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**MARIA ALEJANDRA ROSSI**

Master of Architecture II

Biophilic Design: Transitional Housing for Homeless Veterans

May 10th, 2017

**BIOPHILIC DESIGN**  
**TRANSITIONAL HOUSING FOR HOMELESS VETERANS**

**MARIA ALEJANDRA ROSSI**

Thesis Submitted to the Faculty of The Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

**Master of Architecture**  
In  
Architecture

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Biophilia, Nature, Veterans, Homeless, Healing, Housing

May 10th, 2017  
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# Biohilic Design: Transitional Housing for Homeless Veterans

Maria Alejandra Rossi

## **Abstract**

Biophilia: the close relationship between architecture and nature. In my thesis, I look to embrace that relationship by designing housing for homeless veterans. For veterans, this connection helps the space become a place of healing and reconnection to nature, which is proven to have a positive impact in our health and wellness. The building becomes a container of nature, where the presence of green features and natural elements are present from the moment you come into the building, the choice of materials, the different activities and position of the spaces to welcome the most amount of natural elements into the building. This creates an indoor/outdoor environment where the resident feels secure by the walls but also welcome by nature.

The building captures nature through different activities and moments, where both nature and architecture work together to create a space of healing and peace, a place of freedom, but at the same time a place of security and stability. An oasis in the city, which helps homeless veterans start over and create a space they can call home. The building is equipped to offer different activities and purposes not only for the residents, but also for the employees and visitors. The building becomes a welcoming space for the neighbors but also for nature. The building welcomes different species and promotes the creation of different habitats that can serve the growth of the ecosystem.

Biohilic Design: Transitional Housing for Homeless Veterans

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## General Audience Abstract

### **How can Architecture and Nature work together to create healing spaces?**

The purpose of this thesis was to study the relationship between nature and architecture. Today, rapid growth in cities and urbanization has caused these two to be seen as separate or different, creating spaces that do not promote human well-being and healthy spaces. When in fact, when both nature & architecture work together, it creates the best and healthiest spaces for human health, performance and well-being.

In this project, I focused on creating healing spaces for homeless veterans; a group that is increasing in number in large cities such as Washington D.C. Veterans are falling into homelessness due to Post-traumatic stress disorder, making it hard for them to adapt back into their normal life. Many of them live in poor conditions on the street, shelters and cars; spaces that are not suitable for people living with this disorder.

Instead, I am proposing a transitional housing project where they will be trained, offered job opportunities, and a space where they will be in constant presence of nature from the moment they walk into the building until they get to their room. This is because biophilic design has proven to improve the performance, quality of life, and health of humans. The residents of this project will have an efficient building with communal spaces, spaces for active and passive recreation, and different connections to nature to improve and expedite their healing.

***“Biophilia, if it exists, and I believe it exists, is the innately emotional affiliation of human beings to other living organisms.” -E. O. Wilson***

## ACKNOWLEDGMENTS

This project would have not been possible without the help and support from the following people:

**To God**, the greatest Architect and maker of the world. Miguel de Cervantes wrote that not even a leaf from a tree moves if its not His will and I believe so. Thank you for all the blessings and gifts; The greatest strength, joy and peace comes from above.

**To my grandparents**; the people I love the most. The four of you have taught me the greatest lessons and shown me the purest love. Without you, I would not have become the woman that I am today. Thank for your wise advice and unconditional love. I love you with all my heart.

**To my parents**, mom and dad you are the greatest warriors I know. I have seen you two fight and never give up. Thank you for your love and support, and for always pushing me to do and be a better human being. I could not have asked for better parents.

**To my sister**, my greatest supporter. Thank for your love and all the happiness you bring to my life. I know that I could always count on you, and you can always count on me.

**To my best friend**, Nadia, who despite the distance was there to motivate me and push me to accomplish this. Thank your for your love and support, your friendship is the most wonderful gift.

**To my spiritual parents**, Pastor Tommy and Ivette Mandes. Thank you for your guidance, knowledge, and support throughout all these years. Thank you for loving and believing in me and my family.

**To my committee**; Susan, Paul and Marcia. Thank you for your passion and dedication to teaching and guiding me. Without your advice, challenge, and encouragement this project would not be what it is: a project that I am proud of.

**To my classmates**, thank you for the great memories. I am very thankful for the friendships I formed in these past two years.

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**“The notion that nature was important to healing had been around for thousands of years going back to classical times, when temples of Asclepius, the greek God of healing, were built far from towns, high up on hilltops overlooking the sea.” -Esther M. Sternberg, *Healing Spaces*<sup>1</sup>**



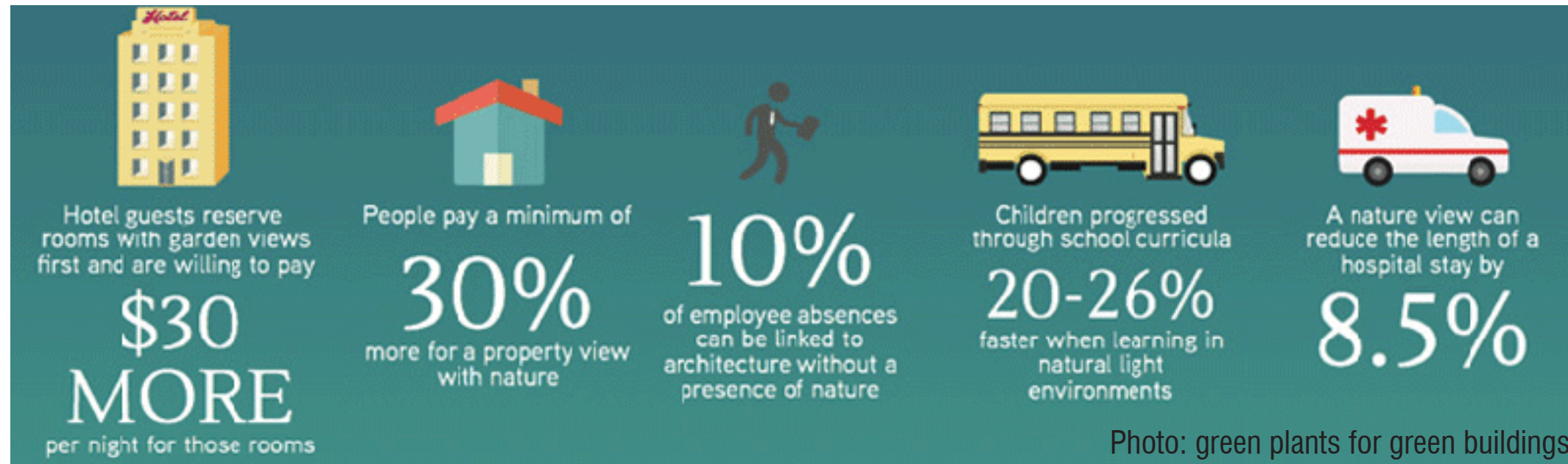
Back in ancient times, people who were sick would visit these temples which were far from the noise and chaos of the towns. These temples had magnificent views, fresh air and were surrounded by beautiful landscape. Here, people were treated with a good diet, pure water, music, sleep, social interaction, and prayer. During the 19th century, hospitals were built with large windows and even skylights. Clinics and hospital were designed to take maximum advantage of the natural light, with windows facing south and solariums. The natural light and connection with the exterior would help people heal faster.

This is how healing spaces were designed in the past, what are we doing now?

## **Are we now building to optimize the use of technology rather than improving human’s health & well-being?**

Dr. Esther Sternberg, on her book *Healing Spaces* talks about designing successful healing spaces. Here, she focuses on the relationship between nature & architecture and how this can improve health and well-being. Today, we spent most of our time inside buildings so we need to create positive and healthy spaces for humans. On her book she describes the connection between indoor & outdoor environments, how our senses respond to our environment, and the importance of contrast in architecture; just to name a few. This book helped me and guided me throughout my decisions in this project to create an environment that was suitable for people dealing with Post-traumatic stress disorder.

# Biophilia & Its Benefits



“**Biophilic Design** is an innovative way of designing the places where we live, work, and learn. We need nature in a deep and fundamental fashion, but we have often designed our cities and suburbs in ways that both degrade the environment and alienate us from nature.” -Biophilicdesign.net <sup>2</sup>



Photos: Terrapin Bright Green LLC

“Biophilic design can reduce stress, improve cognitive function and creativity, improve our well-being & expedite healing; as the world population continues to urbanize these qualities are ever more important.” -Terrapin Bright Green LLC <sup>3</sup>



## Homeless Veterans & PTSD

Veterans are more likely to experience homelessness than any other American, in part because of their high rate of Post-traumatic Stress Disorder, physical injuries, difficulty reintegrating into civilian life & employment.

1 in 3 returning troops are being diagnosed with serious PTSD... only 40% of them will seek help.

50%

**Suffer from mental illness**

70%

**Suffer from substance abuse**

30%

**Are unemployed**

### **Symptoms of PTSD:**

- Difficulty Sleeping
- Numb/Lose of Interest
- Stress & Anxiety
- Angry Outbursts
- Trouble Concentrating
- Emotionally Cut off from Others
- Feeling Upset
- Flasbacks/Nightmares
- Isolation

\*Information from National coalition for homeless veterans <sup>4</sup>

## Program: Transitional Housing

**Transitional Housing:** A project that is designed to provide housing & supportive services to homeless persons to facilitate movement to independent living. The housing is short term, typically from 6 months to up to 2 years.

### Support Spaces

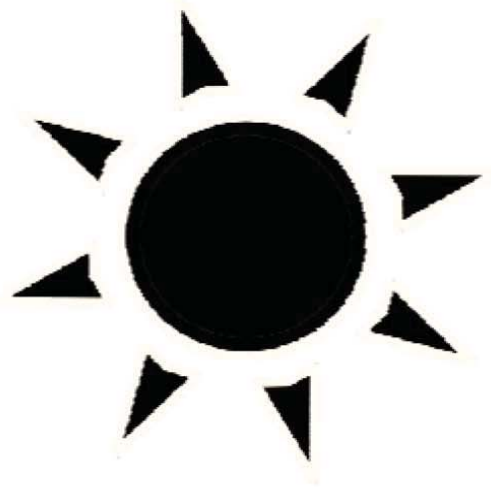
Offices  
Classrooms  
Counseling  
Job Opportunities

### Communal Spaces

Laundry Rooms  
Recreational Spaces  
Community Rooms  
Library

### Individual Units

Kitchen  
Living  
Eating  
Bathing



### Natural Light

By using large windows, glass and translucent materials to allow for nice views as well as natural light to come in the building.



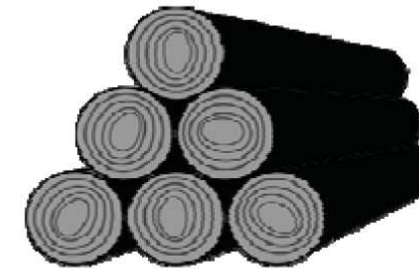
### Ventilation

Fresh air to come into the building through the units and the sunroom that allow for air movement.



### Vegetation

Use landscape to create communal spaces, activities and recreation. Presence of green features from the moment you come in the building until you reach your unit.



### Materiality

Use of organic materials and work with color and contrast

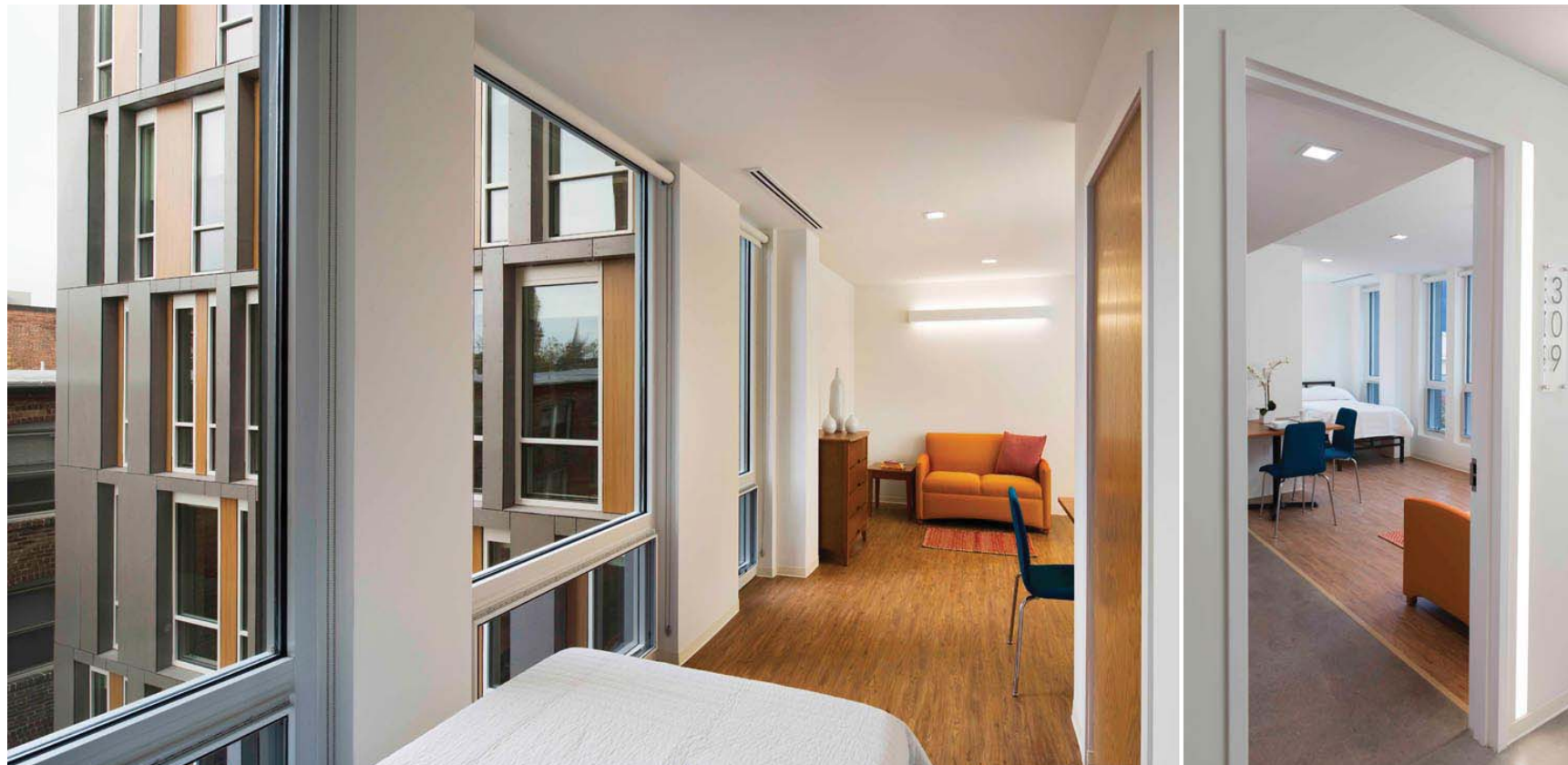


### Quiet Spaces

Keep sound away is important for people with PTSD because this can cause stress in them.

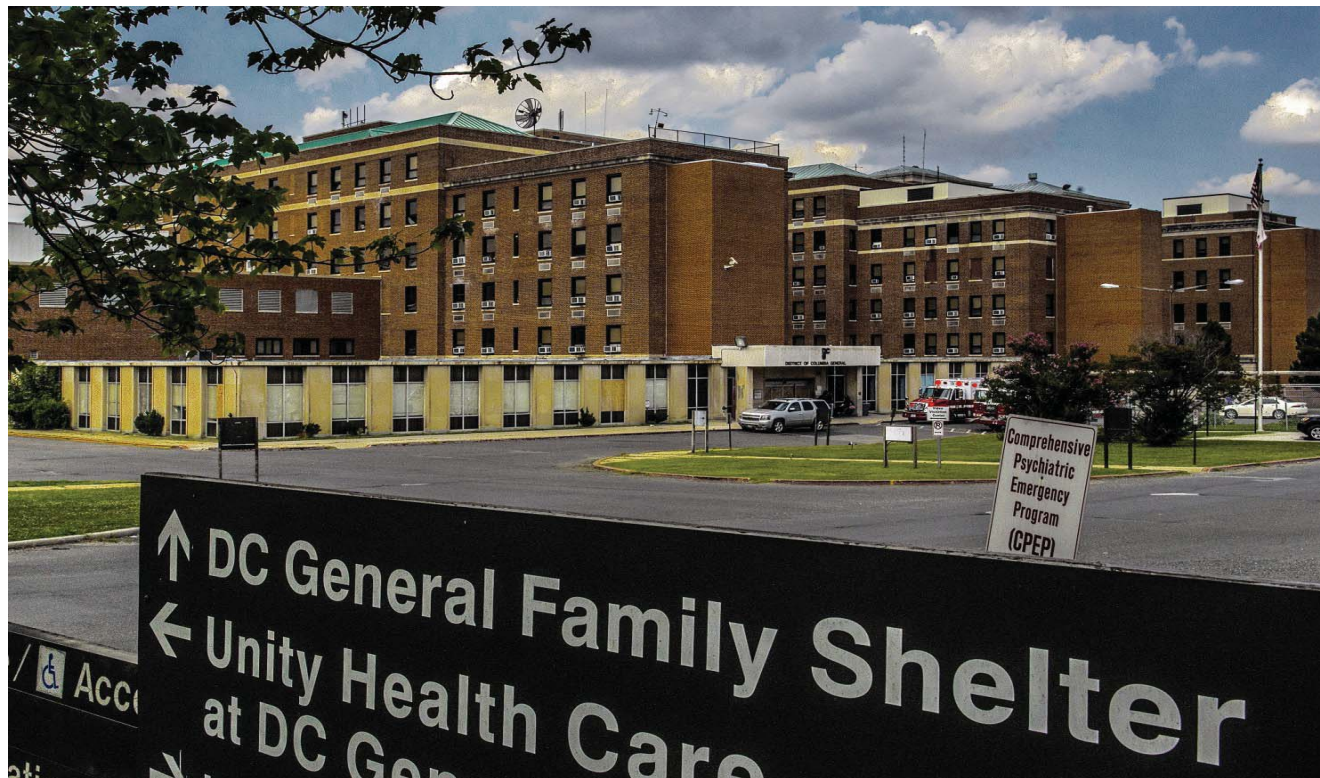
## Precedent

### La Casa Supportive Housing at Columbia Heights Washington, D.C.



La Casa is a great example of a successful housing project in the district, and one that stands out because it meets a greater design quality than most homeless housing projects. The project holds 40 single units with spaces for different activities for the user. The project holds a welcoming lobby, classrooms, laundry rooms, a rooftop garden and spaces for the employees. The project holds LEED Gold standing: it is designed to maximize the amount of natural light that goes into the units; with its large windows the user gets enough light for their daily activities. The building is designed with seven units on each floor, including one ADA unit. This project helped me understand the program and its requirements, and take it to another level. Each unit holds spaces for sleeping, living, cooking and bathing which is what I designated also in my project. The materials used also gave me an understanding on how materiality works along with the program. Besides its design, the activities that La Casa offers were a reference for me to develop different activities on my project.

## Homelessness in DC



Homelessness is a problem in large cities like DC, which lacks of affordable housing. The photos show the current conditions at the DC General Family Shelter, the biggest shelter in the district which has been approved to close down because the building does not meet the requirements for a dignified life; the building is in decay, has many flaws and its not well maintained.



Photo by NBC Washington

**The City's Proposal:** DC Mayor Bowser announced that 8 new shelters would be built around the District. The map shows the proposed sites, this was a good tool for me to pick my site located at Idaho Ave NW. The site is located at the Cathedral Heights neighborhood, a place where suburbs & city life meet. This neighborhood has a good balance of nature and city life, with surrounding parks and amenities at a walking distance. The lot size was also a determining factor, this site had enough spaces for the desired program and the proposed number of units.



## **Area Analysis:**

Address: 3320 Idaho Ave NW Washington, DC

Location: Cathedral Heights Neighborhood

Transportation: 15 min. walk from Cleveland Park & Tenleytown-AU metro station, bus stops & bike share station a block away from site.

Nearby Parks: Glover Park, Melvin Hazen Park & Bryce Park

Major Institutions: Washington National Cathedral, Washington Hebrew Congregation, Sidwell Friends School

Other: Area is mostly residential with single homes and apartments, commercial/mixed use a block away from site with a variety of retail stores and restaurants.

The site is located near American University, the vibrant neighborhood of Tenleytown, National Zoo, and Washington National Cathedral which creates a good mix of residents from all ages and backgrounds, and different activities close to the site. (see previous page)

## **Site Analysis:**

The site currently holds the 2nd District Station with parking spaces, a small gas station for the use of police cars, and storage spaces.

The rest of the block holds a Community Garden where residents can rent/buy spaces to harvest, a playground, a dog park, and two tennis courts.

The site provides many activities for the residents of my project to gather and share with the rest of the community. The site is located in the perfect location, where it is a block away from retail stores and restaurants, but also in a quiet and peaceful neighborhood surrounded by nature. Just behind the site, the gardens create this “oasis in the city” where residents are interacting with nature. I decided to bring in the gardens into my project, and use it not only as a landscape feature, but also as a job opportunity for the residents & the cafe. The rest of the site is surrounded by singles homes of different sizes and apartment buildings that bring people into the different activities that the block has to offer for all ages. (see next page for images)



**DOG PARK**



**PLAYGROUND**



**TENNIS COURTS**



**COMMUNITY GARDEN**



**HOMES**



**POLICE STATION 10**



## Site Conditions

- Site is owned by the city and it currently holds the 2nd District Police Station.
- Zoning Details: RA-1
- Permits low to moderate-density development
- Max. Height Allowed: 40 ft.
- Max. Stories: 3
- Area: 193, 747 sq. ft.

- No connectivity with rest of the site/block
- Retaining wall surrounds 3 sides of the site
- Stair located on right side for pedestrian access
- Site holds a police station, gas station, and small storage buildings.
- 10' elevation change (retaining wall takes care of it)

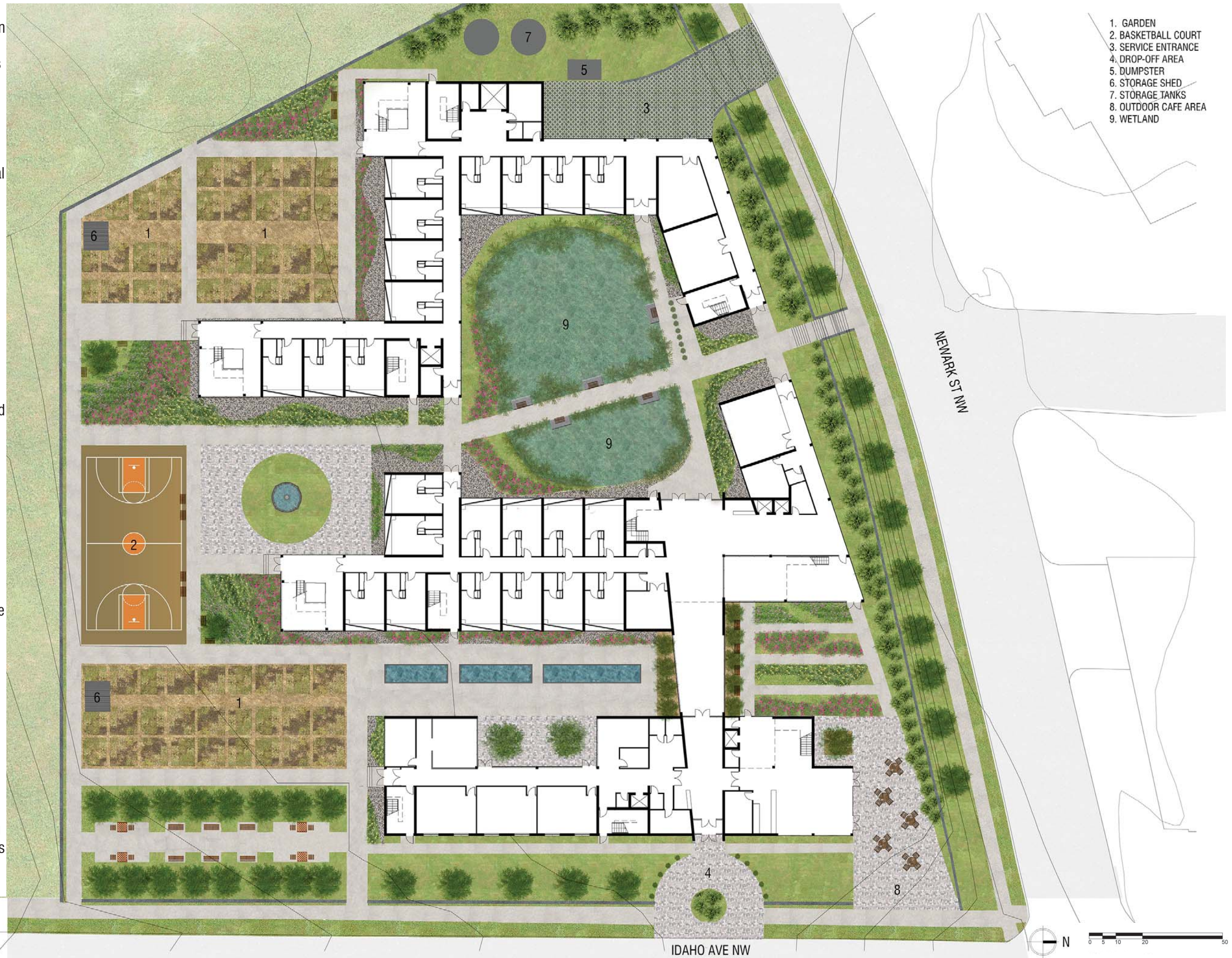


Site entrance is located on Idaho Ave with a drop-off area, which is the main road on site. The project has various entrances from the front side; besides the main entrance there is also a cafe entrance, and two secondary entrances to the active areas on site for the neighbors to access. Newark Street is a secondary street and mostly dedicated to the residential apartments and parks. Facing Newark Street there is a pedestrian entrance Stairway, and a service entrance for cars, emergencies and trash pick-up. This side of the site is where the existing retaining wall is located to hold the elevation change, to cover the wall and control sound coming in, I decided to use the landscape as a "green wall."

The main feature on site is the wetland which takes care of the water management and captures the rainwater that is filtered and later stored on tanks to be used to water the landscape. The wetland also brings other species into the site, acting as a small ecosystem.

The gardens dedicated for harvesting are situated along the south side of the site. Each resident would take care of a space in the garden and harvest different vegetables, herbs and other plants of their choice. These can be used as a profit for the residents to sell in small, improvised farmer's market on site or to be used by the cafe, which also provides job opportunities for the residents.

Other main features/activities on site are: basketball court, lawn spaces for passive recreation, spaces for playing chess and sitting areas, water features & fountain, and gardens with native flowers and plants.



- 1. GARDEN
- 2. BASKETBALL COURT
- 3. SERVICE ENTRANCE
- 4. DROP-OFF AREA
- 5. DUMPSTER
- 6. STORAGE SHED
- 7. STORAGE TANKS
- 8. OUTDOOR CAFE AREA
- 9. WETLAND

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 SITE WITH GROUND FLOOR PLAN

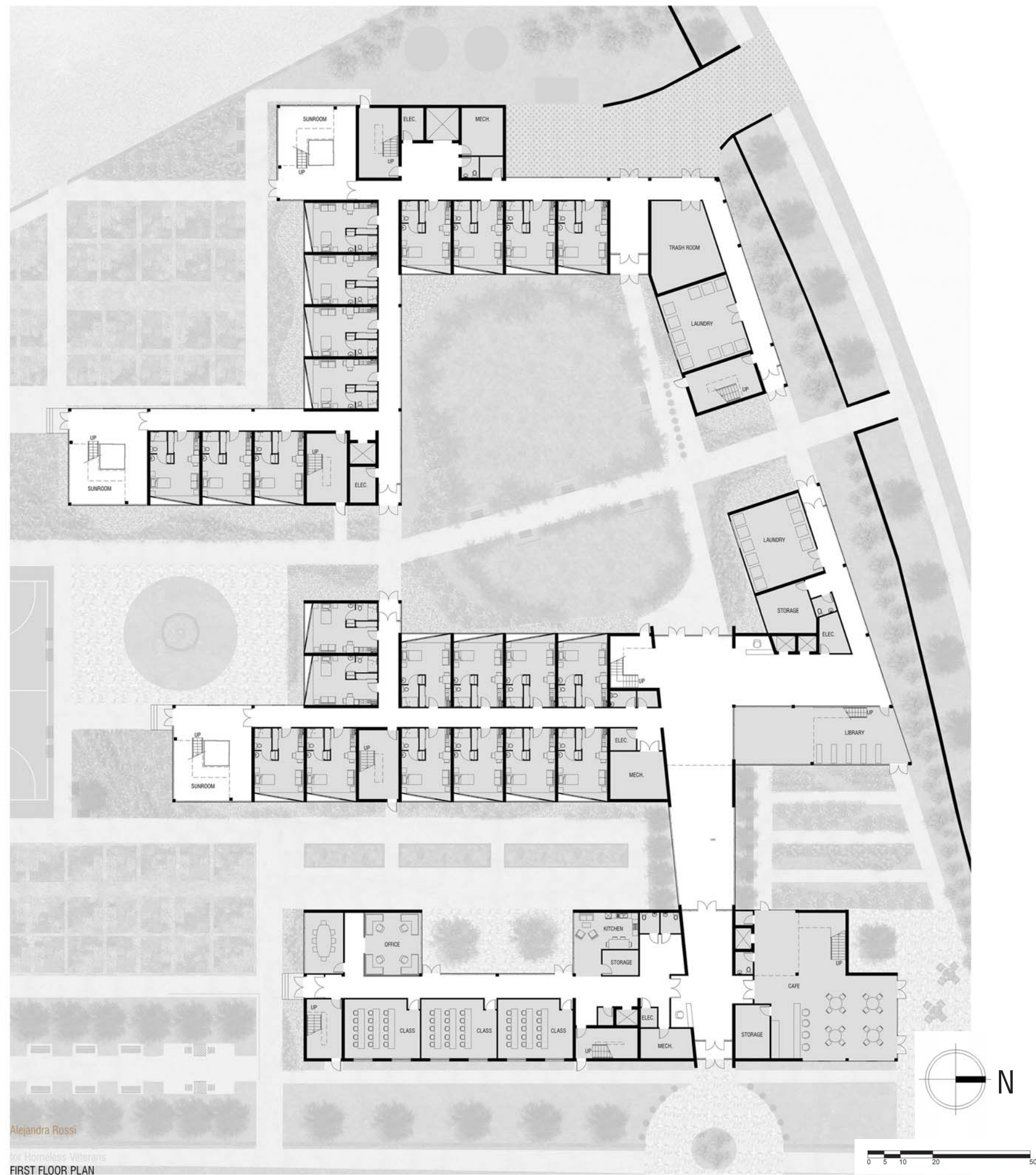
The first floor starts out with the main building on the east side of the site along Idaho Ave; this is where all the offices, classrooms and cafe are placed to be the first thing that users have access to. The reception welcomes the guests who move along the extended walkway to the residential areas and then to their individual units. They are first welcomed by the library, which is a two story area for residents to read and study.

On the north side, facing Newark Street is the service wing. This is where the laundry rooms, storages and trash room are located facing the retaining wall. The rest of the space is composed of twenty-three units with private gardens. Each unit's front wall is rotated at an angle to get the most natural light. Each wing has fire stairs and elevators for the use of the residents.

On the south side, at the end of each hall is where the sunrooms are located. These are two-story spaces that work as interior gardens that can be used during the winter, or any other day where outside activity would be limited. These are multipurpose spaces that serve as winter garden, communal area, or just a space to enjoy the exterior view.

On the west side, or the back side, is where the mechanical and electrical room is located. Behind these, outside, are the tanks for water storage.

As a whole, the design creates courtyards where nature would take place to work along the interior space and give residents another option or reason to be outside.

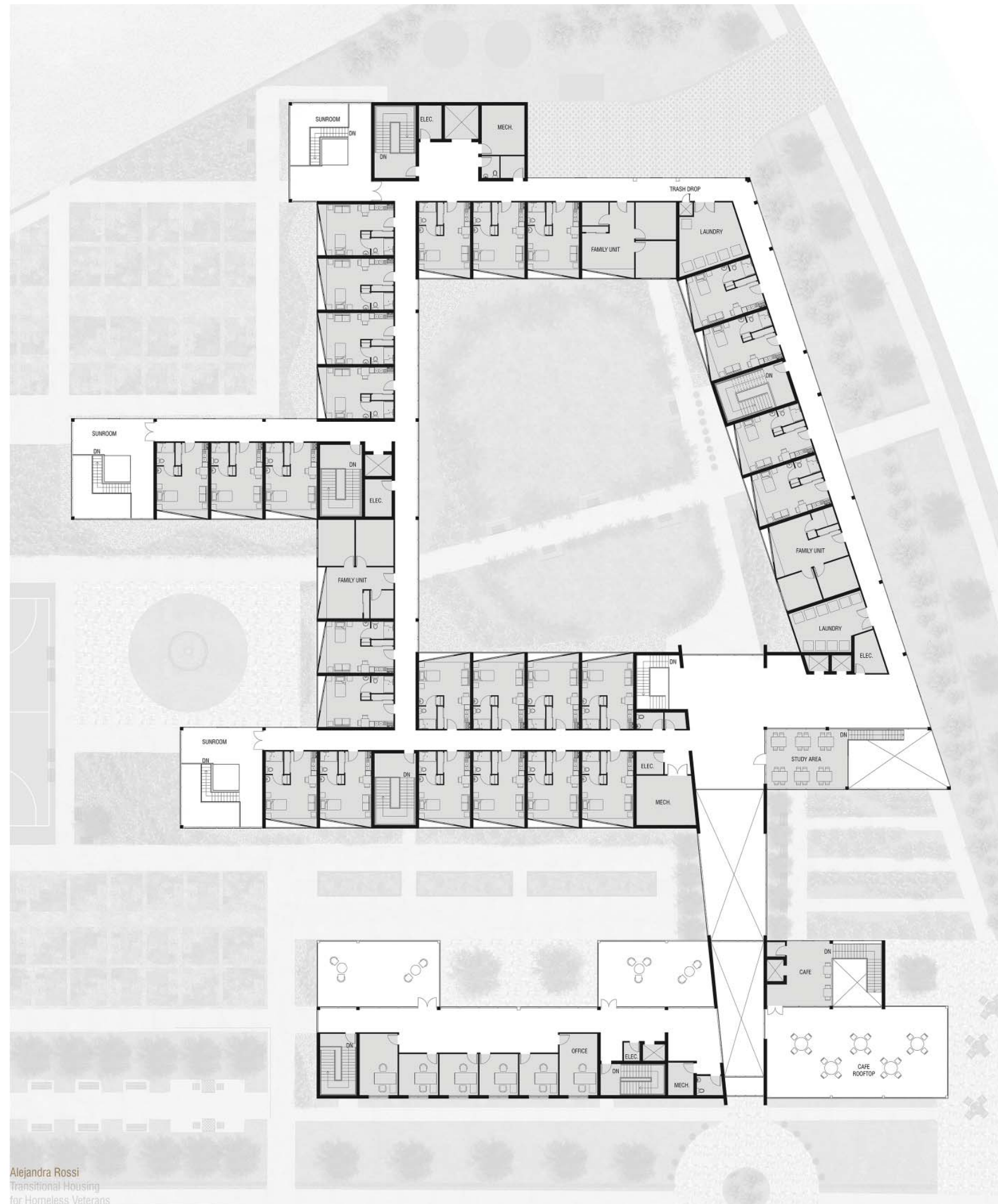


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FIRST FLOOR PLAN

The second floor continues with the main administration building on the east side of the site where the rest of the offices are located for employees. This area also has two rooftop areas where employees can use to have lunch or enjoy the view on their free time. There is also a rooftop area for the cafe on the north side of the main building, where visitors can go up and enjoy a nice view.

On this floor, there are twenty-six single units and three family units. These family units are for female veterans with children, or fathers with children. It was important to provide this option for homeless veterans with families because not all homeless veterans are single and male, although there are very few female veterans with children.

This floor also has two laundry rooms on to serve the units, storage spaces and access to the sunrooms for the residents. Also on this floor, you can access the library.





MAIN ENTRANCE: FACING IDAHO AVE NW

The main entrance elevation shows all the variety of materials that are being used in the building. Glass maximizes the views and natural light on the sunrooms, the use of wood cladding on the units to create a contrast with the white stucco that is present on the rest of the building. Colors are used to create a contrast, while using a color like orange promotes enthusiasm and warmth.

The cafe has polycarbonate wall panels that create more privacy, but still provide for natural light to come in the space.

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EAST ELEVATION





## SERVICE ENTRANCE

The back elevation is mostly used for services, including the mechanical room and storage tanks (shown on site plan), both located along this facade. This is why this elevation is composed mostly of translucent polycarbonate wall panels, which offers good insulating value and resistance while letting natural light to come into the interior of the building. The columns on the inside of the building are painted orange and can be seen through the wall panels.

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WEST ELEVATION





#### FACING NEWARK ST NW

This elevation faces Newark street, where the residential apartments are located, but this is also where the retaining wall is located. On the interior, this part of the building holds all the service needs for the residents such as laundry rooms, trash room and storage spaces. The translucent polycarbonate wall panels allow for both privacy and natural light into hallways and cafe. Windows are placed in between the columns, which are painted orange to be seen through the wall panels, as well as the main hallway, which is painted orange to stand out in all elevations. From here, you can walk into the main interior courtyard, or go up to street level using the stairway.

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NORTH ELEVATION



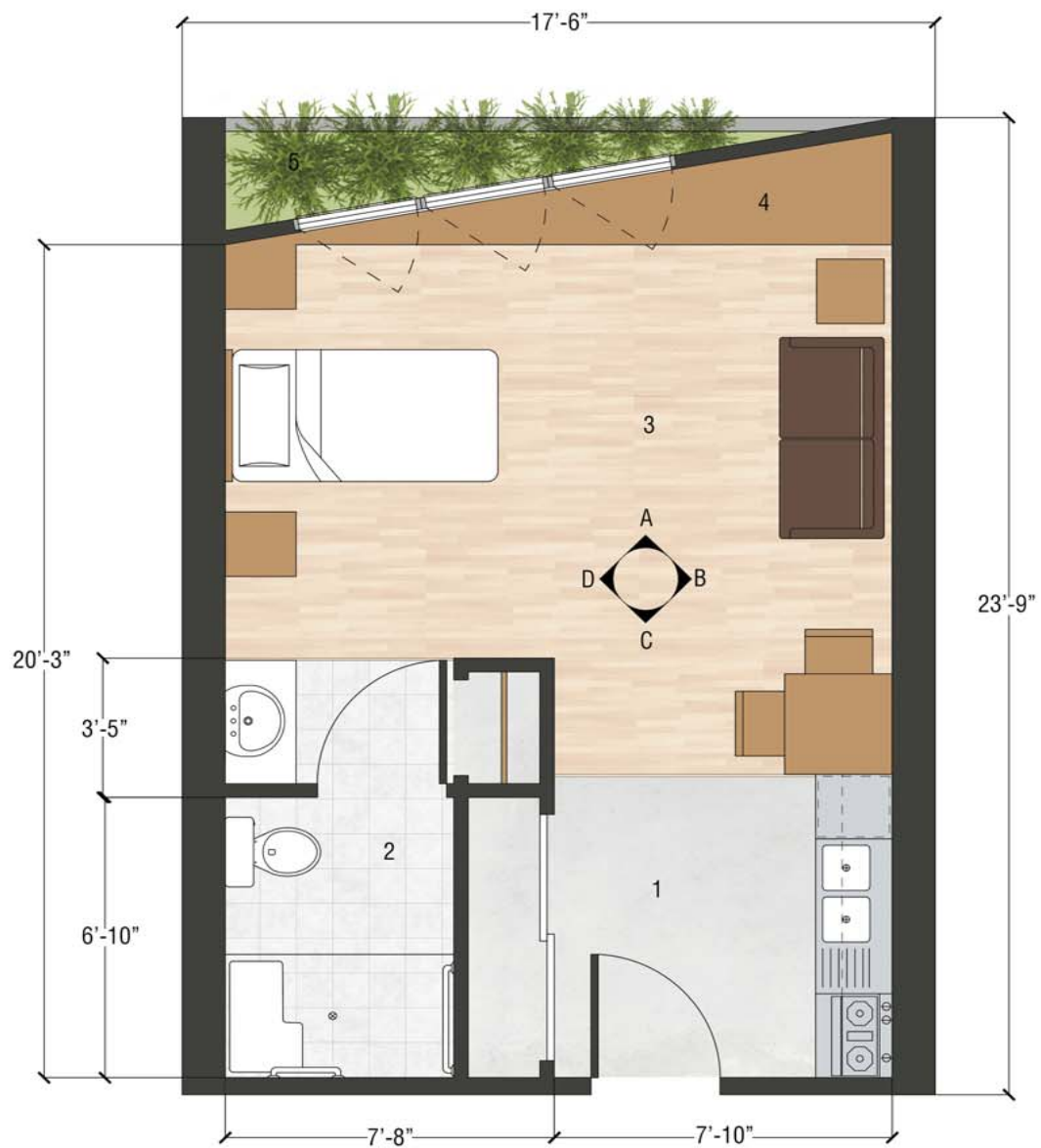


SUNROOMS & UNITS FACING SOUTH TO GET MOST OF DAYLIGHT

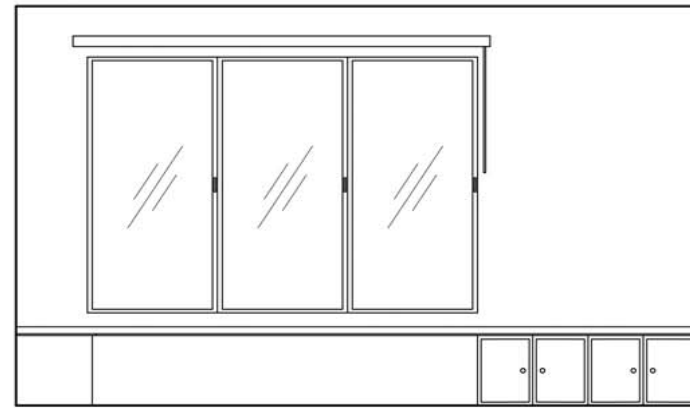
The south elevation is where the sunrooms are located as well as some of the units. Here we can see the contrast of the wood cladding on the exterior of the units, the stucco on the exterior wall and the green of the private gardens. The sunrooms are built with bird safe glass to protect the different species of birds. From here you can enter the main interior courtyard where the wetland is located.

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SOUTH ELEVATION

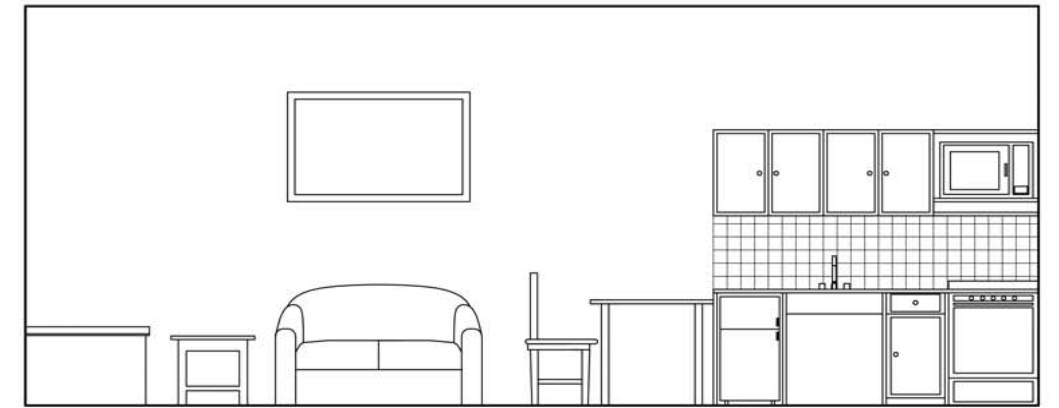




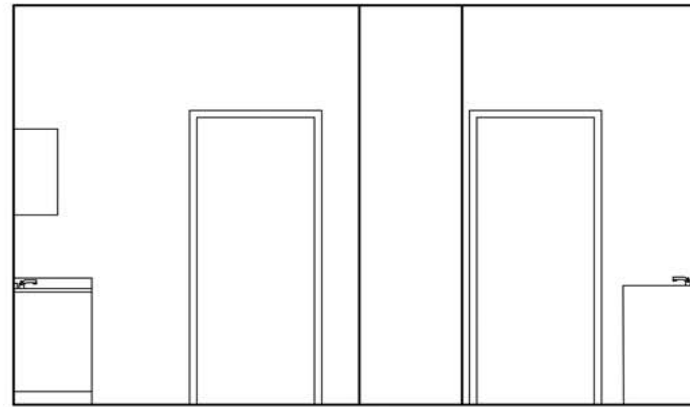
- 1. POLISHED CONCRETE ON KITCHEN AREA
- 2. TILES ON BATHROOM AREA
- 3. WOOD FLOOR ON SLEEPING AREA
- 4. STORAGE/SEATING
- 5. GARDEN



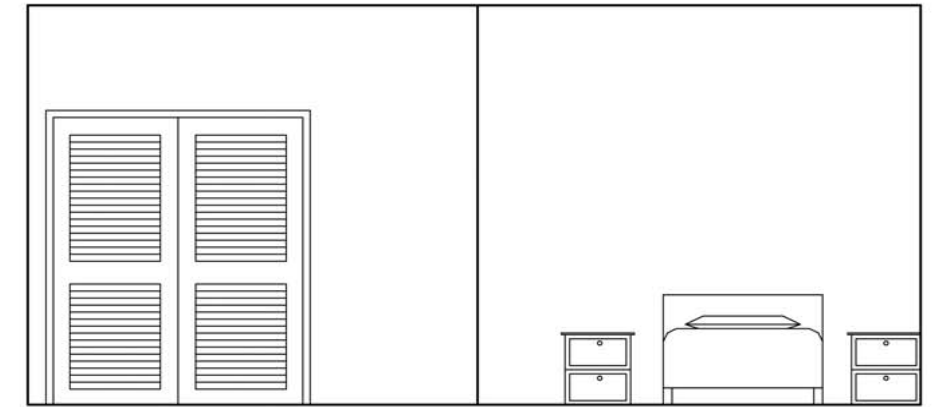
ELEVATION A



ELEVATION B



ELEVATION C



ELEVATION D



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UNIT

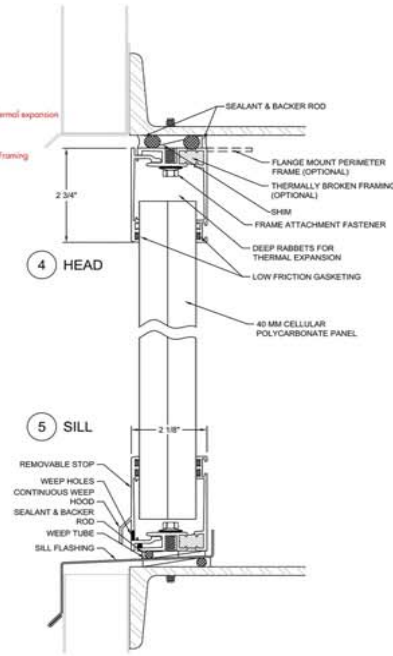


CASEMENT WINDOWS OPEN INWARD TO ALLOW RESIDENT TO ACCESS ITS GARDEN



EACH UNIT HAS A GARDEN WHICH IS TAKEN CARE BY THE UNIT'S RESIDENT

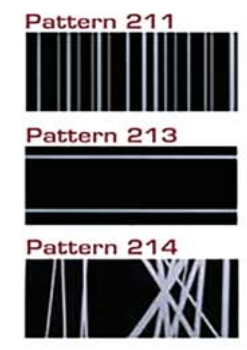




**POLYCARBONATE WALL**

TRANSLUCENT POLYCARBONATE WALL PANELS OFFER BENEFITS INCLUDING ENERGY SAVING VIA DAYLIGHTING, OUTSTANDING INSULATING VALUE, HIGH-IMPACT RESISTANCE AND ELIMINATION OF LEAK-PRONE HORIZONTAL JOINTS. LEED CREDITS ARE AVAILABLE FOR 100% RECYCLABLE POLYCARBONATE & ALUMINUM FRAMING.

Acid-etched glass *AviProtek* Pattern on position 1:



Low-e coating on position 2:



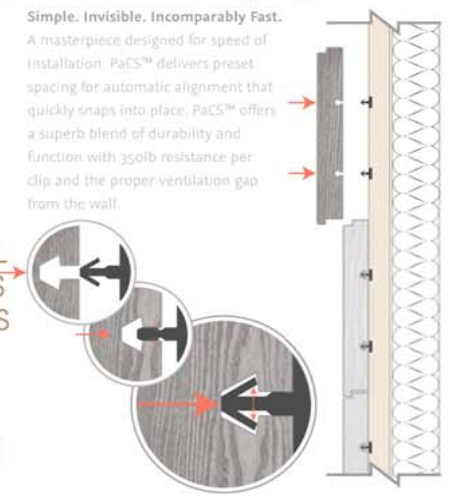
LOW-E COATED ACID-ETCHED BIRD SAFE GLASS. EXCELLENT THREAT FACTOR, EFFECTIVE FROM BOTH A DIRECT OR ANGLED VIEW, NO IMPACT ON LIGHT TRANSMISSION, RESISTANCE IS EQUIVALENT TO NORMAL GLASS. THIS PRODUCTS HELPS ARCHITECTS MEET LEED CREDITS AND A SUSTAINABLE DESIGN WHILE PROTECTING SPECIES

**BIRD FRIENDLY GLASS**



Press and Click Strip cladding system

Simple. Invisible. Incomparably Fast. A masterpiece designed for speed of installation. PaCS™ delivers preset spacing for automatic alignment that quickly snaps into place. PaCS™ offers a superb blend of durability and function with 350lb resistance per clip and the proper ventilation gap from the wall.

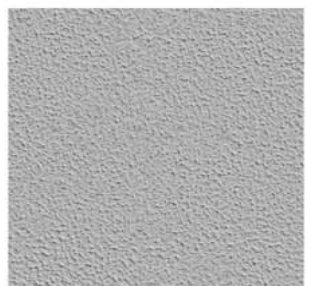


FINISHES LIKE ANY OTHER NATURAL WOOD PRODUCT. THIS CLADDING IS TO BE USED OUTSIDE OF THE UNIT'S WINDOWS, GIVING NATURAL VARIATIONS OF WOOD THAT CONTRAST WITH THE REST OF THE BUILDING AND THE GARDENS. THIS PRODUCT REDUCES COMBUSTIBILITY, IS PAINTABLE, AND HAS A STRONG DURABILITY.

**WOOD CLADDING**



FINISH THE CONCRETE CONSTRUCTION WITH STUCCO AND PAINT. COLOR CAN BE USE AS A GREAT PSYCHOLOGICAL TOOL FOR DEALING WITH POST-TRAUMATIC STRESS DISORDER AND IMPROVING HUMAN BEHAVIOUR. IN PSYCHOLOGY, ORANGE IS PERCEIVED AS THE COLOR OF SOCIAL COMMUNICATION AND OPTIMISM.



**STUCCO & COLOR**



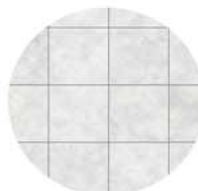
LIVING

BATHING

EATING



WOOD FLOOR



TILES



POLISHED CONCRETE

**THE UNIT**



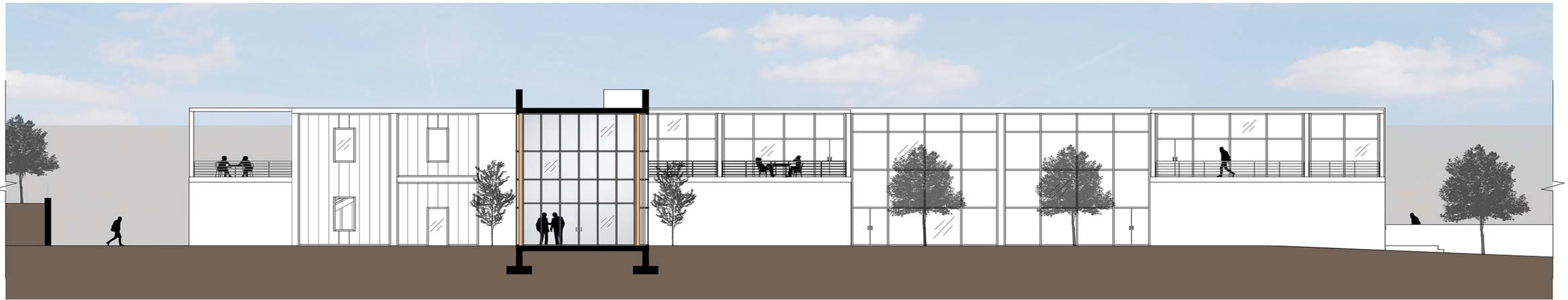
SECTION THROUGH OFFICES/CAFE



KEY PLAN

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BUILDING SECTION A





SECTION THROUGH MAIN HALLWAY LOOKING AT OFFICE/CAFE



KEY PLAN

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for Homeless Veterans  
BUILDING SECTION B





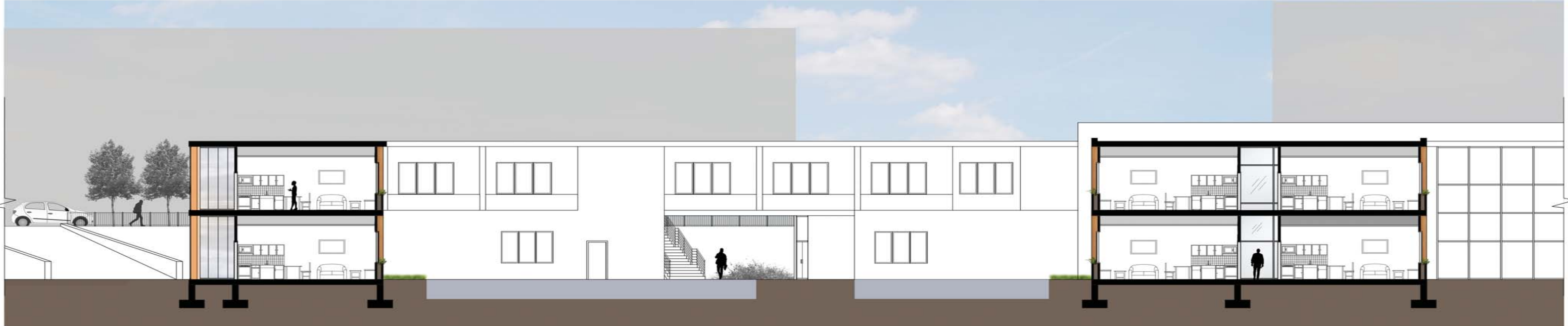
SECTION THROUGH UNITS/SUNROOM



KEY PLAN

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BUILDING SECTION C





SECTION THROUGH UNITS/SERVICE ENTRANCE



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BUILDING SECTION D





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ENTRANCE HALLWAY LOOKING TOWARDS MAIN COURTYARD



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OFFICE AREA SHOWING ROOFTOP AREA AND UNITS





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EXTERIOR VIEW TOWARDS MAIN COURTYARDS, SHOWING PRIVATE GARDENS & PUBLIC GREEN AREAS



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SUNROOM: AN ALL SEASON, MULTIPURPOSE SPACE TO ENJOY THE EXTERIOR VIEW & TO BE USE AS A WINTER GARDEN SPACE



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MAIN COURTYARD SHOWING WETLAND AREA, UNITS WITH PRIVATE GARDENS

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### Selected Images:

#### Cover Page

Human spaces biophilic design hub

<https://www.humanspaces.com>

#### Page 1

Ruins of Empuries : Ruins overlooking the sea

<https://media-cdn.tripadvisor.com/media/photo-s/05/7a/1f/d9/ruins-of-empuries.jpg>

Taunton State Hospital

<http://www.tauntongazette.com/article/20120611/NEWS/306119502>

#### Page 2

Biophilic Design is defined by Green plants for green buildings  
<http://www.plantscapers.com/biophilic-design-is-defined/>  
14 patterns of Biophilic Design

<https://www.terrapinbrightgreen.com/report/14-patterns/>

#### Page 3

Vets helping vets with PTSD

<https://militaryfamilies.extension.org/2012/08/28/vets-helping-vets-with-ptsd/>

#### Page 5

La Casa Supportive Housing

<http://www.studio27arch.com/project/la-casa-permanent-supportive-housing/>

#### Page 6

Fox 5 Investages

<http://www.fox5dc.com/news/1532192-story>

Fire breaks out at DC’s biggest homeless shelter in SE DC

[https://www.washingtonpost.com/local/public-safety/fire-breaks-out-at-dcs-biggest-homeless-shelter-in-southeast-washington/2016/10/24/b9ed184a-99f6-11e6-a0ed-ab0774c1eaa5\\_story.html?utm\\_term=.726a1a1201c6](https://www.washingtonpost.com/local/public-safety/fire-breaks-out-at-dcs-biggest-homeless-shelter-in-southeast-washington/2016/10/24/b9ed184a-99f6-11e6-a0ed-ab0774c1eaa5_story.html?utm_term=.726a1a1201c6)

CBS DC

<http://washington.cbslocal.com/tag/relisha-rudd/>

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DC Mayor Bowser announces new homeless family shelter locations

<http://www.nbcwashington.com/news/local/DC-Mayor-Bowser-Announces-New-Homeless-Family-Shelter-Locations-368117741.html>

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Cafe Deluxe Wisconsin Ave

<https://www.wcsmith.com/apartments/3213-wisconsin-ave-nw/Tenleytown, D.C.>

<https://tenleytowndc.org/>

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