HEALING THROUGH DESIGN:

THE PSYCHOLOGICAL EFFECTS OF DESIGN ON THE ELDERLY

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By

Kellene Kehau DeMello

DArch Committee:

Sara Carr, Chairperson
Andy Kaufman
Beverly Hoversland

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ABSTRACT

The purpose of this dissertation is to document and explore how the built environment impacts elderly individuals dealing with various forms of dementia. The human population within the United States is not only increasing, but the number of those over the age of 65 is also increasing. As U.S. citizens age, the number of individuals with dementia will increase accordingly, which will increase the demand for senior care facilities that focus on treating individuals with dementia-related diseases. When continuing to live at home or with loved ones is no longer an option, family members will look for an appropriate senior care facility where their loved one can live and receive healthcare. Given the medical realities involved in the aging process, design elements must be created in a way that allow residents to physically, psychologically, and emotionally flourish. However, creating such a senior care facility that addresses all of these needs for residents on an individual basis can be challenging when the range and ability of each individual can vary greatly. This dissertation proposes to investigate current senior care facilities from three different locations around the world and three locations on the island of O'ahu to determine the ideal senior care residential design for a modern facility in Hawai'i. This dissertation will also be drawing from growing research on environmental psychology, nature's effect on health, and contemporary advances in senior care for residents with dementia.

Native Hawaiians have a strong connection to and respect for the land along with their ancestral lineage as this element, too, connects each individual to past generations and the places upon which Hawaiians lived and thrived for centuries. These cultural elements are deeply embedded in an understanding of nature's healing powers and the importance of family and one's larger familial community. This dissertation will show how modern conceptualizations of the therapeutic qualities of nature, specifically connected to traditional Hawaiian cultural practice, and the need for human connections within the growing aging population can be interwoven to create a unique architectural design solution for a senior care facility focused on care for individuals dealing with dementia.

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INTRODUCTION

Over the past few decades, our nation's population has been increasing at an accelerated rate. With the rise of population comes, accordingly, the increase of the senior population. As we age, all of our abilities—sensory detection, cognitive acuity, balance, and motor skills—begin to decline. Understanding this human differentiation has never been more important than now, given the steadily increasing senior population. Research exists regarding how more cognizant hospital and school designs could positively impact our respective healing and learning processes. However, with the growing senior population within the United States and, specifically, the Hawaiian Islands, it is important to look at how the built environment could impact the aging process and how senior care homes could be designed and crafted to improve the quality of life for our kūpuna. Thus, it is critical that we design environments that better serve the needs of the aging individual.

Human-environment research suggests that our particular living spaces have a tremendous impact on how we feel, respond, and cope in daily life. Today, designers are shifting toward the idea that environmental modification can be a viable, more sustainable solution for some of our physical, psychological, and emotional problems, especially those increasingly present as we age.

It is important that, as designers, we create spaces that allow an individual to physically, psychologically, and emotionally flourish. All three must be nurtured because one area cannot be present for overall good health if the other two are not. For example, if one is not able to physically flourish, it can negatively impact an individual's psychological and emotional state and vice versa; if one is not psychologically and emotionally well, that individual will not physically flourish. The three key considerations when designing a senior care facility in a way that maintains commitment to aging individuals' needs dictates that the design should promote independence, maintain a sense of community, and expose individuals to the healing powers of nature.

As stated previously, when we age, our physical and mental abilities begin to decline making it difficult for some individuals to continue managing daily activities that were once able to be performed with ease, such as running errands and even cooking, cleaning, and bathing, Designing a living environment that helps our seniors maintain their independence for as long as possible is key for maintaining a high quality of life. Simply giving individuals the feeling that they still have their

independence is, in fact, critical, and this sense of self can be achieved through design by giving seniors the ability to make choices about their daily activities.

Many seniors deal with feelings of isolation, which is why maintaining a sense of community and connection to society is also desirable for the aging population. No one wants to feel alone. This sense of community connection is especially prevalent in Hawaii because many cultures within these islands, especially the Hawaiian culture, embrace the importance of having a strong connection to their familial lineage. Significant to note is that this connection to one's lineage is not only expressed by honoring one's ancestors but also acknowledges a connection to future generations. Thus, for the sake of potential residents, it is essential that this sense of intergenerational connection be represented in the design of senior care facilities in the islands.

Another key design element is the creation of spaces that encourage physical, psychological, and emotional health through incorporating the healing benefits of nature. Not only are there scientific studies that back the theory that gardens as living and growing outdoor spaces have healing capabilities, but there are also a number of cultural theories that support the positive impacts that nature can have on individuals. Native Hawaiians exist as a quintessential example of a culture that is uniquely connected to the land and the power it possesses. The creation of a strong connection to the land and nature through garden features within senior care facilities will not only offer healing benefits to the residents but could also benefit facility employees and even extend into the community as a place for peaceful retreat for all.

In essence, understanding how population increases are impacting society on a national level will lead to the analysis of how the number of individuals over the age of 65 (i.e., seniors or the elderly) is also increasing. Accordingly, the aging population in Hawaii is growing and changing but, as such, this unique population should dictate the consideration of specific cultural elements within the design of an island senior care facility. Evaluating the current senior care facilities that exist in Hawaii and the changes that are occurring in the islands in regards to the increasing senior population, and, for the purposes of this dissertation, with a specific focus on designing facility for individuals dealing with dementia, designers will be able to create senior care facilities that offer transformative features to nurture a healthy and positive quality of life for our elderly island residents.

1.0 RESEARCH IMPERATIVE

Over the next several decades, the age structure of the U.S. population will evolve, and there will be an increased ratio of the elderly as compared to those not yet falling into that age classification.[1] Ortman, Velkoff, and Hogan state in their report "An Aging Nation: The Older Population in the United State" that the American population over the age of 65 is increasing while the population under 18 is declining.[2] This reordering is largely due to the aging group of baby boomers, those born in the years immediately after World War II between approximately 1946 and 1964, who make up nearly one-third of the U.S. population. In the 1990s, they positively impacted economical productivity; however, as they started to age to 65 in the year 2011, the rapid growth in the number of people over the age of 65 began to impact our nation in a significant way. According to the National Institute on Aging, this large population of elderly will begin to strain services and programs as they age.[3] As such, the aging population will affect the U.S. both socially and economically and will present many challenges not only for their families but also for U.S. businesses and health care providers and even planners and architects.

One of the many needs that will arise will be that of more wisely designed senior care facilities. Currently in the U.S., a fewer than adequate number of senior homes exist; approximately half of seniors in need of a care facility will be unable to due to lack of space.[4] In addition, some of the ones that do exist today do not offer most ideal environments for elderly residents to continue to age with comfort. Due to our nation's growing population of the elderly, it is imperative that we reevaluate the current facilities for senior care and adapt their design to become better places for people to age and to encourage living healthy and productive lives.

This dissertation will first examine how the increasing senior population is impacting the nation as a whole, and, then, it will focus on how this situation is specifically impacting Hawaii and what it means to the people who live here—especially the elderly.

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[1] Boris Bohun-Chudyniv et al., "Domestic Trends to the Year 2015: Forecasts for the United States," accessed February 16, 2015, 12.
[2] Jennifer M. Ortman, Victoria A. Velkoff, and Howard Hogan, "An Aging Nation: The Older Population in the United States," *Proc. Economics and Statistics Administration, US Department of Commerce*, 2014, http://beta.census.gov/content/dam/Census/library/publications /2014/demo/p25-1140.pdf, 1.
[3] National Institute on Aging, "Aging in the United States–Past, Present, and Future" (U.S. Department of Commerce Bureau of the Census, 1997), 2.
[4] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 2013, 2–3.

1.1 The Aging Population in the Nation

Over the past four decades, the United States has experienced rapid growth in its elderly population due to the increase number of births following the end of World War II—the baby boomers. As the baby boomers age, they will drive changes in our society to better accommodate the elderly. Our nation's population has also generally increased over the last few decades as people continue to live longer, resulting in a continued increase in the elderly even beyond the collective life span of the baby boomers. From 1900 to 1994, roughly 100 years, the population of those over the age of 65 grew from 3.1 million to 33.2 million. It is anticipated that, by the year 2050, which is roughly half the time of 1900 to 1994, the population over the age of 65 will increase to over 80 million. This translates to 20 percent of the U.S. population being considered elderly or approximately one in every five Americans.[5] The population will be almost double that of the estimated population of 43.1 million seniors in 2012.[6] As more of the population moves into retirement, the culture of society will change creating both challenges and opportunities. The population will change from being mostly working-age to mostly retirement-age, which will cause a large proportion of the population to be dependent on the rest of the population creating challenges not only for families and businesses but also local, state, and national governments. Yet, even with these challenges, opportunities will arise within a variety of areas of society for citizens will have to work together to try to meet the needs of the growing elderly population.[7]

One of the societal issues that will arise given the growing elderly population is funding for elderly care services such as home-care help with transportation, medication administering, personal care, and nutrition monitoring. The ability to provide such services becomes strained due to the increasing number of individuals over the age of 65, along with increased medical costs based on the needs of this aging population. Medicaid exists as the government entity that assists individuals with lower incomes. It finances 43% of spending on long-term care expenses, which comprises only 6% of the Medicaid-receiving population. These statistics indicate

[5] Dak Kopec, *Environmental Psychology for Design*, Second Edition (New York: Fairchild Books, 2012), 133–34.
[6] Ortman, Velkoff, and Hogan, "An Aging Nation," 1.
[7] Sandra L. Colby and Jennifer M. Ortman, "The Baby Boom Cohort in the United States: 2012 to 2060," *Population Estimates and Projections, Washington, DC: US Census Bureau*, 2014, http://www.census.gov/prod/2014pubs/p25-1141.pdf, 1.

that, although long-term care is only needed by a relatively small percentage of the senior population, it consumes a large amount of government funding.[8]

Although these economical concerns and the correlating statistics are based on national standards that show the impact of the growing elderly population, it is important to analyze how Hawaii, specifically, is impacted by the elderly population growth and how impacts might differ when comparing statistics based on national averages versus an island-based number of individuals.

1.2 The Aging Population in Hawaii

As of the early 2000s, in Hawaii there are over 180,000 people over the age of 65. Compared to the national average, Hawaii's elderly population is increasing 2 to 3 times faster.[9] These statistics suggest that Hawaii's resources are depleting at a faster rate than the nation's resources leaving many seniors in Hawaii in need of outside assistance. As one increases in age, very likely so does one's dependency on others and on outside funding for increasing healthcare and housing needs, with seniors over the age of 85 needing the most care.[10]

According to the 2015 State of Hawaii report "Hawaii State Plan on Aging," in 1980, individuals over the age of 65 made up 11.9% of Hawaii's population, increasing to 21.4% by 2010, which was higher than the national rate of elderly population growth.[11] People are also generally living longer. In 1980, individuals over the age of 85 accounted for 0.6% of the elderly population, but it increased to 2.3% by 2010. This increase was 72% higher than the national rate of growth. Alaska and Nevada are the only two states that had higher rates of growth, states both of which are greatly larger in land area compared to Hawaii. Thus, given this information, serious implications exist for the long-term care systems in Hawaii.[12]

Although, the State of Hawaii has a higher elderly population compared to the national average, all islands besides Oahu are estimated to have a higher population increase than Oahu even though they have smaller relative populations. Based on statistics within the "Hawaii State Plan on Aging," from 2007 to 2035, the population

[8] "Medicaid's Long-Term Care Users: Spending Patterns Across Institutional and Community-Based Settings," accessed May 3, 2016, http://kff.org/medicaid/issue-brief/medicaids-long-term-care-users-spending-patterns.
[9] Dr. Cullen T. Hayashida, "Aging in Place: How to Cope" (Department of Sociology University of Hawaii, December 20, 2003), 2.
[10] Betty Lou Larson, "Aging in Place: How to Cope" (Department of Sociology University of Hawaii, December 20, 2003), 3.
[11] State of Hawaii, "Hawaii State Plan on Aging," September 30, 2015, 16.
[12] Ibid.

is to increase at the rate of 0.5 for Oahu, 1.7 for Big Island, 1.2 for Maui, and 1.0 for Kauai. Kauai, with the smallest overall population, has the greatest percentage of individuals over the age of 65 compared to the other islands, which will create challenges for future planning.[13]

In Hawaii, by 2035, approximately 1 in 3 individuals will be considered elderly, compared to the national average of 1 in 5, which will cause stress on existing programs and services in regards to housing and healthcare. Although an increase in such programs and services will be needed, the baby boomers also represent the healthiest and best-educated generation. Thus, we could delay the need for long-term care through educating our aging citizens regarding of services and programs that exist, which will help keep them healthy through preventive techniques, such as exercise programs and meal delivery services, rather than waiting until they are in need of more serious service-based interventions.[14]

1.3 Needs for the Elderly in Hawaii

With the elderly population dramatically increasing within the U.S. and, more measurably within the Hawaiian Islands, thousands of island seniors will be in need of nursing homes; however, the number of available nursing home beds statewide is far less than what will be needed by the aging community. The number of existing beds is also the lowest in the nation. The most recent census showed that the number of people 65 and older in Hawaii equally slightly over 200,000. According to The American Health Association, approximately 24,000 of that 200,000 will need long-term care. Almost half of those individuals will not be able to age in a residential facility due to the lack of space available with, currently, only 7,000 existing spaces in residential care homes and 4,000 spaces in nursing homes.[15] Compared to the national averages, Hawaii's ratio of nursing home beds is significantly lower. There are only 26 nursing home beds per 1000 seniors in Hawaii compared to the national average of 56 beds per 1000.[16] With the elderly population increasing to a greater extent in Hawaii versus the nation, this problem will only worsen unless more spaces in which they can live are developed. In addition, according to the Hawaii Community Foundation's report "Caring for Our Kupuna:

[13] Ibid, 13.
[14] Ibid, 15–16.
[15] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 2–3.
[16] Carol Fukunaga, "Aging in Place: How to Cope" (Department of Sociology University of Hawaii, December 20, 2003), 12.

Building an Aging in Place Movement in Hawaii," by 2030, that 24,000 individuals in need of long-term care will increase to nearly 40,000.[17]

Along with needing adequate space, there also exists the element of cost. The monthly cost for the average nursing home stay ranges between $7,000 and $8,000 making it difficult for families to be able to afford such expenses, especially for the long term.[18] The cost can quickly drain bank accounts and eliminate any sort of inheritance, which may even cause the resident to become a ward of the state and have to relocate from his or her home, which can be stressful for the aging individual and his or her family members. Assisted living can also be expensive ranging from $2,000 to $5,000 a month. The more assistance the individual needs, the higher the monthly costs, and often these facilities are large and house more than 200 residents, thus not allowing for personalized care—a less than ideal living situation.[19]

Hiring a personal caregiver is another alternative, but such a strategy can often be the most expensive, depending on the services needed. In Hawaii, 85% of the time, the caregiver is a family member or friend because it is so expensive to pay for outside services. Also a factor is that, often, aging individuals have a high enough income that they do not qualify for low-income Medicaid insurance coverage, placing the financial burden on that of individual and other family members.[20]

If the number of spaces at nursing and residential care homes remains stagnant, how will we efficiently and effectively scale aging in place services to meet the community's needs? The state's overall bed supply has not increased due to limited funds, yet the population of individuals classified as the elderly is increasing. Therefore, there not only needs to be an increase in nursing home beds, but the quality of these types of facilities must be improved so as to make sure that those who are monetarily providing for each individual to live in such a facility can do so successfully.

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[17] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 2–3.
[18] Ralph S. Matsuda, "Aging in Place: How to Cope" (Department of Sociology University of Hawaii, December 20, 2003), 4.
[19] Ibid., 4.
[20] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 2, 7.

1.4 Aging in Place

Figure 1.1 Image of apartment at The Karmel, Deerfield, Illinois.

(Photograph by Sarah Mechling): This image shows an apartment in an independent living facility that looks like a normal apartment but has features that support aging in place.[21]

Aging in place is another option for elderly care, especially since over 90% of seniors would prefer to remain in their own homes.[22] Aging in place is defined "as a process by which individuals remain in their living environment despite any physical and/or mental decline or increased need for supportive services that occur as they get older. For aging in place to be successful, an individual must have access to services that respond to his or her changing needs."[23] Figure 1.1 shows an apartment in an independent living facility that looks like a standard apartment but has features that support aging in place. This apartment contains wider doorways, accessible hardware, an emergency call system, towel bars that double as grab bars, and many more elements.[24] Figure 1.2 is a floor plan of a home in Asbury Methodist Village, Gaithersburg, Maryland. Asbury Methodist Village is a senior living community, and they offer houses that are designed for residents to age in place. They incorporate universal design principles such wider doorways, levered handles,

[21] Perkins Eastman, *Building Type Basics for Senior Living,* (Somerset, US: Wiley, 2013), 103.
[22] Larson, "Aging in Place: How to Cope," 3.
[23] Eastman, *Building Type Basics for Senior Living*, 385.
[24] Ibid, 103.

lowered and open underneath sink, and design elements that support memory loss during the aging process.[25] As elderly care costs increase, people have shifted toward adopting preventative health measures and implementing more aging-in-place services, which not only reduces overall costs but also improves the quality of life for the aging individual. For example, by installing hand and safety rails in the home to prevent falls, one can prevent injury and unnecessary trips to the emergency room. Preventative strategies such as this not only reduce hospitalization but also help seniors maintain independence and prolong or even completely avoid moving into a nursing home. Seniors who are able to age comfortably and cared for in their own homes tend to have better overall health resulting in less health-related expenses compared to those who leave their homes to live in an assisted care facility.[26]

[25] Ibid, 97.
[26] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 2-3.

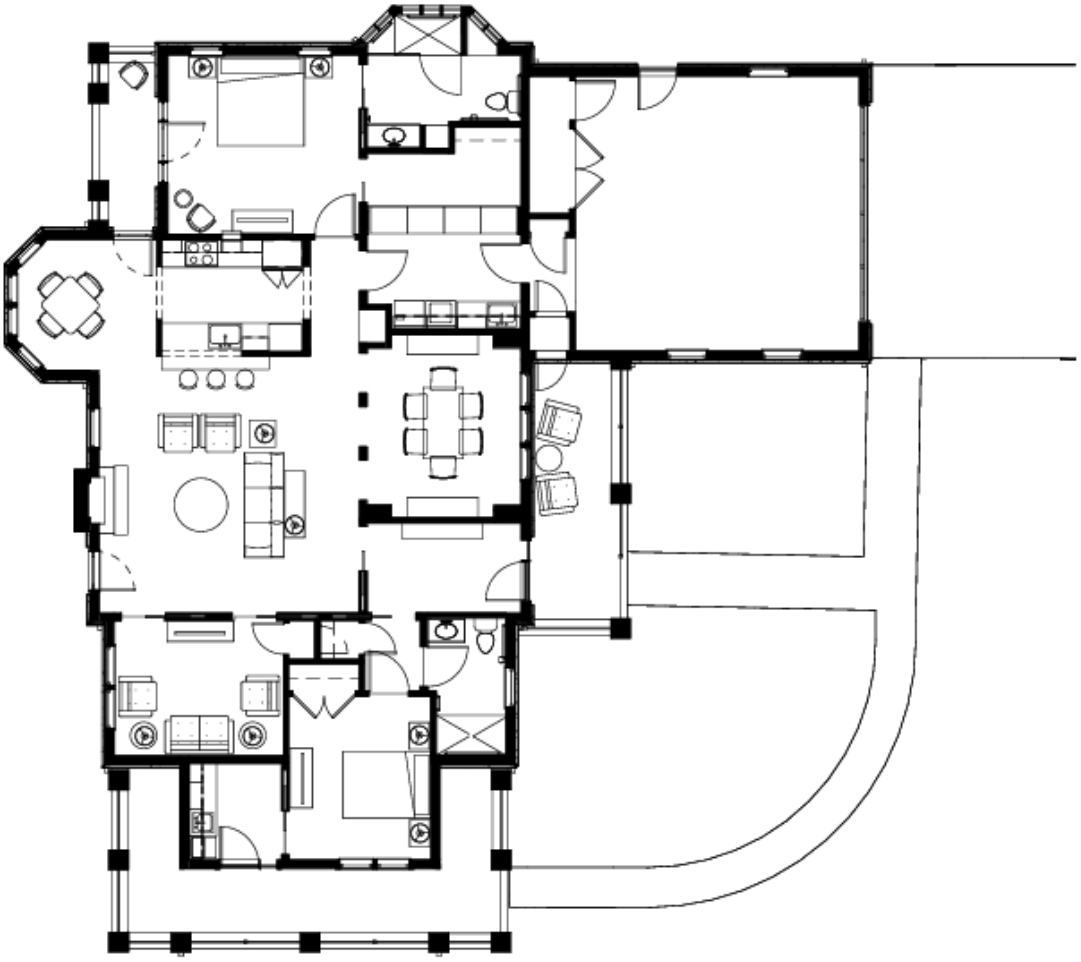

Figure 1.2 Floor plan of The House for Betty, Asbury Methodist Village, Gaithersburg, Maryland

Asbury Methodist Village is a senior living community and they offer houses in this community that are designed for residents to age in place. They incorporate universal design principals, such wider doorways, levered handles, lowered and open underneath sink, and design elements that support memory loss during the aging process.[27]

Aging in place is particularly important in Hawaii because this state has the highest life expectancy in the nation yet the second highest cost of living.[28] As stated previously, there is also limited space in senior care facilities as currently established within the islands. The number of beds currently within Hawaii only serves

[27] Eastman, *Building Type Basics for Senior Living,* 97.
[28] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 2.

approximately 30% of the projected amount of the elderly who would need long-term care in 2035.[29]

In Hawaii, family and friends currently provide a majority of the long-term care for their aging family members. However, aging in place is not always a viable option for many families because it can cause substantial strains on family members, including financial burdens and physical and emotional stress. Problems also arise when families wait too long to seek out assistance, and the aging family member, then, requires a higher level of care than if he or she had received help earlier. Aging-in-place services have the potential to alleviate stress for family members by the bringing in of another to take care of an aging family member resulting in decreasing the chances of the senior being forced into a care home due to the family member being unable to handle the caregiving.[30] To complicate matters, over 20% of the elderly in Hawaii do not even have the option of having family members or friends care for them.[31]

So how do we design and create facilities with qualities from the concept of aging in place? People should be allowed to live independently as long as they wish to do so and are able. However, as they become more fragile and unable to care for themselves and their overall needs affect family members, family friends, or other residents in an apartment building or condominium, individuals who are still spry enough to live in their homes might require home-care services so they can age in place with support, comfort, and grace.

[29] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 7.
[30] Ibid.
[31] Larson, "Aging in Place: How to Cope," 3.

2.0 HOW THE BUILT ENVRIONMENT IMPACTS THE ELDERLY

Given the fact that both a national and a local increase in the elderly population exists, it is important to understand that this increase in the number of aging individuals will impact our collective built environment. The concept of a built environment is that of a material, spatial, and cultural product of human labor that combines physical elements and energy in forms for living, working, and playing. According to Karen Roof and Ngozi Oleru, in their report "Public Health: Seattle and King County's Push for the Built Environment," it has been defined as "the humanitarian-made space in which people live, work, and recreate on a day-to-day basis."[32] Understanding how our environment not only physically but also psychologically impacts us is key for designing a built environment that will help alleviate some of the greatest challenges for people as they age.

Environmental psychology is defined as the science of people's relationships to the places in which they live and work.[33] Both human behavior and the environments within which humans exist must be examined together to be able to underst how the physical environment impacts the users. Whether it is individual or group behavior, that behavior can only be understood in the context of the environment in which it occurs.[34] This relationship between person and place is significant since the majority of our time is spent in the built environment. We live, learn, work, and play within the built environment. Even when we are outside, we spend a significant amount of time surrounded by manmade structures. Parks and gardens, although constructed of natural materials, are still designed and manipulated by the human beings who created them and use them on a daily basis. The design of a physical place influences the psychological state of the people within that space, which in turn shapes their attitudes and behavior. The question would be whether or not the architecture and physical design of a place can support individual's behaviors and activities and help create a culture for them that not only prevents harm from coming to them but also enhances their experience in the spaces in which they lead their daily lives. The answer can be obtained through an understanding of how individuals are psychologically impacted by the built

[32] Karen Roof, "Public Health: Seattle and King County's Push for the Built Environment," *Journal of Environmental Health* 71, no. 1 (2008): 24.
[33] Donald D. Patterson, *Contributions of Environmental Psychology of Visitor Studies* (Jacksonville, Alabama: Jacksonville State University, n.d.), 80.
[34] Patterson, *Contributions of Environmental Psychology of Visitor Studies*, 80.

environment in which they live or work and then carefully designing that environment to fulfill the physical, emotional, and psychological needs of the intended occupants.

Environmental psychology provides a relatively new approach to understanding human behavior within the world of architectural design. According to Donald D. Patterson in his article "Contributions of Environmental Psychology to Visitor Studies," that psychologists first started to examine the impacts of the work environment on human productivity in the 1940s. These studies led architects to begin working with psychologists to design buildings that better met the needs of the intended occupants. Two decades later, the term "environmental psychology" was used was at a conference in the 1960s during which the physical environment was analyzed to see how it impacted the therapeutic progress of psychiatric patients. By the mid-1970s, programs in environmental psychology were being developed, while studies were being conducted and literature created, regarding environmental psychology. Thus, the concept started to expand.[35] These advancements led to many changes in our relationship to the environments we occupy through the designing of the built environment to better meet the psychological needs of the individuals that occupy the space not just the behavioral needs.[36] Before the studies, inspired by Patterson's groundbreaking article, began to be conducted, people would look for solutions to their health problems from typical sources such as medication or therapy. After these studies, such as the study of interrelationship between a person's behavior and their environment conduct by Fisher, bell and Baum,[37] designers began to propose that the built environment can be a solution to a great variety of health problems in they create living spaces that reduce stress and have restorative benefits. A shift toward a more user-centered design would result in a solution that would not only support but also enhance people's quality of life, especially into their senior years. It is important to realize that the built environment plays an intricate role in one's overall psychological and emotional health, which affects one's physical health such as depression and anxiety or even, simply, loneliness or unhappiness. Our built environments must be designed with the intended inhabitants in mind satisfying their needs and personal preferences, and that specifically includes the built environments designed for seniors.

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[35] Patterson, *Contributions of Environmental Psychology of Visitor Studies*, 80–81.
[36] Ibid, 81.
[37] Ibid, 81.

2.1 The Human-Environment Relationship and Its Impacts

The human-environment relationship has been described as a symbiotic one. We shape our environment, and, in return, it shapes us.[38] Accordingly, it is important to recognize how people perceive their respective environments, both involuntary and intentionally, so as to understand how that environment impacts human behavior in the sense of positive or negative responses. There also needs to be an acknowledgement that each individual experiences a given space differently because everyone has, both, a unique knowledge base and specific life experiences.[39] Human beings consistently attempt to gain a clear perception of the natural world around them and to find some way to maximize the interrelationship of their surroundings. Humans, more than any other creature, possess an innate desire to connect to their surroundings so as to feel comfortable, connected, and, therefore, productive.

More specifically, Native Hawaiians exemplify this keen relationship with the land upon which they live and work. The Hawaiian people have, then and now, a great understanding and respect for the land—the ʻāina. Through an innate awareness of the natural environment around them, Native Hawaiian would use the structure of each ahupuaʻa to maximize a healthy and sustainable community.[40] An ahupuaʻa is defined as a section of land that runs from the mountain to the sea. It encompasses ocean fisheries, beaches, agriculture land, and forest. Each ahupuaʻa provided the necessary food supply for the people in that area to thrive.[41] The ahupuaʻa land division system also signifies how the Hawaiians had an understanding that specific areas of each island have distinct significance, purpose, and function. Through this understanding and connection, they were able to maintain a balance between nature and man-made elements.[42] The cultural practices within pre-Contact Hawaii were not only for necessity but also for the sake of spirituality and tradition. Through working with the natural environment, Hawaiians also created substantial and meaningful connections to the land, sea, and sky. We can learn from the Native

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[38] Kopec, *Environmental Psychology for Design*, 1.
[39] David E. Alexander and Rhodes W. Fairbridge, *Encyclopedia of Environmental Science* (Kluwer Academic Publishers, n.d.), 223.
[40] Hawaiian Studies Institute Staff, *Life in Early Hawai'i: The Ahupua'a*, 3rd Edition (Kamehameha Schools, 1994).
[41] W.D. Alexander, "A Brief History of the Land Titles in the Hawaiian Kingdom," Thrum, *Hawaiian Annual*, 1891. 105-106. *Sites of Oʻahu,*.(Honolulu:, Bishop Museum Press, 1986), xii.
[42] Donald Mitchell. "Resource Units in Hawaiian Culture." (Honolulu: Kamehameha Schools Press,1992), 80.

Hawaiians connection to nature and their connection to its healing properties to alleviate present day illnesses.

According to David E. Alexander and Rhodes W. Fairbridge from their article "Encyclopedia of Environmental Science," research has identified physical illness and attentional fatigue as outcomes of environmental stressors. One solution to reducing these symptoms is by creating more supportive living and working environments.[43] Understanding the relationship between an individual and his or her respective environment is essential for that individual's health and shows how our environments can create healthier settings for certain activities. Human-environment research proves that environment has a tremendous impact on human beings. For example, there are many studies, such as the ones conducted by Clare Cooper Marcus the show being exposed to nature has healing impacts,[44] which evaluate the positive impacts of incorporating aspects of nature in the built environment, which will be further discussed in section 2.3 and 4.3. It affects how individuals feel, react, and deal with daily situations. As such, our built environment impacts our emotional state, which influences how we live our lives.[45] Because of the amount of impact our environment has on us, it is beneficial to understand those influences in order for designers to ensure a healthy living both psychologically, physiologically, and emotionally. In "Encyclopedia of Environmental Science," Alexander and Fairbridge state that "people tend to seek out places where they feel competent and confident."[46] The space must have enough complexity to make it interesting but not too much where it frustrates the user. This concept is particularly significant when designing living spaces for the elderly. The space must have enough stimuli to encourage activity but must still be safe and not cause feelings of frustration.

Today, people are living longer than in previous generations, but many are affected by chronic illness. Not only is the maintenance of physical health important, but it is also critical to consider the psychological, physiological, and emotional health of the occupants of our buildings. The World Health Organization defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[47] As designers, architects need to be aware of

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[43] Alexander and Fairbridge, *Encyclopedia of Environmental Science*, 223.
[44] Clare Cooper Marcus and Marni Barnes, *Healing Gardens: Therapeutic Benefits and Design Recommendations* (John Wiley & Sons, 1999), 34.
[45] Sally Augustin, *Place Advantage: Applied Psychology for Interior Architecture*, 1 edition (Hoboken, N.J: Wiley, 2009), 15.
[46] Alexander and Fairbridge, *Encyclopedia of Environmental Science*, 223.
[47] World Health Organization and others, "Basic Documents," Forty-Fifth Edition, Supplement, October 2007, http://apps.who.int/iris/handle/10665/43637, 1.

how building designs impact human health with full awareness of the possible physical, psychological, and emotional effects upon users.

2.2 Importance of Environmental Psychology

Because the majority of our daily lives are spent in the built environment, including gardens and parks that are manipulated by human beings, it is critical to understand how our physical environments impact us in both positive and negatives ways in order to be able to understand how we can manipulate the overall built environment to impact one's overall well-being in a positive way. Physicians often use medication and surgery to solve physical ailments, while counselors or therapists use methods of introspection and behavior modification to solve psychological issues. Environmental psychologists look at many factors and influences, including environmental impacts such as natural and sensory elements and spatial organization, to adjust the physical surroundings to enhance positive behaviors and reduce undesirable behaviors.

Environments built for human habitation must be carefully designed to fulfill the needs of the intended occupants because the environment plays a crucial role in human behavior. Our environment greatly influences who we can be and the potential we can reach, which is especially significant for one who is aging because as they age they will face physical and psychological challenges and their environment should help them overcome those challenges not accentuate them.[48] Designers must understand how the environment and its individual elements could impact the users of that space. Environmental psychology can serve to create supportive environment for people challenged by physical, psychological, and age-related illnesses and injuries and the stress and anxiety related to daily life or end-of-life issues. This awareness is particularly important in facilities that house the elderly because the built environment can greatly influence the aging process and the quality of life.

The amount and diversity of knowledge that are required to solve today's complex design problems call on designers to have a wider knowledge on a wider number of topics and to know when to find other knowledgeable people to bring onto the team. One of the issues that prevents the progressions of social awareness with respect to human health and the built environment is the segmented approach to

[48] Alain De Botton, *The Architecture of Happiness*, Reprint edition (New York: Vintage, 2008), 11.

problem solving. There needs to be greater dialogue between academic departments, social organizations, designers, and the actual users of the spaces designed.

What can be helpful to guide designers in the identification and application of knowledge is the theory that design and human behavior can actually become a framework to test knowledge, make decisions, and measure outcomes. With the increasing emphasis on evidence-based design, designers must focus on the education of design decisions and how they can explain human behavior. Understanding various theories about design and human behavior, such as those based on the benefits of nature like Rachel and Stephen Kaplan's attention restoration theory[49], can increase the probability that design solutions will work. This theory, along with others, will be further discussed in the following sections.

Essentially, a direct relationship between two disciplines can provide answers and solutions to problems that arise in design. Many studies show the human-environment connection. What needs to be made is a stronger connection between design and psychology to create more meaningful architecture that not only looks beautiful but also positively impacts the users and the environment.

2.3 The Benefits of Nature on the Elderly

Both natural and built environments affect our behavior, interpersonal relationships, and psychological states both positive and harmful ways. This fact is particularly important as more people move into cities due to more employment opportunities and service amenities. For the first time, the number of people living in cities, roughly 3 billion, will be greater than those living in more rural neighborhoods.[50] These urban cities generally have fewer natural elements, such as green vegetation and water elements, as compared to rural neighborhoods.[51] However, nature helps us recover from the stresses of life and helps protect against future stress, thus positively impacting one's health and helping improve one's concentration and ability to think more clearly, so less exposure to nature means reduced chances to alleviate psychological stresses.[52]

Researchers have claimed that biophilia has an importance to human well-being. Biologist Edward O. Wilson was one of the first to introduce the biophilia

[49] Rachel Kaplan and Stephen Kaplan, *The Experience of Nature: A Psychological Perspective*, 1St Edition (Cambridge; New York: Cambridge University Press, 1989). 15-18.
[50] Jules Pretty, "How Nature Contributes to Mental and Physical Health," *Spirituality and Health International* 5, no. 2 (2004): 68–78, 68.
[51] Ibid, 68–69.
[52] Ibid, 68–69.

hypothesis.[53] Biophilia is defined as "the inherent human inclination to affiliate with natural systems and processes, especially life and life-like features of the nonhuman environment."[54] This relationship is essential because exploring the human connection to nature has proved to impact our physical, emotional, and intellectual well-being.[55] One way designers have tried to connect the built environment to nature is through biophilic design which is the attempt to apply biophilia to the built environment."[56] To make this connection, however, has been a challenge as it is difficult to translate the value of nature to the built environment. Stephen Kellert states that "people's physical and mental well-being remains highly contingent on contact with the natural environment, which is a necessity rather than a luxury for achieving lives of fitness and satisfaction even in our modern urban society."[57] Not only have studies shown that nature can enhance healing and aid in recovery, but contact with nature has also been shown to improve cognitive function, such as concentration and memory.[58] Rachel and Stephen Kaplan described the Attention Restoration Theory, which attributes the improvement of concentration and attention span due to interaction with nature, both through viewing and active engagement.[59] This theory has been further validated by studies that examine "the restorative effects on cognitive functioning" from natural environments versus more urban ones.[60] The studies show that natural environments improve attention spans greater than urban surroundings. The studies also show how interactions with nature improve memory.[61] This is vital when it comes to seniors who are dealing with memory loss as they age because it shows that being exposed to natural elements might be able to improve one's memory, or at least reduce factors that may aid in one's memory deterioration. Studies have also shown that "the human brain responds functionally to sensory patterns and cues emanating from the natural environment."[62] This theory has been referred to as biomimicry. Humans are drawn to designs derived from nature. We as human's desire some form of order and

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[53] Edward O. Wilson, *Biophilia* (Harvard University Press, 1984), 10–11.
[54] Stephen R. Kellert, Judith Heerwagen, and Martin Mador, *Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life* (John Wiley & Sons, 2011), 2.
[55] Wilson, *Biophilia*, 117.
[56] Kellert, Heerwagen, and Mador, *Biophilic Design*, 2.
[57] Ibid*,* 2.
[58] Ibid*,* 3.
[59] Kaplan and Kaplan, *The Experience of Nature*, 15-18.
[60] Marc G. Berman, John Jonides, and Stephen Kaplan, "The Cognitive Benefits of Interacting With Nature," *Psychological Science* 19, no. 12 (December 2008): 1207–12, doi:10.1111/j.1467-9280.2008.02225.x, 1207.
[61] Berman, Jonides, and Kaplan, "The Cognitive Benefits of Interacting With Nature," 1208.
[62] Kellert, Heerwagen, and Mador, *Biophilic Design*, 3.

organization with elements of complexity, and nature exists as a perfect example of the balance between patterns and complexity.[63] This concept is also key in designing a senior care facility with individuals dealing with dementia, as they can often can become disoriented because it shows that nature as a wayfinding mechanism can be beneficial. Several studies show that wayfinding and spatial navigation can be potentially increased through views of nature from within a facilities circulation.[64] This will be further discussed in section 4.1 and 4.3.

The concept of nature and its healing properties are an ancient concept dating back to over a thousand years ago. Cultures and societies throughout the centuries have acknowledged the many benefits of nature and how it impacts one's well-being, with Asian and Western cultures being a few of the more prominent.[65] One particular culture that used nature as an element for healing was the Greeks, who had one of the first networks of healing places called Epidauros in which they used water from a natural spring in cleansing rituals and other healing ceremonies.[66] Another example is with ancient Roman military hospitals, which were some of the first hospitals ever and were naturally ventilated and lit.[67] One of the first examples of a garden being used as a healing garden was in Monasteries.[68] These monastery gardens included large trees that would shade walkways and be visual stimulus to patients within the structure. They sometimes included elements such as water for rituals. The buildings were also often naturally lit and took advantage of cross-ventilation.[69] The gardens in monasteries were used as pleasing distractions to those who were sick.[70] Thus, throughout history, healing places were found in nature and gardens were essential parts of the built environment.[71] In more recent times, emphasis has been placed on more technology driven approaches, such as medical procedures and medicines, and

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[63] Stephen R. Kellert, *Building for Life: Designing and Understanding the Human-Nature Connection*, 2 edition (Washington, DC: Island Press, 2005), 129 – 148.
[64] S. Jiang and S. Verderber, "On the Planning and Design of Hospital Circulation Zones: A Review of the Evidence-Based Literature," *HERD: Health Environments Research & Design Journal*, October 14, 2016, doi:10.1177/1937586716672041, 2.
[65] Roger S. Ulrich and R Parsons, "Influences of Passive Experiences with Plants on Indvidual Well-Being and Health," ed. Diane Relf (The Role of horticulture in human well-being and social development: a national symposium, 19-21 April 1990, Arlington, Virginia, Portland, Or: Timber Press, 1992), 93–105.
[66] Wilbert M. Gesler, *Healing Places* (Lanham, Md: Rowman & Littlefield Publishers, 2003), 17.
[67] Edwin Heathcote, "Architecture and Health," in *The Architecture of Hope: Maggie's Cancer Caring Centres*, ed. Charles Jencks, 1 edition (London: Frances Lincoln, 2010), 59.
[68] Clare Cooper Marcus and Naomi A. Sachs, *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces* (Wiley, 2013), 6.
[69] Marcus and Sachs, *Therapeutic Landscapes,* 6.
[70] Nancy Gerlach-Spriggs, Richard Kaufman, and Sam Bass Warner Jr, *Restorative Gardens: The Healing Landscape* (New Haven, CT: Yale University Press, 2004).
[71] Marcus and Barnes, *Healing Gardens*, 17.

the connection between healing and nature has become lost. Nature has become considered more as an element of a decoration than as a major design element. Even when gardens are present in medical facilities, they often are not even included on maps or in wayfinding.[72] With healthcare facilities being one of the most stressful environments, it is essential that elements, like nature, are implemented into design to reduce stress and improve quality of life. A recent study that surveys professions working in dementia-serving assisted living facilities found that "secure outside activity space" was one of the most important amenities desired in regards to physical design.[73] This shows how industry professional's value having a safe space to interact outside is important to the quality of care they can provide.

According to Clare Cooper Marcus there are three types of healing that occur when being exposed to nature. The first is "relief from physical symptoms" or at least the relief from awareness of those symptoms.[74] The is key for long-term illnesses such as dementia as being constantly reminded of one's disability can have negative impacts such as depression or anger. The second type of healing is stress reduction. Dealing with any medical condition can be emotionally and physically draining for both the patient but also family members and staff.[75] As one ages, motor skills decline which decreases mobility and makes daily tasks difficult. Loss of abilities is one of the causes of stress in dementia patients, along with loss of memory and realizing one's dementia is progressing.[76] In Roger Ulrich's article titled "Health Benefits of Gardens in Hospital," he states, "In the case of hospitals and other healthcare facilities, there is mounting evidence that gardens function are especially effective and beneficial settings with respect to fostering restoration for stressed patients, family members, and staff" [77] Having a place that can help reduce the stress is beneficial. A study conducted in 2013 concluded that living in places with higher percentage of green spaces correlates to lower stress, which was measured through cortisol secretions in men and women between the ages of 35–

[72] Marcus and Barnes, *Healing Gardens*, 24.
[73] W.L. Keane, A. Cislo, and B.R. Fulton, "Defining the Dementia Market," *Assisted Living Today* 10 (2003): 14–17, 15
[74] Marcus and Barnes, *Healing Gardens*, 34.
[75] Ibid, 24.
[76] Elizabeth C. Brawley, *Designing for Alzheimer's Disease: Strategies for Creating Better Care Environments*, 1 edition (New York: Wiley, 1997), 12.
[77] Roger S. Ulrich, "Health Benefits of Gardens in Hospitals," in *Paper for Conference, Plants for People International Exhibition Floriade*, vol. 17, 2002, 2010, http://jarrettservices.com/resources/HealthBenefitsofGardensinHospitals.pdf.

55.[78] Although the demographic for this study is not specifically seniors, it does show how increase percentages of nature present in daily life impacts an individual's stress levels. In another study conducted by Tang and Brown titled "The Effects of Viewing a Landscape on Physiological Health of Elderly Women" showed that viewing the natural landscape resulted in lower blood pressure and heart rates of women doing so versus women who had no view of nature.[79] This study shows how just viewing nature, not actually having to be surrounded by it, can have positive benefits on individuals. Additional studies conducted by Ulrich show that exposure to natural elements, even if just visually, for only three to five minutes can have substantial impact on recovery from stress resulting in restoration to one's health. Ulrich states that "certain nature scenes effectively sustain interest and attention, and accordingly can serve as pleasant distractions that may diminish stressful thoughts."[80] Exposure was also found to reducing negative feelings and thoughts such as sadness, frustration, and being scared while simultaneously eliciting positive feelings such as happiness and peace. These changes were signified through positive improvements in "blood pressure, heart activity, muscle tension, and brain electrical activity".[81] Ulrich's research claims that restoration is the main driver for individuals wanting to access nature in a healthcare setting. Gardens and exposure to natural elements are not only beneficial to patients in a healthcare facility but also to staff and family members visiting patients.[82] Access to a garden or views of nature can provide opportunities to have break from the clinical settings and a temporary escape from the stress associated with being in a medical environment. Cooper-Marcus and Barnes concluded from their reports that patients reported, in regards to stress, that gardens provided a "positive escape (and send of control)".[83] One patient interviewed by Cooper-Marcus and Barnes stated, "It's a good escape from what

[78] Jenny Roe et al., "Green Space and Stress: Evidence from Cortisol Measures in Deprived Urban Communities," *International Journal of Environmental Research and Public Health* 10, no. 9 (September 2, 2013): 4086–4103, doi:10.3390/ijerph10094086, 4087.
[79] Joyce W. Tang and Robert D Brown, *The Effects of Viewing a Landscape on Physiological Health of Eldelry Women* (The Haworth Press, Inc., 2005), 187–202.
[80] Roger S. Ulrich et al., "Stress Recovery during Exposure to Natural and Urban Environments," *Journal of Environmental Psychology* 11, no. 3 (September 1, 1991): 201–30, 228.
[81] Ibid, 229.
[82] Roger S. Ulrich, "Effects of Gardens on Health Outcomes: Theory and Research," in *Healing Gardens: Therapeutic Benefits and Design Recommendations*, by Clare Cooper Marcus and Marni Barnes (John Wiley & Sons, 1999), 27-86.
[83] Marcus and Barnes, *Healing Gardens,* 24.

they put me through. I come out here between appointments. . . . I feel much calmer, less stressed".[84]

The third type of healing would be improvement in the overall sense of well-being. Marcus states, "[T]o facilitate hope is to enhance health."[85] For the purpose of this dissertation, well-being is being defined as physically, psychologically, and emotionally healthy. Living an inactive lifestyle can result in a magnitude of negative impacts on one's health. This is particularly relevant to the senior population as they are often the most sedentary group of the overall population. The more time one spends being sedentary can be "related to morbidity and premature mortality."[86] Having an environment that encourages an active lifestyle is critical when discussing a senior care facility, and a key aspect of creating a supportive environment is designing a safe environment for a senior to access nature and take part in activities outside. A study entitled "Outdoor Environmental Supportiveness and Older People's Quality of Life" found a positive correlation between conducting personal projects and quality of life. The study also looked at how an outdoor supportive environment can aid in the personal activities thus improving quality of life. In the study, ?? states, "There is growing evidence that being outdoors and active in nature is important in later life" and that "planning and design of the outdoor environment should include the aim of encouraging participation in nature-related activities for older adults."[87] This study supports the theory that how our outdoor environment is designed and built impacts how it can be utilized thus impacting the users', in this case seniors', quality of life and overall sense of well-being.

2.4 How Planning Plays a Role

Although the primary focus of this research and, as such, dissertation is on a singular site within a larger suburban development, it is important to understand how master planning can also have a positive impact on the elderly. It not only impacts the success of a retirement facility, but it also impacts how the elderly who are not dealing with major ailments can successfully age in place and navigate their respective living communities. Seniors look at their surrounding built environment

[84] Marcus and Barnes, *Healing Gardens,* 27.
[85] Ibid, 34.
[86] Katherine Brookfield et al., "The Home as Enabler of More Active Lifestyles among Older People," *Building Research & Information* 43, no. 5 (September 3, 2015): 616–30, doi:10.1080/09613218.2015.1045702, 1-2.
[87] Angela Curl et al., "Outdoor Environmental Supportiveness and Older People's Quality of Life: A Personal Projects Approach," *Journal of Housing For the Elderly* 30, no. 1 (January 2, 2016): 1–17, doi:10.1080/02763893.2015.1087925, 14.

different than non-seniors in regards to available facilities, accessibility and positive environments. Questions that run through seniors minds include the following: "Can I get there from here? Will I be safe? How long will it take? Are sidewalks set back from the street and shaded?"[88] It is necessary to understand that when considering seniors, it is not just about whether those services and facilities exist with a community but whether the seniors access them? In order for an individual to successfully and productively age, he or she must be able to not only maintain their daily activities within their home but also to be able to continue to perform normal activities within their community.[89]

Many of the elderly in the U.S. have difficulty with finding adequate transportation, mainly due to their lack of physical mobility. They may have difficulties getting to the bus stop or end up waiting long periods of times for shuttle services. These challenges make it difficult for them to conduct daily activities, such as going to doctor's appointments or getting groceries, making it difficult for them to age with ease within their own homes. Organizations do exist, however, that provide some of these services, which enables the elderly to continue to live relatively independent lives.[90] Some of the in-home services offered in Hawaii include meal delivery systems, adult day care, transportation assistance, help with chores, personal care and hygiene, and legal assistance, among many others. This variety of services have multiple organizations that provide them. For example, Meals on Wheels is an example of an organization in Hawaii that provides free meals, if qualified, to seniors delivered to them in their homes. There are also services that offer support to family members caring for seniors.[91]

It is within these areas of community assistance that planning can play a key role—community being a larger development such as a neighborhood or even city—for allowing the elderly to age as they wish for as long as possible. Universal design is a concept that has been applied to many buildings, including residential and public spaces; however, the concept of universal design should not stop within a building but should extend to the community around it.[92] A well designed community will positively impact the ability of the elderly to age in place. Characteristics of a

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[88] Pauline Abbott EdD et al., eds., *Re-Creating Neighborhoods for Successful Aging*, 1 edition (Baltimore, Md: Health Professions Press, 2008), xix.
[89] EdD et al., eds., *Re-Creating Neighborhoods for Successful Aging*, 4-5.
[90] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 9.
[91] "Honolulu, Hawaii Department of Elderly Affairs Division (EAD) - About Services," accessed September 13, 2016, http://www.elderlyaffairs.com/site/448/about_services.aspx.
[92] EdD et al., eds., *Re-Creating Neighborhoods for Successful Aging*, 3.

successfully designed community that supports seniors in the aging process could include informative street design, a variety of services in a central location, and dependable and easily accessible public transportation. The built environment should also support seniors in their ability to access "health care systems, goods, services, recreation and education"[93] Informative street design impacts one's ability to get around that community by supporting seniors independence and ability to stay active and mobile. If they are unable to maintain active and independent due to their external environment, seniors could become isolated and frail due to inactivity. If a senior can easily navigate a community, it allows them to continue to run errands such as shopping, along with encouraging community involvement and social interaction. In a study conducted by interviewing 200 seniors over the age of 65, it was revealed that certain components of a street more appealable to use, and, if these components are not there, it hinders the seniors from venturing from their home. Desirable characteristics included adequate seating, smooth pavements, greenery, bus stops with protection from elements, public restrooms, and clear wayfinding details. The study concluded that "older people's quality of life can be significantly improved by good street design."[94] The need for more nature has also been of high importance even on the planning level. There has been a need for better planning as our society has become more urbanized. Although urbanized areas have many positive qualities and elements, in some areas there has been a decrease in quality of life. The impacts of our urban environment have led to studies that assess the urban landscape and determine whether or not they have a high or low quality of life.[95] These studies concluded that "a high level of landscape quality can increase the productivity of people due to a mental relaxation generating an overall happiness."[96] This information shows how significant one's environment is on his or her quality of life, including the larger surrounding built environment like neighborhoods and cities.

Social connection is critical to the elderly in terms of longevity and aging in places, as the aging process often leaves them feeling isolated. The elderly with strong social ties tend to be happier overall and in better physical and mental

[93] EdD et al., eds., *Re-Creating Neighborhoods for Successful Aging*, 5.
[94] Rita Newton et al., "Increasing Independence for Older People through Good Street Design," *Journal of Integrated Care* 18, no. 3 (June 2010): 24–29.
[95] Athanasios Alexandru Gavrilidis et al., "Urban Landscape Quality Index – Planning Tool for Evaluating Urban Landscapes and Improving the Quality of Life," *Procedia Environmental Sciences* 32 (2016): 155–67, doi:10.1016/j.proenv.2016.03.020, 155.
[96] Gavrilidis et al., "Urban Landscape Quality Index – Planning Tool for Evaluating Urban Landscapes and Improving the Quality of Life," 165.

health.[97] Given this idea, it is important that communities are accessible to the elderly so they can age in place even when they start to face challenges due to the aging process. This can be done by increasing the number of sidewalks along with making sure that those sidewalks are wide enough and Americans with disabilities Act (ADA) compliant. The communities, specifically that those within the Hawaiian Islands, should also be mixed-use, meaning a combination of residential, commercial, and business development, which would allow the elderly better access to the services they need, rather than having to travel across island.[98] Newer communities are being designed with accessibility in mind; they are some of the older ones that were not. One example of this case is Kaneohe that has minimal sidewalks, and where there are sidewalks, they are not necessarily complete sidewalks. Urban sprawl has led to large areas of houses with community amenities, such as grocery stores, movie theaters, and healthcare facilities being separated and grouped together making it necessary to drive to get around. Mix-used communities increase social connectivity and can also can decrease the use of the automobile and increase the likelihood that people will walk more.[99]

These design guidelines for more elderly friendly communities do not have to only be applied to new neighborhoods but also to neighborhoods going through redevelopment. Communities that were not designed as retirement communities but have, over time, obtained a high population of seniors are often referred to as naturally occurring retirement communities (NORCs**).** Due to the increase of the elderly in these communities, programs and services for them have developed to assist them with aging in place.[100] Having these programs in a centralized place within communities supports the elderly in having more independence and to age in place for a longer period of time by decreasing stress and anxiety and feelings of loss. By reducing these feelings through design, the aging process can be slowed rather than accelerated. An example of a NORC is Washtenaw County in Michigan where a NORC organization called Blueprint for Aging assists seniors. According to Blueprint for Aging, key components of a successful NORC are "centers for physical activity (like exercise centers); a full, year-round calendar of events; effective communication between service providers and the community; and a strong sense of

[97] Andrew L. Dannenberg, Howard Frumkin, and Richard J. Jackson, *Making Healthy Places: Designing and Building for Health, Well-Being, and Sustainability* (Island Press, 2012), ch.7.
[98] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 8.
[99] EdD et al., eds., *Re-Creating Neighborhoods for Successful Aging*, 4.
[100] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 10.

trust in those providers."[101] Blueprint for Aging acts as a central forum for residents to find information and services in the area making it easier for seniors to take advantage of services that allow them to maintain a high quality of life.

Another way planning can play a role in the aging process is by understanding what services are currently provided in communities and what ones are not. A good resource for determining what is needed in a specific community to make it a successful NORC is NORC Blueprint. It is an organization that aids in developing and evaluating a NORC. Each community is unique and has different needs. By figuring out what services currently exist and where they are located, designers can begin to determine the gaps in services. Community needs would not be met if a generic plan is used for all communities. The community also needs to be aware of what services are in place for the elderly. If the senior and their loved ones do not have knowledge of what services existing, that senior or family member will be unable to take advantage of services offered and help the elderly age in place for as long as possible. Caregivers also need to have knowledge as to what the next steps are once the elderly can no longer live alone.[102] Most communities, including those in Hawaii, have a resource center, which is a good place to start looking at what resources are available. Seeking advice from a lawyer who specializes in elder law is also a viable resource depending on individual situations.

[101] Gavrilidis et al., "Urban Landscape Quality Index – Planning Tool for Evaluating Urban Landscapes and Improving the Quality of Life," 165.
[102] Hawaii Community Foundation, "Caring for Our Kupuna: Building an Aging in Place Movement in Hawaii," 6.

3.0 ALIMENTS PARTICULAR TO THE ELDERLY

The elderly represent the fastest growing population in the U.S., and, as we age, our abilities and senses decline. Motor and cognitive limitations influence every aspect of an elderly person's daily life and determine the amount and type of activities they can and can't do. As part of the normal aging process, a person's mind and body begins to react and function more slowly, and they experience a decline in one or more of the five senses. The rate at which these senses decline is dependent on many factors including the built environment. The American Academy of Family Physicians reports that most people over the age of seventy have two or three chronic conditions that interfere, to some degree, with their daily lives.[103] However, it is important to remember that aging itself is not a disease but the process of life. In our youth-driven culture, growing older is generally viewed as undesirable. Our built environment even reflects the emphasis on youth due to it being designed for young people, such as many things being technology driven and the fast-pace way of life. Within a youth-driven community, quickness and efficiency are key. As an American society, we have a strong desire to remain youthful, which results in older adults being in denial of their disabling conditions and can lead to frustration when they feel they can't "keep up." This leads to lowering the quality of life for an individual at a time when he or she should be encouraged to live as comfortably and productively as possible. Designers and architects, then, have the opportunity to help alleviate frustration by becoming more aware of age-related challenges and how these challenges can be minimized through the built environment.

3.1 Physical Aliments

In the U.S., more than 50% of the population has some form of impaired physical ability, with people over the age of 65 having a 50% higher chance of experiencing an accident leading to a disability. (See Table 2.1.) As people continue to age to 70 and older, they have a 79% chance of having one of these seven chronic conditions: sensory deficits, arthritis, high blood pressure, heart disease, diabetes, lung diseases, stroke, and cancer. Their chance of having impaired mobility

[103] David Alan Kopec and American Society of Interior Designers, *Designing for the Elderly Population: The Americans with Disabilities Act and Its Implications for an Aging America* (Washington, DC: ASID, 2006), 56.

also increases.[104] Living with these limitations can be psychologically debilitating, especially when that person's environment emphasizes them, in the sense that one might not be able to bath on their own due to inability to get into a bathtub. A design solution would be to have a walk-in shower which would allow the individual to continue to take care of their own hygiene versus having to depend on someone else. With any ailment, it is important to develop architectural designs that highlight what a person can do and not what they cannot do, and the environment should not reflect the occupant's disability. If it does, the environment enforces the idea that the disability defines the occupant, which it does not.

Table 3-1 Everyday activities that many individuals over age sixty find difficult to perform.[105]

PERCENTAGE OF ADULTS AGE SIXTY AND OVER WHO HAVE ANY DIFFICULTY PERFORMING SELECTED FUNCTIONAL ACTIVITIES	
ACTIVITY	PERCENT WHO HAVE DIFFICULTY
Stooping, crouching, or kneeling	51%
Standing on one's feet for about two hours	42%
Walking for a quarter of a mile	30%
Lifting or carrying something as heavy as 10 pounds	29%
Doing chores around the house	28%
Walking up 10 steps without resting	26%
Standing up from an armless char	26%
Going out to do things like shopping, movies, or sporting events	22%
Sitting for about 2 hours	21%
Reaching up over one's head	18%
Participating in social activities	18%
Getting in or out of bed	17%
Using one's finger to grasp or hold small objects	17%

One of the leading causes of death in people over the age of 65 is heart disease. A symptom that is linked with heart disease, which is highly common for the elderly in the U.S., is high blood pressure.[106] To help reduce the chances of having heart disease and high blood pressure through design is to reduce emotional and physical stress. Emotional stress can come from being frustrated when one is unable

[104] Aging in the Know: Your Gateway to Health and Aging Resources on the Web (March 15, 2005). Trends in the elderly population. Retrieved February 6, 2009 from www.healthinaging.org/aginginthenow/chapters_ch_trial.asp?ch=2.
[105] R. Bethene Ervin, "Prevalence of Functional Limitations among Adults 60 Years of Age and over: United States, 1999–2002," *Adv Data* 375 (2006): 1–7, 4–7.
[106] Robert Beaglehole and Rodney Jackson, "Alcohol, Cardiovascular Diseases and All Causes of Death: A Review of the Epidemiological Evidence," *Drug and Alcohol Review* 11, no. 3 (July 1, 1992): 275–90, doi:10.1080/09595239200185811.

do what they used to be able to easily do.[107] Through architectural design, these frustrations can be alleviated by allowing the elderly to function better, which reduces stress and physical ailments associated with it. An example of this would be say a senior is unable to maintain proper hygiene because he or she has difficulty stepping into a bathtub, which then requires someone else to assist them in shower causing that senior to become stressed. By replacing the bathtub with a walk-in shower, the built environment now allows the senior to be able to contain bath themselves, resulting in reduced stress. This also allows the senior to continue conducting normal daily activities which also supports them in maintaining their current physical level and not decrease it. Studies have shown that allowing seniors to maintain their daily activities are important aspects in reducing stress and maintaining quality of life.[108]

As we age, one of the main physical impairments that one must deal with is loss of mobility. One of the major causes for loss of mobility is arthritis, which affects nearly 43 million Americans. Like many disabilities affecting the elderly, arthritis varies greatly from person to person with there being more than 100 various forms of the ailment. This variability often makes it difficult to design retirement facilities because arthritis impacts some of our elderly population in such a variety of ways resulting in a variety of physical challenges.[109] Arthritis can limit range of motion causing great discomfort and unhappiness. There is currently no cure, but exercise is often recommended because it helps strengthen muscles around joints and increases endurance and flexibility and reduces pain and stiffness. Design elements can promote physical activity by creating a safe and enjoyable environment alleviating any frustration or stress. Specifically, universal design principles are a solid place to start when addressing mobility difficulties for the elderly.[110]

Another physical challenge that people deal with as they age is change in vision, which oftentimes can be the most significant and depilating change. Around the age of forty, most individuals start sensing changes in their vision.[111] By the time an individual is sixty, one's pupil has decreased to one third the size it was when one was twenty.[112] It becomes challenging to read small print due to a condition called

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[107] Kopec, *Environmental Psychology for Design*, 139.
[108] Curl et al., "Outdoor Environmental Supportiveness and Older People's Quality of Life," 2.
[109] Kopec, *Environmental Psychology for Design*, 141.
[110] Ibid, 140–141.
[111] Kopec, Dak. *Health, Sustainability and the Built Environment*. Illustrated edition. New York: Fairchild Books, 2008, 241.
[112] "Aging Changes in the Senses: MedlinePlus Medical Encyclopedia," accessed May 7, 2015, http://www.nlm.nih.gov/medlineplus/ency/article/004013.htm.

"presbyopia" in which one's eyes have difficulty changing shape to read close things due to the eye lens hardening.[113] Even seniors with 20/20 vision still have difficulties with vision compared to when they were younger.[114] Designers can help those with vision disabilities by ensuring that there is appropriate and adequate lighting for every area within a given dwelling. For example, where reading or other close work is expected, lighting should be bright and fall directly onto the desired area. It is also important to consider using light fixtures that can be adjusted to fit the need of the task and the user. Having adjustable lights, such as dimmers, also gives the individual the feeling of being in control of his or her environment. Other eye conditions that cause vision loss in elderly are cataracts, glaucoma, and macular degeneration. Cataracts can be fixed through surgery, but there is no fix for glaucoma.[115] Because of vision loss as we age, appropriate lighting becomes even more critical, and general lighting should be increased by approximately 20%. Although increased light is desired, it is also important to make sure there are drastic differences in lighting within a space or between spaces because, as we age, it becomes harder for our eyes to adjust quickly to light changes.[116] The loss of peripheral vision also accompanies aging.[117] This makes it even more critical that there are clear and open pathways to make it easier to travel from one destination to another. Not being able to easily travel from place to place increases stress, which could cause them to become immobile more quickly.

Hearing loss is also a characteristic of aging that can cause problems. Not only does loss of hearing occur, but it also affects one's balance. The inner ear changes vibrations into nerve signals and controls one's balance. Hearing loss associated with aging is called "presbycusis." Aging will cause the ear structure to change, reducing one's ability to hear and maintain balance.[118] Hearing loss is a factor to consider within architectural design. Material selection, such as hard surfaces versus soft surfaces, and spatial organization, such as large open spaces versus smaller spaces can impact the audio environment for the elderly by either accentuating noise or reducing it. Also, designing safety rails and adequate seating along walkways aid those who are having trouble balancing.

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[113] Kopec, *Health, Sustainability and the Built Environment*, 241.
[114] John A. Brabyn et al., "Visual Impairments in Elderly People Under Everyday Viewing Conditions," *Journal of Visual Impairment & Blindness* 94, no. 12 (December 2000): 741.
[115] Kopec, *Health, Sustainability and the Built Environment*, 241.
[116] Ibid, 241.
[117] "Aging Changes in the Senses."
[118] Ibid.

Many physical ailments come with aging, but, through careful and considerate design, the built environment can ease the difficulties associated with aging making it easier for the elderly to do everyday tasks. These are often easier to design for versus psychological ailments because physical disabilities are easier to recognize and address. Psychological disabilities are more challenging because their severity differs greatly from individual to individual and can also be difficult to diagnose.

3.2 Psychological Aliments

Along with physical disabilities, many of the elderly have to deal with psychological disabilities, which can often stem from disease. The major psychological disability that affects the elderly is dementia.[119]

Dementia is not one disease but rather an overall term for decline in memory.[120] Although scientists know dementia is due to loss of or damage to brain cells, they do not know what causes this dementia to take place. Dementia is categorized as a loss in at least two areas of complex behavior that impact a person's ability to function on a daily basis. These losses of abilities could be anything from memory loss to language difficulties. Individuals with dementia often have difficulty controlling their emotions and can even have changes in personality.[121] Alzheimer's disease is the most common type of dementia in people 65 and older and accounts for 60% to 80% of dementia cases. The second most common dementia occurs after a stroke and is called vascular dementia.[122] Dementia's primary symptoms include a reduction in cognitive abilities and increased spatial disorientation.[123] Some estimates suggest that the disease will affect up to 16 million Americans by the year 2050.[124]

This data leads to the idea that design spaces and environments must be created in a way that helps certain aging individuals with their dementia. There needs to be areas specifically designed for activities that can stimulate the elderly intellectually such as designated spaces that provide ideal environments to read or

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[119] Kopec, *Environmental Psychology for Design*, 141.
[120] "Dementia – Signs, Symptoms, Causes, Tests, Treatment, Care | Alz.org," accessed May 5, 2015, http://www.alz.org/what-is-dementia.asp.
[121] Kopec, *Health, Sustainability and the Built Environment*, 65–66.
[122] "Dementia–Signs, Symptoms, Causes, Tests, Treatment, Care | Alz.org."
[123] R. Passini et al., "Wayfinding in a Nursing Home for Advanced Dementia of the Alzheimer's Type," *Environment and Behavior* 32, no. 5 (September 1, 2000): 684–710, doi:10.1177/00139160021972748, 684–710.
[124] Alzheimer's Association. (2004). Statistics fact sheet. Retrieved from www.alz.org.

do puzzles.[125] However, those dealing with dementia often do not handle high levels of stimulation because it often agitates them, makes them anxious, and causes them to become confused.[126] This is where design comes into play because a balance needs to be created between adequate stimulation and too much stimulation. One way of dealing with varying stimulation needs might be to have different level of stimulus in different rooms to accommodate a variety of users and their needs.

Another common condition that affects the elderly is strokes, which are one of the leading causes of death in the United States. When someone has a stroke, the blood supply is cut off from the brain causing damage to brain tissue. The severity of a stroke can vary greatly, often leaving one with paralysis on one side of the body and difficulties communicating. It can also damage cognitive ability leaving one feeling frustrated and even leading to depression. When designing for someone who has had a stroke the design must reflect the changes the client is going through. For example, if a right-handed person loses mobility on the right side of his or her body, redesigning a space to make it easier for that person to use their left hand is critical.[127] Another variable in the disease's progression is the person's degree of privacy, especially when it relates to the control and freedom of choice regarding accessibility to body and mind.[128] A designer should consider various levels of privacy while still maintaining safety.

Designing for the elderly should embrace a combination of functionality and interdisciplinary perspectives to achieve a more holistic design. Liliane Choney states, "A goal of design for people with different abilities is to accommodate a given situation or circumstance without the initiatives being so obvious as to draw attention."[129] The most significant thing is to consider when designing for dementia is safety. No matter what element of design one is dealing with, the finished product needs to be safe for the users.

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[125] Kopec, *Health, Sustainability and the Built Environment*, 66.
[126] Richard Fleming and Nitin Purandare, "Long-Term Care for People with Dementia: Environmental Design Guidelines," *International Psychogeriatrics* 22, no. 07 (November 2010): 1084–96, doi:10.1017/S1041610210000438, 1086.
[127] Kopec, *Health, Sustainability and the Built Environment*, 65.
[128] Debra G. Morgan and Norma J. Stewart, "Multiple Occupancy Versus Private Rooms on Dementia Care Units," *Environment and Behavior* 30, no. 4 (July 1, 1998): 487–503, doi:10.1177/001391659803000404.
[129] Dak Kopec, "Whole Health: Designing for Human Health Requires an Interdisciplinary Approach," *Icon*, Winter 13, 30.

4.0 DESIGN ELEMENTS

There are various definitions of good health, and until the twentieth century for a long time the primary definition was simply the absence of a recognizable illness. But today, the concept of good health has evolved to include mental health and psychological well-being. It calls upon us to consider how we think and feel, how we learn and communicate, how we form and sustain relationships, and, most critically, how we cope with shocking circumstances and life's stresses. Kristen Day, Daisy Carreon, and Cheryl Stump state, "Design is regarded as a therapeutic resource to promote well-being and functionality among people with dementia."[130] Architects and designers need to incorporate ways to alleviate stress and encourage relaxation into their conceptualization of a given built environment, especially when it comes to creating living spaces for the elderly. Topics such as lighting, biophilic design, and color theory all demand attention when thoughtfully designing and shaping the interior environment for the elderly.

4.1 Spatial Organization

Spatial organization is a challenging consideration for designers, especially when working with retirement and nursing facilities. Spatial organization encompasses many aspects including the following: how spaces are separated, how to connect exterior and interior spaces, and how social/public spaces are organized with each other. Spatial organization is the main driver in how users navigate experience the built environment. The layout of the building, along with scale and architectural language, impact whether or not the facility has a more residential feeling versus an institutional environment.[131] The spatial organization of a senior care facility with dementia care can help facilitate both privacy and social interactions. It can also support independence and stimulate curiosity.[132] According to Dr. Gesine Marquardt and Dr. Peter Schmieg, "The physical environment has a great potential for supporting a resident's wayfinding abilities."[133] However, these studies also

[130] Kristen Day, Daisy Carreon, and Cheryl Stump, "The Therapeutic Design of Environments for People with Dementia a Review of the Empirical Research," *The Gerontologist* 40, no. 4 (2000): 397–416, 397.
[131] EDAC Emily Chmielewski and Perkins Eastman, "Excellence in Design: Optimal Living Space for People With Alzheimer's Disease and Related Dementias," accessed September 18, 2016, http://www.perkinseastman.com/dynamic/document/week/news/download/3421211/3421211.pdf, 6.
[132] Brawley, *Designing for Alzheimer's Disease,* 47.
[133] G. Marquardt and P. Schmieg, "Dementia-Friendly Architecture: Environments That Facilitate Wayfinding in Nursing Homes," *American Journal of Alzheimer's Disease and Other*

indicate that, even though certain organization of spaces and orientation are more conducive to seniors with dementia being able to orient them, it is important to understand that other factors that impact an individual's overall well-being and quality of life. This section will discuss the challenges of wayfinding and organization of spaces in a dementia care facility.

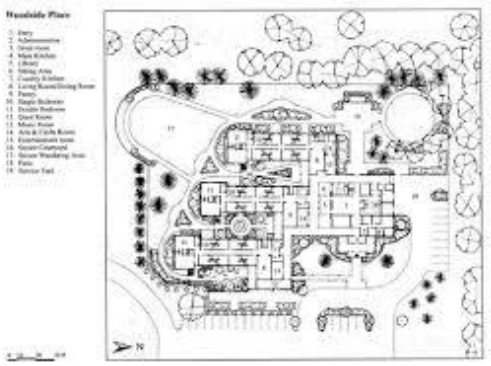

Figure 4.1 Floor Plan of Woodside Place, Oakmont, Pennsylvania

Woodside Place is an excellent example of a more homelike feel due to its floor plan and size.[134]

It is important that spaces are organized from public to private, which is similar to a home.[135] Through the organization and separation of spaces, the built environment can acknowledge individual needs for both communal and private spaces. Woodside Place in Oakmont, Pennsylvania, is considered to be one of the first facilities that went from a large institution setting to a smaller more residential like setting.[136] Figure 4.1 shows the floor plan of Woodside Place. It has 3 residential wings with a central public space. A significant factor in design this was the scale and how the spaces were organized. This facility is one of the first examples of a senior care facilities being modeled more like a home. Its design supports "a model of care that empowers people and improves the quality of residents' lives."[137] Woodside Place is an excellent example of how changing the scale and layout of a facility can greatly impact the residents quality of life and care provided.

Depending on the type of patients and their specific needs, the spatial organization requirements vary. For example, if an aging individual needs to

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Dementias 24, no. 4 (August 1, 2009): 333–40, doi:10.1177/1533317509334959, 1.
[134] Chmielewski and Eastman, "Excellence in Design," 7.
[135] Eastman, *Building Type Basics for Senior Living*, 95.
[136] Chmielewski and Eastman, "Excellence in Design," 7.
[137] Ibid.

maintain physical activity to stay healthy, a designer can aid in increased activity by increasing distances between one area of the facility to another to encourage individuals to walk more. However, if someone has mobility issues, it can be very difficult for that individual to move around and negotiate personal space, so designing a space with long distances between important living area and conduct everyday activities can cause residents to become frustrated and possibly even digress more quickly. It is the designer's responsibility to offer users various circulation paths so individuals can choose what type of path they prefer to take. For example a more agile person will take advantage of a walking path versus an individual with mobility issues would choose to take a shorter path.

No matter the physical ability of a resident, studies have shown that being able to navigate and access spaces within their environment has been linked to quality of life.[138] It has a;sp been shown that facilities with a lower number of residents, a singular living and dining area, and a simple circulation system create a better quality living environment.[139] Studies have shown that L-, H-, and square-shaped circulation layouts resulted in residents having increased spatial orientation.[140] When discussing building organization, size of a facility plays a key role. It has been found that larger buildings with simple layouts work better,[141] but smaller facilities do better with layouts that are more complex.[142] Another thing to consider is that although studies have shown that straight circulation systems allowed residents to navigate easier.[143] It is critical to note that long straight corridors have a more institutional feel, versus a more homelike environment, which other research shows is important for quality of life in a senior care facility. This is where it is the designer's responsibility to balance the effectiveness of a layout with creating an appropriate and successful environment. Many designers have used a continuous path around a focal point, such as a courtyard. This typology has been recommended due to the fact that it allows residents to explore while maintaining

[138] Marquardt and Schmieg, "Dementia-Friendly Architecture," 333.
[139] Ibid, 337.
[140] Solve Elmståhl, Lena Annerstedt, and Owe Åhlund, "How Should a Group Living Unit for Demented Elderly Be Designed to Decrease Psychiatric Symptoms?," *Alzheimer Disease & Associated Disorders* 11, no. 1 (March 1997): 47–52, doi:10.1097/00002093-199703000-00008, 49.
[141] Passini et al., "Wayfinding in a Nursing Home for Advanced Dementia of the Alzheimer's Type," 13-14.
[142] Elmståhl, Annerstedt, and Åhlund, "How Should a Group Living Unit for Demented Elderly Be Designed to Decrease Psychiatric Symptoms?" 49.
[143] Marquardt and Schmieg, "Dementia-Friendly Architecture," 335.

orientation to the surrounding spaces.[144] However, although this is seen as a successful solution by architects, it has not been proven through empirical studies.

Entry into a senior care facility that specialized in dementia care is different than most other facilities because residents most likely will not be frequently coming and going. The entry is mostly for staff and visitors, including the family. The entry, along with being welcoming, should be directly linked to the administrative area of the facility. However, they entry should be screened from the residents on the interior. Residents being able to see the entry could cause agitation and increase the desire to want to exit the facility.[145] Studies have also shown that residents attempt to exit the facility is decreased when visually blocking exits.[146]

Furthermore, if designers focus on dementia, safety is critical. Exits need to be monitored in order to prevent residents from wandering outside or off site.[147] Visual access to residents is also an important consideration.[148] There needs to be a direct visual access from one space to another.[149] Ways to maximize visual access is by having larger hallways, which has been shown to decrease disorientation.[150] It also helps to have "meaningful decision points."[151] When caregivers no longer have to worry about where residents are able to move about, it allows them to feel comfortable letting them explore. On the other hand, if residents can see the lavatory or the next resting place, they may feel more inclined to move around. The spatial organization should give residents opportunities to engage rather than discouraging wandering.

As people age, they also have a harder time remembering things, so it is ideal to keep circulation between spaces simple. A few ways of doing this is limiting entrances/exits and keeping pathways simple with minimal choices of which direction one can turn. Having multiple options on along a path can create frustration due to not knowing or remembering which way one needs to go. Ways to minimize

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[144] Marquardt and Schmieg, "Dementia-Friendly Architecture," 333.
[145] Chmielewski and Eastman, "Excellence in Design," 24-25.
[146] N. L. Wilson et al., "The Effects of Visual Barriers on Exiting Behavior In a Dementia Care Unit," *The Gerontologist* 35, no. 1 (February 1, 1995): 127–31, doi:10.1093/geront/35.1.127, 127.
[147] Kopec, *Health, Sustainability and the Built Environment*, 66.
[148] Fleming and Purandare, "Long-Term Care for People with Dementia."
[149] Marquardt and Schmieg, "Dementia-Friendly Architecture," 338.
[150] Elmståhl, Annerstedt, and Åhlund, "How Should a Group Living Unit for Demented Elderly Be Designed to Decrease Psychiatric Symptoms?" 48.
[151] Ann Netten, "The Effect of Design of Residential Homes in Creating Dependency among Confused Elderly Residents: A Study of Elderly Demented Residents and Their Ability to Find Their Way around Homes for the Elderly," *International Journal of Geriatric Psychiatry* 4, no. 3 (May 1989): 143–53, doi:10.1002/gps.930040305, 143.

confusion is by clearly distinguish different spaces. Using different colors, textures, and patterns can indicate different spaces or directions. Conventional wayfinding is not as impactful to individuals with dementia; it is more about visual connection and creating spaces that elicit a unique feeling.[152] For example, one residential pod might have a more lush feeling (greener color tone and green plants) versus another residential pod has a more warm feeling (warmer material pallet). A resident with a view of both pods will be able to identify their pod through visual recognition. Another element that could assist a resident in identifying their room would be having an element that distinguishes their door from another such as a display case next to their door/room with personal memorabilia.[153] The spaces can also assist with wayfinding. For example, hallways can differ indicating whether or not that area is a private area or a more public common space.[154] It is important to have environmental cues that assist the residents in navigating the building. Another helpful design element would be to place the entry for a large lanai near the interior living area. This increases the residents ability to find it and in result being able to use the space more.[155] This concept can also be applied to the garden. This reinforces the concept that by making spaces visual available, it increases the physical use of that space.

Having moveable seating is important because, when one is able to vary seating design it gives one the feeling of being in control of his or her environment.[156] Basically, the design of retirement or nursing facilities is all about balance in minimizing frustration but allowing residents freedom and control as they move into their latter years of life. The design of a home for the elderly needs to create a space where each individual can feel relaxed and comfortable, whether it is inside or out, so as to increase quality of life.

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[152] Eastman, *Building Type Basics for Senior Living*, 93.
[153] K. H. Namazi, T. T. Rosner, and L. Rechlin, "Long-Term Memory Cuing to Reduce Visuo-Spatial Disorientation in Alzheimer's Disease Patients in a Special Care Unit," *American Journal of Alzheimer's Disease and Other Dementias* 6, no. 6 (November 1, 1991): 10–15, doi:10.1177/153331759100600603, 10.
[154] Chmielewski and Eastman, "Excellence in Design," 8.
[155] Marquardt and Schmieg, "Dementia-Friendly Architecture," 337.
[156] Clare Cooper Marcus and Naomi A. Sachs, "Designing Outdoor Spaces To Fit Specific Patient Populations," *Healthcare Design*, April 1, 2014, http://www.healthcaredesignmagazine.com /article/designing-outdoor-spaces-fit-specific-patient-populations.

While little documentation currently exists regarding spatial organization in building design in reference to the elderly, an element of the interviews and analysis that follow will contribute to this research with a discussion of how four existing facilities have handled design elements and if they consistently encounter any problems.

4.2 Sensory Experience

Another element of design specifically when considering residents dealing with dementia is sensory stimulation. There is no magical amount that is good for individuals with dementia and many professionals have debated over what is therapeutic and what is harmful. The environment designs aim for is one that sparks excitement and curiosity but doesn't cause stress or anxiety.[157] Sensory stimulation encompasses many elements including light, color, sound, and materials. There is no one solution, and any design decision has many implications. Lighting, materials, and color also contribute to the feeling of the facility. They can either create a residential environment or a more intuitional environment.

LIGHT

Light exists as a significant sensory experience and can greatly impact the quality of life for an individual living in a senior care facility. When discussing light, one must consider both natural and artificial light as both have major impacts on humans and their health. It is important that all spaces incorporate as much natural light as possible because a majority of seniors are greatly underexposed to sunlight which is detrimental to their health.[158] Sunlight impacts the nervous system, one's mental health, and one's appetite.[159] Natural light also helps regulate human circadian rhythms, which are important to our health and mood, and regulate hormones such as serotonin and melatonin.[160] Improved sleep patterns have also been linked to exposure to natural light.[161] It has been shown that not enough exposure to natural light can lead to deterioration of the visual sense and even lead

[157] Eastman, *Building Type Basics for Senior Living*, 94.
[158] Brawley, *Designing for Alzheimer's Disease*, 85.
[159] Ibid*,* 72.
[160] Peter Boyce, Claudia Hunter, and Owen Howlett, "The Benefits of Daylight through Windows" (Troy, New York: Rensselaer Polytechnic Institute, September 12, 2003), 49.
[161] Andrew Satlin et al., "Bright Light Treatment of Behavioral and Sleep Disturbances in Patients with Alzheimer's Disease," *American Journal of Psychiatry* 149, no. 8 (August 1992): 1028–32, doi:10.1176/ajp.149.8.1028, 1030.

to physical illness.[162] Studies have also shown that, when individuals are not exposed to enough light, they tend to have increased agitation, and when those individuals light exposure is increased, agitation decreases.[163] The impact of exposure to bright light in reduction of agitation was most significantly seen in mid to late stages of dementia.[164] One way of encouraging sun exposure for seniors is by supplying ample outdoor spaces, such as patios and gardens, that encourage residents to occupy them and spend as much time outside as possible.

Another element to consider is precisely when, during the course of a day, one is exposed to sunlight. Exposure in the morning helps wake up residents, and continued exposure throughout the day helps maintain one's circadian rhythm. Evening exposure is also a positive thing. When designing for sunlight, one should be aware of "sundowning," which can occur in seniors with Alzheimer's Disease. Sundowning is indicated by a decreased desire for physical activity in the evenings.[165] Increased sun exposure has been shown to relieve sundowning in seniors.[166] Some rooms should be oriented towards the west to take advantage of the light from sunsets.[167] Sun exposure in the evening is also critical for seniors as it has been shown to improve sleep quality.[168]

Artificial light is also a key element in a senior care facility, especially since as we age, changes in our vision cause our sight to decline. Additionally, most medical facilities use fluorescent lights with acrylic lenses, which are poor sources of light due to glare and do not look like they would be found in a residential home.[169] In a recent study, The American Medical Association declared that light at night results in adverse health outcomes, which are particularly relevant for medical facilities that are in operation around the clock such as within a hospital or elderly care facility. The study evaluated the efficacy of using daylight-mimicking LEDs to enhance cognitive functioning and improve the health of residents with dementia. The

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[162] Brawley, *Designing for Alzheimer's Disease,* 72.
[163] Satlin et al., "Bright Light Treatment of Behavioral and Sleep Disturbances in Patients with Alzheimer's Disease," 1029.
[164] Barbara B. Lovell, Sonia Ancoli-Israel, and Richard Gevirtz, "Effect of Bright Light Treatment on Agitated Behavior in Institutionalized Elderly Subjects," *Psychiatry Research* 57, no. 1 (June 1995): 7–12, doi:10.1016/0165-1781(95)02550-G, 10.
[165] Eastman, *Building Type Basics for Senior Living*, 94.
[166] Brawley, *Designing for Alzheimer's Disease,* 77.
[167] Eastman, *Building Type Basics for Senior Living*, 94.
[168] Scott S. Campbell, Drew Dawson, and Michael W. Anderson, "Alleviation of Sleep Maintenance Insomnia with Timed Exposure to Bright Light," *Journal of the American Geriatrics Society* 41, no. 8 (August 1993): 829–36, doi:10.1111/j.1532-5415.1993.tb06179, 832.
[169] Eastman, *Building Type Basics for Senior Living*, 95.

daylight-mimicking LEDs allowed lights to be on 24 hours a day but regulated the patient's circadian rhythm allowing them to get a better night's rest resulting in improved health.[170] By realizing the impacts of the environment on the residents, adjustments can be made to allow the nurses to properly care for them while the architectural design actually improves the quality of life for the residents dealing with dementia. Lighting should be designed as more ambient and indirect. This makes the environment safer and more comfortable for both the residents and staff.[171] The level of illumination needs to be increased to account for the decline of vision as one ages. When increasing the light, a consistent light level throughout the space needs to be maintained in order to prevent areas on the ground that could be considered a hole or step by someone who has impaired vision. Task lighting should be provided in specific areas such as reading nooks. Other things to be mindful of are glare, how light impacts color, and minimizing drastic changes in light levels, specifically between indoors and outdoors as there can be a significant difference in light brightness.[172]

COLOR

Another sensory influence to consider is color, which is closely linked to light as light can impact color. Elizabeth Brawley states that "the light that comes from the sun is the foundation for color."[173] Designers enhance the resident's experience and potentially impact clinical outcomes by understanding color impacts in healthcare facilities. It has been acknowledged that color has both an emotional and physical impact on humans and that these impacts can be used as therapeutic elements. Because it has been shown that color can stimulate reduce anxiety and speed recovery it is being used as a tool in many healthcare settings, including senior care facilities.[174]

As we age, our perception of color changes compared to when we were younger. It is important to remember that seniors' vision is affected changes as they age and at different rates, comparably, even if individuals are the same age. The major difference is a decline in being able to distinguish between colors, with the

[170] Eugenia V. Ellis, et al., "EBD Using Daylight-Mimicking LEDs for Improved Health Outcomes in Older Adults at St Francis," in *ARCC Conference Repository*, 2014, http://www.arcc-journal.org/index.php/repository/article/view/279.
[171] Brawley, *Designing for Alzheimer's Disease,* 87.
[172] Ibid*,* 87.
[173] Ibid, 107.
[174] Ibid, 107.

blue to yellow area of the color spectrum being affected the most.[175] Even though it is more difficult to distinguish blues and greens than reds and yellows at any age, it becomes even more difficult for older people because of the yellowing of the eye's lens.[176] This fact suggests that, in the design sense, warm colors are the best choice for interiors and furnishings because it makes it easier to distinguish between them. However, pastels are particularly difficult for seniors to distinguish, especially cool tones, which can often appear gray.[177] If used, the key is to still create a color contrast.[178] Creating high contrast between different color elements within design is the best way to enhance seniors' ability to accommodate for their vision loss. Glare and the inability to distinguish edges of light colored elements are the two environmental factors that most influence seniors in reference to visual barriers.[179]

The best way to approach color when designing a senior care facility would be to consider the colors in terms of light and dark. By considering them through this relationship, designers are able to create distinction between elements such as a light toilet and darker floors and walls.[180] This attention to color contrast has the potential to help an elderly individual identify the placement of the toilet as compared to the floor also being light in color, which would make it difficult to see the toilet and lead to frustration. See Figure 4.2 and Figure 4.3 for examples successful color palettes. The images show Warroad Senior Living Center in Warroad, Minnesota—a facility that adopted a warm color palette, which is recommended for seniors, but still managed to create contrast between elements so each can be seen easier by individuals with visual impairments.

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[175] Brawley, *Designing for Alzheimer's Disease*, 110.
[176] "Aging Changes in the Senses."
[177] B. A. Cooper, "Long-Term Care Design: Current Research on the Use of Color," *The Journal Of Healthcare Design* 6 (1993): 61–67, 66.
[178] Kopec, *Health, Sustainability and the Built Environment*, 242.
[179] Leon A. Pastalan, "The Empathic Model: A Methodological Bridge between Research and Design," *JAE* 31, no. 1 (September 1977): 14, doi:10.2307/1424529, 14.
[180] E. Brawley, "Alzheimer's Disease: Designing the Physical Environment," *American Journal of Alzheimer's Disease and Other Dementias* 7, no. 1 (January 1, 1992): 3–8, doi:10.1177/153331759200700103, 5.

Figure 4.2 Living area in Warroad Senior Living Center in Warroad, Minnesota

Images shows example of a successful color pallette. The designer used a warmer color pallette but still manages to show contrast between elements.[181]

Figure 4.3 Enclosed patio in Warroad Senior Living Center in Warroad, Minnesota

Images shows example of a successful color palette. The designer used a warmer color palette but still manages to show contrast between elements.[182]

[181] "Healthcare Architects | Warroad Senior Living Center | Warroad, MN," accessed October 4, 2016, http://www.healthcarearchitects.com/expertise/skilled/warroad1.htm#img/warroad14.jpg.

[182] "Healthcare Architects | Warroad Senior Living Center | Warroad, MN."

It is also useful to use distinct and contrasting colors to help residents distinguish one space from another, which is especially beneficial for elderly people dealing with dementia to help orient them with their respective surroundings.[183] The older human beings become, the harder it gets to distinguish differences between similar colors.[184] This color selection theory also applies to elements that provide safety, such as markings on the edges of stairs and curbs and on signs that contain safety warnings.[185] This brings up the issue again of how to create distinction without using colors or patterns that can cause confusion or create unsteadiness for someone with impaired depth perception.[186]

Although creating contrast is essential, it is difficult to recommend specific color choices because seniors vision impairments can vary greatly. For example, a set of colors may be ideal for one individual but can cause visual challenges for another. It is important to use resources and organizations that specialize in vision impairments. One key resource to use is The Lighthouse, Inc. They are the world's leading resource on vision impairments and specialize in knowing what colors would be ideal for specific vision impairments.[187] Table 4.1 presents a few color recommendations.

Table 4-1 Good and Poor color choices[188]

GOOD COLOR CHOICES FOR CONTRAST	POOR COLOR CHOICES FOR CONTRAST
Light color against black	Dark green against bright red
Dark color against white	Yellow against white or similar lightness
Light yellow against dark blue	Blue against green or similar lightness
Dark red against light green	Lavender against pink

SOUND

As previously discussed, hearing loss is one of the many impacts of aging. Impairments in hearing are not limited to just a lack of individuals' ability to hear noises them but also include the inability to locate the orientation of the source of

[183] Kopec, *Health, Sustainability and the Built Environment*, 66.
[184] Brabyn et al., "Visual Impairments in Elderly People Under Everyday Viewing Conditions," 741.
[185] Kopec, *Health, Sustainability and the Built Environment*, 242.
[186] Ibid, 66.
[187] Brawley, *Designing for Alzheimer's Disease*, 114.
[188] Ibid, 115.

the noise, which can cause confusion and anxiety.[189] Balance is also impacted by hearing loss.

In order to aid seniors with their hearing, the built environment must decrease the background noise in order for voices, which should be increased if necessary, to be heard. Reducing background noise is beneficial because loud ambient sound is stressful to many seniors, especially those with dementia. Noisy spaces can also increase hearing impairments.[190] In addition, loud environments can make it hard for residents to concentrate, which impacts both residents and staff.

Sound from different spaces needs to be controlled so noise in one space does not distract residents in another. One solution is to use carpet which, will reduce noise from traveling through the air. Carpet also has less glare than other materials. However, the carpet being used needs to make sure that someone who has mobility difficulties, such as a walker, can still walk on it without difficulty or tripping.[191] Walls, ceilings, windows, and doors all have products that offer sound reducing qualities and should be chosen where appropriate, for example bedrooms and bathrooms where noise transfer should be kept to a minimum. Size of a facility and location of spaces factor into whether designers would need to use sound-proofing materials. One can also control noise by separating spaces that have different noise goals. For example, more quiet spaces, such as bedrooms, should not be next to an activity room where loud activities take place.

Although too much noise can be bothersome, no noise can also have negative impacts. Complete silence is uncomfortable, which is why there should be some noise, and that noise should be meaningful and informative.

MATERIAL SELECTION

Material selection is significant because seniors are impacted more on a sensory level versus on an intellectual level when dealing with dementia. Because seniors experience their environment on more of a sensory level, designers need to be aware of overstimulation from excessive patterns or design. Patterns can be complementary and provide positive stimulation, but patterns should be used while being mindful of their impacts, as too much can cause agitation.[192] A smart way to

[189] Brawley, *Designing for Alzheimer's Disease*, 135.
[190] Ibid, 137.
[191] Eastman, *Building Type Basics for Senior Living*, 94.
[192] Brawley, *Designing for Alzheimer's Disease*, 128.

incorporate patterns and textures is through elements that can be easily changed to accommodate resident's different needs. Pillows, blankets, and curtains are all easy ways of adding texture in a semi-permanent way. All of these elements can come in a variety of sizes and patterns and can be used in multiple ways to add character to a space. Blankets can even be hung to add sound elimination along with making a space more personable for a resident, especially if the blanket has emotional value to that resident. These elements also create a more residential feel because they are elements that are commonly found in homes.

Although hard finishes are easier to clean, they should be limited as they cause a more institutional-like feeling. Things that should be avoided in large amounts are vinyl, laminate, and metal (for doors).[193] However, in recent times, manufacturers are making laminates and vinyl that mimic the look of finer materials such as wood.

Another thing to consider when selecting materials is glare. Depending where an item is located, light hitting a particular surface could cause a glare, which is a problem for the elderly because, often, their eyes have particular difficulties adjusting to glare. It could also cause difficulty in differentiating between materials or objects. This consideration needs to be balanced with not having enough light to also distinguish differences in a given environment. Lights should be placed where they can be easily accessed and so that individuals do not have to walk far in the dark to turn them on. In addition, using motion-activated lights is a wise idea because then they automatically turn on and off without anyone having to physically get to them.[194]

4.3 Natural Environment and Landscape

Because of nature's many positive benefits, healing gardens are becoming more popular in healthcare settings. They provide patients, family members, and even employees with a sanctuary and relief from stress. Although healing gardens have different therapeutic properties that are typically not associated with medical treatments, they have great benefits.[195] Each person interacts differently with these gardens. For example, some prefer to sit quietly, whereas others find it more therapeutic to be interactive. There is viewing nature, whether in reality of through a

[193] Eastman, *Building Type Basics for Senior Living*, 95.
[194] Kopec, *Health, Sustainability and the Built Environment*, 242.
[195] Terry Hartig and Clare Cooper Marcus, "Essay: Healing Gardens–Places for Nature in Health Care," *The Lancet* 368 (2006): S36–37.

medium such as a painting or a picture, being in nature, and interacting with nature.[196] Any level of interaction with nature reaps psychological health benefits and should be seen as an important therapeutic resource. Having potted plants indoors can even be beneficial to patients who are unable to go outside.[197]

Figure 4.4 Public space in Massachusetts General Hospital
Hospital brings nature in by hanging plants from the ceiling.[198]

Another technique to exposing individuals to nature without going outside is through a representation of nature, such as a painting or a picture. According to studies conducted by Roger Ulrich, it was found that stress was reduced when patients were able to view pictures of vegetation or water versus pictures with more of an urban context.[199] Viewing nature through a window can also be influential on one's health. Other studies conducted by Ulrich also showed how a window with a view of nature also impacted an individual's health by reducing recovery time after a surgery.[200] A separate study conducted by M. Saffarinia showed how bringing plants, pictures of forests and cane fields, and a small waterfall into a hospital waiting room was able to reduce both systolic and diastolic blood pressure and pulse rate in

[196] Pretty, "How Nature Contributes to Mental and Physical Health," 68.
[197] Marcus and Sachs, "Designing Outdoor Spaces To Fit Specific Patient Populations."
[198] "Massachusetts General Hospital | NBBJ," accessed September 11, 2016, http://www.nbbj.com/work/massachusetts-general-hospital-lunder-building/.
[199] Roger Ulrich, "View through a Window May Influence Recovery from Surgery," *Science* 224, no. 4647 (April 27, 1984): 420–21, doi:10.1126/science.6143402, 420-421.
[200] Ulrich, "View through a Window May Influence Recovery from Surgery," 420-421.

individuals.[201] These studies show how even bringing in little bits of nature into the built environment can have a monumental impact on users. These studies have influenced medical facilities to incorporate nature, such as healing gardens and images of nature, into medical facilities, along with orienting rooms towards views of nature. A good example of this is the Massachusetts General Hospital located in Boston, Massachusetts and designed by NBBJ. Not only did they bring nature in by hanging plants from the ceiling in the public spaces (see Figure 4.4), they also oriented patient rooms to look out into a bamboo garden. (See Figure 4.5.) Massachusetts General Hospital has received multiple awards and publications recognizing it as a successful example of Healthcare design and utilizing nature as a healing element.[202]

Figure 4.5 Patient room at Massachusetts General Hospital

Patient rooms were given a view of the bamboo gardens.[203]

[201] M. Saffarinia, S. Tavakkoli, and A. Alipor, "Effects of Environmental Design Inspired by Nature on Psychological and Physiological Responses of Clients in Medical Spaces," *International Journal of Environmental Research* 6, no. 3 (2012): 689–694.
[202] "Massachusetts General Hospital | NBBJ."
[203] "Massachusetts General Hospital | NBBJ."

However, although viewing nature has great healing benefits, in order for a garden to be considered a healing garden, it needs to encourage other activities, such a gardening or walking groups, and not just viewing of the nature.[204] Although some facilities have some type of outdoor green space, they are being underutilized. In a recent study conducted by Kearney and Winterbottom where forty residents in three-long term care facilities where interviewed, it was found that, although the residents interviewed desired access to green spaces, in reality they spent little time outdoors. Some of the reasons for lack of use of the green spaces were physical barriers, lack of staff assistance, and design configuration problems.[205] These findings were echoed in another study conducted by Cutler and Kane. This study included a large group of residents: 1,988 individuals from 40 nursing homes from 5 different states. This second study determined that these facilities had limited outdoor spaces and was only being used about once a month by only 32% of the residents that had the physical capability to take advantage of the spaces.[206] Both of these studies show two important things. The first is that facilities often lack adequate outdoor spaces. The second is that even facilities that have outdoors facilities are not being used due to several factors. According to studies conducted by Rodiek, reasons for lack of use are "accessibility, overall aesthetics and specific features, such as shade, sitting accommodations, plants and views."[207] One way of encouraging active use of a garden is by having some of the structured activities that elderly care facilities have occur outside. Having structured activities that occur outside increase the chances that the residents will use the garden on their own.[208]

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[204] Marcus and Barnes, *Healing Gardens*, 60.
[205] Anne R. Kearney and Daniel Winterbottom, *Nearby Nature and Long-Term Care Facility Residents: Benefits and Design Recommendations* (The Haworth Press, Inc., 2005), 7-9.
[206] Louis J. Cutler and Rosalie A. Kane, *As Great as All Outdoors: A Study of Outdoor Spaces as a Neglected Resource for Nursing Home Residents* (The Haworth Press, Inc., 2005), 29-31.
[207] Susan Rodiek, "Resident Perceptions of Physical Environment Features That Influence Outdoor Usage at Assisted Living Facilities," *Journal of Housing For the Elderly* Volume 19 (September 23, 2008), 95-107.
[208] Marcus and Sachs, *Therapeutic Landscapes*, 151.

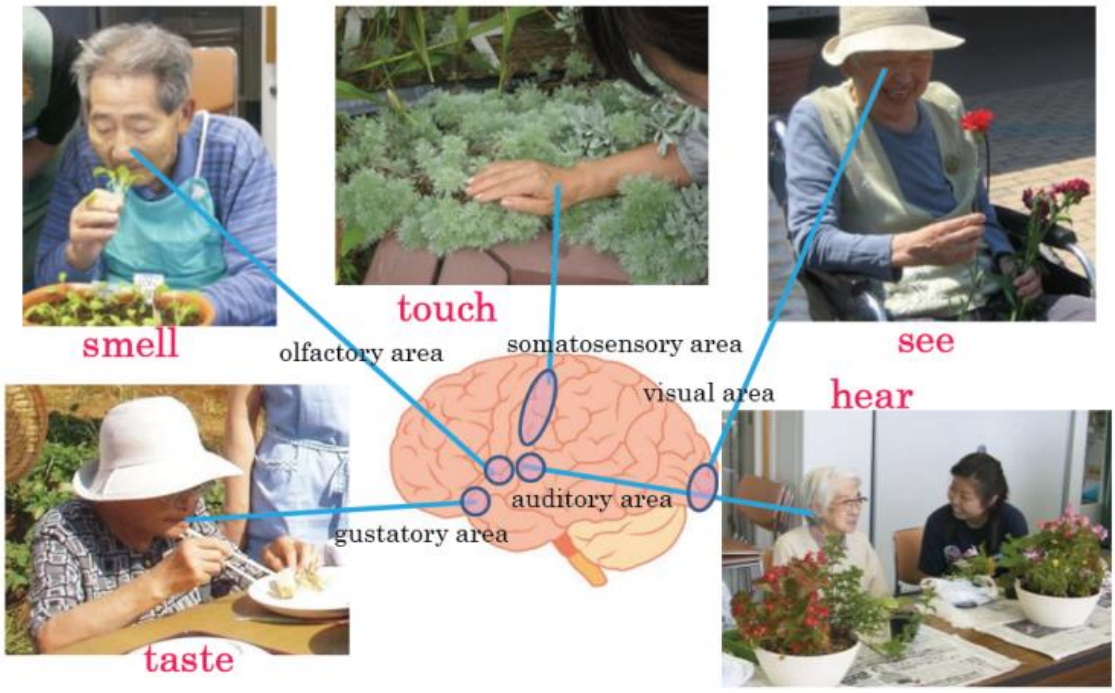

Figure 4.6 Horticulture Therapy

Gardening activates the five senses.[209]

Gardening is a good example of a structured activity because it not only benefits the body physically but also mentally. According to Joann Woy in "Accessible Gardening", gardening can lead to "increased physical strength and mobility, mental and emotional improvements, increased self-esteem and self-confidence."[210] Additionally, gardening can give seniors a sense of control, especially with many tools that have been adapted for use for the physically challenged. Using gardening as a therapeutic tool is not a new discovery and has even been linked to cultural practices such as ancient Egypt. Today it is often referred to as horticulture therapy.[211] Horticultural therapy is defined as "A process utilizing plants and horticultural activities to improve individuals' social, educational, psychological, and physical adjustment, thus improving their body, mind, and spirit."[212] Horticultural therapy is defined as "A process utilizing plants and horticultural activities to improve individuals' social, educational, psychological, and physical adjustment, thus improving their body, mind,

[209] Masahiro Toyoda, "Horticultural Therapy in Japan-History, Education, Character, Assessment," JAD, no. 2 (2012): 51–65, 58.
[210] Joann Woy, *Accessible Gardening*, 1 Edition (Stackpole Books, 1997), 4.
[211] Woy, *Accessible Gardening*, 4.
[212] Dannenberg, Frumkin, and Jackson, *Making Healthy Places*, 385.

and spirit."[213] Horticultural therapy became popular after World War II in conjunction with occupational therapy as a means of aiding in the restoration of physical and mental health. Horticultural therapy was soon offered in programs in education and was seen being implemented in various types of hospitals such as psychiatric, rehabilitation, and veteran's hospitals.[214] Horticultural therapy has been shown to have physiological, psychological, and social effects.[215] According to Mooney and Nicell, horticultural therapy is especially useful for seniors with dementia due to the fact that it can be easily adapted to the various skill levels and needs of the individual. Money and Nicell also determined that horticultural therapy can "decrease or slow negative effects of aging" and aid the reduction of negative behaviors such as agitation.[216] Gardening can easily be simplified or made more challenging to adapt to the individuals' physical abilities and their personal needs. This is excellent for seniors dealing with dementia or other types of mental or physical disabilities because their impairments can greatly vary between individuals.[217] By being an active participate in gardening, it causes the individual to improve their physical and mental skills. Part of this is due to the fact that they are reaping physical benefits, such as vegetables as herbs, from their hard work, which gives participants a feeling of connection to a larger entity. Stephen Kellert states, "People are biologically programmed to engage nature as a source of practical utility beyond the obvious material rewards because such actions can also produce self-sufficiency, self-confidence, and a feeling of independence gained by exercising their ability to survive with competence and craft."[218] By immersing oneself in nature, he or she receives many physical and psychological benefits.

Like discussed in previous sections, research has shown how views of nature have beneficial and positive impacts on seniors.[219] There are also many benefits of active gardening because it stimulates the five senses, rather than just visually from viewing nature.[220] Figure 4.6 shows how the different sense can be simulated, for example by physically planting things one is stimulating their touch sense. It is

[213] Dannenberg, Frumkin, and Jackson, *Making Healthy Places,* 385.
[214] Marcus and Sachs, *Therapeutic Landscapes*, 52.
[215] Toyoda, "Horticultural Therapy in Japan-History, Education, Character, Assessment," 58.
[216] Patrick Mooney and P. Lenore Nicell, "The Importance of Exterior Environment for Alzheimer Residents: Effective Care and Risk Management," in *Healthcare Management Forum*, vol. 5 (Elsevier, 1992), 23–29, 26-27.
[217] Shannon E. Jarrott, Hye Ran Kwack, and Diane Relf, "An Observational Assessment of a Dementia-Specific Horticultural Therapy Program," *HortTechnology* 12, no. 3 (2002): 403–410. 403.
[218] Kellert, *Building for Life,* 52.
[219] Ulrich, "Health Benefits of Gardens in Hospitals."
[220] Toyoda, "Horticultural Therapy in Japan-History, Education, Character, Assessment," 57.

important that seniors continue to participate in activities that stimulate all senses. Gardening also has the potential to encourage social interaction, with other residents, staff, and even family.[221] Gardening can give a sense of community and encourage social interaction which helps fight feelings of isolation and depression which is often felt by seniors as they age.[222] Figure 4.7 and Figure 4.8 shows how gardening can bring people together and encourage social interaction. Gardening can also be a self-esteem booster by eliciting feelings of accomplishment.[223] By facilitating horticulture therapy we are able to improve quality of life in seniors with dementia by creating a sense of community and self-worth which decreases feelings of isolation, anxiety, and depression.[224] Incorporating nature with exercise can make it more enjoyable, which may increase activity levels. Being outdoors also exposes patients to natural light, which helps restore the natural body rhythms of individuals dealing with dementia and could improve their sleep patterns.[225] A good example of a garden that balances both the viewing aspect of nature and a working garden is the Sophia Louise Dubridge-Wedge Living Garden at the Family Life Center in Michigan designed by Martha Tyson of Douglas Hills Associates in Evanston, Illinois. (See Figure 4.6.) The garden is half-an-acre and contains both a strolling garden and a working garden and was design specifically for patients with Alzheimer's and other forms of dementia. The working part of the garden is near the main building in a rectangular shape with raised garden beds and a potting area in the shade. The strolling garden has several elements including a pond with a waterfall, gazebos, and various seating elements throughout.[226]

[221] Toyoda, "Horticultural Therapy in Japan-History, Education, Character, Assessment," 58.
[222] S. Noone et al., "The Nourishing Soil of the Soul: The Role of Horticultural Therapy in Promoting Well-Being in Community-Dwelling People with Dementia," *Dementia*, December 23, 2015, doi:10.1177/1471301215623889, 1.
[223] Toyoda, "Horticultural Therapy in Japan-History, Education, Character, Assessment," 57.
[224] Noone et al., "The Nourishing Soil of the Soul," 8.
[225] Kopec, *Health, Sustainability and the Built Environment*, 66.
[226] Clare Cooper Marcus, "No Ordinary Garden," *Landscape Architecture*, accessed September 7, 2016, https://www.asla.org/lamag/lam05/march/EditorsChoice.html.

Figure 4.7 Gardening

Visible accomplishment in horticultural activities.[227]

Figure 4.8 Horticulture therapy

Mobile gardening station enables seniors with mobility challenges to still garden.[228]

When designing garden spaces for senior care facilities, one must accommodate a wide range of users, with the needs of the most vulnerable patients coming first. The greatest consideration must be safety and security. Safety can be difficult because garden design must address the possibility of wandering off. There also needs to be careful consideration regarding types of plants as individuals with diminished mental capacity could put inappropriate things into their mouths, such as

[227] Toyoda, "Horticultural Therapy in Japan-History, Education, Character, Assessment," 58.
[228] Ibid, 58.

the leaves or flowers of plants. Therefore, all plants need to be non-toxic, even though many commonly used plants have toxic elements. There are over 100 non-toxic plants to choose from and some of these include azaleas, oleander, wisteria, daffodils, bleeding hearts, and hydrangea.[229] Pansies are another good example of a plant to choose as it is non-toxic but also comes in several of vibrant colors.[230] The garden also must be accessible both physically and visually to both residents and workers while still maintaining a sense of privacy for those who are enjoying the garden. The natural exterior environment also should not feel institutional. To help feel non-institutional, a high ratio of greenery to "hardscape" (manmade elements such as sidewalk or stones) and a variety of vegetation should be incorporated to create enough of a visual stimulus to provide interest but not too much that it causes over stimulation.

Accessibility and maneuverability are two other characteristics of a garden that are critical to its success. Most of the hardscapes that will be in a garden will be pathways allowing access to and throughout the garden, with one example being sidewalks. Sidewalks need to be a minimum of 4 feet and 7 feet to accommodate 2 wheelchairs passing at the same time. For turnaround spots in the garden, minimum dimensions should be 6 x 6 feet to allow for a wheelchair make a complete rotation. An edge guide, such as an upward beveled edge, is also needed along sidewalks to prevent from "falling" off the walkways.[231]

When it comes to material choice for walkways, concrete is an excellent choice for its durability and low-maintenance. Typical walkways are 4" thick but should be increased to 6 inches for heavy wheelchair use. When using concrete, there are many options when discussing aesthetics as various colors and textures can be added to concrete.[232] This not only makes it visually more appealing but can also be a way to incorporate wayfinding. Other materials to consider are brick and wood, however these two materials are more expensive than concrete, less durable, and requires more maintenance than concrete. Some materials that should be avoided because they can be slippery are flagstone, tile, and asphalt (which can also get very hot).[233]

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[229] Marcus and Sachs, "Designing Outdoor Spaces to Fit Specific Patient Populations."
[230] Brawley, *Designing for Alzheimer's Disease*, 211.
[231] Woy, *Accessible Gardening*, 2.
[232] Ibid, 6.
[233] Ibid.

Walkways also need handrails. Handrails should be on both sides of the walkways to accommodate individuals with various disabilities on different sides of the body. Handrails should be 1 ½ inches thick in diameter, 3 ½ inches away from the mounting surface and should be able to support up to 250 pounds of weight. On flat surfaces, rails should be installed at 30 inches from the ground, for stairs or ramps rails should be installed at 32 inches and 3 inches at landings. Material selection for the rail is also critical since, most likely, it will be outside, so there needs to be consideration for heat. Metal is not a good choice as it can cause the handrail to become very hot and unusable and dangerous versus a finished wood rail, which retains less heat.[234]

Another key design element for a garden at a senior care facility to consider is the inclusion of a variety of sitting options. As we age, we become easily tired. So places to rest along a walking route must be available and must be visible from the previous rest spot. A good distance to aim for is 20 feet between resting spots.[235] There should also be various chair and bench styles that can accommodate groups or individuals. There also needs to be ample shade to provide protection from the sun. Shaded areas are essential for some residents because many psychotropic medications make people more susceptible to glare and UV exposure.[236]

To make it easier for residents to garden, raised beds should be used. Even raising the garden bed 9 to 12 inches can greatly reduce the strain on the gardener when bending over. The beds should not be raised higher than 3 feet as, at that point, it becomes difficult to access the plants. Widths of the garden beds are also critical. If access to the raised garden beds are only on one side then it should be between 2 and 3 feet, but, if one can access the garden beds on both sides, it can be between 4 and 5 feet wide.[237]

Additionally, there needs to be a transition area between the building and the garden. First, it helps individuals adjust their eyes to the change of lighting from interior to exterior. Second, a covered area allows the garden to be accessible even when it is raining or there is other bad weather. Plants should also be in vibrant colors like red, yellow, orange, and white, as they are easier to see that those in cooler tones like blue and purple. Another thing to remember is that the elderly

[234] Woy, *Accessible Gardening*, 6.
[235] Marcus and Sachs, "Designing Outdoor Spaces to Fit Specific Patient Populations."
[236] Ibid.
[237] Woy, *Accessible Gardening*, 6.

sometimes walk slowly and may have a lower gaze, so one needs to consider various textures, plant height, visual detail, and color, among other items.[238]

Overall, having a garden is one of the most ideal things that can be implemented in any medical facility, especially a retirement or nursing facility home to residents dealing with dementia. Such residents often lose short-term memory but retain long-term memory, so gardens often provided them with the simple pleasures such as feeling the breeze, viewing the flora, and watching birds at a feeder, while sitting in a beautiful setting, and even, for some, gardening. Although there have been many links to the positive impacts of including a natural outdoor environment within a built space, a need still exists for more empirical studies on gardens in healthcare facilities.[239]

4.4 Sense of Place

Sense of place is defined as "place-specific values and personal bonds that individuals form with their surroundings, including the biophysical, socio-cultural, psychological, and political-economic aspects of one's environment."[240] In the western world, sense of place is defined as a more physical representation of the surrounds environment. Christian Norberg-Schulz, a Norwegian architect, is a theorist in the concept of genius loci which he "described as representing the sense people have of a place, understood as the sum of all physical as well as symbolic values in nature and the human environment."[241] Norber-Schulz defines genius loci through four different levels: 1) topography of the land, 2) the light and other natural conditions of the site, 3) surrounding buildings and 4) the cultural landscape.[242] Hawaiian sense of place tends to be more spiritual. The meaning and connection of place cannot be fully understood by just looking at it. A sense of identity is developed through storytelling (Hawaiian ʻōlelo noʻeau) that is passed down from generation to generation. The journey of experiencing a place and the gaining of knowledge through stories that are passed down from generation to generation, one is able to begin to understand the deeper layers and meaning of a

[238] Marcus and Sachs, "Designing Outdoor Spaces to Fit Specific Patient Populations."
[239] Clare Cooper Marcus and Marni Barnes, *Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations* (Martinez, CA: Center for Health Design, 1995), 7.
[240] Noa Kekuewa Lincoln and Nicole M. Ardoin, "Cultivating Values: Environmental Values and Sense of Place as Correlates of Sustainable Agricultural Practices," *Agriculture and Human Values* 33, no. 2 (June 2016): 389–401, doi:10.1007/s10460-015-9613-z, 6.
[241] Christian Norberg-Schulz, *Genius Loci: Towards a Phenomenology of Architecture* (New York: Rizzoli, 1979), 33-48.
[242] Norberg-Schulz, *Genius Loci,* 33-48.

place, and only then will the unique characteristics of Hawaiian sense of place will be understood.

There must be an understanding of a places history, its purpose and its uses in order for one to be able to appropriately capture a sense of place. For the Hawaiians, that knowledge was often obtained from stories, literature and kūpuna (seniors). This is often how one gained an understanding of the original context of a site such as the original climate, vegetation, and natural landscape. Native Hawaiian identified all things associated with the gods to be scared which included all land. Water sources, observations points, and other natural elements were considered sacred and though to perpetuate the Native Hawaiian's life and culture. Native Hawaiians spent a majority of their time working the land to be able to provide food and substance which led to their realization of the importance of the harmony between humans and land.[243] Humans need the land because it provides for the people, thus the impacts of humans on the land impact humans survival. To the Hawaiians, plants were physical representations of historic beliefs. Plants not only dictated the survival of the Hawaiian people, but held physical and spiritual ties to their past.[244] These cultural values were passed on from generation to generation and continue to be maintained and used to inform the actions of daily life. Although the people of Hawaii's relationship to the land have evolved over time, the core traditional ideology still remains. This is because culture is a dynamic structure and, although it is passed from generation to generation, it also evolves over time.[245]

Through modernization, this Hawaiian sense of place and connection was lost. Many designs were labeled Hawaiian or labeled as having a sense of place but often it was generic motifs, such as a flower pattern or roof shape, that was being applied to a building as an afterthought. That deeper and more spiritual connection where not being thought through. Through an understanding of Hawaiian culture and site, designers are able to create a meaningful connection between man and nature through architecture. By doing creating an authentic cultural representation, one is able to respect the past, while propelling into the future. The importance of culture and landscape is not in its individual parts but in how they function together. This is the essence of the relationship native Hawaiians had with their homes.

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[243] Jared Diamond. *Guns, Germs, and Steel: The Fates of Human Societies*. (New York: W.W. Norton & Co, 1999), 219–220.
[244] E.S. Craighill Handy, Elizabeth Green Handy and Mary Pukui, *Native Planters in Old Hawaii: Their Life, Lore, and Environment*, (Honolulu: Bishop Museum Press, 1991), 32–45.
[245] Conrad Kottack, "Mirror of Humanity. A Concise Introduction to Cultural Anthropology." (Boston:McGraw-Hill Higher Education, 2007), 42–48.

Hawaiian sense of place is directly tied to time and genealogy. The goal of this senior care facility is to increase the users' awareness of their natural environment through the architectural design. Architecture, specifically, is deeply rooted in the idea of "a culture of place" especially in Hawaii where there is a particularly strong connection to lineage and culture. Hawaii is a unique place in many ways but especially culturally. It is a melting pot of traditions and ethnicities. And even today, Native Hawaiian values percolate throughout the islands in a way that is as vibrant and alive than ever. This is especially key when designing a senior care facility in Hawaii because the residents will have a special connection to Hawaii and that needs to come through in the facility in order to create an environment that is relevant to the seniors lifestyle and create a high quality of life. By establishing a base of cultural influences and incorporating trans-cultural values of such as lōkahi (balance), ʻohana (family), aloha (love), and malama (to care for)[246]we can reach interconnectivity between the earth, ocean, sky and the people. The four specific values, lokahi, ʻohana, aloha, and malama, are the focus of this dissertation.[247]

At the center of overall health for Native Hawaiians is lōkahi, which means balance or working harmoniously as a unit.[248] It represents the idea that health is holistic and encompasses not only physical health but also psychological and spiritual health. An individual's body must be healthy but so must their relationships with others including family members, one's ancestors and the gods. According to the concept of lokahi, mental and spiritual health must be good before healing of the physical body can take place.[249] Lōkahi also means the balance between the land and its caretaker. This means one must to harmoniously with the natural environment. This is key in designing a senior care facility that focuses on dementia care. Most facilities acknowledge the physical health but there's been a push in new facilities to acknowledge other areas of health, such as psychological and emotional health. It is not only medically important, but also culturally important to create an environment that supports multiple aspects of health. Having a balance with nature can lead to balance in all aspects of one's health.

The word ʻohana means family. The prefix ʻoha means the sprout or bud of the Kalo plant. Kalo is seen in the same manner as part of the Hawaiian extended

[246] Stanford School of Medicine, *Health and Health Care of Native Hawaiian & Other Pacific Islander Older Adults*, 2010, 20.
[247] Stanford School of Medicine, *Health and Health Care of Native Hawaiian & Other Pacific Islander Older Adults*, 20.
[248] Kameʻeleihiwa. *Traditional Hawaiian Metaphors.* Center of the Pacific. 2008, 16.
[249] Stanford School of Medicine, *Health and Health Care of Native Hawaiian & Other Pacific Islander Older Adults*, 20.

family.[250] Today, many families have multiple generations living together, which is for both cultural reasons and financial reasons.[251] The Hawaiians have strong linage ties of generations to each other. One's life does not just begin when they are born, but actually entwined with their ancestors. That life then extends onto the next generation. This concept is known as piko kolu, meaning connecting the past, present and future.[252] Because family members have such close relationships, when one is sick, it affects the entire family. The concept of ʻohana is key when discussing elderly care. It is critical to take this island-based concept and apply in the built form of retirement and nursing facilities when building within the Hawaiian Islands. One way doing so would influence the architectural design is by creating an environment that encourages interaction with others to create a sense of community within the facility. It is also necessary to consider the fact that family members will want to visit or be involved in the resident's life, so there must be places in which this interaction can occur.

Aloha means love, but specifically in relation to the elderly, it also means caring and compassion. The aging community within our society needs to be cared for and respected most of all. This concept has been lost in certain facilities where the surroundings feel more institutionalized. By bringing this concept back to the core of a retirement or nursing facility, it will positively impact the quality of life of residents.

The responsibility to malama, which means to care for, especially when it comes to loved ones, is also principal for consideration in architectural design. This value strongly relates to ʻohana and the entire dynamic of multi-generational living.[253] There is also the saying "malama the ʻāina," which means to take care of or respect the land. Bringing this concept into a senior care facility through built design would not only be beneficial for residents but would also lend itself to more sustainable and respectable architecture in the sense that the natural formation of the land is taken into consideration.

Another key element of the Native Hawaiian culture is the tie to the land. They have a strong and unique relationship with nature and this relationship allows them to reap the healing benefits. Although farming of the land was for utilitarian

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[250] Handy, Handy and Pukui, *Native Planters in Old Hawaii,* 32-45.
[251] Stanford School of Medicine, *Health and Health Care of Native Hawaiian & Other Pacific Islander Older Adults*, 20.
[252] Mitchell, *Resource Units In Hawaiian Culture,* 80.
[253] Stanford School of Medicine, *Health and Health Care of Native Hawaiian & Other Pacific Islander Older Adults*, 20.

purposes, it also served a greater importance of caring for the spiritual and familial connection to the land. Connection allows for the establishment of symbiotic and nurturing relationships which are inherent in Hawaiian culture.

As the number of seniors continues to rise in throughout the nation and, specifically, in Hawaii, we must realize that an increasing number of individuals over the age of 65 will be aging with fewer resources unless more facilities are built and unless they are built in a way that recognizes the healing aspects of nature and has strong cultural ties, not only to the island but to the people it serves.

When designing anywhere in the world, the people and culture of that place need to be taken into consideration. A design can only be relevant to a specific place if the history and current understanding of that place is acknowledged. By linking a senior care facility to the surrounding context and community creates a unique and special bond that is recognized by both residents and staff of that facility, which then directly correlates to increased health and quality of life.

5.0 CASE STUDIES

5.1 Introduction

Along with site visits to existing facilities in Hawaii, this chapter considers three case studies conducted by other researchers, two of them within the United States and the other one in the Netherlands. These three sites were selected based on their uniqueness and the fact that they received recognition for being innovative solutions for the rising population of individuals over the age of 65 and their special yet complicated needs. These sites were also selected for their various scales and approaches to see how facilities handle design challenges at the various scales and in various ways. Architects and designers can learn a great deal from others in the field noting that the sites were chosen specifically for elements within their design that correlate with needed design for innovative new retirement and nursing care facilities in Hawaii.

5.2 Dementia Village Advisers (DVA) - De Hogeweyk, Amsterdam Location

Architects: Molenaar & Bol & VanDillen
Built: Phase 1 = 04/2008; Phase 2 = 12/2009
Location: De Hogeweyk, Amsterdam, Netherlands
Project Size: 11,500 square meters

De Hogeweyk, which is essentially an entire community for individuals with dementia. De Hogeweyk was developed by Dementia Village Advisers (DVA) who has other locations with similar villages as De Hogeweyk. De Hogeweyk is part of Hogewey care centre. A "weyk" or "wijk" being a group of houses, similar to a village, is a specially designed village with 23 houses for 152 dementia-suffering seniors. Figure 5.1 (below) shows the site plan of De Hogeweyk and the overall organization of the village.

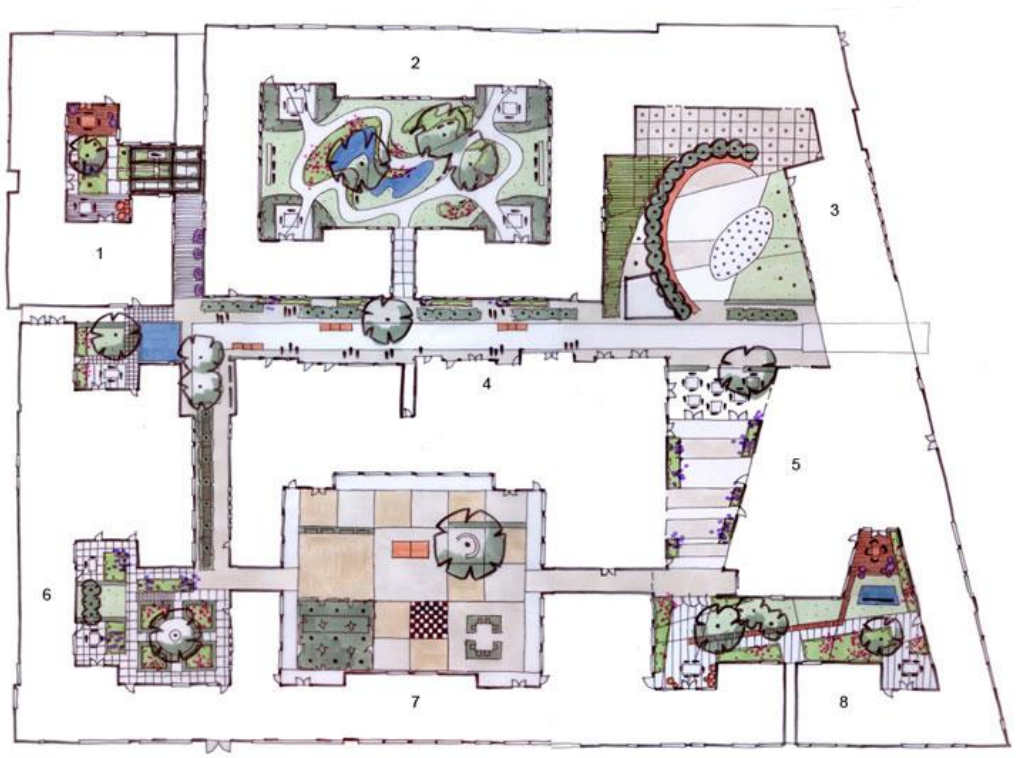


Figure 5.1 De Hogeweyk: Site Plan showing the various courtyards.[254]

[254] "The Amazing Village in The Netherlands Just for People with Dementia," TwistedSifter, accessed May 8, 2015, http://twistedsifter.com/2015/02/amazing-village-in-netherlands-just-for-people-with-dementia/.

What stands as the cornerstone for an amazing location, is the way its built design wholly ensures each resident's safety while still allowing them to feel independent. De Hogeweyk is a gated village designed specifically as a senior care facility for patients who have been diagnosed with severe cases of dementia, often Alzheimer's Disease. Although they are allowed to roam the grounds freely, they are unable to leave the facility. It spans four acres of land and cost approximately $22 million to construct, which was funded primarily by the Dutch government and the rest from sponsorship and local organizations. As of 2015, The cost per room is approximately $5,600 per month.[255] De Hogeweyk is praised by Alzheimer Nederland (the Dutch Alzheimer's Foundation) for being the first of its kind and a "pioneering" model Project for individuals dealing with differing types and degrees of dementia.[256] It is said that the residents are more active and require less medication than patients in traditional nursing homes.[257] This is a positive thing because it reduces the expenses, such as medical costs, that might occur during the aging process. Less medication also means the residents are healthier and essentially living a better quality of life.

Figure 5.2 De Hogeweyk Supermarket

(Left) Exterior of supermarket in De Hogeweyk. (Right) Interior of supermarket in De Hogeweyk.[258]

De Hogeweyk contains a supermarket, a doctor's office, a hair salon, restaurants, a theater, various small shops, and a club room, mimicking a small

[255] "The Amazing Village in The Netherlands Just for People with Dementia."
[256] Fedderson and Ludtke. *Lost in Space: Architecture and Dementia*.
[257] "Stepping Back in Time: Help for Alzheimer's," *Psychology Today*, accessed April 14, 2016, http://www.psychologytoday.com/blog/reading-between-the-headlines/201204/stepping-back-in-time-help-alzheimers
[258] "The Amazing Village in The Netherlands Just for People with Dementia."

community.[259] Figures 5.2 to 5.4 show various images of public spaces in De Hogeweyk. Figure 5.2 shows the supermarket, Figure 5.3 shows a restaurant, and Figure 5.4 shows a theater. The village allows the residents to manage their own household with the help of family and staff, including washing laundry, cooking, and house cleaning. Approximately 250 full-time and part-time physicians, nurses, and specialists work to provide 24-hour care and create a daily living experience that is as close to how their lives had been before dealing with elements of dementia as possible. Employees wear normal clothes rather than uniforms, that would most fit into the role they are portraying to the residents, for example cashiers, grocery-store attendees, and post office clerks, none of whom wear clinical uniforms. In Figure 5.5 you can see how the employees assisting the residents are dressed versus an employee in a typical medical setting.

Figure 5.3 De Hogeweyk: Restaurant in De Hogeweyk.[260]

[259] Fedderson and Ludtke, *Lost in Space: Architecture and Dementia*.
[260] "The Amazing Village in The Netherlands Just for People with Dementia."

Figure 5.4 De Hogeweyk: Theatre in De Hogeweyk[261]

The staff will assist residents in need, but they will not correct them, which could cause frustration. However, the staff never lie or deceive the residents. Since finances are often difficult for individuals with dementia, money is taken out of the equation completely and there is no exchange of money in the seniors daily lives. For example, when going to the grocery story, they do not have to pay for the groceries, which means they do not become confused with things such as change. All services, such as food and medicine, are included in the monthly fees.[262] The idea of reducing stress and removing the clinical feeling by the employees not wearing hospital-type uniforms allows the residents to be more at ease and feel as if they are living life the way they always have.

[261] "The Amazing Village in The Netherlands Just for People with Dementia."
[262] "The Amazing Village in The Netherlands Just for People with Dementia."

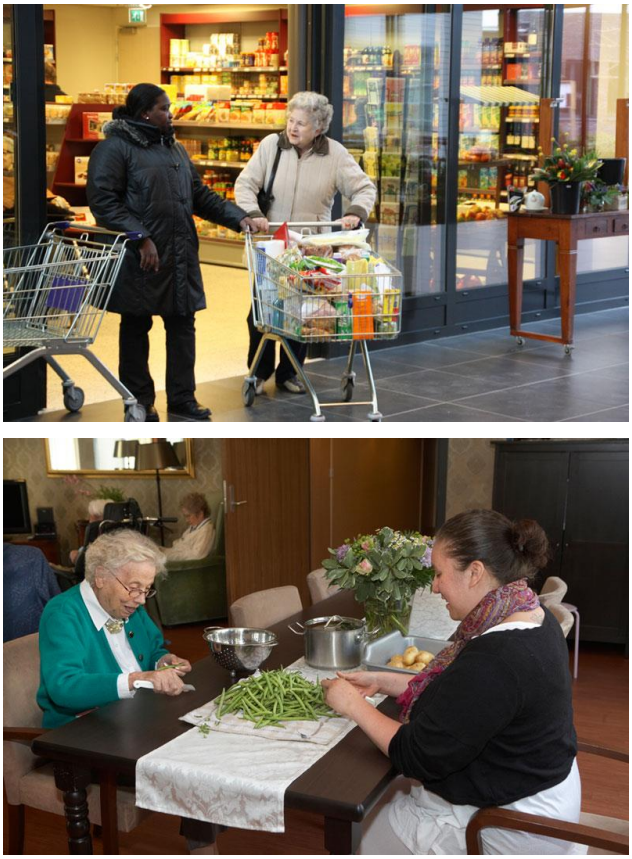


Figure 5.5 De Hogeweyk: Employees Assisting Residents

Employees dressed in regular clothes assisting residents in De Hogeweyk with daily activities.[263]

The perimeter of De Hogeweyk is lined with two-story apartment buildings, all finished in different materials to relate to the surrounding buildings and also to differentiate apartment buildings within the community. In addition, the design strategy allows the facility to be secure without feeling fenced in. The main entry doubles as a security gate to prevent residents from wandering off grounds. There is a central boulevard containing the public buildings to allow for easy movement for residents throughout the village and less chance of their getting confused or lost. The residential buildings are connected with small courtyards, gardens, and other green spaces, which you can see images of in Figure 5.8. The two levels of each building are connected via stairs and elevators, and the second level contains walkways that provide horizontal connection.[264] See Figure 5.1 and Figure 5.6 for reference. There are 23 residential apartments with 152 residents, and each

[263] "The Amazing Village in The Netherlands Just for People with Dementia."
[264] Fedderson and Ludtke, *Lost in Space: Architecture and Dementia*.

apartment are separated by lifestyles.[265] In each apartment, there are six to seven large private rooms and a shared living room, kitchen, and dining room. Private rooms give the residents a sense of solitude and freedom, yet the shared public spaces give them a sense of community, which reduces the feelings of isolation often associated with aging. There are no locks on the doors, so the residents are free to explore the village as they please. Residents have few restrictions, just like the outside world.[266] In addition, each apartment has a permanent team of care, with at least two caregivers present at all times.[267] There are 7 various design lifestyles offered at De Hogeweyk including the following: Upper class, Homey, Urban, Christian, Artisan, Indonesian, and Cultural.[268] Figure 5.7 shows examples of various interiors. Each lifestyle has unique floor plans, materials, and color palettes, which help satisfy residents' cultural backgrounds and lifestyles. The design of each built space is important to help residents keep a sense of identity as they age. The variety and clarity of the materials also help orient the residents while still maintaining as sense of normality.[269]

[265] "The Amazing Village in The Netherlands Just for People with Dementia."
[266] "Hogewey," *Wikipedia, the Free Encyclopedia*, January 28, 2016, https://en.wikipedia.org/w/index.php?title=Hogewey&oldid=702164367.
[267] Fedderson and Ludtke, *Lost in Space: Architecture and Dementia*.
[268] "The Amazing Village in The Netherlands Just for People with Dementia."
[269] Fedderson and Ludtke, *Lost in Space: Architecture and Dementia*.

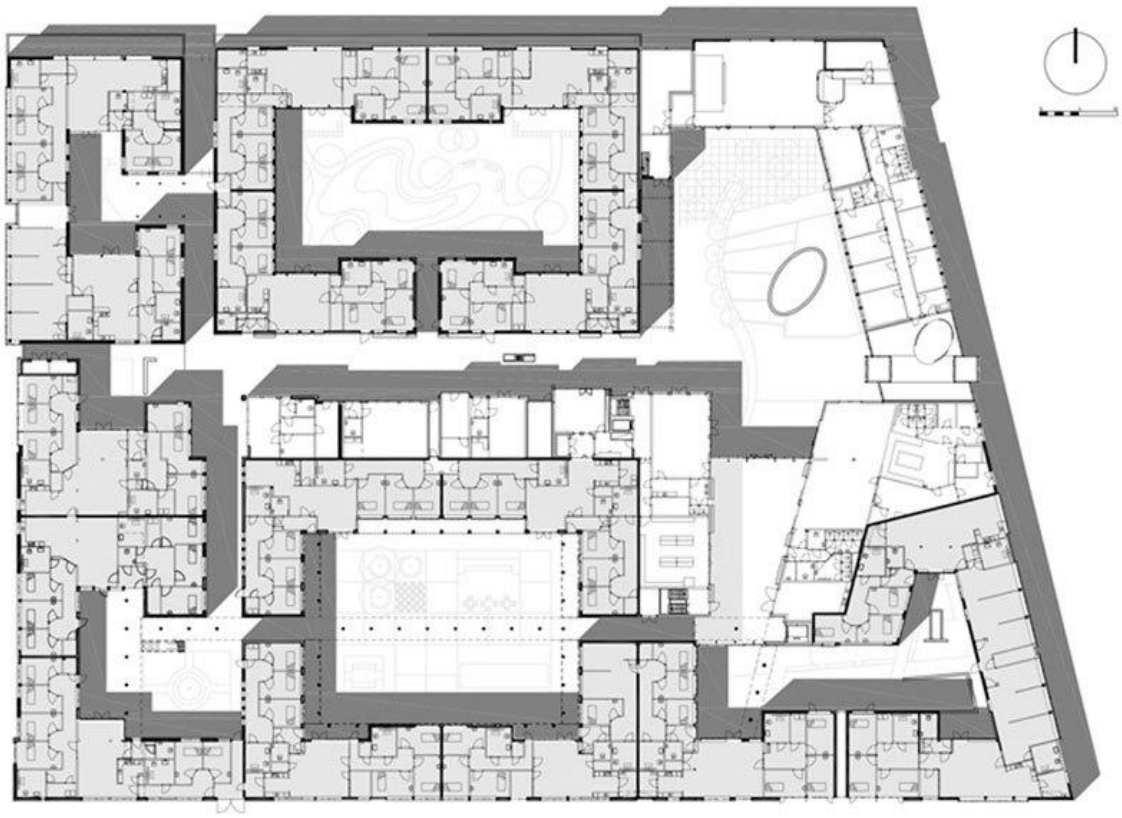


Figure 5.6 De Hogeweyk: Floor Plan of Second Level

Site Plan showing the various courtyards.[270]

[270] "The Amazing Village in The Netherlands Just for People with Dementia."

Figure 5.7 De Hogeweyk: Various Lifestyles

Four examples of residential interiors at De Hogeweyk.[271]

[271] "The Amazing Village in The Netherlands Just for People with Dementia."

Figure 5.8 De Hogeweyk: Courtyards

Courtyards between buildings in De Hogeweyk.[272]

[272] "The Amazing Village in The Netherlands Just for People with Dementia."

The developers have stated that, although De Hogeweyk successfully carries out their vision of a de-institutionalized living environment for people with dementia, there are still improvements that can be made and will be considered for a possible follow-up project on a neighboring site.[273]

5.3 Cohen Rosen House

Architects: THW Design (Thompson Hancock Witte & Associates)
Built: 2013
Location: Rockville, Maryland
Gross Floor Area: 16,500 square feet

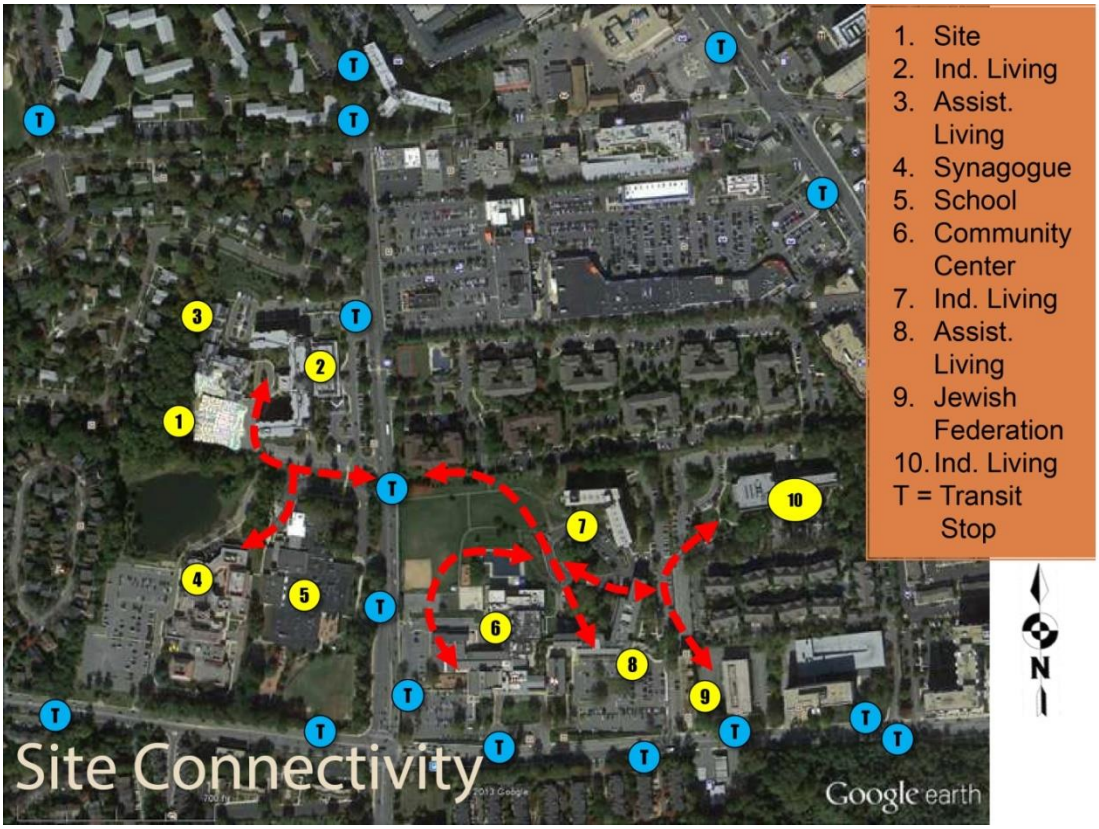


Figure 5.9 Cohen Rosen House: Site Plan
Diagram showing site connectivity to community of Cohen Rosen House.[274]

The Cohen Rosen House is part of a larger community called Charles E. Smith Life Communities (CESLC), which includes independent living, assisted living, and a rehab and recovery program and, as with De Hogeweyk, was designed specifically for

[273] Fedderson and Ludtke, *Lost in Space: Architecture and Dementia*.
[274] "DFAR12: Cohen Rosen House – Design for Aging," accessed April 19, 2016, http://network.aia.org/designforaging/ourlibrary/viewdocument?DocumentKey=9c5a2047-c31f-4a82-828d-3cc923032e36.

residents suffering from dementia. See Figure 5.9 for reference. The establishment exists as a new 18-bed, assisted/living memory care house with the first Assisted Living LEED Silver certification (New Contraction) in Maryland and has received several awards and recognition for its innovative design in regards to memory care. Five of the six honors were related to design innovation, while the sixth one was related to sustainable features.[275] According to the *Washington Jewish Week*, "The Design for Aging Review, The International Association of Homes and Services for the Aging, The Assisted Living Federation of America, The National Association of Home Builders and Environments for Aging magazine all honored Cohen-Rosen for its innovation in design."[276]

The goal was for this project was to stand as a home both physically and symbolically for residents dealing with dementia.[277] It combines elegance with memory care design.[278] According to the 2013 Showcase issues of Environments For Aging, ""At Cohen-Rosen House, the quality and connectivity of spaces, unique design of individual resident rooms with large memory boxes (see Figure 5.10 below), generous use of artwork and homelike feel all contribute to an enhanced quality of life for its residents."[279] The current site was chosen from two options because it had the best connection to the rest of the facilities as well as a beautiful view of the lake. Some of the challenges included incorporating existing service traffic and fitting the required program into the restrictive site.[280]

[275] "Senior Services Profiles," accessed April 16, 2016, http://www.bethesdamagazine.com/Bethesda-Magazine/Senior-Services-Profiles/index.php.
[276] "Cohen-Rosen House Recognized for Interior Design and Green Initiative," accessed April 16, 2016, http://washingtonjewishweek.com/8099/cohen-rosen-house-recognized-for-interior-design-and-green-initiative/special-focuses/home-design/.
[277] "DFAR12: Cohen Rosen House – Design for Aging."
[278] "Senior Services Profiles."
[279] "Cohen-Rosen House Recognized for Interior Design and Green Initiative."
[280] "DFAR12: Cohen Rosen House – Design for Aging."

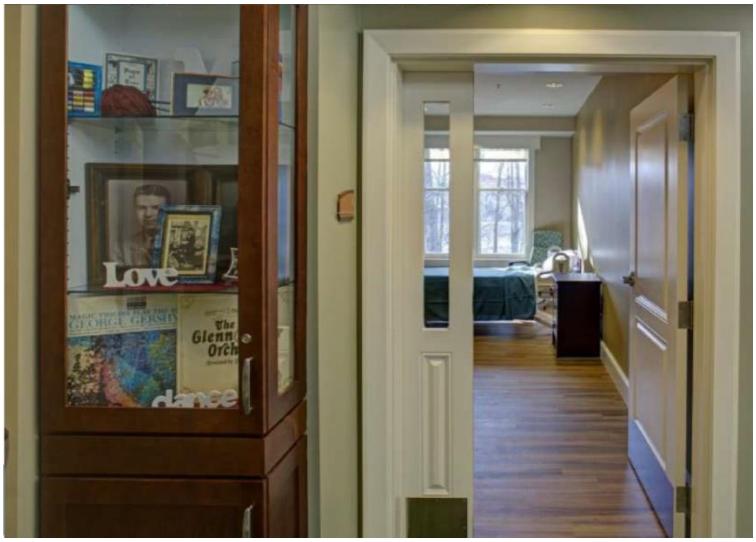


Figure 5.10 Cohen Rosen House: Residential Rooms

Entry to one of the residential rooms with memory boxes.[281]

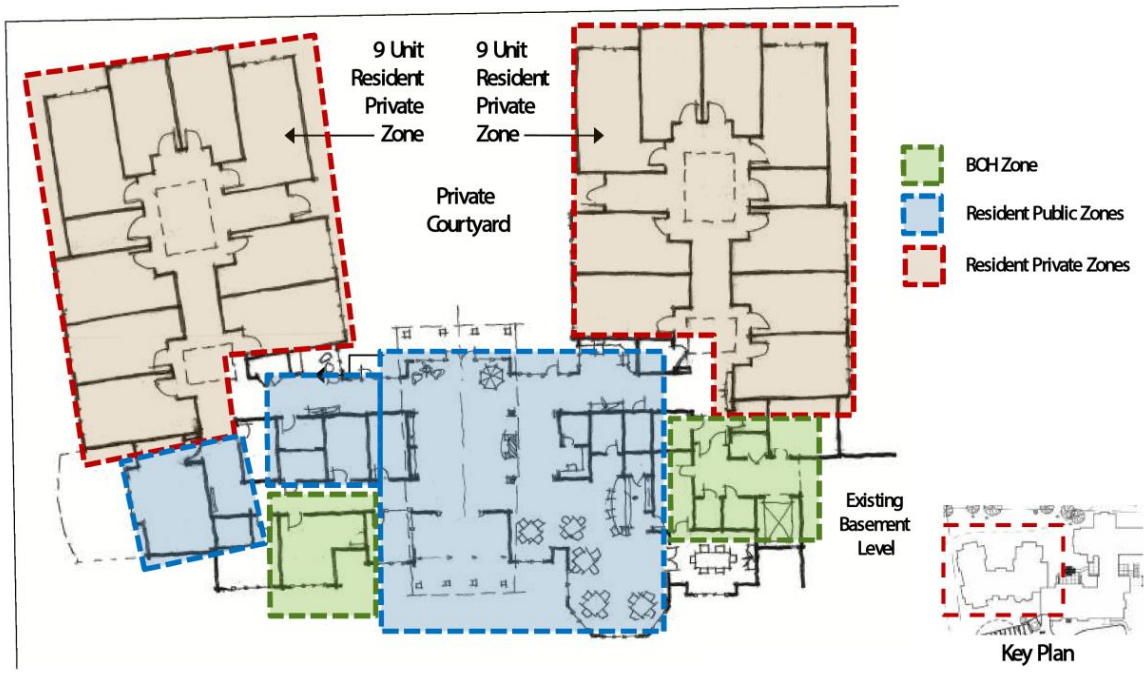


Figure 5.11Cohen Rosen House: Zones

Organizational zones at Cohen Rosen House.[282]

[281] "DFAR12: Cohen Rosen House – Design for Aging."

[282] Ibid.

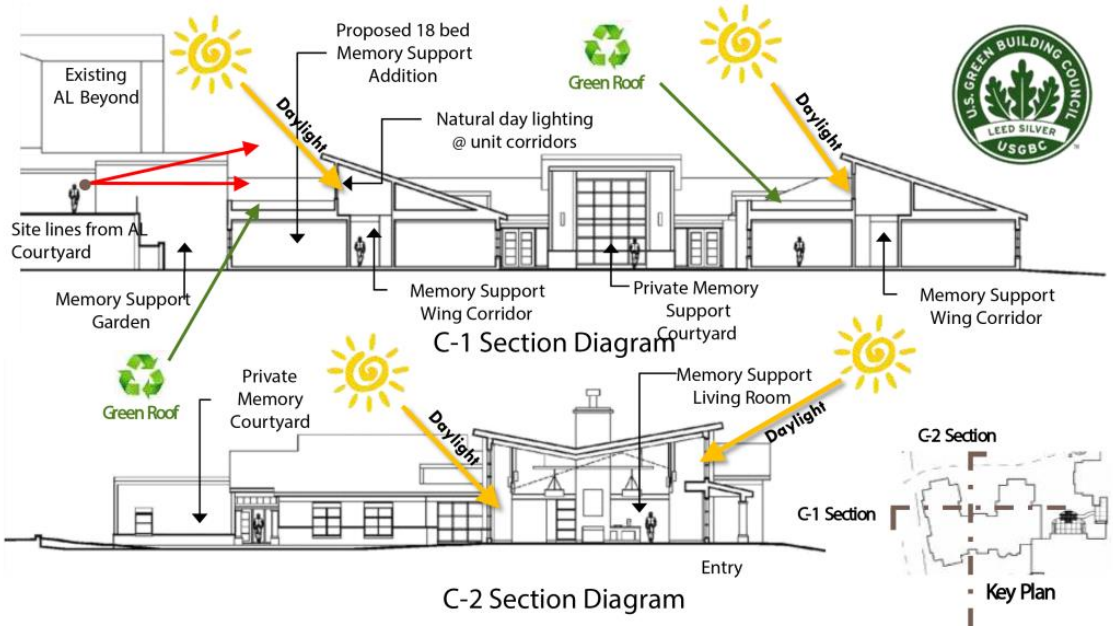


Figure 5.12 Cohen Rosen House: Daylighting

Site and building sections showing daylighting.[283]

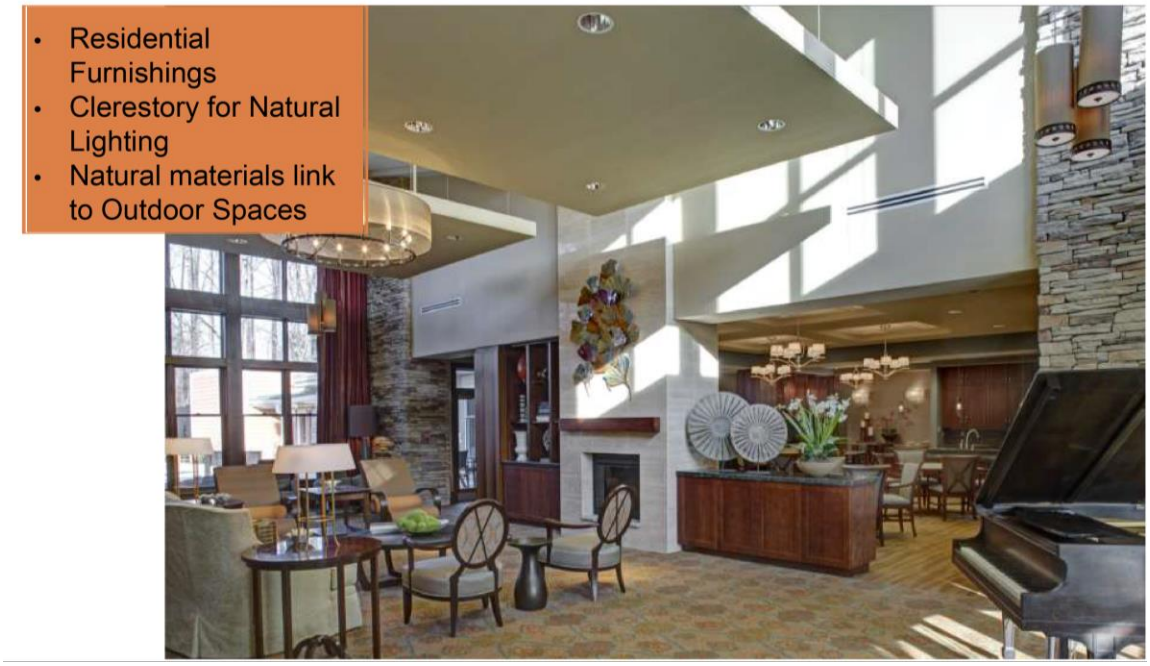


Figure 5.13 Cohen Rosen House: Living Room

Living room showing materiality and daylighting.[284]

The home is organized into public and private zones. (See Figure 5.11) The public zones include a multi-purpose room, a living room, and a dining space, all of

[283] "DFAR12: Cohen Rosen House – Design for Aging."
[284] Ibid.

which encourage socialization. A site line study (see Figure 5.14) of the public areas was conducted to ensure visually connectivity of spaces, which contributes to the encouraged socialization along with increasing the residents comfortability in moving around the facility. The Cohen Rosen House uses art as a means of wayfinding. They also incorporate clerestory windows to allow indirect natural light.[285] (See Figure 5.13) In fact, 97 percent of the spaces in the Cohen Rosen House are lit by natural light.[286] Natural daylighting was important because it helps regulate circadian rhythms and minimize the effects of sundowning in dementia patients. (See Figure 5.12) When designing the layout of the facility, they conducted a site line study to ensure that the bed location promoted visual access to the entry, bathroom, and exterior (See Figure 5.15). The rooms were also divided into zones: staff, family, and resident zones. When choosing materials, they made sure the colors, textures, and light levels were suitable for memory care residents. They also used repetition of natural materials to link indoors and outdoors, along with large windows.[287]

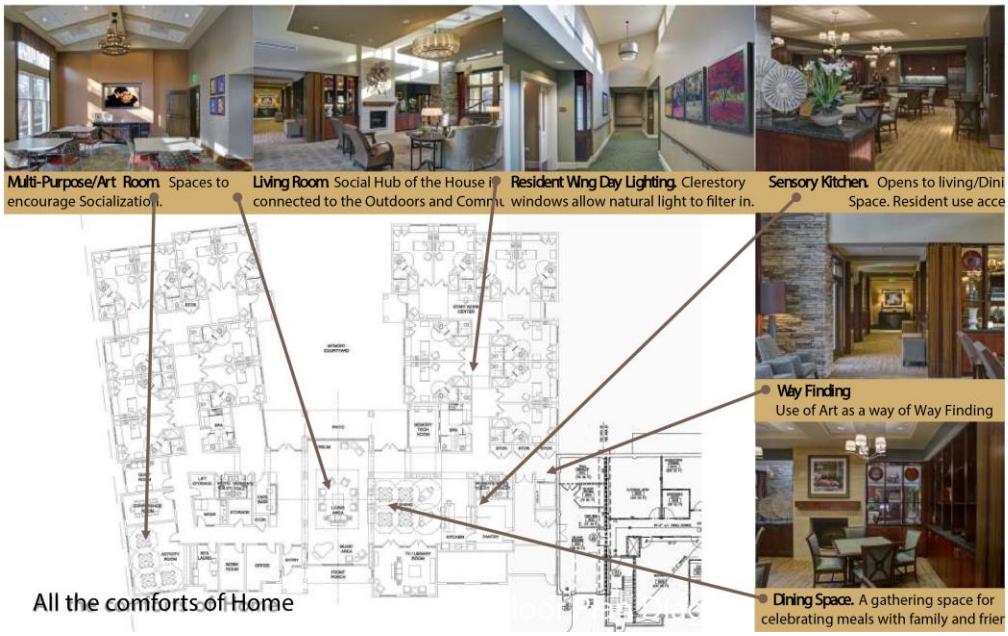


Figure 5.14 Cohen Rosen House: Public Spaces

Site line study of public areas[288]

[285] "DFAR12: Cohen Rosen House – Design for Aging."
[286] "Senior Services Profiles."
[287] "DFAR12: Cohen Rosen House – Design for Aging."
[288] Ibid.

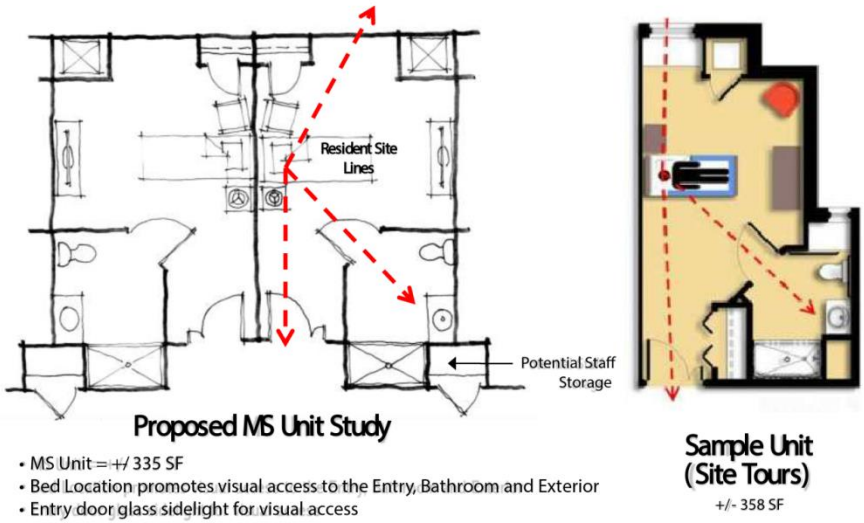


Figure 5.15 Cohen Rosen House: Site Line Study

Room site line study.[289]

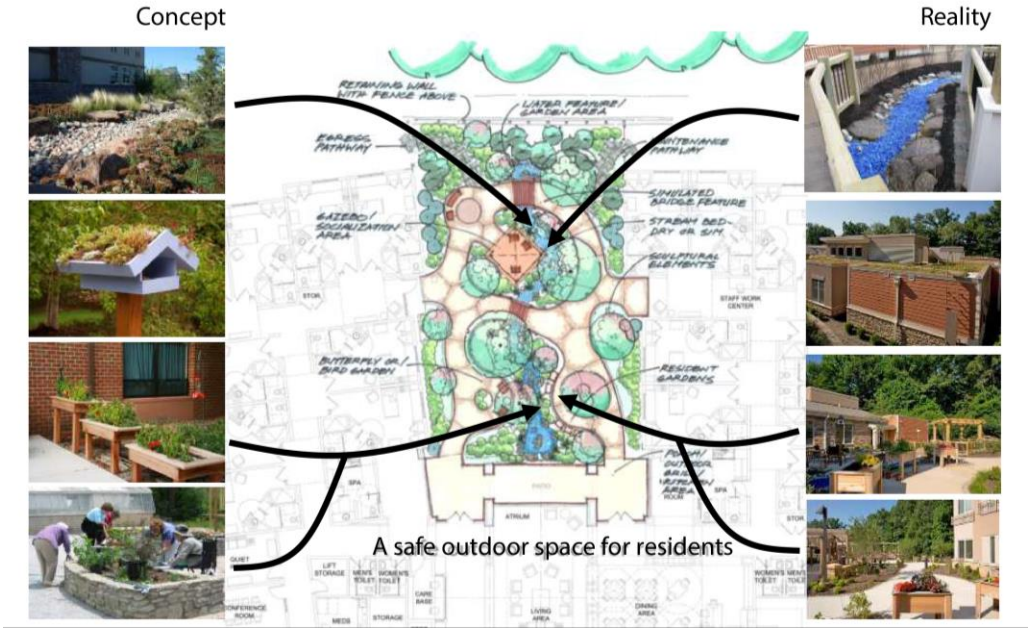


Figure 5.16 Cohen Rosen House: Memory Garden Concepts

Memory garden concept site plan.[290]

[289] "DFAR12: Cohen Rosen House – Design for Aging."
[290] Ibid.

Figure 5.17 Cohen Rosen House: Memory Garden

Memory garden amenity concepts.[291]

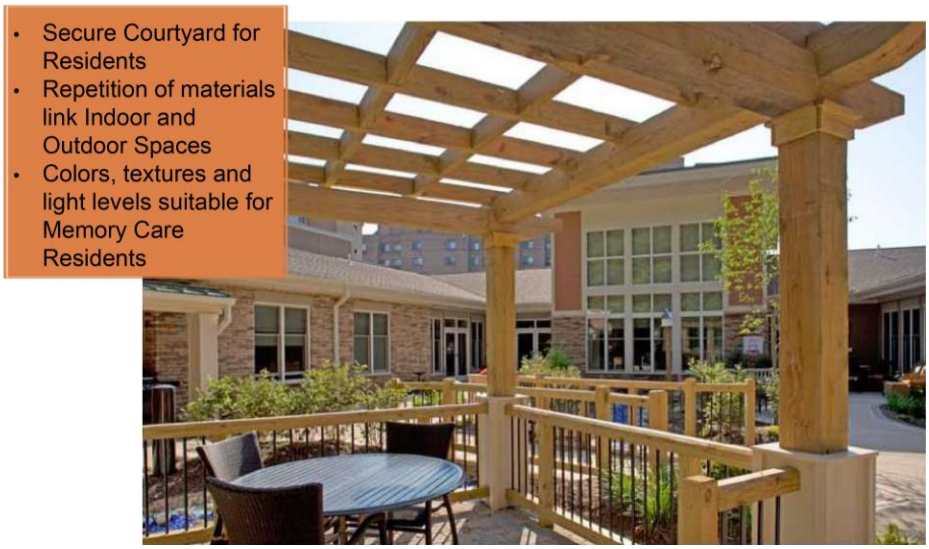


Figure 5.18 Cohen Rosen House: Exterior Courtyards

Exterior courtyard that is secure for residents.[292]

One of the amenities includes a memory garden, which contains a water feature, a bird aviary, butterfly gardens, and several gathering areas, and outdoor

[291] "DFAR12: Cohen Rosen House – Design for Aging."
[292] Ibid.

courtyards that are secure for residents.[293] (See Figure 5.16, Figure 5.17 and Figure 5.18) The facility also has green roofs for water quality management, which aided in the 20 percent reduction in water use. A few other design amenities include a dining room where residents can make snacks with their families, a four seasons room that simulates an outdoor environment, an area for massage therapy, calming rooms and lounges, and a tech center specially designed for patients with memory issues.[294]

Individuals dealing with dementia are much more than patients with a common diagnose. Residents of senior care facilities are unique and have different personalities and life experiences.[295] The president and CEO of CESLC Warren. R Slavin states, "Our ability to provide the highest quality of life for the elders we serve is significantly enhanced by the environmental standards set at Cohen-Rosen House. Not only are we providing an environmentally sound environment for today's residents but for future generations as well."[296]

5.4 Custead Care Center–Haven Hospice

Architects: AG Architecture
Built: August 2012
Location: Orange Park, Florida
Total Area: 29,276 square feet

[293] "DFAR12: Cohen Rosen House – Design for Aging."
[294] "Senior Services Profiles."
[295] "DFAR12: Cohen Rosen House – Design for Aging."
[296] "Cohen-Rosen House Recognized for Interior Design and Green Initiative."

Figure 5.19 Haven Hospice Custead Care Center Main entrance[297]

Although Haven Hospice Custead Care Center is not specifically an elderly care facility, it was modeled after long-term care and design methods used in memory care and resident/family-centered solutions. The center provides inpatient palliative and end-of-life care, respite care support for families and caregivers, and grief support.

Oftentimes, families are heavily involved in the hospice experience, which can be challenging for all involved. Typically hospice care centers are modeled after typical skilled nursing facilities with some additional lounge areas provided for family use, but these are not the best solution for meeting the needs of clients and their families.[298] At a hospice, patients and their families are facing end-of-life illnesses. Thus the goal of the center is to provide comfort through compassionate and attentive spaces and to help maintain quality of life. They aim to provide the best possible care and relieve suffering and stress associated with their illness.[299]

[297] "DFAR12: Haven Hospice Custead Care Center – Design for Aging," accessed April 19, 2016, http://network.aia.org/designforaging/ourlibrary/viewdocument?DocumentKey=b64c3b42-07f0-4ac3-9d9a-1a427f028b50.
[298] Ibid.
[299] "Haven Hospice's Custead Care Center Opens in Orange Park, Florida," October 1, 2012, http://www.floridaelder.com/haven-hospices-custead-care-center-opens-in-orange-park-florida/.

Patient Room Headwall w/ concealed equipment

Typical Patient Room Floor Plan

PATIENT ROOM FEATURES

1. MEDIA CENTER
2. BUILT IN PATIENT WORKSTATION
3. CUSTOM BENCH W/ BUILT IN STORAGE
4. CUSTOM BUILT IN WARDROBE W/ SEPARATE CAREGIVER WORKSTATION
5. FLEXIBLE FURNITURE FOR VISITORS
6. PATIENT BED ON HEADWALL W/ CONCEALED EQUIPMENT

Patient Room Custom built details

Typical Patient Bathroom

Figure 5.20 Haven Hospice Custead Care Center: Private Rooms

Private rooms for residents.[300]

The Haven Hospice Custead Care Center has 18 private inpatient rooms. (See Figure 5.20. It was built to the Florida Department of Emergency Management's standards for a Special Needs Shelter, which means that it can withstand the impact of a Category 3 hurricane, crucial for the Orange Park, Florida, area. The site design also preserved 80% of the trees on the nine-acre site. (See Figure 5.21) They offer a non-denominational chapel (see Figure 5.24) for memorial services, prayers, and meditation, along with a large community room that can be used for various events.[301] To make the space feel more comforting, there are four distinct yet centrally locating living rooms where patients and families can gather and visit.[302] (See Figure 5.21) An entry pavilion is also included, which contains administrative areas and counseling rooms all while maintain a strong visual connection a landscaped courtyard. The 18 private rooms are divided into two zones and are large,

[300] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."
[301] Ibid.
[302] Ibid.

to accommodate family members who wish to spend time with a resident, along with featuring private family bathrooms.[303] There is also a community dining area, a family kitchen, and a children's play area.[304] To maintain a homelike feel, the back-of-house components are separated from the public spaces by being isolated in a separate part of the building.[305] Another key element is the outdoor space, which includes enclosed porches and landscaped courtyards.[306] (See Figure 5.23 below and Figure 5.24 below) Tremendous effort regarding the architectural design was put forth to make sure the facility maintained a residentially scaled household-type environment, instead of a more institutionalized feeling.[307] The Haven Hospice Custead Care Center has been recognized for connecting to nature (See Figure 5.25 below) and promoting a sense of community because it was designed to fit the local context and is specifically detailed for person-centered care. The Custead Care Center has been honored and recognized for its forward-thinking approach to hospice care with a Citation of Merit from the judges for *Healthcare Design Magazine*'s Architectural Showcase.[308]

[303] "Haven Hospice's Custead Care Center Opens in Orange Park, Florida."
[304] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."
[305]"Haven Hospice's Custead Care Center Opens in Orange Park, Florida."
[306] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."
[307] "Haven Hospice's Custead Care Center Opens in Orange Park, Florida."
[308] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."

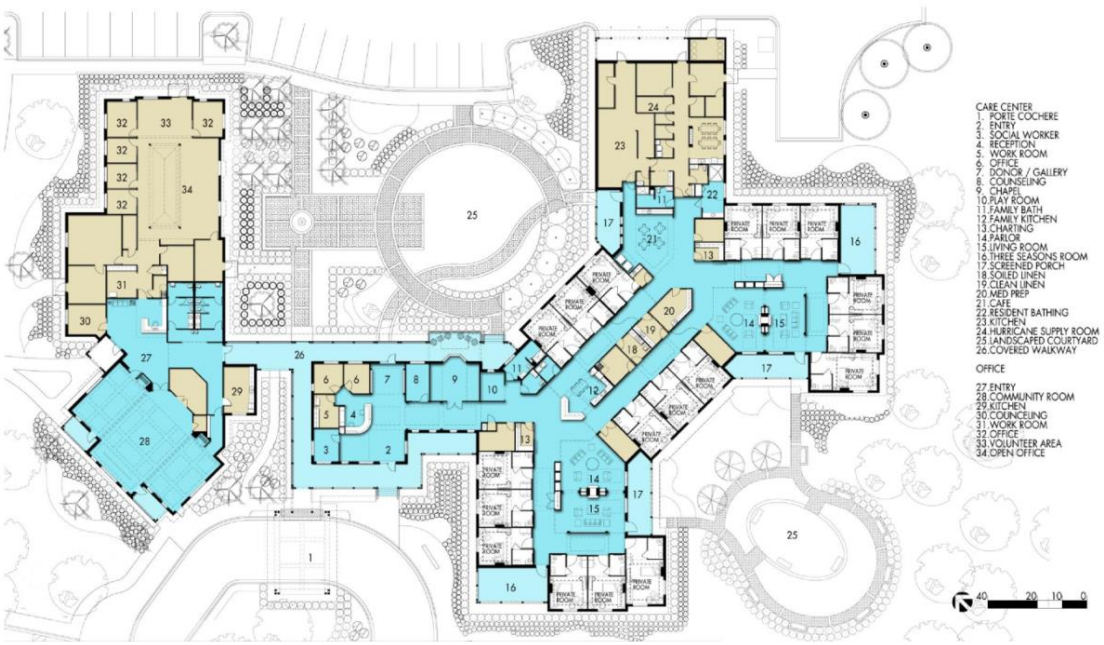


Figure 5.21 Haven Hospice Custead Care Center Floor Plan[309]

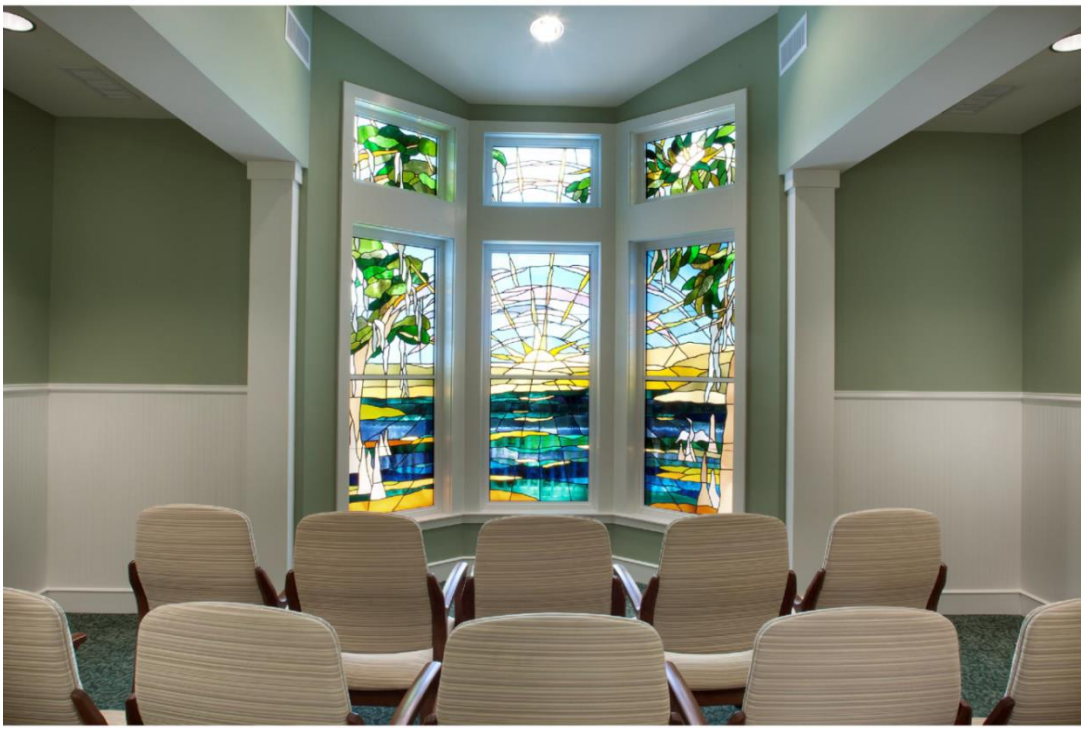


Figure 5.22 Haven Hospice Custead Care Center: Chapel[310]

[309] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."
[310] Ibid.

Figure 5.23 Haven Hospice Custead Care Center: Courtyard

Main public courtyard[311]

Figure 5.24 Haven Hospice Custead Care Center: Courtyard

Private courtyard for residents.[312]

[311] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."
[312] Ibid.

Figure 5.25 Haven Hospice Custead Care Center: Enclosed Patio
Enclosed patio that allows residents to connect to nature.[313]

5.5 Case Study Conclusions

Although all three case studies varied in size and were different in their design solutions, all three are excellent examples of facilities that are greatly in tuned with the individual. They all encapsulate humanistic design which leads to transformative results. All three incorporated multiple areas of interaction with nature, the spatial organization in all three allowed for a residential like atmosphere while still allowing residents their private space, and allowed certain spaces to be adaptable to allow residents feel like their space was their own. The matrix below in figure xx shows a quick analysis of the qualities at each facility.

[313] "DFAR12: Haven Hospice Custead Care Center – Design for Aging."

	NAME	LOCATION	OPENED	SQUARE FOOTAGE (SITE)	FLOORS	TOTAL BEDS	SINGLE BEDS	DOUBLE BEDS	% FILLED	SETTING: Urban	SEPERATION OF PATIENTS	GARDEN
1	Dementia Village Advisers (DVA) - De Hogeweyk	Amsterdam, Netherlands	2008	123,785	2	152	152	0	NA	X		X
2	Cohen Rosen House	Rockville, Maryland	2013	16,500	1	18	18	0	NA	X	X	X
3	Custead Care Center–Haven Hospice	Orange Park, Florida	2012	29,276	1	18	18	0	NA	X		X

MEMORY GARDEN	WALKING PATH	GARDENING	GARDEN VISIBILITY	CONTROLLED LIGHTING	DAYLIGHTING: PUBLIC SPACES	DAYLIGHITING: ROOMS	CIRCULATION	SALON	PT ROOM	PETS	FOOD CHOICES
	X	X	10	X	X	X		X			X
X	X	X	10	X	X	X		X	X		X
	X	X	10	X	X	X					X

Figure 5.26 Case Study Matrix

6.0 SITE VISITS TO EXISTING SENIOR CARE FACILITES

A key part of research conducted for this dissertation was visiting existing senior care facilities on the island of Oʻahu. The intent was to see various types of current facilities on Oʻahu and observe what they are providing. The case studies have directly influenced the selection of the three specific residences for the site visits in that two of the case study sites focus on the needs of individuals dealing with dementia and that the third possesses design elements that include extended family needs and the natural world outside the facility itself.

The three things that were being observed during the site visits were the location of the site, the interior layout and design, and the exterior design elements. When analyzing the location of the site, it was being observed in reference to the surrounding context and community. When observing the interior layout and design, some of the characteristics that were being examined were the separation of spaces, how those spaces were connected through circulation, and any other elements that might be relevant. When observing the exterior elements of the facility, nature and how it was incorporated was the main focus. Because each facility is different in multiple ways, for example size, level of dementia of patients, etc., the main purpose of the site visits was to examine how these different facilities hand similar elements.

Due to various reasons, which are discussed at the end of the site visits in section 6.4, residents and employees were unable to be interviewed. However, at each facility either a manager or an equivalent position was able to answer questions and show the facility.

6.1 Site 1[314]

This site exists as a two-story facility housing a total of 28 individuals all of whom were dealing with some form of dementia. The staff specializes in treatment for residents with dementia. Their goal is "to help change the standard of care for those with memory impairments in Hawaii by serving as a model memory care residence."[315]

Figure 6.1 Site 1: Front entrance[316]

6.1.1 Location of Site

This site is located near a residential neighborhood although it is not directly located next to houses. Upon arriving on site one pulls up to a security gate that is controlled by a security guard on the inside. The security is for preventing the residence from wandering, which is especially important since the facility is located on a busy road. The door to enter the building is also secured. (See Figure 6.1 above for image of front of building)

[314] This site chose to remain anonymous. Name and sources kept private for these reasons.
[315] Source kept anonymous.
[316] Source kept anonymous

6.1.2 General Interior Layout and Design

Figure 6.2 Site 1: Public Area[317]

The facility has two levels and can accommodate fourteen residents on each floor in both single and double occupancy rooms. Both levels have almost identical floor plans (refer to Figure 6.4 below and Figure 6.5 below for reference of spaces). Each floor has a kitchen, a dining room (see Figure 6.2 above), and a large living room. These public spaces are located toward the front of the facility and have an open layout making it easier for residents to navigate their way through the spaces. A healing garden is located on the first floor with the second floor having access to the garden via a stairwell. Each floor has a secure walking path with a covered lanai that can be accessed by residents any time. In addition, both floors have residential-style kitchens (see Figure 6.3 below) with all standard appliances except a stove top due to issues of safety.[318] The second floor has a large lanai that wraps around part of the building allowing one to look out toward the ocean, specifically Kaneohe Bay.

[317] Source kept anonymous
[318] Source kept anonymous

Figure 6.3 Site 1: Resident Kitchen

The bedroom units, which are more private spaces, are toward the back of the facility. There are 9 units on each floor, totaling 18 for the entire facility. Each floor has 5 double-occupancy rooms and 4 single-occupancy rooms, housing 14 residents per floor and 28 in the facility. There is one hall that connects all the rooms to one another and to the public spaces minimizing the residents getting lost. In addition, there are open shelves with transparent doors that hold personal memorabilia which are located near residents' doorways (into their room) that help residents identify their rooms.

To encourage the feeling of independence, residents are allowed to roam anywhere within the facility; this includes interior spaces, the healing garden, and lanais. Any time a resident passes through a door or gets in or out of bed, a silent alert is sent to staff. This system allows staff to safely monitor the residents without making them feel restricted. As such, residents have privacy and reduce the need to be physically and visually monitored by staff at all times.

Residents within this facility are given faux keys to their rooms. This allows residents to feel like they have control of their personal living spaces, while allowing caretakers to properly ensure their safety. Residents also have control over the design of their individual spaces; they can paint and decorate however they wish. Residents can open and close their own bedroom windows, except for individuals who the staff feels might try to either leave the facility or harm themselves. In such

cases, locks are implemented on the windows to control the amount they open to ensure safety of each respective resident.

Figure 6.4 Site 1: First Level Floor Plan

Diagram of spaces in first site.

Garden/Natural Elements
Entry
Private Rooms
Circulation
Public spaces: Living room, dining room, kitchen, etc.
Back of House: offices, storage, commercial kitchen, etc.
Walking Path
Lanai
Bench

Figure 6.5 Site 1: Second Leve Floor Plan

Diagram of spaces in first site.

6.1.3 Exterior Configuration and Features

This facility features a healing garden that is located on the first floor and to which residents have unrestricted access. It is located toward the back of the facility to create a private and reflective environment. This design reduces the chances of overstimulation, which can lead to frustration and, as such, could impact the residents' desire to use the garden and the adjoining walking path. The walking path within the garden can be enjoyed both in a leisurely sense and as part of coordinated activities, such as walking tours. Another addition, a hand bar has been installed and seating is provided along the path. The path is also shaded both by trees and overhangs extending from the building. There are areas that are protected from rain, although slipping then becomes a problem even with proper flooring and safety measures.

6.1.4 Interview

For this site visit the Director of Community Relations was interviewed. He was very knowledgeable about the facility, staff, and residents. In regards to the residents, he knew their habits, personalities, and truly understood the individual needs of each resident. He was able to explain how the spaces were used and how they were flexible to be able to accommodate the different residents and their needs. He described certain challenges that the facility faced such as how residents sometimes become distraught if they leave the facility with their family and return, as they are unable to remember the facility. This shows the importance of creating a healthy environment as the facility is most likely the only place residents will occupy until they pass.

6.2 Site 2 – The Plaza Mililani

Figure 6.6 The Plaza Mililani Street View[319]

The Plaza Mililani is a five-story assisted living facility housing a total of 128 individuals all of whom are at different levels of care needed. (See Figure 6.6 above) This facility stands as an impressive example when analyzing how a senior care facility can be incorporated into a growing, vibrant community and still flourish. Site 2 offers residents a variety of care programs, including assisted living and memory care, as well as respite (short-term stay) programs. The memory care is designated on the 5th floor and is specifically designed to address the needs of residents dealing with memory loss on a variety of levels.

6.2.1 Location of Site

Site 2 is located in a community with a family-age demographic. Site 2 is located between residential homes and commercial businesses. One of the key elements in creating a dynamic living environment for the elderly is designing a facility that does not isolate them. The facility has several types of apartments including studios and semi-private designations.[320] Continued interaction with family and community is important and location is key. As one approaches Site 2, you enter an open parking lot.

[319] "The Plaza at Mililani | MW Group, Ltd. | Honolulu, Hawaii Real Estate Development," accessed August 31, 2016, http://www.mwgroup.com/property/plaza-mililani.
[320] "Plaza at Mililani - The Plaza Assisted Living - Mililani Hawaii," accessed May 8, 2015, http://www.theplazaassistedliving.com/locations/mililani.

6.2.2 General Interior Layout and Design

Figure 6.7 The Plaza Miliani: First Level lobby[321]

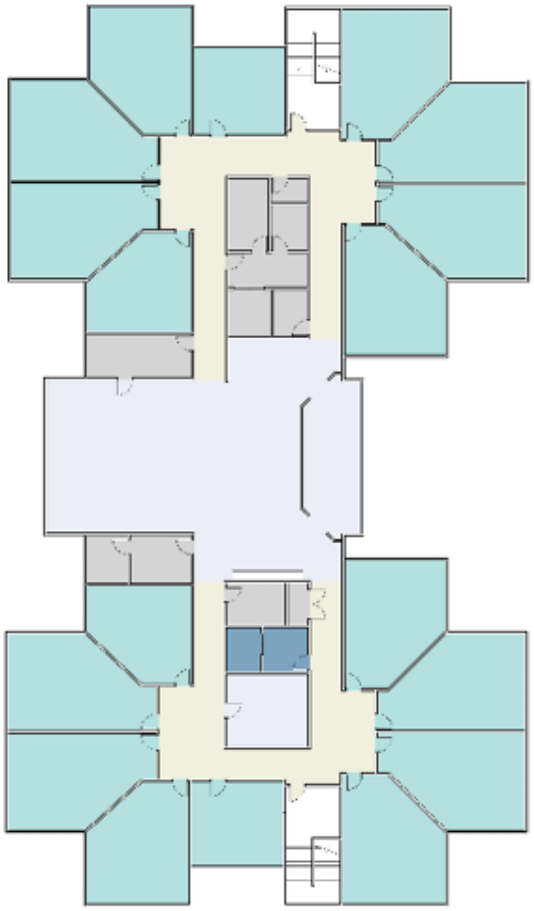
This facility has five floors all with the same floor plan (refer to Figure 6.8 below and Figure 6.9 below for reference of spaces). The entry into the building consists of an automatic sliding door into a lobby (see Figure 6.7 above). There is a front desk that is occupied by a staff member 24-hours a day to monitor who comes and leaves through the main entry. Near the main entry and front desk are elevators that access the 4 other floors. The memory care units are located on the fifth floor. If a patient's dementia was to progress past a certain point, he or she would have to be moved to another facility that would be better suited for their level of care. Upon arriving at a given floor, one finds a mini lobby that has a door with a code lock but that remains open during the day allowing the residents to move freely through the facility with the lobby as means to pass from one area to another. There are two groups of residential bedrooms that are connected by a living room that lies in between the two groups of rooms creating a figure 8-like circulation. Each floor has

[321] "Plaza at Mililani - The Plaza Assisted Living - Mililani Hawaii."

32 residents living in either double- and single-occupancy rooms (See Figure 6.10 below).

Figure 6.8 The Plaza Miliani: Ground Entry Level

Diagram of spaces in first site.



Garden/Natural Elements
Entry
Private Rooms
Circulation
Public spaces: Living room, dining room, kitchen, etc.
Back of House: offices, storage, commercial kitchen, etc.
Walking Path
Lanai
Bench

Figure 6.9 The Plaza Mililani: Memory Care Floor (5th Level)

Diagram of spaces in first site.

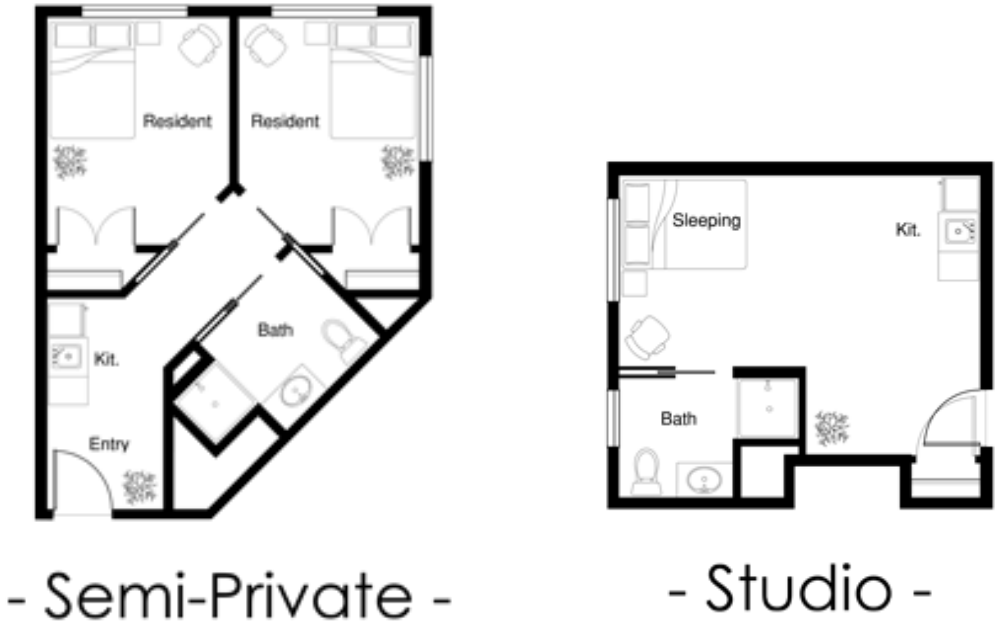


Figure 6.10 The Plaza Miliani: Typical Floor Plan of Residential Rooms
(Left): an example of a semi-private room; (Right): is an example of a private room.

6.2.3 Exterior Configuration and Features

This facility has a small garden located on the second floor. Residents on other floors can access the second floor via elevator or stairs. The garden is located on a lanai. A small waterfall is located just off of the lanai going from the second floor to the first. It is not physically accessible to residents or staff.

6.2.4 Interview

For this site visit the Resident Relations Manager was interviewed. Because the residents of this facility are more independent, including the residents with dementia, the dynamics of this facility were different than Site 1. He explained how residents with severe cases of dementia would probably need to be moved to a more secure facility. Residents with slight cases of dementia would benefit here because they can still be independent but be assisted in certain areas that they find challenging, for example preparing meals. He was able to explain how the spaces were used and how they were flexible to be able to accommodate the different

residents and their needs. For example, rooms could be decorated and furnished per the residents liking.

6.3 Site 3 – Ka'amilo Hale

Figure 6.11 Ka'amilo Hale: Entry[322]

This site exists as a single-story facility housing a total of 5 individuals all of whom were dealing with some form of dementia.

6.3.1 Location of Site

Site 3 is located in a residential neighborhood and has been converted from a residential into a private senior care home so the configuration is similar to a typical single-family dwelling. It is located in a residential neighborhood with a nearby shopping center and medical clinics. A bus stop (line 11) is located just at the end of the facility's driveway. This facility was selected because its smaller size and the home-like feel. When arriving on site, there is a driveway with a garage for

[322] "Kaamilo Hale Aiea Nursing Home - Kaamilo Hale," accessed May 8, 2015, http://kaamilohale.com/?page_id=2.

employees and family visitors. There is no security gate, and the residents only have one point of access—the front door. There is a back door but exits into the yard.

6.3.2 General Interior Layout and Design

When one enters into the facility, they arrive at a foyer. The facility has an open floor plan meaning from the foyer one can enter the living room or the kitchen. From these public spaces, a short hallway connects them to the four bedrooms. The rooms are on one side of the hallway with the other side being windows that visually open to the yard. There are two double-occupancy rooms and four single-occupancy rooms. Each room has a full bathroom that were added when converted into a care home. The owner has a private suite on the second floor and resides at the facility day and night. The facility also has a room for visitors, such as family members, to stay when visiting (if they do not live on the island of Oahu).[323]

[323] "Kaamilo Hale Aiea Nursing Home - Kaamilo Hale."

Figure 6.12 Ka'amilo Hale: First Level Floor Plan

Diagram of spaces in first site.

6.3.3 Exterior Configuration and Features

Like previously stated, this facility was a single-family dwelling converted into a care home resulting in the backyard being similar to one you would find in a

residential home. The backyard is visible from the kitchen, living room, and hallway. The yard also contains a small garden for herbs and a large mango tree. There are walkways for the residents to use.

6.3.4 Interview

For this site visit the owner and full-time live-in caretaker was interviewed. She was very knowledgeable about the facility, staff, and residents, including their individual likes and dislikes along with understanding each resident's personal needs. This in large part is due to the fact that it is a smaller facility and she lives there full-time. She was also involved in the design of the facility and is planning on opening another. One thing she noted was that, since most of her residents need assistance in bathing, it would have been better to have one spa-like bath where they bathe the residents and have half-baths in the bedrooms. This shows how the size of the facility and the severity of dementia in the residents impacts what design strategies are better. In a larger facility where some residents can still bathe themselves, private bathrooms in rooms are ideal. Another thing she noted important was the importance of storage. She also stated that challenge was creating a space that is bright and spacious but not too large to be overwhelming for the residents.

6.4 Site Visits Conclusion

The purpose of visiting these three existing senior care facilities was to gain a better understanding a current facilities on the island of O'ahu. The intent was to see various types of facilities and observe what they are providing. The focus for selecting the site visits were facilities that concentrated on individuals dealing with dementia and design elements that include extended family needs and the natural world outside the facility itself. The three things that were observed during the site visits were the location of the site, the interior layout and design, and the exterior design elements.

When observing the site locations, it was necessary to understand the surrounding contexts of each site. All three facilities were located in somewhat of a residential area. This fact was important because maintaining a connection to community is important for seniors as they age. How these three sites allowed for the interaction with the surrounding context differed in each case. Site 1 was located in a traditional neighborhood but was isolated from the surrounding houses because it was located on a main road compared to Ka'amilo Hale, which was also located in

a neighborhood and not isolated. The Plaza Mililani was located in a community in between the public spaces and neighborhoods. This location seemed like the most ideal considering the ideal community for senior living because The Plaza is an assisted living facility that offers residents more independence than the other two facilities.

When observing the interior layout and design of each facility, some of the characteristics that were being examined were the separation of spaces, how those spaces were connected through circulation, and any other elements that might be relevant. Due to the specific scales of each built design, layout and design varied. Ka'amilo Hale, which housed 8 residents, had little circulation compared to The Plaza, which houses 128 residents. Ka'amilo had a relatively open floor plan with a short hall that connected a few of the bedrooms. The Plaza not only had multiple circulation paths per floor but also contains vertical circulation. The first site's size is between The Plaza and Ka'amilo Hale. Site 1 is multiple stories, but each floor acts as its own facility. All three sites create both private and public spaces. Site 1 creates the most defiant barrier between private and public through a wall. The Plaza pushes the two private spaces to the outside with the public spaces in the middle between the two. Ka'amilo Hale does something similar by putting the private spaces toward the outside of the facility with the public spaces in the middle.

When observing the exterior elements of the facility, nature and how it was incorporated was the main focus. Site 1 is the only facility that had a designated walking path and memory garden. Site 1 also has sitting gardens and a large lanai overlooking the ocean. The Plaza had a garden, lanai, and waterfall on the second floor. Ka'amilo Hale was converted from a residential house, so they have a yard that contains planter bed and landscape of trees and plants. Overall, Site 1 has the exterior environment most clearly designed toward individuals with dementia.

Visiting these three senior care facilities on Oahu furthered showed the need for senior care facilities that specialize in dementia care here on Oahu. Because the three sites house seniors in various stages of aging, it exemplifies the benefits of have a specialized facility. Currently on Oahu, there are facilities that are being built specifically for seniors with dementia, but with the number of seniors with dementia increasing there will definitely be a need for more. Site 1, which is the second facility built under their organization, is currently in construction for its third location due to the high demand. One of the most significant lessons learned from the site visits that would not necessarily have been known from the literature is how both the staff and

the built environments need to adapt according to the specifics situations and needs of current residents living at the facilities.

Another thing was that not all facilities are the right fit for every senior citizen, which is why it is important to have different facilities that meet the various needs of seniors as they age, such as continued loss of mobility or increased severity of dementia. The site visits also showed how the facilities take into consideration the needs of the staff. Site 1 was encouraging regarding of the concept of family and was open to staff members bringing their children to work, which also benefited the residents through the interaction shared with young people. Since Ka'amilo Hale was a smaller facility and only had one or two staff members (depending on the time of day), other than the caretaker, the environment was more family oriented also. As for The Plaza at Mililani, the residents were more independent, so they did not depend on the staff as much as residents did on the other sits. However, the facility offered plenty of space that was designated to staff only to allow them to recuperate if necessary.

One of the challenges when conducting the site visits was the fact that the employees and residents were not allowed to be interviewed. For the residents, it was because of legal restrictions. Because seniors with dementia are considered to be psychologically handicapped, permission from their legal caretaker, such as a family member, would have been needed. When it came to interviewing the workers, they were unable to be interviewed during working hours because they were occupied with work responsibilities. The employees would have had to come in on their own time to be interviewed. However, by being able to interview either a manager or an equivalent position at each facility, enough information was able to be collected about the facility.

Although each facility incorporated some local elements, none had a strong connection to sense of place. None of the designs of the facilities took into consideration the culture or history of that site. All three of the sites made no effort to have a larger connection outside of the site, either to nature or the community. Site 1 did have access to views of the ocean, however spaces were not specifically designed around the view.

The matrix below in Figure 6.13 shows a quick analysis of the qualities at each facility. Because the three facilities varied in type of care offered, the matrix was a way of evaluating and comparing certain elements.

	NAME	LOCATION	OPENED	SQUARE FOOTAGE (SITE)	FLOORS	TOTAL BEDS	SINGLE BEDS	DOUBLE BEDS	% FILLED	SETTING: Urban	SEPERATION OF PATIENTS	GARDEN	MEMORY GARDEN
1	Site 1	Kaneohe	2012	38,250	2	28	4	5	100%	X		X	X
2	Plaza at Mililani	Mililani	2010	35,545	5 (1 memory care)	128	4	7	85%	X	X	X	
3	Kaamilo Hale LLC	Aiea	2009	10,976	1	8	4	2	100%	X		X	

WALKING PATH	GARDENING	GARDEN VISIBILITY	CONTROLLED LIGHTING	DAYLIGHTING: PUBLIC SPACES	DAYLIGHITING: ROOMS	CIRCULATION	SALON	PT ROOM	PETS	FOOD CHOICES
X	X	5	X	X	X		X		X	X
	X	1	X	X	X		X	X		
	X	10	X	X	X					X

Figure 6.13 Matrix for Site Visits

7.0 DESIGN: Site Selection and Analysis

When choosing a site, I looked at four things: distribution of the elderly population on Oahu, locations of existing facilities, distribution of Native Hawaiians on Oahu, and location of Hawaiian Homestead lands. These elements were key in determining a location for a successful senior care facility that is rooted in the culture of Hawaii and can take advantage of the healing properties of nature. These parameters indicated that Nanakuli would be an ideal site. Figure 7.1 shows the location of the chosen site. This would be an ideal site because it is rooted in the needs of both the senior population on Oahu and the Native Hawaiian population on Oahu. After choosing a site, I analyzed 3 things: climate, geographical location, and historical background.

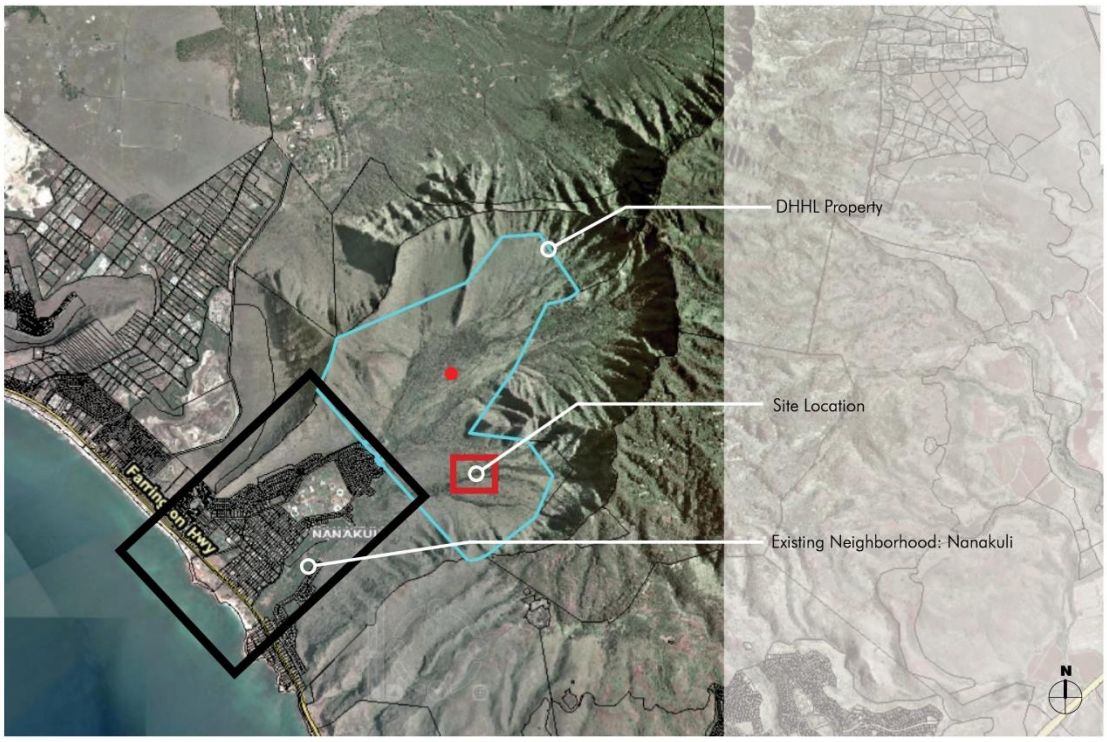


Figure 7.1 Site Location: Nanakuli
Site indicated in red square.[324]

[324] Base image from http://gis.hicentral.com/maps.html

7.1 Senior Population Distribution on Oahu

The first step was to determine how the senior population is dispersed across the island of Oahu. Figure 7.1 shows this distribution. It ranks the areas from 1 through 7 by the percentage of senior individuals to the total population with 1 being the highest. This was key to determine areas with high populations of seniors and also areas with high percentages of seniors. The greater the general population indicates that most likely there will be an increase of seniors in that area as the population ages. It was critical to identify the areas on the island that had a higher percentage of seniors. For example, Ko'olaupoki, Area 2, has a lower total population compared to Ewa, Area 3, but has a higher percentage of seniors. This data aids in indicating what area of Oahu will potentially have the highest needs for senior care facilities.

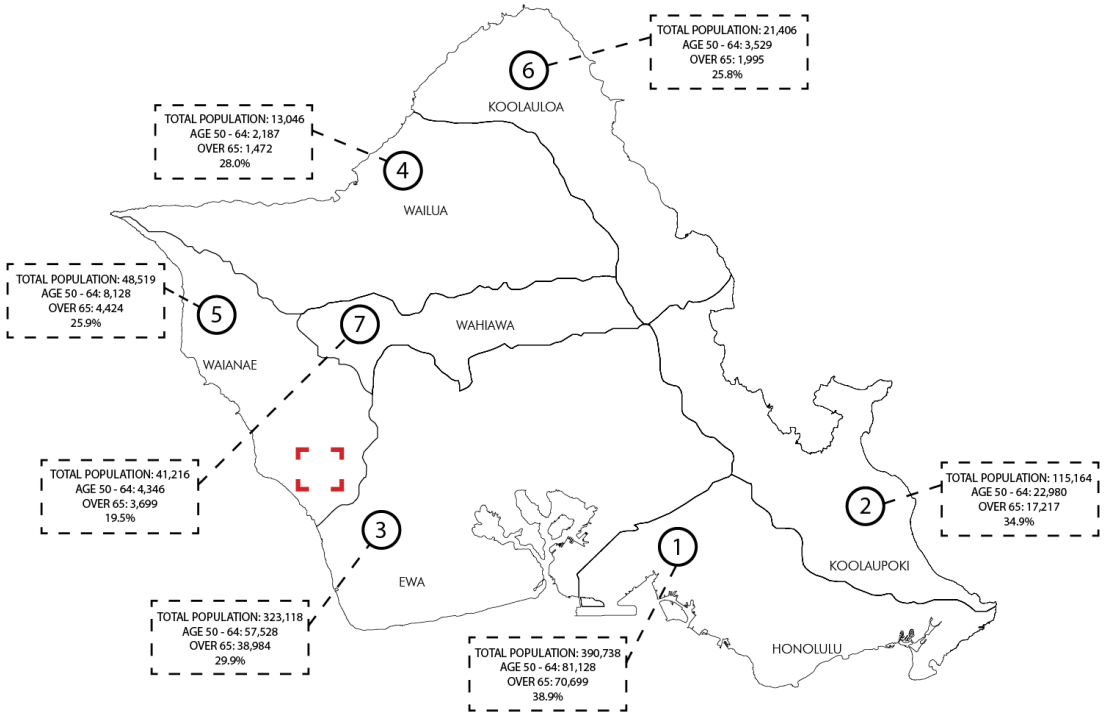


Figure 7.2 Elderly Population Distribution [325]

[325] Data from: http://planning.hawaii.gov/gis/various-maps/census-interactive-online-maps/

7.2 Senior Care Facility Distribution on Oahu

Along with identifying the distribution of seniors on Oahu, it was important to understand where existing facilities are located. Figure 7.3 below shows the distribution of facilities across Oahu. The gray circles with a black outline show which facilities offer some type of memory care. The red circles are the facilities that focus on individuals with some form of dementia. By understanding where the existing facilities, along with where the highest density of the elderly, are located was imperative in helping to determine what areas of the island could be potentially lacking adequate facilities. This established what areas are in need of a senior care facility that specializes in dementia care. From Figure 7.3, one can see that the north-west side of the island is lacking in facilities in general. The diagram also shows that Oahu is lacking in senior care facilities that focus on dementia. Based on the research from Section 1.2 and 1.3, the current capacity of existing facilities does not even come close to the need.

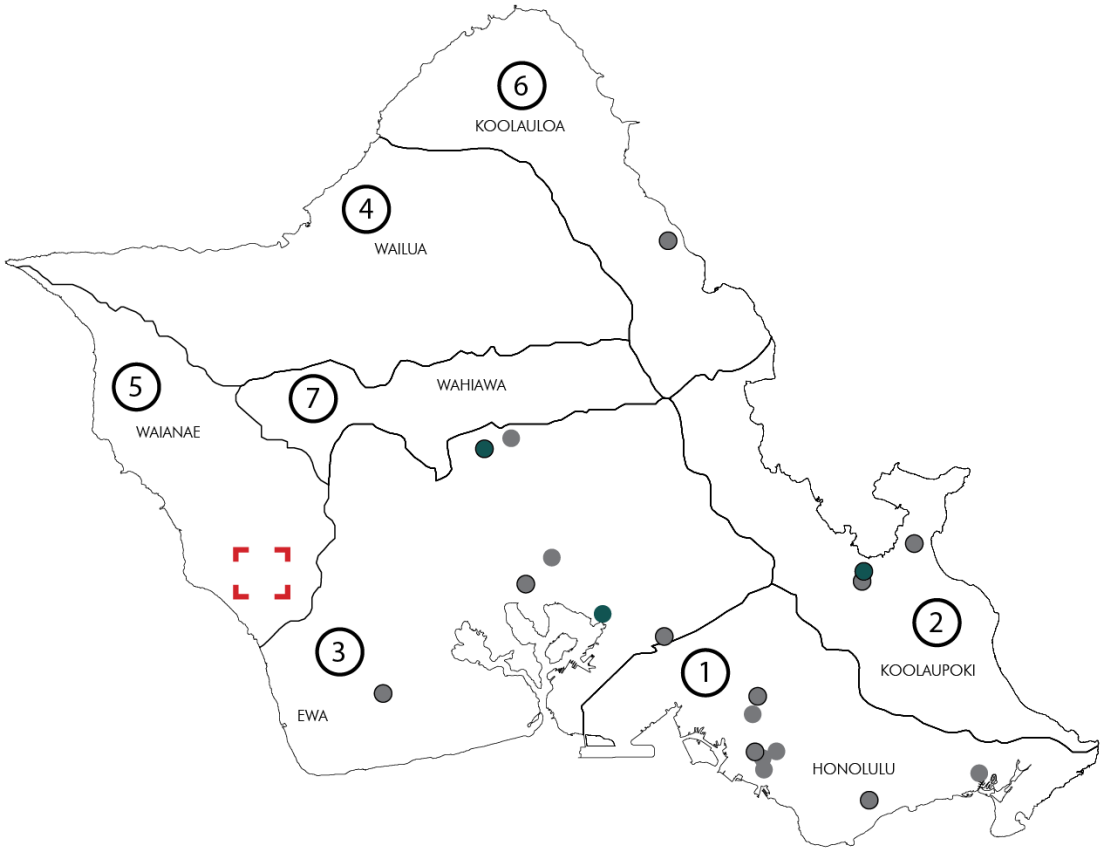


Figure 7.3 Senior Care Facilities

7.3 Hawaiian Population Distribution on Oahu

When designing in Hawaii, it is important to consider the people of Hawaii, specifically Native Hawaiians. Hawaii has a population of approximately 1.2 million with about 265 thousand of that being native Hawaiians.[326] It was important to not only look at where there was a general need for the population of Oahu but also for the Native Hawaiians. Figure 7.4 illustrates the distribution of ethnicities on Oahu. There are currently no senior care facilities that specialize in dementia care specifically designed with a focus on Native Hawaiians, which is critical because this is the Native culture of Oahu. Having a senior care facility that speaks to the culture of the island is key for creating an environment that facilitates a healthy living environment for the aging here in Hawaii.

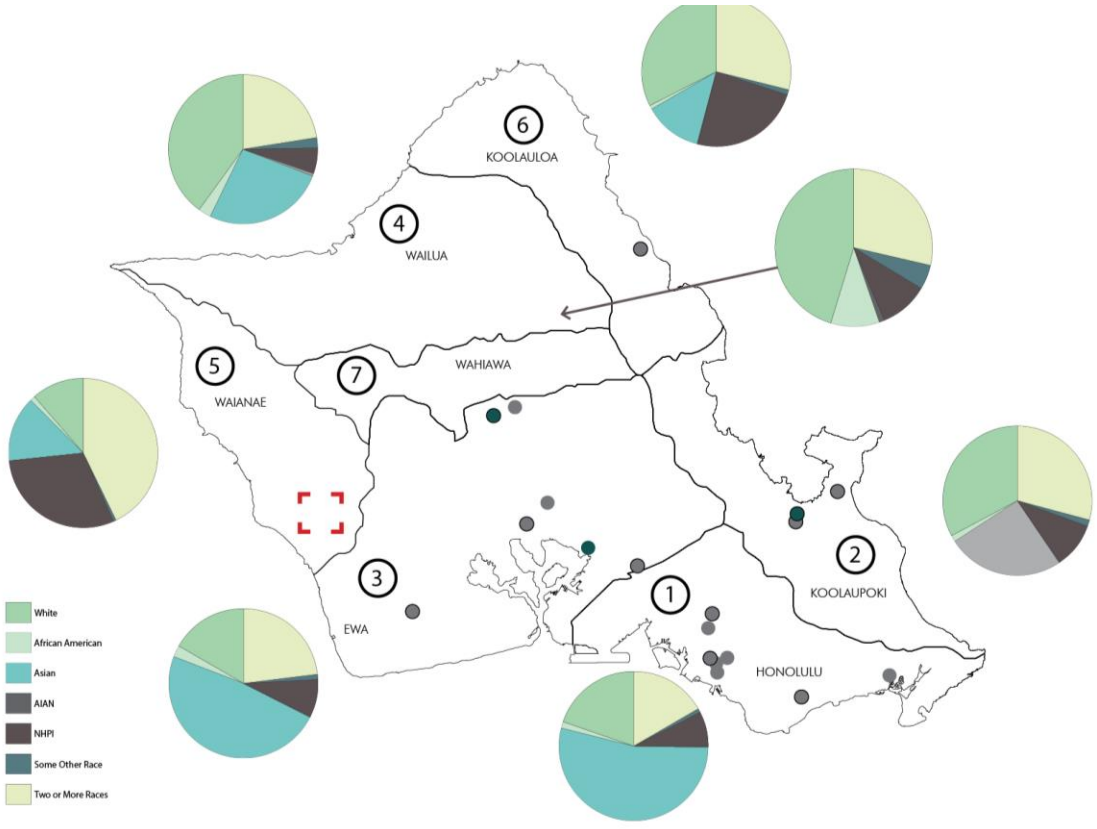


Figure 7.4 Ethnicity Distribution[327]

[326] A.J. Kaufman, R. Adams, and L.J. Cox, "A TROPICAL PARADISE: NATIVE HAWAIIANS AND VISITORS TO HAWAII LANDSCAPE PERCEPTION OF AESTHETIC QUALITIES OF THE URBAN FOREST AND NATURAL LANDSCAPES OF HAWAII," *Acta Horticulturae*, no. 775 (November 2008): 131–37, doi:10.17660/ActaHortic.2008.775.15, 1.
[327] Data from: "Population Estimates, July 1, 2015, (V2015)," accessed October 31, 2015, //www.census.gov/quickfacts/table/PST045215/1553900,00.

7.4 Hawaiian Homestead Lands on Oahu

It was not only key to look at the distribution of Native Hawaiians, but also to take into account where the Hawaiian Homestead lands are located. The Department of Hawaiian Home Lands (DHHL) manages lands that are designated for Native Hawaiians. DHHL builds homes, on designated land, that are offered at a reduced price to Native Hawaiians. Because of Hawaii's high cost of living, DHHL assists Hawaiian families in being able to afford a home in Hawaii. This concept can be translated to senior care facilities. Figure 7.4 below identifies where on Oahu the Hawaiian Homestead lands are located. This is critical in creating a culturally based design. It also helps with funding both for the construction of the project and helping reduce the cost of living at the facility for future residents. By providing a financially affordable facility that is rooted in the community and culturally appropriate would greatly influence the facilities' success.

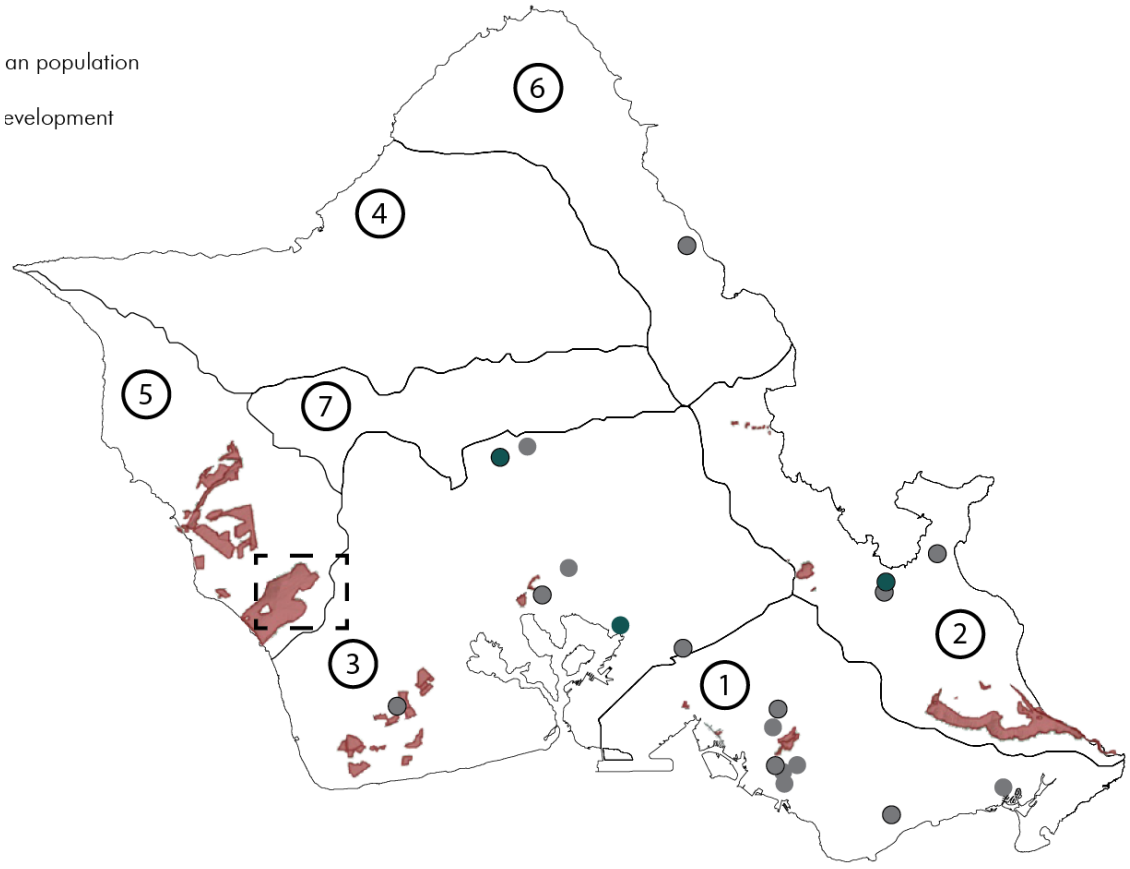


Figure 7.5 DHHL Hawaiian Homestead Lands

7.5 Climatic

Nanakuli is typically a dry hot climate. Figure 7.5 below shows the average high and low temperatures and the average rainfall broken down by month. However, as one moves up the mountain, the climate becomes more hospitable. It becomes cooler and has more rainfall. The west side of the island of Oahu is known for being drier even during ancient times. Fishing always was good, but the lower lands received little rain and were not conducive to planting. However, higher up toward the mountains, there is a sacred spring that was used for agricultural purposes. Stories recount that there is still taro growing from when Native Hawaiians originally planted it and is thriving from the rainfall that occurs there.[328] Because of the two mountain ranges that surrounds the site; it creates a funnel effect, which results in wind coming from both below and above the proposed site. The mountain ranges also provide a longer period of shade both in the morning and evenings. This allows for more indirect light, rather than direct light. This is key for seniors as to minimize glare but provided ample amount of daylight, which, as shown in section 4.2, is beneficial to seniors. The air flow also allows for a design that can be naturally ventilated which from the site interviews and research on the healing aspects of nature show is beneficial for seniors, who tend to dislike air conditioning or too cold of conditions. The minimal rain also is beneficial in that the outdoor spaces are safer because majority of the time they will not be slippery from rain, making them useable most of the time.

[328] Elspeth P. Sterling and Catherine C. Summers, *Sites of Oahu* (Honolulu: Bishop Museum Press, 1978).

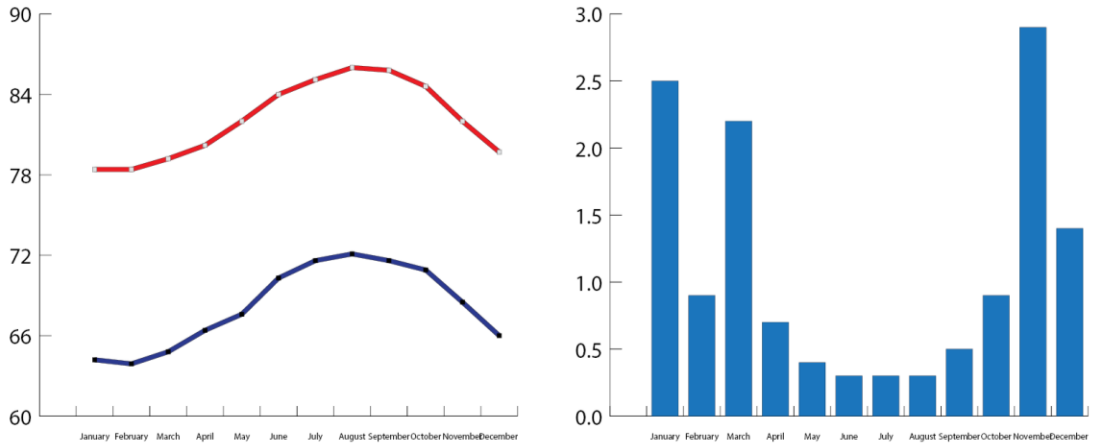


Figure 7.6 Climate

(Left) Average monthly temperature. (Right) Average monthly rainfall.

7.6 Geographical

Like stated before, the site is located on Hawaiian Homestead lands. Figure 7.6 shows DHHL's master plan for the area. For the purpose of this dissertation, it is assumed that this master plan will be carried out and this senior care facility will be a part of the community design and incorporated into the overall planning of this area. The site is located at the top of a cluster of residential homes between a small valley. According to the United States Census Bureau, in 2010 there were 12,666 residents. Since 2010, Nanakuli has seen a 17.1% rise in population. In 2010, 8.8% of that population was over the age of 65. Native Hawaiians make up 41.6% of the ethnicity composition of the area.[329] Because Nanakuli has strong community, family, and cultural ties, it makes it a smart choice for a senior care facility. This area is also lacking in general of senior care facilities, but especially facilitates that focus on dementia care.

The geographical location is ideal of views. These views include the ocean, the mountains, and the community below. These are all key elements in creating a healthy environment, one that is described in the previous sections. The health benefits of these views will be further discussed in the design section.

[329] "Population Estimates, July 1, 2015, (V2015)," accessed October 31, 2015, //www.census.gov/quickfacts/table/PST045215/1553900,00.

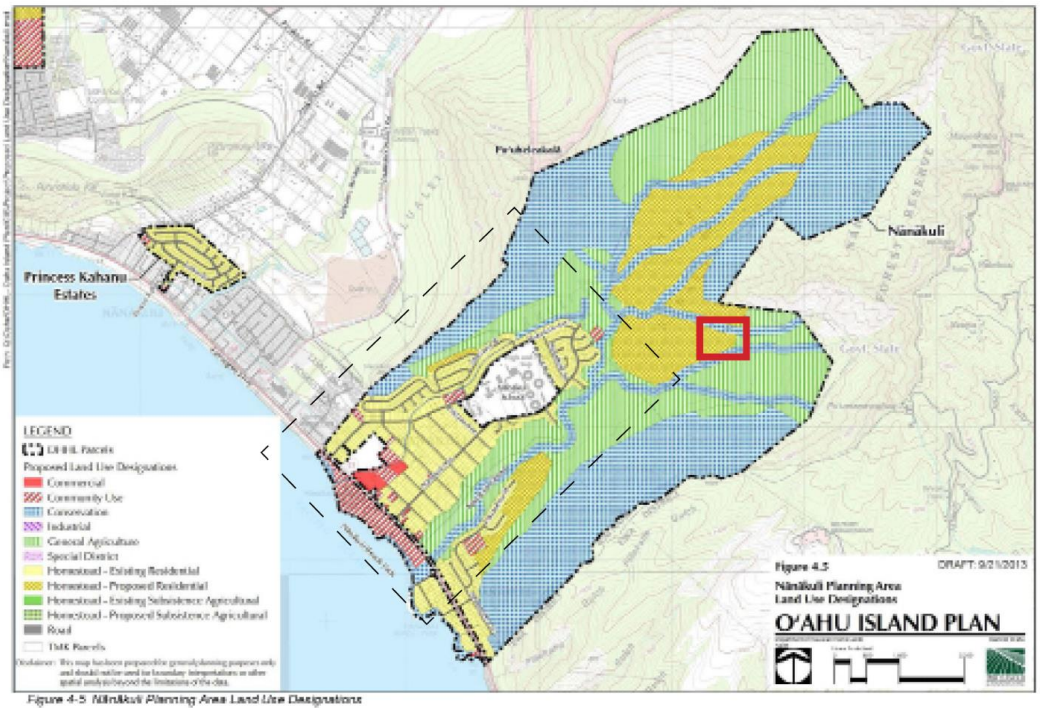


Figure 4-5 Nānākuli Planning Area Land Use Designations

Figure 7.7 Nanakuli Master Plan[330]

[330] Hawaiian Home Lands, "Oahu Island Plan," July 2014, http://dhhl.hawaii.gov/wp-content/uploads/2013/04/DHHL-OIP-Final-140708.pdf.

8.0 Design Implementation

8.1 Spatial Organization

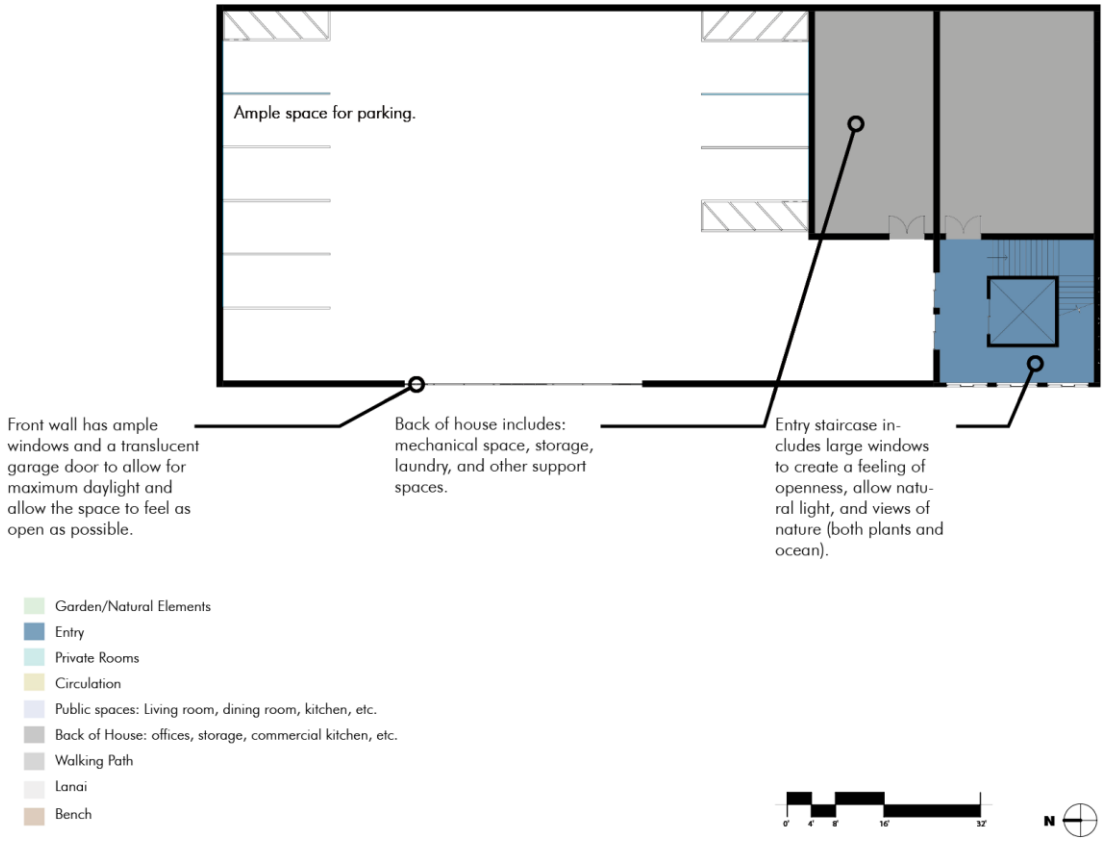


Figure 8.1 Ground Level Floor Plan

Ground level plan diagraming different spaces and elements.

Figure 8.2 Main Level Floor Plan

Main level plan diagraming different spaces.

The facility is positioned in a small valley between two smaller mountain ranges and sits on a slight slope. The first floor (see Figure 8.1) contains the parking garage, mechanical equipment, and back of house facilities. It also contains the entry into the second level, which is where the main program of the facility is located. There are two reasons the facility is designed this way. The first reason is that elevating the main program to the second level takes optimal advantage of the views while still maintaining the look and feel that matches the rest of the community, which are low-lying buildings. The second reason is that it creates an environment for the residents where they are secure and safe, but have the feeling of freedom. They are also elevated from the road, which could be distracting or agitating, depending on the individual. The main goal of the structure of the facility is it to create a peaceful environment where the residents feel like they have freedom and independence, which is important for a senior to maintain as they age.

The main entry into the facility is a large open stairwell, with an elevator (see Figure 8.2). The entry is mostly for staff and visitors and not the residents because it is recommended that seniors with dementia not leave the facility as much as possible because it can cause frustration and anger when they return as they may not remember that the facility is where they live. From the stairwell, one has views of the ocean and community, but not of the interior of the facility. As the research showed in section 4.1, it was important that the residents have limited visually access to the main entry as seeing it could encourage feelings of wanting to exit the facility. Once one arrives at the second level via stairs or elevator, one enters a hallway that takes residents and visitors to the main facility.

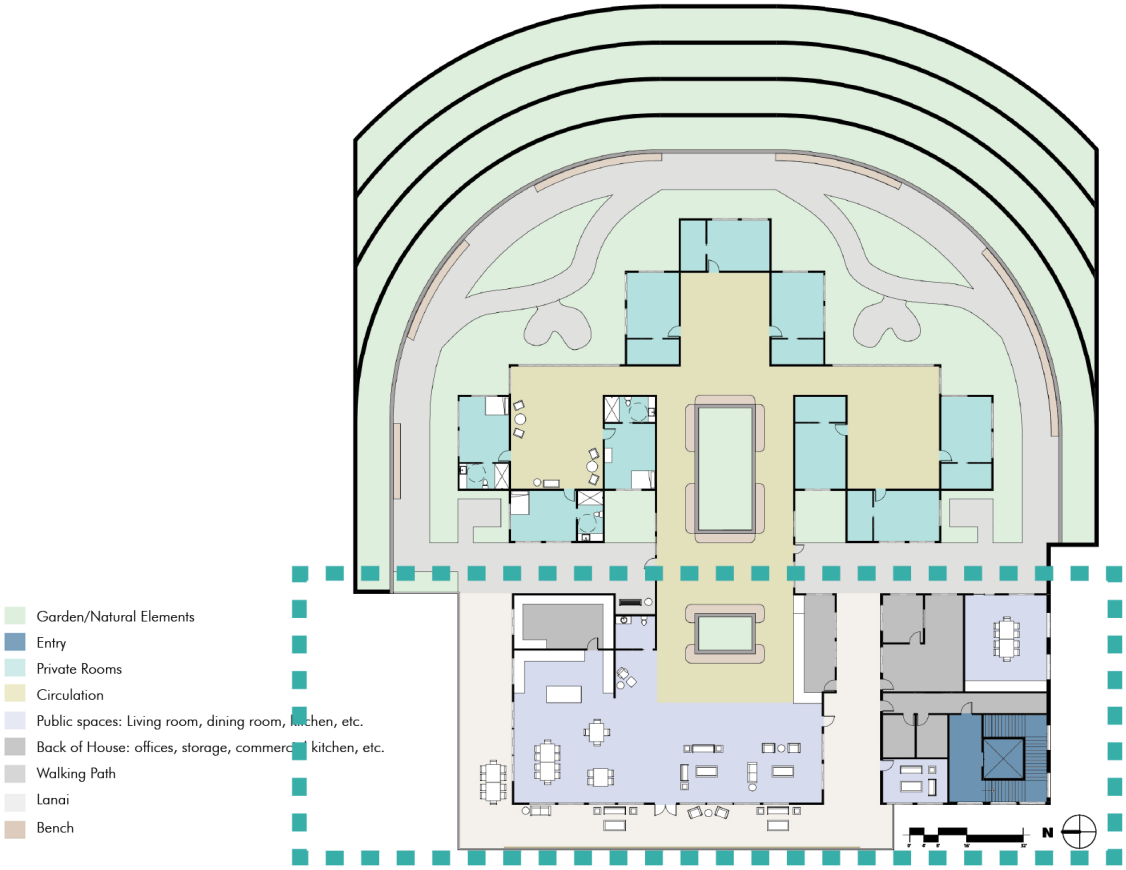


Figure 8.3 Main Level Floor Plan: Public Areas

Diagram of public areas which are indicated in dashed box.

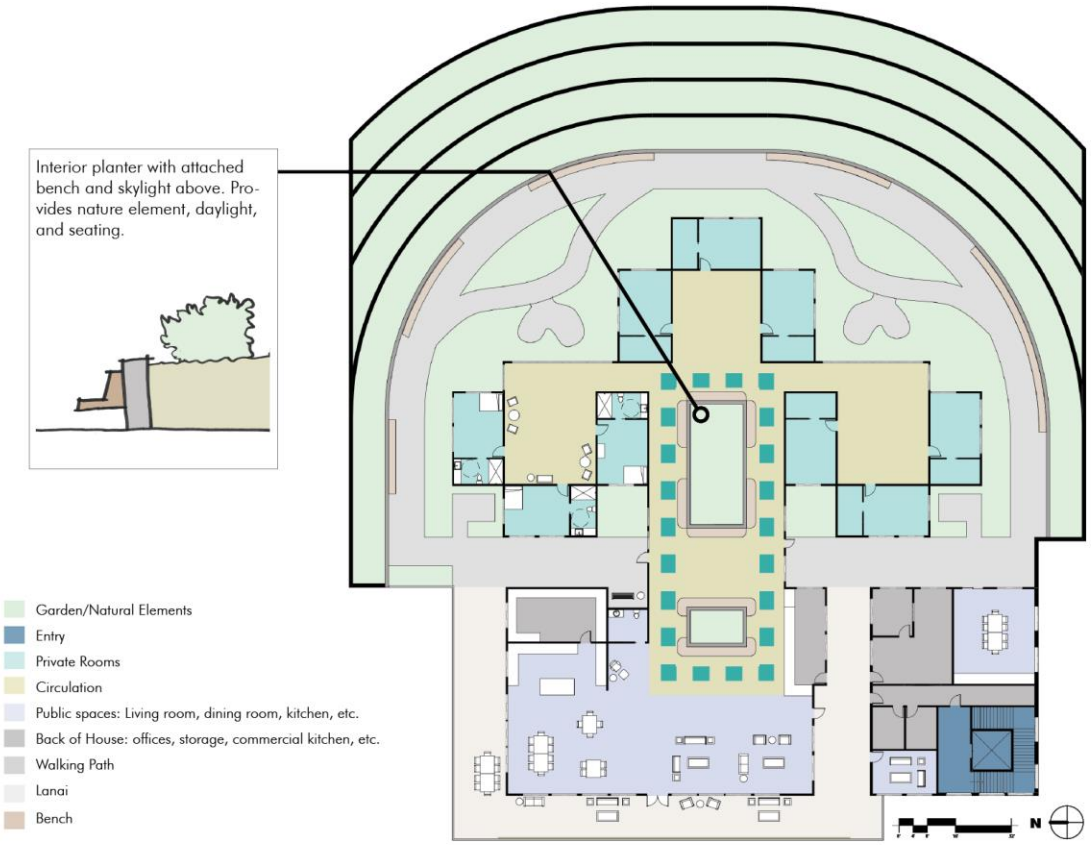


Figure 8.4 Main Level Floor Plan: Main Circulation Area

Diagram of main circulation area which is indicated in dashed box along with detail of planter area.

Upon entering the main facility, one enters the public area, which contains the living room, dining room and kitchen (see Figure 8.3 and Figure 8.5). The private areas, the rooms, are separated by a wide hallway with a large courtyard planter (see Figure 8.4). This was key in separating the public and private spaces in order to ensure that residents have privacy and their own separate spaces to retreat to if desired. The hallway was designed to be extra wide to bring in the natural elements, to ensure visual connectivity of spaces, and to reduce the feeling of an institute by not having a long narrow hallway. Although this facility tries to maintain visual line sights of spaces, it is important that there are wayfinding cues, such as signage or symbols, throughout the building to aid the residents in finding their way throughout the facility. There are two main circulation paths, an interior one and an exterior one. Both are in the shape of a loop to enhance orientation and limit confusion and getting lost.

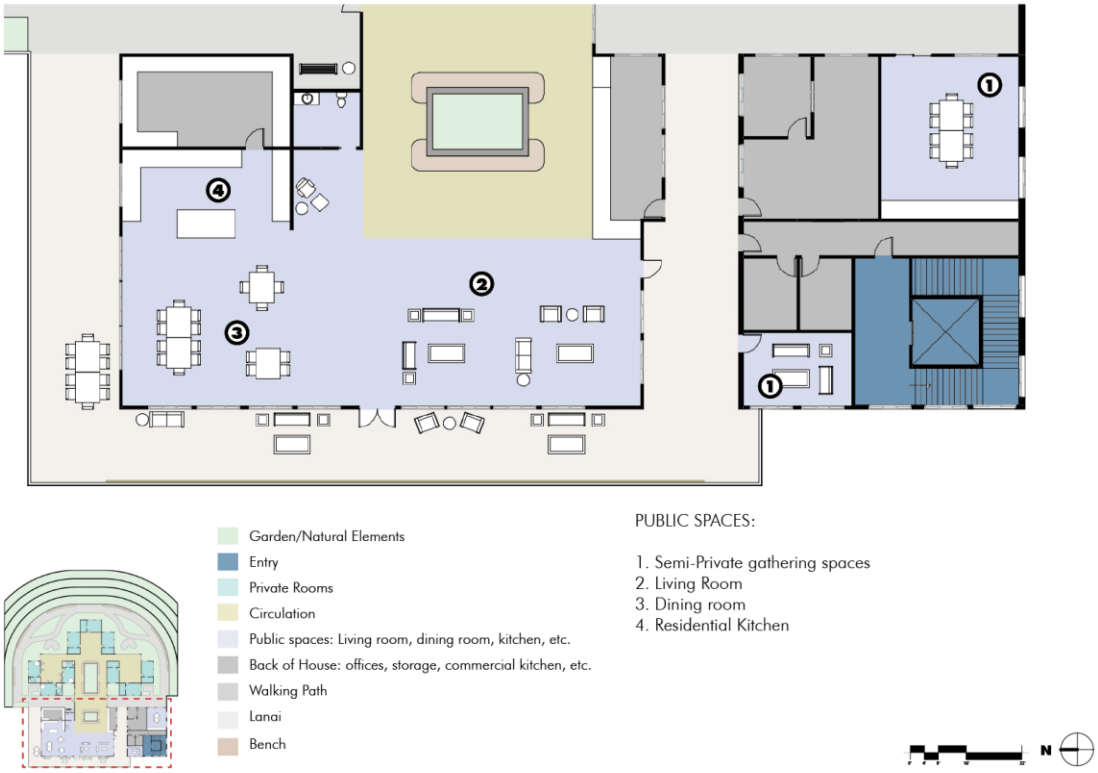


Figure 8.5 Main Level Floor Plan: Public Area Descriptions

Diagram and details of the public spaces.

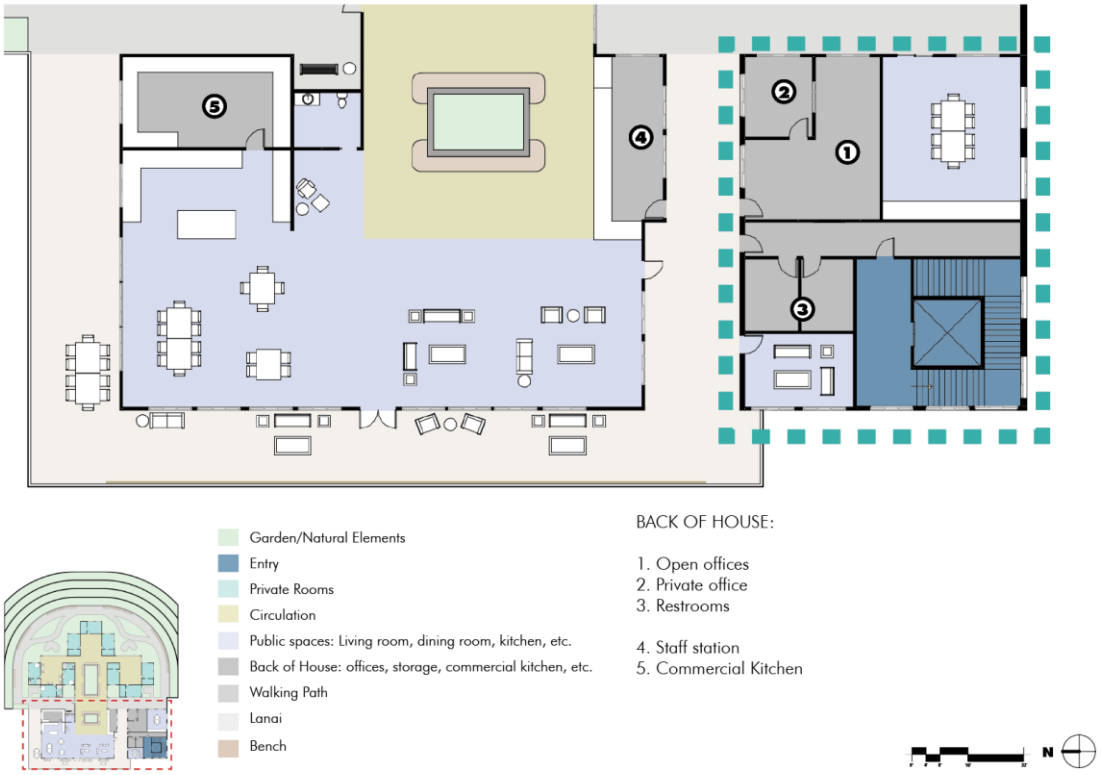


Figure 8.6 Main Level Floor Plan: Back of House Areas

Diagram and details of back of house areas.

There will be a commercial kitchen where a professional chef prepares meals for the residents (see Figure 8.6). This area will be kept out of view from the residents as not to cause agitation by being able to visually see a space that there are not allowed to access. To create a more homelike experience, there will also be a residential kitchen, which will open to the dining room and living room and look out onto the lanai and ocean. The residents will have access to this kitchen, and organized activities, such as baking, will take place here. Visitors will also be able to use this space with the resident they are visiting, if they wish. The common areas are designed to be flexible to accommodate various resident activities. The size of the facility was determined by what would be the best environment for the residents. Research shows that 10 to 14 residents are the right amount to support personal relationships.[331] This facility will range from 9 to 18 residents, with the ideal occupancy being 12 individuals residents. All rooms will be single occupancy except

[331] Chmielewski and Eastman, "Excellence in Design," 6.

some rooms could hold 2 residents, only if they are either a couple or for some reason want to room with one aother (see Figure 8.7and Figure 8.8). Single occupancy rooms have been shown to offer residents more privacy and give them the feelings of independence and control along with their dignity.[332] The hallways near the rooms were made more private to aid in distinguishing the private rooms from the public areas.

Both the public and private spaces where designed with adaptability in mind. Adaptability in the public spaces comes from the fact there are a variety of spaces to meet the different needs of the users. Certain spaces are more intimate while others are more community oriented. The rooms are also adaptable in that color, furnishings and decorations can all be modified to the individual resident's needs. Residents also have the option to customize the area outside their room entry, whether it is more decorations such as plants or a sitting area to look outside (see Figure 8.9). The garden also allows adaptability to the seniors as there are multiple areas that can be configured to suit various needs of the residents. Like the public areas, the garden has are more intimate areas and more community oriented areas. There are also a variety of gardening areas to meet the various needs and likes of the residents.

[332] Chmielewski and Eastman, "Excellence in Design," 6.

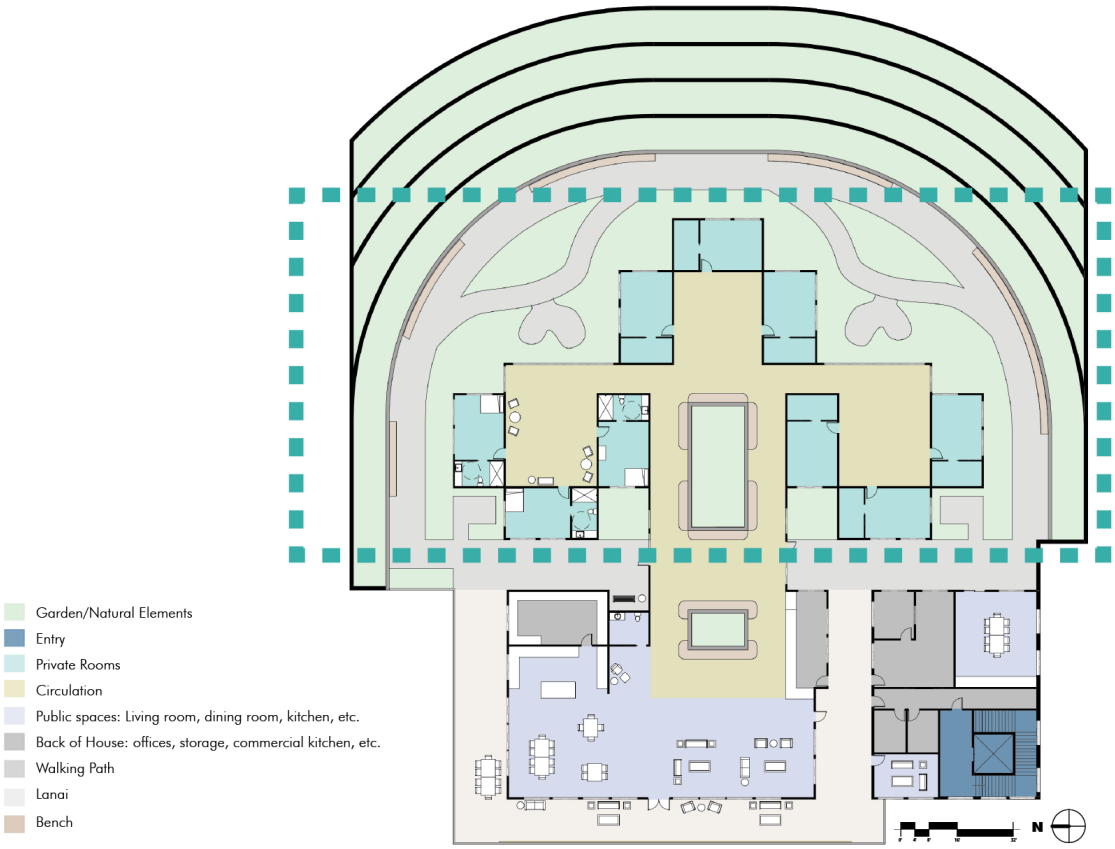


Figure 8.7 Main Level Floor Plan: Private Areas

Diagram of Private areas which are indicated in dashed box.

1. Mini gathering spaces for residents allow more intimate/private time. Also has view of nature.

2. Single occupancy except for this one which can be double for couples.

3. Large bathrooms for comfort in case there are multiple people in there. Also site lines from bed to toilet.

4. Furniture in room varies to accommodate the various needs of the residents.

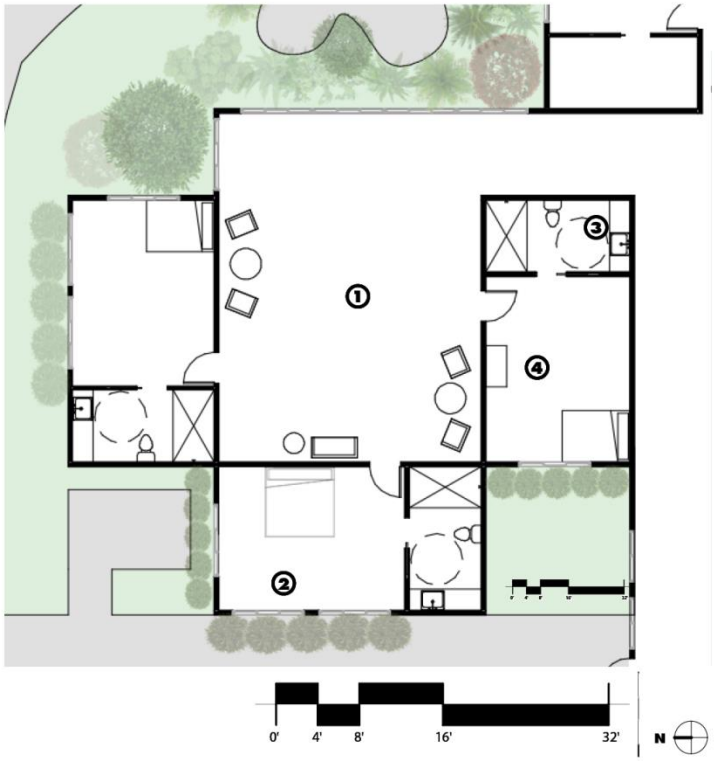


Figure 8.8 Main Level Floor Plan: Private Residential Rooms

Diagram and details of the private residential rooms.

Figure 8.9 View looking from sitting area by the private residential rooms looking into the garden.

8.2 Sensory Experience

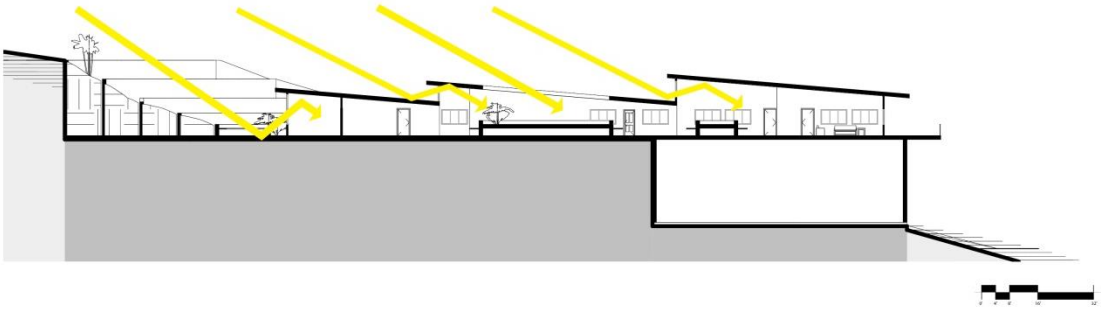


Figure 8.10 East West Building Section: Sunlight

Diagram showing morning sun and how the roof allows for indirect light to enter the building. During the summer, this is around 7:30 am and during the winter around 8:45 am.

As stated before in section 4.2 light is a very impactful element on seniors. Because of this, the design takes advantage as much as possible of bringing in natural light, especially indirect ambient light. This is done through the form of the building and roof. Because of the slope of the roof, it allows for plenty of indirect light to come into the interior, along with skylights (see Figure 8.10). Also, wherever possible, windows are incorporated to allow as much light as possible as well as to

allow as much natural ventilation as possible. The roof also aids in ventilation by letting out hot air and encouraging cross ventilation (see Figure 8.11 and Figure 8.12).

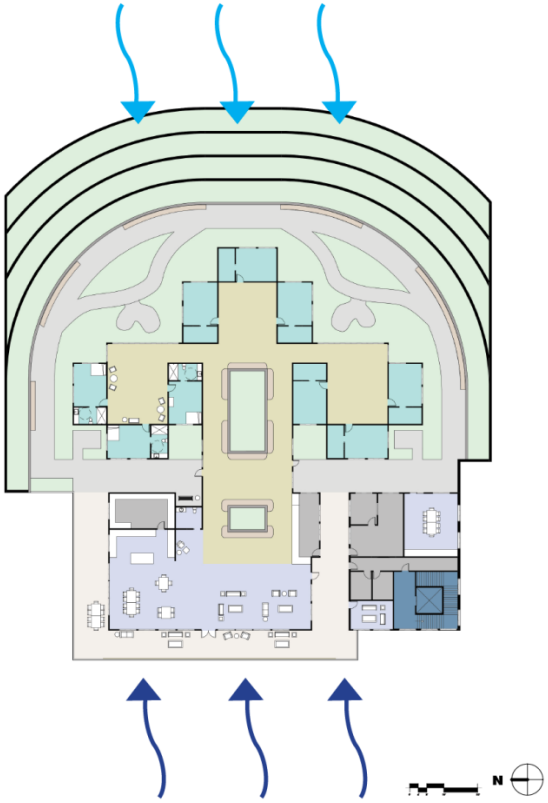


Figure 8.11 Main Level Floor Plan: Wind direction

Diagram shows direction of wind. Typical wind direction comes from the east, but because the facility is located on a mountain side near the ocean some wind will come from the west.

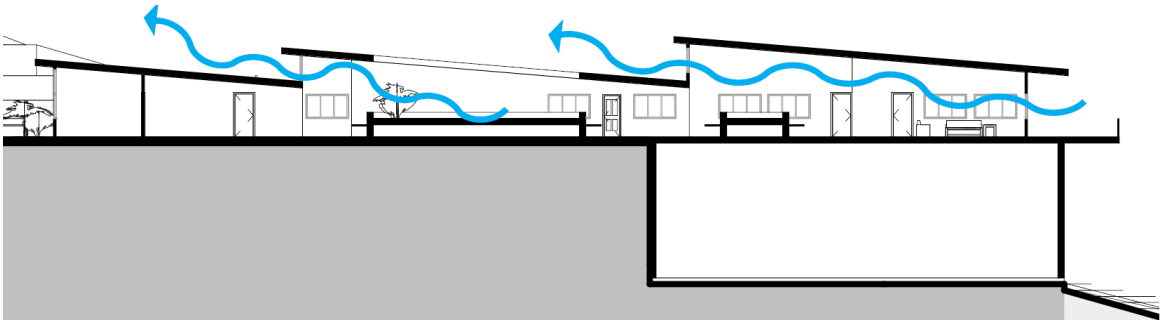


Figure 8.12 East West Building Section: Natural Ventilation

Diagram shows how the roof allows for natural ventilation and encourages wind flow.

For the private rooms, color, decorations, and materials would be picked depending on individual residents to best suit their lifestyle, personality, and needs. This is important to allow the resident to feel like their room is their own space and a reflection of themselves. Staff would work with the resident and their family to decide on materials that would also be safe and appropriate. It was also key in both the private and public areas that the materials and furniture, although durable, still had a residential appearance as to create a non-institutional like environment.

To ensure quality control of sound, separation of spaces was key. The design separates the private room from the main living area to provide sound barriers. There are also 2 private rooms that can either be used for nosier activities or quiet spaces, depending on the need of the residents and the activities going on that day. It would be up to the staff to determine the best space for activities to occur.

8.3 Natural Environment and Landscape

Because nature has been shown to be restorative, reduce stress, and be overall a positive impact on an individual's psychological, physiological, and emotional health one of the main goals of the design was to incorporate nature as much as possible, not just as a single garden that an individual to go to but for nature to be incorporated in daily activities of both the residents and the staff. It was also a goal to incorporate different levels of viewing and experiencing nature in order to meet the various needs of all users of the building. The idea was to create unique experiences throughout the facility to offer various therapeutic benefits.

A)

B)

C)

Figure 8.13 Images of Ocean Views from Site

Since the site is located in an undeveloped area, views from site location are estimated. A. Shows the view from lower than the site. B. Shows the view higher from the site and C. Shows an estimated view from the site.

Figure 8.14 View of Site from current neighborhood.

Image shows location of site along with the views of the mountain ranges.

The facility has three main views of nature which include the following: views of the ocean (see Figure 8.13), views of the mountains (see Figure 8.14), views of various gardens. The views of the ocean and views of the mountain were to provide vast views of the greater natural environment and community. It creates a very open feeling and provides areas for thinking, reflection and relaxation. The two different views of the oceans and mountains also aim to meet the needs of the residents and staff by providing views of various elements that would align with one of their likings, or ideally both.

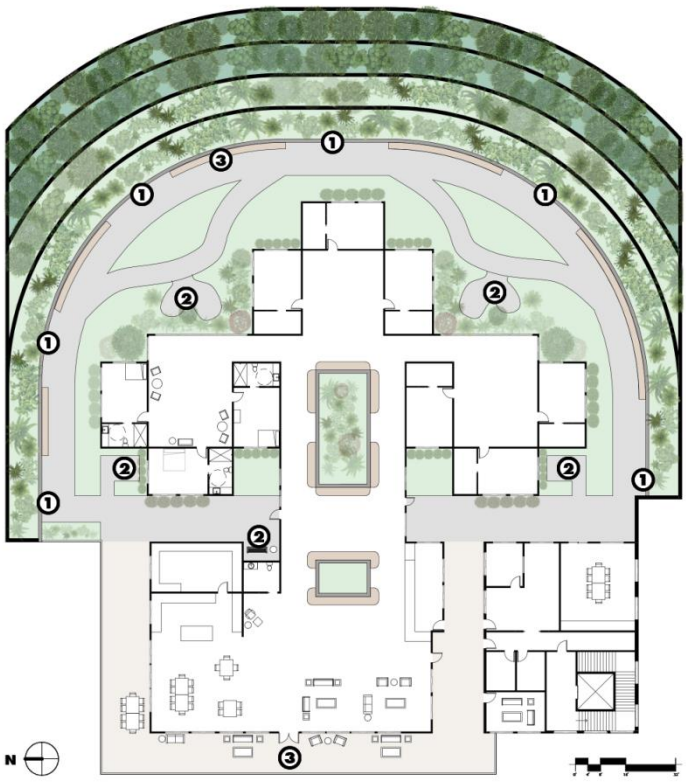


Figure 8.15 Main Level Floor Plan: Landscape Elements

Diagram of different types of areas within the landscape: 1. Gardening areas 2. Larger sitting nooks 3. Smaller sitting areas.

The third view of nature includes gardens, both interior and exterior. The gardens are broken down to smaller elements to create variety for the residents and staff and also to create unique moments which are important for seniors dealing with dementia (see Figure 8.15). The landscape is divided into high, medium and low densities (see Figure 8.16). In Figure 8.17, Figure 8.18, Figure 8.19, there are descriptions of examples of plants that meet the different density types. Other plants would be used that would do well in the Nanakuli environment. The different types of landscape densities are to create a variety of plants to meet the various needs of the residents. It also creates areas of interest and allows residents to find a type garden they like, depending on their personal preferences.

Interior courtyard and views of nature from interior community gathering areas were critical because they have proven to reduce aggressive behaviors and create stronger social ties and higher sense of safety. Providing natural elements,

such as physical plants and views of nature, from the interior was also important to provide nature for residents in staff in their daily activities and also to provide exposure to nature to individuals that don't particularly like going outside. They can still reap the positive benefits of nature without having to exit the facility. For the residents and staff who do enjoy being outdoors, it was important to provide plenty of direct access to outdoor space for them to use.

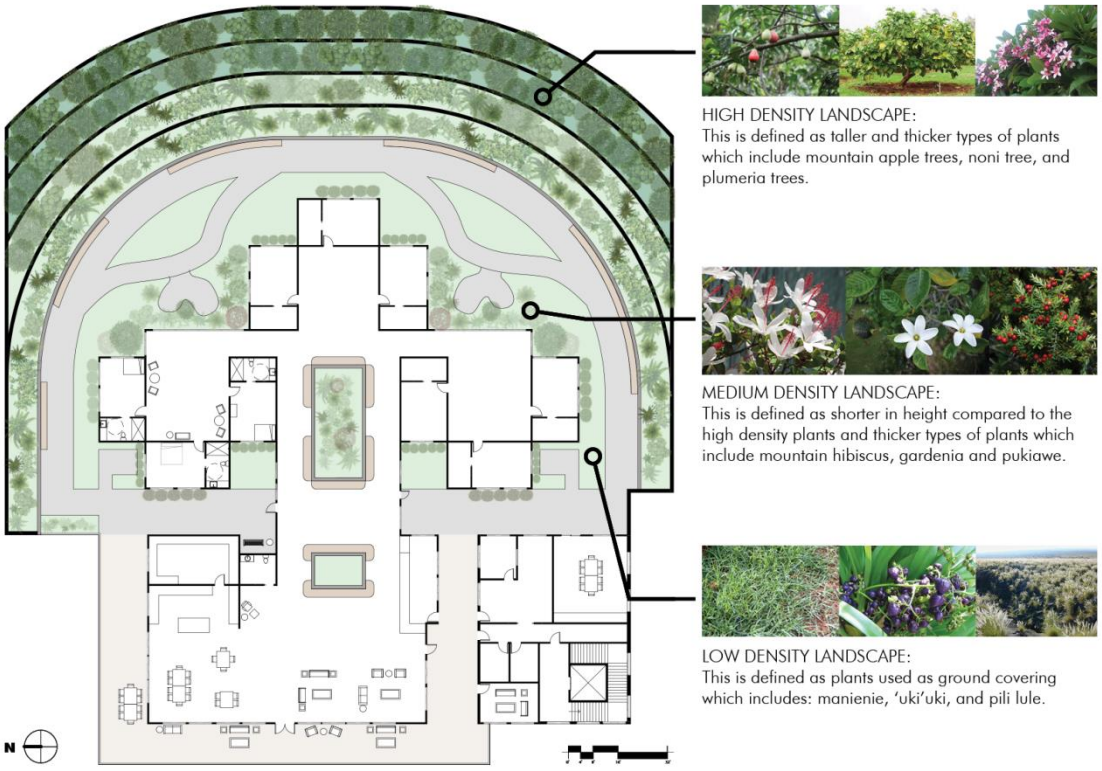


Figure 8.16 Main Level Floor Plan: Landscape Diagram

Floor plan diagraming landscape concepts along with landscape density descriptions.

Figure 8.17 Low Density Plant: Riviera Bermuda Grass

(Left) Riviera Bermuda Grass: Riviera Bermuda Grass is a drought tolerant grass which grows well in a wide variety of soils. It tolerates both acid and alkaline soil conditions. It holds up well under heavy foot traffic and is very durable grass.[333] (Middle) ʻUki'uki: The ʻuki'uki plant, or Hawaiian Lily, is a perennial herb known for its purple berries and white flowers that bloom year-round. In partial to full sun the plant will stay around 2-3 ft. high. The plant is great to control soil erosion.[334] (Right) Pili Lule: Pili forms tufts of light blueish-green blades that range in height from 2-3 ft. high. Requires full sun and minimal watering.[335]

[333] "Bermuda Grass a Favorite for Hawai'i Lawns | The Honolulu Advertiser | Hawaii's Newspaper," accessed September 7, 2016, http://the.honoluluadvertiser.com/article/2007/Feb/16/il/FP702160319.html.
[334] "Native Plants Hawaii - Viewing Plant : Dianella Sandwicensis," accessed September 7, 2016, http://nativeplants.hawaii.edu/plant/view/Dianella_sandwicensis.
[335] "Native Plants Hawaii - Viewing Plant : Heteropogon Contortus," accessed September 7, 2016, http://nativeplants.hawaii.edu/plant/view/heteropogon_contortus.

Figure 8.18 Medium Density Plants

(Left) Kokio Kea: Kokio Kea usually stays in the 5-8 foot tall range. The dense bush has beautiful white and fragrant flowers at the ends of its branches. It is very durable plant being wind, sun and drought tolerant. Resistant to bugs that tend to destroy other hibiscus plants. Used as a laxative by young women, while the flowers were often strung into lei.[336] (Middle) Gardenia brighamii: The Native Hawaiian Gardenia, Nanu, is a very fragrant flowering plant that is easy to care for and easy to grow. In an environment of full sun, the 3'-6' shrub can be found in bloom during the months of October to December. Nanakuli is well suited for the Nanu due to the dry and well-drained soil conditions which the shrub prefers.[337] (Right) Pukiawe: The pukiawe grows as a shrub or small tree, from a few feet to 15' in height. Needs moderate water and tolerates drought conditions. Grows best in dry areas.[338]

[336] "Kokio Kea," accessed September 7, 2016, http://www.hawaiiannativeplants.com/ourplants/ kokio-kea/.
[337] "Native Plants Hawaii - Viewing Plant : Gardenia Brighamii," accessed September 7, 2016, http://nativeplants.hawaii.edu/plant/view/gardenia_brighamii.
[338] "Styphelia Tameiameiae – Pukiawe – Hawaiian Plants and Tropical Flowers," accessed October 27, 2016, http://wildlifeofhawaii.com/flowers/1148/styphelia-tameiameiae-pukiawe/.

Figure 8.19 High Density Plants

(Left) Ohia: The common name is the mountain apple. Medium sized perennial tree usually grows around 16' - 40'. The fruit season is typically March to April. The tree does not grow well in drought unless it is grown with irrigation; however it thrives in full sun.[339] (Middle) Noni: The noni tree, is a small tree less than 10 feet high. It has tremendous amounts of medicinal uses along with its utilitarian functions. Mature trees can spend their entire lives in perpetual drought. It is abundant in full sun and can grow well in 80% shade. It can be used to cure allergies, arthritis, asthma, burns, cancer, cardiovascular disease, chronic fatigue, diabetes, digestive problems, muscle and joint pain, and a whole lot more.[340] (Right) Plumeria: The plumeria tree is known for its fragrant flowers. It requires full sunlight and may require irrigation during drought. But be aware of over watering. Height can vary from a couple feet to up to 30 feet.[341]

All the private rooms have various views of nature. For the two rooms that do not have as much visual access to nature as the other private rooms, it would be recommended that either artwork or live plants be brought into the space depending on the preferences of the individual. Severity of dementia of the resident and safety should also be taken in consideration when deciding between artwork and live plants.

The exterior garden is broken up into nodes along one continuous path (see Figure 8.16). The continuous path allows for easy navigation and the nodes provide semi-private areas. The nodes also offer various types of seating and different types of views. See Figure 8.20, Figure 8.21, Figure 8.22 and Figure 8.23 for examples of different seating nodes and the types of main plants they would contain. There are also various areas where gardening can take place (see Figure 8.15). One area is closer to the building to allow easy access for individuals that have less mobility. Another area is along the first terrace where the bench is absent. This allows the residents to walk right up to where they would garden, which also would be at an elevated level to make it easier versus having to bend down. The different level of

[339] "FoodPlant Tropics: Propagating Hawaiian Plants," accessed September 7, 2016, http://www2.hawaii.edu/~strauch/PlantTropics/PropCanoePlants.html#ohia.
[340] "Canoe Plants of Ancient Hawai`i: NONI," accessed September 7, 2016, http://canoeplants.com/ noni.html.
[341] "Plumeria (National Gardening Association)," accessed September 7, 2016, http://garden.org/ learn/articles/view/2132/.

terraces also allow for a variety of plants and a variety of density (see Figure 8.24 and Figure 8.25). The terraces also follow the natural topography of the land and minimizes the appearance of a large wall, which could agitate seniors by giving them the feeling they are trapped.

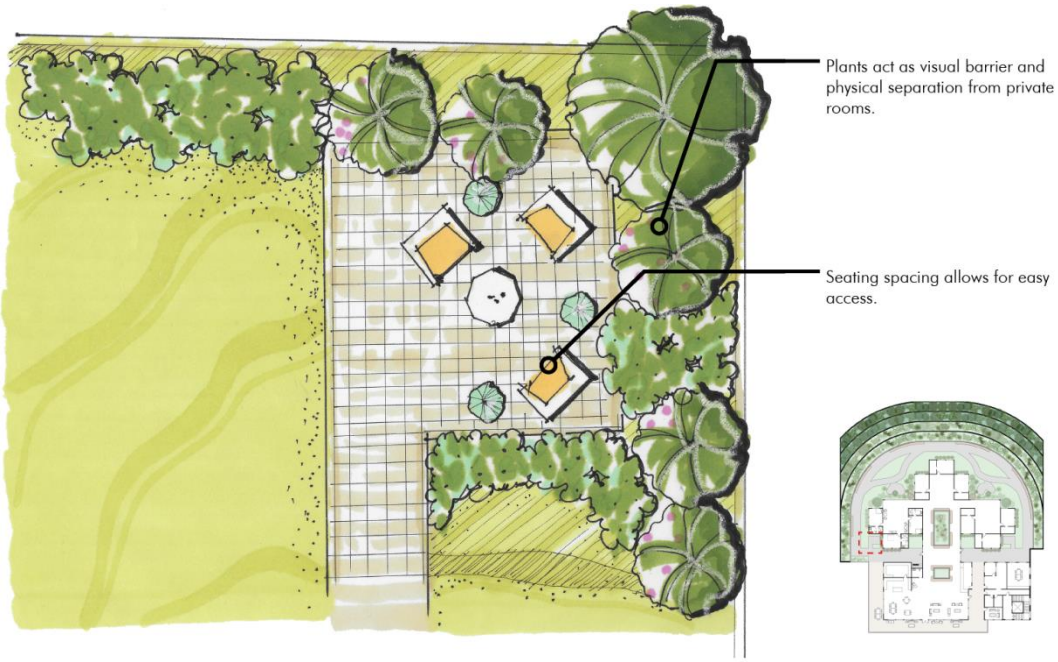


Figure 8.20 Diagram of Sitting Nook 1

Diagram of sitting nook 1 identifying key elements.

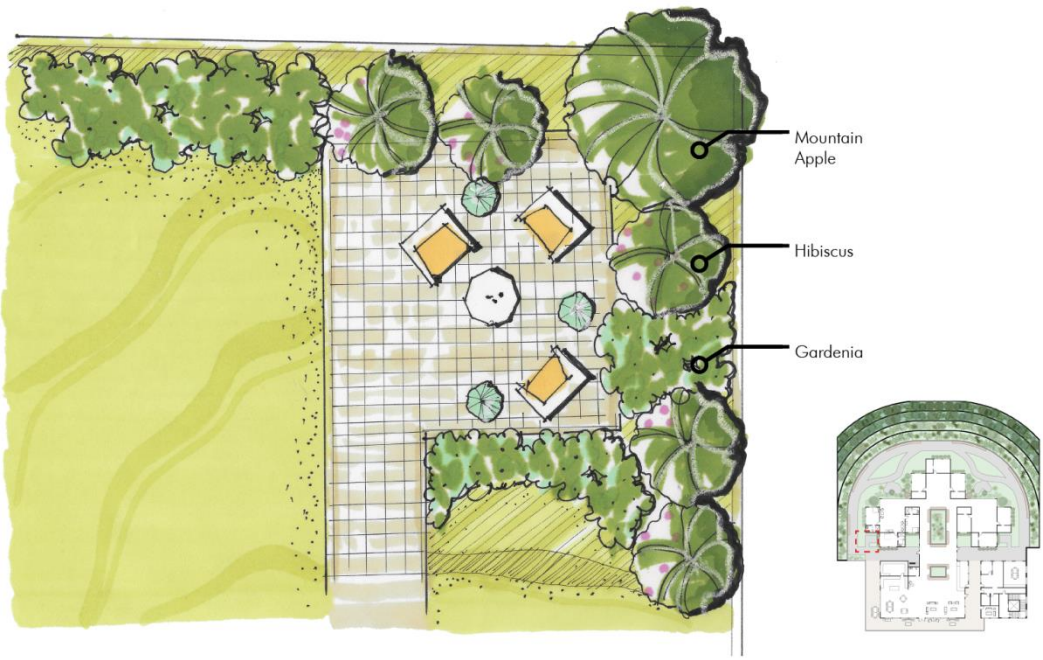


Figure 8.21 Plants of Sitting Nook 1

Typical/main plants in sitting nook 1.

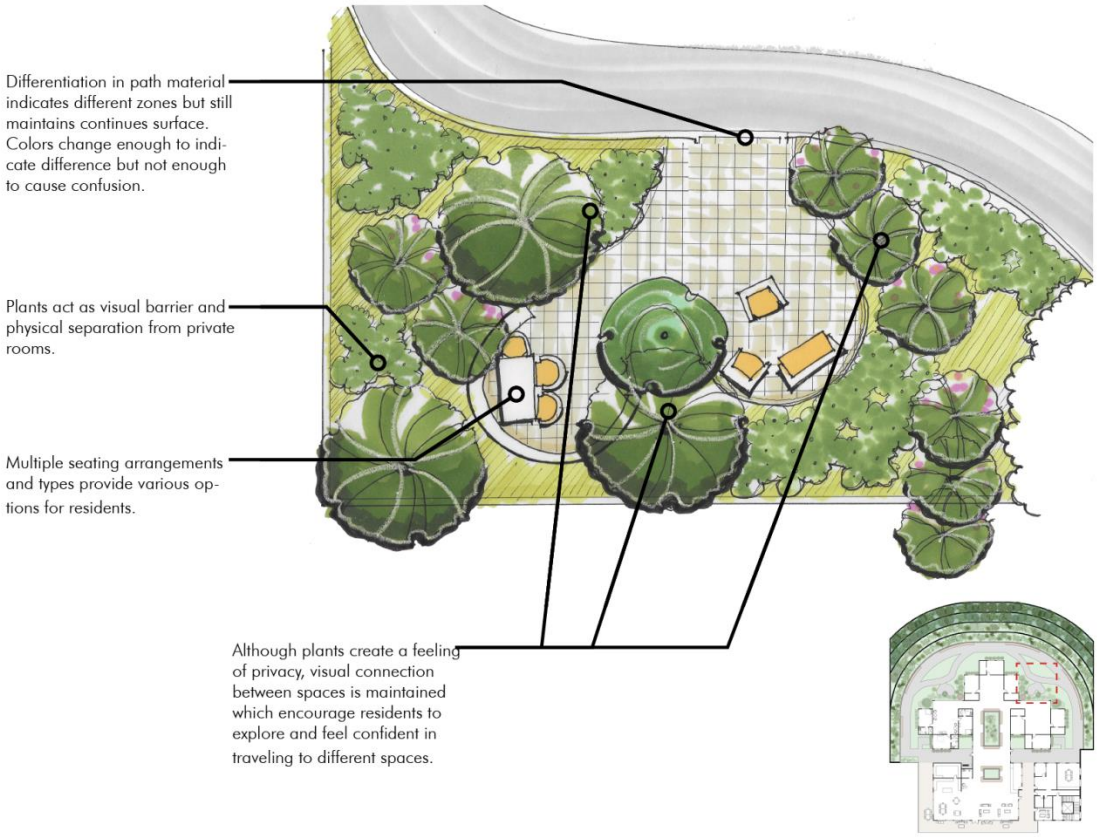


Figure 8.22 Diagram of Sitting Nook 2

Diagram of sitting nook 2 identifying key elements.

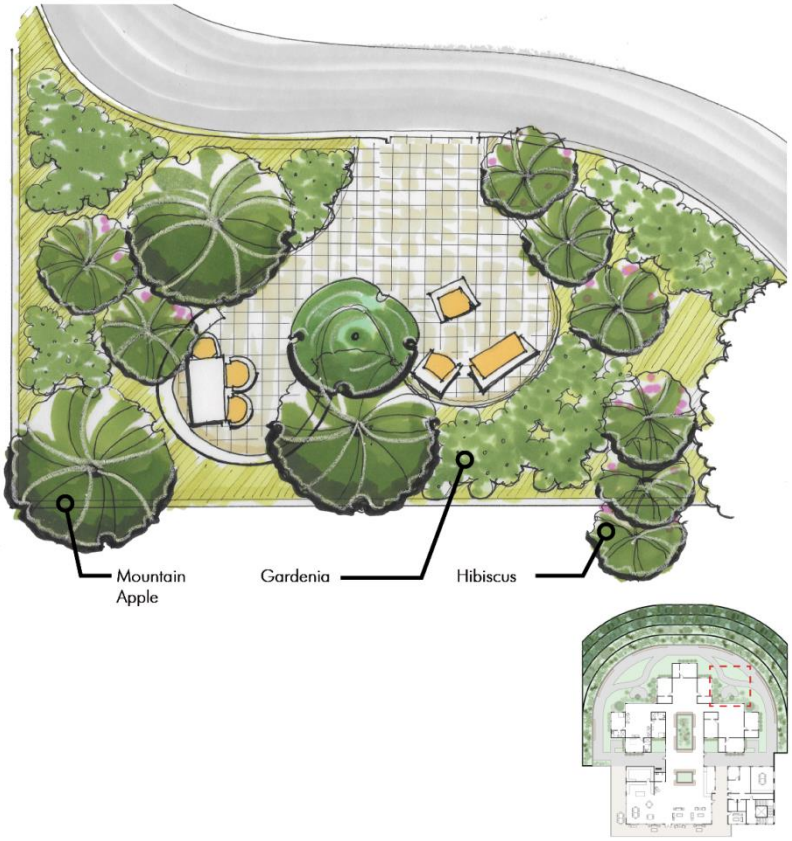


Figure 8.23 Plants of Sitting Nook 2

Typical/main plants in sitting nook 2.

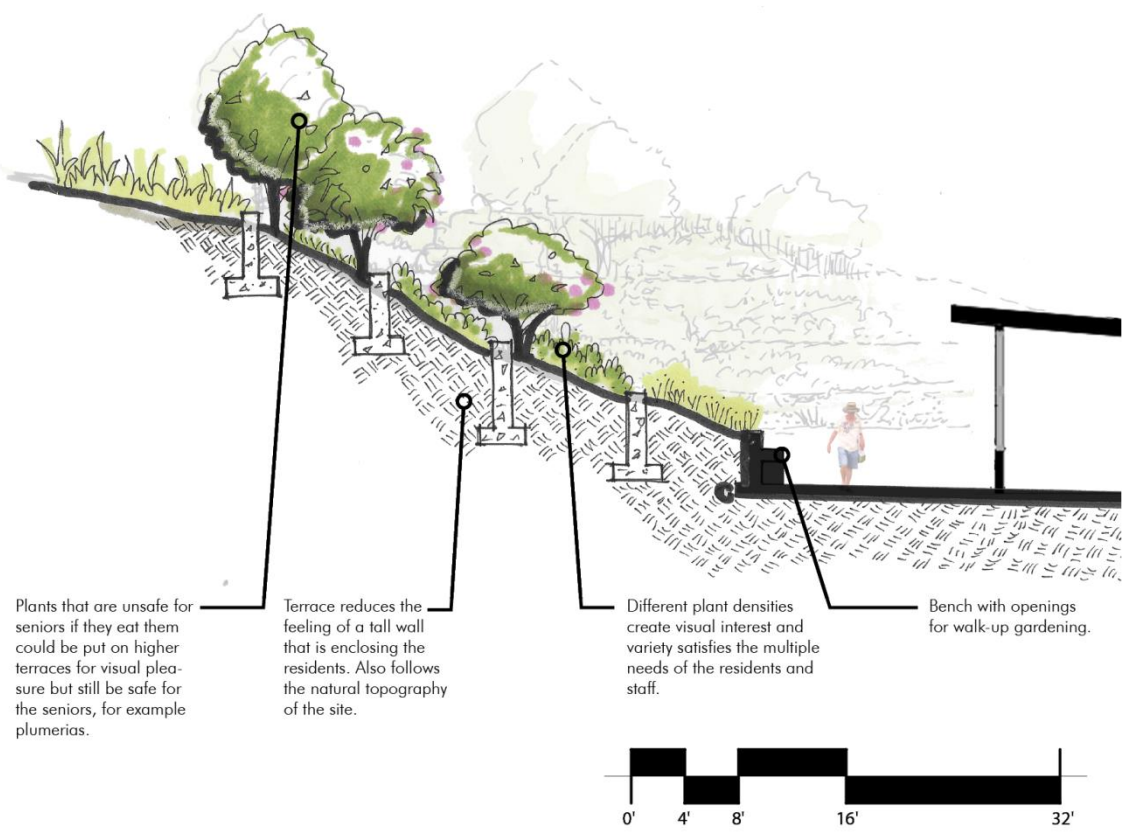


Figure 8.24 East West Section: Garden Terrace Elements

Diagram of different key elements in the garden terrace.

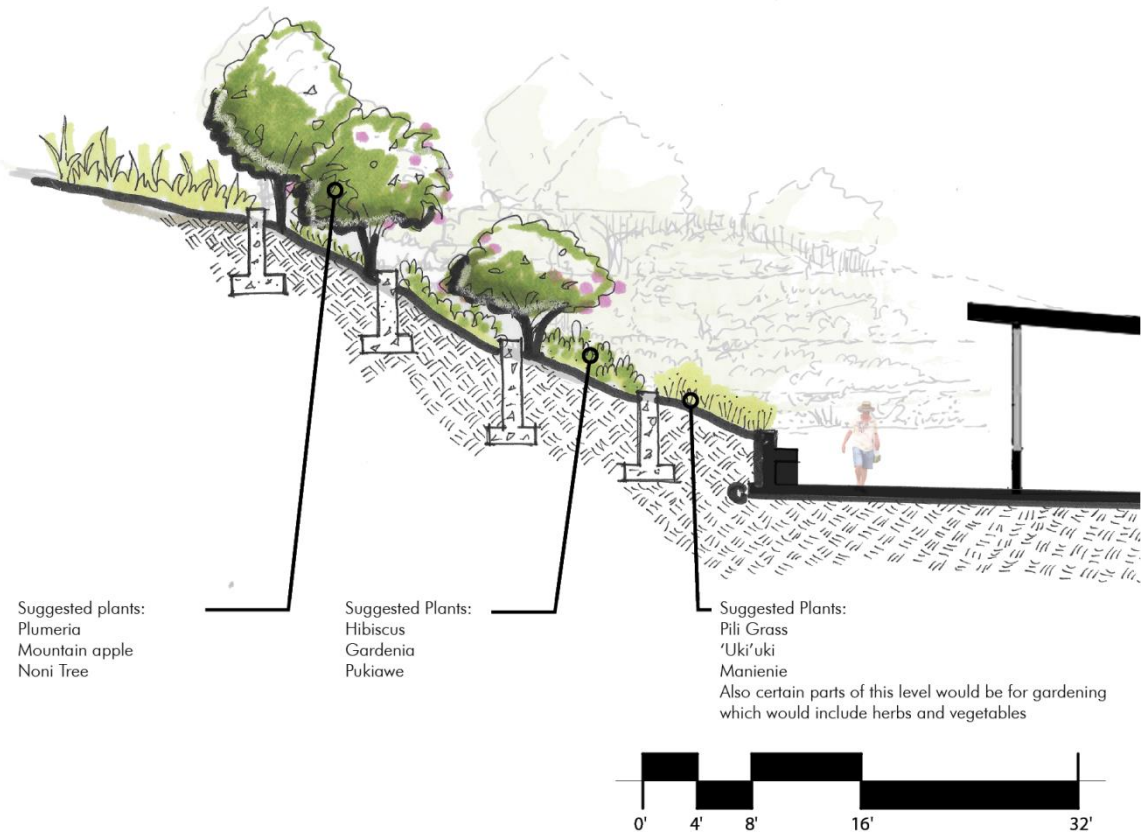


Figure 8.25 East West Section: Garden Terrace Plants

Diagram of suggested plants in the garden terrace.

8.4 Sense of Place

Since the native Hawaiians have a strong connection to land and community it was important to maintain that connection, even though the residents needed to be somewhat restricted in their freedom of leaving the facility for their safety. Hawaiians used both the ocean and the mountains as navigational tools, along with using them to sustain their communities by using the ocean and mountains for their resources, such as food and building materials. The Hawaiians also have a strong connection to lineage and communities. This is why it was critical to maintain a visual connection to the mountains, the ocean, and the community.

When selecting a site sense of place was a key factor. The other was finding an area with a need for a senior care facility focused on dementia care, which was not hard due to the high demand throughout the entire island of Oahu. For the purpose of this dissertation, it was important that the site chosen had a strong

connection to community and nature. Nanakuli was the ideal location because it has a strong Native Hawaiian community, largely due to the fact that a significant part of the neighborhood exists as Native Hawaiian Homestead lands. Also, Nanakuli does not currently have any senior care facilities that focus on dementia care.

Because there is open land to develop in Nanakuli, it creates a nice canvas to be able to implement various design concepts. A key element is that the site can be placed within a vibrant community yet has a sense of serenity and peace by being elevated away from the main traffic avenues. It is a balance of still being connected to the community yet having an escape from over-stimulation.

9.0 CONCLUSION

This dissertation is the accumulation of research, analysis, study, representation, and creation regarding a potential senior care facility focusing on dementia care in Hawaii. The research analysis regarding the increasing senior population and associated impacts and challenges, physically, psychologically, emotionally, seniors face as they age, and how elements of the built environment impact individual and overall well-being.

As the nation's senior population increases, many challenges will arise with one of them being a need for senior care facilities that specialize in dementia care. There is no doubt that Hawaii will feel these impacts, especially since the ratio of those over the age of 65 in relation to the general population of the nation is greater than the nations. With the high cost of living, families will face the challenge of deciding where to place their family members as they age. One option is aging in place. But when a senior needs more care than that which can be given in this type of at-home living situation, families must look to other options such as senior care facilities. One fact is that seniors dealing with elements of dementia require more care and supervision to ensure their respective safety and overall well-being.

Senior requiring more care that the family can provide leads to seniors have to enter a care facility. Often times these facilities provide a safe environment but tend have a more institutional-like atmosphere and do not take into account the overall well-being of the individual. When designing for seniors with dementia, the highest priority is the well-being of each individual. This focus requires understanding how design decisions and each specific element impacts one's quality of life. Each person has his or her unique personality and likes and dislikes, and these specifics are important to understand that some design solutions will be successful and some will not be based on individual preference. There is no magical solution when designing a senior care facility due to the fact that every individual is unique and faces specific ailments and challenges as they age. In addition, as one ages, the progression of ailments, such as dementia or vision, increase at different rates.

One of the larger elements that need to be included in a senior care facility is nature. There have been many studies that have shown that nature has many positive impacts on individuals, such as reducing stress, increasing the healing process, and providing distraction from discomfort. Senior care facilities are starting to incorporate healing gardens, which is a wise and compassionate decision, but

nature definitely needs to be recognized as a major healing element and incorporated throughout the entire facility rather than as an isolated external element. In Hawaii, nature can also be a major element that creates a sense of place through Native Hawaiians deep cultural connection to it. Through specific plant types and different physical connections to various elements (e.g., the mountains and ocean), one is able to maintain that connection even in a senior care facility in modern times.

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