



Headlands Institute Campus Improvement and Expansion Plan

Environmental Assessment



August 2009

National Park Service
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ENVIRONMENTAL ASSESSMENT
Headlands Institute Campus
Improvement and
Expansion Plan

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GOLDEN GATE NATIONAL RECREATION AREA
Marin County, California
Lead Agency: National Park Service

ABSTRACT

The *Headlands Institute Campus Improvement and Expansion Plan Environmental Assessment* (EA) presents and evaluates alternatives to improve and expand the Headlands Institute (HI) environmental education and conferencing campus which currently occupies eight historic structures and approximately seven acres in the Marin Headlands at Fort Cronkhite.

This environmental assessment (EA) describes and analyzes four alternatives—**three action alternatives** and **one no action alternative**—for the improvement and expansion of the HI campus. The purpose of the project is to provide state-of-the-art on-site environmental education services that meet an increasing need and demand and to demonstrate the National Park Service's (NPS's) and HI's core message of stewardship of natural and cultural resources. Improvement and expansion of HI is needed because the current campus facilities are inadequately sized and in less than optimal condition to accommodate increasing demand for high-quality environmental education in a national park setting. Action is also needed to ensure the long-term financial sustainability of HI's programs.

The three action alternatives propose varying configurations for a renovated campus which would provide a teaching model of sustainable living and state-of-the-art learning facilities. Campus improvements proposed under all action alternatives include preservation and rehabilitation of historic resources; the provision of additional lab, classroom, dining and dorm spaces; restoration of an on-campus riparian corridor; increased teaching spaces connected to the surrounding environment; additional playing areas; improved campus circulation (pedestrian and vehicular) and parking; increased capacity for up to 350 students (a 75% increase from the current capacity of 200 students); and improved campus security and safety.

Comments: The EA will be available for public review and comment for 30 days. Review copies are available at Golden Gate National Recreation Area Headquarters (Building 201 Fort Mason, San Francisco, CA) and the following local libraries: Marin County Free Library; Mill Valley Public Library; Pt. Reyes Station Library; Sausalito Public Library; and San Francisco Public Library Main Branch. Comments must be submitted or postmarked on or before September 14, 2009. Comments may be submitted online at <http://parkplanning.nps.gov/goga> (click on project and follow instructions), in writing at the public meeting, by e-mail to goga_planning@nps.gov, or by mail to: Superintendent, Fort Mason Building 201, San Francisco, CA 94123, Attn: Campus Improvement at Fort Cronkhite). A public meeting is scheduled for August 19th from 4 – 7 pm at the Bay Model in Sausalito, CA (see project website noted above for details).

Written comments received on the EA will be reviewed to determine whether any important new issues or reasonable alternatives or mitigation measures have been suggested. If major substantive issues are raised which point to the potential for significant impacts, an Environmental Impact Statement would be prepared, otherwise a Finding of No Significant Impact (FONSI) will be prepared. Questions regarding this project may be directed to Carey Feierabend (415.561.4975), or emailed to: goga_planning@nps.gov.

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LIST OF ACRONYMS

°C	Celsius
µg/m ³	micrograms per cubic meter
ACHP	Advisory Council on Historic Preservation
ACM	asbestos containing materials
ADA	Americans with Disabilities Act
ADRP	archaeological data recovery program
BAAQMD	Bay Area Air Quality Management District
BMP	best management practices
CCEP	Costal Corridor Enhancement Project
CEQ	Council on Environmental Quality
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
cfs	cubic feet per second
CZMA	Coastal Zone Management Act
dBA	Decibels (A-weighted scale)
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FMSA	Farallones Marine Sanctuary Association
ft	feet
FY	Fiscal year
GGNRA, or the park	Golden Gate National Recreation Area
GIS	geographic information system
GMP	General Management Plan
HI	Headlands Institute
IDT	interdisciplinary team
km	kilometer
kWh	kilowatt hours
lb	pounds
LBP	lead-based paint
LEED	Leadership in Energy Efficient Design
LOS	level of service
L RTP	Long-range Transportation Plan
MHFB Transportation Plan	Marine Headlands Fort Baker Transportation Improvement and Management Plan
mg/L	milligrams per liter
mL	milliliter
MMC, or the Center	Marine Mammal Center
mph	miles per hour
NO	nitrogen oxide
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NRCS	Natural Resources Conservation Service

NTU	nephelometric turbidity units
PEPC	Planning, Environment, and Public Comment (NPS database)
PM ₁₀	Particulate matter less than 10 microns in diameter
ROD	record of decision
SEED	Science and Environment Educational Development
SHPO	State Historic Preservation Officer
TEAM	Teen Environmental Action Mentorship
THPO	Tribal Historic Preservation Officers
USEPA, or EPA	United States Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
USC	U.S. Government Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
YNI	Yosemite National Institutes

GLOSSARY

Area of Disturbance	The physical area that is subject to direct disturbance from project implementation.
Area of Excavation	A subset of the area of disturbance which involves grading activities or excavation of materials six inches or greater in depth.
Adaptive management	A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form—"active" adaptive management—employs management programs that are designed to experimentally compare selected policies or practices, by implementing management actions explicitly designed to generate information useful for evaluating alternative hypotheses about the system being managed.
Best management practices	Effective, feasible (including technological, economic, and institutional considerations) conservation practices and land- and water-management measures that avoid or minimize adverse impacts to natural and cultural resources. Best Management Practices may include schedules for activities, prohibitions, maintenance guidelines, and other management practices.
Biofiltration swales	Vegetated drainage ditches that use multiple mechanisms to remove pollutants from water. They generally reduce runoff velocities and sediment transport, enhance filtration of runoff and provide for uptake of nutrients and breakdown of other contaminants prior to discharge to receiving waters.
LEED certification	The certification of sustainable building practices administered by the US Green Building Council under the title, Leadership in Energy and Environmental Design (http://www.usgbc.org/). LEED is a comprehensive rating system considering everything from location to construction practices to interpretive elements. LEED rates projects on a scale from certified to bronze, silver, gold and platinum.
NIKE core	The four Cold War-era Nike buildings that compose the center of the current Headlands Institute campus: Buildings 1010, 1011, 1012, 1013.
Open space	Portions of the Fort Cronkhite grounds that are regularly used for organized programming and educational activities by the Headlands Institute.

EXECUTIVE SUMMARY

Headlands Institute (HI), a partner with Golden Gate National Recreation Area (GGNRA) since 1977, is proposing to improve and expand their environmental education and conferencing campus. The HI campus is located in the Marin Headlands at Fort Cronkhite, which includes historic World War II and Cold War-era buildings. HI currently occupies eight historic structures and approximately seven acres within the Fort. HI focuses on field science education for kindergarten through twelfth grade students, and also functions as a youth and adult conferencing and retreat center. The mission of HI is “dedicated to teaching science and environmental education in nature’s classroom to inspire a personal connection to the natural world and responsible actions to sustain it” (YNI n.d.:17).

This environmental assessment (EA) describes and analyzes four alternatives for the improvement and expansion of the HI campus.

Purpose and Need for Action

The *purpose* of the project is to provide state-of-the-art on-site environmental education services that meet an increasing need and demand and to demonstrate the National Park Service’s (NPS’s) and HI’s core message of stewardship of natural and cultural resources. Improvement and expansion of HI is *needed* because the current campus facilities are inadequately sized and in less than optimal condition to accommodate increasing demand for high-quality environmental education in a national park setting. Action is also needed to ensure the long-term financial sustainability of HI’s programs.

The renovated campus proposed in this plan would provide a teaching model of sustainable living and state-of-the-art learning facilities. In addition, it would aid in teaching students to be environmental stewards and allow instructors to incorporate the unique park resources of the Marin Headlands into the learning experience. Campus improvements proposed include additional lab, classroom, dining and dorm spaces; increased teaching spaces connected to the surrounding environment; additional playing areas; improved campus circulation (pedestrian and vehicular) and parking; and increased security and safety. It is anticipated that up to 350 students (a 75% increase from the current capacity of 200 students) could be served under the improvement and expansion plan.

Project Objectives

The objectives of the project include:

- 1) Preserve and interpret the site’s layered natural and cultural resources so students can experience the resources, understand how they have interacted over time, and learn how to sustain them.
- 2) Renovate campus facilities to be teaching models of sustainable living that interconnect stewardship in the park, at home and throughout life.
- 3) Improve and expand classrooms and labs to provide students with state-of-the-art learning tools that support HI’s curriculum and experiential group teaching method.
- 4) Maintain the long-term financial stability of HI and further its mission as a park partner by expanding its student body and conference programming, to serve as many people as possible while protecting the Marin Headlands and the park’s environmental resources.
- 5) Improve sleeping accommodations and dining facilities to comfortably and efficiently accommodate students so that they can focus on learning.

- 6) Provide an efficient, comfortable, safe and accessible place to learn and work by integrating sustainable design measures as well as Americans with Disabilities Act (ADA) access provisions.
- 7) Integrate the indoor and outdoor spaces on the campus with the defining resources of the site to immerse students in the place and enable them to experience all aspects of the environment—from flora and fauna to quiet and darkness—with minimum impact on sensitive resources.
- 8) Minimize environmental impacts to the site, including impacts caused by traffic, circulation, and programming on and off the HI campus.
- 9) Achieve zero net increase in water and energy use and sewage output while increasing the student body by up to 75%.
- 10) Create a cohesive and unified campus within a manageable area while continuing to make the best use of the buildings currently occupied by HI.

Alternatives

The No Action alternative and three action alternatives were analyzed for this environmental assessment.

Alternative A: No Action—The No Action alternative consists of continuing existing/ongoing HI management and operations. HI currently occupies eight buildings within Fort Cronkhite and uses the fort's parking areas, circulation routes, and open spaces. The buildings provide administration, education, housing and dining facilities for staff, students, and conference attendees. The same spaces are used for both educational and conferencing purposes. Currently, an average of 200 visitors participating in the Field Science Programs stay overnight at the HI campus. Most of the teaching experience occurs away from the campus in the national park environment. Currently, 22 such off-campus teaching sites are routinely used by HI. HI currently employs 53 staff members.

Elements Common to all Action Alternatives—Activities or elements that would take place under all action alternatives (but would not take place under No Action) include:

- Expansion of the capacity of the programs and facilities to accommodate up to 350 students (a 75% increase from the current capacity of 200); staff would increase from the current 53 to as many as 80.
- Rehabilitation of seven of the eight buildings currently occupied by HI within Fort Cronkhite.
- Building 1054 would be vacated by HI and returned to NPS for management (eliminated from HI campus)
- Building 1059 would be rehabilitated for interpretive and dormitory purposes, and jointly managed with NPS.
- Enhancement of the HI campus landscape—re-establishment of historic roads and perimeters; restoration using native vegetation; creation of new and altered open spaces and activity areas, removal of social trails; replacement of campus signage and lighting.
- Enhancement of the riparian corridor running through and under the HI campus on Fort Cronkhite from Bunker Road to the edge of Rodeo Lagoon.
- Circulation and parking improvements—a new student drop-off loop would be established; parking spaces would be removed/replaced at a 1:1 ratio.

- Increased management of off-campus teaching sites and addition of new sites as student body grows.
- Incorporation of sustainable systems and design to minimize the use of non-renewable resources and the production of waste.
- All improvements would meet applicable codes and ADA accessibility standards.
- Project implementation would occur over a three- to eight-year period.

All landscape modifications, building rehabilitation, and new construction proposed under action alternatives would be conducted in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and guidance provided in the *Preliminary Report on the Headlands Institute Campus Landscape* (Auwaerter and Curry 2008).

Alternative B: Rehabilitation Only—Alternative B would rehabilitate 13 existing historic buildings within the Fort Cronkhite campus. Implementation of this alternative could result in the relocation of NPS functions currently housed in three Fort Cronkhite buildings (Building 1046—maintenance, Building 1042—short-term housing dorm, and Building 1034—fire dorm). This alternative focuses on creating a unified campus organized around a central open space with views of the defining natural and cultural resources of the Marin Headlands—the lagoon, the ocean, and the batteries.

Alternative C: Rehabilitation and Three New Buildings—Alternative C would rehabilitate 10 historic buildings and construct up to three new buildings within historic building footprints at Fort Cronkhite. Construction would be in a style compatible with the historic World War II buildings. This alternative maximizes the concentration of campus on the east end of Fort Cronkhite and offers multiple opportunities to demonstrate and use state-of-the-art sustainable construction.

Alternative D: Rehabilitation and One New Building—Alternative D would rehabilitate 12 structures and construct one new building within a historic building footprint at Fort Cronkhite. Implementation of this alternative would result in the relocation of park functions currently located in two Fort Cronkhite buildings (maintenance, short-term housing dorm). This alternative combines a newly unified campus organized around a central open space with the opportunities offered by state-of-the-art sustainable new construction.

Preferred Alternative—The preferred alternative for the Program implementation is Alternative D for reasons described below.

- Alternative D presents the most advantages for the evaluation factors of operational efficiency, resource protection, and visitor experience when compared to the other action alternatives. Specifically for operational efficiency, one of the project objectives is to have a cohesive and unified campus.
- Alternative D would provide for the most efficient consolidation of HI's campus functions on or adjacent to the former Nike site and central open space compared to the other alternatives.
- For cultural resource protection, Alternative D would include the rehabilitation of 12 historic buildings, which is more than Alternative C and only one building less than Alternative B. In terms of new construction, only one new building would be constructed at the northeast corner of the campus on the footprint of a historic building. In comparison to Alternative C, which includes construction of three new buildings, this would be less of an impact on the site. The new building would be compatible with the historic setting and would visually reinforce an understanding of the historic complex's spatial organization. It would also be LEED-certified

and provide opportunities for hands-on learning experiences for students in state-of-the-art, sustainable building practices.

Environmentally Preferable Alternative—The action alternatives are very similar in their overall beneficial and adverse effects on park resources, the majority of which are negligible to minor in intensity. However, construction of new buildings was found as a discriminator that would increase the intensity of impacts. New construction would occur under Alternatives C and D. Taking all impacts together, the differences between the various alternatives are not great, but Alternative B is anticipated to have slightly reduced adverse impacts overall. For this reason, Alternative B was selected as the environmentally preferable alternative.

Impact Topics Analyzed

The following individual impact topics were analyzed in this environmental assessment to determine the potential effects that would occur as a result of implementation of each of the four alternatives:

- Soils
- Water Resources
- Vegetation
- Wildlife
- Species of Special Concern
- Air Quality
- Cultural Resources
- Visitor Experience
- Transportation
- Visual Resources
- Park Operations

No impairment to park resources is expected under the proposed alternatives. Please refer to Table 4 for a summary of impact intensities by alternative. Proposed mitigation measures are described in Table 5.

Environmental Review Process

The EA will be available for a 30-day public review and comment period beginning on the date the legal notice appears in the Marin Independent Journal. Written comments received on the EA will be screened to determine whether any important new issues or reasonable alternatives or mitigation measures have been suggested. If major substantive issues are raised which point to the potential for significant impacts, an Environmental Impact Statement would be prepared, otherwise a Finding of No Significant Impact (FONSI) will be prepared.

CHAPTER 1. PURPOSE AND NEED

1.1 Introduction and Background

1.1.1 Introduction

Since 1977, the Headlands Institute (HI) has partnered with Golden Gate National Recreation Area (GGNRA, the park) to provide environmental education. Since then, HI has grown into an organization that now provides environmental education to over 11,000 students annually in a national park setting. GGNRA park lands are located within Marin, San Francisco, and San Mateo counties and include approximately 74,800 acres. This includes land, water bodies, and approximately 50 miles of bay and ocean shoreline located in the San Francisco Bay Area. HI is located at Fort Cronkhite, within GGNRA park boundaries in the western portion of the Marin Headlands, north of the Golden Gate Bridge (Figure 1).

HI is a part of the larger organization known as NatureBridge (formerly Yosemite National Institutes [YNI]). NatureBridge is a national organization with a mission “dedicated to teaching science and environmental education in nature’s classroom to inspire a personal connection to the natural world and responsible actions to sustain it” (YNI 2008). It has provided educational opportunities in the national parks since 1971 and currently includes three campuses: Yosemite Institute in Yosemite National Park, Headlands Institute in the Marin Headlands of GGNRA, and Olympic Park Institute in Olympic National Park, Washington (YNI 2008). Educational programs include field science education for schools and other groups, adult education, teen leadership programs, summer day camp, and conference and retreat facilities (YNI 2008).

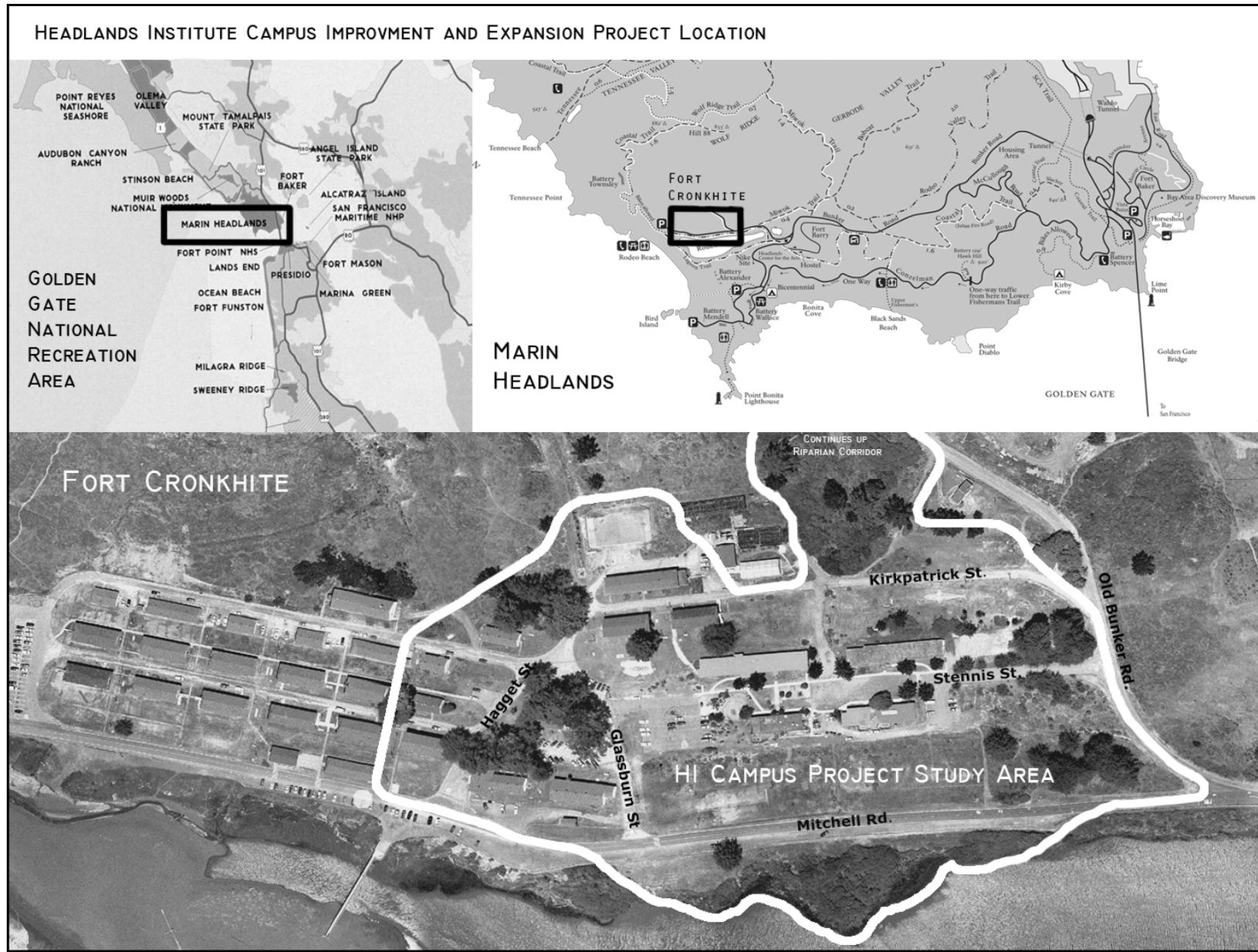
HI focuses on field science education for kindergarten through twelfth grade students, and also functions as a conference and retreat center. In addition to its core field science program, HI provides multi-day youth summer activities, a teen leadership program, and a training program for teachers in environmental education. For a variety of reasons (see section 1.2 *Purpose and Need* below), the park and HI now propose to improve these offerings and increase student capacity.

1.1.2 Background

HI has been a long-term partner with GGNRA and is included in the park’s long-term planning efforts (*General Management Plan* [NPS 1980]). The mission of HI is the same as that of NatureBridge—dedicated to teaching science and environmental education in nature’s classroom to inspire a personal connection to the natural world and responsible actions to sustain it” (YNI n.d.:17).

This mission is directly related to the educational policies of the National Park Service (NPS), which state that “Parks will be managed as places to demonstrate the principles of science, to illustrate the national experience as history, to engage learners throughout their lifetimes, and to do these things while challenging visitors in exciting and motivational settings.” Schools and the possibility of partnerships they offer the NPS are also called out as important: “Schools represent a microcosm of society and present myriad opportunities for the Service to foster stewardship in future generations. Therefore, curriculum-based programs will be designed to link classroom learning with experiences in the parks.” Specific objectives of the NPS curriculum-based educational programs include the “stories and meanings attached to park resources, the threats to the condition of those resources and the conservation or preservation issues relevant to the park” (NPS 2006a, sec. 7.3.1.1.).

Figure 1. Project Location Map with Project Study Area Highlighted



In addition, the park has committed to working closely with partners to provide high-quality and innovative programs and materials to help visitors better understand the meaning and relevance of park resources. The park wants to enhance its status as a center of educational excellence in the NPS for school-aged children, as well as enhance teacher training programs, thereby increasing children's access to the park for place-based learning. The Science and Environmental Education Development (SEED) for Teachers is a teacher training program offered by HI that provides leadership, stewardship, and environmental connection skills for educators to strengthen classroom curriculum. More specific to Headlands Institute goals, the park wishes to expand the current K-12 education partnerships with nonprofit partners in the park.

The Headlands Institute's three primary principles include:

- **Sense of place**—An awareness of place is fundamental to understanding humans and their interactions with the environment. This awareness would include a better understanding of the physical characteristics of a place (e.g., climate, landforms, vegetation, wildlife), as well as settlement history, resource use, and the emotional and spiritual and artistic relationships that humans have with the environment.
- **Interconnections**—An understanding that all physical and cultural aspects of places are interrelated and that change in any one part of it will affect other components as well.
- **Stewardship**—Based on the development of the two prior principles, students are better prepared to make informed decisions about their relationship to healthy natural and human communities. Students are encouraged and inspired to consider a respectful, long-term perspective in their decisions, so that they serve as stewards of the environment to build a sustainable world (YNI n.d.: 19).

HI's educational program themes promote these principles and are designed to inspire participants to think about, investigate and engage with their environment. These themes are broad ideas incorporating a variety of concepts and include community connections, marine ecology, terrestrial plants and animals, earth and physical sciences, watersheds, Marin Headlands history, team building, and the broad definition of "environment." These themes are presented to students in typical two- to five-day programs through a variety of methods, including field visits to 22 off-campus sites, laboratory and classroom work on the campus, visits to other park facilities, and composting and nursery activities.

In addition to environmental science education, HI offers summer coastal camps, a youth program (Teen Environmental Action Mentorship [TEAM]), environmental education teacher training programs, and conference facilities for groups from 10 to 200 individuals (approximately 10,000 annual conference-goers). TEAM is a year-round paid environmental education internship and leadership program for San Francisco Bay Area high school youth. Through TEAM, participants discover their inner strength as leaders, their ability to influence others, and the importance of diversity, community and hands-on learning. TEAM interns gain first-hand knowledge about the field of environmental education through one-on-one mentorships with HI's professional educators, and by leading interactive activities with HI's elementary school participants.

The HI conference program exists to provide revenue for the core educational programs and to bring conference and retreat groups into the park to experience and appreciate the resources. The relatively low cost of the conference program provides access to many groups. The conference program functions as an integral part of HI's financial stability.

1.1.3 Project Location

The HI campus at Fort Cronkhite is a part of the larger Forts Baker, Barry, and Cronkhite Historic District, which was listed in the National Register of Historic Places (NRHP) in 1973. Fort Cronkhite is located on the western-most portion of the Marin Headlands and includes a World War II installation and a later Cold War-era Nike Missile administrative center within its boundaries (Figure 1). HI currently occupies eight buildings from both eras. For its educational programming, HI utilizes both the Fort Cronkhite campus and surrounding park land (see Figure 1).

1.2 Purpose and Need for the Plan

1.2.1 Purpose

The *purpose* of the project is to provide state-of-the-art on-site environmental education services that meet increasing need and demand and demonstrate the park's and HI's core message of stewardship of natural and cultural resources. HI proposes to improve the effectiveness and reach of its educational programming by enhancing and expanding its facilities within Fort Cronkhite.

The project would enable HI to maximize the potential of the site itself to teach the environmental stewardship described above. The renovated campus would become a teaching model of sustainable living and would encourage students to investigate the layered cultural and natural resources of the Marin Headlands in ways that teach them to be environmental stewards in the park, at home, and throughout their lives. The project would provide students with state-of-the-art learning facilities and incorporate the unique resources of the Marin Headlands into the learning experience. And, it would bring this extraordinary educational experience to up to 75% more students while preserving and protecting the natural and cultural resources of the Marin Headlands.

1.2.2 Need

The *need* for the project describes existing conditions, problems, or opportunities that have prompted the park and HI to take action. Improvement and expansion of HI is needed because the current campus facilities are inadequately sized to accommodate increasing need and demand for high-quality environmental education in a national park—HI would like to be able to reach more students and provide more opportunities for program participation. Furthermore, in its current state, HI's campus does not exemplify the organization's core message of environmental stewardship; the campus landscape does not take advantage of opportunities to connect students to the layered natural and cultural resources of the site. The campus facilities do not meet HI's day-to-day operational needs in a manner that fully supports the educational programs, nor does it provide an ideal learning environment. Lastly, expansion of the campus to accommodate more students and overnight guests is important to ensure the long-term financial sustainability of HI's programs, campus facilities, and preservation of park resources.

Increase in Demand and Outreach for Program Participation

HI and the NPS strive to satisfy as great a percentage of the need and demand for the environmental educational services as possible, while maintaining a high-quality and efficient operation and minimizing environmental impacts. The current campus accommodates an average of 200 students per day (approximately 11,000 annually). 174,000 students in the appropriate grade range live within HI's target region of the Bay Area and Sacramento. At this current capacity, HI reaches less than 7% of students within the target region annually. Of the students and schools that do currently participate, a disproportionate number do not come from underserved inner-city and new-immigrant communities—the same communities which are under-represented in park visitation. To fulfill the GGNRA's mission to offer national park experiences to a large and diverse urban population, it is

critical to reach these students who constitute an important component of the next generation of park stewards. Expansion of the campus and programs would enable HI to attract more students overall and, importantly, to better reach these under-represented students while continuing to serve all the schools that have historically participated. Together, improvements and expansion of the campus would enable HI to more effectively serve the educational mission it shares with the NPS.

Environmental Stewardship and Resource Preservation

This project is also needed to realize the educational potential of the cultural and natural resources of the campus site. Decades of incremental additions within Fort Cronkhite obscure the elements of World War II and Cold War history of the site, and the layers of natural and cultural history buried beneath the fort landscape are invisible to students.

The current campus also does not fully demonstrate how students can apply the environmental stewardship they learn on the trail to their everyday life at home and school. HI's sustainable practices have already earned it recognition and certification by Marin County as a "Green Business." Still, much of the campus infrastructure is not sustainable, and many of the sustainable elements go unnoticed by students.

On a deeper level, the current campus misses opportunities to interconnect the students' lives and the life of the park and give the students stewards' eyes. For instance, if staying in the dorms connected students to the lives of young soldiers, or playing on the fields connected students to the lives of Miwok children, students would go home curious about who lived in their house or played on their school grounds before they arrived. If a stream that currently runs through a culvert under the campus were revealed, students would go home wondering where the streams are buried in their neighborhoods and how they might restore those streams. Equally important, if the park experience changed students' point of view, this park, as well as the principle of setting aside cultural and natural resources, would become part of their lives—a place and idea they would want to regularly experience and protect, rather than just occasionally visit.

Campus Deficiencies

The current campus misses opportunities to provide an effective, comfortable, and secure learning environment. The following campus conditions need to be addressed to enhance the quality of the student or conference-goer experience:

- **Lack of Lab and Classroom Space**—The campus has three 14-station labs for 200 students. There are only six indoor teaching spaces, forcing student groups to meet in dorms and hallways when weather keeps them inside.
- **Lack of Teaching Spaces Connected to the Site**—From many of the outdoor and indoor teaching spaces on campus, students cannot see Rodeo Lagoon or the Pacific Ocean. Sitting in the fire circle, a parking lot disrupts students' views of the ocean. Groups of students sit next to well traveled roads because these are the best available locations that offer connections to the resources students are studying.
- **Lack of Dining and Sleeping Accommodations**—The dining hall accommodates 130 chairs, however the hall can only seat 110 students comfortably; setting the program's total capacity at 220 for two dinner seatings. The tight configuration of the dining hall makes it impossible to separate serving and seating areas, limiting the ability to use the dining hall as a classroom or event space between meals. Diners must wait in line outdoors, with no protection from the elements (such as an outside canopy). The tight configuration of dormitory bunks makes it difficult for chaperones to supervise students and interferes with students' sleep, leaving them less ready to learn the next day.

- **Inadequate Outdoor Infrastructure**—The playing areas are worn to dirt because they are too small and not properly engineered. Students' daily routes often follow social trails rather than properly designed and engineered paths.
- **Lack of Definition and Sense of Place**—The campus has no clear entrance, center, perimeter, or internal circulation system. Finding one's way around campus is a challenge for students. Visitors are not aware they have entered HI's campus nor do they have a sense of the boundaries of the campus.
- **Lack of Identifiable Campus Circulation Routes**—There is a lack of formal or accessible paths between the campus core and the resources along the upper (north) and lower (south) terraces. The social paths are difficult to climb with luggage, susceptible to weather, and inaccessible to some people with disabilities (other accessible routes exist). Use of these social paths also degrades the site's cultural and natural resources. The 1970s-era paths within the Nike core function effectively, but are neither attractive nor reflective of the historic patterns of the fort.
- **Lack of Security and Safety**—The lack of defined boundaries leads to a perceived and real lack of security and safety. Chaperones feel compelled to keep students in a few highly impacted areas because the rest of the campus is too undefined to feel safe. Traffic on Mitchell Road immediately south of campus forms a dangerous edge close to the campus (Figure 1).
- **Lack of Efficient Campus Pick-up/Drop-off Sites**—The bus drop-off area is inadequate as it holds only two buses and can restrict vehicle circulation. Often buses must back out, which is difficult and not a best safety practice. Students step off the bus onto a dirt and gravel shoulder that can be muddy in rain, does not reflect HI's stewardship ethic, and does not give a positive first impression of an environmental education campus. Students have no sheltered area to wait for or depart from buses.
- **Parking Lot Location Issues**—The main parking lot obscures the best views of the defining natural resources—the lagoon and ocean. Moreover, it creates an entry experience defined by vehicles rather than the resources or HI's lessons of stewardship. The kitchen parking lot brings "back of the house" activities into the center of campus. Finally, the informal parking around the kitchen lot degrades the landscape and viewshed.

Need for Growth and Long-term Sustainability

To fund its core education programs and ensure long-term financial sustainability while fulfilling its mission, HI needs to increase its student body and conference program. In recent years, HI has followed through on its commitment to assuring a representative student body through scholarships, while at the same time costs to operate the program have risen more than tuition can cover. HI's ability to raise tuition is constrained by the market and a limit on what parents view as a reasonable cost for school trip. As part of its financial planning, HI determined that the number of students could be increased without a proportionate increase in operational costs, creating a greater financial margin. The conference program also makes a significant contribution to HI's financial sustainability and ability to give scholarships. Net funds generated by the conference program cover 19% of the Institute's costs and this figure would increase as the program grew and took advantage of economies of scale. Therefore, the need to secure the long-term financial stability of HI and long-term availability of its programs could be fulfilled by increasing the student body.

1.3 Project Objectives

The project *objectives* are specific steps toward fulfilling the purpose and must be achieved to a large degree for the project to be considered a success. The following are the primary objectives of the proposed HI campus project:

- 1) Preserve and interpret the site's layered natural and cultural resources so students can experience the resources, understand how they have interacted over time, and learn how to sustain them.
- 2) Renovate campus facilities to be teaching models of sustainable living that interconnect stewardship in the park, at home, and throughout life.
- 3) Improve and expand classrooms and labs to provide students with state-of-the-art learning tools that support HI's curriculum and experiential group teaching method.
- 4) Maintain the long-term financial stability of HI and further its mission as a park partner by increasing its student body and conference programming to serve as many people as possible while protecting HI's and the park's environmental resources.
- 5) Improve sleeping accommodations and dining facilities to comfortably and efficiently accommodate students so they can focus on learning.
- 6) Provide an efficient, comfortable, safe, and accessible place to learn and work by integrating sustainable design measures as well as ADA access provisions.
- 7) Integrate the indoor and outdoor spaces on the campus with the defining resources of the site to immerse students in the place and enable them to experience all aspects of the environment—from flora and fauna to quiet and darkness—with minimum impact on sensitive resources.
- 8) Minimize environmental impacts to the site, including impacts caused by traffic, circulation, and programming on and off the HI campus.
- 9) Achieve zero net increase in water and energy use and sewage output while increasing the student body by up to 75%.
- 10) Create a cohesive and unified campus within a manageable area while continuing to make the best use of the buildings currently occupied by the Headlands Institute.

1.4 Scope of the Environmental Assessment

This environmental assessment (EA) analyzes the No Action alternative and three action alternatives for the HI Improvement and Expansion Project. It fully describes project alternatives, existing conditions in the project area, and analyzes the effects of each project alternative on the environment. It also identifies mitigation measures to avoid or reduce adverse effects.

The EA provides the Section 106 determination of effect for affected cultural resources required under the *National Historic Preservation Act (NHPA)*, as well as providing input for the Biological Assessment requirement under the *Endangered Species Act*.

1.5 Summary of Laws, Regulations and Policies

1.5.1 Park Related Documents

National Park Service Organic Act, Redwood Act

Under the *Organic Act*, the Department of the Interior and the NPS are directed to “conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (16 USC § 1). This was reiterated in the *Redwood National Park Expansion Act of 1978*, under which the NPS is directed to conduct its actions in a manner that will ensure no “derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress” (16 USC § 1a-1).

National Park Service Management Policies 2006

With conservation as its predominant mandate, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. While the NPS has discretion to allow negative impacts when necessary, the NPS cannot allow an adverse impact that constitutes resource impairment (NPS 2006a, sec. 1.4.3). An action constitutes impairment when its impacts “harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values” (NPS 2006a, sec. 1.4.5). To determine impairment, the NPS must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts” (NPS 2006a, sec. 1.4.5). *NPS Management Policies 2006* require that these determinations, and all planning decisions in the Service, be based on current scientific and scholarly understanding of park resources and ecosystems (NPS 2006a, sec. 2.1.2). *NPS Management Policies 2006* also have separate chapters on the appropriate management of the parks and their resources (e.g., wilderness, natural and cultural resources, etc.), as well as on education and interpretation (NPS 2006a, sec. 7). *NPS Management Policies 2006* specifically reference their partnership with environmental education organizations in section 7.3.1.1, which states in part “To continue to meet the demand from schools for NPS programs, parks will identify, in cooperation with park partners, alternative means for program delivery...”

National Park Service Directors Orders

The National Park Service has several sources of detailed written guidance to help managers make day-to-day decisions, which include Director’s Orders. These directives and guidelines remain in effect until superseded. The National Park Service has issued the following Director’s Orders which are relevant to the project:

Director’s Order #12 Conservation Planning, Environmental Impact Analysis, and Decision-making. This Director’s Order and the accompanying Handbook describe the NPS’ approach to NEPA, environmental analysis, public involvement, and making resource-based decisions. They set forth direction in using interdisciplinary teams, incorporating scientific and technical information, and establishing a solid administrative record for NPS actions.

Director’s Order #42: Accessibility for Visitors with Disabilities in National Park Service Programs and Services. Under this order, NPS ensures that all people should have the highest level of accessibility that is reasonable to NPS programs, facilities and services in conformance with applicable regulations and standards. Accordingly, the NPS seeks to provide that level in the planning, construction, and renovation of buildings and facilities and in the provision of programs and services

to the public and to employees. NPS seeks to provide the highest level of accessibility that is reasonable, and not simply provide the minimum level that is required by law.

Similarly, Director's Order #16A provides for reasonable accommodations for applicants and employees with disabilities.

Golden Gate National Recreation Area Enabling Legislation

The GGNRA was established by Congress in 1972 (PL92-589). The language of the enabling legislation states the park's purpose as follows:

In order to preserve for public use and enjoyment certain areas of Marin and San Francisco Counties, California, possessing outstanding natural, historic, scenic and recreational values and in order to provide for the maintenance of needed recreational open space necessary to urban environment and planning, the Golden Gate National Recreation Area is hereby established (NPS 1980).

The nearby presence of several million people provided an unprecedented opportunity to make national park resources and programs available to a wide variety of visitors, many of whom had not been able or willing to access more remote national parks. Based on the record, this "parks to the people" idea was clearly intended by Congress and the administration to be a major purpose of the GGNRA.

The enabling legislation also requires that the park and its visitors "utilize the resources in a manner which will provide for recreation and education opportunities consistent with sound principles of land use planning and management," and that the recreation area be preserved "as far as possible in its natural setting" and protected from uses that would "destroy the scenic beauty and natural character of the area" (NPS 1980).

Golden Gate National Recreation Area General Management Plan, 1980

The GGNRA *General Management Plan* (NPS 1980) is combined with that for Point Reyes National Seashore, which adjoins the GGNRA. The *General Management Plan* ensures that decisions made for GGNRA achieve the park's purpose as cost-effectively and consistently as possible. The joint *General Management Plan* notes that the resources in these two park units would be of outstanding significance even if they did not exist at the fringes of a great city. Together, these two parks represent one of the nation's largest coastal preserves. The *General Management Plan* goes on to say that "in spite of the outstanding quality of the scenic, natural, and historic resources" in the GGNRA, it may be the "sharp contrast" between the intensively developed urban environment of San Francisco and the park's adjacent and undeveloped areas that make it unique. This wide variety of resources and outdoor settings provide opportunities for a "correspondingly diverse array" of recreational and educational activities of "a quality and character found nowhere else." Both GGNRA and Point Reyes National Seashore are currently updating their general management plans. The operation of an environmental education center at Fort Cronkhite is consistent with the *General Management Plan*. While the GGNRA is in the process of creating a new *General Management Plan*, there are no proposals to eliminate the Headlands Institute program at Fort Cronkhite.

1.5.2 Other Federal Regulations, Laws and Policies

National Environmental Policy Act

The Council on Environmental Quality (CEQ) regulations for implementing the *National Environmental Policy Act* (NEPA) requires that federal agencies integrate the NEPA process with other planning efforts to ensure that decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts (CEQ 1978: sec. 1501.2). These regulations further describe the decision-making process used to determine when to prepare an EA—that is, when it is likely that a proposed

action would have no significant impact on the environment (CEQ 1978: sec. 1501.4). Internal scoping with the NPS, HI and its contractors has indicated that proposed actions would not have a significant effect on the environment and, therefore, an EA is the appropriate NEPA document.

National Parks Omnibus Management Act (16 USC 5901 et seq.)

This act underscores NEPA in that both are fundamental to NPS management decisions. Both acts provide direction for articulating and connecting resource management decisions to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available, so they provide alternative options for resource impact analysis should this be the case. Specifically, the *National Parks Omnibus Management Act* directs the NPS to use the findings of science and the analyses of scientifically-trained resource specialists in decision making.

Endangered Species Act

This act requires all federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and/or NOAA Fisheries on all projects and proposals having potential to impact federally endangered and threatened plants and animals. Listed animal species may experience short-term disturbance or enhancement of their habitat if the proposal is implemented.

National Historic Preservation Act

The NHPA is the principal legislative authority for management of cultural resources associated with NPS projects. Section 106 of the NHPA requires all federal agencies to consider the effects of their actions on cultural resources determined eligible for inclusion in the National Register of Historic Places: this assessment is done in consultation with the State Historic Preservation Officer (SHPO) and Advisory Council. In addition, the NHPA requires that federal agencies take actions to minimize harm to historic properties that would be adversely affected by a federal undertaking. Building in an existing historic district and any modification of existing historic buildings may affect eligibility or cause unnecessary adverse effects to the resources if it is not done according to certain standards explained in the cultural resources analysis of this EA.

Migratory Bird Treaty Act and Executive Order 13186

The *Migratory Bird Treaty Act of 1918* makes it unlawful to kill, capture, buy, sell, import, or export migratory birds, eggs, feathers, or other parts. The January 2001 Executive Order 13186 restated the value of migratory birds and directed agencies to develop and implement memoranda of understanding with the USFWS to protect them. Actions in the alternatives may temporarily disturb migrating birds.

Coastal Zone Management Act

The *Coastal Zone Management Act (CZMA)* requires federal agency participation in the development of coastal states' coastal zone management programs. The California Coastal Commission implements the CZMA. The CZMA also requires federal agencies to prepare a consistency determination for every federal agency activity within or outside the coastal zone that affects land or water use or natural resources of the coastal zone. A consistency determination indicates that the federal activities are consistent with the enforceable parts of the state programs. Once the EA is completed, it and a letter regarding consistency with the CZMA will be submitted for review in compliance with these requirements.

Clean Water Act

Section 404 of the *Clean Water Act* regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development and water resource projects. Section 404 requires a permit

before dredged or fill material may be discharged into waters of the United States, unless otherwise exempt from Section 404 regulations.

Executive Order 11988

Executive Order 11988 – Flood Plain Management addresses floodplain issues related to public safety, conservation, and economics. It generally requires federal agencies constructing, funding or permitting projects in a floodplain to:

- Avoid incompatible floodplain development
- Be consistent with the standards and criteria of the National Flood Insurance Program, and
- Restore and preserve natural and beneficial floodplain values.

Executive Order 11900

Executive Order 11900 – Protection of Wetlands requires federal agencies to follow avoidance, mitigation, and preservation procedures with public input before proposing new construction in wetlands.

1.6 Scoping Process and Public Participation

Scoping is designed to be an open process to gather early input in the NEPA process. In addition to notifying interested parties about a proposed project, it is designed to identify environmental issues and alternatives to be addressed in the EA.

A number of internal scoping meetings were conducted with NPS and HI staff to identify the project's purpose, need, and objectives; to develop preliminary action alternatives; and to identify associated issues and impact topics.

Public scoping occurred from May 22, 2007, to July 16, 2007, and included an open house, mailings, a public meeting, and a formal public scoping session on June 16, 2007. These meetings were designed to receive input regarding the draft purpose, need, and objectives of the plan; the preliminary action alternatives; and issues of concern to the public related to the Headlands Institute planning effort. Communication with USFWS, the State Historic Preservation Officer (SHPO), and other agencies has also occurred. A more detailed description of scoping activities is presented in the *Consultation and Coordination* chapter of this EA.

1.7 Issues and Impact Topics

Environmental issues are statements of problems or opportunities that might occur if the actions identified in the alternatives were implemented. The degree to which these become problems or advantages is analyzed as a set of impact topics in the *Environmental Consequences* chapter of this EA.

This summary of issues and impact topics has been developed in collaboration with the NPS, Headlands Institute, and public comments received. Only the impact topics containing specific issues with potential to result in more than a negligible or minor change to a park resource or value are included.

1.7.1 Natural Resources

- **Soils**—Stream restoration activities to daylight the stream within the Fort Cronkhite campus (e.g., excavation and vegetation removal) or on-campus construction may increase erosion directly or through trampling, crushing, and removal of vegetation. In addition, the use of

certain natural park locations (steep slopes, embankments, frequently used trails) for educational programs has the potential to increase erosion through social trails or access.

- **Water Resources**—Construction and rehabilitation of buildings, use of facilities, landscaping choices, parking lots, and other on-campus features could alter erosion and sedimentation, oil and grease, groundwater infiltration and surface, stream hydrology, water quality, and stormwater flows. Daylighting of the stream through campus could alter turbidity, oxygen levels, and other stream parameters. Since the stream discharges into Rodeo Lagoon, related effects on the lagoon must be considered.
- **Vegetation (includes wetland and riparian vegetation)**—Stream restoration activities in the Fort Cronkhite area would result in vegetation removal/restoration activities along the riparian corridor adjacent to the campus. Construction of new buildings would also require vegetation removal, and heavy equipment and construction crews may trample adjacent vegetation. In addition, student use of park locations off-campus for educational programs could result in trampling or indirectly affect vegetation through soil erosion and loss in frequently used areas.
- **Wildlife**—Construction, rehabilitation, and stream restoration activities within the Fort Cronkhite campus may result in disturbance of wildlife and may alter wildlife habitat along the riparian corridor and in aquatic habitat in the stream and lagoon. The use of natural park locations for educational programs has the potential to disturb or displace upland or marine and aquatic wildlife.
- **Species of Special Concern**—Water quality or hydrologic changes from stream restoration may create habitat for red-legged frogs (federal threatened species) and may alter water quality entering the lagoon, where tidewater gobies (federal endangered) live and breed. In addition, the use of off-campus park locations for educational programs has the potential to disturb or displace other species of special concern (California brown pelican—federal listed; mission blue butterfly—federal endangered; rare plants). Increased human activity during construction may also cause wildlife of concern to avoid the area.
- **Air Quality**—Heavy equipment used to construct or rehabilitate buildings, deliver construction supplies, or to daylight the culverted stream under campus emit air pollutants. Transportation of additional students, conference visitors, and staff may create air pollutants.

1.7.2 Cultural Resources

- **Archeological Resources**—Ground-disturbing activities involved in building and landscape rehabilitation, new construction, and stream restoration activities within the Fort Cronkhite campus have the potential to affect unknown archeological materials.
- **Cultural Landscapes/Historic District (includes historic structures)**—The project involves the rehabilitation of existing historic structures and, under two alternatives, new construction of structures on historic footprints within Fort Cronkhite. As Fort Cronkhite comprises a component of the larger NRHP-listed Forts Baker, Barry, and Cronkhite Historic District, any modifications to it have the potential to affect the integrity and significance of the resource.

1.7.3 Other Impact Topics

- **Visitor Experience**—Currently the Marin Headlands and the Fort Cronkhite area are used by a variety of visitors throughout the year. An increase in student and conference numbers has the potential to degrade their enjoyment of recreational resources and soundscapes, and the ease with which they are able to travel to and park in these areas. In addition, short-term

noise, dust or construction traffic, or restricted access could reduce current visitors' enjoyment or cause them to visit other locations.

- **Visual Resources**—Campus improvements would change the visual character of the historic Fort Cronkhite and Nike complex and create a vegetated riparian corridor in a grassy area. The highly visible area would be impacted during construction.
- **Transportation (traffic volume, level of service, parking)**—HI currently shares thoroughfares and parking facilities with many other park users (employees, other park visitors, park partners). An increase in HI student and conference numbers could affect levels of service, circulation, and parking adequacy in and around the Fort Cronkhite campus.
- **Park Operations**—An increase in student numbers within the fort has the potential to displace certain existing park functions at Fort Cronkhite, as well as alter the need for certain utility/infrastructure capacities. In addition, rehabilitation/construction and stream restoration activities (excavation) within the fort area have the potential to temporarily disrupt both park staff/functions and the provision of utilities.

1.8 Issues Eliminated from Further Consideration

The following impact topics were eliminated from further consideration, either because the topic was not relevant in the context of the project and its setting, or because the project's effects would be only minor, negligible or beneficial.

- **Wilderness Values**—No designated wilderness areas are located within the study area.
- **Indian Trust Resources and Sacred Sites**—No Indian trust resources are held by the park. Sacred sites have not been identified within the study area.
- **Prime and Unique Farmlands**—No lands qualifying as prime or unique farmlands are found within the project area.
- **Wild and Scenic Rivers**—No designated wild and scenic rivers are located within the study area.
- **Ethnographic Resources**—No known ethnographic resources are believed to be located within the study area.
- **Environmental Justice (Executive Order 12898)**—The project is not believed to have the potential to result in disproportionately high and adverse human health or environmental effects on minorities and low-income populations and communities. The project would increase opportunities for under-represented students—particularly low-income students of color—by increasing the scholarship pool and overall capacity.
- **Human Health and Safety (Hazardous Materials and Waste)**—No hazardous materials/waste are known to exist in areas for which ground disturbing activities are proposed within the project area, although certain areas of fill could have elevated metal levels. Additionally, there is a potential for abandoned utility lines, some of which may have asbestos-containing materials, in the project site. With respect to the buildings that would be rehabilitated under the project, lead-based paint (LBP) and asbestos are a concern as they are commonly found in historic buildings. LBP can be found on painted structures as well as in the soil surrounding the building. Asbestos containing materials (ACM) can be found in areas such as insulation, tiles, drywall, stucco, mastic, tape, and transite. Friable asbestos is a human health hazard and must either be contained or removed. In addition to LBP and ACM, mercury switches and ballasts are also likely.

However, as part of building rehabilitation, the construction contractor would be responsible for conducting testing for lead-based paint either before or concurrent with construction activities. If found, any necessary cleanup would be done either before or concurrent with construction activities that would disturb these materials. If a building is found to contain friable asbestos, the material should either be sealed or removed by qualified contractors. If a building has not been tested, the contractor would conduct the necessary testing prior to project implementation. As needed, this testing and mitigation work would be coordinated with the GGNRA Environmental Programs Office.

During building rehabilitation, construction workers would implement best management practices (BMPs) to avoid exposure to hazardous levels of lead-based paint and asbestos. These BMPs (described below) address worker safety hazards that may arise during renovation, including respiratory protection, protective clothing, housekeeping, hygiene facilities, medical surveillance, and training among other BMPs. Abatement and remediation crews should experience no adverse impacts when the project is run properly and the long-term effect with the removal of these materials would be beneficial. Specific BMPs are as follows:

- Comply with all applicable regulations and policies during the removal and remediation of asbestos and lead paint.
- Providing on-site air monitoring during all abatement activities and perimeter monitoring to ensure no contamination of work or adjacent areas.

With respect to contaminated soils, during the design phase of the project, managers would develop a decision framework for HI and NPS to address the potential for unidentified contamination suspected or discovered during construction activities. The framework will allow both parties (or their contractors) to identify and manage contaminants in a timely manner that is protective of human health and the environment. The framework will discuss potential contaminants, the notification/coordination process, and applicable regulatory requirements. The NPS would coordinate the process with regulatory agencies.

Before site excavation or subsurface construction, as a standard operating procedure, the contractor would develop a Hazardous Materials Workplan to govern requirements and provisions that apply when the contractor encounters, discovers, or is notified of potential contamination in or around buildings or soil or groundwater.

- **Socioeconomics**—The project would only create a small number of new jobs, and would not substantially affect the overall socioeconomic character of the Marin Headlands or San Francisco Bay Area.
- **Gateway Communities**—The project would create new opportunities for students from the adjacent community of Marin City, a low-income community with predominantly African-American and Latino residents. Marin City students have participated in the program in small numbers in the past. The growth of scholarship funds created by the project would enable more Marin City students to participate. Beyond this expansion of opportunity, no effects to GGNRA gateway communities are anticipated as a result of the project.
- **Night Sky**—The project proposes to use lighting systems designed to avoid effects to a dark night sky and no project-related adverse effects to night views are anticipated. The project will reduce the light pollution emitted by the campus by replacing existing relatively high polluting fixtures with state-of-art fixtures that minimize pollution and energy use. Currently the HI campus, and Fort Cronkhite as a whole, is lit by a variety of historic and more recent fixtures that are mostly purely functional, ranging from bare bulbs and mercury lamps to

simple fixtures with traditional shades to direct light downward. The improved campus will minimize light pollution by:

- o using all full cut off FSA/International Dark Sky approved fixtures
- o limiting the areas lit and time they are lit to only what is necessary for safety and active programming.
- o Use motion sensors and other technology to limit lighting when areas not in use.

Since the project proposes to use lighting systems designed to avoid effects to a dark night sky, no project-related adverse effects to night views are anticipated.

- **Seismicity, Tsunami, and Geotechnical Hazards**—While the project is located in a seismically active area, existing buildings used by HI have had some seismic work done. Additional retrofit work, as needed, would be done as part of the building rehabilitation process. Similarly, new buildings would be designed and constructed to the necessary geotechnical specifications and to the most current seismic standards. As such, the risk posed by a seismic event under the project would be similar to, if not less than, under current conditions. Retrofits and new construction would comply with all applicable building codes implemented by NPS.

Tsunamis are also a potential geological hazard at the site. The U.S. Geological Survey has estimated a tsunami frequency probability as follows: 50-year tsunami approximately 7 feet; 100-year tsunami 7.9 feet; and a 500-year tsunami 15.3 feet (NPS 2007b). While the low-lying areas at Fort Cronkhite could be flooded by such waves, any new buildings would be constructed at locations higher than this level. Once again, the risk under the project would not significantly exceed current conditions.

- **Global Climate Change**—The project has been designed such that it would not be substantially affected by global warming and associated climate and sea level changes. In addition, the project has incorporated sustainability elements which would reduce HI's contribution to global warming. As such, the project would have negligible to beneficial effects related to global climate change. More details regarding climate change as it relates to the project, and the park in general, are provided in the paragraphs below.

Global warming and associated climate and sea level changes are likely to have an effect upon GGNRA's natural systems, cultural resources such as the coastal defense system, and the park's infrastructure. The most likely changes that GGNRA will experience in the coming decades are:

- o coastal erosion and flooding more prevalent as sea level rises and winter storm severity potentially increases;
- o wildland fire season will increase in duration and there will be more and larger fires;
- o plants will become more drought stressed as temperatures increase, even if rainfall also increases, leading to greater susceptibility to pathogens and invasive species.

To properly manage and care for these resources, the park must monitor the changes as they emerge and develop new adaptive strategies to respond to these threats. Scientists and park staff are monitoring a variety of indicators for climate change including air temperature, humidity and wind speed; water quality, quantity, temperature and salinity; sea level; and vegetation and wetland cover. These data will help park managers understand what is happening and inform their response to ecosystem disruptions. As part of this, the park will conduct an inventory of park resources (both natural and cultural) and rate them for climate change risk. For buildings and facilities, the inventory will assign a climate risk index to assist in the evaluation and prioritization of maintenance projects.

The following are particular areas of global climate change that have been considered as part of this project:

Sustainable practices. In Chapter 2, each of the alternatives address elements of sustainability that HI would incorporate including opportunities associated with building rehabilitation, new construction, infrastructure upgrades, hydrologic system restoration, and program operations. Through the proposed building rehabilitation in these alternatives, HI anticipates improving the heating, insulation, water use and lighting efficiency of HI's facilities.

Resource monitoring. The park anticipates creating a science advisory group made up of internal staff and external experts to develop a monitoring plan for natural resources and shoreline erosion. HI would work with the NPS to assist in monitoring and evaluating park resources and the effects of global climate change as part of its educational programming. The park plans to develop programs and materials to assist local schools and teachers in explaining many aspects of climate change to students as well as to actively develop and promote exhibits, events, lectures, and brochures for park visitors. These activities are in direct alignment with HI's programmatic themes and operational practices.

Effects of sea level change. Low-lying areas around Rodeo Lagoon have the potential for inundation as a result of sea level rise. As part of the alternatives development process, the NPS and HI took into account the potential change in sea level that may occur at Fort Cronkhite, which was a factor for identifying appropriate sites for new construction. As a result, for those alternatives that contemplate new construction, HI located it on the upper terrace, farthest away from the lagoon, and further back and upslope than many other buildings and roads, to avoid any potential conflicts with rising sea level.

Furthermore, the NPS, in coordination with San Francisco Bay Conservation and Development Commission (BCDC) and the United States Geological Survey (USGS), will be updating the coastal vulnerability maps as part of the GMP process. The park will monitor the changes to sea level and other indicators of global warming, in coordination with HI and other affected park partners, and make adaptive management decisions as necessary in the future.

CHAPTER 2. ALTERNATIVES

2.1 Alternatives Development Process

The development of alternatives to expand and improve the facilities for the Headlands Institute (HI) has a relatively long history, dating back to 2001. In the last several years, NPS, HI and the public have discussed possible alternatives and worked together to develop concepts to address HI's needs while also avoiding environmental impacts from HI activities. The following is a summary of the development of the action alternatives.

2.1.1 Background

In 2001, HI held internal design discussions to develop a plan for renovating the Cold War-era Nike core of campus. These discussions resulted in a range of plans but none that appeared to fully demonstrate the quality of the HI programs or take advantage of the on-site resources. In 2003, HI organized internal workshops to explore the creation of a sustainable campus that would reflect the ideals shared with the park and fully interpret the site's resources. HI also surveyed students, teachers, and conference attendees to assess their views of the current campus and improvement priorities. This participatory process resulted in a conceptual plan for the campus and convinced HI and NPS leaders to launch a formal process to improve and expand the campus.

A project concept was developed in 2005, and an interdisciplinary team (IDT) was formed, which brought together representatives from key NPS divisions and the educational and administrative leaders of the HI and their consultants. A preliminary set of planning guidelines was developed in 2006 by the IDT to assist in the development of alternatives.

HI Educational Program Development

Throughout 2006, the IDT prepared the foundation for developing project alternatives by evaluating the educational themes of the NPS and HI and considering how the teaching of each theme could be improved through curriculum changes or physical improvements on or off campus. These themes include, among others, marine ecology, terrestrial plants and animals, and Marin Headlands history.

In 2006, an HI committee compiled information on existing issues and questions related to educational and conference programming, along with possible options for resolution (HI 2006). These included education programming issues related to capacity constraints, student transportation needs, goals related to student demographics (socioeconomics, racial/ethnic composition, scholarship support, age), the number and size of hiking groups visiting off-campus locations, on-campus space needs (dining, labs, dorms, etc.), and resource considerations both on and off-campus.

As part of the alternatives formulation process (see below), the IDT recognized that it was critical to review NPS and HI educational goals to ensure each aspect of the project was founded on serving those goals. HI students primarily learn in the field on trails in the GGNRA, where they spend seven to eight hours a day. They also prepare for and follow up those outdoor education experiences in their home classroom and on the HI campus. The IDT reviewed each educational theme and considered how physical improvements on-campus or off-campus or curricular improvement at the HI campus or in home schools could improve the teaching of that theme. This analysis revealed what physical improvements to campus would have a benefit that could not be served elsewhere, thus helping HI to focus the project on essential campus improvements.

HI Program Participants

In 2006, approximately 9,500 field science students from 224 schools in the area participated in educational opportunities provided by HI year-round, with peak participation occurring in the fall and spring. Eighty-four percent of HI field science students stay overnight at HI to participate in two- to five-day programs. Although HI offers programming for K-12 students, 78% of field science groups are comprised of fourth to seventh graders (HI 2006).

HI's campus also hosts many conference groups. This conference program is an integral part of HI's financial stability. Surplus funds generated by the conference program cover 19% of HI's expenses. Approximately 10,000 conference-goers representing some 246 groups currently utilize the HI conference facilities (HI 2006). These are typically one- to two-day weekend events, although some monthly group meetings, seminars, and public hearings also make use of campus facilities. The same dorm facilities used by students are also used by conference goers. Conference participants predominantly utilize campus on weekends or other times when children are not present.

HI now has 235 beds for field science students but, due to group size and gender constraints, an average of about 200 are in use at a time. Capacity is currently defined as 200 field science participants or 150 conference participants (HI 2006). The size of the student body is currently dictated by the capacity of the dorms and the dining hall.

HI Program Capacity

NPS and HI decided that the size of the student body should be an element of developing project alternatives for several reasons, including achieving the NPS and HI's shared mission, preserving natural and cultural resources, optimizing teaching and financial efficiency, and securing the long-term financial viability of the program. HI's current capacity is based on the size of the facilities rather than a consideration of what would be educationally and environmentally optimal. HI currently serves a very small percentage (7%) of the local students in HI's target grades. Even combined with the other residential environmental learning center in the GGNRA, the Point Bonita YMCA, less than 12% of local students have the opportunity to be immersed in a national park each year (based on California State Department of Education Statistics and annual attendance figures for HI and the Point Bonita YMCA). To fulfill its goal of nurturing the next generation of national park stewards, HI needs to reach more students. HI leadership also recognized that the diversity of the student body is still not fully representative of HI's target areas. Expanding the student body would help address this issue by creating spaces for new schools from under-represented communities to participate without excluding any currently participating schools.

HI also explored the financial implications of the improvement project and the size of the program. Findings from a University of California Berkeley Haas School of Business study commissioned by HI revealed that the number of HI students could be increased without a proportionate increase in costs, creating a greater financial margin (Toby 2005). Initially, HI recognized that this greater margin was needed to defray the costs of improving campus facilities and fund additional scholarships. On conducting further long-range economic planning, HI recognized that expanding the capacity of the campus to accommodate up to 350 students (including chaperones) would be important to maintain the long-term economic viability of the overall program. In recent years, HI followed through on its commitment to assure a representative student body through scholarships, while at the same time costs to operate have risen more than tuition can cover. HI's ability to raise tuition is constrained by the market and a limit on what parents view as a reasonable cost for school trips. To fund the program and ensure long-term financial sustainability while fulfilling its mission, HI needs to increase the number of students and conference guests it serves.

To explore the ideal size for its program, HI conducted a survey of peer institutions. In interviews, these institutions indicated they viewed the optimal size for on-campus environmental education programs to be 140 to 400 students (Cancian 2005). The dominant factor for this range was matching student body size to available facilities. Several of the institutions stated that while their current optimal number was on the lower end of this range, they would like to grow if they had the facilities and could be sure to maintain the teacher/student ratio and thus the quality of programming. On the higher end of the range, peer institutions indicated they were nearing a point of critical mass where the total number of students would begin to diminish the outdoor experience.

HI and NPS concluded that, in the interest of balancing all factors—resource protection, program and physical improvement, financial stability—the alternatives for this EA should study the effects of accommodating up to 350 overnight guests. Therefore, the action alternatives considered below each focus on a different approach to accommodating up to 350 students—rehabilitation of existing buildings, new construction, or a combination of the two.

2.1.2 Alternatives Formulation

In January 2007, the IDT and an extended team consisting of additional park and HI staff participated in an internal alternatives development workshop from which three alternative concepts for campus improvements and expansion were drafted, including: 1) rehabilitation of existing historic buildings at Fort Cronkhite; 2) construction of new buildings on the footprints of former historic buildings, or 3) a combination of historic building rehabilitation and new construction. All of these concepts were believed to be able to accommodate a range of between 200 and 350 students and the options were differentiated by their methods of adding space. All of these alternatives share a common approach to the landscape based on historic rehabilitation of the Cold War-era Nike building complex at the center of campus and completing a sustainable rehabilitation of the World War II era landscape surrounding this core. Through the winter and spring of 2007 these concepts were refined and then reviewed and approved for scoping.

In May through July 2007, public scoping, open houses, and solicitation of public comments (see Chapter 5) provided valuable input for the refinement of the alternatives to be studied in this EA. In addition, the IDT identified the need for supplemental data collection about park resources that could be affected by proposed actions under these alternatives. Work included the preparation of a feasibility study of the enhancement of the riparian corridor that runs through the campus, a survey of wetlands, a preliminary report on the Fort Cronkhite cultural landscape, particularly the areas affected by HI project, and other reports referenced in this analysis. Information from these studies and data collection efforts was used to refine the plan alternatives.

With regards to selecting which historic buildings could be considered for inclusion as part of HI campus expansion alternatives, HI staff identified buildings adjacent to the current campus that would meet program needs and fit the planning objectives identified earlier in the process. Criteria used by HI included proximity to the current campus, size and layout of structure, and ease of rehabilitation. Likewise, the NPS identified buildings that HI could study as part of this process, which included buildings currently occupied by the NPS. Buildings occupied by other park partners were eliminated from consideration. Working together, HI and NPS staff refined the list of buildings to be studied for reuse by HI.

In January 2008, the IDT held an internal workshop to further refine the alternatives. After a detailed presentation to the extended team and extensive discussion, a set of alternatives was approved for study in the EA. In August 2008, the NPS and HI held a Choosing by Advantages workshop at which a new alternative was created that was a hybrid of the existing two action alternatives. This became Alternative D, the preferred alternative included in this EA. As a result, three action alternatives, in

addition to the No Action alternative, were carried forward for analysis in the EA and represent a reasonable range of alternatives. They are:

- A. No Action (existing conditions).
- B. Rehabilitation Only—improvement and expansion through rehabilitation of 13 existing buildings to accommodate up to 350 students.
- C. Rehabilitation and Three New Buildings—improvement and expansion through a combination of rehabilitation of 10 existing buildings and construction of three new buildings on historic building footprints to accommodate up to 350 students.
- D. Rehabilitation and One New Building—improvement and expansion through a combination of rehabilitation of 12 existing buildings and construction of one new building on a historic building footprint to accommodate up to 350 students.

An overview of the building configurations for each alternative is presented in Section 2.3.3 below.

2.2 Preferred Alternative

A specific value-analysis (Choosing by Advantages - CBA) process, conducted in August 2008, was used to select the NPS preferred alternative. This process identifies project-specific evaluation factors based on project goals and the NPS mission, and ranks the relative advantages of each of the alternatives in meeting the evaluation factors. The alternatives were developed through project scoping and refined over time by the IDT and were carried forward into a CBA session. During the CBA process, a new alternative (Alternative D) was developed and identified as having the best combination of long-term benefits for achieving project objectives while also ensuring a high level of resource protection and enhancement consistent with the requirements of NEPA and the NPS management policies.

The action alternatives have many elements in common. So, for those features that distinguish one alternative from another, Alternative D presents the most advantages for the evaluation factors of operational efficiency, resource protection, and visitor experience when compared to the other action alternatives. Specifically for operational efficiency, one of the project objectives is to have a cohesive and unified campus. Alternative D would provide for the most efficient consolidation of HI's campus functions on or adjacent to the former Nike site and central open space compared to the other alternatives. For cultural resource protection, Alternative D would include the rehabilitation of 12 historic buildings, which is more than Alternative C and only one building less than Alternative B. In terms of new construction, only one new building would be constructed at the northeast corner of the campus on the footprint of a historic building. In comparison to Alternative C, which includes construction of three new buildings, this would be less of an impact on the site. The new building would be compatible with the historic setting and would visually reinforce an understanding of the historic complex's spatial organization. It would also be LEED-certified and provide opportunities for hands-on learning experiences for students in state-of-the-art, sustainable building practices.

2.3 Alternatives Description

2.3.1 Alternative A: No Action Alternative

The No Action alternative is a description of existing/ongoing HI management and operations. The No Action alternative also sets a baseline against which to compare impacts of action alternatives. No Action for this project would be the continuation of existing HI programming and facility use with no change to program capacity, staffing, parking, circulation, buildings or open space use.

HI currently occupies eight historic buildings within Fort Cronkhite and uses the fort's parking areas, circulation routes, and open spaces. The buildings provide administration, education, housing, and

dining facilities for staff, students, and conference attendees (Figure 2). The same spaces are used for both educational and conferencing programs; these programs are typically scheduled during different parts of the week (students during the week; conferences during the weekend) so there is little interaction between user groups. Currently, overnight field science students average 200 per day. The conference program can serve up to 150 people at a time, though the majority of conference groups in 2007 were composed of less than 50 participants. In addition, HI's educational programming uses approximately 22 sites in the surrounding park lands in close proximity to campus as teaching sites (Figure 3). HI employs 53 staff members.

The HI campus is best understood through the experience of students and participants during a typical day and night participating in the program. A typical student's HI experience occurs from Monday through Friday throughout the school year. As students step off the bus at the central parking lot, they can see Rodeo Lagoon, the Pacific Ocean and Fort Cronkhite. Most students then walk into the core of campus formed by the two rows of Nike buildings. Some students also walk up the hill to a World War II era building that serves as the third dorm. The dorms are filled with bunk beds, providing comfortable but rustic group sleeping experiences.

Each day on campus starts with a large group morning meeting, after which students break into hiking groups, each led by a Field Science Educator. On a typical day, students will spend seven hours off campus on trails studying the natural and cultural resources of the Marin Headlands, completing challenging group activities, and quietly journaling on the beach or atop a ridge. Some hiking groups spend part of their day in one of HI's three labs—the ocean lab with live tide pool species, the skins and skulls lab, or the microscope lab.

Students return from the trail by 4:00 p.m. for "free time" until dinner at 5:30 or 6:30. Many students spend their free time on campus playing games on a dirt field between the Nike buildings, at the volleyball court overlooking the central parking lot, or at the basketball court up the hill. Other students join a parent chaperone for a walk to the beach or have quiet time.

Dinner is served in two shifts in the old Nike mess hall. Like the dorms, the dining hall is comfortable but crowded for a group experience. After dinner students participate in an evening program, ranging from a slideshow and discussion in a classroom to a night hike on the beach to a fire side chat and sing-a-long. Students go to bed at 9:00 p.m. to rest for another day on the trail.

On the weekends, HI's prime visitors are conference attendees (primarily adults) who arrive by cars and carpools. Parking for conference offerings is typically in the central fort lot and the Rodeo Beach paved lot at the west end of the Fort Cronkhite barracks. Conference attendees have sleeping and eating experiences similar to those of students described above, but they have a very different experience of HI campus in between meals. Rather than go out into the park on trails for seven hours during the day, conference attendees spend most of their time attending meetings and indoor activities in HI classrooms. They still enjoy the views of the ocean and the fresh air, but only get off campus during the little break time they have before and after dinner. During the week, HI also hosts smaller conferences and strategic retreats, usually in the classrooms that are empty while students are out on trail.

HI Campus Description

Building Uses. The central campus area is located within historic Fort Cronkhite, whose landscape is defined by World War II- and Cold War-era (1960s) structures, open lawns between the buildings and stands of large trees, parking lots, and circulation routes. These features can be seen from a variety of locations including several roadways, open spaces to the west and south, as well as from several hiking trails (refer to Chapter 4, section 4.12.2 for Visual Resources methodology). HI currently uses

eight historic structures for administration activities, teaching, dormitories, dining, and conferencing and occupies just over 34,000 square feet of built space (Figure 2; Table 1).

Table 1. Fort Cronkhite Buildings Used by HI

Building #	Square Footage	Historic Association	HI Use
1010	5,838	Cold War era	Dormitory and classroom
1011	4,366	Cold War era	Two classrooms, three laboratories, teacher preparation area
1012	3,451	Cold War era	Dining hall accommodates 110 students at one seating
1013	6,430	Cold War era	Dormitory
1033	3,258	World War II era	Administration
1035	4,800	World War II era	Dormitory and classroom
1054	4,800	World War II era	Two large classroom/meeting rooms; also functions as primary conferencing space
1060	1,320	World War II era	Workshop

All but one of the HI buildings are clustered in the eastern half of Fort Cronkhite (Figure 2) and one building (1054) is at the westernmost end of the Fort. Building 1054's location provides beautiful ocean views, a short walk to the beach, and immediate access to the adjacent western parking lot.

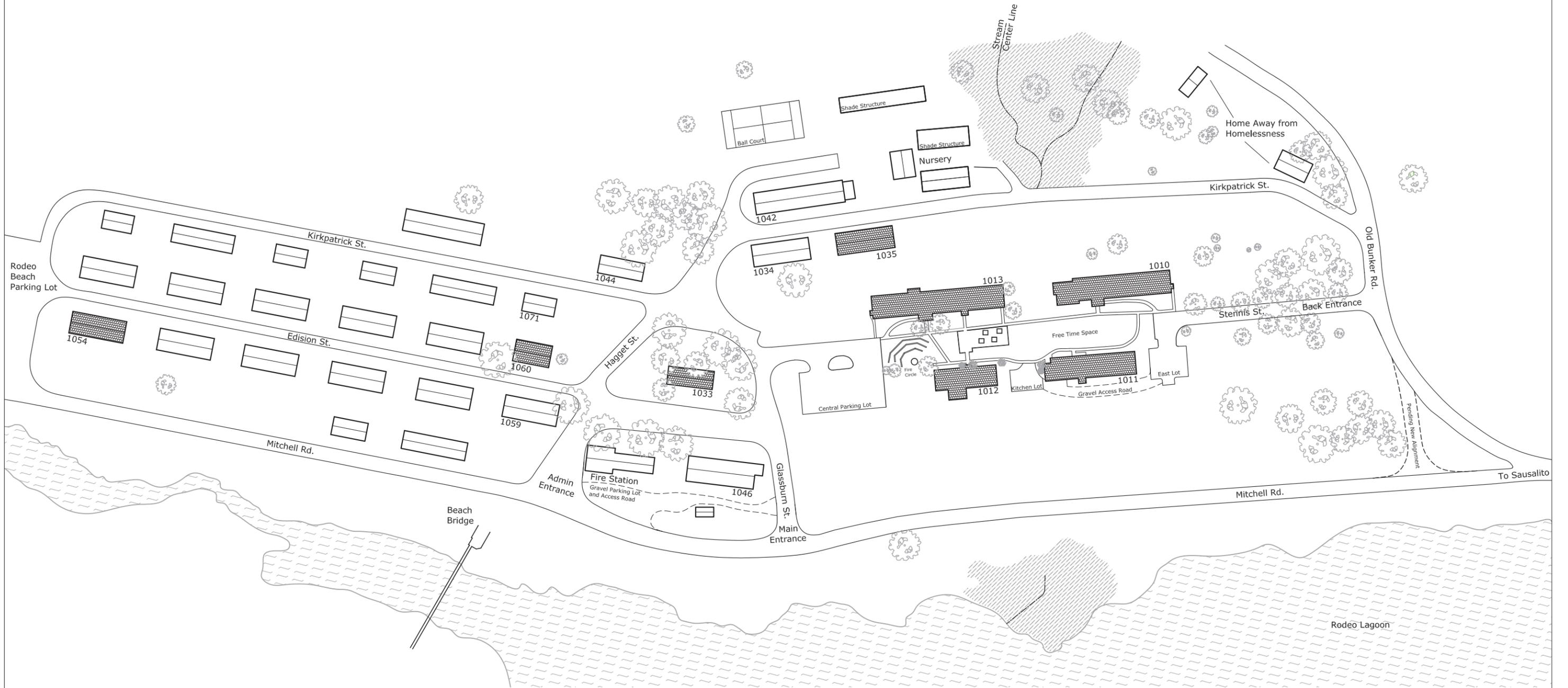
Open space. In total, the current campus includes approximately 44,000 square feet of open space used for educational programming and other HI activities. The historic fort landscape was defined by open turf fields with few or no shrubs or trees. The size and number of open fields grew as many World War II era buildings were removed in the later half of the 20th century. HI uses these fields as outdoor classrooms, for organized activity, and free time spaces for students. Several of these fields have been adapted for specific uses, including a whale bone display, a compost education area, and a volleyball court. The landscape between the Nike buildings that runs through the center of campus has been converted from a road bed into a playing area, a series of teaching spaces, and a fire circle.

As part of a national park, all of the open spaces on the HI campus are open to public visitors, although within the perimeter of HI buildings, visitors are monitored and non-HI group activities are discouraged in order to protect the students and provide the best environment for education. Open space on campus is used infrequently by conference participants.

Campus Access, Parking, and Circulation. The HI campus has three informal entrances. The main entrance is located on Glassburn Street just north of Mitchell Road. The "back" entrance to campus is off Bunker Road on the remnant of Stennis Street and is typically used by staff, service deliveries, and regular visitors. The administrative entrance to the campus is on Hagget Street just north of Mitchell Road.

Two-thirds of students arrive by bus and one-third by carpools (HI 2006). On a typical day, the student traffic would include 2 buses and 5-15 cars visiting the campus. Currently, buses and cars deliver students to campus at the central parking lot just off of Glassburn. Conference attendees typically arrive on campus by car.

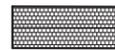
Figure 2.
Alternative A: No Action



Legend

Scale 1" = 150' at 11x17

Currently HI Occupied Buildings



Alternative A Building Uses

Dorms/Classrooms	Classrooms/Labs	Dining	Administration
1010 1013 1035	1011 1054	1012	1033 1060

Parking at Fort Cronkhite is non-exclusive with the exception of the parking lot east of HI's kitchen (Building 1012), which is used only for deliveries and kitchen staff. HI staff and educational program participants primarily use those parking lots most conveniently located to its facilities. These lots are shared by the staffs of HI, other park partners, and NPS, as well as student transportation vehicles, conference goers, and other park visitors (Figure 2). Conference goers typically arrive in private vehicles, often carpooling, and use those areas located most convenient to their meeting places. HI employees use an average of 24 parking spaces on a daily basis. Staff not driving private vehicles carpool, walk, or bike to the campus. Parking in and around the HI campus is sufficient for HI staff, visitors, and most deliveries, but access and parking for dining hall deliveries is inadequate. Approximately 2-3 semi-truck deliveries are made to the campus per week on weekdays.

Outside of the campus core (Buildings 1010–1013), the primary vehicular and pedestrian circulation is on historic fort roads (e.g., Mitchell, Glassburn, Hagget, Kirkpatrick, etc.). Within the campus core pedestrians use a system of concrete paths as well as social trails that connect the campus core with the buildings to the north and the lagoon and beach trails to the south. Some of these social trails have been surfaced with gravel by HI as a measure to reduce soil erosion.

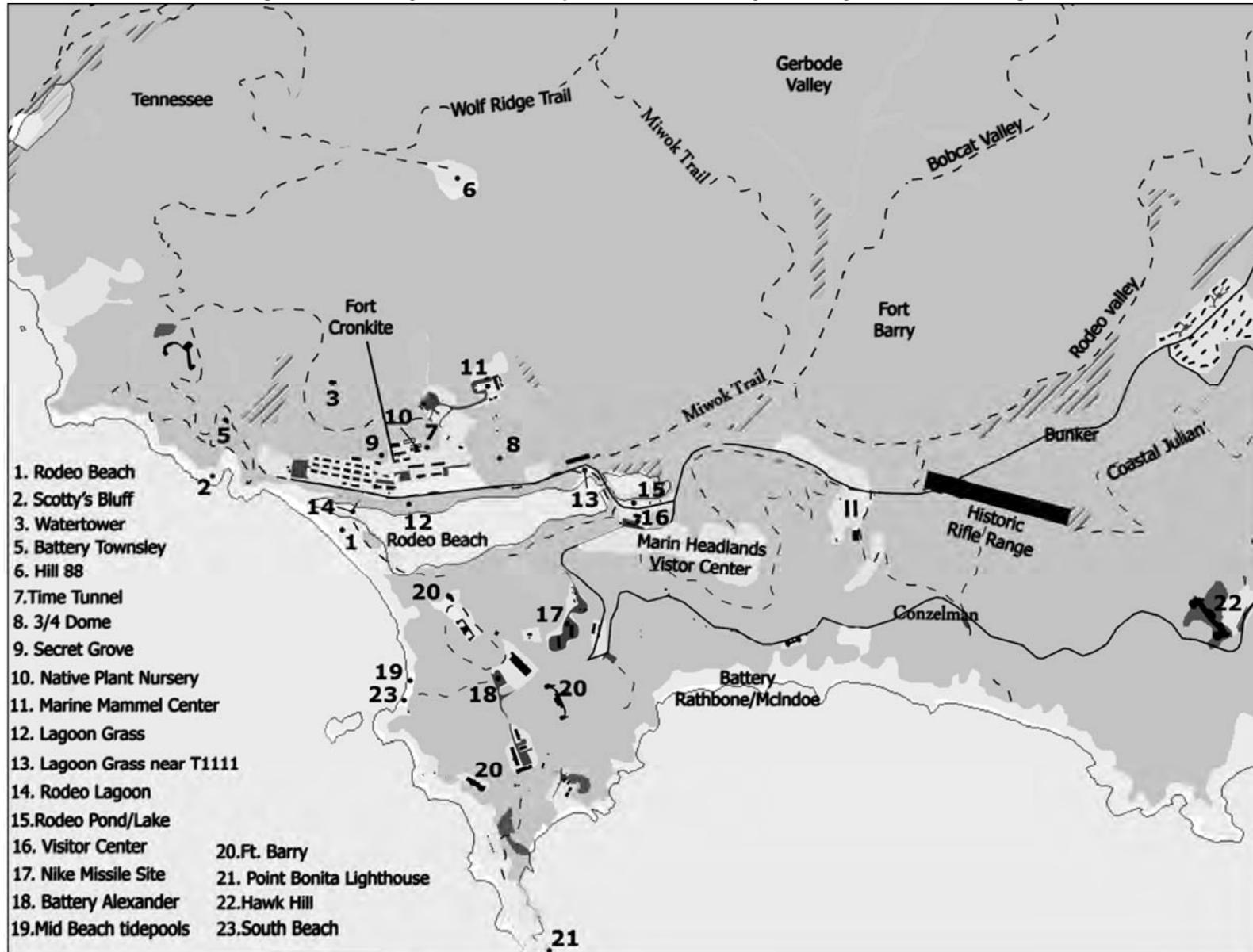
Off-Campus Site Use. Over its 30-year history, HI has used a variety of off-campus teaching tools and outdoor locations to complement on-campus educational programming. Currently, 22 off-campus park sites are used by HI to enhance the students' learning opportunities (Figure 3). Students are educated in the "leave no trace" concept to minimize any effects on the sites they visit. Students also participate in stewardship activities, often aimed at the restoration of the environment surrounding trails and teaching sites. To determine which off-campus sites to visit, Field Science Educators review matrices of available off-campus trails and teaching sites and reserve those areas that best match the hiking groups' learning objectives.

HI and NPS are developing an adaptive management program to ensure that the HI's use of off-campus teaching sites does not negatively affect the sites' natural and cultural resources. This program would expand over time to include any additional sites that HI groups visit (see below). Monitoring criteria are being developed for use by HI staff and approved by the NPS. The monitoring program would include a description of desired conditions and establish indicators and thresholds for each site. HI staff would provide NPS with periodic surveys and reports evaluating each site based on the predetermined criteria. If the NPS resource management staff determined that any site had achieved or exceeded an established threshold condition, measures would be taken such as redesigning programs, curtailing or discontinuing student visits, or implementing site restoration, until the site's desired conditions had been re-established.

Sustainability. Under this alternative, HI would continue its ongoing efforts to increase the sustainability of campus operations through modifying procedures and practices and making physical improvements that do not require substantial rehabilitation or construction. Over the past decade, these types of improvements have led to a significant decrease in HI's use of electricity and water. In 2005, in recognition of these efforts, HI won a Green Business Certification from Marin County. HI would continue to implement other similar sustainability measures; however, without undertaking significant rehabilitation, many further improvements could not be achieved.

Park Functions. Park occupied buildings at Fort Cronkhite include the maintenance sign shop (1046), the fire dorm (1034), short-term housing dorm (1042), historic barracks (1059), law enforcement rangers and interpretive/education rangers (1056), natural resources (1061), grounds and sign shop (1070), and maintenance operations (1066). Actions in Alternative A would not affect current park operations in these buildings.

Figure 3. Twenty-two Off-campus Sites Currently Used by HI for Teaching



2.3.2 Elements Common to all Action Alternatives

The following actions are common to all action alternatives.

HI Program Expansion

Program Capacity Expansion. Each action alternative proposes a capacity of up to 350 students (current capacity is 200). All action alternatives also include the continuation and growth of the conference program in proportion to the expansion in student capacity. For instance, if the student capacity increased 75% from 200 to 350, the maximum conferencing capacity would also increase 75% or from 150 to 260 visitors.

Staff Increases. Under the action alternatives, HI staff is anticipated to increase from the current level of 53 to up to as many as 80, due to the anticipated increase in number of students. It is expected that both staff and student increases would be implemented incrementally as new and rehabilitated facilities come on line.

HI Campus Facilities

All action alternatives include the continued use and improvement (rehabilitation) of seven of the eight existing HI Buildings (Buildings 1010, 1011, 1012, 1033, 1035 and 1060). Under the action alternatives, HI would move out of Building 1054 because it is located at the far west end of Fort Cronkhite, outside the core of campus. The building would be returned to the NPS for reuse.

The following is a brief listing of the goals for building rehabilitation and, where applicable, new construction for the action alternatives. Greater details regarding specific rehabilitation/construction treatments and actions would be developed during the design phase of the project. Any outdoor areas requiring trenching or ground-disturbance during the construction period to aid in landscape or building rehabilitation would be restored to a condition consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1996) and the preliminary cultural landscape report (Auwater and Curry 2008) once the construction phase is complete.

Historic Building Rehabilitation. All rehabilitation of historic structures would fulfill the following goals and requirements:

- Rehabilitate buildings for existing and new uses; retain existing historic character in compliance with *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
- Use state-of-the-art sustainable materials, fixtures, and systems in a manner that engages students.
- Fulfill Americans with Disabilities Act (ADA) standards for access to facilities.
- Upgrade or expand existing utilities and infrastructure that service HI buildings in a manner that better serves visitors, protects resources, and decreases the use of non-renewable resources.
- Abatement of hazardous materials such as lead paint and asbestos-containing materials. Appropriate abatement treatments would be decided on a case-by-case basis following GGNRA and NPS guidelines and oversight.
- Remove most non-historic additions and alterations from historic buildings, including the Cold War-era Nike buildings (Buildings 1010–1013) that have diminished historic character.
- Meet model building codes including the California State Historic Building Code.
- Solar panels would be placed on the four historic Nike buildings as part of a comprehensive sustainability program for the improved campus.

Dorms

- Sleeping rooms would be reconfigured to allow more space between bunks and to separate bunks into a variety of group sizes to match program management.
- Bathrooms would be renovated with a variety of sustainable fixtures side-by-side to engage students in comparing technologies.

Classrooms/Labs

- Additional space would be created through rehabilitation to fully accommodate the student body.
- Rooms would be reconfigured to match student group and program size and make most efficient use of space.
- Rooms would be designed for multiple uses with furnishing and equipment easily stored when not in use.
- State-of-the-art learning technology would be installed.

Building 1059. Action alternatives include the rehabilitation of this historic barracks structure for interpretation in collaboration with the NPS. This could include use of the second floor as an HI dormitory, and shared use of interpretive/public space on the first floor.

Building 1054. Building 1054, located on the westernmost edge of Fort Cronkhite, is separated from the rest of HI campus by over 200 yards. Under the action alternatives, the current uses in Building 1054—two large multi-purpose classrooms, meetings rooms, storage, restrooms—would be relocated to buildings in the campus core. Building 1054 would be vacated by HI and returned to the NPS.

HI Landscape Enhancement

Landscape Treatment. All action alternatives would implement the same landscape treatment (rehabilitation) developed in compliance with the guidelines of the preliminary cultural landscape report (Auwaerter and Curry 2008) and reviewed and approved by the NPS. Within the historic boundaries of the Nike administration site, the defining characteristics of the Cold War-era Nike resources would be rehabilitated. Outside the historic Nike boundaries, the landscape would be rehabilitated to reinforce the historic World War II development pattern and reveal the earlier layers of cultural and natural resources. All the action alternatives would include the removal of non-contributing features and the addition of some small-scale features as a means to improve wayfinding and visitor services, while enhancing the historic landscape in accordance with the *Secretary's of the Interior's Standards for the Treatment of Historic Properties* (NPS 1996).

The key elements of this landscape treatment include:

- Rehabilitating the World War II landscape beyond the Nike core and the riparian corridor. This would include removing the native and non-native plants that have volunteered or been added after the period of significance, leaving a simple landscape of turf and mature trees marking entrances and key locations.
- Rehabilitating the Nike landscape, including reestablishing the clear terracing of the landscape, reinstalling the orthogonal pathways, removing trees and shrubs not intentionally planted during the period of significance, and relocating the modern fire circle outside of the Nike core.
- Reestablishing the historic Stennis Road corridor through the Nike core, as a pedestrian route with a permeable surface edged with historically-compatible curbing.
- Reestablishing the historic Nike perimeter, including some representation of original fencing and other approaches to mark the edge.
- Converting the central parking lot into a central open space and the kitchen lot into a teaching open space following the historic form and curbing of the parking lots located on those sites and replacing parking lost to other areas at a 1:1 ratio.

- Restoring native vegetation outside of a defined edge of the World War II fort and in specific interpretive areas within the fort, including the riparian corridor and the footprints of some historic buildings. This would include the removal of non-native trees that have spread from the small groves historically planted on the fort.
- Creating a space adjacent to the restored riparian corridor to interpret the Coast Miwok's association with the area.
- Removing social trails and creating defined circulation between Nike and World War II portions of campus following the orthogonal form of historic paths.
- Removing the informal volleyball court from the lawn south of Building 1035 and replacing it with a sand activity court in the historic footprint of a World War II building.
- Adding new directional and informational signage.
- Replacing outdated and inefficient lighting fixtures with new state-of-the-art fixtures to minimize light pollution. The new fixtures will incorporate downcasted FSA/International Dark Sky approved equipment, motion sensors, and energy efficient lights to minimize light pollution.

Small-scale Features in the Landscape. All the action alternatives would include the removal of non-contributing features and the addition of some small-scale features as a means to improve wayfinding and visitor services, while enhancing the historic landscape in accordance with the preliminary cultural landscape report. These small-scale features may include, but are not limited to, exterior infrastructure, teaching decks, a fire circle cover, kiosks and signage, cisterns and swales, and tables, benches and trash receptacles.

Riparian Corridor Enhancement

Under all action alternatives, the riparian corridor running through and under the HI campus would be enhanced from Bunker Road to the edge of the Rodeo Lagoon (Figure 4). This project would include the daylighting of several buried reaches of the stream above and below the historic Nike installation, the enhancement of currently visible reaches, the removal of non-native plants, and revegetation with native plants. All these enhancements would be done in compliance with the guidelines of the preliminary cultural landscape report (Auwaerter and Curry 2008).

The riparian corridor enhancement would be designed to:

- Achieve the maximum possible enhancement/restoration of the ecological functions of the stream in balance with the cultural resources and educational role of the site;
- Accentuate the site's layered history by revealing pre-development natural systems.
- Create a living outdoor classroom in which students can monitor, study, and steward a riparian ecosystem and all visitors can learn about the restoration and function of riparian corridors.

As historic development has segmented the stream into distinct reaches, the plans for riparian corridor enhancement are best described reach-by-reach (Figure 4). The habitat values, site constraints, goals, and proposed actions for each reach are detailed in a summary by Kamman Hydrology & Engineering, Inc. (KHE 2008a). In brief, the plans for each reach include:

Reach 0 (north of Bunker Road, outside campus boundary). Install a sediment catchment basin and bank improvements to mitigate upstream watershed disturbances. This reach is outside the campus project boundaries, but is important to include because without these upstream measures sediment inputs could quickly degrade downstream enhancements.

Reach 1 (from footbridge south to educational zone). Lay back overly steep banks and construct step pools to reduce incision and increase storage capacity for water and sediment; remove non-native trees and other plants and restore native plant communities.

Figure 4. HI Campus and Fort Cronkhite - Stream Restoration Project Reaches

Reach 2 (from southern edge of Reach 1 to Kirkpatrick Street). Combine ecological enhancements planned for Reach 1 with educational enhancements to enable students to experience and study the stream with minimum impact, such as boardwalks, consolidated trails, and natural barriers to off-trail activity. Reaches 1 and 2 would be kept distinct to constrain the impacts of educational use to limited areas.

Reach 3 (tributary from Bunker Road to confluence stream north of Kirkpatrick Street). Create upslope sediment basin and in-stream detention features to trap excess sediment; remove non-native trees and other plants, and restore native plant communities.

Reach 4 (passage under Kirkpatrick Street). Install a free-span bridge or natural bottom arch culvert that provides ecological continuity, enabling the stream and students to pass under Kirkpatrick Street with minimal disruption.

Reach 5 (south from Kirkpatrick Street to northern boundary of Nike installation). Daylight culverted stream and reestablish natural willow riparian corridor ecological functions; reengineer or reroute utilities that cross the corridor; install trails, platforms, interpretive signage, and study stations to create low impact outdoor classrooms.

Reach 6 (culvert beneath Nike installation). Install larger capacity pipe, build headwalls and energy dissipation structures that minimize impact on adjacent enhanced reaches, and potentially install earthen bottomed culvert and interpretive culvert entrances.

Reach 7 (south from Nike installation to Mitchell Road). Daylight the culverted stream channel and reestablish an in-set distributary delta terrace and willow riparian corridor; reengineer or reroute utilities that cross this corridor; install trails, platforms, interpretive signage, and study stations to create low impact outdoor classrooms; create a Coast Miwok cultural interpretation area in the willow thicket surrounding this reach. This would be created in close consultation with tribal representatives.

Reach 8 (culverts beneath Mitchell Road). Install a causeway or a series of earthen bottom culverts to accommodate water flow from the rehabilitated riparian delta under Mitchell Road.

Reach 9 (south from Mitchell Road through existing delta to Rodeo Lagoon). Create pilot channels across the delta and adjacent wetlands to connect the upstream distributary channel network to the expanded lagoon wetland fringe, remove non-native plants and enhance the willow riparian woodlands, and potentially construct a boardwalk and blind to enable students to study the Lagoon ecology.

Campus Access, Parking, and Circulation

Bus Circulation and Dropoff. Under the action alternatives, the bus drop-off location would move from the current main parking lot to a new bus drop off zone added to the southern edge of Kirkpatrick St. just above the relocated main parking lot and just west of the intersection of Kirkpatrick St. and Bunker Road (shown in Figure 5). Buses would enter campus by turning right (north) onto Glassburn St. from Mitchell Rd. They would proceed north to Kirkpatrick Street and turn right, heading east. When they reached the new main parking lot entrance, they would pull into the new bus drop-off zone.

The bus drop off zone would provide room for 3 buses to load and unload simultaneously. The drop off zone would be created by widening Kirkpatrick Street just enough to allow traffic to safely pass without altering the historic roadway any more than necessary. A relatively narrow roadway is desirable to slow traffic in an area where students are getting on and off buses. This section of Kirkpatrick Street currently receives very low usage and does not provide the single route to any facility.

Once buses had dropped off or loaded students, they would proceed east, turn right (south) to drive down Bunker Road back to Mitchell Road where they would turn left (west) and proceed back to U.S. 101. This succinct loop (right on Glassburn Street, right on Kirkpatrick Street, right on Bunker Road and left back on to Mitchell Road) matches historically intended circulation patterns.

HI will collaborate with neighbors in Fort Cronkhite in refining this circulation plan to minimize the impact of HI students on adjacent park partners including park operations.

Visitor Vehicle Circulation. Under all the action alternatives, campus visitor vehicle circulation would focus on two loops on the east side of campus, again minimizing traffic through the fort (see map, Figure 5). The main visitor vehicle access would be reached by turning left (west) off of Bunker Rd. onto Kirkpatrick St. and then immediately left into the new main parking lot. Visitor vehicles would exit by turning right (east) out of the parking lot and proceeding back to Old Bunker Road. The secondary visitor vehicular access would be reached by turning left (west) off of Bunker Rd. onto Stennis St., which leads to the historic east parking lot. From both of these lots, visitors would take pedestrian paths to the east end of the restored Stennis St. and then proceed into campus.

Parking Modifications. Under the action alternatives, parking removed by HI would be replaced in a new parking lot constructed just southwest of the intersection of Kirkpatrick Street and Bunker Road. As shown in Figures 6 through 8, the action alternatives include variations on this parking lot. Common to all action alternatives would be the removal of the parking spaces in the kitchen lot beside Building 1011, the elimination of the informal road behind Building 1011, and the conversion of the central parking lot into a central open space.

The new main parking lot would be a double loaded single aisle pull through parking lot approximately 160 ft x 60 ft, accommodating 34 spaces including 2 ADA accessible spaces. The lot would be paved with a permeable surface to maximize infiltration and natural filtration. What water did not drain through the permeable pavement of the new main parking lot would drain to a biofiltration swale. Biofiltration swales are vegetated drainage ditches that use multiple mechanisms to remove pollutants from water (see glossary). The proposed bioswale would be along the southern edge of the main parking lot. Details of the configuration and planting palette would be developed in concert with the NPS natural resources staff during the design phase.

Off-Campus Site Use

Adaptive Management Program for Off-Campus Teaching Sites. HI and NPS are developing an adaptive management program to ensure that the HI's use of off-campus teaching sites does not negatively affect the sites' natural and cultural resources. This program would expand over time to include any additional sites that HI groups visit (see below). In some instances, selected sites may be enhanced to increase capacity to support ecological and educational objectives. Monitoring criteria are being developed for use by HI staff and approved by the NPS. The monitoring program would include a description of desired conditions and establish indicators and thresholds for each site. HI staff would provide NPS with periodic surveys and reports evaluating each site based on the predetermined criteria. If the NPS resource management staff determined that any site had achieved or exceeded an established threshold condition, measures would be taken such as redesigning programs, curtailing or discontinuing student visits, or implementing site restoration, until the site's desired conditions had been re-established.

Site Selection Process for Additional Off-Campus Teaching Areas. HI and NPS recognize that there may be a need to vary or increase currently used off-campus teaching sites to accommodate more students, reduce visitation to specific locations, or expand the educational opportunities through new locations. The portions of the Marin Headlands within student hiking distance of campus hold many more potential teaching spaces than are currently in use. HI is working with NPS to develop a process for selecting additional appropriate sites for educational programs. HI and NPS would identify and select new sites through a collaborative process (described in Appendix A) that would ensure protection of park resources and visitor experience, including those of students.

Sustainability

All action alternatives are designed to reach three sustainability benchmarks which are described below:

- 1) A minimum silver or higher Leadership in Environmentally Efficient Design (LEED) rating (achievable rating may vary by alternative).
- 2) Zero increase in electricity usage, natural gas use, water usage, and sewage output while increasing the number of students by up to 350.
- 3) Reduced non-natural stormwater runoff from the site and create a more natural runoff regime.

LEED Certification and Sustainable Building Goals. A silver or higher LEED rating would be achieved. While the achievable rating would vary by alternative, all action alternatives would:

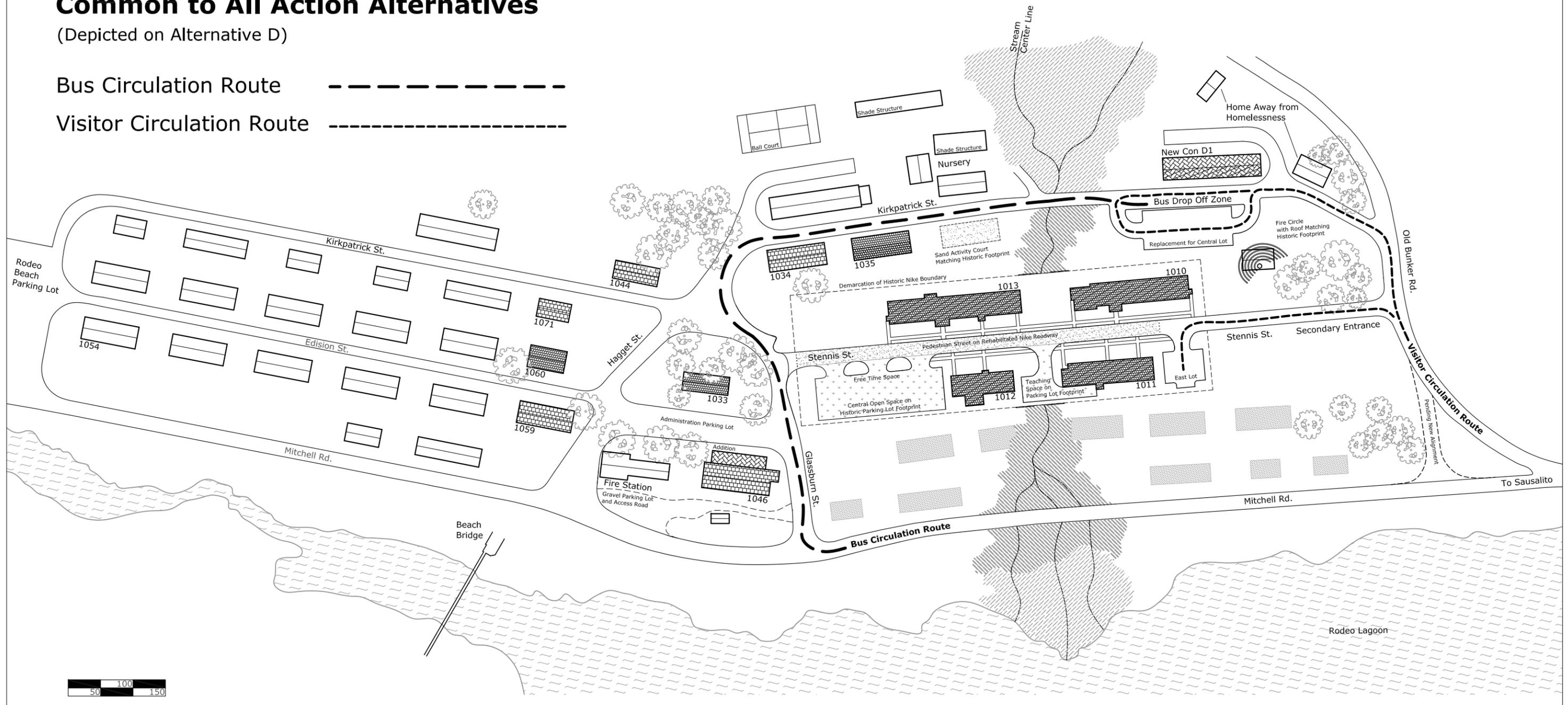
- Support access to campus by public, mass and alternative transportation.
- Site a majority of functions in reused historic buildings.
- Only construct new buildings on previously disturbed historic footprints of buildings.
- Only construct new landscape elements on previously disturbed ground.
- Daylight and enhance a riparian corridor.
- Restore 1.5 acres of native vegetation.
- Decrease impervious surface and unfiltered runoff to the lagoon.
- Use best management practices (BMPs) to minimize construction impacts.

Figure 5: Bus and Visitor Circulation Routes Common to All Action Alternatives

(Depicted on Alternative D)

Bus Circulation Route - - - - -

Visitor Circulation Route - - - - -



- Recycle and reuse materials removed during rehabilitation.
- Provide a majority of electrical power through on-site solar generation.
- Reduce per-capita water use and sewage output by over 40% through water conservation and reuse measures.
- Utilize all natural cooling and minimize energy use for heating through insulation, right-sizing and participatory management.
- Minimize waste through management, reuse, recycling and composting.
- Reduce light pollution through carefully designed interactive lighting (see lighting description in *Landscape Treatment*, above).
- Use the most sustainable materials and technology for each application, with an emphasis on overtly or transparently sustainable materials that create teaching moments.
- Use multiple sustainable materials and technologies side-by-side to illustrate their potential and their applicability.

Zero Increase in Utilities. All action alternatives would also reach beyond LEED standards to achieve zero increase in electricity, natural gas, and water usage and sewage output while increasing the number of students by up to 350.

- Zero increase in off-site generated electricity usage would be achieved through the installation of solar panels to generate electricity on-site. The action alternatives include the incorporation of panels into building roofs (existing and proposed new construction), though the exact placement would vary by alternative (see Figures 6-8). HI, in collaboration with the NPS, would explore other opportunities for the incorporation of photovoltaic cells into the project at the design phase; any additional panels would be compatible with the historic setting and would be subject to review and approval by NPS. Details regarding the anticipated changes in energy usage are provided in Chapter 4, Section 4.13.4.
- A propane conservation plan would be developed to ensure that natural gas usage is efficient and sustainable.
- Zero increase in water usage and sewage output would be achieved through a range of water conservation and efficiency measures (Carlile-Macy, 2008). The Institute's current peak quarterly water usage and thus sewage output is 401,000 gallons. To grow from 200 to 350 students without expanding this usage and output, per capita water usage would need to be cut by 43%. This is achievable through water conservation measures in the three areas of campus that use the vast majority of the water—the kitchen, dorms and classroom buildings, which includes the bathrooms. The conservation measures and their contribution to overall reduction in water use and sewage production are summarized in Chapter 4, Section 4.13.4 (see also the Carlile-Macy report in Appendix B, for more detail).

Water Resource Management. The action alternatives would also include a water resource management program to reduce stormwater runoff from the site and create a more natural regime. This would be achieved by:

- Re-engineering hardened ground surfaces to maximize infiltration and minimize runoff with sediment.
- Re-engineering site drainage to resolve minor ponding/flooding and erosion that occurs on campus. Daylighting the stream to the edge of the Nike core and re-establishing the natural drainage pattern would contribute to resolving both these problems.
- Converting the central parking lot, which currently drains directly into the lagoon, into a landscaped area to reduce runoff.
- Installing biofiltration swales in all replacement parking lots.
- Installing cisterns and infiltration basins to capture and either reuse or enhance infiltration of roof run off.

Project Implementation

HI's construction program is anticipated to begin in 2011 and would continue over approximately three to eight years depending on available funding. Construction activities would be phased to a) keep the educational and conference programs open at the same time, b) continue programs at current levels throughout construction, and c) minimize impacts to resources and visitor experience.

Construction staging would be located within or in close proximity to HI campus to control the area of disturbance. There may be a need for additional minor staging areas depending upon the sequencing and size of storage areas needed.

2.3.3 Alternative B: Rehabilitation Only

Alternative B proposes to meet the project purpose and need through the rehabilitation of existing structures within the Fort Cronkhite campus according to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and the landscape treatment guidelines of the preliminary cultural landscape report (Auwaerter and Curry 2008). This alternative focuses on creating a unified campus organized around a central open space with views of the defining natural and cultural resources of the Marin Headlands: the lagoon, the ocean and the batteries (Figure 6).

As previously introduced in Section 2.1.2, Table 2 below presents an overview of the building configurations for each alternative.

Table 2. Buildings Included in Each Alternative

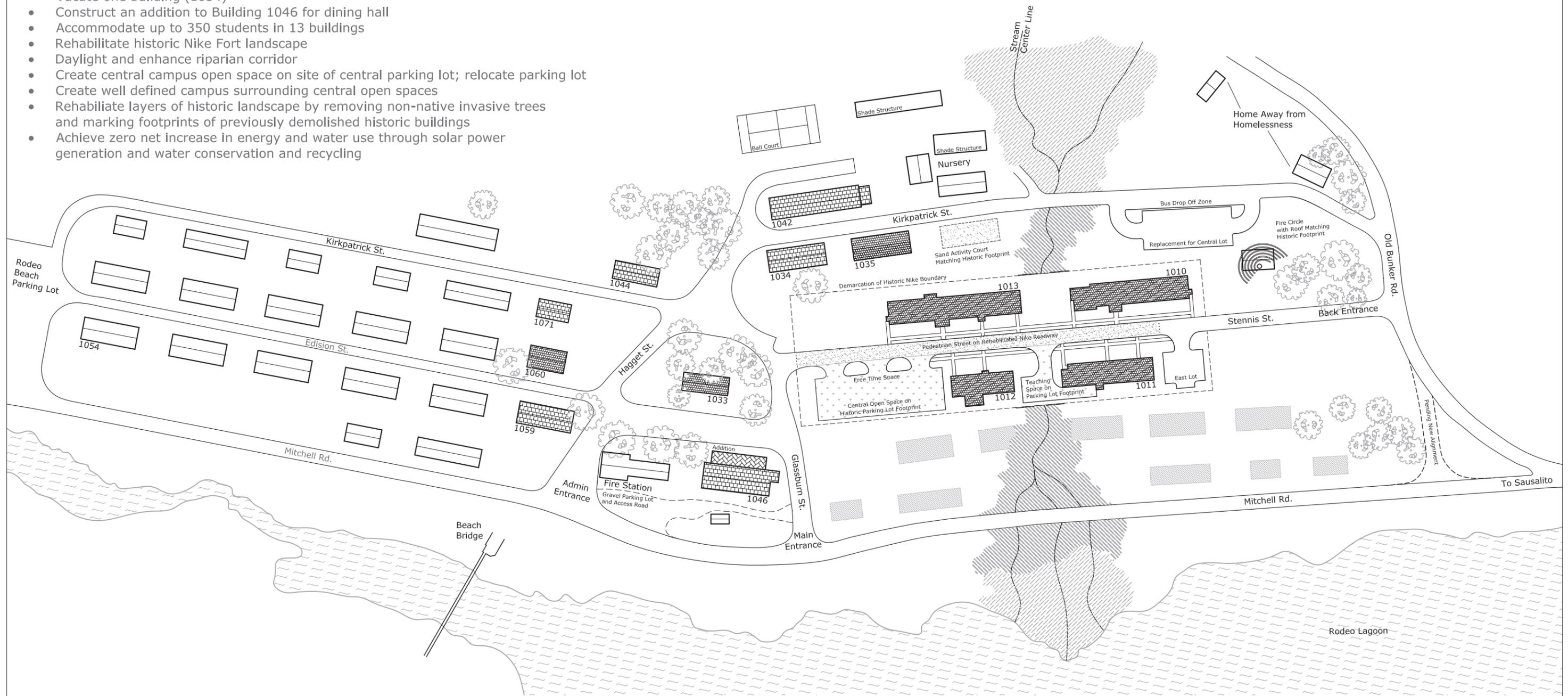
No Action Alternative A	Included in Alternative B Rehabilitation Only	Included in Alternative C Rehabilitation and Three New Buildings	Included in Alternative D Rehabilitation and One New Building
1010	1010	1010	1010
1011	1011	1011	1011
1012	1012	1012	1012
1013	1013	1013	1013
1033	1033	1033	1033
	1034		1034
1035	1035	1035	1035
	1042		
	1044	1044	1044
	1046		1046
1054			
	1059	1059	1059
1060	1060	1060	1060
	1071	1071	1071
		New Construction C1	New Construction D1
		New Construction C2	
		New Construction C3	

Building Uses

Under this alternative, HI would rehabilitate and occupy 13 buildings primarily in the eastern half of Fort Cronkhite, to provide 55,674 square feet for HI use (refer to Tables 1 and 2). As is true for all action alternatives, HI would rehabilitate seven of the eight buildings currently used by HI and improve Building 1059 for joint NPS/HI uses. This alternative also proposes the rehabilitation of five additional World War II buildings.

Figure 6. Alternative B: Rehabilitation

- Expand campus through reuse of 6 additional historic buildings
- Vacate one building (1054)
- Construct an addition to Building 1046 for dining hall
- Accommodate up to 350 students in 13 buildings
- Rehabilitate historic Nike Fort landscape
- Daylight and enhance riparian corridor
- Create central campus open space on site of central parking lot; relocate parking lot
- Create well defined campus surrounding central open spaces
- Rehabilitate layers of historic landscape by removing non-native invasive trees and marking footprints of previously demolished historic buildings
- Achieve zero net increase in energy and water use through solar power generation and water conservation and recycling



Legend

Scale 1"=150' at 11x17

50 100 150

HI Currently Occupied Historic Buildings		Proposed Marked Historic Building Footprints	
Proposed Additional HI Occupied Historic Buildings		Current Riparian Corridor	
Proposed Solar Panels on Building Roofs		Proposed Enhanced Riparian Corridor	

Alternative B Building Uses			
Dorms/Classrooms	Classrooms/Labs	Dining	Administration
1010	1011	1046 with addition	1033
1013	1012		1060
1034	1044		
1035	1071		
1042			
1059			

2.3.4 Alternative C: Rehabilitation and Three New Buildings

Alternative C would meet the project purpose and objectives through a combination of rehabilitation of existing structures and new construction within the historic building footprints at Fort Cronkhite (Figure 7). This alternative maximizes the concentration of the campus on the east end of Fort Cronkhite and offers multiple opportunities to use state-of-the-art sustainable new construction.

Building Uses and New Construction

As is true for all action alternatives, seven of the eight buildings currently used by HI would be rehabilitated and Building 1059 would be improved for new uses. Two World War II era buildings—1044 and 1071—would be added to the campus and rehabilitated as classrooms/labs, which is also their current use (refer to Table 2). In addition, this alternative proposes the construction of up to three new buildings (C1, C2, and C3) on historic footprints along Kirkpatrick Street, for a total of 17,500 square feet of new space. A new dining hall would be created on the first floor of new building “C3” at the northeast corner of campus (Figure 7). Two other new buildings would house additional labs, classrooms, and dorms. The location of these new buildings would consolidate most of HI facilities east of Glassburn Street. The implementation of this alternative would result in an increase in square footage to a total of 55,174 square feet.

New construction would be in a style compatible with the historic World War II buildings and in accordance with the *Secretary of the Interior’s Standards for the Treatment of Historic Properties*. New buildings would be designed to be “distinguishable, but compatible,” with the goal of introducing new buildings into the historic fabric of Fort Cronkhite without misrepresenting them as historic structures. The new buildings would be constructed in a similar form and dimensions as Building 1042 (140 feet long by 34 feet wide and with a 26 foot high rooftop peak). Under this alternative, solar panels on the roof of one newly-constructed building, in addition to the roofs of the 4 historic Nike buildings, would enhance the sustainability of the improved campus by providing on-site electricity (Figure 7).

Open Space

Under this alternative, the construction of new buildings would decrease the amount of open space used for HI activities. The areas where new construction would occur are currently used extensively for teaching and other HI activities. These activities would be moved to the new open space created on the site of the current central parking lot which would be designed to stand up to consistent use for educational and free-time activities. This field would be created using soil and sub-strata engineering techniques intended to improve drainage and avoid compaction to result in a resilient, healthy, and long-lived turf. A new sand volleyball court and group challenge area would be created in the historic building footprint immediately east of Building 1011. Under this alternative the total available open space would drop to 40,000 square feet from the 44,400 square feet that is currently available.

Campus Access, Parking, and Circulation

See the *Elements Common to all Action Alternatives* section (2.3.2) above for bus and visitor circulation patterns.

The access drive leading behind the new dining hall building (new building C1) would be reestablished on the historic roadbed to allow service access off of Kirkpatrick Street. The drive would be approximately 22 feet wide and 220 feet long and designed to be consistent with guidelines of the preliminary cultural landscape report (Auwater and Curry 2008).

Park Functions

Under this alternative no park functions would be relocated.

Under this alternative, Building 1046 would be rehabilitated and an addition would be constructed to serve as a new dining hall. The location and size of Building 1046 make it the best option for a dining hall amongst existing buildings; located at the historic center of the fort, immediately off Mitchell Road, it is readily accessible for deliveries and visitors. Building 1046 offers direct ocean views that would connect guests to the cultural and natural resources of the area. The open floor plan of Building 1046 is the biggest in the immediate area of HI and with a 1,600 square foot building addition it could comfortably accommodate up to 175 people for dining at one time. The facility would also double as a central public space for events. Rehabilitating Building 1046 as a dining hall would also require the addition of new entrances and access paths, consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. The proposed addition on the south side would include a staff and delivery entrance. A new delivery path would be installed from the central administrative parking lot south to the delivery entrance.

Buildings 1044 and 1071 would be rehabilitated to create additional laboratories and classrooms. The use of these buildings would create a continuous perimeter for the campus just west of Hagget Street and pull these areas more definitively into the HI campus. Buildings 1034 and 1042 would be rehabilitated to provide dorm space.

Open Space

Under this alternative, open areas for learning and play would increase from 44,000 square feet (No Action alternative) to 58,000 square feet as the central parking lot would be converted to a new central open space, the kitchen lot converted into a teaching area, and the open spaces west of Glassburn Street included within the broader campus. The expanded western perimeter of the campus would increase the outdoor spaces available for teaching and use during free time, quadrupling the available spaces with views of the ocean, lagoon and batteries. The new central open space would be designed to stand up to consistent use for educational and free-time activities. This field would be created using soil and sub-strata engineering techniques intended to improve drainage and avoid compaction to result in a resilient, healthy, and long-lived turf. A new sand volleyball court and group challenge area would be created on the historic building footprint immediately east of Building 1035. Beyond the formalized open spaces described above, all the space within the perimeter formed by HI buildings is considered open space and teaching space for student use. In addition to the new campus central open space, the open spaces north of Building 1033, north of the intersection of Glassburn and Hagget Streets and southeast of the intersection of Hagget and Kirkpatrick Streets would become prime teaching and activity spaces primarily, but not exclusively, used by HI programs.

Campus Access, Parking, and Circulation

See the *Elements Common to all Action Alternatives* section (2.3.2) above for bus and visitor circulation patterns.

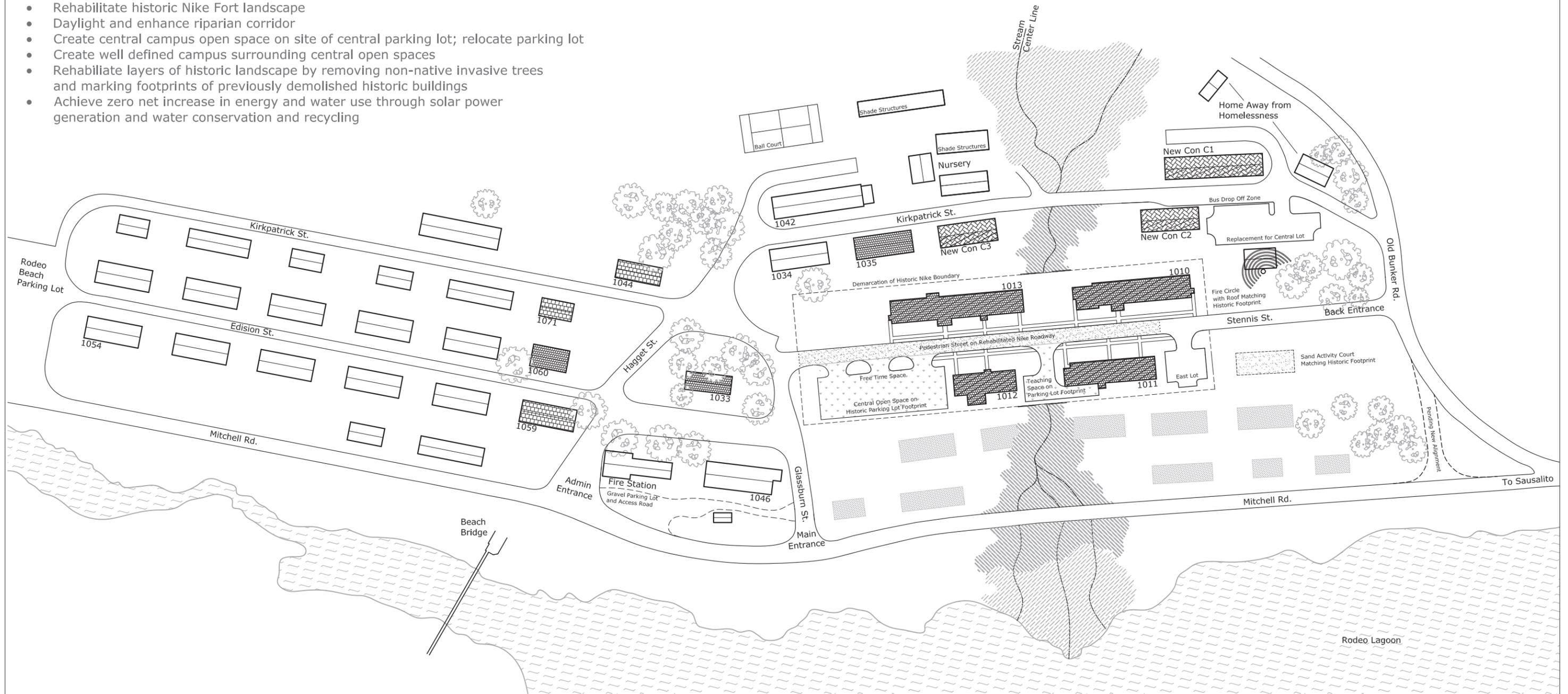
Access to the kitchen storage at Building 1046 would be located to minimize visibility of delivery activity and conflicts with existing circulation and parking.

Park Functions

Under this alternative several NPS functions would be relocated from their current locations at Fort Cronkhite to other locations in the park. These include: the maintenance shop in Building 1046, the fire dorm in Building 1034, and the short-term housing dorm in Building 1042. The terms of relocation of any park functions would be agreed upon by HI and the NPS. These terms would include provisions that relocation buildings and spaces would be as good as, or better than, the original space and that the relocation spaces would be fully available before any moves.

Figure 7. Alternative C: New Construction and Rehabilitation

- Expand campus through reuse of 3 additional historic buildings and construction of 3 new buildings on footprints of historic buildings
- Vacate one building (1054)
- Accommodate up to 350 students in 13 buildings
- Rehabilitate historic Nike Fort landscape
- Daylight and enhance riparian corridor
- Create central campus open space on site of central parking lot; relocate parking lot
- Create well defined campus surrounding central open spaces
- Rehabilitate layers of historic landscape by removing non-native invasive trees and marking footprints of previously demolished historic buildings
- Achieve zero net increase in energy and water use through solar power generation and water conservation and recycling



Legend

Scale 1"=150' at 11x17

Currently HI Occupied Historic Buildings		Proposed Marked Historic Building Footprints	
Proposed Additional HI Occupied Historic Buildings		Current Riparian Corridor	
Proposed HI Occupied New Construction		Proposed Enhanced Riparian Corridor	
Proposed Solar Panels on Building Roofs			

Alternative C Building Uses			
Dorms/Classrooms	Classrooms/Labs	Dining	Administration
1010	1011	New Con C1	1033
1013	1012		1060
1035	1044		
1059	1071		
New Con C2			
New Con C3			

2.3.5 Alternative D: Rehabilitation and One New Building (Preferred)

Alternative D would meet the project purpose and objectives through rehabilitation of existing structures and the construction of one new building within a historic building footprint at Fort Cronkhite (Figure 8). This alternative combines a unified campus organized around a central open space, characterized by views of the defining natural and cultural resources of the Marin Headlands, and providing the opportunities offered by state-of-art sustainable new construction.

Building Uses and New Construction

As is true for all action alternatives, seven of the eight buildings currently used by HI would be rehabilitated and Building 1059 would be improved for new uses. In this alternative, four additional World War II era buildings—1034, 1044, 1046, and 1071—would be included as part of the campus (refer to Table 2). In addition, this alternative proposes the construction of one new building (D1) on a historic footprint located just northwest of the intersection of Kirkpatrick Street and Old Bunker Road (see Figure 8) and the addition of 1,600 square feet of space to Building 1046, for a total of 10,000 square feet of new space. The increase in area under this alternative would result in a total campus size of 55,674 square feet.

A new dining hall would be created in either the new building (D1) or the expanded Building 1046. Both buildings offer the large single floor needed for a dining hall and desired views of the defining resources—the lagoon, ocean, and batteries. Both buildings are also located at the edge of campus on existing roads, offering easy service access without bringing truck traffic into campus. At the same time, their locations on opposite corners of campus would create two distinct experiences—a dining hall in the new Building D1 would move the center of campus east concentrating activity in the Nike historic core and the open spaces along Kirkpatrick Street, while a dining hall in Building 1046 would reinforce the new campus central open space and the open spaces around Building 1033 as the center of campus. No decisions have been made as to which location is preferable, and would be decided at a future date when funding options are secured and specific programmatic details are refined. As such, Alternative D includes both options so that the new dining hall can be placed in the optimal location as the campus design evolves.

Other buildings would house additional labs, classrooms, and dorms. Similar to Alternative B, the use of these buildings would create a continuous perimeter of the campus west of Haggert Street and pull these areas more definitively into the HI campus.

Similar to Alternative C, constructing a new building would provide an opportunity to use state-of-the-art sustainable design in a manner that creates learning experiences to relate directly to students' home and school environments. The new building would be designed to meet the standard for LEED certification for compatible new construction in a historic district.

New construction would be in a style compatible with the historic World War II buildings and in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. The new building would be designed to be "distinguishable, but compatible," with the goal of being introduced into the historic fabric of Fort Cronkhite, without misrepresentation as historic structure. As described for Alternative C, this means that the new building would be constructed in a similar form and dimension as the historic Building 1042 (140 feet long by 34 feet wide and with a 26-foot high rooftop peak). Under this alternative, solar panels would be incorporated into the roof of the new building, as well as on the historic Nike building roofs to enhance the sustainability of the improved campus by providing on-site electricity (Figure 8).

Open Space

Under this alternative, open space for learning and play would increase from 44,000 square feet (No Action Alternative) to 51,600 square feet as the central parking lot is converted to an open space, the

kitchen lot is converted into a teaching open space, and the open spaces west of Glassburn are brought within the campus perimeter. The expanded western perimeter of the campus would increase the outdoor spaces available for teaching and use during free time. A new central open space would be designed to stand up to consistent use for educational and free time activities. This field would be created using soil and sub-strata engineering techniques intended to improve drainage and avoid compaction to result in a resilient, healthy, and long-lived turf. A new sand volleyball court and group challenge area would be created in the historic building footprint immediately east of Building 1035. In addition to the new campus central open space, the open spaces north of Building 1033, north of the intersection of Glassburn and Hagget Streets and southeast of the intersection of Hagget and Kirkpatrick Streets would become prime teaching and activity spaces primarily, but not exclusively, used by HI programs.

Campus Access, Parking, and Circulation

See the *Elements Common to all Action Alternatives* section (2.3.2) above for bus and visitor circulation patterns.

The historic access drive leading behind the new building D1 would be reestablished on the historic roadbed to allow service access off of Kirkpatrick Street. The drive would be approximately 22 feet wide and 220 feet long and consistent with rehabilitation guidelines of the preliminary cultural landscape report (Auwater and Curry 2008).

Park Functions

Under this alternative two NPS functions would be relocated from their current locations at Fort Cronkhite to other locations in the park. These include: the maintenance shop in Building 1046 and the fire dorm in Building 1034. The terms of relocation of any park functions would be agreed upon by HI and the NPS. These terms would include provisions that relocation buildings and spaces would be as good as, or better than, the original space and that the relocation areas would be fully available before any moves.

2.4 Alternatives Considered but Dismissed

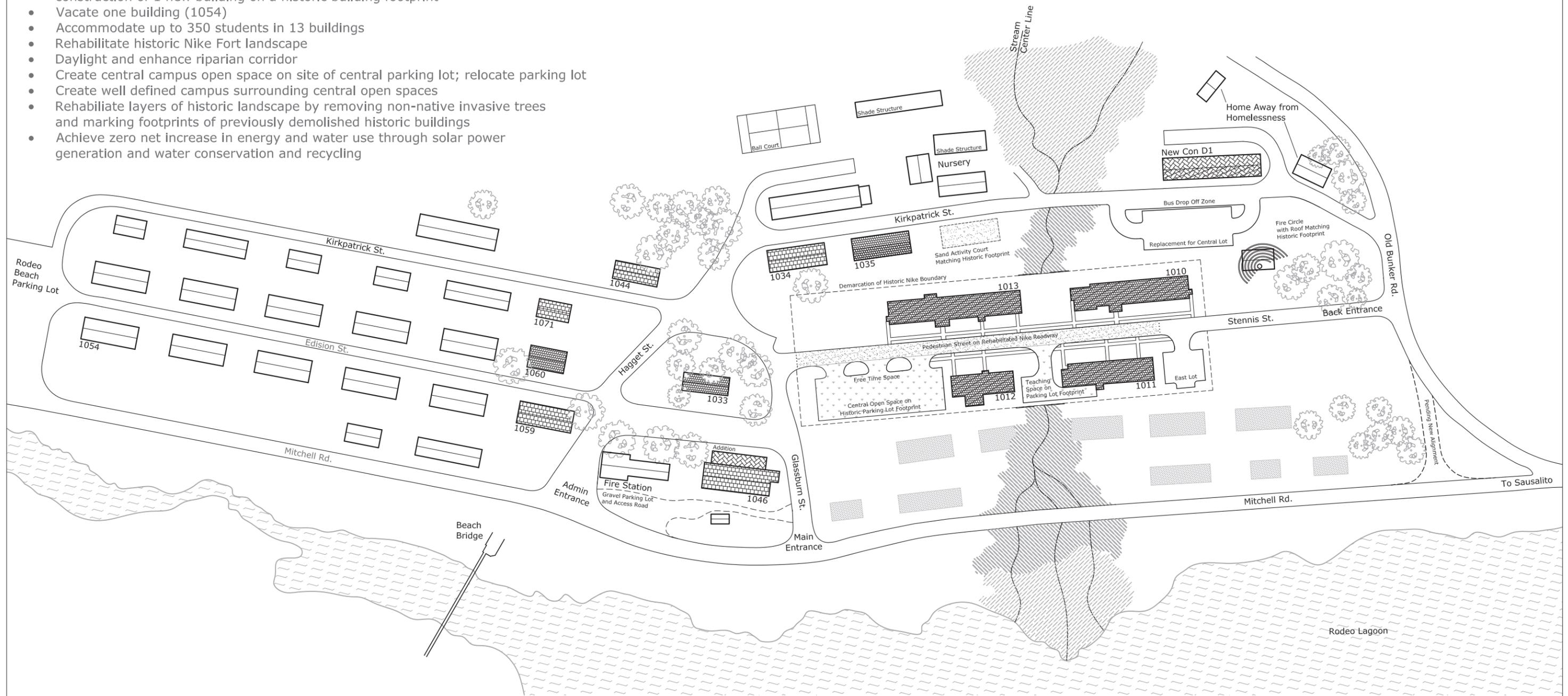
CEQ requires that a full range of reasonable alternatives is analyzed in a NEPA document (Q1a). Reasonable alternatives are those that are “practical or feasible from the technical and economic standpoint and using common sense” (Q2a). Alternatives that cannot be implemented or do not resolve the need for action and fulfill the purpose in taking action are eliminated from further analysis. Alternatives can be dismissed from further analysis for a variety of other reasons, including: cost, technical or logistic barriers; and/or unacceptable environmental impacts (NPS 2001:20). This section describes alternatives that have been considered but eliminated from further study. This discussion includes only alternatives initially thought at one time to be viable or suggested by the public. Reasoning for their elimination (e.g., technical/economic infeasibility, inability to meet project objectives, etc.) is also included.

2.4.1 New Construction Only

HI considered the possibility of expanding its campus through the construction of new buildings only, adjacent to the existing structures and the campus core. This alternative would not include rehabilitation of any additional existing buildings in Fort Cronkhite. Expanding and improving the campus through *only* new construction would involve building four to six new structures surrounding the core of Cold War-era Nike buildings that serve as the center of campus. HI and NPS considered all of the possible locations for new buildings within Fort Cronkhite that would be compatible with the historic setting. HI also prepared preliminary cost estimates for this alternative. Based upon the results of this analysis, the alternative of expanding and improving the campus through new construction only was dismissed for the following reasons:

Figure 8. Alternative D: Rehabilitation and One New Building

- Expand campus through reuse of 5 historic buildings and construction of 1 new building on a historic building footprint
- Vacate one building (1054)
- Accommodate up to 350 students in 13 buildings
- Rehabilitate historic Nike Fort landscape
- Daylight and enhance riparian corridor
- Create central campus open space on site of central parking lot; relocate parking lot
- Create well defined campus surrounding central open spaces
- Rehabilitate layers of historic landscape by removing non-native invasive trees and marking footprints of previously demolished historic buildings
- Achieve zero net increase in energy and water use through solar power generation and water conservation and recycling



Legend



Scale 1"=150' at 11x17

HI Currently Occupied Historic Buildings		Proposed Marked Historic Building Footprints	
Proposed Additional HI Occupied Historic Buildings		Current Riparian Corridor	
Proposed HI Occupied New Construction		Proposed Enhanced Riparian Corridor	
Proposed Solar Panels on Building Roofs			

Alternative D Building Uses

Dorms/Classrooms	Classrooms/Labs	Dining	Administration
1010 1011 1012 1013 1034 1035 1059	1044 1046 1071	New Con D1 or 1046 with addition	1033 1060

- Construction of new buildings on sites outside of the historic footprints would not be compatible with the historic district; new construction would be restricted to the size and location of historic footprints.
- The NPS and HI determined that construction on 12 historic building footprints along Mitchell Road would create an unacceptable impact to visual resources by dramatically altering the views of the fort and introducing non-historic buildings in the landscape. This would not be compatible with the cultural landscape, as assessed in the preliminary cultural landscape guidelines (Auwaerter and Curry 2008), and would also be within the 100-year floodplain. This left only five footprints for potential new construction of which one falls directly in the course of the riparian corridor and another sits on top of the current Golden Gate National Parks Conservancy Native Plant Nursery, leaving only three potential historic footprints for new construction.
- Together with existing buildings occupied by HI, the three available footprints would not provide adequate square footage to meet the program needs for the proposed 350 students.
- Even if more building footprint options were available, HI determined that the costs for implementing an alternative that accommodated the program needs only through new construction would be infeasible because of the higher costs of new construction as compared to rehabilitation, and the shorter schedule and thus concentrated expenditures required to most efficiently complete new construction.

2.4.2 Campus Improvements without Expansion

HI considered the alternative of improving the campus without expanding the number of students. This alternative was dismissed for the following reasons:

- Improving facilities without expanding student capacity would not fulfill a key purpose of the project—to provide high-quality environmental education services to more students to meet the increasing need and demand.
- Improving facilities without expanding student capacity would not provide the revenue need to assure long-term sustainability of the program.
- It would not be feasible to raise the funds to pay for the proposed improvements without the attractive result of expanding the number and diversity of students.

2.4.3 Expansion Off-Site

HI considered the alternative of expanding its program on sites other than the Fort Cronkhite campus. A review of other possible sites in the Marin Headlands included options to collaborate with other park partners. HI also evaluated the potential of community-based and media-based programs, such as taking HI curriculum to school sites or creating a series of DVDs that capture HI curriculum. After evaluating the options, HI concluded that it would implement several of these off-site components as program supplements, but dismissed off-site expansion as an alternative because:

- HI's mission is to engage students in experiential learning in nature's classroom to inspire the next generation of national park stewards. These learning experiences can only take place in natural settings in the park.
- HI's curriculum is place-based, developed around the unique combination of natural and cultural resources in the Marin Headlands.
- No other sites existed to accommodate expansion in the Marin Headlands.
- While HI plans to expand its collaboration with other park partners, these opportunities do not expand HI's capacity to provide experiential, place-based learning in the Marin Headlands.

- Off-site expansion would not fulfill the planning objectives to create a unified campus within a manageable area, to continue HI's use of historic buildings at Fort Cronkhite, and restore the historic Nike core within Fort Cronkhite (see the *Alternatives Development Process* section above).

2.4.4 Dining Hall Options

HI considered the alternative of improving the campus as described under Alternative D, but with a dining hall located at the center of campus. This alternative was dismissed for the due to the lack of existing buildings or historic buildings site available in the center of campus that could accommodate an adequate dining hall. In addition, placing the dining hall at the center of campus requires bringing semi-trucks through campus which is seen as a significant danger and impact in comparison to the other proposed locations on the edge of campus.

A dining hall to accommodate 100% of students was not proposed for a variety of reasons. To begin with, the size needed for such a purpose (10,000 square feet or more) would be out of scale with the cultural landscape and contradicts the personal camp atmosphere of HI. In addition, since two-shift dining works effectively for HI, a larger building would be ecologically and financially wasteful.

2.4.5 Extensive Rehabilitation Alternative

An alternative similar to action Alternative B in this EA was considered during the Choosing by Advantages session. Similar to Alternative B, this option would only reuse existing buildings to accommodate the expansion and improvements to the Headlands Institute campus; however, unlike Alternative B, it would not include the reuse of Building 1042 for Headlands Institute needs. Instead, this alternative would rehabilitate 14 historic buildings, 6 of which would be west of Glassburn Avenue, thus resulting in a more spread-out campus footprint than Alternative B. The resulting environmental impacts were otherwise very similar to Alternative B and had similar advantages for resource protection, visitor enjoyment, and other advantages factors relevant to the NPS. Therefore, because these two alternatives were very similar to one another, this one was dismissed from further analysis as part of the environmental analysis.

2.5 Environmentally Preferable Alternative

NEPA includes six statements of purpose in Section 101(b) of the Act. The degree to which an alternative fulfills these statements of policy is one measure of environmental superiority, and is used to help in identifying the environmentally preferable alternative in an EA or EIS. Because it is intended to help in identifying one alternative over others, the discussion focuses on differences, rather than similarities, among alternatives.

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.
- Preserve important historical, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

NPS identifies the environmentally preferable alternative in its NEPA documents for public review and comment. The environmentally preferable alternative is defined by CEQ NEPA regulations as the alternative that “causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves and enhances historic, cultural and natural resources” (40 CFR 1500–1508). The CEQ NEPA regulations also indicate that the environmentally preferable alternative is the one that “will promote the national environmental policy as expressed in NEPA’s Section 101” (Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations 40 CFR 1500 – 1508; Question 6a).

Using both the CEQ’s interpretations of the Section 101 purpose statements and the comparison of environmental effects to natural and cultural resources expected under each alternative (Table 5 at the end of this chapter - refer to the *Environmental Consequences* chapter of this EA for detail on environmental effects of each alternative), Alternative B is identified as the environmentally preferable alternative. It is believed to be the alternative that would cause the least damage to and the best protection and preservation of the park’s natural and cultural resources.

The action alternatives are very similar in their overall beneficial and adverse effects on park resources, the majority of which are negligible to minor in intensity. However, construction of new buildings was found as a discriminator that would increase the intensity of impacts. New construction would occur under Alternatives C and D. Taking all impacts together, the differences between the various alternatives are not great, but Alternative B is anticipated to have slightly reduced adverse impacts overall. For this reason, Alternative B was selected as the environmentally preferable alternative.

2.6 How Alternatives Meet Project Objectives

As stated in Section 2.4 of this EA, action alternatives selected for analysis must meet all objectives to a large degree. Action alternatives must also address the stated purpose of taking action and resolve the need for action. Alternatives that did not meet the plan objectives were dismissed from further analysis (see the *Alternatives Considered but Dismissed* section above). All action alternatives would meet all objectives to a large degree and address the project’s stated purpose and need.

2.7 Summary Tables

Table 3 presents a comparison of project components by alternative. A summary of environmental effects to park resources is presented in Table 4 by alternative; however, a detailed resource analysis of environmental effects is provided in Chapter 4. Mitigation measures have been designed to minimize or avoid adverse effects to resources and are applicable to all alternatives. These measures are presented in Table 5.

Table 3. Elements of the Alternatives

Alternative Element	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building
Program capacity	200 students.	Up to 350 students.	Same as Alternative B.	Same as Alternative B.
Staff size	53 staff members.	Up to 80 staff members.	Same as Alternative B.	Same as Alternative B.
Buildings	8 buildings, 34,624 square feet.	13 buildings, 55,674 square feet.	13 buildings, 55,174 square feet.	13 buildings, 55,674 square feet.
Rehabilitation	N/A	13 historic structures	10 historic structures	12 historic structures
New construction	N/A	N/A	Up to 3 new buildings	1 new building
Open space (on campus)	44,000 square feet: Campus open space located east of Glassburn Street and south of Kirkpatrick. Fort lawns used for playing areas, group activities, teaching, a volleyball court and a composting area. Fire circle and central play area located in Nike core.	58,000 square feet: Increase in number of usable areas. Actions include conversion of central parking lot to a campus open space and the expansion of the campus west of Hagget Street creating multiple new ocean view outdoor spaces. Fire circle and central play area would be relocated out of rehabilitated Nike core.	40,000 square feet: Net loss of open space and associated teaching/activity areas with construction of new buildings east of Hagget Street and no campus expansion west of Hagget Street. Conversion of central parking lot to campus open space and relocation of activities out of Nike core would be the same as under Alternative B.	51,600 square feet: Increase in the number of usable areas. Actions include conversion of central parking lot to a campus open space and the expansion of the campus west of Hagget Street creating multiple new ocean view outdoor spaces. Fire circle and central play area would be relocated out of rehabilitated Nike core.
Access and circulation	<p>Vehicular access and arrival:</p> <ul style="list-style-type: none"> - 3 campus points of access. - Main visitor arrival and bus drop-off in central parking lot on west end of campus. <p>Campus circulation:</p> <ul style="list-style-type: none"> - Pedestrian circulation on historic road and non-historic concrete paths. - Continued use of numerous non-historic 	<p>Vehicular access and arrival:</p> <ul style="list-style-type: none"> - 3 access points same as alternative A. - New bus drop off on Kirkpatrick street and two loop circulation system for visitor vehicles. - Unpaved informal drive to Building 1012 removed. <p>Campus circulation:</p> <ul style="list-style-type: none"> - Pedestrian circulation on historic roads, rehabilitated Stennis Street, and new pathways following historic patterns. 	<p>Vehicular access and arrival:</p> <p>Same as Alternative B with addition of new service access drive provided behind new dining hall north of Kirkpatrick Street.</p> <p>Campus circulation:</p> <p>Same as Alternative B</p>	<p>Vehicular access and arrival:</p> <p>Same as Alternative C.</p> <p>Campus circulation:</p> <p>Same as Alternative C</p>

Table 3. Cont.

Alternative Element	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building
	social trails around campus.	- Social trails removed.		
Parking	Non-exclusive parking in existing lots around Fort Cronkhite.	Non-exclusive parking in existing lots around Fort Cronkhite. Removal of kitchen and central campus lots with 1:1 replacement of parking capacity in new lot southwest of the intersection of Kirkpatrick and Bunker Road.	Same as Alternative B.	Same as Alternative B.
Use of off-campus education sites	22 sites regularly used. HI administered system to control number of hiking groups visiting sensitive sites. Monitoring and management as needed in consultation with NPS and other park partners.	Increased use of existing 22 sites with addition of new sites to accommodate additional students, under the collaborative HI/NPS management program. Formalize and implement a collaborative HI/NPS monitoring and adaptive management program for current and future off-campus education sites.	Same as Alternative B.	Same as Alternative B.
Landscape treatment	N/A	Rehabilitation to enhance the historic character and serve contemporary uses in accordance with cultural landscape report guidelines. Enhance the historic character of the Nike core, reestablish the historic road corridor, the form of the historic parking lots and presence of the historic perimeter. Convert central parking to campus open space, mark historic building footprints. Daylight and enhance the riparian corridor.	Same as Alternative B.	Same as Alternative B.

Table 3. Cont.

Alternative Element	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building
Riparian corridor treatment	N/A	Stream daylighted north and south of Nike core. Stream corridor south of Bunker Road enhanced. Trails, interpretive signage and education and student science sites added.	Same as Alternative B.	Same as Alternative B.
NPS functions	N/A	Relocation of NPS functions– the maintenance shop (1046), fire dorm (1034), dorm (1042); upgrade and redesign utilities as needed for building rehabilitation and stream enhancement.	No relocation of NPS functions; upgrade and redesign of utilities as needed for building rehabilitation and stream enhancement; installation of new water, sewer, power utilities (underground) as needed for new construction.	Relocation of NPS functions– the maintenance shop (1046) and the fire dorm (1034); upgrade, redesign and installation of new utilities (underground) similar to Alternative C for new construction.
Sustainability measures	Continue Green Business practices, resource conservation measures and interactive sustainability opportunities.	Rehabilitate campus, achieve a minimum silver level of LEED certification. Achieve zero net increase in use of commercially provided power, water and sewage production, using solar panels and state-of-the-art water conservation/reuse.	Similar to Alternative B but with expanded opportunities for state-of-the-art systems and conservation with construction of three new buildings.	Same as Alternative B with addition of opportunity to design one state-of-the art sustainable building that would serve as dining hall.
Total area of project disturbance	N/A	22 acres	18 acres	22 acres
Total area of Excavation	N/A	12.37 acres	10.99 acres	12.22 acres
Total Volume of Excavation (riparian and on-campus work)	N/A	44,147 cubic yards	42,483 cubic yards	44,512 cubic yards
Area of disturbance to existing riparian corridor	N/A	4.7 acres	Same as Alternative B.	Same as Alternative B.
Area of project restoration (riparian and landscape)	N/A	1.5 acres	Same as Alternative B.	Same as Alternative B.
Area of impervious surface	222,990 square feet	212,320 square feet	214,740 square feet	209,920 square feet
Project implementation	N/A	Construction to begin 2011 and last about 3 to 8 years depending on funding.	Same as Alternative B.	Same as Alternative B.

Table 3. Cont.

Alternative Element	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building
Construction staging	N/A	Located within or in close proximity to HI campus. Potential staging areas include the parking lot at the west end of the campus, a disturbed area south of Stennis Street, or other areas not frequently used by visitors.	Same as Alternative B.	Same as Alternative B.

Table 4. Environmental Consequences, by Alternative

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>				
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
Soils					
Construction	No impact	Moderate / Minor	Same as Alternative B.	Same as Alternative B.	SSL-1: Ground Disturbance Timeframe SSL-2: Soil Erosion Prevention SSL-3: Soil Loss Prevention SSL-4: Staging Areas SSL-5: Soil Reuse WR-1: Runoff WR-2: Planting and Revegetation after Landscape Treatment
On Campus Activities					
Campus Use	Minor	Negligible	Same as Alternative B.	Same as Alternative B.	
Permeable Surface Area	No impact	Beneficial			
Riparian Corridor Enhancement					SSL-1, SSL-2, SSL-3, SSL-4, SSL-5, WR-1, WR-2
Construction	Minor	Moderate / Minor	Same as Alternative B.	Same as Alternative B.	
Long Term		Beneficial			
Off Campus Activities	Minor	Minor to beneficial	Same as Alternative B.	Same as Alternative B.	
Cumulative	Beneficial	Beneficial	Same as Alternative B.	Same as Alternative B.	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
Water Resources					
Construction	No impact	Moderate / Minor	Same as Alternative B.	Same as Alternative B.	SSL-1, SSL-2, SSL-3, SSL-4, SSL-5, WR-1, WR-2 WR-3: Equipment Inspections WR-4: Spill Prevention and Response
Erosion		Moderate / Negligible			
Hazardous Material Spills					
On Campus Activities					
Erosion	Minor	Negligible	Same as Alternative B.	Same as Alternative C.	
Stormwater and Recharge	Minor	Beneficial			
Flood Risk	No Impact	No Impact	Negligible		
Riparian Corridor Enhancement	Minor	Moderate / Minor	Same as Alternative B.	Same as Alternative B.	SSL-1, SSL-2, SSL-3, SSL-4, SSL-5, WR-1, WR-2, WR-3, WR-4
Short-term Erosion		Moderate / Negligible			
Hazardous Material Spills during Construction		Moderate			
Sediment Pulses after Construction		Beneficial			
Long Term					
Off Campus Activities	Negligible to Minor	Moderate to Beneficial	Same as Alternative B.	Same as Alternative B.	
Cumulative	No Impact	Beneficial	Same as Alternative B.	Same as Alternative B.	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>					
Vegetation					
Construction	No Impact	Minor to Moderate / Beneficial	Same as Alternative B.	Same as Alternative B.	WR-2 SSL-6: Noxious Weed Control
On Campus Activities	Negligible to Minor	Negligible	Same as Alternative B.	Same as Alternative B.	
Riparian Corridor Enhancement	No Impact		Same as Alternative B.	Same as Alternative B.	SSL-6
Vegetation Removal		Moderate			
Spread of Invasives		Moderate / Negligible			
Long-Term Habitat		Beneficial			
Off Campus Activities	Negligible to Minor	Minor to Beneficial	Same as Alternative B.	Same as Alternative B.	
Cumulative	Beneficial	Beneficial	Same as Alternative B.	Same as Alternative B.	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>					
Wildlife					
Construction	No Impact	Minor to Moderate / Negligible to Moderate	Same as Alternative B.	Same as Alternative B.	BR-1: Pre-Construction Educational Training BR-3: Nesting Bird and Raptor Protection Measures BR-6: Protection of Bat Populations BR-7: California Brown Pelican Protection VE-4: Construction-Related Noise Control
On Campus Activities	Negligible	Negligible to Beneficial	Minor to Beneficial	Same as Alternative C	
Riparian Corridor Enhancement	No Impact	Moderate / Negligible to Moderate	Same as Alternative B.	Same as Alternative B.	BR-1, BR-3, BR-6, BR-7, VE-4 BR-2: Aquatic Wildlife Impact Avoidance and Minimization BR-4: Goby Protection Plan
Construction		Beneficial			
Long Term					
Off Campus Activities	Minor to Moderate	Minor to Beneficial	Same as Alternative B.	Same as Alternative B.	
Cumulative					
Short Term	Minor to Moderate	Same as Alternative A	Same as Alternative A	Same as Alternative A	
Long Term	Beneficial				

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>					
Species of Special Concern					
<i>Tidewater goby</i>					
Construction	No Impact	Minor	Same as Alternative B	Same as Alternative B	BR-1
On Campus Activities	Minor	Same as Alternative A	Same as Alternative A	Same as Alternative A	
Riparian Corridor Enhancement	No Impact		Same as Alternative B	Same as Alternative B	BR-1, BR-4
Construction		Moderate / Moderate			
Long Term		Beneficial			
Off Campus Activities	Minor	Minor to Beneficial	Same as Alternative B	Same as Alternative B	
Cumulative	Beneficial	Beneficial	Same as Alternative B	Same as Alternative B	
<i>California red-legged frog</i>					
Construction	No Impact	Minor	Same as Alternative B	Same as Alternative B	
On Campus Activities	No Impact	Same as Alternative A	Same as Alternative A	Same as Alternative A	
Riparian Corridor Enhancement	No Impact		Same as Alternative B	Same as Alternative B	BR-1, BR-2, BR-4, BR-5
Construction		Moderate / Moderate			
Long Term		Beneficial			
Off Campus Activities	Minor	Minor to Beneficial	Same as Alternative B	Same as Alternative B	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
Cumulative	Negligible to Minor	Minor to Beneficial	Same as Alternative B	Same as Alternative B	
California brown pelican					
Construction	No Impact	Minor / Minor	Same as Alternative B	Same as Alternative B	BR-1, BR-7, VE-4
On Campus Activities	No Impact	Same as Alternative A	Same as Alternative A	Same as Alternative A	
Riparian Corridor Enhancement	No Impact	Moderate / Moderate	Same as Alternative B	Same as Alternative B	BR-1, BR-3, BR-7, VE-4
Off Campus Activities	Minor	Minor	Same as Alternative B	Same as Alternative B	
Cumulative	Minor	Minor	Same as Alternative B	Same as Alternative B	
Salt Marsh Common Yellowthroat					
Construction	No Impact	Moderate / Negligible	Same as Alternative B	Same as Alternative B	BR-1, BR-3, BR-7, VE-4
On Campus Activities	No Impact	Same as Alternative A	Minor	Same as Alternative C	
Riparian Corridor Enhancement	No Impact	Moderate / Minor	Same as Alternative B	Same as Alternative B	BR-1, BR-3, BR-7, VE-4
Construction		Beneficial			
Long Term					
Off Campus Activities	Minor	Minor	Same as Alternative B	Same as Alternative B	
Cumulative	Beneficial	Beneficial	Same as Alternative B	Same as Alternative B	
Plants of Special Concern					
Construction	No Impact	Same as Alternative A	Same as Alternative A	Same as Alternative A	
On Campus Activities	No Impact	Same as Alternative A	Same as Alternative A	Same as Alternative A	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
Riparian Corridor Enhancement	No Impact	Same as Alternative A	Same as Alternative A	Same as Alternative B	
Off Campus Activities	Negligible	Minor	Same as Alternative B	Same as Alternative B	
Cumulative	Negligible	Negligible	Same as Alternative B	Same as Alternative B	
Air Quality					
Construction	No Impact	Minor to Moderate	Same as Alternative B	Same as Alternative B	
Emissions		Negligible			
Odors					
On Campus Activities	Negligible	Negligible	Same as Alternative B	Same as Alternative B	
Weekdays		Negligible to Minor			
Weekends					
Riparian Corridor Enhancement	No Impact	Minor	Same as Alternative B	Same as Alternative B	
Off-campus use	Negligible	Minor	Same as Alternative B	Same as Alternative B	
Cumulative	No Impact	Negligible	Same as Alternative B	Same as Alternative B	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>					
Cultural Resources					
Construction	No Impact			Same as Alternative C	CR-1: Pre-Construction Field Surveys and Training CR-2: Archaeological and Native American Monitoring CR-3: Previously Undiscovered Cultural Resources CR-4: Cultural Resources Monitoring Plan CR-5: Treatment of Historic Properties and Landscape
Buried Resources		Minor to Major / Minor	Same as Alternative B		
Building Rehab		Beneficial	Same as Alternative B		
Addition to 1046		Minor/Minor	N/A		
Landscape Enhancement		Beneficial	Same as Alternative B		
Parking Modifications		Negligible to Beneficial	Same as Alternative B		
Solar Panels		Minor	Same as Alternative B		
New Buildings	N/A	Minor			
On Campus Activities	Negligible	Negligible	Same as Alternative B	Same as Alternative B	
Riparian Corridor Enhancement	No Impact		Same as Alternative B	Same as Alternative B	CR-1, CR-2, CR-3, CR-4, CR-5
Buried Resources		Minor to Major / Minor			
Effects on Cultural Landscape		Minor/Minor			
Off Campus Activities	Negligible	Negligible	Same as Alternative B	Same as Alternative B	
Cumulative	Negligible	Beneficial to Minor	Same as Alternative B	Same as Alternative B	
Section 106 Finding	No adverse effect	No adverse effect	Same as Alternative B	Same as Alternative B	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>					
Visitor Experience					
Construction	No impact	Negligible to Moderate / Negligible to Minor	Same as Alternative B	Same as Alternative B	VE-1: General Measures VE-2: Construction Management Plan VE-3: Construction Exclusion Areas – Visitor Restrictions VE-4
Public Access/ Restrictions		Negligible			
Circulation/Parking		Negligible to Moderate / Negligible to Moderate			
Soundscapes/Noise					
On Campus Activities	Negligible to Minor	Beneficial	Negligible to Beneficial	Beneficial	
Riparian Corridor Enhancement	No impact	Negligible to Moderate / Negligible to Minor	Same as Alternative B	Same as Alternative B	VE-1, VE-2, VE-3, VE-4
Construction		Beneficial			
Long Term					
Off Campus Activities	Negligible	Negligible to Minor	Same as Alternative B	Same as Alternative B	
Cumulative	Beneficial	Beneficial	Same as Alternative B	Same as Alternative B	
Transportation					
Construction	No Impact	Negligible to Minor / Negligible to Minor	Same as Alternative B	Same as Alternative B	TR-1: Traffic Control Plan

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
On Campus Activities	No Impact				TR-2: Participation in a TDM Program TR-3: Parking Monitoring and Outreach
New Visitor and Bus Drop-off		Negligible			
Parking Modifications		Negligible	Same as Alternative B	Same as Alternative B	
Program Capacity		Minor to Major / Minor to Moderate			
Staff Size		Negligible to Minor / Negligible to Minor			
Riparian Corridor Enhancement	No Impact	Negligible to Minor / Negligible to Minor	Same as Alternative B	Same as Alternative B	TR-1
Off Campus Activities	No Impact	Negligible	Same as Alternative B	Same as Alternative B	
Cumulative	No Impact	Minor	Same as Alternative B	Same as Alternative B	
Visual Resources					
Construction	No Impact	Minor to Moderate / Minor	Same as Alternative B	Same as Alternative B	VR-1: Minimization of Construction-Related Visual Impacts
On Campus Activities	No Impact		Same as Alternative B	Same as Alternative B	CR-5
General		Beneficial			
Solar Panels		Negligible to Minor			
Riparian Corridor Enhancement	No Impact	Minor to Moderate / Minor	Same as Alternative B	Same as Alternative B	CR-5 VR-1
Off Campus Activities	No Impact	Negligible	Same as Alternative B	Same as Alternative B	
Cumulative	No Impact	Beneficial to Moderate	Same as Alternative B	Same as Alternative B	

Table 4. Cont.

Resource Topic	Impact by Alternative (before mitigation/after mitigation)				Mitigation Measures
	Alternative A No Action	Alternative B Rehabilitation Only	Alternative C Rehabilitation and Three New Buildings	Alternative D Rehabilitation and One New Building	
<i>Note that all impacts listed are adverse unless specifically identified as beneficial.</i>					
Park Operations					
Riparian corridor maintenance	No impact	Minor	Same as Alternative B	Same as Alternative B	
Utility/infrastructure improvements	No impact	Moderate / Minor	Same as Alternative B	Same as Alternative B	PO-2: Utilities
Access/circulation	No Impact	Negligible	Same as Alternative B	Same as Alternative B	
Relation of Park Functions	No Impact	Moderate / Minor	No Impact	Same as Alternative B	PO-1: Relocations
Public Safety	No Impact	Negligible	Same as Alternative B	Same as Alternative B	
Adjacent Park Partners	No Impact	Beneficial to Moderate / Beneficial to Minor	Same as Alternative B	Same as Alternative B	PO-3: Adjacent Uses
Cumulative	No impact	Beneficial to Minor	Same as Alternative B	Same as Alternative B	

Table 5. Mitigation Measures

ID	Name	Measure
Soils, Seismicity, and Landslide Hazards		
SSL-1	Ground Disturbance Timeframe	The ground disturbing aspects of construction will be limited to the period between April 15 and October 31 (typical dry season).
SSL-2	Soil Erosion Prevention	<ol style="list-style-type: none"> 1. To the extent practical, all equipment, materials, and construction personnel will limit movements to access roads, surface streets, or other disturbed areas that are already compacted. 2. All residual soils and/or materials will be cleared from the project site once activities are complete. 3. Building materials and other project-related materials will not be stockpiled or stored where they could spill into water bodies or storm drains or where they will cover aquatic or riparian vegetation. 4. Routine watering of dust-prone construction areas, especially during the dry season, will be used to reduce generation of fugitive dust and to control migration of sediment outside of the project area. 5. No stockpiled soils shall remain exposed, unless surrounded by properly installed and maintained silt fencing or other means of erosion control. 6. Restored banks will be constructed at a slope no greater than 3:1 and energy dissipation structures (woody debris, rocks, etc) will be used in channel to prevent future bank erosion.
SSL-3	Soil Loss Prevention	To help minimize the amount of sediment transported through the site from upstream erosional problems, a linear sediment catch basin will be excavated along the existing maintenance road for the reach of the stream north (upstream) of Bunker Road.
SSL-4	Staging Areas	Staging areas will be located in previously disturbed areas near project sites. Staging areas will be returned to pre-construction conditions or better once construction had been completed.
SSL-5	Soil Reuse	Soils excavated during ground-disturbing activities will be reused to the extent that these locally-derived materials are found to be clean and weed-free. Any such reuse is subject to applicable NPS policies and guidance.
SSL-6	Noxious Weed Control	Soils and vegetation contaminated with weed seeds from within the GGNRA will be segregated and disposed of or treated as appropriate. Similarly, soils heavily infested with noxious invasive plant material will be disposed of off-site.
Water Resources		
WR-1	Runoff	Practices will be implemented to ensure that concentrated run-off and discharges are redirected away from exposed slopes or stockpiled soils, including the placement of a vegetated buffer, hay wattles or bales, silt screens, or other materials to filter and reduce runoff velocity if needed.
WR-2	Planting and Revegetation After Landscape Treatment	<ol style="list-style-type: none"> 1. Sites where activities result in exposed soil will be stabilized to prevent erosion and revegetated as soon as feasible after activities are complete. 2. Erosion control fabric, hydromulch, or other mechanism will be applied as appropriate to provide protection to seeds, hold them in place, and help retain moisture. Tightly woven fiber netting or non-

Table 5. Cont.

ID	Name	Measure
WR-3	Equipment Inspections	<p>binded materials (e.g., rice straw) will be used for erosion control or other purposes at the work sites to ensure that the California red-legged frogs do not get trapped. This limitation will be communicated to the contractor through use of Special Provisions included in the bid solicitation package. No plastic mono-filament matting will be used for erosion control.</p> <ol style="list-style-type: none"> 1. All vehicles and equipment will be kept clean. Excessive build-up of oil or grease will be avoided. 2. All equipment used in the creek channel will be inspected for leaks each day prior to initiation of work. Action will be taken to prevent or repair leaks, if necessary. 3. Vehicle and equipment maintenance activities will be conducted off-site or in a designated, protected area away from the channel where vehicle fluids and spills can be handled with reduced risk to water quality. 4. If maintenance must occur on-site, designated areas will not directly connect to the ground, surface waters, or the storm drainage system to prevent the run-on of stormwater and runoff of spills. The service area will be clearly designated with berms, sandbags, or other barriers. 5. Secondary containment, such as a drain pan or drop cloth, to catch spills or leaks will be used when removing or changing fluids. Fluids will be stored in appropriate containers with covers, and properly recycled or disposed of off-site.
WR-4	Spill Prevention and Response Plan	The Headlands Institute will develop a Spill Prevention and Response Plan prior to commencement of construction activities to contain and/or clean up any stored or spilled fuels or chemicals and prevent oil, grease, or fuel leaks from equipment.
Wildlife		
BR-1	Pre-Construction Educational Training	Prior to construction activities, all personnel will participate in an educational training session conducted by a qualified biologist. ¹ Training sessions will include identification of National Park Service staff resource contacts; special-status plants, wildlife, or other sensitive resources in the work area; markings for the limit line of disturbance; thresholds that will trigger a change in implementation techniques or require a halt in project implementation; prohibitions on feeding resident wildlife; and proper disposal of food waste and garbage to discourage feeding by wildlife which may increase predation on native wildlife. Upon completion of training, employees or contracting crews will be required to sign a form stating that they attended the training and understand all the conservation and protection measures.
BR-2	Aquatic Wildlife Impact Avoidance and Minimization	Prior to and during activities in the wetted portion of the creek, native fish, tadpoles, and other vertebrates will be removed and relocated outside of the project area by a qualified biologist. Aquatic wildlife will be excluded from the work area by blocking the stream channel above and below the work area with fine-meshed net or screens. The bottom of the screens will be completely secured to the channel bed. Exclusion screening will be placed in areas of low water velocity to minimize fish impingement. Screens will be checked periodically and cleaned of debris to permit free flow of water.

¹ A qualified biologist (including those specializing in botany, wildlife, and fisheries) is determined by a combination of academic training and professional experience in biological sciences and related resource management activities.

Table 5. Cont.

ID	Name	Measure
BR-3	Nesting Bird and Raptor Protection Measures	<ol style="list-style-type: none"> 1. To the greatest extent possible, activities will be planned and conducted outside the bird-nesting season (defined as January 1—July 31 for raptors, and March 1—July 31 for landbirds). 2. In intensively managed landscapes, vegetation will be maintained at a height of less than 8” throughout the landbird nesting season to discourage the nesting of such bird species. Any vegetation (i.e., trees, shrub, grasses) taller than 8” that is not removed within the timing window specified in the GGNRA Standard Operating Procedures for vegetation cutting and removal will be subject to the additional measures 3 and 4, below. 3. If work is conducted within the nesting season, prior to the onset of construction involving ground-disturbing activities using heavy machinery, a qualified wildlife biologist will be retained to conduct pre-maintenance surveys for raptors and nesting birds within suitable nesting habitat in a 300 foot radius of the construction area. If no active nests are detected during surveys, activities may proceed. If active nests are detected then measure 4 will be implemented. 4. If active nests are identified within the construction area, a biologist will establish a suitable nest buffer in coordination with NPS where no work can occur until the young have successfully fledged or the nests have been otherwise abandoned.
BR-4	Goby Protection Plan	<ol style="list-style-type: none"> 1. For in water work in Rodeo Lagoon, silt fencing will be installed during construction activities to exclude individual tidewater gobies from entering the work area. Prior to construction activities, a qualified or permitted biologist will use a 1/8th inch mesh diameter beach seine, dip nets, and/or minnow traps to sample the enclosed work area within the lagoon for tidewater gobies. If any tidewater goby individuals are located and captured within this area, the individuals will be relocated to suitable habitat nearby within Rodeo Lagoon. 2. Reentry into the work zone will be prevented through the use of fine mesh aquatic fences or nets.
BR-5	California Red-legged Frog Avoidance and Impact Minimization Measures	<p>No more than 48 hours prior to and during construction activities along the creek, a biological monitor will search all work localities for the presence of California red-legged frogs. The search area will encompass a 50-foot radius around the work sites. All rodent burrows, leaf litter deeper than 2 inches, or other obvious refugia will be surveyed for the presence of the species. Vegetation that will be disturbed within the work areas will be removed during these surveys to aid in observations of the species. To prevent direct injury to California red-legged frogs, removal of vegetation within suitable frog habitat will be accomplished by a progressive cutting of vegetation from the overstory level to ground level to allow frogs to move out of the work area. Should any frogs be observed, activities will cease until the animal is removed and relocated by a qualified or permitted biologist. Captured frogs will be relocated to suitable habitat outside of the construction zone, either upstream or downstream of the construction zone.</p>
BR-6	Protection of Bat Populations	<p>Preconstruction surveys for bat species will be conducted in areas of suitable habitat within the project area. For tree-roosting bats, all potential roost trees that must be removed will be surveyed and identified in the field, and the following procedures will be applied prior to felling: (1) avoid implementing tree removal between April 1 and August 31 to protect potential maternity roosts, (2) trees will be removed under the warmest possible conditions practical, (3) sections of the exfoliating bark will be peeled off the tree gently to search for any roosting bats underneath, (4) noise and vibrations (e.g., striking the tree base) will be created on the tree itself. When cutting sections of the bole, if any hollows or cavities (such as woodpecker holes) are</p>

Table 5. Cont.

ID	Name	Measure
BR-7	California Brown Pelican Protection	discovered, a biologist will carefully check for the presence of bats in those areas.
Cultural Resources		
CR-1	Pre-Construction Field Surveys and Training	Where not already completed, professional archeologists will perform surveys prior to ground disturbance in areas previously undisturbed. In addition, HI will provide training for all personnel involved with ground disturbance activities to facilitate recognition of potential archaeological materials and to avoid impacts to deposits.
CR-2	Archaeological and Native American Monitoring	HI will ensure that there is an archaeological monitor and representative of the Federated Indians of the Graton Rancheria (Coast Miwok) during ground-disturbing activities in the vicinity of recorded archaeological resources. While the goal of the NPS is to preserve archaeological resources, this mitigation measure will ensure that if additional deposits associated with known sites are discovered, there will be an archaeologist and Native American representative on site to identify and assess the find and impacts immediately and to halt construction.
CR-3	Previously Undiscovered Cultural Resources	<p>Inadvertent Discoveries: If buried cultural resources are inadvertently discovered during ground-disturbing activities, work shall stop in that area and within a 100-foot radius of the find until a qualified archaeologist can assess the significance of the find. Alternatively, an archaeologist and Native American monitor may monitor ground disturbances in vicinity of the site to ensure that such discoveries are protected until they can be properly recorded and assessed, and management decisions can be made about their treatment. Avoidance in place or no adverse effect from project actions is the preferred approach to all discoveries that are potentially eligible for listing on the NRHP. Inadvertent discoveries will be treated in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). The archaeological resource will be assessed for its eligibility for listing on the NRHP in consultation with the SHPO (and a Native American monitor from the Federated Indians of Graton Rancheria if it is an indigenous archaeological site) and a determination of the project effects on the property will be made. If the site will be adversely affected, a treatment plan will also be prepared as needed during the assessment of the site's significance. Assessment of inadvertent discoveries may require archaeological excavations or archival research to determine resource significance. Treatment plans will fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects.</p> <p>Discovery of Human Remains: If human skeletal remains are encountered, all work shall stop in the vicinity of the discovery, and the find will be secured and protected in place. The Marin County coroner and Park Archaeologist will both be immediately notified. If a determination finds that the remains are Native American, and that no further coroner investigation of the cause of death is required, they will be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries). The coroner will also contact the NAHC (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs.</p>

Table 5. Cont.

ID	Name	Measure
CR-4	Cultural Resources Monitoring Plan	A cultural resource monitoring plan will be prepared to ensure that ground-disturbing activities within the project area result in no adverse effects to buried resources. The monitoring program will include oversight of project schedules and excavation areas to ensure that important opportunities for archaeological discovery are realized, and that potentially buried archaeological deposits are recognized in the course of active excavation and restoration. If archaeological resources are found that could be adversely affected by the proposed Project, NPS shall comply with Mitigation Measure CR-3.
CR-5	Treatment of Historic Properties and Landscape	<ol style="list-style-type: none"> 1. Building and landscape rehabilitation will conform to The Secretary of the Interior's Standards for the Treatment of Historic Properties. 2. Recommendations provided in the Preliminary Report on the Headlands Institute Campus Landscape, Fort Cronkhite, Marin Headlands (Auwaerter and Curry 2008), and its final document, will be used to guide design work for the project area. 3. Guidelines for compatible new construction will be prepared to ensure compatibility of new building construction and the introduction of other new elements into the historic setting and will be subject to review and approval by NPS.
Visitor Experience		
VE-1	General Measures	<ol style="list-style-type: none"> 1. The project will conform to the Americans with Disabilities Act/ Architectural Barriers Act Accessibility Guidelines (US Access Board, July 2004), the draft accessibility guidelines for outdoor developed areas prepared by the U.S. Access Board's Regulatory Negotiation Committee, and other relevant and current guidelines. 2. Whenever possible, construction work that could potentially affect the visitor experience will be scheduled during the time of lowest park visitation. 3. Visitor information regarding Headlands Institute campus expansion and improvements (e.g., construction-related activity which could affect visitors—noise, traffic detours, etc.) will be provided via the park website, signage, rangers, or a park newsletter to enhance the public's understanding of the issue and to help them better plan their visits.
VE-2	Construction Management Plan	For each phase of work, the Headlands Institute will develop a construction management plan to carefully sequence construction activities to minimize disruption to existing facilities and services. The plan shall be submitted and approved by NPS and will include information on days/hours of operation, times in which particularly loud or noisy operations could occur, how equipment will be maintained, how noise and disruption will be minimized, safety protocols, etc.
VE-3	Construction Exclusion Areas-Visitor Restrictions	During construction, HI will ensure that all active construction, staging, and stockpile areas are fenced to render them inaccessible to the public. To minimize visual intrusiveness of fencing, it will be designed and installed to blend into the surrounds as much as possible. All construction, staging, and stockpile access will be gated and kept locked except when in use. Signs will be conspicuously posted to inform the public about the need for caution and to safely route visitors around construction areas. Established and maintained walkways will be provided across the site, as well as barrier fencing along trails and paths.

Table 5. Cont.

ID	Name	Measure
VE-4	Construction-Related Noise Control	<ol style="list-style-type: none"> 1. Contractors will work collaboratively with the NPS and the Headlands Institute to schedule concentrated period of construction, considering NPS functions and Headlands Institute programming. 2. All equipment will be operated and maintained to minimize noise generation. Contractors will ensure that power equipment (vehicles, heavy equipment, and hand equipment such as chainsaws) is equipped with original manufacturer's sound-control devices, or alternate sound control that is no less effective than those provided as original equipment. Equipment will be operated and maintained to meet applicable standards for construction noise generation. No equipment will be operated with an unmuffled exhaust. 3. Contractors will use hydraulically or electrically powered construction equipment, when feasible. 4. Contractors will locate stationary noise sources as far from sensitive receptors, such as student dorms, conference areas, offices and work buildings, as possible. 5. Contractors will limit the idling of motors except as necessary (e.g., concrete mixing trucks). 6. Construction activities will be limited to normal business hours (7 a.m. - 4 p.m.). Work that is particularly noisy work will be limited to the hours of 10:00 a.m. and 3:00 p.m. to the extent possible to minimize noise disruptions (i.e., when field school students are off campus).
Transportation		
TR-1	Traffic Control Plan	A traffic control plan will be developed in conjunction with the construction documents for review and approval by NPS. This plan will include information on construction phases and duration, traffic scheduling, staging area management, visitor safety, construction equipment travel routes, detour routes, parking area closures, and pedestrian and bicyclist movements on adjacent routes.
TR-2	Participation in a TDM Program	The Headlands Institute will comply with the provisions of any future NPS Transportation Demand Management program for the Marin Headlands area.
TR-3	Parking Monitoring and Outreach	The Headlands Institute will monitor participant parking to identify management issues in a timely manner and will work with NPS and other partners to seek timely solutions. HI will encourage participants to use alternative means of transportation. HI will provide information on alternative transportation and parking availability to all visiting groups and encourage groups to provide that information to their members. HI will provide this information directly to individual participants in programs with individual registration, and will make parking availability and alternative transportation information available on its website and in outreach materials. In addition, HI will coordinate with NPS when expecting a large number of conference attendees or other large events planned in the area.
Visual Resources		
VR-1	Minimization of Construction-Related Visual Impacts	Construction activities will be coordinated with other construction activities in the area to the greatest extent possible to minimize visual intrusion of construction equipment and activity in popular visitor areas.

Table 5. Cont.

ID	Name	Measure
Park Operations		
PO-1	Relocations	Prior to the relocation of any park operations, the NPS and the Headlands Institute will agree to a transition plan and specific terms and conditions for such move. Conditions may include that buildings and spaces to which park operations will relocate to be in good or better condition than the function's original space, and these new spaces are fully ready and available for occupancy prior to any moves.
PO-2	Utilities	Utility/infrastructure work that requires interruptions in service will be coordinated at least 60 days in advance between the NPS, the Headlands Institute, and other appropriate park partners located within Fort Cronkhite.
PO-3	Adjacent Uses	Other users located in proximity to the Headlands Institute campus will be provided with at least 60 days advance notification of any planned construction activity. HI will designate a construction representative who will be responsible for providing Partners with updated construction information and responding to complaints regarding construction activities. A contact telephone number for construction representative will be conspicuously posted on construction site fences and will be included in the written notification of the construction schedule sent to nearby Park Partners and posted on the website.

CHAPTER 3. AFFECTED ENVIRONMENT

3.1 Soils

The study area is within the Coast Ranges geological province of California. The Marin Headlands are part of a block of folded and faulted marine sedimentary and volcanic rock overlying geologically younger sediments. The hills to the north of Fort Cronkhite are mostly underlain by sedimentary chert, volcanic greenstone and to a lesser extent sedimentary greywacke of the Franciscan complex.

Soils on the site, including the slopes north of Fort Cronkhite where the riparian corridor enhancement is proposed, are classified by the Natural Resources Conservation Service (NRCS) into three discrete units: Tamalpais-Barnabe Variant, Cronkhite-Barnabe Complex, and soils developed on artificial fill (“xerorthents”) (KHE 2008b). These soils are characterized by slow to moderate permeability, rapid stormwater runoff, and a high hazard for soil erosion, soil creep, and occasional land sliding (NRCS 1985 as cited in NPS 2009). The soils are moderately well- to well-drained. Their ability to hold water is related to soil depth, which is in turn a function of hillslope position, with steeper slopes underlain by thin soils typically 13 to 16 inches deep (KHE 2008b). These soils have a low water-holding capacity. Hillslope hollows have deeper soils with moderate water-holding capacity. These deeper soils have more well-developed layers, including an upper layer of loam, an intermediate layer of clay loam and a bottom layer of weathered bedrock, and vary between 60 and 100 inches in depth. Fort Cronkhite and the Nike Missile site itself are located on a highly disturbed pad of cut and fill. Borings at Fort Cronkhite described the soil as primarily “fatty clay” (WJE 2003). Borings for the relocated Marine Mammal Center to the north of the Headlands Institute (HI) campus also found clay soils which were dense gravelly clayey sand fill covering hard sandy clay on the portion closest to the study area.

Construction of the World War II era cantonment at Fort Cronkhite included major changes to the soils and topography at the site. The fort was graded into a sequence of seven terraces, each of which was occupied by a row of buildings. The stream that had flowed through the site was culverted underground during this time. Although the composition of fill is unknown, it is likely a combination of rock, concrete, asphalt, and other material that had been mechanically moved, mixed, and graded. The volume of fill materials added to Fort Cronkhite during construction is not known. At this time, most of the ground on campus is either cement walking paths or planted in turf walking paths. The total amount of developed and/or impervious surface in the study area is 222,990 square feet. Social trails on the campus have been created over the years, including at least one up to the riparian area that travels a slope and erodes during storm events. Some of these paths have been surfaced with gravel.

Erosion of hillside soils is problematic in the Marin Headlands, and several trails, roadways, and parking areas in the area have resulted in soil erosion, many of which are considered major problems in the Marin Headlands and Fort Baker Transportation Infrastructure and Management Plan (also called “MHFB Transportation Plan” in this EA; NPS 2009). Most of the problems have resulted from trails and roads that are too steep and lack proper drainage facilities, unrestricted car use and loss of vegetation, or undefined parking areas that are larger than needed (NPS 2009). Some of these sites (20 are named in the MHFB Transportation Plan Final EIS) are close to or the same as off-campus sites used by HI, including access to Rodeo Beach (north end), the Marin Headlands Visitor Center and the former quarry. Other sites used by groups of HI (and YMCA and hostel) students where erosion from social trails is a concern include “Scotty’s Bluff,”

“North Valley,” “Plateau of the Gods” to the north and west of the campus, and the beach and tidepools access by the South Beach trail (refer to Figure 3 in Chapter 2, *Alternatives*).

Consultants analyzing the proposed riparian corridor enhancement as part of the project estimated that annual sediment yield under pre-disturbance conditions for the drainage basin of the unnamed stream would have been 90 to 143 tons per square kilometer. This is within the range of nearby measured sediment production; Lone Tree Creek watershed 20 miles to the north yields about 214 tons per year per square kilometer, but attributes 53% of that to mass wasting (landslides, creep, etc.). Eliminating this source indicates about 100 tons per square kilometer of sediment per year is lost to erosion in the Lone Tree Creek drainage (Lehre 1082 as cited in KHE 2008b), which is within range of that calculated for the basin in which the campus is located. It is also consistent with current conditions in a neighboring watershed (Gun Gulley, which drains to the Rodeo Beach “surfer” parking lot) where average watershed-wide annual erosion rates were calculated as 65 tons per square kilometer (Shaw 2006).

In the 95 acre (0.38 square kilometer) drainage that includes the HI campus, sediment production of 90 to 143 tons per square kilometer translates to 34-55 tons per year of sediment. Gradients in the upper watershed are steep, typically between 30 and 55 percent. In the lower watershed, they are still moderately steep (averaging 32 percent), but are less so than in the upper slopes (KHE 2008a). In addition to steep slopes, the hillsides in the watershed have been destabilized by historic development and diversion of the stream into culverts both around the maintenance yard upstream and under the Nike campus downstream. This has increased the potential for small slope failures, which occur at least once a year in the watershed and require sediment removal from the culvert outlet into the lagoon (KHE 2008b).

3.2 Water Resources

The study area lies in the 4.4 square-mile Rodeo Lagoon watershed. The lagoon is the predominant aquatic feature in the watershed; the two major tributaries to the lagoon are Rodeo and Gerbode creeks; Gerbode Creek is a tributary of Rodeo Creek, which itself flows directly into the lagoon. Both valleys were part of dairy operations through much of the 20th century. Drainage from the hills to the north and south of the lagoon, including from the stream that runs under the HI campus, are minor additional sources of fresh water.

The lagoon itself is variously measured as between 35 and 40 acres and is brackish. In the winter, strong wave action and increased discharge from Rodeo Creek open a seasonal channel across the beach connecting the lagoon to the ocean. Gentler waves redeposit sand on the beach, closing the channel in the spring; it remains closed through the summer and fall. Just upstream of the lagoon, Rodeo Lake covers 5.5 acres of open water. The lake is an unnatural feature created in 1937 by building a causeway and weir to separate Rodeo Lake from the remainder of the lagoon to provide a source of fresh water for base personnel.

Historic changes to water resources in the Marin Headlands have altered hydrologic and chemical characteristics of the entire coastal Rodeo Lagoon system. Changes to topography, vegetation and watercourses, as well as the construction of roads, parking lots, buildings, trails, and other built features, have altered the rates and volume of surface water drainage within this watershed. Other streams that feed into the lagoon have likewise been channeled and/or culverted to facilitate U.S. Army development of the Marin Headlands. The primary water quality concern in this area is the increase in turbidity and sedimentation of area streams. Several of the trails have

erosional gullies along much of their surface, and sediment from these trails is transported via overland flow and culverts.

Sampling and analysis of water quality have found that it is generally good with a few exceptions (NPS 2009, NPS 1993, BioSystems Analysis, Inc. 1993). Rodeo Lagoon was found to have high pH values, which may be related to algal photosynthesis. High sediment loading was found at sample sites downstream from the stables and low dissolved oxygen levels were found near the Rodeo Dam. Dissolved oxygen levels varied from 4.5 mg/l in Rodeo Lake to 15.2 mg/l in Rodeo Lagoon. The highest dissolved oxygen levels were found during an algal bloom in the summer (when the algae were photosynthesizing and producing oxygen). When these algae die, bacterial decomposition consumes dissolved oxygen. Turbidity ranged from 5.2 to 289 nephelometric turbidity units (NTU) in Rodeo Lagoon. Turbidity at the lake and lagoon may be affected not only by sediment inputs, but also by wind and turnover in benthic sediments as well as algal blooms. Studies have indicated that some fish life stages are affected when turbidity levels exceed 400 NTU. Temperature averaged 10.5°C, although a 1989 United States Geological Survey (USGS) report indicated temperatures could be much higher (ranging from 12 to 17.5°C) (Madej 1989).

Nitrate and nitrite were not detected above the reporting limit in either sediment or lagoon water samples. Ammonia concentrations varied between 0.02 mg/l (Rodeo Creek, Lake and Lagoon) to 0.18 mg/l (Rodeo Lagoon). While lagoon water oxygen levels were measured as being near saturation, sediments were anoxic. This may limit a process known as denitrification which occurs in most aquatic environments and which converts ammonium to gaseous nitrous oxide and nitrogen. Sampling of sediments indicated that nitrogen was not being removed from the system, and given the relatively long period of time between flushing by ocean waters has a long residence time in the lagoon.

Phosphate levels ranged from 0.015 mg/L (Rodeo Creek) to 0.404 mg/L in the lagoon. In one of the studies, sediment and water samples contained concentrations of ammonium and orthophosphate above the reporting limit. EPA recommends that phosphate concentrations not exceed 0.05 mg/L for the protection of aquatic life. These nutrients (nitrogen in ammonium and phosphorus in orthophosphate), as well as those from the abundant bird population that uses the lagoon area, contribute to algal blooms at the lagoon.

Coliform counts ranged between 240 and 900 fecal coliform units per 100mL. Wet weather fecal coliform counts were higher than California Department of Health Services surface water objectives. New animal management practices at upland stables have since lowered average nutrient and coliform inputs.

Minimum lagoon water surface elevations are associated with the late summer, when inflows are reduced and the lagoon slowly loses water to evaporation. Baseflow measured in August and September of 2004 in Rodeo Creek averaged 0.03-0.04 cubic feet per second (cfs). During the low flow period, the surface elevation declines an average of 0.01 feet per day (Shaw 2006). Lagoon water also flows through Rodeo Beach, at a rate estimated to be as high as 1.34 cfs. In addition to inflow from Rodeo and other small creeks, groundwater seepage also helps to maintain lagoon water levels (ibid). Salinity drops during this dry period as well. The lagoon fills slowly during winter rainfall events and overtops the beach several days following a storm. Rodeo Creek baseflow during February 2004 ranged from 5.55 to 34.8 cfs, for example. Bedrock between the lagoon and ocean is at an elevation of 9 feet above mean sea level and is a control on the base level in the lagoon (ibid).

The unnamed stream that runs under the Nike core of the HI campus begins below a spring in the upper subwatershed south of Fort Cronkhite and flows about 3500 linear feet to the lagoon (KHE 2008a). Historic maps and studies indicate between one and four springs in this 95-acre watershed. One measurement of stream discharge upstream of the HI campus in March of 2008 indicated it was 0.21 cfs per square mile. Dry season flows in the range of 0.02 to 0.04 cfs per square mile have been reported in other locations in the Rodeo Lagoon watershed. Bed material for this stream is primarily gravel; fine grained materials overlie the gravel in the valley areas adjacent to the channel. Just upstream of the Nike campus a small tributary channel joins the primary stream collecting drainage from upstream areas to the east. Construction of buildings at Fort Cronkhite during the World War II era included directing stream flow into culverts upstream of the fort and burying them in fill materials all the way to the edge of the lagoon. The grade between Kirkpatrick Street and Mitchell Road is now 9%; confining flows to a pipe has likely eliminated any connection between the stream and a shallow groundwater system through the project area. Additional development of the still above-ground portion of the stream upstream of the Headlands Institute campus to create the Marin Roads and Trails maintenance yard resulted in the diversion of the channel to the west around the complex, including placement of the creek into a culvert buried by fill materials for approximately 250 feet upstream of Bunker Road. The watershed for this stream is shown in Figure 9.

Figure 9. Watershed of Unnamed Stream that Would Be Rehabilitated



Source KHE 2008b

Fill materials have collapsed in a formerly culverted section of the stream above Bunker Road and a large gully incised to bedrock has formed. This kind of bank failure and deep cutting of the stream channel is typical north of campus, although a tangle of tree roots and other woody debris helps to slow flows in a 20-foot section used by Headlands Institute for teaching purposes. In its more central portion, the stream has been placed in a culvert and the entire corridor buried under 5-10 feet of manmade fill. The pipe flows to the south side of Mitchell Road, where it empties into Rodeo Lagoon.

This is in stark contrast to what appears to be a broad, gently sloping (about 5% grade) plain of a diffuse system of distributary channels that transected grassland and wet meadow habitat prior to development of the fort. Based on photos and evidence from other sub-watersheds that empty into the south end of Rodeo Lagoon, it appears that the Army may have dug out continuous channels to help drain the area and provide flood protection in the early 1900s (KHE 2008a). The developed of a continuous, well-defined channel likely triggered geomorphic changes to the project area. Higher shear stresses associated with the concentrated flow would tend to increase sedimentation with incision (deep cutting of the channel) resulting (KHE 2008a).

According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (Panel 06041C0510D), the project area is located in an area of undetermined, but possible flood risk. Based on topography, extensive flooding of the HI campus is unlikely; however, localized flooding during large storm events is possible along the margins of Rodeo Lagoon and the unnamed tributary which flows through the campus. Flooding of the campus would be a particular risk during storm events where flows exceed the capacity of the culverts in the segments where the stream is underground; flows would then proceed overland through the campus. Inundation of the low elevation areas of the campus would also be possible in the event of sea level rise.

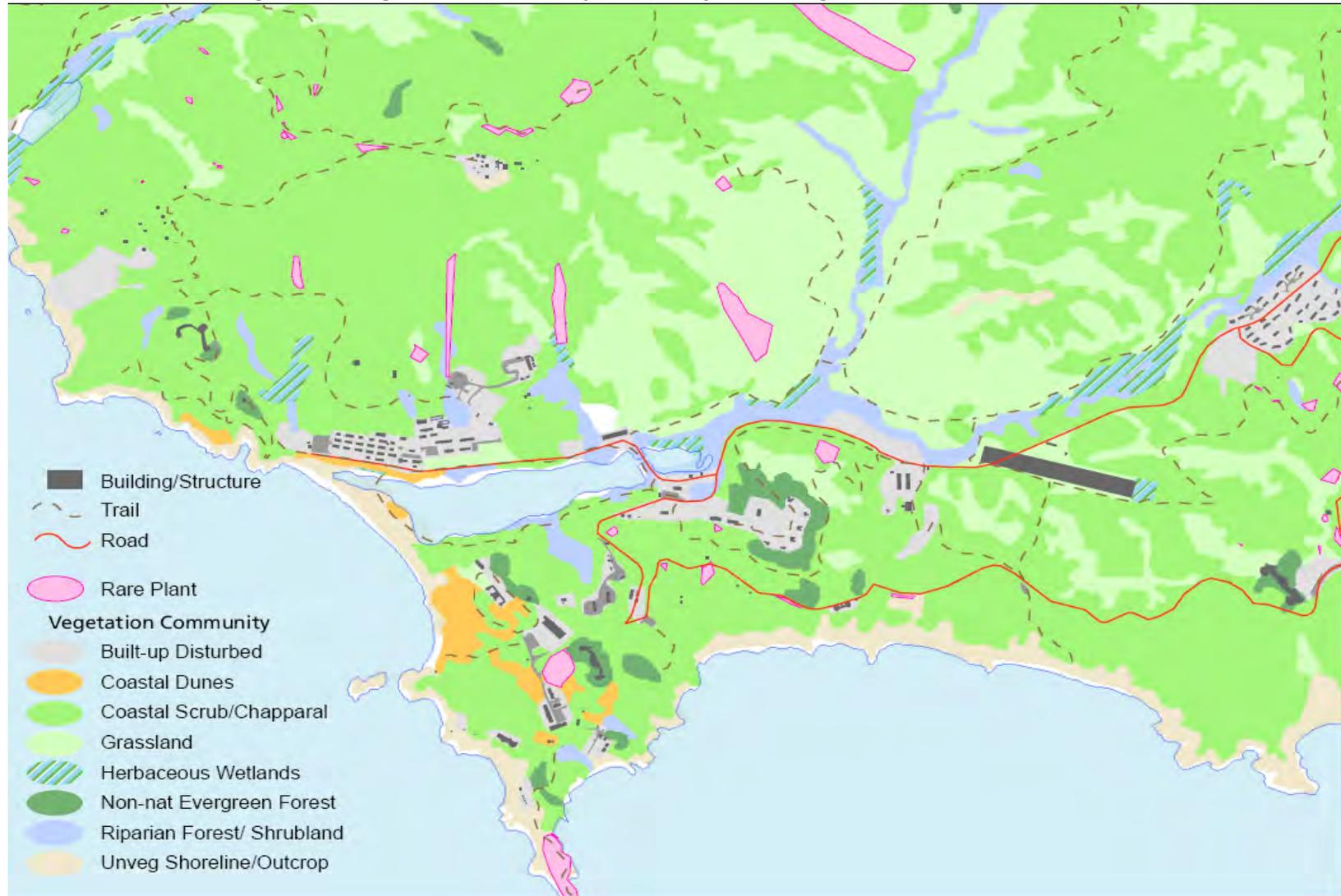
3.3 Vegetation

Vegetation in the Marin Headlands is diverse and is part of the central coast region of the California floristic province. The area is characterized by mild year-round temperatures, and the presence of fog extends the flowering period of many plants. Vegetation at the site is also influenced by sea spray and strong winds. In addition to a range of native vegetative communities, the study area also supports non-native weedy and ornamental plants resulting from historic grazing, fire suppression, and military and park development. Because the analysis of impacts in this EA includes those for resources where education takes place, the description of vegetation includes that in most of the Marin Headlands. Vegetative communities, including riparian and wetlands, as well as general locations of rare plants, are mapped on Figure 10.

The dominant vegetative types within this area are coyote brush scrub and coastal prairie (Figure 10). Coyote brush scrub (or "chapparal") is dominated by the evergreen shrub coyote bush (*Baccharis pilularis*), as well as other shrub species including coffee berry (*Rhamnus californica*), poison oak (*Toxicodendron diversilobum*), and California blackberry (*Rubus ursinus*). Other species that may occur include California sagebrush (*Artemisia californica*), toyon (*Heteromeles arbutifolia*), and huckleberry (*Vaccinium ovatum*). Herbaceous species include cow parsnip (*Heracleum lanatum*) and bracken fern (*Pteridium aquilinum*).

Coastal prairie or coastal grasslands are also common. Although pristine coastal prairie is dominated by perennial bunchgrasses, the grasslands at the site are dominated by non-native annual grasses. This change from perennial bunchgrasses to annual nonnative species has resulted in part from historical grazing, deliberate planting, altered fire regimes, and human land uses of the Marin Headlands. Common species include the invasive perennial purple velvet grass (*Holcus lanatus*), wild oats (*Avena fatua*), annual Italian wild rye (*Lolium multiflorum*), rattlesnake grass (*Briza major*), and soft chess (*Bromus hordeaceus*).

Figure 10. Vegetation in the Project Vicinity, including Wetlands and Rare Plants



Source: NPS Database: 1994 GGNRA vegetation map GIS layer and 2004 rare plant GIS layer

Native grasses that are occasionally encountered include purple needlegrass (*Nasella pulchra*), California fescue (*Festuca californica*), California oatgrass (*Danthonia californica*), California brome (*Bromus carinatus*), and blue wild rye (*Elymus glaucus*). Forbs such as English plantain (*Plantago lanceolata*), mustard (*Hirschfeldia incana*), and Italian thistle (*Carduus pycnocephalus*) thrive, and native wildflowers such as California poppy (*Eschscholzia californica*), miniature lupine (*Lupinus bicolor*), and blue dicks (*Dichelostemma pulchellum*) are present as well (May and Associates 2008; KHE 2008a).

Coastal scrub covers sandy substrates and rocky outcrops in the inland portions of dunes at the Marin Headlands as well as some portion of the lagoon shoreline near campus. Typical shrub species in this community include bush lupine (*Lupinus arboreus*) and California sagebrush. Dunes in the south part of Rodeo Beach are visited by students and are slated for possible restoration by the park. The foredune (dune parallel to coastline and closest to the ocean) is often populated with native dune grass and non-native beachgrass (*Ammophila arenaria*) and iceplant (*Carpobrotus edulis*). Low-growing dune mat species, including beach burr (*Franseria chamissonis*), yellow sand verbena (*Abronia latifolia*), and dune strawberry (*Fragaria chiloensis*) grow in the foredune. Low growing shrubs such as sagewort (*Artemisia pycnocephala*) and tansy (*Tanacetum douglasii*) occur in some dunes.

Historical land use and development has either changed vegetation or permanently removed it. For example, building to accommodate military personnel or park visitors (trails, roads, parking lots, restrooms, visitor center, etc.) or to build batteries or Cold War-era Nike related radar resulted in the permanent loss of vegetation at those sites in several locations in the Marin Headlands where native and nonnative vegetation was graded and removed to make way for these facilities. As such non-native, sometimes invasive species of forbs, grasses, shrubs, and trees are common at the campus and surrounding areas. Deliberate planting of nonnative trees (Monterey pine [*Pinus radiata*], Monterey cypress [*Cupressus macrocarpa*], Eucalyptus, acacia, Douglas fir [*Pseudotsuga menziesii*], redwood and pine species) for shade and wind protection, ornamental shrubs, and other vegetation (turfgrass, European beachgrass and iceplant for example) to stabilize erosion or dunes has also resulted in the spread of these species and displacement of native plants. A few scattered native madrone (*Arbutus menziesii*) and live oak (*Quercus virginiana*) also grow in the Marin Headlands. In addition to non-native invasive annual grasses described above, jubata grass [*Cortaderia jubata*], fennel [*Foeniculum vulgare*], iceplant, and French and Scotch broom [*Genista monspessulana*, *Cytisus scoparius*] all grow in disturbed areas of the site, such as along roads and trails. The campus is primarily planted in turfgrass, a combination of non-native grass species that holds up well to use.

3.3.1 Riparian and Wetland Vegetation

Reference Vegetation for Unnamed Creek

In preparing their report on site conditions, the stream restoration contractors KHE used nearby "reference sites" to compare hydrologic and vegetative conditions in less disturbed stream corridors (KHE 2008a). Reference Site 2, an intermittent creek near Building T1111 east of the campus was used to compare conditions at Reaches 1-3 (see Figure 4). The site was found to support willow riparian woodlands with a diversity understory of shrubs and herbaceous species, including California blackberry, various rush species, cow parsnip, sedge (*Cyperus* sp.) and soft rush. Vegetation that may have been present originally at Reach 5 (now underground, the section directly north of the campus) would have been a diverse mosaic of habitats including willow riparian woodlands, emergent marsh and seasonal wetlands along low-lying areas comparable to the "Surfer" parking lot tributary, Reference Site 1. The site is species rich and supports some of the same species as identified at Reference Site 2. A third reference site near the Fort Barry area

and entering Rodeo Lagoon contains brackish marsh, wet meadow adjacent to the emergent marsh and diverse willow riparian habitat along the gently sloped banks above the lagoon. Vegetation here may best approximate less disturbed conditions for Reaches 7 and 9. Here surface supply and groundwater connectivity support a variety of plant communities along a gradient between riparian woodland, meadow and lagoon marsh fringe including willow, thimbleberry, ninebark, twinberry, wax myrtle and poison oak as well as the riparian species identified at Reference Site 2 above.

Current Vegetation

Current vegetation in the Marin Headlands is shown in Figure 10. The vegetation at the sites described above lies in sometimes stark contrast to that along the unnamed stream slated for restoration at Ft. Cronkhite. In upstream reaches, it is vegetated by dense and relatively non-diverse willow riparian woodlands with a sparse understory. The dominant willow species is Arroyo willow (*Salix lasiolepis*) and includes Pacific willow (*S. lucida* ssp. *Lasiandra*) as well. The understory is vegetated with a variety of shrubs and herbaceous species including California blackberry (*Rubus ursinus*), rushes (*Juncus* spp.), soft rush (*Eleocharis* spp.), horsetails (*Equisetum* spp.), umbrella sedge (*Cyperus* spp.), cow parsnip (*Heracleum lanatum*), and sedges (*Carex* spp.). One section, just upstream of the "Time Tunnel" teaching site, is more species rich than other daylighted sections of the stream, with a more open tree canopy and diverse assemblage of wet meadow species, willows and shrubs. The middle reaches of the stream are buried under fill which is vegetated with grassland species composed primarily of annual species characteristic of disturbed sites with a few individuals of native perennial species. Where the culvert empties on the south side of Mitchell Road, cattails grow close to shore and a wet meadow fringe and small delta support willow riparian woodland and marsh fringe vegetation. Outside the study area, willow riparian woodland includes other tree species (California bay laurel, coast live oak, red alder) and understory species (thimbleberry, ninebark, twinberry, wax myrtle, and poison oak).

Rodeo Lagoon is the predominant wetland in the Rodeo watershed. Students visit the lagoon as well as Rodeo Lake immediately upstream. Vegetation growing on the shores of the lagoon and lake fall into several categories of wetland, including palustrine emergent, palustrine scrub-shrub, and estuarine emergent. The lagoon itself is categorized as estuarine unconsolidated bottom and does not support emergent vegetation, but does serve as habitat for algae and single-celled plants. Palustrine wetlands are freshwater wetlands subject to various runoff and flooding regimes and are vegetated with either sedges and grasses (emergent) or shrubs (willow). Estuarine emergent vegetation is able to withstand a mix of fresh and tidal water. Species known to occur in the vicinity of Rodeo Lagoon include meadow barley (*Hordeum brachyantherum*), buttercups (*Ranunculus californicus*), rushes, horsetail, luzula (*Luzula comosa*), sedges, and soft rush. Non-native velvet grass (*Holcus lanatus*) and Harding grass (*Phalaris aquatica*) may also occur. In addition, HI instructors have observed a potential spread of nonnative capeweed at the Rodeo Pond off-campus teaching site that may be exacerbated by heavy-use and visitation.

In addition to the wetlands associated with Rodeo Lagoon, freshwater wetlands have been identified in several locations across the Marin Headlands in association with the MHFB Transportation Plan (NPS 2009). For example, much of the Rodeo Creek valley is less disturbed than Gerbode Creek Valley (both feed Rodeo Lagoon) and is vegetated along its valley floor by wetlands (Shaw 2006). According to wetland delineations performed in 2007 for the MHFB Transportation Plan, the Rodeo watershed contains approximately 72 acres of wet meadow habitats, including 6 palustrine emergent wetlands dominated by herbaceous sedges, rushes, and grasses and 17 palustrine scrub-shrub wetlands dominated mainly by arroyo willow. Slope wetlands, in the form of seeps and springs, are also common in the area. NPS surveys have

indicated that a total of 76 springs or seeps were once present in the Rodeo Creek watershed. Of these, approximately 65 remain (Striplen et al. 2004).

A campus-specific survey for wetlands did identify three freshwater seeps totaling 0.27 acres near Building 1044. One of these is unvegetated and the other two are covered with typical wet meadow species (May and Associates 2008). All three were inadvertently created during military site development where flat benches were excavated into natural hill slopes. Over time, two of the sites became vegetated with rushes (*Juncus effuses*), velvet grass (*Holcus lanatus*), and California blackberry (*Rubus ursinus*). Where the meadows transition to uplands, this vegetation becomes intermixed with California fescue (*Festuca californica*) (ibid). Wet meadow vegetation is also found along the upper reaches of the unnamed creek which runs through the campus (KHE 2008a).

In addition, existing use of the Marin Headlands area (such as outdoor activities and educational hikes) has led to trampling of vegetation especially when visiting sites off of a designated trail. Vegetative trampling has been noted by HI instructors at the Time Tunnel riparian area that daylight north of campus, the lagoon edge, Rodeo Lake and Plateau of the Gods.

3.4 Wildlife

The Marin Headlands supports a diverse array of habitat and wildlife species. Coastal scrub, grasslands, and other upland habitats are used by a particularly wide variety of bird species, many of which use these areas for nesting. Patches of woodland are more rare, and non-native eucalyptus and Monterey pine and Monterey cypress offer foraging and nesting habitat for bird species, including those that would not otherwise be present. Several species of bats, including Townsend's western big-eared bat and Yuma myotis, are known to use buildings in the Marin Headlands for roosting and maternity colonies.

The Farallones Marine Sanctuary Association's (FMSA) Beach Watch program is a long-term monitoring program, founded in 1993 to provide a baseline data set to assist in the early detection of natural and human-caused environmental effects on bird and marine species (FMSA 2009). The Beach Watch surveys 42 coastal beach segments every two to four weeks from Bodega Head in Sonoma County to Año Nuevo State Reserve on the San Mateo/Santa Cruz county line. Shore birds recorded by Beach Watch more than five times (e.g., more than five total observations have been recorded) include black oystercatcher, black turnstone, greater yellowlegs, killdeer, long-billed curlew, marbled godwit, sanderling, whimbrel, and willet. Analysis of the frequency of shorebirds per linear kilometer of beach showed that the average numbers of four indicator species (willetts, godwits, sanderlings, and whimbrels) were each lower than most other coastal beaches near the GGNRA. The reasons for this are unknown. An NPS analysis of the Beach Watch data from Rodeo Beach, the 300 feet of ocean nearest the shore and the western 1/3 of Rodeo Lagoon found that 102 different bird species were detected and that the most frequently recorded species was the federally endangered California brown pelican (NPS, unpublished data). A variety of gulls and cormorants were also common, as were terns. Elegant terns were found at an average of 2.6 birds per survey. The lagoon was populated with great blue herons, black-crowned night-herons, and snowy and great egrets, particularly in early fall.

The lagoon also supports several fish species, including prickly sculpin, threespine stickleback and the federally endangered tidewater goby (see the *Species of Special Concern* section). Non-native fish species such as yellowfin goby and striped bass may also use the lagoon. Rodeo Lake and Rodeo Creek provide open water, marsh, and riparian habitats; these may support the highest wildlife diversity because they are used by a combination of aquatic and terrestrial wildlife species.

Historical changes to the study area include the loss of a meandering delta formation as well as connections between the brackish tidal lagoon and freshwater stream running through the HI campus when the unnamed stream was altered. The loss of sections of the unnamed stream corridor when it was culverted, and the riparian connection between it and the lagoon, substantially degraded the quality and availability of riparian habitat. Because some riparian and marsh habitat associated with the campus creek remain, channeling and culverting some of the stream may not have resulted in the extinction of any species at or near the site; in addition, riparian and creek-marsh interface habitat does remain nearby (feeding into the adjacent "Surfer" parking lot, on the south side of the lagoon, along Rodeo and Gerbode creeks, etc.).

The existing riparian corridor that runs through campus may also support a relatively high diversity of wildlife, although vegetation along much of the corridor is described as a dense, nearly monospecific canopy of arroyo willow and a relatively sparse understory. In other areas of the park, riparian areas are heavily used by a variety of wildlife in all seasons and were identified as the habitat "most thoroughly used" by birds in the nearby Redwood Creek watershed. Willows are known to support bird life, and several species may nest in this riparian vegetation, including Wilson's warbler, Brewer's blackbird, American goldfinch, Swainson's thrush, bushtits, chickadees, white-breasted nuthatch, wrentits, and varied thrush (NPS 2006b). Raptors, including the red-shouldered hawk, sharp-shinned hawk, and white-tailed kite also nest in very large riparian trees, including non-native eucalyptus, Monterey pine, and Monterey cypress. Many of these birds have been observed by park staff, and anecdotal observations include Wilson's warbler, Brewers' blackbird, red-tailed hawk, red-shouldered hawk, and great-horned owl, as well as common yellowthroat, American robin, black phoebe, western bluebird, red-winged blackbird, marsh wren, and white-crowned sparrow (T. Williams pers. comm. 2008). California newts and California giant salamanders have also been found in the riparian corridor, and habitat may be suitable for Pacific tree frogs or western aquatic garter snakes.

Mammals in the Marin Headlands include coyotes, bobcats, raccoons, skunks, gray fox, black-tailed deer, brush rabbit, and badgers. River otters have been reported to use Rodeo Beach as well as the lagoon and lake. Small mammals associated with riparian areas in other parts of the park include western harvest mice, California voles, broad-footed mole, pocket gopher, deer mouse, and roof rats (NPS 2006b). Several species of seal and sea lion are known to occur in the vicinity of the project area and could haul out on Rodeo Beach and Bonita Cove. Marine mammal strandings are also reported by the Marine Mammal Center located east of the HI campus; on Rodeo Beach an average of 6 per year were reported between 2000 and 2003.

Invertebrates in the project area include insects associated with the lagoon and upland areas, as well as anemones, starfish, and other species that occupy tidepools visited by students.

Historic Changes to Wildlife Habitat in the Area

Historic development of Fort Cronkhite likely removed what is now known to be important wildlife habitat, as it was built in an area of coastal scrub, coastal dune and native coastal prairie, all habitat types that are becoming relatively rare in California as development continues to take place. In addition to building many acres of facilities, roads and trails, remaining native vegetation was removed and replanted in nonnative ornamental species for shade and wind protection or for perceived aesthetic reasons. This effectively removed any remaining high quality wildlife habitat from the fort.

Historic activities in the Marin Headlands outside Fort Cronkhite that may have affected wildlife or wildlife habitat include grazing, fire suppression and military and park development. For example, building to accommodate military personnel or park visitors (trails, roads, parking lots, restrooms,

visitor center, etc.) or to build batteries or Cold War-era Nike related radar has resulted in the permanent loss of wildlife habitat at those sites in several locations in the Marin Headlands. Grazing, deliberate planting and human land uses of the Marin Headlands has also resulted in changes to habitat. For example, grasslands at the site and across most of California changed from perennial bunchgrasses to annual nonnative species as a result of grazing, fire suppression and historic human land uses. These kinds of changes can displace native wildlife that have co-evolved with native vegetation as food and shelter. Deliberate planting of European beachgrass and iceplant at Rodeo Beach to stabilize dunes has dramatically favored deer mice over other small dune rodents, for example. Impacts from historic uses could range from minor to major, and be localized or regional.

3.5 Species of Special Concern

Species of special concern include plants and animals that are either on the federal or state list of threatened and endangered species, are named as being of special concern by a state agency, or are otherwise considered rare, unique, sensitive, or of management concern. While no listed plant species are known to grow in the study area, three listed animals would potentially be affected by actions in the alternatives—the tidewater goby, the California brown pelican, and the California red-legged frog. Other listed or rare species that do not occur on campus, but have habitat in the area of the Marin Headlands where off-campus education takes place, include western pond turtle, steelhead trout, salt marsh common yellowthroat, white-tailed kite, and several bat species. Mission blue butterflies colonize areas of the Marin Headlands, some of which are included in off-site teaching areas. However, students are instructed to stay on trail and away from flagged areas at these sites which indicate habitat for these species to minimize disturbance. Furthermore, a majority of these species are not likely to occur on-site where rehabilitation, construction, and riparian corridor enhancement would take place. This applies to the western pond turtle, steelhead trout, white-tailed kite and mission blue butterfly species. Therefore, only incidental disturbance from HI students similar to that of any visitor would affect these species, which is equivalent to a negligible or no impact finding. As such, these species are dismissed from further discussion.

3.5.1 Listed Animal Species

Tidewater Goby

The tidewater goby (*Eucyclogobius newberryi*) is found in Rodeo Lagoon. It is a federally listed endangered species and is a California Species of Special Concern. Found only in California, it is almost unique among fish along the Pacific coast in its restriction to brackish coastal lagoons with salinities of less than 10 parts per thousand (USFWS 2004). The tidewater goby, a member of the Gobiidae family, is the only species in the genus *Eucyclogobius*. It is a small benthic fish, rarely exceeding 2 inches in length, and is characterized by large pectoral fins, a blunt elongated tail, and a ventral sucker-like disk formed by the complete fusion of the pelvic fins. The goby's body is a mottled dark olive color and is nearly translucent.

This species historically occurred in at least 87 California coastal lagoons from San Diego County to Humboldt County; it has since disappeared from most of these sites. They are threatened by coastal development and loss of habitat; water diversions and altered water flows upstream of coastal lagoon and estuary habitat; groundwater overdrafting; channelization of rivers; discharge of agricultural and sewage effluents; cattle grazing and sedimentation of habitat that results; introduced non-native species; and drought (Federal Register 50 CFR Part 17; 11/28/06).

The tidewater goby's habitat consists of brackish shallow lagoons and lower stream reaches where the water is fairly still but not stagnant. The species is typically found in water less than 1 meter (3.3 feet) deep and salinities of less than 12 parts per thousand (USFWS 2004). Small crustaceans, aquatic insects, and mollusks are its primary diet. The tidewater goby apparently spends all life stages in lagoons. It may enter the marine environment only when forced out of the lagoon by strong storms. Reproduction occurs year round although distinct peaks in spawning, often in April and May, do occur. When breeding, males dig vertical burrows where females deposit eggs. Within nine to ten days larvae emerge and are approximately 0.25 inch long. The larvae live in vegetated areas within the lagoon until they are about 0.75 inch in length.

Surveys from 1996 to 1999 documented variable densities of tidewater gobies in the lagoon. While they were somewhat consistent for three of the years, ranging between 6.3 and 12.2 individuals per square meter, densities of over 40 per square meter were recorded in the fourth year (Fong 1999a as cited in NPS 2009). Densities are typically highest in the fall and lowest in the winter.

California Brown Pelican

The California brown pelican (*Pelecanus occidentalis californicus*) is listed as a federal and state endangered species, and is a California fully protected species. An early Recovery Plan for this species (USFWS 1983) noted this once widespread species experienced serious declines in the 1960s and 70s from reproductive failures related to pesticide use and pollution. As a result the species was classified as endangered in 1970; the California subspecies was further protected when the state designated it as endangered in 1971.

Nesting is restricted to islands in the Gulf of California and along the outer coast from Baja California to West Anacapa and Santa Barbara Islands in southern California. Non-breeding California brown pelicans range northward along the Pacific Coast from the Gulf of California to Washington and southern British Columbia. Non-breeding brown pelicans are common in many of the coastal areas of the park, including in Rodeo Lagoon and offshore of Rodeo Beach at Bird Island from April to December. From January to March, they are less frequently seen and roost in smaller flocks.

The California brown pelican is one of six recognized subspecies of brown pelican. Brown pelicans are distinguished by their large size and brown color. Adults weigh approximately 9 pounds, and have a wingspan of over 6 feet. They have long, dark bills with big pouches for catching and holding fish. The brown pelican is easily distinguished from the American white pelican, the only other pelican in its range, which is white with black primary and secondary flight feathers.

Brown pelicans dive from flight to capture surface-schooling marine fishes. In California they feed primarily on Pacific mackerel, Pacific sardine, and northern anchovy. Anchovies comprise 90 percent of their diet during the breeding season.

The lagoon, Rodeo Beach, and Bird Island are considered a significant roosting site in Northern California. Between April and December, Bird Island may be occupied by several thousand pelicans. The birds also bathe, feed, and roost in nearby Rodeo Lagoon by the hundreds, where they primarily occupy the western two-thirds of the water area. The pelicans primarily roost at the west edge of the lagoon in the early morning, and during storms on a point of sand near the southwest corner (May and Associates 2007 as cited in NPS 2009).

California brown pelicans are highly sensitive to human disturbance and noise, and any threats to roosting or fishing resources can affect them. Human activity, off-leash dogs, and small fishing boats nearshore pose a threat to these roosting areas. Pollution, oil spills, sedimentation, effects

to fisheries, and climatic factors could also cause changes in the quantity and quality of their main source of food, the northern anchovy. The Recovery Plan for pelicans indicates that this sensitivity to continuous human disturbance and predators may be why breeding and roosting take place on offshore islands (USFWS 1983). Channel Islands National Park restricts kayakers or boaters to within 100 meters of roosting or nesting colonies because they are so sensitive to human disturbance, including the presence of vessels, noise and light (NPS 2008). Although it is unknown whether noise or human activity is most to blame, it is likely that pelicans are sensitive to both and that many individuals roosting in the area of the lagoon closest to the campus would be intolerant of construction noise. Pelicans that do not tolerate noise levels at the 70 dBA range (similar to a vacuum cleaner at 3 feet) would leave the northern shore of the lagoon and roost on the southern end or fly offshore to Bird Island, other favored roosting spots for this species.

California Red-Legged Frog

The California red-legged frog (*Rana aurora draytonii*) is federally listed as a threatened species and is a California species of special concern. The California red-legged frog had been extirpated from 70 percent of its former range by the time its 2002 Recovery Plan was written by the USFWS. It is restricted to coastal drainage from central California to north Baja California.

The California red-legged frog occurs from sea level to elevations of about 1,500 meters (4,921 feet), primarily in wetlands and streams in coastal drainages of central California. The California red-legged frog requires a variety of habitat elements with aquatic breeding areas embedded within a matrix of riparian and upland dispersal habitats. Breeding sites are in aquatic habitats including pools and backwaters within streams and creeks, ponds, marshes, springs, sag ponds, dune ponds, and lagoons. The adults require dense, shrubby, or emergent riparian vegetation closely associated with deep (greater than 2 1/3-feet deep) still or slow moving water. The largest densities of California red-legged frogs are associated with deep-water pools with dense stands of overhanging willows (*Salix* spp.) and an intermixed fringe of cattails (*Typha latifolia*). California red-legged frogs aestivate (enter a dormant state during summer or dry weather) in small mammal burrows and moist leaf litter. They have been found up to 100 feet from water in adjacent dense riparian vegetation.

Recent studies have confirmed that Rodeo Lake is used as a breeding site for red-legged frogs, and that Rodeo Creek provides suitable non-breeding habitat (Wood 2005 as cited in NPS 2007a). In addition, juvenile red-legged frogs were observed in October 2005 using the eastern shoreline of Rodeo Lagoon due to the abundance of flying insects (Fong as cited in NPS 2007a).

Salt Marsh Harvest Mouse

The salt marsh harvest mouse (*Reithrodontomys raviventris*) is federally and state listed as endangered; it has fully protected status under the California Fish and Game Code (sec. 4700). This species is restricted to the San Francisco Bay area and inhabits salt marshes with dense cover, particularly pickleweed. Based on extensive trapping of harvest mice, the western extent of the mouse's range was determined to be Corte Madera Marsh in eastern Marin County. Therefore, potential habitat at Rodeo Lagoon is outside this species' range (May & Associates 2007). Salt marsh harvest mice were reportedly trapped at Rodeo Lagoon in 1992, although subsequent review of the trapping records concluded the individuals were likely misidentified western harvest mice. Rodeo Lagoon used to be breached regularly, resulting in higher salinity levels from tidal influence. However, this no longer occurs, which may be partially responsible for the lack of pickleweed habitat around the lagoon. Therefore, even if the salt marsh harvest mouse may have once occurred at Rodeo Lagoon, current conditions (low salinity levels and lack of pickleweed) would likely preclude its presence today (May & Associates 2007).

3.5.2 Rare Unlisted Wildlife

Salt Marsh Common Yellowthroat

The salt marsh common yellowthroat (*Geothlypis trichas sinuosa*) is a federal and state subspecies of concern (the *species* common yellowthroat is not in danger at this time) that breeds in coastal California. In Marin County, this species usually occurs in freshwater marsh, coastal swales, and riparian thickets and swamps. It can also occur in brackish marsh, salt marsh, and upland habitats with dense groundcover. Salt marsh common yellowthroats are common nesters in suitable habitat throughout Marin County and are likely to nest in the Marin Headlands. Some authors have suggested that populations may move from brackish and freshwater marshes where they breed to salt marshes dominated by pickleweed during the winter. Breeding areas are most commonly tidal marshes where bulrush, peppergrass, and cattail are prevalent. Males begin establishing territories in mid-March and the nesting season lasts through late July (Solano County Water Agency 2004).

Threats facing the salt marsh common yellowthroat include continued habitat loss due to development and urbanization. Loss of habitat through urbanization has caused an 80 to 95% decline in this subspecies over the last 100 years. Another potential threat may be brood parasitism by brown-headed cowbirds, as common yellowthroats as a whole are one of the more frequent cowbird hosts among North American warblers (Dunn and Garrett 1997 as cited in Solano County Water Agency 2004).

3.5.3 Rare Unlisted Vegetation

No federal or state listed species of plants were found in the Marin Headlands in a 2005 survey conducted in association with the MHFB Transportation Improvement and Management Plan EIS. The survey team was looking particularly for six endangered species (*Alopecurus aequalis* var. *sonomensis*; *Arenaria paludicola*; *Delphinium luteum*; *Pentachaeta bellidiflora*; *Trifolium amorenium*; and *Cordylanthus mollis* ssp. *Mollis*) which had potential habitat in the study site. The survey took place over a 3-day period in May and was focused on areas where -related changes might occur. No individuals of any of these species were located (URS 2005).

Four rare plant species—coast rock cress (*Arabis blepharophylla*), San Francisco wallflower (*Erysimum franciscanum*) Franciscan thistle (*Cirsium andrewsii*), and San Francisco gumplant (*Grindelia hirsutula* var. *maritime*) are known to occur within the Marin Headlands (Taylor 2004).

Coast Rock Cress

Coast rock cress is a perennial herb that occurs in coastal California counties from Monterey to Sonoma. It occurs in coastal bluff scrub, coastal prairie, coastal scrub, and broadleafed upland forest and is threatened by competition (CNPS 2008). It is listed as having limited distribution and “not very endangered in California” with between 20 and 80 occurrences by the California Native Plant Society (CNPS).

San Francisco Wallflower

San Francisco wallflower is a perennial herb found in six California coastal counties, including Marin and San Francisco. It is found in coastal dunes, coastal scrub, valley and foothill grasslands, and chaparral. The species is characterized as having limited distribution and as being “fairly endangered” in California by the CNPS (CNPS 2008a).

Franciscan Thistle

Franciscan thistle is a perennial herb with a limited distribution in Contra Costa, San Francisco, San Mateo, Sonoma, and Marin counties. It is considered rare, threatened, or endangered in

California by the CNPS, but is not on any state or federal list of threatened or endangered species. CNPS indicates only between 6 and 20 occurrences exist in the state and that Franciscan thistle is threatened by development and non-native plants. It grows in coastal scrub, bluff scrub, coastal prairie, and broadland upland forest (CNPS 2008b).

San Francisco Gumplant

San Francisco gumplant is a perennial herb considered “fairly endangered” in California by CNPS with between 6 and 20 occurrences in the state. It is a perennial herb that has been found in California coastal counties from San Luis Obispo to Marin. It grows in coastal bluff scrub, coastal scrub, and valley or foothill grassland and is threatened by coastal development and non-native plants (CNPS 2008c).

Because the surveys have not been exhaustive, it is possible that other rare plant species occur at the Marin Headlands. While no listed species are believed to have the potential for occurrence, several rare species are considered moderately or highly likely to occur somewhere in the Marin Headlands. Table 6 shows those rare plant species known to occur or considered moderate or highly likely to occur in Marin Headlands and the kind of habitat each occupies. Similar to animal species, the type of impact the HI would have on these species is very likely to be incidental, with the potential for trampling or creating a social trail near an individual. These are the same types of impacts other visitors have, and since none have been located in the study area, all but those found in the 2005 survey are dismissed from further discussion.

Table 6. Rare Plant Species that Occur or Have the Potential to Occur in Marin Headlands

Species	Listing Status		Habitat	Potential for Occurrence
	Fed	CNPS		
Coast Indian paintbrush (<i>Castilleja affinis</i> ssp. <i>Affinis</i>)	SLC		Coastal scrub, chaparral	High
California croton (<i>Croton californicus</i>)	SLC		Coastal sage scrub, chaparral	Moderate
Coast rein orchid (<i>Piperia elegans</i>)	SLC		Chaparral, pine and fir forest, coastal scrub	Moderate
California goosefoot (<i>Chenopodium californicum</i>)	SLC		Open sites in clay or sandy soils	Moderate
Nuttall's milk vetch (<i>Astragalus nutallii</i> var. <i>virgatus</i>)	SLC		Coastal bluff scrub and coastal dunes	Moderate
California saltbush (<i>Atriplex californica</i>)	SLC		Coastal dunes and coastal scrub	Moderate
Purple owl's clover (<i>Castilleja exserta</i> ssp. <i>Latifolia</i>)	SLC		Coastal dunes and bluffs	Moderate
San Francisco Bay spineflower (<i>Chorizanthe cuspidate</i> var. <i>cuspidate</i>)	SC	1B	Coastal bluff scrub, dunes, coastal prairie and coastal scrub	Moderate
Large flowered linanthus (<i>Linanthus grandiflorus</i>)	SC	4	Coastal bluff scrub, coastal scrub, grasslands, coniferous forest	Moderate
Coast rock cress (<i>Arabis blepharophylla</i>)	SLC	4	Coastal bluff scrub, coastal scrub, coastal prairie, coastal upland forest	Known to occur
Franciscan thistle (<i>Cirsium andrewsii</i>)	SC	1B	Coastal bluff scrub, coastal scrub, coastal prairie, coastal upland forest	Known to occur.
Curly-leaved monardella (<i>Monardella undulata</i>)	SC	4	Chaparral, dunes, scrub, coastal prairie, closed-cone coniferous forest	Moderate

Species	Listing Status		Habitat	Potential for Occurrence
	Fed	CNPS		
San Francisco wallflower (<i>Erysimum franciscanum</i>)	SC	4	Chaparral, dunes, coastal scrub, valley/foothill grassland	Known to occur
Fragrant fritillary (<i>Fritillaria liliacea</i>)	SC	1B	Coastal scrub, coastal prairie, woodland, valley grassland	Moderate
San Francisco gumplant (<i>Grindelia hirsutula</i> var. <i>maritime</i>)	SC	1B	Sandy or serpentine soils in coastal bluff scrub, coastal scrub, valley and foothill grassland	Known to occur
Marsh microseris (<i>Microseris paludosa</i>)	SLC	1B	Coastal scrub, valley, foothill grassland, coniferous forest, woodland.	Moderate
San Francisco owl's clover (<i>Triphysaria floribunda</i>)	SC	1B	Coastal prairie, coastal scrub, valley, foothill grassland, serpentine.	Moderate
California broomrape (<i>Orobanche californica</i> ssp. <i>californica</i>)	SLC		Coastal bluffs	Moderate
California triquetrella moss (<i>Triquetrella californica</i>)	SLC	1B	Coastal bluff scrub, coastal/scrub	Moderate
San Francisco gilia (<i>Gilia capitata</i> ssp. <i>Chamissonis</i>)	SC	1B	Coastal dunes/coastal scrub	Moderate
Seashore starwort (<i>Stellaria littoralis</i>)	SC	4	Coastal bluff scrub, coastal scrub, dunes, wetlands	Moderate
Salt marsh owl's clover (<i>Castilleja ambigua</i> ssp. <i>Ambigua</i>)	SLC		Coastal bluff and coastal prairie	Moderate
Davy's clarkia (<i>Clarkia davyi</i>)	SLC		Coastal bluffs and coastal prairie	Moderate

Source: Appendix D of the MHFB Transportation Plan Final EIS

Federal categories:

- SC Species of concern
 SLC Species of local concern
 * Possibly extirpated

California Native Plant Society categories

- 1B Plants rare, threatened or endangered in California and elsewhere
 2 Plants rare, threatened or endangered in California but more common elsewhere
 3 Plants for which more information is needed
 4 Plants of limited distribution – a watch list.

3.6 Air Quality

The Bay Area Quality Management District operates a regional air quality monitoring network that regularly measures concentrations of major categories of air pollutants, called “criteria” pollutants. These include carbon monoxide, nitrogen dioxides, ozone, sulfur dioxide, and particulates. The San Rafael station is the closest to the study area, and has recent data for ozone, carbon monoxide, and PM₁₀ (particulates greater than 10µm in size). These data (2002–2004) indicate that air quality is generally quite good, and that ozone or carbon monoxide standards have not been exceeded in the three-year monitoring period. National particulate standards have also not been exceeded, but state standards of a maximum 24-hour dose of 50 µm/m³ have been exceeded. This standard was exceeded a total of four times in the three-year period and was calculated (measurements are only taken every six days) to have been violated a total of 24 days (NPS 2009).

Regional flow patterns affect air quality in the Marin Headlands by moving pollutants downwind, which is generally blowing from the west or northwest. Moderate winds disperse pollutants and reduce pollutant concentrations. An inversion layer traps pollutants, primarily in the summer. Normal precipitation occurs from November through February and totals an average of 35 inches.

3.7 Cultural Resources

The NPS recognizes five categories of cultural resources for management purposes: archaeological resources, structures, cultural landscapes, ethnographic resources, and museum objects (NPS 1998). It is not expected that ethnographic resources and museum collections will be affected by this proposal; consequently, they are not discussed further. Archeological and cultural resources may be impacted and are described in more detail below.

The project is located within the Forts Baker, Barry, and Cronkhite National Register District, which was listed in the NRHP in 1973. The property is significant based on its military history, with an overall period of significance extending from 1866 to 1973, although the later Nike structures are listed as contributing resources (Auwaerter and Curry 2008). Fort Cronkhite was built as a World War II cantonment, although half of it was converted over a period of years to a 1960s-era Nike Administration area, leaving a core of Nike structures with high integrity surrounded by enough features of the World War II era to add complexity and layering to the east wing of the area. The west part of the area retains extraordinarily high integrity and is considered to be an exemplary World War II cantonment, and is related to but not at the center of the descriptive analysis given below.

As required by Section 106 of the NHPA, the “area of potential effect” was determined to aid in the identification and evaluation of effects to cultural resources. In this case, there is one direct area of potential effect where construction will occur at Fort Cronkhite and a larger area, the entire historic district, where there will be consideration for how the effects of the construction activity in Fort Cronkhite might have district-wide, indirect effects (see the *Cultural Resources* section of the *Environmental Consequences* chapter for more detail).

3.7.1 Cultural Resource Context for HI Project Area

The Native American population that once occupied Marin County, including what now is the Marin Headlands area, are today referred to as Coast Miwoks. The era of Spanish exploration and settlement brought great disruption to the traditional Native American ways of life and decimated native populations in the San Francisco area. In 1769 the Portola Expedition discovered and claimed San Francisco Bay on behalf of the Spanish Crown, and in 1775-1776 the Anza expedition brought settlers from Sonora overland to found a mission and a presidio (Hayes 2007).

Mexico became independent of Spain in 1822 after which the missions were secularized. The political center of power thus shifted more and more toward the land-owning elite, and regional land use patterns still recognized today were set in place. The vast ranchos with their equally vast herds of cattle became the basis for much of the economic activity in the area. To the north of San Francisco, new settlers began to develop a regionally significant dairy industry in the 1850s that thrived for about 100 years; a number of the original dairy ranches continue to operate, as cattle ranches, within the park boundaries (Livingston 1995).

At the start of the 20th century, the United States assumed control of territories across the Pacific Ocean in the Philippines, Hawaii, and the Panama Canal Zone. After the attack on Pearl Harbor propelled the United States into World War II, the West Coast became an official theater of war

and its defenses were reinforced accordingly for the duration, including the development of Fort Cronkhite. During the Cold War that followed, the Army deployed Nike anti-aircraft missiles around the Golden Gate (Toogood 1980). HI currently occupies the administration portion of Nike Site SF87, which is located in Fort Cronkhite.

3.7.2 Cultural Resources by Category

Archeological Resources

There are currently 27 archeological sites included in the Forts Baker, Barry and Cronkhite historic district in the Archeological Survey Management Information System, and it is possible that additional undiscovered sites exist. Archeological resources from indigenous populations of Native Americans within the present boundaries of GGNRA typically consist of sites, such as village sites, camps, rock shelters, procurement sites such as food gathering and hunting spots or quarries for tool making, food processing sites such as shell middens, funerary sites, and trails. Isolated artifacts relating to many of the above functions may appear in areas with greater or lesser association to these sites. Historic archeological resources expected within and around military fort resources would likely include privy pits, refuse deposits/dumps, foundations, etc.

Prior reconnaissance efforts have identified at least five areas within the historic district with prehistoric deposits, one of which is south of Rodeo Lagoon and within the larger, indirect area of potential effect (Forts Baker, Barry, and Cronkhite National Register District). Park partners have found numerous isolated artifacts near Rodeo Lagoon and in other Marin Headlands locations.

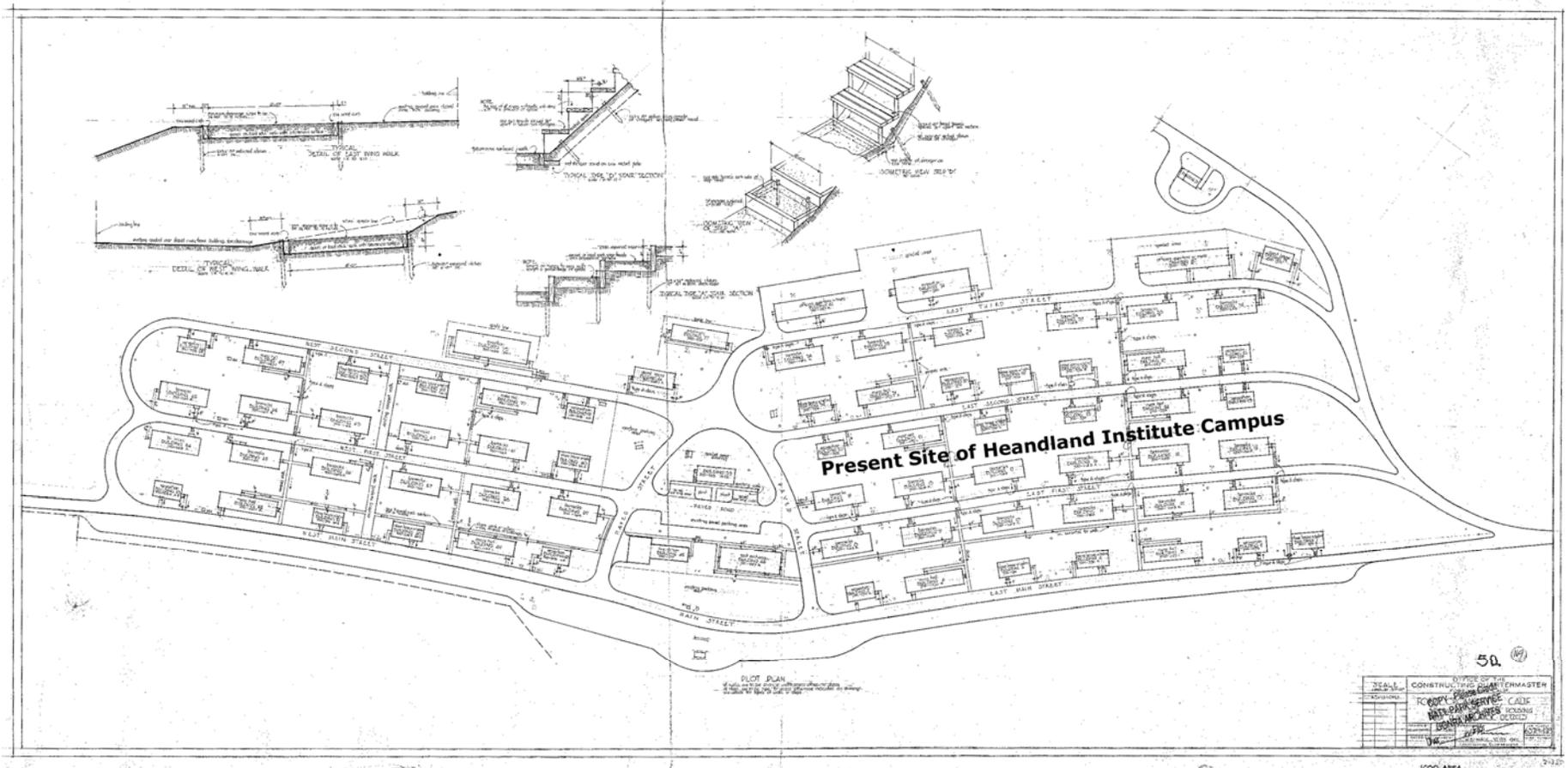
An intensive pedestrian survey of portions of the Marin Headlands was conducted in 2005 to supplement existing cultural resource inventories for the Marin Headlands road corridors (Barker and Bamaal 2005). This resulted in the mapping of historic archaeological sites and features and remnants of the cultural landscape that were not included in previous study efforts, many of which are within the areas of potential effect.

Cultural Landscapes

Cultural landscapes are environmental settings that human beings have created in the world that reveal the fundamental ties between people and the land and reflect the human need to grow food, give form to settlements, meet a need for recreation or work, or bury the dead (NPS 1998). Historic structures are included within the cultural landscape discussion as all such affected resources fall within the Fort Cronkhite landscape. Unless otherwise noted, the following description of Fort Cronkhite is summarized from Auwaerter and Curry (2008).

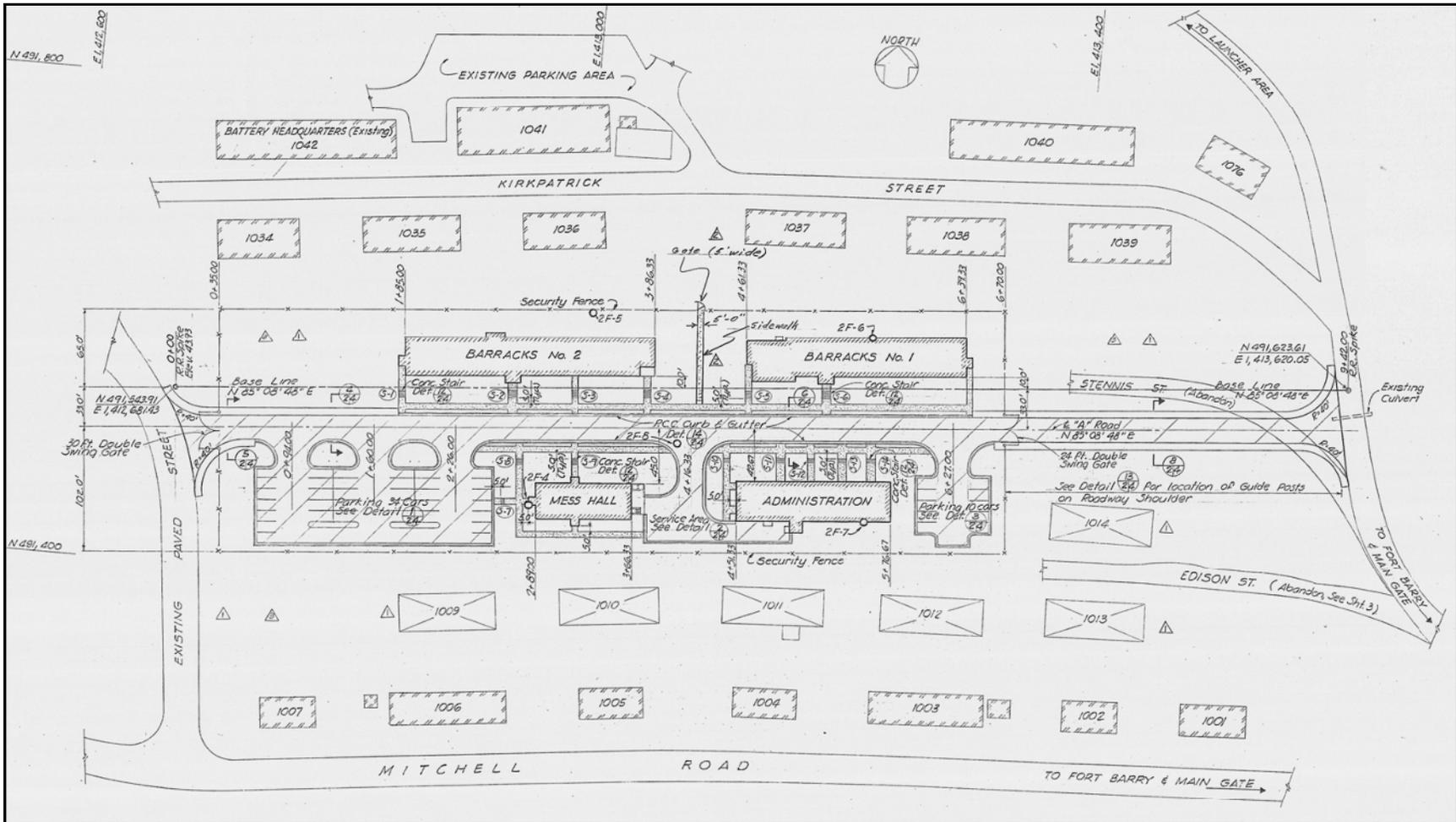
The historic resources at Fort Cronkhite fall within a period beginning in 1940 with the initial construction of the cantonment (Figure 11), continuing through construction of the Nike administration complex (SF-87A) in the east wing of the cantonment in c.1964-1966, and ending with decommissioning of the fort and its Nike systems in 1974 (Figure 12). The Nike administration complex at Fort Cronkhite was part of a system of three interrelated installations that typically comprised a Nike site: a radar station (SF-87C) on Hill 129, also known as Hawk Hill on the Fort Barry/Baker boundary; and a missile launch area at Fort Cronkhite (SF-87L) that has been redeveloped as the Marine Mammal Center.

Figure 11. Planview of the Fort Cronkhite Cantonment during World War II



Source: Auwaerter and Curry 2008

Figure 12. Planview of East Wing of Fort Cronkhite, including the Nike Complex (center)



Source: Auwaerter and Curry 2008

The western half of the cantonment is the best surviving example of the World War II barracks to be found today within GGNRA. The Nike administration complex located within Fort Cronkhite has undergone considerable change since the end of the historic period as a result of its adaptive reuse as the HI campus. Since the end of the historic period in 1974, the character of the west wing and central area of the cantonment has remained largely unchanged aside from the removal of four structures in the lower row of buildings along Mitchell Road, and creation of a parking lot on the former parade ground. In the east wing, the line of buildings along Mitchell Road has been removed, as well as several more World War II-era buildings along Kirkpatrick Street, creating additional open space around the Nike complex and increasing its isolation from the original cantonment. A greenhouse and nursery area were added north of Kirkpatrick Street in recent decades. Within the Nike complex, the landscape has been altered since the end of the historic period with removal of the central drive; reduction in the size of the large parking lot; alteration of the terraces; removal of the perimeter fence; and addition of a sunken amphitheater, new shrubs and trees, and a wing on the mess hall. These changes were made after 1977 as part of the HI campus development (Figure 13).

Since the end of the historic period in 1974, the spatial organization of the cantonment has also been altered with the removal of the lower rows of World War II-era buildings in both the east and west wings along Mitchell Road, and the removal of several more World War II-era buildings in the east wing along Kirkpatrick Street north of the Nike complex. These changes have overall set the cantonment apart from Mitchell Road, and have changed the character of the Nike complex from a space set within the east wing, to more of a separate, distinct space that has further opened the spatial character of the landscape.

Auwaerter and Curry (2008) provides additional details regarding the overall Fort Cronkhite cantonment landscape, including natural systems and features, spatial organization, land use, circulation, topography, vegetation, buildings and structures, views and vistas, and small-scale features, as well as treatment guidelines.

3.8 Visitor Experience

The project area is located in the Marin Headlands of GGNRA, within and around Fort Cronkhite (Figure 14). The GGNRA is one of the most heavily visited urban area parklands in the United States, with the Marin Headlands area being a particularly popular area of the park, especially with the local community.

The GGNRA lands surrounding the HI campus are unique not only in their diversity and quantity of natural and cultural features, but also in their proximity to a major urban population that has worldwide status as a tourist destination. This juxtaposition makes the HI and surrounding GGNRA land's resources and recreational opportunities readily accessible to a large number of people, and enhances the importance of the special qualities for which it was set aside. Park visitors can be local residents who have the park as part of their "backyard" as well as visitors from all over the world who have traveled to San Francisco to see many different attractions as part of their visit. GGNRA is visited by over 16 million people annually.

The Marin Headlands area provides a variety of recreational activities, including surfing, picnicking, walking, hiking, running, dog walking, biking, wildlife viewing, and horseback riding. Popular trails in the area include the Miwok, Coastal, Wolf Ridge, and Lagoon trails. The Visitor Center is located in Fort Barry, which is in the immediate Fort Cronkhite vicinity (Figure 14).

Figure 13. Present-day Planview of Fort Cronkhite and Remaining Historic Structures



Hatch marks denote buildings currently used by HI

Figure 14. Marin Headlands, GGNRA, with Trails, Facilities, and Fort Cronkhite Identified

The visitor center is open daily from 9:30 a.m. to 4:30 p.m. and offers exhibits on natural and human history, a Miwok shelter, restrooms, and a bookstore. In addition, NPS provides ranger and docent led tours of the Point Bonita lighthouse, Nike Missile Site, Battery Townsley, as well as an educational program.

The Marin Headlands area is also available for private events and functions that require special use permits (weddings, receptions, organized events, etc). Between 2000 and 2006, 154 such events have been held (an average of 22 per year) in the area. These events brought a combined 13,123 people to the Rodeo Beach area over the six year span. On average, the highest number of special use permits are issued in September (an average of 20 between 2000 and 2006), bringing 2,416 people to the area. December is the lowest use month for special permits, with three on average. Note that HI does not obtain special permits for any of its activities, although conference program participants may obtain special use permits for other reasons. For instance, a beach wedding at Rodeo Beach (which would require a permit) may also use HI facilities for the reception (which would not require a permit).

As a nationally recognized model of park partnerships and public involvement, the park affords opportunities for thousands of people to participate in site stewardship, habitat restoration, and interpretive activities. GGNRA continues to expand this interaction through cultural, environmental, and educational programs offered at a variety of sites. An unusual characteristic of the GGNRA compared to other national parks is that many of its visitor programs are run by private nonprofit park partners who occupy the historic military buildings and contribute to the overall maintenance requirements of the park.

Partners at the Marin Headlands and Fort Baker include a variety of organizations ranging from museums to hostels as listed below. They offer a variety of recreational and educational opportunities for park visitors.

- *Bay Area Discovery Museum (located in historic and new Fort Baker buildings)—* educational exhibitions and programs for children focusing on the arts, humanities, science, and technology.

- *The Golden Gate Raptor Observatory (offices located at Fort Cronkhite)*—a cooperative program of staff members and volunteers offering public weekend programs.
- *The Headlands Center for the Arts (nine historic Fort Barry buildings)*—host for a variety of community and educational programs and private special events throughout the year.
- *The Marin Headlands Hostel (Hostelling International)*—two historic buildings at Fort Barry. Provides overnight accommodations and educational youth programs, and is available for private events and conferences.
- *Marine Mammal Center (immediately east of Fort Cronkhite)*—a highly visited marine wildlife research and rescue organization providing educational programming and other events for school children and the general public. The Center’s headquarters were previously under re-construction and the visitor center, gift shop, classroom, and marine mammal hospital is now re-opened to the public.
- *The YMCA Point Bonita Outdoor Education and Conference Center (Fort Barry)*—a multi-purpose conference facility that accommodates overnight or extended stays and offers day camps, outdoor educational programs, nature hikes, picnic areas, and a dining hall.
- *Fort Baker Conference and Retreat Center (historic Fort Baker buildings and adjacent non-historic Capehart area)*—this conference and retreat center provides space for meetings, dining, and overnight accommodations (NPS 2009: 131-132).
- *Home Away From Homelessness*—a program that provides educational destination areas for homeless youth and their families from Marin and San Francisco. Once such destination is the “Beach House,” located in Fort Cronkhite. The Beach House operates 5 days a week and provides a relaxing nature experience for youths between the ages of 5 and 17.
- *Antenna Theatre*—this is a non-profit arts organization which creates original work in many disciplines, sometimes in the Marin Headlands. The Antenna experience can take the shape of a carnival, an immersive maze, a performance piece, a radio program, a guided mystery tour, a sideshow or a giant walk-through sculpture. Antenna uses them all to put the audience member, or “audient,” into the middle of the action.
- *GGNPC Native Plant Nursery*—located in Fort Cronkrite, the nursery supports the restoration of native plant communities in the Marin Headlands, most of which have been degraded by invasive plants. It also grows plants for native landscaping around non-historic buildings. The nursery partners with the Marin Headlands Institute by providing hands-on educational programs for HI’s students along with hosting many field trips for middle and high school students.
- *Presidio Riding Club*—a private, non-profit cooperative organization with a facility located on Bunker Road just east of the Marin Headlands Visitor Center. The PRC does not offer public trail rides or lessons due to NPS regulations.

3.8.1 Soundscape

In a park setting, a natural soundscape is an area characterized by certain ambient acoustical and sound level qualities, absent the intrusion of sounds caused by humans or human technology. The natural soundscape is a component of any park setting that is intended to be managed or appreciated as natural. The natural soundscape is viewed as a resource, as having value for its presence, and as a value to be appreciated by visitors. Many park visitors have an expectation of seeing, hearing, and experiencing phenomena associated with a specific natural environment. The

sounds made by wind, birds, ocean waves, deer, waterfalls, and many other natural phenomena are associated by visitors with unique features and resources of parks (NPS 2004).

The natural soundscape of a park, and visitors' appreciation of it, is considered a component of the general visitor experience. Natural soundscapes include all natural sounds that occur within and beyond the range of sounds that humans can perceive. NPS strives to preserve, to the greatest extent possible, the natural soundscapes of parks (NPS 2006a, sec. 4.9). Components of the natural soundscape include such things as sounds produced by animals (birds, frogs, etc.) and those produced by physical processes (wind, water, etc.). The natural soundscape is considered the baseline condition against which current conditions are measured and evaluated.

Typical sources of human-produced noises that can intrude on a park's natural soundscape include vehicular noise, aircraft overflights, construction activities, and human activity. When compared to backcountry areas, a park's developed area (visitor centers, staff offices/residences, etc.) experiences higher noise levels as a result of, among other things, the elevated/concentrated human activity, and the concentrated vehicular traffic and mechanized noise associated with visitation and park operations (maintenance, visitor services, etc.). Background noise in the park is generally much lower than that expected or tolerated in developed areas in which federal noise guidelines are generally applied. Park and park partner operations in and around Fort Cronkhite generate noise intermittently from personnel, vehicles, generators, hand tools such as hammers and power saws, heavy equipment such as backhoes and tractors, and smaller power equipment such as chain saws and weed-eaters. Noise from park operations above ambient levels is currently confined to daylight hours (NPS 2004).

The current ambient noise environment in the general HI project area is influenced by motor vehicles traveling on Bunker and Mitchell roads. Occasional aircraft overflights also contribute to the ambient noise environment. Visitor activities (e.g., groups of visitors) can also frequently be heard, particularly around facilities such as the HI and YMCA whose programming involves hundreds of students using their campuses and surrounding park lands.

3.8.2 Accessibility

Both HI and NPS strive to make their programs and facilities accessible and to operate in compliance with the letter and the spirit of the Americans with Disabilities Act and other legal requirements related to accessibility. While the principals of universal design are not mandatory, they achieve an even greater level of accessibility than the ADA legal minimums, and NPS encourages efforts to implement these measures whenever possible. Currently, all of the Institute's public buildings have accessible ramped entrances and accessible path of travel throughout the public areas of the first floors. The historic two-story buildings do not have elevators and some of the non-public areas on the first floors, such as boiler and storage rooms, are not accessible. With the exception of the administration building, all public bathroom facilities have been retrofitted for accessibility. All classrooms are accessible. The ocean lab was carefully designed to enable mobility-impaired students to have full access to interacting with the live specimens in the table tanks. The older microscope lab is not fully accessible. In general, the campus landscape has been retrofitted to increase accessibility; however, the historic terracing of the landscape leaves many paths too steep to be accessible. The Institute is also committed to creating the most accessible possible outdoor learning experience by working with each student and groups of students to meet their needs. For instance, HI has specially designed beach wheel chairs that enable mobility-impaired students to participate in beach activities. To make the trail experience accessible, the Institute designs routes through key sites which are also accessible by vehicle, so students who cannot hike the trail can still experience the park with their classmates.

As a historic military landscape, the Marin Headlands also offers an array of roads turned to trails that, while not fully wheelchair accessible, do offer opportunities to students who could not access traditional trails.

3.9 Transportation

Information on existing transportation conditions was obtained primarily from the MHFB Transportation Plan (Nelson\Nygaard 2002) and the *Marin Headlands and Fort Baker Existing Conditions Report* (Nelson\Nygaard 2000).

Approximately 88% of summer visitors travel to this area of the park by automobile, while less than 5% use transit, which is available from San Francisco to the Marin Headlands only on Sundays. Approximately 5% of visitors reported using a bicycle to enter the park. Because of the park's geographic location, only a small number enter the park by walking. Primary vehicular access is provided by Bunker Road, which connects with U.S 101 and Alexander Avenue in Sausalito (NPS 2009). In addition, Conzelman Road provides a secondary connection from Bunker Road to the Golden Gate Bridge via a short connection on McCullough Road. Visitor parking is located in and immediately around Fort Cronkhite (Figure 14).

3.9.1 Roadways and Traffic

Access

Located just north of the Golden Gate Bridge, the study area is within a reasonable travel distance from San Francisco and most communities in Marin County. As mentioned above, access to HI is provided via two roads: Bunker Road and Conzelman Road. The Conzelman Road entrance is off Alexander Avenue just north of the U.S. 101 south entrance ramp to the Golden Gate Bridge. The Bunker Road entrance is at the eastern terminus of the Barry-Baker tunnel on Danes Drive.

Main Roads in the Study Area

Bunker Road is a two-lane road between Fort Cronkhite, Fort Barry, Rodeo Valley, and Fort Baker. To the north, it provides access to the Marin Headlands through the one-lane Barry-Baker tunnel between Fort Baker and the Fort Barry area. Motor vehicle travel through the tunnel alternates between eastbound and westbound traffic and is controlled by traffic signals on each end of the tunnel. Four-foot-wide, striped Class 2 bicycle lanes are provided for several hundred feet on both sides of the tunnel. However, pedestrians are not permitted in the tunnel.

In the immediate vicinity of the HI campus, the major roadway is Mitchell Road, which traverses east-west to the south of Fort Cronkhite (along the northern boundary of Rodeo Lagoon). At the eastern boundary of the fort, Old Bunker Road runs north-south, connecting to Kirkpatrick Road, which is the east-west roadway along the northern boundary of the fort. Hagget Street is the main access to the fort, running north-south through the center of the fort just to the west of the HI campus. Other roadways within Fort Cronkhite include Glassburn Street and Edison Street. Access to the dining hall is by an informal gravel road that runs behind Building 1011.

Traffic Volume

Information on traffic volumes and flow is primarily based on the results of a comprehensive data collection effort performed for the MHFB Transportation Plan (NPS 2009). In summary, the primary traffic in the area is recreational, with employee trips from the HI estimated to be less than 5% of the existing traffic on a weekend day. This amount of non-recreational travel is considered negligible with regard to traffic forecasts for this project and would fall within the normal fluctuations of traffic. Vehicle counts on Conzelman Road (west of the U.S. 101

southbound on-ramp) and Bunker Road (west of the Barry-Baker tunnel) indicate that the total combined daily vehicle trips entering or exiting the Marin Headlands on both roads is approximately 4,000 during a spring weekday and 5,800 during a summer weekday (Nelson\Nygaard 2000). Average daily traffic volumes on weekends are about twice that on the weekdays during spring and summer. For both spring and summer, about two-thirds of all inbound and outbound trips into the Marin Headlands are via Conzelman Road. The other one-third are made via the Barry-Baker tunnel.

In terms of traffic generated by HI, the two major trip sources are student drop-off/pick-up and participants in the conference program. In 2007, 252 schools participated in HI programming. About 154 schools (61%) delivered students by bus. Students from about 98 schools (39%) were dropped off by car by pulling just past the bus drop off to the curb in front of the kiosk at the northeast corner of the main lot (HI 2008b) (Figure 2). As stated in Chapter 2, on a typical day, anecdotal data suggests that student traffic would include 2 buses and 5-15 cars visiting the campus. Survey data has shown that on average, 3.7 students arrive in each car. Using 2007 information about student arrivals, this resulted in the numbers shown on Table 7, which is roughly consistent with anecdotal data. Preliminary survey data from HI suggests that approximately 60% of cars bringing students stay overnight, while 40% leave and return to pick up students at the end of their program, generating twice the number of car trips. Off-campus excursions as part of the student programs generate additional trips, although this is primarily by bus and does not generate as much traffic as student arrivals/departures. For instance, in 2007, 1841 students participated in off-campus trips, approximately ¼ of the number arriving/departing for the general program (HI, unpublished data).

Table 7. Trips Generated by HI Student Arrivals, 2007

Period	Number of Students Arriving		Number of Cars	
	by Bus	by Car	per Season	per Week
Winter	2218	1207	326	25
Spring	2970	1249	338	26
Summer-Fall	2826	1305	353	27
TOTALS	8014	3761	n/a	n/a

Source: HI, unpublished data

For the conference program, no data has been collected regarding the number of conference participants arriving per car or the specific number of trips. 265 groups used the HI facilities in 2007, and the use of the Sunset Room (and Surfer Lot) is shown in Table 8.

Table 8. Number of Guests and Groups using the Sunset Room, 2007

Period	Number of Guests	Number of Groups
Winter	943	23
Spring	1438	32
Summer	1326	21
Fall	1428	28
Total	5135	104

Source: HI, unpublished data

In addition to these two traffic sources, HI generates vehicle trips associated with its summer day camp. In 2007, there were nine week-long summer day camp sessions conducted on weekdays,

averaging 55 campers per session (48 arriving by car) (HI, unpublished data). These campers are dropped off and picked up daily, generating two round trips per car per day. Carpooling and public transit opportunities are made available, although data on the average number of students per car is not available.

Level of Service

To evaluate the performance of intersections, turning movement counts were obtained from HI staff for the intersections of Bunker Road and Field Road. Counts were performed on two weekend days between 2 p.m. and 6 p.m. when visitation at the park is highest. The turning movement counts were used to calculate the level of service (LOS) at the intersection. The level of service is defined by the *Highway Capacity Manual* (Nelson\Nygaard 2000) as a measure of the ability of an intersection or roadway segment to accommodate traffic volumes. LOS values range from LOS A, which indicates free-flow conditions with minimal delay, to LOS F, which indicates congested conditions with extremely long delays. LOS A, B, C, and D are generally considered satisfactory service levels in urban areas. LOS E and LOS F are typically considered unacceptable. Currently, the intersection of Bunker Road and Field Road operates at LOS A during the weekday peak hour as well as the weekend peak hour.

Parking

There are approximately 1,593 parking spaces in the Marin Headlands, and 440 parking spaces at Fort Cronkhite (NPS 2009). Primary parking areas near HI are shown in Table 9. An inventory of parking utilization conducted in July 2000 showed that the majority of parking areas in the study area are not used to capacity even during a sunny summer weekend day. The exceptions are areas at Battery Spencer, Overlook 1, and the Point Bonita trailhead, where there is high competition for a limited number of spaces, which is outside of the immediate parking area.

Table 9. Primary Parking Areas near the Headlands Institute

Location	Description	Designation	Surface	Number of Parking Spaces (est.)
Mitchell Road				
Bunker to Rodeo Beach Lot	Head-in	Unmarked	Gravel	150
Fort Cronkhite	Varies	Varies	Gravel	116
Rodeo Beach				
Paved Lot	Lot	Striped	Paved	94
Gravel Lot	Lot	Marked	Gravel	80
Bunker Road				
Home Away from Homelessness	Lot	Unmarked	Gravel	3
Maintenance Yard, Government Vehicle Lot	Lot	Unmarked	Gravel	12
R and T Employee Lot	Lot	Unmarked	Paved	13
Visitor Lot	Lot	Unmarked	Gravel	10
Maintenance Yard to the Marine Mammal Center	Parallel	Striped	Paved	19
Marine Mammal Center	Lot	Striped	Paved	47

Parking Utilization

Parking utilization refers to the balance between parking supply and demand during peak visitation periods. A parking utilization study conducted in the summer of 2000 documented parking use at major park recreation sites on a summer weekend day. The study was conducted only at the major use sites and not for the entire park because of the large number of minor parking facilities. At no point does the parking demand exceed overall parking supply under current conditions on a

typical visitation day. However, during occasional sunny weekend days (12-16 days a year), parking at Fort Cronkhite is over-subscribed, as vastly larger numbers of visitors come to the park (HI, unpublished data).

HI use of parking is directly related to student arrival and departure, off-campus field trips, conference participation, the summer day camp, and staff usage. Only a portion of HI-related trips result in usage of parking, as many are simply pickup or dropoff and either do not use parking or only use parking for a short time. No definitive data has been collected that estimates the total parking usage, with the exception of staff parking. Staff usage of parking lots averages 24 cars on weekdays, with much fewer (3-5) on weekends (HI, unpublished data).

3.10 Visual Resources

Fort Cronkhite is located along the westernmost area of the Marin Headlands, itself a primary visual resource of the San Francisco Bay Area and GGNRA (Figure 14). In general, the Marin Headlands is characterized by steep cliffs, rolling hills, a valley floor leading to Rodeo Beach, narrow roadways, military structures and fortifications including Fort Cronkhite, and other historic U.S. Army structures (Figure 15, NPS 2009: 124).

The fort is visible from a variety of locations including several roadways—Bunker, Field and Conzelman. The fort can also be viewed from open space locations to the west and south (beaches, the shoreline of Rodeo Lagoon, the ocean), as well as from several hiking trails in the general study area—Miwok, Rodeo Lagoon, Coastal, and Wolf Ridge Trails. It is also visible from other park facilities, including the Nike Missile Site on Field Road and Fort Barry (Figure 16, No Action photographs).

The fort is situated at the base of a gentle south-facing slope offering panoramic views of Rodeo Lagoon to the south and the Pacific Ocean to the west. Wolf Ridge rises to the north behind the fort. The natural landform of the Fort Cronkhite site is a gentle grade paralleling the lagoon's shore which influenced the fort's architectural design and transportation patterns. Indeed, most structures are oriented along a series of stepped terraces parallel to the natural slope (Auwaerter and Curry 2008) (Figure 16, Rodeo Beach Dunes viewpoint).

The Marine Mammal Center is located immediately to the northeast of Fort Cronkhite and below Wolf Ridge. The majority of this site is paved and development is characterized by predominantly two-story buildings, parking areas, and parked cars (Figure 16, all viewpoints).

Current views of the Fort Cronkhite landscape reveal its original organization dating to the initial World War II construction—a largely orthogonal plan consisting of two wings extending from a central area which is shaded by mature trees. The World War II mobilization cantonment reveals an arrangement of one- to two-story wood-frame barracks, mess halls, and supply buildings characterized by pent and gable roofs and a consistent painting scheme (red roofs, white siding). Overhead utility lines, still in use, are also visible.

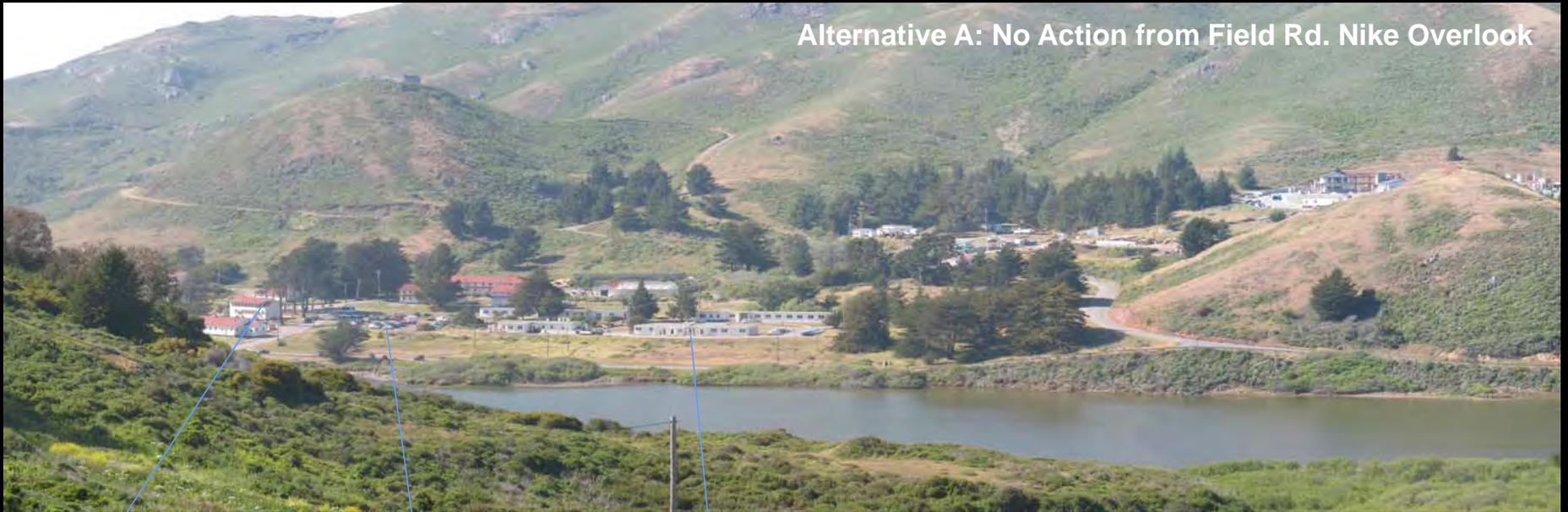
Four structures associated with the Nike Missile base SF-87 (1960s) are located within the interior of the fort and present a visual contrast to the World War II development surrounding it (Figure 15). The Cold War-era Nike structures are characterized by one-story, concrete block construction with shed roofs, all of which are still visible today (Auwaerter and Curry 2008) (Figure 15; Figure 16).

Figure 15. Aerial View of Fort Cronkhite with HI Campus Buildings Indicated



Note the four Nike Structures located in the middle, right of the photo (grey, shed roofs)

Figure 16: Alternative A Visual Simulations Page 1 of 2



Alternative A: No Action from Field Rd. Nike Overlook

WWII Era Buildings

Main Parking Lot

Nike Era Buildings

Main Parking Lot

WWII Era Buildings



Alternative A: No Action from Wolf Ridge

Figure 16: Alternative A Visual Simulations Page 2 of 2



The World War II-era cantonment was a standardized layout designed to fit within any sort of landscape, and the Nike Missile administration complex was inward focused. Neither was designed to capture views out to the landscape or within the cantonment. Existing tenants of the property, in particular HI, do value views out to the surrounding landscape for aesthetic and educational purposes (Auwaerter and Curry 2008, 10).

The vegetation of Fort Cronkhite is dominated by turf grass which was historically used to stabilize the fort's terracing. While vegetation was initially sparse, after World War II specimen trees (Monterrey pine and cypress, ornamental shrubs) were planted around the post headquarters building (center of the fort) and along the roads within the fort (Auwaerter and Curry 2008). A variety of non-native plants—Monterrey pine and cypress, Cape ivy, Kikuyu grass—that have spread or been planted over the years are also visible within the fort's boundaries. The areas surrounding Fort Cronkhite are characterized by naturally vegetated (scrub and occasional stands of trees) rolling hills, the Pacific Ocean and Rodeo Lagoon, and other features of the built environment dominated by the former military presence (World War II- and Cold War-era structures).

Two perennial streams, one of which bisects the cantonment in the vicinity of the Cold War-era Nike buildings, and one located west of the fort, were piped underground during the World War II development of Fort Cronkhite. Both run in a general north-to-south manner and ultimately discharge into Rodeo Lagoon. Vegetation associated with these streams is evident immediately above and below the fort, including willow riparian woodlands, wet meadows, marshes, grasslands, and coastal prairie vegetation (KHE 2008a) (Figure 16, No Action photographs).

3.11 Park Operations

Park operations that could be affected by this project include existing NPS functions located at Fort Cronkhite, maintenance requirements related to riparian corridor restoration, and the provision of utilities.

NPS utilizes 18 historic structures within Fort Cronkhite, 3 of which could be affected by the improvement and expansion plan. These include the maintenance sign shop and grounds (Building 1046), the fire dorm (Building 1034), and the short-term housing dorm (Building 1042).

The dormitory housing provided in Building 1042 was renovated in 2008 and is considered a valuable asset for the park. Its 24 single rooms are used by NPS seasonal employees and full time (40 hour/week) interns/volunteers.

The Fire Dorm, Building 1034, currently houses about five seasonal public safety employees: firefighters, lifeguards, and law enforcement. Fire and lifeguard employees are seasonal employees. The housing is primarily used from May 1 through November 30 of each year. For the most part, the facility is empty from December through April. (Eickenhorst pers. comm. 2008)

The maintenance shop in Building 1046 houses the Marin Headlands' grounds crew as well as the sign shop offices and workshops.

Utilities

Utilities utilized within Fort Cronkhite include potable water, sewage, stormwater, and power, all of which could be affected by the proposed improvement and expansion plan.

Potable Water. Potable water to the Marin Headlands, including Fort Cronkhite, is provided by the Marin Municipal Water District through a metered main near the intersection of Alexander Avenue and East Road. The distribution system is gravity fed from a reinforced concrete storage tank, where it is

rechlorinated by the park prior to distribution to the Marin Headlands. Water use for all facilities in the Marin Headlands (NPS and partners) are limited to 192,000 gallons per day on average—use can be higher in the summer and lower in the winter, but must not exceed a total of 69 million gallons per year. The Fort Baker lodging and conference program facility is limited to 8.4 million gallons per year, and the renovated Marine Mammal Center is expected to use between 3.7 and 5.7 million gallons per year. The HI campus uses approximately 16 million gallons per year (based on a peak quarterly average of 401,000 gallons).

Wastewater. Currently wastewater flows from Fort Cronkhite into the Fort Baker collection system. From there, it is conveyed to the Fort Baker pumping station for discharge to the Sausalito-Marin City Sanitary District's treatment plant. In general, the sanitary system of Fort Cronkhite is believed to be in fair condition. Historically, some problems have arisen related to infiltration/inflow of surface and groundwater into the sewer system during wet weather. This occasionally results in system overflows and exceedance of contractual maximum discharge to the Sausalito-Marin City Sanitary District treatment plant (Feierabend pers. comm., March 5, 2008).

Stormwater. Stormwater is currently collected into the culverted stream or flows overland, ultimately discharging directly to Rodeo Lagoon. Currently, maintenance conducted by NPS related to the unnamed stream consists of minimal activities to maintain drainage and preclude flooding within the stream corridor. The only location requiring ongoing maintenance is the culvert outlet to Rodeo Lagoon (seasonal clearing of discharged sediments to maintain conveyance) (KHE 2008a).

Electricity. Pacific Gas & Electric supplies electrical utility needs to Fort Cronkhite. The electrical distribution system is believed to be in fair condition.

CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

The National Environmental Policy Act (NEPA) requires the disclosure of environmental effects of proposed federal actions, and any adverse environmental effects that cannot be avoided should the preferred alternative be implemented. The *Environmental Consequences* chapter analyzes both beneficial and adverse impacts that would result from implementing any of the four alternatives described in this Headlands Institute (HI) Campus Improvement and Expansion Plan Environmental Assessment. In addition, this chapter includes a summary of laws and policies relevant to each impact topic, definitions of impact “thresholds” (negligible, minor, moderate, major), explanations of methods used to analyze impacts, and the analysis methods used for determining cumulative effects. As required by the CEQ regulations implementing NEPA, a summary of the environmental consequences for each alternative is provided in Table 4 (see Chapter 2 *Alternatives*). The resource topics presented in this chapter, and the organization of the topics, correspond to that presented in Chapter 3, *Affected Environment*.

4.1 Summary of Laws and Policies

Three overarching environmental protection laws and policies guide the actions of NPS in the management of the parks and their resources—NPS Organic Act; NEPA and its implementing regulations; and the National Parks Omnibus Management Act. For additional information on relevant laws and regulations, please refer back to the *Summary of Laws, Regulations, and Policies* in Chapter 1, *Purpose and Need*.

NPS Organic Act of 1916 (16 U.S.C. 1) commits NPS to making informed decisions that perpetuate the conservation and protection of park resources unimpaired for the benefit and enjoyment of future generations. NEPA, passed in 1969, is implemented through regulations of CEQ (40 CFR 1500–1508). NPS has, in turn, adopted procedures to comply with NEPA and CEQ regulations as found in Director’s Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making (NPS 2001), and its accompanying handbook. The National Parks Omnibus Management Act (Omnibus Act, 16 USC 5901 et seq.) underscores NEPA in that both are fundamental to park management decisions. Both acts provide direction for connecting resource management decisions to the analysis of impacts, and communicating the impacts of these decisions to the public through the use of appropriate technical and scientific information. Collectively, these guiding regulations provide a framework and process for evaluating the impacts of the proposed alternatives for improvement/expansion actions within HI and GGNRA.

4.2 General Analysis Methods

The analysis of impacts follows CEQ guidelines and Director’s Order 12 procedures. This includes the application of results of the relevant scientific research related to park resources which has been conducted within GGNRA and the Fort Cronkhite area in particular. It also includes the use of other best available scientific literature applicable to the region and setting, the resources being evaluated, and the actions being considered in the alternatives.

All alternatives have been evaluated for their effects on the resources and values determined during the alternatives development and scoping processes. For each impact topic, impacts are defined in terms of thresholds of effect, context, intensity, duration, and timing. Impacts and cumulative effects are discussed in each impact topic. Definitions of intensity levels vary by impact topic. Where it is not specifically stated otherwise under each impact topic, the following definitions apply.

4.2.1 Assessment Methods

For each impact topic, thresholds are established to determine the magnitude and extent of effects. These thresholds are generally derived from best professional judgment and scientific literature. Assessment methods and specific thresholds are identified under each topic area.

4.2.2 Type of Impact

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

4.2.3 Context and Duration

Local: Occurs primarily within the immediate vicinity of Fort Cronkhite and to a lesser extent in the western Marin Headlands to include the campus and teaching sites.

Regional: Occurs throughout the Marin Headlands, and/or in the surrounding park lands and community.

Short term: Impacts that would not continue beyond the action itself, e.g. would last only during construction.

Long term: Impacts would extend beyond the few weeks or months of construction.

4.2.4 Geographic Analysis Area

The geographic area for the analysis of impact related to HI improvements and expansion efforts encompasses Fort Cronkhite and its immediate surroundings, as well as the 22 off-campus sites used by HI as part of the field school programming activities (refer to Figure 3 in Chapter 2).

4.2.5 Cumulative Impact Scenario

CEQ regulations for the implementation of NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions" (40 CFR 1508.7). Cumulative impacts are addressed for all alternatives, including the No Action Alternative. The geographic analysis area for cumulative impacts can be local, regional or larger depending on the resource and sources of impact to it. For the purposes of this project, the following projects were considered for the cumulative impact analysis. Their relevance to specific resource topics is discussed or elaborated within the impact discussion of each topic.

Past Projects

GGNRA Fire Management Plan. NPS issued a Record of Decision (ROD) for the Final Fire Management Plan EIS in February 2006. The proposed action describes a strategy for managing fire in the park to reduce risks to the public, firefighters, sensitive resources, and park facilities. Proposed fire management policies that apply to the Marin Headlands include prescribed burns in the Marin Headlands to manage coastal scrub, prescribed test burns to enhance mission blue butterfly habitat,

and the reduction of fuel hazards near historic structures and heavily developed areas that receive high visitation.

Fort Baker EIS. NPS issued a ROD for the Final EIS for the Fort Baker Plan in 2000. As part of this plan, a retreat and conference center opened in the summer of 2008 and is located around the rehabilitated historic parade ground. Over 28 historic buildings, including houses, barracks, a gymnasium and a chapel, were rehabilitated to preserve their significant historic features, and new lodging units were constructed to be environmentally friendly and architecturally sensitive to the historic area. Future projects include improvements to the Fort Baker waterfront with conversion of the existing marina and historic boat shop to public uses with a center for community meetings and programs. Natural habitat in Fort Baker will be maintained and restored and minor trail improvements with some new trail construction will be implemented.

Fort Cronkhite Structural/Seismic Evaluation of Historic Building Foundations and Upgrades. In 2003, NPS contracted for a visual survey of 18 World War II historic building foundations at Fort Cronkhite. The study included preparing preliminary calculations with the latest building seismic evaluation and rehabilitation guidelines, developing repair recommendations for the foundation deficiencies found, developing conceptual cost estimates for these repairs, and preparing this report. Following the preparation of this report, most of the building foundations where deficiencies were identified have been upgraded or will be upgraded by NPS in the very near future.

Present Projects

Fort Baker and Marin Headlands Transportation Management Plan EIS. The purpose of the MHFB Transportation Plan is to provide improved access to and within the Marin Headlands and Fort Baker for a variety of users and to initiate these improvements in a way that minimizes impacts to park resources. A Final EIS was completed in March 2009. The preferred alternative includes:

- the rehabilitation and reconstruction or widening of roadways
- parking improvements and some parking fee implementation to fund transit services
- increased transit options to and within the study area
- extensive pedestrian circulation enhancements
- improved bicycle access

Several specific components of the plan are relevant to the HI campus planning effort. These include the following:

1. *Roadway modifications*—Mitchell Road would be widened to improve bicycle safety and some of the head-in parking along the road would be removed. Bunker Road would be widened slightly and an associated sidewalk would be built to connect the maintenance yard parking to the interior of Fort Cronkhite. The improvements would better accommodate pedestrians and school groups visiting the MMC and the west side of Fort Cronkhite than current conditions. The Bunker Road/Mitchell Road/Bunker Road intersection would be reconfigured for safety improvements and made into a three-way stop.
2. *Parking at Fort Cronkhite*—the preferred alternative of the MHFB Transportation Plan calls for a reduction over time from 540 spaces to 342 spaces. The reduction would occur through the removal of spaces primarily at the unpaved Rodeo Beach parking lot and along Mitchell Road. Some of the removed parking would be replaced with new infill parking elsewhere in Fort Cronkhite, the specific locations to be determined by NPS at a later date. Some replacement parking could be located within the current project area of the HI campus expansion plans; however the location and design of any new parking areas would be consistent with the

treatment recommendations in the Cultural Landscapes Report and would be sited in consultation with HI.

3. *Transit access*—a new internal shuttle system for Fort Baker and the Marin Headlands would be implemented to provide mobility within the park.
4. *Rodeo Beach parking lot restoration*—the unpaved lot at the west end of Fort Cronkhite would be removed and restored to its pre-existing wetland condition to re-establish natural hydrologic and wetland conditions. The project would result in a net restoration of 1.3 acres of a sedge-dominated emergent wetland habitat from what is now upland habitat and unpaved parking. The total estimated fill for this project is 2300 cubic yards with most of the fill requirements being met onsite.
5. *Trail improvements*—the trail system throughout the Marin Headlands would be improved and, as much as possible, made more accessible to park visitors, including those with disabilities. Work would include some new trail construction, trail closures and rerouting, and other trail rehabilitation actions such as drainage improvements, erosion control, and accessibility improvements.

Marine Mammal Center Site and Facilities Improvements. The Marine Mammal Center (MMC), a park partner, is a marine wildlife research and rescue organization that rescues and rehabilitates injured, sick, or orphaned marine mammals for return to the wild. In 2002, NPS and the MMC prepared an environmental analysis for improvements to the Center; the scope of the project was to renovate the existing facilities and site to provide to better care for marine mammals and to provide for improved visitor and educational facilities. The first phase of construction was completed in June 2009, and the facility has been re-opened to the public.

Dog Management Plan EIS. The park is conducting a planning process to help the park decide how best to manage dog-walking in the park. This effort will result in a dog management plan and EIS that will specify which of the GGNRA managed lands will be open to on-leash dog-walking and off-leash dog-walking and which areas will be closed to dog-walking. The Marin Headlands, including the Rodeo Beach area, is included in this study.

Southern Marin Equestrian Plan. The park has begun the environmental analysis process for the preparation of a Southern Marin Equestrian Plan. This plan will propose options for the future use of three stables located in the park that currently provide space and facilities (stalls, riding rings, trailer parking) for various equestrian activities, such as riding lessons and the boarding of horses. The plan will address site and facility needs, improvements, and protection of important resources at and surrounding the sites. One of these stables is located near Fort Cronkhite, along Bunker Road, and is known as the Presidio Riding Club Stables at Fort Barry buildings 901, 902 & 905. A plan and EA is anticipated in 2010.

Hawk Hill/Hill 129 Site Rehabilitation. The park has begun a planning effort for upgrades to amenities and accessibility at Hawk Hill. The project is intended to restore habitat for the mission blue butterfly and improve the site for public visitation and use by the Golden Gate Raptor Observatory. Phase 1 of the project will involve full or partial removal of the Monterey pines as part of a restoration of mission blue butterfly habitat on the western slope of the gun batteries, as well as replacement of non-historic stairs and rails, and installation of new pedestrian circulation. Phase 2 will include repairs to historic structures, possible addition of amenities, improvements to the viewing station, and creation of a large-group gathering area. (NPS 2008).

Park-wide Long Range Transportation Plan. GGRNA is in the process of revising its 1980 *General Management Plan* (GMP) and concurrently developing the first NPS park-level transportation planning process, a Long-Range Transportation Plan (LRTP). The LRTP will provide NPS leaders with a replicable park-level transportation planning process, benchmarks for evaluating transportation projects in an asset-informed environment, and transportation investment priorities for future planning and operational decisions.

General Management Plan for the GGNRA and Muir Woods National Monument Update. A new GMP that builds on the 1980 GMP is currently underway. The park anticipates completing the final plan and EIS in 2011. This multi-year public planning process will result in a document that articulates the long range vision for the future of NPS-managed lands within the park boundary. The new GMP will have a particular emphasis on lands that have been added since the 1980 GMP, including lands in San Mateo County, and lands where conditions or knowledge of resource sensitivity have changed since the 1980 plan was completed. The GMP will identify management zones that define the kinds of visitor experiences and the condition of natural and cultural resources desired in the park. All of the draft alternatives under consideration envision the HI as a key partner that will remain in Fort Cronkhite and continue to provide vital educational programs.

As part of the GMP process, NPS will also study long-term locations for park operational facilities, including needs for maintenance and public safety. Currently, some of these park operations are housed in Fort Cronkhite structures and may or may not be re-located in the long-term. NPS does not anticipate conflicts between park operational needs and the needs of HI or other partners.

Cultural Landscape Report for Forts Barry and Cronkhite. NPS is preparing a cultural landscape report for Forts Barry and Cronkhite. The report will consist of:

- a district-wide landscape analysis with broad-scale treatment guidelines relevant throughout the historic district;
- individual landscape analyses for the built-up areas of Fort Barry and Fort Cronkhite, including documentation, analysis, and treatment recommendations specific to each fort; and
- focused treatment recommendations for certain areas relating to the need for site-specific mitigations evolving from the transportation plan.

The completed report will guide future site preservation, rehabilitation, and enhancement work. The preliminary report on the HI campus landscape and treatment guidelines (Auwaerter and Curry 2008) will be updated and amended as necessary during the course of the Cultural Landscape Report's preparation (if research and new information warrant any amendments). The anticipated completion date is 2010.

Coastal Corridor Enhancement Project. The Coastal Trail Corridor Enhancement Project (CCEP) is designed to preserve, enhance, and restore disturbed coastal habitats along the Coastal Trail between Muir Beach (Marin County) through the Marin Headlands and farther south. These actions would result in the preservation and enhancement of 970 acres and the restoration of 30 acres of disturbed coastal habitat (NPS 2009, 142).

Infrastructure/Utility Projects. NPS conducts regular maintenance and repair work to utilities and the infrastructure system at Fort Cronkhite and throughout the Marin Headlands. Future capital improvements to the utility systems include construction of additional lift stations and repair/expansion of wet wells; repairs to sewer and water lines, etc. Implementation of these projects will be subject to funding availability.

4.2.6 Impairment Analysis

NPS is required to evaluate the potential effects of proposals as to the likelihood they would cause "impairment" of park resources and/or values. An action results in impairment when its impacts "harm the integrity of park resources or values" (NPS 2006a, secs. 1.4.4 and 1.4.5). "Whether an impact meets this definition depends on the particular resources and values affected; the severity, duration and timing of the impact; the direct and indirect effects; and the cumulative effects of the impact in question and other impacts" (NPS 2006a, sec. 1.4.5).

Established by the 1916 Organic Act, one of the primary purposes of the national park system is the mandated conservation of park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. Although NPS has the discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that park resources and values remain unimpaired unless a specific law directly provides otherwise. An impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park,
- key to the natural or cultural integrity of the park, or
- identified as a goal in the park's *General Management Plan* or other relevant NPS planning documents.

An analysis of the potential for resource and/or value impairment has been included for the following topics: vegetation, wildlife, species of special concern (including threatened and endangered species), soils, water quality/resources, air quality, visual resources, and cultural resources. Visitor experience, park operations, transportation, and seismic/ landslide hazards are not considered park resources or values and, therefore, no impairment statements are provided for those topics.

Unacceptable Impacts

The impact threshold at which impairment occurs is not always readily apparent. Therefore, NPS will apply a standard that offers greater assurance that impairment will not occur. NPS will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. Therefore, for the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would be inconsistent with a park's purposes or values; or:

- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process; or
- create an unsafe or unhealthful environment for visitors or employees; or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or unreasonably interfere with park programs or activities, or an appropriate use, or the atmosphere of peace and tranquility, or the natural soundscape maintained in natural, historic, or commemorative locations within the park, or NPS concessioner or contractor operations or services.

In accordance with *Management Policies 2006*, park managers must not allow uses that would cause unacceptable impacts to park resources. To determine if unacceptable impact could occur to the resources and values of GGNRA, the impacts of proposed actions in this EA have been evaluated based on the above criteria. A determination on unacceptable impacts is made in the Conclusion section for each of the resource topics carried forward in this chapter.

4.3 Soils

4.3.1 Guiding Regulations and Policies

NPS *Management Policies 2006* (NPS 2006a, sec. 4.8.2.4) direct parks to "...prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil or its contamination of other resources...." If the use of off-site soil to repair damaged sites is needed, parks are to select materials that are the best match for the original native soils. If excavation of soil is required for an approved facility development project, parks are to minimize excavation and erosion as well as the migration of soils off site during and following development.

4.3.2 Assessment Methods

Thresholds

The following impact thresholds were established to describe the relative changes in soils under the various alternatives being considered:

- Negligible:** Changes in the rate of erosion, soil function, or loss of topsoil or native soils would be at the lower levels of detection.
- Minor:** Changes in the rate of erosion, soil function, loss or gain of topsoils or native soils would be measurable or perceptible. Important or unique soils could be affected, but the overall character in a particular area of the site would remain as it is now.
- Moderate:** Changes in erosion, soil function or gain or loss of topsoil or native soils would be noticeable. Important or unique soils could experience observable or measurable effects, and the character of the site may be perceptibly altered.
- Major:** Changes in erosion, soil function or gain or loss of topsoil or native soils would be substantial and highly noticeable, altering the character of the site in an obvious way. Important or unique soils could experience large-scale loss at the site.

4.3.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

No new impacts on campus beyond those that have historically taken place would occur if the No Action Alternative were implemented. HI students are off-campus for much of the day, but many students spend their free time on campus playing games on a dirt field between campus buildings, or at the volleyball or basketball courts. Use of the playing area may have minor localized long-term adverse impacts on soil compaction and erosion under the No Action Alternative. Students also walk between buildings for classroom activities, including use of either cement paths or dirt or gravel social

trails. Under the No Action Alternative, existing social trails would not be modified, therefore minor long-term localized adverse impacts from erosion could continue under this alternative along these social paths. Weekend visitors are mostly conference attendees who spend the majority of their time indoors, with negligible impacts on soils at the site. Currently, the amount of impervious surface area on the campus totals 222,990 square feet.

Deliveries of food and supplies requires driving over curbs and the use of a gravel road, which has increased compaction and erosion of soils in the vicinity of the kitchen storage entrance, minor localized adverse impacts.

The adverse impacts described above are generally localized and minor due to the fact that the surficial soils at the campus are already disturbed.

Riparian Corridor Enhancement

Under the No Action Alternative, no riparian corridor enhancement would take place. No stabilization of the stream banks in the upstream portion of the drainage would occur. Continuation of existing conditions under the No Action Alternative would result in localized minor adverse impacts.

Off Campus Activities

HI educators spend the majority of their time with students at off-campus teaching locations. The primary concern for off-campus sites is the impact of foot traffic, generally along social trails created by students and other visitors to access a particular site. These trails and use can change the physical properties of soil, compacting it and reducing pore space and ability to absorb water, as well as loss of stabilizing vegetation. Increases in runoff during storm events result, and this in turn, usually increases the erosion of the soil itself, particularly on steep slopes. These impacts have been noted to have occurred from visitor use (including student use by HI) at Rodeo Lake (particularly on the south shore) and at the riparian area that runs through campus.

The current process for monitoring and addressing impacts to off-campus program sites is described in the *Alternatives* chapter. In brief, restrictions on use of a particular site are developed in response to a concern from NPS, HI educators or other park partners. Closures have been issued by NPS for resource protection or through collaboration between park partners when other reasons dictate fewer or no visits.

Under the No Action Alternative, impacts to soils from use of off-campus sites would be as much as moderate, localized, and either short-term or long-term (depending on the site). In a regional context (e.g., compared to other impacts in the Marin Headlands) impacts to soils from HI use would be at most minor, as impacts from other sources (historic, development, automobile use, construction, etc.) are more substantial.

Cumulative Impacts

The MMC recently centralized its operations to the northeast of the campus in an area of steeper slopes and erodible soils. Despite erosion control measures, soil erosion remains possible as a result of MMC activities (NPS 2004). This could combine with the identified erosion impacts at the HI campus under the No Action Alternative, potentially resulting in up to moderate localized adverse cumulative impacts.

Several other cumulative projects, including the MHFB Transportation Plan and the CCEP, involve actions that may have a nexus to the impacts of off-campus HI activities. Actions under the MHFB Transportation Plan include installing new trails (Rodeo Lagoon to Battery Alexander for example), creating a stairway on the north end of Rodeo Beach for access, decompacting and revegetating some

areas (at the former quarry) and closing roads to vehicle or trail use (the “back driveway” to the Marin Headlands Visitor Center for example). Each of these and other actions on the 20 most disturbed road and trail sites would decrease soil erosion, a beneficial impact.

The CCEP would rehabilitate over 500 acres of disturbed habitat in the Marin Headlands, concentrating on removing nonnative vegetation and replanting it with native species (NPS 2007). In addition, non-designated (social) trails would be closed and rehabilitated in many cases; this latter action would have cumulative regional benefits.

The park is also undertaking several planning processes, including dog management, equestrian, long-range transportation and general management planning. Each of these may include changes in visitor or park management activities that have impacts on soil conditions. Because each of these planning processes is likely to respond to existing resource issues, it is likely that each would result in beneficial impacts to soil erosion or compaction in the Marin Headlands.

Where the actions under these projects occur in the locations used by HI students, the beneficial effects of these cumulative projects would be greater than the adverse erosion/compaction impacts from student use, resulting in a beneficial cumulative impact overall.

Conclusion

Under the No Action Alternative, use of the campus by students and staff may have up to minor impacts to soils from compaction and erosion, especially on social trails or where deliveries take place. Up to moderate localized adverse impacts to a few teaching sites off-campus may occur from social trails and heavy use; however, the beneficial effects of other future projects, most notably the Marin Headlands/Ft. Baker Transportation Plan and the CCEP, would be greater than the adverse effects of HI’s off-campus use, resulting in a cumulatively localized and regional beneficial impact overall.

No impairment of park soils would occur under Alternative A. Because the impacts previously described (1) are not inconsistent with the park’s purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on soil resources under Alternative A.

4.3.4 Impacts of Alternative B—Rehabilitation Only

Construction

This section describes potential effects resulting from building rehabilitation activities. Effects related to riparian corridor enhancement are discussed in a separate section below. The primary construction activity affecting soils would be the regrading of all land between the Nike buildings and rehabilitated buildings to recreate the historic terraces. Smaller scale landscape treatment activities that could also affect soils include reestablishing an existing historic road corridor as a pedestrian route through the center of campus, removing non-historic and non-native trees and shrubs, converting parking lots into open space, and replacing social paths with defined pedestrian circulation routes. Rehabilitation of buildings under this alternative would be primarily internal, and grading or excavation of soils would generally not be required, except for limited exterior work. However, equipment and supplies could be delivered by trucks, stored on staging areas at the campus, moved across campus to the appropriate buildings, etc., which could result in some small-scale soil erosion. Finally, infrastructure improvements for potable water, electricity, and sewage would involve installation of new distribution or collection systems underground, such as for stormwater and/or greywater for treatment and recycling. These activities would result in ground disturbance to install subsurface drains, biofiltration swales, cisterns and infiltration basins.

Overall, Alternative B would result in ground disturbance of about 12.4 acres (excluding the riparian corridor enhancement) and regrading/reuse of an estimated 26,000 cubic yards of material, most of it fill (Table 3). When considered with elements common to all action alternatives, the total area of potential campus disturbance (earth movement, excavations, vegetation alteration, etc.) under Alternative B is 21.6 acres, almost all of which would occur in previously disturbed areas. It is possible that the excavation for the riparian corridor enhancement would reach depths previously undisturbed. As previously described, approximately 1.5 acres will be revegetated with native plants. The balance of the disturbed landscape will be revegetated consistent with the historic conditions of the Fort, as described in the Cultural Landscape report. The historic Fort landscape consisted primarily of turf grass.

Although nearly all ground disturbances would take place in previously disturbed areas, it would require digging and short-term stockpiling of soils. Stockpiled soils would be subject to erosion from wind and rain. In addition, areas left unvegetated or unstabilized could lead to erosion and soil loss. Impacts would be considered both short-term and long-term, up to moderate localized adverse impacts. Implementation of Mitigation Measure SSL-1 (*Ground Disturbance Timeframe*), SSL-2 (*Soil Erosion Prevention*), SSL-3 (*Soil Loss Prevention*), SSL-4 (*Staging Areas*), SSL-5 (*Soil Reuse*), WR-1 (*Runoff*), and WR-2 (*Planting and Revegetation after Landscape Treatment*) would reduce these impacts to minor levels.

On Campus Activities

All of the action alternatives would increase use of the campus by program participants by as much as 75%. Conference participants do not heavily use the landscaped or natural areas of the site; however, students do use these areas. The general impacts to soils from on-campus activities have been previously described under Alternative A. Increasing the use of the site by 75% would introduce potential for increased impacts compared to those described for that alternative. However, the site would be designed to address existing erosion issues and to withstand increased use; for this reason, impacts are considered negligible (and in some cases beneficial where existing impacts are remediated by the project actions).

In addition, many of the campus improvements would be deliberately planned to increase the amount of permeable surface area. In this alternative, 212,320 square feet of impervious surfaces in the study area would result (Table 3). This is a 4.7% decrease in impervious surfaces compared to Alternative A and a localized long-term benefit to soils by returning natural infiltration capacity.

Riparian Corridor Enhancement

Riparian corridor enhancement is common to all action alternatives; throughout the *Environmental Consequences* chapter, it is analyzed in detail in this section (Alternative B), and subsequently referenced in the analysis of other two action alternatives.

Riparian corridor enhancement could affect natural soils where the stream is above-ground, in addition to manmade fills in the area where the stream is culverted. In sections where the creek will be daylighted, excavation to depths of 5-10 feet to access the culvert would be required. The riparian corridor enhancement also involves two road crossings at Mitchell Road and Kirkpatrick Street. The Mitchell Road crossing in particular would require widening the channel and creating a few passageways across a 350-foot width to help recreate the original delta fan and increase lateral flow. This would be accomplished by excavating sections of the road and road shoulder and installing a causeway or series of earthen-bottom culverts. Channels would also be dug into the existing delta to help reestablish flow with the lagoon. All of these actions could lead to erosion and loss of topsoil.

Some above-ground sections of the stream that would be restored have unnaturally steep banks and high rates of erosion resulting from development and changes to the stream that occurred historically. These sections are primarily those upstream of the Nike campus. As identified in Mitigation Measure SSL-2 (*Soil Erosion Prevention*), restoration would include "laying back" of steep slopes, making the streambanks less steep and the entire stream area wider. Banks generally would be constructed so that they are no more than 3:1 in slope and would offer increased area for the stream to deposit sediment, creating natural overbank topography.

All of these restoration activities would involve digging and either stockpiling and re-using sediment where it is needed or hauling it off site where it is not. The riparian corridor enhancement is expected to remove on the order of 18,000 cubic yards of material (Table 3). Per Mitigation Measure SSL-5 (*Soil Reuse*), soils that are native to the site, such as those along banks where widening takes place, would be re-used either in the riparian corridor enhancement or elsewhere on campus. Artificial fill taken from the culverted portion of the stream would be hauled offsite if not needed for restoration or on-campus work. This focus on reuse of native soils and fills would keep impacts to native soils from restoration activities localized and no more than moderately adverse. Implementation of Mitigation Measure SSL-1 (*Ground Disturbance Timeframe*), SSL-2 (*Soil Erosion Prevention*), SSL-3 (*Soil Loss Prevention*), SSL-4 (*Staging Areas*), SSL-5 (*Soil Reuse*), WR-1 (*Runoff*), and WR-2 (*Planting and Revegetation after Landscape Treatment*) would reduce these impacts to minor levels.

As noted in the *Affected Environment* chapter, some sediment loss occurs on a regular basis from the subwatershed upstream of the campus. Stabilizing the section of stream above Bunker Road is considered out of the scope of the HI project. However, to help minimize the amount of sediment carried in the channel and deposited in Rodeo Lagoon during and following restoration, under Mitigation Measure SSL-3 (*Soil Loss Prevention*), a linear sediment catch basin would be excavated along the existing maintenance road for the reach of stream north (upstream) of Bunker Road. This sediment catch basin would be accompanied by other small scale means to slow velocity (retrofit culvert with a header, energy dissipating structures, etc.) and catch sediment (check dams to help slow upstream incision and sediment loss) on this particular reach of the stream (see Mitigation Measures SSL-2 and SSL-3). The enhancement of the stream corridor that is part of this plan would all take place south (downstream) of this basin. Although it is possible that sediment loads may be higher than average during the storms immediately following restoration, the total for any given year is not expected to be higher than the 34-55 ton average reported in the *Affected Environment* chapter.

In the long term, native soils would be re-used to create more gently sloping stream banks, terraced streambeds and natural grade. Reduced grade and energy dissipation structures (woody debris, rocks, etc.) would help in slowing incision of the channel and less steep slopes would help in stabilizing banks and keeping them from slumping. Terraced and wider banks would also provide surfaces for sediment to deposit where overbank topography would eventually result in native riparian vegetation and additional stabilization from roots. With the mitigation measures identified above to reduce impacts, overall the riparian corridor enhancement would result in long-term localized beneficial impacts to soils in the project area.

Off Campus Activities

As with the riparian corridor enhancement, the management approach on off-campus activities is common to all action alternatives; throughout the *Environmental Consequences* chapter, it is analyzed in detail in this section (Alternative B), and subsequently referenced in the analysis of other action alternatives.

The general impacts to soils from off-campus activities have been previously described under Alternative A. With the increased number of students, some additional erosion from use of existing

and new sites is likely, and additional short-term or long-term localized moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites from erosion by park visitors, including those associated with HI, would be kept to no more than short-term minor and localized. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

While cumulative impacts are described under Alternative A, some additional adverse impacts are anticipated under this alternative due to construction activities and increased student usage. However, the long-term benefits from the riparian corridor enhancement and other campus improvements, alongside the other identified cumulative projects, would be beneficial, and despite the adverse impacts associated with this alternative, there would be long-term localized and regional beneficial cumulative impacts overall.

Conclusion

On campus construction activities would primarily affect previously disturbed areas. Impacts to native soils would be minimal and kept to no more than minor, short-term and localized through the use of mitigation measures. Negligible impacts from increasing the use of the site would occur because of removal of social trails and creating clear walkways. Long-term benefits to soils by increasing the extent of permeable surfaces, changing access areas, repairing social trails, creating green play areas, etc. could occur. Short-term impacts to native soils from excavation during stream restoration would be localized, adverse and no more than moderate, and would be mitigated to a level of minor. Long-term localized benefits to native soils from their reuse to create stable banks, floodplain terraces and a more natural grade would also occur. Impacts associated with off-campus site use to accommodate increased student numbers would be kept no more than localized, short-term and minor adverse with implementation of the off-campus site management program. Formalizing monitoring and action thresholds for off-campus site use would even provide benefits at existing impacted sites. Cumulative impacts would be primarily beneficial and result from ongoing and completed larger planning processes, most notably the MHFB Transportation Plan and the Coastal Corridor Enhancement Project. Overall, there would be no adverse impacts greater than moderate, and all impacts would be mitigated to a level of minor to negligible.

No impairment of park soils would occur under Alternative B. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on soil resources under Alternative B.

4.3.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

The effects of construction activities would be similar to those described for Alternative B; while the construction of new buildings under this alternative would have potential to increase the intensity of impacts in those locations, the total footprint of soil disturbance under this alternative would be smaller. The building sites are located where previous structures were built on xerorthents, and are relatively level. Grading and excavation are therefore likely to be minimal compared to that of an undisturbed site.

New construction and landscaping, new parking lots and activity areas would disturb about 10.6 acres in this alternative (Table 3). This smaller number, as compared to other alternatives, is the result of a more centralized campus. Although less area would be disturbed than under Alternative B, the volume of material regraded and reused (about 24,500 cubic yards) would be very close to that in Alternative

B (about 26,000 cubic yards). This is because more material will need to be removed to build foundations for construction of new buildings. All of the new construction, including all or most of a 25-foot area of disturbance around the buildings, would take place on xerorthents soils, as the closest neighboring Barnabe variants are not found on campus. While building on Barnabe variants has limitation for slope, shrink/swell properties and the hardness of bedrock, xerorthents have no such limitations (NRCS 2008).

When considered with elements common to all action alternatives, the total area of potential campus disturbance (earth movement, excavations, vegetation alteration, etc.) under Alternative C is 17.5 acres, all of which would occur in previously disturbed areas. It is possible that the excavation for the riparian corridor enhancement would reach depths previously undisturbed. As with the other action alternatives, a total of 1.5 acres will be revegetated with native plants under this alternative. The balance of the disturbed landscape will be revegetated consistent with the historic conditions of the Fort, as described in the Cultural Landscape report.

Stockpiled fill would be subject to wind and water erosion and loss, and construction equipment would increase compaction, and have potential to result in trampling and loss of stabilizing vegetation and result in increased runoff and erosion. Impacts would be considered both short-term and long-term, up to moderate localized adverse impacts. Implementation of Mitigation Measure SSL-1 (*Ground Disturbance Timeframe*), SSL-2 (*Soil Erosion Prevention*), SSL-3 (*Soil Loss Prevention*), SSL-4 (*Staging Areas*), SSL-5 (*Soil Reuse*), WR-1 (*Runoff*), and WR-2 (*Planting and Revegetation after Landscape Treatment*) would reduce these impacts to minor levels.

On Campus Activities

Impacts under this alternative would be very similar to those described for Alternative B. Under Alternative C, the placement of new buildings would decrease the amount of open space used by HI and would concentrate activities in the central open space. However, the site would be designed to withstand increased use, and negligible, or in some cases beneficial, localized long-term impacts are therefore anticipated.

This alternative would result in 214,740 square feet of paved or covered surfaces that are impervious to infiltration (Table 3). This is a 3.7% decrease in impervious surfaces compared to Alternative A and a localized long-term benefit to soils.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term impacts to soils would be localized and mitigation measures would reduce impacts to minor adverse levels. Overall, the riparian corridor enhancement would result in long-term localized beneficial impacts to soils in the project area.

Off Campus Activities

Impacts would be as described for Alternative B; short-term or long-term localized moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites from erosion by park visitors, including those associated with HI, would be kept to no more than short-term minor and localized. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; additional short-term adverse impacts related to construction, and impacts to native soils from restoration activities localized and no more than moderately adverse, long-term localized and regional beneficial cumulative impacts overall.

Conclusion

Impacts and mitigation would be generally as described for Alternative B. The overall footprint of construction-related ground disturbance would be less than under that alternative, reducing the extent of impacts, although construction of new buildings could increase impact intensity. Concentration of on-campus activities to a more centralized area would also have additional potential for impacts; however, the campus areas where these activities take place would be designed to withstand this use.

No impairment of park soils would occur under Alternative C. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on soil resources under Alternative C.

4.3.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)**Construction**

The effects of construction activities would be similar to those described for Alternatives B and C. Only one new building would be constructed and new construction and landscaping, new parking lots and activity areas would disturb about 12.2 acres (Table 3). This falls in between the extent of disturbance that would result under Alternatives B (about 12.4 acres) and C (about 10.7 acres). Landscaping treatment would be nearly as extensive as in Alternative B, as only one fewer building (Building 1042) would be rehabilitated. The volume of material regraded or reused is the greatest of the three action alternatives and totals about 26,500 cubic yards (Table 3).

When considered with elements common to all action alternatives, the total area of potential campus disturbance (earth movement, excavations, vegetation alteration, etc.) under Alternative D is 21.7 acres, all of which would occur in previously disturbed areas. It is possible that the excavation for the riparian corridor enhancement would reach depths previously undisturbed. As with the other action alternatives, a total of 1.5 acres will be revegetated with native plants under this alternative. The balance of the disturbed landscape will be revegetated consistent with the historic conditions of the Fort, as described in the Cultural Landscape report.

Overall, impacts and mitigation would be as described for the previous alternatives; minor adverse with the implementation of mitigation.

On Campus Activities

Impacts under this alternative would be very similar to those described for Alternatives B and C. The amount of open space would increase, distributing use over a larger area; however, this area would be designed to withstand an increase in use. This alternative would result in 212,320 square feet of impervious surface, the same as in Alternative B (Table 3). This is a 4.8% decrease in impermeable surface area at the site and a long-term localized benefit to soils.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-impacts to soils would be localized and mitigation measures would reduce impacts to minor adverse levels. Overall, the riparian corridor enhancement would result in long-term localized beneficial impacts to soils in the project area.

Off Campus Activities

Impacts would be as described for Alternative B; short-term or long-term localized moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites from erosion by park visitors, including those associated with HI, would be kept to no more than short-term minor and localized. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; additional short-term adverse impacts related to construction, and impacts to native soils from restoration activities localized and no more than moderately adverse, long-term localized and regional beneficial cumulative impacts overall.

Conclusion

Impacts and mitigation would be generally as described for Alternative B. The overall footprint of construction-related ground disturbance would be slightly less than under that alternative, reducing the extent of impacts, although construction of a new building could increase impact intensity.

No impairment of park soils would occur under Alternative D. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on soil resources under Alternative D.

4.3.7 Mitigation Measures***SSL-1: Ground Disturbance Timeframe***

The ground disturbing aspects of construction would be limited to the period between April 15 and October 31 (typical dry season).

SSL-2: Soil Erosion Prevention

1. To the extent practical, all equipment, materials, and construction personnel will limit movements to access roads, surface streets, or other disturbed areas that are already compacted.
2. All residual soils and/or materials will be cleared from the project site once activities are complete.
3. Building materials and other project-related materials will not be stockpiled or stored where they could spill into water bodies or storm drains or where they will cover aquatic or riparian vegetation.
4. Routine watering of dust-prone construction areas, especially during the dry season, would be used to reduce generation of fugitive dust and to control migration of sediment outside of the project area.
5. No stockpiled soils shall remain exposed, unless surrounded by properly installed and maintained silt fencing or other means of erosion control.
6. Restored banks would be constructed at a slope no greater than 3:1 and energy dissipation structures (woody debris, rocks, etc) would be used in channel to prevent future bank erosion.

SSL-3: Soil Loss Prevention

To help minimize the amount of sediment transported through the site from upstream erosional problems, a linear sediment catch basin would be excavated along the existing maintenance road for the reach of the stream north (upstream) of Bunker Road.

SSL-4: Staging Areas

Staging areas would be located in previously disturbed areas near project sites. Staging areas would be returned to pre-construction conditions or better once construction had been completed.

SSL-5: Soil Reuse

Soils excavated during ground-disturbing activities will be reused to the extent that these locally-derived materials are found to be clean and weed-free. Any such reuse is subject to applicable NPS policies and guidance.

WR-1: Runoff

Practices will be implemented to ensure that concentrated run-off and discharges are redirected away from exposed slopes or stockpiled soils, including the placement of a vegetated buffer, hay wattles or bales, silt screens, or other materials to filter and reduce runoff velocity if needed.

WR-2: Planting and Revegetation after Landscape Treatment

1. Sites where activities result in exposed soil will be stabilized to prevent erosion and revegetated as soon as feasible after activities are complete.
2. Erosion control fabric, hydromulch, or other mechanism will be applied as appropriate to provide protection to seeds, hold them in place, and help retain moisture. Tightly woven fiber netting or non-binded materials (e.g., rice straw) would be used for erosion control or other purposes at the work sites to ensure that the California red-legged frogs do not get trapped. This limitation would be communicated to the contractor through use of Special Provisions included in the bid solicitation package. No plastic mono-filament matting would be used for erosion control.

4.4 Water Resources

4.4.1 Guiding Regulations and Policies

The Clean Water Act requires NPS to “comply with all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution.” NPS *Management Policies 2006* direct parks to take all actions needed in parks “to maintain or restore the quality of surface waters and groundwaters” consistent with the Clean Water Act and any other applicable laws or regulations (Sec. 4.6.3). Parks are also tasked with managing watersheds as complete hydrologic systems and minimizing human-caused disturbance to natural upland processes such as runoff, erosion and mass movements. Streams are to be managed to protect stream processes that create habitat features such as floodplains, riparian systems, woody debris accumulation, terraces, gravel bars, etc. (Sec. 4.6.6).

4.4.2 Assessment Methods

Although quantitative estimates of the amount of increased sediment are not possible given that weather would play an important role, agency reports, the scientific literature and professional judgment were used to qualitatively assess impacts. The impacts to hydrology, stream and delta processes and floodplain function along the stream corridor were based on two technical reports prepared by Kamman Hydrology and Engineering (KHE 2008a and 2008b), consultants hired by NPS and HI to design the stream restoration project and assess its adverse and beneficial impacts to several natural resources.

Thresholds

- Negligible:** Chemical, physical, or biological changes or changes in ground or surface water infiltration or flow, to stream bank stability, delta formation processes, lagoon connectivity, floodplain function or other aspects of stream hydrology would not be detectable. Adverse changes to water quality would not result in the exceeding of any short or long term water quality standard or criterion. The effect on water supply and availability would not be measurable.
- Minor:** Chemical, physical, or biological effects, changes in stream bank stability, delta formation processes, lagoon connectivity, floodplain function or other aspects of stream hydrology would be barely detectable. Adverse changes to water quality would not result in the exceeding of any short or long-term water quality standard or criterion. The effect on water supply and availability would be barely measurable.
- Moderate:** Chemical, physical or biological effects, changes in stream bank stability, delta formation processes, lagoon connectivity, floodplain function or other aspects of stream hydrology would be noticeable. Adverse changes to water quality would not result in the exceeding of any short or long-term state or federal water quality standard or criterion, although they may result in occasional increases in pollutants beyond those identified in park plans. The effect on water supply and availability would be noticeable.
- Major:** The impact is severe. Chemical, physical, or biological effects, changes in stream bank stability, delta formation processes, lagoon connectivity, floodplain function or other aspects of stream hydrology would be frequently altered from stated desired conditions in park plans or from natural conditions; water quality may slightly and singularly exceed federal or state standards or criteria. The effect on water supply and availability would be highly noticeable.

4.4.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

Under the No Action Alternative, sediment from unvegetated areas of the site would continue to be carried into the storm drain system. Use by students on campus has a minimal effect on water resources at the site. Although use of the social trails on campus potentially causes some erosion and sedimentation or siltation of the unnamed creek running through campus and the lagoon, the impact is localized and minor adverse.

Stormwater from Fort Cronkhite currently flows directly to Rodeo Lagoon through surface flow and an onsite stormwater drainage system includes drains on campus in each parking lot and along the historic roads. Deliveries and cars and buses parked on the campus may also leak oil, which could enter the lagoon via stormwater drains or sheet flow. These are also considered localized minor adverse impacts.

Riparian Corridor Enhancement

No stream restoration would take place under the No Action Alternative. However, leaving the stream unrestored would continue existing impacts to hydrology, floodplain function, connectivity to the lagoon, bank stability and other features of the unnamed stream that flows under the Nike core of campus.

The combination of past impacts from trenching, culverting, burying and rerouting the stream corridor have destroyed much of its floodplain function, hydrology, streambank stability and aquatic habitat. Rather than a slow-moving fan of channels entering the lagoon, a small delta and wetland occurs immediately next to the water's edge where the stream outlet joins the lagoon. Natural stream processes as well as stream structure and function have all experienced moderate or major adverse localized effects from Army development of the site. These effects would persist under the No Action Alternative, which is considered to be a minor localized adverse impact.

Off Campus Activities

As noted above, HI educators spend most of the day with groups of students outside at various teaching points off-campus. Currently, 22 teaching sites are used (refer to Figure 3 in the *Alternatives* chapter). Of those, only a few have the potential to impact water resources. These include the use of the riparian area that runs north and south of campus and underground through the Nike core of campus, two sites at the edge of Rodeo Lagoon, the bridge over the lagoon, and Rodeo Lake. This may include activities in the water (such as water sampling), or activities in adjacent locations (e.g. riparian areas). Although increases in sedimentation may be measurable, in the context of natural and other sources of anthropogenic sediment production, it is considered a minor impact to water quality. Historic land use practices, including road building, stream diversion and grazing operations have had a much larger influence on the rate of sediment loss in this watershed over pre-disturbance conditions, and impacts from HI use to water quality would be negligible in this context. Furthermore, the off-campus site management program administered by HI assures that these areas are managed in a sustainable manner and that measures are implemented if individual sites are experiencing negative ecological effects.

In addition, use of established or social trails in the watershed by HI students could compact or destabilize soils and expose them to increased wind or water erosion. Social trails are likely to be worse in terms of erodibility as they are not designed or engineered to minimize erosion. However, increases in sedimentation of streams or the lagoon in the watershed related to HI student use is negligible given the natural loss of soils and more severe impact of roads, trail building, development and historic uses described above. Overall, impacts are considered negligible to minor adverse.

Cumulative Impacts

The effects of the various cumulative projects on erosion, compaction, and loss of topsoil were discussed in Section 4.3.3, which addresses the impacts of the No Action Alternative on soils. To the extent that erosion reaches surface water bodies, this could lead to adverse impacts. However, the conclusion in Section 4.3.3 is that cumulative impacts to soils were beneficial, including reductions in erosion; corresponding benefits to water quality would be experienced as the amount of sediment reaching water bodies would be decreased.

With regard to other water quality constituents, HI activities have the small potential for discharges of non-point source contaminants, such as runoff from cars using the site. Several of the cumulative projects are planning efforts that will reduce non-point source pollution, such as the MHFB Transportation Plan, the Dog Management Plan and Southern Marin Equestrian Plan, all of which are likely to reduce the amounts of nutrients, coliform, oil and grease, etc. reaching local creeks, Rodeo Lake, and Rodeo Lagoon. As such, while HI's contributions are negligible or minor adverse, overall impacts are considered beneficial in the larger planning context.

The No Action Alternative would have negligible impacts related to ground or surface water infiltration or flow, water supply, geomorphology (such as delta formation processes, lagoon connectivity), floodplain function or other aspects of stream hydrology; as such, no cumulative impacts are anticipated.

Conclusion

Use of the campus by HI (foot traffic, erosion, fuel, oil leaks) continues to have localized minor adverse effects on water quality. Use of off campus sites may have some localized minor adverse impacts to water resources through erosion of surface trails or lagoon, creekbeds or pond edges, and tracking soil into tidepool areas. Within the context of the larger planning process, cumulative impacts are anticipated to be beneficial.

No impairment to park water resources would result from implementing Alternative A. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on water resources under Alternative A.

4.4.4 Impacts of Alternative B—Rehabilitation Only**Construction**

The impacts of construction related to excavation, stockpiling of soils, etc., have been previously discussed in the soils discussion in Section 4.3.4, and are not repeated here. Such erosion could have short-term, localized moderate adverse impacts to water quality. With implementation of the previously identified mitigation measures, potential for sedimentation to reduce water quality would be minor adverse.

Accidental leaks or spills of hazardous materials used during construction activities (oil, grease, fuels, and chemicals such as those needed to remove lead paint) could potentially contaminate the lagoon, creek, or groundwater. As described in Chapter 1, the approach to building rehabilitation would ensure that potential water quality impacts related to lead paint, mercury ballasts, etc. would be negligible. However, contamination from other construction-related hazardous materials is considered a potential short-term, localized moderate adverse impact. Implementation of Mitigation Measure WR-3 (*Equipment Inspections*) and WR-4 (*Spill Prevention and Response Plan*) would reduce this impact to a negligible level.

On Campus Activities

The increased use of the campus by students is not expected to have more than negligible impacts to water quality because social trails would be eliminated and clear paved walkways would be available for traveling around campus, reducing the potential for erosion that could adversely affect receiving waters.

In the long run, the rehabilitated on-campus landscape would decrease runoff and stormwater discharge by:

- Re-engineering hardened ground surfaces to maximize infiltration and minimize runoff with sediment.
- Re-engineering site drainage to resolve minor ponding/flooding and erosion that occurs on campus. Daylighting the stream to the edge of the Nike core and re-establishing the natural drainage pattern would contribute to resolving both these problems.
- Converting the central parking lot, which currently drains directly into the lagoon, into a landscaped area to reduce runoff.
- Installing biofiltration swales in all replacement parking lots.
- Installing cisterns and infiltration basins to capture and either reuse or enhance infiltration of roof run off.

Current parking lots would be replaced with permeable surfaces, the playing area would be reengineered to enable water to infiltrate, and rainwater would be captured from roofs in cisterns allowing it to be used for irrigation or slowly infiltrated through installed infiltration basins.

Water that does not infiltrate through the permeable pavement of the new main parking lot would drain to a biofiltration swale. Biofiltration swales are vegetated drainage ditches that use multiple natural mechanisms to remove pollutants from water. The proposed swales filtering the runoff from the main parking lot would first function as long infiltration basins, allowing the maximum proportion of runoff to be filtered through the soil. Infiltration would be maximized by lining the swale with permeable soil over a base of aggregate.

The planting in the swale would filter pollutants both from the water before it infiltrates and more importantly from the surface flow through the swale once the soil and base is saturated. A diverse palette of plants capture polluting particles (known as phytoextraction) and a subset of these plants actually break down the toxins (known as phytotransformation). The particular plant palette for the main parking lot swales would be chosen from a list approved by NPS natural resources to assure no invasive non-native species were introduced to the watershed. The proposed swale would run most of the 140 foot length of the southern edge of the new main parking lot. The depth and width of the swale would be based on the surface area and planting needed to process the expected runoff from the parking lot.

Impermeable surfaces would be decreased by 4.8% on the site (Table 3). This decrease, along with the various water quality treatment features described above, would reduce the amount of contaminants reaching the unnamed creek and Rodeo Lagoon. The reduced volume of runoff would also more closely reflect the natural, predevelopment condition at the site. Overall, there would be long-term, localized beneficial impacts related to water quality, stormwater discharge, and groundwater recharge.

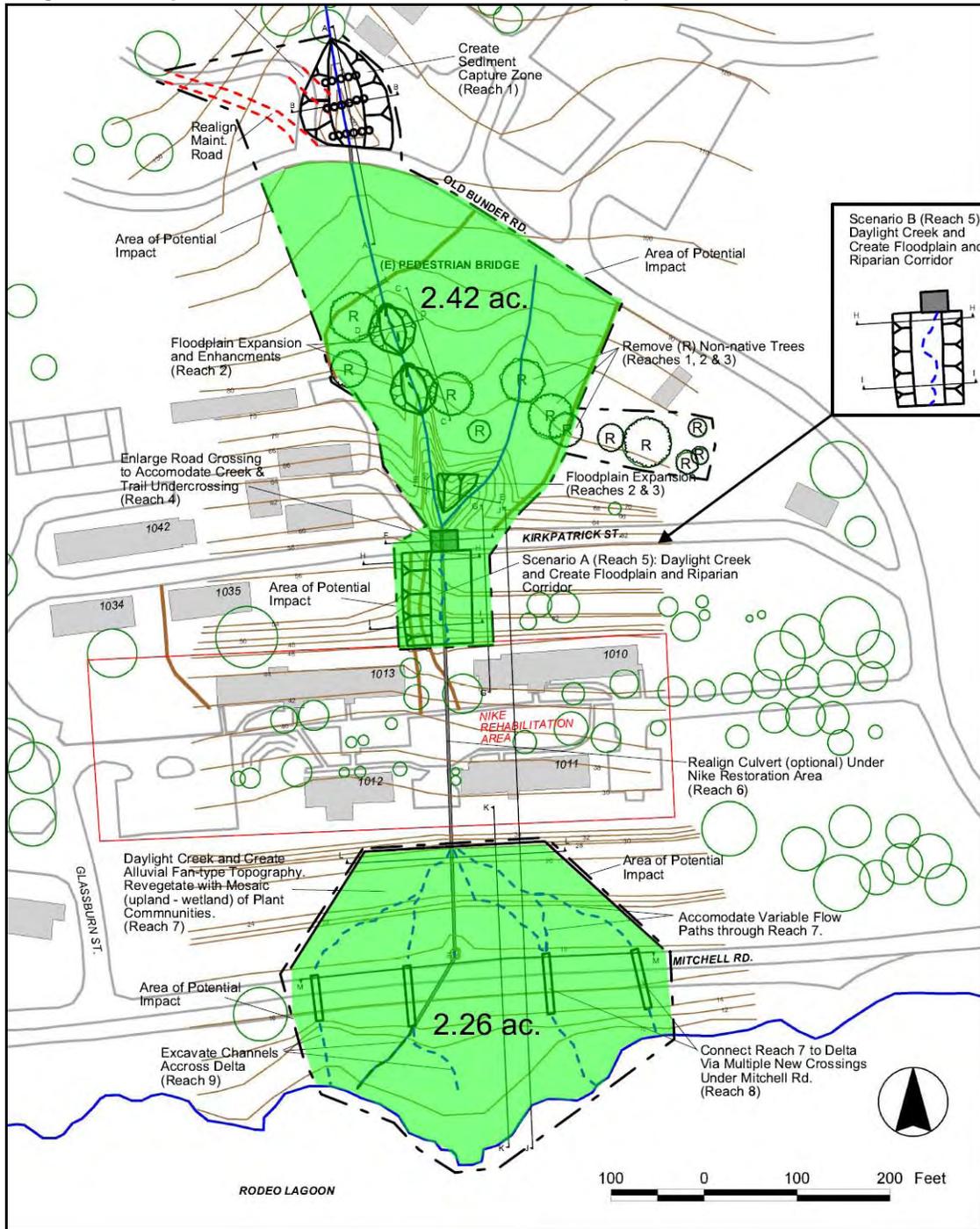
Riparian Corridor Enhancement

The plans for the riparian corridor enhancement are shown on Figure 17. The impacts related to earthwork associated with the restoration have been previously discussed in the soils analysis in Section 4.3.4, and are not repeated here. Discharges of sediment could have moderate short-term localized adverse impacts to water quality, particularly if an unexpected storm event occurred during the dry season. With implementation of the previously identified mitigation measures, potential for sedimentation to reduce water quality would be reduced to minor adverse.

In addition, accidental leaks or spills of hazardous materials used during restoration activities (oil, fuels, etc.) could potentially contaminate the lagoon, creek, or groundwater. This is considered a potential short-term, localized moderate adverse impact. Implementation of Mitigation Measure WR-3 (*Equipment Inspections*) and WR-4 (*Spill Prevention and Response Plan*) would reduce this impact to a negligible level.

As discussed in the soils analysis in Section 4.3.4, upstream watershed inputs of sediment are considered problematic. To help minimize the amount of sediment carried in the channel and deposited in Rodeo Lagoon during restoration, Mitigation Measure SSL-3 (*Soil Loss Prevention*) includes excavation of a linear sediment catch basin along the existing maintenance road for the reach of stream north (upstream) of Bunker Road. This sediment catch basin and other small scale means to slow velocity (retrofit culvert with a header, energy dissipating structures, etc.) and catch sediment (check dams to help slow upstream incision and sediment loss) on this particular reach of the stream would be part of this plan (see Mitigation Measures SSL-2 and SSL-3). All of these are anticipated to have long-term beneficial effects on water quality downstream by reducing the volume of sediment.

Figure 17. Riparian Acres of Disturbed under the Riparian Corridor Enhancement



At the end of the construction period, some loose soil would remain in the creek bed, and would cause pulses of sedimentation into the creek and into the lagoon for some period of time. The increased width, terracing, and slower velocity of the stream following restoration would help in keeping the impacts of these pulses to water quality to a minimum. However, for at least the first winter following restoration, pulses of sediment and increases in turbidity of both the creek and lagoon at the stream delta are likely. This is a short-term localized moderate adverse impact.

Long-term benefits to water resources along the length of the corridor would come from laying back and stabilizing stream banks, providing additional floodplain area and restoring function, creating additional space for lateral movement in the lower reaches, slowing velocity of the stream flow, increasing infiltration, reducing flows, and revegetating with native plant species. Because of the increased channel cross-section, flood risk would be decreased as the channel would be better able to pass flood flows. Large sediment loads can be deposited as flows slow on these wider floodplains, which decreases turbidity and improves water quality. Native floodplain or riparian vegetation also is known to filter contaminants, improving water quality.

In the lower reaches, the restored delta formation would provide more area where sediment can deposit, creating habitat for native riparian and wetland species to grow, which in turn would provide additional sediment and water quality filtering capacity. Excavating lower level depressions would reconnect surface and groundwater flows, a more natural feature. Overall, the riparian corridor enhancement would result in long-term localized beneficial impacts.

Off Campus Activities

The general impacts to water resources from off-campus activities have been previously described under Alternative A. Under Alternative B, impacts from use of the Time Tunnel would be eliminated through stream enhancement, a beneficial impact. With the increased number of students, some additional erosion from use of existing and new sites is likely, and additional localized, short-term and long-term moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites from erosion by park visitors, including those associated with HI, would be kept to no more than minor. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

While cumulative impacts are described under Alternative A, some additional adverse impacts are anticipated under Alternative B due to construction activities and increased student usage. However, the long-term benefits from the riparian corridor enhancement and other campus improvements, alongside the other identified cumulative projects, would be beneficial, and despite the adverse impacts associated with this alternative, there would be long-term beneficial cumulative impacts overall.

Conclusion

On campus construction activities could have short-term localized moderate adverse effects related to sediment and release of construction-related hazardous materials, but would be kept to no more than minor through the use of mitigation measures. There would be negligible effects from increased use of the campus, and the rehabilitated campus landscape would have localized, long-term beneficial impacts related to water quality, stormwater discharge, and groundwater recharge. The riparian corridor enhancement could have short-term localized moderate adverse effects related to construction activities that would be mitigated to a level of no more than minor. Over the long term, the riparian corridor enhancement would be beneficial by creating a more naturally functioning riparian system, with corresponding benefits to water quality, hydrology, flooding, groundwater recharge, etc. With implementation of the off-campus site management program, off-campus site use to accommodate increased student numbers would have no more than short-term, localized minor adverse impacts. Within the context of the larger planning process, cumulative impacts are anticipated to be long-term and beneficial. Overall, there would be no adverse impacts greater than moderate, and all impacts would be mitigated to a level of minor to negligible.

No impairment to park water resources would result from implementing Alternative B. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not

create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on water resources under Alternative B.

4.4.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

The effects of construction activities would be similar to those described for Alternative B; while the construction of new buildings under this alternative would have potential to increase the intensity of impacts in those locations, the total footprint under this alternative would be smaller. Construction of new buildings would be several hundred feet from Rodeo Lagoon and would be unlikely to have more than minor potential for erosion/sedimentation to the lagoon. However, new construction is quite close to the creek than runs through campus; if restoration of the creek occurred prior to construction, then runoff or sedimentation from construction into the restored creek would be more likely than in Alternative B. Overall, erosion or release of construction-related hazardous materials could have short-term, localized moderate adverse impacts to water quality. With implementation of the mitigation measures identified for Alternative B, potential for sedimentation or other contaminants to reduce water quality would be reduced to minor.

On Campus Activities

Impacts would be similar to Alternative B. In Alternative C, about 3.7% of the study area would be changed from impervious to permeable surfaces (including the area from new construction), with benefits that are slightly smaller than those identified for Alternative B (refer to Table 3). New facilities constructed under this alternative would be unlikely to be subject to flood risk due to their distance from the unnamed creek and Rodeo Lagoon, with negligible impacts.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term adverse impacts would be negligible to moderate with the inclusion of prescribed mitigation measures. Overall, the riparian corridor enhancement would result in long-term localized beneficial impacts.

Off Campus Activities

Impacts would be as described for Alternative B; some additional localized, short-term and long-term moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites from erosion by park visitors, including those associated with HI, would be kept to no more than minor. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; long-term beneficial cumulative impacts overall.

Conclusion

General impact conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; overall, there would be no adverse impacts greater than moderate, and all impacts would be mitigated to a level of minor to negligible.

4.4.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

The effects of construction activities would be similar to those described for Alternative C, although the impacts related to new construction would be smaller due to the lesser degree of new construction. With implementation of the mitigation measures identified for Alternative B, potential for sedimentation or other contaminants to reduce water quality would be short-term and minor adverse.

On Campus Activities

Impacts would be similar to Alternative B. The new building constructed under this alternative would be unlikely to be subject to flood risk due to its distance from the unnamed creek and Rodeo Lagoon, with negligible impacts.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term adverse impacts would be negligible to moderate with the inclusion of prescribed mitigation measures. Overall, the riparian corridor enhancement would result in long-term localized beneficial impacts.

Off Campus Activities

Impacts would be as described for Alternative B; some additional localized, short-term and long-term moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites from erosion by park visitors, including those associated with HI, would be kept to no more than minor. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; long-term beneficial cumulative impacts overall.

Conclusion

General impacts conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; overall, there would be no adverse impacts greater than moderate, and all impacts would be mitigated to a level of minor to negligible.

4.4.7 Mitigation Measures

SSL-2: Soil Erosion Prevention

(see full description in Section 4.3.7 and in Table 5)

SSL-3: Soil Loss Prevention

(see full description in Section 4.3.7 and in Table 5)

WR-1: Runoff

(see full description in Section 4.3.7 and in Table 5)

WR-2: Planting and Revegetation after Landscape Treatment

(see full description in Section 4.3.7 and in Table 5)

WR-3: Equipment Inspections

1. All vehicles and equipment will be kept clean. Excessive build-up of oil or grease will be avoided.
2. All equipment used in the creek channel will be inspected for leaks each day prior to initiation of work. Action will be taken to prevent or repair leaks, if necessary.
3. Vehicle and equipment maintenance activities will be conducted off-site or in a designated, protected area away from the channel where vehicle fluids and spills can be handled with reduced risk to water quality.
4. If maintenance must occur on-site, designated areas will not directly connect to the ground, surface waters, or the storm drainage system to prevent the run-on of stormwater and runoff of spills. The service area will be clearly designated with berms, sandbags, or other barriers.
5. Secondary containment, such as a drain pan or drop cloth, to catch spills or leaks will be used when removing or changing fluids. Fluids will be stored in appropriate containers with covers, and properly recycled or disposed of off-site.

WR-4: Spill Prevention and Response Plan

The Headlands Institute will develop a Spill Prevention and Response Plan prior to commencement of construction activities to contain and/or clean up any stored or spilled fuels or chemicals and prevent oil, grease, or fuel leaks from equipment.

4.5 Vegetation

4.5.1 Guiding Regulations and Policies

NPS *Management Policies 2006* state that parks are to prevent or remove exotic plant species if possible and maintain native plants (Sec. 4.4.1, 4.4.1.1). Wetlands, including marsh and riparian vegetation, are addressed separately from other vegetation types in this impact analysis as they are protected by a specific set of laws and regulations.

Section 4.6.5 of NPS *Management Policies 2006* addresses the management of wetlands on NPS lands and requires parks to prevent the destruction, loss or degradation of this unique vegetative community (NPS 2006a). NPS also supports a policy of no net loss of wetlands, a goal outlined by the White House Office on Environmental Policy in 1993 and Executive Order 11990. Director's Order 77-1 establishes NPS policies, requirements, and standards for implementing Executive Order 11990. NPS requires a statement of finding and mitigation for any projects that may impact more than 0.25 acres of "natural" wetlands except for those related to recreational facilities (e.g., overlooks, bike/foot trails, and signs) and minor stream crossings that completely span channel and wetlands (i.e., no pilings, fill, or other support structures).

In addition to these laws and policies, Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act authorize the U.S. Army Corps of Engineers to grant permits for construction and disposal of dredged material in waters of the United States, which includes wetlands.

4.5.2 Assessment Methods

Information on the type of vegetation in the study area, including rare or unique vegetation such as plants of concern or wetlands, was gathered primarily from park documents and maps. The current condition of vegetation was provided in large part from observations by HI and NPS staff. Best professional judgment and the scientific literature were used to predict the extent of impact that would

occur under each alternative. Impacts to historic vegetation planted by the U.S. Army at Ft. Cronkhite are covered as a cultural resource in that section.

Thresholds

- Negligible:** There would be no measurable or perceptible changes in the geographic extent of any native vegetative plant community, its continuity, integrity or species richness. No detectable changes to sensitive plant communities (including wetlands) would occur and no individuals of any rare or unique plant species would be affected. Key environmental conditions influencing plant communities (such as soils and water quality) would not be affected.
- Minor:** Measurable changes in the geographic extent of a native vegetative plant community, its continuity, integrity or species richness may occur, but its viability would be unaffected. Slight changes to sensitive plant communities (including wetlands) may occur, with one or a few individuals of rare or unique plant species affected. Changes in environmental conditions influencing plant communities (such as soils and water quality) would be at the lower levels of detection. The potential for changes in the abundance of nonnative species would be detectable but minimal.
- Moderate:** Noticeable changes in the geographic extent of a native vegetative plant community, its continuity, integrity or species richness may occur, but its viability would remain. Detectable changes to sensitive plant communities (including wetlands) may occur, with some individuals of rare or unique plant species affected. Changes in environmental conditions influencing plant communities (such as soils and water quality) would be measurable. The potential for changes in the abundance of nonnative species would be noticeable.
- Major:** Substantial changes in the geographic extent of a native vegetative community, its continuity, integrity or species richness may occur. Although the communities would remain viable regionally, small populations may be eradicated. Noticeable changes to sensitive plant communities (including wetlands) may occur, with small populations of rare or unique species affected. Changes in environmental conditions influencing plant communities (such as soils and water quality) would be obvious. The potential changes in abundance of nonnative species would be substantial.

4.5.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

Ornamental plantings at the campus are comprised of species that are not consistent with the cultural landscape and are not native to the area. Because the potential for their spread is minimal, the impact is considered long-term, localized minor adverse.

Currently, use by students on campus has a minimal effect on planted vegetation at the site, as shrubs or ornamental plantings are avoided and turfgrass is intended to withstand excessive use. Some social trails at the campus do travel through areas that may have originally been vegetated with native grasses and forbs, and their loss is a long-term minor localized impact associated with continued operations. Deliveries may also require driving over curbs or on turfgrass; this is also a negligible impact as it is possible that a few native plants grow in the affected area.

Riparian Corridor Enhancement

Under the No Action Alternative, no riparian corridor enhancement activities would take place. While historic impacts to vegetation occurred in the past as a result of stream modifications, the No Action Alternative itself would have no impacts.

Off Campus Activities

Areas where the students or other visitors create or use social trails to access a view or other resource can result in trampling and removal of vegetation along that trail. Impacts in the future would be localized, and anticipated to range from negligible or minor adverse at most sites, to moderate adverse near the pond, lagoon or in riparian areas, where vegetation is considered more sensitive and unique. The current process for monitoring and addressing impacts to off-campus program sites has been previously described and would provide protection for sites that are impacted, ensuring impacts remain localized and minor adverse at most.

The potential spread of seeds of non-native invasive species could be an impact, although practices imposed by HI are likely to prevent any impact related to HI use from becoming more than negligible.

Cumulative Impacts

Actions in the park that could affect vegetative communities that are also affected by this project include the Fire Management Plan, MHFB Transportation Plan, the relocation of the MMC, the CCEP, general visitor use, and other planning processes.

Fire management activities resulting from the park's Fire Management Plan could include prescribed burning and/or mechanical thinning, as well as suppression of wildfires in areas of the Marin Headlands. While this would have short-term adverse effects on vegetation, prescribed burning is believed to be regionally beneficial to native vegetation over the long term.

An analysis of impacts to wetlands that would result from actions taken to implement the preferred alternative in the MHFB Transportation Plan indicated that some sites would overlap with off-campus HI student learning locations. Most of the impacts to wetlands from the MHFB Transportation Plan are beneficial. For example, the dirt parking lot at the west end of Ft. Cronkhite prevents a coastal connection to an existing riparian area. The parking lot would be removed and restored to wetland and dune habitat, a benefit for native vegetation. A new stairway would be installed to provide access to the north end of Rodeo Beach. These actions would keep students from climbing over existing banks and from using social trails to access sites north of the parking lot. The Rodeo Lake site would be modified to remove fill from the shoulders of the road and expand wetland habitat in the lagoon and lake, providing benefits for palustrine and estuarine wetland vegetation at the site. HI students access Hawk Hill by climbing the switchbacks behind the Rifle Range, where palustrine wetlands exist. Students do not cross the area of wetlands, but this is an area where several transportation-related projects may have adverse and beneficial impacts to wetlands (new parking area would be adverse, trail restoration would be beneficial). Small wetlands near the Point Bonita lighthouse may be adversely affected by a new trail and turn-around; this is in the vicinity of trails used by HI students to access the lighthouse and/or tidepools in the area. The combined activities in the MHFB Transportation Plan would have permanent adverse impacts on 0.64 acres of wetlands and would restore just over 3 acres of wetland and dune habitat. Those that would particularly be additive with HI impacts include Site 2, Rodeo Lagoon/Lake, where a net increase in wetlands approximately 1 acre would occur. Vegetation at this site has been trampled from students accessing the lake and lagoon for water quality sampling; increasing wetland habitat by removing fill would help in mitigating student-related impacts.

Actions in the MHFB Transportation Plan would also have adverse and beneficial impacts on other types of vegetation. Construction activities would result in minor short-term impacts to 15 acres of vegetation and permanent loss of 5.6 acres. About 5 acres of vegetation lost permanently would be coyote brush scrub (the remainder is mowed grass). Beneficial impacts to 13 acres of vegetation from removing trails, roads or parking and revegetating would also occur.

Relocation of the MMC had permanent impacts by removing 0.40 acres of non-native annual grassland and 15 Monterey pine or cypress trees. Mitigation for these impacts included planting or restoration of about 0.2 acres of native plants at the project's southeast edge. Placement of a road for this project also permanently filled 0.08 acres of wetlands. These impacts were considered localized and moderately adverse in intensity in the environmental assessment for the project (NPS 2004).

The CCEP is aimed at removing targeted invasive non-native plant species and closing selected social trails to public access. Implementation of the CCEP would result in the treatment and control of more than 66 acres of non-native invasive plants in the Marin Headlands, as well as closure of 18,000 linear feet of social trails primarily to protect mission blue butterfly habitat. These efforts would have long-term beneficial impacts on native vegetation.

Existing visitor use also contributes to the creation and continued use of social trails across the Marin Headlands, an adverse impact of unknown intensity. The park is undergoing several planning processes, including dog management, equestrian, long-range transportation and general management planning. Each of these may include changes in visitor or park management activities that have additive adverse or beneficial impacts on vegetation. Because each of these planning processes is more likely to respond to existing resource issues, it is likely that each would result in cumulative beneficial impacts to vegetation in the Marin Headlands.

Overall, considering all cumulative projects including continued HI activities, impacts are considered to be both local and regional, and beneficial over the long term.

Conclusion

Current use by HI may have minor adverse impacts to vegetation on campus from trampling. Localized negligible or minor impacts at most off-campus teaching sites, with some possible local moderate impacts to pond, lagoon or riparian vegetation may be ongoing. The No Action Alternative's contribution to cumulative adverse impacts in the Marin Headlands to vegetative communities is slight, and overall cumulative impacts are both local and regional, and beneficial over the long term.

No impairment to park vegetation would result from implementing Alternative A. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on vegetation under Alternative A.

4.5.4 Impacts of Alternative B—Rehabilitation Only

Construction

The primary on-campus construction activities affecting vegetation would be landscape treatments and installation of sustainability measures, which would involve removal of existing vegetation between and around Nike buildings. As noted on Table 3, Alternative B would result in the removal of about 11.5 acres of existing landscaping to be replanted in either native species or culturally significant nonnative vegetation. The native species that HI would use to replant the areas outside the fort include coyote brush, California sagebrush, monkeyflower, yerba buena and golden yarrow.

Because the campus and surrounding area is primarily populated by non-native species, impacts to native vegetation from landscaping treatment during construction would be minimal (localized, minor, short-term and adverse). Another long-term, local to regional moderate adverse impact could result from spread of non-native, noxious invasive species by handling and disposal of vegetation and soil contaminated with weed seeds. Implementation of Mitigation Measures WR-2 (*Planting and Revegetation after Landscape Treatment*) and SSL-6 (*Noxious Weed Control*) would eliminate these adverse effects and result in localized long-term beneficial impacts.

On Campus Activities

Increased numbers of students and conference participants have the potential for short- and long-term adverse impacts to vegetation. Although conference participants do not heavily use the landscaped or natural outside areas of the site, students use them extensively. Revegetating the recontoured terraces with use-resistant grasses and reestablishing the historic Stennis Street corridor and historic orthogonal pathways as pedestrian walkways through the Nike core would minimize impacts to these grassy areas. Increased use could also affect replanted areas outside the World War II boundary of the fort. Trails would be established within these areas (such as from campus to the lagoon), and students' conduct would be guided by HI's "leave no trace" ideology which encourages the use of area within trail limits and avoidance of native vegetation. As such, impacts from increased use would be negligible.

Riparian Corridor Enhancement

The riparian corridor enhancement would target removal of non-native species, including Monterey cypress, Monterey pine, and numerous invasive understory species such as pampas grass, French broom, bull thistle and prickly ox tongue (KHE 2008a). The reaches to be daylighted possess surface vegetation consisting of disturbance-tolerant and naturalized grassland species which are also for the most part non-native. While removal of this vegetation would be mostly beneficial, laying back stream banks would require the removal or disturbance of 0.035 acres of riparian vegetation, some native, from Reaches 1-4. Similarly, work in Reaches 8 and 9 would result in the disturbance of 0.06 acres of wetlands. These are considered short-term, moderate localized adverse impacts.

Moderate adverse impacts could also result from spread of non-native, noxious invasive species as a result of handling and disposal of removed vegetation and soil contaminated with weed seeds. Implementation of SSL-6 (*Noxious Weed Control*) would eliminate these adverse effects and result in negligible impacts.

Following vegetation removal, the entire area would be replanted with native species or culturally significant non-native plants. In addition, willow riparian vegetation would be pruned to improve species richness. These activities would occur in the context of a larger riparian corridor that would be expanded by the widening of Reach 4, the daylighting of Reaches 5, 7 and 8, and the reconstruction of Reaches 7, 8 and 9 to reestablish a natural-forming delta feature. This would provide additional opportunities for native riparian plantings and recruitment, and a greater variety of microhabitats for a diversity of species. For instance, the final grade of Reach 7 will be deliberately undulating to allow the establishment of a wide range of vegetation dictated by depth to groundwater and distance to the lagoon. The downstream reaches in the delta would naturally revegetate with willow as well as other riparian habitat, wetland fringe, brackish marsh fringe and wet meadow fringe species.

Overall, riparian corridor enhancement would create 0.87 acres of new riparian habitat and 0.23 acres of new wetland habitat. In the context of the Marin Headlands, the benefits of expanding the delta and wetland vegetation would be small; however at a localized level (in the unnamed creek subwatershed or HI campus, for example), the improvements in habitat available for riparian and wetland species would represent beneficial impacts for these unique vegetative communities.

Off Campus Activities

The general impacts to vegetation from off-campus activities have been previously described under Alternative A. Under this alternative, impacts to vegetation from use of the Time Tunnel would be eliminated through stream enhancement, a beneficial impact. With the increased number of students, some additional trampling of vegetation from use of existing and new sites is likely, and additional short-term and long-term localized moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites to vegetation from park visitors, including those associated with HI, would be kept to no more than short-term, minor and localized. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

While cumulative impacts are described under Alternative A, some additional disturbance to vegetation would be anticipated due to construction activities and increased student usage. However, the long-term benefits from the riparian corridor enhancement and other campus improvements, alongside the other identified cumulative projects, would be beneficial, and there would be beneficial cumulative impacts overall.

Conclusion

Construction and landscaping treatments have potential localized, negligible to moderate, short-term and long-term adverse impacts on native vegetation. However, implementation of mitigation measures would result in long-term beneficial impacts. Expanded use of the campus is anticipated to result in negligible adverse impacts to vegetation. The riparian corridor enhancement is anticipated to result in moderate short-term localized adverse impacts on vegetation, which would be mitigated to negligible in the short-term through mitigation. Over the long term, benefits would accrue from restoring riparian vegetation, marsh fringe and other wetland habitats. Off-campus impacts to vegetation would be no more than minor adverse, and beneficial in certain cases. Cumulative impacts would be beneficial in the larger context. Overall, all impacts would be moderate adverse or less, and would be mitigated to a negligible or beneficial level.

No impairment to park vegetation would result from implementing Alternative B. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on vegetation under Alternative B.

4.5.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

The effects of construction activities would be similar to those described for Alternative B; while the construction of new buildings under this alternative would have potential to disturb additional areas of vegetation, these areas are primarily composed of non-native species. In addition, the total disturbance footprint under this alternative would be smaller, with landscape treatments totaling about 9.5 acres and total area disturbed of about 11 acres (Table 3). With implementation of the mitigation measures identified for Alternative B, impacts would be beneficial.

On Campus Activities

Impacts would as described for Alternative B; impacts from increased use would be negligible.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term, moderate localized adverse impacts during the construction period, and beneficial overall.

Off Campus Activities

Impacts would be as described for Alternative B; additional short-term and long-term localized moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites to vegetation from park visitors, including those associated with HI, would be kept to no more than short-term, minor and localized. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; beneficial cumulative impacts overall.

Conclusion

General impacts conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; overall, all impacts would be moderate adverse or less, and would be mitigated to a negligible or beneficial level.

4.5.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)***Construction***

The effects of construction activities would be similar to those described for Alternative C, although the impacts related to new construction would be smaller due to the lesser degree of new construction. Landscape treatments would total 11.2 acres and total area disturbed would be about 12.2 acres (Table 3). With implementation of the mitigation measures identified for Alternative B, impacts would be beneficial.

On Campus Activities

Impacts would as described for Alternative B; impacts from increased use would be negligible.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term, moderate localized adverse impacts during the construction period, and beneficial overall.

Off Campus Activities

Impacts would be as described for Alternative B; additional short-term and long-term localized moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites to vegetation from park visitors, including those associated with HI, would be kept to no more than short-term, minor and localized. For sites that have current issues, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; beneficial cumulative impacts overall.

Conclusion

General impacts conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; overall, all impacts would be moderate adverse or less, and would be mitigated to a negligible or beneficial level.

4.5.7 Mitigation Measures

SSL-6: Noxious Weed Control

Soils and vegetation contaminated with weed seeds from within the GGNRA will be segregated and disposed of or treated as appropriate. Similarly, soils heavily infested with noxious invasive plant material will be disposed of off-site.

WR-2: Planting and Revegetation after Landscape Treatment

(see full description in Section 4.3.7 and in Table 5)

4.6 Wildlife

4.6.1 Guiding Regulations and Policies

NPS *Management Policies 2006* require parks to maintain animals that are native to park ecosystems (Sec. 4.4.1). Specifically, they are to preserve and restore natural abundances, diversities, distribution and behaviors, restore native animal populations where they have been extirpated by past human actions and minimize human impacts.

Some groups of wildlife, including marine mammals, commercial fish species and migratory birds are further regulated. For example, “Essential Fish Habitat,” as established under the Magnusen-Stevens Fishery Management Act, is intended to protect spawning and rearing habitat of more than 65 commercially fished species. Protection is managed through the National Marine Fisheries Service.

The Migratory Bird Treaty Act, which was first enacted in 1918, implements domestically a series of treaties between the United States and Great Britain (on behalf of Canada), Mexico, Japan, and the former USSR, which provide for international migratory bird protection and authorize the Secretary of the Interior to regulate the taking of migratory birds. The act makes it unlawful, except as permitted by regulations, “at any time, by any means, or in any manner, to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird, included in the terms of conventions” with certain other countries (16 USC 703). This includes direct and indirect acts, although harassment and habitat modification are not included unless they result in the direct loss of birds, nests, or eggs.

The Marine Mammal Protection Act, which was most recently reauthorized in 1994 (16 USC 1361 et seq.), establishes a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters. The term “take” is statutorily defined as, “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” Harassment is defined under the 1994 amendments as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal in the wild, or has the potential to disturb a marine mammal in the wild by causing disruption to behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

4.6.2 Assessment Methods

Information on the type of wildlife in the study area was gathered primarily from park documents and personal communication with park staff. Information from the Beachwatch program at the Gulf of the Farallones National Marine Sanctuary was used to determine shorebird species and frequency. Best professional judgment and the scientific literature were used to predict the extent of impact that would occur under each alternative.

For evaluation of impacts of noise on wildlife, the following information on birds was considered. Waterfowl appear to be more overtly responsive to noise than other birds (Bowles 1995). Although waterfowl can adjust to noise disturbances, the process is slow. At least one study (Belanger and Bedard 1990 as cited in Bowles 1995) found that flight responses of migratory waterfowl exposed to overflights by light aircraft and helicopters never completely habituated, and that changes in behavior as a result of exposure to noise were extensive enough that they could be translated into energetic losses. Other studies of Pacific black brants (Ward et al. 1986 and Miller 1991 as cited in Bowles 1995) found that the geese typically flew from the pond where they were exposed when aircraft flew overhead, and that the duration of responses was constant with repeated exposure, indicating no habituation. Flight responses took place even when the helicopters were as far away as 3 km, a range at which noise would be just detectable. In studies of other water birds (egrets, snow geese), individuals returned to the area less than five minutes following overflights even when the aircraft had come quite close (400 feet; Kushlan 1979 and David & Wisely 1974 as cited in NPS 1994a). However, as noted above, several species of ducks appear to have habituated to even very loud noise.

Thresholds

The following thresholds were used to determine the magnitude of effects on wildlife and wildlife habitat:

- Negligible:** There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.
- Minor:** Impacts on native species, habitat or natural processes sustaining them would be detectable, but would not be expected to be outside the natural range of variability. Small-scale changes in the amount of wildlife habitat or in the quality of habitat could take place. Disturbance of a few individuals is possible, but no change to population levels would result from disturbance as important behaviors such as breeding would not be interrupted.
- Moderate:** Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages. Mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species at the project site.
- Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and could be outside the natural range of variability for short periods of time. Noticeable changes in the amount or quality of wildlife habitat could take place. Population numbers, population structure, genetic variability, and other demographic factors for species might experience changes, but would be expected to remain stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting population levels. Individuals may temporarily relocate to avoid disturbance and construction or other activities may result in the permanent loss of some individuals.
- Major:** Breeding animals of concern are present; animals are present during vulnerable life stages; mortality or interference with activities necessary for survival would regularly occur, and may threaten the continued existence of the species at the project site.
- Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Substantial and obvious changes in the amount or quality of wildlife habitat could take place. Population numbers, population structure, genetic variability, and other demographic factors for species are likely to

experience changes and the population may be substantially depressed. Disturbance may result in long term or permanent relocation of many individuals or partial or full populations of wildlife in the vicinity of the project.

4.6.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

Continued use of the fort and especially of HI campus by students and staff will keep wildlife from using any microhabitats that do exist on the site for the most part, as most species are sensitive to the presence of humans and to noise. A few are more tolerant of humans and even thrive on crumbs or garbage, and occasional breeding birds may occupy nests on campus, particularly in non-native trees. The fort generally does not offer high quality habitat for wildlife and impacts of continued use are considered negligible.

Riparian Corridor Enhancement

Under the No Action Alternative, no riparian corridor enhancement activities would take place. While historic loss of wildlife habitat occurred in the past as a result of stream modifications, the No Action Alternative itself would have no impacts.

Off Campus Activities

Generally, use by students of off campus sites have impacts to wildlife that are similar to other visitors—that is, temporary disturbance from the presence of humans and noise. These are minor, localized and short term for the most part. However, HI teaching groups can visit particular sites many more times in a given week, are in larger groups and stay longer than other park visitors. For wildlife that are restricted to certain habitats, such as those residing in tidepools, nests, etc., or where habitat is rare and unavailable elsewhere (freshwater lakeshore, freshwater-lagoon interface, etc.), exposure to larger groups of students on a regular basis may cause high stress levels, secretion of stress hormones, decreases in feeding or reproduction and even lead to increased mortality.

HI educators are sensitive to the impact students may have on wildlife, and teach students to be quiet, respectful, keep their distance from animals and not touch tidepool animals or stranded marine mammals. Although this helps to minimize impact, some wildlife likely would move to other locations or would choose not to occupy habitat that would otherwise be suitable because of this persistent human presence. Shorebirds along Rodeo Beach, for example, are sensitive to the presence of humans and will fly or run to keep away from them. Birds use beach areas and the lagoon edge for feeding and resting on their migration, and may not stop at Rodeo Beach if students are present. This forces them to fly on to find resting habitat elsewhere, and if it is already fully occupied or otherwise unavailable, may ultimately mean they do not have the energetic resources to complete their trip. The beach is frequently visited by HI groups, including in the evenings for recreational use. As noted in the *Affected Environment* chapter, the frequency of four indicator species of shorebirds is lower at Rodeo Beach than expected given park averages; it is unknown but possible that the consistent presence of students contributes to these lower numbers.

Other teaching sites where wildlife may be affected include the Time Tunnel, “Secret Grove” and Rodeo Lake and Lagoon. Raptors including hawks and owls roost and may nest in the large trees at Fort Cronkhite, and willow thickets such as those along the stream corridor provide areas for smaller species to nest. The lagoon provides habitat for a variety of birds, and Rodeo Lake may be part of a

wildlife corridor for many species. Impacts to species in rare habitat, such as riparian or wetland, may be more intense because the habitat is unique and species diversity is high. While impacts to wildlife at these sites are generally minor, sites supporting sensitive species, unique habitat, or where animals engage in critical behaviors (nesting, feeding, resting for migration) are likely to experience localized, short-term or long-term moderate adverse impacts.

Cumulative Impacts

Actions in the park that could affect wildlife also affected by this alternative include visitor use and use by park partners, the MHFB Transportation Plan, fire management, the relocation of the MMC and the CCEP.

Visitor use contributes to impacts to wildlife. As noted above, most wildlife are sensitive to the presence of humans and human-caused noise and will expend energy running or flying from it. Walking humans or slow-moving boats tend to have a disproportionate impact on wildlife, as they are a perceived source of danger not posed by a quicker moving vehicle for example. Use can also result in degraded habitat from designated trails, visitor facilities, social trails and trampling of vegetation. Impacts are likely to be localized, short term, minor adverse for the most part because much of the Marin Headlands remains contiguous without trails or human disturbance.

Existing visitor use not related to environmental education also contributes to the creation and continued use of social trails across the Marin Headlands, an adverse impact of unknown intensity to wildlife. The park is undergoing several planning processes, including dog management, equestrian, long-range transportation and general management planning. Each of these may include changes in visitor or park management activities that have additive adverse or beneficial impacts on wildlife. Because each of these planning processes is more likely to respond to existing resource issues, it is likely that each would result in cumulative beneficial impacts to wildlife in the Marin Headlands.

Fire management activities resulting from the park's Fire Management Plan such as prescribed burning and/or mechanical thinning, and suppression of wildfires in areas of the Marin Headlands, could have direct impacts on wildlife from noise and the presence of human activity, as well as altering habitat. For example, some vegetative communities have evolved to burn frequently (chaparral, coastal scrub, grasslands) with low-temperature fires. Manipulating fire frequency or suppression can alter the geographic extent of these communities, the presence of non-native species and the ability of these species to invade native communities, with changes to the distribution and abundance of native wildlife resulting. Generally, the goals of NPS fire management activities include restoring wildlife habitat to benefit native species, although safety and other considerations prevent wide-scale burning. Impacts would on balance be beneficial, and minor to perhaps moderate in intensity.

The MHFB Transportation Plan would result in the net gain of approximately 2.5 acres of wetland and dune habitat. This would help alleviate impacts from HI off-campus use on this rare wildlife habitat. Other habitat changes resulting from implementing the MHFB Transportation Plan include the loss of 5 acres of coastal scrub and the restoration of 13 acres of habitat in a variety of vegetative types. Creating new trails would also have potentially adverse impacts by creating human entry into what is now a contiguous patch of habitat. These include new Coastal Trail segments, Rodeo Creek crossings, and a new bike tunnel bypass to Fort Baker. This would remove 6.36 acres of wildlife habitat with minor, long-term adverse impacts. Revegetating and other restoration would add 18.9 acres, with long-term minor beneficial effects. Implementing the MHFB Transportation Plan would also have temporary adverse impacts to wildlife from noise and the presence of heavy equipment, which could result in crushing injuries to the animals themselves or to their habitat. Noise would disrupt feeding, breeding and other behaviors and would at least temporarily if not permanently displace those individuals capable of escape in many cases (NPS 2009).

Building the MMC adjacent to Fort Cronkhite also resulted in a small amount of filled wetland and 0.2 acres of native planting. Nonnative trees that provide nesting habitat were also removed, with long-term minor or moderate impacts on wildlife habitat in the vicinity.

The CCEP is aimed at removing targeted invasive non-native plant species and closing selected social trails to public access. Implementation of the CCEP would result in the treatment and control of more than 66 acres of non-native invasive plants in the Marin Headlands, as well as closure of 18,000 linear feet of social trails primarily to protect mission blue butterfly habitat. These efforts would have minor or moderate beneficial impacts on wildlife by restoring habitat and minimizing human use.

Cumulatively, the various activities identified above would have short-term and long-term minor to moderate adverse impacts during construction or other activities/uses, with long-term benefits from habitat restoration, improvement and restrictions on use. The adverse effects associated with HI activities would not fundamentally change these impact conclusions.

Conclusion

Continued use of the campus likely has negligible effects to wildlife, although use of the Time Tunnel area in the "HI Creek" corridor could result in localized, moderate adverse impacts. The sustained use of off-campus sites may also have moderate localized impacts. In the context of the larger Marin Headlands environment, these impacts would be minor where adequate habitat exists elsewhere. Cumulatively, there would be a combination of minor to moderate adverse impacts, alongside beneficial impacts. Overall, impacts would be range from negligible to moderate adverse, and in some cases beneficial.

No impairment from impacts to park wildlife would occur if Alternative A were implemented. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on park wildlife under Alternative A.

4.6.4 Impacts of Alternative B—Rehabilitation Only

Construction

On-campus activities that would most affect wildlife in Alternative B involve ground disturbance and the use of heavy equipment on site. Due to the relative lack of wildlife habitat on the campus, these activities are unlikely to substantially affect wildlife in the immediate construction area. However, certain species residing on campus are less mobile, such as invertebrates, amphibians, reptiles and small mammals. Such species would be subject to crushing injuries or death from digging, grading or being killed by the vehicles themselves; however, because of the low probability and the fact that only common species would be subject to this impact, it is considered a short-term minor adverse impact.

Disturbance to adjacent wildlife from construction noise and activity is also of concern. A detailed discussion of noise generated by construction activities, including the amount of noise anticipated at various distances, is provided in Section 4.10.4. Some impacts of noise on wildlife include startle reflexes, increased metabolic rate and energy depletion, disruptions of feeding, breeding or communication. For those wildlife on or near campus at the time grading or excavating begins, most will be disturbed enough to leave the area. If habitat is available within walking or flying distance, impacts may be short-term, localized and minor adverse. Others may be unable to find suitable habitat, or may incur energy costs in moving that are enough to cause more severe, short-term localized moderate impacts. Nesting birds, shorebirds and migrating birds may be particularly affected

because alternative habitat is unavailable or the species tends to be more sensitive to loud noise. Some work under Alternative B would be done on buildings west of Glassburn in the vicinity of Monterey pine and cypress trees that may be used for nesting raptors, for example. Impacts to these few individuals may be localized, short-term and moderately adverse.

Noise levels at the lagoon are likely to be in the 70 dBA range even though it is several hundred feet from the construction site. Some waterfowl (duck species) in the lagoon for example may acclimate to these noise levels, while other more sensitive species (herons, egrets) are likely to abandon the northern shore of the lagoon while construction is ongoing. Wildlife that is less mobile, such as invertebrates, amphibians, reptiles and small mammals have each been shown to be less sensitive to noise than birds, but could nonetheless experience short-term localized moderate adverse effects from vibrations or the intensity of combined noise.

Finally, erosion and sedimentation from construction activities, to the extent that it reaches Rodeo Lagoon, could degrade habitat in the lagoon.

Construction phasing, which would limit the amount of construction at any given time, would help alleviate adverse effects, as would the measures previously identified for erosion control, locating staging areas, runoff, planting and revegetation, etc. However, overall impacts to wildlife from construction activities are considered short term, localized and moderately adverse. Mitigation Measures BR-1 (*Pre-Construction Educational Training*), BR-3 (*Nesting Bird and Raptor Protection Measures*), BR-6 (*Protection of Bat Populations*), BR-7 (*California Brown Pelican Protection*), and VE-4 (*Construction-Related Noise Control*) would reduce certain impacts to negligible to minor levels, particularly to the focal species under Mitigation Measures BR-3, BR-6, and BR-7. For other species, such as those for whom mitigation would not reduce or avoid impacts (such as wildlife which cannot migrate out of the project area), impacts would remain moderately adverse on a local level—although these impacts are considered only minor in the context of the larger Marin Headlands environment, given the extent of habitat and species abundance elsewhere.

On Campus Activities

Use of the campus by an increased number of students and staff could adversely affect wildlife. However, as noted in the No Action Alternative, habitat on campus is of low quality and does not support diverse or abundant wildlife. Increasing use will therefore only have negligible effects. In the long term, some landscaping would be replaced with native species and provide habitat for wildlife, a benefit for wildlife.

Riparian Corridor Enhancement

The impacts of construction activities described above would also apply to the construction activities for the riparian corridor enhancement. Several non-native trees may be removed as a part of stream restoration. These trees may be used for nesting by raptors, or by bats for roosting. However, suitable trees (both native and non-native) would remain available nearby. In addition, laying back banks adjacent to the stream or digging out space to recreate the delta could result in crushing injuries or death, temporary loss of riparian or marsh habitat, and siltation of the lagoon itself with adverse effects on resident fish, amphibians, birds, mammals, or other aquatic life in the study area. Because the riparian and lagoon fringe areas are unique habitats, species diversity and abundance is often higher and changes experienced as more intense adverse impacts than for upland animals. These impacts would be short-term, localized, and moderately adverse.

The mitigation measures identified for the construction of the on-campus improvements would also be implemented here. Several additional mitigation measures would be implemented which would further reduce the impacts of construction of the riparian corridor enhancement: Mitigation Measures BR-2

(*Aquatic Wildlife Impact Avoidance and Minimization*) and BR-4 (*Goby Protection Plan*). Mitigation would reduce certain impacts to negligible to minor levels, particularly to the focal species under Mitigation Measures BR-2, BR-3, BR-4, BR-6, and BR-7. For other species, such as those for whom mitigation would not reduce or avoid impacts (such as wildlife which cannot migrate out of the project area), impacts would remain moderately adverse on a local level—although these impacts are considered only minor in the context of the larger Marin Headlands environment, given the extent of habitat and species abundance elsewhere.

Following completion of the riparian corridor enhancement, the corridor would support a wider range and abundance of wildlife species. Invertebrates, fish, amphibians, reptiles, birds and mammals would all use the riparian corridor and restored marsh habitat. Riparian and particularly wetland vegetation would act as a filtering agent to remove sediment from the water before it enters the lagoon, helping to reduce turbidity levels and improving habitat for fish and amphibians. These are long-term regional and local benefits to wildlife for some riparian or wetland species.

Off Campus Activities

The general impacts to wildlife from off-campus activities have been previously described under Alternative A. With the increased number of students, some additional impacts from increased use of existing and new sites is likely, and additional localized, moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites by park visitors, including those associated with HI, would be kept to no more than short-term, minor and localized. For sites that have current issues related to disturbance of wildlife, impacts would be beneficial.

Cumulative Impacts

While cumulative impacts are described under Alternative A, additional disturbance to wildlife would be anticipated due to construction activities and increased student usage. However, the long-term amenities provided by the riparian corridor enhancement would combine with the beneficial impacts of other identified cumulative projects. Collectively, the various cumulative projects, including this project, would have short-term and long-term minor to moderate adverse impacts during construction or other activities/uses, with long-term benefits from habitat restoration, improvement and restrictions on use of certain off-campus sites.

Conclusion

Impacts to wildlife from ground disturbance, noise and activity during construction of the riparian corridor enhancement and on campus would be short-term, localized, and adverse, ranging up to moderate. With mitigation, impacts would be reduced, but some could remain locally moderate. The impacts of expanded use of the campus would be negligible, with some beneficial impacts accruing from limited wildlife habitat that is created. The riparian corridor enhancement would have long-term beneficial impacts to wildlife, particularly marsh and riparian species. Off-campus impacts to wildlife would be no more than minor adverse, and beneficial in certain cases. Cumulatively, impacts would be a combination of minor to moderate adverse and beneficial. Overall, impacts (after mitigation) would be no more than locally moderate in the short term, with many being negligible or beneficial over the long term.

No impairment from impacts to park wildlife would occur if Alternative B were implemented. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner

or contractor operations, there would not be unacceptable impacts on park wildlife under Alternative B.

4.6.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

The effects of construction activities would be similar to those described for Alternative B, although perhaps of somewhat greater intensity due to the construction of new buildings under this alternative. The new buildings would be built in what is likely poor wildlife habitat that has been previously disturbed and is vegetated primarily with non-native grasses. However, some are adjacent to the riparian corridor and noise from construction may particularly disturb riparian wildlife if stream restoration has already been completed and animals have occupied the new habitat. In addition, although the extent of landscaping may vary slightly from alternative to alternative, the impact from noise and the presence and use of heavy equipment would be virtually the same regardless of extent. Impacts would be as described for Alternative B, and the mitigation measures identified for Alternative B would apply here; overall impacts to wildlife from construction activities are considered short term, localized and moderately adverse with mitigation.

On Campus Activities

Impacts would be generally as described for Alternative B. The new buildings would create human activity in an area that is relatively free of continuous disturbance now, and may reduce its use both as habitat and as a travel corridor between the stream and upland habitat. Night lighting, while being inwardly directed, may adversely affect nocturnal wildlife, including several species of bats that live in the vicinity. However, these impacts are considered minor adverse at most.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term, negligible to minor adverse impacts with the implementation of proscribed mitigation. Long-term effects would be beneficial.

Off Campus Activities

Impacts would be as described for Alternative B; Additional localized, moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites by park visitors, including those associated with HI, would be kept to no more than short-term, minor and localized. For sites that have current issues related to disturbance of wildlife, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; short-term and long-term minor to moderate adverse impacts during construction or other activities/uses, with long-term benefits from habitat restoration, improvement and restrictions on use of certain off-campus sites.

Conclusion

General impacts conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; overall, impacts (after mitigation) would be no more than locally moderate in the short term, with many being negligible or beneficial over the long term.

4.6.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

The effects of construction activities would be similar to those described for Alternative C, although perhaps of somewhat reduced intensity due to the construction of only one new building under this alternative. Impacts would be as described for Alternative B, and the mitigation measures identified for Alternative B would apply here; overall impacts to wildlife from construction activities are considered short term, localized and moderately adverse with mitigation.

On Campus Activities

Impacts would be generally as described for Alternative C, although the impacts of the new building would be somewhat less than described for the three buildings under Alternative C; impacts are considered minor adverse at most.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term, negligible to minor adverse impacts with the implementation of proscribed mitigation. Long-term effects would be beneficial.

Off Campus Activities

Impacts would be as described for Alternative B; additional localized, moderate impacts beyond the No Action Alternative are possible. However, with the off-campus site management program, impacts at all sites by park visitors, including those associated with HI, would be kept to no more than short-term, minor and localized. For sites that have current issues related to disturbance of wildlife, impacts would be beneficial.

Cumulative Impacts

Impacts would be as described for Alternative B; short-term and long-term minor to moderate adverse impacts during construction or other activities/uses, with long-term benefits from habitat restoration, improvement and restrictions on use of certain off-campus sites.

Conclusion

General impacts conclusions, mitigation and conclusions regarding impairment would be as described for Alternative B; overall, impacts (after mitigation) would be no more than locally moderate in the short term, with many being negligible or beneficial over the long term.

4.6.7 Mitigation Measures

BR-1: Pre-Construction Educational Training

Prior to construction activities, all personnel will participate in an educational training session conducted by a qualified biologist. Training sessions would include identification of National Park Service staff resource contacts; special-status plants, wildlife, or other sensitive resources in the work area; markings for the limit line of disturbance; thresholds that would trigger a change in implementation techniques or require a halt in project implementation; prohibitions on feeding resident wildlife; and proper disposal of food waste and garbage to discourage feeding by wildlife which may increase predation on native wildlife. Upon completion of training, employees or contracting crews would be required to sign a form stating that they attended the training and understand all the conservation and protection measures.

BR-2: Aquatic Wildlife Impact Avoidance and Minimization

Prior to and during activities in the wetted portion of the creek, native fish, tadpoles, and other vertebrates will be removed and relocated outside of the project area by a qualified biologist. Aquatic wildlife will be excluded from the work area by blocking the stream channel above and below the work area with fine-meshed net or screens. The bottom of the screens will be completely secured to the channel bed. Exclusion screening will be placed in areas of low water velocity to minimize fish impingement. Screens will be checked periodically and cleaned of debris to permit free flow of water.

BR-3: Nesting Bird and Raptor Protection Measures

1. To the greatest extent possible, activities would be planned and conducted outside the bird-nesting season (defined as January 1—July 31 for raptors, and March 1—July 31 for landbirds).
2. In intensively managed landscapes, vegetation would be maintained at a height of less than 8" throughout the landbird nesting season to discourage the nesting of such bird species. Any vegetation (i.e., trees, shrub, grasses) taller than 8" that is not removed within the timing window specified in the GGNRA Standard Operating Procedures for vegetation cutting and removal will be subject to the additional measures 3 and 4, below.
3. If work is conducted within the nesting season, prior to the onset of construction involving ground-disturbing activities using heavy machinery, a qualified wildlife biologist will be retained to conduct pre-maintenance surveys for raptors and nesting birds within suitable nesting habitat in a 300 foot radius of the construction area. If no active nests are detected during surveys, activities may proceed. If active nests are detected then measure 4 would be implemented.
4. If active nests are identified within the construction area, a biologist will establish a suitable nest buffer in coordination with NPS where no work can occur until the young have successfully fledged or the nests have been otherwise abandoned.

BR-4: Goby Protection Plan

1. For in water work in Rodeo Lagoon, silt fencing would be installed during construction activities to exclude individual tidewater gobies from entering the work area. Prior to construction activities, a qualified or permitted biologist would use a 1/8th inch mesh diameter beach seine, dip nets, and/or minnow traps to sample the enclosed work area within the lagoon for tidewater gobies. If any tidewater goby individuals are located and captured within this area, the individuals would be relocated to suitable habitat nearby within Rodeo Lagoon.
2. Reentry into the work zone would be prevented through the use of fine mesh aquatic fences or nets.

BR-6: Protection of Bat Populations

Preconstruction surveys for bat species will be conducted in areas of suitable habitat within the project area. For tree-roosting bats, all potential roost trees that must be removed will be surveyed and identified in the field, and the following procedures will be applied prior to felling: (1) avoid implementing tree removal between April 1 and August 31 to protect potential maternity roosts, (2) trees will be removed under the warmest possible conditions practical, (3) sections of the exfoliating bark will be peeled off the tree gently to search for any roosting bats underneath, (4) noise and vibrations (e.g., striking the tree base) will be created on the tree itself. When cutting sections of the bole, if any hollows or cavities (such as woodpecker holes) are discovered, a biologist will carefully check for the presence of bats in those areas.

BR-7: California Brown Pelican Protection

Work in close enough proximity to disturb potential brown pelican roosting sites near the Lagoon will be conducted between December and April when pelicans tend to be sporadically present in low numbers.

VE-4: Construction-Related Noise Control

1. Contractors will work collaboratively with the NPS and the Headlands Institute to schedule concentrated period of construction, considering NPS functions and Headlands Institute programming.
2. All equipment will be operated and maintained to minimize noise generation. Contractors will ensure that power equipment (vehicles, heavy equipment, and hand equipment such as chainsaws) is equipped with original manufacturer's sound-control devices, or alternate sound control that is no less effective than those provided as original equipment. Equipment will be operated and maintained to meet applicable standards for construction noise generation. No equipment will be operated with an unmuffled exhaust.
3. Contractors will use hydraulically or electrically powered construction equipment, when feasible.
4. Contractors will locate stationary noise sources as far from sensitive receptors, such as student dorms, conference areas, offices and work buildings, as possible.
5. Contractors will limit the idling of motors except as necessary (e.g., concrete mixing trucks).
6. Construction activities will be limited to normal business hours (7 a.m. - 4 p.m.). Work that is particularly noisy work will be limited to the hours of 10:00 a.m. and 3:00 p.m. to the extent possible to minimize noise disruptions (i.e., when field school students are off campus).

4.7 Species of Special Concern

4.7.1 Guiding Regulations and Policies

The federal Endangered Species Act (ESA) of 1973, as amended, requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) before taking actions that (1) could jeopardize the continued existence of any federally listed plant or animal species or species proposed for listing, or (2) could result in the destruction or adverse modification of critical or proposed critical habitat for federally-listed species.

In addition, NPS *Management Policies 2006* (NPS 2006a) state that state and locally listed species are to be managed in a manner similar to the treatment of federally listed species to the greatest extent possible. Species that are rare, unique, declining but not listed are to be inventoried and managed to maintain their natural distribution and abundance (sec. 4.4.2.3).

4.7.2 Assessment Methods

A register / catalog / directory of listed threatened and endangered species in the general area was obtained through the USFWS website. Given habitat, disturbance levels and insights from NPS and HI staff, as well as survey information from previous compliance efforts, the campus was determined to be free of any listed species. Stream restoration, which will extend off campus and into the delta and fringe of Rodeo Lagoon has the potential to affect tidewater goby, California red-legged frog and California brown pelican, as well as the unlisted but rare salt marsh common yellowthroat. The extent of beneficial impacts to listed species that may re-enter the wider northwestern Marin Headlands area following stream restoration was predicted using NPS and other agency reports and best professional judgment.

This section includes analysis of impacts to endangered tidewater gobies, endangered California brown pelicans, threatened California red-legged frogs, the unlisted but rare salt marsh common yellowthroat and four rare plant species described in the *Affected Environment* chapter.

Thresholds

The following thresholds were used to determine the magnitude of effects on species of special concern.

- Negligible:** There would be no observable or measurable adverse or beneficial impacts to species of special concern, their habitats, or the natural processes sustaining them in the proposed project area.
- Minor:** Individuals may temporarily avoid areas. Actions would not adversely affect critical periods (e.g., breeding, nesting, denning, feeding, resting) or habitat.
- Moderate:** Individuals may be impacted by disturbances that interfere with critical periods (e.g., breeding, nesting, denning, feeding, resting) or habitat; including potential for physical injury or mortality of special status individuals.
- Major:** Potential loss of federally-listed individuals, critical habitat, or loss of large numbers of special status individuals. Impacts could not be mitigated.

4.7.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

On-campus use by HI students or staff does not directly affect any species of special concern, as no individuals are known to occupy habitat at Fort Cronkhite. Continued on-campus use at current levels would therefore generally have no impact on any species of special concern. The exception to this is that stormwater drains into Rodeo Lagoon, and erosion from use, as well as oil or grease from parked cars does wash into habitat used by tidewater gobies. This is a localized, long-term minor adverse effect on gobies.

Riparian Corridor Enhancement

Under the No Action Alternative, no riparian corridor enhancement activities would take place. While historic loss of habitat for tidewater gobies, California red-legged frogs, salt marsh common yellowthroat and other unknown but now rare species may have occurred in the past as a result of stream modifications, the No Action Alternative itself would have no impacts.

Off Campus Activities

The impacts of HI students on plants or animals of special concern would be the same as those described for vegetation and wildlife. If students are in the vicinity of rare plants, they may trample individuals or create social trails in the vicinity that increase runoff and erosion of soils. Human use of a site where wildlife occur can cause physiological and behavior responses that include hormonal changes, increased heart rate, flight, interruptions in feeding, breeding or other behaviors, etc. As noted above, intense reactions to even distant sources of noise are more typical of birds than other species. Use of upland areas can also compact soil, increase runoff and erosion and result in increased sedimentation and siltation of stream, lake or lagoon habitat with possible minor impacts to tidewater gobies or California red-legged frogs.

Specific sites used by HI that may affect listed or rare species include those near the edge of the lagoon and Rodeo Lake. Rodeo Lake and the section of Rodeo Creek upstream of it are used by California red-legged frogs: the lake during breeding, and the creek for non-breeding activities. The eastern shore of the lagoon is also an area where California red-legged frogs have been seen feeding on insects (NPS 2007). The frogs are more active in early morning and evening, or during or following rainstorms where they take advantage of wet vegetation to travel between habitats. Although HI students may encounter frogs, instructors are careful to ensure the animals are left alone and no impacts occur. It is possible that use of the lagoon or lake sites has increased erosion and sedimentation with localized minor adverse impacts to water quality and related impacts on frog habitat.

The same is true for tidewater gobies, which occupy slow moving or still waters in the lagoon. Some minor adverse impact to this species is possible from increases in sedimentation and siltation related to use of lagoon edge sites.

The lagoon edge and riparian corridor on campus are also places that the salt marsh common yellowthroat might roost or even nest. Disturbance from student use could cause yellowthroats to nest elsewhere, or if it is intense to possibly abandon established nests. This is a possible minor long-term localized adverse impact.

California brown pelicans also roost in the lagoon and along its shore between April and December and may be disturbed by student groups walking the lagoon trail. The MHFB Transportation Plan has proposed trail improvements in the southwest part of this trail to reduce disturbance by visitors, as this is one of the primary roosting locations in the lagoon. However, continued use by HI students of Rodeo Beach, the lagoon trail (particularly along the western side of the lagoon where pelicans prefer to roost) and lagoon edge sites would continue intermittent and temporary disturbance of pelicans, a minor adverse impact.

Although HI students range widely in the Marin Headlands, none of the sites where instruction currently takes place would directly affect any known rare plant (Figure 18). Access to the Point Bonita lighthouse is along a trail that crosses through a patch of rare plants, but students are told to stay on trails and are monitored by instructors. Impacts are therefore unlikely to occur and considered negligible.

Cumulative Impacts

Tidewater Gobies. Of the various threats to tidewater goby discussed in the *Affected Environment* chapter, development of the lands in the Rodeo Lagoon watershed is considered the main threat to tidewater gobies, as the lagoon is designated as part of this species' critical habitat. The lagoon is the only known habitat in the park used by gobies. Another source of potential impact in the Marin Headlands is removing fill from a portion of the shoreline of Rodeo Lagoon. This action is proposed to help in restoring habitat along the eastern edge of the lagoon and is part of the MHFB Transportation Plan. The MHFB Transportation Plan Final EIS notes that activity in the lagoon to remove fill may result in the loss of some individuals, and is therefore a moderate adverse impact. However, the habitat created by the fill removal would offer major long-term benefits for this species as well (NPS 2009). The No Action Alternative would be anticipated to make negligible to minor contributions to cumulative impacts on the goby.

Red-legged Frogs. Threats include elimination or degradation of habitat from development and land use activities, and habitat invasion by non-native aquatic species, most notably the bullfrog. The No Action Alternative would be anticipated to make negligible to minor contributions to cumulative impacts on the California red-legged frog.

California Brown Pelican. In the Marin Headlands, cumulative impacts to this species could come from actions taken to implement the MHFB Transportation Plan. Pelicans would be temporarily disturbed by the construction of a trail and fence segment at the southern end of Rodeo Beach, and may also be disturbed when fill is removed from a portion of Rodeo Lagoon. These are considered minor short term adverse effects. The installation of a fence by NPS as a component of the MHFB Transportation Plan would provide minor benefits for pelicans by moving visitors walking along the lagoon further from the lagoon itself along this trail segment. The No Action Alternative would be anticipated to make minor contributions to cumulative impacts on the California brown pelican.

Figure 18. Rare Plant Communities and Off-Campus Use by Headlands Institute



(Refer to Figure 3 in the Alternatives chapter for a key of off-campus sites.)

Salt Marsh Common Yellowthroat. In the Marin Headlands, moderate short-term adverse effects from removing fill from the lagoon and constructing Rodeo Creek crossings are possible, particularly if the birds are nesting. Creating riparian and wetland habitat along Rodeo Creek and lagoon would provide moderate localized benefits for this species. Disturbance from student use could contribute a possible moderate adverse impact.

Conclusion

Continued use of the campus would have potential minor localized long-term adverse impacts on tidewater gobies from stormwater drainage. Use of off-campus sites may have moderate impacts on salt marsh common yellowthroat, minor adverse impacts to red-legged frog habitat from use of the Rodeo Lake, and minor adverse impacts to tidewater gobies or California brown pelicans from use of lagoon edge sites. No known impacts from use to rare plants would occur as a result of HI use.

Cumulative moderate short-term adverse impacts to salt marsh common yellowthroats and major short-term adverse impacts to gobies and frogs are anticipated, although the actions under Alternative A would not contribute to these impacts. In the long-run, MHFB Transportation Plan restoration activities would have moderate long-term beneficial impacts on yellowthroats and major long-term beneficial impacts on gobies and red-legged frogs by creating riparian and marsh habitat. Fencing a segment of the lagoon trail have short-term minor adverse and long-term minor beneficial impacts on roosting California brown pelicans. The No Action Alternative would contribute negligible to moderate adverse effects, depending upon the species, but long-term cumulative impacts would remain beneficial overall.

Implementing Alternative A would not impair any species of special concern in the park. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on any species of special concern in the park under Alternative A.

4.7.4 Impacts of Alternative B—Rehabilitation Only

Construction

The types of construction activities that would cause impacts to rare or listed plants and animals include excavation, grading and other forms of soil disturbance as well as noise. No rare plants or listed animals have been found on campus, and so this discussion is limited to indirect impacts of construction, e.g., impacts to species of special concern in the vicinity of noise emitted by construction on-campus. As noted in the analysis of impacts to wildlife, noise levels just from on-campus work are likely to be in the 90+ decibel range.

The great majority of heavy equipment noise from landscaping treatment and other outdoor activities on campus would remain several hundred feet from the lagoon (about 500 feet at the closest), which means noise at the lagoon edge would have dropped off to around 70-75 dBA for the most part. The exception to this is that an addition to Building 1046, which is much closer to the lagoon, would be a part of Alternative B. While construction of this addition is occurring, noise levels would be in the 85-90 dBA range at times. The species of special concern that may be most sensitive to noise would be the two bird species in the area, California brown pelicans and salt marsh common yellowthroat.

Using information on the impact of noise to waterfowl (no studies of impacts specific to brown pelicans have been done), it is possible that some individual pelicans may habituate to construction noise at this level, while others would not. It is likely that all pelicans in the vicinity of Building 1046 would temporarily abandon the northern shore of the lagoon when construction noise levels reach 85-90 dBA. Energy expenditure to access other sites in the lagoon would be nominal, and since thousands of birds roost in the area, it is likely that habitat is available in a number of less noisy places on the far side of the lagoon. Noise levels at the southern end of the lagoon would be lower and in the 60-65 dBA range for the most part (and in the 75-80 dBA range during construction of the Building 1046 addition). This is similar to normal conversation, and is less likely to disturb pelicans, particularly after they determine it is not associated with a safety hazard. Therefore, impacts from on-campus construction noise are anticipated to be short-term, localized, and minor adverse. Mitigation Measures BR-7 (*California Brown Pelican Protection*) and VE-4 (*Construction-Related Noise Control*) would reduce these impacts, although not to a negligible level.

If salt marsh common yellowthroat are occupying habitat along the riparian corridor or at the marsh fringe, noise of construction on campus would disturb them as well. If construction begins in the

spring, it is possible that some individuals of this species may be nesting. Very loud noise may cause birds to abandon their nests, with loss of the eggs or fledglings. If this happens, it would be a localized, short-term moderate adverse effect on this species in the study area. Implementation of the measures identified above for pelicans, as well as Mitigation Measure BR-3 (*Nesting Bird and Raptor Protection Measures*), would reduce the impacts to salt marsh common yellowthroat to negligible levels.

Some very slight increase in runoff and siltation of the lagoon may occur from on-campus construction. However, with the implementation of previously identified erosion control measures, the chance of loose or stockpiled sediment reaching the lagoon would be minimal to none. Should it enter the lagoon, impacts to tidewater gobies or California red-legged frogs would be short-term, localized and minor.

In addition to the mitigation cited elsewhere, Mitigation Measure BR-1 (*Pre-Construction Educational Training*) would also reduce impacts on wildlife species of special concern.

No impacts to plant species of special concern are anticipated from construction activities.

On Campus Activities

In general, no additional impact to species of special concern from increased on-campus use is expected; continued on-campus use at current levels would generally have no impact on any species of special concern. However, gobies may experience localized, long-term minor adverse effect from runoff.

Riparian Corridor Enhancement

The impacts of construction activities described above would also apply to the construction activities for the riparian corridor enhancement. Noise would be even more intense than for the on-campus work, as stream restoration would take place during a single dry season. The section where noise would be loudest and human activity greatest would be at and above the Mitchell Road crossing, which is less than 100 feet from the lagoon edge. Here a combination of trucks and heavy equipment would generate noise in the 95-100 dBA (at 50 feet) sound level. At this noise level, all California brown pelicans or salt marsh common yellowthroats in the vicinity would be very likely to leave the area. Sound levels at the opposite end of the lagoon where pelicans are likely to roost would remain in the 75-80 dBA range (similar to a car going 65 miles per hour at a distance of 25 feet, or a diesel truck at 50 feet); this may be too loud for many individuals to remain in the lagoon at all, and it is possible that many or most of the pelicans on the lagoon would abandon it for Bird Island or other locations. Pelicans may be additionally affected by the sight of construction equipment and human activity. If high numbers of pelicans no longer roost in the lagoon during stream construction, a localized short-term moderate impact to this population is possible. Though the abandonment of nests or roosting spots by birds could result in impacts, Mitigation Measures BR-3 (*Nesting Bird and Raptor Protection Measures*), BR-7 (*California Brown Pelican Protection*) and VE-4 (*Construction-Related Noise Control*) would reduce these impacts by conducting work outside of the nesting seasons. The abandonment of roosting sites by salt marsh common yellowthroat is considered to be a minor adverse impact in the short term, due to the presence of nearby available habitat and the temporary duration of construction.

Although some fish are sensitive to pressure waves or low frequency sound, these are generated underwater for the most part and tidewater gobies are unlikely to be affected by construction noise. However, restoration of Reaches 8 and 9 (near the lagoon) would involve significant alteration of the riparian corridor as it approaches the lagoon as well as of the existing delta. Gobies are known to inhabit shallow water around the edge of the lagoon and delta. Because they create and occupy

burrows in lagoon sediment, it is possible that excavating channels or widening the floodplain in these sections could crush individuals or degrade habitat for this species. It is also possible that California red-legged frog could be present in this area and subject to similar impacts. Any take of frogs or gobies would be considered a moderate adverse impact. Mitigation Measure BR-4 (*Goby Protection Plan*) would be expected to reduce impacts to frogs and gobies, but impacts cannot be eliminated. Even with extensive seining (i.e., use of a vertical net to isolate and exclude fish), etc., some mortality of fish would be expected, because tidewater goby burrow in the mud and it is extremely difficult to exclude all fish. Stream restoration would, therefore, be likely to result in incidental take. This is a moderate adverse impact of the action alternatives.

In addition, construction activities involving disturbance to the existing riparian corridor could adversely affect California red-legged frogs if they are present in the area. This could include crushing injuries or death from digging, grading or being killed by the vehicles themselves. As discussed above, any take of frogs is considered a moderate adverse impact. Implementation of Mitigation Measures BR-2 (*Aquatic Wildlife Impact Avoidance and Minimization*) and BR-5 (*California Red-legged Frog Avoidance and Impact Minimization Measures*) would reduce this impact; however, the potential for take cannot be entirely eliminated. Because of the possibility of incidental take, this is considered a moderate adverse impact of the action alternatives.

In the long-term, stream restoration would create habitat for gobies and red-legged frogs, as well as for salt marsh common yellowthroat. This would occur as a result of increased extent and quality of riparian habitat for frogs and yellowthroats, and the restoration of the deltaic formation at the base of the lagoon, which would create additional shallow-water transitional habitat for frogs and gobies. Each of these is a long-term localized benefit for these species, particularly for tidewater gobies as Rodeo Lagoon is the only spot in the entire park where this species occurs.

In addition to the mitigation measures identified above, Mitigation Measure BR-1 (*Pre-Construction Educational Training*) would be implemented to reduce impacts on wildlife species of special concern.

No impacts to plant species of special concern are anticipated from riparian corridor enhancement.

Off Campus Activities

Impact mechanisms related to off-campus use on species of special concern would be as described for the No Action Alternative, although impacts would be potentially of greater intensity due to increased student use. In particular, the establishment of additional off-campus sites to accommodate growth in the HI program could have impacts on plants or animals of concern. For example, although no off-campus use of areas takes place in areas where mission blue butterfly now live, the southeastern part of the Marin Headlands is a possible location for additional teaching sites. As noted in Figure 19, this area contains butterfly habitat, and impacts from inadvertent trampling of larvae or host plants are possible. However, students would be directed by HI instructors to stay on trails and designated view, picnic or other developed areas, so the impacts to this species would be negligible. Impacts to habitat for red-legged frogs or disturbance of brown pelicans or salt marsh yellowthroat are also conceivable results of dispersed and increased use of off-campus sites, to the extent that these sites are located on, or in proximity to, habitat for these species. However, with implementation of the off-campus site management program, impacts at all sites to species of special concern from park visitors, including those associated with HI, would be kept to no more than minor and localized. Beneficial impacts to red-legged frogs and tidewater gobies are possible from reduction in impacts to soils and water quality at Rodeo Lake.

Cumulative Impacts

Cumulative impacts to the various species are as identified in Alternative A. The impacts identified above to red-legged frog, tidewater goby, California brown pelican, and salt marsh common yellowthroat would contribute to these cumulative impacts. However, impact conclusions would not exceed those identified for Alternative A.

**Figure 19. Generalized Locations of Species of Special Concern;
No Impacts to Steelhead are Anticipated**



(Source: NPS 2007)

Conclusion

Impacts from construction noise on-campus and from the riparian corridor enhancement would disturb California brown pelicans and salt marsh common yellowthroats, a short-term localized minor to moderate impact. Minor localized short-term adverse impacts to tidewater gobies from increases in siltation are also possible. Working in and near the lagoon and creek could result in localized short-term moderate adverse impacts to tidewater gobies and red-legged frogs, despite a host of mitigation measures. In the long term, benefits to gobies, yellowthroat and possibly for red-legged frogs from restoring stream and lagoon fringe habitat would result. Off-campus activities would result in no more than minor adverse impacts on any species.

Implementing Alternative B would not impair any species of special concern in the park. Although impacts to tidewater gobies could be major in intensity, gobies are abundant in Rodeo Lagoon and the population would rebound. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for

future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on any species of special concern in the park under Alternative B.

4.7.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

The effects of construction activities would be generally as described for Alternative B. However, unlike Alternative B, Alternative C does not include an addition to Building 1046, and so noise levels are not expected to exceed 75 dBA at the northern lagoon edge. However, Alternative C includes construction of three new buildings in the northeastern portion of the campus in an area that is quite close to the above-ground portion of the stream corridor slated for restoration. Salt marsh common yellowthroat may occupy existing riparian habitat or new habitat in the enhanced riparian corridor (depending upon whether construction of the riparian enhancement is complete at the time). Because construction could begin in the spring, it is possible that yellowthroat may also be nesting during this time. If so, very loud noise may cause birds to abandon their nests, with loss of the eggs or fledglings. If this happens, it may be a moderate adverse effect on this species in the study area. Otherwise, impact conclusions would be as described for Alternative B, and the mitigation measures identified for Alternative B would apply here; with mitigation, impacts to species of special concern would be negligible to short-term, localized and minor.

On Campus Activities

Impacts would be as described under Alternative B; continued on-campus use at current levels would generally have no impact on any species of special concern. However, gobies may experience localized, long-term minor adverse effect from runoff. In addition, minor long-term impacts could occur on yellowthroats under this alternative if they are sensitive to the noise and human activity that would be associated with new buildings on campus.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; with mitigation, short-term minor to moderate adverse impacts on California brown pelicans, salt marsh common yellowthroat, gobies, and California red-legged frog. Long-term localized benefits for all species resulting from increase in habitat.

Off Campus Activities

Impacts would be as described for Alternative B; with implementation of the off-campus site management program, impacts at all sites to species of special concern from park visitors, including those associated with HI, would be kept to no more than minor and localized. Beneficial impacts to red-legged frogs and tidewater gobies are possible from reduction in impacts to soils and water quality at Rodeo Lake.

Cumulative Impacts

Impacts would be as described for Alternative B; beneficial overall.

Conclusion

General impacts conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; short-term localized moderate impact on California brown pelicans and red-legged frogs, and minor to moderate localized short-term adverse impacts to tidewater gobies and yellowthroat. Overall, there would be long-term benefits to gobies, yellowthroat and possibly red-legged frogs. Off-campus activities would result in no more than minor adverse impacts on any species.

4.7.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

The effects of construction activities would be generally as described for Alternative C. However, Alternative D only includes construction of one new building in the northeastern portion of the campus, reducing potential impacts to salt marsh common yellowthroat somewhat from those described under Alternative C. In addition, this alternative includes an addition to Building 1046, which is quite close to the northern shore of the lagoon. This would have the same short-term, localized, and minor adverse impacts to California brown pelican as described under Alternative B. Overall, impact conclusions would be as described for Alternative C, and the mitigation measures identified for Alternative C would apply here; short-term, localized and minor impacts to tidewater gobies or California red-legged frogs, and potentially moderate adverse effect on salt marsh common yellowthroat.

On Campus Activities

Impacts would be as described under Alternative C, although potential impacts to yellowthroats would be reduced because there would only be one new building in proximity to the riparian corridor; continued on-campus use at current levels would generally have no impact on any species of special concern. However, gobies may experience localized, long-term minor adverse effect from runoff.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; with mitigation, short-term moderate adverse impacts on California brown pelicans, salt marsh common yellowthroat, gobies, and California red-legged frog. Long-term localized benefits for all species resulting from increase in habitat.

Off Campus Activities

Impacts would be as described for Alternative B; with implementation of the off-campus site management program, impacts at all sites to species of special concern from park visitors, including those associated with HI, would be kept to no more than minor and localized. Beneficial impacts to red-legged frogs and tidewater gobies are possible from reduction in impacts to soils and water quality at Rodeo Lake.

Cumulative Impacts

Impacts would be as described for Alternative B; beneficial overall.

Conclusion

General impacts conclusions, mitigation, and conclusions regarding impairment would be as described for Alternative B; short-term localized moderate impact on California brown pelicans, moderate localized short-term impacts to salt marsh common yellowthroat and red-legged frogs, and minor to moderate localized short-term adverse impacts to tidewater gobies. Overall, there would be long-term benefits to gobies, yellowthroat and possibly red-legged frogs. Off-campus activities would result in no more than minor adverse impacts on any species.

4.7.7 Mitigation Measures

BR-1: Pre-Construction Educational Training

(see full description in Section 4.6.7 and in Table 5)

BR-2: Aquatic Wildlife Impact Avoidance and Minimization

(see full description in Section 4.6.7 and in Table 5)

BR-3: Nesting Bird and Raptor Protection Measures

(see full description in Section 4.6.7 and in Table 5)

BR-4: Goby Protection Plan

(see full description in Section 4.6.7 and in Table 5)

BR-5: California Red-legged Frog Avoidance and Impact Minimization Measures

No more than 48 hours prior to and during construction activities along the creek, a biological monitor would search all work localities for the presence of California red-legged frogs. The search area would encompass a 50-foot radius around the work sites. All rodent burrows, leaf litter deeper than 2 inches, or other obvious refugia will be surveyed for the presence of the species. Vegetation that would be disturbed within the work areas would be removed during these surveys to aid in observations of the species. To prevent direct injury to California red-legged frogs, removal of vegetation within suitable frog habitat would be accomplished by a progressive cutting of vegetation from the overstory level to ground level to allow frogs to move out of the work area. Should any frogs be observed, activities would cease until the animal is removed and relocated by a qualified or permitted biologist. Captured frogs would be relocated to suitable habitat outside of the construction zone, either upstream or downstream of the construction zone.

BR-7: California Brown Pelican Protection

(see full description in Section 4.6.7 and in Table 5)

VE-4: Construction-Related Noise Control

(see full description in Section 4.6.7 and in Table 5)

4.8 Air Quality

4.8.1 Guiding Regulations and Policies

Beyond NPS's responsibility to protect air quality under the Clean Air Act and the 1916 Organic Act, NPS *Management Policies 2006* state that NPS will, "seek to perpetuate the best possible air quality in parks to; (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas. The Service will... minimize air quality pollution emissions associated with park operations... (Sec. 4.7.1)."

Air quality within the San Francisco Bay Area Air Basin is under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). The BAAQMD is responsible for implementing emissions standards, and administers air quality regulations developed at the federal, state, and local levels.

4.8.2 Assessment Methods

The air quality analysis methods and thresholds are based on those in the MHFP Transportation Plan Final EIS. The analysis includes a general discussion of potential short-term impacts on air quality resulting from construction. Short-term construction-generated criteria air pollutant and precursor emissions (e.g., ROG, NOX, and PM₁₀) are qualitatively assessed as recommended by the Bay Area Air Quality Management District. The BAAQMD does not require quantification of construction emissions. Instead, it requires implementation of effective and comprehensive feasible control measures to reduce PM₁₀ emissions (Bay Area Air Quality Management District 1999). PM₁₀ emitted during construction activities varies greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, and weather conditions. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be

reasonably implemented to reduce PM₁₀ emissions during construction. These control measures are aimed at controlling PM₁₀ emissions and are summarized in Table 10. The impact analysis assumes that these measures are implemented as a standard operating procedure.

Table 10. BAAQMD Feasible Control Measures for Construction Emissions of PM₁₀

Basic Control Measures. The following controls should be implemented at all construction sites.

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least 2 feet of freeboard.
- Pave, apply water three times daily, or apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.

Enhanced Control Measures. The following measures should be implemented at construction sites greater than 4 acres in area.

- Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (i.e., previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily, or apply (nontoxic) soil binders to exposed stockpiles (e.g., dirt and sand).
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

Optional Control Measures. The following control measures are strongly encouraged at construction sites that are large in area, located near sensitive receptors, or for any other reason may warrant additional emissions reductions, but HI is not required to implement.

- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Install windbreaks or plant trees or vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

Note: If water is used, only as much water as necessary for dust control shall be used in order to avoid runoff. Storm drain inlet control measures (e.g. sandbags, filter fabric, etc.) should be used. Dry sweeping is a preferred alternative to water sweeping.

Source: Bay Area Air Quality Management District 1999.

While construction equipment also emits CO and ozone precursors, construction-related emissions of these pollutants were not estimated, because they are already included in the emission inventory that forms the basis for BAAQMD's regional air quality plans, and those emissions are not expected to impede attainment or maintenance of ozone and CO standards in the Bay Area (Bay Area Air Quality Management District 1999).

An analysis of potential long-term, operational air pollutant impacts is also provided. None of the alternatives would result in the operation of any major stationary emission sources of criteria, odorous, or toxic air pollutants. Consequently, the analysis of potential long-term impacts focuses on mobile source emissions. Regional mobile source criteria air pollutant and precursor emissions (ROG, NO_x, and PM₁₀) are qualitatively assessed based on a comparison of the predicted change in daily traffic volumes from existing conditions to the BAAQMD-recommended screening trigger levels. In addition to long-term regional mobile source impacts, potential long-term local mobile source CO impacts are qualitatively assessed based on a comparison of the predicted change in the level of service at individual locations (i.e., roadway segments and intersections) from existing conditions, to the BAAQMD-recommended screening trigger levels.

For this analysis, short-term impacts would be associated with construction and demolition activities, while long-term impacts would be based on changes in mobile source emissions on a regional (i.e., daily traffic volumes) and local (i.e., traffic level of service at individual locations) scale.

Thresholds

Impact thresholds are defined separately for short-term construction-generated emissions, and long-term regional and local mobile source emissions. The short-term threshold levels were selected based on BAAQMD-recommended cut-off values for determining whether basic, enhanced, or optional control measures would be implemented during construction. The long-term threshold levels were selected based on screening trigger levels for long-term operational emissions (i.e., regional mobile source ROG, NO_x, and PM₁₀ emissions; and local mobile source CO emissions). More specifically, according to the BAAQMD CEQA Guidelines (BAAQMD 1999), the implementation of projects that generate less than 2,000 trips per day would not result in long-term mobile source emissions that exceed the BAAQMD's thresholds of significance (i.e., 15 ton/year or 80 lb/day of ROG, NO_x, or PM₁₀) or violate applicable ambient air quality standards.

Short-Term Construction-Generated Emissions:

- Negligible:** The area of construction activity would not change from the area disturbed under the No Action Alternative. In addition, there would be no potential for impact to air quality from odors associated with project activities.
- Minor:** The construction area would be equal to 4 acres or less. In addition, sensitive receptors may notice odors, but they would be barely detectable and not offensive.
- Moderate:** The construction area would be more than 4 acres but less than 15 acres. In addition, sensitive receptors would notice odors and may find them objectionable.
- Major:** The construction area would be 15 or more acres and located near sensitive areas. In addition, sensitive receptors would nearly universally notice odors and find them objectionable.

Long-Term Regional and Local Mobile Source Emissions:

- Negligible:** The daily traffic volume or the level of service for individual locations would not change.
- Minor:** The change in daily traffic volume from existing conditions would be less than 1,000 trips. The level of service for individual locations would change by one category and would remain at an acceptable level (LOS A, B, C, or D).
- Moderate:** The change in daily traffic volume from existing conditions would be 1,001 to 2,000 trips. The level of service for individual locations would change by more than one category but would remain at an acceptable level (LOS A, B, C, or D).
- Major:** The change in daily traffic volume from existing conditions would be more than 2,000 trips. The level of service for individual locations would change from acceptable (LOS A, B, C, or D) to unacceptable (LOS E or F).

4.8.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

Under the No Action Alternative, students, staff and conference attendees would continue to use cars and buses as transportation to the site. However, there would be no change from existing conditions in the number of trips, hence there would be negligible impacts.

Riparian Corridor Enhancement

No riparian corridor enhancement would take place under the No Action Alternative. Therefore, there would be no impacts.

Off Campus Activities

While the majority of off-campus activities are conducted on foot, under the No Action Alternative, students and staff would occasionally use cars and buses for field trips at locations off campus. However, there would be no change in the number of trips from existing conditions, hence there would be negligible impacts.

Cumulative Impacts

Because the No Action Alternative would not have any impacts, there would be no contribution to any cumulative air quality impacts.

Conclusion

Under this alternative, no construction activities would occur that could generate emissions. In addition, HI related traffic would remain at current levels and would have negligible effects on air quality. There would be no contribution to any cumulative air quality impacts. Overall, impacts would be negligible.

Implementing the No Action Alternative would not impair park air quality. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on air quality in the park under Alternative A.

4.8.4 Impacts of Alternative B—Rehabilitation Only***Construction***

Construction activities could generate emissions. However, appropriate PM₁₀ control measures as shown in Table 10 would be implemented. In general, construction would be phased such that the active construction area at any given time would be 4 acres or less, resulting in a localized and regional short-term minor adverse impact. The construction area may exceed 4 acres for certain periods (for instance, when both the riparian corridor restoration and the campus improvements are happening simultaneously), but would never exceed 15 acres; during these periods, this would be considered a short-term, localized and regional, moderate adverse impact. Odors during construction would be primarily limited to construction equipment exhaust; these would be anticipated to be generally barely detectible and not offensive, and as such, impacts would be minor.

On Campus Activities

Alternative B would involve an increase in student and conference participant numbers. Under existing conditions, 2 buses and up to 40 cars bring students and HI staff onto the site on weekdays, on average. This number would increase by up to one bus and 10 to 15 new cars per day. These new trips would not be anticipated to degrade LOS and would be considered negligible impacts on air quality.

On weekends, up to 150 conference guests can be accommodated, although the average group size is 50. Assuming some carpool, between 40 and 120 cars may be associated with the conference program center. As a conservative assumption, these numbers would be doubled under the conference program expansion; in other words, an equal number of new trips would be generated. This would be well below 1000 new trips per day, but would change LOS on Bunker Road from "A" to "C" (see Section 4.11.4), and is therefore consistent with the threshold for a short-term, localized moderate adverse impact. Note that this would only occur when there are a large number of conference participants; smaller numbers would result in negligible to minor impacts.

Riparian Corridor Enhancement

The construction-related effects of the riparian corridor enhancement emissions have been evaluated as part of the construction analysis, above. Odors during riparian corridor enhancement activities are possible, not only from construction equipment but also from excavation of sediment that is rich in decaying organic matter, which could contain malodorous reduced sulfur compounds. However, such odors would be anticipated to be generally barely detectible to most sensitive receptors, and as such, impacts would be minor. In the long term, no new vehicle trips would be generated by the enhancement, and there would be no impact.

Off Campus Activities

While the majority of off-campus activities would be conducted on foot, under this alternative, there may be some slight increase in use of cars and buses for field trips at locations off campus. However, this would result in far fewer new trips than necessary to trigger a moderate impact, even considering the traffic generated by on campus activities described above. Impacts are considered minor adverse.

Cumulative Impacts

Construction activities associated with the various cumulative projects would generate impacts that would be anticipated to be no more than negligible to minor adverse. To the extent that construction activities under these projects and Alternative B occur at the same time, they could combine to create a cumulative impact. However, in no case would such an impact be anticipated to exceed the threshold for a moderate adverse impact, and such an impact would only be anticipated very infrequently during periods of intense construction activity.

While some of the cumulative projects could generate additional mobile source emissions, the MHFB Transportation Plan is anticipated to reduce the number of vehicles on the road over the long term, a beneficial impact on long-term emissions. In combination with the minor impacts of Alternative B on long-term emissions, overall long-term cumulative impacts would be considered negligible.

Conclusion

Construction activities associated with on campus improvements and the riparian corridor enhancement would result in short-term, regional and local, minor adverse impacts, with a possibility of infrequent moderate impacts. Both on campus and off campus activities would generate minor adverse long-term emissions, although emissions from the conference program expansion could be moderate during larger events. Cumulatively, impacts are considered negligible.

Implementing Alternative B would not impair park air quality. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts on air quality in the park under Alternative B.

4.8.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

Impacts would be as described for Alternative B; localized and regional short-term minor to moderate adverse impacts with implementation of proscribed mitigation.

On Campus Activities

Impacts would be as described for Alternative B; negligible to minor impacts from increased vehicle trips.

Riparian Corridor Enhancement

The construction-related effects of the riparian corridor enhancement have been evaluated as part of the construction analysis, above; no impact from new vehicle trips, and minor impacts from odors during construction.

Off Campus Activities

Impacts would be as described for Alternative B; minor adverse impacts.

Cumulative Impacts

Impacts would be as described for Alternative B; negligible adverse impacts.

Conclusion

Impacts and conclusions regarding impairment would be as described for Alternative B; short-term, regional and local, minor adverse impacts during construction, negligible to minor adverse long-term impacts from emissions, and cumulatively negligible impacts overall.

4.8.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

Impacts would be as described for Alternative B; localized and regional short-term minor to moderate adverse impacts with implementation of proscribed mitigation.

On Campus Activities

Impacts would be as described for Alternative B; negligible to minor impacts from increased vehicle trips.

Riparian Corridor Enhancement

The construction-related effects of the riparian corridor enhancement have been evaluated as part of the construction analysis, above; no impact from new vehicle trips, and minor impacts from odors during construction.

Off Campus Activities

Impacts would be as described for Alternative B; minor adverse impacts.

Cumulative Impacts

Impacts would be as described for Alternative B; negligible adverse impacts.

Conclusion

Impacts and conclusions regarding impairment would be as described for Alternative B; short-term, regional and local, minor adverse impacts during construction, negligible to minor adverse long-term impacts from emissions, and cumulatively negligible impacts overall.

4.9 Cultural Resources

4.9.1 Guiding Regulations and Policies

NPS is charged with management and protection of cultural resources through a variety of guidance documents and legislation in which NPS managers avoid, or minimize to the greatest degree practicable, adverse impacts on park resources and values. The following are the primary guidance documents used by NPS for the management of cultural resources.

The National Historic Preservation Act (NHPA), as amended, is the principal legislative authority for management of cultural resources located within national parks. It requires federal agencies to strive to minimize harm to historic properties that would be adversely affected by an undertaking. Section 106 of the NHPA requires all federal agencies to consider the effects of their actions on cultural resources determined eligible for inclusion in the National Register of Historic Places (NRHP) (see discussion below). Section 110 of the NHPA, among other things, charges federal agencies with the responsibility to establish preservation programs for identification, evaluation and nomination of cultural resources to the NRHP.

NPS-28: Cultural Resources Management Guidelines (NPS 1998) is the fundamental basis for managing cultural resources in the National Park System. It contains park management standards and other requirements for cultural resources, including archeological resources, historic and prehistoric structures, museum collections, cultural landscapes and ethnographic resources. This document also addresses energy conservation and historic preservation. Federal agencies are required to reduce energy consumption; this guideline addresses the means to ensure preservation of historic material and character while conserving energy. For example, proposed retrofit measures would be reviewed by historical architects and/or landscape architects, and other cultural resources specialists who will consider whether (1) the evaluation of effect for compliance purposes is adequate; (2) the proposed action is planned and will be conducted in accordance with relevant management policies, guidelines, and standards; and (3) the proposal incorporates all feasible measures to minimize any adverse effects on cultural resources) (NPS 1998, Chapter 4).

NPS *Management Policies 2006* outlines park service management policies for cultural resources including the identification and evaluation of cultural resources, the integration of this information in planning and decision-making, and the stewardship to ensure that cultural resources are preserved and protected (NPS 2006a, 60).

Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments, November 6, 2000) provides for regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications.

Section 106 Compliance

This cultural resource analysis is intended to comply with the requirements of both NEPA and Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties). A Section 106 finding of effects follows the conclusion statement for each alternative.

The Advisory Council on Historic Preservation's regulations for implementation of Section 106 require that impacts to historic resources be identified and evaluated by determining: (1) the area of potential effects (the area of geographic study); (2) identifying cultural resources present in the area of potential effects that are either listed on or eligible for listing on the NRHP; (3) applying the criteria of adverse effect (see below) to affected cultural resources either listed on or eligible for listing on the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the ACHP's regulations, a determination of either adverse effect or no adverse effect must be made for affected NRHP-listed or eligible cultural resources located within the area of potential effects. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the NRHP. Adverse effects also include reasonably foreseeable effects caused by the proposal that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects). The resolution of adverse effects can occur in a variety of ways, in accordance with 36 CFR 800.6 (Resolution of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish, in any way, the characteristics of the cultural resource that qualify it for inclusion in the NRHP. All effect determinations are made in consultation with the California SHPO.

In all cases where new cultural resources are discovered during project activities, or where it is discovered post-review that NRHP-eligible resources may be affected, potential adverse impacts to those NRHP-eligible resources will be coordinated by the park with the SHPO. Impact threshold definitions below contain statements specifically related to adverse impacts as defined in 36 CFR 800.

4.9.2 Assessment Methods

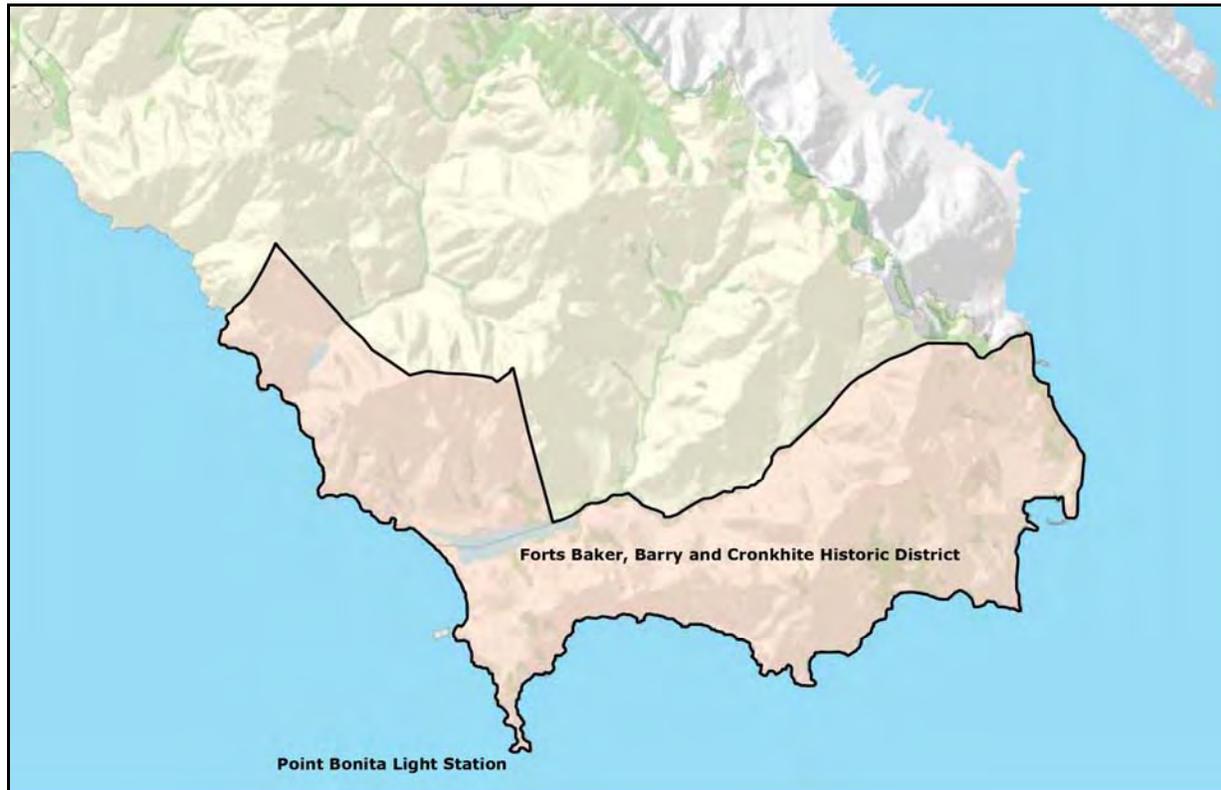
The following describes the methodology used to evaluate the impacts to cultural resources that could result from implementation of HI Campus Improvement and Expansion Plan.

Area of Potential Effect

In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106, the "area of potential effects" is determined as the geographic area within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties (36 CFR 800.16(d)). For analysis of effects to cultural resources for HI Improvement and Expansion project, the area of potential effect is comprised of the two sections; the larger area surrounding the project site that could be indirectly affected, and the area on which the project would occur. These are defined as follows:

1. The indirect area of potential effects consists of the Forts Baker, Barry, and Cronkhite National Register District and allows for a cumulative look at effects of the project on the National Register property (Figure 20). The Forts Baker, Barry, and Cronkhite Historic District consists of a 2,279 acre area of uplands and tidelands comprising Forts Baker, Barry, and Cronkhite, extending west along the north side of the Golden Gate from San Francisco Bay on the east to the Pacific Ocean on the west (National Register Nomination Form, 1973). This larger Historic District area is historically and architecturally significant as a district because of its role in the seacoast defenses of San Francisco Bay. The effects of HI improvement and expansion plans within the historic district will be assessed for effects to its general integrity.
2. The direct area of potential effects is defined as Fort Cronkhite and its cantonment area (Figure 21). This is the area in which the greatest potential to affect cultural resources exists as a result of HI expansion and improvements activities (e.g., construction activities, structure alterations, etc.).

**Figure 20. Forts Baker, Barry, and Cronkhite Historic District
(Indirect Area of Potential Effects)**



Context

Local: Impacts to cultural resources occur within the vicinity of Ft. Cronkhite.

Regional: Impacts to cultural resources occur within the western Marin Headlands, including the Forts Baker, Barry and Cronkhite National Register District.

Duration

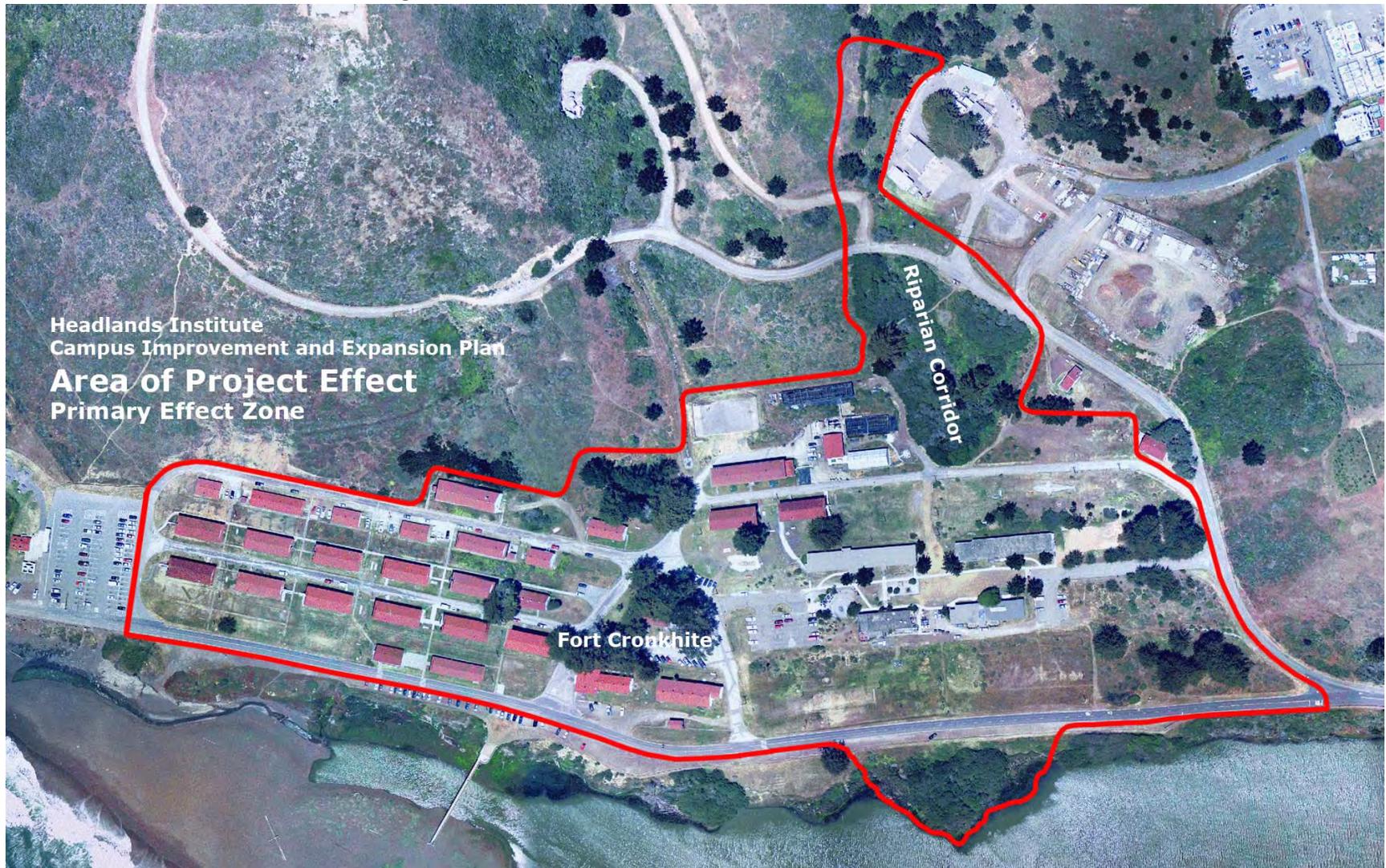
Archeological Resources: Due to the non-renewable nature of archeological resources, adverse impacts are considered permanent. Beneficial effects would be similar in duration to those defined under cultural landscapes.

Cultural Landscapes

Short-term: Effects to cultural landscapes would persist for less than one year (e.g., construction phase).

Long-term: Effects to cultural landscapes would persist for more than a year.

Figure 21. Fort Cronkhite (Direct Area of Potential Effects)



Thresholds

The following thresholds were used to determine the magnitude of impacts to cultural resources resulting from implementation of any of the alternatives. (Note: Cultural resources are nonrenewable resources and adverse effects to them generally consume, diminish, or destroy the original historic materials or form, resulting in a permanent loss in the integrity of the resource that can never be recovered.)

Archeological Resources

Negligible: Impact is at the lowest levels of detection with neither adverse nor beneficial consequences. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor: Beneficial impact: Preservation of a site(s) in its natural state. For purposes of Section 106, the determination of effect would be no adverse effect.

Adverse impact: Disturbance of a site(s) results in little loss of integrity or important information potential, and the qualities of the site(s) (the material aspects that provide a connection to the past and to the land that are important to the Coast Miwoks) are retained. For purposes of Section 106, the determination of effect would be no adverse effect.

Major: Beneficial impact: Active intervention to preserve a site(s). For purposes of Section 106, the determination of effect would be no adverse effect.

Adverse impact: Disturbance of a site(s) results in loss of most or all site integrity and its potential to yield important information related to the site's significance, or its importance to the Coast Miwoks. For purposes of Section 106, the determination of effect would be adverse effect. A memorandum of agreement is executed between the NPS and applicable State or Tribal Historic Preservation Officer and, if necessary, the ACHP in accordance with 36 CFR 800.6(b).

Impairment: See discussion under "General Analysis Methods" above.

Cultural Landscapes

Note: All historic structures within the study area are considered part of the Forts Baker, Barry, and Cronkhite Cultural Landscape and are, therefore, addressed under cultural landscapes.

Negligible: The impact is at the lowest levels of detection or barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor: Beneficial impact: Character-defining features would be preserved in accordance with the *Secretary of the Interior's Standard for the Treatment of Historic Properties*, therefore maintaining the integrity of the cultural landscape. For purposes of Section 106, the determination of effect would be no adverse effect.

Adverse impact: The impact would not notably affect the character-defining features of a cultural landscape listed on or eligible for the National Register of Historic Places. For purposes of Section 106, the determination of effect would be no adverse effect.

Moderate: Beneficial impact: The landscape or its features would be rehabilitated in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, to make possible a compatible use of the landscape while preserving its character-defining features. For purposes of Section 106, the determination of effect would be no adverse effect.

Adverse impact: The impact would alter a character-defining feature or features of the cultural landscape but would not diminish the integrity of the landscape to the extent that its National Register eligibility would be jeopardized. For purposes of Section 106, the determination of effect would be adverse effect.

Major: Beneficial impact: The cultural landscape would be restored in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* to accurately depict the features and character of a landscape as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be no adverse effect.

Adverse impact: The impact would alter a character-defining feature(s) of the cultural landscape, diminishing the integrity of the resource to the extent that it would no longer be eligible to be listed on the National Register. For purposes of Section 106, the determination of effect would be adverse effect. A memorandum of agreement is executed between the NPS and applicable State or Tribal Historic Preservation Officer and, if necessary, the ACHP in accordance with 36 CFR 800.6(b).

Impairment: See discussion under "General Analysis Methods" above.

Assumptions Related to Cultural Resource Analysis. To promote consistency and clarity, the following assumptions have been made for the evaluation of effects to cultural resources under all alternatives:

- Fort Cronkhite is an element of the larger Forts Baker, Barry and Cronkhite National Register District which has been listed in the NRHP.
- Under all alternatives, it is assumed that future development and associated effects to cultural resources (landscape, archeological resource) within Fort Cronkhite would be conducted in compliance with Section 106 of the NHPA.

4.9.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts (no adverse effect).

On Campus Activities

Under the No Action Alternative, actions of HI that would affect cultural resources are expected to be very limited and conducted according to guidance documents (*Secretary of the Interior's Standards* and Cultural Landscape Report [Auwaerter and Curry 2008]). Impacts would be negligible (no adverse effect).

Riparian Corridor Enhancement

No riparian corridor enhancement would take place under the No Action Alternative. Therefore, there would be no impacts (no adverse effect).

Off Campus Activities

Under this alternative, HI would continue to use 22 off-campus park sites to for learning opportunities involving both natural and cultural resources (refer to Figure 3 in Chapter 2). Pre-visit discussions with field groups include expressing park concerns regarding the removal or displacement of historic or prehistoric artifacts and instilling a “leave in place” or “observe and report” ethic. The numbers of hiking groups using these areas would be restricted by HI to avoid overuse. In addition, these trails and destination points would be monitored for impacts by Field Science Educators and use of a site would be curtailed or stopped if HI, NPS or Park Partner staff identifies an effect to natural or cultural resources. As a result, there would be negligible impacts on both archeological and cultural landscape resources within the larger Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

Cumulative Impacts

No actions would be taken under the No Action Alternative that could result in cumulative impacts to cultural resources. Impacts would be negligible (no adverse effect).

Conclusion

Under this alternative, no construction activities would occur that could adversely affect archeological or cultural landscape resources. On campus activities would result in negligible impacts. Off campus activities would also be negligible or beneficial. There would be no contribution to any cumulative impacts. Overall, impacts would be negligible or beneficial.

No impairment of park resources or values would occur under the No Action Alternative. Because the impacts previously described (1) are not inconsistent with the park’s purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts to cultural resources in the park under Alternative A.

For purposes of Section 106 of the NHPA, no cultural resources listed in or eligible for the NRHP are expected to be adversely affected under this alternative (no adverse effect), see Table 11 below.

Table 11: Alternative A Section 106 Assessment of Effect

Resource	Treatment	Section 106 Finding
<u>Archeological resources</u>	No ground disturbance proposed.	No adverse effect
<u>Cultural Landscape</u>	Continued maintenance of site – no improvements proposed.	No adverse effect
<u>Historic Buildings</u>	No improvements or rehabilitation proposed.	No adverse effect

4.9.4 Impacts of Alternative B—Rehabilitation Only

Construction

Ground Disturbance. A variety of actions are proposed for all action alternatives involving ground disturbance within Fort Cronkhite. Ground disturbance has the potential to adversely affect prehistoric and historic archeological resources, particularly those buried resources which have not been previously identified or evaluated. Much of the fill within the Fort Cronkhite cantonment area has been previously disturbed by fort development over the past 60 years. While much of the project-

related earth-moving activity would occur within this zone (e.g., removal/replanting of vegetation, removal/replacement of parking lots, etc.), infrastructure improvements and other activities could include a minor amount of excavations into native soils.

These activities have the potential to result in permanent, localized adverse impacts depending on the archeological resource involved and the level of disturbance created, particularly if within undisturbed soils layers. These potential impacts occur through the loss of cultural context of artifacts, features, etc. Depending upon the resource, this could be a major adverse impact. However, with the implementation of Mitigation Measures CR-1 (*Pre-Construction Field Surveys and Training*), CR-2 (*Archaeological and Native American Monitoring*), CR-3 (*Previously Undiscovered Cultural Resources*), and CR-4 (*Cultural Resources Monitoring Plan*), adverse impacts to archeological resources within Fort Cronkhite would likely not exceed minor in intensity (no adverse effect).

Historic Building Rehabilitation. Under this alternative, HI would rehabilitate and occupy 13 total buildings primarily in the eastern half of the Fort Cronkhite barracks. The majority of the rehabilitation work involves the interior of the structures. The most recent study related to the historic Fort Cronkhite landscape considers the park's *General Management Plan* (NPS 1980, currently being updated) and the need to accommodate contemporary uses by HI in its recommendation of rehabilitation as the most appropriate primary treatment (Auwaerter and Curry 2008:11). Rehabilitation is defined as

...the act or process of making possible a compatible use for a property through repair, alteration, and additions while preserving those portions or features which convey its historical, cultural or architectural values (NPS 1996, 49).

Under rehabilitation, historic properties can be given new uses that require minimal change to their character as long as preservation is ensured. Treatment does not need to recreate a literal historic character in the landscape at any one point during the historic period, but rather preserve and enhance the multiple layers of development through 1974 (Auwaerter and Curry 2008,13).

Rehabilitation of Fort Cronkhite historic structures would be undertaken in a manner designed to preserve the character-defining features of the buildings which contribute to their significance (e.g., form structure, roofs, exterior materials, etc.). These efforts would result in an improved state for existing and new uses of the historic structures. In addition, most non-historic additions and alterations that diminish historic character would be removed from historic buildings.

See "HI Campus Facilities, Historic Building Rehabilitation" under *Elements Common to All Action Alternatives* in the *Alternatives* chapter for details on rehabilitation treatment. The rehabilitation work, per Mitigation Measure CR-5 (*Treatment of Historic Properties and Landscape*), would conform to appropriate guidance documents. Rehabilitation activities which allow for compatible uses of historic structures are therefore expected to result in long-term, localized, direct benefits to the Fort Cronkhite cultural landscape and the larger Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

Addition to Building 1046. Under Alternative B, an addition to the north side of building 1046 would be constructed to allow its possible use as a dining hall and events space. The addition would resemble the general construction techniques of the existing World War II structure (red, pent and gable roof; open eaves; white flushboard siding, etc.) making it relatively unremarkable visually.

New additions to historic structures should not destroy historic character but should be differentiated from the old and compatible with the existing historic character. This would be done by giving the new

addition a contemporary feel and by creating a clear dividing line between the new and existing structures. New additions would also be constructed in such a way that, if removed later, the essential form and integrity of the original historic property would be unimpaired (NPS 1996, 49). The addition to the building would preserve character-defining features and allow for the structure's use in a manner compatible with the landscape. With adherence to appropriate guidance documents per Mitigation Measure CR-5 (*Treatment of Historic Properties and Landscape*), the addition to Building 1046 would result in a minor, long-term, direct, localized adverse impact to the cultural landscape of Fort Cronkhite and the Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

Landscape Enhancement. In general, the HI project area landscape at Fort Cronkhite would be rehabilitated to support its contemporary use by HI to reinforce the historic development pattern, and to reveal the earlier layers of cultural and natural resources. Character-defining elements of the Cold War-era Nike complex would be rehabilitated (e.g., orthogonal pathways, historic road corridor, terracing, removal of non-contributing small-scale features [see the *Alternatives* chapter for additional detail]).

In addition, the historic perimeter around the Nike complex would also be delineated (fencing, vegetation). Trees/ shrubs not intentionally planted during the period of significance would be removed and native and historic vegetation would be restored. The cultural landscape report recommends that "treatment of vegetation should maintain the turf, shrubs, and trees that existed through the end of the historic period, and replant in kind those that have been lost or require removal due to condition" (Auwaerter and Curry 2008, 16).

All actions would be conducted in accordance with guidance documents per Mitigation Measure CR-5 (*Treatment of Historic Properties and Landscape*), and would serve to reestablish a considerable degree of the original historic integrity of both the World War II- and the Cold War-era Nike elements of the fort. Expected beneficial effects to the Fort Cronkhite cultural landscape and the larger Forts Baker, Barry, and Cronkhite National Register District would be long-term, direct, localized (no adverse effect).

Parking Modifications. Under Alternative B, the central and kitchen parking lots would be removed and replaced in other areas within the current HI campus, and the bus drop-off location would be relocated. These parking lots were original elements of the Nike complex but have been altered since the end of the historic period (1974). Auwaerter and Curry recommend that if new parking lots are constructed within the fort, they may be more appropriate in the east wing and should be "placed in inconspicuous locations, or be placed where they can reestablish historic spatial patterns, such as on building footprints" (2008: 17, 20).

Replacement lots would be located in inconspicuous areas and, ideally, within existing historic structure footprints to aid in reestablishing the original spatial organization of Fort Cronkhite. As described in Chapter 2, the relocated bus drop off configuration would preserve the historic circulation pattern and character of the roadway.

Because the removal and replacement of parking areas would be conducted in accordance with guidance documents per Mitigation Measure CR-5 (*Treatment of Historic Properties and Landscape*), these actions would result in negligible to minor, long-term, direct, localized benefits to the Fort Cronkhite cultural landscape and the larger Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

Solar Panels. Solar panels would be used to enhance the sustainability of the improved campus under Alternative B. Panels would be placed on the flat shed roofs of the four Nike buildings. From

ground-level views into the fort, the panels would not be easily discernable, while they would be visible from higher vantage points (refer to Section 4.12.4 for visual simulations).

The Fort Cronkhite cantonment landscape has been described as being overall uniform, uncluttered and simple. The two character areas (World War II and Nike) are differentiated by architectural style and density. World War II development is characterized by painted, two-story wood-frame buildings of standard design (pent and gable roofs, open eaves, flushboard siding, etc.). These structures are painted in a standard white color with red roofs, resulting in an air of uniformity among them. The Nike administration complex is characterized by four long, horizontal one-story buildings set in two parallel rows and built of painted, unsurfaced concrete block with low shed roofs (Auwaerter and Curry 2008, 8-9) (refer to Section 4.12.4).

The introduction of roof-mounted solar panels into the historic Fort Cronkhite setting would result in the addition of non-historic feature into the cultural landscape. However, the installation of panels on the flat-roofed Nike buildings would not be readily visible from most vantage points, especially from significant viewpoints. Therefore, this would result in a local, minor adverse impact to the Fort Cronkhite cultural landscape (no adverse effect). The no adverse effect determination is related to the fact that, while character-defining features of the landscape is being altered, it would not diminish the integrity of the landscape to the extent its National Register eligibility would be jeopardized. In addition, removal of the solar panels in the future would leave the historic property unimpaired—one of the standards for rehabilitation as described in the Secretary of the Interior's Standards.

On Campus Activities

Following construction activities, no further actions on the site would be taken that would be likely to adversely affect archeological resources or the cultural landscape. Impacts would be negligible (no adverse effect).

Riparian Corridor Enhancement

The riparian corridor enhancement would involve ground disturbance within Fort Cronkhite. Ground disturbance has the potential to adversely affect prehistoric and historic archeological resources, particularly those buried resources which have not been identified or evaluated. In particular, riparian restoration activities in areas to the north and south of the Nike complex could affect buried resources, particularly south of the Nike complex where historic World War II structures once stood and have since been removed (Auwaerter and Curry 2008).

These activities have the potential to result in permanent, localized adverse impacts depending on the archeological resource involved and the level of disturbance created, particularly if within undisturbed soils layers. These potential impacts occur through the loss of cultural context of artifacts, features, etc. Depending upon the resource, this could be a major adverse effect. However, with the implementation of Mitigation Measures CR-1 (*Pre-Construction Field Surveys and Training*), CR-2 (*Archaeological and Native American Monitoring*), CR-3 (*Previously Undiscovered Cultural Resources*), and CR-4 (*Cultural Resources Monitoring Plan*), adverse effects to archeological resources within Fort Cronkhite would likely not exceed minor in intensity (no adverse effect).

In addition, the daylighting of the creek would alter a feature that was created as part of the World War II era. However, it would be conducted in a manner that would not compromise the integrity of the overall cultural landscape, as it would conform to appropriate guidance documents per Mitigation Measure CR-5 (*Treatment of Historic Properties and Landscape*). Riparian corridor enhancement activities would therefore result in minor, long-term, direct, localized adverse impacts to the Fort Cronkhite cultural landscape and the larger Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

Off Campus Activities

With the increased number of students, some additional impacts to archeological and cultural landscape resources from increased use of existing and new sites are possible. However, the off-campus site management program would identify and avoid impacts to known archeological and cultural landscape resources, and would require implementation of appropriate management measures for archeological sites or small-scale landscape features that are newly discovered. As such, impacts to both archeological and cultural landscape resources within the larger Forts Baker, Barry, and Cronkhite National Register District by park visitors, including those associated with HI, would be negligible (no adverse effect).

Cumulative Impacts

A variety of NPS- and HI-sponsored projects have the potential to cumulatively affect the cultural resources of Fort Cronkhite and surrounding lands.

Since the 1970s, several rows of World War II-era buildings in both the east and west wings along Mitchell Road and Kirkpatrick Street have been removed. The Nike complex replaced numerous World War II-era buildings in the mid-1960s. The Nike structures have undergone change through the years; however, their overall character remains largely intact. Within the Nike complex, several circulation and parking lot modifications have occurred, as well as alterations of terraces and vegetation, removal of fencing, the addition of an amphitheater, and the addition of a wing on the dining hall. Greenhouse and nursery buildings were also added north of Kirkpatrick Street in recent decades. Vegetation has also varied over the years, including the spread of a number of non-native plants since the end of the historic period (1974), including Monterey pine and cypress, Cape ivy, and Kikuyu grass, although some of the Monterey pine and cypress are historic plantings. In the past few decades, the planting scheme at the Nike complex has been modified (Auwaerter and Curry 2008). Though the landscape has undergone some alteration, these changes have not significantly affected the integrity of the Forts Baker, Barry, and Cronkhite National Register District.

Several guidance documents have recently been compiled which are focused on the components of the Forts Baker, Barry, and Cronkhite National Register District. These include the Preliminary Report on HI Campus Landscape, Fort Cronkhite, Marin Headlands (Auwaerter and Curry 2008) and the Cultural Landscape Report, Fort Baker, GGNRA (NPS 2005b). These documents are designed to consolidate existing research, evaluate landscape resources and propose treatment for rehabilitation of cultural landscape features, a long-term benefit to cultural resources in the Marin Headlands area.

Immediately to the northeast of Fort Cronkhite, improvements to the MMC (NPS 2004) have resulted in localized, long-term, minor adverse impacts to cultural resources, none of which have significantly affected the integrity of the Forts Baker, Barry, and Cronkhite National Register District. The Section 106 finding for these improvements was no adverse effect.

Also, recent improvements implemented at Fort Baker included rehabilitation and new construction of facilities which were designed to preserve and be compatible with the historic area and were not found to significantly affect the integrity of the Forts Baker, Barry, and Cronkhite National Register District. The Section 106 finding for these improvements was no adverse effect.

In recent years numerous military bases have been closed or transferred to other federal ownership. Within GGNRA, NPS is mandated by the NHPA to preserve and protect these historic properties. To that end, the GGNRA ensures preservation of these resources through adaptive use by park partners, providing continued life and maintenance of the structures and landscapes (NPS 1999:4-44), which provides a cumulative benefit to the park's cultural resources.

Impacts to cultural resources related to transportation projects have occurred in the past and will continue to occur within the Marin Headlands. The MHFB Transportation Plan Final EIS (NPS 2009) includes long-term, moderate, adverse impact to cultural resources related to modifications to a number of sensitive, character-defining features of historic roadways within the Marin Headlands. The Section 106 finding concluded that this action has adverse effects on historic resources.

The GGNRA Fire Management Plan (NPS 2005a) was designed, among other things, to provide a framework for all fire management activities in a manner that is responsive to natural and cultural resource objectives. In the past, important characteristics of cultural landscapes within the park have been altered in the absence of fire, and the risk of wildland fire damaging historic structures increases as fuel loading increases. The Fire Management Plan addresses management of increased fuel loads in the vicinity of cultural resources as well as within the park at large. In fact, one of the goals of the plan is to “preserve historic structures, landscapes, and archeological resources from adverse effects of fire and fire management activities, and use fire management wherever appropriate to rehabilitate or restore these cultural resources” (NPS 2005b, vi). Moderate, long-term beneficial effects to cultural resources are expected under the plan’s preferred alternative related to mechanical treatment and prescribed fire actions. At the same time, minor adverse effects to archeological resources related to fire management actions are also possible. All actions reviewed under the Fire Management Plan to date have received findings of no adverse effect under Section 106.

Additional alterations to the Fort Cronkhite landscape are expected in the future. For instance, the existing Fire Station within Fort Cronkhite has an established need for improvement which will affect the historic structure as well as the fort’s cultural landscape. If future park projects designed to improve or expand fire services or operations are undertaken in accordance with the Secretary of the Interior’s Standards and cultural landscape guidance documents, both cumulative benefits and adverse effects to Fort Cronkhite and the larger Forts Baker, Barry, and Cronkhite National Register District are possible at levels not likely to exceed minor in intensity. The Section 106 finding for these improvements was no adverse effect.

Although there is a cumulative adverse effect resulting from the MHFB Transportation Plan’s adverse effect finding under Section 106, this Alternative of the Headlands Institute Campus Improvement and Expansion Plan would result in no adverse effect and therefore would not contribute to the overall adverse cumulative impact.

Conclusion

Long-term effects to the park’s archeological and cultural landscape resources under Alternative B range from negligible adverse to beneficial. These effects are related to the proposed historic building rehabilitation, parking modifications, general landscape enhancement actions, and the riparian corridor enhancement. Negligible to minor, long-term, adverse effects to archeological resources would result from ground disturbance related to landscape alterations (e.g., vegetation modification, solar panel installation, riparian corridor enhancement etc.). Minor, long-term adverse effects related to the introduction of non-historic solar panels to the Fort Cronkhite landscape (roof-mounted) are also expected for the Fort Cronkhite landscape as well as for the larger Forts Baker, Barry, and Cronkhite National Register District. On campus and off campus activities are anticipated to result in negligible adverse effects. This alternative would not contribute to the overall adverse cumulative impact on cultural resources.

No impairment of park resources or values would occur under Alternative B. Because the impacts previously described (1) are not inconsistent with the park’s purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do

not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts to cultural resources in the park under Alternative B.

For purposes of Section 106 of the NHPA, no cultural resources listed in or eligible for the NRHP would be adversely affected under this alternative (no adverse effect), see Table 12 below.

Table 12: Alternative B Section 106 Assessment of Effect

Resource	Treatment	Section 106 Finding
<u>Archeological resources</u>	No known resources in immediate project area. Conduct surveys prior to ground disturbance in previously undisturbed areas and monitor during ground disturbance as determined necessary.	No adverse effect
<u>Cultural Landscape</u>	Rehabilitate to enhance historic character and serve contemporary uses in accordance with cultural landscape report guidelines and treatment recommendations.	No adverse effect
<u>Historic Buildings:</u> <u>Bldg. No. / Historic Association</u> 1010 – Cold War, Nike complex 1011 – Cold War, Nike complex 1012 – Cold War, Nike complex 1013 – Cold War, Nike complex 1033 – World War II 1034 – World War II 1035 – World War II 1042 – World War II 1044 – World War II 1046 – World War II 1059 – World War II 1060 – World War II 1071 – World War II	Rehabilitate 13 structures. Includes construction of compatible addition to Building 1046 and the installation of photovoltaic panels on the Nike complex buildings' roofs.	No adverse effect

4.9.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

While some of the specifics would be slightly different under this alternative, the impacts of historic building rehabilitation, landscape enhancement, and parking modifications would be as described under Alternative B (long-term, localized, direct, minor adverse impacts from solar panels, negligible to beneficial effects from landscaping, rehabilitation, and parking). There would be no addition to Building 1046.

The impacts of ground disturbance would also be similar to those described for Alternative B, although they would be increased somewhat by the construction of three new buildings, involving the excavation (approximately three feet in depth) of foundation areas. A construction zone of 50 feet around each new building site could be expected to experience ground disturbance. Even considering

this new construction, for the above categories, the impact conclusions and mitigation measures identified for Alternative B would also apply to Alternative C; with mitigation, impacts would likely not exceed minor in intensity (no adverse effect).

The new buildings also have the potential for effects on the cultural landscape of Fort Cronkhite. Specific guidance is provided related to new construction in the Secretary for the Interior's Standards:

New additions, exterior alterations, or related new construction shall not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and shall be compatible with the historic materials, features, size, scale, proportion, and massing to protect the integrity of the property and its environs (NPS 1996,49).

New construction within Fort Cronkhite would be in a style compatible (materials, size, scale, mass) with existing and former historic World War II buildings and in accordance with the Secretary of the Interior's Standards and with the Fort Cronkhite cultural landscape report (Auwaerter and Curry 2008), per Mitigation Measure CR-5 (*Treatment of Historic Properties and Landscape*). New buildings would be of similar size, form and color to the structures that were once located within the historic footprints of buildings 1036, 1038 and 1040 (refer to Section 4.12.5 for visual simulations). In keeping with the Secretary of the Interior's Standards, the new buildings would deliberately be designed as compatible with but distinguishable from existing historic structures by introducing a contemporary feel to the new structures. New structures would reinforce the spatial relationships that characterized Fort Cronkhite in the past and would return some integrity to the spatial organization and density of the overall landscape. With mitigation, impacts would be direct, long-term, localized and minor to the Fort Cronkhite landscape (no adverse effect). Similar minor impacts would be expected for the Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

The introduction of roof-mounted solar panels into the historic Fort Cronkhite setting would result in the addition of non-historic features into the cultural landscape. However, the installation of panels on the flat-roofed Nike buildings would not be readily visible from most vantage points, especially from significant viewpoints. The installation of panels on the roof planes of new buildings would be designed as an integral and inconspicuous feature of the building, detailed in a manner so as not to detract from the historic character of the setting. Therefore, the introduction of solar panels in these instances would result in a local, minor adverse impact to the Fort Cronkhite cultural landscape (no adverse effect).

On Campus Activities

Impacts would be as described under Alternative B; negligible impacts (no adverse effect).

Riparian Corridor Enhancement

Impacts and mitigation would be as described under Alternative B; with mitigation, adverse effects to archeological resources within Fort Cronkhite would likely not exceed minor in intensity (no adverse effect), and negligible to minor, long-term, direct, localized adverse impacts to the National Register District.

Off Campus Activities

Impacts would be as described under Alternative B; negligible impacts (no adverse effect).

Cumulative Impacts

Impacts would be as described under Alternative B; no contribution to the overall adverse cumulative impact.

Conclusion

While there would be some differences amongst the alternatives (e.g., new building construction, no addition to Building 1046), overall impacts and mitigation and conclusions regarding impairment would be as described under Alternative B; long-term minor adverse impacts to the park's archeological and cultural landscape resources, negligible to minor, long-term, adverse impacts to archeological resources would result from ground disturbance, and minor long-term adverse impacts related to the introduction of non-historic solar panels. On campus and off campus activities are anticipated to result in negligible impacts. This alternative would not contribute to the overall adverse cumulative impact on cultural resources.

For purposes of Section 106 of the NHPA, no cultural resources listed in or eligible for the NRHP would be adversely affected under this alternative (no adverse effect), see Table 13 below.

Table 13: Alternative C Section 106 Assessment of Effect

Resource	Treatment	Section 106 Finding
<u>Archeological resources</u>	No known resources in immediate project area. Conduct surveys prior to ground disturbance in previously undisturbed areas and monitor during ground disturbance as determined necessary.	No adverse effect
<u>Cultural Landscape</u>	Rehabilitate to enhance historic character and serve contemporary uses in accordance with cultural landscape report guidelines and treatment recommendations. Construct three new buildings located within footprints of historic World War II buildings once on the site. New buildings would be compatible with the World War II historic setting and would include photovoltaic panels on south facing roofs.	No adverse effect
<u>Historic Buildings:</u> Bldg. No. / Historic Association 1010 – Cold War, Nike complex 1011 – Cold War, Nike complex 1012 – Cold War, Nike complex 1013 – Cold War, Nike complex 1033 – World War II 1035 – World War II 1044 – World War II 1059 – World War II 1060 – World War II 1071 – World War II	Rehabilitate 10 structures, including the installation of photovoltaic panels on the Nike complex buildings' roofs.	No adverse effect

4.9.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

Impacts and mitigation would be as described under Alternative C, although only one new building would be constructed (refer to Section 4.12.6 for visual simulations); effects would be minor adverse to the Fort Cronkhite landscape (no adverse effect). Similar minor effects would be expected for the Forts Baker, Barry, and Cronkhite National Register District (no adverse effect).

On Campus Activities

Impacts would be as described under Alternative B; negligible impacts (no adverse effect).

Riparian Corridor Enhancement

Impacts and mitigation would be as described under Alternative B; with mitigation, adverse effects to archeological resources within Fort Cronkhite would likely not exceed minor in intensity (no adverse effect), and negligible to long-term, direct, localized benefits to the National Register District.

Off Campus Activities

Impacts would be as described under Alternative B; negligible impacts (no adverse effect).

Cumulative Impacts

Impacts would be as described under Alternative B; no contribution to the overall adverse cumulative impact.

Conclusion

While there would be some differences amongst the alternatives (e.g., new building construction, no addition to Building 1046), overall impacts, mitigation and conclusions regarding impairment would be as described under Alternative B; long-term benefits to the park's archeological and cultural landscape resources, negligible to minor, long-term, adverse impacts to archeological resources would result from ground disturbance, and minor long-term adverse impacts related to the introduction of non-historic solar panels. On campus and off campus activities are anticipated to result in negligible effects. This alternative would not contribute to the overall adverse cumulative impact on cultural resources.

For purposes of Section 106 of the NHPA, no cultural resources listed in or eligible for the NRHP are expected to be adversely affected under this alternative (no adverse effect), see Table 14 below.

Table 14: Alternative D Section 106 Assessment of Effect

Resource	Treatment	Section 106 Finding
<u>Archeological resources</u>	No known resources in immediate project area. Conduct surveys prior to ground disturbance in previously undisturbed areas and monitor during ground disturbance as determined necessary.	No adverse effect

Resource	Treatment	Section 106 Finding
<u>Cultural Landscape</u>	<p>Rehabilitate to enhance historic character and serve contemporary uses in accordance with cultural landscape report guidelines and treatment recommendations.</p> <p>Construct one new building located on footprint of historic World War II building once on the site. New building would be compatible with the World War II historic setting and would include photovoltaic panels on south facing roofs.</p>	No adverse effect
<u>Historic Buildings:</u> <u>Bldg. No. / Historic Association</u> 1010 – Cold War, Nike complex 1011 – Cold War, Nike complex 1012 – Cold War, Nike complex 1013 – Cold War, Nike complex 1033 – World War II 1034 – World War II 1035 – World War II 1044 – World War II 1046 – World War II 1059 – World War II 1060 – World War II 1071 – World War II	<p>Rehabilitate 12 structures. Includes construction of compatible addition to Building 1046 and the installation of photovoltaic panels on the Nike complex buildings' roofs.</p>	No adverse effect

4.9.7 Mitigation Measures

CR-1: Pre-Construction Field Surveys and Training

Where not already completed, professional archeologists will perform surveys prior to ground disturbance in areas previously undisturbed. In addition, HI will provide training for all personnel involved with ground disturbance activities to facilitate recognition of potential archaeological materials and to avoid impacts to deposits.

CR-2: Archaeological and Native American Monitoring

HI will ensure that there is an archaeological monitor and representative of the Federated Indians of the Graton Rancheria (Coast Miwok) during ground disturbing activities in the vicinity of recorded archaeological resources. While the goal of NPS is to preserve archaeological resources, this mitigation measure would ensure that if additional deposits associated with known sites are discovered, there will be an archaeologist and Native American representative on site to identify and assess the find and impacts immediately and to halt construction.

CR-3: Previously Undiscovered Cultural Resources

Inadvertent Discoveries: If buried cultural resources are inadvertently discovered during ground-disturbing activities, work shall stop in that area and within a 100-foot radius of the find

until a qualified archaeologist can assess the significance of the find. Alternatively, an archaeologist and Native American monitor may monitor ground disturbances in vicinity of the site to ensure that such discoveries are protected until they can be properly recorded and assessed, and management decisions can be made about their treatment. Avoidance in place or no adverse effect from project actions is the preferred approach to all discoveries that are potentially eligible for listing on the NRHP. Inadvertent discoveries will be treated in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). The archaeological resource will be assessed for its eligibility for listing on the NRHP in consultation with the SHPO (and a Native American Monitor from the Federated Indians of Graton Rancheria if it is an indigenous archaeological site) and a determination of the project effects on the property will be made. If the site will be adversely affected, a treatment plan will also be prepared as needed during the assessment of the site's significance. Assessment of inadvertent discoveries may require archaeological excavations or archival research to determine resource significance. Treatment plans will fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects.

Discovery of Human Remains: If human skeletal remains are encountered, all work shall stop in the vicinity of the discovery, and the find will be secured and protected in place. The Marin County coroner and Park Archaeologist will both be immediately notified. If a determination finds that the remains are Native American, and that no further coroner investigation of the cause of death is required, they will be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries). The coroner will also contact the NAHC (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs.

CR-4: Cultural Resources Monitoring Plan

A cultural resource monitoring plan would be prepared to ensure that ground-disturbing activities within the project area result in no adverse effects to buried resources. The monitoring program would include oversight of project schedules and excavation areas to ensure that important opportunities for archaeological discovery are realized, and that potentially buried archaeological deposits are recognized in the course of active excavation and restoration. If archaeological resources are found that could be adversely affected by the proposed Project, NPS shall comply with Mitigation Measure CR-3.

CR-5: Treatment of Historic Properties and Landscape

1. Building and landscape rehabilitation will conform to The *Secretary of the Interior's Standards for the Treatment of Historic Properties*.
2. Recommendations provided in the Preliminary Report on HI Campus Landscape, Fort Cronkhite, Marin Headlands (Auwaerter and Curry 2008), and its final document, would be used to guide design work for the project area.
3. Guidelines for compatible new construction will be prepared to ensure compatibility of new building construction and the introduction of other new elements into the historic setting and will be subject to review and approval by NPS.

4.10 Visitor Experience

4.10.1 Guiding Regulations and Policies

The importance of and commitment to visitor experience is affirmed in various NPS documents. The 1916 Organic Act requires NPS to ensure its natural and cultural resources are not impaired, while providing for the enjoyment of these resources. NPS *Management Policies 2006* (NPS 2006a) state

that the enjoyment of park resources and values by the people of the U.S. is part of the fundamental purpose of all parks and that NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. As many forms of recreation occur outside a national park setting, NPS seeks to provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the natural and cultural resources found in a particular unit.

NPS has committed to providing facilities which are designed to be accessible to all individuals. All practicable efforts will be made to make NPS facilities, programs, services, employment, and meaningful work opportunities accessible and usable by all people, including those with disabilities. This policy reflects the commitment to provide access to the widest cross section of the public and ensure compliance with all applicable guidelines in effect at the time of construction. Accessibility will be provided consistent with preserving park resources and providing visitor safety and high quality visitor experiences (NPS 2006a, Sec. 9.1.2).

The visitor experience often includes the enjoyment of a park's natural soundscape. NPS Management Policies charges NPS with preserving "to the greatest extent possible, the natural soundscapes of parks" (NPS 2006a sec. 4.9). "The natural ambient sound level—that is, the environment of sound that exists in the absence of human-caused noise—is the baseline condition, and the standard against which current conditions in a soundscape" should be measured and evaluated (NPS 2006a, sec. 8.2.3). Human activities that generate noise, including that caused by mechanical devices, are to be monitored in and around parks. The Management Policies further require parks to evaluate impacts of motorized equipment in their planning and are required to choose equipment that has the least potential for impact to the natural soundscape (NPS 2006a, sec. 8.2.3). In addition, Director's Order 47 (Soundscape Preservation and Noise Management) articulates NPS policies that address the protection, maintenance or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources (NPS 2000).

4.10.2 Assessment Methods

The purpose of this impact analysis is to determine if the proposed actions are compatible or in conflict with the purpose of the park, its visitor experience goals, and the direction provided by NPS policies. The potential for change in visitor experience and use, including effects to the park's natural soundscape, is evaluated by identifying anticipated effects resulting from project implementation.

Effects to the visitor experience related to traffic and parking restrictions are addressed and are not intended to function as a technical transportation analysis. Rather, they are analyzed as to how they would effect a visitor's enjoyment of the area. See the *Transportation* section for additional analysis of transportation-related effects.

The analysis of the effects of noise on visitor experience in national parks involves a variety of factors, many of which are not easily quantifiable. These include, among other things, a visitor's expectation (e.g., presumptions of noise levels in developed vs. undeveloped/wilderness areas), a visitor's personal characteristics (the likelihood of being annoyed by noise), and the degree to which a quiet experience is desired (Gramann 1999). For instance, visitors may perceive noise as more annoying when it occurs in areas they expect to be very quiet. A visitor's expectation and the difference between existing noise levels and those from mechanical sources also affects whether visitors report annoyance and interference with natural quiet. For example, exit interviews at 23 National Park units (NPS 1994a) found that a higher percentage of backcountry (compared to front country) visitors recalled hearing aircraft and were more likely to experience interference with enjoyment and natural quiet because of it. Whether or not sounds are consistent with the settings in which they are heard appears to be an important factor in judging whether the visitor experience is adversely or positively affected.

Noise receptors in the area could be affected by construction noise, and include those taking part in HI programming, park staff, park partners, as well as other park visitors who frequent the Rodeo Beach and Rodeo Lagoon areas, a variety of park trails (e.g., Miwok, Coastal, Lagoon, Ridge) and cultural resource sites (e.g., batteries) in the surrounding park lands. All of these users would be considered noise receptors for the purposes of this analysis. The closest receptors include HI program participants, park staff, and park partners located within the Fort Cronkhite. Table 15 provides general information on typical noise levels, 50 feet from their sources, associated with heavy construction equipment. Noise levels vary with distance from the source and with operation mode. For instance, at 10 feet away grading equipment produces 94 dBA, while at 70 feet the level falls to 82 dBA. As points of reference, normal conversation at the source point results in a 60 dBA noise level, while whispering at five feet result in a 20 dBA noise level. At levels above 80 dBA, it is recommended that exposure time be limited to avoid hearing loss (National Institute for Occupational Safety and Health 2006). Table 16 provides additional information on predicted noise levels from any source at various distances from a construction site using a combination of the three loudest pieces of construction equipment simultaneously.

Table 15. Noise Emission Levels Typical for Construction Equipment

Equipment	Typical Noise Level (dBA) 50 feet from Source
Backhoe	80
Grader	85
Loader	85
Roller	75
Bulldozer	85
Truck	88
Scraper	89

Note: dBA = A-weighted decibel scale.

Source: Federal Transit Administration 1995.

Table 16. Examples of Estimated Noise Levels Associated with Construction Areas

Distance Attenuation	
Distance to Receptor (feet)	Sound Level at Receptor (dBA)
50	92
100	86
200	80
400	73
600	69
800	67
1,000	64
1,500	60
2,000	57
2,500	54
3,000	51
4,000	47
5,280	43
7,500	36

The following assumptions were used:

Basic sound level drop-off rate: 6.0 dB per doubling of distance.

Assumes simultaneous operation of three pieces of heavy equipment (scraper, truck, bulldozer).

Distance for reference sound level: 50 feet

Source: Jones and Stokes 2002

The visual effects of the alternatives on visitor experience are discussed in Section 4.12.

Context and Duration

- Short-term:** Effects would be perceptible to visitors only temporarily (e.g., construction-related) and/or these management actions would persist for less than one year.
- Long-term:** Effects would be repeatedly perceptible to visitors, lasting for at least a year or more.

Thresholds

The following thresholds were used to determine the magnitude of impacts on the visitor experience.

- Negligible:** Visitors would not likely be aware of changes related to visitor use, in critical characteristics of visitor experiences fundamental to the park's purpose and significance, or in any defined indicator of visitor satisfaction.
- Minor:** Visitors would be aware of changes related to visitor use, in critical characteristics of visitor experiences fundamental to the park's purpose and significance, or in any defined indicators of visitor satisfaction, but the effects would be minor. While noticeable, effects would not disrupt the experience and enjoyment of the park's values and facilities.
- Moderate:** Visitors would be aware of readily apparent changes related to visitor use, in any critical characteristic of visitor experiences fundamental to the park's purpose and significance, or in any defined indicators of visitor satisfaction. Detectable effects would degrade/limit the visitor's ability to experience and enjoy the park's values and facilities within certain areas.
- Major:** Visitors would be highly aware of changes related to visitor use, in any critical characteristic of visitor experiences fundamental to the park's purpose and significance, or in defined indicators of visitor satisfaction. These effects may prompt visitors to choose pursue their activity/experience in other areas outside the park.

4.10.3 Impacts of Alternative A—No Action

Construction

No construction would take place under the No Action Alternative. Therefore, there would be no impacts.

On Campus Activities

Accessibility. It is HI's goal to make its programming accessible, as well as comply with relevant regulations regarding accessibility, given the limitations of its location within an historic fort. The current state of accessibility within HI campus is relatively good with a few exceptions. Where access restrictions would persist, HI is committed to providing a comparable visitor experience in an alternative location. The provision of ADA-compliant access to most park resources within HI campus is considered a minor to moderate, long-term, localized benefit to the visitor experience. At the same time, the inaccessible nature of several areas of campus (see above) constitutes a negligible to minor, long-term adverse effect to visitor experience.

Soundscape. While HI educational programming is designed to minimize its effect on other visitors, it is possible that some visitors may be affected by HI-related noise on campus. It is the practice of HI to keep noise to a minimum so as not to disturb other visitors but it is not uncommon to hear student groups in and immediately around the Fort Cronkhite campus. HI intentionally plans that

activities involving noise are separated from other park visitors (upper terraces of campus and large areas where visitors who could be disturbed can avoid a student group) (Cancian 2008d). However, depending on the time of day, location of other visitors, numbers of students in a given area, wind patterns, and the type of HI activity, it is possible that visitors could temporarily be affected by noise related to HI programming. Depending on the visitor and his/her expectations in a particular area, adverse effects related to the park's soundscape likely range from negligible to minor, short-term and localized.

Riparian Corridor Enhancement

No riparian corridor enhancement would take place under the No Action Alternative. Therefore, there would be no impacts.

Off Campus Activities

Off Campus Site Use. The use of the off-campus teaching sites by HI hiking groups has the potential to negatively affect visitor experience for those visiting park trails and beaches during times when student groups are present. This could include those visitors who may have expectations of an experience marked by solitude, as well as those with expectations of experiencing park's resources that are unaffected by overuse or what they may perceive as crowding. The likelihood of conflict is elevated by the use of the area by participants of other park partner programs where similar educational programming occurs.

That said, several factors minimize negative effects to other park visitors as a result of HI off-campus programming. For one, the field school would continue to be focused on weekdays, while the majority of the general public tends to visit the area on weekends, reducing the potential for conflicts. In addition, under this alternative, HI would continue to implement a quota system which limits off-campus trail and teaching site use to prevent crowding of an area and to minimize the potential for a visitor's hike to be interrupted by multiple hiking groups. For instance, some sites would be restricted as to how many groups may visit and when they may visit. The "leave no trace" ethic that HI students practice extends to their behavior on trail (noise kept to a minimum, efforts not to disturb other visitors). It is likely that the continued HI use of the off-campus teaching sites would result in negligible, short-term, localized adverse effects to visitor experience, particularly for visitors in the area during weekdays.

In addition, as previously described, under the No Action Alternative, HI in collaboration with NPS would continue to monitor the off-campus teaching sites to avoid negative effects to the park's natural and cultural resources. The use of a site would be curtailed or stopped if HI, NPS or Park Partner staff identifies a negative effect to the park's resources. This is considered a benefit to the visitor experience related to the protection and preservation of park resources, the primary reason for park visitors' use of the area.

Accessibility. It is HI's goal to make its off campus programming accessible, as well as comply with relevant regulations regarding accessibility, given the limitations associated with the use of teaching sites along trails in a national park. While most of the trails and beach areas of the Park used as teaching sites by HI are not accessible due to their grade or surfacing, HI strives to provide all students access to the National Park experience and HI is committed to providing a comparable visitor experience in an alternative location. The inaccessible nature of several off-campus areas therefore constitutes a negligible to minor, long-term adverse effect to visitor experience.

Soundscapes. Some visitors may be affected by off campus HI-related noise. As described above, it is the practice of HI to keep noise to a minimum so as not to disturb other visitors but it is not uncommon to hear student groups. HI intentionally plans that activities involving noise are separated

from other park visitors (Cancian 2008d). In addition, HI has implemented a quota system which limits off-campus trail and teaching site use to prevent crowding and associated noise to minimize the potential for adverse effects to visitors (see “off-campus site use” discussion above). However, depending on time of day, location of other visitors, numbers of students in a given area, wind patterns, and the type of HI activity, it is possible that visitors could be affected by noise related to HI programming. Depending on the visitor and his/her expectations in a particular area, adverse effects related to the park’s soundscape likely range from negligible to minor, short-term and localized.

Cumulative Impacts

A variety of projects have resulted in beneficial effects to the visitor experience within the Marin Headlands and HI campus area.

Over the decades, Fort Cronkhite has undergone a number of physical improvements which have influenced visitor experience. For instance, several buildings used by HI have undergone rehabilitation to provide expanded and improved visitor opportunities to the public (field science school, conference program). Park partners such as the Golden Gate Raptor Observatory, housed at Fort Cronkhite, routinely provide educational opportunities for park visitors, a beneficial effect.

Upon implementation, the Marin Headlands/Fort Baker Transportation Management Plan (NPS 2009) will result in greater access to and within the Marin Headlands area by providing infrastructure improvements that promote public transit, pedestrian and bicycle travel to improve visitor experience and enhance environmental quality, that rehabilitate the Marin Headland/Fort Baker transportation road and trail infrastructure, and that reduce traffic congestion at key park locations and connecting roads (NPS 2009). These actions would result in cumulative beneficial effects to visitor experience.

The Trails Forever projects within the park focuses on, among other things, the on-going improvement and enhancements of the Coastal Trail, a major scenic trail through the park which runs along the coastline, to the north and south of Fort Cronkhite. Planned improvement at Hawk Hill/Hill 129 would include visitor access improvements, habitat restoration of Mission Blue Butterfly, and the completion of an historic structures study, all of which would further enhance visitor experience in the future. Cultural Landscape Reports being completed for Forts Barry, Baker (NPS 2005b) and Cronkhite (Auwaerter and Curry 2008) will serve to guide improvements to the historic fort areas and provide enhanced visitor services and opportunities.

MMC, located immediately to the northeast of Fort Cronkhite has recently undergone a large improvement project (NPS 2004). The Center offers educational programming including marine science education and other events for school children and the public, serving over 60,000 people a year.

The YMCA Point Bonita Outdoor Education and Conference Center at Fort Barry offers additional visitor services similar to those provided at HI. These include a multi-purpose conference facility which accommodates up to 150 people for over-night or extended stays. In addition, day camps and student outdoor educational programs are provided, along with nature hikes, picnic areas, and a dining hall serving three meals a day. Their continued provision of these services and facilities is a cumulative benefit for visitors.

The Fort Baker Conference and Retreat Center and The Golden Gate Institute have recently been developed and is designed to provide space for meetings, dining, and overnight accommodations (NPS 2009). This area provides additional visitor opportunities to visitors to the Marin Headlands area of the park, a cumulative beneficial effect for visitors. The provision of these services and facilities is a cumulative benefit for visitors.

The Headlands Center for the Arts is designed as an artists-in residence program and contributes to the park's interpretive role by teaching an appreciation of the natural and historic environment as a source of creative inspiration (NPS 1981). This is considered a cumulative benefit to visitor experience by providing unique opportunities to the public.

Within this context, while several beneficial and minor adverse impacts have been identified associated with the No Action Alternative, overall cumulative visitor experience impacts are anticipated to be beneficial.

Conclusion

Implementation of the No Action Alternative would result in localized long-term benefits to the visitor experience related to the on-going monitoring and protection of park resources, as well as the existing state of accessibility of campus facilities. In addition, negligible, short- and long-term, localized adverse effects to the visitor experience would be expected to occur as a result of the use of off-campus sites (potential conflict with other users), the lack of accessibility of several areas of campus, and effects to the park's natural soundscape related to the use of off-campus teaching sites. A variety of projects have resulted in positive cumulative effects for visitor experience in the Marin Headlands/Fort Cronkhite area.

4.10.4 Impacts of Alternative B—Rehabilitation Only

Construction

During construction, staging area(s), building rehabilitation activities, utility/infrastructure activities, and other landscape modifications (re-terracing, vegetation modifications, solar panel installation) could affect the visitor experience by creating safety issues and related access restrictions, changing parking and circulation, and increasing noise in certain locations for periods of time. Each issue is discussed in more detail.

Public Access/Restrictions. For safety reasons, visitor restrictions would occur in some areas of HI campus as per Mitigation Measure VE-3 (*Construction Exclusion Areas-Visitor Restrictions*). These would include active construction areas (e.g., solar panel installation), landscape enhancement areas (e.g., vegetation and topographic modifications), and construction staging areas. Some construction areas may be fenced to ensure safety. Construction equipment would be stored in designated staging areas which would also be restricted from the public. Depending on when construction activities occur, such restrictions could affect access to existing teaching areas and pedestrian circulation routes within HI campus for a period of time. Collectively, these construction-related activities would undoubtedly restrict public access to certain areas of Fort Cronkhite, if only periodically. While safety issues would be negligible with implementation of Mitigation Measure VE-3, the resulting restrictions in access would have short-term, localized, minor adverse impacts on visitor experience.

Circulation/Parking. Reconfiguration of parking areas has the potential to cause some initial confusion for visitors who are familiar with the existing parking situation in the Fort Cronkhite area. Effects to visitors would be minimized by building replacement lots prior to the elimination of current lots and providing adequate signage. In addition, construction traffic could interfere with park visitors. With implementation of TR-1 (*Traffic Control Plan*), adverse effects to the visitor experience are expected to be negligible, short-term, and localized.

Soundscapes/Noise. Under Alternative B, hand tools and mechanized equipment would be used for landscape modifications such as vegetation removal and re-terracing (e.g., graders, front-end loaders, trucks), historic building rehabilitation (e.g., hand tools, power drills, saws, trucks), rooftop mounted solar panel installation (e.g., excavators, power hand tools, trucks), and riparian restoration (e.g., front-end loaders, trucks, excavators). This use of mechanized equipment, particularly heavy

equipment, will result in temporary increases in noise levels within and around Fort Cronkhite/HI campus and affect visitors to the area. The intensity of the effects on the park's soundscape would vary with the type of construction activity, its location, and the duration of the activity. Noise impacts are also affected by a variety of other factors, including the distance from noise-sensitive receptors, weather, topography, ambient noise levels, etc. Noise effects would be compounded by simultaneous use of several pieces of noise-generating equipment.

Other than breakfast on campus, HI students would typically be off-campus for field school activities during construction activities. Conferences participants should not be affected as construction work is not anticipated for weekends when conferences are typically conducted. However, some HI staff, park staff and park partners would be near campus throughout the day while construction activities are occurring. Minor to moderate short-term, localized, adverse effects are anticipated for those individuals who are exposed to construction noise.

While construction noise would be reduced in areas that are further away (lagoon, beach, trails, etc.), changes in the soundscape would be more noticeable as these are relatively quiet areas within the Marin Headlands. Assuming three pieces of heavy equipment working simultaneously at Fort Cronkhite, visitors within a mile of Fort Cronkhite could experience noise levels of approximately 43 dBA; those within a ½ mile radius of Fort Cronkhite could experience noise levels of approximately 55 dBA; those within a ¼ mile could experience levels of 60-64 dBA (refer to Table 16). This latter level equates approximately to the noise level of normal conversation. Logically, as one moves closer to the construction zone, the potential for greater visitor impacts occurs. For instance, those visitors along the north side of Rodeo Lagoon (Mitchell Road) could experience noise levels of approximately 70 dBA. Construction within the southern-most reach of the riparian corridor would occur along Mitchell Road and it is possible that visitors in the immediate vicinity could experience noise levels in those areas of 80-90 dBA during heavy equipment use.

Effects to the park's soundscape from construction activity would be moderated in some cases by natural sounds (ocean waves), climatic conditions (wind direction), and topography. The degree to which any of these factors would moderate noise impacts would vary depending on the weather and the specific location of a particular visitor. For instance, if a visitor was walking along Rodeo Beach with prevailing winds from the west, impacts to the soundscape from heavy equipment use within Fort Cronkhite may be minimal or unnoticeable.

Considering these many factors, it is believed that construction-related noise effects to the park's soundscape in on- and off-campus areas could result in short term, localized, negligible to moderate adverse impacts on visitor experience. The range in impact would vary based upon the sound level at the receiver, and the receiver's perception of the sound. The effects would be short-term and localized. Implementation of Mitigation Measures VE-1 (*General Measures*), VE-2 (*Construction Management Plan*), and VE-4 (*Construction-Related Noise Control*) would generally reduce these impacts to a minor adverse level, although isolated instances of moderate impacts are likely.

On Campus Activities

In general, the increased use of the campus itself by HI students is not expected to substantially impair the experience of the students, park partners, or other park visitors, as this use would be consistent with the purpose of the campus as an educational facility. The difference is anticipated to be perceived as a minor adverse impact. Alteration of the bus drop-off location and route should not cause adverse effects on park visitors.

In addition, campus enhancements would include a variety of factors which would improve the visitor experience for both HI students and general park visitors. First, the upgrades and expansion of

existing utilities and infrastructure that service HI buildings would better serve visitors. ADA-compliant access would be provided in all HI buildings within Fort Cronkhite. Design would be in such a manner as to fulfill Americans with Disabilities Act (ADA) standards and NPS directives (see *Guiding Regulations and Policies* above), per Mitigation Measure VE-1. New directional and informational signage would be added to HI campus for more efficient way-finding. An addition would be constructed on the north side of Building 1046 to allow for its possible use as a dining hall and, to a lesser degree, a central meeting space. This would help create a unified campus organized around a central open space, provide views of defining natural and cultural resources (lagoon, batteries, etc.) of the area, and enhance students' experience of a sense of place and history. Building 1059 (historic, two-story, World War II barracks) would be rehabilitated and used for interpretive programs with NPS. The addition of this interpretive space to Fort Cronkhite and HI campus would enhance the visitor experience in its furtherance of the understanding of the World War II fort experience.

Finally, under Alternative B, open space for learning and play would increase from 44,000 square feet (No Action) to 58,000 square feet, resulting in additional open space teaching and free time space and improved views to the ocean and lagoon. The provision of additional open space under Alternative B would result in long-term localized benefits for HI students, but may not directly benefit the general public.

Collectively, the rehabilitation and interpretation of historic Fort Cronkhite structures would result in long-term, localized benefits to visitor experience related to infrastructure improvements, increased accessibility, furtherance of the understanding of the historic significance of the fort, as well as the provision of additional space for park enjoyment, environmental education and conference events.

Riparian Corridor Enhancement

Impacts of construction of the riparian corridor enhancement would be as described above for on campus construction, and the mitigation measures identified there would apply here as well. Riparian enhancement activities have the potential to affect public access to portions of the campus and areas immediately adjacent to the stream. For safety reasons, public access would be restricted in all restoration enhancement areas during construction and their buffers per Mitigation Measure VE-3.

Work extending south across Mitchell Road would involve a restoration area up to 300 feet wide over which a causeway may be constructed or culverts installed. This area is currently used by a variety of visitors as it provides access to Rodeo Lagoon and other trails and parking areas (see KHE 2008a for greater detail). Vehicular traffic would be re-routed/detoured from Mitchell Road and Kirkpatrick Street during riparian restoration activities. Work along these two roads would not occur simultaneously and visitors would not be prevented from traveling farther west toward the ocean and parking areas as they do now.

Riparian restoration work is planned for completion within one year of commencement. Work would not be conducted throughout the entire riparian corridor simultaneously but would proceed in a phased fashion, minimizing, to a degree, the amount of area which may be restricted to the public at any one time. In addition, seasonal restrictions for construction work would be implemented as a result of mitigation for impacts to wildlife and species of special concern, which would influence when and where restoration activities can occur.

As stated above, the impacts of construction of the riparian corridor enhancement would be generally as described above for on campus construction, and the mitigation measures identified there would apply here as well.

In the long-term, the riparian enhancement would provide interpretive spaces such as a Coast Miwok interpretive space designed to interpret the Coast Miwok's association with the area. In addition, several interpretive elements (e.g., Time Tunnel trail, teaching circles) related to the riparian enhancements efforts may be installed along the restored stream corridor and related information would be integrated in HI curriculum. These would be beneficial effects related to the visitor experience.

Off Campus Activities

Access limitations and the potential for conflicts between HI groups and other park visitors at off-campus sites would be generally as described under Alternative A. With the increased number of students, some additional impacts arising from increased use of existing and new sites is likely, both as a result of direct conflicts between HI activities and other visitors, as well as the potential for overuse to lead to resource degradation and related degradation of the visitor experience. However, the off-campus site management program would identify and ameliorate any issues at locations where there is resource degradation, consistent overcrowding, or conflicts amongst by park visitors. As such, impacts would be kept to no more than short-term, negligible to minor and localized.

Cumulative Impacts

Cumulative impacts of Alternative B are similar to those described for the No Action Alternative. The alternative would contribute to additional cumulative short-term impacts on visitor experience as a result of construction, while providing long-term benefits related to improved facilities and infrastructure, and additional interpretive opportunities. Overall, while there may be some adverse impacts, cumulative visitor experience impacts are anticipated to be long-term and beneficial.

Conclusions

Project construction is anticipated to lead to short-term, localized minor to moderate adverse effects related to restricted access, circulation/parking alterations, and effects to soundscapes. Over the long term, impacts to visitor experience under Alternative B would be beneficial as a result of historic building rehabilitation, increased HI capacity, ADA-compliant accessibility, historic building rehabilitation, utility/infrastructure improvements, enhanced interpretation, improved signage, off-campus site resource management, and provision of additional open space on campus. In addition, a variety of positive cumulative effects would influence visitor experience in the Marin Headlands/Fort Cronkhite area.

4.10.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

Although this alternative would result in the construction of new buildings, construction impacts would be generally as described for Alternative B. The construction of these new buildings would not result in any new or substantially greater impacts, therefore the impact conclusions and mitigation for this alternative would be the same as for Alternative B (short-term negligible to moderate adverse impacts with mitigation).

On Campus Activities

On campus activities would have impacts as described for Alternative B, with the following differences as described below:

- **New Construction.** The three new two-story buildings would use state-of-the-art sustainable design in a manner that creates learning experiences to relate directly to students' home and school environments. They would provide opportunities to create dynamic and effective educational spaces for HI programming. A new dining hall would be created on the first floor

of one of the structures. The two other buildings would contain labs, classrooms and dorms. The addition of these buildings under Alternative C is expected to result in additional long-term, localized benefits to visitor experience related to provision of additional space for enhanced learning opportunities (improved HI programming/capacity).

- **Open Space.** Under this alternative, open space within HI campus would decrease from 44,000 square feet (No Action Alternative) to 40,000 square feet. This is primarily attributable to the construction of new buildings which would be built on historic footprints now functioning as open space. HI currently uses open space areas as outdoor classrooms, organized activities, and free-time spaces for students, all of which contribute to the visitor experience of students for learning and education. However, this loss would be offset by provision of improved outdoor amenities on the HI campus. Consequently, the net loss of open space under Alternative C would result in negligible effects to the visitor experience.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term minor adverse with mitigation, long-term beneficial.

Off Campus Activities

Impacts would be as described for Alternative B; short-term, negligible to minor and localized.

Cumulative Impacts

Impacts would be as described for Alternative B; overall, while there may be some adverse impacts, cumulative visitor experience impacts are anticipated to be long-term and beneficial.

Conclusion

Impacts and mitigation would be generally as described for Alternative B (short-term, localized minor to moderate adverse effects during construction, beneficial long-term effects), with additional long-term localized benefits associated with the new buildings, and long-term, localized minor adverse effects related to the reduction in open space.

4.10.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

Although this alternative would result in the construction of one new building, construction impacts would be generally as described for Alternative B. The construction of the new building would not result in any impacts that were not disclosed under Alternative B, and therefore the impact conclusions and mitigation for this alternative would be the same as for Alternative B.

On Campus Activities

On campus activities would have impacts as described for Alternative C, with the following differences as described below:

- **New Building.** Only one new two-story building would be constructed as opposed to three buildings in Alternative C. The beneficial impacts cited under Alternative C would be correspondingly reduced.
- **Open Space.** Under this alternative, open space within HI campus would increase from 44,000 square feet (No Action Alternative) to 51,600 square feet. This would result in additional areas for teaching and free time space and play as well as improved views to the ocean and lagoon. The provision of additional open space under Alternative D would result in

benefits to the visitor experience related to the enhanced opportunities for HI program participants.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; short-term minor adverse with mitigation, long-term beneficial.

Off Campus Activities

Impacts would be as described for Alternative B; short-term, negligible to minor and localized.

Cumulative Impacts

Impacts would be as described for Alternative B; overall, while there may be some adverse impacts, cumulative visitor experience impacts are anticipated to be long-term and beneficial.

Conclusion

Impacts and mitigation would be as described for Alternative B (short-term, localized minor to moderate adverse effects during construction, negligible to beneficial long-term effects), with additional long-term localized benefits associated with the new building.

4.10.7 Mitigation Measures

VE-1: General Measures

1. The project will conform to the Americans with Disabilities Act/ Architectural Barriers Act Accessibility Guidelines (US Access Board, July 2004), the draft accessibility guidelines for outdoor developed areas prepared by the U.S. Access Board's Regulatory Negotiation Committee, and other relevant and current guidelines.
2. Whenever possible, construction work that could potentially affect the visitor experience would be scheduled during the time of lowest park visitation.
3. Visitor information regarding HI campus expansion and improvements (e.g., construction-related activity which could affect visitors—noise, traffic detours, etc.) would be provided via the park website, signage, rangers, or a park newsletter to enhance the public's understanding of the issue and to help them better plan their visits.

VE-2: Construction Management Plan

For each phase of work, HI will develop a construction management plan to carefully sequence construction activities to minimize disruption to existing facilities and services. The plan shall be submitted and approved by NPS and will include information on days/hours of operation, times in which particularly loud or noisy operations could occur, how equipment would be maintained, how noise and disruption would be minimized, safety protocols, etc.

VE-3: Construction Exclusion Areas- Visitor Restrictions

During construction, HI will ensure that all active construction, staging, and stockpile areas are fenced to render them inaccessible to the public. To minimize visual intrusiveness of fencing, it will be designed and installed to blend into the surrounds as much as possible. All construction, staging, and stockpile access will be gated and kept locked except when in use. Signs will be conspicuously posted to inform the public about the need for caution and to safely route visitors around construction areas. Established and maintained walkways would be provided across the site, as well as barrier fencing along trails and paths.

VE-4: Construction Related Noise Control

(see full description in Section 4.6.7 and in Table 5)

TR-1: Traffic Control Plan

A traffic control plan would be developed in conjunction with the construction documents for review and approval by NPS. This plan would include information on construction phases and duration, traffic scheduling, staging area management, visitor safety, construction equipment travel routes, detour routes, parking area closures, and pedestrian and bicyclist movements on adjacent routes.

4.11 Transportation**4.11.1 Guiding Regulations and Policies**

NPS Management Policies (NPS 2006) instructs park units to consider several factors when modification of a road inside the park is needed (such as for stream restoration). Most of these factors are more germane to a proposal to expand or construct roadway systems to accommodate additional visitors or provide additional access to a park site. However, Section 9.2 of the policies indicates parks should consider whether the road modification “is appropriate and necessary to meet park management needs....” and requires that it be “designed with extreme care and sensitivity to the landscape through which it passes.” In addition Section 9.2.4 states that “ permanent parking areas will not normally be sized for the peak use day, but rather for the use anticipated on the average weekend day during the peak season.”

4.11.2 Assessment Methods**Traffic Volume**

As previously discussed in Chapter 3, average daily traffic volumes on weekends are twice as high as weekday volumes during the spring and summer. Therefore the weekend volumes are used as a baseline in this assessment in order to present a conservative impact analysis. Non-recreational trips made by employees of HI are included in the existing counts accessing the park and were estimated from employment data collected from the park partners (Nelson\Nygaard 2000). Employee trips from HI are estimated to be less than 5% of the existing traffic on a week-end day. This amount of non-recreational travel is considered negligible with regard to traffic forecasts for this project and would fall within the normal fluctuations of traffic. Therefore, the non-recreational trips were not projected separately from general traffic volumes.

Impact intensities for traffic volume are defined below:

- Negligible:** The change in daily traffic on Bunker Road would be less than 10%.
- Minor:** The change in daily traffic on Bunker Road would be between 10% and 20%.
- Moderate:** The change in daily traffic on Bunker Road would be between 20% and 30%.
- Major:** The change in daily traffic on Bunker Road would be more than 30%.

Level of Service

To evaluate impacts on the level of service, the intersection of Bunker Road and Field Road was selected for analysis, as it is an intersection near to the campus that receives the most significant traffic volumes. The intersection analysis was conducted following the procedures for unsignalized intersections as outlined in the Highway Capacity Manual. Six levels of service (LOS A through LOS F) are defined for intersections, based on the average total delay to a motorist at the intersection. An intersection described as LOS A has the lowest delay, while LOS F is the most delay.

Impact intensities for levels of service are defined below:

- Negligible:** The level of service for individual locations would remain the same.
- Minor:** The level of service would change by one category and would remain at an acceptable level of service (LOS A, B, C or D).
- Moderate:** The level of service would change by more than one category and would remain at an acceptable level of service (LOS A, B, C or D).
- Major:** The level of service would change by one or more categories and would deteriorate to an unacceptable level of service (LOS E or F).

Parking Utilization

As described in the *Affected Environment* chapter, a parking utilization study conducted in the summer of 2000 documented parking use at major park recreation sites on a summer weekend day. Using the results of the 2000 study, expected parking utilization was projected for HI under each alternative. The utilization rates were compared with the planned capacity near the site in order to identify locations where supply and demand would be out of balance on a peak summer weekend day and a peak fall week day.

The following impact thresholds were established for parking utilization:

- Negligible:** There would not be a perceptible change in the current parking balances and/or imbalances.
- Minor:** A change in the current parking balances and/or imbalances would be slightly perceptible.
- Moderate:** A change in the current parking balances and/or imbalances would be moderately perceptible.
- Major:** A change in the current parking balances and/or imbalances would be very perceptible.

4.11.3 Impacts of Alternative A - No Action Alternative

Construction

There would be no construction activities under this alternative, therefore there would be no construction traffic that could affect traffic volume, Level of Service, or parking utilization. There would be no impact.

On Campus Activities

There would be no changes in traffic volume, Level of Service, parking supply, or parking demand as a result of this alternative. Therefore, there would be no impact.

Riparian Corridor Enhancement

There would be no enhancement activities under this alternative, therefore there would be no construction traffic that could affect traffic volume, Level of Service, or parking utilization. There would be no impact.

Off Campus Activities

There would be no changes in traffic volume, Level of Service, parking supply, or parking demand as a result of this alternative. Therefore, there would be no impact.

Cumulative Impacts

The No Action Alternative would not contribute to any cumulative impacts.

Conclusion

There would be no impacts to traffic volume, Level of Service, or parking utilization as a result of this alternative.

4.11.4 Impacts of Alternative B—Rehabilitation Only

Construction

The traffic volume associated with additional contractor vehicles and equipment being moved would be very small. This would be anticipated to have negligible effects on traffic volumes and Level of Service along Bunker Road. While construction traffic would utilize some parking spaces, construction would occur on weekdays when excess parking is available. Minor adverse impacts are possible on an infrequent basis, but overall, impacts would be considered negligible. In addition, Mitigation Measure TR-1 (*Traffic Control Plan*) would be implemented to further ensure that any adverse impacts are minimized.

On Campus Activities

Program Capacity. The amount of vehicle trips would increase as a result of the increase in program capacity, by approximately one bus and 10 to 15 vehicles per day. Because the student program occurs on weekdays, the impact to traffic volumes and Level of Service along Bunker Road from this expansion is expected to be no more than minor adverse. Since students are generally dropped off for this program, the change in parking utilization is expected to be minor adverse as well.

This alternative would include the continuation and growth of the conference program with growth proportionate to the growth in student capacity. Currently, the conference program serves up to 150 visitors at a time, with the exception of several larger events, such as the YouthQuest environmental conference. In 2007, the majority of conference groups were composed of less than 50 participants. Assuming some participants carpool, between 40 and 120 cars may be associated with the conference program. Under Alternative B, the maximum conference program capacity would increase 75%, or to 260 visitors, with the mean conference group anticipated to remain below 100. Using a conservative assumption, the maximum number of vehicles for conference participants would double, resulting in approximately 240 total vehicles under this alternative.

The conference program generally occurs during the weekend, when traffic volumes along Bunker Road are at their highest levels. An expansion of the conference program is expected to have a local minor adverse impact to traffic volumes along Bunker Road. Assuming a worst-case scenario with the maximum number of conference participant vehicles, the impact to level of service at the intersection of Bunker Road and Field Road is expected to be moderate: an analysis of this intersection indicates a change from LOS "A" to "C" with the addition of 120 trips at the weekend peak hour.

With respect to parking utilization, impacts are difficult to predict as the amount of parking utilized on any given weekend is highly variable. However, parking capacity is already exceeded on certain weekends, and the additional traffic generated by this alternative would exacerbate this problem. It is likely that other weekends where parking would otherwise be adequate would also exceed capacity as a result of the increase in number of vehicles from the conference program. These impacts to parking utilization due to the conference program expansion are expected to be locally moderate on a short-term, infrequent basis. However, when taken in the context of the overall parking situation throughout the year, this change is expected to only be slightly to moderately perceptible, and as a result, impacts would be considered minor to moderate overall over the long term. Implementation of Mitigation Measures TR-2 (*Participation in a TDM Program*) and TR-3 (*Parking Monitoring and Outreach*) would help alleviate impacts, but cannot be guaranteed to reduce impacts below the minor to moderate level.

Staff Size. Under Alternative B, the number of HI staff is anticipated to increase from 53 to 80 related to the anticipated increase in students. There would be a negligible local impact to traffic volume and level of service. While the impact on parking utilization would generally be negligible, it is likely that there would be short-term minor impacts on busy weekdays, as well as those infrequent

weekends when parking capacity in the area would already be exceeded or impacted by the expansion of the conference program. Implementation of Mitigation Measures TR-2 (*Participation in a TDM Program*) and TR-3 (*Parking Monitoring and Outreach*) would help alleviate impacts.

Visitor and bus drop-off. Under Alternative B, a new bus drop off loop would be established following the historic fort circulation system. The proposed vehicle circulation loops would make use of the historic circulations patterns in the fort and minimize traffic in the pedestrian portions of campus and the fort as a whole. There would be no traffic volume changes in the Marin Headlands or Fort Cronkhite as a result of this action. Therefore, there would be no traffic volume impacts resulting from the new drop-off. The Level of Service on Bunker Road is not expected to be negatively impacted as a result of this change. Since Bunker Road currently operates at a LOS of "A" in the vicinity of Field Road, this improvement would not be perceptible. Finally, this facility would not alter parking utilization. Overall, impacts would be negligible.

Parking Modifications. Under Alternative B, any parking removed by HI would be replaced in a new parking lot constructed just south of Kirkpatrick Street just west of the intersection with Bunker Road. These modifications will not impact traffic volumes or level of service along Bunker Road. Because parking will be replaced at a 1:1 ratio, parking utilization is expected to be negligible as well. There would be a negligible impact to traffic volume, level of service, and parking utilization as a result of the parking modifications.

Riparian Corridor Enhancement

Restoring the stream corridor would involve closing Kirkpatrick Road and Mitchell Road on alternating schedules for several months (August 15–November 15) and re-routing traffic. While this would affect traffic patterns in the vicinity of the campus, it would not affect traffic volumes, nor would it be anticipated to adversely affect Level of Service along Bunker Road.

However, stream restoration would involve between 8 and 50 trips per day to haul soil and other debris away from the corridor. HI staff estimate 50 trips per day for 21 days and 8 trips per day for 130 days, using dump trucks with a capacity of 10 cubic yards. At the higher estimate, Level of Service would decrease from LOS A to LOS B along Bunker Road. There would be a minor local impact to traffic volume and Level of Service along Bunker Road during this period of time.

While construction workers' vehicles would utilize some parking spaces, construction would occur on weekdays when excess parking is available. Minor short-term localized adverse impacts are possible on an infrequent basis, but overall, impacts would be considered negligible.

Mitigation Measure TR-1 (*Traffic Control Plan*) would be implemented to minimize adverse impacts.

Off Campus Activities

Field trips conducted as part of off campus activities are anticipated to generate only minor amounts of traffic and parking demand, and would have negligible impacts overall.

Cumulative Impacts

The MHFB Transportation Plan (NPS 2009) is expected to result in cumulative adverse and beneficial effects to transportation over the lifetime of the plan. Beneficial effects would be long-term and related to transit, vehicular safety, bike and pedestrian access and safety, wayfinding, reduction in automobile trips, traffic volume, and level of service at many intersections. Adverse impacts to transit, parking, bicycle and pedestrian access/safety, traffic volume and level of service would result from construction activities and would range from minor to major over the short-term.

Under the MHFB Transportation Plan, a reduction in parking from 540 spaces to 342 spaces would occur over time, primarily at the unpaved Rodeo Beach parking lot and along Mitchell Road. While some of the removed parking would be replaced with new infill parking, some of which could be located within proximity to the HI campus, this would nevertheless result in minor to moderate adverse impacts over the long-term.

NPS plans to conduct a feasibility study for a ferry to service different park sites to enhance visitor experience and provide alternative means of access. Fort Baker has been identified as a potential water transit terminal. There is no estimated completion date for the study (NPS 2009); however, the potential provision of ferry transit to Fort Baker would be a beneficial effect to transportation within the Marin Headlands.

Parking and roadway improvements (improvements along the existing access road, new parking lot) have also occurred at the MMC, located immediately northeast of Fort Cronkhite, a beneficial effect to transportation in the area (NPS 2004).

Implementation of the GGNRA Fire Management Plan (NPS 2005a) includes the use of several “fire roads” which include portions of Bunker Road and Simmons Road, and a portion of the Coast Trail between the riding stables and Slacker Hill (NPS 2008). Related cumulative effects to transportation are estimated to be negligible and short-term. Periodic and on-going maintenance operations (maintenance of roadways, parking facilities, trails, building; erosion control actions) throughout the GGNRA parklands may create adverse cumulative impacts during the period when actions are undertaken but would likely be considered negligible and short-term.

Overall, cumulative projects would result in both adverse and beneficial impacts in the long-term, with some short-term impacts related to construction activities. Construction of Alternative B would be phased to avoid traffic impacts from overlapping with other significant construction projects. In addition, the long-term cumulative effects discussed above would combine with the adverse impacts of the expanded conference program on parking. Considering all cumulative projects including Alternative B, impacts are anticipated to be minor adverse overall.

Conclusion

Construction of the on campus improvements and the riparian corridor enhancement would result in negligible to minor short-term impacts. On campus activities would have negligible to minor adverse impacts in general, with moderate impacts on an infrequent basis as a result of the expanded conference program. Off campus activities would have negligible impacts, and cumulative impacts would be minor adverse. With implementation of mitigation, no impacts would exceed moderately adverse.

4.11.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

Impacts and mitigation would be as described for Alternative B; minor adverse impacts possible on an infrequent basis, but overall, impacts would be considered negligible with mitigation.

On Campus Activities

Impacts and mitigation would be as described for Alternative B; negligible to minor localized long-term impacts with mitigation on LOS, and negligible to moderate short-term adverse impacts on parking utilization with mitigation.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; minor short-term localized adverse impacts are possible on an infrequent basis, but overall, impacts would be considered negligible.

Off Campus Activities

Impacts would be as described for Alternative B; negligible impacts.

Cumulative Impacts

Impacts would be as described for Alternative B; overall, minor adverse impacts.

Conclusions

Impacts and mitigation would be as described for Alternative B; on-campus activities would have negligible to minor adverse impacts in general, with moderate to major impacts on an infrequent basis, though mitigation measures would ensure that no impacts exceed the moderate level.

4.11.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

Impacts and mitigation would be as described for Alternative B; minor adverse impacts possible on an infrequent basis, but overall, impacts would be considered negligible with mitigation.

On Campus Activities

Impacts and mitigation would be as described for Alternative B; negligible to minor localized long-term impacts with mitigation on LOS, and negligible to moderate short-term adverse impacts on parking utilization with mitigation.

Riparian Corridor Enhancement

Impacts and mitigation would be as described for Alternative B; minor short-term localized adverse impacts are possible on an infrequent basis, but overall, impacts would be considered negligible.

Off Campus Activities

Impacts would be as described for Alternative B; negligible impacts.

Cumulative Impacts

Impacts would be as described for Alternative B; overall, minor adverse impacts.

Conclusions

Impacts and mitigation would be as described for Alternative B; on-campus activities would have negligible to minor adverse impacts in general, with moderate to major impacts on an infrequent basis, though mitigation measures would ensure that no impacts exceed the moderate level.

4.11.7 Mitigation Measures

TR-1: Traffic Control Plan

(see full description in Section 4.10.7 and in Table 5)

TR-2: Participation in a TDM Program

Headlands Institute will comply with the provisions of any future NPS Transportation Demand Management program for the Marin Headlands area.

TR-3: Parking Monitoring and Outreach

The Headlands Institute will monitor participant parking to identify management issues in a timely manner and will work with NPS and other partners to seek timely solutions. HI will encourage participants to use alternative means of transportation. HI will provide information on alternative transportation and parking availability to all visiting groups and encourage groups to provide that information to their members. HI will provide this information directly to individual participants in programs with individual registration, and will make parking availability and alternative transportation information available on its website and in outreach materials. In addition, HI will coordinate with NPS. When expecting a large number of conference attendees or other large events planned in the area.

4.12 Visual Resources**4.12.1 Guiding Regulations and Policies**

The Organic Act of 1916 act states that “[The National Park Service] shall promote and regulate the use of Federal areas known as national parks, monuments, and reservations hereinafter . . . to conserve the scenery and the natural and historic objects and the wildlife therein...” (16 USC 1).

NPS Management Policies 2006 state that the enjoyment of park resources and values is part of the fundamental purpose of all parks, and that scenery is included in those resources and values that are subject to the no-impairment standards (NPS 2006a, Sec. 1.4.6).

4.12.2 Assessment Methods

Analysis of effects to visual resources as a result of the project is based on three observation points: Wolf Ridge (north of Fort Cronkhite), Rodeo Beach dunes (south/southwest of Fort Cronkhite), and the Nike site on Field Road (southeast of Fort Cronkhite) (Figure 22). Observation points were selected by the Interdisciplinary Team as likely points from which visitors would view HI campus within Fort Cronkhite.

Wolf Ridge. The Wolf Ridge observation point is located at the terminus of the trail, to the north of Fort Cronkhite, about 800 feet above the fort. The observation point is reached by visitors via existing park trails to the east, west and north of Fort Cronkhite.

Rodeo Beach Dunes. This observation point is located in an area where visitors tend to walk to view the lagoon and its wildlife, to the south/southwest of Fort Cronkhite on the southern side of the lagoon. This point is reached by visitors via Rodeo Beach and the lagoon trail.

Nike Viewpoint. This observation point is located at a pull-out off of Field Road to the southeast of Fort Cronkhite and Rodeo Lagoon. Visitors reach this area via Field Road, south of the Marin Headlands Visitor Center. Interpretive signs explain Nike elements that can be viewed from the overlook (Cancian, pers. comm. 2008a).

The assessment of impacts considers whether the resulting visual changes would have an adverse or beneficial effect on a scenic vista, would substantially damage or improve scenic resources, or substantially degrade or improve the existing visual character of the site. The degree to which an alternative would affect the visual resources of the landscape (either adversely or beneficially) is linked to the degree of visual change or contrast that would be created by its implementation. Specifically, impacts to scenic resources will be determined by analyzing the ability of the alternatives to preserve the scenic qualities of the study area, including scenic vistas, vegetation, and landforms.

Figure 22. Aerial View of Project Area with Observation Points Indicated***Duration of Impacts***

Short-term: Effects would be temporary and related to construction, restoration, or demolition activities.

Long-term: Effects would be permanent and continual.

Type of Impacts

Beneficial impacts would enhance the existing landscape character, access to historically important viewpoints or a sequence of viewpoints, or the visibility of a viewpoint or sequence of viewpoints.

Adverse impacts include effects that would reduce the existing landscape character, access to historically important viewpoints or a sequence of view-points, or the visibility of a viewpoint or sequence of viewpoints.

Thresholds

Negligible: The impact to visual character and views would be imperceptible or not detectable. Effects would be noticed by few people within the vicinity of the

impacts; however, the impacts would not dominate either the foreground or background.

Minor: The impact to the visual character and views would be slightly detectable or localized within a relatively small area. Most of the landscape character would be retained with the alteration of small elements. Changes to the visual character would be detectable but they would not appreciably alter important landscape characteristics or views, and scenic quality would not be negatively affected. The landscape would have the capability to visually absorb most of the changes.

Moderate: The impact to the visual character and views of the site would be readily apparent (i.e., the landscape character would change). One or more secondary features or views would be altered but key features or views would remain intact. Effects would dominate the foreground vistas and be noticeable by most people, but the effects would not dominate the broader landscape character and viewshed.

Major: The impact would be substantial, highly noticeable, and/or result in changing the character of the landscape in a way that would cause substantial degradation or improvement. Key features of views would change. A majority of foreground and background viewsheds would be dominated by changes and/or impacts would be noticed over large distances.

4.12.3 Impacts of Alternative A—No Action

Under this alternative, campus configuration would remain unchanged from current conditions, as depicted in Chapter 3, Figure 16.

Construction

There would be no construction activities under this alternative, therefore there would be no visual impacts from construction.

On Campus Activities

There would be no changes in on campus activities under this alternative. Therefore, there would be no impact.

Riparian Corridor Enhancement

There would be no enhancement activities under this alternative, therefore there would be no visual impacts.

Off Campus Activities

There would be no changes in off campus activities. Therefore, there would be no impact.

Cumulative Impacts

The No Action Alternative would not contribute to any cumulative impacts.

Conclusion

There would be no impacts to visual resources a result of this alternative.

4.12.4 Impacts of Alternative B—Rehabilitation Only

Construction

Under Alternative B, construction-related visual impacts would vary in intensity over the three to eight years of construction activity. The primary visual effects would be related to areas of disturbed ground, buildings and landscaping in various states of construction/rehabilitation, the presence/use of staging areas for equipment, vehicles and stockpiles, and the use/presence of heavy equipment throughout the project area. The majority of the building rehabilitation activities would involve interior work and would not be visible, although exterior work and construction of the addition to the north side of Building 1046 would be visible (Figure 23, Rodeo Beach observation point, left side of simulation photo).

Construction staging area(s) would be located within or in close proximity to HI campus so as to minimize the area of disturbance. Specific sites have not been established but could include the central parking lot, area between the Nike complex and Mitchell Road, Kirkpatrick Street between the riparian corridor and Building 1076, etc. (Cancian, pers. comm. 2008). Equipment (e.g., graders, excavators, loaders, dump trucks, etc.) to be used in expansion and improvement activities throughout HI campus would be stored at staging sites.

It is likely that the presence of construction activities, staging areas and heavy equipment would be visible from different park locations during construction. From the three observation points from which analysis was conducted (Figure 23), views of many areas of the fort are masked by trees or structures which could mitigate visual impacts of staging and heavy equipment use. Based on views into the fort as depicted in Figure 23, it is likely visual resources would experience minor to possibly moderate, short-term, localized adverse effects over the construction period of three to eight years. The more intense impacts would likely be associated with views from the south where construction activities would be more noticeable. From some view into the fort (e.g., from the north—Wolf Ridge), visual effects are expected to be minimal. Implementation of Mitigation Measure VR-1 (*Minimization of Construction-Related Visual Impacts*) would help minimize impacts.

On Campus Activities

Building rehabilitation and construction of the addition to Building 1046 would be completed in compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and the Fort Cronkhite cultural landscape report (Auwaerter and Curry 2008) (see Mitigation Measure CR-5). As a result, when complete, all buildings would continue to resemble the general construction techniques of the existing structures (red roof, white siding), making the rehabilitation and addition relatively unremarkable related to the general visual character of the fort (a negligible impact).

Open space within HI campus would increase under this alternative by converting the central parking lot to a campus central open space and the kitchen lot to teaching open spaces (Figure 23, Nike observation point), as well as expanding the campus west of Hagget Street to provide additional outdoor spaces available for teaching and free-time use. The removal of these highly noticeable parking lots and vehicles and the expansion of open space west of Hagget Street would result in long-term, localized benefits to the park's visual resources.

Under this alternative, solar panels would be located on the flat shed roofs of the four Nike buildings (Figure 23, all observation points). Depending on a visitor's location, panels would be more or less apparent in views of Fort Cronkhite. From more distant locations north of the fort, the panels would be evident visually due to the difference in roof color of the Nike buildings, and may appear out of character with the World War II- and Cold War-era Nike landscape (e.g., Figure 23, Wolf Ridge observation point). In closer locations with views into the fort from the south, the panels are not readily noticeable (e.g., Figure 23, Rodeo Beach and Nike observation points). Depending on a



Alternative A: No Action from Field Rd. Nike Overlook

New Campus Green

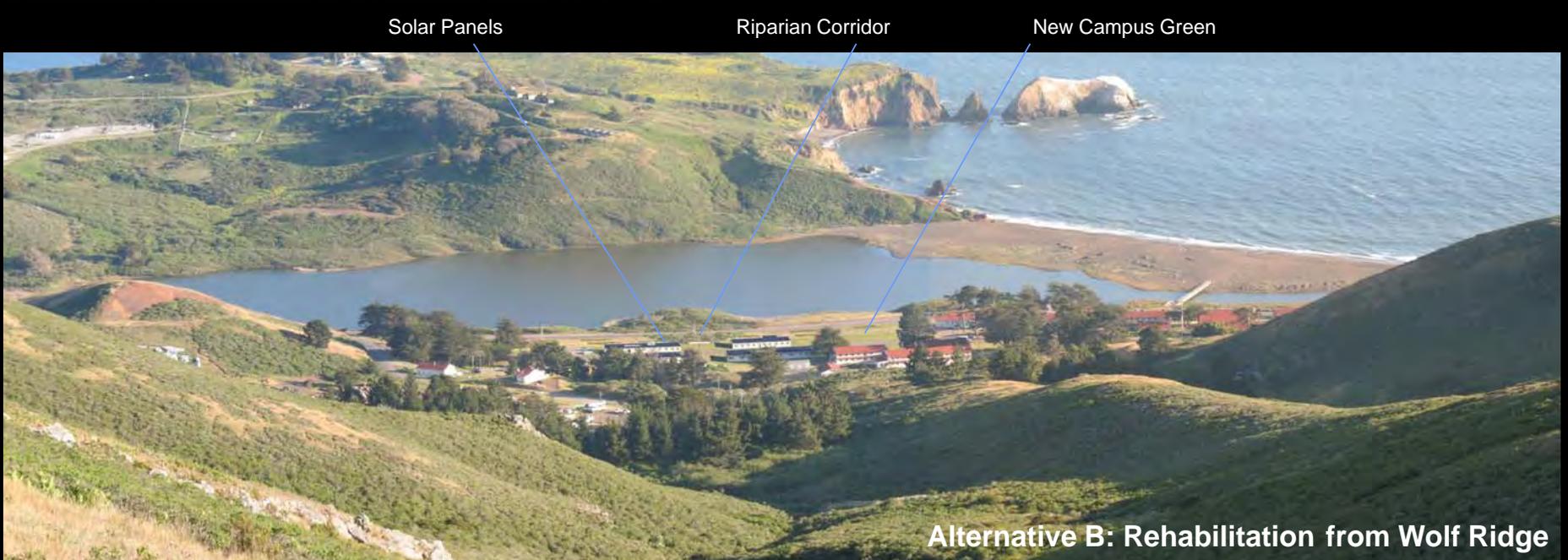
Riparian Corridor

Solar Panels

New Parking Lot



Alternative B: Rehabilitation from Field Rd. Nike Overlook





visitor's location and perspective, adverse effects to the park's visual resources could range from negligible to minor, long-term, direct, and localized.

Other modifications to the fort's landscape under this alternative include:

- *Vegetation modifications*— non-native and native plants that were installed after the period of significance or spread on their own will be removed and the historic turf will be restored to bring back the defining character of fort landscape. On the lower terraces between Mitchell Rd. and the Nike Fort, the historic footprints of World War II era buildings will be marked with native planting. This will create two visible lines of rectangular "footprints" of native shrubs running across the fort turf recalling the pattern the historic fort while restore native vegetation.
- *Re-terracing within Nike complex*—re-grading between the four Nike buildings to reestablish the historic Nike terraces.
- *Riparian enhancement*—the riparian corridor running north-to-south through Fort Cronkhite, some of which is piped underground, would be restored above and below the Nike complex.

These actions would influence the visual nature of Fort Cronkhite in several notable ways (Figure 23). Numerous mature trees and shrubs would be removed from the area. At the same time native plant species would be planted to delineate historic features of the fort and the historic turf grass would be reestablished. Re-terracing actions would not result in notable effects to the visual character of the area, particularly when viewed from areas farther from the fort.

Per Mitigation Measure CR-5, all landscape modifications would be made in accordance with the Secretary of the Interior's Standards and the Fort Cronkhite cultural landscape report (Auwaerter and Curry 2008). Collectively, these actions would result in long-term, localized benefits to the park's visual resources. These benefits derive from the reestablishment of natural and historic landscape characteristics and the restoration of the natural riparian corridor which has been degraded over the years by fort development and non-native plant intrusions.

In summary, with the exception of the solar panels, which would have negligible to minor localized long-term adverse effects, impacts would be long-term and beneficial.

Riparian Corridor Enhancement

Construction activities associated with the riparian corridor enhancement would be as described under construction, above. These impacts would persist for one year. After restoration is complete, the newly planted riparian vegetation would take some time to mature. It is expected that within one to two years, the revegetation corridor would obscure the visual effects of the ground vegetation disturbance. Within 10 years, it could be expected that the vegetation would appear much as it is represented in Figure 23. This is considered a short-term, localized, minor adverse impact.

The long-term aesthetic benefits of the riparian corridor have been discussed above as part of the on campus activities.

Off Campus Activities

Because off-campus activities would be managed to ensure that degradation of cultural and natural resources does not occur, they are expected to have negligible visual impacts.

Cumulative Impacts

A variety of NPS- and HI-sponsored projects have affected the visual character of Fort Cronkhite and surrounding lands in the last few decades. Within the fort cantonment, these include various

modifications to structures, circulation and parking, vegetation, etc. Since the 1970s, several rows of World War II-era buildings in both the east and west wings along Mitchell Road and Kirkpatrick Street have been removed (Auwaerter and Curry 2008, 6). These alterations result in the visual perception of the cantonment area being set back from Mitchell road, as well as creating additional open space around the Nike complex. Within the Nike complex, several circulation and parking lot modifications have occurred, as well as alteration of terraces and vegetation, removal of fencing, the addition of an amphitheater, and the addition of a wing on the dining hall. A greenhouse and nursery area was also added north of Kirkpatrick Street in recent decades (Auwaerter and Curry 2008). These changes have resulted in alteration of the visual perception of Fort Cronkhite.

Immediately to the northeast of Fort Cronkhite, improvements to the MMC (NPS 2004) have also resulted in actions which have modified the visual resources of areas surrounding Fort Cronkhite. These include short- and long-term, minor-moderate adverse effects to the park's visual resources are related to visual intrusions associated with construction activity and the introduction of new built features in the natural landscape of the Marin Headlands (Figure 16, Rodeo Beach observation point). These effects are being mitigated by existing visual screening (NPS 2004,16).

Under the MHFB Transportation Plan (NPS 2009), construction activities would have short-term minor adverse effects. However, minimizing the intrusion of automobiles and encouraging alternative modes of transportation to the area would have long-term benefits to the visual resources in the vicinity of Fort Cronkhite.

Under the Fire Management Plan for Golden Gate National Recreation Area, prescribed burns and the reduction of fuel hazards near historic structures and heavily developed areas would have short-term, adverse negligible to minor impacts and long-term benefits to visual resources (viewsheds) (NPS 2005a).

The CCEP would preserve, enhance, and restore disturbed coastal habitats along the Coastal Trail between Muir Beach (Marin County) through the Marin Headlands and farther south. Preservation, restoration and enhancement of disturbed coastal habitat would result in a benefit to the visual resources of the area (NPS 2009, 142).

In summary, in combination with the HI project, short-term minor to moderate adverse cumulative impacts are anticipated, along with long-term benefits to visual resources surrounding Fort Cronkhite.

Conclusion

Construction activities and the riparian corridor enhancement would result in negligible to moderate, localized short-term adverse effects. Implementation of mitigation would help reduce these impacts. Over the long-term, negligible to minor localized adverse effects would result from the installation of solar panels on the Nike buildings. At the same time, with mitigation guiding the campus improvements, long-term localized benefits to visual resources related to increased open space areas, improvements to the HI campus, and the riparian corridor enhancement are also expected.

No impairment of park resources or values is anticipated under this alternative. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts to cultural resources in the park under Alternative B.

4.12.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Construction

Construction impacts under Alternative C would be generally as described under Alternative B (minor short-term, localized adverse effects with mitigation). The construction of three new buildings would contribute to adverse effects, but would not change the impact conclusions. Implementation of identified mitigation would help minimize impacts.

On Campus Activities

Impacts would be generally as described under Alternative B (negligible adverse to long-term localized benefits), with the following distinctions:

- **Open Space.** Under this alternative, open space within HI campus would decrease, primarily from the construction of up to three new buildings which would be built on historic footprints now functioning as open space. Views from Rodeo Beach Dunes observation point (Figure 24) reflect the presence of new buildings on previous open space areas but this is not as apparent from more distant locations to the north (Figure 24, Wolf Ridge observation point). At the same time, the current central parking lot would be converted to a campus central open space and the kitchen lot would be converted to a teaching open space, both of which would provide a more open perception of the fort from certain viewpoints (Figure 24, Nike observation point). The general loss of open space and the perception of it from some viewpoints into Fort Cronkhite would likely result in long-term, direct, localized, minor adverse effects to the park's visual resources. At the same time, the removal of highly noticeable vehicles and parking lots from sweeping views into the fort from the south would result in long-term, localized benefits to visual resources.
- **Solar Panels.** Under this alternative, the placement of solar panels would occur on the south-facing side of the gable roofs of the three new two-story buildings in addition to the Nike buildings. Visual impacts would be similar as those described for Alternative B; however, the panels would be more visible on the new buildings, resulting in localized, direct and long-term negligible to minor adverse impacts.
- **New Buildings.** The three new two-story buildings would be located on the historic footprints of former Buildings 1036, 1038 and 1040 (along Kirkpatrick Street), constructed in a style compatible with the historic World War II buildings, and would be completed in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and with the Fort Cronkhite cultural landscape report (Auwaerter and Curry 2008) (see Mitigation Measure CR-5). New buildings would be of similar size, form and color to the structures that were once located at these locations. These new structures would be evident in views into Fort Cronkhite, particularly from vantage points located south of the fort (e.g., Figure 24, Rodeo Beach and Nike observation points). While the effects to the park's visual resources from the presence of the new structures would be readily noticeable, they would not stand out as inconsistent with the existing landscape of the fort. While some individuals may perceive these buildings as having minor long-term, localized adverse impacts, others might consider the impacts negligible or beneficial. Ultimately, with implementation of Mitigation Measure CR-5, it is believed that the presence of up to three new buildings would not substantially degrade the visual character of Fort Cronkhite.

Riparian Corridor Enhancement

Impacts and mitigation would be as described under Alternative B; short-term, localized, minor adverse impacts and long-term, localized benefits with mitigation.

Off Campus Activities

Impacts would be as described under Alternative B; negligible visual impacts.

Cumulative Impacts

Impacts would be as described under Alternative B; short-term minor to moderate adverse cumulative impacts are anticipated, along with long-term benefits to visual resources surrounding Fort Cronkhite.

Conclusion

Impacts and mitigation would be generally as described for Alternative B (negligible to moderate, localized short-term adverse effects related to construction/ long-term benefits from improvements, and long-term, negligible to minor localized adverse effects from solar panels). Construction of three additional buildings may have additional short-term and long-term minor adverse impacts, as would the slight reduction in open space the campus.

No impairment of park resources or values is anticipated under this alternative. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts to cultural resources in the park under Alternative C.

4.12.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Construction

Construction impacts under Alternative D would be generally as described under Alternative B (minor short-term, localized adverse effects with mitigation). The construction of one new building would contribute to adverse effects, but would not change the impact conclusions. Implementation of identified mitigation would help minimize impacts.

On Campus Activities

Impacts would be generally as described under Alternative B (negligible adverse to long-term localized benefits), with the following distinctions, which are shown in Figure 25:

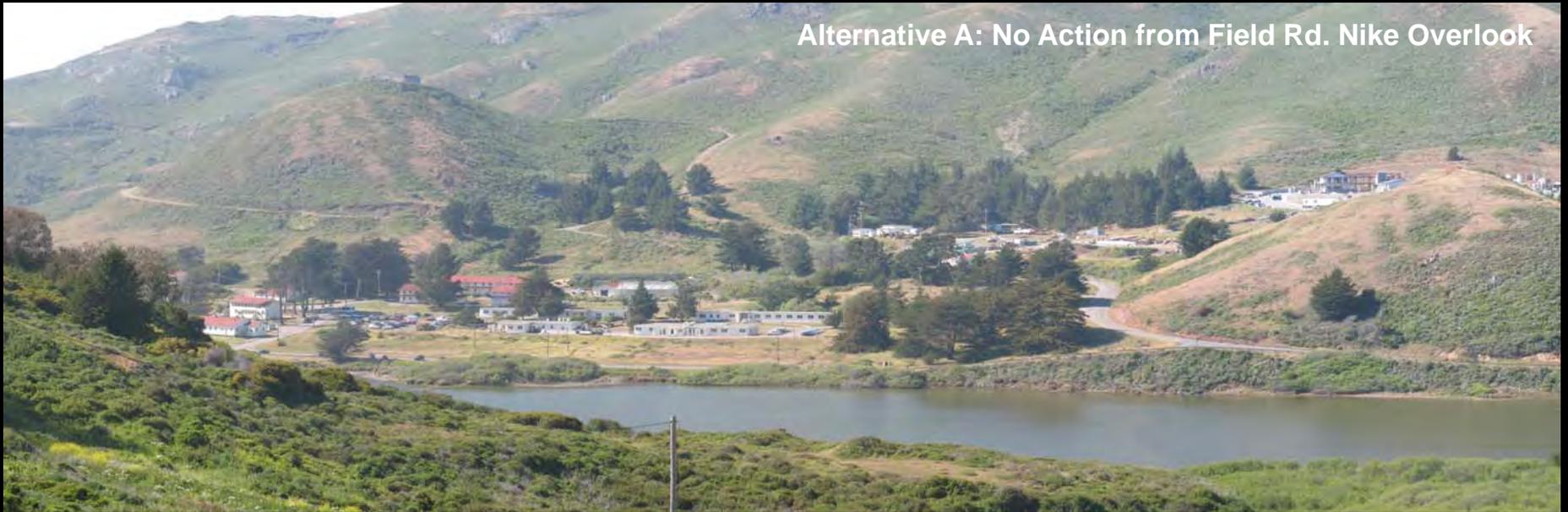
- **Solar Panels.** Under this alternative, solar panels would be placed on the south-facing side of the gable roof of the new two-story building in addition to the Nike buildings. Visual impacts would be similar to those in Alternative C (localized, direct and long-term negligible to minor adverse impacts).
- **New Building.** The discussion of new buildings under Alternative C would apply to the new two-story building under this alternative (no substantial degradation of visual character with mitigation).

Riparian Corridor Enhancement

Impacts and mitigation would be as described under Alternative B; short-term, localized, minor adverse impacts and long-term, localized benefits with mitigation.

Off Campus Activities

Impacts would be as described under Alternative B; negligible visual impacts.



Alternative A: No Action from Field Rd. Nike Overlook



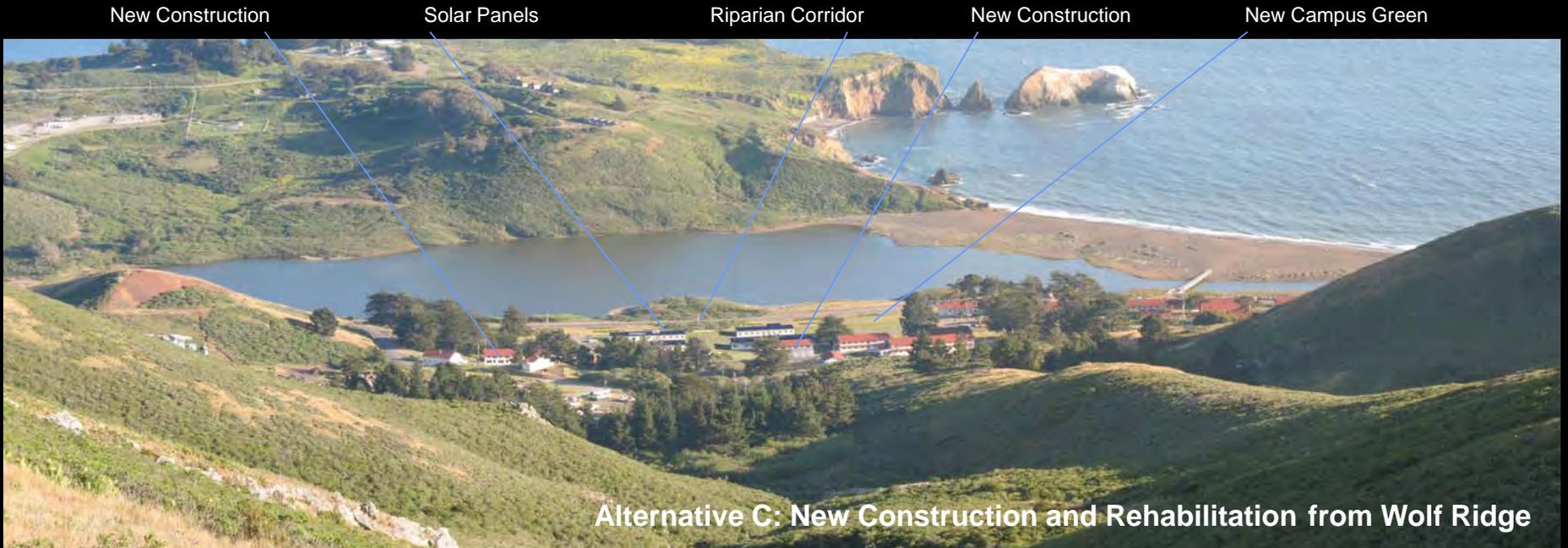
New Campus Green

Riparian Corridor

New Construction

Solar Panels

Alternative C: New Construction and Rehabilitation from Field Rd. Nike Overlook





Alternative A: No Action from Rodeo Beach



New Campus Green

New Construction

Solar Panels

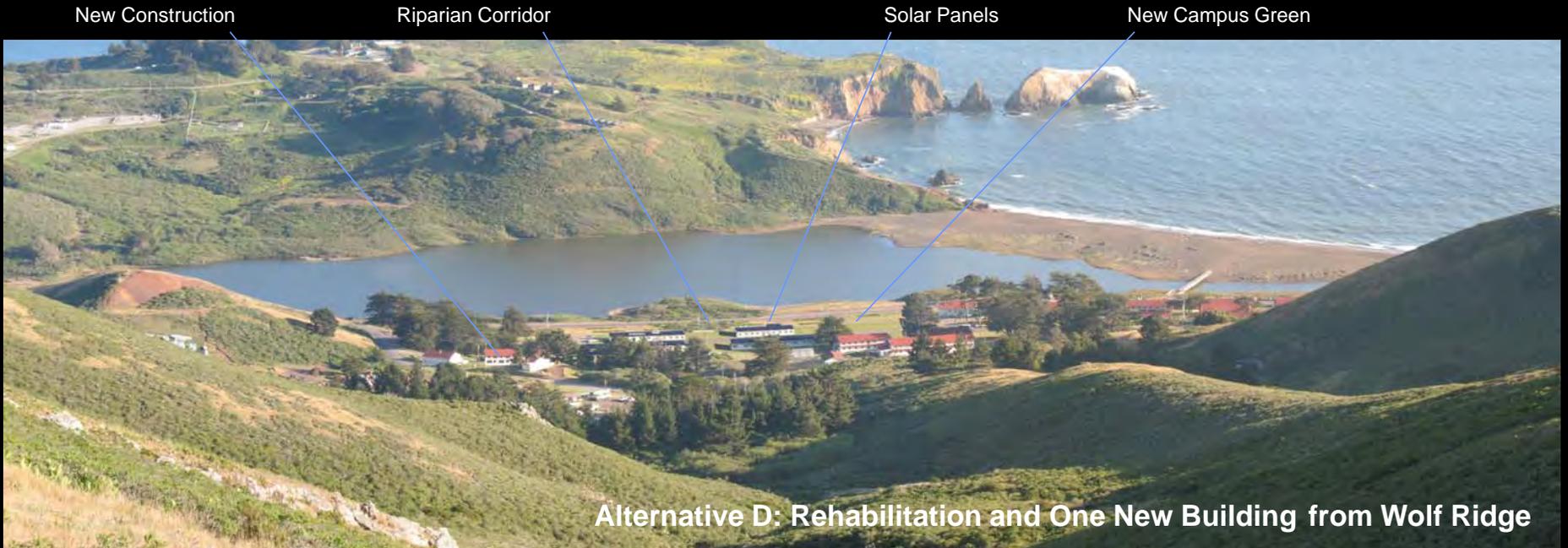
Riparian Corridor

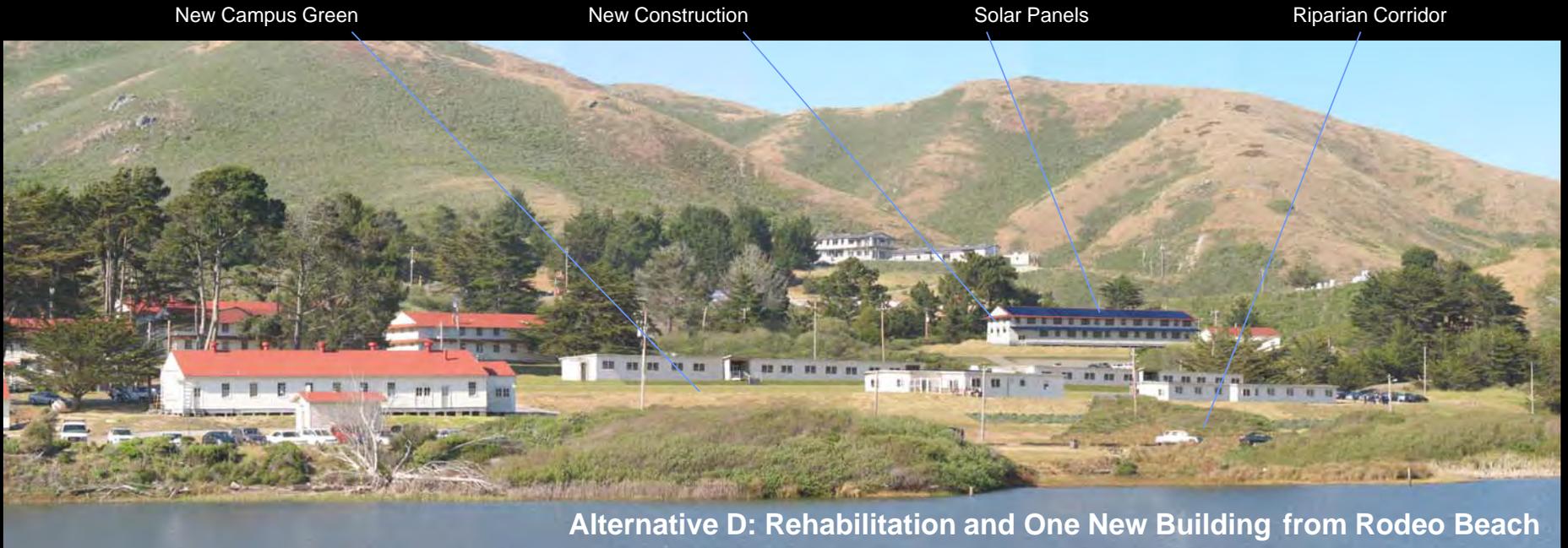
Alternative C: New Construction and Rehabilitation from Rodeo Beach

Figure 25: Alternative D Visual Simulations Page 1 of 3



Figure 25: Alternative D Visual Simulations Page 2 of 3





Cumulative Impacts

Impacts would be as described under Alternative B; short-term minor to moderate adverse cumulative impacts are anticipated, along with long-term benefits to visual resources surrounding Fort Cronkhite.

Conclusion

Impacts and mitigation would be generally as described for Alternative B (negligible to moderate, localized short-term adverse effects related to construction/ long-term benefits from improvements, and long-term, negligible to minor localized adverse effects from solar panels). Construction of the new building may have additional short-term and long-term minor adverse impacts.

No impairment of park resources or values is anticipated under this alternative. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or concessioner or contractor operations, there would not be unacceptable impacts to cultural resources in the park under Alternative D.

4.12.7 Mitigation Measures

CR-5: Treatment of Historic Properties and Landscape

(see full description in section 4.9 and in Table 5)

VR-1: Minimization of Construction-Related Visual Impacts

Construction activities would be coordinated with other construction activities in the area to the greatest extent possible to minimize visual intrusion of construction equipment and activity in popular visitor areas.

4.13 Park Operations

Several aspects of park operations have the potential to be affected by project implementation. These include individual park functions housed within Fort Cronkhite (maintenance shop, dorms), maintenance operations, and provision of utilities/infrastructure within Fort Cronkhite. This analysis is focused on the ability of the park to adequately and efficiently provide for functions that ensure efficient park operation.

4.13.1 Guiding Regulations and Policies

NPS *Management Policies 2006* (NPS 2006a) detail the basic service-wide policies for implementation of the Organic Act, including NPS park operations. The Management Policies require that park operations achieve certain conditions related to the accomplishment of management goals through environmental leadership and the use of sustainable practices in planning, design siting, construction and maintenance.

4.13.2 Assessment Methods

Facilities/functions related to park operations that could be affected by the project are concentrated within and immediately adjacent to Fort Cronkhite and include the possible transfer of certain park functions to other areas of the park, the maintenance of the restored riparian corridor, and the provision of adequate utilities/infrastructure related to HI improvement and expansion project. Information on current park operations was provided by the park and HI. Best professional judgment was used to assess impacts.

This section of the *Environmental Consequences* chapter is organized differently from the rest due to the nature of the topics addressed.

Duration of Impacts

- Short-term:** Effects would not continue beyond the action itself (e.g., construction phase).
- Long-term:** Effects would be extend beyond the construction phase, lasting for at least a year or more.

Thresholds

- Negligible:** Park operations would not be affected or the effect would not be noticeable or outside normal variability. No detectable changes to utility use patterns on site would occur.
- Minor:** The effect would be detectable but would be of a magnitude that it would not have an appreciable effect on park operations. While possibly noticeable to staff or park partners, it would not be noticeable to the general public. Very small scale effects to utility use patterns may occur.
- Moderate:** The effect would be readily apparent, resulting in discernable changes in park operations noticeable to staff, park partners, and possibly to an aware general public. Changes to utility use patterns would be readily measurable.
- Major:** The effect would be readily apparent, resulting in substantial changes in park operations in a manner noticeable to staff, park partners, and the general public. Changes to utility use may mean limits for the area are close to being reached.

4.13.3 Impacts of Alternative A—No Action

Under this alternative, there would be no changes in riparian corridor maintenance, utilities/infrastructure, access/circulation, locations of park functions, public safety, or adjacent park partners. As such, there would be no impacts, cumulative or otherwise.

4.13.4 Impacts of Alternative B—Rehabilitation Only

Riparian Corridor Maintenance

The proposed riparian corridor enhancement would alleviate the need for clearing of the Lagoon culvert and ameliorate current surface water retention problems. However, the proposed design incorporates various components which would require ongoing inspection and maintenance, including but not limited to:

- A sediment detention basin above Bunker Road. This basin is intended to capture high sediment loads (long term and episodic) from upstream areas, would require regular and event driven clearing of accumulated sediments;
- Proposed additions to infrastructure, which may require periodic clearing or maintenance, including:
 - The Kirkpatrick Street crossing;
 - Nike rehabilitation area related headwalls and retaining walls in Reaches 5, 6 and 7;
 - All project culverts (Bunker Road, Kirkpatrick Crossing, Nike Rehabilitation Area invert, Nike RA outlet, and Mitchell Road Crossing), which would be designed to pass anticipated water and sediment loads, but would require routine infrastructural inspection and maintenance;

- Re-rerouting of sewer and water lines to cross the corridor using either Kirkpatrick street or the newly re-established Stennis Street as a bridge over the creek; and
- Native plant restoration areas and areas known to support invasive non-native plant communities, which would require routine inspection and maintenance (KHE 2008a, 3-4).

In general, the stream corridor enhancement project would increase maintenance needs related to the addition of infrastructure. The riparian corridor enhancement is intended to reestablish natural stream/floodplain watershed dynamics that are self maintaining. However, the need for regular maintenance would remain, and would be local and predictable, as episodic failures would be less likely (KHE 2008a). Effects to park operations related to these increased stream maintenance functions would be long-term, minor, adverse, and localized.

Utility/Infrastructure Improvements

Alternative B includes the upgrade or expansion of existing utilities (water, wastewater, electrical service) infrastructure that service HI buildings. No increase in use of utilities is anticipated due to the implementation of sustainable design measures as described in Chapter 2 (solar panels, water conservation and efficiency, etc.). The solar potential study conducted by High Sun Engineering (High Sun Engineering, 2008) concluded that the action alternatives would generate at least 285,000 kilowatt hours (kWh) annually. From June 2006 through June 2008, the Institute's average annual usage was 132,000 kWh. Without discounting for planned conservation measures, a 75% increase in students could increase the usage to no more than 231,000 kWh, less than the 285,000 kWh the solar panels would produce. Thus, the solar panels could meet all of the Institute electrical needs even as the number of students expands. The project sets its initial goal as not increasing off-site electricity usage while growing by 75% because the initial capital cost of the solar generation system may prohibit installing all the possible panels.

Table 17, below summarizes the conservation measures and their contribution to overall reduction in water use and sewage production (see Carlile-Macy report in Appendix B, for more detail). The chart only lists the first level of water conservation measures using current, fully tested technology that conserves water at the initial point of use. The final infrastructure design would include new improved technologies and interpretive devices that would result in additional water conservation; however, the savings from these measures are not included in the table below or needed to reach the 43% goal.

Table 17. Estimated Savings for Water Use and Sewage Production

Building	Proposed Technologies	% Change in Overall Water Use and Sewage Production
Kitchen	<ul style="list-style-type: none"> ▪ Air-Knife for Dish Rinsing ▪ High Efficiency Dishwasher 	19.95%
Dorms	High Efficiency Showers, Sinks and Toilets	31.3%
Classrooms	<ul style="list-style-type: none"> ▪ Foam Flush Toilets ▪ High Efficiency Sinks 	11.5%
TOTAL		62.75%

Infrastructure improvements are related to building rehabilitation and riparian corridor enhancement activities and would be designed to better serve visitors, protect resources and decrease the use of

non-renewable resources. Benefits to park operations would be expected related to resource protection and reliability of future utility functions.

However, during construction, disruptions in utilities or infrastructure would be considered moderately adverse. With implementation of Mitigation Measure PO-2 (*Utilities*), impacts related to occasional interruptions in utility service would be minor, short-term and localized.

Access/Circulation

During riparian restoration activities, access along Mitchell Road and Kirkpatrick Street may require re-routing/detouring. Regardless, access to all of the campus and the rest of Fort Cronkhite would still be available. All work on the stream is scheduled to occur in one year and re-routes/detours are not anticipated to persist over long period of time during this period. All changes to access and circulation would be coordinated with park partners to ensure pedestrian circulation and safety. Effects to park operations related to the altered circulation patterns would therefore be negligible.

Relocation of Park Functions

Under this alternative, several NPS functions may be relocated from Fort Cronkhite buildings to other buildings at the fort or elsewhere in the park. These include the maintenance sign shop and Marin Headlands grounds building (Building 1046), and the dorm uses in Buildings 1034 and 1042. Both dorms are considered geographically dependent (e.g. within Marin Headlands). Building 1034 is considered particularly geographically dependent because it houses the wildland fire program participants; building 1042 houses park interns and volunteers.

While relocation could result in a long-term moderate adverse impact, implementation of Mitigation Measure PO-1 (*Relocations*) would be implemented. With this measure in place, effects to park operations related to relocation of specific park functions would be minor adverse, short-term, and localized or regional depending upon the destination of the move.

Public Safety. An increased capacity at HI from students and conference users could result in an increased need for fire protection, police services, and emergency response. However, the number of additional service calls is anticipated to be negligible.

Adjacent Park Partners. Implementation of the project could result in impacts on park partners neighboring the HI campus, both as a result of construction-related effects as well as increased capacity of the HI program. Proper coordination with the partners would help alleviate effects associated with planning and construction of the project. For instance, HI would need to coordinate with the native plant nursery early enough to allow for adequate plant propagation in support of revegetation activities for the project. Coordination of access and circulation issues with park partners, including routes and wayfinding/signage during and post construction, would help ensure adequate pedestrian circulation and safety, as well as minimize other disruptions to, or even enhance, park partner operations.

The construction effects would be consider localized, short-term and moderately adverse, but would be reduced to minor through implementation of Mitigation Measure PO-3 (*Adjacent Uses*). The long-term effects would be localized and minor, as the expanded program would be noticeable but would not have an appreciable effect on park operations, and proper coordination between HI and park partners is anticipated. Short-term and long-term effects to park partners who are not located in proximity to the campus would be negligible.

Cumulative Impacts

On-going funding and budget constraints limit the amount of staff time available for park operations activities such as long-term maintenance commitments. Current operations include numerous efforts

related to park goals involving natural and cultural resources management and protection, construction/maintenance park facilities, provision of visitor services and public outreach, and visitor and staff safety. Collectively these issues result in minor, cumulative, adverse impacts to park operations.

In addition, the existing Fire Station located in the building immediately west of Building 1046, along Mitchell Road, has an established need for rehabilitation which will be addressed in the future. Improvement to the facility could result in a beneficial cumulative effect to park operations.

Future infrastructure/utility work planned at Fort Cronkhite/Marin Headlands includes lift stations repair/expansion of wet wells which allow NPS to better regulate the pumping to the sanitary district. Future repairs to sewer and water lines are also anticipated. Other project work that has had an effect on utility systems includes the Fort Baker rehabilitation and new construction project, the new MMC, and the MHFB Transportation Plan's changes to roads, parking areas, and associated utilities. Collectively, these actions would result in future cumulative benefits to park operations related to utility services.

This alternative would contribute to, but would not change the overall cumulative impacts identified above.

Conclusion

Effects to park operations under Alternative B include minor, long-term benefits associated with improved infrastructure and resource protection. Negligible to minor, short-term, adverse effects would result from potential utility service interruptions during construction, temporary circulation alterations during riparian enhancement activities, and the possible relocation of park functions to other areas within the Marin Headlands. Minor, long-term, direct, adverse effects related to additional stream maintenance requirements are also expected. Cumulative impacts to park operations include minor adverse effects related to budget constraints, as well as beneficial cumulative effects related to future improvements to the Fire Station and utility infrastructure.

4.13.5 Impacts of Alternative C—Rehabilitation and Three New Buildings

Effects to park operations under this alternative are similar to those described under Alternative B with the exception of the possible relocation of park functions. Relocation of park functions to other areas of Fort Cronkhite or the Marin Headlands is not proposed under Alternative C. As discussed in Section 4.13.4, impacts are expected to be as follows:

- Riparian Corridor Maintenance –long-term, minor, adverse, and localized
- Utility and Infrastructure Improvements –minor, short-term and localized with mitigation; long-term benefits
- Access Circulation / Public Safety–negligible
- Relocation of Park Functions–minor adverse
- Public Safety–negligible
- Adjacent Park Partners–beneficial to short-term minor adverse.
- Cumulative–minor adverse effects related to budget constraints, as well as beneficial cumulative effects related to future improvements to the Fire Station and utility infrastructure

Conclusion

Impacts and mitigation would be generally as described under Alternative B (summarized above), although relocations and related mitigation would not be necessary.

4.13.6 Impacts of Alternative D—Rehabilitation and One New Building (Preferred)

Effects to park operations under this alternative are similar to those described under Alternative B with the exception that under this alternative, NPS functions currently housed in Building 1042 would not be moved. That said, the overall effect to park operations remains the same as that described under Alternative B. As discussed in Section 4.13.4, impacts are expected to be as follows:

- Riparian Corridor Maintenance—long-term, minor, adverse, and localized.
- Utility and Infrastructure Improvements –minor, short-term and localized with mitigation; long-term benefits.
- Access Circulation / Public Safety—negligible.
- Relocation of Park Functions—minor adverse
- Public Safety—negligible
- Adjacent Park Partners— beneficial to short-term minor adverse.
- Cumulative—minor adverse effects related to budget constraints, as well as beneficial cumulative effects related to future improvements to the Fire Station and utility infrastructure.

Conclusion

Impacts and mitigation measures would be as described under Alternative B (summarized above).

4.13.7 Mitigation Measures

PO-1: Relocations

Prior to the relocation of any park operations, NPS and the Headlands Institute would agree to a transition plan and specific terms and conditions for such move. Conditions may include that buildings and spaces to which park operations would relocate to be in good or better condition than the function's original space, and these new spaces are fully ready and available for occupancy prior to any moves.

PO-2: Utilities

Utility/infrastructure work that requires interruptions in service would be coordinated at least 60 days in advance between NPS, the Headlands Institute, and other appropriate park partners located within Fort Cronkhite.

PO-3: Adjacent Uses

Other users located in proximity to the Headlands Institute campus will be provided with at least 60 days advance notification of any planned construction activity. HI will designate a construction representative who will be responsible for providing Partners with updated construction information and responding to complaints regarding construction activities. A contact telephone number for construction representative will be conspicuously posted on construction site fences and will be included in the written notification of the construction schedule sent to nearby Park Partners and posted on the website.

CHAPTER 5. CONSULTATION AND COORDINATION

5.1 Project Scoping

Project scoping is designed to gather early input in the NEPA process. These efforts include both internal scoping and public involvement. In addition to notifying interested parties about the proposed project, the purpose of scoping is to solicit input on the conceptual range of alternatives being contemplated and to identify issues and concerns that should be studied in the environmental document.

Any communications between the agencies or the public and NPS resulting from the scoping process (as well as additional information regarding this project) can be accessed online at the NPS Planning, Environment and Public Comment (PEPC) website (<http://parkplanning.nps.gov.goga>).

5.1.1 Internal Scoping

Discussion of ideas related to expansion and improvement of HI have been ongoing since 2001. In 2003, HI organized 11 internal workshops (students, staff, and board members) to explore creating a sustainable campus that reflects the ideals HI shares with the park and fully interprets the site's resources. HI surveyed students, teachers, and conference attendees to clarify views of the current HI campus and operations, as well as to determine priorities for improvement. This effort resulted in the formulation of an internal conceptual plan in 2005.

In addition, an interdisciplinary team (IDT) consisting of NPS representatives and educational and administrative leaders of the HI and their consultants was formed to provide guidance for the improvement plan. In 2006 the IDT developed a set of planning guidelines for the development of alternatives for the HI plan (see the *Alternatives Development Process* section of the *Alternatives* chapter for more detail).

In January 2007, the NPS and HI team members participated in an internal alternatives development workshop from which alternative concepts for campus improvements and expansion were drafted. These concepts were further refined and approved for presentation during public scoping which was held in the spring and summer of 2007 (see below).

In January 2008, an internal IDT workshop was held to further refine the plan alternatives. Comments obtained through public scoping efforts (see below) were considered in this effort. As a result, two action alternatives (rehabilitation and rehabilitation/new construction), in addition to the No Action alternative, were identified for analysis in the EA. In 2008, the alternatives for the project were further refined.

The NPS and HI used a decision making process called Choosing by Advantages (CBA) to help make value based decisions and identify a preferred alternative for the HI Campus Improvements and Expansion project. The timing of this CBA coincided with the drafting of the Administrative Draft Environmental Assessment for the project. This value engineering process used to improve value or make selections in many types of construction and planning projects was customized to meet the needs of the park with this particular project at this particular phase of the planning and environmental review process. A one and a half-day workshop including NPS and HI staff, managers, and consultants took place in August 2008 at which the alternative Rehabilitation and One New Building, (Alternative D as included in this EA) was selected as the preferred alternative by NPS and HI. Of the alternatives which were developed through project scoping and refined over time by the

IDT, the CBA process identified Alternative D as having the best combination of long-term benefits for achieving project objectives while also ensuring a high level of resource protection and enhancement consistent with the requirements of NEPA and the NPS management policies.

5.1.2 Public Scoping

The public scoping comment period ran from May 22 through July 16, 2007 during which time open houses and solicitation of public comments were designed to gather early input on the public's ideas and thoughts on the project and the range of conceptual alternatives being considered. These efforts also resulted in the identification of data gaps and studies needed for natural and cultural resources that could be affected by the planning process. Information from these studies and data collection efforts was used to refine the plan alternatives.

In May 2007, the HI and the NPS sent direct mailings (postcards) to approximately 4,100 park visitors, interested organizations and park neighbors with the goal of identifying those individuals and groups either directly involved with or potentially impacted by the project, as well as those interested in obtaining information about it. This mailing also included the notice of public scoping. An additional mailing (4 page flyer) with more detailed project information was sent to a smaller more refined list (approximately 400 mailings), including libraries and organizations, to announce the park's open house, the HI open house, and the public scoping meeting (held June 16, 2007).

Notice of the project was also included in the flyer that announced the May 22, 2007, GGNRA open house and referred interested members of the public to the park's website and Planning, Environment, and Public Comment (PEPC) website for more project information. The GGNRA open house was informational and not considered a formal scoping meeting for the HI project, although it was designed to solicit input on a proposed range of alternatives and issues and concerns related to it. Materials shared at the open house were also posted on the PEPC website.

On June 14, 2007, the HI and NPS hosted a public meeting at the Bay Model facility in Sausalito which was lightly attended though the meeting was highly publicized. The format of this meeting included an informal open house, followed by presentations on the history of the HI and a project overview; a question and answer period followed. Staff also encouraged interested parties to attend the open house and scoping session at the HI on Saturday, June 16th. On June 16, 2007, an open house and scoping session was held at the HI. The event had been announced at the May 22nd park open house meeting, on the PEPC website, and through the 4500 postcards and flyers mailed to interested parties. The open house provided an opportunity for persons to tour the campus, look at the current buildings and landscape, and get a better understanding of the project's purpose and need. Background materials were available to inform participants and allow them an opportunity to provide feedback on the project. Fewer than 10 members of the public attended the June 16 open house.

Public scoping resulted in five written comments. Comments focused on issues of visitor experience, historic resources, natural resources, the area of analysis, green building, use of historic footprints within Fort Cronkhite, use and availability of existing space within Fort Cronkhite, increased student population and its effect on park resources, effects on and collaboration with other partners (YMCA), and traffic circulation within/around Fort Cronkhite.

5.1.3 Agency Scoping

NPS and the HI prepared scoping packets which included descriptions of the conceptual alternatives, issues identified for study, the draft environmental screening form, and the dates of public scoping for interested or affected public agencies. No agency comments were received during initial public scoping.

A list of regulatory and/or interested agencies included in this scoping notification is presented in Table 18. Letters to the SHPO and the Advisory Council on Historic Preservation informing them of early planning efforts can be accessed from the NPS website.

Table 18. Agencies Included in Initial Scoping Efforts

Federal Agencies	State and Local Agencies, Commissions, Boards and Officials
National Marine Fisheries Services	California Coastal Commission
U.S. Army Corp of Engineers—postcard and flyer	San Francisco Bay Regional Water Quality Control Board
U.S. Department of Homeland Security – FEMA—postcard	CA State Department of Fish and Game, Central Coast Region
U.S. Fish and Wildlife Service	State Environmental Protection Agency
U.S. Environmental Protection Agency, Region IX	State Historic Preservation Officer
Advisory Council on Historic Preservation	Marin Municipal Water District--postcard
	Sausalito Marin City Sanitary District—flyer
	Governor’s Office of Planning and Research

Note: Unless otherwise noted, all agencies were sent scoping letters on June 1, 2007.

5.2 Agency Consultation

5.2.1 U.S. Fish and Wildlife Service

The Endangered Species Act of 1973 requires that each federal agency, in consultation with the USFWS and/or NOAA Fisheries, ensure that proposed agency actions do not jeopardize the continued existence of a listed species or result in destruction or adverse impact to designated critical habitat. A list of listed threatened and endangered species in the general area was obtained through the U.S. Fish and Wildlife Service website. The NPS will initiate formal consultation with the USFWS with the submittal of a Biological Assessment (BA). The USFWS will also be provided a copy of this EA for their review and determination of concurrence with the BA’s findings.

5.2.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) administers a permitting program under Section 404 of the Clean Water Act to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. In addition, all proposed work and/or structures extending bayward or seaward of the line on the shore reached by mean high water in tidal water must be authorized by USACE pursuant to Section 10 of the Rivers and Harbors Act. NPS will need to obtain a permit from USACE for activities related to the riparian corridor enhancement. A wetland delineation report is currently in preparation to facilitate the USACE permitting process.

5.2.3 California Coastal Commission

The California Coastal Zone Management Act protects coastal environments. While the act transferred regulatory authority to the states and excluded federal installations from the definition of the “coastal zone,” it requires that federal actions be consistent with the state coastal management plans. Activities taking place within the coastal zone under the definition established by the California Coastal

Management Plan require a federal consistency determination. Because this project will take place in the coastal zone, the EA will need to be submitted to the California Coastal Commission for a federal consistency determination.

5.2.4 California State Historic Preservation Officer and the Advisory Council on Historic Preservation

The NPS initiated consultation with the California State Historic Preservation Officer (SHPO) and Advisory Council on Historic Preservation by letter on June 8, 2007 regarding the HI Improvement and Expansion planning process. The NPS did not receive any comments from these agencies at the scoping phase. NPS staff then met with the SHPO on June 1, 2009 to discuss several park projects that have sustainability components, including the HI campus plan. At this meeting, the NPS received feedback on the HI project and specific proposals for new solar panel installations and new construction as included in the alternatives in this EA. This feedback has been incorporated into the document.

Native American Consultation

On April 21, 2009, Steve Cancian, HI project manager, met with Paul Scolari, NPS Native American Liaison, Mia Monroe, NPS interpretive specialist, and Nick Tipon, Liaison for Federated Indians of Graton Rancheria, on site at the HI campus to present the project plans and ask the tribe if the proposed Miwok interpretive area was appropriate. Mr. Tipon expressed unqualified support for the interpretive area and agreed to be involved in on-going consultations as the design process continued. He also specifically agreed that it was appropriate to describe the general proposal in the EA, including the location along the enhanced riparian corridor between campus and Mitchell Rd. The park will be consulting with the tribe on the aspects of the project related to the potential for indigenous archeology.

5.2.5 Regional Water Quality Control Board

Section 401 of the Clean Water Act requires that an applicant pursuing a federal permit to conduct an activity that may result in a discharge of a pollutant to a water of the State to obtain a Water Quality Certification (or waiver), verifying that the discharge will not violate state water quality standards. Water Quality Certifications are issued by RWQCBs in California. For this project, the San Francisco Bay Regional Water Quality Control Board would issue a water quality certification for the project to allow permitting under Section 404 of the Clean Water Act. NPS will need to apply for a water quality certification from the Regional Board.

5.3 List of Environmental Assessment Preparers

<i>Name</i>	<i>Title</i>
<u>Total Quality NEPA</u>	
Heidi West	Principal
Kathie Joyner	Senior Analyst/ Project Manager
Jonathan Stewart	Analyst
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Lisa Devoto	Analyst

5.4 List of Contributors

<i>Name</i>	<i>Title</i>
<u>HI Staff</u>	
Steve Rasmussen Cancian	Project Manager and Landscape Architect, consultant to HI
Elizabeth Larose Dunn	HI Director
Cleveland Justis	HI Director (through mid-2007)
Melissa Meiris	HI Education Director
David Paoli	HI Board of Directors, Member
Aaron Rich	HI Director of Sales and Marketing
Duffy Ross	HI Education Director (through mid-2007)
Robert Rugani	HI Board of Directors, Member
Laurel Talbot	HI Director of Operations
Wilford Welch	HI Board of Directors, Chair
Rob Rugani	HI Board of Directors, Co-Chair
<u>Golden Gate National Recreation Area Staff</u>	
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Nancy Hornor	Chief of Planning and Compliance
Craig Kenkel	Chief of Cultural Resources
Matt Kiolbassa	Assistant Fire Chief
Howard Levitt	Chief of Interpretation
Mia Monroe	Interpretive Supervisor, Muir Woods/Marin Headlands
Steve Ortega	Environmental Protection Specialist
Michelle Rios	Architect
Aaron Roth	Chief of Business Management
Jerry Scheumann	Facility Manager
Tamara Williams	Hydrologist

5.5 List of Recipients

Following is the list of agencies and organizations that will receive a copy of this EA.

5.5.1 Federal Agencies

U.S. Fish and Wildlife Service
 Advisory Council for Historic Preservation
 Gulf of the Farallones National Marine Sanctuary
 National Marine Fisheries Service
 Natural Resources Conservation Service
 U.S. Army Corps of Engineers
 Environmental Protection Agency

5.5.2 State Agencies

California Coastal Commission
California Coastal Conservancy
California Department of Fish and Game
California Department of Parks and Recreation
California Department of Transportation
California Native American Heritage Commission
California Office of Planning and Resources State Clearinghouse
California State Lands Commission
California Resources Agency
State Historic Preservation Office

5.5.3 Regional, County, and Municipal Agencies

Association of Bay Area Governments
Bay Area Air Quality Management District
San Francisco Bay Regional Water Quality Control Board
Marin County Community Development Agency
Marin County Department of Public Works
Federated Indians of Graton Rancheria
City of Sausalito Department of Community Development
Sausalito-Marin City Sanitary District
Marin County Board of Supervisors
San Francisco Bay Conservation and Development Commission

5.5.4 Libraries

The following is a list of public venues where the public can access this EA and review the document onsite.

- Mill Valley Library, 375 Throckmorton Ave., Mill Valley, CA; (415) 389-4292
- Marin Headlands Visitor Center, Fort Barry, Marin Headlands, CA; (415) 331-1540
- Sausalito Public Library, 420 Litho Street, Sausalito, CA; (415) 289-4121
- Pacific West Regional Office Visitor Center, Fort Mason, Building 201, San Francisco; (415) 561-4700
- San Francisco Civic Center Public Library, 100 Larkin Street, San Francisco, CA

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Appendix A

NEW SITE SELECTION PROCESS FOR ADDITIONAL OFF-CAMPUS TEACHING AREAS

APPENDIX A.

Site Selection Process for Additional Off-Campus Teaching Sites

Together the Headlands Institute (HI) and NPS have developed the following process to select new off-campus teaching sites:

- A. The Headlands Institute will develop a list of criteria for identifying new sites. This list will be based on the Headlands Institute's needs, but also take into account other programs in the Headlands.
- B. The individual GGNRA divisions of Natural Resources, Cultural Resources, and Interpretation will review the criteria and the Headlands Institute will revise to create a consensus document.
- C. The Headlands Institute and NPS will then organize a series of discussions at the regular Park Partner Educator Meetings to share and brainstorm all possible new sites and then prioritize sites for full exploration.
- D. In anticipation of the first Park Partner Educator Meeting discussions on new sites, the Headlands Institute and NPS will ask all the educators and interpreters working in the Headlands Institute to begin considering and exploring potential new sites. In consultation with NPS, the Headlands Institute will develop a one-page new site profile form that will enable everyone to easily document a site and check it against the criteria.
- E. After the Park Partner Educator Meetings develop a prioritized list of potential new sites, the Headlands Institute will lead the exploration of these sites following the process below. The number of sites explored and the timeline will be determined by the need, including conditions at existing sites and whether and how much the Headlands Institute will be growing. If growth is planned, off-campus sites to accommodate that growth will be explored and approved *before* the growth occurs. Under this adaptive management approach, it is also understood that growth can only occur if it can be accommodated at off-campus sites agreeable to NPS and HI *or* at other sites on campus or elsewhere in the park or area.

The site selection process will start with the list generated at the Park Partners Educator Meetings, and then proceed by the following steps:

- A site selection team (composed of Headlands Institute educators and representatives of other Headlands education programs) will review a prioritized list generated at the educator meetings and refine it based on the criteria and the educational themes for which sites are most needed (for example, if many sites exist for raptor observation, but not enough exist for riparian ecology, riparian sites would be prioritized). The site selection team may visit sites if members are not familiar enough with the locations to make judgments. The goal will be to identify more sites than are needed for each theme to allow additional editing by NPS and avoid any unnecessary concentration of use.
- This edited list will then be shared with the individual GGNRA divisions of Natural Resources, Cultural Resources, and Interpretation for review and comment. If helpful, the Headlands Institute and GGNRA divisions will meet to review the options. If needed, field visits to the new sites will be conducted. After these discussions, the site selection team will propose a final list of new sites for NPS approval. If the potential for new impacts is greater than disclosed in this document, additional environmental analysis will be conducted as needed.
- The site selection team will then use the off-campus site adaptive management program process to determine the thresholds and indicators for each new site.

Appendix B

HEADLANDS INSTITUTE WATER CONSERVATION STUDY



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HEADLANDS INSTITUTE WATER CONSERVATION STUDY

Using water the water conservation and efficiency measures detailed below, the Headlands Institute can reduce its per capita water usage by over 60%. This conclusion is the result analyzing the Headlands Institute's current water infrastructure and examining the quarterly water meter readings and subsequent billing for buildings included in the Headlands Institute Fort Cronkhite Campus during the extended period from the 4th quarter 2001 through the 3rd quarter of 2008.

Peak water use occurred during the 4th quarter of 2002 and the 1st quarter of 2008, lending consistency to the billing scan. The Institutes total water usage in the 4th quarter of 2002 was 401,000 gallons; the total usage in 1st quarter of 2008 was 297,000 gallons. The 4th quarter of 2002 was selected as the baseline peak against which to credit water savings potential. Using 4th Quarter 2002 enables this plan to capture the water conservation measures the Institute has implemented in the last six years; whereas using 1st quarter of 2008 would discount those efforts and underestimate the Institute's peak water usage before conservation.

Two methods for achieving more efficient use of the same amount of water are proposed: high-efficiency fixtures; and changes in use patterns, including using methods and design to enhance monitoring and interpretive value in everyday uses, increased awareness of water conservation, and intramural competition.

Actual per capita water use is difficult to discern exactly due to quarterly metering and variable attendance rates. It is apparent, however, that the greatest opportunity for conservation is in the kitchen and bathrooms. Major water use in commercial food service kitchens occurs at the dishwashing station, which consists of a prep station and the dishwasher itself. The water savings achievable in this area involve replacing the blow-off wand with a compressed air or vacuum wand for removing plate and scullery scrapings. Replacing the existing dishwasher with a modern low-water (low energy) use

completes the package. Commercial dishwashers can use from 0.33 gallons per rack (gpr) to 20 gpr (see chart below).

Savings in dormitory water use involve recovering the saving from replacing the EPAct '92-compliant low flow fixtures with high-efficiency fixtures with equivalent or greater user comfort perception and efficacy, but significant water use reductions. This includes high-efficiency toilets (HETs) rated at 1.1 gpf or better, sink faucet aerators rated at 0.5 gpm, and shower heads rated at 1.5 gpm. Additionally, in the public areas and boys dorms, the bathrooms can be equipped with waterless urinals. The savings from waterless urinals is not included in the chart below due to the difficulty of determining urinal use and flushing with a primarily grade school user group.

Another significant incremental water savings is achievable by upgrading the restrooms in the classroom and lab building (and future buildings). This building represents perhaps the major day-use building in the facility under normal use patterns, and is also a use point for day visitors, a variable and somewhat unpredictable impact. Replacing the conventional toilets with the extremely high-efficient models now available that flush with a 3 oz. solution of soapy water per flush, and waterless urinals, nearly completely eliminates toilet water use. Refitting with 0.5 gpm sink aerators further reduces water use.

The chart below calculates that together these fixture upgrades will reduce per capita water use by 62.75%. In addition to the infrastructure improvements, interpretive features involving the interaction of student campers present a wide variety of opportunities. Making water conservation, management, treatment, recycling, and reuse a visible and participatory part of the Headlands Institute experience can both increase awareness and conservation and greatly reduce water use. Meters in each building are now usually located in the mechanical rooms, but by adding either telemetry to remote meters or relocating the metering to the building lobbies, with a readily readable daily total and counters, could be used to foster competition between dorms, between boys and girls, and between past 'record holders' for lowest water use.

The high-efficiency fixtures can also be set up as interpretive features with signage and technical schematics. In addition, use of graywater from showers and sinks in the landscape, for the establishment of drainage corridor uplands, a cypress grove, and other building landscape or green breaks, can be designed as part of the teaching program. At the same time, the amount of wastewater conveyed to the sewer system would be reduced.

While some of the solutions developed in this analysis incur no increased cost, others may come at somewhat of a premium. As an offset to this, and due to the nature of the Institute, this project is an attractive target for donations by many of the manufacturers of equipment that could be incorporated. Once options are decided upon, a solicitation of donated equipment can reduce the capital budget for updating and expanding the facilities.

Impact of Water Conservation and Efficiency Measures

Building	% of overall water use that occurs in this building	Current Technology	% of water used by current technology	Proposed Technology	% change in water use realized by change to new technology	% change in overall water use realized
Kitchen						
	28.5%					
		Dishwasher Station Pre-Rinse Valve	50%	Air-Knife	100%	14.25%
		Dishwasher	40%	High Efficiency Dishwasher	50%	5.7%
Dorms						
	48%					
				Changes since 2002	30%	15.8
		Showers 2.5 gpm	20%	Showers 1.5 gpm	40%	2.6%
		Toilets 1.6 g/flush	50%	Toilets 1.1 g/flush	32%	5.2%
		Sinks 2.5 gpm	30%	Sinks 0.5gpm	80%	7.7%
Classrooms Lab (Day Use Bathroom)						
	12%					
				Changes since 2002	25%	3%
		Toilets 1.6 g/flush	78%	Foam Flush	98%	6.9%
		Sinks 2.5 gpm	22%	Sinks 0.5gpm	80%	1.6%
TOTAL SAVINGS						62.75%