

# BREAKING THROUGH BARRIERS

## NAVAL AIR STATION- PENSACOLA



## SUSTAINABILITY

*Sustainable development is a new way of looking at what we do and how we do it. It means integrating the demands of our economy with the ability of our environment to sustain us today and for future generations.*

*There is no easy route to sustainable development, no sudden dramatic solution to the problems before us, no magic wands.*

*Beaches do not clean themselves instantly; our atmosphere will not be instantly free of harmful substances.*

*Environmental improvement requires persistence and dedication. It involves doing some big things and a lot of little things better.*

*For individuals it involves how to shop, how to deal with household waste, how to travel from place to place.*

*For companies it involves where to locate a plant, the kind of new machinery to buy, how much water, energy, paper, and chemicals to use.*

*For government it means properly planning policies, setting tough but realistic targets (with budgets to meet them), and reporting on progress – regularly, publicly.*

*Everybody works or nothing works.*

*Sustainable development really means planning for life.*

From Canada's "Green Plan in Brief"

*Man is a product of nature. He has been created according to the laws of nature. If he is sufficiently aware of those laws, if he obeys them and harmonizes his life with the perpetual flux of nature, then he will obtain (for himself) a conscious sensation of harmony that will be beneficial to him.*

-Le Corbusier, The Open Hand

*A hundred years ago, Louis Sullivan proclaimed that "form follows function." Based on a deeper understanding of how our forms and fate are shaped by ecologically interconnected flows of energy, information, materials and resources, a better dictum for today might be "form follows flow."*

- Ecological Design Institute

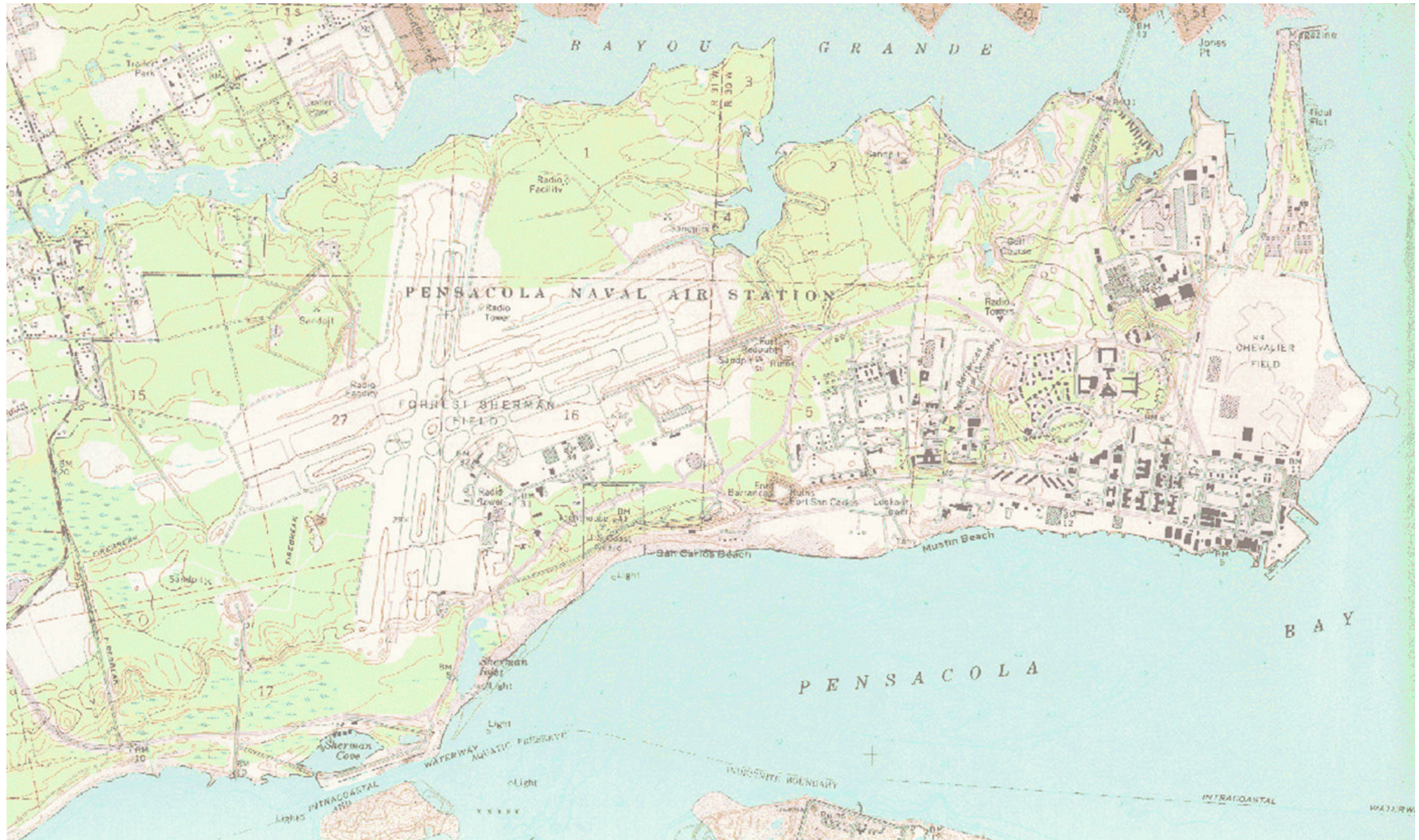
Architecture can be defined as the interaction of energy and material resources resulting in place. Architecture, in creating place, is creating nature, or rather a synthetic version thereof. As Corbusier implies, harmony can be achieved by learning from nature. As we have evolved from nature, so has our built environment. We stand to gain tremendously from a reconciliation of these two worlds. Professionals in the design, development, and construction fields are finding themselves in the position of being able to bridge the gap. Doing so requires a comprehensive approach to design, where architecture and planning includes more than just the immediate. Architecture has progressed from primitive mud huts, to encompass community and ecology- in essence the whole fabric of our surroundings. This requires an interdisciplinary approach that integrates architecture, design, planning, chemistry, biology, environmental sciences, resource management, and civil engineering. Working together with these other professions gives us the opportunity to better understand the implications of our work, and the role it plays in our ecosystems.

In participation in the "Breaking through Barriers" design competition, we seek to identify the inherent architecture of natural systems and how these can be emulated in our own systems. Understanding our ecology, we come to realize that all living systems are cyclical, in that waste becomes food. Waste is a necessary and important component of the food chain, however, often in our "throwaway" society and industries, we neglect this potential. Architects and planners can design places and communities to be sustainable and more efficient, where waste becomes reused as a valuable commodity. We are attempting to identify and explore an architecture of waste, and its role in our built environs.

We pose these questions in the context of the Pensacola Naval Air Station. In formulating a master plan, we seek to explore sustainable solutions to existing problems facing the local ecosystem, and eliminate future conflict with the environment. The traditional military base is shifting in form and function. In this new age of information and understanding, we see this as an opportunity to set an example for others. Where architecture and planning, approached sustainably, can positively impact our environment, making it better than it was before any intervention. The potential of this project includes the establishment of a model of sustainable design, that might serve as a learning resource for future generations of builders.

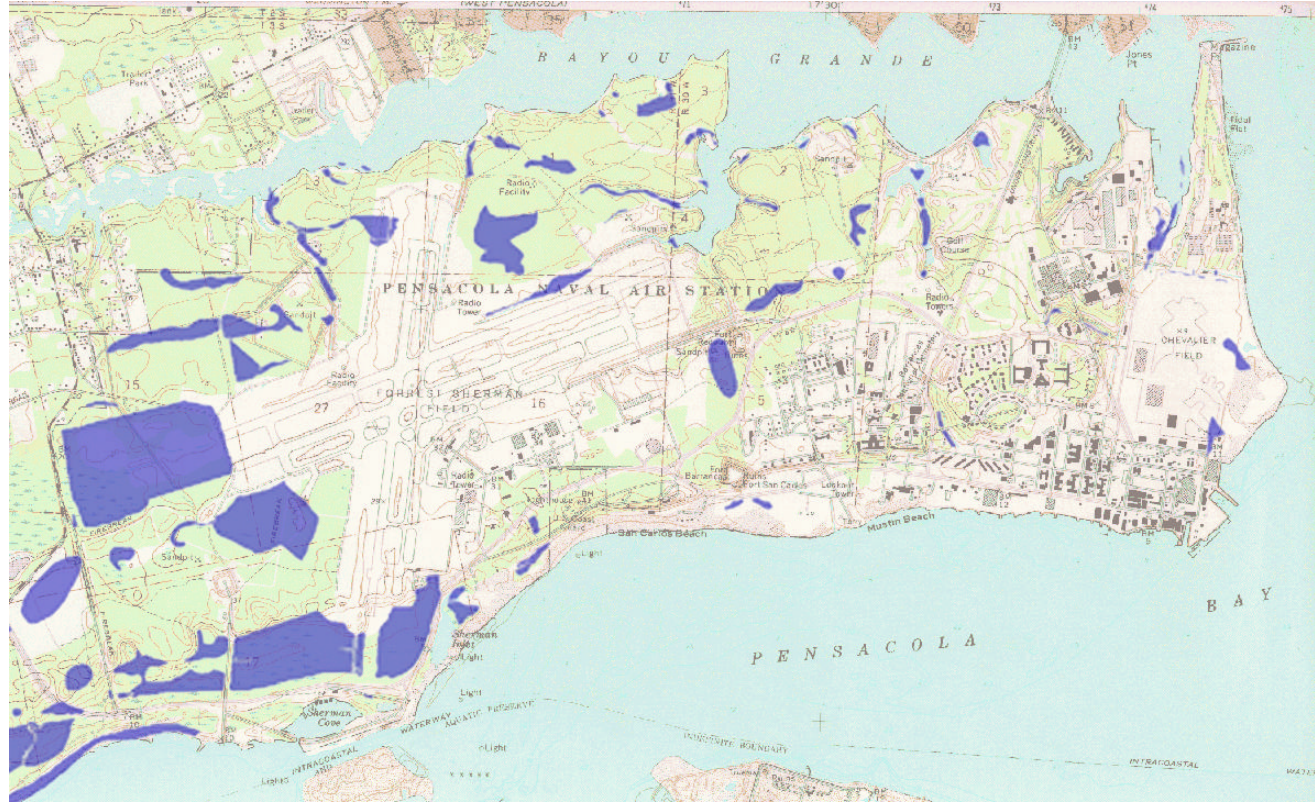


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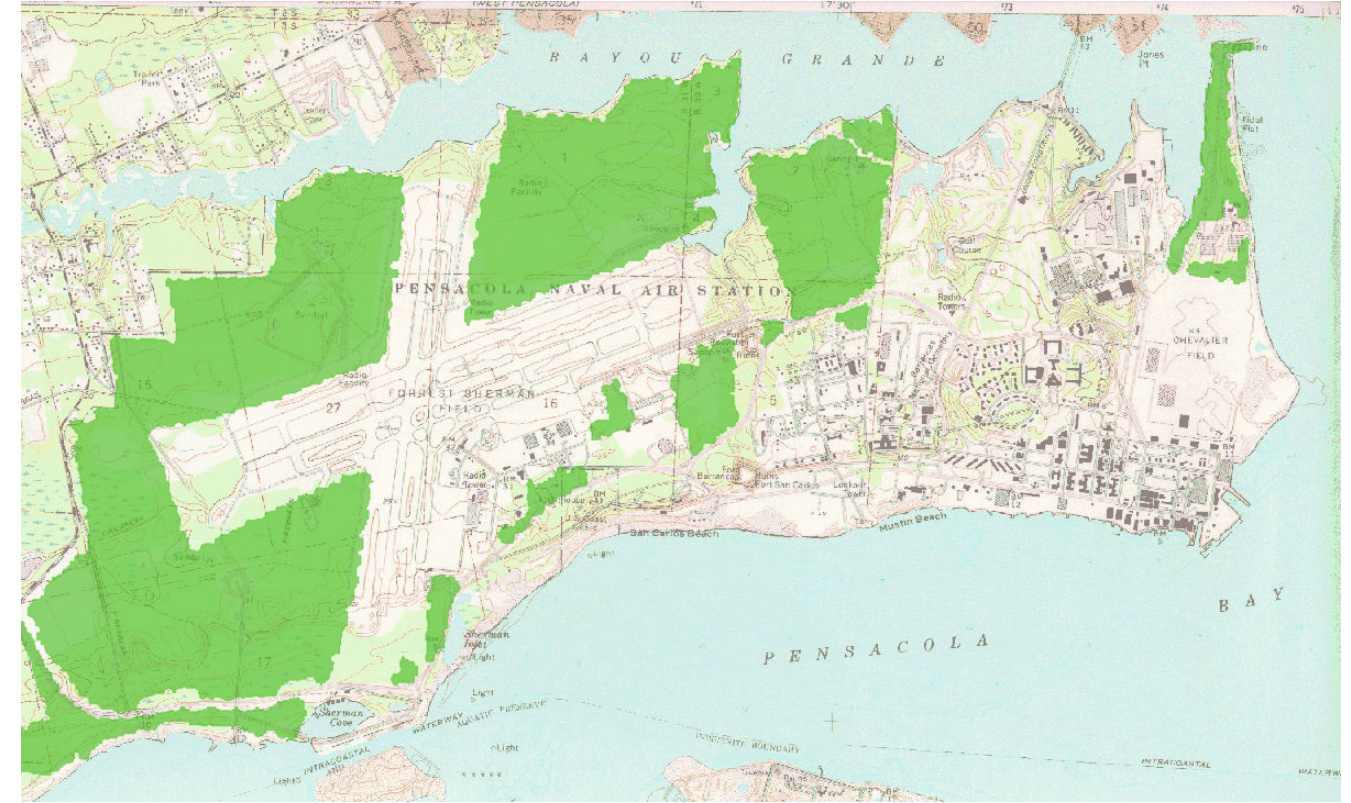




## Wetland Locations



## Forested Land



### Important Wildlife Habitats

The plants and animals we are trying to protect almost exclusively inhabit three habitats: coastal marshes and wetlands, beaches, and forested land. If at all possible, these three habitats should not be disturbed, and human traffic should be kept at low levels. Prior to any new construction, the proposed construction site should be surveyed and studied to determine potential problems with threatened, endangered, and sensitive species. Some species could be moved or transplanted if necessary. Also, environmentally unfriendly practices should be centralized in a non-environmentally sensitive area to minimize the risk of potential disaster.



**Endangered Species**

There are several threatened and endangered species of special concern in the NAS- Pensacola area. The intrusion of humans and the destruction of wildlife habitat as well as the introduction of xenobiotic and natural pollutants has endangered many of the native species in the area. Obviously, the expansion of the base is going to cause more problems for the resident and migratory wildlife. Our objective is to minimize the damage to the local ecology as well as provide an opportunity for the restoration of the native habitat.

The following is a list of species of special concern in Pensacola. These species should be protected and encouraged to repopulate Pensacola.

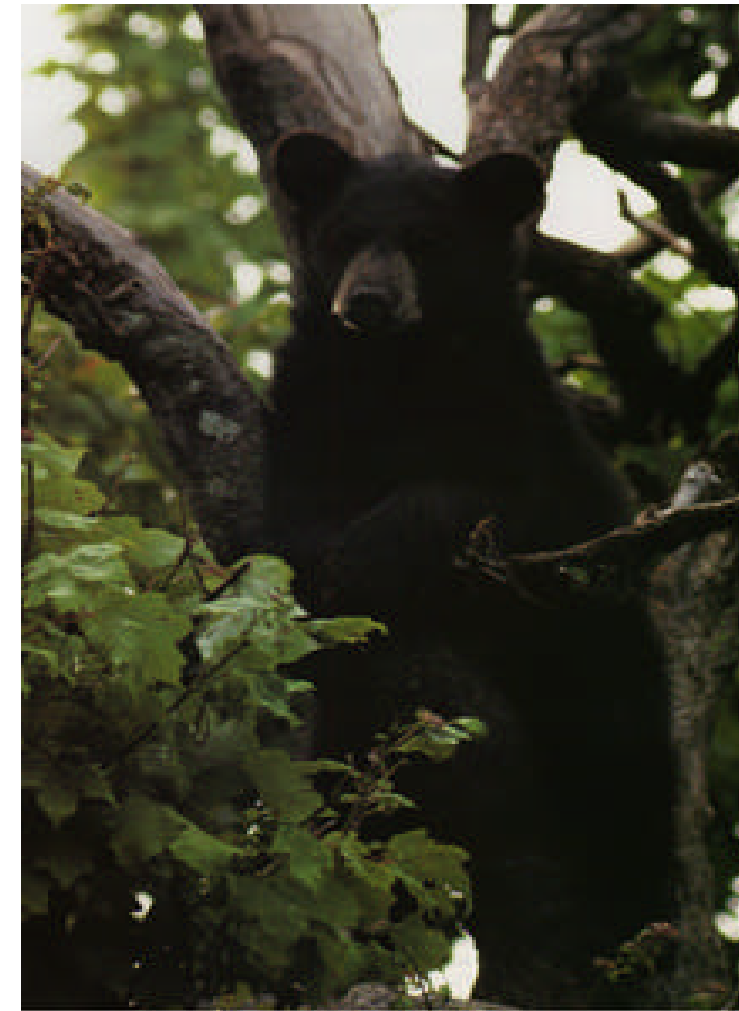
Loggerhead Turtle  
 Leatherback Turtle  
 Atlantic Ridley Turtle  
 Perdido Key Beach Mouse  
 Florida Black Bear  
 Arctic Peregrine Falcon  
 Bald Eagle  
 Water Sundew  
 Heartleaf  
 Panhandle Lily  
 Orange Azalea

Green Turtle  
 Hawksbill turtle  
 Eastern Indigo Snake  
 West Indian Manatee  
 Southeastern Snowy Plover  
 Southeastern Kestrel  
 Cruise's Golden-Aster  
 Trailing Arbutus  
 Mountain Laurel  
 Large-leaved Jointweed  
 White and Red Pitcherplant





### 100 Year Flood Plain

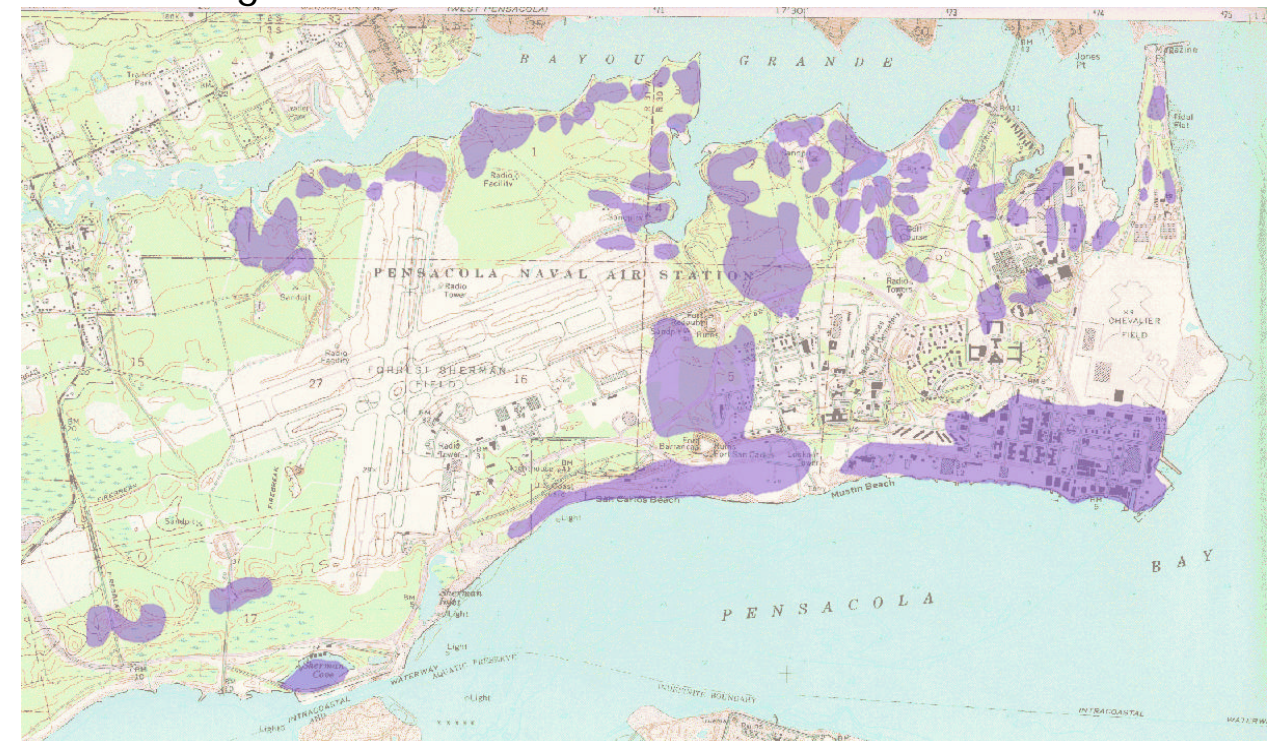


### DEVELOPMENT SENSITIVE AREAS

The 100 year flood plain provides an obstacle for future development of NASP. Any building in this area would be a high risk. This area also often coincides with federally protected areas, which can also limit construction.

These highlighted areas are suspected to be of archaeological and historical importance. Any building activity in these areas should be investigated thoroughly for any artifacts that could be pertinent to local history. This will alleviate any unforeseen delays and cancellations in the building process. Information obtained could also prove valuable to the historic- tourism industry.

### Archaeological and Historical Areas





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## Management recommendations

With the large number of endangered species at NASP, wildlife management is difficult and extremely complex. The beaches and marshes must be protected from human interference, since they are the habitats and breeding grounds of almost half of the endangered animals living in and around NASP. A small fraction of the more fragile habitats should be accessible to the public, via bike paths and raised wooden walkways, to promote public understanding and appreciation for wildlife and endangered species. On these, "people trails" tours will be held and signs posted to educate the public about the importance of preserving wildlife in its natural habitat. The remaining habitat should be left undisturbed, and human traffic should be discouraged. Other similar wildlife areas will be established in the forested areas and around endangered plants. Field trips and scientific research throughout the base could also be encouraged.





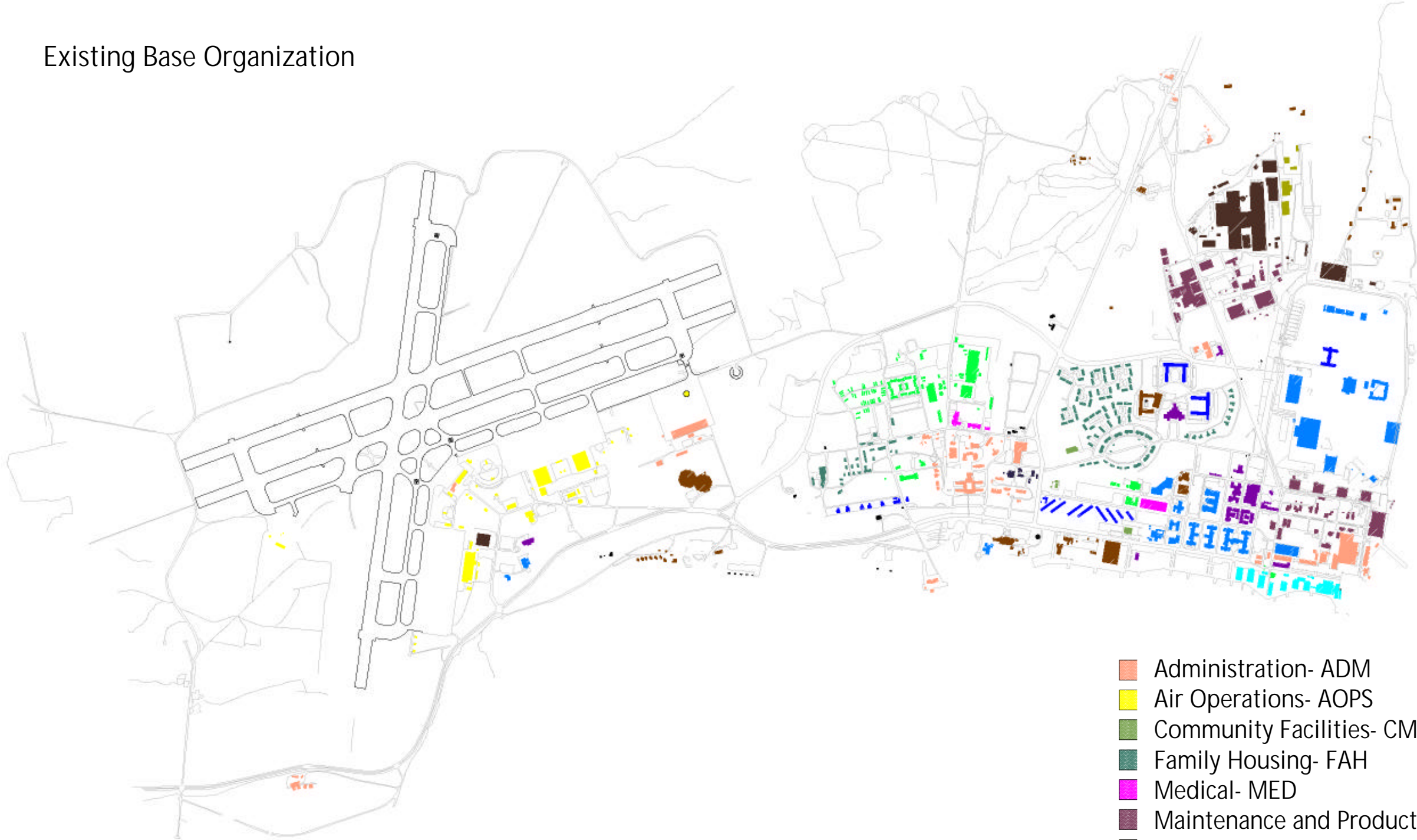
Existing Base Footprint



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Existing Base Organization



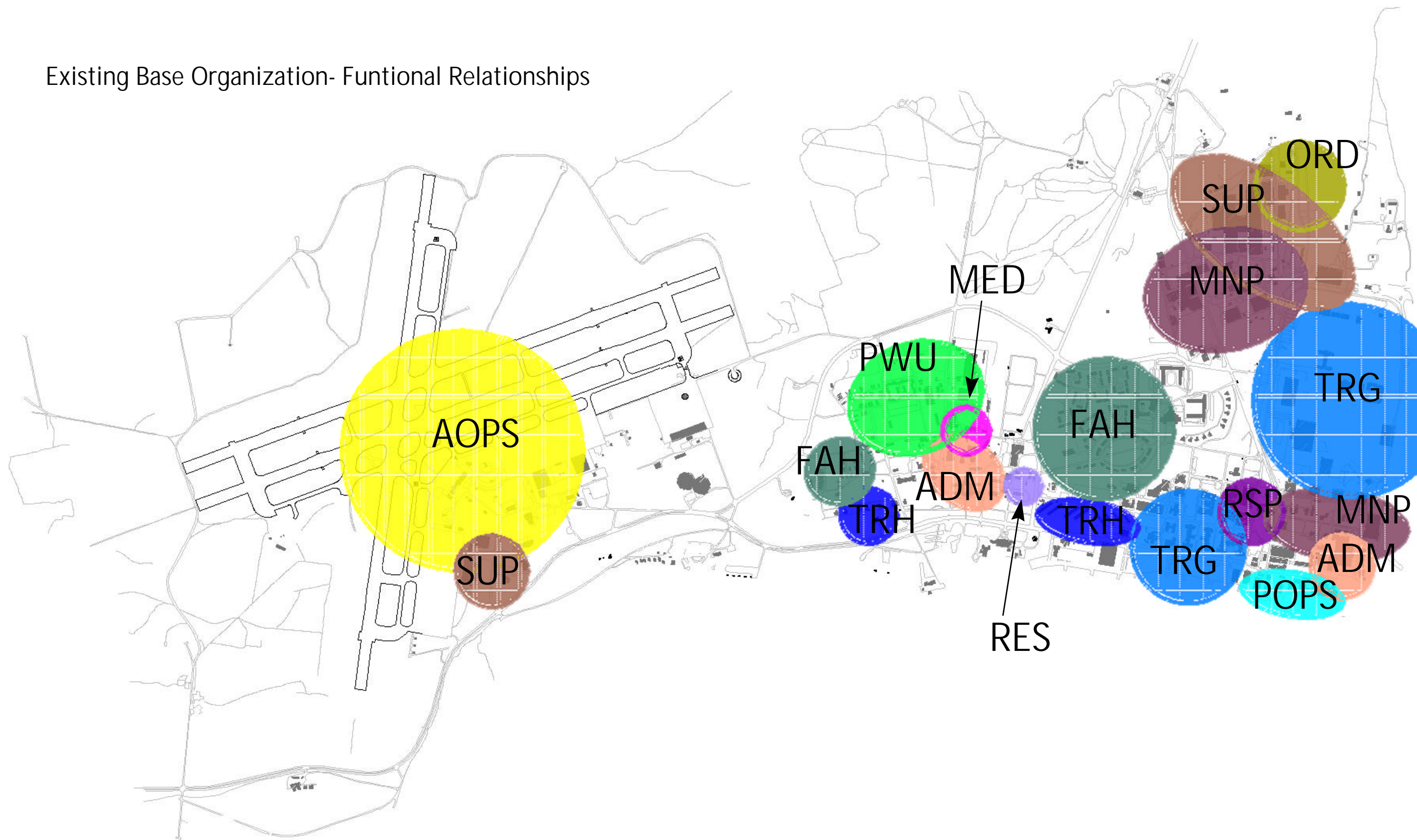
- Administration- ADM
- Air Operations- AOPS
- Community Facilities- CMF
- Family Housing- FAH
- Medical- MED
- Maintenance and Production- MNP
- Ordnance- ORD
- Port Operations- POPS
- Power Works and Utilities- PWU
- Recreation- REC
- Research- RES
- Residential Support- RSP
- Supply- SUP
- Training- TRG
- Troop Housing- TRH

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Existing Base Organization- Funtional Relationships

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# Ideal Base Organization

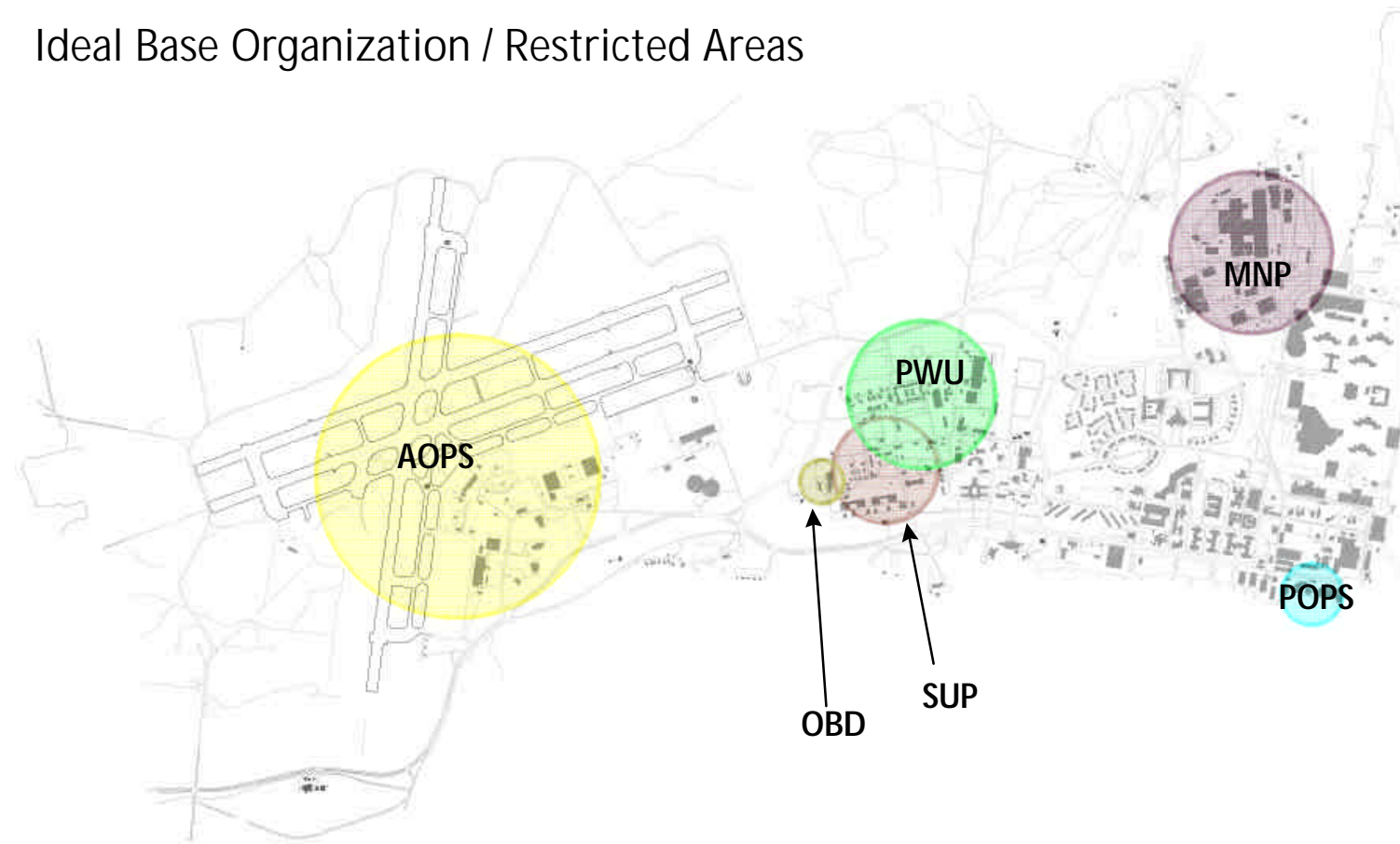
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- Research- RES
- Residential Support- RSP
- Supply- SUP
- Training- TRG
- Troop Housing- TRH



## Ideal Base Organization / Restricted Areas



General public access includes the following areas:

- |                     |                      |
|---------------------|----------------------|
| Administration      | Community Facilities |
| Family Housing      | Medical              |
| Recreation          | Research             |
| Residential Support | Training             |
| Troop Housing       |                      |

These areas form the heart of NAS Pensacola. Historically referred to as the Old Navy Yard. This plan aims to create a campus-like feel to the base community. This is quite appropriate, given NASP's prominent role in naval education. Breaking through barriers attempts to soften the military presence of the base, while promoting a strong sense of community.

- |   |   |
|---|---|
| <span style="color: orange;">■</span> Administration      | <span style="color: purple;">■</span> Research            |
| <span style="color: green;">■</span> Community Facilities | <span style="color: brown;">■</span> Residential Support  |
| <span style="color: teal;">■</span> Family Housing        | <span style="color: blue;">■</span> Training              |
| <span style="color: magenta;">■</span> Medical            | <span style="color: blue;">■</span> Troop Housing         |
| <span style="color: brown;">■</span> Recreation           | <span style="color: blue;">▨</span> Future Family Housing |

## IDEAL BUILDING USAGE

Restricted access includes the following areas:

- |                               |                                  |
|-------------------------------|----------------------------------|
| AOPS - Air Operations         | MNP - Maintenance and Production |
| ORD - Ordnance                | POPS - Port Operations           |
| PWU - Power Works & Utilities | SUP - Supply                     |

Due to the sensitive nature of many naval operations, this planning approach serves to preserve security, without alienating the remainder of the base from the mainland. Pedestrian and motorized traffic is discouraged throughout the area, and is serviced by restricted military-only public transportation.

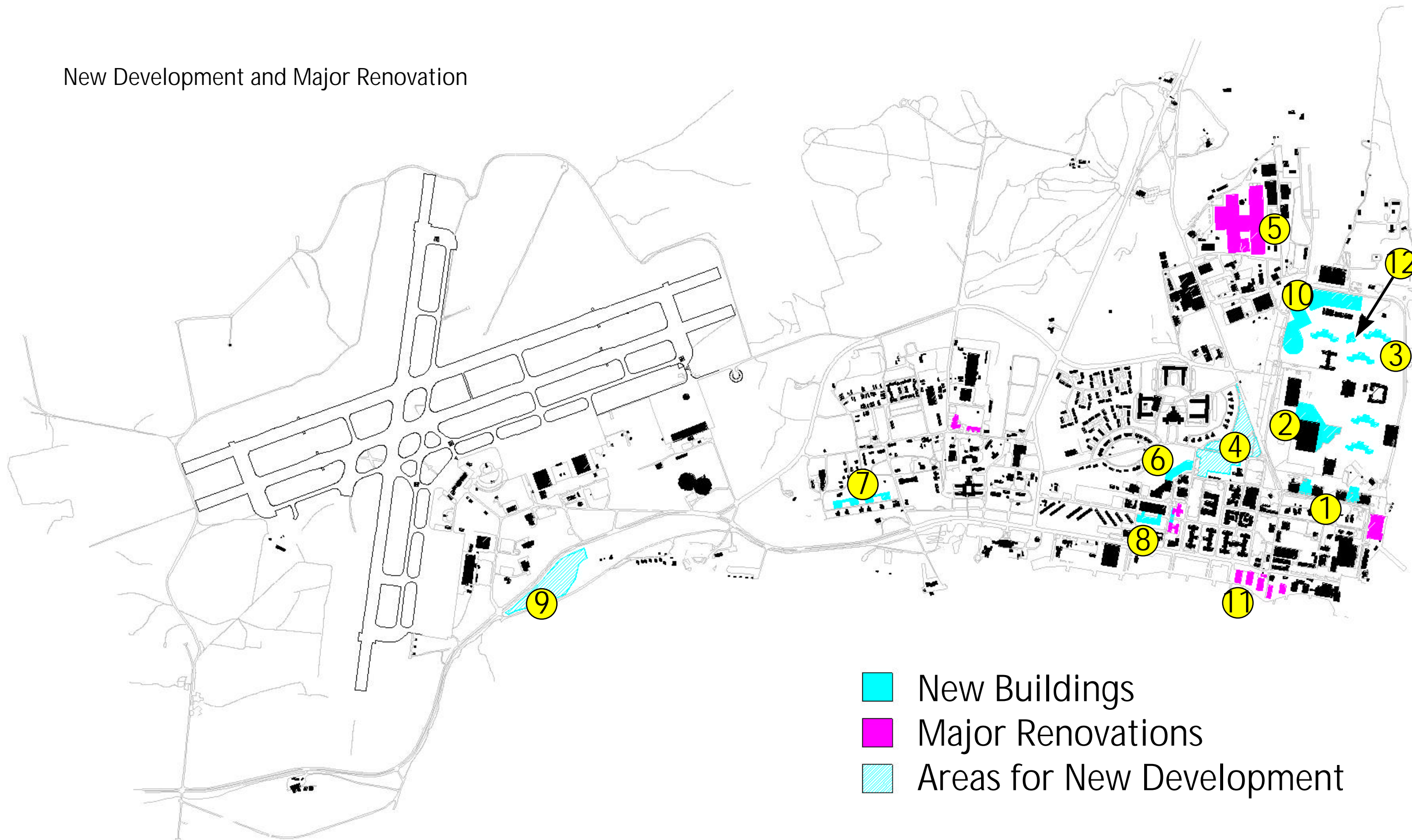
This plan calls for the consolidation of Maintenance and Production operations to the area northwest of Chevalier Field, formerly a mixed use area shared with Supply operations. This siting is closest to the mainland, so as to provide easy access for off-base employees, as well as delivery and shipping routes, minimizing traffic and congestion. Supply and Ordnance operations are relocated to a centralized facility south of Power Works and Utility operations, creating an industrial park-like setting.



Ideal Base Organization/ Community Area



New Development and Major Renovation





## NEW DEVELOPMENT

New development includes the incorporation of the Naval Air Technical Training Center (NATTC), relocating from Memphis, Tennessee. Development is primarily located at Chevalier Field, and areas directly south.

- ① Operations Building- 2 @ approx. 60,000 sq. feet  
Two infill buildings incorporating atrium spaces.
  - ② Training Center- approx. 215,000 sq. feet  
New building as infill between two existing structures.
  - ③ Dormitory Building- 5 @ approx 80,000 sq. feet  
Refer to Prototype Dormitory Plan
- Classroom Buildings-  
Renovation of existing facilities south of Chevalier Field, vacated by the relocation of Maintenance and Production operations.
- In addition to the incorporation of NATTC, new development includes the following facilities:
- ④ Expanded Family Housing Area-  
Central community location will replace housing lost to the relocation of Supply operations, along with meeting existing and future housing needs. Structures will be in the form of townhouses, rather than single family detached units. This will reduce waste, energy consumption, and construction costs. Pedestrian oriented development is stressed, with vehicular traffic limited to alleys behind structures.
  - ⑤ Navy Resale Distribution Center- approx. 166,000 sq. feet  
This major renovation of the former supply warehouse employs a large percentage of base employees in the repair, reuse, and resale of base items. Location allows for easy access by employees and truck deliveries from off- base.
  - ⑥ Survival Training Educational Facility- approx. 50,000 sq. feet  
Accommodated by the expansion of the existing Survival Training Educational Facility.

- ⑦ Supply Building- 4 @ approx. 18,000 sq. feet  
Will be the operations center for relocated Supply facilities.
  - ⑧ Medical Building- approx. 45,000 sq. feet  
Accommodating both base medical facilities and those needed by the incorporation of NATTC. Located across from existing medical and dental clinic. It will be the centerpiece for relocated Medical Center.
  - ⑨ Area for Wind & Solar Energy-  
South of Sherman Field, located along the coastline to take advantage of ocean winds, this area will provide for the generation of clean, renewable energies.
  - ⑩ Chevalier Plaza-  
A mixed use facility at the northwest corner of Chevalier Field, this will house a visitor's center, base historic museum & society, four level parking garage, and retail space. This will serve as the significant introduction to the base, located adjacent to a major transit stop. The construction of retail is in hopes of alluring local businesses to the base.
  - ⑪ Recreation Complex- 3 @ approx 70,000 sq. feet  
A major renovation of abandoned warehouses adjacent to pier area.
  - ⑫ Chevalier Amphitheater- seating for approx 2,000  
Located among development on Chevalier Field site, this outdoor arena will be a place of community congregation and entertainment.
- Food & Plant Production Areas-  
New dormitory building will house attached greenhouses dedicated to producing vegetables, flowers, herbs, and landscaping plants for utilization on the base.

Vehicular access alley for pedestrian oriented development



from The Next American Metropolis, by Peter Calthorpe



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## CONSTRUCTION

The development of NAS- Pensacola involves much in the way of new construction as well as the demolition of some existing structures. It is important to deal with each individual activity as part of a larger whole. If one building needs to be torn down, then as much recyclable material as possible should be salvaged during demolition so that it may be used again in another structure (i.e. recycled crushed concrete used as aggregate in other concrete applications) or can be used in order to return the demolition site to its original appearance (Large rubble and concrete used as in-fill ). Criteria pertaining to the percentages of recyclable materials that is to be implemented into a structure, needs to be set. By specifying the amount of recyclable materials that can be included, future recycling can be quantified easier. In some instance it may even be appropriate to require a demolition/recycling bid along with the initial construction bid. This allows an up front evaluation of the future environmental impacts of the planned project. The project can be assessed in terms of its long term effects on the environment and the bidding contractor can be held responsible for the recycling options that are included in the original bid. Future sustainable development will have to be receptive to changing paradigms relating to the scope of a project, including its life cycle environmental impacts.



### Architectural Precedents





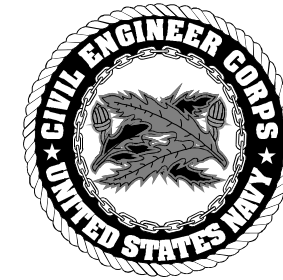
BASE ENVIRONMENTAL OFFICE

In addition to initial planning, a healthy and efficient environment requires careful supervision. This requires a comprehensive approach that includes extensive oversight of planning, construction, and facilities management. Breaking Through Barriers proposes the establishment of a Base Environmental Office, which would work to implement sustainability throughout the base. The office will incorporate the:

- Officer in Charge of Construction (OICC)
- Resident Officer in Charge of Construction (ROICC)
- Regional Environmental Health Office (PREVMED)
- Navy Public Works Unit (PWC)
- Naval Construction Battalions
- Base Historian Office

Sustainable Development is also about the sharing of ideas and knowledge. In promoting ethical design, the Base Environmental Office will establish a sustainable workshop at the base, inviting local professionals, environmental concerns, other interested parties, and possibly students from Florida A&M University's Sustainable Design and Planning Graduate Program. Additionally, the office will oversee educational outreach programs aimed at teaching all ages about the potentials of and need for sustainability and a healthy environment.

The Base Environmental Office will also sponsor additional design competitions for future development. These competitions will stress the environmental and economic implications of sustainable design. Breaking through Barriers proposes that the first might be the sustainable development of a recreation complex located adjacent to the pier area. The program involves the incorporation of community, recreation, and tourism, as well as the dock. This area of historic importance, where existing abandoned warehouses are slated to be torn down. The competition also includes the establishment of a launch dock on the site, for a pedestrian ferry across the Escambia Bay, to Santa Rosa Island and Fort Pickens. While being an integral part of NAS-Pensacola's history, access is limited to a forty minute, full-circle drive northwest through Pensacola, south through Gulf Breeze, and finally west across the island. It is an enormous expenditure in energy, considering Fort Pickens is a mere few thousand yards across the bay.



Florida A&M University



Naval Air Station, Pensacola, Fla.

OFFICIAL U. S. NAVY PHOTOGRAPH

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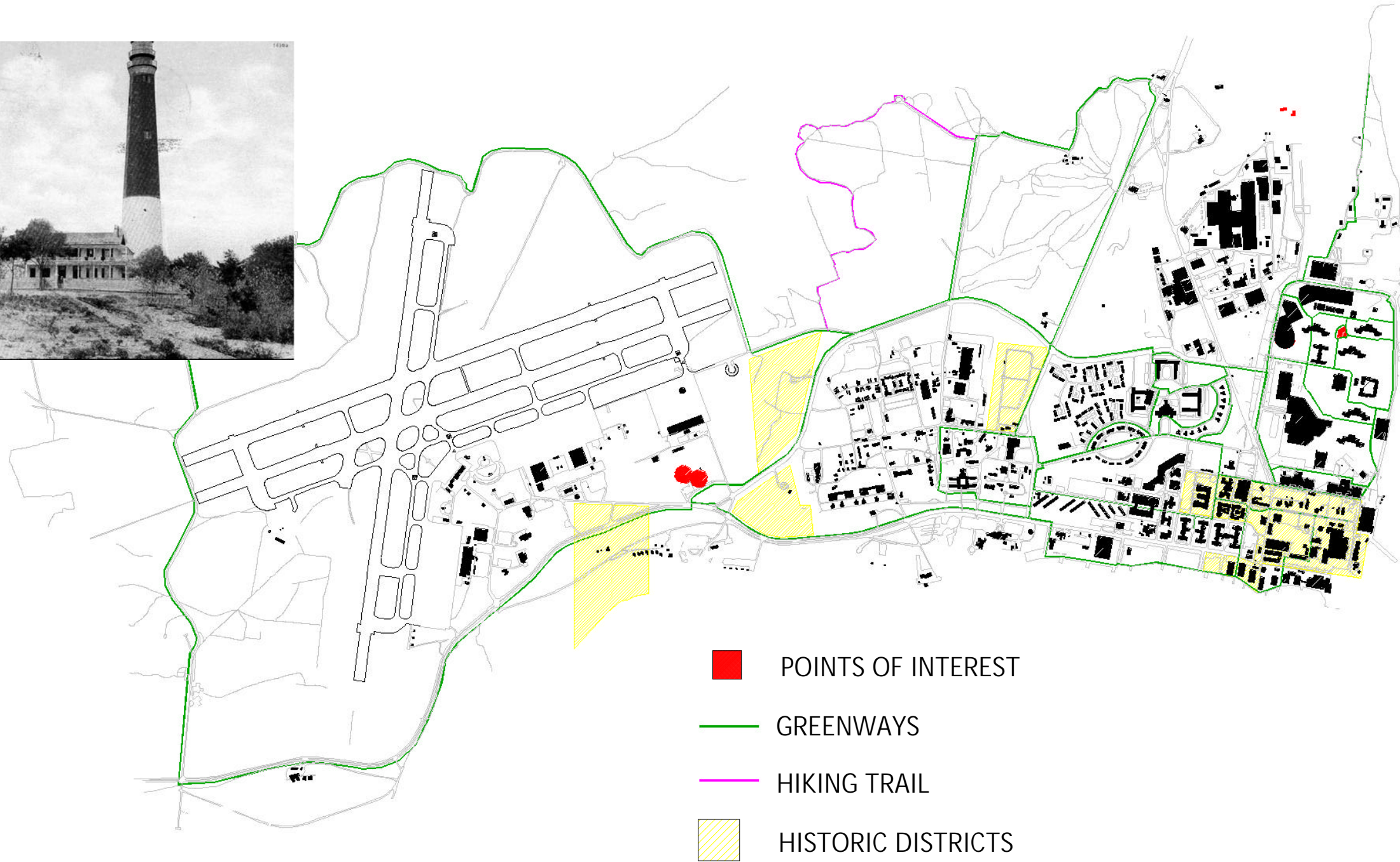
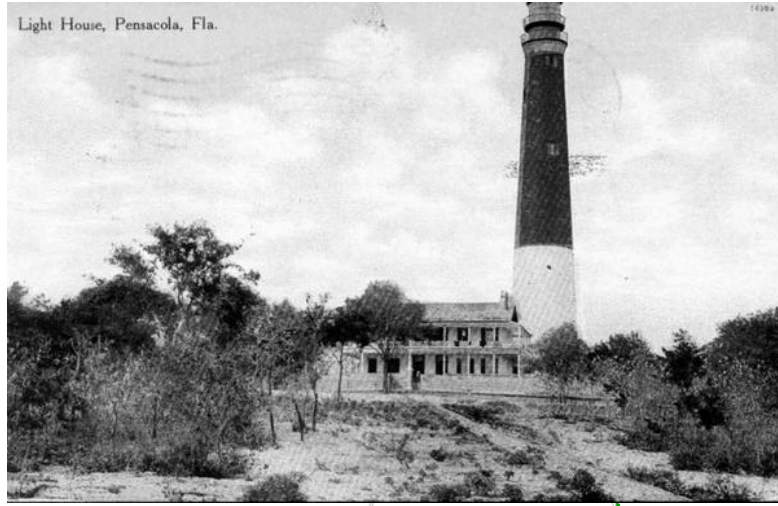


Boat Basin, U. S. Naval Air Station, Pensacola, Fla.

OFFICIAL U. S. NAVY PHOTOGRAPH

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**ECO- TOURISM**

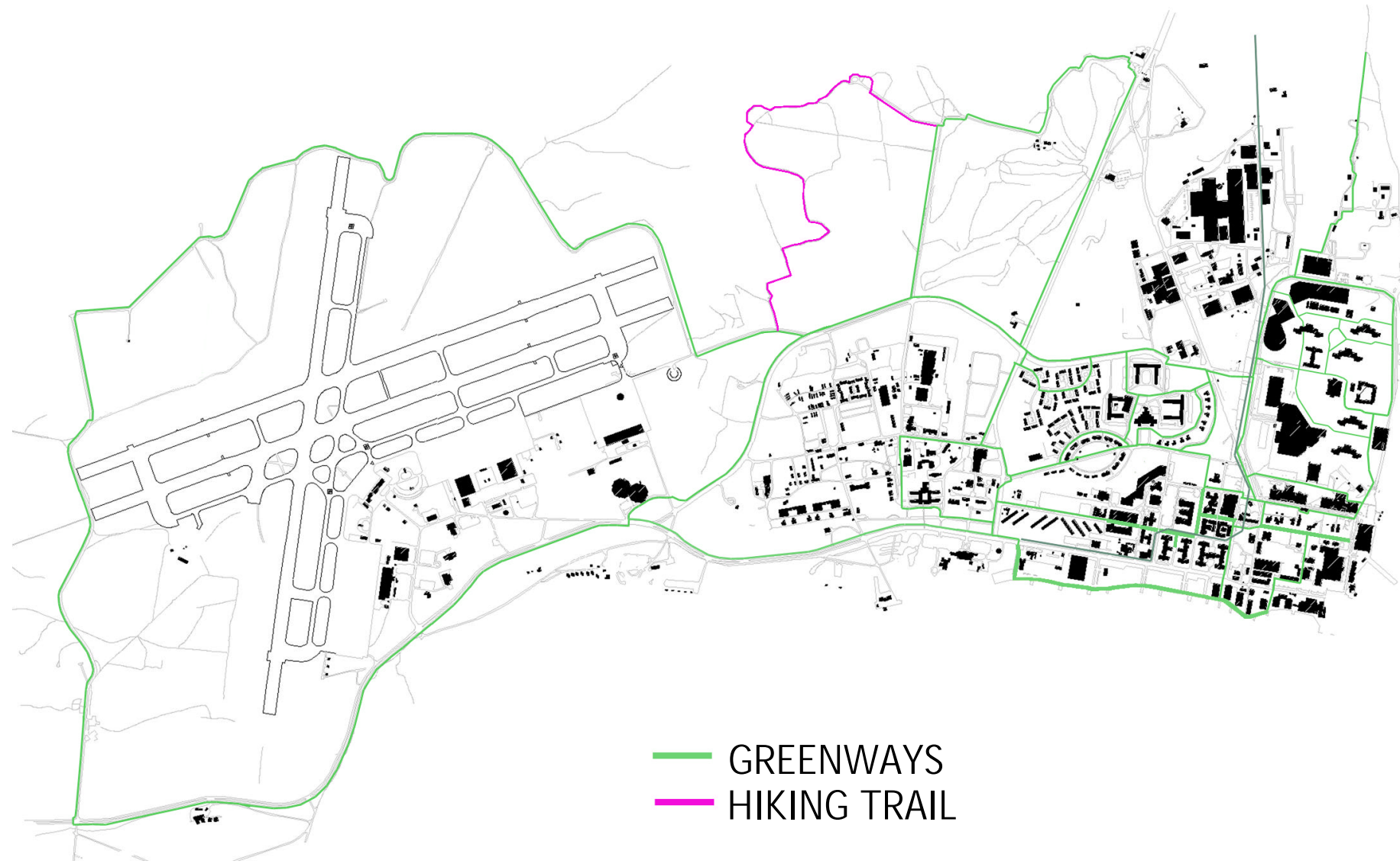
To achieve a sharing of sustainable knowledge and ideas, NAS- Pensacola must actively open itself to tourism. The base will serve as a living model of sustainability as well as a place of historical importance. The Navy should take a highly involved role in promoting eco- tourism, stressing the preservation and enhancement of cultural and historical areas, while sharing them with the general public. Tourism, being one of the major industries in western Florida, also has the opportunity of creating revenue, both from tourists and from retail attracted to the base by tourists. The National Park Service has established the Guiding Principles of Sustainable Design, which outlines sustainable tourism and development strategies for our National Park System. The Department of the Navy should treat NAS- Pensacola along similar lines.



- HISTORIC DISTRICTS:**
- Fort Barrancas
  - Fort Redoubt
  - Pensacola Lighthouse
  - Barracas National Cemetery
  - Old Navy Yard

- POINTS OF INTEREST:**
- National Museum of Naval Aviation
  - Visitor's Center/ NASP History Museum
  - Sailing Facility
  - Chevalier Amphitheater





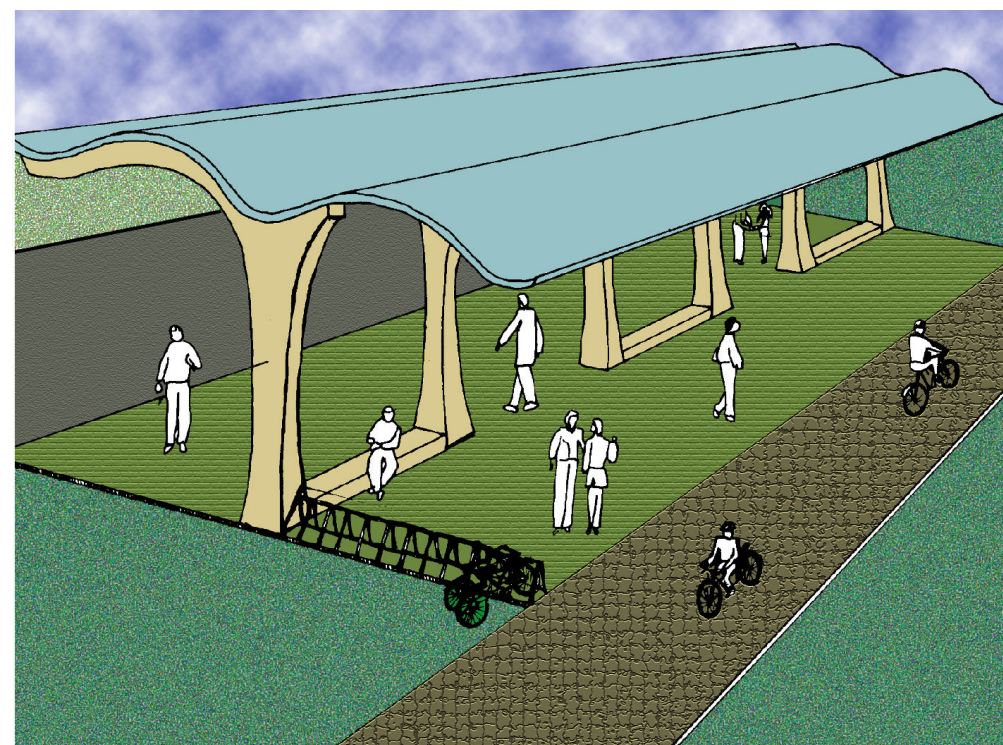
— GREENWAYS  
— HIKING TRAIL

## GREENWAY SYSTEM

In an effort to make NAS- Pensacola a tighter pedestrian oriented community, Breaking through Barriers proposes the establishment of a "Greenway" system. This encompasses a series of sidewalks, bike paths, bike pavilions, pedestrian avenues, and nature trails. The purpose is to provide a network of alternative transportation routes around the base, encouraging pedestrian and bicycle traffic, and the use of a public transportation system that is closely allied with the greenways.

The greenways will also be used to provide an educational tour of the base, taking the visitor through historic and scenic areas. Along the greenways, there will be signs illustrating sustainability at work, as well as signs explaining the historic sites and natural areas. The user/ visitor will be taught about how important these natural areas are and the role they provide in the ecosystem. Northeast of Sherman Field, along the Bayou Grande, the greenway will become exclusively a nature trail, off limit to bicycles. Visitors can travel around this area to continue the educational tour of the natural areas. Residents may well use the greenway system as an exercise loop and for various additional recreational uses.

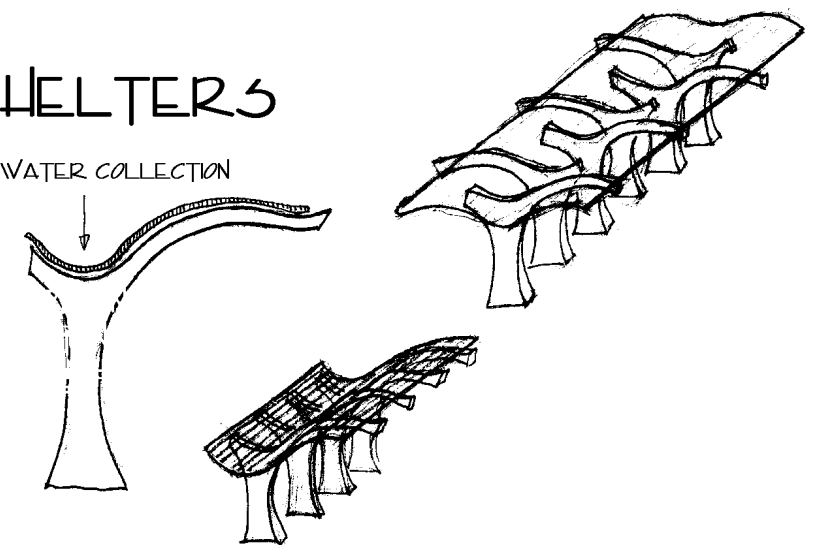
Construction of the greenway system will vary according to the conditions immediately at hand. It will take various forms along the way, each best suited to upholding the environmental integrity of the area. In most cases, the greenway development is limited to following existing roads so as to minimize the negative impact of construction.



## GREENWAY SHELTERS

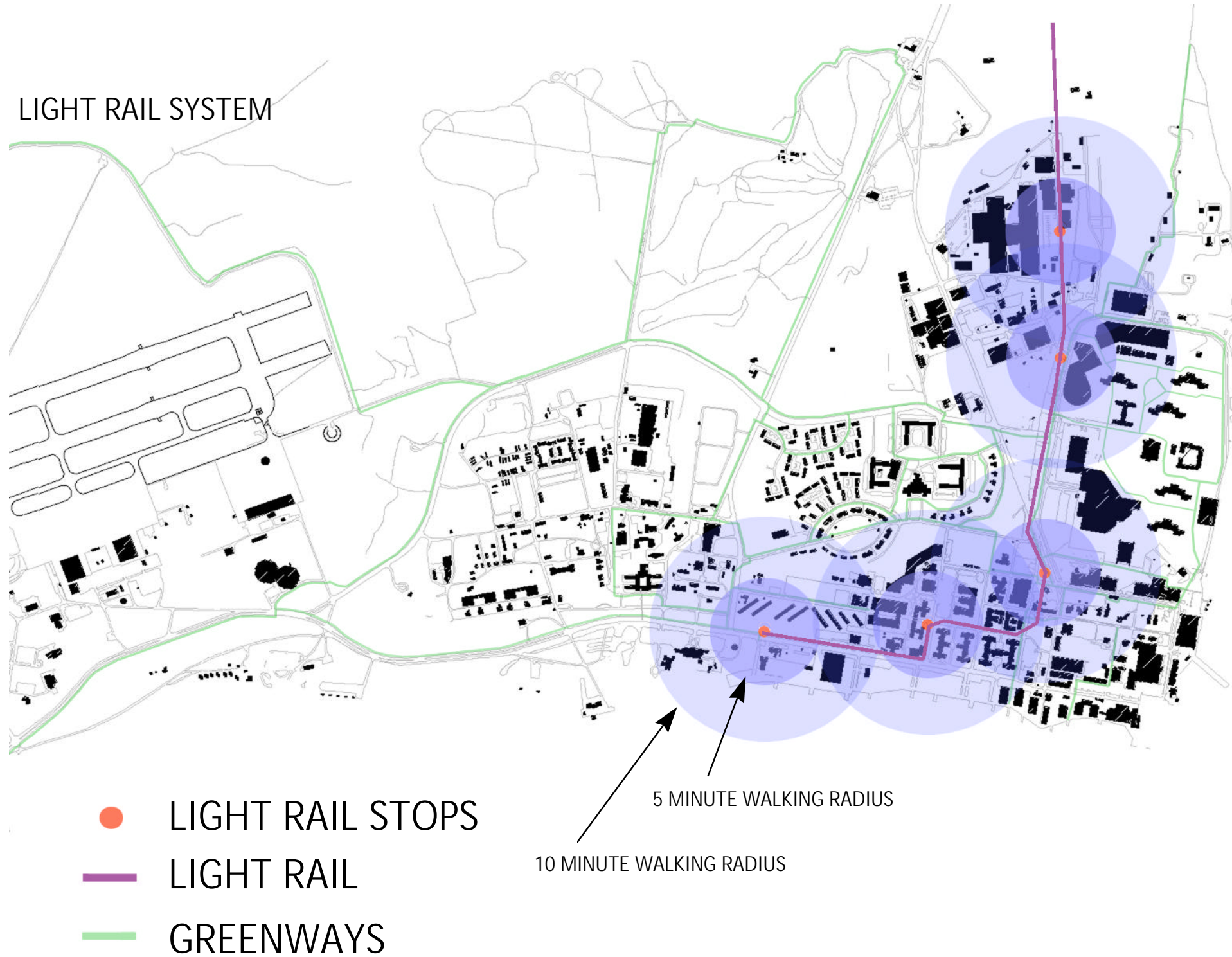
REST  
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RAINWATER COLLECTION





LIGHT RAIL SYSTEM

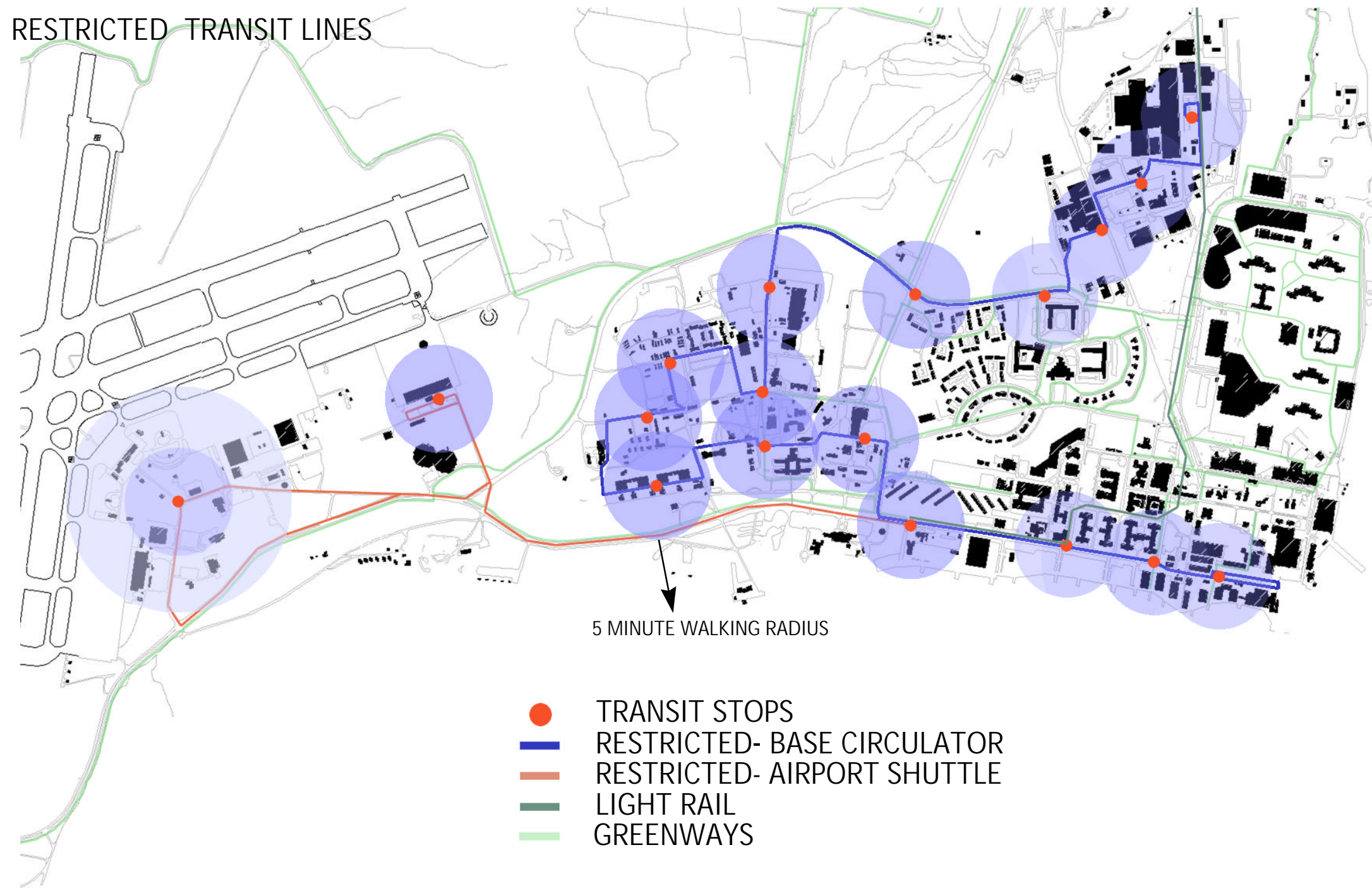


LIGHT RAIL SYSTEM

In order to minimize vehicular traffic, and the air pollution associated with it, Breaking through Barriers proposes the creation of an alternatively powered transit system to serve visitors, residents, and employees of NAS- Pensacola. The first level of transit is the establishment of an electric powered light rail system, to follow the foundation of an old marine railroad that was abandoned prior to 1907. The light rail will be serviced by a park and ride lot across the Bayou Grande Bridge in Warrenton. This is an effort to keep excess vehicles off the base altogether. The idea of a light rail system will encourage the use of public transit, and will be integrated into the whole visitor experience. The visitor will want to be a part of the light rail trip into NASP.

There will be five stops on the base, each one no further than ten minutes walking distance from one another. At each stop, there will be connecting service to other base transit systems, as well as immediate access to the Greenway System. The light rail will pick up at the park and ride lot approximately every 25 minutes.

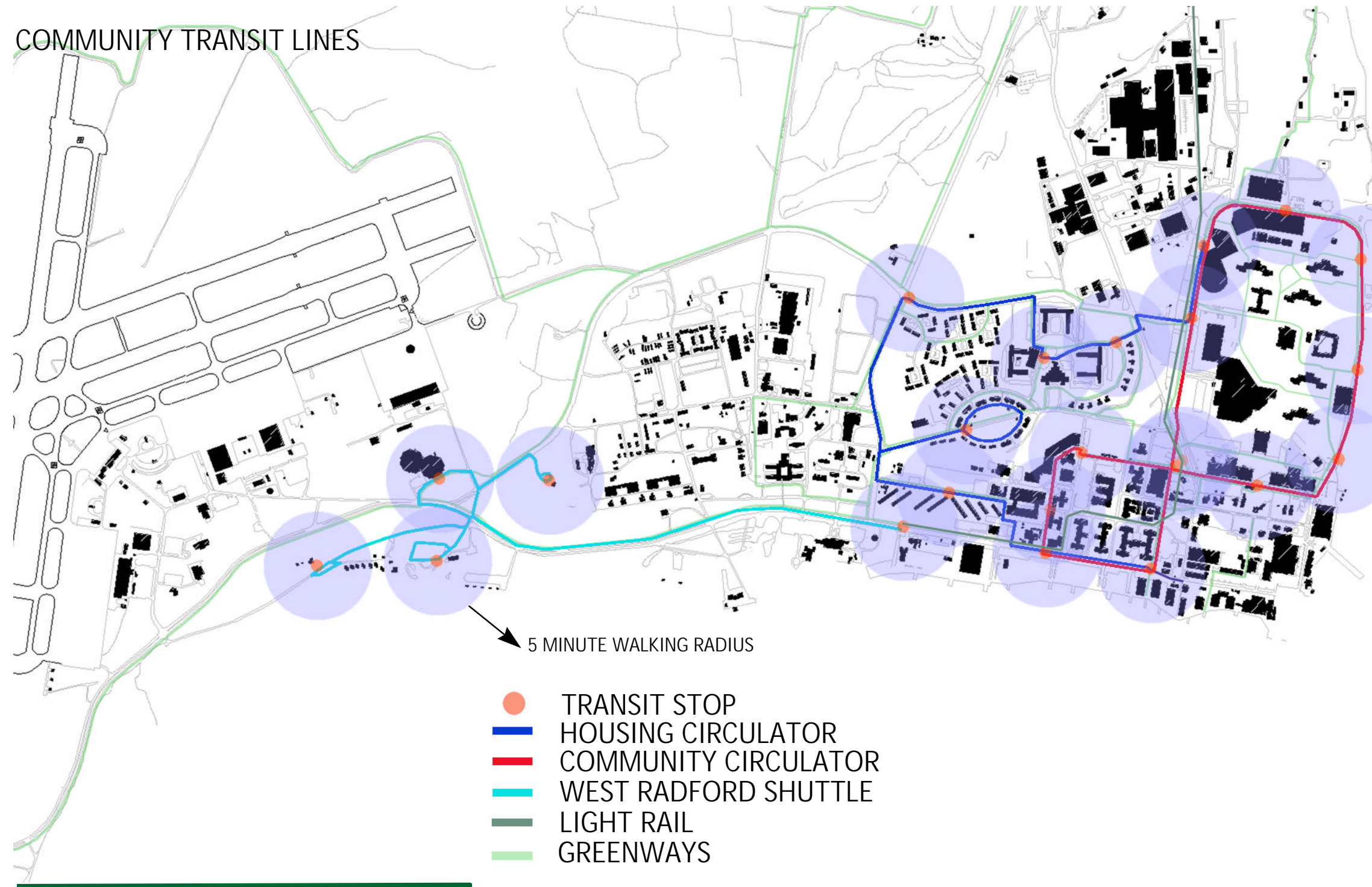




#### ELECTRIC MINI-BUS SYSTEM

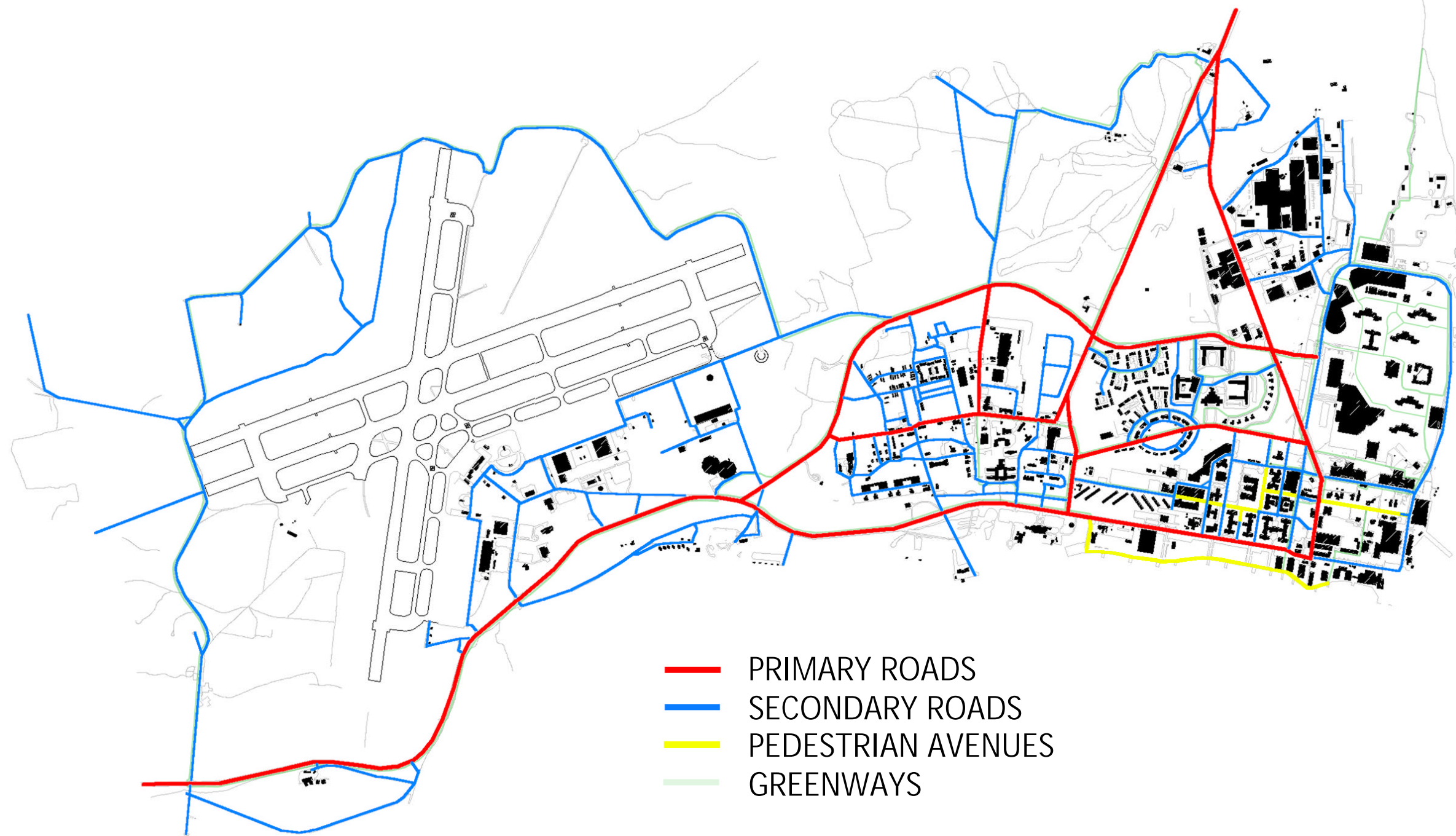
The second level of transit is the establishment of a system of mini-bus service. The buses are fed by the light rail and offer access to the remainder of the base. There are two levels of service. The first is a restricted, military-only line consisting of a base circulator and an airport shuttle. The base circulator includes two electric mini-buses at peak hours, providing access to restricted areas for authorized personnel. Transit stops, integrated into the Greenway System, will serve as charging stations for the electric mini-buses.





Community transit lines comprise the second level of mini-bus service. This service is open to general public access, for use by visitors, residents, and base personnel. There are three lines, each serviced by one electric mini-bus. Lines include a housing circulator, which originates at the primary light rail stop at the northwest corner of Chevalier Field, and circulates through troop and family housing. A community circulator services Chevalier Field/ NATTC and the core community area. The West Radford Shuttle runs down Radford Boulevard to provide access to Fort Barrancas, the National Museum of Naval Aviation, Lighthouse Restaurant, and Pensacola Lighthouse.





INFRASTRUCTURE

Transportation problems encountered at NASP, mainly peak hour overloading, are common problems in many communities today. Less costly alternatives that alleviate the traffic problems, while coming up short in dealing with the environmental concerns, include variable direction lanes as well as shift staging. Using variable direction lanes allows a highway or road to perform during peak hour traffic flow (where flow is overwhelmingly in one direction) as if it were several lanes larger. A six lane highway, such as Navy Boulevard across the Bayou Grande Bridge, can have as many as four lanes open in the peak direction during common congestion periods if the two middle lanes are assigned variable directional capabilities. Shift staging is also another way to alleviate the traffic problem, by assigning personnel varying work schedules so as to spread out traffic. Even though either of these solutions can reduce transportation problems, neither of the two deal will reduce harmful impact on the environment caused by automobiles.

A greener alternative is to promote the use of alternative transportation systems. The proposed light rail and electric mini-bus systems are a clean form of economical transportation. The Greenway system for pedestrian and bicycle traffic is another alternative which involves a little more user effort, but nonetheless allowing a greater number of people to arrive at their workplace with less congestion on the base. Both systems are environmentally sound; the electric buses would allow a clean burning vehicle to transport a large number of passengers more efficiently than any sort of car-pooling, and thus alleviating traffic problems. Using a bicycle or walking to work in a climate such as Pensacola will be encouraged among those for which it is feasible.

Off- base traffic is to be discouraged on the base. A park and ride lot across Bayou Grande Bridge will provide ample parking for both employees and visitors. There they will be able to access the light rail system onto the base. For these reasons, new construction of roads and parking lots is discouraged. Indeed, in some areas of the historic Old Navy Yard, roads are to be closed off with ballards and chains, to create pedestrian avenues that are to be integrated into the Greenway system. These avenues will limit traffic into the core community area, while not affecting circulation. Access will be limited to emergency vehicles only. Additional parking is needed for residents of the base, and this will be facilitated by the construction of a parking garage on the north side of Chevalier Field. While such structures are often considered unsightly and inappropriate, this will not be the case. The structure will combine parking with retail space on the street side. The purpose of the structure is to consolidate parking, while promoting the use of the electric transit routes and the Greenway system. This automobile "storage" structure will serve to discourage residents in using personal automobiles for around base travel. Base transit systems will be quite sufficient for this purpose.

As road systems deteriorate and repairs or replacement are needed, it should be taken into account that the road surface itself is recyclable. Reuse of a surface that has been milled, and then repaved with recycled asphalt, costs much less in the long term, especially when compared with the costs of constant maintenance and total replacement. The asphalt is milled off of the surface of the road, sent to a hot mix plant where the recycled material is combined with some virgin material, and then placed and paved on another road. Asphalt is a petroleum based product, and thus non- renewable. It needs to be recycled. For roads that were built poorly to begin with, the deteriorated surface can be "composted" into the earth to provide a stable base on which to place the new surface. The recycling also takes less energy than the traditional methodology. The clear choice is that as much asphalt as possible should be recycled in order to reduce cost and environmental impact.

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## STORMWATER MANAGEMENT

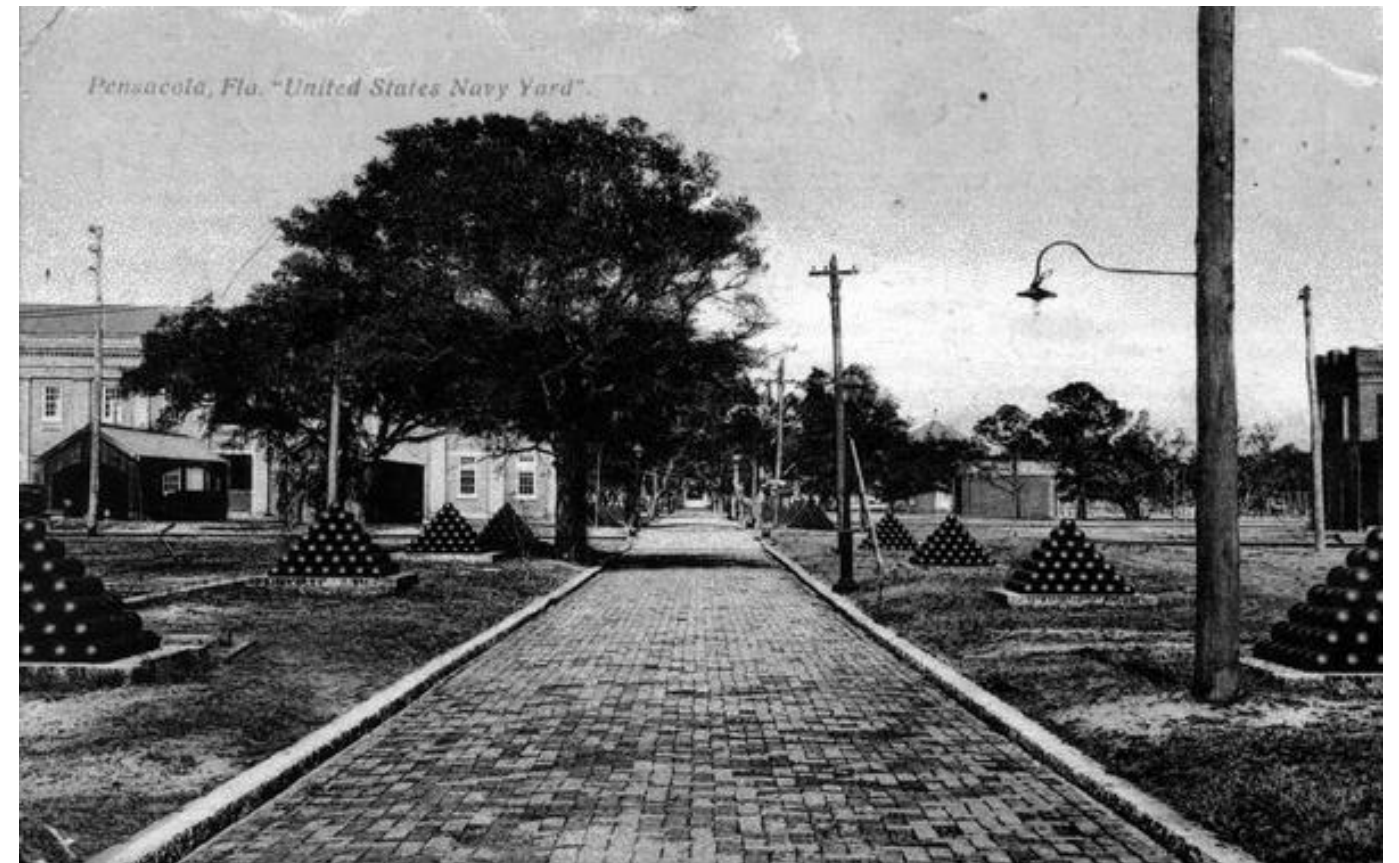
In order to mitigate the amount of stormwater that is released into the bay a detention pond approach could be taken. By allowing stormwater to reside in these detention ponds and then running the water through the wastewater treatment plant would be a simple and economical way to clean the water. Also, a separate treatment plant could be created just for runoff water. This would be costly but would greatly benefit water quality as a whole. This clean water could also be used for non potable uses rather than releasing the water back into the bay. The solids in this water will settle out naturally in the detention ponds so only the liquid will have to be treated. Minimal treatment will have to be done to this water since potable water is not desired. The water from rooftops and streets can all be piped through the sewer system to this plant and these detention ponds can be utilized in periods of high flow. A emergency spillway will also be installed in the detention pond to allow water to overflow during extreme weather events. Cleaning this water before it enters the bay is essential, and since the money is being spent to clean the water, why not use it water for purposes on the base.



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## Perimeters and Edges

The perimeters and edges of a military base offer a interesting design challenge. The design of security measures within the envelope of the base must be effective and readable. However it must be soft enough for the general public living on the base not to be offended. The security checkpoints could be designed with the local architecture of the base and surrounding areas in mind. This can also be accomplished by using landscaping devices that add to the safety of the building or area in which they are placed. Reinforced concrete planters make a suitable vehicle blockage and a decorative urban element. Decorative bollards and chain also accomplish this in some of the more historic areas of the base, as well as keeping vehicular traffic off the pedestrian avenues. Walls are constructed to add to the visual fabric of the base. High walls of brick and other suitable building materials (dependent upon the site) can be built in high visibility areas. Other fenced areas can be disguised with plantings of dense shrubbery that will add an additional obstacle. These should be kept far enough away from the actual fences that it does not obscure the view of security personnel. The layout of streets and the buildings on those streets create a security matrix that can be utilized in the event of situation that threatens the security of the base. These safety zones can be effectively shut down and managed by security forces. Often this strategy yields pleasant urban corridors which rely upon pedestrian zones, such as those proposed in the infrastucture plan. A ripple system of security zones can be implemented on the base. This would put the most sensitive of the base further into the site, creating layers of security zones. As one enters these deeper layers, security becomes tighter and more visible. A dual system of public transportation helps to restrict access, as certain areas are designated for personnel in accordance to their security access levels.



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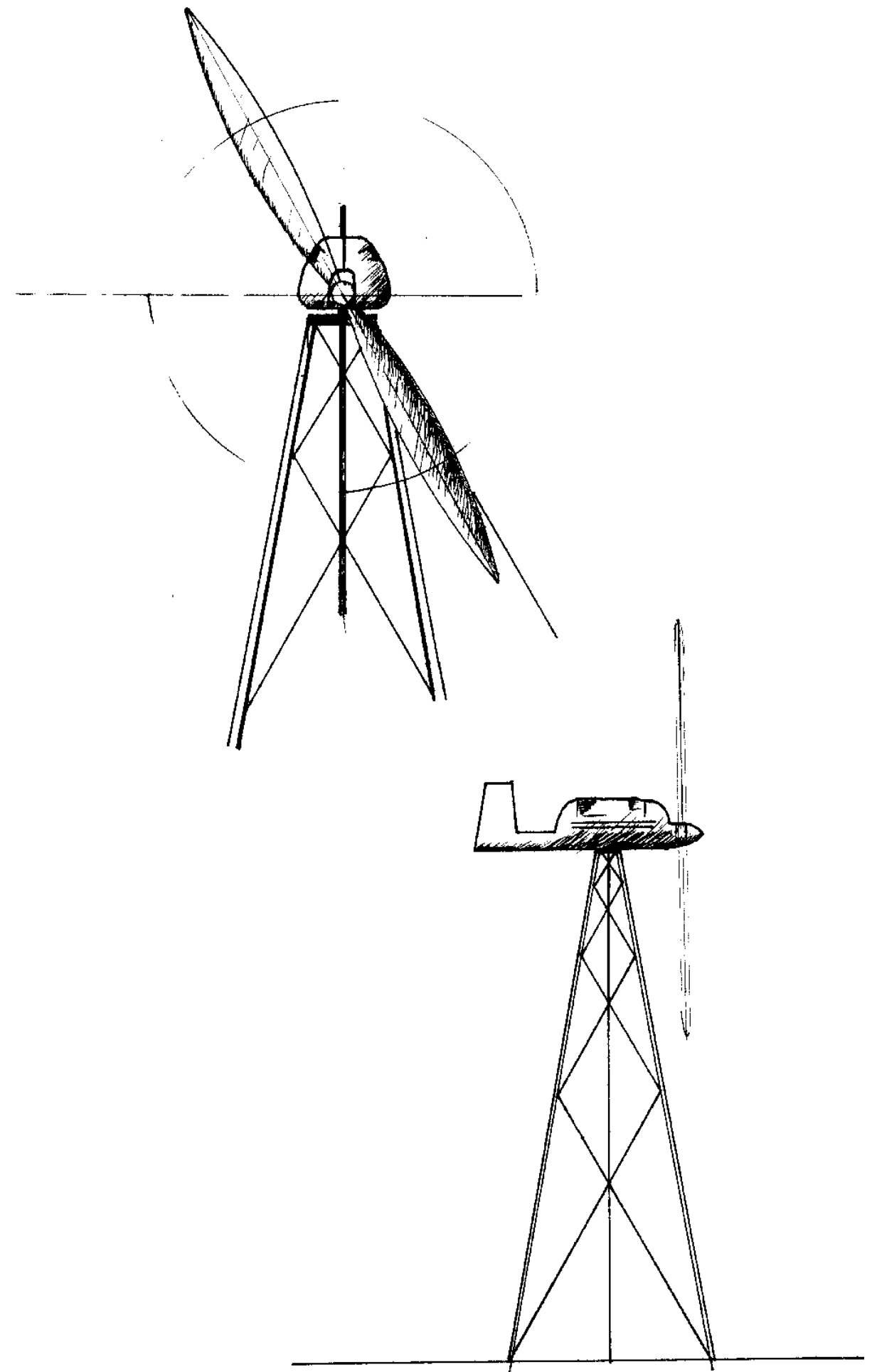
## Wind Power

Wind is an abundant resource available to NAS- Pensacola that can be harnessed easily, producing clean energy that is as cheap as the power that an Escambia county consumer can purchase from the power companies. Due to NASP's coastal location, ample winds provides an excellent source of potential energy.

The advantages of wind include that it is a renewable resource that will exist as long as the land and the water still heat and cool at different rates. This temperature differential will allow for a substantial enough breeze that will allow power to be produced almost constantly. However since Pensacola is not likely to see sustained wind speeds equivalent to that of "The Gorge" on the Colorado River it should be advised that wind power system that works along with the existing grid power be installed in this area.

In order to justify such an initial investment, which will no doubt be a large down payment on the future energy bills which NASP currently pays, a wind power system which is connected to the grid would allow a unique opportunity for the Naval Air Station to sell any energy that they produce in excess of their needs. As aforementioned, the initial investment may seem a bit excess, however, the federal government is in a unique position to apply financial resources towards a energy project that is practically guaranteed to save money in the long term. A large scale wind farm could be constructed and used as an experimental site where the feasibility of such a system could be analyzed for further use at other government sites. In addition, the information and the technology gained from such a venture can be filtered into the consumer market in an effort to reduce fossil fuel consumption.

A few hurdles remain to be crossed and further research is necessary to insure that the wind turbine generators produce clean power without any detrimental effects to the environment. One of the major concerns is how the spinning blades could affect the migratory bird population of the area. Spinning blades in close proximity to the airport could also emit low- frequencies which might interfere with the operation of airport systems. Another concern is that the noise generated might affect people in the vicinity, however with an FAA-18 taking off in close proximity it is doubtful that anyone would notice the wind turbine. If these remaining obstacles are investigated and are found to be inconsequential, then there is almost no reason not to fund such a project.





Wind power generation has come a long way in the last several years, and under ideal conditions with cutting edge technology, a farm in the plains was able to produce electricity on a large scale. They achieved this at a cost of only three and a half cents per kilowatt-hour, less than almost any consumer pays for electricity on or off the grid. These numbers include the initial materials for the wind turbines and other startup costs, including the inverters, controllers and wiring needed. NASP is not as an ideal site for wind generation, however it would give a real world perspective on the possibility of large scale power production in an environment that does not have an average wind velocity of twenty-five mph throughout the year.

The wind generation system is one that should be researched and implemented in order to allow the NAS- Pensacola to free itself from the dependency of grid power, and non-renewable resources. At the same time the installation would serve as an excellent opportunity for researchers to examine how the system performs in this environment and how to improve it for future applications. It adds up to federal funds well spent.

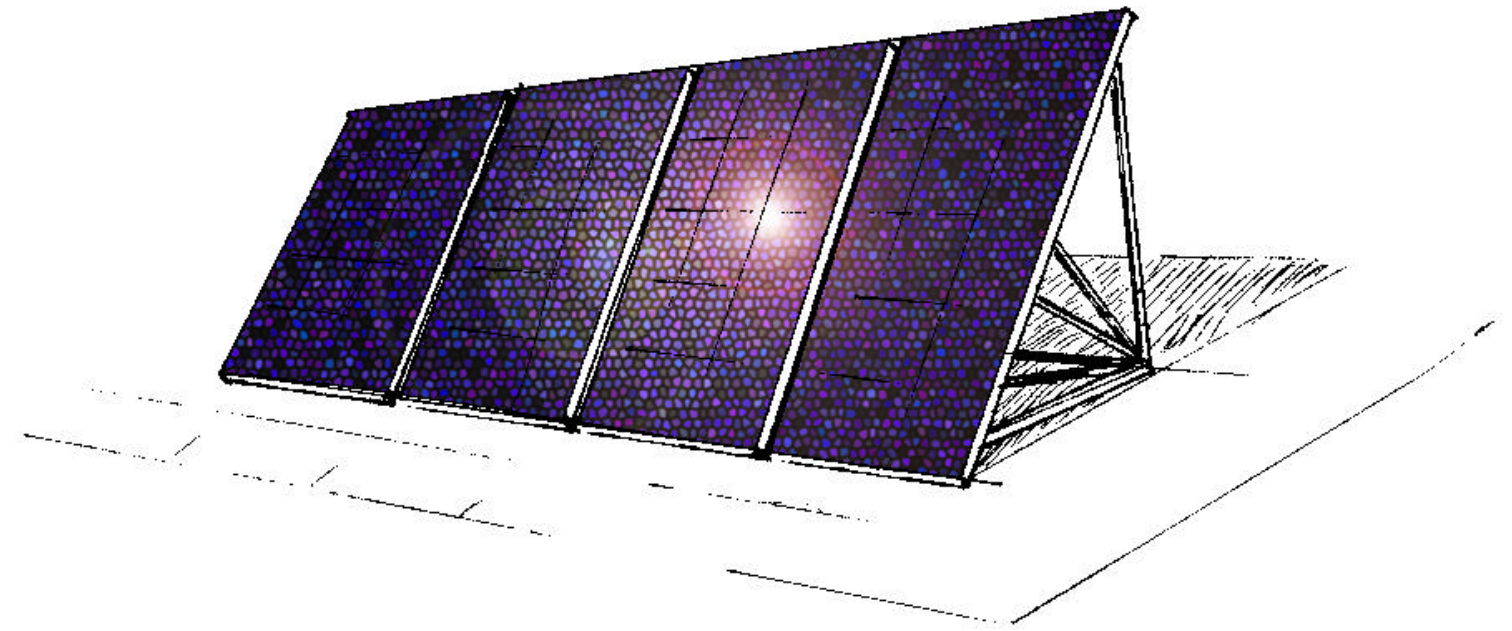
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### Solar Power

The idea that the sun can serve as an energy source for our electrical needs is neither new nor un-researched. We are merely turning to the sun once more. In the last few years, the cost of the technology to extract energy from the sun, has progressed to a point where more and more people are considering solar power as an alternative to conventional fossil fuel. This has been made possible by more efficient photovoltaic cells which can produce power at a fraction of the cost of just a few years ago. Increased size of the cells, new collection methods, and non-reflective coatings have all contributed to the incremental increases in the efficiency of the cells. With increased efficiency, however the technology is approaching a point where the cells themselves are becoming very expensive. Instead the focus of much of today's research is on collecting the sunlight more efficiently. To do this intricate tracking systems and reflecting surfaces can be used to concentrate the sunlight on the photovoltaic cells.

The overwhelming problem with solar power is that it can be very cost prohibitive. However, once a consumer has all of the operating hardware and has installed the system, the payback period usually extends beyond the life of the system. Because of this, an installation such as NASP will have a hard time implementing a retrofit system. Implementing solar systems in new construction and major renovation projects, so that they serve as multi-purpose structures, is a more feasible approach. Solar cells can be used as roofing panels, and research is underway to allow the production of clear cells which

would offer extreme consumer flexibility, as the clear cells would allow a window to serve as a power source. When the solar cells are implemented into the structure like this, they allow the cost of the solar cells to be offset by the normal building materials that they are replacing. (i.e... the roofing material costs) By using the solar cells as a multi-functional material, the cells obtain a shorter payback period. Another alternative still is the "solar farm", where a large area is devoted to solar power generation and at such a scale that it possible to produce power at reasonable rates. The solar farm technique requires a rather large initial investment in order to construct an efficient system and this tends to be the downfall of this technique. One possible application for the Naval Air Station would be to install the photovoltaic cells in place of traditional roofing structures. This would allow for a large number of cells to be installed in an ideal location in which they would serve dual functions as a weather shelter and an energy source.

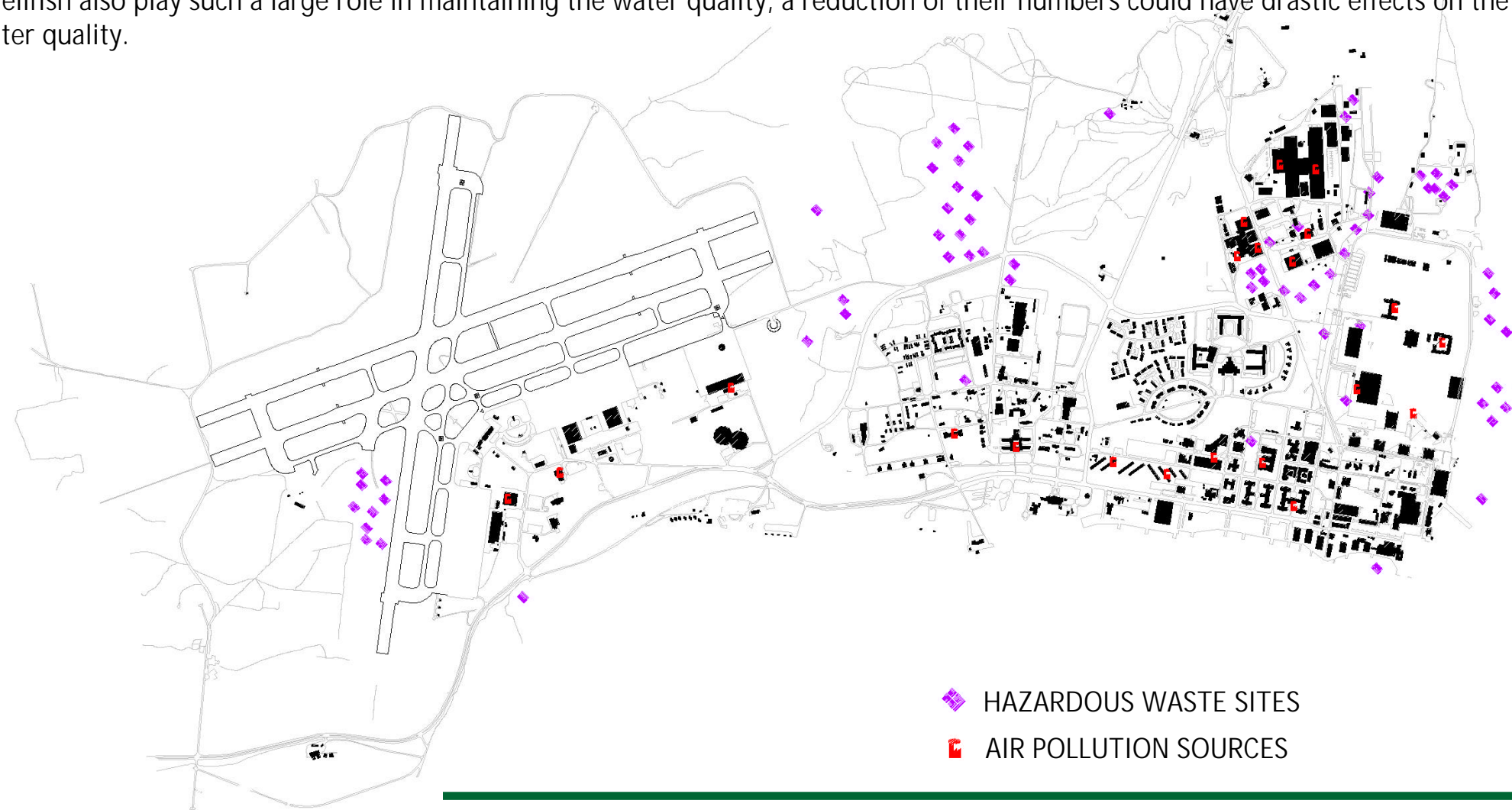


Large scale solar power is not the only way to use solar power efficiently; small less costly systems can make sense and save the investor money. One such application that would be applicable to NASP is solar powered runway lights. This system allows a photovoltaic cell to charge a battery during the day to power the lights at night and in inclement weather. This system has not only been shown to save money, but also provides a safety feature to the airport. Additional safety lies in the fact that each individual light has its own dedicated power source; with this setup, problems with the lighting system are limited to one light at a time, so that the runway would remain lit at all necessary times. Other small scale applications include traffic signs and signals, as well as highway lighting to be powered by solar cells with battery storage units.

## Pollutants and Hazmats

Pollutants are to be contained and kept out of environmentally fragile areas. Monitoring stations and wells will be established to monitor and prevent possible pollution. Routine inspection of facilities should be mandatory at NASP, as a precaution against contamination. Underground fuel storage tanks should be moved above ground to prevent any contamination of the groundwater.

Special attention needs to be paid to the pollutants that may contaminate the coastal areas, so as to protect local commercial fishing for the shellfish that inhabit the coastline. Due to the way shellfish feed by filtering the water, they may contain high concentration levels of pollutants and toxic substances. This may prove to be hazardous or fatal to the people consuming the shellfish. Since shellfish also play such a large role in maintaining the water quality, a reduction of their numbers could have drastic effects on the local water quality.



## Cleanup Recommendations

The polluted sections of NAS- Pensacola should be sorted by toxicity, mobility, and degradation time. The most toxic and mobile pollutants should be cleaned up first, and then the sites with the longest degradation times. Short lived, not so toxic sites may be left alone until fit for future use. A strategy is to consider polluted sites for future construction. The polluted material could be excavated and then treated and stored, while a new building is built in the crater. While being expensive, it solves two problems once, and saves money in the overall budgeting.

Non polluted demolition rubble as well as spare tires and other non hazardous solid wastes, can be reused and recycled, as construction materials or use as an artificial ocean reef. Wildlife and people should be discouraged from polluted sites by constructing fences and signs.



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## ECONOMIC ASSESSMENT

In the fields of architecture, planning, and construction, new theories are arising concerning the life cycle of a structure and the use of such words as "recycle", "reuse", and "sustainability". Among these disciplines, these words were largely ignored words until very recently. This sustainable movement is very needed today, as we search to clean up the trails of environmental degradation we have left behind. Despite preconceived notions that any environmentally positive action will cost money, sustainability has proven that it can be financially beneficial. There are two approaches to sustainable development or "green" design. The first is to build everything with any and all of the greenest products and methods available. The other is to selectively choose which applications will have the greatest benefit. While most green design alternatives are beneficial, implementation of all possibilities can prove extremely cost prohibitive, if not budget- impossible. Public expenditures, especially, must take into account relevance and long- term potential. Federal funding is more likely to sponsor well budgeted, selective sustainable approaches. At NAS- Pensacola, an effective system is needed in to evaluate and balance monetary savings versus merit.

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## CONCLUSION

Sustainability is a learning process. Nothing is concrete and immutable. Breaking Through Barriers recognizes the necessarily flexible nature of sustainable planning. Ideas and strategies set forth may well change or prove unfeasible. Periodic review and revision of the CDP is necessary. At these times an assessment of policies and progress of planning initiatives must be conducted to determine positive and possible negative implications. Since sustainability is inherently flexible, this plan must be treated in the same regard.

This CDP is an attempt to bring the ideas of sustainability to a major government installation so that it may serve as a prototype for other developments. In this plan, an effort was made to suggest ideas that were practical and realistic. Also, some gestures were made towards ideas that technology may be able to bring about in the future. Some of these suggestions are meant to be implemented quickly, while others are more of a long term strategy. A few may have a high initial startup cost, however the long term advantages are a necessity. One thing to remember when looking at green solutions is that many of the paybacks for such design take time to surface, and as institutions implement sustainable design and green concepts, the cost of the technology will decrease due to increased money available for research and development. Sustainable concepts and techniques will start to become attractive as investments which will then spur development. The scope of this development plan is an obstacle, yet it also offers many advantages for these changes. Often large scale sustainable issues are not incorporated into master planning. The almost autonomous nature of a military base yields an interesting scenario for these ideas. Obstacles often faced in the private sector could be overcome quite easily due to the nature of military administration. Breaking through Barriers, as an exercise in the sustainability, yields exciting possibilities for development in the realm of master planning.

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 U.S. Environmental Protection Agency

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