2012

Enhancing Human Health and Recovery Through Biophilic Design

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ENHANCING HUMAN HEALTH AND RECOVERY THROUGH BIOPHILIC DESIGN

A Thesis Presented

by

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Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF ARCHITECTURE

May 2012

Architecture + Design Program
Department of Art, Architecture and Art History

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ABSTRACT

ENHANCING HUMAN HEALTH AND RECOVERY
THROUGH BIOPHILIC DESIGN

MAY 2012

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The unquestionable human reliance on the natural world throughout history has reinforced the intuition of the human affinity for nature and the notion that human physical, psychological and even moral well being is largely dependent on experiencing a diverse and healthy natural environment. This connection has ultimately influenced the decisions we have made thus far to endure as a species and has resulted in tremendous changes to both our natural and physical framework.

This thesis focuses on creating an interconnection between life, nature and the built environment to create architecture that enriches our daily lives through the use of Biophilic Design. The primary goal is to create a Veteran Rehabilitation Center in Rochester, New York where war veterans will be provided with a facility harnessing the essential characteristics necessary for a smoother transition back to their once traditional lifestyles. Occupants of this built environment will be inspired, invigorated and comforted by their surroundings and provided with an innovative soothing ambiance to reflect from the traumatizing effects of war.

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CHAPTER 1

BIOPHILIC DESIGN

1.1 Introduction

The role of the natural environment in human growth and development has been a critical factor that is often underutilized and unappreciated in our modern urban society. Biophilic Design, or *biophilia* is the inherent human inclination to affiliate with natural systems and processes. This affinity became biologically encoded in enhancing human physical, emotional and intellectual fitness during the course of human evolution due to the surrounding natural context the human mind and body developed in.

1.2 Restorative Design

Biophilic Design is a sustainable solution to the unfortunate design of the modern urban built environment. Where degradation of the natural systems has caused an increasing separation between the human and the natural environment. This design process is commonly referred to as "Restorative Environmental Design" because of its unique design approach that "aims at both a low-environmental-impact strategy that minimizes and mitigates adverse impacts on the natural environment, and a positive environmental impact or biophilic design approach that fosters beneficial contact between people and nature in modern buildings and landscapes.[1]

1.3 Dimensions of Biophilc Design

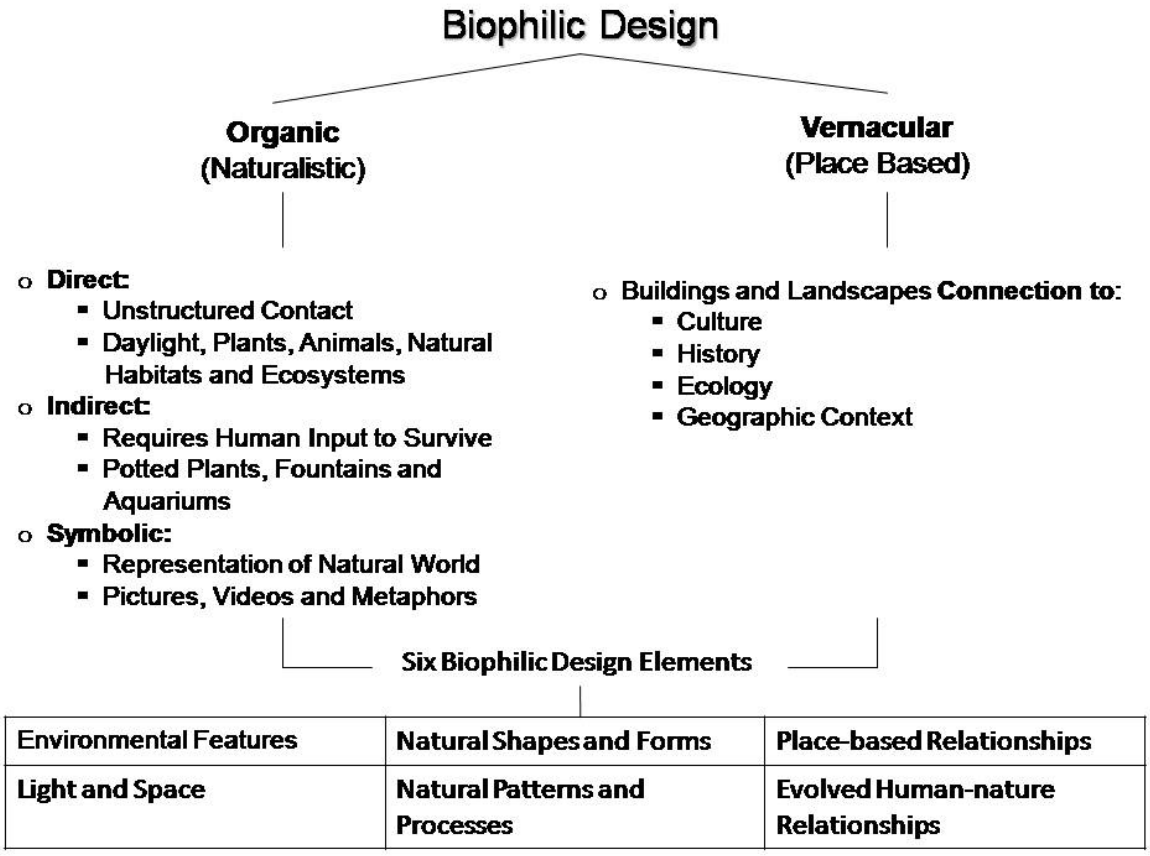

Figure 1: Organic & Vernacular

Biophilic Design is broken down into two main categories that can result in different design solutions, each demonstrating a relationship with the natural environment. Vernacular or place based design, refers to buildings and landscapes that create an attachment to place by connecting culture, history, ecology within a geographic context. Organic design or a naturalistic approach uses forms and shapes in both the building and the landscape that directly, indirectly or symbolically represent those found in the natural environment.[2] This thesis is primarily focused around the use of organic design techniques to create a harmonious relationship to nature.

1.4 Experiencing Nature

The natural world is all around us. However, through the continuous development of poorly designed urban spaces, we have managed to isolated ourselves from nature. Experiencing natures positive qualities and unique spaces can be a truly amazing experience. As humans we enjoy the aesthetic and the relaxing characteristics it creates. Edward O. Wilson studied the human approach to the natural world in search of instinctive moves that a large majority of humans would choose to make if they were given complete freedom to choose a setting for their homes or offices. It was apparent through this study that people gravitate toward an environment that combines three features, "people want to be on a height looking down, they prefer open savanna like terrain with scattered trees and copses and they want to be near a body of water such as a river or lake, even if all these elements are purely aesthetic and not functional."[3]

CHAPTER 2

NATURES AFFECT ON HUMAN HEALTH

2.1 Why Exposure Aids Human Health

Several experimental studies have been conducted that seek to find if exposure to nature really can improve human health at both a physical and psychological level. These experiments have primarily been conducted in nursing homes and hospitals because this group of the population is often sick or in pain and is under close supervision of doctors to analyze the patients responses. Furthermore these spaces also provide living areas so patients are present in these conditions for an extended period of time.

It is believed that nature posses the ability to make the human body feel more at ease and comfortable in a particular setting, which in turn can improve our stress levels, reduce the amount of pain felt after an instance such as surgery and it also has the power to distract and sooth the mind and body simultaneously. One study conducted in a hospital setting used patients recovering from abdominal surgery and analyzed the amount of strong narcotic pain medications required by patients located in two identical rooms with differing views. Room 1 had a view of a brick wall and rooftop several feet away. Whereas room 2 had a view to nature and the surrounding landscape. Results showed that patients with the window view out to nature felt significantly less pain after surgery and required less medication that those with the view of the building, implying a faster healing rate. Furthermore patients with the view to nature had better emotional well being, fewer minor complications and had fewer post surgery complications.[4]

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Analgesic Strength	Number of Pain Drug Doses (days 2-5 after surgery)	
	Nature View Patients	**Wall** View Patients
Strong	0.96	2.48
Moderate	1.74	3.65
Weak	5.39	2.57

Figure 2: Nature vs. Brick Wall

Image Source: Kellert, Stephen R., Judith Heerwagen, and Martin Mador. *Biophilic Design: the Theory, Science, and Practice of Bringing Buildings to Life*. Hoboken, N.J.: Wiley, 2008. pg 94. Print.

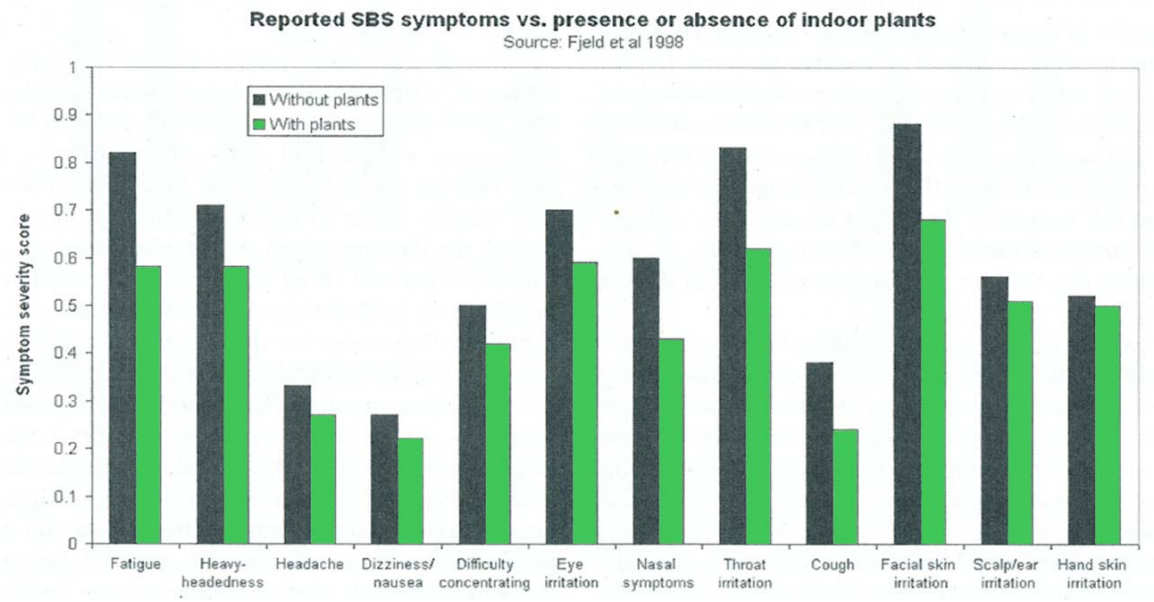

Figure 3: Natures Influence on Minor Health Issues

Image Source: Kellert, Stephen R., Judith Heerwagen, and Martin Mador. *Biophilic Design: the Theory, Science, and Practice of Bringing Buildings to Life*. Hoboken, N.J.: Wiley, 2008. pg 128. Print.

CHAPTER 3

HARMONIZING THE NATURAL AND BUILT ENVIRONMENTS

3.1 Method

One of the biggest challenges we face in the coming year is shifting our design focus from the typical LEED conscious buildings, to Restorative Environmental Design or Biophilc Design that strives to knit the building within the existing fabric of the natural environment. These structures will perform at the same level of energy efficiency as traditional LEED buildings, but more importantly they will not turn their backs to the natural environment. The building and landscapes of this design process create a harmony between one another that will generate environments capable of enriching our daily lives.

Promoting more positive contact between people and nature in the built environment is slowly becoming the new effective practice of green design. James Wines suggests that "people will never want to keep an aesthetically inferior building around no matter how well stocked with cutting edge thermal glass, photovoltaic cells, recycled materials and zero emissions carpeting it may contain. The mission of sustainable design is also to recover those fragile threads of connectedness with nature."[5]

3.2 Designing In Harmony

Figure 4: Loblolly House

Image Source: "Loblolly House." *Kieran Timberlake Architects*. 2008. Web. 1 Nov. 2011. <www.kierantimberlake.com/home/index.html>

Kieran and Timberlake Architects Loblolly House, located in Taylors Island, Maryland is a great example of how the built environment can be designed to integrate into the natural environment with little disturbance. The house uses several influential features from the surrounding site within the design to create a home integrated within its context. Several major factors that influenced the design of this structure included the verticality of the surrounding forest, as well as the play between solid and void experienced when looking through the trees on the site. By using natural materials and taking advantage of natural features such as view, orientation and the impact of changing weather conditions, a successfull relationship was established between to the natural and built environment.

Figure 5: Integrating Site Features

Figure 6: Nature Within The Built Environment

Image Source: "Loblolly House." *Kieran Timberlake Architects*. 2008. Web. 1 Nov. 2011. <www.kierantimberlake.com/home/index.html>

CHAPTER 4

PSYCHOLOGICAL COMFORT IN THE BUILT ENVIRONMENT

4.1 Introduction To Comfort

"After words such as self-confidence, self esteem, melancholy and sentimental were first introduced, an emergence of something new in the human consciousness became apparent: the internal world of the individual, of the self and of the family."[6] This notion introduced the idea of a spatial experience at a psychological level.

4.2 Experiencing Comfort

Every space we experience no matter where it is located, will affect our psychological perception, resulting in a certain interpretation of the space. There are numerous elements that will subconsciously affect how we feel, such as color, texture, sound, light, movement and aroma for starters. These items all affect how we feel in a space and can result in different psychological responses to a space.

Colors for example can have a significant impact on the mind and when used correctly can influence the human body to feel a certain way. A common example of this is demonstrated in fast food restaurants such as McDonalds and Burger King where red, yellow and orange are often used. This is because their primary intention is to get customers in and out quickly. These three colors are said to stimulate the appetite and promote action. In doing so they create an uncomfortable dinning environment that encourages a quick meal.

Unlike fast food restaurants, a sit down restaurant has the intentions of luring people in and keeping them there. They may use elements of sound and smell, enticing people to come inside and dine. Once inside elements such as a water fountain which provides a soothing sound can result in people extending their stay, as their level of comfort could be increased. This application is often used in malls, as the soothing notion of a waterfall can result in people staying in a space for a longer period of time, resulting in them spending more money.[7] Each unique instance alters the level of comfort we feel at a psychological level and can result in a powerful means of changing the way we inhabit a space.

4.3. Sense of Place

Architect Terri Boake argues that "designers need to think in terms of a spectrum of comfort when designing the reduced-impact buildings of the future." To begin to solve this mystery it is essential to understand how comfort is being addressed in present day architecture and more importantly, has it been successful in achieving its goal. Figure 7 demonstrates just a few of the ongoing list of necessities that impact the notion of a comforting sense of place.

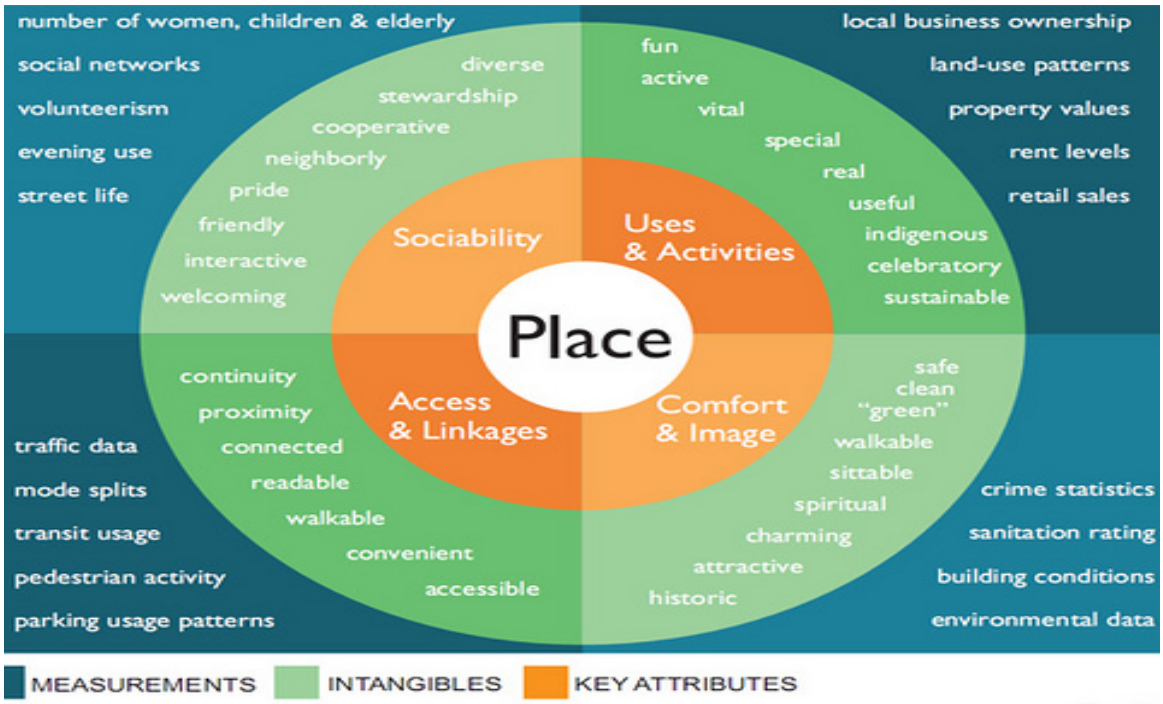

Figure 7: Designing A Sense of Place

Image Source: "Planetizen." May 2009. *Redefining "Comfort" in the Architecture of the Future* . 4 May 2011. < http://www.planetizen.com/node/38747>

Each individual element on the chart supports the four main characteristics of sociability, comfort, access and programmatic uses that combine to form a positive and successful sense of place. Creating a positive spatial experience should be approached using this "spectrum" of qualities in order to address a variety of issues, to a large and diverse group of users.

4.4 Dynamic Space

Furthering this investigation into comfort, much of the attention has been directed toward the architectural characteristics of a space. Specifically focusing on the use of

forms, materials and the incorporation of natural vegetation, as the combination of these elements establish a major part of our built environment.

The first space that demonstrates these present day characteristics of dynamic comfort is the "Blesso Loft" in New York City designed by architect Joel Sanders and landscape designer Andrea Steel. This penthouse apartment strives to merge building and landscape, by bringing nature in and pushing living space to the outdoors. This concept of bringing the landscape indoors plays a large part in achieving a comfortable interior environment. From a psychological standpoint, the human body is inclined to be more content in a space that provides the qualities of both an indoor and outdoor space. This will result in an increased satisfaction with the interior space and will likely allow one to enjoy these areas for a longer period of time

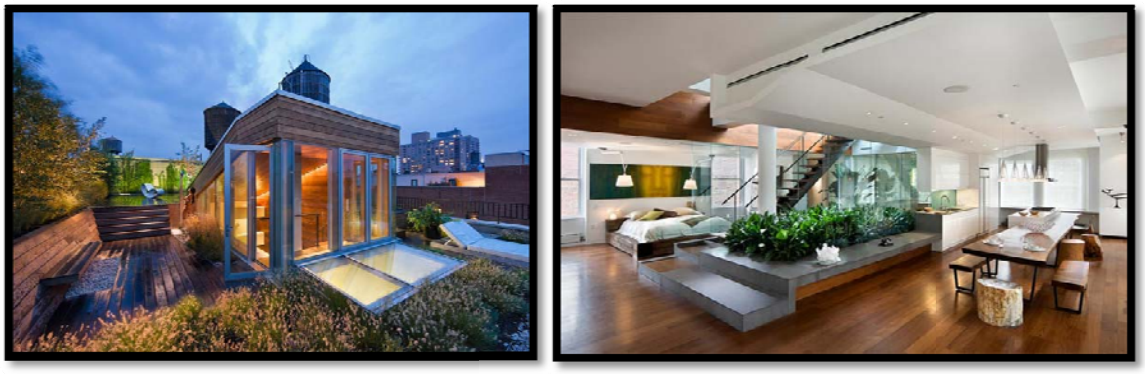

Figure 8: The Blesso Loft

Image Source: McHugh, Sharon. "A Green Machine For Living." *World Architecture News*. 30 Oct. 2008. Web. Feb. 2011. <http://www.worldarchitecturenews.com/index.php?fuseaction=wanappln.projectview&upload_id=10577>.

This open interior space is shaped from several rectilinear forms that express the horizontal and reinforce the spacious feeling experienced in the apartment. Using a variety of natural materials and color tones on the walls and ceilings, allows guest to

differentiate the numerous programmatic spaces, separating private from public without the use of internal walls. Fluctuating ceiling planes create areas with different levels of intimacy. In the bedroom for instance, a lower ceiling height is used to define it as a private area while increasing the level of intimacy. Semi-public areas are defined with higher ceiling heights that are recessed from one another, creating gaps for natural light to enter.

One of the most interesting spaces that this apartment has is the rooftop garden that provides another gathering area in an outdoor environment. Since the outdoor garden is located on the second level, a visual link was created by bringing lush vegetation inside, while enhancing the indoor environment. The transition space begins to foreshadow what is at the top of the stairway and creates an effective expansion of the living room. The natural vegetation at the rooftop level brings privacy and peace to this exterior space and provides a secluded environment to enjoy the New York City skyline.

This newly designed loft demonstrates a similar style and aesthetic that many architecture firms are expressing, especially in residential applications. The simple elegant solution provides a warm environment to its residents and is successful in that aspect. But does the space itself provide comfort? To a majority of people it may, but others may find that it lacks complex order and the feeling of human occupation in the space. Grant Hildebrand once said "order alone is monotony, not enough to keep the mind alive" and "complexity alone is chaos." This dwelling space although beautiful from an architectural standpoint may provide only certain aspects of comfort. Referring back to the various elements of comfort, it can be argued that the space is successful at; providing a positive spatial experience, using light, materials, textures, color, movement

and separation of spaces through an open floor plan in a harmonious manor. Yet the space is selective at the cultures that would experience comfort in it, thus making it an appealing option to only a select group of individuals.

As our perception of meaningful space through comfort continues to evolve parallel to the advancements of society, the approaches in design continually progress in response to influences of the past. The creativity that designers portray through architecture can have countless origins and concepts leading to a range of solutions that bring different atmospheres and feelings to the spaces we experience.

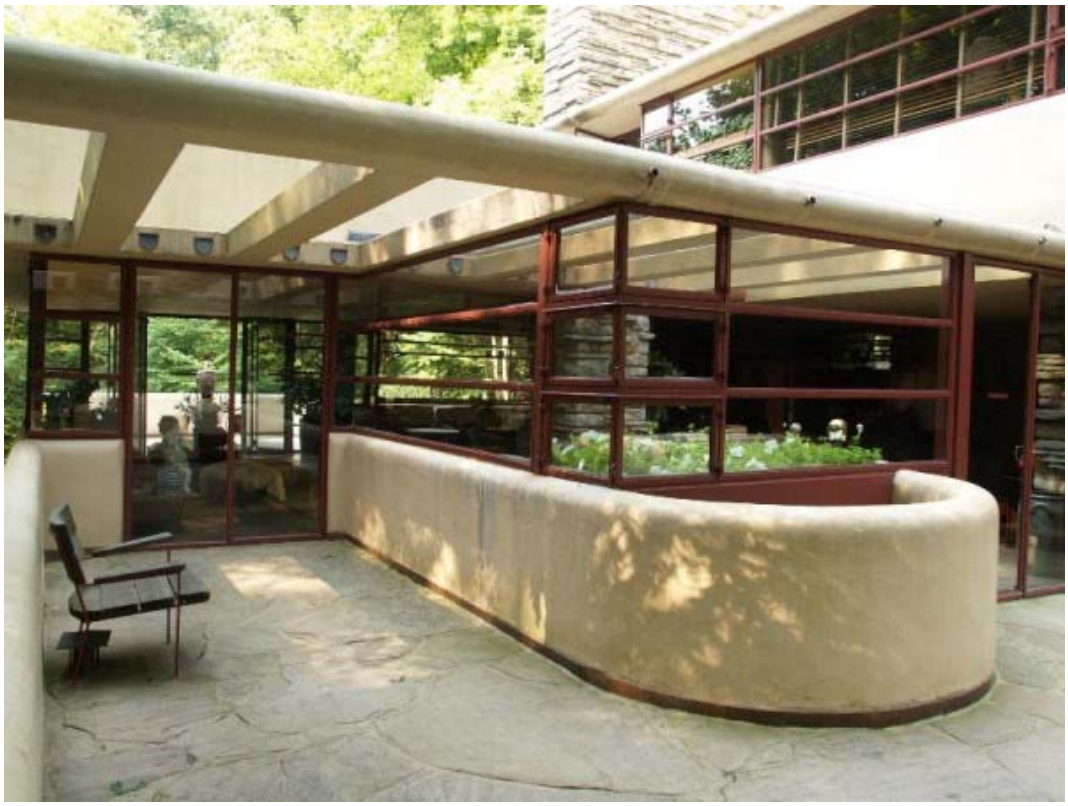

Figure 9: Falling Water Transition Space

Image Source: "Interior Design, Industrial Design, Design News and Architecture Trends Inspiration." *Interior Design*. Web. 10 Feb. 2012. <http://designlike.com/2011/04/10/fallingwater-by-frank-lloyd-wright/>.

Grant Hildebrand in *Orgins of Architectural Pleasure* explores abstract levels of survival tactics, as a means of creating interesting architectural characteristics relevant to the instincts of our ancestors. Hildebrand investigates five survival advantageous characteristics; prospect, refuge, enticement peril and complex order as a means of organizing and experiencing space.[8] The juxtaposition of prospect and refuge is an interesting and applicable are to focus in relation to Biophilic Design. The interaction between the built form and our presence in it acts as a catalyst that draws us into a space. In spaces such as Frank Lloyd Wright's Falling Water, the approach to the space demonstrates this concept. These straightforward yet complex mysteries created by controlling view, lighting and the areas where we rest in the context of a space, generates a feeling of curiosity. This consequently leads to the exploration of the areas of refuge, while visually experiencing the areas of prospect in the distance. This instance is a very exciting way to begin to pull people into and through a site, as well as throughout the interior of the structure, furthering the exploration of these spaces.

Expanding on this concept of using form to pull people through a space, the juxtaposition of prospect and refuge also showcases these similar strategies. However, instead of pulling one through an interior space, this notion explores pulling people from the exterior into a space, leading to further exploration of this area of refuge.

Movement, culture, prospect and refuge can be better understood in Renzo Piano's Jean-Marie Tjibaou Cultural Center in Noumea. Creating structures that symbolized a contemporary version of the wood huts the Native Kanak people would dwell in, creates a comforting environment that is geared towards the Kanak culture of New Caledonia. The site itself expresses a linear movement through multiple pathways that pull visitors through the natural site. The use of materials gives an "unfinished" appearance that was deliberately designed as a reminder that the culture is "still in the process of becoming." This belief that was originally held by the deceased Canaque leader, gave inspiration to the Kanak people and improves upon the connection to the culture and the landscape. Although the technological advancement of the newly established facility far surpasses that of the Kanak people of the past, the cues and links created connect the tribes past to the present by preserving the tribes rich values.[9] The deeper meaning and relationship acknowledged through the treasured cultural moral, was the primary reason for the accepted and successful result of the architecture.

Figure 10: Jean-Marie Tjibaou Cultural Center

Image Source: Silloway, Kari. "Marie Tjibaou Cultural Center New Caledonia by Renzo Piano." *Galinsky*. 2004. Web. 20 Feb. 2012. <http://www.galinsky.com/buildings/tjibaou/index.htm>.

Each of the precedents explored demonstrates in its own way a comforting environment that suits the needs and desires of the user. By looking deeper into the projects themselves there were several key elements that the projects portrayed that overall created a successful space for that particular project and its associated users. With so much of the affects of comfort being transmitted through a physiological means, we will focus on these principals first. Both the Blesso Loft and the Tjibaou Cultural Center created a satisfying comfort through the expressive clean geometries and forms used in the design. They established a visual link to the surrounding spaces, whether it

was the surrounding landscape or the city skyline that reinforced the connection it established a sense of place within the structure while facilitating the needs and desires of its users. The designs also expressed a fluctuating level of intimacy according to the spaces use. The warm materials created a more emotional and expressive feeling of comfort that brought a sense of physical well being and enjoyment to the space. This affect was reinforced through the natural vegetation both inside and outside the space and conveyed a sense of peace and harmony to each project. The incorporation of nature within the architecture has proven to reduce stress, especially for those with high levels and creates a natural environment that is good for emotional well being.

Today as a society we have become an urban dwelling species. Incorporating successful internal and external environments is incredibly important in the new spaces we are creating, reconnecting us to nature and bringing pleasure to our lives. This can be achieved using old notions of prospect and refuge and creating a connection from the cozy and dark interior space to the grand and expansive exterior space. Hildebrand once stated "this acute awareness of traditional is a modern phenomenon that reflects a desire for custom and routine in a world characterized by constant change and innovation." This concept of prospect and refuge for many years had brought happiness to countless lives and cultures, but over the years has become forgotten in many architectural applications.

Complex order in architecture can also enhance a comforting experience in a space and separates architecture from "just building," according to Hildebrand. Together they create a richness and balance that we enjoy. A variation in order is something demonstrated especially well through Renzo Piano's project, as the enticing features have

the power to induce exploration of space. We can enhance this process and create "safe exploration" by playing with light and allowing movement to occur from darker areas to brighter areas. This is just one of the many ways light that can be articulated in a space. However, its overlying contribution of creating comfort in a space can be achieved in a number of ways.

CHAPTER 5

THE AUDIENCE

5.1 War Veterans and PTSD

Over the years the United States in particular has been involved in several wars that has sacrificed the physical and psychological well being of millions of Americans exposed to the traumatizing affects of war. Many of those who are fortunate enough to return home from war have experienced a difficult transition period due to the vivid memories they now carry from their experiences. This unfortunate affect that many soldiers suffer from is referred to as Post Traumatic Stress Disorder or PTSD.

PTSD is a very serious disorder that is impacting more people each day due to the continual violence we face worldwide. The primary affects of PTSD increase anxiety and depression levels in people and often times bring back vivid flashbacks of their experiences. Currently there is no specific cure or way to heal the emotional scars that soldiers encounter, as each person suffers from different tragedies. The primary way that this disorder is being dealt with to date is through counseling. Soldiers are encouraged to talk through their experiences in both a one-on-one and group settings to help alleviate much of the painful memories they carry.[10]

Figure 11: Veterans With PTSD

Image Source: "EFT Zone." November 2008 *EFT for War Veterans. 18 Nov 2011.* <http://www.eftzone.com/2008/11/11/eft-for-war-veterans/>

So how do you help treat a disorder where each person needs are different? This is where Biophilic Design can play a critical role. By creating soothing and relaxing environments in addition to the current therapy treatments being used today, we can create environments that will stimulate the human body at multiple levels. If people are provided with an environment that provokes both physical and psychological comfort, this could help to enhance therapy sessions, relax patients, and improve the healing and transition periods that many soldiers endure when returning from war.

5.2 Transitioning

When returning from war soldiers are faced with a difficult transition period as many of their lifestyles and daily priorities change. After interviewing numerous veterans and listening to the stories of many others, it was made clear that one of the biggest changes they encountered was the shift from a structured military lifestyle to an unstructured civilian lifestyle.

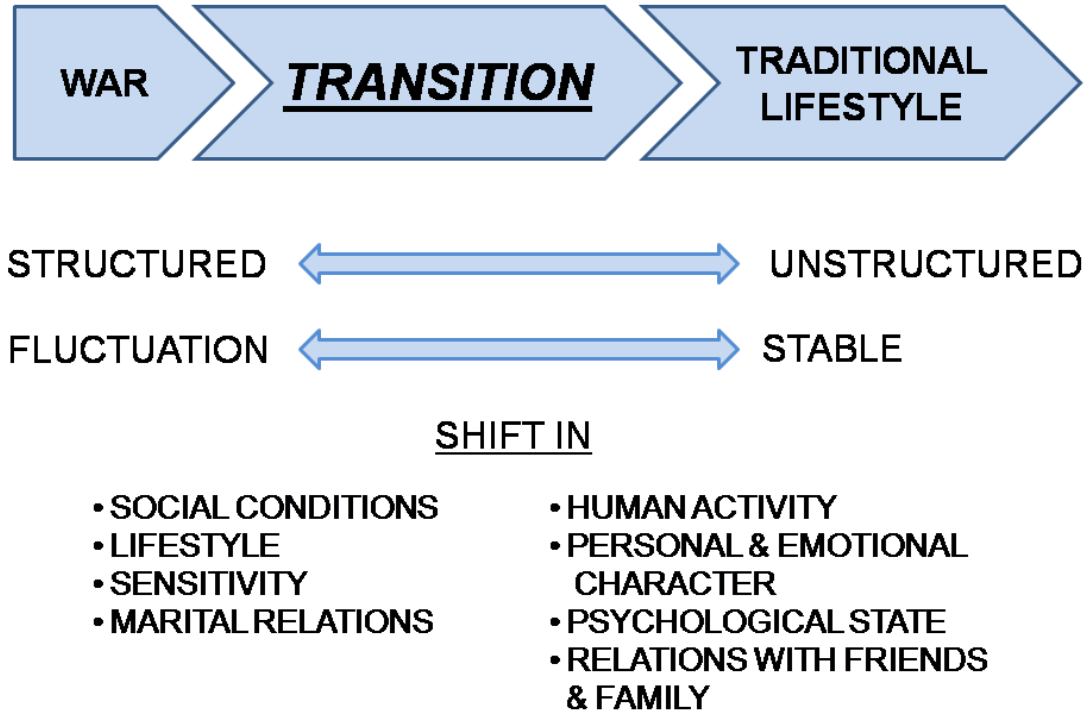

Figure 12: Transitioning From War

These drastic change have left many soldiers lost when returning home after war, unaware of what the next step in their life should be. Employment in particular is a very difficult hurdle for many veterans as they are unaware of what jobs they are qualified for. This has proven to be a serious problem as unemployment amongst veterans has lead to an increase in homelessness nationwide. As of 2006, 25% of the veterans polled had spent some time homeless. That is nearly half a million U.S. veterans.

Figure 13: Homeless Veterans

Image Source: "National Alliance to End Homelessness." December 2006 *Veteran Homelessness.* 28 Nov 2011. <http://www.endhomelessness.org/>.

5.3 Veterans Village of San Diego

When soldiers return home from war and are faced with difficulties finding employment and dealing with the many complex emotions they now carry, they need a place to turn to. Veterans Village of San Diego is a very unique rehabilitation facility that is structured to help treat veterans who may suffer from a variety of problems including PTSD, drug and alcohol addiction, homelessness and unemployment. The

facility is different than a typical Veteran Affairs hospitals as it strives to help reshape veterans lives instead of focusing primarily on their medical needs.

Figure 14: VVSD Courtyard

Image Source: "Veterans Rehabilitation Center (VRC)." *Veterans Village of San Diego*. 2010. Web. 15 Oct. 2011. <http://www.vvsd.net/vrcenter.htm>.

The facility creates a pleasant outdoor landscape with a lot of open space to provide gathering and seating areas for soldiers to interact with one another. The campus itself is dived into two main zones (Figure 17) half being the housing area and the other half the rehabilitation facilities. The areas buffering the zones from each other are green landscaped walkways, creating small intimate seating areas as you pass through on the way to your residence. Nearly 40% of the campus consists of green space for gathering and circulation between the facilities. Due to the warm San Diego climate this set up is

made possible. However on days when the weather is not spectacular, the campuses size is also reduced by 40% as those outdoor spaces no longer become a hot spot.

Figure 15: VVSD Exterior Green Space

Image Source: "Veterans Rehabilitation Center (VRC)." *Veterans Village of San Diego*. 2010. Web. 15 Oct. 2011. <http://www.vvsd.net/vrcenter.htm>.

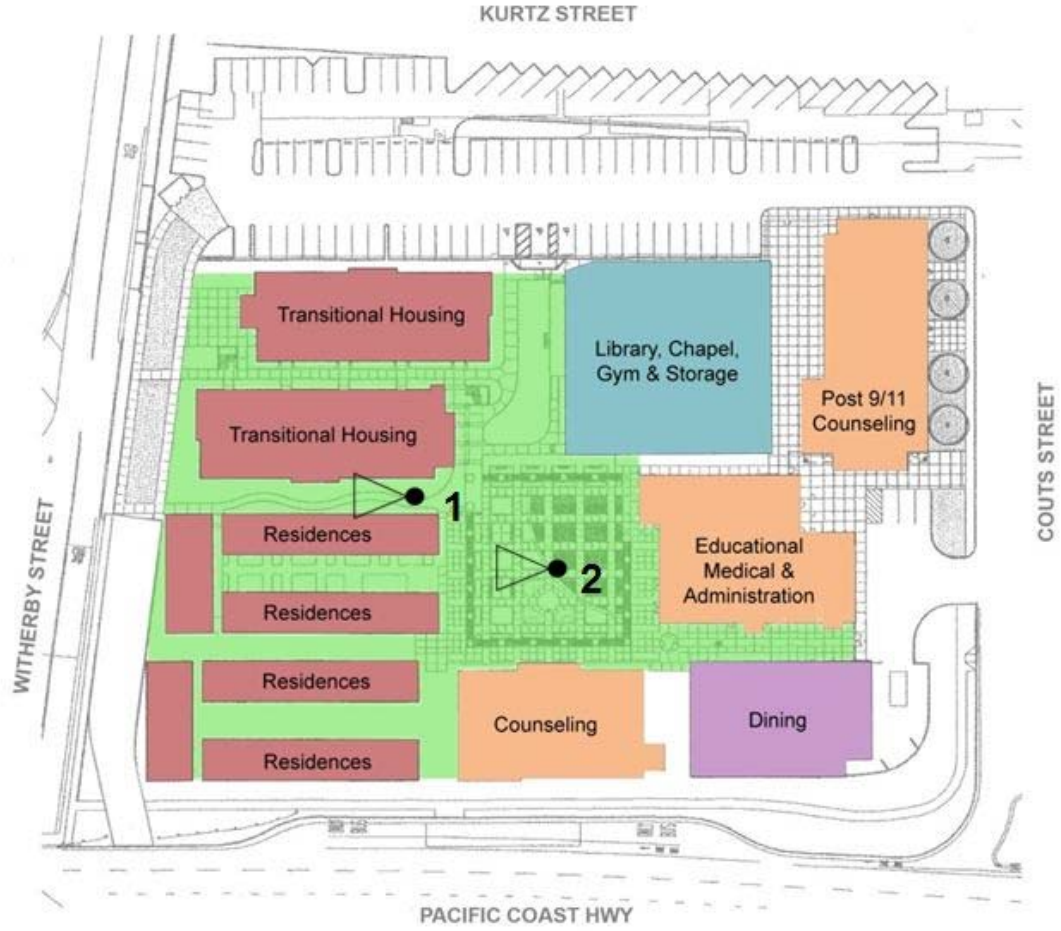

Figure 16: VVSD Site Plan

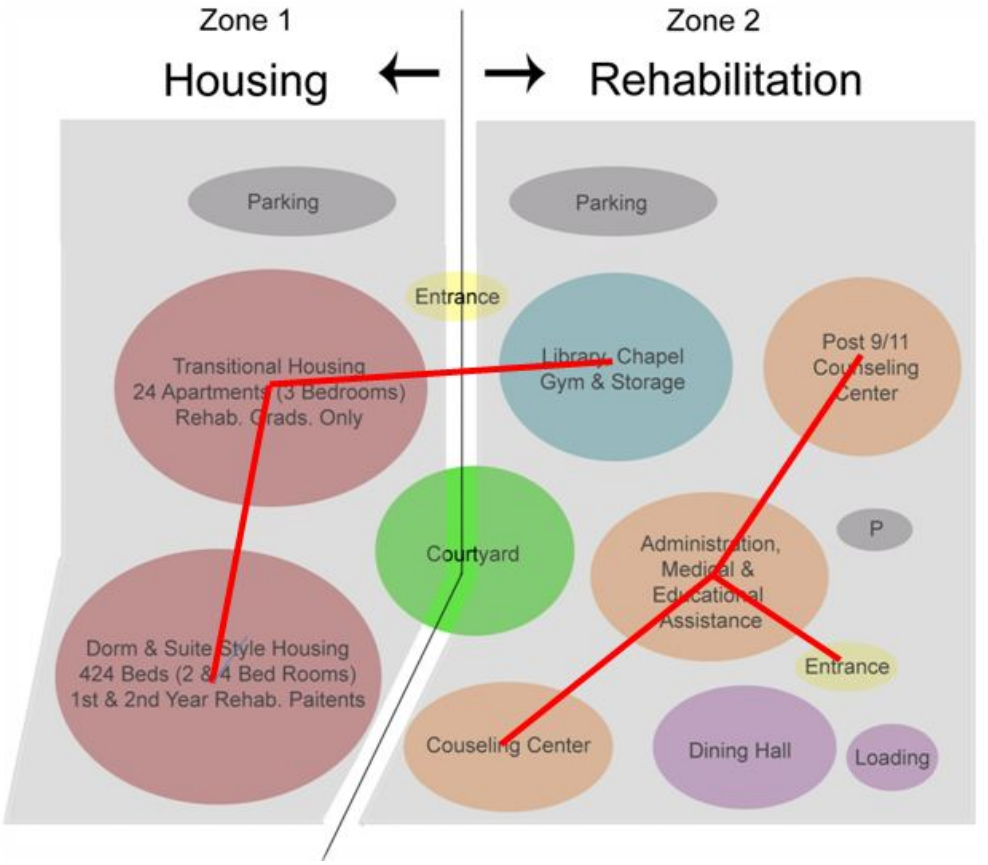

Figure 17: Site Adjacencies

The campus provides a very structured daily routine for the soldiers, as this is the lifestyle that they were once accustomed to. By using simple notions the owners of the VVSD were able to create a facility that functioned very similar to the military. For instance the room layouts and bunk sizes are similar to that in a typical barrack at a military base. This is all part of a collective effort to create an effective transitional facility that is more comfortable and familiar to the veterans.

CHAPTER 6

CREATING A BIOPHILIC REHABILITATION FACILITY

6.1 Applying The Theory

Preservation of our natural environment is an incredibly important mission that has received increased attention over the past two decades. However, today much of the focus is directed solely on the performance factors of the buildings we are creating. Often times little attention is directed towards the human affinity for the natural environment and the positive impact it can bring to our lives. The combination of natural materials and vegetation integrated into the indoor environment has not only shown positive impacts among sick patients, but also to healthy people as well. Individuals associated with indoor spaces that incorporate natural vegetation and views to nature are found to have lower stress levels, increased productivity, better focus, higher moral character and even have the ability to heal from sickness at faster rates. With such substantial affects to the human body and the numerous ways the natural environment evokes positive aspects in our daily lives, leaves one to question why it is disregarded in many of the new building standards to date. It would be in the best interest of the veteran population to create a rehabilitation center based on the theories of biophilic design, resulting in a structure that is equally rewarding to both the environment and to human health.

6.2 Goals and Challenges

This facility will strive to make a connection to the natural environment at all three levels direct, indirect and symbolic, creating a facility that provides many traits representative of being outside within an indoor environment. Due to the geographic

location of this site, the facility will have to provide spaces that will be accessible throughout all four seasons to be successful. Furthermore it will push the envelope of creating a low impact design community where both passive and active sustainable systems will be integrated without compromising the elegant and natural feel. If these elements of biophilc design can be effectively incorporated, our veterans who are so often accustomed to living in an uncomfortable environment, will be provided with a soothing natural environment that still preserves the sense of security and structure they felt while in the armed forces. Providing this satisfying environment that will enhance the health and recovery time in combination with a facility that can tend to the physical and emotional needs of the veteran population, will provide the best and fastest overall transition back into society.

6.3 Site

Using the three basic features of the natural environment that humans gravitate towards, helped determine the best location for this Veteran Rehabilitation Center. The site is located in Webster, New York just 4 miles outside the City of Rochester. along the eastern shore of Irondequoit Bay. This site located on a large peninsula 3/4 of a mile away from the Webster Army Reserve Center. The site contains many features that makes this the perfect location for this facility. The site has a dynamic topography offering places to access the water as well as provide high points that create opportunities to take in the view of the bay. The landscape orientation is spread from east to west allowing for plenty of southern exposure and has access to many nature trails and a park located on the north side of the peninsula.

Figure 18: Rochester, NY Site

Figure 19: Site Aerial

6.4 Zoning

The site is currently zoned as a Waterfront Development District that woud permits the development of a rehabilitation center and the associated living facilities as long as the facility protects the scenic views and is designed in harmony with its environment. Furthermore the facility must provide active and passive recreational opportunities and abide by the 25ft setback requirements from the waters edge.

6.5 Site Analysis

The site contains a number of features that needed to be taking into consideration when approaching it from a design perspective. First and foremost the site has an extensive amount of topography change from the access point to the water line, totaling about 150 feet in grade change. Also as shown in the existing conditions model below (Figure 20) there is a distinct ridgeline that passes east to west through the middle of the site. This ridgeline is a crucial element because in the winter season when the sun is located at its lowest angle, results in much of the site north of this ridge line being put in shadow (Figure 21). This would work against many of the passive design techniques that the project is looking to accomplish.

Figure 20: Existing Site Topography

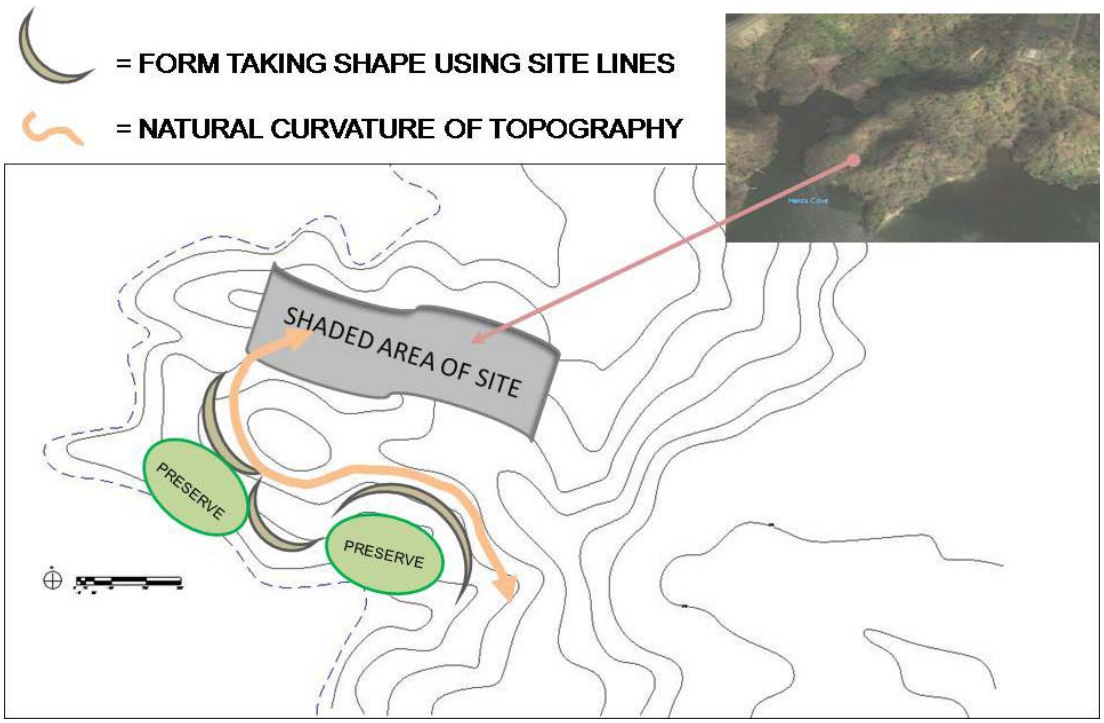

Figure 21: Influence of Site Variables on Form

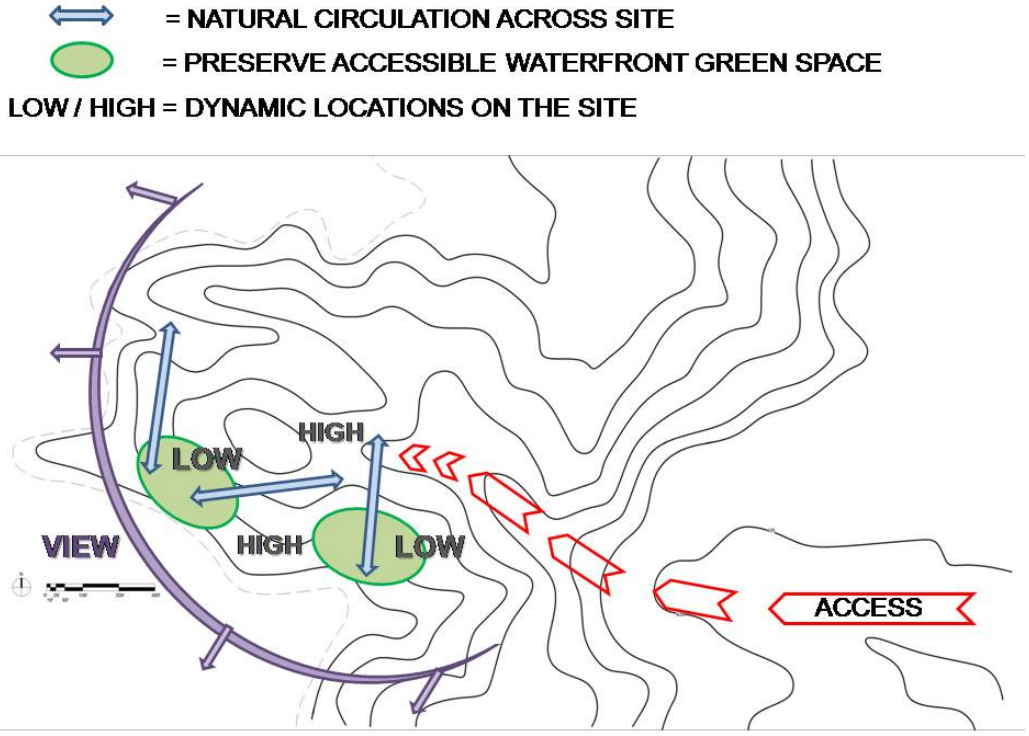

Figure 22: Site Diagram

The sites existing topography exhibits several interesting elements that creates two distinct areas where a smooth transition can be made from the ridge to the water line. These natural circulation paths are used by deer and other animals that inhabit the site as they provide the smoothest transition up and down the site in order to access the water. Currently these two pockets contain mature trees with tall canopies that allow for a circulation underneath them.. It will be beneficial to preserve these two areas to create shaded outdoor natural green spaces that act as a buffer between the water and the rehabilitation and living facilities. Also these deer trails help to inform the easiest areas to navigate throughout the site and will be taken into consideration for basing circulation methods off the natural process that occur on the site.

6.6 The Program

Rehabilitation Center	55,000 ft²
Rehabilitation Living Facilities	75,000 ft²
Transitional Housing Facilities	25,000 ft²
Total (Including Circulation):	190,000 ft²

Figure 23: Basic Program

The facilities are designed to establish a one year long rehabilitation program that would accommodate living facilities for all of its candidates. Those who have graduated from the rehabilitation program but would like to remain in close proximity to benefit from the counseling center and the other services have the opportunity to live in the transitional housing facility as a means of creating an additional step in the transition process.

Rehabilitation Center
❖ Community Gathering ▪ Visitor Check In ▪ Movie Theater ▪ Performance Stage ▪ Indoor / Outdoor Social and Relaxing Areas
❖ Food Service ▪ Dining Hall ▪ Cafe
❖ Health & Wellness ▪ Counseling Center ▪ Physical Health Center
❖ Educational ▪ Education Guidance Center ▪ Employment Assistance Center
❖ Spiritual ▪ Chapel ▪ Counsel Room
❖ Guests and Family ▪ Private Rooms
❖ Recreation ▪ Weight Room ▪ Arts and Crafts ▪ Water Activities ▪ Nature Trail Walks
Rehabilitation Living Facilities
❖ Residences ▪ Barrack Style (8-12 people) ▪ Suite (3-6 people) ▪ Dorm (2 people)
Transitional Housing ❖ Residences ▪ Apartments (25units) (1-3 Bedrooms)

Figure 24: Full Program

6.7 Form Development

The overall building form was designed based on several key attributes of the site and the surrounding context that would enhance the biophilic characteristics of the campus. The primary factor that drove much of the buildings form dealt with the views that could be experienced from the site. The investigation into form studied different

techniques that would provide views across the bay from the main rehabilitation spaces and all of the residential space. To accomplish this task the building programs were blended together, creating a campus that would minimize walking distance to the desired rehabilitation areas while providing one main structure that can be used year round.

The form itself is derived from the naturally flowing site lines that are manipulated in a three-dimensional sense to accommodate the necessary pragmatic spaces. By merging the differing layers of site driven forms together, in combination with an appropriate organizational method allowed the facility to take shape. Using the sites change in topography, this three story facility is able to be nestled right into the hillside, providing good thermal qualities for its performance factors, while also preserving the views from all points across the site.

The campus layout is organized in a fashion that the main rehabilitation space would have the best possible view from the building, to further connect with nature and help to enhance the recovery times of the patients involved in the program. Residential units are all provided access to the outdoors, as well as to an ample amount of natural light and ventilation.

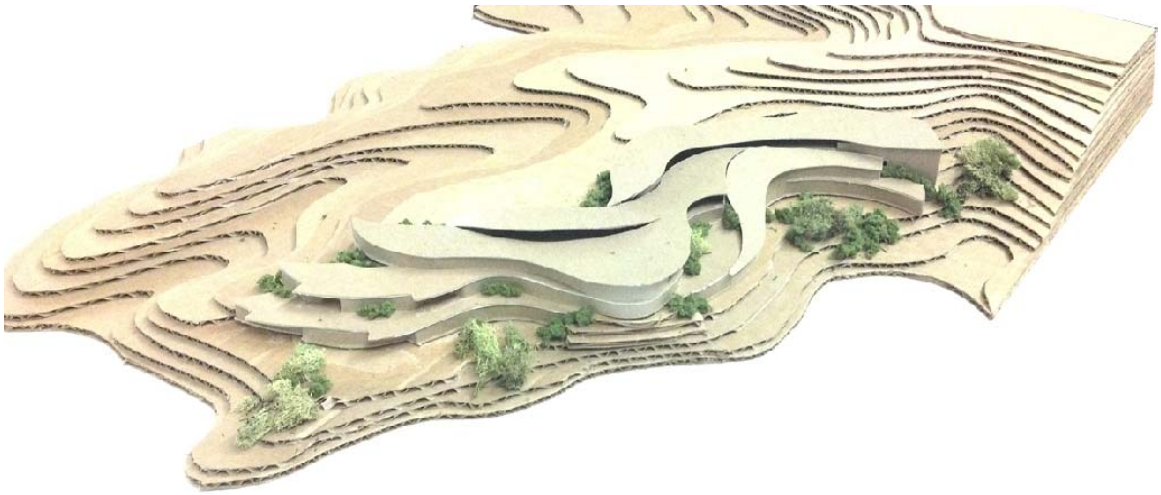

Figure 25: Site Model

6.8 Expressing Biophilic Design

Forming an interconnection between the physical and natural framework was the greatest challenge in this project. The objective was to implement a method of crafting an indoor environment that is feasible yet still illustrated many abstract characteristics of natural environment, was carried out in several ways. The primary and most visible notion was expressed in the overall structural members. This system was influenced by the geometry of a tree and simulating a structure that provides a similar feeling of being underneath a tree and its canopy. By analyzing the forms, the main structural components were derived and implemented in the atrium space and in various transition spaces throughout the campus. The structural members in the residential areas are at a smaller scale and transform between levels to double as posts for the railings on the seating areas above (Figure 26 & 30). These unique feature were used in combination with bringing vegetation and local materials of stone and wood found on site and locally to create a natural and warming indoor environment.

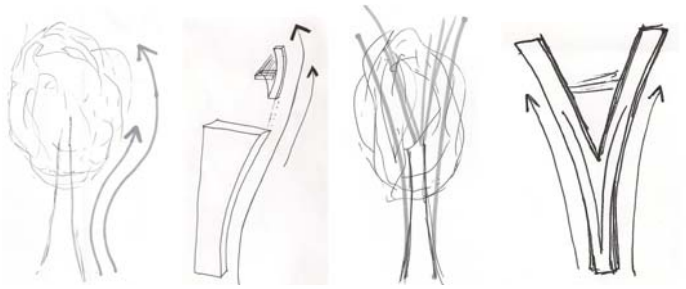

Figure 26: Influence of Nature on Structural Members

The main atrium space utilizes the plants in many ways. Using the influence of a natural landscape, the planters create seating and gathering areas of various sizes so that groups from the counseling center can meet in an enjoyable informal setting. The plants themselves provide a buffer between the many differing spaces throughout the atrium where informal group meetings can take place, while just twenty feet away others can be relaxing and playing checkers or socializing in a soothing environment.

Figure 27: Atrium

In addition to bringing vegetation into the facility and creating a structure that provides a feel similar to that of an outdoor environment, the design also allows areas of the glass facade to open on all three levels providing a protected atrium with good natural ventilation and access to the outdoors on each floor. Also by incorporating a large skylight in the center of the atrium, allows light to penetrate deep into the atrium spaces. To reduce the intensity of this direct sunlight, thin film photo voltaic panels are used to collect energy from the sun while also filtering and diffusing the amount of sunlight entering the atrium, providing a well light space. The position of this skylight is placed directly over the main ramping system that allows all patients no matter their disability, to transition between the three main levels.

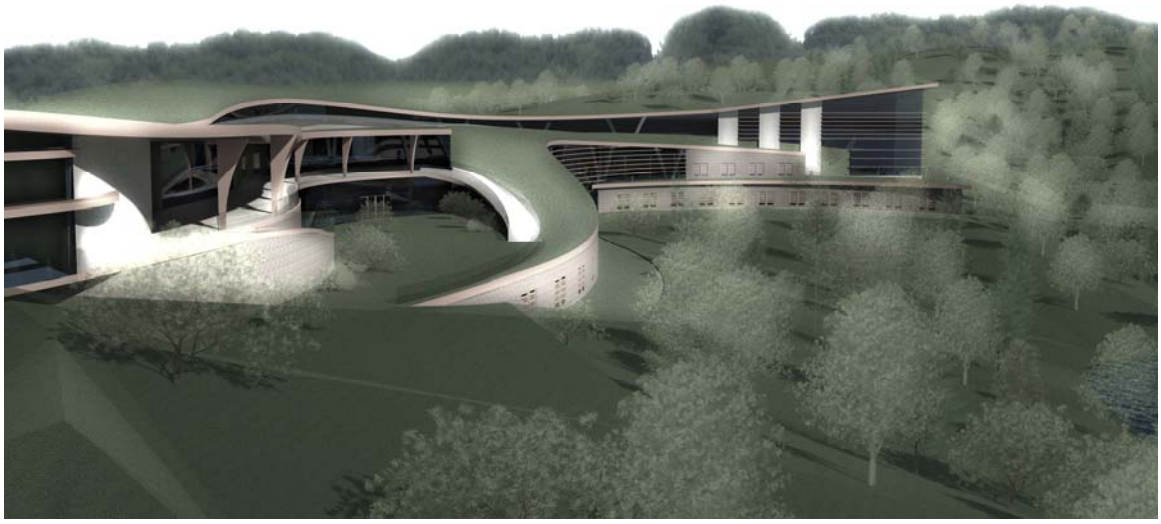

Figure 28: Exterior View of Main Atrium and Courtyards From Hillside

In the residential areas of the rehabilitation facility the transition between the indoor and outdoor environment differ, due to the differential in scale of the two areas. In the residential sectors of the facility the design strives to create a system of layers to create an easier transition from the indoor to the outdoor environment. The purpose of

this is to provide several different experiences for the users of the facility. This system is composed of four main layers, the indoor programmatic or living spaces, the indoor atrium, an outdoor semi-protected space, followed by the outdoor unprotected space.

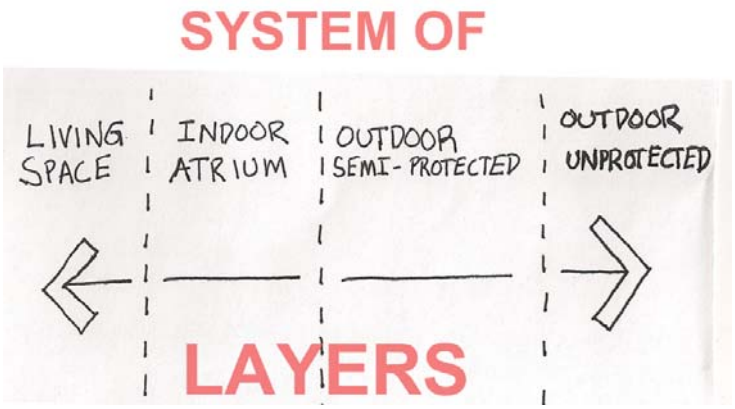

Figure 29: System of Layers

The main locations that demonstrated this notion are at the vestibule areas where users are provided with areas that use large overhangs and shading devices to create multiple experiences depending on the atmosphere the user chooses to be a part of. These shading devices morph at the ends to provide seating areas. One area is a semi-protected covered outdoor space, while the opposite side provides seating to take in the views of the water while being completely outdoors(Figure 30).

Figure 30: Transition Space Along Greenway

CHAPTER 7

THE OUTCOME

7.1 Conclusion

Creating a rehabilitation center that incorporates many techniques of biophilic design can effectively provide the veteran population with a facility unlike any other in existence today. By establishing an inspiring and enjoyable experience that cohesively integrates our natural and built environments will provide veterans with a new kind of facility that will utilize a unique approach to enhancing the lifestyles of those who have given so much for us.

Figure 31: Rehabilitation Center View From Irondequoit Bay

Figure 32: Full Presentation Board

Figure 33: Presentation Board 1

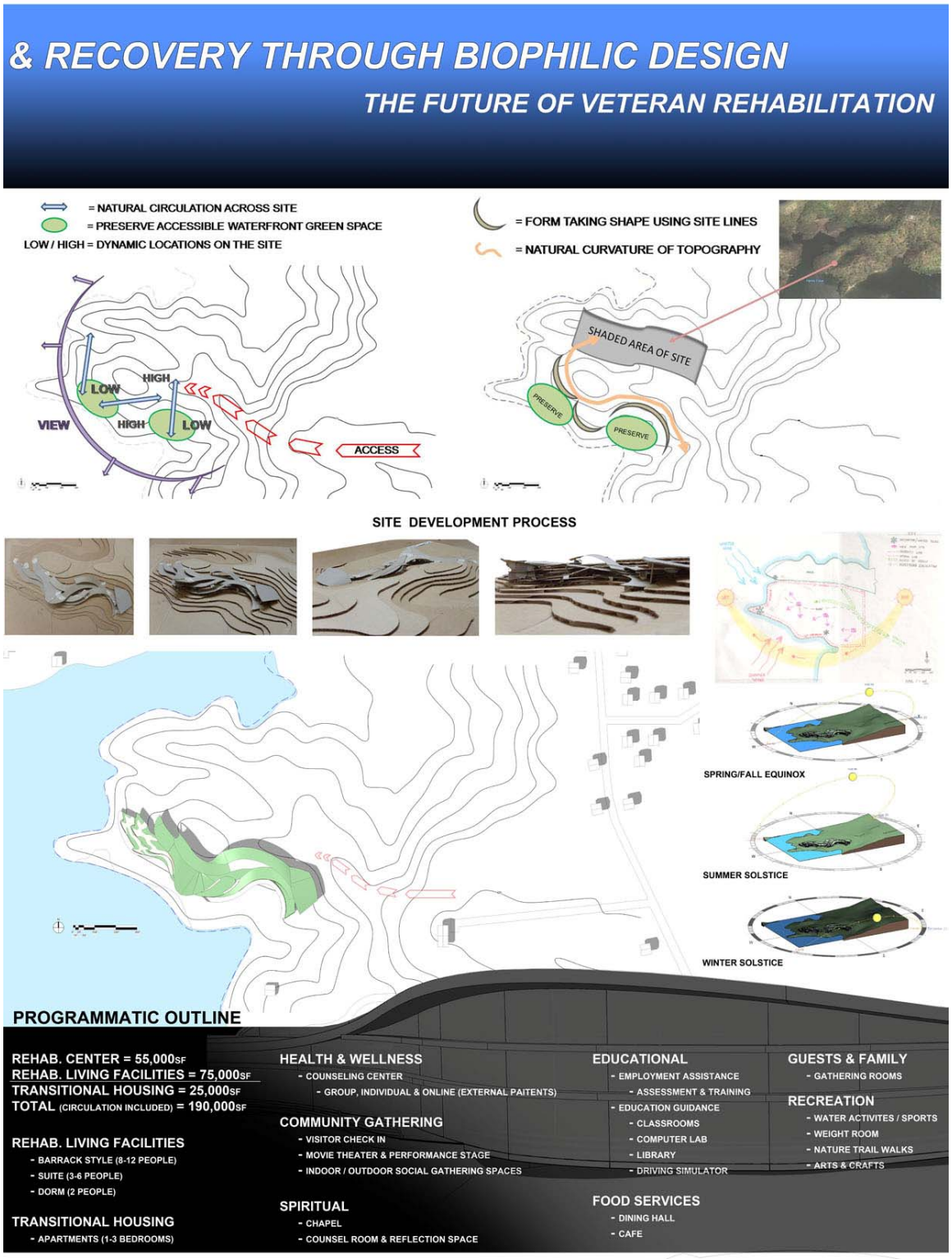

Figure 34: Presentation Board 2

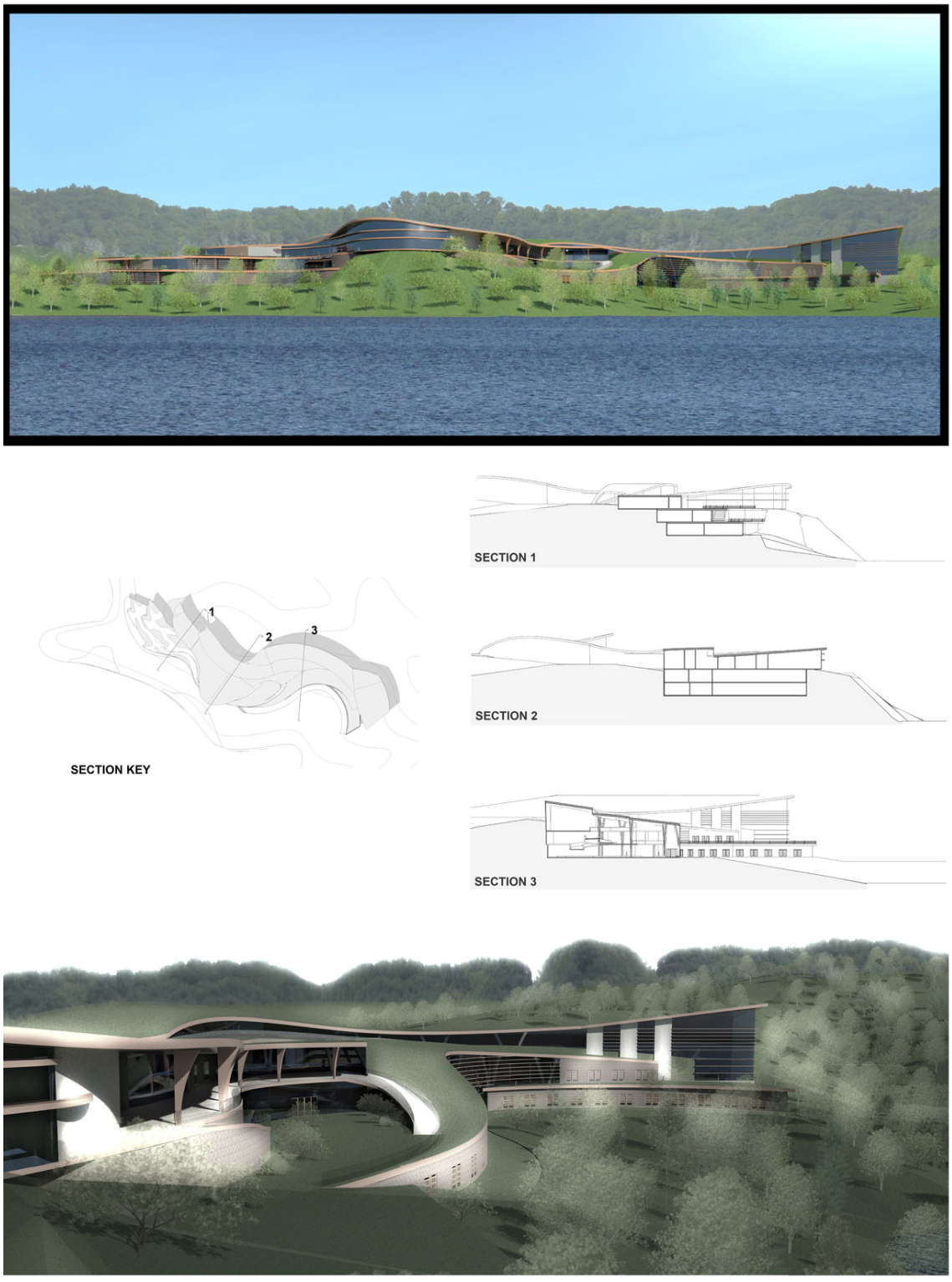

Figure 35: Presentation Board 3

Figure 36: Presentation Board 4

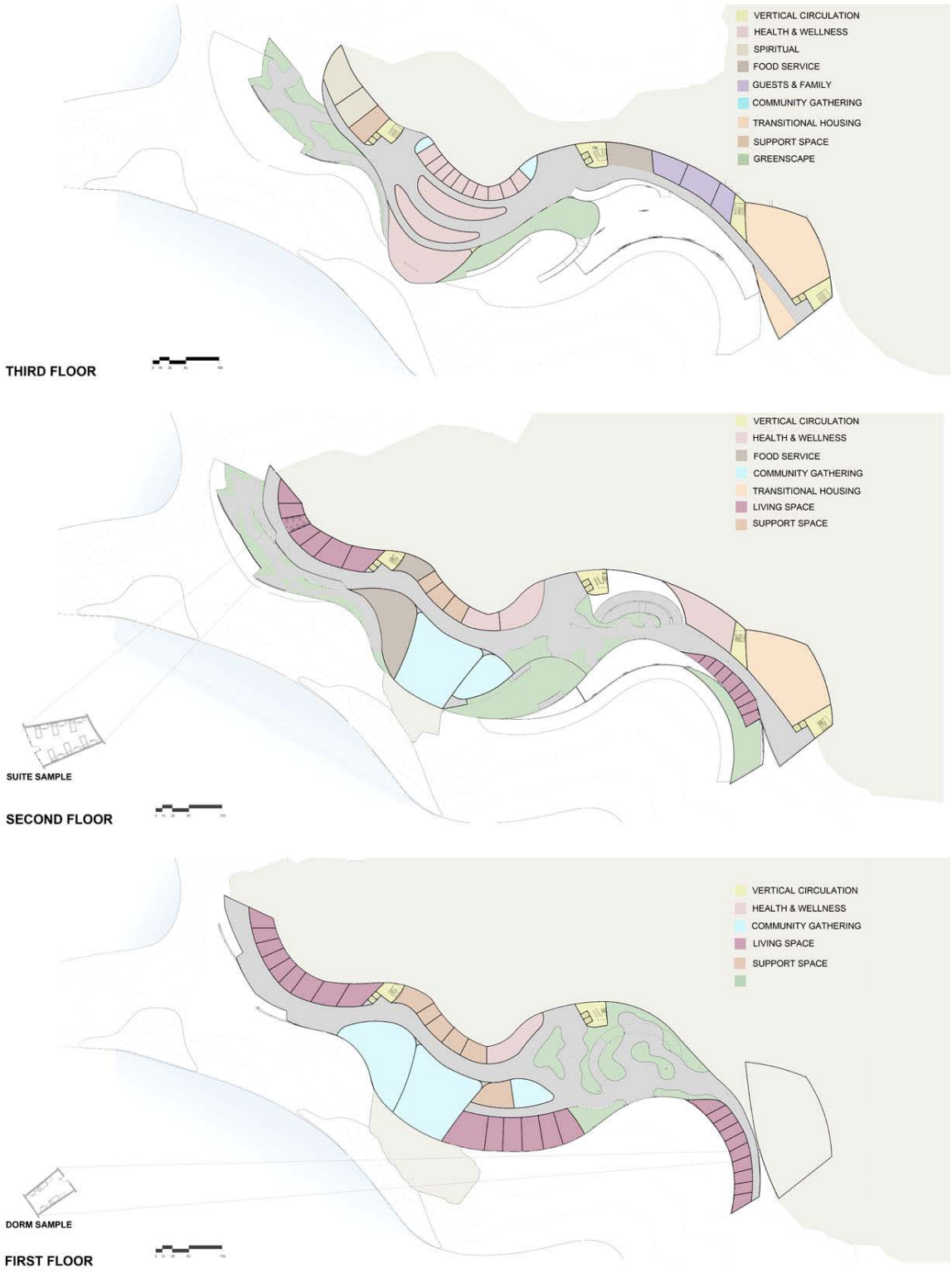

Figure 37: Presentation Board 5

ENDNOTES

[1] Kellert, Stephen R., Judith Heerwagen, and Martin Mador. *Biophilic Design: the Theory, Science, and Practice of Bringing Buildings to Life*. Hoboken, N.J.: Wiley, 2008. pg 5. Print.

[2] Kellert, Stephen R. *Building for Life: Designing and Understanding the Human-nature Connection*. Washington, DC: Island, 2005. pg 5. Print.

[3] Kellert, Stephen R., Judith Heerwagen, and Martin Mador. *Biophilic Design: the Theory, Science, and Practice of Bringing Buildings to Life*. Hoboken, N.J.: Wiley, 2008. pg 23. Print.

[4] Kellert, Stephen R., Judith Heerwagen, and Martin Mador. *Biophilic Design: the Theory, Science, and Practice of Bringing Buildings to Life*. Hoboken, N.J.: Wiley, 2008. pg 94. Print.

[5] Kellert, Stephen R. *Building for Life: Designing and Understanding the Human-nature Connection*. Washington, DC: Island, 2005. pg 94. Print.

[6] Rybczynski, Witold. *Home: A Short History of an Idea*. New York, NY: Penguin, 1987. pg. 35 Print.

[7] Oracle Think Quest Education Foundation." January 2010. Color psychology. 29 Mar 2011. <http://library.thinkquest.org/27066/psychology/nicolorpsych>

[8] Hildebrand, Grant. *Origins of Architectural Pleasure*. Berkeley: University of California, 1999. Print.

[9] Silloway, Kari. "Marie Tjibaou Cultural Center New Caledonia by Renzo Piano." *Galinsky*. 2004. Web. 20 Feb. 2012. <http://www.galinsky.com/buildings/tjibaou/index.htm>.

[10] "The United State Department of Veteran Affairs." January 2007 *National Center for PTSD*. 21 Apr 2012. <http://www.ptsd.va.gov/public/pages/what-is-ptsd.asp>.

BIBLIOGRAPHY

"EFT Zone." November 2008 *EFT for War Veterans. 18 Nov 2011.* <http://www.eftzone.com/2008/11/11/eft-for-war-veterans/>

Hildebrand, Grant. *Origins of Architectural Pleasure*. Berkeley: University of California, 1999. Print.

"Interior Design, Industrial Design, Design News and Architecture Trends Inspiration." *Interior Design*. Web. 10 Feb. 2012. <http://designlike.com/2011/04/10/fallingwater-by-frank-lloyd-wright/>.

Kellert, Stephen R. *Building for Life: Designing and Understanding the Human-nature Connection*. Washington, DC: Island, 2005. Print.

Kellert, Stephen R., Judith Heerwagen, and Martin Mador. *Biophilic Design: the Theory, Science, and Practice of Bringing Buildings to Life*. Hoboken, N.J.: Wiley, 2008. Print

"Loblolly House." *Kieran Timberlake Architects*. 2008. Web. 1 Nov. 2011. <www.kierantimberlake.com/home/index.html>

McHugh, Sharon. "A Green Machine For Living." *World Architecture News*. 30 Oct. 2008. Web. Feb. 2011. <http://www.worldarchitecturenews.com/index.php?fuseaction=wanappln.projectview&upload_id=10577>.

"National Alliance to End Homelessness." December 2006 *Veteran Homelessness.* 28 Nov 2011. <http://www.endhomelessness.org/>.

"Oracle Think Quest Education Foundation." January 2010. Color psychology. 29 Mar 2011. <http://library.thinkquest.org/27066/psychology/nicolorpsych>

"Planetizen." May 2009. *Redefining "Comfort" in the Architecture of the Future.* 4 May 2011. < http://www.planetizen.com/node/38747>

Rybczynski, Witold. *Home: A Short History of an Idea*. New York, NY: Penguin, 1987. Print.

Silloway, Kari. "Marie Tjibaou Cultural Center New Caledonia by Renzo Piano." *Galinsky*. 2004. Web. 20 Feb. 2012. <http://www.galinsky.com/buildings/tjibaou/index.htm>.

"The United State Department of Veteran Affairs." January 2007 *National Center for PTSD*. 21 Apr 2012. <http://www.ptsd.va.gov/public/pages/what-is-ptsd.asp>.

"Veterans Rehabilitation Center (VRC)." *Veterans Village of San Diego*. 2010. Web. 15 Oct. 2011. <http://www.vvsd.net/vrcenter.htm>.