building 596 (McDonald's). Under the NADP these occupied buildings may be removed or rebuilt elsewhere to conform to the land use plan. These services may be relocated in the vicinity by the military.

# LAND USE PLAN

The NRP has been divided into several parcels. Each has a set of preferred uses and desired densities. Overall uses within the NRP are research and development, office, education, public, retail, housing, burrowing owl and open space. Provided in the following sections are descriptions of these uses, as well as proposed projects and parcel densities.

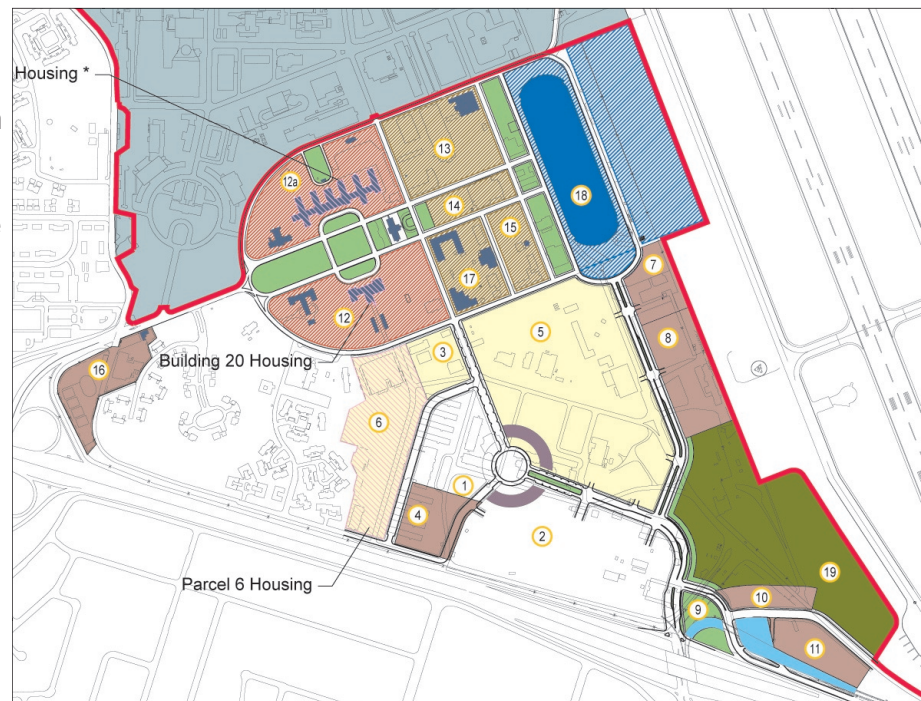
## Research and Development/Office Facilities

Research and development uses include support functions such as office areas, laboratories, high-bay space, parking and limited retail.

Research and development/office is anticipated to be the primary use for Parcels 1, 2, 8 and 12, and a potential use for Parcels 3, 4, 5, 6, 13 and 17. Parcel 1 has been selected as the preferred site for the proposed, state-of-the-art Carl Sagan Center for the Study of Life in the Cosmos. The Sagan Center will offer approximately 8,350 square meters (90,000 square feet) of research and development space as well as 2,800 square meters (30,000 square feet) of auditorium space for lectures and public events. The Sagan Center will focus on basic research in the fields of information technology, nanotechnology, biotechnology and astrobiology.

Preferred densities for Parcels designated as primarily for research and development/office use range from a floor area ratio (FAR) of 0.18 for Parcel 4 to 0.71 for Parcel 2 and 1.15 for Parcel 6.

Parcel	Parcel Area (hectares)	Parcel Area (acres)	FAR (floor area ratio)	Developable Area (square meters)	Developable Area (square feet)
1	2.43	6.00	N/A	11,148	120,000
2	7.90	19.53	0.71	55,742	600,000
3	1.03	2.53	0.75	7,711	83,000
4	1.50	3.70	0.18	2,661	28,645
5	11.58	28.6	0.75	86,864	935,000
6	3.81	9.42	1.15	43,850	472,000
7	1.26	3.11	0.88	11,148	120,000
8	2.43	6.00	0.75	18,116	195,000
9	0.26	0.65	N/A	N/A	N/A
10	0.77	1.91	N/A	N/A	N/A
11	1.36	3.35	0.08	1,115	12,000
12	7.91	19.55	N/A	25,548	275,000
13	2.59	6.4	0.75	19,510	210,000
14	0.87	2.15	0.27	2,323	25,000
15	1.06	2.62	0.35	3,716	40,000
16	1.85	4.56	0.35	6,503	70,000
17	1.72	4.26	N/A	4,181	45,000
18	5.70	14.09	0.81	46,452	500,000
19	8.70	21.5	N/A	N/A	N/A
No Change	N/A	N/A	N/A	869	9,355
Subtotal	64.7	159.9		347,457	3,740,000



Land Use Plan: NASA Research Park (above) and proposed parcels and permitted development table (top)





## Public Facilities

Public facilities include uses to foster community building in the NRP and to support the NRP's research and educational activities. Specifically, these uses include conference and training facilities, overnight accommodations, museums, auditoriums, exhibition spaces, childcare facilities, transit facilities and structured parking.

Parcels for which public facilities are the primary use are parcels 7, 10, 11, 13, 14, 15, 16 and 18. Public facilities are also a potential use for parcels 3, 4 and 5.

Museum partners will be located in the northern part of the NRP. Parcel 7 has been identified as a preferred location for a museum and offers 11,150 square meters (120,000 square feet) on three acres, yielding a FAR of 0.88. Museums focused on technology, aerospace and space exploration will be the key to the further advancement of NASA's education and outreach mission. They will house the exhibits and displays that inspire children, helping to develop the next generation of engineers and scientists. They will also record and store the history that is being made at Ames Research Center and in Silicon Valley.

An existing NASA museum partner, the California Air and Space Center, has proposed occupying Hangar One in parcel 18, converting the historic structure into a place where visitors can imagine and experience the future of space exploration. The future of space exploration is the primary focus of the California Air and Space Center. This facility will include simulators, exhibits, a large-format theatre, facilities for special events, conferences and educational activities, and visitor support space for a gift shop and restaurant.

Parcels 10 and 11, at the southern Ellis Street entrance to the NRP, are designated as a Transit Center for the shared-use of all partners. Located adjacent to the light rail station, this land is the potential location for peripheral parking lots/structures that may be shared by employees and visitors. This 2-hectare



*Ames Community Day and Open House, 1997: An estimated 220,000 people toured Ames Research Center (top and above)*

(5.3-acre) lot has 1,100 square meters (12,000 developable square feet).

Preferred densities for parcels designated as primarily for public facilities use range from a floor area ratio (FAR) of 0.08 in Parcel 11 and 0.35 in Parcel 16 to 0.75 in Parcel 13.

## Educational Facilities

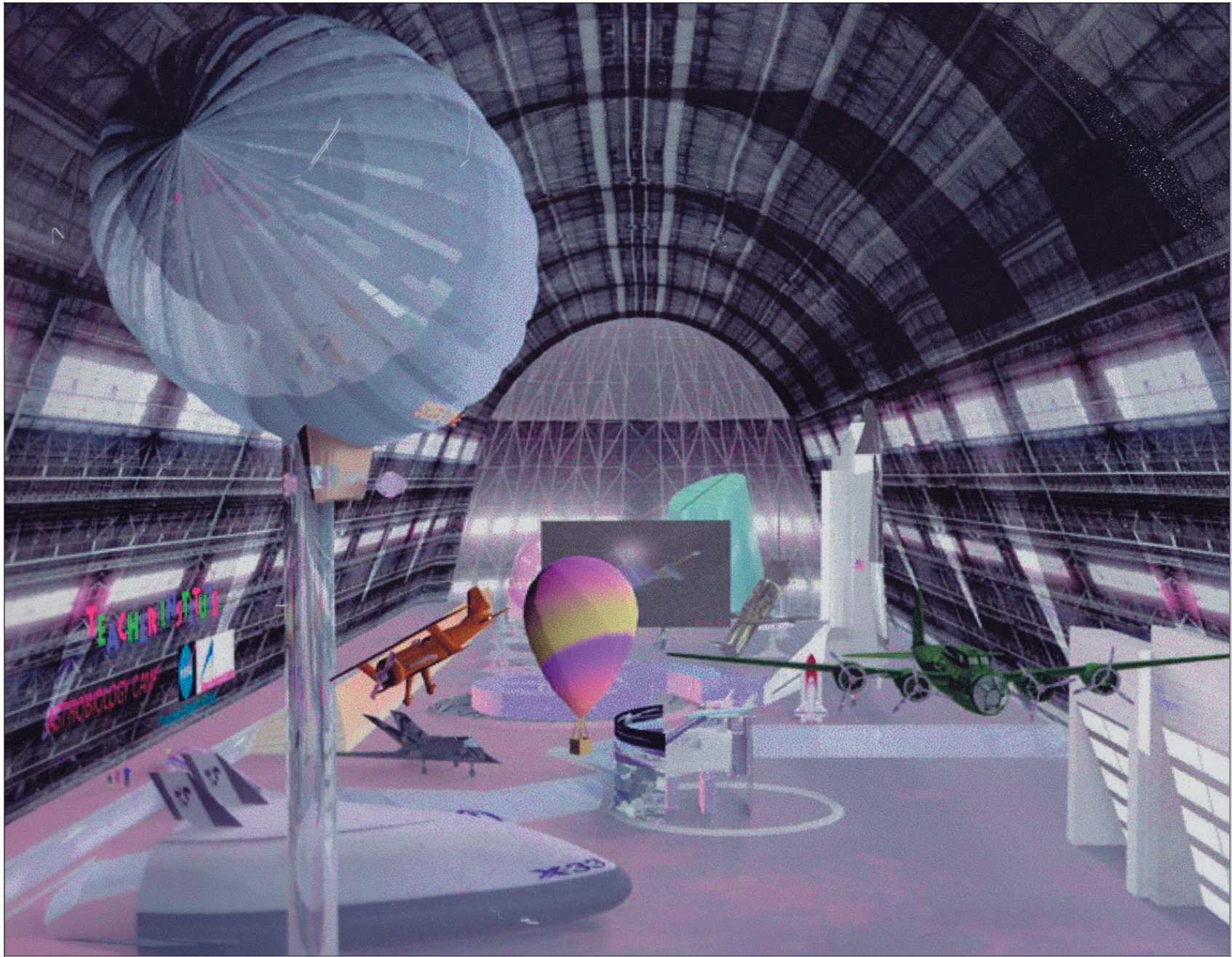
Educational facilities include classrooms, offices, lecture halls, research facilities and ancillary facilities required to achieve NASA's mission related to education and outreach at all levels—from elementary to post-doctorate. Appropriate partners for this zone include public and private universities and colleges. Objectives for these partnerships include:

- Enhancing the education of the local work force, creating graduate, postdoctoral, intern, sabbatical and other opportunities for visiting scholars.
- Developing public educational programs on site.
- Strengthening science and technology in regional school systems.

The university partners will be located in the northwest portion of the NASA Research Park site; bordered by Wescoat Road, Cody Road, Ellis Street, McCord Avenue Extension and Bailey Road. Parcels 3 and 5 have been designated primarily for educational use. Parcels 12 and 18 are also potential sites for educational uses. Parcels 3 and 5 constitute more than 12-hectares (31-acres), with a developable area of 94,600 square meters (1.02 million square feet). NASA has targeted a maximum 0.75 floor area ratio (FAR) for these parcels.



*Hangar One has reuse potential as a large-scale facility for events and expositions*



Artist's concept of the California Air and Space Center

## Open Space

Open space uses include common landscaped areas as well as wildlife habitat. Open space will be preserved to enhance the NRP's quality of environment and to protect and preserve natural resources. Facilities in the open space areas will be highly restricted and may only support the open space area and ancillary recreational uses. These facilities could include bus shelters and public restrooms. Parking will not be allowed within these areas.

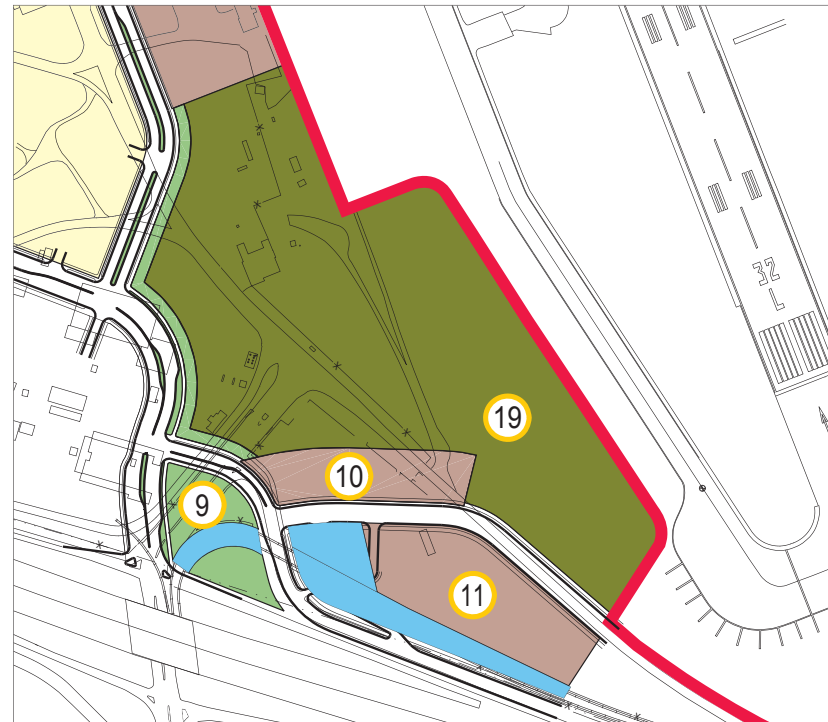
## Burrowing Owl Preserve

Parcel 19 is a 9-hectare (21.5-acre) parcel that has been designated a burrowing owl preserve. This site was selected because of its high concentration of existing and active owl nests. To ensure the protection of its burrowing owl population, NASA has prepared a Burrowing Owl Habitat Management Plan that sets forth standards and processes for protecting burrowing owls and fostering their continued presence at Ames Research Center

There will be no new construction in this zone. Limited pedestrian access trails are proposed adjacent to the preserve. Parking will not be allowed in this area.



*The Burrowing Owl*



*Parcel 19: Designated burrowing owl preserve*

## PLANNING GOALS

### A Collaborative Campus

The NRP is designed to promote collaborations among employees, residents and visitors. The site plan seeks to achieve the overall feel of a campus. A central planning element is the Town Center, the “heart” of the NRP with a large green open space surrounded by outdoor seating areas and architecturally significant buildings. It is in this area where NASA, academia, industry and non-profit organizations will physically meet. Retail stores located around or near the Town Center will be accessible by all the partners. This design is intended to ensure the development of a lively, inviting public space for both casual and formal meetings.

A campus atmosphere is further reinforced by the commitment to pedestrians and bicycle use. The site has been organized to promote and encourage pedestrian use between partner buildings and other desirable locations within the NRP (e.g. Transit Center, Town Center retail, Historic District) and the Ames Campus. All streets include tree-lined sidewalks and the university partners are encouraged to connect their campuses with all-weather pedestrian and bicycle paths. A linked system of parks, plazas and pathways will create a pedestrian-oriented system distinctly separate from vehicle circulation zones.

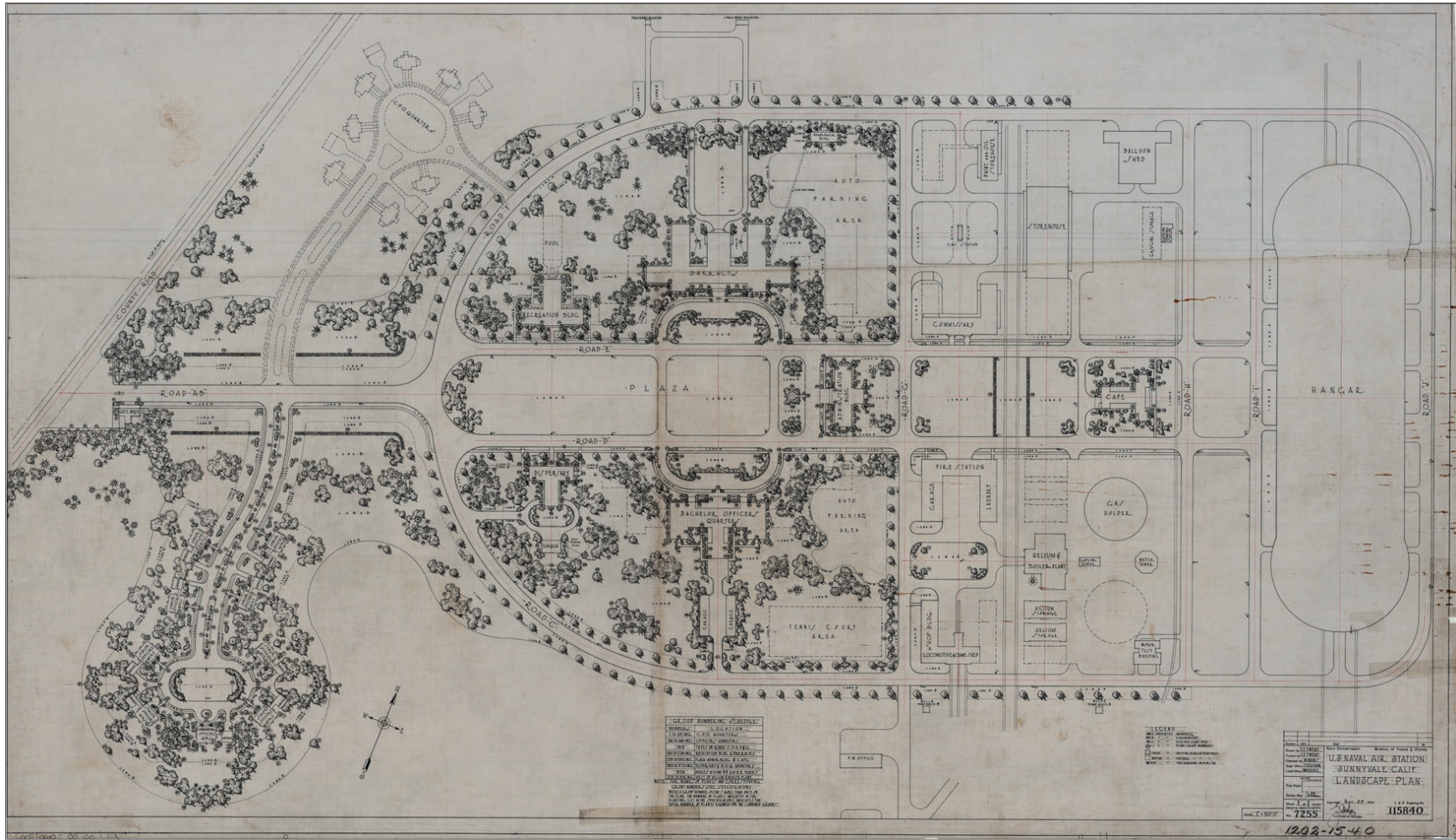
The new road network and streetscapes within the NRP are also designed to reinforce the campus-like environment. Major intersections will be controlled with traffic signals or stop signs. Pedestrian crosswalks will be clearly delineated. Street widths have been designed

to slow traffic and accommodate bicycle lanes. On-street parking will be allowed, where appropriate, to intentionally slow traffic in areas of high pedestrian activity.

Guidelines for building massing, height and character will all contribute to the campus environment. The NRP Design Guide articulates design principles in greater detail.



*Illustration of NASA Research Park Town Center*



Shenandoah Plaza: 1933 Master Plan

## Historic District

Shenandoah Plaza is the NRP's most architecturally distinct district. Its clear, powerful arrangement of buildings and spaces has remained intact for 50 years, testimony to the strength of the original Master Plan concept. It will retain its character under the NADP. The Historic District may have commercial, research and development, housing, public and educational facilities. However differing development guidelines will apply to renovation and construction within this zone.

New construction around the grassy, open half of Shenandoah Plaza west of McCord Avenue will be discouraged. All historically significant buildings will be renovated and leased pursuant to the National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470), and the Historic Resources Protection Plan. This includes continued use of Hangar One as a venue for large-scale special events.

Infill construction is proposed east of McCord Avenue. All historically significant buildings in this area will remain. Demolition of non-contributing buildings is being coordinated with the State Historic Preservation Office. The primary use for this space will be a training and conference center. The training and conference center will include state-of-art meeting facilities that can be configured to support a variety of activities. Approximately 250 rooms for overnight accommodations will also be provided at the facility.

This area has 25,500 square meters (275,000 developable square feet) on 4.5-hectares (11.2-acres). The proposed floor area ratio (FAR) for these parcels of historic infill ranges from 0.27-0.75. Currently the average FAR in the Historic District is about 0.35.

## Historic District Character

The Historic District has retained its original Master Plan's

spatial organization and Spanish Colonial Revival architectural heritage. A significant element of the district is its axial layout, with roads, landscaping and buildings arranged symmetrically to highlight the dominant feature, Hangar One. Broad expanses of lawn and mature planting complement the historic structures. Shenandoah Plaza's architectural integrity will be preserved through application of the Secretary of the Interior Guidelines for the Treatment of Historic Properties and by following specific design guidelines for buildings and landscapes in the historic district, which are included in the Historic Resources Protection Plan.

Within the Historic Area, two unifying urban design principles will be applied:

## Architectural Compatibility

- Preserve the original 1933 buildings and carefully design additions to them in the same architectural style.
- For new buildings and additions, emphasize compatibility with the character of the district by following consistent design guidelines for building form, massing, proportions, materials and colors.

## Strengthen Master Plan Spatial Concept

- Restore the clarity of the 1933 Master Plan.
- Improve Wescoat and Bushnell Roads as important boulevards to define and emphasize the district edges.
- Follow strong design guidelines for siting of new buildings and additions, emphasizing consistent relationships of buildings to streets.

See the *Historic Resources Protection Plan* for more information about design principles within the Shenandoah Historic District.

## OPEN SPACE

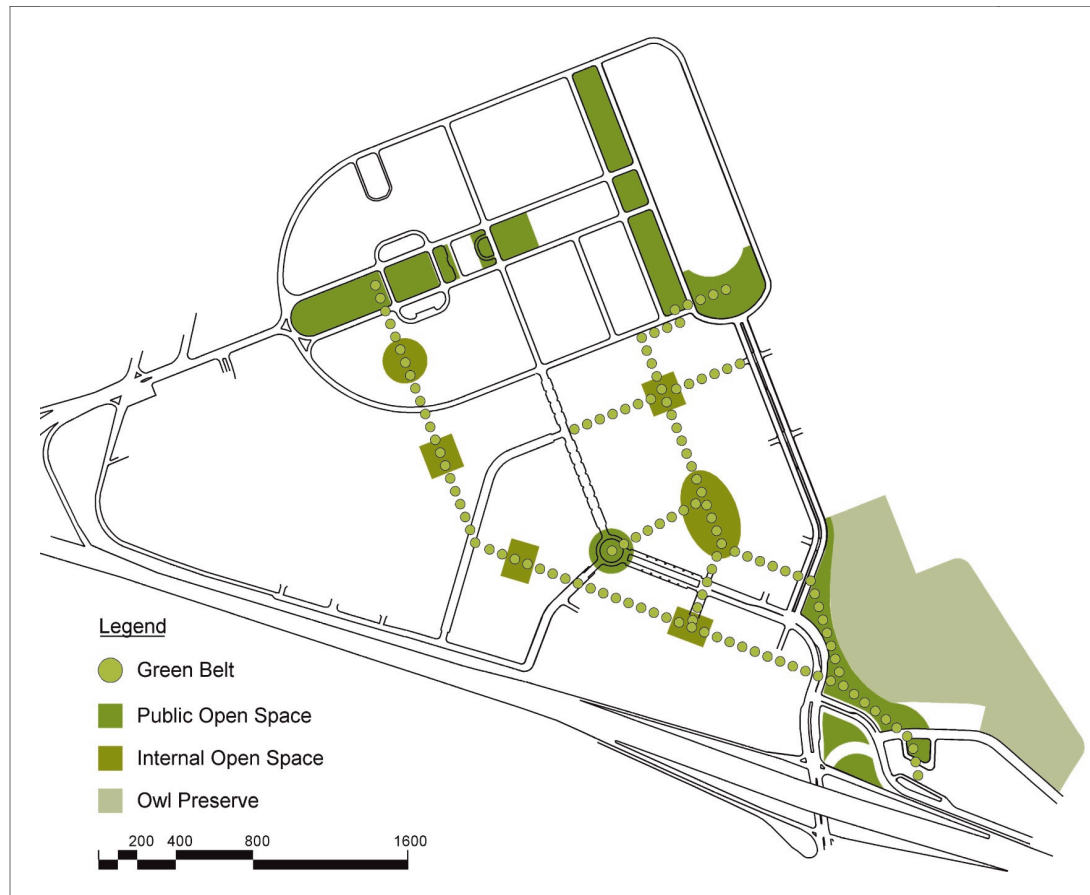
The NASA Research Park open space system creates a linked system of parks, plazas, gardens and pathways providing a variety of public amenities and spaces for passive and active recreation. More than 8 hectares (19 acres) of public open space, including the burrowing owl preserve, have been designated within the NRP.

The 2-hectare (4.5-acre) central green in Shenandoah Plaza will be preserved. A new greenbelt will run the length of Hangar One and separate the structure from any new infill construction to the west.

Hangar One Plaza is located at the southern end of the hangar in front of its large, clamshell doors. This space is ideally suited for special event gatherings and the display of aircraft and other space related exhibits. It also provides an interface between the activities in Hangar One and uses developed in Parcel 7.

NASA and its partners will work together with local public transit providers to develop a NRP Transit Center located near the Valley Transit Authority's Light Rail stop near the Ellis Street Gate. The Transit Green will provide over a half acre of open space at the entrance to the NRP. This open space will protect the visual corridor up to Hangar One and create an attractive setting for those arriving at the site.

A heavy buffer of trees and shrubs currently exists along the frontage of U.S. Highway 101 at the southern end of the NRP. This landscaped zone will remain. Additionally, Partners will have publicly accessible open space within their campuses.



*Open space system for NASA Research Park*



# TRANSPORTATION

The creation of a public research and development campus at the NRP will necessitate the realignment of existing roads and the creation of new transportation routes. The overall goal of these improvements is to encourage alternative transportation and minimize the impact of new traffic. The plan includes peripheral parking, bicycle paths and a dedicated pedestrian framework that will link buildings and outdoor spaces.

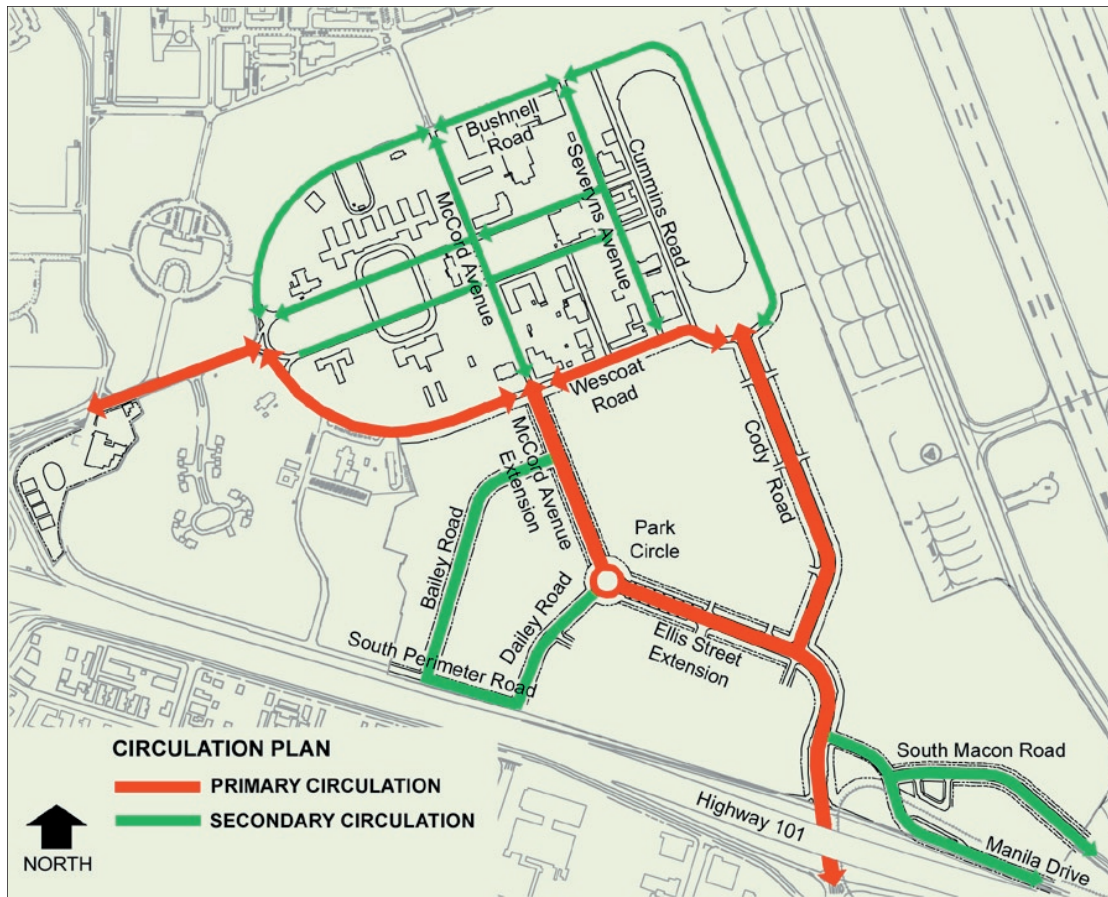
## Roadway Configuration

The roadway configuration within the historic district will remain as it is now. Due to the unfocused and scattered pattern of existing development in the area outside of the historic district, redevelopment of the NRP will require the re-routing of many roadways and sidewalks. NASA will remove

the existing Ellis Street Gate and create a new gateway friendly to pedestrian and bicycle traffic where Ellis Street meets U.S. Highway 101. This gateway will include the Transit Center. Ellis Street will be transformed into a landscaped boulevard.

Once inside the NRP visitors will be able to park at lower cost in the peripheral lot or continue on Ellis Street to the Town Center or travel north towards Hangar One. Cody Road will be realigned so that Hangar One will become its focal point, creating a strong view corridor. The now utilitarian Cody Road will become an urban thread weaving together the university partners and other educational facilities and providing views of the burrowing owl habitat. The new Cody Road will be pedestrian friendly and provide dedicated bicycle paths. On-street parking will be provided initially but may be removed if additional roadway capacity for special events is required later.

As Ellis Street approaches the Town Center it will diminish in size from four lanes to two. Ellis Street terminates at the



Proposed circulation plan

Town Center. The circular configuration of the Town Center is intended to slow vehicles. A new road, the McCord Avenue Extension, will connect the Town Center to the Historic District.

## Transportation Demand Management

Through an aggressive Transportation Demand Management (TDM) Program, NASA seeks to raise the standard in promoting alternative transit use. A specific TDM Plan has been developed for the NRP. The TDM Plan goals are:

- Provide site access in a way that supports sustainable development.
- Provide a transportation infrastructure that supports a pedestrian and bicycle-friendly environment.
- Reduce single-occupancy vehicle trips to the site to minimize the traffic-related environmental impacts of the NRP.

There are a number of site-wide and partner-specific programs that will help minimize automobile dependence:

A shuttle service is planned. This service will include several routes: among areas within the NRP, among development districts throughout Ames Research Center and from the Ames campus to local public transportation stations. For example, a shuttle will connect the Transit Center to the university parcels and housing in Bay View. In addition, preferential parking will be designated for carpool and vanpool parking.

Adequate and secure all-day bicycle parking will be provided and bike racks located in common areas. A fleet of on-site bicycles will be maintained. An on-site car share program is being developed.

Parking supply and management is also an important part of the TDM Plan for the NRP. All parking will be controlled-access parking. A partner may offer free or subsidized parking to its employees through a parking cash-out program

or transportation allowance program, which gives the same amount to employees who do not drive to work. Parking is considered a shared resource among all residents. Shared lots and structures will be run by a third party parking management group. The goals of these parking strategies are to reduce congestion, increase local transit use and help realize sustainability objectives.

Additional details can be found in the NRP Transportation Demand Management Plan.

## HOUSING

To mitigate the environmental impacts of the NADP on the regional housing supply and provide a resource critical to NRP partners and the surrounding community, housing will be provided on site. Approximately 810 residential units are planned within the NRP. Parcel 6 will contain 590 dormitory-style units. Several buildings in the historic district will be renovated to accommodate an additional 220 units. All housing will be for short-term occupancy only. This housing will be available to the researchers, students, educators, engineers and staff affiliated with NASA Ames Research Center. Housing will be primarily dormitory-style facilities ranging from 150 to 800 square feet in size.

Additional townhouse-style housing will be located in Bay View. Information on this housing stock can be found in the Bay View section (page 79).

## INFRASTRUCTURE

The conversion of NRP land from secure government facility to public research and development campus will necessitate many infrastructure upgrades. The utility capacity entering and leaving the site is generally adequate. But the internal

distribution systems are aged and require replacement. The systems need to be realigned for the new site plans. Roadways are discussed in the Transportation section.

Planned utility systems upgrades include the following:

**Water:** Water demands for development under the NADP were calculated based on standardized usage rates. A dual feed looped water system for distribution is proposed. Provision of a 3.2 million-liter (.85 million-gallon) storage tank and pressure pump is also recommended.

**Sanitary Sewer:** A new pipe network is required for build out conditions. The existing backbone is adequate except for the existing intersection of the sewer pump station that will require updating. Repairs to existing lines are also recommended.

**Storm Drainage:** A new collector pipe network and an outfall system is required. The amount of drainage will be similar to current conditions. However the existing system must be rebuilt as it is aged and inadequate to handle existing runoff. New piping will parallel the existing storm lines and will extend to a new settling basin. From there the storm water flows to the storm water evaporation ponds.

**Electric:** Existing substation capacity and transformers at both the Ames Campus and the NRP substations will be added. The bus, breaker and air switches at each substation will be upgraded to accommodate full build out loads. Additional conduits will be provided to supply the NRP.

**Gas:** The primary improvement to this utility system is the provision of a new four-inch loop around portions of the NRP.

**Telecommunications:** The NRP will include a new broadband data communications infrastructure. The new fiber backbone will be looped around the NRP.



**MOFFETT  
FIELD  
2001**

**AUGUST  
11 & 12**

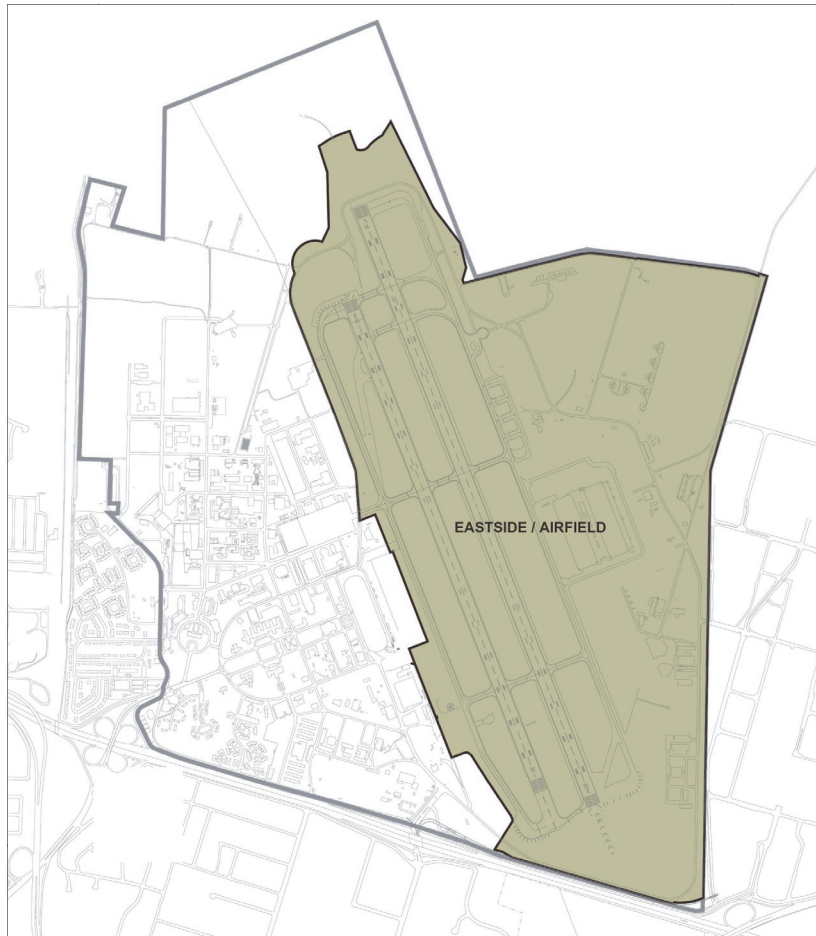
NASA Ames Research Center  
Mountain View, California  
Gates Open at 9:00am



**Air Show & Technology Exposition**

*NASA hosts air shows and technology exhibitions*

# EASTSIDE/AIRFIELD DISTRICT



The airfield is used primarily by NASA, the California Air National Guard and other resident agencies and partners. The airfield is essential to NASA's continuing aerospace research and development activities.

Approximately 1,100 square meters (12,000 square feet) of new construction is proposed in this district by NASA.

The airfield, airfield-support areas and the California Air National Guard sub-area that make up the Eastside/Airfield comprise approximately 385 hectares (952 acres.) The runways are on a northwest-to-southeast axis based on prevailing wind patterns. They lie almost directly in the center of Ames Research Center. The runways span from the wetlands, in the north, to U.S. Highway 101, in the south.

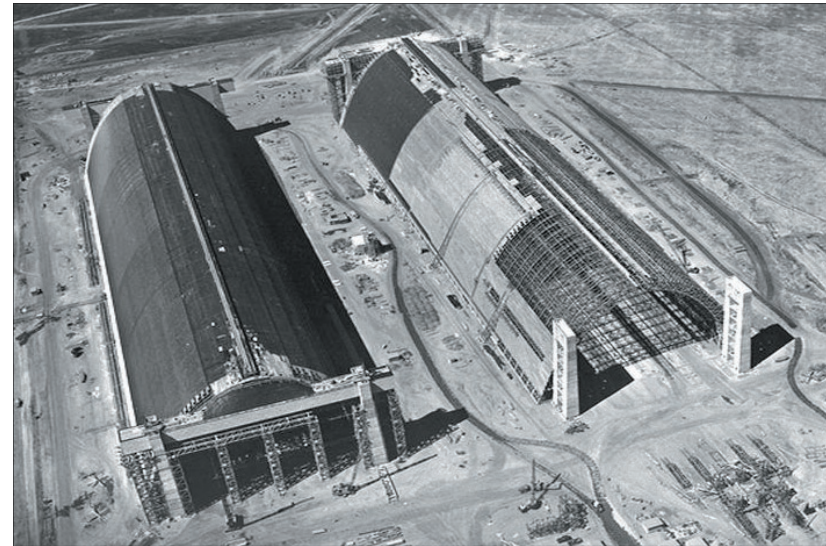
## CONCEPT: PRESERVATION OF A LIMITED-USE FEDERAL AIRFIELD

### Moffett Federal Airfield History

Moffett Field was originally established in 1931 to house Naval dirigibles, including the USS Macon. Naval dirigibles were intended to support the U.S. Naval Fleet in maneuvers in the Pacific Ocean. In 1945, the Airfield was renamed after Admiral Moffett, who lost his life in the crash of the USS Macon in 1935, and the runways were improved to handle modern aircraft. By 1950, jet aircraft replaced dirigible operations and Moffett Field soon became the largest Naval Air Transport base on the West Coast. Most of the buildings that are within the Eastside/Airfield district were constructed between the 1940s and the 1960s. In 1963, noise and air traffic issues led to the end of intense jet aircraft operations at Moffett Field. At that time, Navy Orion P-3 long-range ocean surveillance aircraft replaced jet aircraft. Upon transfer of the airfield from the Navy to NASA in 1994, Moffett Federal Airfield was established as a limited-use federal airfield.

### Limited-Use Federal Airfield

Moffett Federal Airfield will continue to serve as a limited-use federal airfield primarily in support of NASA's aerospace research and development activities. The Stratospheric Observatory for Infrared Astronomy (SOFIA) program is one example of an airborne research program at Ames. Under the SOFIA program, the largest airborne telescope in the world will be mounted aboard a specially modified Boeing 747 aircraft. The telescope will make observations that are impossible for even the largest and highest ground-based telescopes. The airfield is also used extensively by the California Air National Guard 129<sup>th</sup> Rescue Wing (129<sup>th</sup> RQW). The 129<sup>th</sup> RQW is the only Air National Guard Unit located in



*Hangars Two and Three under construction*



*Hangar Two under construction*



Hangars Two and Three today



Test flight of the Stratospheric Observatory for Infrared Astronomy

the northern portion of California. Other partners and resident agencies use the airfield through Space Act Agreements and Interagency Agreements with NASA. This includes Lockheed Martin Corporation and Space Systems/Loral, which use the airfield to ship satellite parts. Ames Research Center also plans to use the airfield for an annual airshow and technology exposition.

## EXISTING FACILITIES

In addition to the parallel runways, the Eastside/Airfield development district contains 56 structures, totaling more than one million square feet. Built in 1943, Hangars Two and Three are historic structures and are part of the Shenandoah Plaza Historic District. Together they total more than 72,000 square meters (780,000 square feet). Their frames are constructed of treated California fir trees. The wood interior and inadequate internal fire suppression systems make adaptive reuse a challenge.

Moffett Federal Airfield is closed to general aviation, but open for authorized uses 24 hours a day, seven days a week. NASA is responsible for airfield support functions. The 129<sup>th</sup> RQW provides air traffic control, crash/fire/rescue service and airfield security to NASA on a cost reimbursable basis.

Runways 32R and 32L were originally constructed in 1944 and 1945 respectively. Although runway 32R is 2,800 meters (9,200 feet) and 32L is 2,500 meters (8,150 feet) in length, safety clearances have restricted the runway surface available for aircraft operations to 2,300 meters (7,480 feet). The airfield is not subject to *Federal Air Regulations (FAR)* but NASA voluntarily adheres to *FAR Part 77*, regulating objects affecting navigable airspace, and *FAR Part 139*, regulating airport certification and operations.

Under Navy operation, Moffett Field was subject to an *Air Installation Compatibility Use Zone (AICUZ)*. The *AICUZ* is

similar to *FAR Part 77* in that it regulates uses adjacent to the airfield. Numerous waivers to *AICUZ* regulations were granted to the Navy, due to pre-existing conditions. These waivers have carried over into NASA airfield operation. The most notable waivers include:

- Runways 32R and 32L were constructed prior to modern safety regulations and are too close together for simultaneous use.
- U.S. Highway 101 and South Macon Road are within the minimum permitted distance from the ends of the runways.

Other waivers include those that allow buildings to violate distance requirements from the runways, and allow aircraft parking adjacent to hangars.

The City of Sunnyvale operates a municipal golf course within a portion of the southeast runway clear zone on NASA property. Eight holes of the 18-hole Sunnyvale Municipal Golf Course are located on federal property past U.S. Highway 101.

Another 18-hole golf course located around ordnance storage facilities in the northeast portion of the site, is operated by the Air Force primarily for the morale, welfare and recreation of military personnel. The Moffett Field Golf Course is located exclusively on federal property.

The northwest runway-clear zone contains wetlands and Cargill salt evaporation ponds. Other structures on the Eastside/Airfield are related to flight operations and airfield administration.

## California Air National Guard 129<sup>th</sup> Rescue Wing (RQW)

The 129<sup>th</sup> Rescue Wing is an Air National Guard Unit that occupies approximately 40-hectares (100-acres) in the southeast corner of the Eastside/Airfield. The primary mission

of the 129<sup>th</sup> RQW is to save lives, performing rescues in a wide variety of conditions from Pacific seas to the Sierra Nevada mountains. The 129<sup>th</sup> RQW has developed a Master Plan and prepared an Environmental Assessment for its site at Ames Research Center. This Master Plan includes the consolidation of 129<sup>th</sup> RQW operations into existing facilities, and the construction of a new aircraft maintenance hangar. Once constructed, the new hangar will house those operations currently conducted in Hangar Three.

The 129<sup>th</sup> RQW currently operates a motor pool complex located within the NASA Research Park development district. The motor pool will be relocated onto 129<sup>th</sup> RQW land on the Eastside/Airfield. This will consolidate military operations and allow for redevelopment in the NRP that is consistent with the Land Use Plan.



*The California Air National Guard perform a rescue mission with HH-60 Pavehawk and MC-130 Combat Shadow aircraft*



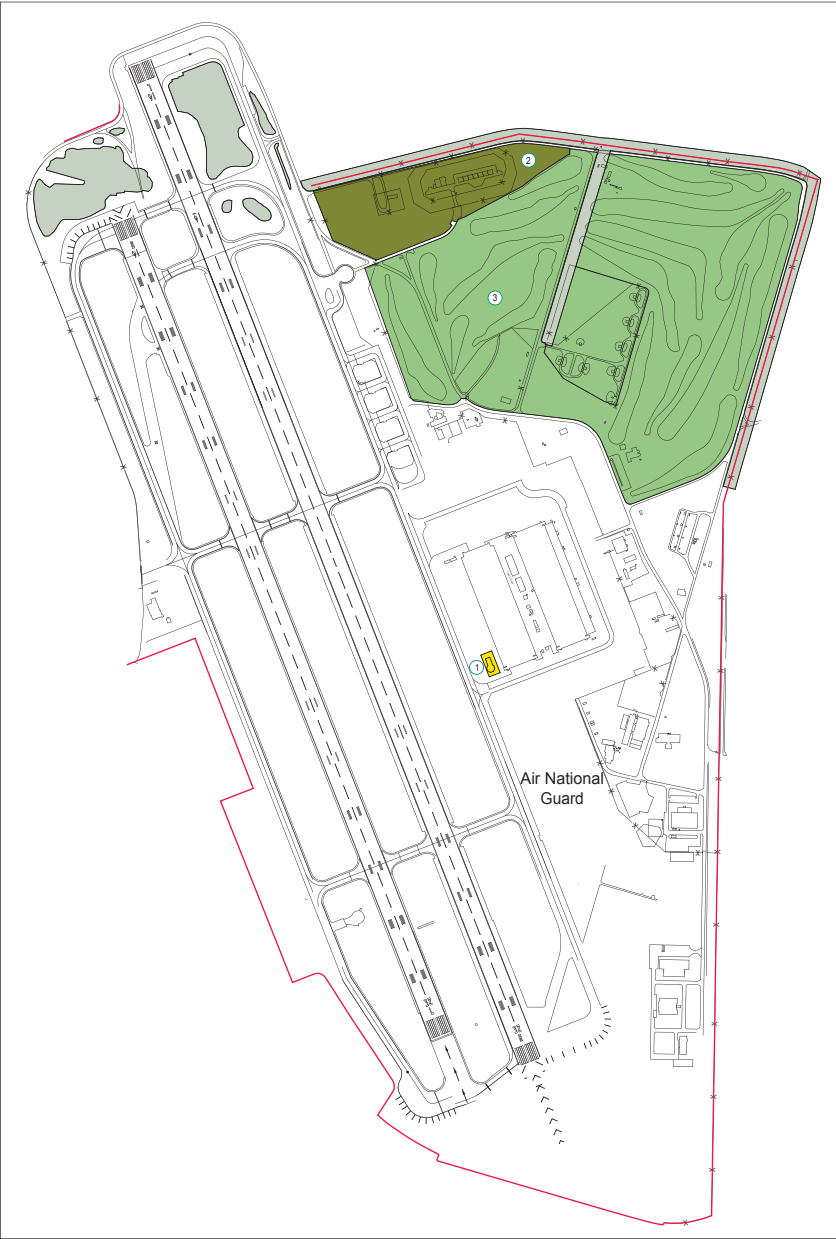
# LAND USE PLAN

The remaining military presence at Ames and on-going airfield operations will be consolidated into the Eastside/Airfield development district. NASA will:

- Continue to operate the airfield following *Federal Air Regulations Parts 77 and 139*.
- Maintain the waivers described above.
- Encourage the use of air traffic patterns that minimize noise events in the surrounding communities.

NASA and the 129<sup>th</sup> RQW will continue to be the primary users of the airfield. However, new users may come from partnerships within NASA Research Park and other federal agencies such as the Federal Emergency Management Agency.

As part of its consolidation, NASA plans to relocate the existing air traffic control tower from the NRP into the Eastside/ Airfield District. The new 1,100-square-meter (12,000-square-foot) control tower will be located in Parcel 6 near the southwest corner of Hangar Two.



Land Use Plan: Eastside/Airfield

Parcel	Parcel Area (hectares)	Parcel Area (acres)	FAR (Floor area ratio)	Developable Area (square meters)	Developable Area (square feet)
1 A/T Control Tower	0.19	0.46	0.80	1,175	12,000
2 Preserve	8.82	21.26	N/A	N/A	N/A
3 Open Space	58.55	147.11	N/A	N/A	N/A
X No Change	25.05	61.54	N/A	73,863	855,636
Subtotal	34.8	230.7		82,978	971,636

Eastside/Airfield proposed parcels and permitted development table

## PLANNING GOALS

The most important goal for the Eastside/Airfield is to designate a portion of the site for aviation-related functions. Through careful planning, existing military and airfield operations will be consolidated in an Eastside/Airfield site that is secure from the public. A buffer is provided to protect the public from stored ordnance.

## OPEN SPACE

There are three open space initiatives in the Eastside/Airfield. NASA will grant an easement for the construction of a section of the Bay Trail along the northern edge of the district, providing a link between existing trail segments in Mountain View and Sunnyvale. The goal of the Bay Trail Project is to provide a connected network of pedestrian and bicycle paths around the San Francisco Bay.

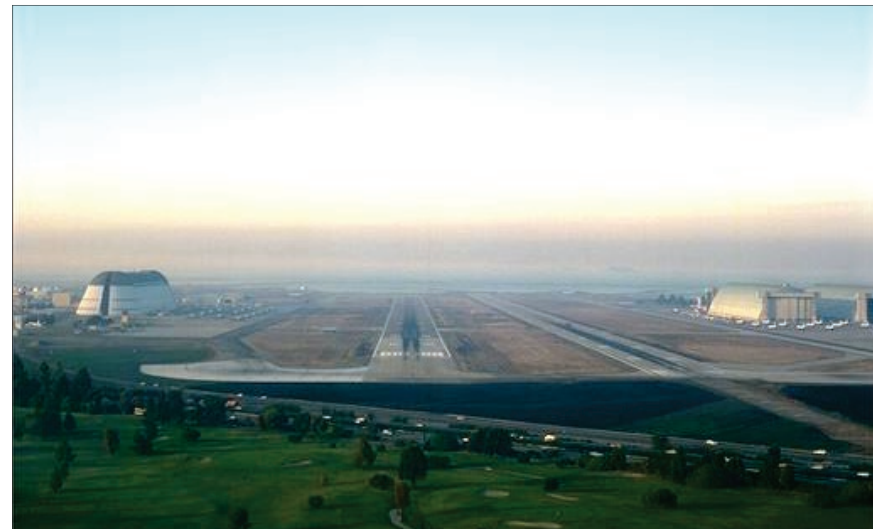
Significant open space will be preserved in the northern section of the district. An existing 59.5-hectare (147-acre) parcel of open space will be maintained. Serving as both recreational space and a buffer zone around existing ordnance storage bunkers for the California Air National Guard, this open space parcel currently contains an 18-hole golf course. The golf course is operated and maintained by the U.S. Air Force. The golf course primarily serves retired military personnel; however anyone with access to the site may play.

Finally, the NADP creates a 10-hectare (24-acre) preserve just south of the Bay Trail Extension. No new construction will be permitted in this zone. The preserve may occasionally house ordnance on a temporary basis in an existing bunker, but otherwise the ordnance storage facilities in the preserve will be closed. The preserve is important because sightings of Burrowing Owls have been recorded in the district.

## TRANSPORTATION

The existing road network for the Eastside/Airfield will not change significantly under the NADP. There are currently about 300 permanent employees, primarily associated with the California Air National Guard, that work in the Eastside/Airfield District. Because of the limited number of daily vehicle trips, there is no specific transportation demand management plan for this district. The east gate at Fifth Avenue will remain open to provide additional access to the district for commuters and public buses. The east gate will be open during the morning and evening commuting hours.

A state-commissioned panel has begun to study the feasibility of a commuter ferry system on the Bay. A site on the northern edge of the Eastside/Airfield has been preliminarily identified as the best south bay location for a ferry port. The NADP does not preclude the development of this ferry port. However, a new ferry system would require an environmental analysis not covered by NASA's 2002 Final Programmatic Environmental Impact Statement.



*Sunnyvale Golf Course (foreground) and the airfield*

## HOUSING

There is no housing planned for the Eastside/Airfield under the NADP. For more information about additional proposed short-term housing, see the NASA Research Park (page 55) and Bay View (page 79) sections.

## INFRASTRUCTURE

The following are infrastructure changes necessary in the Eastside/Airfield:

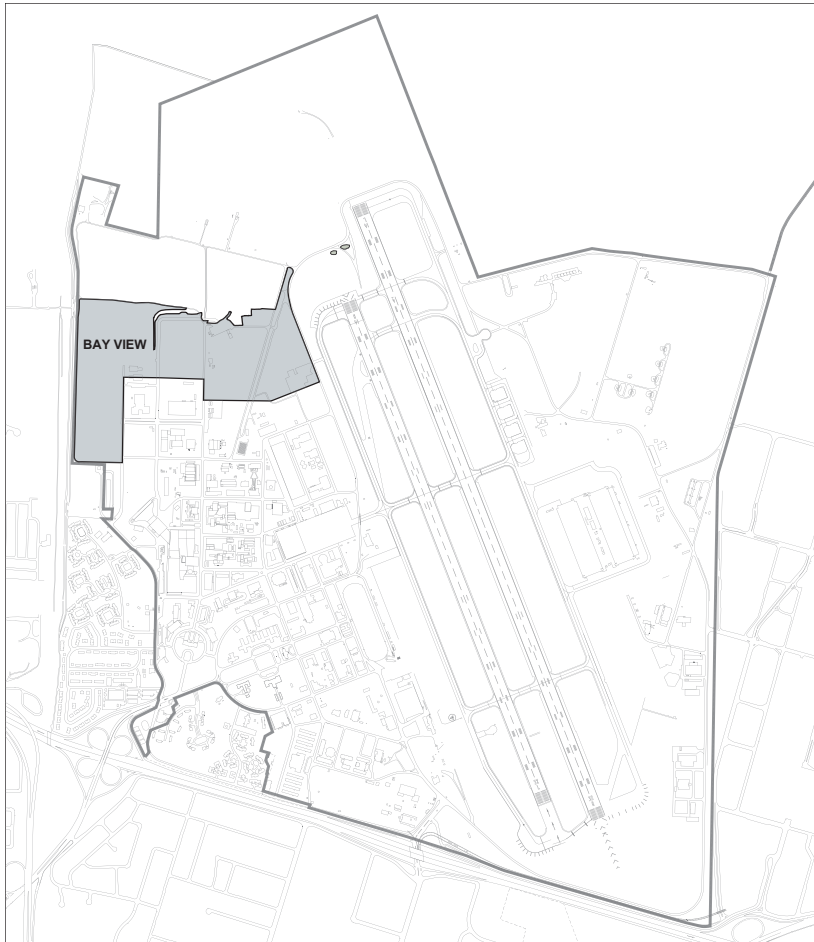
- Upgrade of sanitary sewer pump station.
- Potential upgrade of substation for back-up power to NRP.
- Reclaimed water routed to golf course and NRP.

The Eastside/Airfield is currently serviced by Sunnyvale's reclaimed water system. Reclaimed water will be used for irrigation at the Moffett Field Golf Course.



*Illustration of the residential area in Bay View*

# BAY VIEW DISTRICT



As a yet primarily undeveloped area, the 38-hectare (95-acre) Bay View district is expected to evolve as the primary housing community for the NASA Research Park.

The parcel is bordered by wetlands to the north, the Eastside/ Airfield District to the east, and the Ames Campus to the south. Approximately 115,000 square meters (1.2 million square feet) of new construction is planned for the Bay View district.

## CONCEPT: ENABLE A COLLABORATIVE COMMUNITY

A critical component that enables the NASA Ames Development Plan is housing. The NADP seeks to create a unique community of researchers, students and educators living and working in an environment that encourages collaboration and discovery. The provision of short-term housing will contribute to a campus-like environment and allow partners at Ames Research Center to maximize the opportunity for creative interaction. Additionally, the provision of temporary housing will allow some students, educators and researchers an opportunity to come to Silicon Valley who might not otherwise be able to because of the region's very high cost of living.

Bay View will also contain recreational facilities that will contribute to the quality of life of all employees at Ames Research Center.

## EXISTING STRUCTURES

Other than the Outdoor Aerodynamic Research Facility and the Telecommunications Gateway Facility (building N-254) just east of De France Avenue, the Bay View development district is essentially an undeveloped area. Under the NADP, high noise tests at the Outdoor Aerodynamic Research Facility will be mitigated or terminated.

## LAND USE PLAN

Residents and guests at Bay View must have easy access to the site. Therefore, the existing security fence will be moved eastward from Perimeter Road to Wright Avenue. This will provide public access to the housing and recreational areas of Bay View.

There are three primary land uses: housing, community services, and open space. Housing for the educators, students, researchers and staff at Ames Research Center will be established at Bay View. It is expected to be a mixed-density neighborhood with mixed-unit types.

Some community-support amenities will be provided at Bay View. Community services will be centered in Parcel 2, a 1-hectare (2.3-acre) parcel adjacent to the housing. Approximately 4,500 square meters (48,000 square feet) for support services will be built, which may include space for small grocery stores, dry cleaners, cafes, restaurants, or bookstores. This district will also contain a day care center for the residents of Bay View. The day care center will care for approximately 150 children and will include a playing yard. Another possibility for this site is the development of a Community Center. The Community Center could provide facilities for special events, meetings and fitness equipment.

The 2-hectare (5-acre) Parcel 3, which is located to the east of the housing area has been identified as NASA reserve. This parcel currently contains the Ames Research Center telecommunications gateway facility. This facility houses the primary outside cable plant, satellite uplink, switchgear, hubs and routers for all NASA telephone and data communications support at Ames. To accommodate future information technology planning, this parcel will remain reserved for NASA's use.

## PLANNING GOALS

To complement the NRP and Ames Campus, Bay View will provide an urban housing component. In respect to the natural setting, recreational areas, broad common areas and open space are integrated into the housing.

## OPEN SPACE

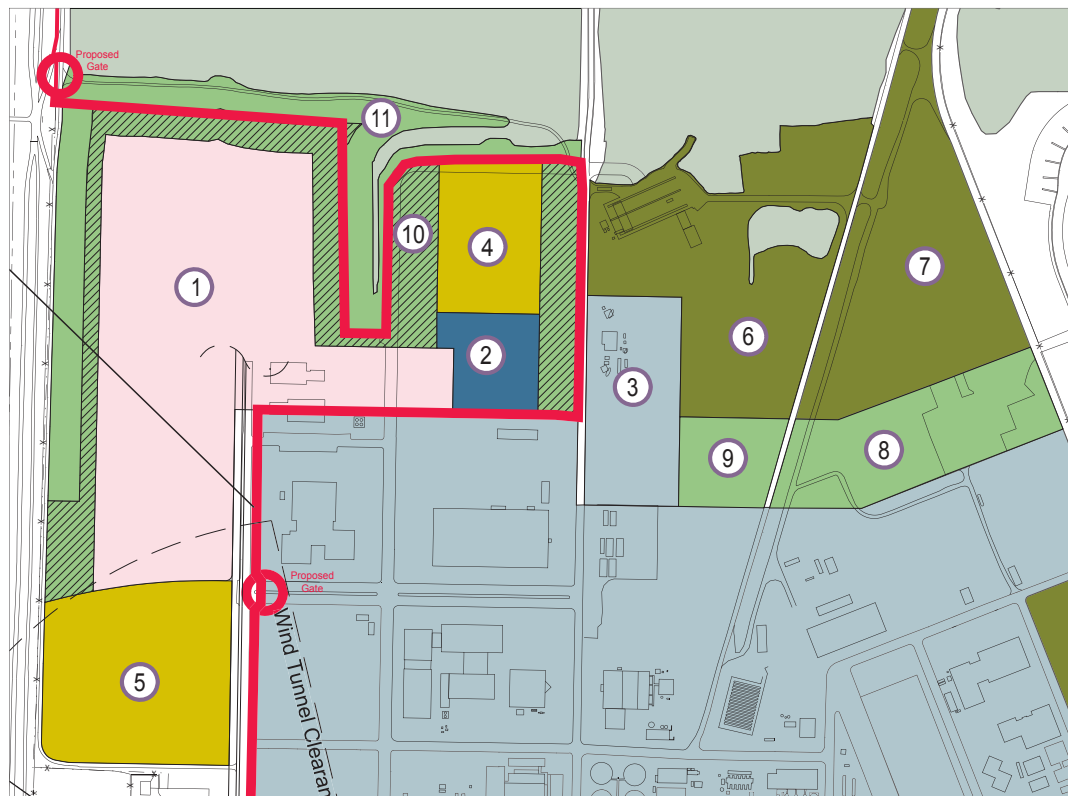
Much of the open space in Bay View is preserved under the NADP for the benefit of the small community of short-term residents, of NASA employees and of the region. Wetlands are the most sensitive and significant natural habitat at Ames Research Center. Most of these wetlands lie to the north of Bay View. The NADP will ensure that no loss of wetland functions, values or acreage will occur. There will be no construction in the wetlands. A planned easement for the Bay Trail will provide limited community access to some of the area north of Bay View.

Recreational facilities including a park, playing fields and picnic grounds will be constructed on more than 4.5 hectares (11 acres) in Parcels 4 and 5. These facilities will be available to all personnel and students at Ames Research Center.

NASA Ames is committed to protecting its burrowing owl colony. Establishment of owl preserves, avoidance of impacts to other existing habitat and supplementary mitigation measures are expected to ensure protection of this species. More than 11 hectares (27 acres) in Parcels 6 and 7 are dedicated to a burrowing owl preserve in Bay View. No

Parcel	Parcel Area (hectares)	Parcel Area (acres)	FAR (floor area ratio)	Developable Area (square meters)	Developable Area (square feet)
1 Housing	9.03	22.06	1.19	111,019	1,243,050
2 Community Support	0.03	2.3	0.48	4,450	48,000
3 NASA Reserve	2.05	5.06	N/A	N/A	N/A
4 Recreation	1.63	1.02	N/A	N/A	N/A
5 Recreation	2.95	7.37	N/A	N/A	N/A
6 Preserve	8.16	15.82	N/A	N/A	N/A
7 Preserve	4.91	12.10	N/A	N/A	N/A
8 Open Space	2.07	6.30	N/A	N/A	N/A
9 Open Space	0.80	2.23	N/A	N/A	N/A
10 Open Space	4.52	11.17	N/A	N/A	N/A
11 Open Space	3.02	7.46	N/A	N/A	N/A
<b>Subtotal</b>	<b>36.9</b>	<b>93.1</b>		<b>115,474</b>	<b>1,243,050</b>

Bay View proposed parcels and development table



Land Use Plan: Bay View

new construction will be allowed in the preserve. Parking is not allowed within this area. For more information about the comprehensive protection program, see the Burrowing Owl Habitat Management Plan.

To maintain its natural setting, additional open space is dedicated in Bay View in Parcels 8, 9, 10 and 11. Approximately 11 hectares (27 acres) of open space will ring the new housing stock, creating a wide greenbelt around this development. This open space will also serve as a “wetlands buffer” to the north. Neither construction nor parking will be allowed in the open space.

## TRANSPORTATION

The creation of a residential community in Bay View will necessitate realignment of existing roads and the creation of new transportation routes.

### Roadway Configuration

The existing street system in Bay View is limited. Direct access to the area is provided by Parsons Avenue, DeFrance Avenue, Lindbergh Avenue and Victory Road. These streets are mainly two-lane roadways, serving low-traffic volume. In some cases, these roads do not have sidewalks, finished curbs or gutters. Several modifications to the existing network will occur:

- The existing pattern of roads will be extended, widened and improved.
- A new bridge may be built by the City of Mountain View over Stevens Creek to align with Charleston Road in Mountain View. The bridge is intended to relieve traffic in an area heavily developed by the city of Mountain View. A separate Environmental Assessment will be required for this project. Prior

to construction of a Stevens Creek Bridge, a more detailed traffic analysis will be done in cooperation with the city.

- Wright Avenue will be expanded to provide an adequate gateway from the south to Bay View.

### Transportation Demand Management

The NADP embraces a very aggressive Transportation Demand Management (TDM) program. Bay View will be subject to the same TDM program implemented in the NASA Research Park. This program includes a shuttle service with routes between Bay View, the NRP and the CalTrain Station in Mountain View. A well-marked bicycle and pedestrian path will connect Bay View to other sites at Ames Research Center. Secure bicycle parking and bicycle racks will be provided. Automobile parking will be limited. Residents and visitors will pay for parking.

Additional details can be found under Transportation Demand Management in the NASA Research Park section (page 55).



*NASA will encourage alternative transit use*



## HOUSING

It is anticipated that Bay View will become the primary location for short-term housing at Ames Research Center. Approximately 111,000 square meters (1,195,000 square feet) of new housing will be constructed on a 9.3-hectare (23-acre) parcel. This translates to roughly 1,120 units, ranging in use from double-occupancy apartment-style to single-family townhouses. A range of housing types will add flexibility to the site and is expected to add interest and variety within this small community. All housing will be constructed, operated and maintained by a third party pursuant to a Space Act Agreement with NASA.

## INFRASTRUCTURE

Because of its current underdevelopment, new infrastructure will need to be installed for Bay View. Roadways are discussed above under Transportation. Other utility systems that must be installed include the following systems: electrical, natural gas, telecommunications, water supply, sanitary sewer and storm drain.

Adequate utility capacity enters and leaves Ames Research Center now to support Bay View, but new distribution systems will need to be installed to provide service to the new development. These utilities can be drawn from Ames Research Center itself or from the City of Mountain View depending on the agreements reached.



*Bay View Residential Area: Residential Building Conceptual Prototype, Study Sketch*

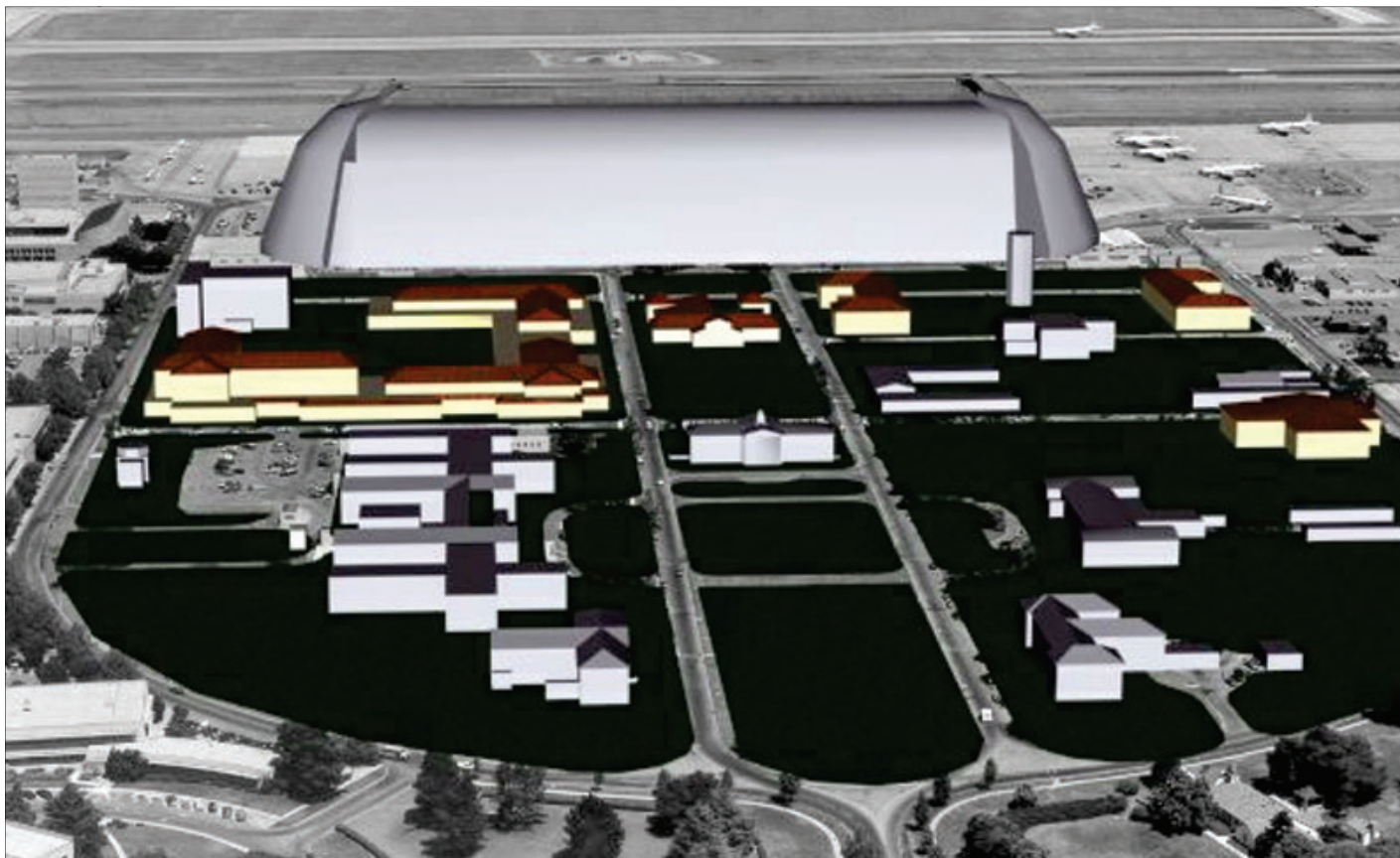


Conceptual Illustrative plan of the NASA Research Park area

# IMPLEMENTATION STRATEGY

The NADP implementation strategy will guide future activities within the NASA Research Park. Implementation of the NADP will begin after a Record of Decision is signed for the 2002 Final Programmatic Environmental Impact Statement. A final Record of Decision is expected in the summer of 2002. The overall success of the NASA Research Park

will depend upon implementing a workable approach to governance, establishing business terms to support public/private partnerships, and well coordinated phasing of existing building rehabilitation and new development. These key implementation issues are briefly discussed in the following pages.

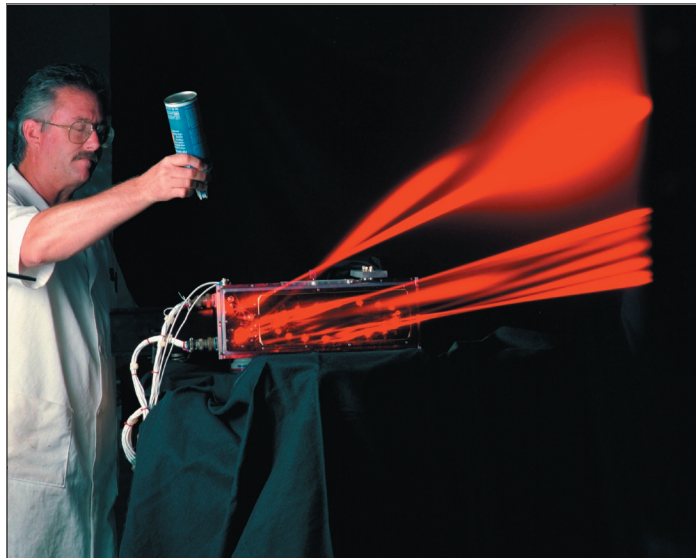


*Conceptual 3D Model of proposed infill development in the Shenandoah Historic District*

## MANAGEMENT AND GOVERNANCE

NASA will continue to operate the Ames Campus and directly develop the programs and institutional mechanisms to implement the NADP. NASA's responsibilities include:

- Providing overall management of Ames Research Center
- Ensuring compliance with the Space Act and all other applicable federal laws, regulations and NASA policies
- Assigning buildings and land areas to partners
- Establishing programmatic guidelines and goals and communicating these to existing and prospective partners
- Monitoring compliance with applicable federal,



*Laser-activated testing of Open Pass Tuneable Infrared Monitor of the Atmosphere mirror motion base assembly*

state, and local environmental laws and regulations, NASA's environmental policies, and NASA's environmental risk management programs and sufficiency of partner hazmat plans and environmental management programs

- Providing technical assistance, particularly in science education, research program development and program management to existing and prospective partners
- Adopting and ensuring compliance with design and construction guidelines for historic and non-historic properties, including sustainable design requirements.
- Monitoring rehabilitation and construction activities of on-site partners
- Providing for public safety including law enforcement, medical emergencies, fire emergencies, structural fire response and hazardous materials first response

The ongoing operations of NASA Research Park are expected to be a joint responsibility of NASA and its Partners. NASA expects its Partners to establish a tenants' association to support the daily operations of NASA Research Park. The activities of the tenants' association would include maintenance and insurance for the common area, collection of capital reserves, maintenance of utilities and other infrastructure, implementation of the transportation demand management plan, coordination of special events, as well as other agreed upon activities. A tenants' association management mechanism benefits both NASA and its Partners by limiting NASA's risk exposures and allowing Partners to control the cost and quality of services provided to NRP.

## PARTNERSHIP AGREEMENTS

Ames Research Center is primarily using two legal authorities under which partners can use and occupy facilities-the Space Act and the National Historic Preservation Act. The Space Act provisions relating to agreements include:

- Contracts
- Cooperative agreements
- Leases
- Concessions Contracts
- Permits
- Other Transactions

NASA has authority to use a “Reimbursable Space Act Agreement” for certain building occupancy transactions involving non-federal entities. Reimbursable Space Act Agreements are based on cost recovery from on-site parties engaged in research relating to NASA’s mission.

NASA’s primary financial goal is to leverage existing federal appropriations to support the maximum possible level of research and development, educational programs and learning opportunities. To accomplish this goal, NASA will seek reimbursement from NADP partners of government costs directly supporting their occupancy in the NASA Research Park, charge appropriate rent for historic properties in the NRP, and generate new funds for collaborative scientific research through the independent Research Investment Fund.

NASA will enter into a lease, agreement or permit for the use and occupancy of designated buildings and land at Ames Research Center with qualifying partners, subject to the following minimum business terms:

- **Subordination.** Fee ownership will not be subordinated.
- **Term.** The agreement term will be appropriate to the proposed use, based on market conditions, and subject to applicable laws.
- **Rent and Cost Reimbursement.** The proposed lease, agreement or permit will include a minimum base rent or cost reimbursement as appropriate, with provisions for periodic adjustment and/or revaluation.
- **Permitted Uses.** All uses shall be consistent with the Space Act and all appropriate NASA plans and policies. All uses are subject to approval by NASA.
- **Assignment and Agreements.** NASA will have the right to approve any assignment of the agreement or subtenants.
- **Performance Benchmarks.** All documents, including the historic lease, agreement, or permit or any development agreement executed prior to the issuance of a lease, agreement or permit, will contain time and performance benchmarks with clear termination provisions for non-performance.
- **Assurances.** The agreement will include provisions for liquidated damages, performance bonds, or other remedies to assure completion of the project.
- **Taxes.** NASA’s partners will be responsible for all taxes, assessments and fees imposed by federal, state and local agencies on occupied property and interests.
- **Broker Policy.** NASA will not pay commissions to brokers who are involved in transactions. Brokerage fees will be the sole responsibility of the respective collaborative partner.

## OPERATIONS

The implementation of the NADP presents challenges that will require careful coordination among NASA and its Partners to ensure that the NASA Research Park is well managed in both the short- and long-term.

- **Maintenance and Operating Expenses.** NASA will continue to be responsible for maintenance and operating costs associated with the Ames Campus and NASA-occupied facilities in other planning districts. However, NASA's Partners will be responsible for maintenance and operating expenses associated with the greater portion of Bay View and the NASA Research Park.
- **Rehabilitation of Historic Structures.** NASA will look to its Partners who wish to occupy historic buildings to finance and undertake the rehabilitation of those historic structures. Rehabilitation of buildings will be designed and constructed in compliance with applicable laws and standards set forth by the U.S. Secretary of the Interior. NASA will review and approve rehabilitation projects in consultation with the State Historic Preservation Office.
- **New Development.** Substantial new development is proposed in the NADP and NASA expects that all but a small portion of new space outside the Ames Campus will be financed and constructed by NASA's Partners. NASA will have the responsibility for reviewing plans and construction documents, issuing building permits and monitoring construction.
- **Transportation Demand Management and Parking.** To reduce automobile dependency and to minimize traffic impacts generated by the NADP, NASA has established a Transportation Demand Management (TDM) plan. The TDM plan addresses ways to reduce automobile

trips and outlines a shared parking program to ensure the efficient use of parking resources. Revenue associated with the parking programs is expected to be reinvested in support of TDM programs. While NASA will be responsible for overseeing progress towards the achievement of the TDM goals, NASA will rely upon its Partners to finance, construct, and operate the TDM program and provide appropriate parking facilities. Partners may elect to carry out their TDM responsibilities through either the partner Tenants Association or the establishment of a separate Transportation Management Association.

- **Utilities and Other Infrastructure.** Implementation of the NADP will require the replacement of virtually all the existing infrastructure in the NRP, at a total estimated cost of approximately \$50 million. In addition, new utility systems are required to serve development in the Bay View district. NASA's Partners will fund and construct necessary upgrades and installation of new systems. To reduce the initial capital outlays for infrastructure improvements, NASA will explore with its Partners innovative infrastructure financing mechanisms including the possibility of third-party privatization.
- **Landscaped Grounds and Open Space.** The NADP calls for a new system of green areas and open space areas. Partners will construct new public green spaces as off-site improvements. Open space will be managed by NASA and its Partners in accordance with the Burrowing Owl Habitat Management Plan.

## FINANCIAL STRATEGY

In order to fund activities under the NADP, NASA will establish public/private partnerships with its academic, industry, and educational partners utilizing existing legal authorities. An underlying assumption of the NADP is that activities and improvements that primarily benefit NASA's Partners will be financed and operated by Partners. As part of the implementation of the NADP, NASA will work with its Partners to formulate a financial strategy that satisfies the multiple programmatic objectives of the NADP. Key elements include:

- **Capital Improvements.** NASA's Partners will finance and construct both infrastructure improvements as well as their own facilities. Total facility and infrastructure capital requirements are estimated to be \$850 million.
- **Reserves.** NASA will continue to be responsible for capital improvements and replacements in the Ames Campus and other NASA-occupied facilities in other planning districts. Funding of future NASA capital improvements will be subject to Congressional budget approval. However, future infrastructure upgrades and replacement in the NRP will be funded by reserves set aside by the Partner Tenants Association.
- **Insurance.** To limit liability exposures of the government, NASA will require its non-federal Partners to carry appropriate general commercial liability and environmental legal liability insurance. Business loss coverage may also be required of Partners as appropriate.
- **ISP Charges and Other Cost Recovery.** In accordance with 31 U.S.C. 9701 and OMB Circular A-25, NASA will seek to recover its costs of providing services to Partners. ISP services will include but may not be limited to law enforcement, structural fire response, hazardous materials first response, emergency

medical response, fire alarm monitoring, environmental oversight, remediation monitoring, land use and property management oversight, and safety and health services oversight. In addition, Partners may demand additional services from NASA that will be billed to the respective Partner on a cost reimbursable basis.

- **Research Investment Fund.** In order to support collaborative research and education programs under the NADP, Partners may generate an endowment, the Research Investment Fund, that will be managed by an independent non-profit organization. Partner obligations to contribute to this Fund would be set forth in each Partner's lease, permit, cooperative agreement, or other instrument authorizing the use and occupancy of NASA lands.

## IMPLEMENTATION PHASING

A phasing plan for construction of all sites at NASA's Ames Research center is essential as an information tool to understanding how the project will physically occur. For the various Partners, it assists with the coordination between NASA and its Partners, as well as becoming a tool for business models (financial/feasibility studies). The goal of the phasing plan is to produce several development scenarios, answering the questions of what goes where, when and why, and what the cost implications are.

The phasing plan will address several issues:

- Transportation demand management phasing
- Demolition of existing structures
- Utilities and infrastructure improvements master planning
- Housing development phases
- Stabilization and rehabilitation of historic buildings

- Management Program activities
- Research Program
- Economic modeling

In addition, the general conformity requirements of the Clean Air Act limit the nitrogen oxides (NOx) emissions of the federal agencies' activities to 100 tons/year in ozone containment areas. Emissions from construction, vehicles, and area and stationery sources will be monitored throughout the construction of the NADP to ensure compliance with the Clean Air Act.

Plans, projects, capital improvements, long term lease agreements, and research programs will be phased over time. The specific timing of individual improvements and leases is uncertain. Under the current plan, the NASA project is projected to be completed by approximately the year 2015.

Summer 2002	EIS Record of Decision signed	
Fall 2002	Partner Agreement negotiations	
2003-2006	Phase 1:	0-3 years, 1,110,000 Sq. Ft.
2007-2010	Phase 2:	3-6 years, 1,110,000 Sq. Ft.
2011-2014	Phase 3:	6-10 years, 1,480,000 Sq. Ft.

## MONITORING AND IMPLEMENTING THE NADP

Throughout the implementation of the NADP, NASA will monitor the activities and projects carried out to ensure they are consistent with the plan. In addition, NASA will monitor and assess the effectiveness of mitigation measures adopted as part of the NADP and make adjustments as necessary. In the event that NASA, its Partners, or the general public seeks to modify the NADP in order to better reach mutual goals, NASA will initiate a plan amendment process as required in compliance with the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.) and the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470).

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*Aerial of Shenandoah Plaza*

## REFERENCES

- Architectural Resources Group, *Guidelines for Rehabilitation of Historic Structures*.
- Association of Bay Area Governments. *Bay Trail Plan*, July 1989.
- Brady and Associates. *Moffett Field Comprehensive Use Plan Final Environmental Assessment*, August 1994.
- California Air National Guard 129th Rescue Wing (CANG EA). *Final Master Plan Short Range Projects Environmental Assessment*, March 1997.
- City of Mountain View. *Presentation of the Final Report From the Joint Cities of Mountain View and Sunnyvale Community Advisory Committee on Moffett Federal Airfield*, July 10, 1997.
- Design, Community & Environment, *NASA Ames Development Plan Final Programmatic Environmental Impact Statement*, 2002.
- Erler and Kalinowsky, Inc. *Draft Environmental Issues Management Plan (EIMP), for NASA Research Park, Moffett Field*, December 2001.
- NASA Ames Research Center. *Biological Assessment for the NASA Ames Development Plan*, Brian Staab, November 2001.
- NASA Ames Research Center. *NASA Ames Proposed Six Point Initiative*.
- NASA Ames Research Center. *NASA Ames Research Center Economic Development Concept Workbook*, June 1999.
- NASA Ames Research Center. *NASA Research Park Design Guide*, November 2001.
- National Research Council. *A Review of the New Initiatives at the NASA Ames Research Center*, April 2001.

- Nelson/Nygaard Consulting Associates. *NASA Research Park and Bay View Transportation Demand Management Plan*, May 2002.
- PAI/Issi Team. *NASA Ames Research Center Historic Resources Protection Plan for portions of Moffett Field, California*, November 2000.
- Trulio, Lynn. *Burrowing Owl Habitat Plan: Development Planning, Evaluation of Impacts to Burrowing Owls and Identification of Avoidance and Mitigation Measures for the NADP*, March 2001.
- World Commission on Environment and Development. *Our Common Future*, Oxford University Press, 1987.

## CREDITS

- Lisa Lockyer, NASA Office of the Assistant Director for Development
- Michael Marlaire, NASA Office of the Assistant Director for Development
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## NASA Research Park



*"Somewhere, something incredible is waiting to be known."*

*-Carl Sagan*