Maximizing Minimal Green Space

Re-thinking land use on Coast Guard Bases
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Abstract

Green space and how it is utilized on Coast Guard bases varies widely due to a lack in regulations on green space development. Creating a design and development model for green space that can be applied to all bases and yet still be customizable, will help set guidelines on this type of land use that can ultimately increase the morale and well-being of the Coast Guard members. The model will be based on small scale design that incorporates nodes of activity, creating spaces that encourage physical fitness and recreation that address Coast Guard fitness requirements, support military functions, and increase the opportunities for outdoor social gathering spaces.

Inherent to the node designs will be the use of ecologically minded design that will encourage habitat creation and storm water filtrations in conjunction with the use native plants. These micro-scale designs will focus on conservative installation and maintenance costs and require smaller spaces to implement than typical larger scale solutions, yet could pay off exponentially in increased physical and positive social activity in these spaces. Once the model is created, it will be applied to the Coast Guard Base Seattle located on Pier 36, downtown Seattle, WA.
Introduction

The Coast Guard has traditionally been the underdog of the military services: small in numbers, substantially less funding and more operational missions in comparison to our Department of Defense counterparts. Always doing more with less has become the informal motto of the Coast Guard and we take pride in being creative & efficient in always getting the job done. The same mentality applies to our bases designs; function trumps any other feature as they are built to solely support operational requirements. The small bases the Coast Guard typically owns are almost always adjacent to a body of water, highly functional and little space is reserved for recreation. However, the small amount of green space that is left over, is usually designed & modeled after the traditional, formal landscape designs from the early to mid-20th century.

With our current resource constraints and ecological movement afoot, Coast Guard bases cannot afford to remain stuck in the 20th century. This project’s goal is to show that even small amounts of green space can be utilized to provide valuable ecological services, improve the human/nature relationship, respect security & functionality as well as provide recreation opportunities. Designing the green space to be as functional as the rest of the base
Introduction

**Research Problem**

How can the Coast Guard implement micro-scale, ecological design practices, enhance recreation and members’ work place experience to maximize available minimal green space?
Goal & Objectives

**Goal**

Maximize function of green space on Coast Guard bases by incorporating green infrastructure and recreation opportunities.

**Objectives**

Identify opportunities to incorporate low impact development (LID) for rainwater harvesting, storm water management and enhancing ecosystem services on Coast Guard bases.

Capitalize on small, underutilized spaces and surrounding resources to provide recreation opportunities.

Respect the main function, safety & security of base.

Use design strategies that are pertinent to common environmental issues found on Coast Guard bases throughout the United States.
Literature Review

Green Infrastructure
Recreation
Security Design
Parking & Circulation
Green Infrastructure

Stormwater management
This is an issue at the forefront for the Coast Guard due to the majority of their bases are located on a body of water; stormwater management is an area that the Coast Guard can improve upon. Of all of the water issues facing Coast Guard bases, stormwater management is one that I will focus on primarily due to the nature and location of Coast Guard bases and their impact on many bodies of water. Since the majority of bases are already built, retro-fitting is the most likely option. Low Impact Design (LID) design solutions will be incorporated into the trail system design based on the ability to incorporate “micro-measures” or many small design solutions. These decentralized elements for addressing stormwater on site vice off site via a traditional storm sewer, will act to treat water closer to where it falls and improve the water quality of the adjacent natural body of water.

First, we should discuss the question of: what is Low Impact Development (LID)? The definition from the U.S. Environmental Protection Agency (EPA) is “an approach to land development or re-development that works with nature to manage stormwater as close to its source as possible.”(water.epa.gov/polwaste/green/)

A brief history of Low Impact Development (LID) shows that it was developed by Prince George’s County, Maryland in the 1990’s looking at the feasibility of using bio retention to meet the stormwater management needs instead of a very costly traditionally engineered method. The agency’s work was funded by a grant from the U.S. EPA and found that, not only would it meet the needs of the stormwater management objective, but also would improve aesthetics, lower construction and maintenance costs and would increase the Time of Concentration of the storm water. All beneficial to the project and manual on “Bioretention Design Manual” was born.

The goal of using LID design solutions is to mimic the pre-development hydrologic functions of the site.(LID DOD 2010) However, there are also
added design benefits for using LID techniques. Some of these added benefits include: creation of wildlife habitat, reduction in cost of infrastructure, recreational enjoyment opportunities, and helps create a sense of place and enhance livability of an area.

Within the LID-DOD UFC 3-210-10, it outlines methods for the Department of Defense to incorporate LID design elements, they have divided the techniques into 5 categories: Site Utilization, Filtration, Interception/Infiltration, Retention of Stormwater Volumes and Structural. They will be discussed in detail below.

Site Utilization is how the overall site is designed for use. Techniques include: reduction of impervious surfaces, narrowing streets, vertical construction, building parking structures, removal of curbs, gutters and paved swales, disconnecting impervious surfaces, using rougher surfaces to slow down water movement, retaining tree cover and increasing the overall Time of Concentration of the stormwater flow onsite.

Filtration is the filtering of stormwater and removal of some of the sediment and pollutants via natural means. Some elements used for filtration on site include: vegetative buffers, filter strips, vegetative swales, check dams, sediment traps and overland flow (vice removal via built structures).

Interception/Infiltration techniques remove some of the pollutants carried by stormwater and retain the water for use on site by vegetation. These techniques include: depression storage, bio-infiltration, pervious pavements, open pavers, rain gardens, infiltration trenches, tree boxes, deep mulch beds, tree cover and soil amendments.

Retention of stormwater volumes translates to holding runoff from impervious surfaces for treatment after the rain event. These include: rain barrels, storage and release cisterns, and parking lot storage that drains to infiltration zones.
Literature Review

Structural techniques are typically the most costly but can be very effective. A few types of structural techniques include: Green roofs, rainwater reuse systems, parking structures and irrigation storage systems. The Sustainable Sites Handbook addresses the issue of stormwater management with many of the same design techniques; however they are not called LID. The design elements are broken into four approaches to stormwater design:

1. Practices that reduce runoff
2. Practices that mitigate runoff by emulating evapotranspiration and infiltration
3. Practices that convey runoff from larger events
4. Practices that protect or restore receiving bodies of water.

1. Practices that reduce runoff include: Reduction of impervious surfaces such as reducing roof area, road length/width, parking area, curbs and gutters, connected impervious surfaces, drainage directed into storm sewers, and reduction in overall developed areas and increasing porous pavements.

Compost blankets that help reduce erosion and increase Time of Concentration of stormwater by promoting permeability and vegetation growth. Conserving undeveloped/natural areas on site. Rainwater harvesting and reuse. Green/vegetated roofs.

2. Practices that mitigate runoff by encouraging evapotranspiration and infiltration:
   Use of multiple types of stormwater management systems and not relying on one. Redundancy is important for the rain events that are atypical and in case of failure in one doesn’t mean failure of the entire system. Minimize reliance on pipes, inlets, curbs, gutters, paved channels and other below surface infrastructure. These methods do not allow for natural processes of evapotranspiration or infiltration. Recycle the runoff as often as possible. This helps minimize the use of potable water. Use rain gardens or rain pockets as a way to encourage reuse, infiltration and evapotranspiration. These small gardens can be used throughout a site and linked to mimic natural water systems.
Literature Review

Use or incorporate bio-retention areas into the site plan. While they can need a lot of space, they might not be the best option for small sites.

3-Practices that convey runoff from larger infrequent storm events: Vegetated swales and step pools can be used. The step pools offer an outlet for energy dissipation before entering an adjacent body of water, minimizing erosion of the shoreline. This is beneficial for sites directly on a body of water, like most Coast Guard bases. Another option is the bio-swale with micro pools. Same concept as the vegetated swale with step pools with the exception of that they have an underdrain for the excess amount of water that transports the water to other stormwater management elements (i.e., detention ponds, standard stormwater infrastructure, etc.). The benefit of these bio-swales is that they convey the runoff, provide filtration and some infiltration of the stormwater, increasing the quality of the runoff.

4-Practices that protect or restore receiving water bodies: Level spreaders that create low velocity sheet flow into vegetated areas before the runoff drains into the body of water. This method converts concentrated flow into lower velocity flow, reducing the energy before it enters the river, stream, bay, etc. This helps in reducing erosion. Stormwater wetlands with emergent aquatic vegetation are another technique that can provide immense benefit to the quality of the stormwater runoff that travels through a stormwater wetland. Stream, riparian, and floodplain enhancements or restoration can also contribute to improving stormwater runoff water quality that enters the body of water. The healthier the body of water, the better able it is to naturally treat stormwater runoff and maintain its ecological health.
In the Handbook of Water Sensitive Planning and Design, LID is discussed but there is a focus on “micro measures” which is important and pertinent for Coast Guard bases that are typically small, utilitarian and have little space to spare. The approach and mentality of this handbook seemed especially pertinent to retrofitting a Coast Guard base because it encourages the patterns of design to “make components multi-functional, use every square inch and use natural processes freely.”

Some of the techniques they mentioned, not already mentioned above, are:
- Subsurface recharge beds
- Disconnecting roof and pavement connections from sewer lines and directing the runoff towards vegetation or infiltration basins.
- Rehabilitating soils to increase infiltration rates and pollutant neutralizing microbial activity.

These and the other techniques described above are relatively simple and inexpensive to incorporate. Retro-fitting a base during a renovation, utility replacement project or during some other work on the existing site provide for opportunities to incorporate these “micro measures” and increase the green infrastructure on the base, one small micro-measure at a time. These three approaches to stormwater management offer ideas and attitudes for incorporating into the trail system nodes that will include recreation, function and green infrastructure.
Literature Review

**Sustainability**
In, *Greening Federal Facilities*, “…Federal facility managers, who administer more resources and have more impact on the environment than any other group in the world.” (Executive Summary) Herein lies an opportunity for the Coast Guard to help lead the way in creating more sustainable bases, and also to support local and national level companies in the progression to make sustainability a standard, not the exception. This starts with a simple concept; using native plant species. The benefits of using native plant species are numerous; adapted to climate and natural rainfall, will be healthier and therefore less vulnerable to disease and pests, maintains the community character of the area, and will create habitat to native bird, amphibian and animal species. Trees should be preserved on site if possible and treated as assets. Trees are valuable in that they can shade buildings and people, requiring less cooling by air conditioners, reducing cost.

Water use is also an way to create more sustainable bases and should be analyzed when planning for green spaces. The identification of alternative water supply to typical landscaping needs is paramount. Reclaimed water, and rainwater retention/harvesting are two of the most probable alternative to using potable water.

Developing a drought tolerant design plan is also an important factor. Looking at water quality and using it appropriately is important. Lower quality water can be used for landscaping, saving treated water for drinking, washing, etc.

Water delivery or irrigation is another factor to consider when trying to minimize use. Here are a few strategies that may be used to help create a more efficient and effective irrigation plan for a site:

- **Reduction of aerial sprinkling**
- **Properly zone the irrigation system and the plantings to ensure the most accurate watering and reduction of waste.**

When possible, the use of Reclaimed water for irrigation of the landscape should be used to reduce the use of potable water.
Literature Review

Maintenance and Operations

During the design phase, maintenance and operations should be accounted for and incorporated into the plan. To address the foreseeable maintenance issues before a design is created is the most proactive means to ensure that the site will be maintained appropriately. I looked at the different issues and broke them down into five different areas: Integrated Pest Management (IPM), landscape waste, maintenance of green infrastructure, soil amendments, and reducing the need for power equipment.

Integrated Pest Management (IPM) system can be used for both pests and invasive plant species. It is a way of making informed decisions about issues with low risk to human, environmental or animal health. Here is the process in which IPM works:

- Preventative measures to minimize attractiveness to pests or invasive species. This could include increasing plant diversity, maintaining appropriately watered and healthy native plants, etc.
- Establishing an “action threshold” in which there is a certain point that some measure will have to be taken when there is a specific level of pest activity or number of invasive plants establishing within the site.
- Monitoring the site for the presence of pests or invasive species becomes an important task to ensure issues are found immediately and corrected in the least intrusive means possible.
- Maintaining an array of potential treatment options to include mechanical, physical and biological approaches using chemical as the last resort.
- Conducting a post treatment evaluation to learn what is the most effective and least intrusive means of dealing with different types of pests and invasive species.
Literature Review

Landscape waste should be re-used or composted on site, if possible. If that is not an option, local community or city composting can be a second option that can be used so landscape waste doesn’t end up in a landfill. Care of green infrastructure means ensuring bio-retention areas, rain gardens, vegetative swales, etc are maintained for proper function. It also addresses clearing porous pavements to prevent clogging and not using de-icing measures on them.

Soil amendments means the use of natural composting techniques for soil enhancements vice chemical fertilizers that can ultimately weaken the plants and pollute the groundwater or surrounding bodies of water. Typically a little more labor intensive but works as well as chemical fertilizers if used correctly. Reducing power equipment usage is the act of minimizing the need for lawn mowing and edging to reduce air and noise pollution by getting rid of the traditional turf lawns and replacing with native species gardens.
Active:
Physical fitness requirements are inherent in the physically demanding careers of military members and outdoor recreation and physical fitness have been strong building blocks within the military culture. According to the Coast Guard Weight and Body Fat Manual, there are physical requirements for all personnel to meet upon entering the military and throughout their career. The three goals of the manual for each military member:

1- Are capable of meeting the organization’s operational needs and challenges;
2- Maintain a healthy weight and body fat percentage;
3- Present a sharp professional military appearance.

With these goals, weight and body fat standards must be met twice a year, once in April and then again in October, to ensure you continue to be employed with the U.S. Coast Guard. If a Coast Guard member does not meet the required standards, they may be separated from the service. With the stakes of being physically fit so high, there is a strong emphasis on working out, making healthy food choices and leading an active life in the Coast Guard culture.

In addition to these weight and body fat standards, depending on the career path a member takes within the Coast Guard, there are additional physical fitness tests that assess strength, cardiovascular endurance and flexibility. These jobs include: rescue swimmer, boarding officer and boarding team member.
Currently, the trend in strength training and working out is CrossFit, developed and based on functional movements that maximizes work in short bouts of intensity. This work out regime is extremely popular due to the effectiveness in building strength and cardio endurance along with the ability to complete the workouts with small amounts of equipment. Military and law enforcement personnel are some of the forerunners in adopting this type of physical work out due to their jobs' physical fitness requirements. CrossFit encourages use of low technology, and normally inexpensive equipment and facilities by using things that are not typically thought of as workout equipment. For example, large ropes or line, tires, and other simple items are used creatively to work out with using CrossFit guidelines and exercises in the workout of the day or “WOD” as they are referred to in gyms and on the websites that provide these for free. Part of the appeal of CrossFit is the ability for anyone to do it almost anywhere, in or outside. The opportunity to incorporate an underutilized or overlooked outdoor space on a base to enhance the military members' options for working out is invaluable.

Supporting physical fitness by offering up-to-date and very current philosophies on strength training will support one of the main objectives of having healthy and physically fit members. These fit members then lead better lives, reduce health care costs and improve job performance. Also, with current military spending budget constraints, incorporating areas for working out using the CrossFit regiment can be a good idea for both the military and the members who would normally have to go out and pay typically $100-$200 a month for a membership for a gym that specializes in CrossFit. (crossfit.com)

Opportunities to include spaces for CrossFit and make use of outdoor spaces for physical fitness include running paths, space with walls nearby, a climbing rope, space to swing kettle bells, pull-up and dip bars, and the ability to move in and out of a complimentary gym unimpeded. The trail system can also provide for a known length that can be used for walkers and runners to keep track of their distance.
Passive:
Nodes of activity along these trail systems can also be social gathering places and have a passive recreation focus. Creating social interaction opportunities is important in embracing the *esprit de corps* of Coast Guard members stationed on base together. Morale functions, such as barbeques, picnics, and social gatherings are also an important part of military culture and it should be supported in outdoor spaces where possible. There is also a need to connect areas outside that function for military traditions. For example the observance of colors every day at 8:00am is a traditional time for all military members to gather and honor the flag as it is raised every day. It is also a time for the military leaders to talk to the troops and pass information while also recognizing accomplishments by the unit or by individuals.

Other outdoor traditions include retirement ceremonies, training space and change of command ceremonies. Spaces that allow for this type of gathering are also important to plan for and yet many of these observances are held in parking lots or make-shift areas unworthy of the traditions. Sadly, space is at such a premium that even some of the events that are cornerstone to military history are not even taken into account when an area or new building is designed.
The security of U.S. military bases is paramount and innate due to the missions they have been tasked to accomplish by the federal government and people of the United States. Designing for bases or federal buildings takes into account more than just the function and aesthetics of the building but also a thorough threat analysis must be done. This applies to buildings that are under construction and for buildings that need to be retrofitted. Identifying threats, implementing layered approaches and the method Crime Prevention Through Environmental Design (CPTED) are all applicable to military base security design.

After events occurring on 9/11, there was a surge in adding protection to existing buildings that had not been built in an era of large scale terrorist attacks. Washington D.C. is a prime example of this urgent push to increase security for many of the federal buildings and monuments (FEMA 2007 and Hopper and Droge 2005). In Security and Site Design by Leonard Hopper and Martha Droge, they discuss the analysis, assessment and implementation of design strategies that will increase security of a building or compound.

Types of threats are broken down into any of the following categories:
1) health, safety and welfare,
2) nonviolent crime,
3) internal or workplace violence, and
4) chemical, biological and/or radiological attacks or violent crime from external sources.

The only two categories that design can really address are the health, safety and welfare and the violent crime from external sources (Hopper and Droge 2005, 21-22).

Military bases have strict requirements already in place for security around the perimeter of the base, however, tactics and elements can also be used inside the perimeter to further strengthen the base. With the threat analysis also comes the balance of the risk assessment. Some considerations for the risk assessment would be: How likely of a target is the base? What are is the surround infrastructure and/or buildings and are they a potential target? What is the context? Dense urban, sub-urban or rural setting? What are the vulnerable points that could lead to a potential attack/intrusion?
Military bases have strict requirements already in place for security around the perimeter of the base, however, tactics and elements can also be used inside the perimeter to further strengthen the base. With the threat analysis also comes the balance of the risk assessment. Some considerations for the risk assessment would be:

- How likely of a target is the base?
- What are is the surround infrastructure and/or buildings and are they a potential target?
- What is the context?
- Dense urban, sub-urban or rural setting?
- What are the vulnerable points and/or choke points that could lead to a potential attack/intrusion?

Once the most likely type of attack or vulnerability is identified, the possibility of it actually happening is weighed to determine what type(s) of security design strategies need to be implemented. There are two types of strategies that can be used and may be combined to reinforce the security of the site. These strategies are: layers of defense and CPTED. Layers of defense provide for more response time to an attack and forewarning. According to Hopper and Droge (2005), three layers are ideal. The first layer employs the neighborhood or the context of the site. Identifying the adjacent properties and their uses is key in strengthening the perimeter of the site. Items to consider for the first layer are: overlooking properties or views from outside of the site, nearby transportation, underground utilities, hazardous material storage, tunnels, overhead/tall buildings, critical infrastructure, metro area, proximity to emergency services. Once identified for a site, these elements can be either capitalized on and strengthened or mitigated accordingly.
The second layer is the actual perimeter and surrounding space to the 'assets' or buildings. This can include circulation to get on the base, earth berms to absorb blasts, standoff zones/setbacks (minimum 50ft from building to road/sidewalk).
Natural barriers can also be used for this second layer of defense. Rivers, lakes, steep terrain, barren fields, and dense plants that are difficult to move through quickly and/or without detection. Man-made barriers such as planters, bollards, fencing, walls, buildings, concrete barriers can also be utilized.

The third layer of defense involves “hardening” of the asset (building) through improved building envelope, building systems and utilities. This is typically an architect’s area of expertise but should be designed in conjunction with the landscape as part of the overall function.

Setbacks are a buffer zone of a specific distance that creates a safer environment than a building being right next to a street, for example. Bombs are the most likely event while implementing airplane collision design standards into every building is unreasonable.
Literature Review

Another strategy is Crime Prevention Through Environmental Design (CPTED) which is based on four basic ideas:

Natural Access Control-symbolic and real barriers that prevent crimes. Examples: Creating a perception of risk to offenders-using architectural and landscape structural elements to discourage private areas.

Natural Surveillance-building users are the observers and makes building intruders more visible to the users/residents. Examples: night time lighting, pedestrian friendly sidewalks/streets, and visibility to/from the building through windows into entrances and parking areas, etc.

Territorial Reinforcement-creating a sense of ownership for users so that offenders perceive territorial influence. Examples: fences, landscape planting, etc that define public/private spaces.

Target Hardening-Reinforcement of buildings, utilities, access points, etc.

There are three response classifications to the above strategies:

Natural-Use landscape design and natural occurring elements. Examples include barriers, siting of buildings in reference to natural geography (terrain, natural water features, etc.) and locations of entrances and walkways.

Mechanical-Use devices and technology(target hardening). Examples include Closed Circuit TV and exterior site lighting.

Organizational-Uses management and personnel techniques. Examples include patrol routes, guardhouses, watch towers, surveillance strategies, programs in place to distinguish intruders from site users such as car decals, ID cards, and access badges.
After reviewing these two design strategies, I compiled a list of potential design elements that may be used and considered in the overall base landscape design:

Minimize vehicle velocities approaching base
Tiger Traps
Reinforced Shade/Rain shelters
Improving pedestrian safety
Bollards no more than 2’6” spaced 36-48” apart
Sculptures
Planters with bollards inside-unable to hide a 6” thick package within the foliage.
Water features
Fences
Jersey Barriers
Reinforced street furniture-lights, seating bollards, seating/planters, trash cans
Large groves of trees.

![Diagram of streetscape security elements](chart.png)
List continued:
Rotating wedge barriers
Drop arm crash beams
Turntable Vehicle Barrier
Mix of bollards, seating and trees-parallel to the line of most traffic (vehicle, pedestrian) (Federal Emergency Management Agency) (Hopper and Droge)
Literature Review

Parking and Circulation
Typically an issue on all Coast Guard bases in urban settings, parking can start to consume most of the available land. While, utilizing mass transit would be ideal, depending on hours of work and mission requirements, this may not always be possible. Creative solutions for parking have been eluding base facility engineers and the problem continues. With the constant focus on parking on bases, the pedestrian circulation is typically an afterthought. The buildings and base layout for Coast Guard bases is usually outdated as most of the Coast Guard bases were designed and built during a very different era (most are older and were built in the middle of last century). Also, due to the consolidation of many bases in recent years due to budget constraints and re-organizing, an increase in people and therefore, cars, has plagued base facility engineers. There seems to be a need at most bases that I have visited to come up with a reasonable solution for the added strain of parking and general circulation caused by more people. As of now, most bases still place an emphasis on vehicle circulation and not on pedestrian movement.
Case Reviews

University of Georgia
Pixar Animation Studios
Apple Campus 2
Googleplex Campus
Nike World Headquarters
Bloedel Donovan Park
The case review elements I was searching for in my case reviews included: pedestrian safety elements, security issues, campuses or multi-use sites, green infrastructure/sustainable features, recreation opportunities. Once these elements were determined, six reviews were conducted. The adjacent page shows the highlights of each of the elements and its corresponding design implications.

During the reviews of each of these sites, I went from contemplating doing a fitness trail to thinking of the base as more of a site with multiple pocket parks with micro measures involved. The difference between many of the case reviews and the Coast Guard base is that the large scale campuses were private companies with a lot of space and plenty of resources. I decided that I would have to work on the micro-scale throughout the base.
## Case Reviews

### Case Review Elements

<table>
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<tr>
<th>Element</th>
<th>Design Implications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus/Multi-use site</td>
<td>Multiple outdoor activities available throughout the campus for employee use</td>
</tr>
<tr>
<td>Recreation opportunities</td>
<td>Jogging/walking trail connecting numerous outdoor activities.</td>
</tr>
<tr>
<td>Green Infrastructure/</td>
<td>Native plant palette, curb cuts, &amp; permeable surfaces Stormwater treatment on site.</td>
</tr>
<tr>
<td>Sustainable Features</td>
<td>Secure campus yet has enough activity options for employees to enjoy.</td>
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<tr>
<td>Security</td>
<td>Raised pedestrian paths and marked crossings Strong pedestrian link adjacent public space.</td>
</tr>
<tr>
<td>Pedestrian Safety</td>
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Examples:
- Pixar Animation Studios
- UGA Campus
- Apple Campus 2
- Googleplex
- Nike World Headquarters
- Bloedel Donovan Park
- UGA Campus
- Apple Campus 2
- Nike World Headquarters
- Apple Campus 2
- Nike World Headquarters
Case Reviews

University of Georgia Mike Castronis Fitness Trail

Stats:
Location: University of Georgia campus-Ramsey Recreation Center
Completion Date:
Client: UGA
Size: 20 stations, 2.57 miles

Project description: The Mike Castronis Fitness Trail is woven throughout the Club Sports Complex on the main campus of the University of Georgia. The fitness trail contains 20 stations ranging from stretching to tricep dips and sit up stations. The full trail totals 2.57 miles. The University is committed to sustainability and has incorporated green features such as composting toilets throughout the complex, solar lighting, solar trash compactors and restorative stormwater methods.

Design Implications:
• Fitness trail on a mixed use site
• Sustainable design features within the trail site
• Outdoor workout opportunity
Case Reviews

University of Georgia Mike Castronis Fitness Trail

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### Club Sports Complex

The Club Sports Complex is a lighted 180,000 sq. ft. complex and is solely for the use of the department's Club Sports Program. Outdoor clubs have an opportunity to utilize this field space for practices and competitions.

The Club Sports Complex has several green and sustainable features including:

- Composting toilets which utilize less than 3 ounces of water per flush
- Solar-operated LED lighting in the parking lot
- Restorative storm water methods to improve water quality and irrigation practices
- Solar-powered Big Belly Trash Compactor

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<th>Next Station #</th>
<th>Distance in yds.</th>
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<td>5. Knee Lift and Toe Raise</td>
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<td>16. Overhead Ladder and Fitness Facts</td>
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<td>17. Balance Walk and Target Heart Beat Range Guide</td>
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<td>18. Side Bend and Fitness Facts</td>
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<td>19. Hamstring Pull and Lift and Drop</td>
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<td>20. Tension Release</td>
<td>20</td>
<td>FINISH</td>
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</tbody>
</table>

Congratulations!

TOTAL: 4518 yds.
2.57 miles
4.14 km
Pixar Animation Studios

Stats:
Location: Emeryville, California
Completion Date: 2000, 2011
Client: Pixar Animation Studios
Landscape Architect: PWP Landscape Architecture
Architect: Bohlin Cywinski Jackson
Size: 20 acre campus

Project Description:
The 20-acre campus site follows a traditional feel of the corporate campus with rolling lawns and rose gardens with some playful art throughout the site. However, it provides the ideal workplace park that includes a basketball court, an amphitheater, benches and tables, a volleyball court, a chef’s garden, a swimming pool, and a jogging trail for employees to use.

Design Implications:
• Jogging/walking trail connecting numerous outdoor activities.
• Playful art incorporated into outdoor design as a source of pride of the company’s work.
• No sustainable design elements incorporated.
Case Reviews

Pixar Animation Studios
Case Reviews

Apple Campus 2

Stats:
Location: Cupertino, California
Completion Date: 2016
Client: Apple
Architect/Landscape Architect: Foster + Partners
Size: 176 acre secure campus

Project Description:
The proposed Apple Campus 2 will develop a site that is covered in hardscape and will replace it with over 100 acres of green space and sustainable buildings. The planting palette will mimic the Santa Clara Valley, pre-development. Native plant palette will thrive on little water and will work in conjunction with permeable paving to improve stormwater runoff water quality into the adjacent Calabazas Creek. The buildings of the campus are located amongst the secure landscape, which connects the interior workplaces to the outdoor facilities for relaxation, recreation and reflection. “The entire Campus, indoors and out, is intended to promote shared creativity and collaboration, and spur invention of the next several generations of Apple products.” (F+P)

Design Implications:
• Perimeter paths connect to spaces around the campus
• Raised pedestrian paths, marked bike lanes, bike boxes and crossings maximize visibility for vehicles.
• Secure campus not open to the public yet has enough activity options for employees to enjoy.
• Shared pedestrian and cycle paths.
• Natural, native plant palette, curb cuts, solar panels and permeable surfaces make up the sustainable design elements of the site.
• Incorporated an orchard into the design for the benefit of the employees.
Case Reviews

Apple Campus 2

North Tantau Avenue

1. Tantau Avenue is enhanced as a landscape boulevard with detached sidewalk, plantings, landscaped median, and clearly demarcated bike lanes on both sides.

2. Corporate Auditorium Entrance

3. Additional Bike/Ride Crossings

4. Pedestrian bridges along both sides over bridge.

5. Creek Trail linkage enhanced with paving and landscape plantings.


Vallco Parkway

6. Detached sidewalk, enhanced plantings, landscaped median, and/or painted bike lanes.

East Homestead Road

7. curb autoreduced to a single curb, enhanced landscape plantings, repaving, and replanting.
Case Reviews

Googleplex Campus

Stats:
Location: Mountain View, California
Completion Date: 1997
Client: Google
Landscape Architect: SWA Group San Francisco
Size: 26 acre campus, 5 acre public park

Project description:
The objective of this corporate campus project was to develop the privately-owned corporate headquarters and adjoining public green space. One of the design decisions was to create underground parking for approximately 2000 cars which enabled the landscape architects to integrate the two open spaces, public and private, with water features, shallow pools, fountains, pathways, plazas, and an enormous statue of a dinosaur. This project was a significant departure from typical corporate campuses of the time because it challenged conventional thinking about private and public space. Sustainable features include solar panels on the rooftops of the campus buildings and carports and community bikes available to transit across the campus.

Design Implications:
• Community bikes
• Incorporating adjoining public space into the site design.
• Multiple outdoor activities available throughout the campus for employee use
Case Reviews

Googleplex Campus
Nike World Headquarters Campus

Stats:
Location: Beaverton, OR
Completion Date: 1990
Client: Nike, Inc.
Architect/Landscape Architect: TVA
Size: 213 acres

Project description:
The Nike World Headquarter campus incorporates over 2.5 million square feet captured in 25 buildings. Home to over 6000 employees and expanding, the campus is the epitome of athletic facilities for its employees. Includes two fitness centers, outdoor track, multisport field, volleyball courts, indoor climbing wall, three running trails, including 84 acres of wooded space for employees only, five restaurants, a hair salon, museum and even a sports bar. The design focuses on the town square concept with all buildings and parking on the perimeter.

Design Implications:
- Plethora of physical activity amenities throughout the site available to the employees
- Constructed wetlands to treat stormwater on site.
- Strong pedestrian link between north and south campuses
Case Reviews

Nike World Headquarters Campus
**Bloedel Donovan Park**

**Stats:**
- Location: Bellingham, WA
- Completion Date: 2003
- Client: City of Bellingham
- Landscape Architect: City of Bellingham/Puget Sound Action Team
- Size: Approximately 3 parking spots

**Project Description:**
The City of Bellingham decided to create a rainwater garden in the parking lot of the Bloedel Donovan Park to help decrease the amount of runoff pollutants in the Lake Whatcom. This low impact design approach helped reduce runoff and pollutants into the adjacent waterway, improving the overall health of the lake.

**Design Implications:**
- Low impact design (LID) was very small and used only the space of three parking spaces in the parking lot.
- Cost effective; the rain garden was approximately 1/3 the cost of conventional stormwater conveyance and/or treatment systems.
- Use of LID adjacent to a large waterway
Case Reviews

Bloedel Donovan Park
Site Analysis

Site Context
Site inventory
Existing Green Space
Parking
Drainage
Circulation & Access
Opportunities & Constraints
U.S. Coast Guard Base Seattle is located downtown Seattle, WA at Pier 36, nestled between two facilities belonging to the Port of Seattle. It resides at the mouth of the east waterway of the Duwamish River and the base of Elliott Bay. Located on approximately 23 acres, the base is located between the two Port of Seattle container facilities with a small, public shoreline access directly adjacent to the southern border of the base. It is an extremely industrial area and function is the primary goal on the base leaving little space for outdoor areas for people to enjoy. Seattle has a reputation for being a rainy city, while this is true, it doesn’t rain every day. In fact, November through January are the rainiest, coldest and darkest months. Average temperatures are between high 30’s to low 50’s and the precipitation averaging between 4-6 inches per month. June through September are the least rainy and highest average temperature months for Seattle, averaging between 1-2 inches of precipitation per month and temperatures between 70-80 degrees. (weather.com)
Combined with longer days, due to the latitude of Seattle, this makes for pleasantly long summer days in which people love to soak up the outdoors. Seattle is located between the Olympic mountain range to the west and the Cascade range to the east. This dictates the wind direction in the area, typically from the north during the dry, sunny summer and from the south during the rest of the year. Occasionally, Seattle experiences a strong wind from the east through Snoqualmie Pass. Winds average 8-10 miles per hour creating great conditions for sailing in the Puget Sound and lakes of the area.
Coast Guard Base Seattle currently has pedestrian circulation issues and parking is at a premium due to over 1500 members being stationed on the base. When all five Coast Guard Cutters are moored at the base, parking becomes a game of who can get to the base the earliest to secure a spot for the day. Unfortunately, the closest mass transit station is 1.5 miles away and, while some members use it that makes it difficult to commute to the base, especially when it rains the majority of the year. There is the potential for reducing the parking issue by adding a bus stop within a short walking distance of the base entrance on Alaskan Avenue.
Aerial view to the southwest; main parking lot and the Sector building, the most contemporary building on base.
Site Analysis

Main entrance to the galley and barracks building. It includes this existing covered patio used for eating meals outside and waiting for the shuttle that transports people to the federal building downtown.

The inaccessible shoreline needs rehabilitation as it still houses the remains of two old piers, trash and invasive species. It is currently fenced of and typically has cars parked in front of it, blocking visual as well as physical access to the water.
Site Analysis

West end of the gym looking north.

Sector building required security setback, minimally planted & no design elements.
Available green space on the north side of the barracks. It houses some utilities but is in a prime location to harvest run off from the pier and parking area.
Site Analysis

South side of the Sector building and only place for people to sit outside on this part of the base. Notice the functional use of the patio; cart storage, bike racks, and recycling bin. Not pleasant to go outside and have to sit by the trash.
From this diagram, you can clearly see the small amount of green space currently existing on and around the base. Most of the green space has been consumed by parking due to extreme lack of parking on base for the amount of people that are stationed there. What little green space that is left is planted for aesthetic reasons only and there are very few opportunities to sit or be outside on nice days.
Parking takes up the majority of the space onsite. This amount of parking supports both commuter vehicles and work vehicles. The strain on parking is also based on if all of the large ships are in port or underway. Typically they are under way for 2 months at a time, which eases the parking burden for commuters. A couple of times a year, the schedules line up so that all ships are in and that is when the base really feels the strain of the lack of parking.

The base also has a large fleet of government vehicles that are housed in the off base, leased parking lot in the lower right corner of the diagram.
The base has a traditionally engineered stormwater drainage system. The system is a series of outfalls that connect and are directed into Elliot Bay (denoted by the large arrow). Several times a year, the tide is high and Seattle will get above average amounts of rain, which causes the system to back up. This back up creates shallow flooding in the base parking lots.

There are several opportunities to incorporate small bio retention basins throughout the parking lots. Also, the Barracks/Galley building and the Sector buildings were built more recently and have the required setbacks, therefore, incorporate green space that can be used in the design. By increasing natural retention, filtration and infiltration, this will reduce the amount of water travelling through the traditional drain system.
Circulation on site is limited and awkward for vehicles, bicyclist, and pedestrians. There is one main gate in which all modes must pass to be checked by security to gain access to the base. It has the necessary barricades and security measures but is very bicycle and pedestrian unfriendly. There is one other gate that pedestrians may use at the northeast corner of the base, which is convenient and preferred to use if on foot. It is a card swipe access for a turnstile so its not bicycle friendly. Another gate is near the Port Park near southwest corner of the base. However it is locked and no one can use it. This seems like an opportunity to re-institute the gate use for park access. There are no sidewalks through the main parking lot, making it extremely dangerous for pedestrians.
Site Analysis

Opportunities & Constraints

Port of Seattle Park
Unused Green Space Port of Seattle
Port of Seattle Shoreline Rehabilitation Initiative
Secure Fence Line
Barracks Rooftop
Underground utility project
Port of Seattle

Views

Alaskan Way
Massachusetts Ave

N
Site Analysis

Opportunities & Constraints

The constraints on this site are numerous, however, there are some unique opportunities that can be used to enhance the base for its function and its users. Rooftops are the first opportunity that should be utilized due to the fact there are two buildings, Galley/Barracks and Sector, that would be able to potentially accommodate rooftop recreation areas. Next is the main parking lot, with its non-linear shape, there are small parcels that cannot be used for parking so small bio retention basins could be retrofitted into these spaces. The Port park adjacent to the south can be used as “borrowed” space, with easy access for the base users to expand their options for sitting outdoors. Also, the Port of Seattle strip of land adjacent to the east side of the base could provide for an opportunity to create another space for users. Constraints are numerous, resources, available land, priority on parking as well as the weather could be considered a constraint for most of the year. However, the opportunities outweigh the constraints & this base has the potential to be an even more enjoyable, productive place to work.
Design Application

Design Program Concepts
Final Master Plan
LID Elements Section
Highlighted Areas
## Design Program

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Elements</th>
<th>Qualitative</th>
<th>Materials</th>
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<tbody>
<tr>
<td>Identify opportunities to incorporate low impact development for rainwater harvesting, storm water management &amp; enhance ecosystem services on Coast Guard bases.</td>
<td>• LID Stormwater management</td>
<td>• Bio retention basins</td>
<td>• Enhances quality of stormwater</td>
<td>• Locally sourced stone</td>
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<tr>
<td>• Passive &amp; Active Recreation</td>
<td>• Outdoor gym area</td>
<td>• Curb cuts</td>
<td>• Enhances quality of life &amp; health of members</td>
<td>• Recycled tire active surface</td>
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<tr>
<td>• Stormwater management</td>
<td>• Covered patio areas</td>
<td>• Porous pavement</td>
<td>• Increases opportunities for recreation</td>
<td>• Permeable pavers</td>
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<tr>
<td>• Disconnect gutters from sewer system</td>
<td>• Connection to Port Park</td>
<td></td>
<td>• Increases opportunities for interactions</td>
<td>• White tensile shade structures</td>
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<tr>
<td>Capitalize on small, underutilized spaces to provide recreation opportunities.</td>
<td></td>
<td></td>
<td></td>
<td>• Swipe access system for gate</td>
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<tr>
<td>Combine LID strategies in conjunction with recreation opportunities to maximize minimal space.</td>
<td>• Passive &amp; Active Recreation</td>
<td>• Obstacle course</td>
<td>• Enhances stormwater infiltration</td>
<td>• Mulch</td>
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<tr>
<td>• Stormwater management</td>
<td>• Rain gardens w/ seating</td>
<td>• Viewing pier w/ restored shoreline</td>
<td>• Increases amount of recreation opportunities</td>
<td>• Locally sourced stone</td>
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<tr>
<td>• Connectivity to Port Park</td>
<td>• Viewing pier w/ restored shoreline</td>
<td></td>
<td></td>
<td>• Native trees &amp; plants</td>
</tr>
<tr>
<td>Use design strategies that are pertinent to common environmental issues found on Coast Guard bases throughout the United States.</td>
<td>• Outdoor barbeque area</td>
<td>• Security</td>
<td>• Enhances social interactions</td>
<td>• Native shoreline plants</td>
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<tr>
<td>• Stormwater management</td>
<td>• Curb cuts in parking areas</td>
<td></td>
<td>• Improves base landscape sustainability</td>
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<tr>
<td>• Pedestrian/Bicycle safety</td>
<td>• Rain gardens w/ native plantings</td>
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<td>• Increases pedestrian safety</td>
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<tr>
<td>• Security</td>
<td>• Raised walkways</td>
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Design Concept 1

Capitalize on small, underutilized spaces and surrounding resources to provide recreation opportunities.

- Increase outdoor recreation options
- Passive outdoor space-covered
- Active outdoor space-uncovered option for physical fitness
- Access to waterfront
Design

Design Concept 2

Respect the main function, safety & security of base.

- Increased pedestrian & bike safety
- Re-introduce the connection to the waterfront for base users
- Adjacent park more accessible to personnel on base

Connectivity/Safety/Security

Diagram showing improved safety and security measures, including:
- Pedestrian/Bicycle Main Gate & Greenway
- Pedestrian Node: Raised crossing, Covered pedestrian safe zone
- Ped. Access to base waterfront
- Ped. Access, Gate to Adjacent Park
- Proposed Pedestrian/Bicycle Main Gate & Greenway
- Main Vehicle Gate
- Port Park
- Pedestrian Route

Diagram also shows the layout of the base with highlighted areas for connectivity and safety improvements.
Design Concept 3

Identify opportunities to incorporate low impact development (LID) for rainwater harvesting, storm water management and enhancing ecosystem services on Coast Guard bases.

- Increase pervious surface
- Rain gardens to increase Time of Concentration & filtration of stormwater.
- Curb cuts in parking islands
- Reduce amount of water through traditional stormwater piping system
- Rehabilitate shoreline to improve resiliency to storms & reduce erosion

Low Impact Development
Design

Final Master Plan

Rain Garden
Bio retention & Filtration

Barracks Rooftop Patio
Passive Recreation

Galley Patio & BBQ Area
Covered Passive Recreation

Rehabilitated Shoreline
Erosion Reduction & Habitat

Viewing Pier
Passive Recreation

Gate Access to Port Park
Active/Passive Recreation

Outdoor Gym
Active Recreation

Raised Pedestrian Walkways
Safety
Rain Garden
Bio retention & Filtration

Curb Cuts
Bio retention & Filtration

Pedestrian/Bicycle Entry
Safety & Separation of traffic
Filtration

Sector Building Patio
Covered Passive Recreation

Obstacle Course
Active Recreation
Design

Improved pedestrian walkway and main parking lot bio retention basin

Increased Pedestrian Safety
Storm water Filtration
Habitat
Design

Rooftop patio on Barracks

Passive Recreation Opportunity
Partially Covered Outdoor Access
Design

Outdoor workout area adjacent base gym

Active Recreation Opportunity
Centralized Access to all units housed on base
Design

Waterfront park and viewing pier
Native Grasses
Habitat Creation
Passive Recreation Opportunity
Access to Waterfront
Design

Bicycle & Pedestrian Gate

Separation of traffic
Filtration strips & permeable pavement
Small scale changes, as with anything in life, can add up to become a significant impact. There are three different levels of impact these small base design changes can make on many different groups: they can improve the quality of life of the people that work at this base, the wildlife within the area by creating native habitat, and the environment in the form of cleaner run off into Elliot Bay. With this one base, maybe a small change will occur and it will be important to the users, environment and the community. However, if the rest of the Coast Guard bases followed suit, implementing small, positive changes, the Coast Guard with its small footprint, would make a larger positive impact on the quality of life for all of its members and the environment of our country.


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