AMRIYA

ممنوع الدخول
أعمال ترميم
NO ENTRY
RESTORATION WORK
IN PROGRESS

THE UNIVERSITY OF ARIZONA

THE COLLEGE OF ARCHITECTURE, PLANNING AND
LANDSCAPE ARCHITECTURE, UNIVERSITY OF ARIZONA

FALL, 2012

MARK FREDERICKSON, PH.D, LEED AP

BARAN FARAHANI
DAN AROS
HEIMAN LUK
JAIME SEVILLA
JOEY "YUSEF" FELIX
KAWTHAR RAYYAN
LEVI VAN BUGGENUM
LORI RADCLIFFE-MEYERS
NADA AL QALLAF
PAVEL SAVINE
WANYI SONG
WE'AAM AL-ABDULLAH

AL-HAMRIYA URBAN REVITALIZATION

A SUSTAINABLE URBAN LIVING PROTOTYPE FOR LOW-INCOME COMMUNITIES IN OMAN

ACKNOWLEDGMENTS

We have been fortunate enough to have had the opportunity to develop and implement summer study abroad programs on four different continents. Most recently we have worked in Europe, Mexico, Palestine and Panama. This fall semester, for the first time, CAPLA offered a vertical, interdisciplinary and international studio integrated into the core curricula of our three schools. We developed an interdisciplinary team of highly selected students to participate in a compelling urban design studio / practicum in Oman in collaboration with the planning offices of the Muscat Municipality. Their Director and Mayor of Muscat, Sultan bin Hamdoon Al Harthi, is a graduate of CAPLA in architecture, and has invited us to participate in the urban revitalization master planning of the Al Hamriya District of Muscat.

The basic pedagogical intent of the program was to enhance cross-cultural and cross-disciplinary awareness, collaboration and learning in the students and faculty of Architecture, Landscape Architecture, and Planning in both the University of Arizona and the Sultan Qaboos University. We trust that the processes employed and the community development solutions generated during this complex and multi-layered project will eventually gain relevance and bear witness in subsequent research and professional work of all student and faculty participants. It is also anticipated that participating students may discover likely thesis or capstone projects that could become extensions of their experiences in Oman.

Our time spent on this project in Oman seems to have catalyzed a better understanding of the potential influences and confines inherent in our design and planning professions regarding their ability to effect meaningful change in urban fabric. Cultural and professional commonalities have also emerged and have become increasingly apparent to all participants. Although urban areas in Oman and the United States are vividly distinct across a range of criterion; both regions must contend with an array of critical environmental and social issues, i.e. uncontrolled growth, economic stagnation, transportation inefficiencies, a dearth of open space and recreational opportunities, environmental degradation, as well as diminishing sense of place. Although cultural and political schisms are at times all too apparent, students and faculty in the allied design and planning professions do in fact share many common goals. And, we chose to focus this studio experience on perhaps the most important of these objectives: that of creating and revitalizing urban fabric envisioned and developed across a range of interrelated variables that are also their own measures of sustainability. Although we remain apprehensive regarding the use of the term “sustainability”, we do honor it as an elusive yet worthy goal integrated into all of our planning and design efforts. We believe that a truly sustainable urban environment must necessarily be defined across an array of dimensions: economic, cultural, environmental, functional, and aesthetic. Accordingly, in our more complex projects we evaluate the relative merit of our ideas according to the following design and planning ordering systems:

Economy; is the design economically sustainable? Does it create jobs and income sources for the community?
Environment; is the design environmentally sensitive? Does it connect and enhance existing ecosystems? Does it reduce our carbon footprint?
Culture; does the design create opportunities for meaningful social exchange and learning?
Function; does the design circulate effectively? Is it safe? Is it easily maintained?
Aesthetic; has the design identified and created an aesthetic sensibility appropriate to the history and culture of the region and its vision of the future?

These systems are a form of checklist deeply embedded in our design processes, and we believe that an idea's relevance and usefulness increases according to the number of different ordering systems that it engages. For instance, an idea that concerns itself with only aesthetic issues is not nearly as useful as an idea that fully engages not only spatial and image-related issues, but also explores economic, environmental and social issues as well. A park with flowers is fine, but a park with flowers that meanders its way through a community increasing land values, creating economic opportunities, mitigating erosion, promoting urban water harvesting and encouraging meaningful social interaction is a richer, more layered and therefore more relevant concept and eventual urban component. We use these invariably interconnected systems as a means of verifying the relevance of our ideas. Our solutions must be multi-layered and satisfy the complex range of design determinants present in all urban settings. Over the years, we have come to understand and appreciate that landscape Architectural design and planning strategies have the ability to encourage meaningful transformation in urban environments. These ordering systems have in turn, become our definition of sustainability, and our focal intention has always been to develop Al Hamriya as "A Sustainable Urban Living Prototype for Low to Middle Income Communities in Muscat."

This has been a delightfully exciting project, and it has captured all of our imaginations and design energy. Our experience in Oman this past semester has been both enriching and uplifting. It cannot entirely be expressed in words the amount of gratitude that we have for the people who made this project possible. The memories that we will all take away from this experience will undoubtedly continue to shape and nurture both our personal and professional lives. We all sincerely thank you for this opportunity and your essential and insightful participation. We hope you will find utility and relevance in the design and planning products proffered in this document.

We miss all of you, and each of us wants to thank you very, very much for your graciousness during our visit to your wonderful country. It was a formative experience for all of us, and reinforced the Omani reputation for cordiality and kindness.

Once again, thank you.

Mark & Students

CONTENTS

INTRODUCTION

1 INTRODUCTION

This introductory chapter contains a brief overview of the country of Oman, including a description of the Sultanate of Oman, the history of the country- past and present, the culture of Oman and the vernacular architecture of the country, including the influences that have helped shape the look and feel of the site - Al Hamriya, which is located in the city of Muscat, the capitol of Oman. These areas of study all play an important part in the design process as they inevitably influence the project and lend relevance and utility throughout the proposed plan.

SULTANATE OF OMAN

Oman is an Arab-Muslim state which has existed as a nation for thousands of years, yet the modern state (Sultanate of Oman) is a creation of the last two centuries.
It is located on the southeast coast of the Arabian peninsula and is bordered by the United Arab Emirates to the northwest, Saudi Arabia to the west, and Yemen to the southwest. The coast is formed by the Arabian Gulf on the northeast, and the Indian Ocean on the southeast.
Demographically,
The population of Oman is 3 million, with 2/3 Omanis. The population growth is estimated at nearly 4 percent per year.

HISTORY OF OMAN

The country of Oman is at an ideal location for trade. Since the 6th century BC, Oman has benefited from its trading position at the southern extremity of the Arabian peninsula. It was due to this positioning that Muscat became the capital of Oman and a valuable territory.

From the 6th century BC until the arrival of Islam, some 1200 years later, Oman was under the control of the Persian empire. In the 7th century AD, like the rest of Arabia, Oman acquired new masters - the caliphs of Medina.

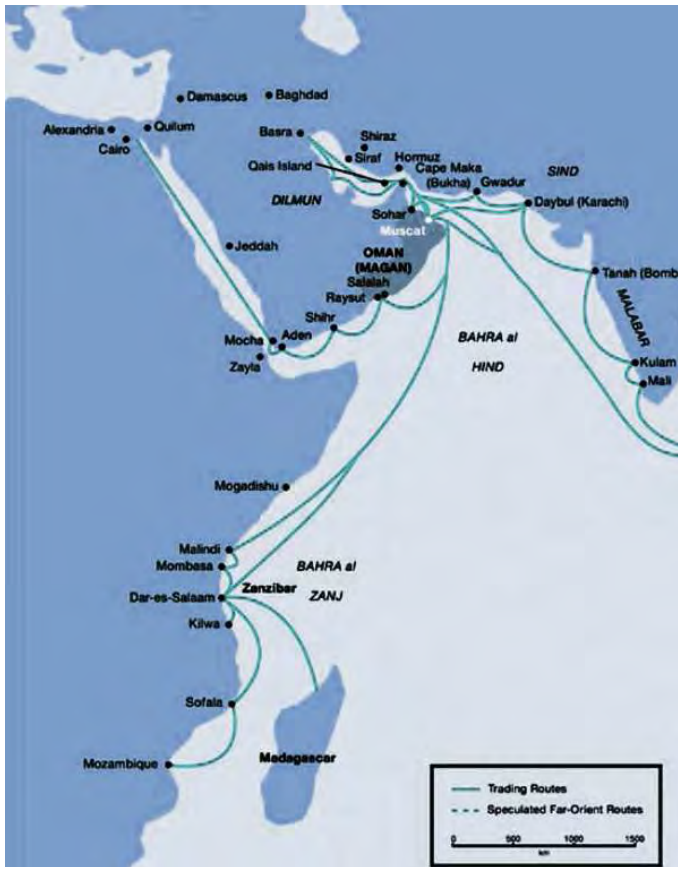
In the early 16th century the Portuguese, wanting to open up their trade route to India, entered the Gulf of Oman. The Portuguese took control of Muscat and the neighboring region. This control was strengthened after 1514, when they captured the island of Hormuz and built a permanent garrison.

By the mid-17th century the Omanis were in a position to fight back. The imam Sultan bin Saif recaptured Muscat from the Portuguese and in 1650 his son, Saif bin Sultan, was ready to extend the conflict down the African coast.

Zanzibar, the main slave market of the east African coast, became an important part of the Omani empire - a fact reflected by the decision of the greatest 19th-century sultan of Oman, Sa'id ibn Sultan, to make it his main place of residence. The economy was improved during this period, but this link with Oman was broken after his death in 1856.

From 1798 the sultans had the support of the British, who in that year made Oman a colony. By the late 19th century British help was needed mainly against imams, which were being elected in Oman's traditional manner. With the help of British, Jordanian and Iranian troops, Qaboos crushed the PFLO by 1975.

At the time of Qaboos' seizure of the throne, Oman's modern source of wealth was just beginning to materialize. The national petroleum company, jointly owned with Shell, began exporting oil in 1967. Today, there are plans underway to also develop Oman's reserves of natural gas.



OMANI ARCHITECTURE

Omani architecture contains a rich heritage of vernacular buildings, and much of Oman's existing vernacular architecture stands unoccupied and in a state of disrepair. These buildings deserve rehabilitation and preservation for they tell the history of this great country. The material used in these vernacular buildings includes stone, mud, brick, wood, lime, and mud plaster, all of which have provided the craftsman with the means to produce a very distinguished architecture.

A spirit of minimalism and austerity, associated with the nature of the city, dominates the vernacular architectural styles and forms of the sultanate. Legislation in the gulf region, restricts the scale of buildings both in number of stories and in the limitation of high-rises in commercial areas.

Architecturally, up until 1970, Muscat and other towns in the sultanate consisted of clusters related in form and organization to the vernacular urban settlements of Arabia and North Africa. The architectural fabric consisted of local materials and the height of buildings was restricted to three stories. The socioeconomic life of the citizens was centered around tribal communities engaged in a combination of trade such as fishing, agriculture and grazing.

The architecture of Oman has been influenced over time by the natural environment. The urban setting is not far removed from the natural landscape, and linking both is an underlying thread of continuity from the ancient to the modern and from one region to the next.

The other major influence is the inherent sense of community which Islam gives its people. Community architecture was an important consideration in the planning of Islamic cities and towns.

URBANISM & USE OF SPACE

The urban character of Oman can be traced back to the Indian mogul architecture style. These styles, which are characterized by two or three story residential buildings are found on the sea fronts of Matrah city. However, these buildings by law must remain a certain exterior color ranging from white to beige or light brown, while also maintaining a unified character and feeling of Oman. The architecture has also been influenced by Islamic architecture which adopts elements such as minarets, courtyards and ornaments. from mosques. Private Omani residences reflect the culture's notion of gender space. Most Omani homes typically have a formal room for men and visitors, while women generally socialize in each other's private quarters.

RELIGION

The culture of Oman is deeply rooted in Islam. Oman has three groups of Muslims which include Ibadism, Shia and Suni Muslims. The mosque is the only formal religious place where Muslims gather to perform prayers and socialize. Mosques reflect the greatest forms and styles of Islamic architecture.

SOCIOCULTURAL

Both men and women engage in agricultural activities. Urban agriculture is a great source of income in Oman.
When people meet for occasions and special events such as marriages, the celebrations are emphasized by clear gender space. This community space is often called 'sibla'. Other activities such as football are a common social activity among young boys. It is typically practiced in open spaces within the neighborhood.

AL HAMRIYA AREA

Located in the southeast corner of the Arabian peninsula, Oman is the oldest independent state in the Arab world. Oman lies in a unique environment of cascading mountain ranges and coastal edges resulting in extreme climates of hot and dry in the interior and high humidity along the coast.

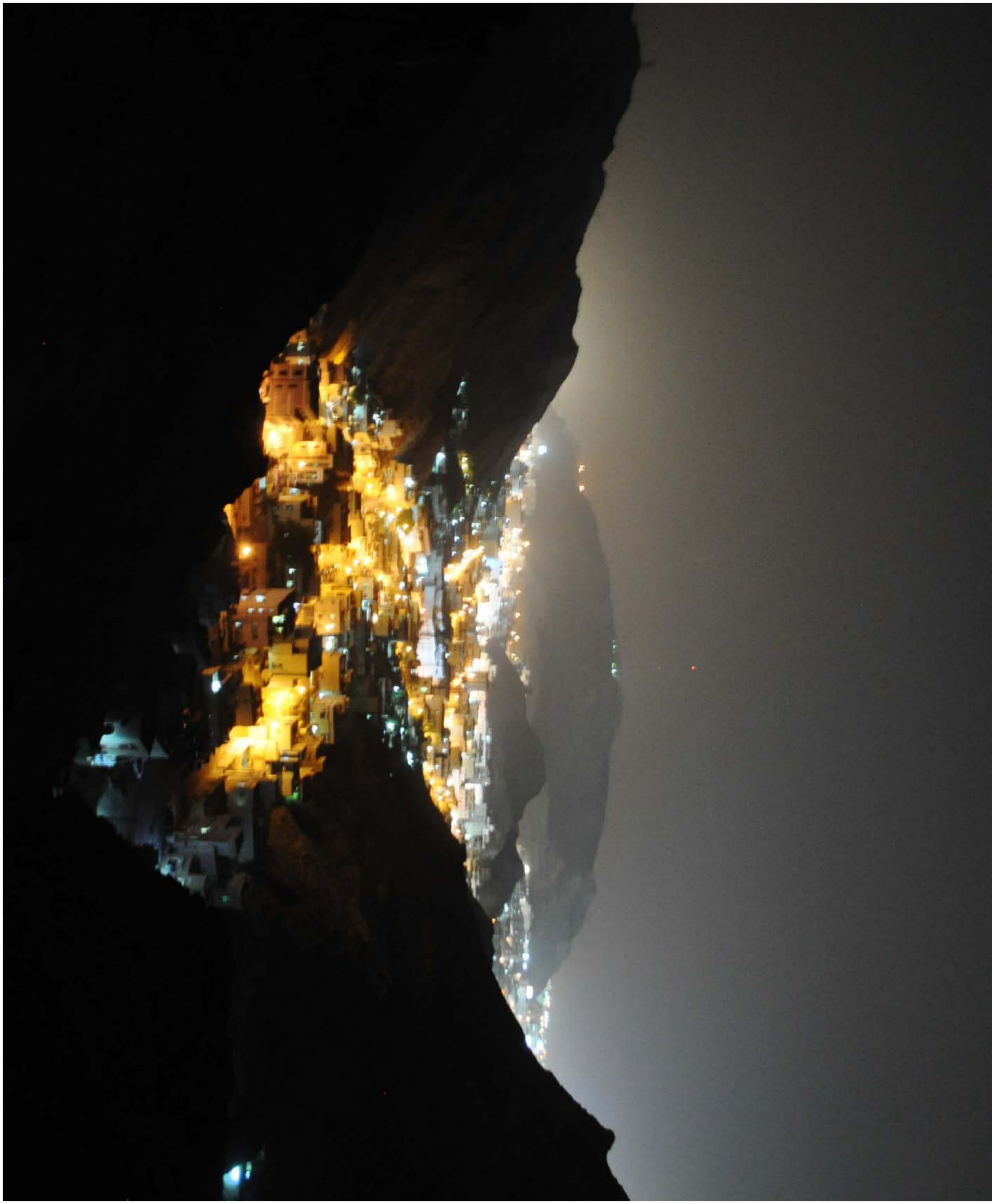
Known for its vast deserts, clean beaches, beautiful mountains, and unique Wadis, Oman is a popular tourist attraction for those seeking an intimate getaway. With the pressures of worldwide development increasing by the day, the country finds itself at a critical crossroad where growth and sprawl could disconnect the city from place and culture.

Until the 1970's, Oman was one of the most isolated countries in the world, which is evident by it remaining one of the more traditional countries within the Gulf region. Proud of its cultural heritage, the ethic of the country is to remain true to itself while also being open to the possibilities of modern technology.

Nestled within the heart of Muscat, Al Hamriya is one of the early developments in the Ruwi district of the city. Surrounded by mountain ranges, the valley shows major concern for past and future issues of flood and drainage control. The pattern of suburban sprawl has lead to most Omani families leaving the area.

Upon early research and site visits, it is clear that there is a population imbalance of workers to families. The apparent lack of planning has lead to overpopulation and over-densification, resulting in a major lack of open space. The inadequate sewage system has escalated portions of the community into an unhealthy environment of sub-standard living. The circulation to and from the site is burdened with severe issues of congestion, due to the dependence on vehicular traffic. The auto centric environment of impervious surfaces only enhances the dangers of flooding, and severs pedestrian connectivity throughout the community.

The intent of our intervention is to offer a sustainable approach toward the urban revitalization of this low income district. Our design process embraces the following categories of concern: functional, environmental, sociocultural, economic, and aesthetic. Influenced by the Omani culture, the design embraces the minimalism of the vernacular with a strong desire to provide a comfortable environment for those who dwell within the community.



INTRODUCTION

2 INFLUENCES

LITERATURE REVIEW & CASESTUDIES

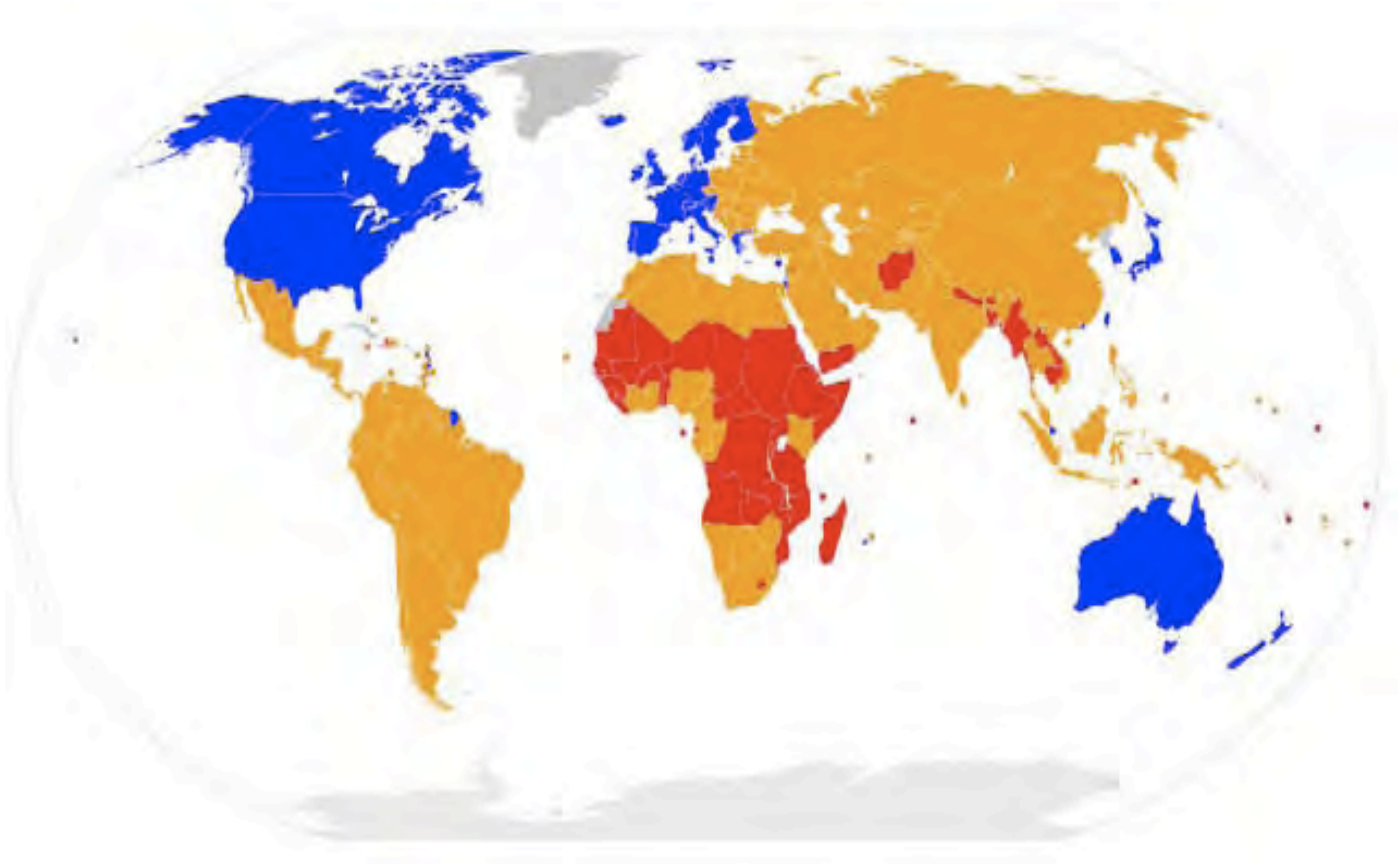
In beginning a new project, the review of existing literature and precedent studies are an important part of the design process, and can help inform the team of relevant applications and solutions to be employed on a site. This process helps deliver informed design that can be run through an array of design and planning ordering systems, thereby revealing the overall relevance of the purposed interventions.

The following pages discuss the design implications distilled from applicable literature and precedent studies that in turn, informed the design of various facets of Al Hamriya.

URBAN AGRICULTURE

What is urban agriculture? Urban agriculture is the concept of increasing the amount of food available to the people of the city by growing it in the under-utilized areas of the urban environment. By promoting local food production, a sustainable infrastructure enhances the local economy by creating jobs, and by reducing transportation and importation costs. Additionally, urban agriculture creates a self-awareness within the community regarding the importance of food and the issues of poverty and hunger that face society during this current period of global recession.

As urban poverty grows, so does urban hunger. Although it is estimated that there is currently more than enough food for everyone in the world, the main problem is insufficient money to buy food or land to grow food (World Hunger Notes 2008).



Another issue is that produce travels long distances, and needs to be selected unripe and turgid. This means that there is an excess amount of water to keep the produce plump, which then reduces the flavor. By incorporating agriculture into the design of the city, we can potentially reduce the carbon footprint, cultivate better tasting foods, reduce the cost of transportation, create jobs, and become less dependent on other cities for fresh produce.

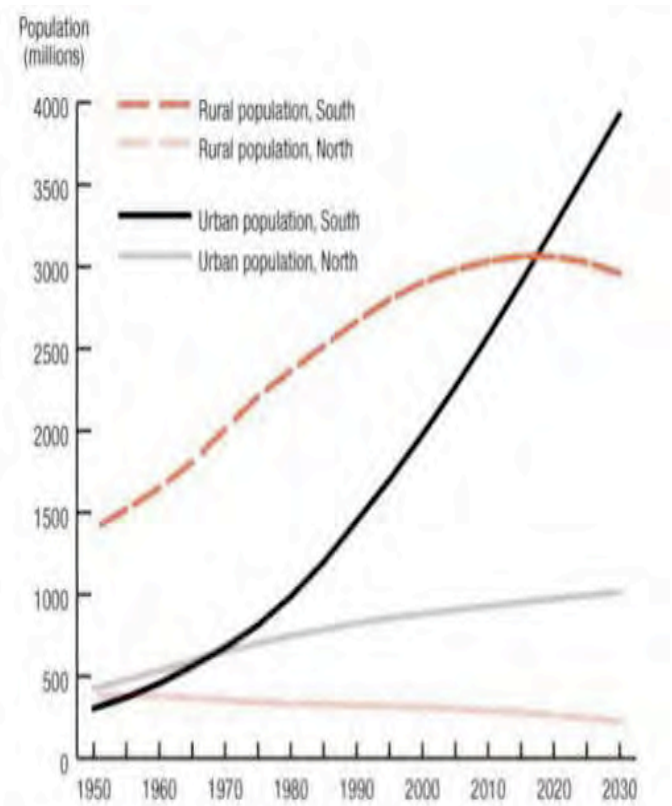


Figure 1. Rural and urban populations in North and South, 1950 to 2030 (projected).
Source: UN (2004).

HORIZONTAL URBAN AGRICULTURE

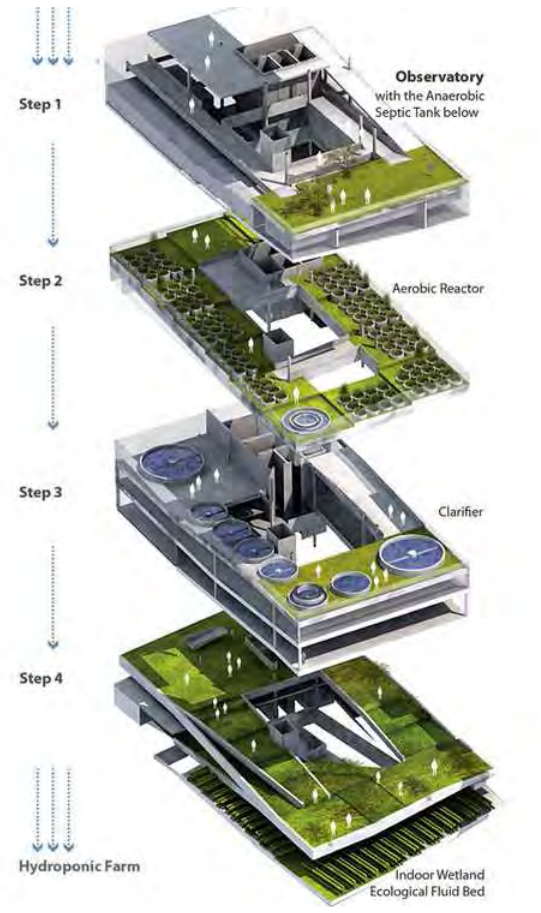
Cuba's Urban Agriculture Movement

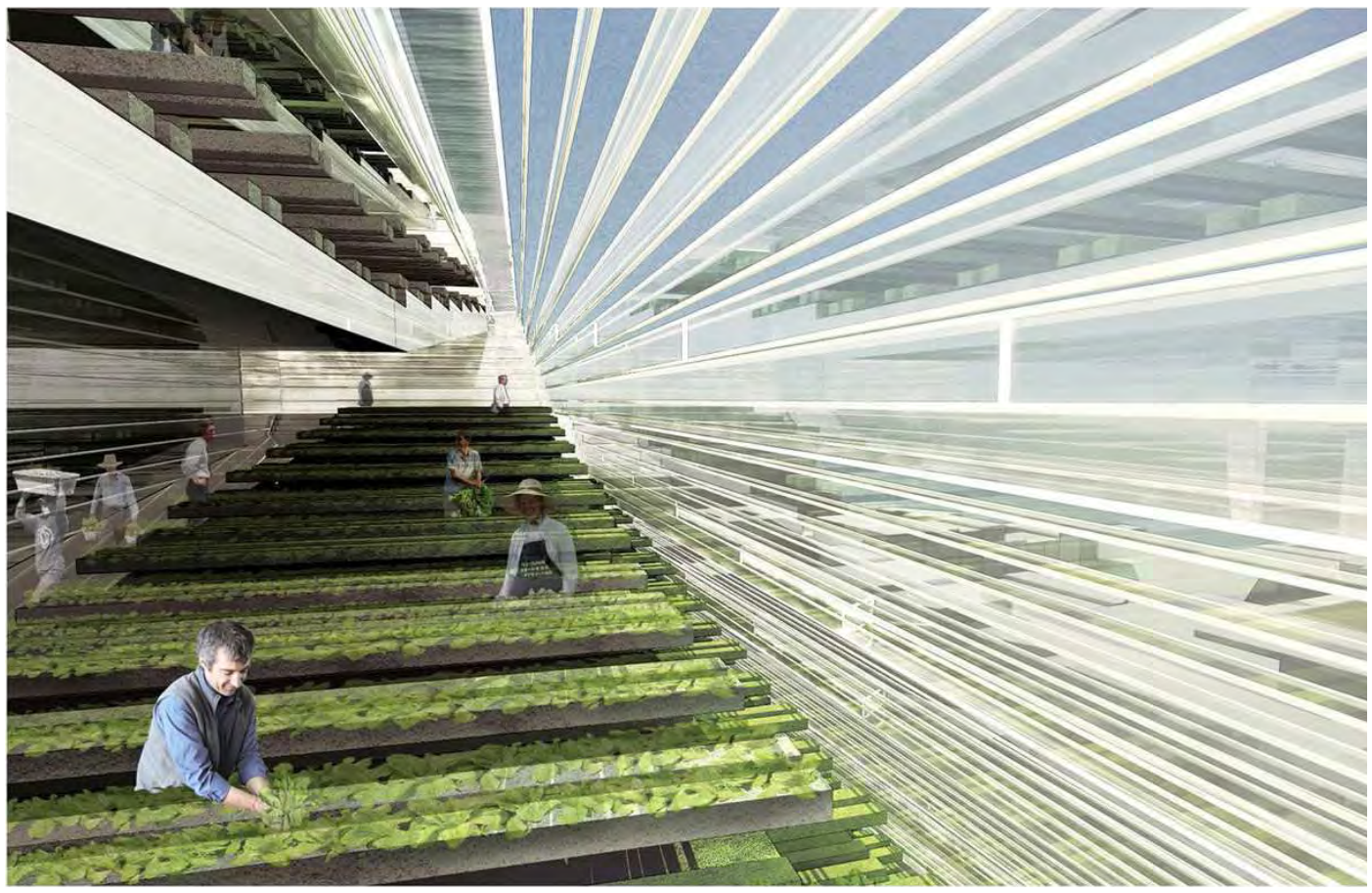
Over the last fifteen years, Cuba has developed one of the most successful examples of urban agriculture in the world. The necessity for Cuba to turn to urban and organic agriculture in the early 1990's is both well known and understood. Agro-ecological production (applying the principles of ecology to agricultural practices), in part, necessitates production sites near the living areas of large concentrations of people, and at the same time avoids the use of toxic petrochemical fertilizers and pesticides, which are no longer available.

VERTICAL URBAN AGRICULTURE

“Urban Farm, Urban Epicenter”, by Jung Min Nam

This is an urban and social vision from the firm Architectural Realm in response to the increasing concern for sustainable urban farming.
While farmlands are being replaced by commercial and residential skyscrapers, the Urban Farm, Urban Epicenter, proposes the creation of a new civic and cultural infrastructure tied with food production and water recycling systems.





WATER STRATEGIES

LIVING MACHINES

The Living Machine System utilizes the latest technologies, and is engineered to mimic the ecology of natural wetlands.

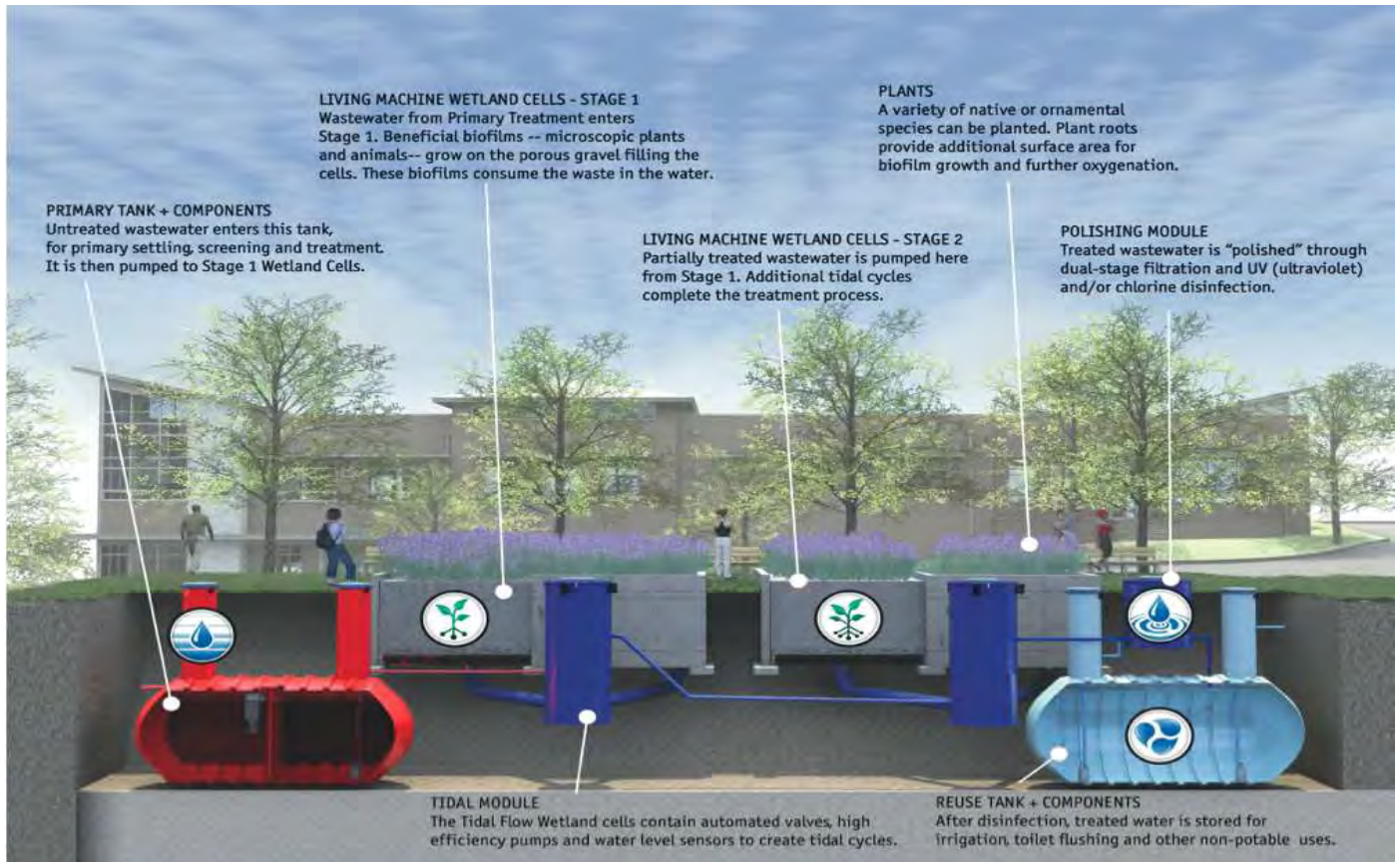
The system provides a lasting water solution by effectively treating and reusing wastewater through a series of wetland cells. These cells are filled with optimized gravel, which promotes the growth of a micro ecosystem, resulting in a high quality reusable water.

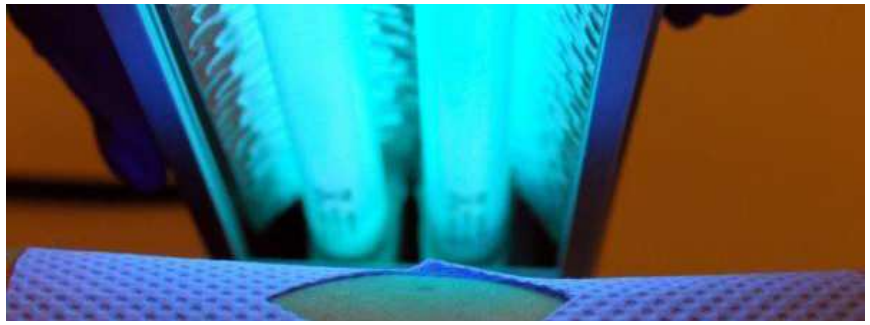
How it works? Water is pumped into a tank where debris settles and degrades, then water flows into an equalization tank which determines the release into specially engineered gravel, sand, and plant boxes (wetland cells).

Following this, different cells with different organisms eat and purify the black or grey water in order to remove the microscopic sediment. The water is then treated with ultraviolet light and is lightly chlorinated to meet suitable standards.

A living machine provides an opportunity for on-site water reuse and provides a living laboratory with on-site educational opportunities. It also utilizes all wastewater and produces high quality water that can be used to flush toilets, supply cooling towers, irrigation, and other non-drinkable situations. In addition, the living machine may save water in remote and drought prone areas.

Attractive and effective foliage can be integrated in the interior and exterior of public spaces and the energy efficient design enables lower operation and maintenance costs. Overall, the technology has a smaller physical footprint and a lighter carbon footprint.





PORT OF PORTLAND HEADQUARTERS, PORTLAND

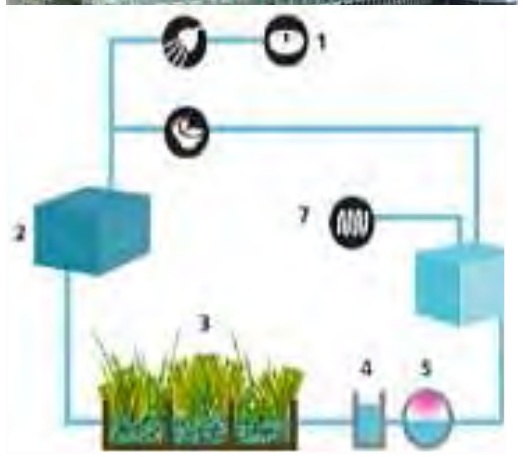
BY ZGF ARCHITECTS

The Port of Portland recently consolidated their headquarters into a shiny, green office building designed by Zimmer Gunsul Frasca Architects (ZGF). Situated right next to the PDX airport, the new Port of Portland Headquarters is a LEED gold office that unifies the entity responsible of Portland's airport, shipping terminals and more. The project was finished in May of 2010 and it includes a green roof, a living machine to process waste water, geothermal heating and cooling, plus a plethora of other sustainable strategies.

The objective of the new 200,000 sq. ft. building was to be sustainable, cost-effective, attractive, and a teaching tool. The system handles all the wastewater from the 500 employees which occupy the building and produces high quality water to be reused to flush toilets. Foliage is fused into both the interior and exterior public spaces. The building has shown a 75% reduction in water use.

The 9th floor of the building features an eco roof that collects rainwater and minimizes storm water runoff, and a green roof planted with drought tolerant plants is located on the other side of the building. Two hundred geothermal wells provide ground source heating and cooling, and an auxiliary cooling tower kicks in for peak periods.

The building features both tried and true resource conservation measures, like using energy efficient lighting, materials from renewable or recyclable sources, and water efficient fixtures. It also relies on innovations like ground-source heating and cooling produced through a closed-loop system reaching 300 feet below the surface and a Living Machine® system, which recycles wastewater on site for reuse in the building's toilets and cooling towers.



The living machine system is a new approach for organic wastewater treatment and water re-use that treats waste water on-site to be reused in the building for non-potable uses.

A Living Machine processes all of the building's wastewater from toilets, sinks and showers for reuse in toilet flushing and the HVAC cooling tower. This is achieved via a series of wetlands on-site, where plants do the dirty work in a series of biotic event ponds. This facility is now the largest commercial facility with a Living Machine wastewater treatment system in the Western U.S.

WETLANDS

Wetlands are defined as “areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.” (Clean Water Act, EPA)

Why are wetlands valuable?

Economics

- A wide range of natural products are derived from wetlands such as fish and shellfish, blueberries and cranberries, timber, wild rice, and medicine and herbs from the soils and plants.

Fish & Wildlife

- Many animals and plants rely on the wetlands for survival, including about 1/3 of the threatened and endangered species in the U.S.

Recreation & Aesthetics

- Wetlands have recreational, historical, scientific, and cultural values.
- A total of $59.5 billion is spent annually in the U.S. towards hunting, fishing, bird watching and wildlife photography.
- People enjoy the fascination of being close to water, which results in hiking, boating, and other recreational activities.

Flood Protection

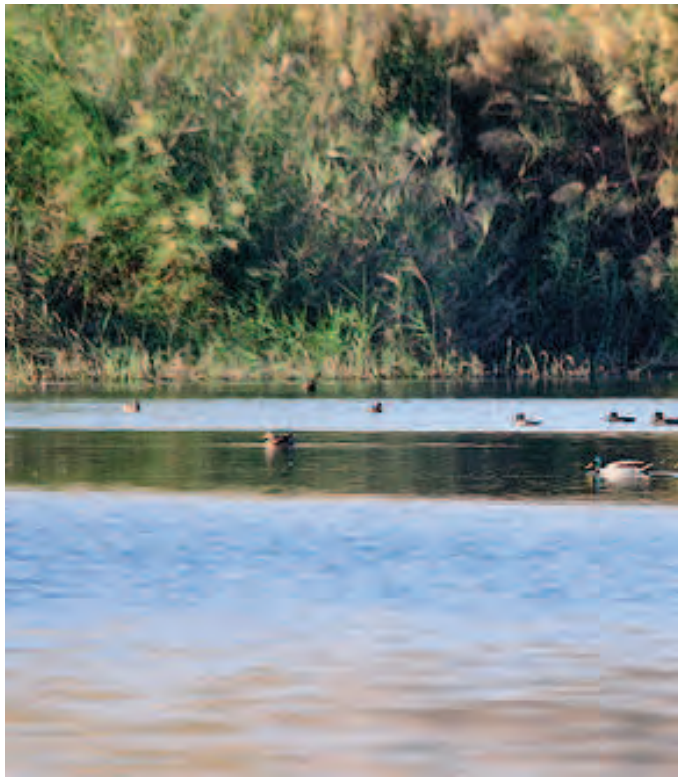
- Wetlands are a vital component in slowing down the speed of flood water in addition to the runoff from pavement and buildings.
- The sponge-like nature of the wetlands allows it to trap and slowly release surface water, rain, snow melt, groundwater and flood waters. Additionally, the roots of trees and other wetland vegetation absorb the water.

Shoreline Erosion

- The plants in wetlands hold the soil in place with their roots and help to slow down the flow of water from the currents.
- In coastal areas, wetlands are utilized to buffer the storm surges from hurricanes and tropical storms.

Water Quality & Hydrology

- The filtering capabilities of wetlands enable the surface runoff to be cleaned and removed of contaminates before the water reaches open water
- The wetlands retain excess nutrients and some pollutants, as well as reducing the sediment buildup that would clog the downstream waterways and harm the fish and amphibian egg development.



AL ANSAB WETLANDS, OMAN

Al Ansab Wetland is a natural wonderland in the heart of Muscat. It provides a showcase for Oman's impressive nature with its abundance of bird life.

The Wetland is home to an amazing 280 species of birds that may be present at different times throughout the year. Visitors can see wading birds such as the Black-Winged Stilt that are residents at the wetland all year. Magnificent eagles arrive in November and may spend the winter in Muscat. The Wetland is not just a special place for birds; it is also a safe haven for Oman's plants, butterflies and other species. The future plan for the wetlands is to provide residents and visitors to Muscat with a world class bird-watching experience.

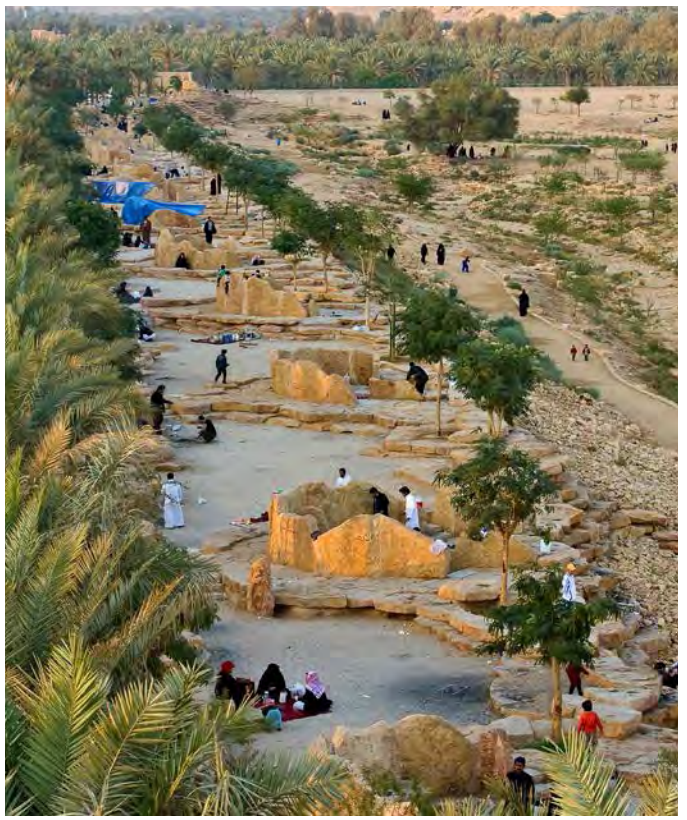
Spread over 40 hectares, Haya is now developing plans to build a visitors' center and car park to promote the site as a nature reserve. The Al Ansab wetland includes five lagoons fed by treated water from Haya's sewage treatment plant. These lagoons serve as a stop-off point for migratory birds and a safe haven for breeding and wintering birds.

The visitors' center at the site will have an exhibition area where Haya will invite schoolchildren and other visitors for both an indoor and outdoor experience.

WADI HANIFA WETLANDS, KSU

by Moriyama & Teshima Planners

The longest and most important valley near Riyadh, Wadi Hanifa is a natural drainage course over 4,000 square km and is a unique geographical treasure in the region. The design intent is to readdress the balance between the resources of the Wadi and the people living around it.
The program aims to serve as an opportunity to implement environmental recreation and tourism. The construction of check dams enables the re-establishment of the natural desert landscape while also creating catchment areas above the Wadi bed. These are combined with a series of natural stone weirs that introduce oxygen into the water and aid in reducing pollution in the Wadi. Parks are designed to facilitate family functions for the day without being disturbed by neighboring families .



QUNLI NATIONAL URBAN WETLAND, CHINA

Flood and water logging were frequent problems historically for this area. Turenscape was commissioned to design a park of 34.2 Hectares of wetlands which are surrounded on four sides by roads and dense development with a future projection of 32 million square meters of buildings to come in the next two decades.

A network of walkways were built around the wetlands to allow visitors to observe and interact within the public urban park. These elevated walkways around the Qunli National Urban Wetland provide a new perspective of the overall project and the surrounding urban environment. The scientific understanding of “water” reduces it to H2O, but water is a living system and should relate to land, life, vegetation and food. Through the transformation of this dying wetland, storm water that frequently caused flood in the city now becomes a positive environmental amenity for the city.

OMAN WILDLIFE

Why Manage Urban Wildlife:

- Urban areas are expanding in area and influence
- Most of the tax-paying, policy influencing public lives in cities
- Wildlife exists in all urban areas

Current Issues in Urban Wildlife:

- Habitat destruction, fragmentation and isolation due to Urban sprawl & development
- Isolation of humans from the natural world, roughly 89% of the public get their wildlife information from TV
- Human-wildlife conflicts.
- Exotic and endangered species

Urban Areas as Habitat:

- Buildings: ledges mimic cliffs, roofs mimic bare ground
- Urban Parks: (Central Park (NYC) has about 200 bird species that are resident or migrate through
- Shade trees along streets

Urban Human-Wildlife Conflicts:

- Collisions with motor vehicles, and building windows
- Disease: rabies, West Nile Virus
- Sanitation
- Predation on pets
- Power outages: Squirrels are the third leading cause after weather and trees
- Building damage

OMAN FLORA & FAUNA

Ethics for using Native vegetation:

- Maintenance and ease of care. Native plants are accustomed to the local environmental fluctuations and do not require as much attention to sustain healthy growth.
- Native vegetation is best suited for the limitation of existing resources and local weather patterns, making them the most hardy choice to thrive in the native soil composition and local rainy seasons.
- Using native vegetation for food and decorative crops is the best way to keep a strong population of local plants alive, and meaningfully connect tradition and beauty in modern developments.
- Invasive species of non native plants can be an issue, encroaching on critical habitat for sensitive local plants that native wildlife depend upon for survival.
- Pollutants introduced to support non native vegetation can infiltrate water supplies and disrupt sensitive ecological balances between plants and animals. This is especially evident where fresh water tributaries meet the ocean and fertilizers can interfere with delicate plant and wildlife balances by causing some species of plants to grow excessively.

THEORIES

These theories are important aspects in the revitalization of an urban fabric and When appropriate were applied to the Al Hamriya Project.

- **New Urbanism** promotes quality architecture and urban design to create a dense mixed use community that is: walkable, connected, sustainable, and has a high quality of life. New urbanism is a descriptive style of human habitat that is community focused and socially sensitive to human functions. The landscape is formed into the built human space.

-**Landscape Urbanism** is an approach to the organization of the design of human habitat based upon the existing landscape form and not on architectural form. Landscape urbanism is an ecological approach to human habitat that is process focused and contextually sensitive to ecological functions. The human space is integrated into the landscape.

- **Smart Growth** is an approach to controlling growth by concentrating growth at urban centers in order to minimize sprawl. Smart growth is a transit based infill built upon policy and relies on growth management tools to make decisions and encourages sustainable communities, combats sprawl, and strengthens urban centers through existing infrastructure.

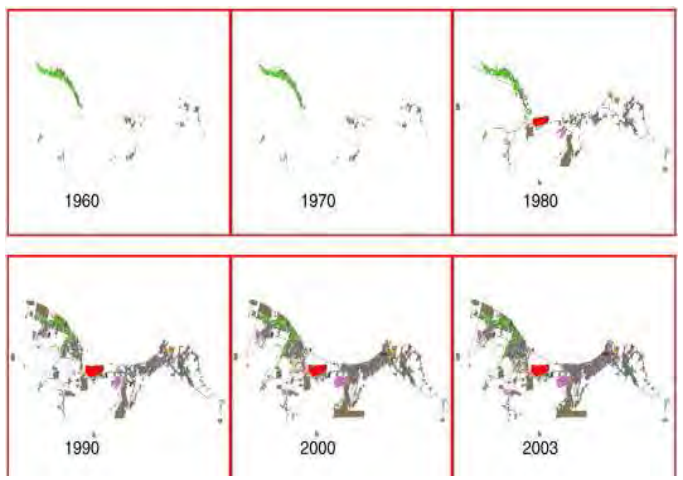
- **Smart Code** is a unified land development ordinance for planning and urban design. It considers: zoning code flexibility, subdivision regulations, urban design, and architectural standards. Smart code supports community vision, transit options, mixed use, and conservation of open lands while preventing sprawl and auto dominated streets.

URBAN FORM, MUSCAT

GROWTH OF MUSCAT

The wealth created in the Oil Boom was invested partially in modern public infrastructure (roads, highways), which caused development to spread quickly. The historic districts of Muscat, with compact traditional buildings, quickly exploded into regions of detached housing and large public developments.

Areas that were traditionally agricultural and fishery based became more and more urbanized. The decrease in farmland and increase in population caused greater demand for resources, so food and other goods had to be imported instead of being locally produced.



The built form reflected the family structure, with extended family members living in close, dense quarters. The dwelling size averaged 120-150 square meters. Families would live in a single series of dwellings that shared a common space. This spatial structure largely reflected the social structure. After the Oil Boom, every individual family was able to afford their own detached home. While contemporary building visually reflects Oman culture, the structure of the traditional family has been dispersed among several houses.

Individual house floor areas increased to over 1000 square meters, which increased the area that needed to be cooled, causing increase in energy consumption.

DESIGN IMPLICATIONS: Planting strategies can be used to cool detached dwellings, new developments may take lessons from the past and build according to historical densities which have cultural as well as environmental benefits.

Urban growth in Muscat is characterized by the following attributes:

-Extreme land consumption;
-Low densities particularly at peripheries
-Private automobile dependency with absence of viable public transport
-Fragmented open space, wide gaps between development and scattered in appearance
-Lack of choice in housing types and prices
-Separation of uses into distinct areas
-One to two story buildings as a default form of development
-Lack of public spaces and community centers
-Life style patterns are oriented towards the single villa on a walled plot as the most favorite residential building type

Half of Oman's population is under 25, and 1/3 of people living in Oman are expatriates. Education and tourism are rapidly expanding, as Oman works to make its young population its greatest asset. The clear demographic challenges are the large expatriate population, dependence on oil, and the unemployment of the youth.

DESIGN IMPLICATIONS

-Create opportunities for young people to take part in small business.
-Provide education opportunities (work -study)
-Understand how young people see their situation, and the changes they would like to see.

URBAN DESIGN FOR ARID CLIMATES

Unique Challenges to Arid-Urban Design

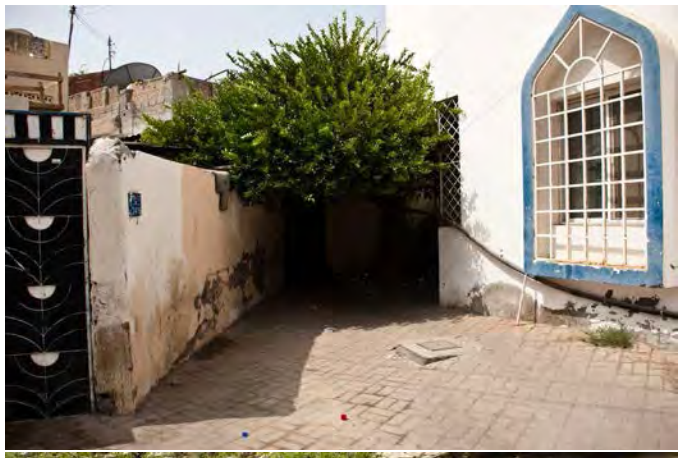
- Wind, dust, radiation, lack of soil cover, lack of precipitation
- Isolation (psychological factor)
- Most urban patterns are imports from temperate climates, which lead to higher taxes, maintenance, construction, energy consumption
- Physical characteristics influence design approach (soil, landform, resources, and vastness of space)

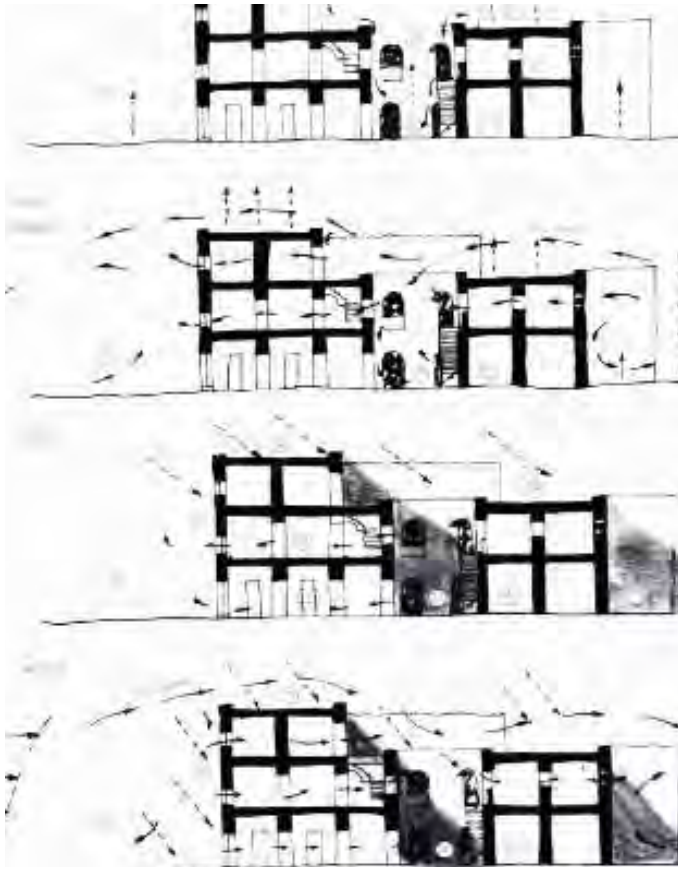
Gideon S. Golany, “Urban Form Design for Arid Regions”
Goals of Urban Design in Arid Regions:

- Minimize / eliminate the discomfort at the micro climatic scale (house/street) while planning the macro environment to be responsive.
- Maximize passive energy systems, conserve energy
- Create a pleasing urban environment to stimulate and afford a high quality of life
- Integrate different scales of native environment into design
- Counteract psychological loneliness of vast areas

Basic Urban Form is a form to manage heat loss/gain, and consists of form, configuration, street patterns and orientation, building materials, color, morphology of city, exposure to radiation, vegetative density,
Elements of urban form:

- Regional clustering of settlements
- Proximity of land uses
- Urban configuration: “the city is an immense artificial and man-made project which penetrates its environment





Shibam in Yemen is known as the “Manhattan of the desert”. Its ancient center, which still comprises 400 inhabitable clay towers, is unique in the world and was declared a World Cultural Heritage site by UNESCO in 1982.

Situated in an age-old cultural landscape, the city had been a junction of caravan trade routes since ancient times. But in the course of the 20th century, Shibam lost its historic economic base, and most of its population slid into poverty. An urban development plan aimed at preservation and economic self-sufficiency and based on the potential and skills of its inhabitants and local government is intended to benefit the population and avert the decline of the old city. The Urban Development Project has approached the city as a living community rather than as an historic artifact frozen in time.

Design Implications

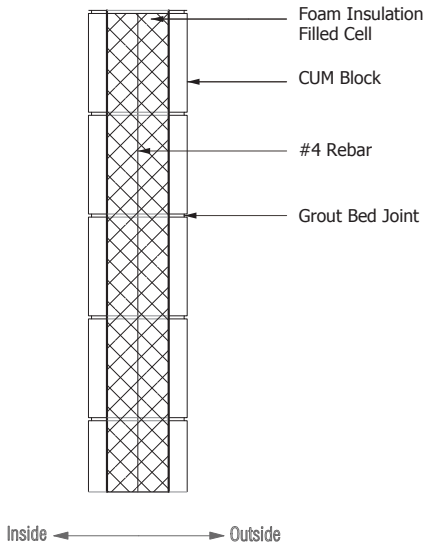
- Urban development plans can be developed despite age of community
- Historic urban areas can be dynamic and not just artifacts frozen in time
- Maximize passive energy systems and inward looking architecture
- Integrate different scales of native environment into design
- Minimize the discomfort at the micro climatic scale while planning the macro-level to be responsive
- Passive open space should not exist within the arid city; areas left “in reserve” should be designed and treated as active spaces until their eventual primary use is determined

THERMAL PERFORMANCE
WALL SECTIONS

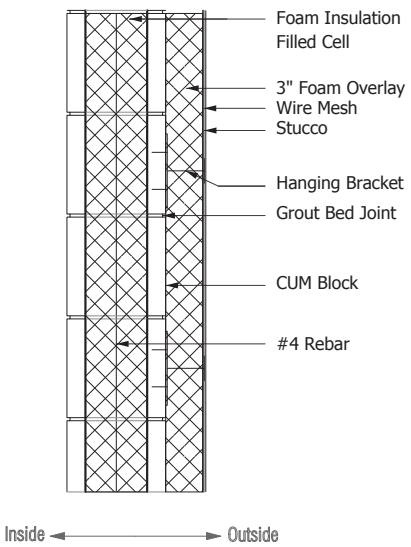
WALL SECTION STRATEGIES

1- CMU

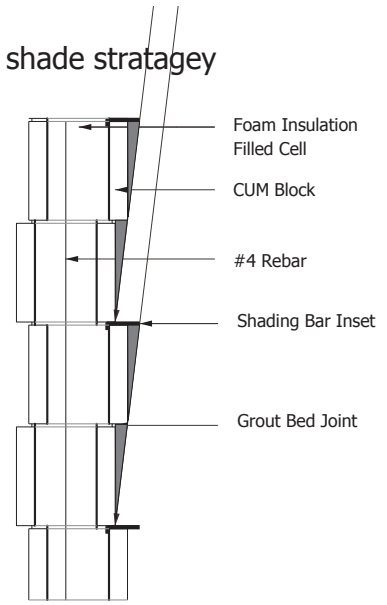
foam filled cells

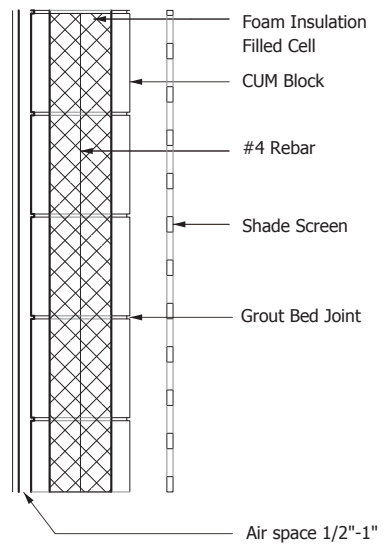


typical w/ foam
clad and stucco seal

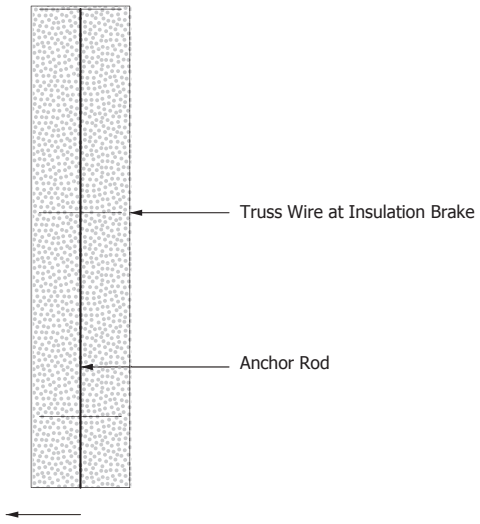


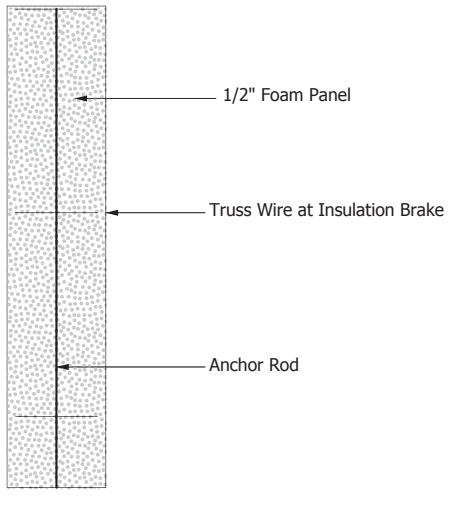
shade stratagey



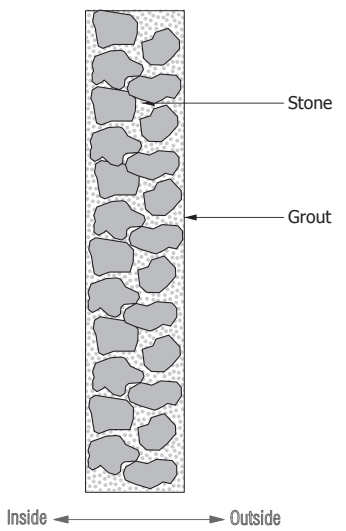


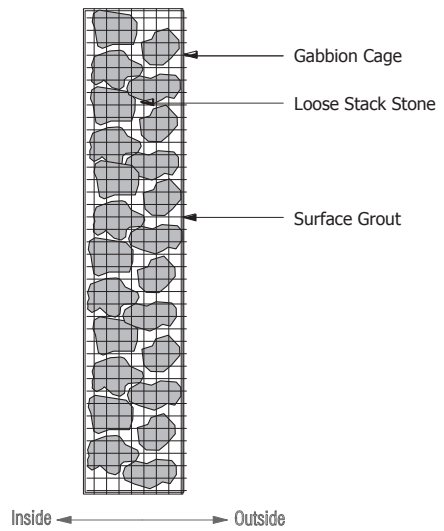
2- RAMMED EARTH



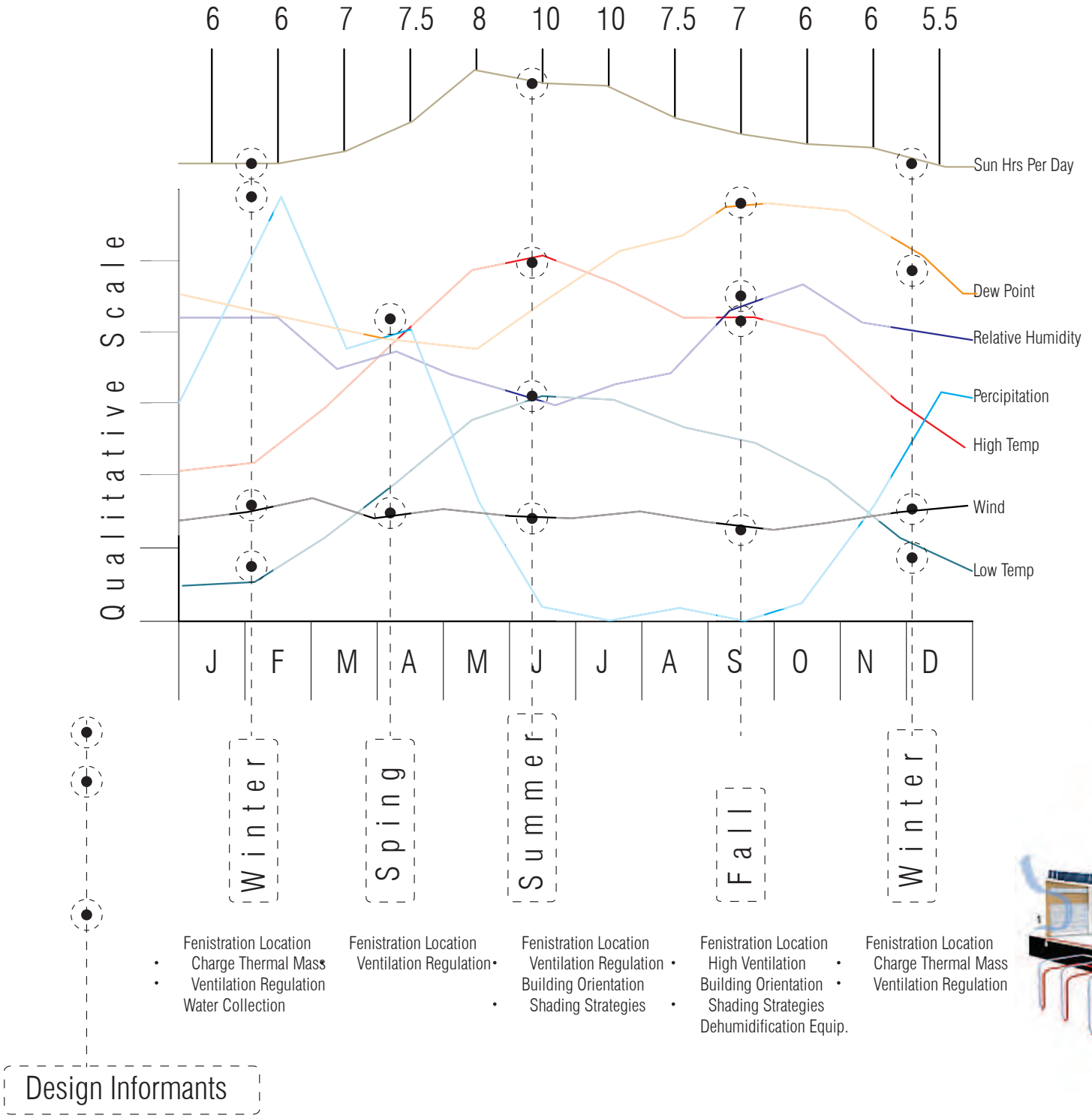


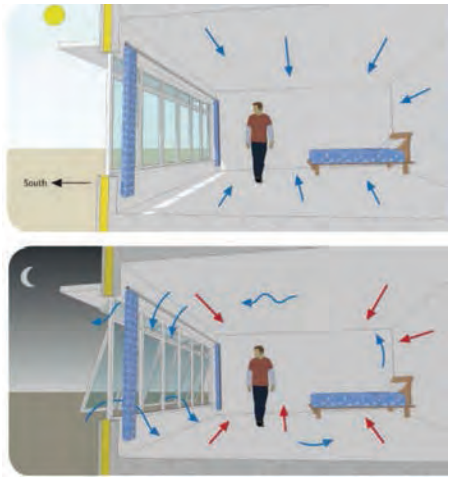
3- STONE WALL



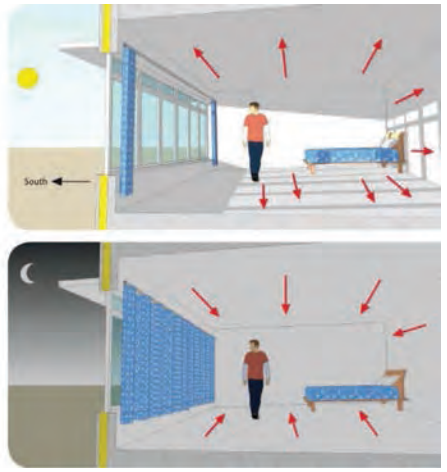


SEASONAL DESIGN IMPLICATIONS

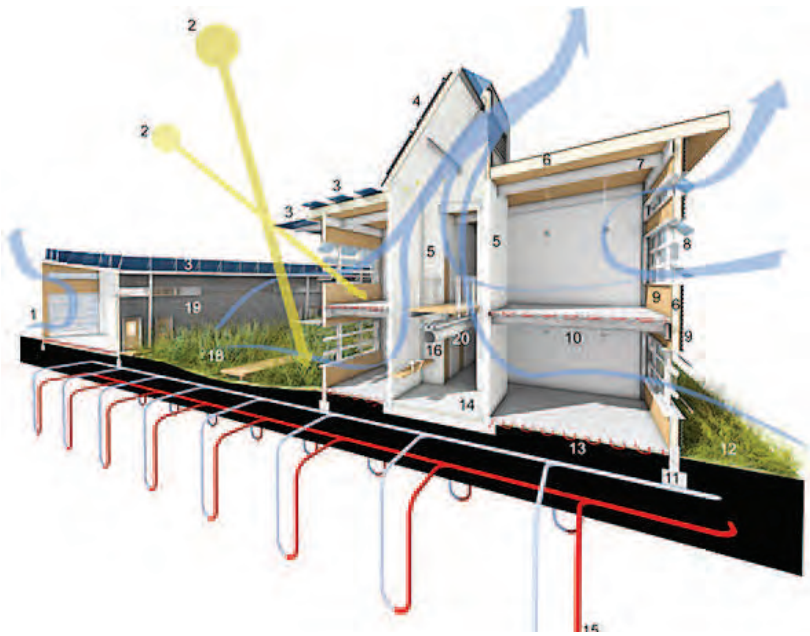




SUMMER



WINTER

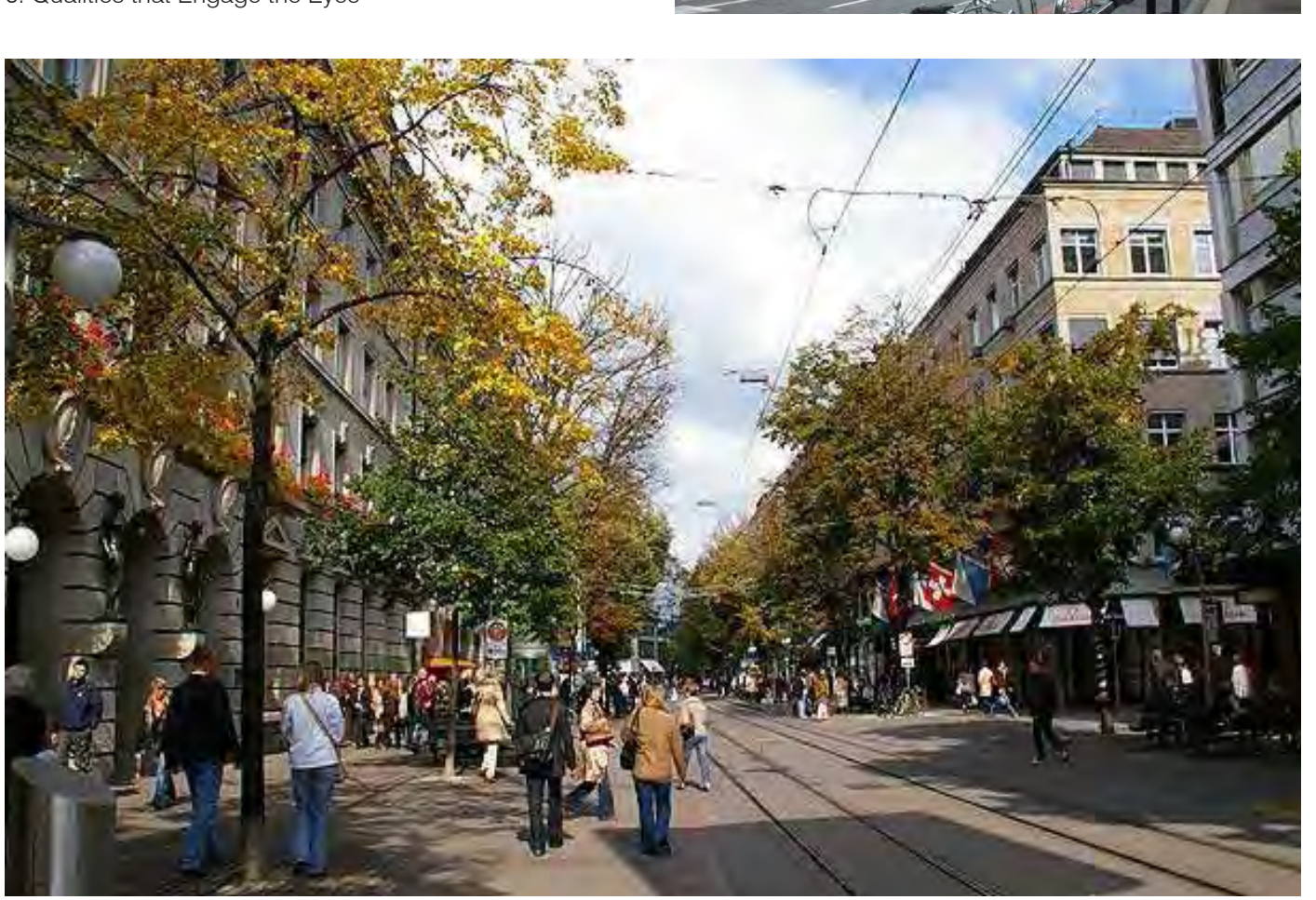


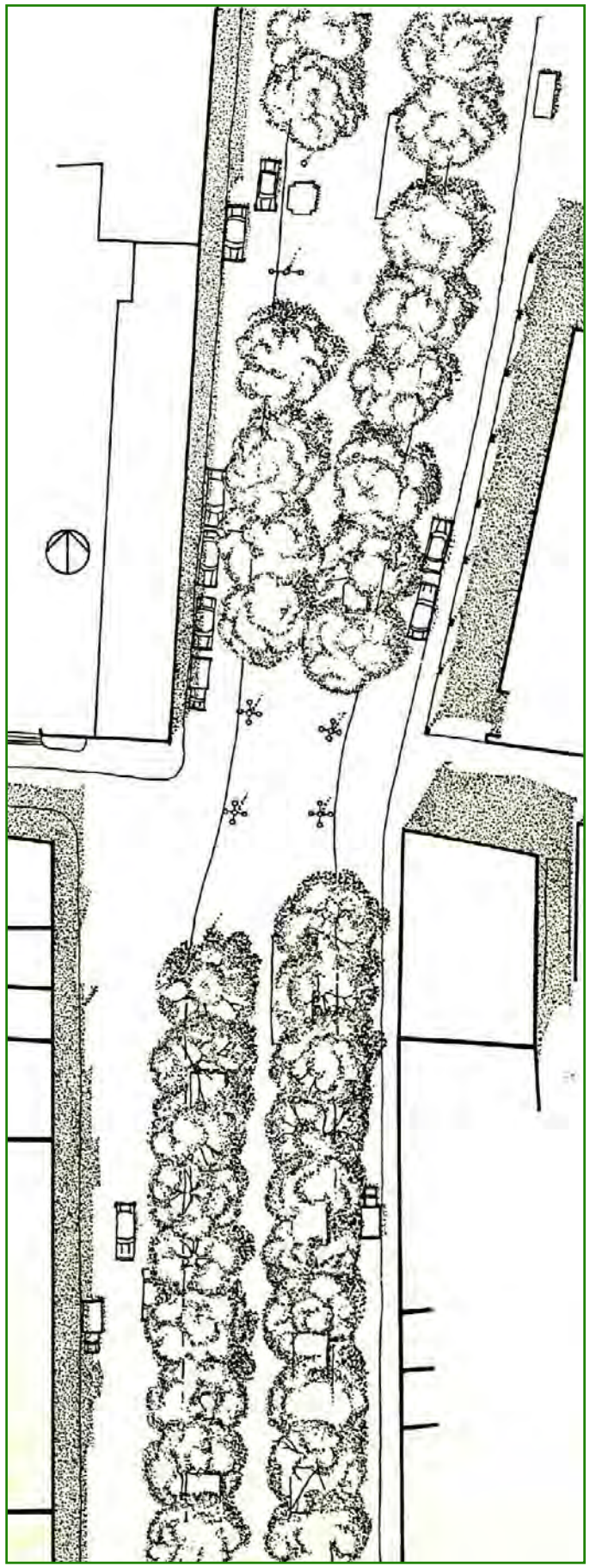
LITERATURE REVIEWS

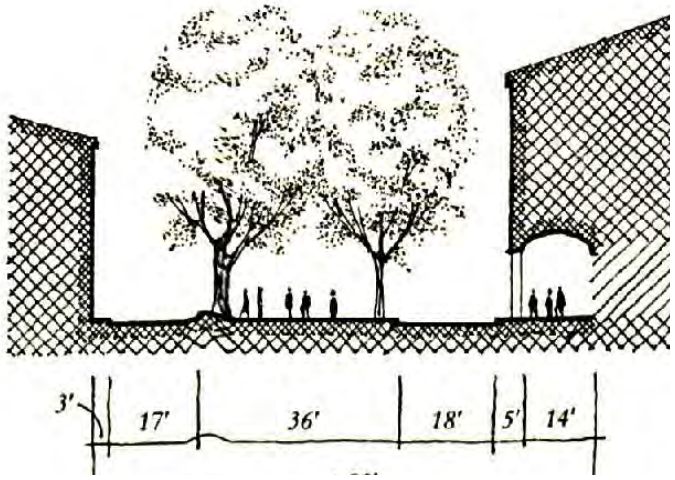
STREETS

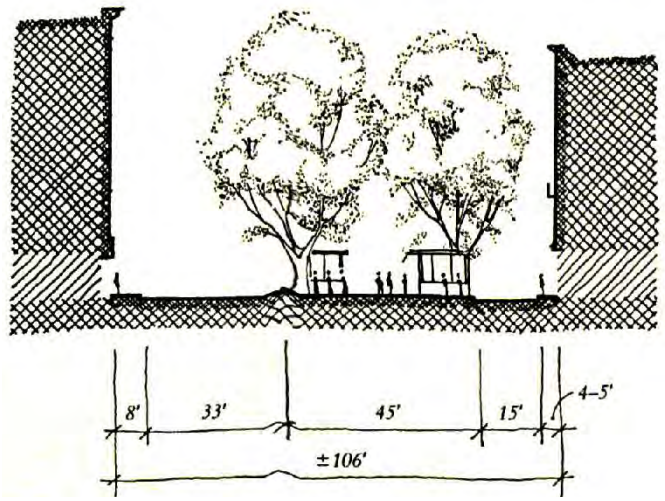
1. Places for People to Walk with Leisure: Appropriate walkway widths to accommodate different walking paces, adjacent functions and safety; mainly from vehicles.
2. Physical Comfort: Offers a comfortable environment, such as shade and coolness
3. Definition: Appropriate proportion of building height and street width
4. Complementarity: Respect between the buildings
5. Transparency: Allow the private realm of buildings to meet with the public street
6. Qualities that Engage the Eyes

Refining the roadway involves three activities:
- Shortening each road to reduce its impact on individual units and clusters, and to reduce costs.
- Organizing parking to relate most directly to each unit without compromising environmental quality.
- Designing the road to assure buffering and integration with the other plan elements.
- Make continuous sidewalks: People like to feel safe and comfortable when they walk in the community, it means that streets must have sidewalks on both sides that connect to each other





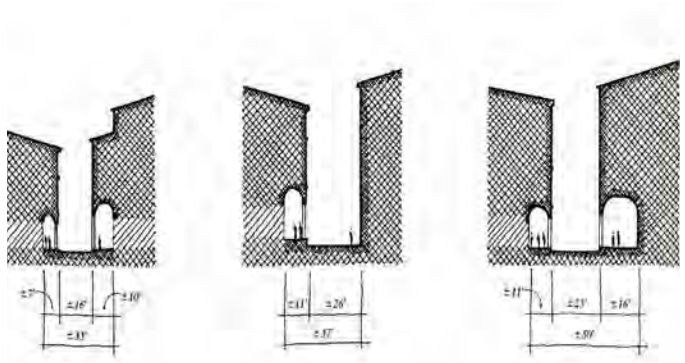


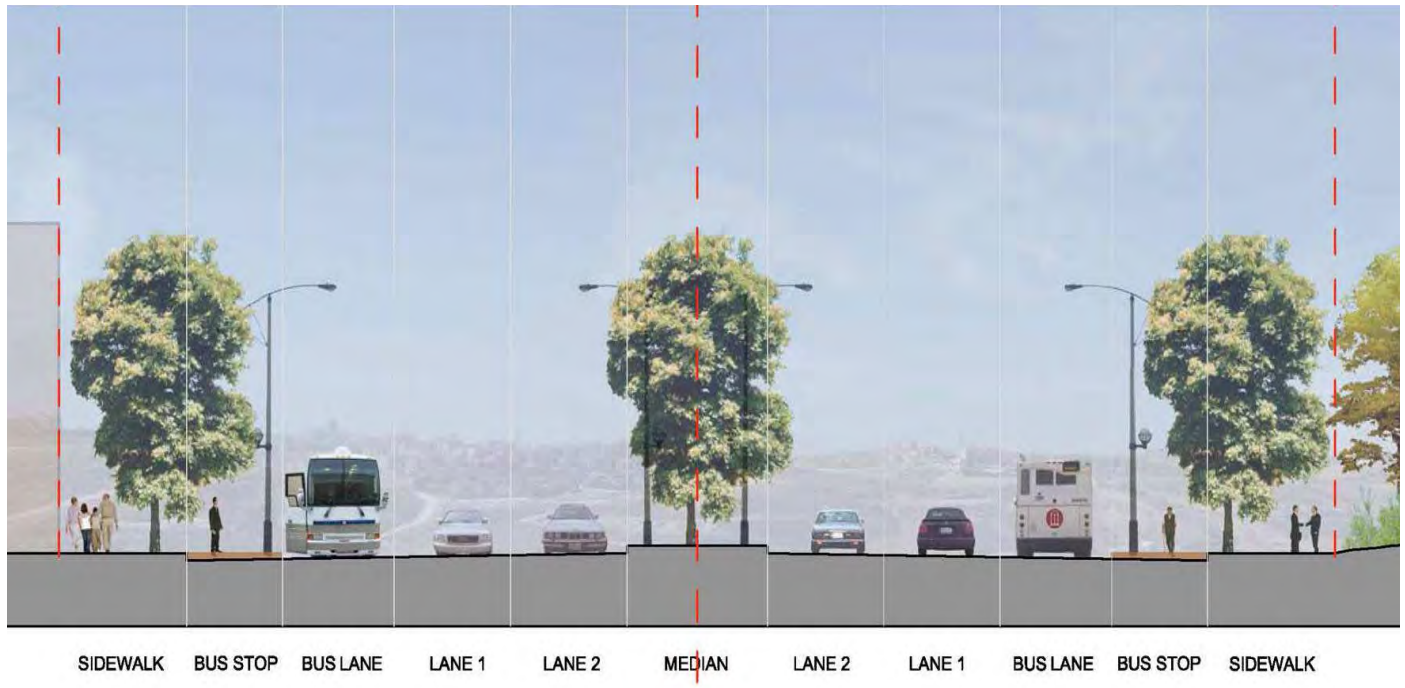


A community's street system has to work together as a whole. If the other major and minor streets don't work well, the main street will also perform poorly because it will be asked to do too much. Conversely, if the main street is an obstacle to travel, the traffic will spill over into the other streets and degrade the entire system.

Utilities need to be placed well out of the pedestrian area of the sidewalk. Moving utilities underground removes the clutter of poles and wires that accumulate over time from many separate projects and take up valuable space. For example, the space is often needed to meet disability access needs.

Street Hierarchy: Transit Parkway (40m ROW), Main Street (30m ROW), Collector Street (24m ROW), Local Street (18-20m ROW), Service Lane (8m ROW).





UNDERPASSES

Underpasses are often perceived as unsafe spaces because many are built to be too small, dark, and do not offer anything to the visitor. Strategies to make underpasses better spaces must deal with light, program and scale.

Sustainable underpass:

The Underpass Park in Toronto proposal shows the difference between a well-lit, programmed pedestrian underpass area and one that has been neglected. Underpass Park will benefit from Waterfront Toronto's sustainable development approach and goal of setting new standards for both architecture and public spaces. Sustainable design features include:

- Re-purposed and reclaimed granite cobblestones for the community garden;
- Recycled rubber materials for recreational court surfaces;
- Planting more than fifty trees, including between the existing ramps;
- Energy efficient LED lighting;
- Drought, salt, and shade tolerant planting for minimal irrigation and maintenance.

Unique program underpass:

An underpass can also be an opportunity for a unique program. The Albertina Passage is organized as a dinner club, comprising a gourmet restaurant, bar and stage for live concerts. Closed to the public in 2009 after the discovery of structural defects, this pedestrian subway - one of many built beneath Vienna's showpiece boulevard in the 1960's - will return to the fold as a newly refurbished 300-seat location. The operator of the new dinner club has run the popular nightspot Club Passage in another underpass beneath the Ringstrasse since 2003.

Natural light:

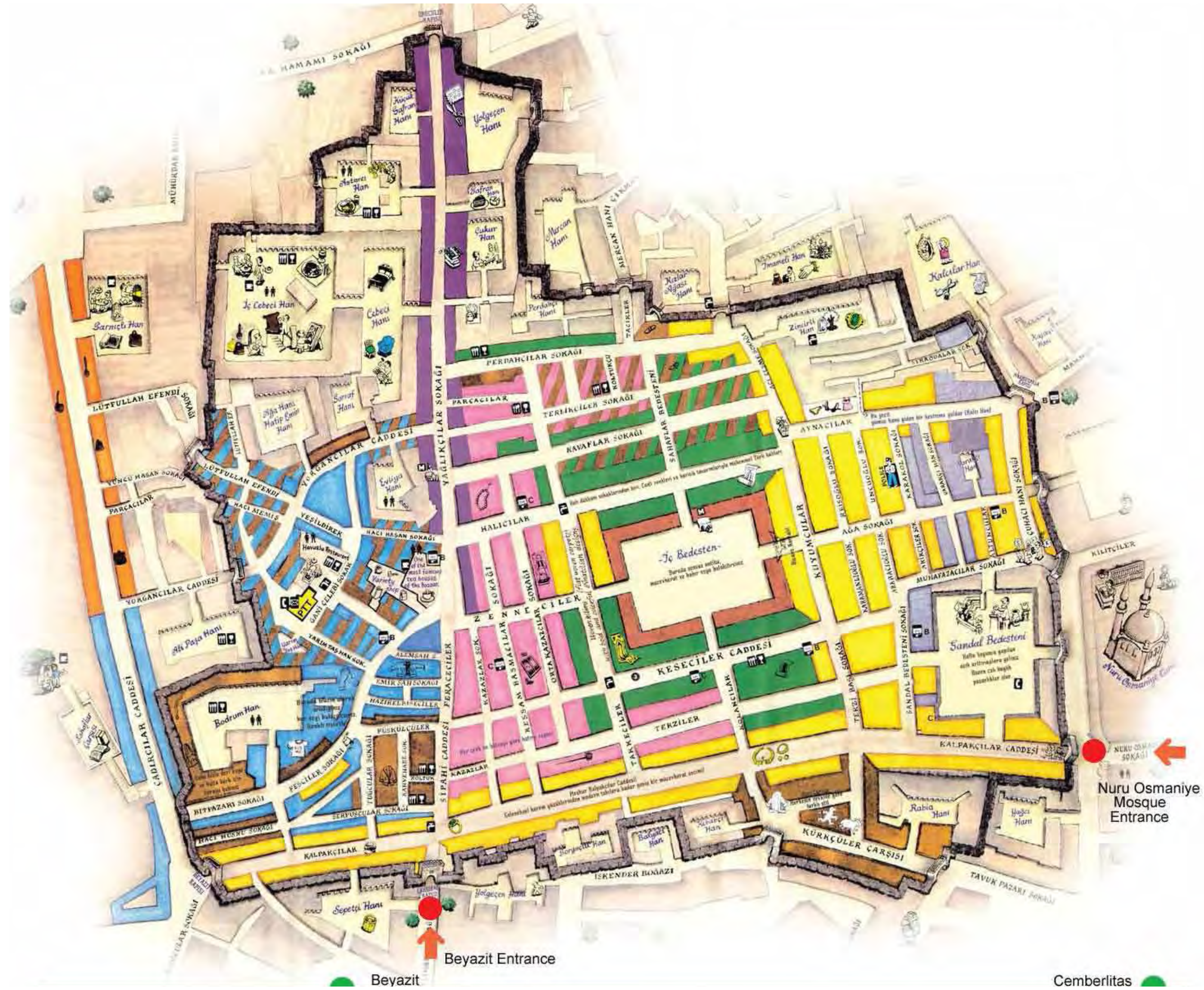
The underpass in Munich demonstrates a natural lighting strategy which makes the space more pleasant. It is lit from above, three slabs of the stone cladding have been removed and replaced with a glass panels on which the motif of the work "Points de Vue" has been printed. This intervention into the architectural grid pattern refers to the rhythm of the stone cladding, but also plays with the relationship between the interior and the imaginary exterior, puzzling the viewer and turning the functional walk through underpass into a rite of passage

Benefits:
Pedestrian tunnels are commonly used in conjunction with underpasses. The pedestrian tunnel can be sub-grade with stairs or ramps leading to the passageway or at ground level with the road. Below-grade pedestrian tunnels and walkways are most prominent in subway accessibility.

Many of the benefits of pedestrian tunnels include the following:

- Increased safety to pedestrians by removing them from heavy car traffic areas
- An increase in the use of public transportation
- Accessibility
- Adds aesthetic appeal to surrounding areas
- Provides increased accessibility to retail merchants
- A potential increase in property values, sales, and revenue
- A decrease in noise and air pollution on affected areas.

Pedestrian underpasses allow for the uninterrupted flow of pedestrian movement separate from the vehicle traffic. They provide complete separation of pedestrians from motor vehicle traffic, and provide crossings where no other pedestrian facility is available. They also can connect off-road trails and paths across major barriers.



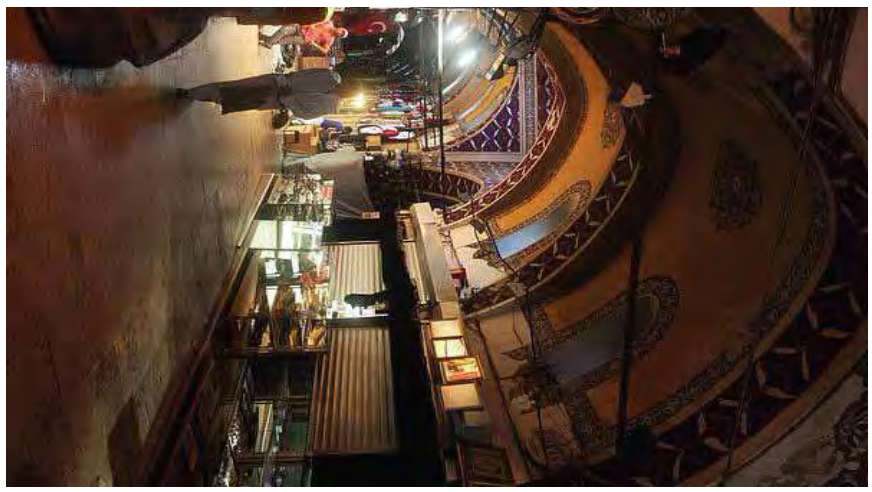
SOUKS & BAZAARS

The Grand Bazaar (Turkish: Kapalıçarşı, meaning “Covered Bazaar”) in Istanbul is one of the largest and oldest covered markets in the world, with 61 covered streets and over 3,000 shops which attract between 250,000 and 400,000 visitors daily. It used to be completely zoned in order to concentrate the trade in one place to provide the highest security against theft, fire and uprising. Areas zoned were:

Precious souk;
- Shoes and clothes souk;
- Carpet souk;
- Second-hand souk;
- Spice souk;
- Sandalwood souk;
- Weapon souk;
- Small inns in a certain zone with a few dispersed.

Currently a concentration of the same businesses along certain roads can be observed again:
1-Jewelers and gold bracelets along Kalpakcılar Caddesi;
2-Gold bracelets along Kuyumcular Carsısı;
3-Furniture along Divrikli Caddesi;
4-Carpets along Sahaflar Caddesi;
5-Leather goods along Perdahçılar Caddesi
6-Leather and casual clothes at the Bit Pazarı;

Problems to be Fixed:
This project should help resolve some of the larger issues of the market, including:
-Lighting and heating problems;
-Lack of a proper toilet facility;
-Lack of control thus dealers remove columns for more space; Concrete on the market’s roof is a great hazard (earthquakes)



LITERATURE REVIEWS

3 SITE ANALYSIS

This chapter provides an overview of al hamriya's existing conditions. It includes current land use, vacant/public land, green networks, vehicular and pedestrian circulation patterns, and washes and water flow. The most important goal of evaluating the area's existing conditions was to derive design guidelines. With an area as rich in history and culture as Oman, a comprehensive site analysis study contributes an exhaustive collection of outstanding facts and figures.

While the initial site analysis we performed was quite intense, our attempt here is to provide only the most salient conditions as they relate to essential design implications.

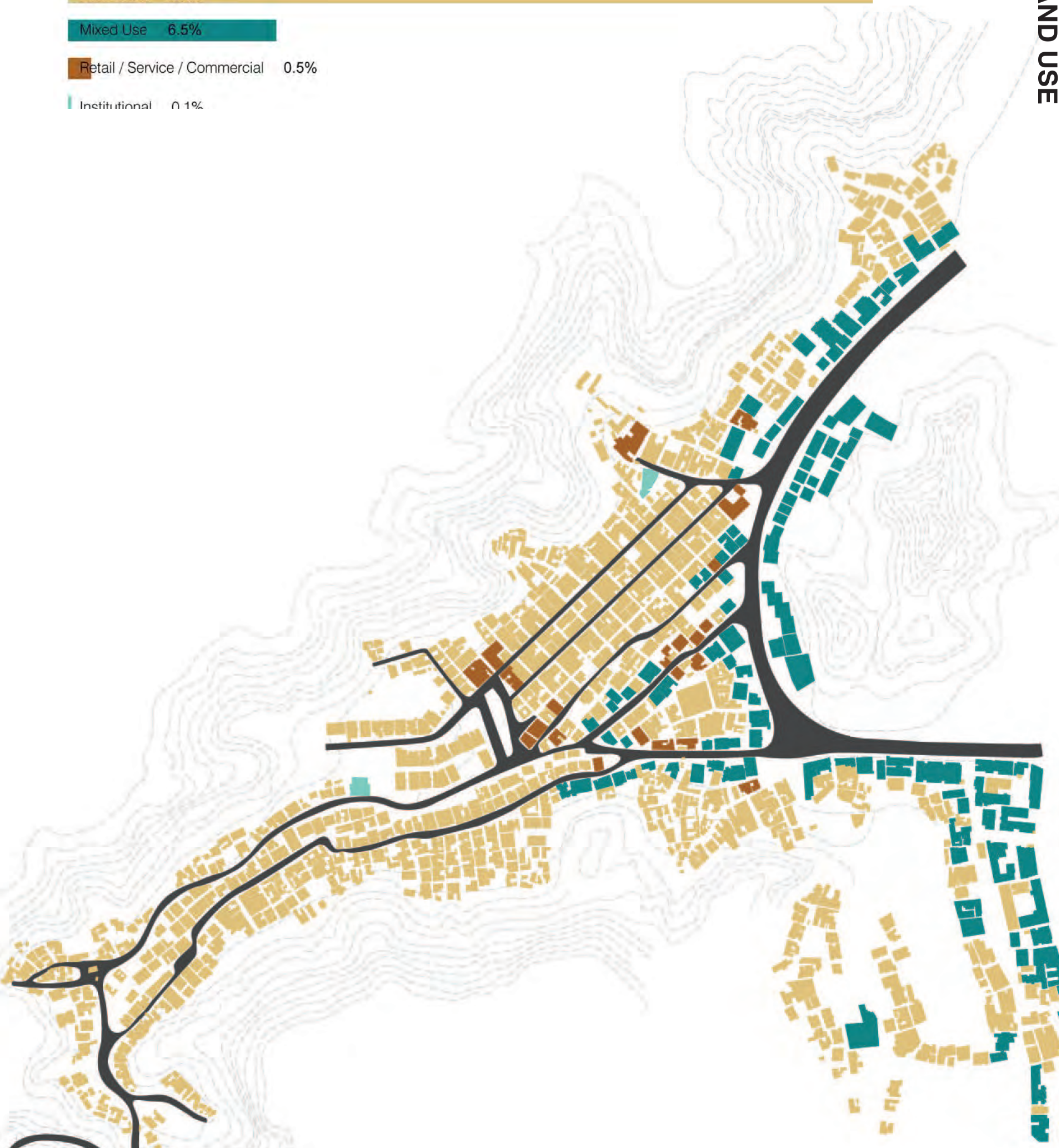
LAND USE

Residential 29.3%

Mixed Use 6.5%

Retail / Service / Commercial 0.5%

Institutional 0.1%



RESIDENTIAL

Residential is the major land use in Al Hamriya. It includes single family housing and multi-family housing.

MIXED USE

Most mixed uses are located along the main streets. They are a combination of residential, retail, commercial, and service. These mixed uses serve the whole site with not only daily supply, but also basic services like banks and internet cafes.

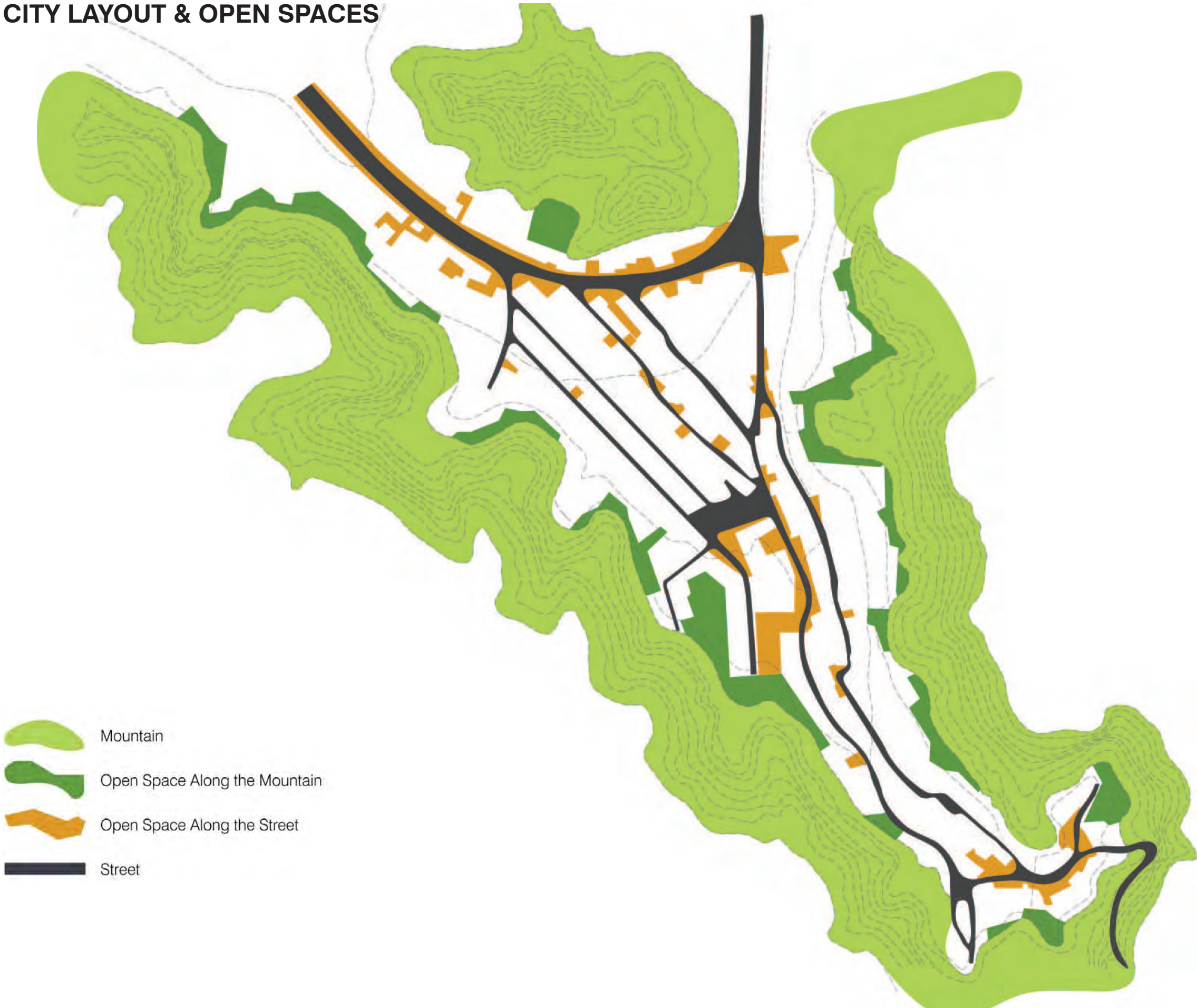
INSTITUTIONAL

A mosque is being built in the middle of the site. Currently no other educational facilities are located within Al Hamriya.

RETAIL/ SERVICE/ COMMERCIAL

This kind of use is mostly found with one story building structures. Operations included small grocery stores, construction material stores, mechanical shops, and repair shops.

CITY LAYOUT & OPEN SPACES

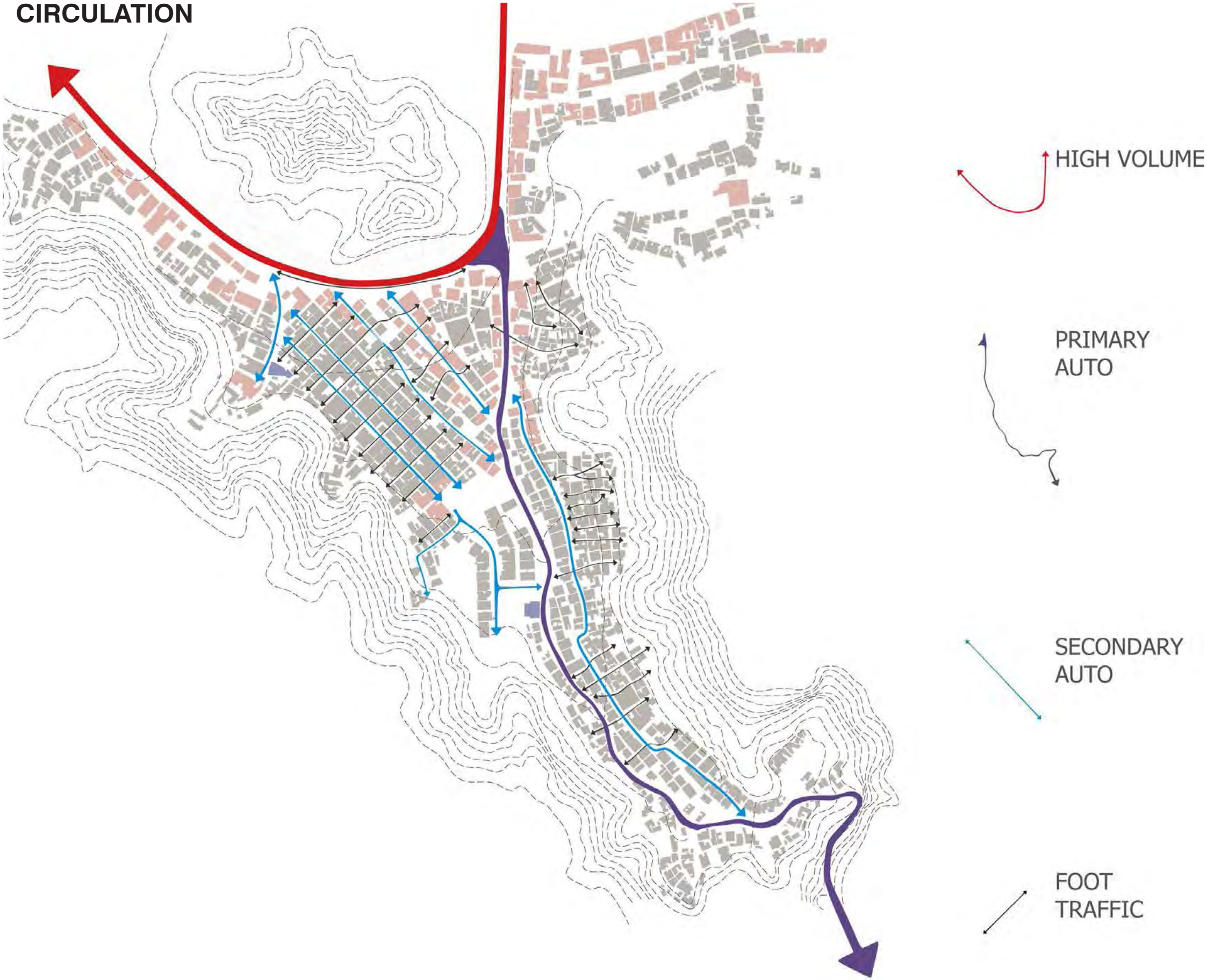


Three kinds of open space have been identified within Al Hamriya, they are: the mountains, open space along the mountains, and open spaces along the streets. With exception of the mountains which are large concentrated open space, other open spaces on site are generally scattered and fragmented.

Currently a lot of abandoned open space can be found between the mountains and the built environment. These open spaces are generally not viable to the whole community, and are just used by nearby residents for parking. Some are not usable due to limited space.

Parking is the most common use of the fragmented open spaces scattered through Al Hamriya.

CIRCULATION

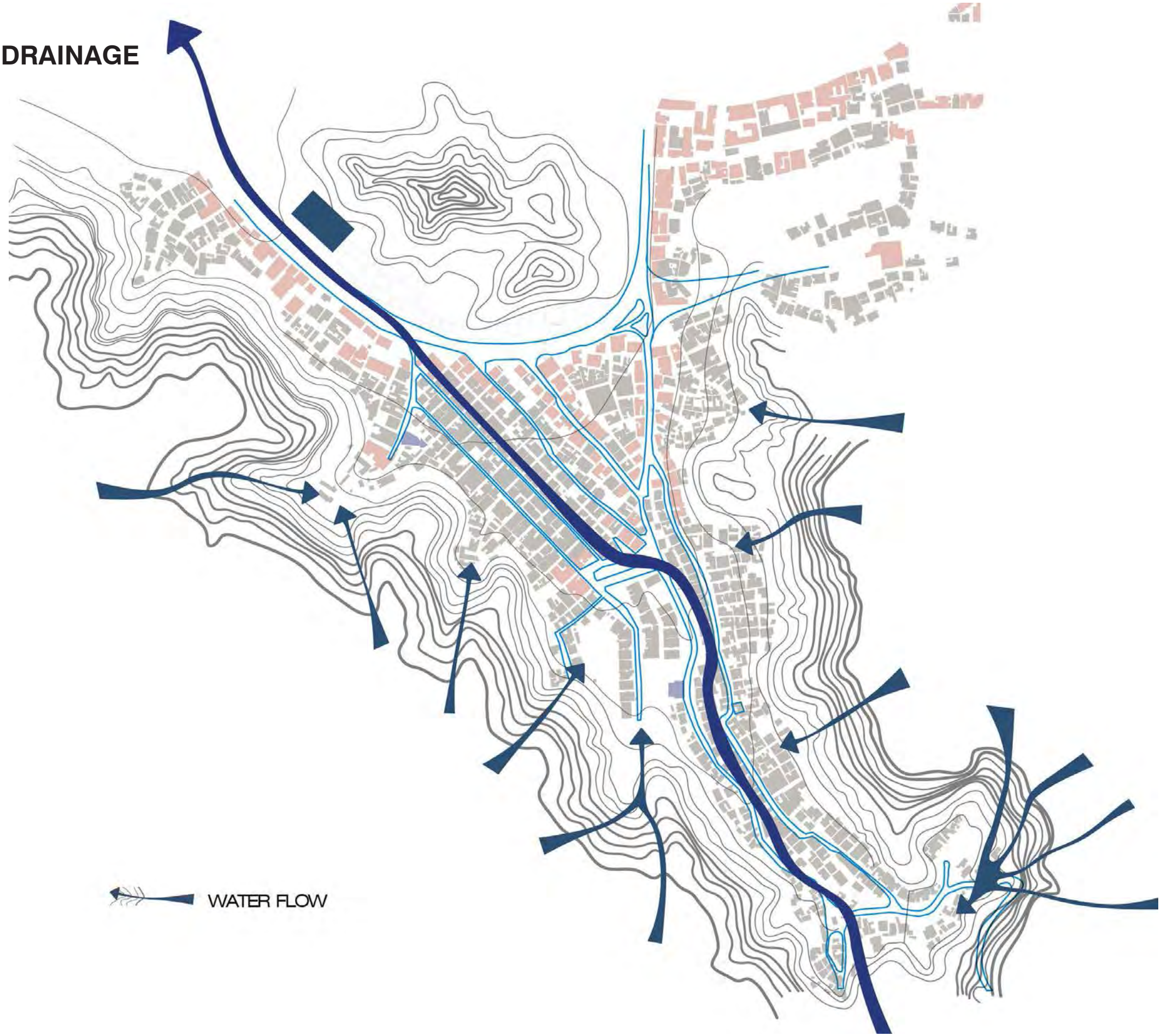


Circulation to and through the site is composed of four different modes/volumes of traffic. The main road accessing the site supports a large volume of automobile traffic and defines the northern edge of Al Hamriya. This road is filled with bumper to bumper traffic, day and night.

An interesting pattern for vehicular site circulation is that streets run north and south and foot paths often run east and west. Below is a typical primary/ secondary vehicular street lined with parked cars.

To navigate the site laterally, one needs to pass down one of the many foot paths servicing this mode of circulation.

DRAINAGE

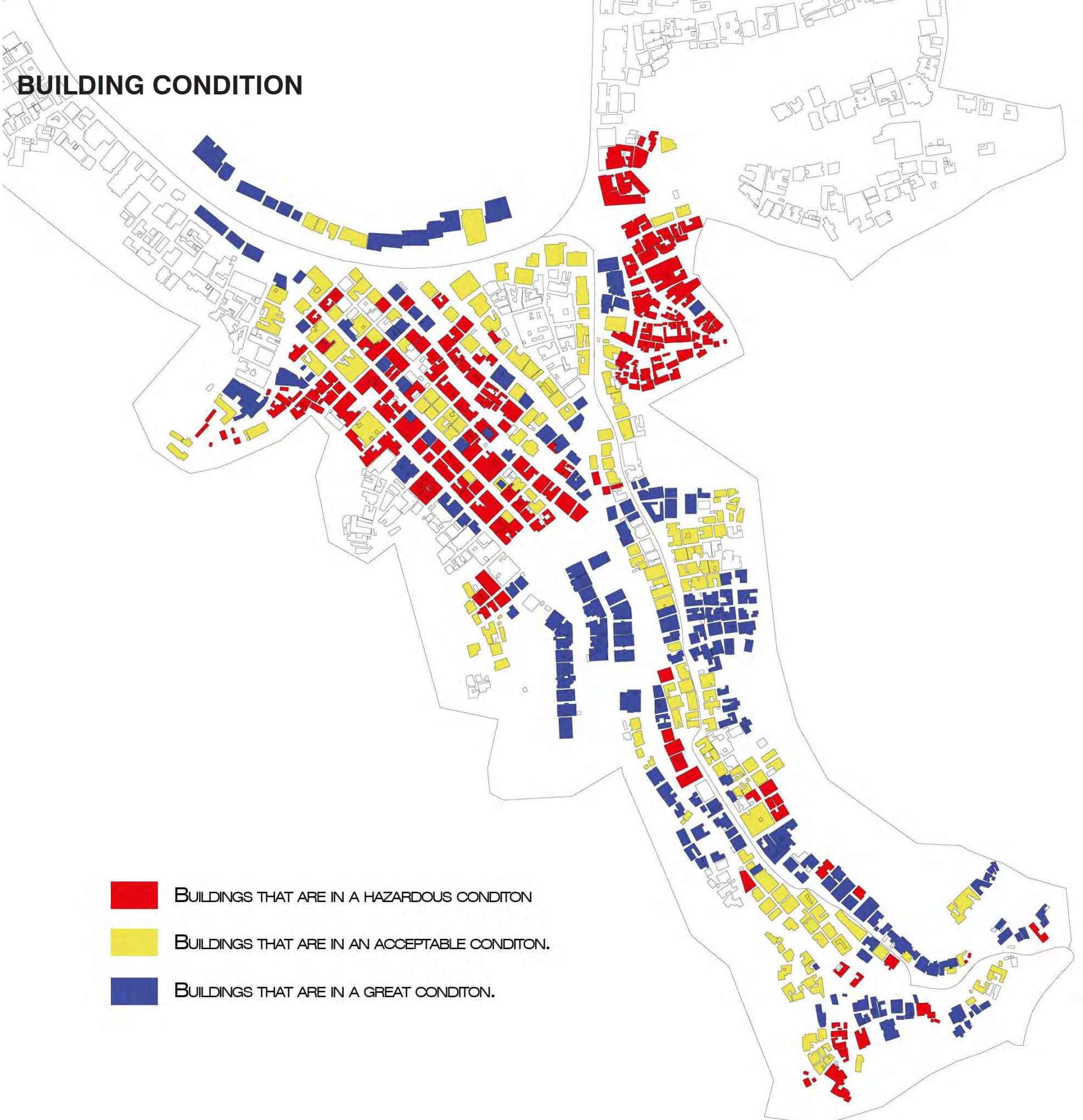


All runoff from the annual rain is channeled through the site and delivered to the ocean through a rather small canal. In the past, flooding has occurred due to excessive rain, and additional redirected runoff. The current canal's capacity to handle runoff is questionable.

The banks of the valley surrounding Al Hamriya are shear, rocky faces, that don't slow water flow enough to give it time to percolate, but rather shed it swiftly, down into the housing below.

In the city fabric, no defined system of drainage, other than streets, are in place to handle runoff.

BUILDING CONDITION



BUILDINGS THAT ARE IN A HAZARDOUS CONDITON

BUILDINGS THAT ARE IN AN ACCEPTABLE CONDITON.

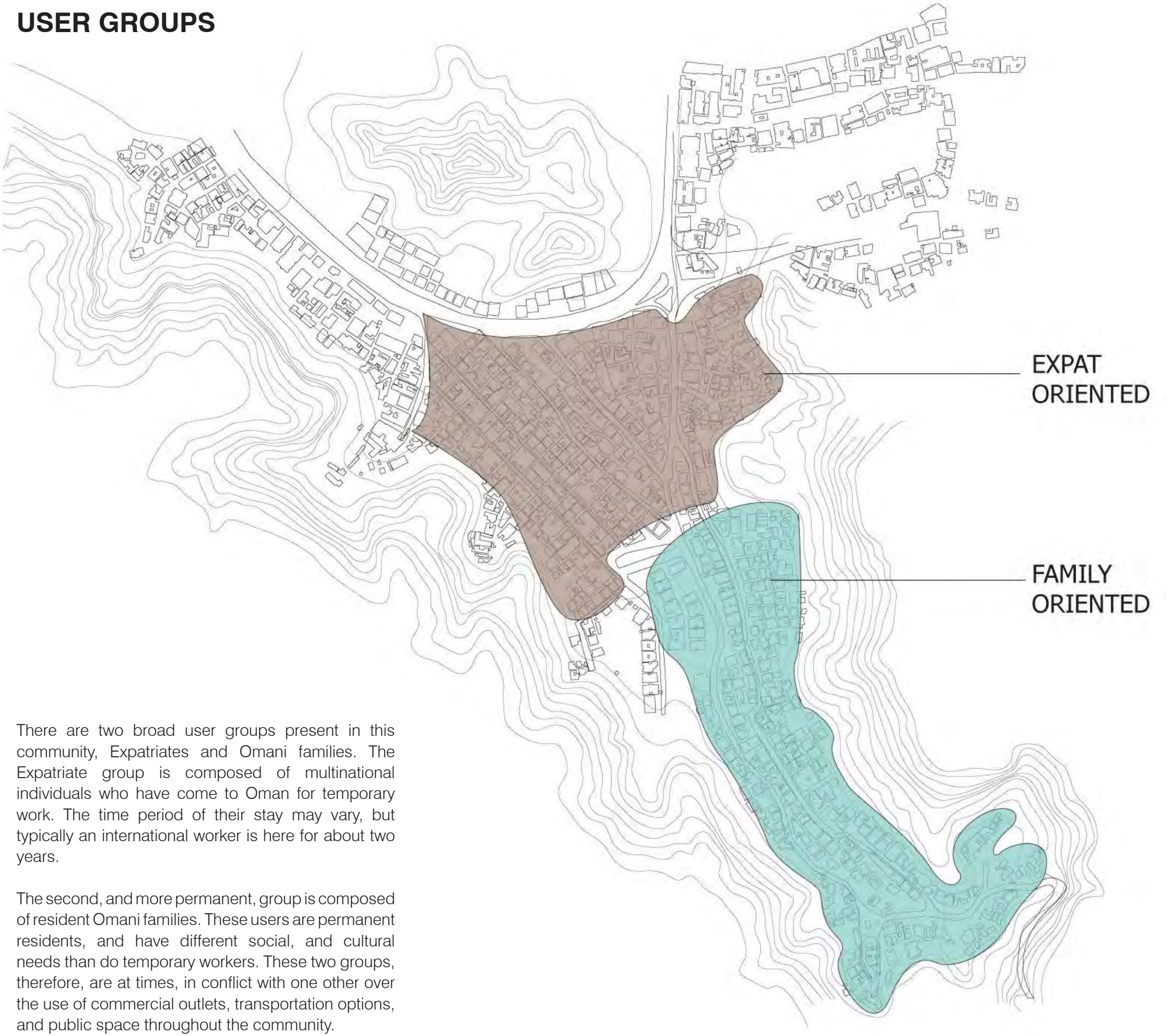
BUILDINGS THAT ARE IN A GREAT CONDITON.

This category of buildings define a large portion of northern Al Hamriya, and visibly display a lack of up-keep. They are also typically single story residences, housing dense populations of expatriate workers. Given the condition of these buildings and nature of their use, they are insufficient to safely support this utility, and when in concentration begin to compose large areas with potential for intervention.

This category of buildings is composed of residences, and mixed use buildings. From the outside they appear to be suitable for supporting their current occupation, but definitive safety and habitability calculations could not be made.

This last section of buildings are considered to be of the best quality, and sufficient for their task. The highest concentration of these buildings reside in the southern half of Al Hamriya.

USER GROUPS



There are two broad user groups present in this community, Expatriates and Omani families. The Expatriate group is composed of multinational individuals who have come to Oman for temporary work. The time period of their stay may vary, but typically an international worker is here for about two years.

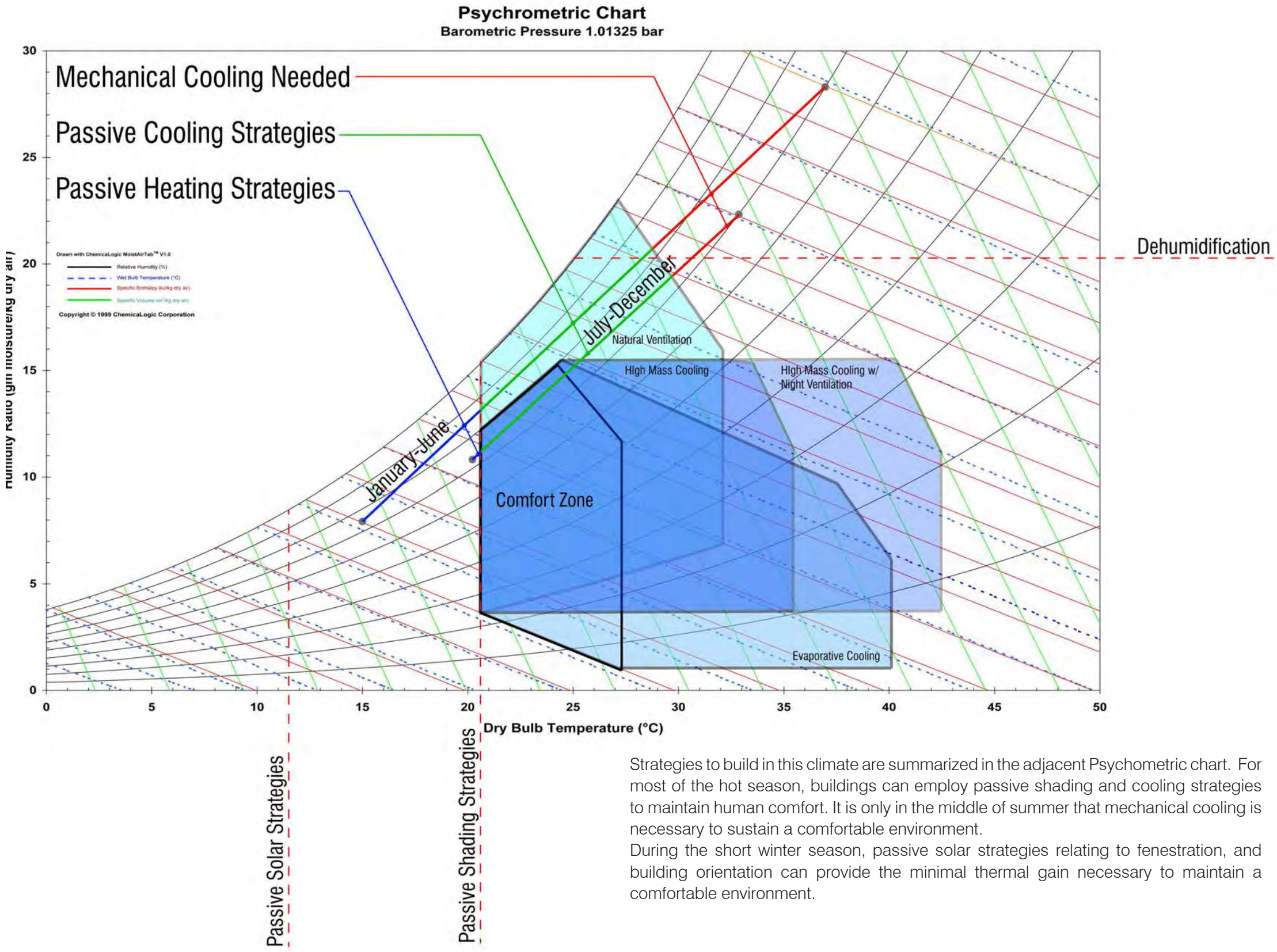
The second, and more permanent, group is composed of resident Omani families. These users are permanent residents, and have different social, and cultural needs than do temporary workers. These two groups, therefore, are at times, in conflict with one other over the use of commercial outlets, transportation options, and public space throughout the community.

The unorganized power lines, utility lines, and exposed sewage systems are creating a poor public health condition in the Al Hamriyah area.

TOPOGRAPHY

The topography around the community is steep, and sharply defines the edge of the city. Due to the density of the bedrock like soil composition, excavation and building above the valley floor is cost prohibitive and therefore rarely done. Additionally, vegetation hardy enough to flourish in this soil composition is limited, so during the rainy season, these shear faces quickly shed water down into the valley floor below.

CLIMATE



Strategies to build in this climate are summarized in the adjacent Psychometric chart. For most of the hot season, buildings can employ passive shading and cooling strategies to maintain human comfort. It is only in the middle of summer that mechanical cooling is necessary to sustain a comfortable environment.

During the short winter season, passive solar strategies relating to fenestration, and building orientation can provide the minimal thermal gain necessary to maintain a comfortable environment.

DESIGN

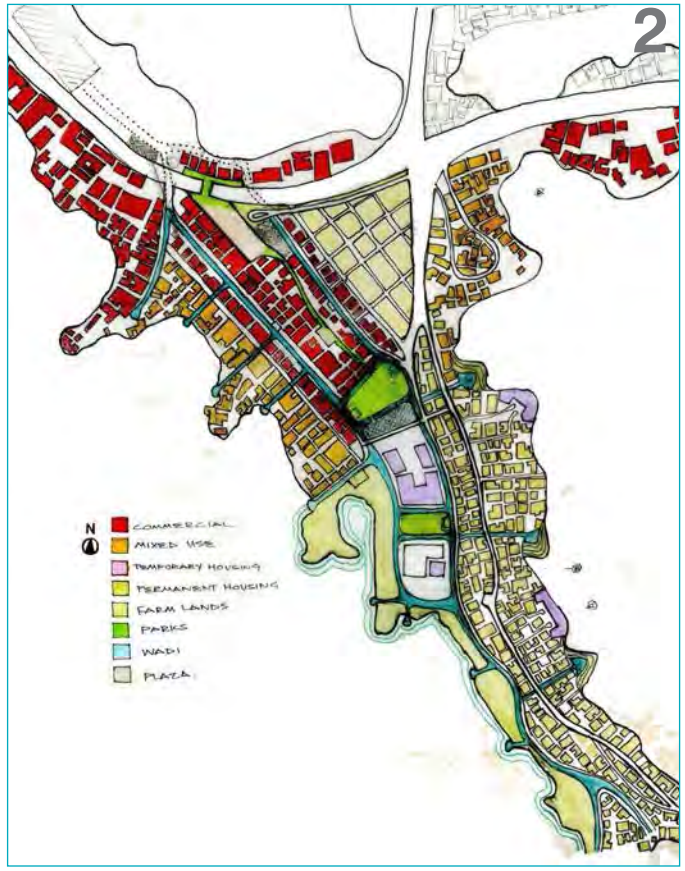
4 DESIGN

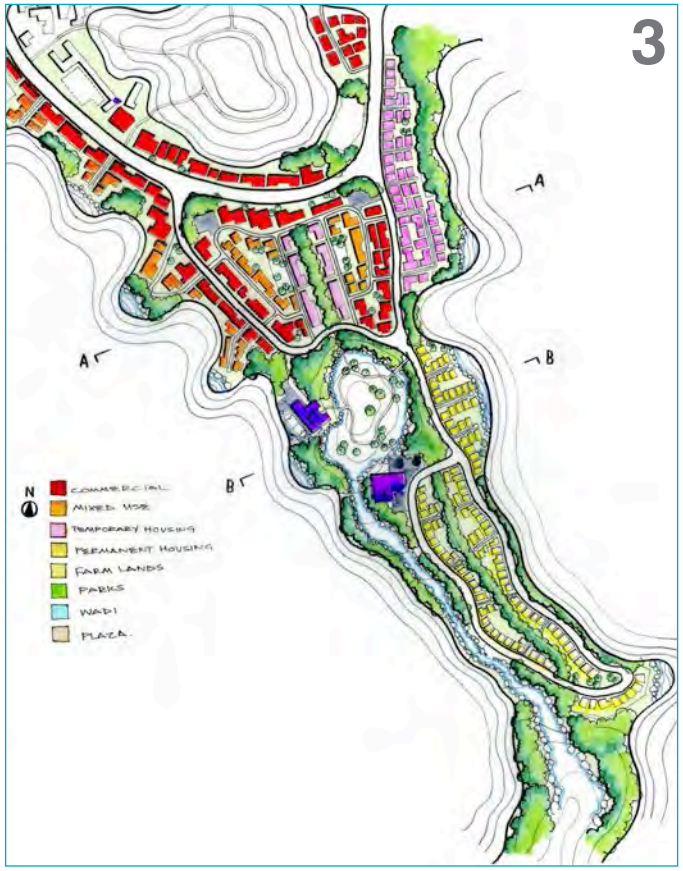
MASTER PLAN AND FOCUS AREAS

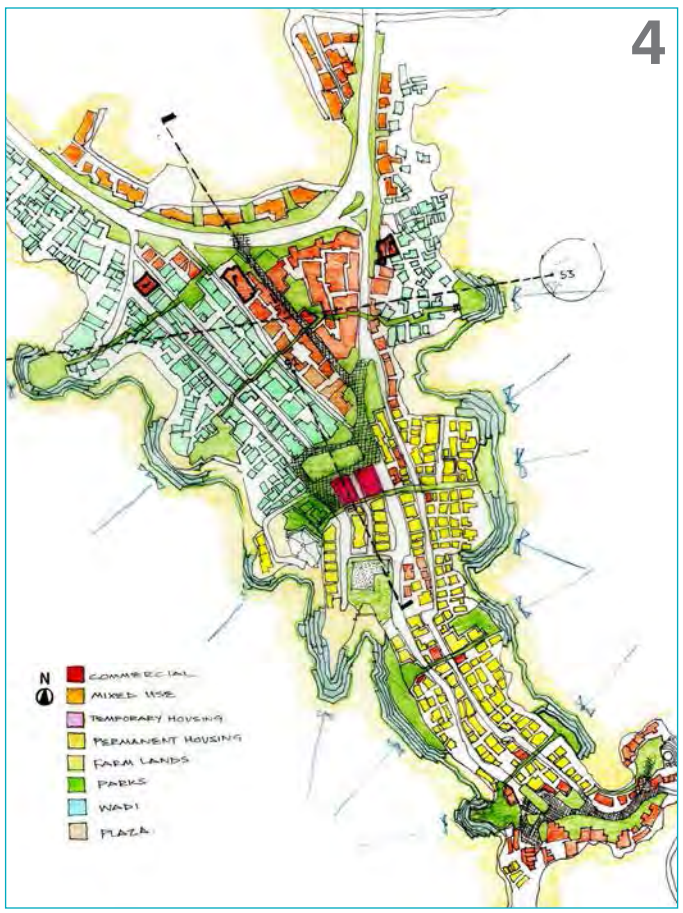
This chapter covers the design and planning progression of the project, which began in Oman and continued for fifteen weeks once the team had arrived back in Tucson, Arizona. The process began with the team separating into 5 different groups to create 5 different concepts that were presented to the mayor Sultan Bin Hamdoon Al Harthi in Oman. The different concepts generated were then synthesized into one final concept based off of feedback received from our clients (Muscat Municipality), and continuing idea generation within the team. Descriptions of each concept, including plans, can be found within this chapter and the overall master plan, sections, and perspectives that were generated by the team, form the conclusion of this book.

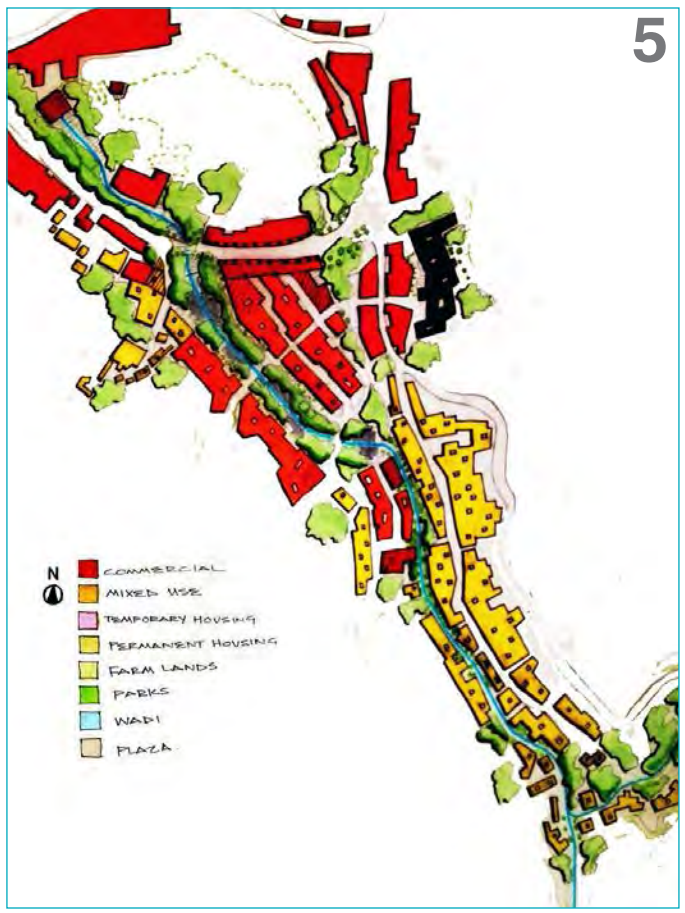
PHASE ONE IN OMAN (PRECEPTS)

Effective liaison with Omani faculty, students and professionals was essential during the pre-design phases of the project. Weeks prior to our arrival, host collaborators assisted in project selection as well as preparation of demographic, cultural, environmental, economic, and site-specific information for us to digest during pre-immersion activities at home in Tucson. We reviewed this data prior to travel and attempted to distill design and planning precepts/design implications, as well as fledgling site development concepts that were tested later on site and in early charrette sessions with host country participants. These exercises helped us better understand central issues, site potentials, and also helped us identify what we don't know and what we need to further investigate. We believe that designers gain insight and inspiration from a variety of sources. An essential part of our design and planning process occurred during pre-design research. We involved our Omani hosts during this phase, and information garnered from a variety of sources was reviewed and incorporated into the design intentions of our teams of landscape architects, planners, and architects. Critical sociocultural, socioeconomic, environmental, functional, and identity-related issues were examined in depth through hybrid qualitative and quantitative methodologies. Our designers then distilled relevant design and planning implications from the analysis of the data collected. These bits and pieces of design ideas (precepts), were eventually incorporated into comprehensive design and planning concepts as a form of post-factum hypothesis generation. As part of our pre-design research, our teams and hosts collected information regarding clients and site through extensive case study analysis, structured interviews and questionnaires. We also undertook exhaustive site inventories, as well as user-group analysis of the site and surrounding context. During contextual analysis we spend a great deal of time on and around the site as non-participant and participant observers. Some methods we employed approximate those of ethnographers and are qualitative in nature. While others are quite factual and employ low inference descriptor variables, we began with a large scale contextual analysis – looking for key factors surrounding the site that may influence our design decisions within the site. This involved detailed analysis of aerial photographs and G.I.S. data. We also photographed the entire site and surrounding urban and natural contexts – looking for existing positive design features unique to the site as well as problem areas in need of attention. During the visit, we had several scheduled trips to visit vernacular towns, Nizwa, Mutrah, the old souk located in Muscat, the municipality, the old fort and Chedi, a five star luxury hotel. These visits allowed us to better understand how to design within the Omani environmental and cultural context. They also gave us insight into creating successful open spaces. We began to understand how the culture and climate were major influences in the design. These visits also allowed us to better understand how modern design and traditional methods of construction and planning can be synthesized into new contemporary and sustainable design strategies.









Ultimately, we were able to develop five different master planning concepts each with fundamentally different approaches. In this manner we were able to generate a range of alternative ideas, thereby allowing us to synthesize the best ideas of each into one final master plan.

From the beginning we all had ideas about creating open space, mixed use development and circulation patterns. These appeared in all five master plans, yet each also offered an array of unique concepts. Initially, we would all brainstorm to develop these unique ideas. By the end of week one we realized that urban agriculture, connected open space and mixed use development should find their way in to the different master plans as these strategies would most likely improve the area and would help create jobs for the workers as well as for the families.

One day prior to leaving Oman, we presented to the Mayor and received excellent feedback regarding what concepts we should keep and what should be omitted from the designs. Some of the ideas identified as “successful were the following: include and maintain portions of the old town; create new dorms for the labor population; create a new souk area; create connected open spaces; provide schools and vocational education opportunities; create public transportation links; reintroduce the wadi to address the issue of flooding along with urban agriculture. All these different ideas were identified as viable and could make this a better area to live, work and play. During the final ten weeks in Tucson, we then synthesized these ideas into one unified master plan for Al Hamriya.

CONCEPT 1

Al Hamriya is known as an area dominated by expatriate workers, and trying to develop a plan that addressed that concern and to develop a design that found balance between single laborers and Oman families became a central design concept.
The first thing was to design the commercial area in a way to have its own open space where workers and visitors can share. We designed the commercial courtyard as a threshold to the site, enhanced by retail and mixed use building, accessible to the people from outside the area and linked by pedestrian underpasses to the opposite edge of the main street, where all terracing and trails leading to the summit of the mountain across to the north.
The worker housing and non-family housing is proposed to be adjacent to the commercial courtyard. It is supposed to develop the area and make it easily for workers to use the place.
The open spaces and green areas are focused in the center of the site where the mosque is located, thereby making it a “central park” which supports the several wadi’s that run through the middle of the site. These wadi’s were designed to support the drainage of flood events and feature native plants.
Flood is controlled also by terracing the slope of the mountains around the site. This controls the water flow during rains and flooding. And these terracing could be an opportunity for urban agriculture.
From the central park an access was made to the mountain east of it. This links the mosque with a gathering area or an amphitheater where people can gather and enjoy the view to the north.
And to serve the families in the south, we proposed pocket areas which are open enclosures between the houses where women can easily use these spaces with a sense of privacy.


N
COMMERCIAL
MIXED USE
TEMPORARY HOUSING
PERMANENT HOUSING
FARM LANDS
PARKS
WADI
PLAZA
A
B
C
D

CONCEPT 2

In the first phase of this optional master plan the main concept was to create a community hub - the islands. These allowed the Omani and expat families to use facilities such as a grocery store, a community center, a gym, a park and an outdoor exhibition space for Friday markets or other events. This would create a nice gathering space for the area as it is lacking a public space which could definitely re-energize Al Hamriya. The other main concept was to bring back the wadi and have that connect all areas of the master plan in order to offer a continuous vector that would allow meaningful relationships to grow throughout the area so that not every zone/area is separated. In addition, the wadi of course helps with the flooding problem and also becomes aesthetically pleasing for the area. The wadi continues underground when it reaches the street and goes into a storage basin.

In terms of the commercial and mixed use areas, they are situated on the north side of the site near the busy street. The commercial hub would include a new souq which would bring money to Al Hamriya. The residential areas and farming are towards the south and middle to create a quiet and safer environment for the families. There is a proposed street that would be used strictly for residents to provide quiet and reduce congestion. In this manner families could allow their children to play outside thereby enhancing the quality of the outdoor spaces. The agricultural areas are situated at the edges of the mountains where water flows directly after rain. In addition this means the area is separated from the main circulation creating an opportunity for urban farming.


COMMERCIAL
MIXED USE
TEMPORARY HOUSING
PERMANENT HOUSING
FARM LANDS
PARKS
WADI
PLAZA.
N

DESIGN

CONCEPT 3

One of the driving forces behind this concept was the environmental issue. This idea was reinforced when the team met with the local sheik, who identified issues with the non-functioning wadi. The concept moved forward and was developed with a focus on day lighting the wadi and bringing it back to a more natural, functioning state. This will not only help to mitigate the environmental hazards of the Al Hamriya area but will also stimulate economic development and improve social equity.

By day lighting the wadi, storm water is directed into the main channel and is detained be natural terracing and native plants giving the water a chance to percolate into the soil. With large storm events the water will continue to move down the wadi until it comes to the large sunken park. Again the water is detained within this park, keeping it on site and allowing enough time for the water to further infiltrate into the soil, or it has the ability to move off site through underground drainage pipes to the proposed detention tank. With day lighting the wadi we help to preserve a natural drainage system and we may even help reconnect fragmented habitats.

Economic development was also a major concern for the area. Local business is important to the economic development of Al Hamriya, and by promoting local small business, hundreds of employment opportunities could be provided to local workers. The proximity of workplace and home would also encourage walking instead of driving, thereby reducing car dependency and helping to mitigate traffic congestion. Local business can include a wide range of functions raging from agriculture to service sectors.

Al Hamriya also has a serious disproportion of gender distribution and racial distribution. The social equity within the area is unbalanced and needs to be addressed for the comfort and safety of everyone. Open space becomes significant to the future development of Al Hamriya because it not only provides potential for recreational purposes but can also provide much needed social space. Diverse scales of open space can provide different uses for different groups of people.


A
B
B
A
N
COMMERCIAL
MIXED USE
TEMPORARY HOUSING
PERMANENT HOUSING
FARM LANDS
PARKS
WADI
PLAZA

CONCEPT 4

Primary strategies for this concept focus on minimizing destruction of existing infrastructure; the introduction of necessary changes to specific nodes; the unification of the city and the resolution of existing conflicts between land use and existing user groups; and by creating opportunities that all users currently lack. The greatest qualities of this community are embodied in how the built environment is nestled into the flanking valley faces and weaving along the valley floor with respect to topography. In efforts to emphasize this relationship, our strategies don't disturb this character, but strengthen this relationship by stitching the transition between topography and built environment through the introduction of urban agriculture. By creating this stitch, it produces an amenity that directly links all users to site and place.

This same ethic of sensitivity is applied in dealing with other interventions creating links within the built environment. Residents of Al Hamriya are connected to the rest of the city in a North-South direction by automobile roads, and East-West by foot paths. To strengthen circulation by foot, we are introducing strategic greenways that provide, safe, shaded, public spaces for pedestrians to circulate about the city. Theses greenways connect amenities that we are proposing to be introduced. These amenities vary in function, but always have the common theme of public space, and have usages that range from parks, soccer fields, urban agricultural facilities, shopping at the new Souq, and accessing the Mosque. Through these greenways, people can gain easy access from their home to necessary local amenities, food and recreation.

The downtown business district is key to the economic viability of Al Hamriya, so in the spirit of preservation, we are proposing that this area be strengthen by introducing a Souq into the existing infrastructure and connecting it to the existing businesses that are currently operating in this district. The new Souq would provide residents outlets to shop at retail, grocery, and restaurant facilities, and prevent them from needing to leave Al Hamriya to meet these basic needs. This district has adjacent worker housing to provide a strong work force to operate the district.

By strengthening circulation routes through the city and energizing the downtown district with shops and housing, the organization and stability of the community as a whole is improved, and it begins to establish a foundation for this community to become a self sustained, model for urban living.


N
COMMERCIAL
MIXED USE
TEMPORARY HOUSING
PERMANENT HOUSING
FARM LANDS
PARKS
WADI
PLAZA
SS

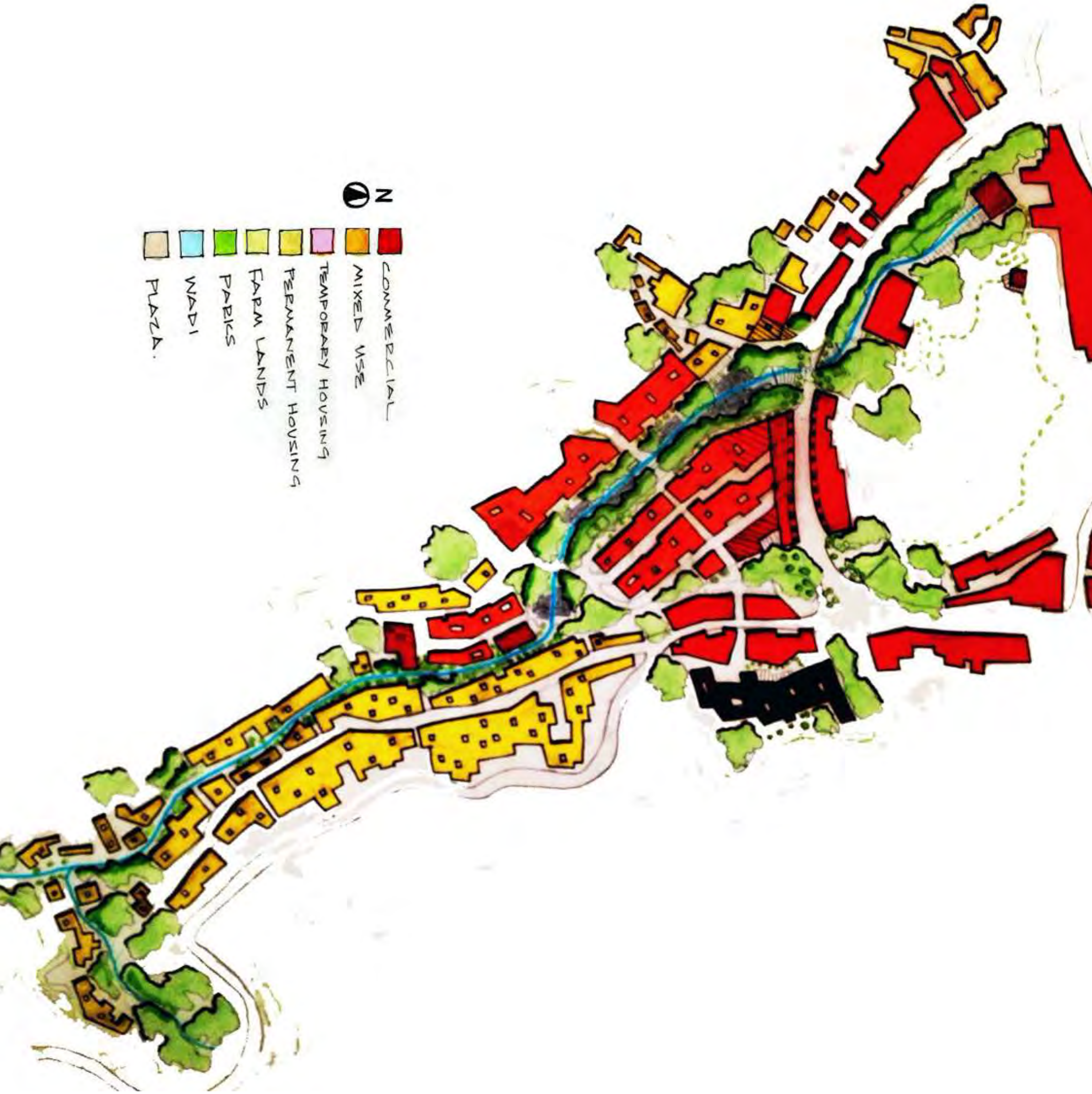
DESIGN

CONCEPT 5

This concept focuses on a strong link from the north to the south mountains of Al Hamriyah. This takes the form of an open Wadi that cuts through the urban fabric. This Wadi also functions as a linear park which cuts through distressed urban fabric, and makes Al Hamriyah a viable and attractive location for visitors. This park would have a commercial street on one side, which would support shops developing on either side of the park. The park would use a variety of micro-climactic strategies including shade structures, xeriscape, water retention, and grey water reuse to create a pleasant atmosphere for its visitors. This park can also become a water treatment system for the site as well as an educational opportunity for such sustainable strategies.

Another concept which is important to the proposal is an upgrade of the existing commercial base of the area. This commercial base is mostly includes the sale of construction materials such as paints and hardware. As a response to the international call for sustainable building, new construction materials may be introduced to the area for this commercial base. This may include solar panels, low carbon paints and finishes, as well as traditional building materials such as mud brick production and distribution.

The phasing of this proposal focuses on upgrading the infrastructure at the same time as building this park. The problem of displacing people also needs to be addressed. The proposal creates an area for dormitories for on site expat workers where people can be moved to create space for further development. After this happens, the main demolition and construction of the park and sewer system can done, and eventually connects to the city sewer and the whole site. Once this is done, the image of the area is essentially transformed and upgraded, which will help encourage investors to revitalize the urban fabric around the new park and infrastructure.


COMMERCIAL
MIXED USE
TEMPORARY HOUSING
PERMANENT HOUSING
FARM LANDS
PARKS
WADI
PLAZA.
N

DESIGN

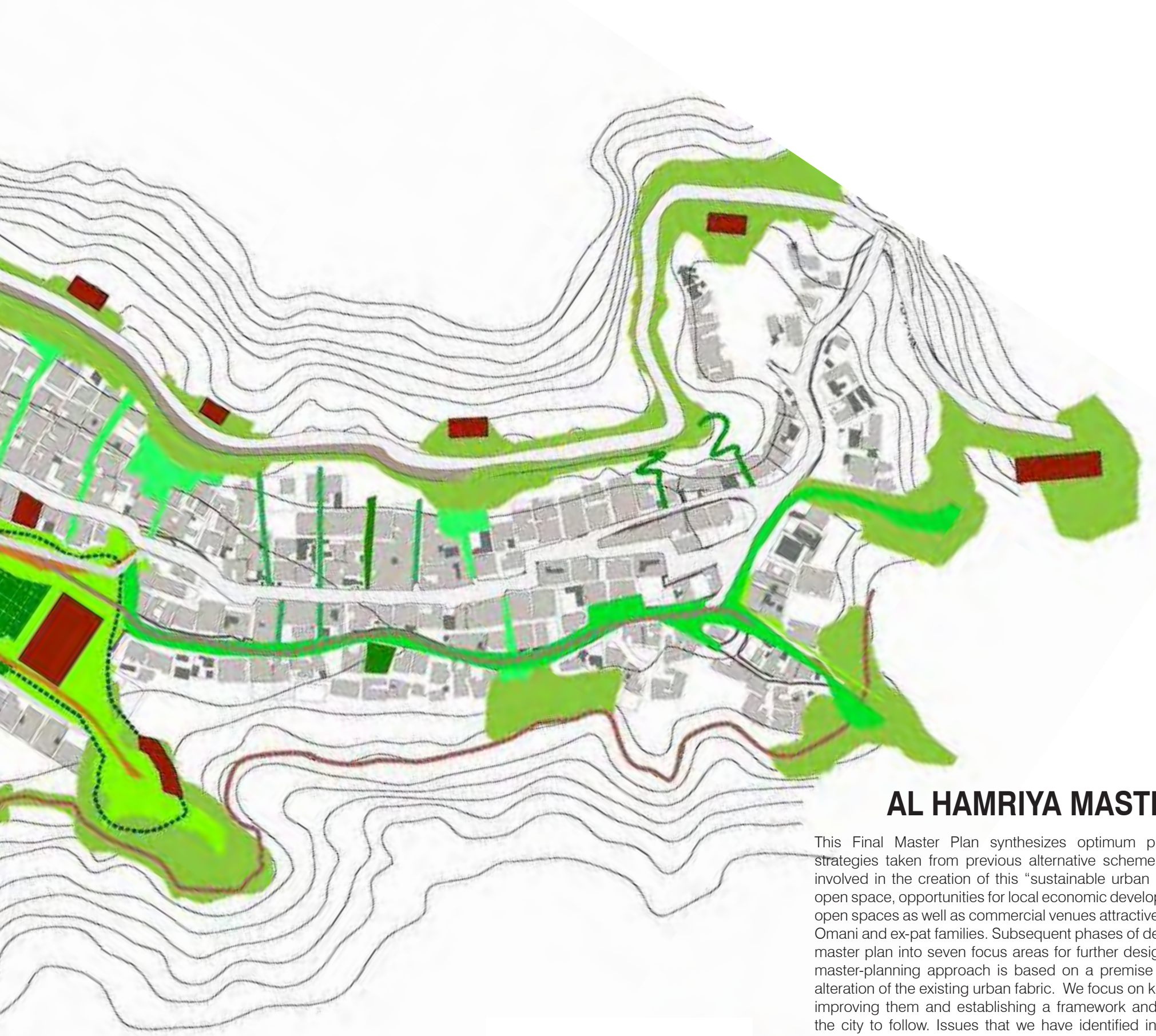

L DIFA'AY TRAD.
الدفاعي للتجارة
بيع الصناديق الحديدية
L BOX
سكة ٥٩٦١
Way 5961
١٥٩
CLINIC

FINAL MASTER PLAN

DESIGN PROCESS

The process leading to the final synthesized master plan is one of the most important aspects of the project. It was conducted collaboratively, involving rigorous discussions and design charrettes within our studio team, combined with periodic input from our Omani compatriots. Once the main conceptual master plan had been established,smaller groups began generating specific ideas for various focus areas. As in the first phase, each sub-group presented their work to the team at the end of each week, making refinements based on group comments. The master plan chapter shows the overall workings of the designed project area, in terms of land use, the open space network, and transportation. This is done so that the focus areas can each be understood as a part of a project-wide plan. The transition zones among the various foci are crucial areas and must be designed collaboratively.


al Qala Street
Suq Kawi Street



AL HAMRIYA MASTER PLAN

This Final Master Plan synthesizes optimum planning and design strategies taken from previous alternative schemes. Primary strategies involved in the creation of this “sustainable urban living prototype” are: open space, opportunities for local economic development; the creation of open spaces as well as commercial venues attractive and useful for young Omani and ex-pat families. Subsequent phases of development divide the master plan into seven focus areas for further design development. This master-planning approach is based on a premise of light to moderate alteration of the existing urban fabric. We focus on key zones, moderately improving them and establishing a framework and ethic for the rest of the city to follow. Issues that we have identified in Al Hamriya include: overpopulation, limited public space, age and cultural interaction concerns among different cultural groups, flooding, and economic stimulation. To address these challenges we have developed proposals that address these issues in the following section.


N

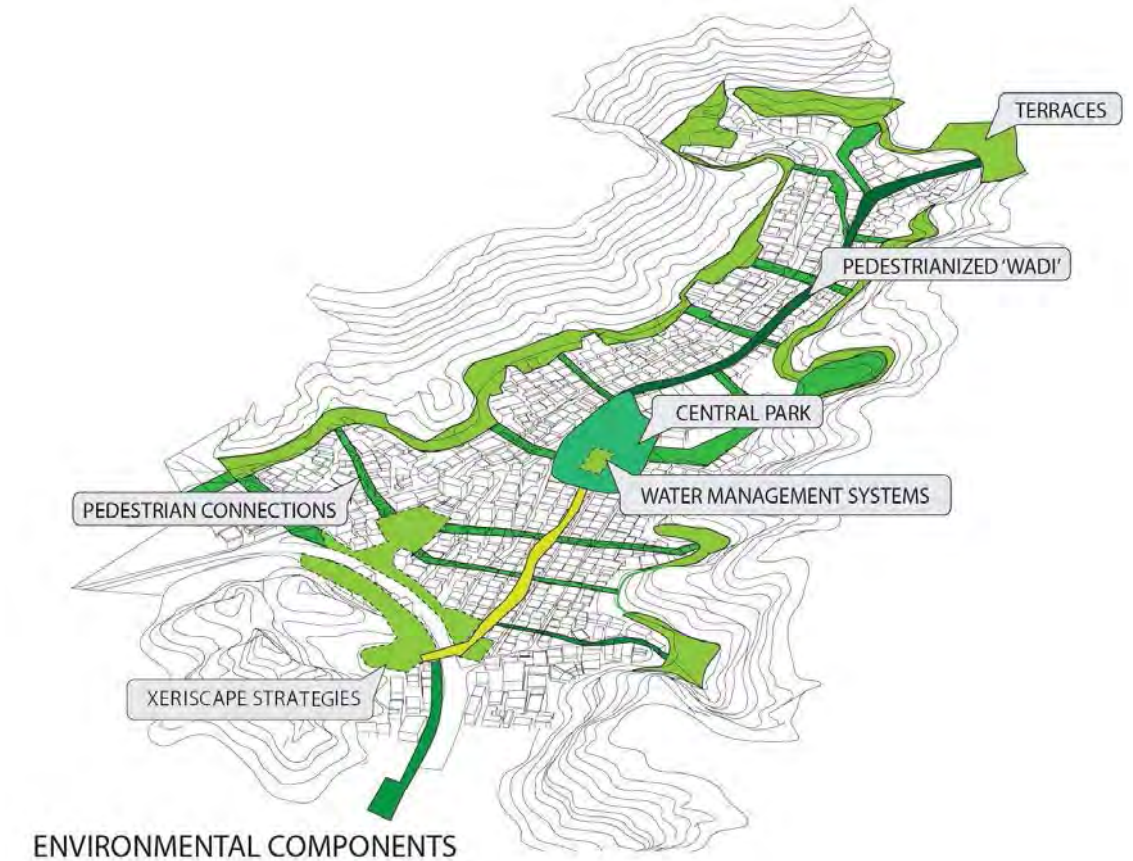
The “Old Souk” is an upgrade of Al Hamriya’s existing economic base of construction material and light industry. This includes dormitories for workers that work on the site, as well as vocation facilities and opportunities for income supplementation with terrace farming.

The strategy of the “Street Edge” is to unify and announce the edge of Al Hamriya, showcasing the various sustainability strategies. The edge also creates opportunity for further development by providing parking and connections to the mountain. The New Souk becomes a catalyst for job creation and creates a new centralized shopping district.

The “Community Heart” features a central open space with a soccer pitch, the community mosque, and building space allocated for small scale local business. These focus areas are unified by the overall strategies which have emerged from previous plans and various discussions.

SCALE 0m 250m 500m

DESIGN STRATEGIES



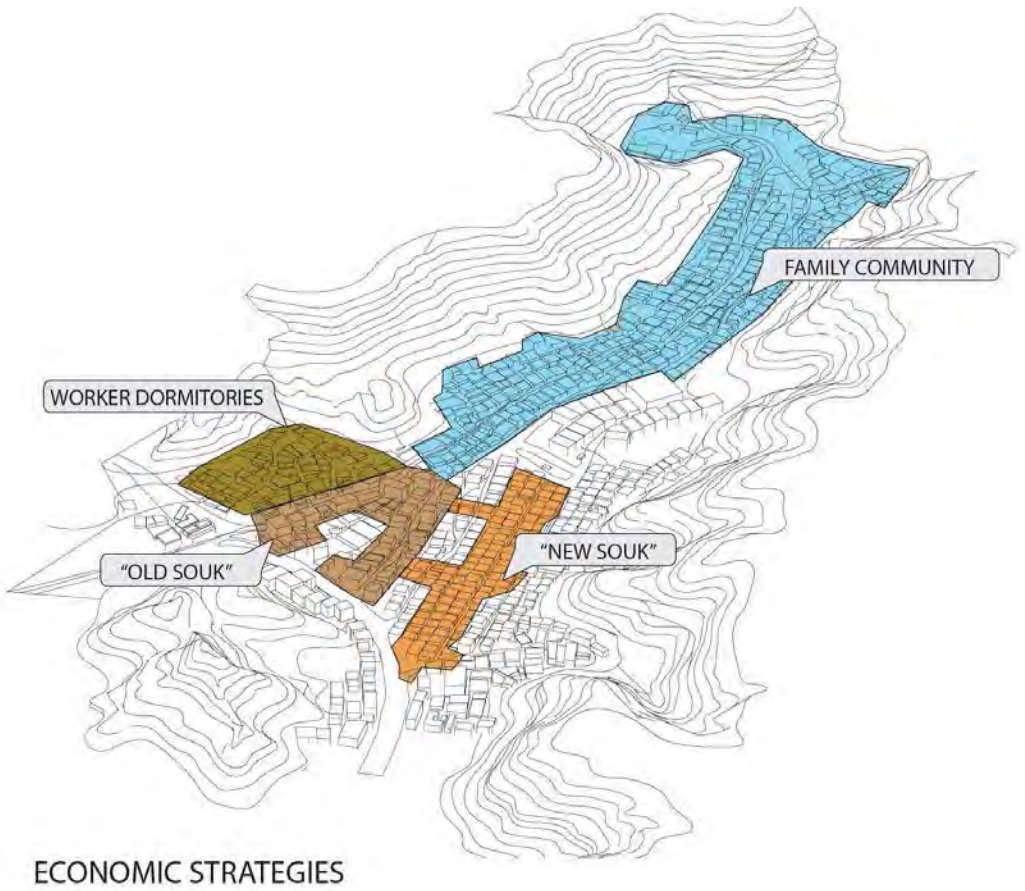
ENVIRONMENTAL COMPONENTS

Flooding here is a primary result of the geographic features of the valley and limited vegetation to absorb monsoon rains. To address these issues, we have proposed the development of a network of terraces around the periphery of Al Hamriya that control sheet flow from the valley faces, and detain it for use in urban agriculture plots at the tail of each major drainage and at the edge of the urban fabric.

•Families can use this amenity as a potential business opportunity, raising, selling and exporting locally grown crops. There are also opportunities for this to develop into larger scale nursery operations.
•Worker families and workers have the benefit of raising their own crops in these terraces and also have opportunity to find employment at one of the facilities that manages this amenity.

ENVIRONMENTAL STRATEGIES:

• Xeriscape, streetscape and shading strategies reduce urban heat island effect.
• Terracing along edges mitigates sheet-flow and creates places for urban agriculture.
• Water retention and storage integrated into a central 'Wadi.'
• Grey water reuse for landscape.
• Landscaped Pedestrian connections for comfort and walk-ability.



ECONOMIC STRATEGIES

People living in this community have to travel out to the greater Muscat area to gain access to work, groceries, and essentials for living. In order for a community to be self sustaining, people need to locally have access to these basic amenities. In order to accommodate this need, we are zoning for a souk to be established along one of the main roads running north-south through the center of Al Hamriya's business district. Omani families can establish businesses here promoting economic growth and job creation. The souk can cater to a variety of needs, supplying locally needed goods, and also provide a place for the manufacturing, and supply of goods for export to the larger community. Workers, and worker families would have local job opportunities in the shops throughout the new souk.

ECONOMIC STRATEGIES:

•Local labor and low tech architectural and landscape architectural solutions create on-site employment for expats.
•Terraces create opportunities for urban agriculture which can be sold on the site.
•Dedicated revitalized/rebuilt buildings for start-up business and entrepreneurship.
•Improvement of existing construction material shops/area that meet the daily needs of Al Hamriya residents.

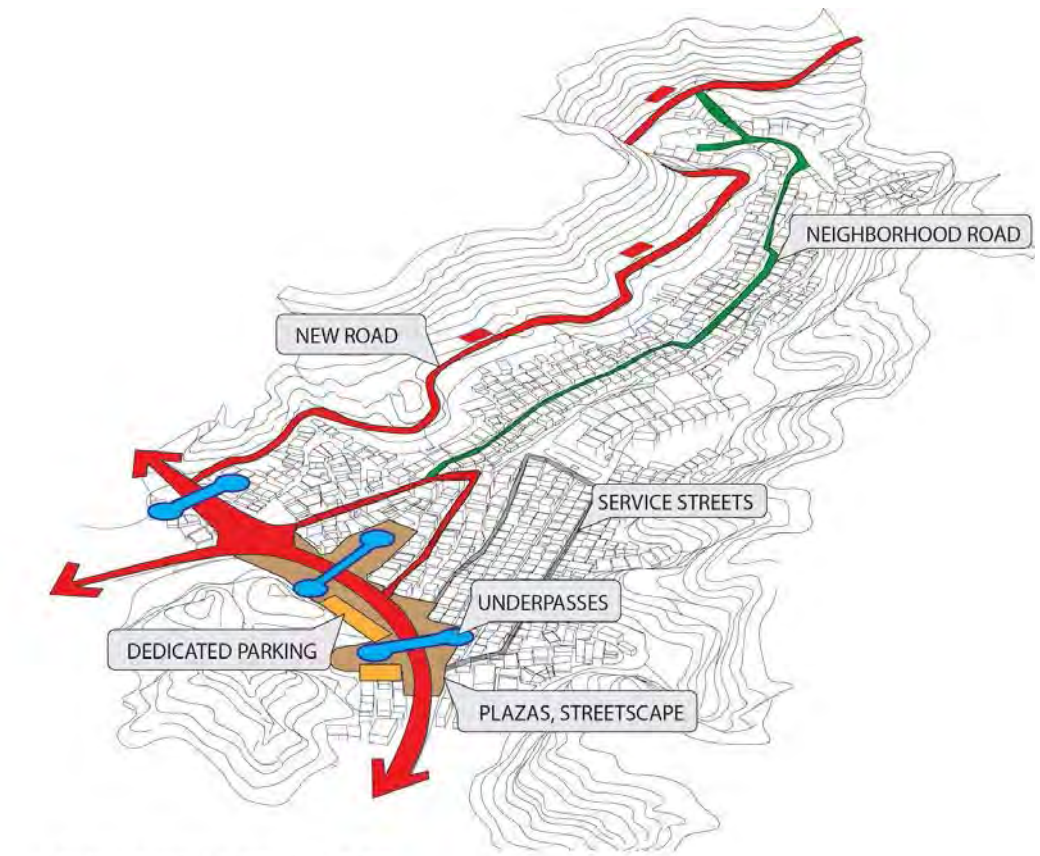
SOCIO-CULTURAL STRATEGIES

There are two predominate user classifications that we are targeting, permanent families, and temporary workers. These two groups are at times incompatible in their use of public open space, so separate accommodations are offered to provide adequate space for each to have their own social outlets.

•Families need larger housing units, and public space that support a safe environment for mixed activities, allowing children and adults to play soccer, watch theater, dine at restaurants, and grow their own food. We are therefore zoning the southern half of the city offer this building type as well as building three large parks that provide connectivity and outdoor space for the listed social activities.
•Temporary workers need smaller housing units, that have direct access to their place of employment, or public transportation connecting them to employment. They also need appropriate social accommodations that have sufficient space for high evening and night usage.

SOCIAL STRATEGIES:

• Open space and amenities such as schools and football fields targeted for young Omanis and families.
• Dedicated areas for women and parks for children.
• Dedicated areas for expats who work and live on the site.
• Connections and space for local business start-ups.
• Vocational school for on site workers.



FUNCTIONAL STRATEGIES

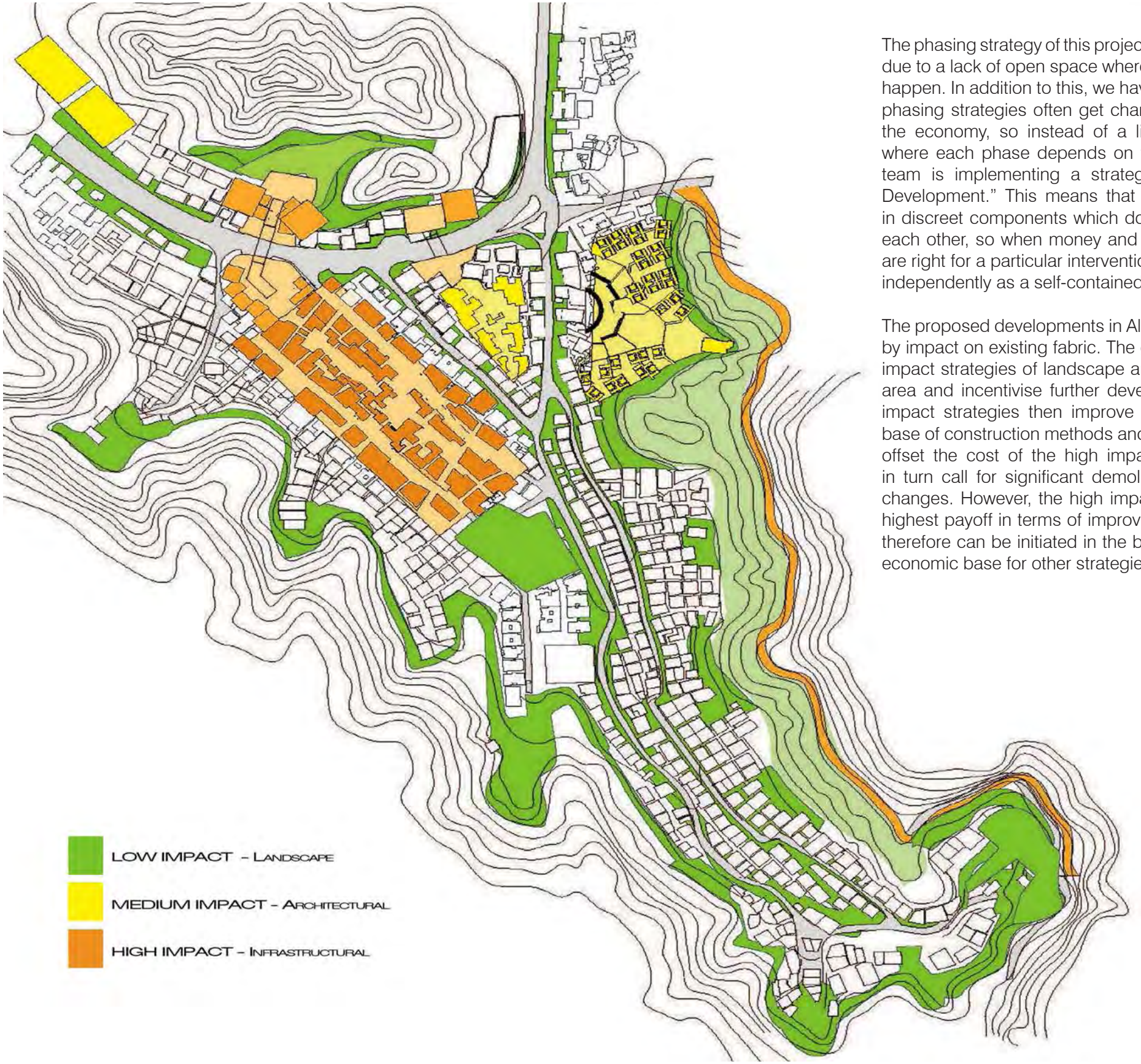
Space to facilitate safe passage for cars and people through the city is very limited along the narrow roads throughout the area. As families become more financially secure and purchase cars, this space become insufficient to accommodate parking, clear passage for moving traffic, and foot traffic.

•For Families in the southern half of the city, space is less limited and parking is addressed at the house level.
•For workers, worker families, and Souk access, we have created three primary parking garages that service the northern half of the city. From these garages, a public transportation loop can service nearby housing, or people can walk to their house or nearby businesses easily from one of these three locations.

FUNCTIONAL STRATEGIES:

• Parking and Plazas along the edge.
• Service streets designated for commercial area.
• Proposed road along outer edge of Al Hamriya for through traffic, and creating connections along the entire site, from mountain to mountain.

MODULES OF DEVELOPMENT



The phasing strategy of this project is particularly complex due to a lack of open space where any development can happen. In addition to this, we have found that traditional phasing strategies often get changed due to politics or the economy, so instead of a linear phasing strategy where each phase depends on the previous ones, the team is implementing a strategy called “Modules of Development.” This means that the plan is developed in discreet components which do not necessarily follow each other, so when money and the political conditions are right for a particular intervention, it can be developed independently as a self-contained improvement.

The proposed developments in Al Hamriya are organized by impact on existing fabric. The general idea is that low impact strategies of landscape architecture improve the area and incentivise further development. The Medium impact strategies then improve the existing economic base of construction methods and labor, which then help offset the cost of the high impact interventions which in turn call for significant demolition and infrastructure changes. However, the high impact strategies have the highest payoff in terms of improvement of the area, and therefore can be initiated in the beginning to create and economic base for other strategies.

LOW IMPACT - LANDSCAPE ARCHITECTURAL

PARKS

The simplest intervention is to design the few available open spaces (parking lots and unused spaces) into parks for the Al Hamriya residents and surrounding areas. This has a relatively small cost and high return as there is almost no demolition necessary.

STREETSCAPE

The simple strategy of planting trees and creating comfortable shaded spaces along the various streets. This strategy is a standard, very inexpensive way to drastically improve a built environment.

TERRACING

The terracing strategy is another low cost way of creating comfortable spaces. The terraces would be built with on site labor, and then help create the economic base for subsequent development by creating space for plant nurseries and urban gardening.

MEDIUM IMPACT - ARCHITECTURAL

PARKING AND WAREHOUSE

This area is where a school has been recently demolished to be replaced by a parking lot. This would create space for ~280 cars. Our proposal is to develop half of the site as parking, and the other half as a warehouse where prefabrication of parts for site buildings will take place. The proposed parking garage will the same capacity as the original.

EXPAT DORMS

A proposal to create better housing for expats that would be working on the site. This module of development would precede the larger developments as the workers that are housed here would work on subsequent phases in order to create a sense of community and reduce transportation costs.

VOCATIONAL SCHOOL

The vocational school would be built in order to develop and teach the techniques of prefab for the laborers in worker housing.

HIGH IMPACT - INFRASTRUCTURE

PLAZA AND UNDERPASS

The plaza and underpasses would then be developed to create an identifiable place in Al Hamriya from which the new souk can develop.

NEW SOUK

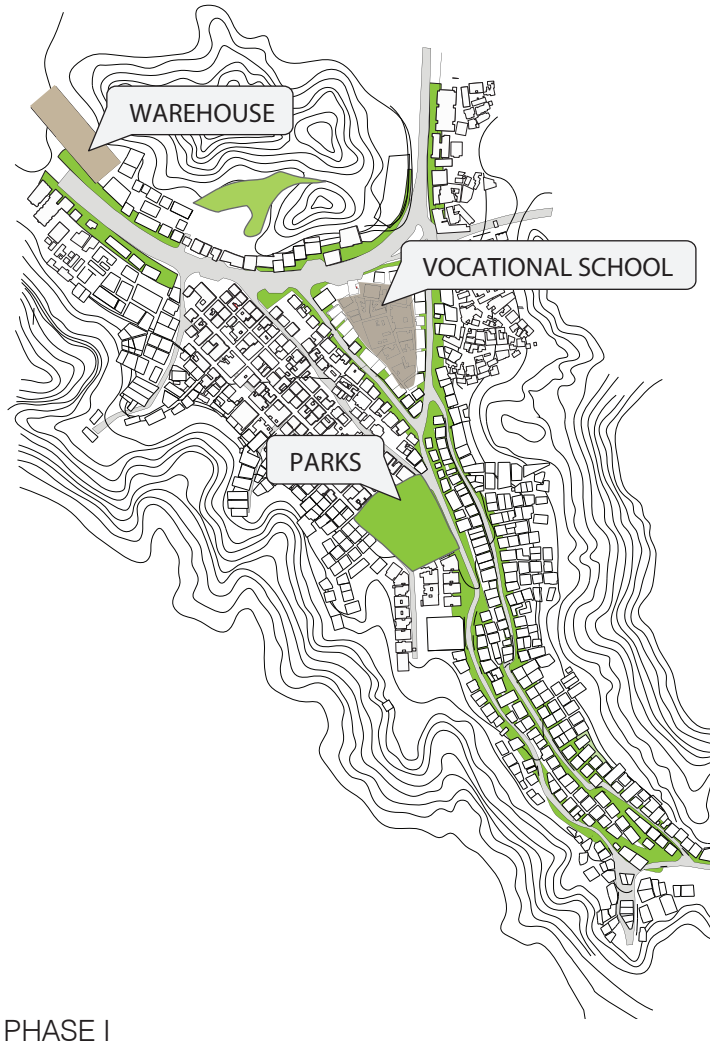
The New Souk is the largest proposed development in terms of impact but also has the highest return on investment. Since the current urban fabric does not accommodate economic development, distressed areas will be demolished and redeveloped with new buildings and circulation.

NEW ROAD

Once all of the developments are complete, it is anticipated that Al Hamriya will become busier, disturbing the family oriented character of the south end. The strategy to build a new road to divert traffic is a possibility to deal with these future possibilities.

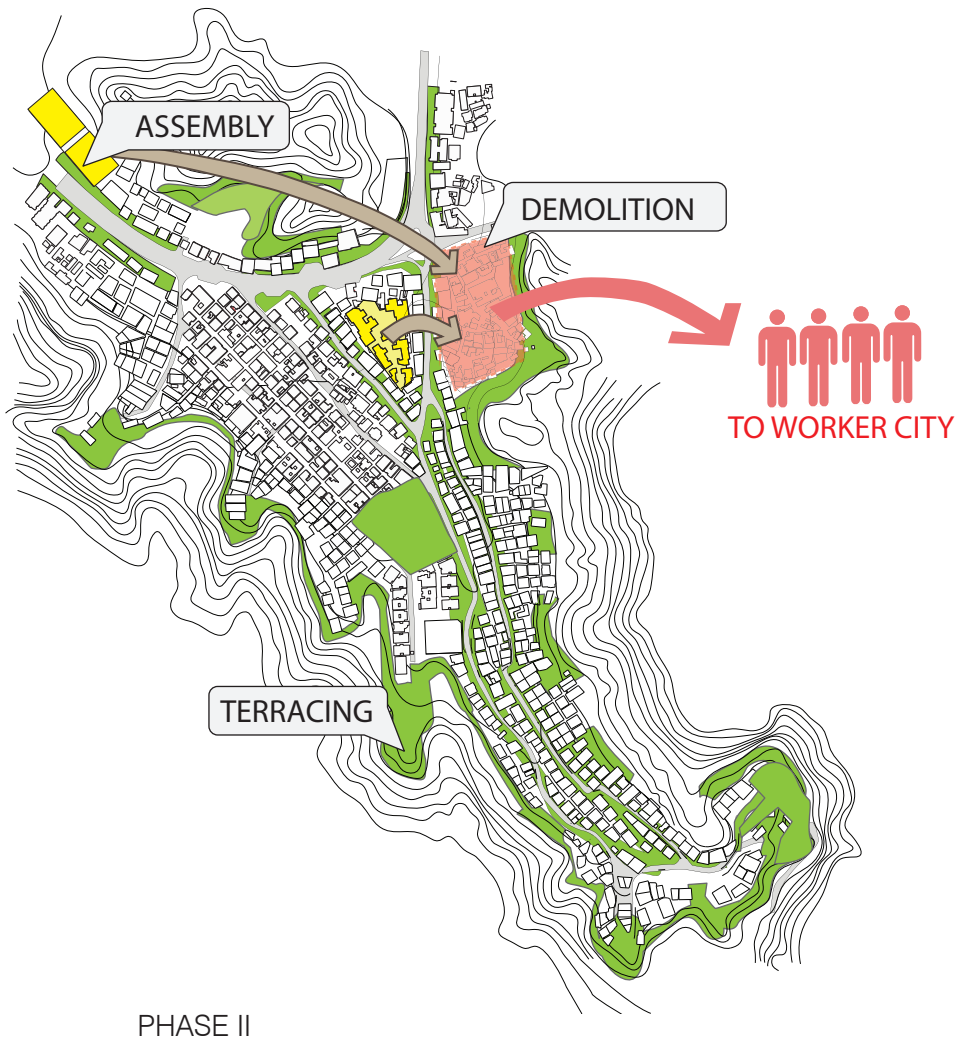
DEVELOPMENT SEQUENCE

While the ‘Modules of Development’ strategy may work when there is sufficient space for development, Al Hamriya’s density causes almost any change to displace large amounts of people. This is a proposed development strategy which deals with the displacement of expatriate workers throughout the development process.



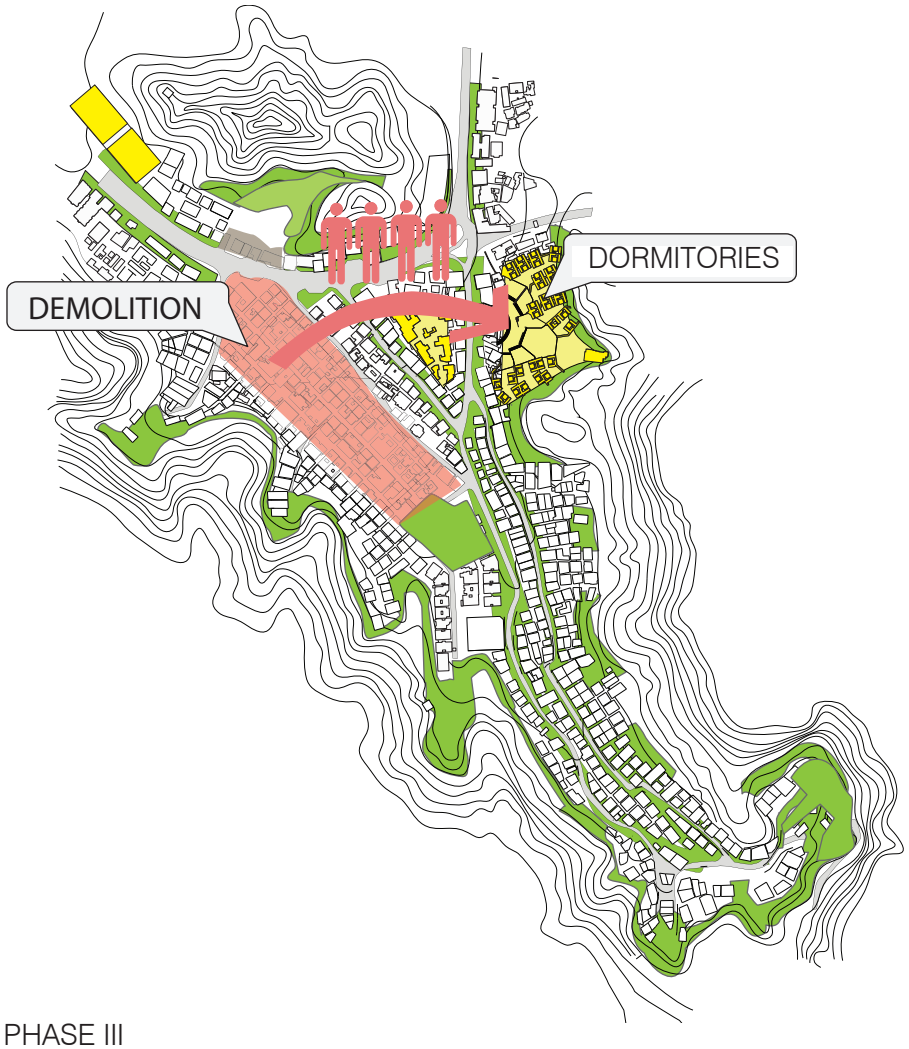
PHASE I

The first phase would once again include the simplest measures of converting unused open space into an attractive public realm. Parks for children and areas dedicated for women are a first step visioned as a series of “gifts” to the local population.
At the same time a vocational school for expatriate residents is built and building techniques for further phases are introduced to the local population. It is assumed that there are expatriates on site who are looking for work, and the use of local labor in the development of these projects reduces overall transportation costs and builds a sense of community. The warehouse for on-site fabrication is also important to build early, since this is where most component assembly will take place for subsequent building projects.



PHASE II

Once the assembly warehouse and vocational school are built, these new skills learned and facilities constructed are employed for the more complex tasks of terrace construction and the proposed areas to be demolished in the area where the future worker housing will be.
The expatriate workers who make up almost all of the residents of this area will by moved to worker residences which are built close to other construction sites throughout the city and offer better living conditions than Al Hamriya currently does.



PHASE III

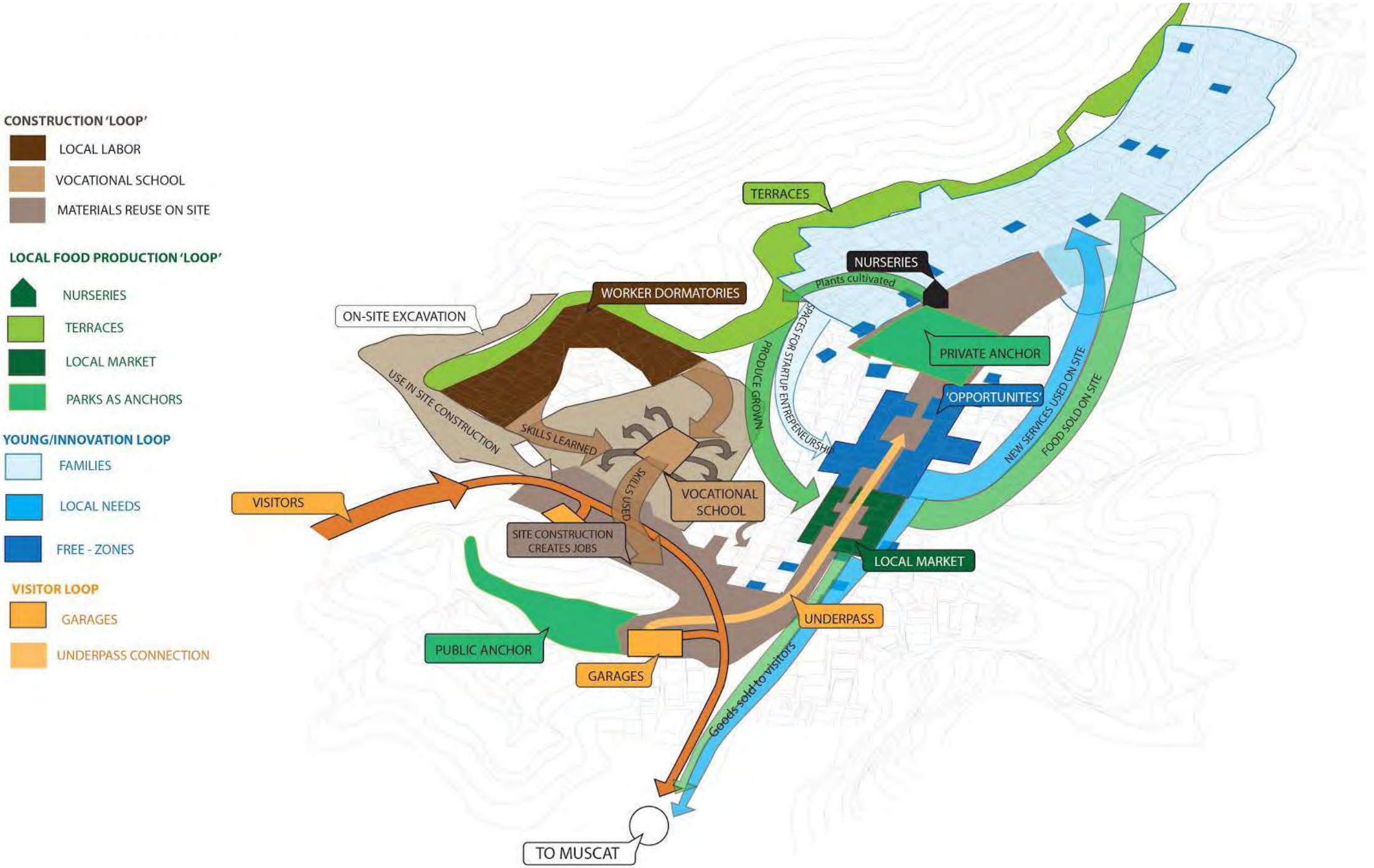
The Dormitories in turn, create space where workers who live in the projected new souk area will be able to live. Following the ‘try to do everything on-site’ ethic, they could become the main local construction force and work on the demolition and new souk construction.

PHASE IV

The completion of the New Souk, underpass, and new road modules can at this point be broken up into further sub-phases as necessary.

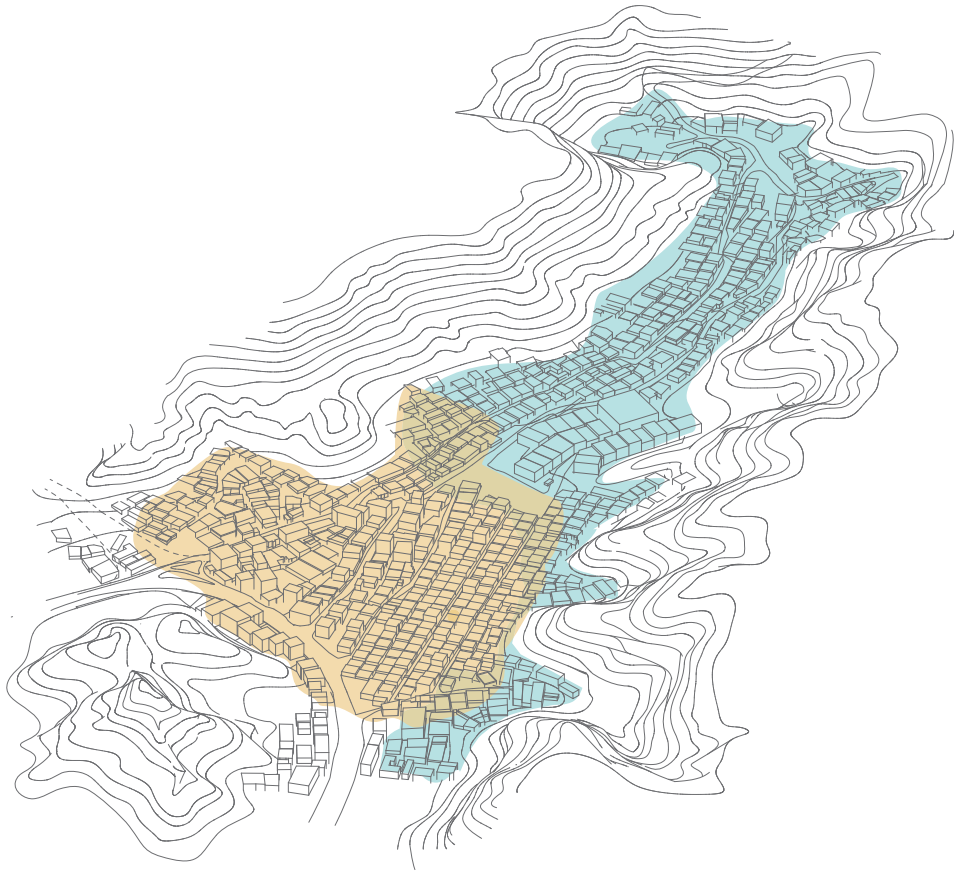
ECONOMIC STRATEGIES

The plan envisions the Al Hamriya area as a sustainable economic system with several sub-systems working together. The construction system upgrades housing and training for on-site expats, and the skills will be in turn used for the other on-site construction projects. The local food production system also employs expats to grow food on terraces created along the edges of the site. This is then sold in the 'new souk' development, generating local income. The visitors loop is a series of developments anchored by two parks served by parking which create attractive places to visit, and create an audience for the souk.

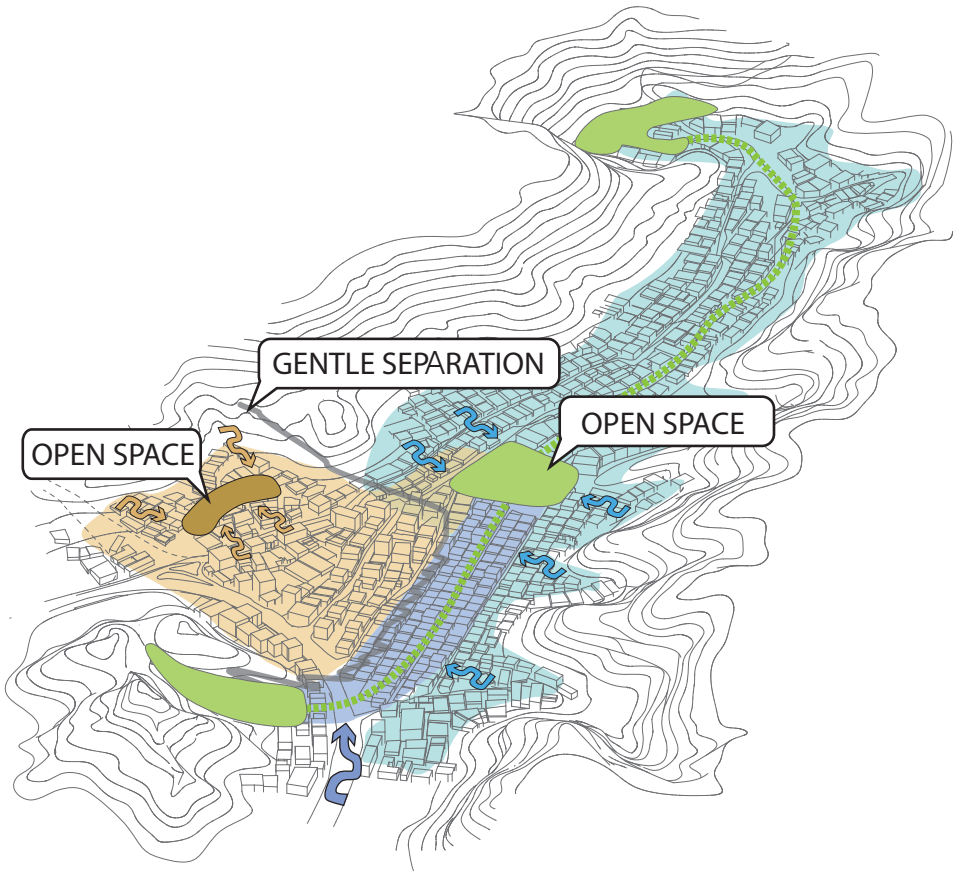


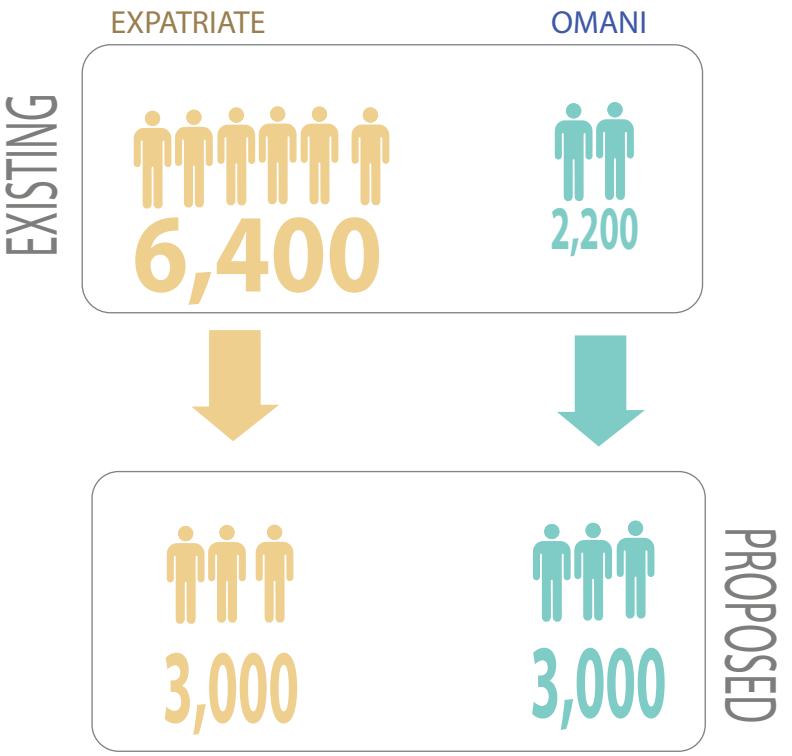
The ‘innovation’ system is a response to the call for Sultan Qaboos bin Said Al Said’s promotion of entrepreneurship in Oman. The idea proposes several buildings scattered throughout the site dedicated to startup business by young people that may serve the needs of the area. It is a physical space that acts as an incentive for entrepreneurship in a developing area. These focus areas are unified by the overall strategies which have emerged from previous plans and various discussions.

DEMOGRAPHICS



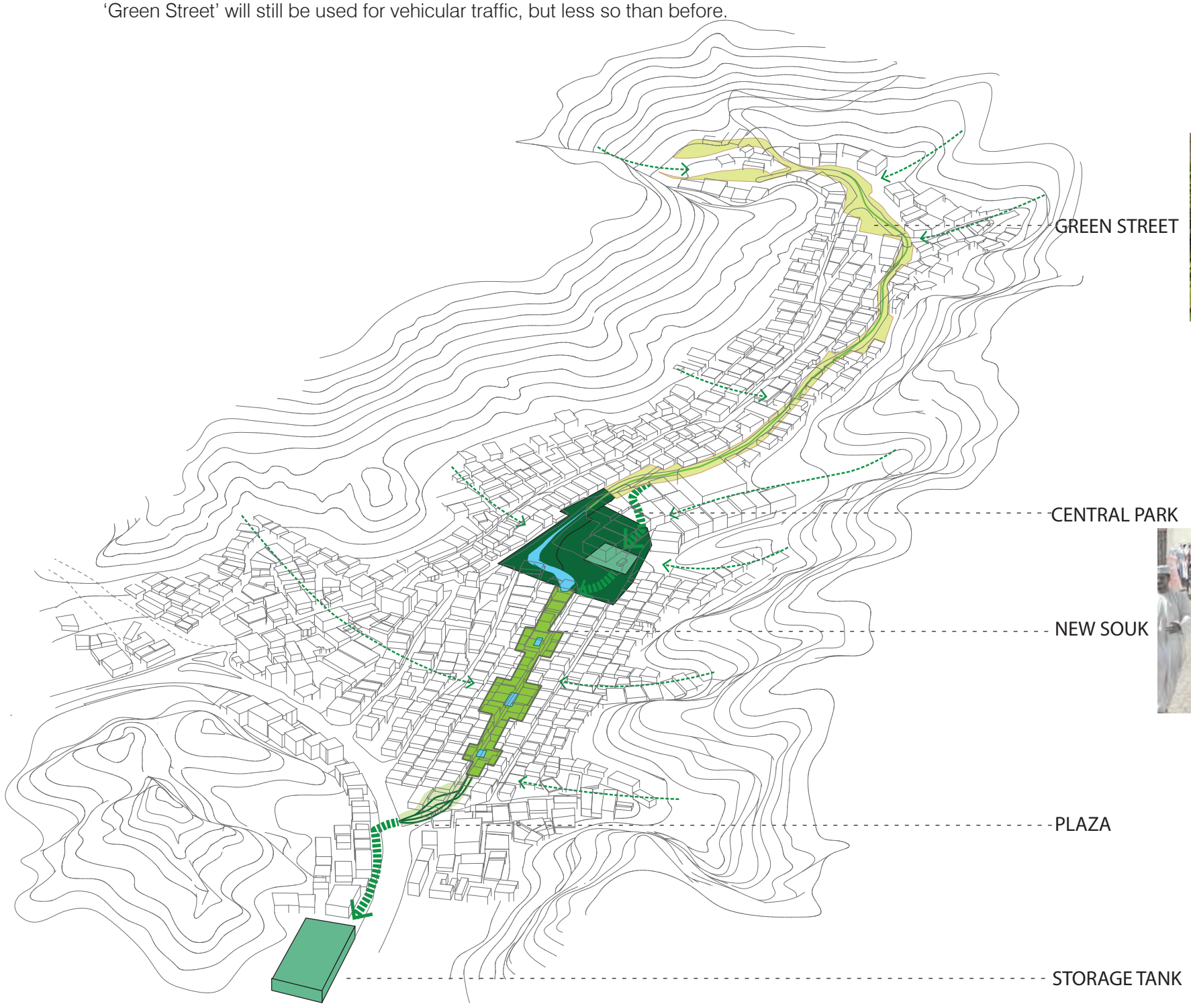
It was noted in the site analysis portion of the book that Al Hamriya has exceeded its carrying capacity in terms of density. The northern part of the site is occupied largely by expatriate workers, many of whom live 4 or more people to a room.
In order to develop the image of Al Hamriya as a Sustainable Low Income development, room needs to be made for the open space and new development that would be attractive for Omani residents. A separation will be created between the expatriate workers and Families on the site in the form of the new souk developments, and both user groups will be located around open space which functions as community identifiers and social outlets. The population of expatriate workers will be reduced to make room for these changes. Many will be moved to worker communities which have better living conditions and social infrastructure than Al Hamriya currently offers. The ones that stay will be housed around a small park and vocational school which will in turn improve their living conditions and employability.
The new family developments will be centered around a series of parks throughout the site - most importantly the ‘Central Park’. These are connected by a pedestrianized zones, which ensure that women and children have dedicated space to socialize and play without the current perceived danger of expatriate overpopulation.





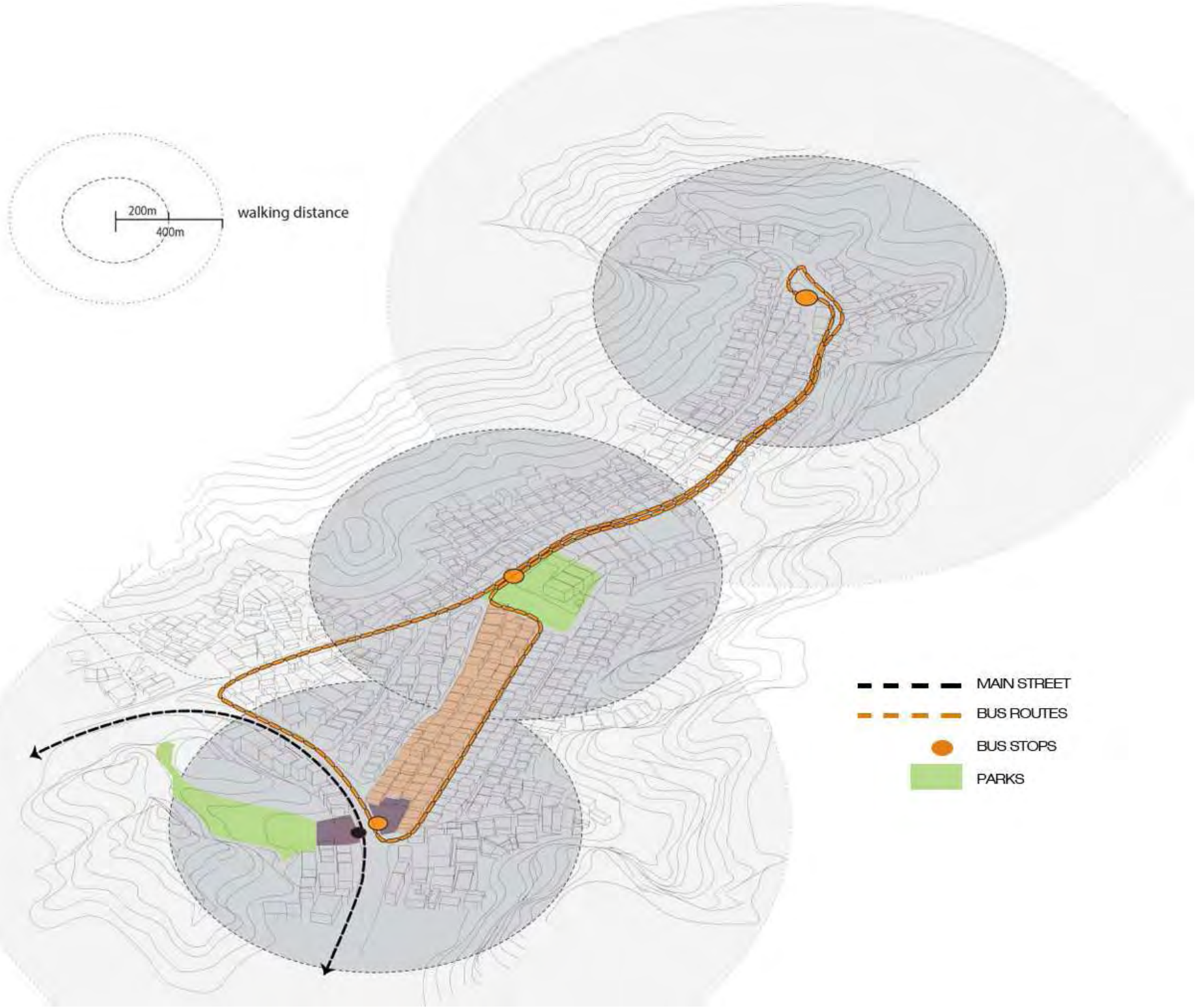
THE WADI

The ‘Wadi’ is a concept which links the north and south ends of the site with a pedestrianized path which interconnects and serves several purposes throughout the area. The main purpose is to mitigate flooding by gathering the water from the site and diverting it into an underground storage tank (proposed on the site of the demolished school north of Al Hamriya). Underground storage and consideration for flooding events is also proposed in the central park area.
Throughout the site the wadi has several functions, and is adaptive to a range of other concepts. It is the main landscape feature of the new souk and the entry plaza of the new souk, where it shades the major pedestrian walkway through the souk. The wadi then turns into the central park - where during some parts of the year water will be visible at the surface. Toward the south end of the site, the Wadi will be largely underground, but will be visible as planted areas and trees along the street. This ‘Green Street’ will still be used for vehicular traffic, but less so than before.

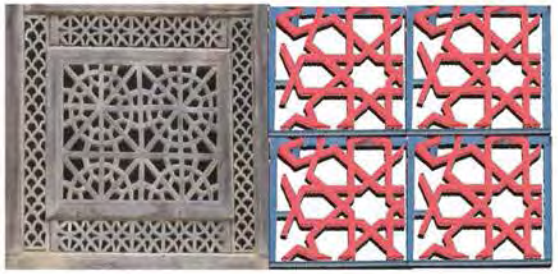


TRANSPORTATION SYSTEM

In order to encourage the future use of public transportation, the plan contains bus stops along two possible routes. The internal route would circle the site, ensuring that no part of the site is more than a 400m (5 minute) walk. The external route would connect the area to the rest of Muscat. This route could be used immediately by expat workers who do not have cars, and in the long term by anyone visiting the area. The stops are located in front of the main souk plaza, so the long term strategy is to encourage visitors to come and enjoy their time.



NEIGHBORHOOD IDENTITY



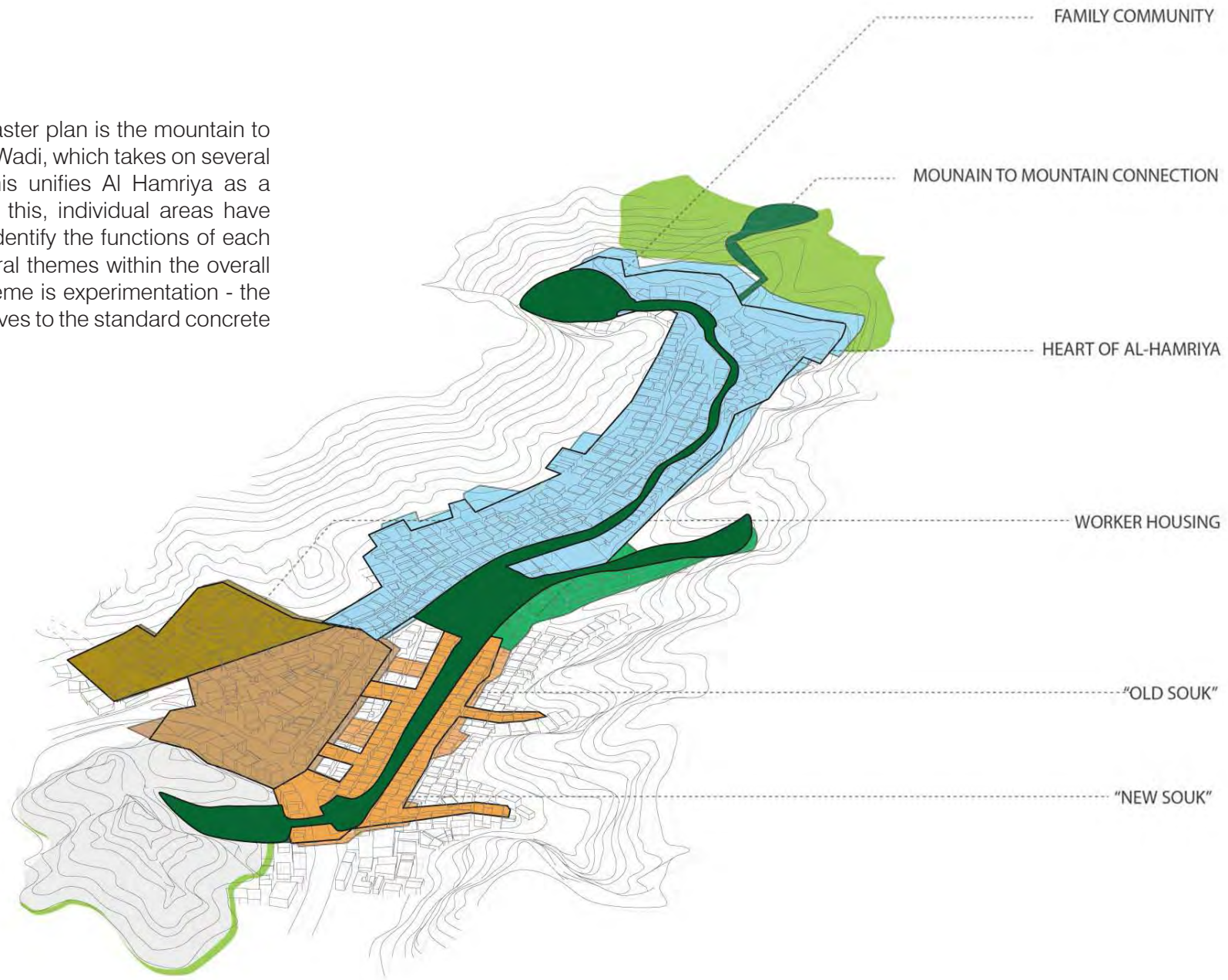
The New Souk is distinguished by a variety of wood and metal shade structures which follow a general theme of the mashrabiya pattern.

The Old Souk uses Gabion and Rammed Earth walls in both architecture and the streetscape.

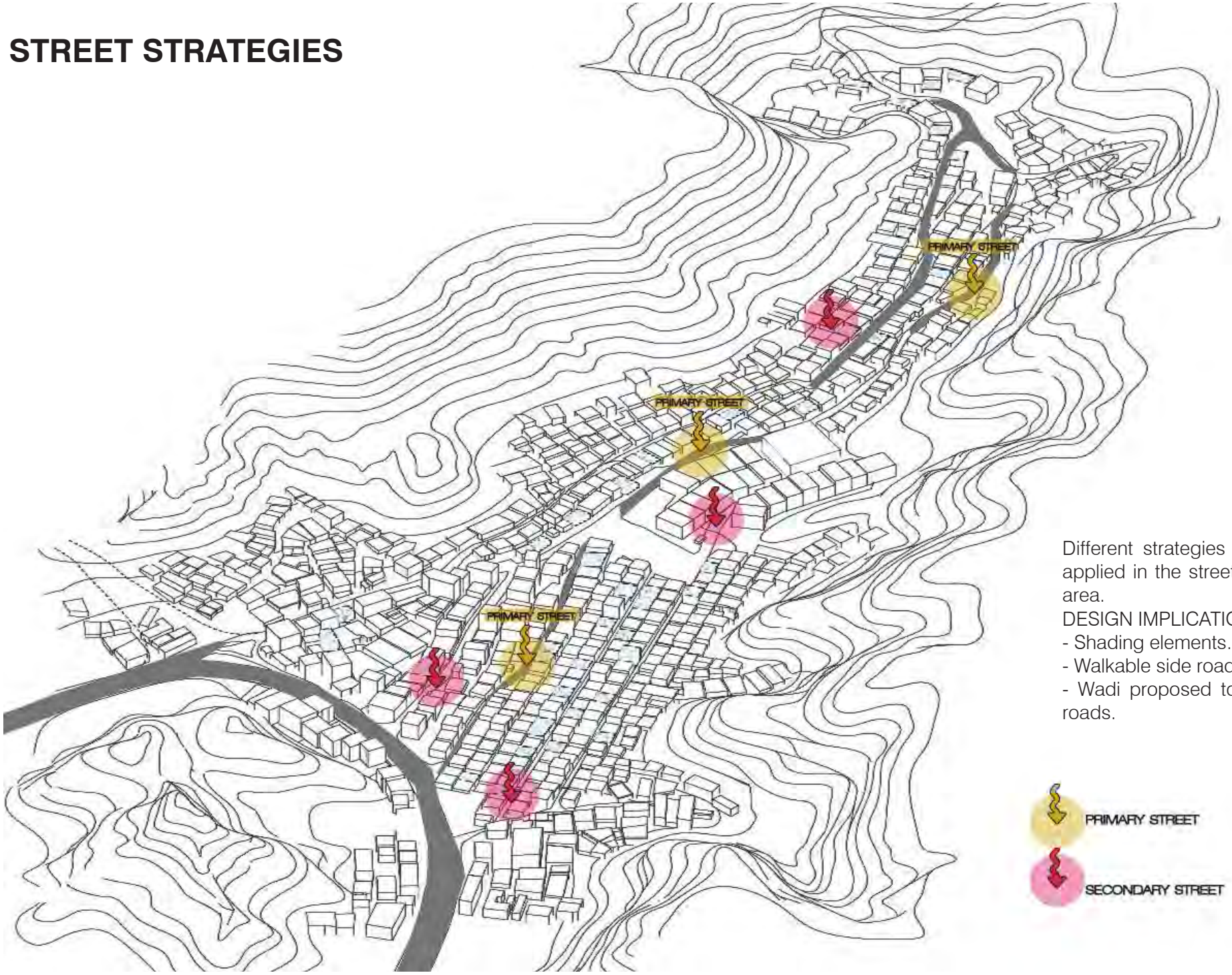
The Wadi follows a planting scheme which creates a series of comfortable, shaded walkways throughout the site.

The Dormitories use a palette of metal panels which are fabricated on site.

One of the main features of the master plan is the mountain to mountain connection made by the Wadi, which takes on several functions throughout the plan. This unifies Al Hamriya as a landscape strategy. In addition to this, individual areas have distinct material strategies which identify the functions of each area and create distinct architectural themes within the overall unification strategy. This overall theme is experimentation - the offering of readily available alternatives to the standard concrete block currently used.



STREET STRATEGIES



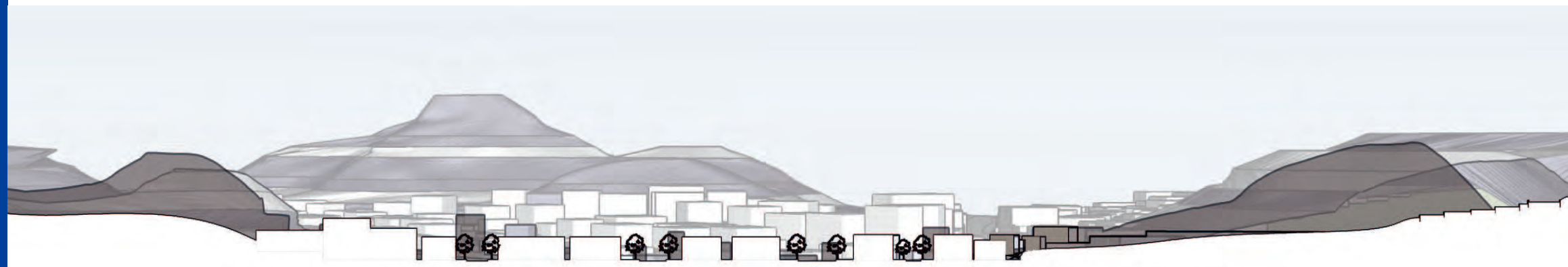
Different strategies are proposed to be applied in the streets of the Al Hamriya area.

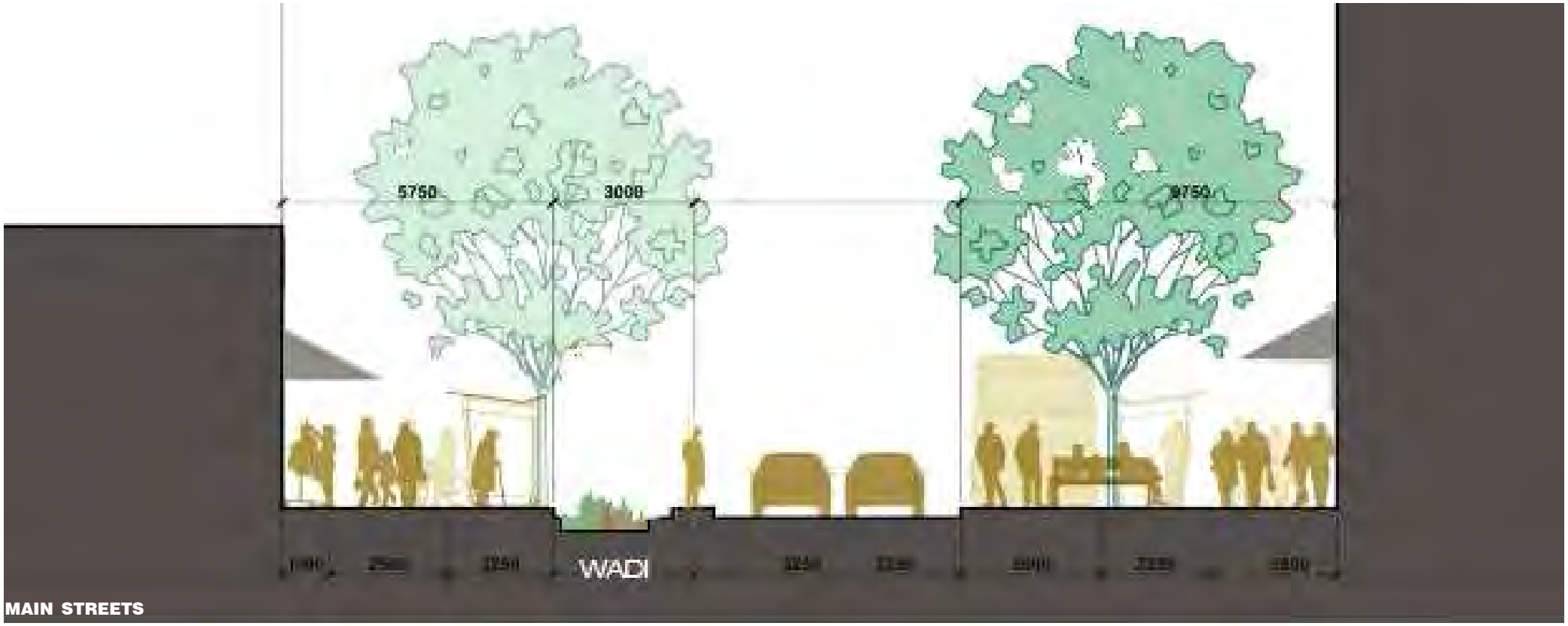
DESIGN IMPLICATION:

- Shading elements.
- Walkable side roads.
- Wadi proposed to go along the main roads.

PRIMARY STREET

SECONDARY STREET

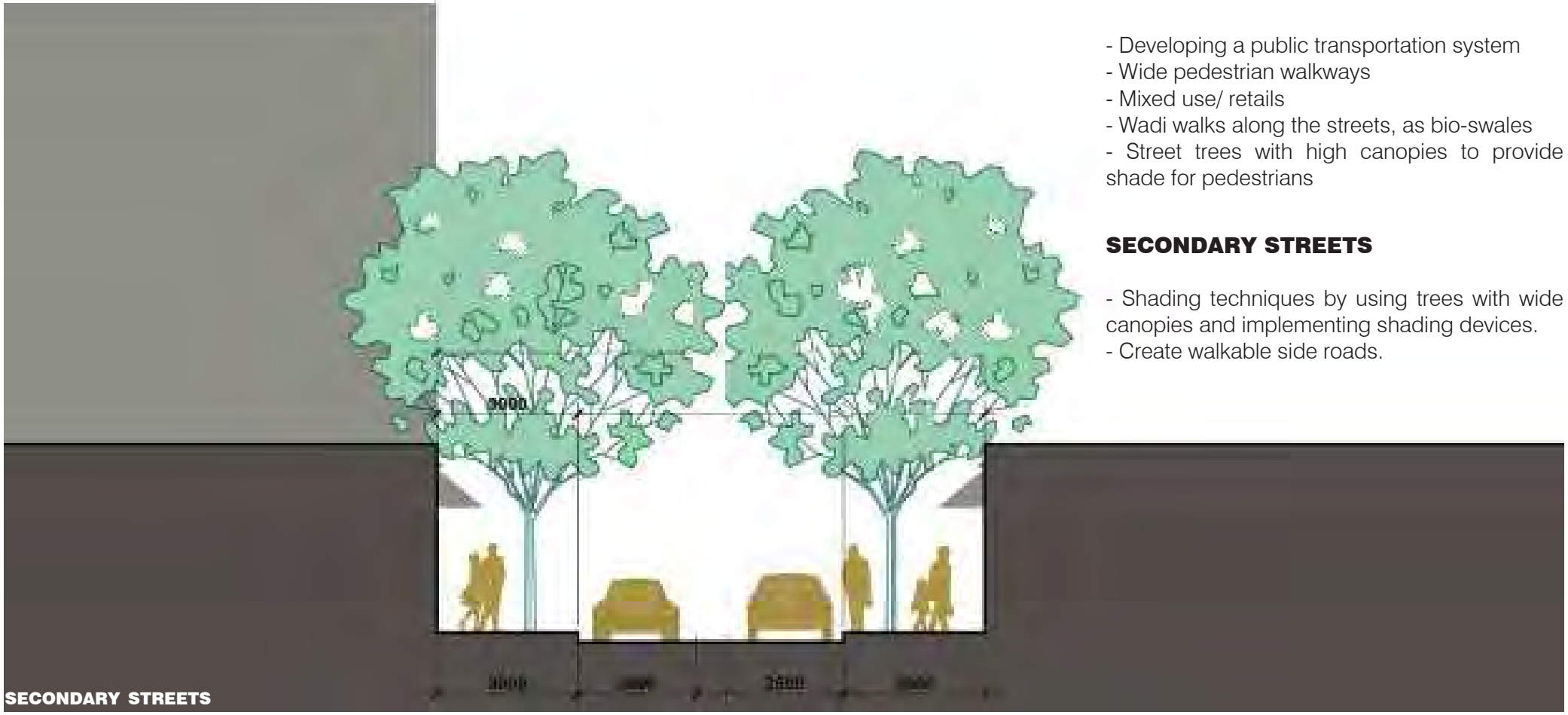




MAIN STREETS

MAIN STREETS & WADI

- Developing a public transportation system
- Wide pedestrian walkways
- Mixed use/ retails
- Wadi walks along the streets, as bio-swales
- Street trees with high canopies to provide shade for pedestrians

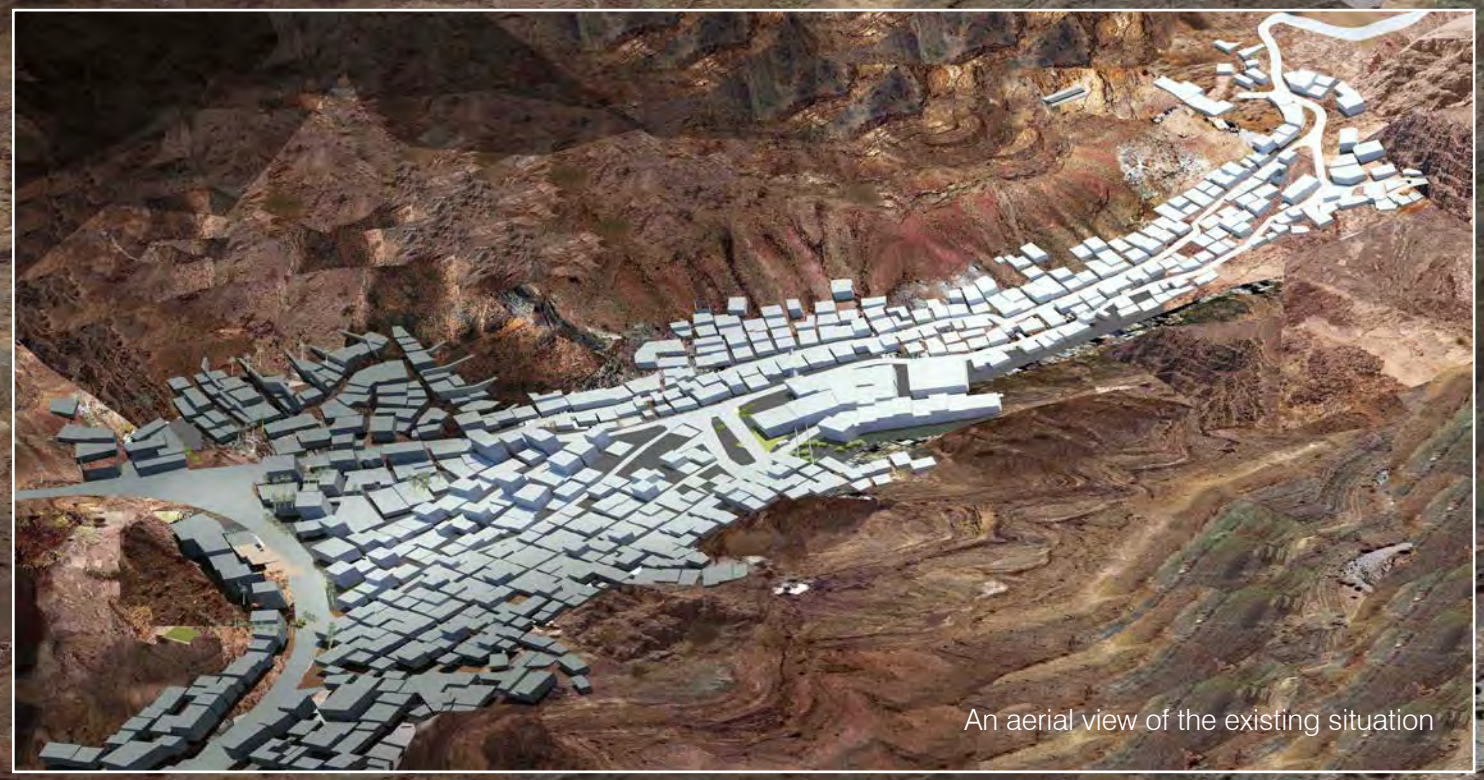


SECONDARY STREETS

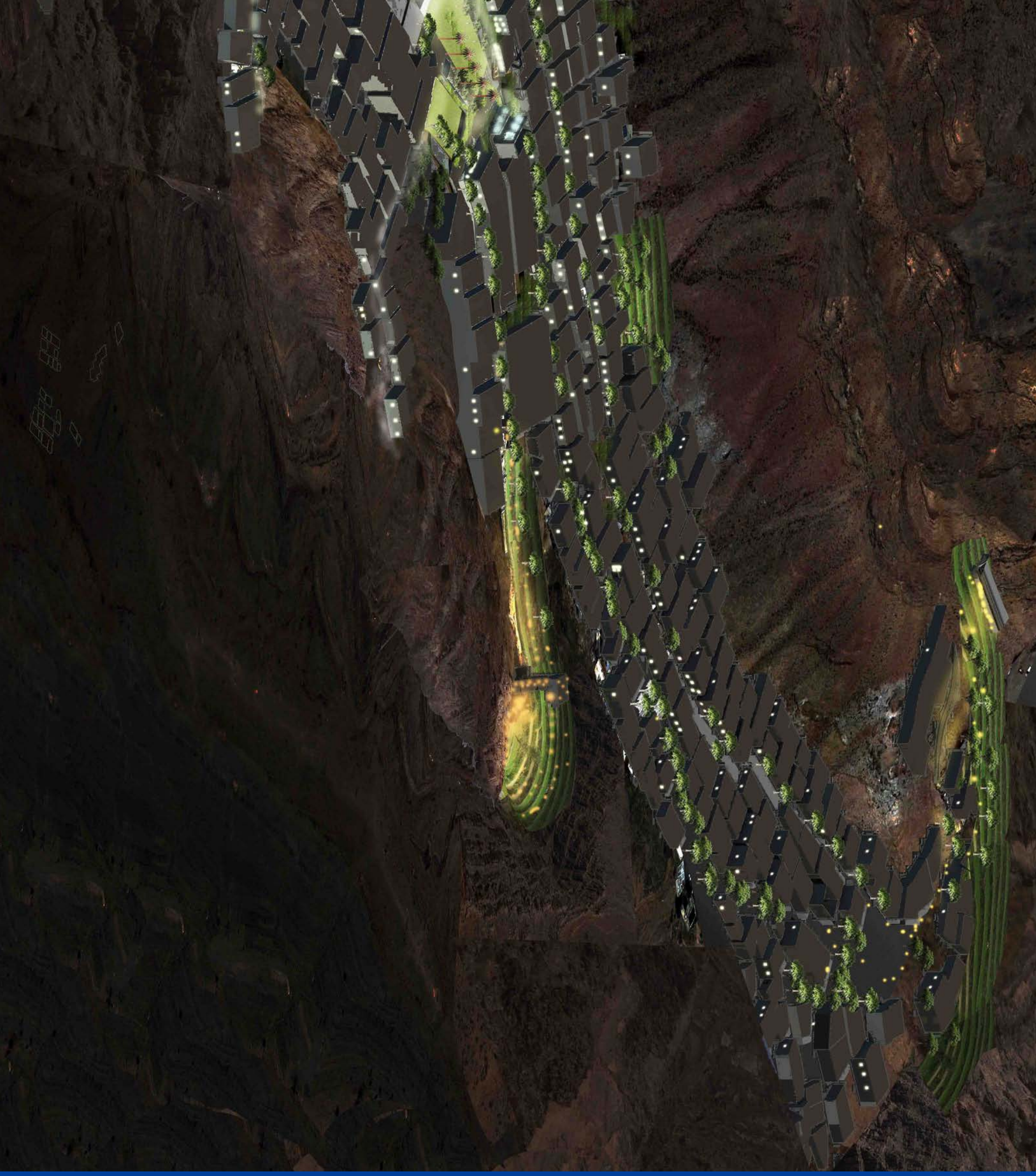
SECONDARY STREETS

- Shading techniques by using trees with wide canopies and implementing shading devices.
- Create walkable side roads.

Mountain to mountain connection that shows the: wadi, open space, “pedestrianaized” human comfort, terraced flood control strategies.



An aerial view of the existing situation

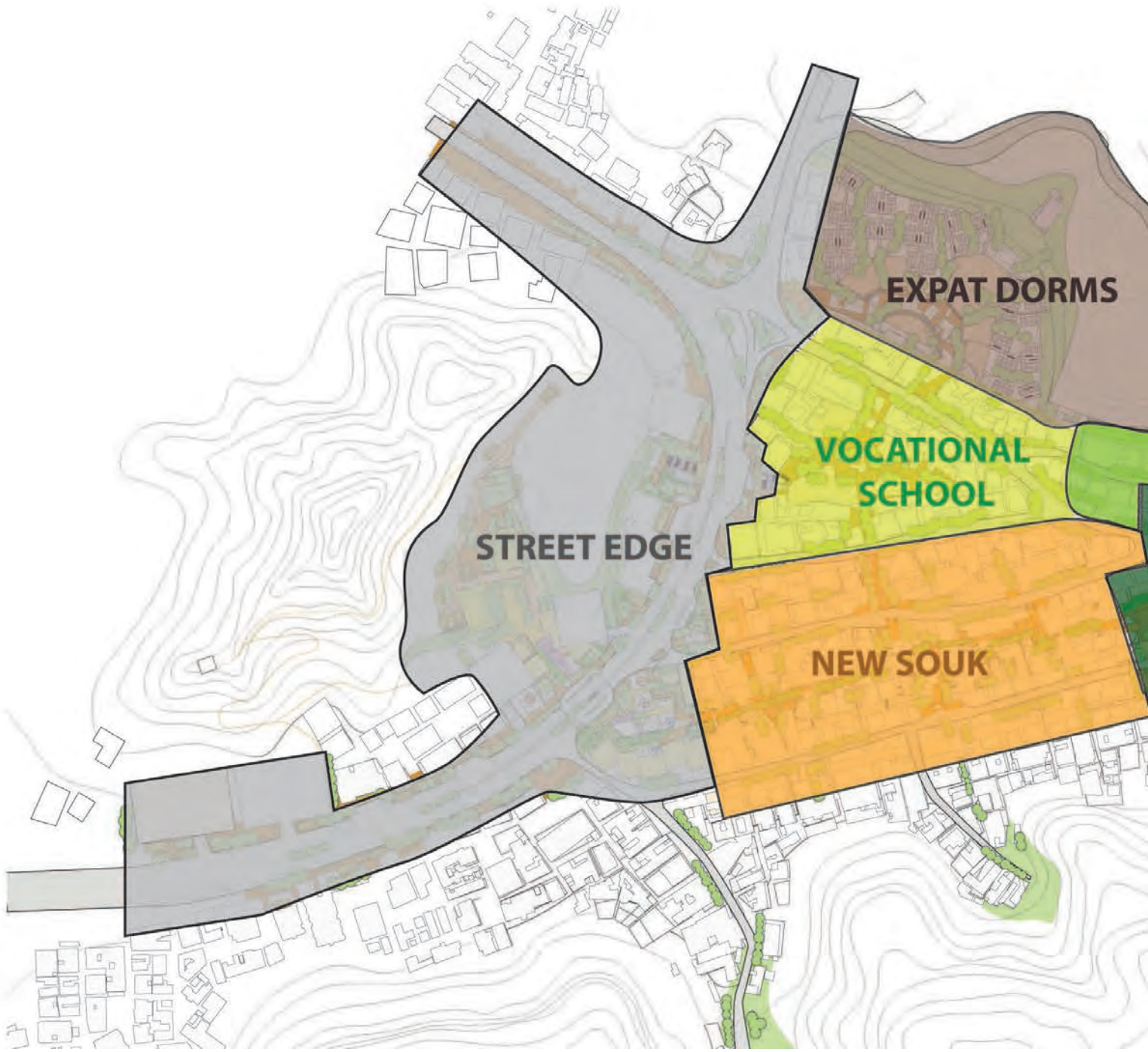


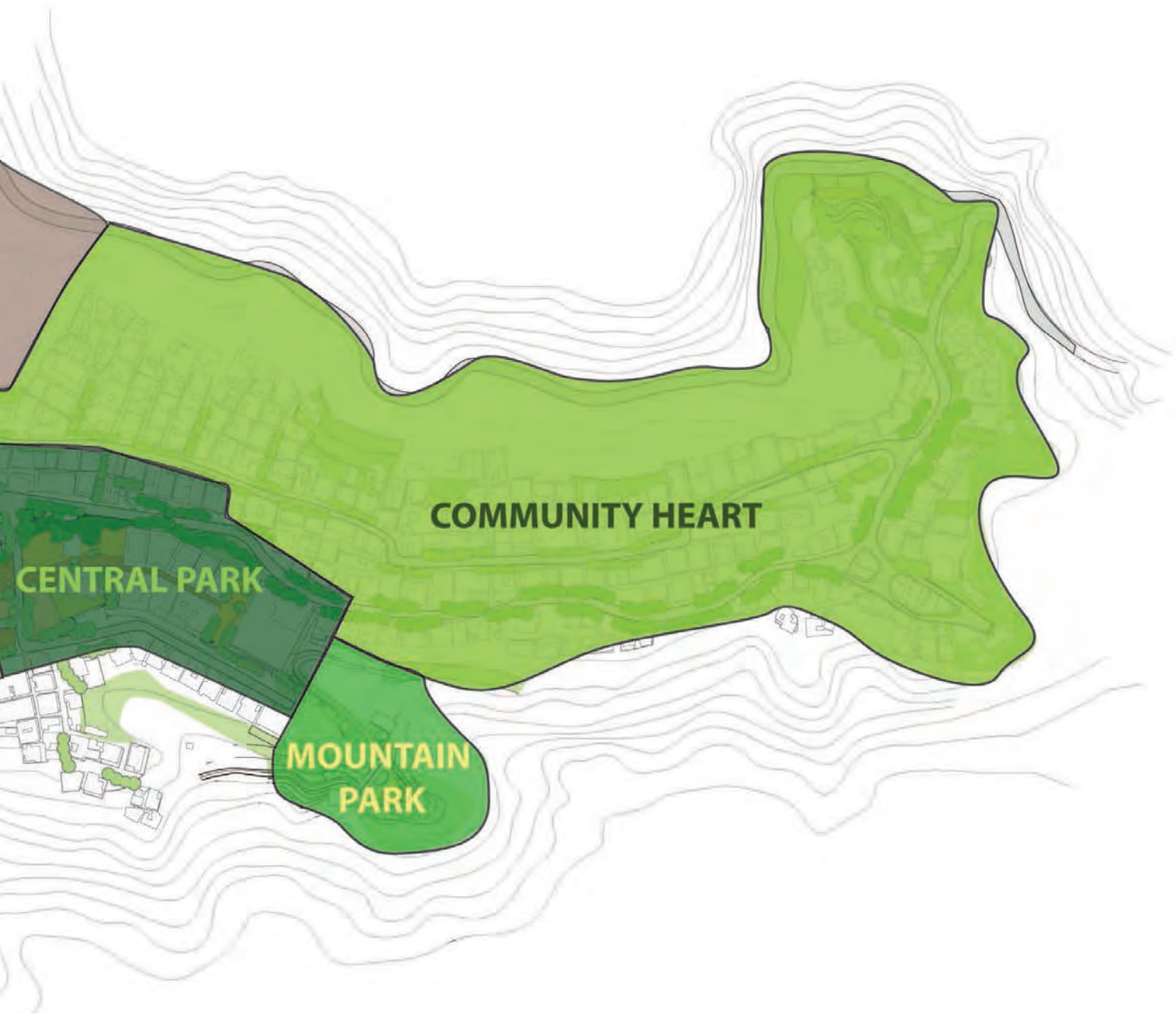
FOCUS AREAS

STREET EDGE

VOCATIONAL SCHOOL

EXPAT DORMS



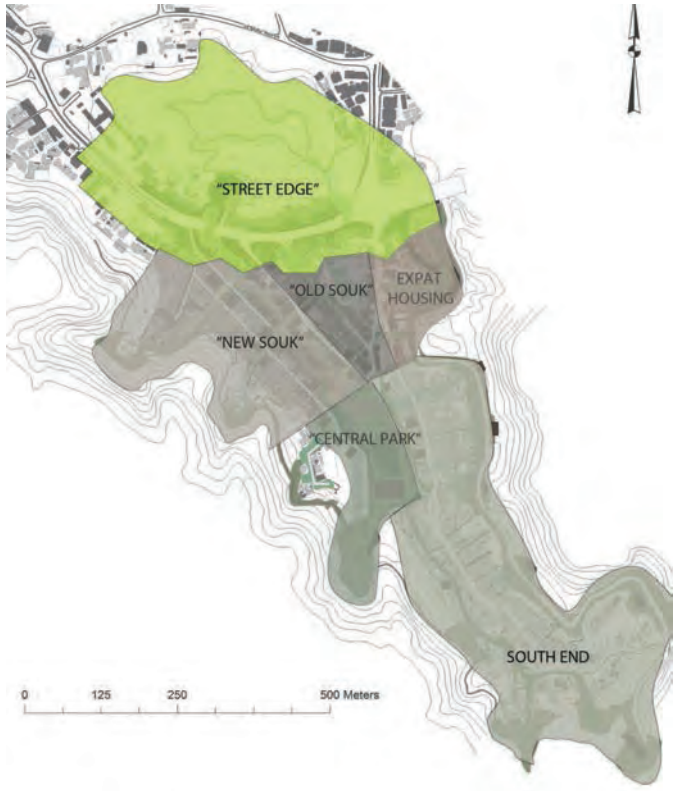


NEW SOUK

CENTRAL PARK

FALAJ PARK

COMMUNITY HEART



STREET EDGE

The street edge area is the public face of Al Hamriya. It creates an identity of a diverse, pedestrian friendly urban area. Currently the street edge is not a notable or attractive space, and one that can be greatly improved with the integration of plazas and pocket parks located in a cohesive manner to unify the area. In addition to creating a sense of place, the street edge must also be a catalyst for further development, and in this regard it provides parking and connections between both sides of the street. A larger park integrated into the mountain serves as an attraction point and urban respite for the area.

STREET EDGE

EXISTING CONDITIONS

SOCIAL

- The street edge is currently not seen as an attractive amenity.
- Expatriate workers are seen waiting outside of buildings waiting for employment opporunities. This, in turn, creates a perception of discomfort to visitors of the area.

ECONOMIC

- The area is known for construction materials and expatriate workers. The shops along the edge are the economic base for Al Hamriya, and with the current situation there is very little opportunity to expand or diversify that economic base.

FUNCTIONAL

- Parking happens along the street in a disorganized fashion.
- There are pullouts which are heavily used, but do not provide nearly enough total parking capacity.
- There is no way to safely cross the street. Crosswalks are difficult to negotiate.

ENVIRONMENTAL

- Water from the area drains into a inadequately sized single concrete channel.
- No shade for human comfort.
- Large urban heat island effect (a lot of exposed concrete).

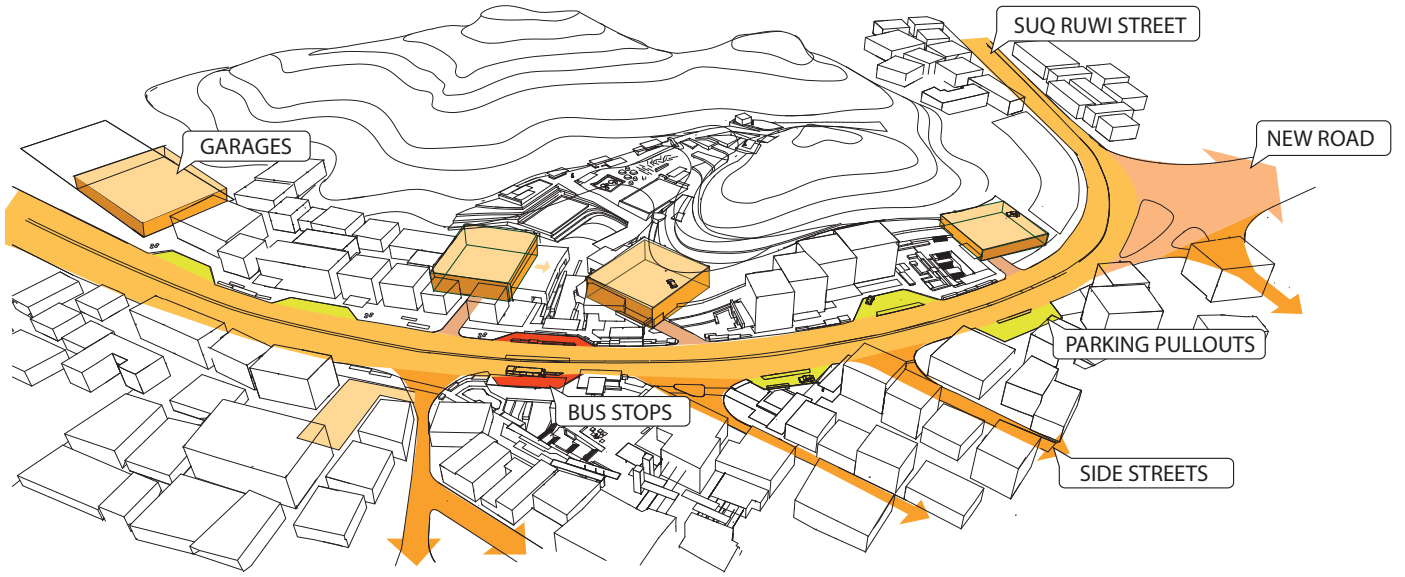
OPPORTUNITIES

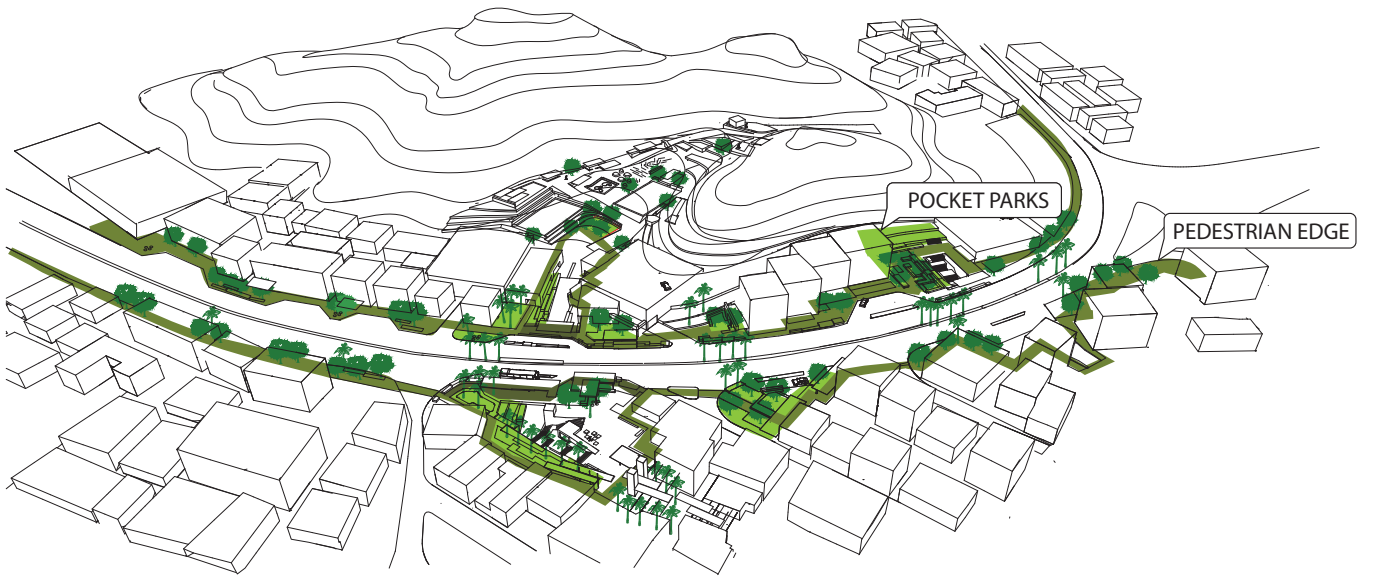
Despite all of the issues, there are several open spaces along the street edge wich are currently not used for anything. These are a perfect opportunity to create comfortable, shaded spaces which will give the area a distinct character.

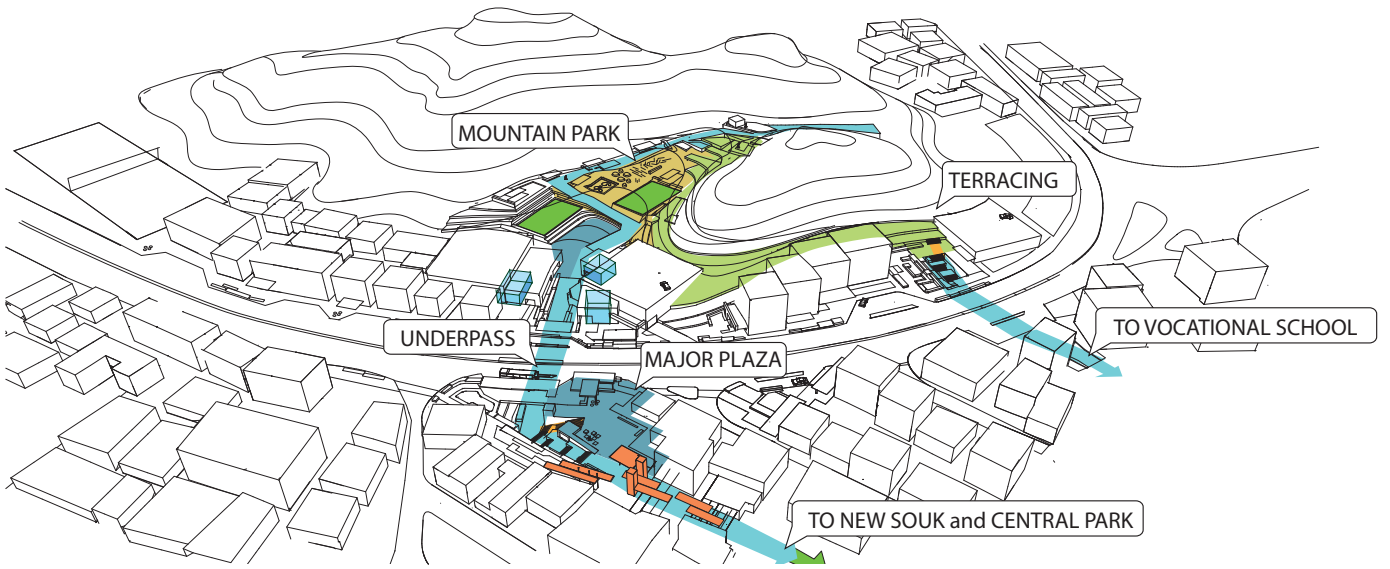
PROPOSED AREA PLAN

STREET EDGE

MAIN STRATEGIES







I PARKING STRATEGY

The parking strategy centralizes and organizes the currently scattered cars along the road into several parking garages on the north side.
- This creates capacity for approximately 420 cars to park along the edge (currently there is room for 100).
- In addition to this, pullouts for on-street parking and bus stops are added along Suq Ruwi street.
- This will increase the possibility of visitors to the area and therefore create the potential for economic development.

II STREETSCAPE STRATEGY

- The purpose of the streetscape is to generally unify the Al Hamriya area and create a distinct urban identity.
- For pedestrians, a continuously shaded edge with a variety of pocket parks and plazas will be created.
- Dealing with the social divide between Omani and expatriates in Al Hamriya, the edge strategy.

III MAJOR PLAZA

- The plaza creates an identifiable location on the edge of Al Hamriya.
- This stimulates economic development and announces the new souk, which will be the main economic driver of the area in later phases.

IV UNDERPASSES

Two underpasses connect the north to the south edges of the street. One connects the Souk to the mountain park and garages, the other one connects to the vocational school and terracing along the mountain.

V MOUNTAIN PARK

- The mountain park will create an attractor for people outside of the area to visit Al Hamriya. It turns the mountain into a unique and accessible amenity.

The diagram on the left shows buildings to be demolished. A total of 16 buildings would be demolished, 14 of them in 'medium' condition according to our analysis.

Perspective view of the streetscape along the main road (below). Where there is space, quiet, shaded spots will be created for respite. Here a rammed earth wall helps mitigate the noise from the cars and creates seating.

STREETSCAPE ALONG MAIN ROAD

One of the most common and inexpensive ways to improve an urban area is streetscape (perspectives show before and after application of streetscape strategies).

- Planting trees creates shade and reduces urban heat island effect.
- Street furniture makes places to sit and relax, as well as creating possibilities for additional functions on the street (vendors, games etc).
- Shade structures create shade and define spaces for movement and for rest, giving the space order and character.

STREETSCAPE MATERIAL

The streetscape unifies the site with a material palette which is available on site and can be built with on site labor. For pedestrians it creates a shaded environment with several micro-climactic strategies:

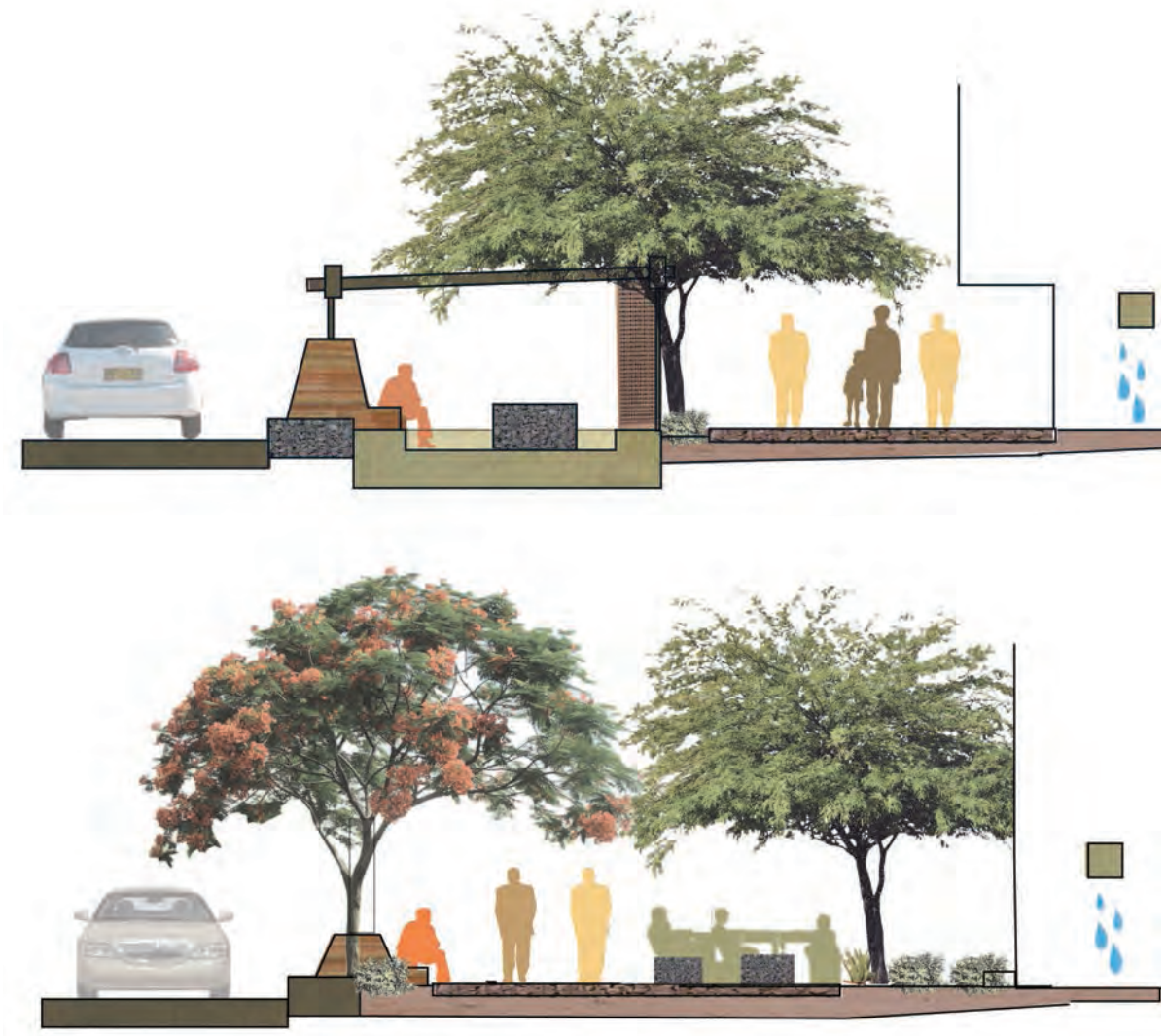
- Reuse of HVAC condensate to water plants

- Rammed earth and gabion street furniture which is in constant shade to create cool seating spaces.

- Seating areas built as shaded, thermal batteries which will radiate cool air to users throughout the day.

- Trees and plants to reduce the urban heat island effect.

- Street furniture which makes sitting in the area comfortable for expats and Omanis alike.



Gabion walls combined with other materials are a very easy way to create streetscape and terracing. Already widely used in the area, they can be a way to kickstart the development.

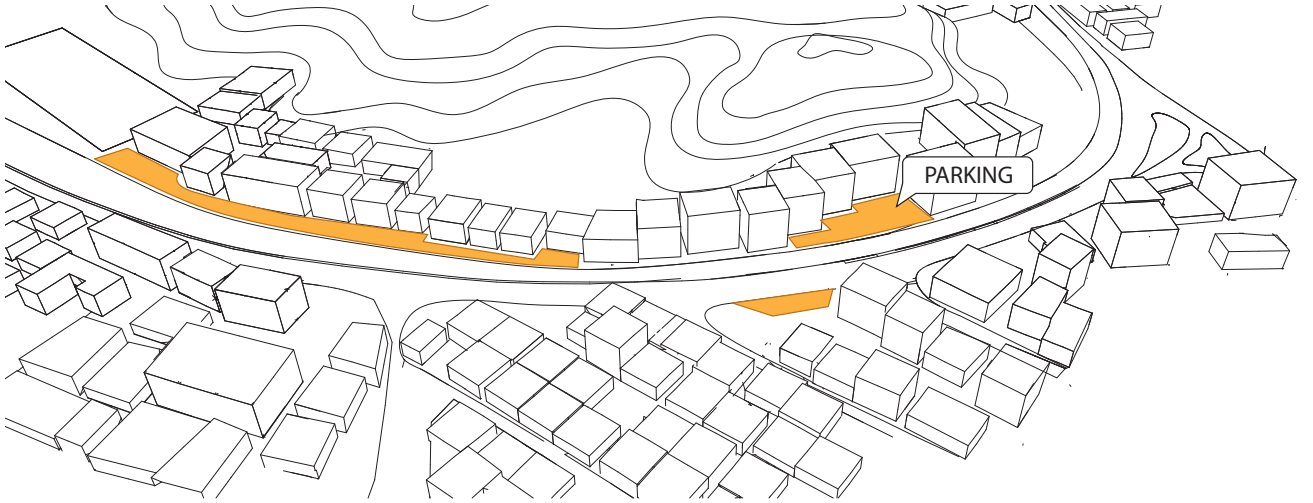
Rammed Earth is labor intensive and works well in dry climates. It also has excellent thermal properties, so developing it as a way of creating jobs and as a long term alternative to concrete may be a useful way to diversify and expand the construction economy of Al Hamriya.

Gabion with recycled materials - Gabion walls most commonly built with stone can also be filled with rubble from demolition, or other materials which are often shipped off for disposal.

Shading trellises with various patterns can also be built by the local labor force. These require more skill and craft, but since there are a large number of workers which already assemble furniture there is evidence that the necessary skill base exists on site. For more ambitious designs, one would have to turn to the possibility of a startup business in the ‘freezone’.

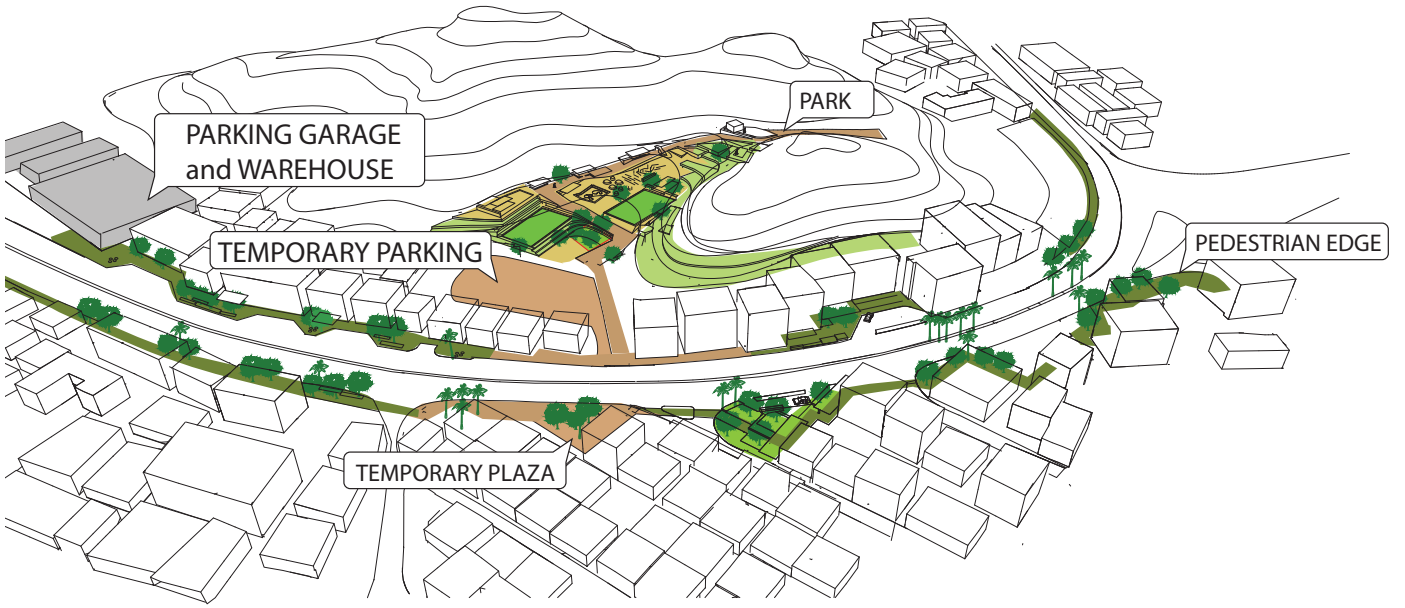
Stone pavers are also labor intensive and can be manufactured on site - possibly with native stone.

PHASING STRATEGIES



EXISTING

The existing condition has no space which is ‘designed’ for human comfort. Large areas are dedicated to parking. The current parking capacity is approximately 100 cars.

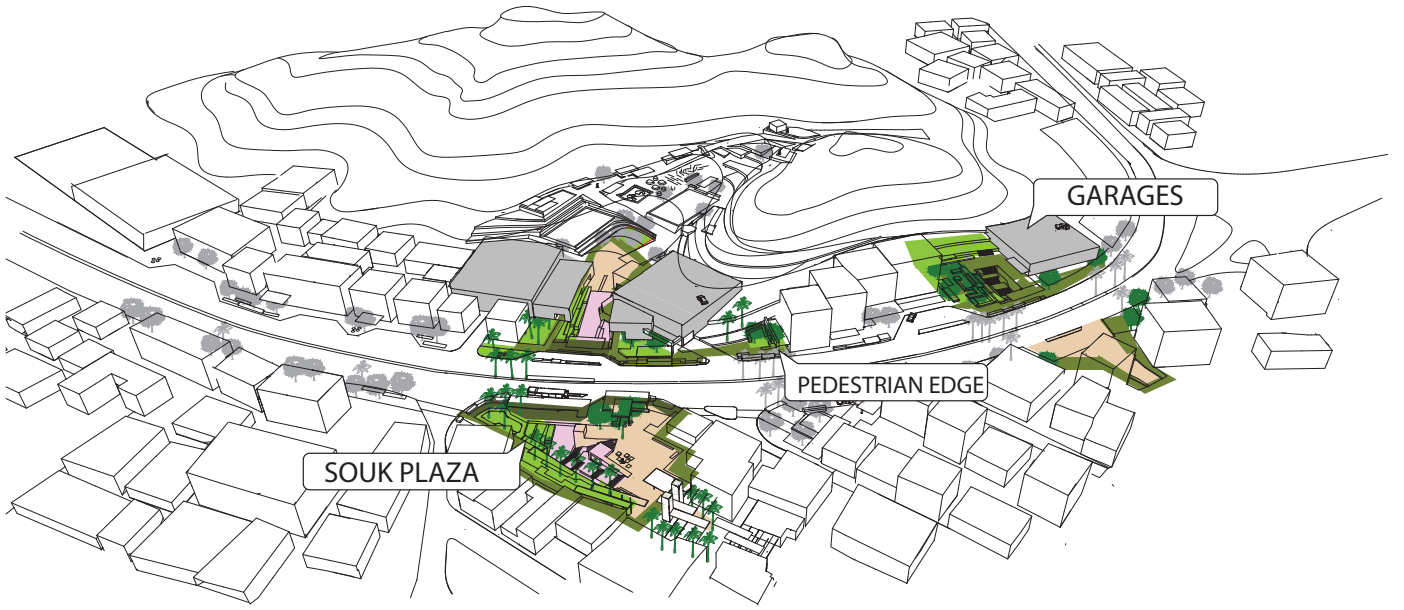


PHASE I - streetscape

The first phase primarily focuses on streetscape and turning open space along the edge into a continuous pedestrian zone with xeriscaped pocket parks and plazas. This is designed to be an immediate way of creating a facade for Al Hamriya which is low cost, and easy to build. This phase focuses on the parts of the edge which will not be effected by later phases.
The area of the demolished school will be developed as parking, which will provide room for the parking which is offset by the streetscape strategy. Parking capacity at this point will be approximately 170 cars.

PHASE II - park

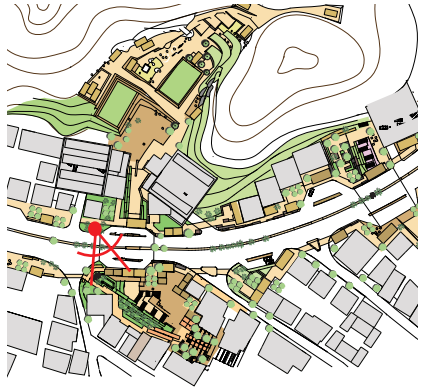
The next phase is developing the mountain park. The development of the mountain will help create an attractor to the area and tie into the network of new open space. Since later phasing calls for development of the area in front of the park, this phase can create temporary parking for the park and for the general area. This requires demolition of at least one building in order to access the area. Parking capacity will be upgraded to 300 cars.



PHASE III - Plazas and Underpasses

This is the highest level of intervention in terms of demolition and new construction. While the previous phases were mostly xeriscape and other strategies which could be almost entirely done with on-site material, the plazas and underpass require heavy machinery and temporary shutting down of infrastructure.
This would occur at a later time and create an entry to the new souk, as well as an identifiable ‘place’ at the edge of Al Hamriya which will create a distinct identity. The garages will upgrade the parking capacity to 420 cars.

Perspective showing the plaza and underpass development phase.
- The plaza will be surrounded by shaded areas with a variety of seating and street furniture to encourage pedestrian activity.
- The wadi emerges alongside the underpass and creates a garden space alongside the plaza. This has the potential to be a waste water management 'living machine' zone for the souk.
- The bus stop occurs at the edge of the plaza next to shaded seating areas.



STREET EDGE AREA PLAN

Detail plan focusing on plazas and connections on either side of the road.

ENTRY TO PLAZA

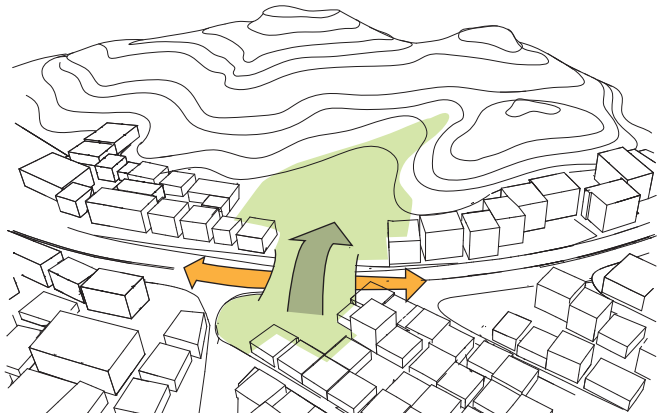
Perspective showing leaving the garage into the plaza on the north side of Suq Ruwi street.

- Shaded walkways along an open plaza with integrated seating.
- The garages are integrated with small shops on the ground floor which ensure that some activity happens in this area.
- The shops also help to offset the cost of the garages over time.
- The integration of the shops, walkways and landscape prevents the garages from dominating the area, as most garages do. This keeps the emphasis on the streetscape and commercial areas which is important for a comfortable urban environment.

PEDESTRIAN UNDERPASS

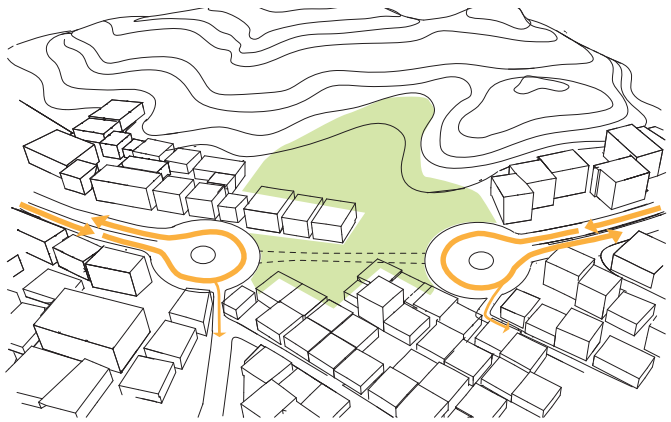
Creating a connection between the sides of Suq Ruwi street is necessary in order to unify Al Hamriya. Currently the road is heavily trafficked, making it difficult and unpleasant to cross.
- Since the south end of Al Hamriya will be developed extensively, ignoring the north end by keeping it cut off would create a situation where businesses on the north side would be left out of the benefits of the development.
- In addition, any development on the mountain would be cut off from the rest of Al Hamriya.

- We considered several options in connecting the two sides of Suq Ruwi street. The decision to develop The underpass strategy in the final proposal was taken cautiously, since we understand that underpasses may be perceived as scary and dangerous spaces. This problem can be turned into an opportunity by developing the underpass as a uniquely designed space. To the right a perspective showing the interior of the underpass.



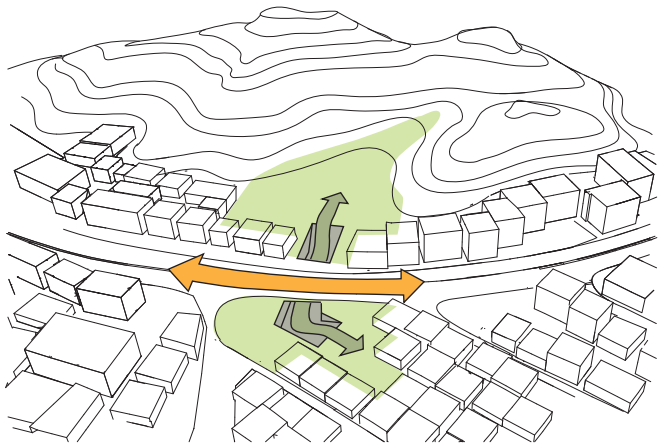
OVERPASS

- While pedestrian bridges are often not efficient ways of connecting two sides of the road due to their height requirements, an overpass creates a continuous connection over a road.
- This would require the road being lowered in order to create adequate room for the overpass, and due to the large area of excavation this possibility was rejected.



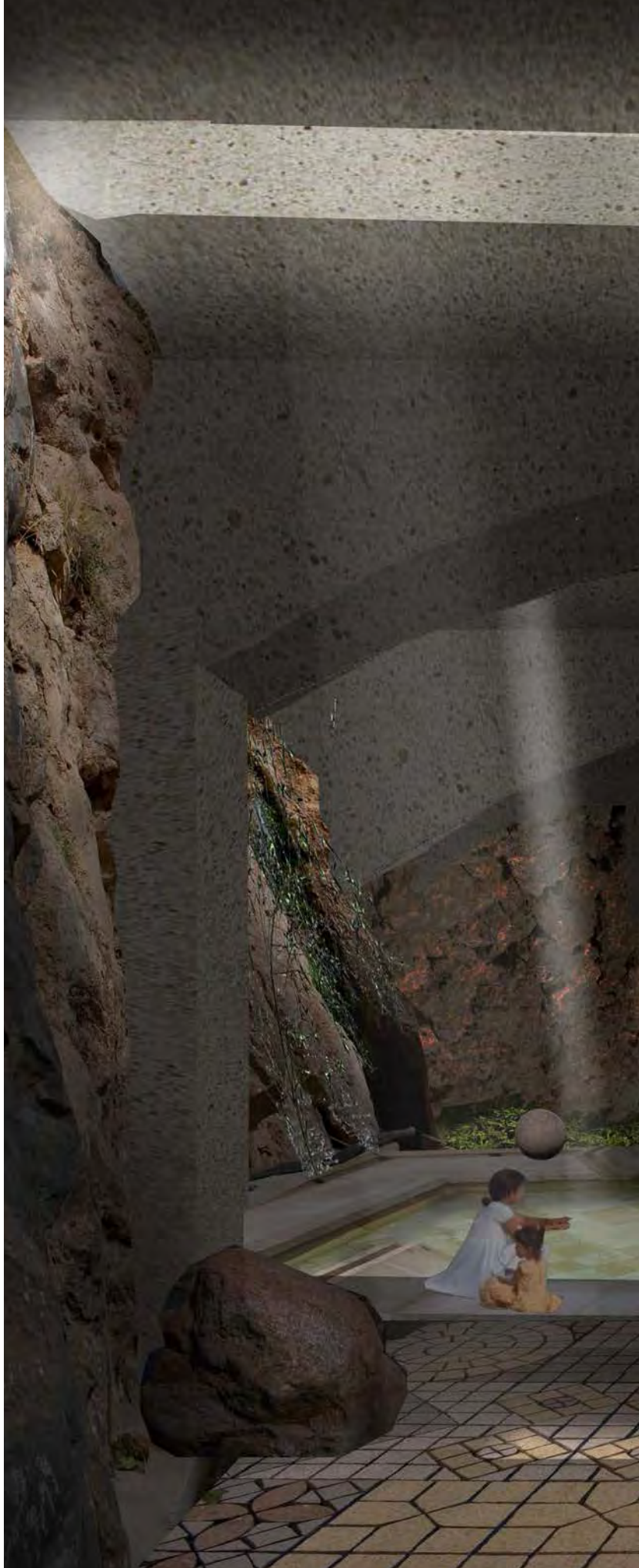
ROUNDABOUTS

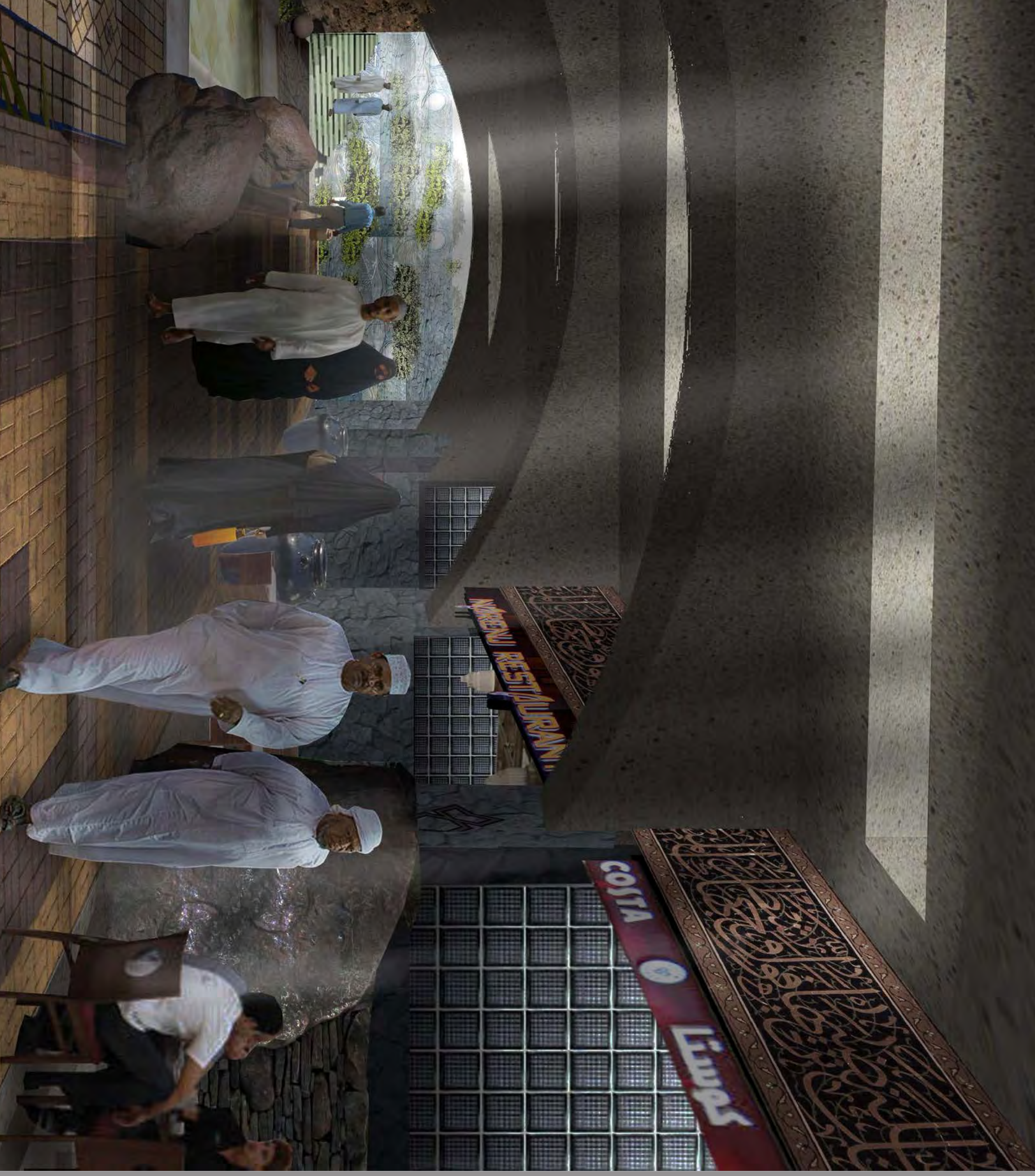
- An idea to disrupt the continuous traffic along the road for private vehicles. The roundabouts would create access to Al Hamriya and create an enormous plaza at the edge.
- This scheme turned out not to be compatible with the larger traffic strategy of the area. The new configuration would also drastically alter the character of Al Hamriya



UNDERPASS

- The underpass would be the least intrusive way to connect the two sides of the street in terms of construction.
- The disadvantage of the underpass option is the general perception of unsafe spaces and the negative association. However, if it is designed correctly, this should not become a problem.





STREET EDGE

UNDERPASS DESIGN STRATEGIES

- Natural lighting
Natural light is necessary to prevent the underpass from being dark and scary. Furthermore, natural lighting if done well can give the space a unique and attractive feeling. Glass block in the medians of the road can help natural light penetrate into the underpass.

- Shops and cafes
Adding shops and cafes in the underpass ensures that it will always be occupied and therefore safe. They also give the underpass an economic base which in time will help to offset the cost of their construction.

- Scale and Proportion
The underpass must be large enough in width and height to prevent people feeling confined. It should feel more like a souk than a standard underpass.

- Entrance integrated into the plaza
Entrances to underpasses are often small and intimidating. The design of the entrance is meant to integrate with the surrounding plaza and wadi elements. It should be perceived as part of a continuous experience.

- Thermal Comfort
Since the underpass is underground, it will naturally be much cooler and therefore more comfortable than the rest of the street. The thermal mass of the ground will naturally keep the temperature stable throughout the day, so the underpass may prove to be a more popular destination than above-grade parks and plazas!

The perspective on the right shows people entering the underpass from the plaza on the south side of Suq Ruwi Street, coming out into the “New Souk.”

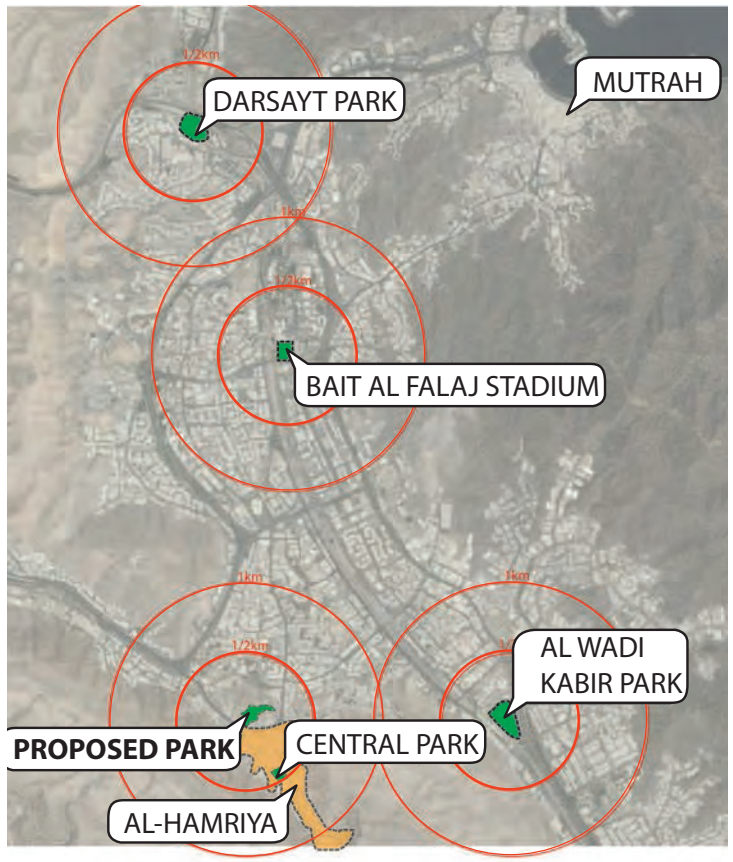
The section below shows the proportion and integration of shops and lighting below street level.

NIGHT TIME STRATEGIES

At night, especially on weekends, Al Hamriya is active with expatriate workers out and about. The aim of the plan is to reduce the chaos, and make Al Hamriya a place where Omanis would feel comfortable at night. In the short term, this is difficult, but in the long term the worker population of the area will be reduced. In addition shops and programs which come from ‘free zones’ will attract Omanis. With both of these desired trends, one can imagine the improvement in the night-time urban landscape.

The strategy for the design of the physical space is generally to create comfortable lighting at night which emphasizes the pedestrian path. The existing condition shows a lighting scheme which is not designed and therefore chaotic. The proposed scheme would be based on uniformly lighted main paths and pocket plazas.

STREET EDGE



MOUNTAIN PARK

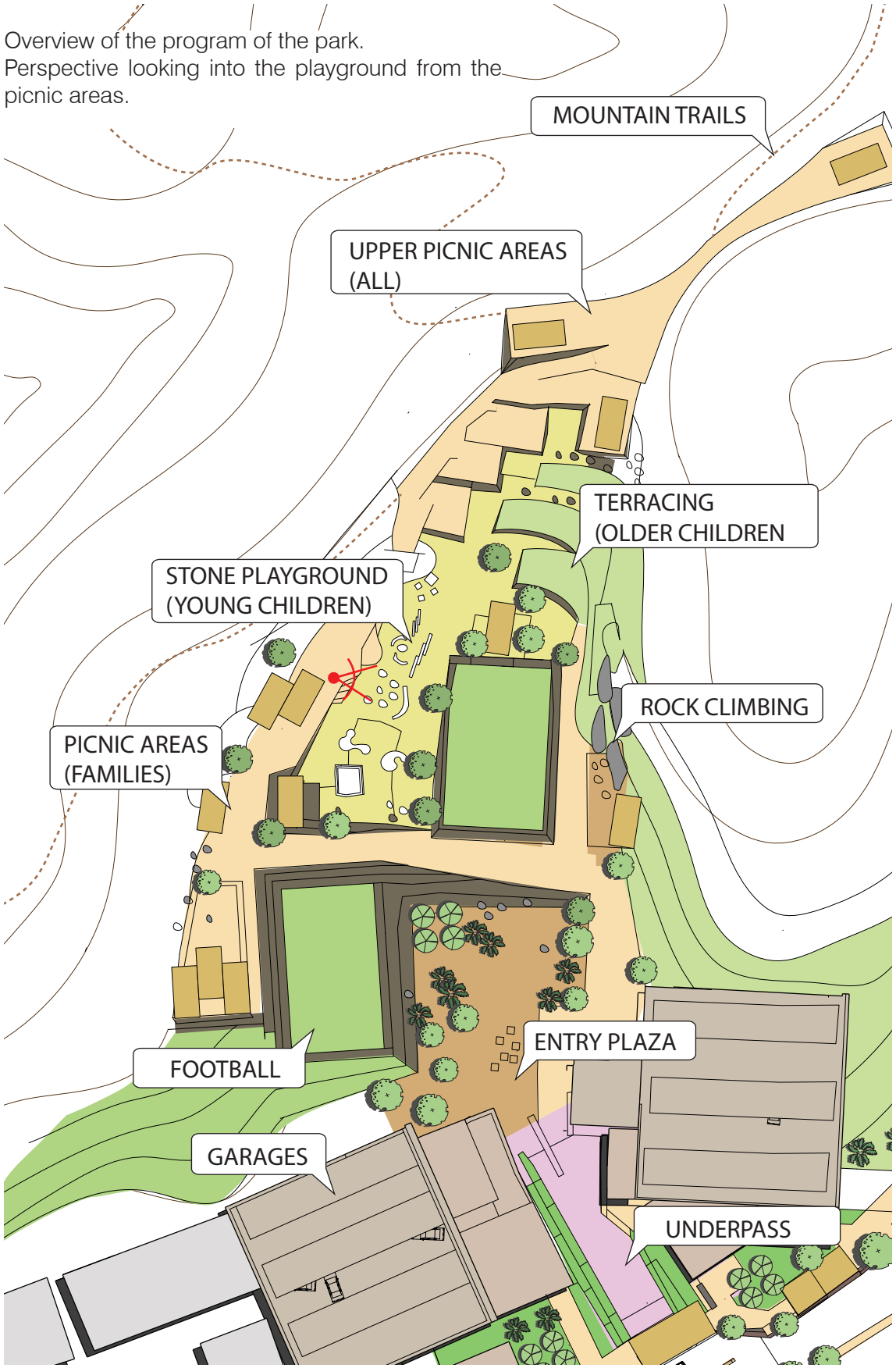
When considering what to use this space for, we kept in mind that among the main requests was for open space, and upon further analysis of parks in the area, it made sense to create a park that would serve residents outside of Al Hamriya. The diagram shows nearby parks, and as the other parks in the area are meant to serve mostly local residents, creating an amenity for those who do not live within walking distance of another park became a strategy to involve a wider area in what may be happening in Al Hamriya. This park will also help stimulate economic development around the street edge and 'New Souk' since it will attract visitors and begin to change the negative stereotype about the area. At night, the park will most probably be used by expatriates, so its use may be divided temporally.

The park is designed to use the natural topography of the mountain to its advantage. It provides a variety of open space and program without ruining views to the mountain.

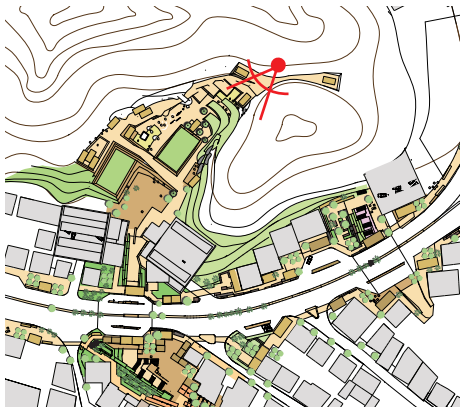
- The park is programmatically divided by the age of the users so as to create a place that will be usable by visitors of all ages.
- Families visiting have dedicated shaded picnic areas with trees and shade structures so they can enjoy a day out (when the weather permits).
- These areas overlook a 'stone playground' for young children (ages 5 - 10). This playground is mainly built with a variety of climbing and rock sculptures which are meant to stimulate exploration and play.
- Above this are terraced areas for older children and teens (11-15) who often prefer to get away and hang out on their own, overlooking the activities below.
- Above that are more picnic areas which overlook Al Hamriya.
- Additional activities integrated into the park include two 1/6 size football fields, footpaths around the mountain, and a climbing wall.

DESIGN STRATEGIES

Overview of the program of the park.
Perspective looking into the playground from the picnic areas.



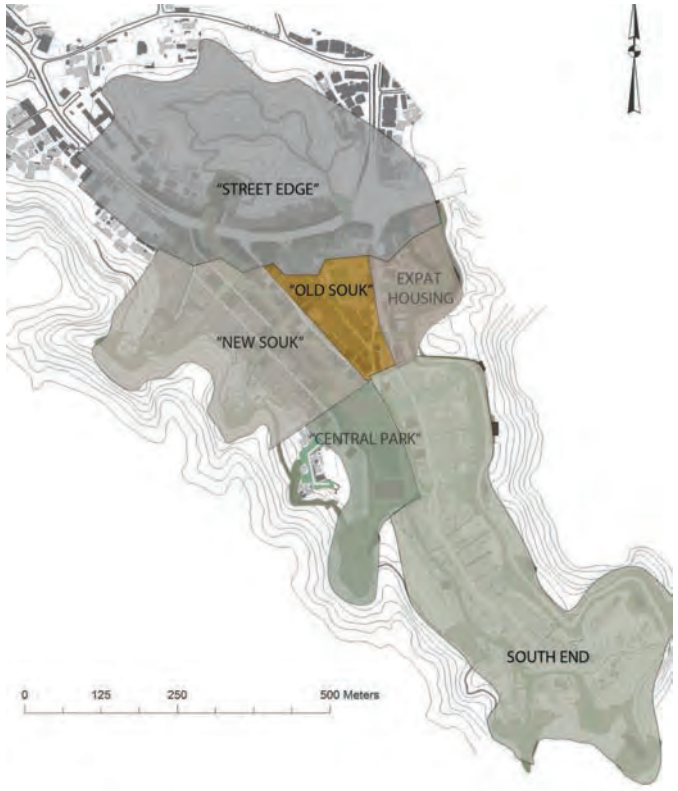
STREET EDGE



Perspective looking down from the top of the park back into Al Hamriya. One would get an overview of the park, including the terracing strategy which is common throughout the site.

- The section shows the park in relation to the mountain. Since it occupies the lower contours, it is accessible and unobtrusive to views to the mountain.
- Trails lead up to higher areas and are separate from the main park.
- The top of the park has the potential for a small vendor (ice cream, cafe etc) as an attractor.
- Shaded area along the park both from shade structures and trees create plenty of spaces to sit and have a picnic with a group or alone.

STREET EDGE



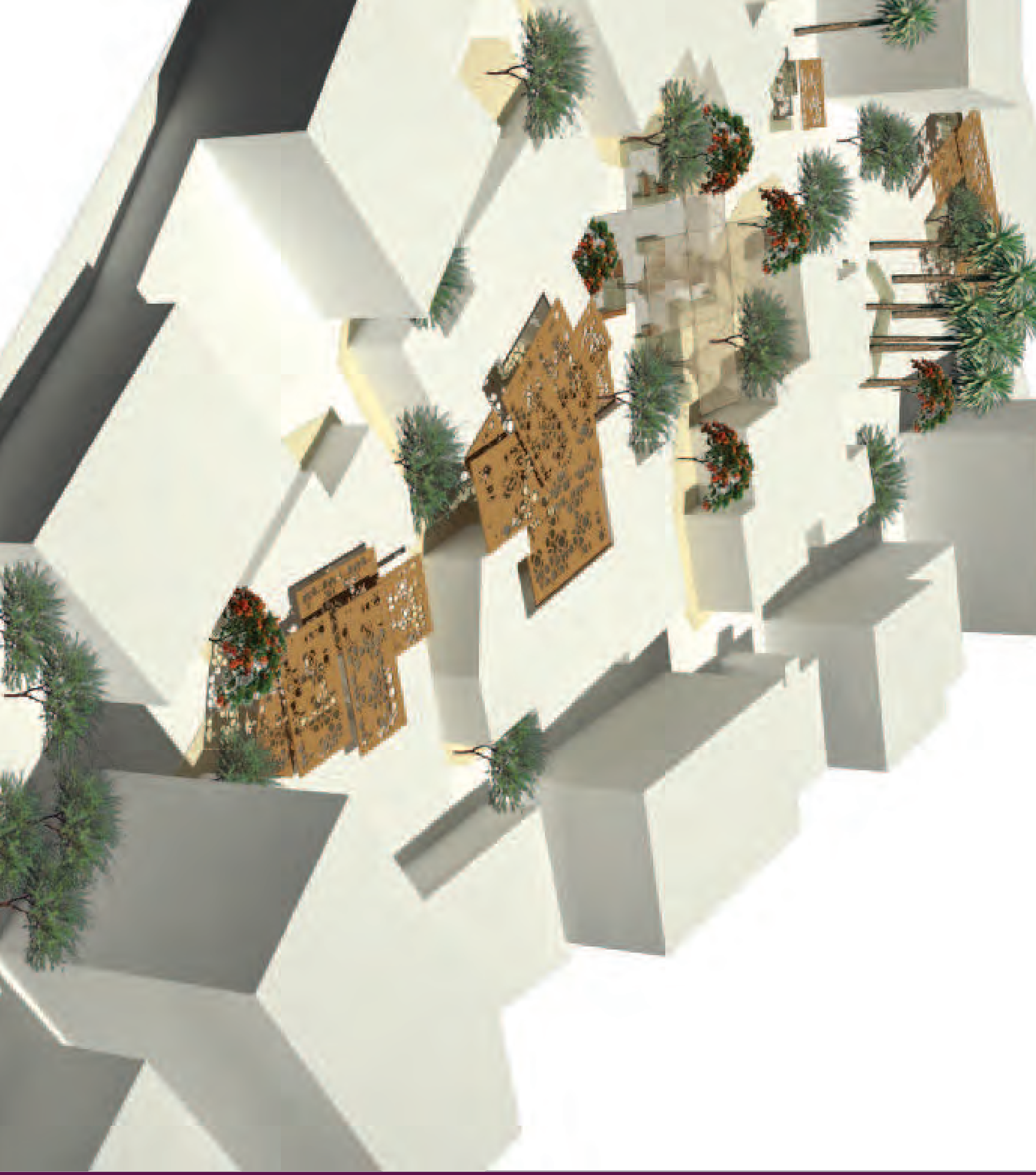
VOCATIONAL SCHOOL (OLD SOUK)

The proposal for the old souk is to convert the inner core of this area into a vocational school for the workers within the community. This need for education stands to reason as the workers learn new skills to be employed towards the re-development of Al Hamriya.

The ethic of the architecture and the landscape architecture is to serve as an example to both the community and students of how creative ideas can come out of low-tech methods. The school creates a learning environment full of opportunity for understanding even by sitting and observing. The innovative use of gabion walls, re-interpreted use of the mashrabiya screen, and an infusion of native plant-life supported by the living machine and rainwater harvesting are but a few examples of on-site sustainable strategies.

Conceptual Rules of Development:

- Creative design by low tech/interediate technology methods
- Educate and inspire
- Shelter from harsh environment



VOCATIONAL SCHOOL

VOCATIONAL SCHOOL AREA PLAN

CONNECTIVE TISSUE

Being that the focus area is at a crucial intersection in the Al Hamriya area, it is vital to establish the important circulation routes to the adjacent sites all around. The basic concept of the circulation is based on the notion of compression and release. The visitor is compressed in areas where movement is encouraged and then released into various courtyard spaces in which the combination of landscape and various shading strategies protect the person from the harsh desert environment.

UNDER PASS CONNECTION
The proposed underpass creates a safe passageway for people to move from the north to south side of the street.

TENSILE ARCADE
The shaded arcade is at the intersection point from the dorms, new souk, central park & street edge.

SHADE CANOPIES
The overhead shade structures are designed around an abstraction of the mashrabiya enabling both protection from the harsh environment and a pleasant pattern of light in the environment.

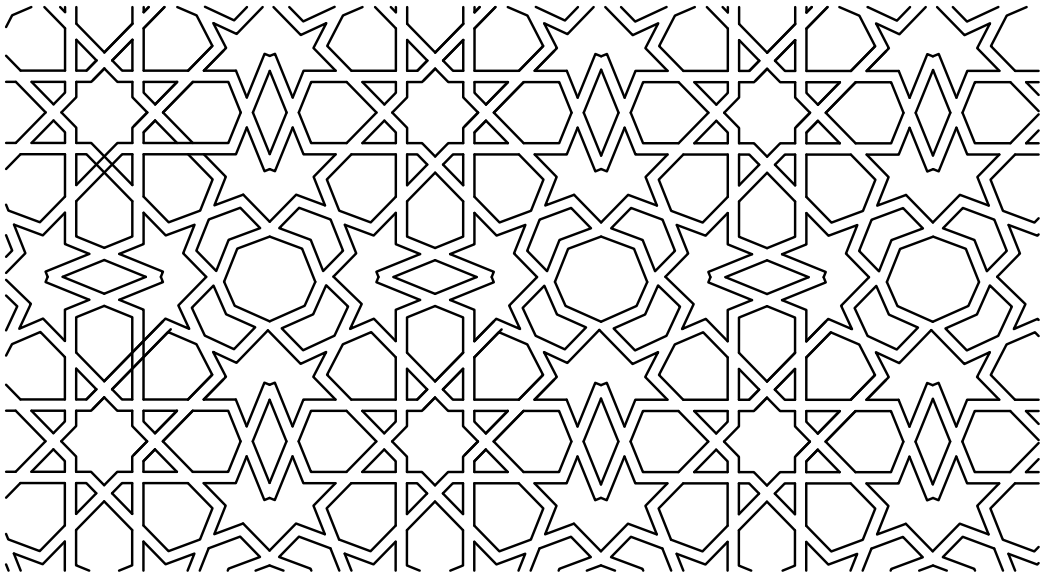
VOCATIONAL SCHOOL
The new school is created to educate the workers of the new sustainable techniques in construction and fabrication.

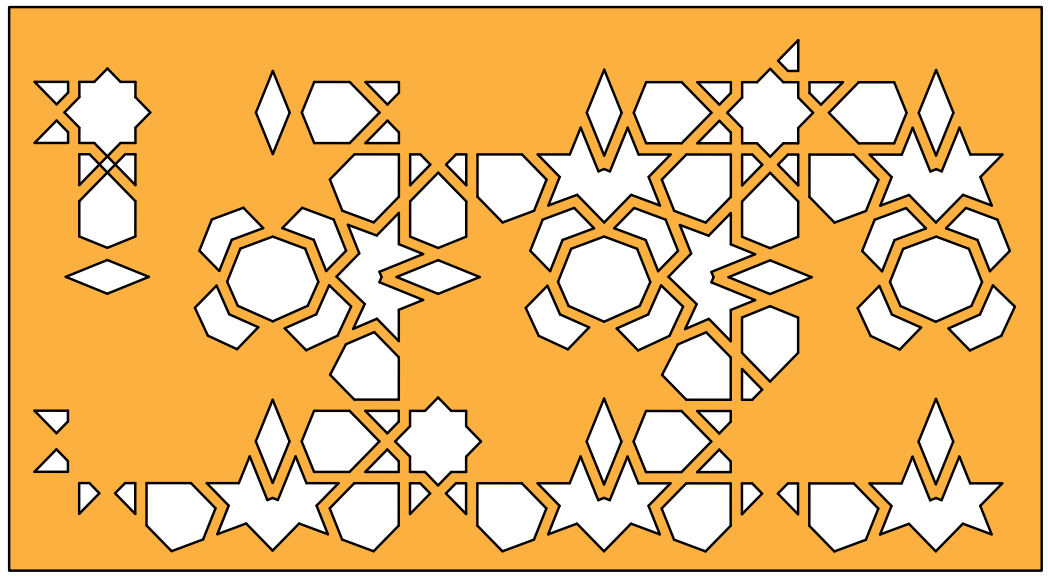
NORTH

Reinterpretation of the Mashrabiya

As a means of providing shade along the various corridors, it became obvious as to why the mashrabiya became a valid derivative of form. Although there is an overwhelming amount of patterns used for the mashrabiya screens in Islamic culture, the common theme is the utilitarian purpose of mitigating the natural environment or the privacy of those whom stand behind it. In the case of a shade structure, the concept is to play with the pattern of solid and void in the pattern to achieve the desirable balance of light and shadow.

01 From North Street Edge





Mashrabiya Abstraction

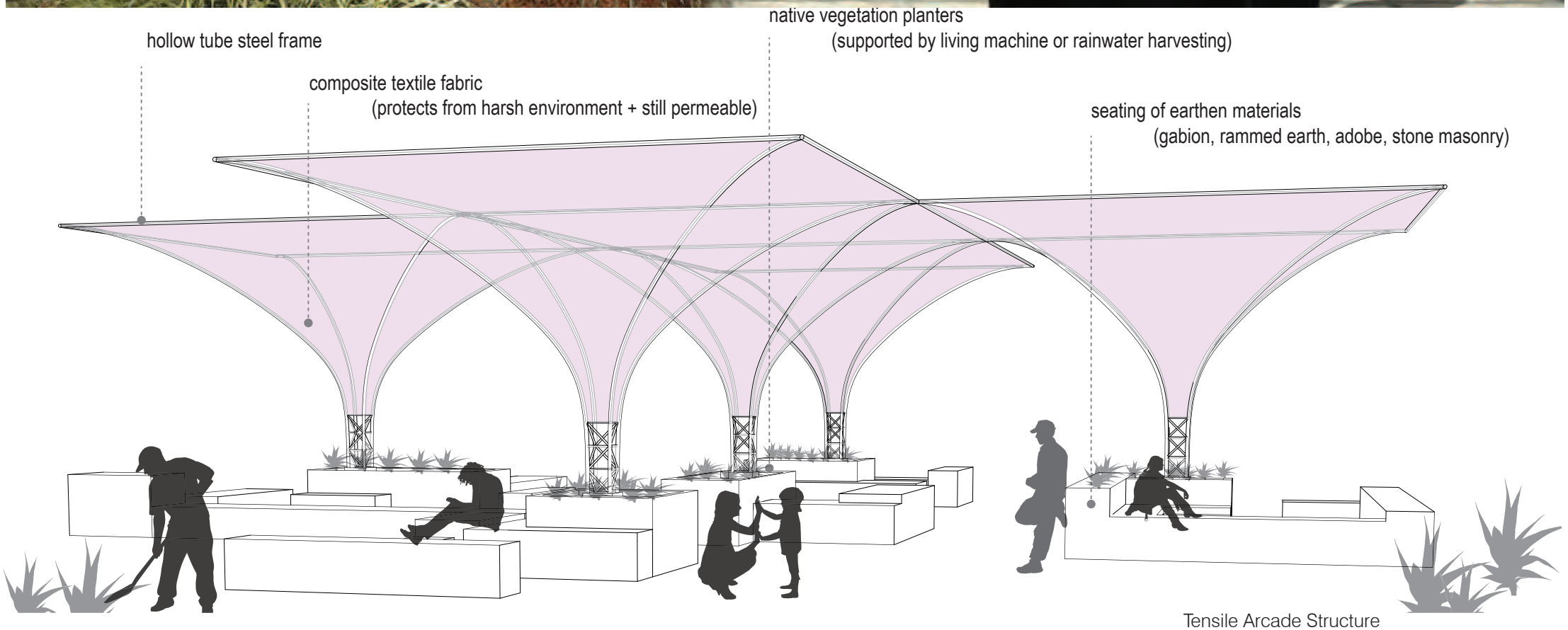
02 Along Underpass

SIMPLE AND MEANINGFUL

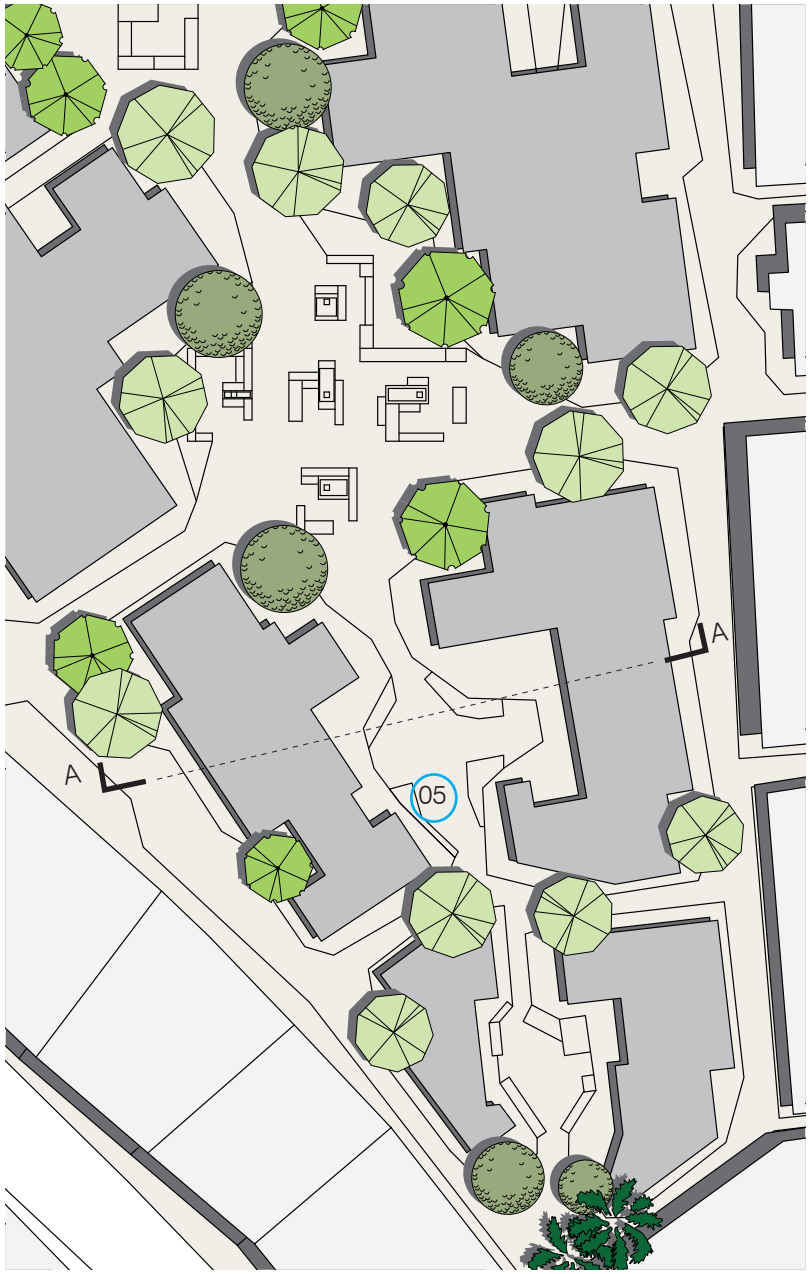
Using a simple strategy of hollow tube steel and composite textile fabric, the central plaza area is covered by a light interpretation of the arcade. By use of the form, the sensation of movement is encouraged while at the same time protecting those whom pause to relax in the space below. Additionally, the interior funnel of the canopies provide a secondary purpose of rainwater harvesting, which supports the plant-life below. This unique plaza of shade and landscape becomes an intimate social opportunity for all the workers, students, and families of Al Hamriya.

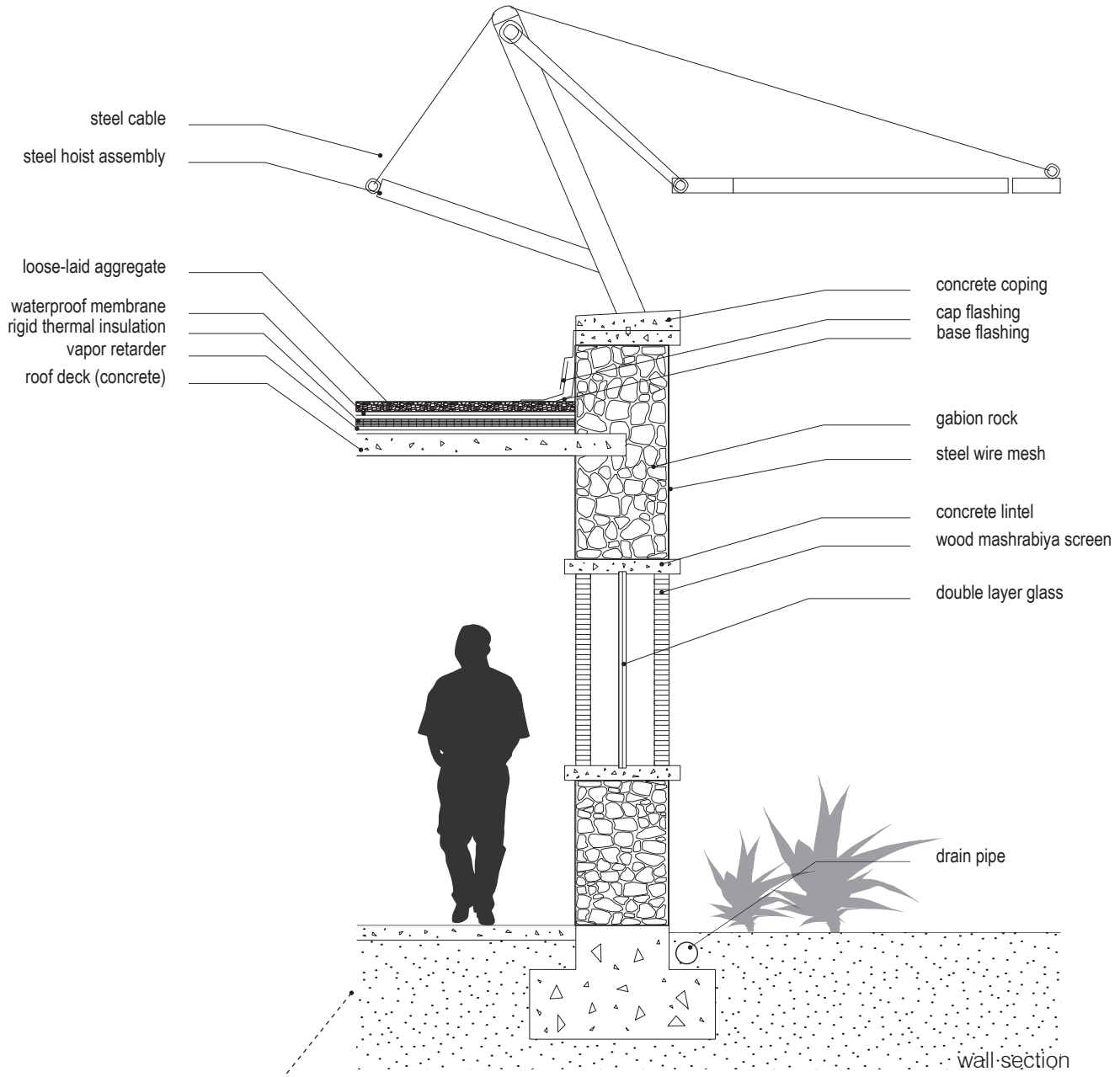
03 **Looking Towards North Street Edge**

04 From New Souk



Tensile Arcade Structure





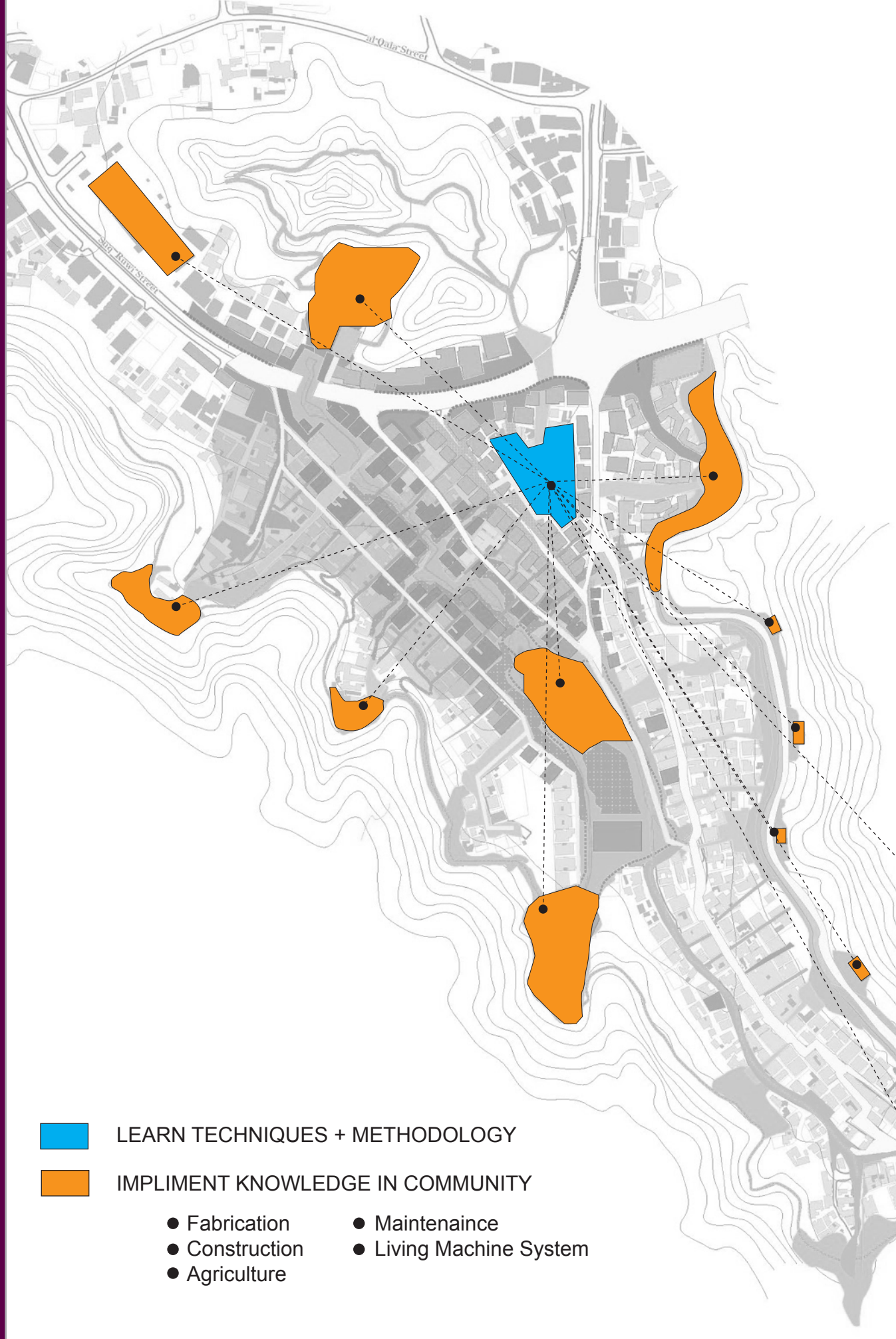
wall section

section AA

A RUSTICATED ENVIRONMENT

Keeping with the notion of the vernacular, the material choice of the vocational school is primarily of stone. However, instead of creating a traditional stone wall, the modern method of gabion walls are used as a low-tech affordable method of development. This material palette is sustainable, as the infill stones take advantage of the waste rubble at the excavation sites of the new worker housing and urban agriculture along the periphery of the valley edge.

05 Interior Courtyard



EDUCATING THE WORKFORCE

The basis for providing a vocational school for the workers is reasonable for the future development of Al Hamriya and Oman. At the new vocational school, workers learn about all the new techniques and fabrication methods, such as innovative construction techniques, the living machine system, and urban agricultural. Once the education is received, the workers are dispersed to the various focus areas in the community where they are now equipped with the knowledge to successfully contribute to the renovation of Al Hamriya. This investment in the workers education only increases the strength of creating a sustainable workforce internally for Oman.

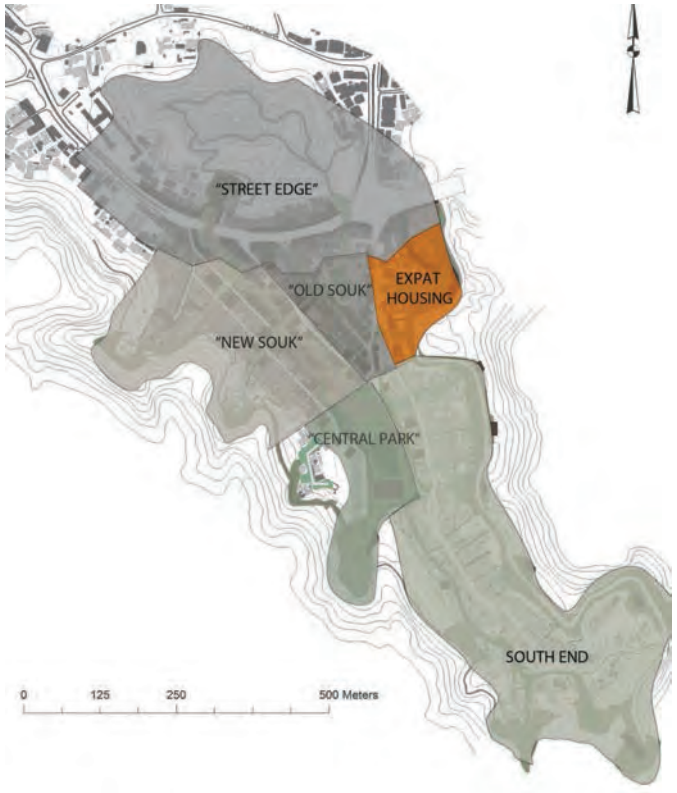
Vocational Materials Laboratory

Vocational Classrooms

VOCATIONAL SCHOOL

EXPATRIATE DORMITORIES

The basis for providing a vocational school for the workers is reasonable for the future development of Al Hamriya and Oman. At the new vocational school, workers learn about all the new techniques and fabrication methods, such as innovative construction techniques, the living machine system, and urban agricultural. Once the education is received, the workers are dispersed to the various focus areas in the community where they are now equipped with the knowledge to successfully contribute to the renovation of Al Hamriya. This investment in the workers education only increases the strength of creating a sustainable workforce internally for Oman.



From site analysis data, housing conditions in Al Hamriya have been generalized into three different qualitative categories. These categories are based on visual conditions, observed during site visits.
The housing conditions in this focus area, fall primarily in the category of most distressed, and in need of major work, to bring them back to a safety level sufficient for enriched living. The majority of the housing units in this area are single story, contending with a dramatic change in topography.

EXISTING AREA PLAN

EXISTING CONDITIONS

Living Conditions
- Dense population
- Distressed Housing
- Large bachelor worker population
- Lacking ownership of living spaces

In order to reduce rent costs, expats maximized the number of people in housing units, exceeding the carrying capacity of the living space. This high volume coupled together with the short time span of employment is reflected in distressed neighborhoods, showing lack of upkeep and ownership of personal living space.

Infrastructure
- Lack of access to Water
- Insufficient Sewage systems
- Chaotic Utility Grid
- Cost Prohibitive Construction Detail

Expat neighborhoods in Al Hamriya have a rich quality of organic growth, but suffer from a tangled patchworks of utilities, servicing the existing housing. Evidence of this is seen throughout neighborhoods in tangles of aerial lines jumping building to building, as well as miscellaneous sources of waste water draining into the streets. Because of the bedrock soil composition, trenching in updated utilities becomes a logistical, cost prohibitive endeavour.

Social spaces
- large population with limited social outlets, no recreational spaces
- overcrowding leading to intimidation

Given the density of expat workers living in this area, the limited open spaces support overwhelming crowds of single, male, workers during the evening hours is grossly over exerted. These crowds dominate these limited outlets deterring any other users, primarily local Omani families, from enjoying them.

Access to Work Opportunities
- Excellent Work Adjacencies
- Dense Building Material Retailers
- Low Diversity of Business Outlets

Access to work in Al Hamriya proper is limited, giving that most construction jobs employing expat workers are occurring in the greater Muscat area. However, Al Hamriya has direct access to Sultan Qaboos Boulevard, and has a healthy concentration of material supply retailers. As a result of its direct access to transportation infrastructure, Al Hamriya is a great location for workers to live, resulting in the high concentration of worker residence.

AERIAL DIAGRAM

HOUSING

Introduce a streamlined prototype for developing and constructing energy efficient housing, that fosters small community connections.

STONE WALL

The stone walls serve as armatures to hold the modular dorms. They trace lines from the existing urban fabric in this area, preserving a trace of its form. The walls house the utilities, and services, and integrate with the living machine on site.

URBAN AGRICULTURE TERRACES

Provide an integrated approach to sustainable living, by supplying workers a place to raise their own food, using harvested water from annual rain, and waste water from the dormitories.

LIVING MACHINE

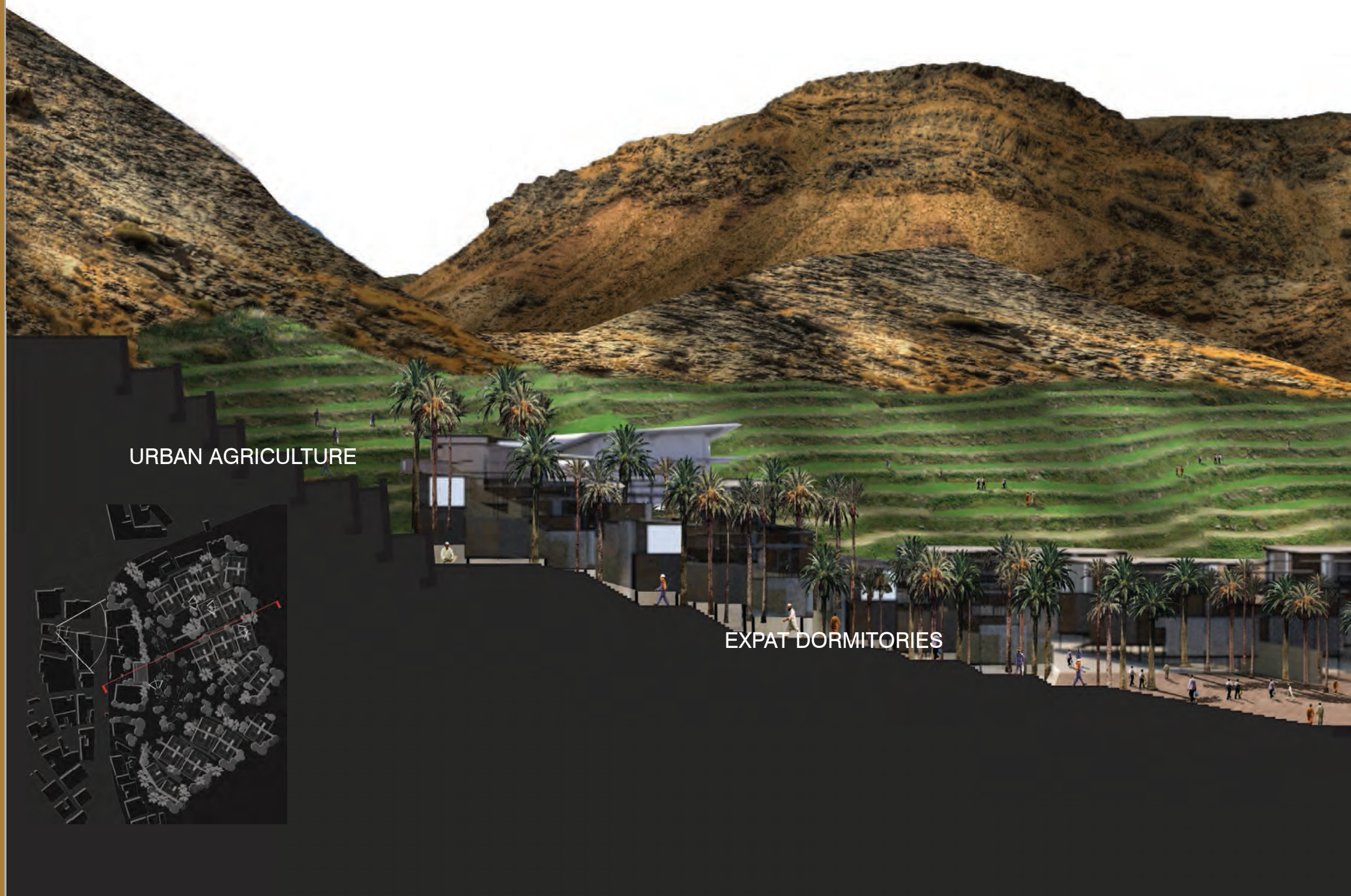
PARK

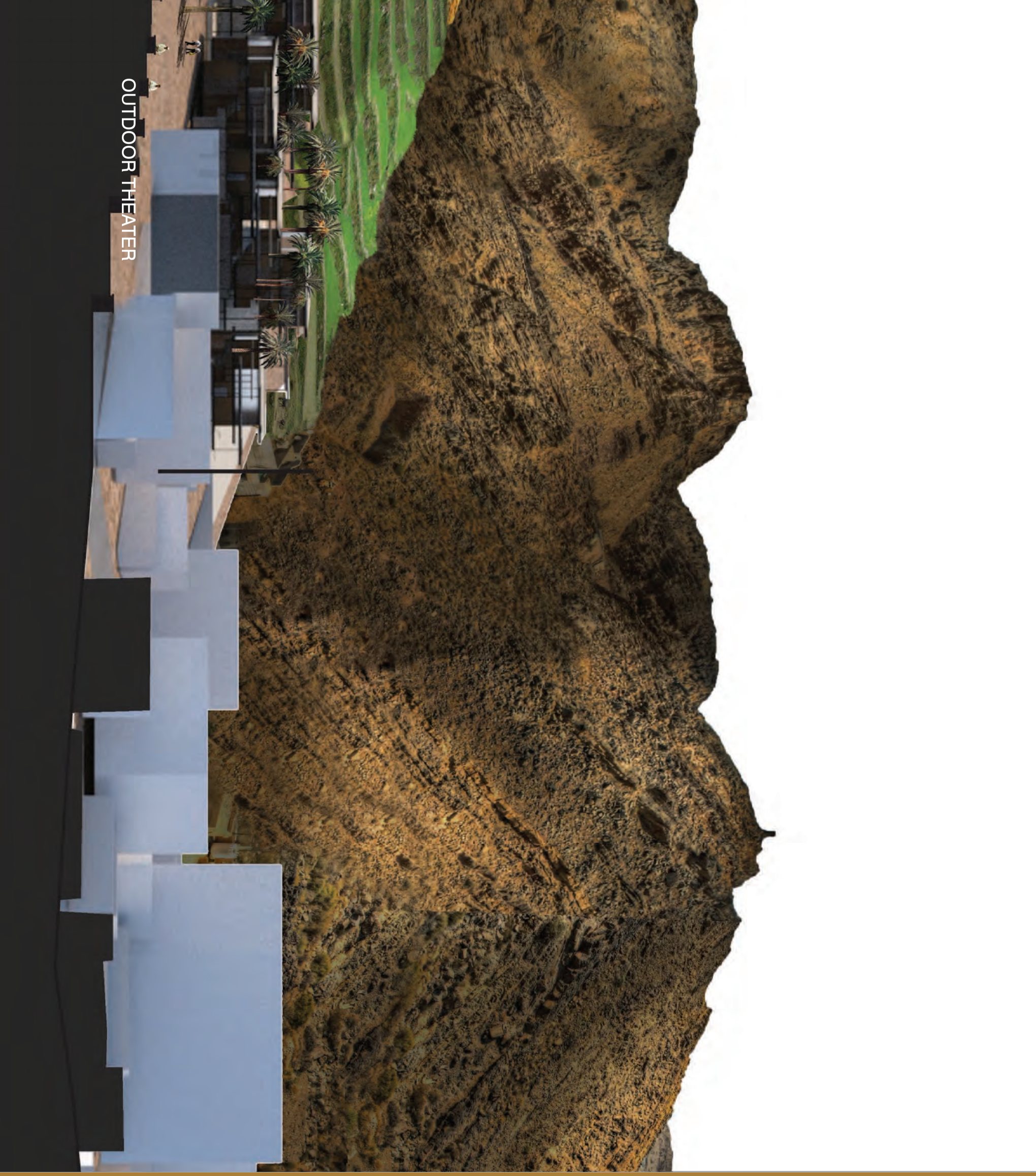
Provide social spaces that build community at multiple scales. The greater context of Al-Hamriya does not provide sufficient space for workers and bachelors to converse, thereby reducing the mob effect.

NORTH

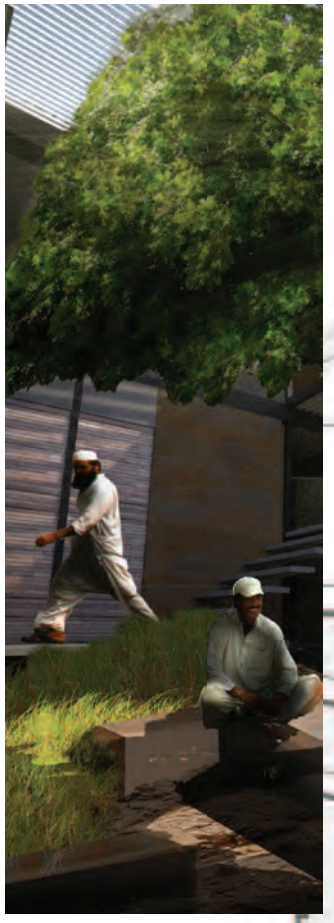
EXPATRIATE DORMITORIES
AREA PLAN

SITE SECTION





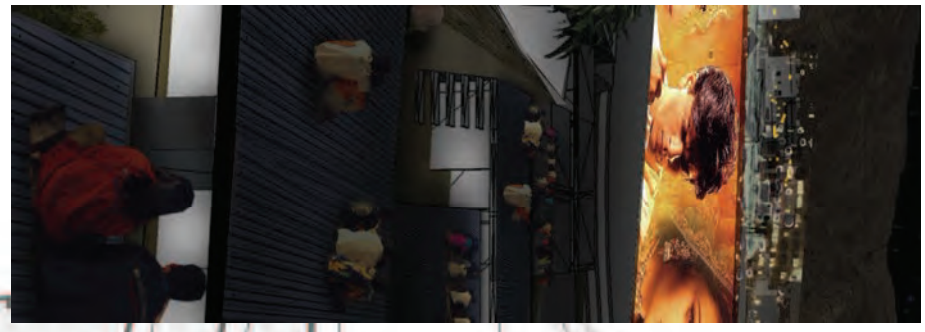
EXPATRIATE DORMITORIES



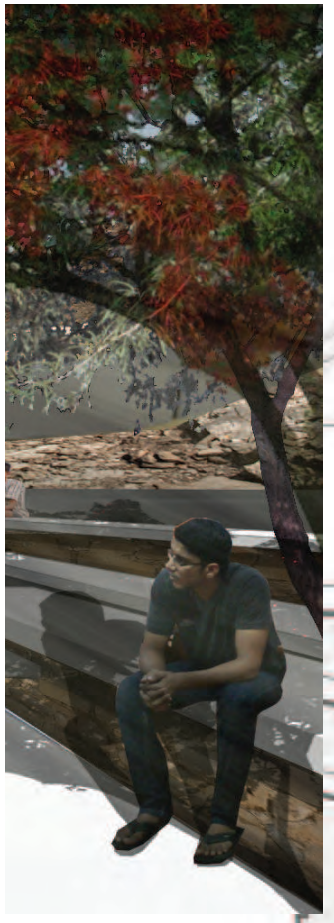
Private:
Unit Courtyards

We have proposed an array of different social gathering environments for these expat workers on site to ease existing overcrowding. First at the most private scale, the courtyards of the unit clusters provide an intimate gathering space for small groups of residents.

Semi - Public:
Unit Rooftops



EXPATRIATE DORMITORIES



Public:
Cinema Park

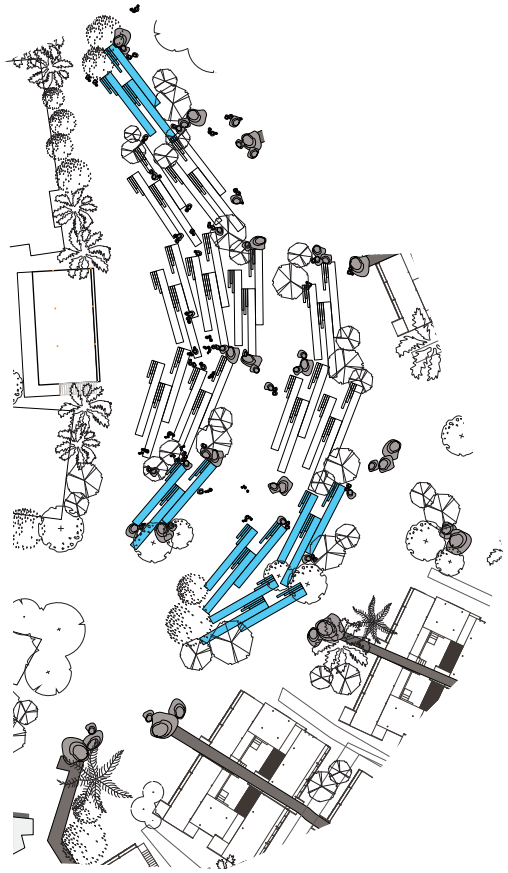
The outdoor theater Park is an open space for bigger social gatherings, and is an outdoor theater where movies may be projected in the evenings.

CINEMA PARK

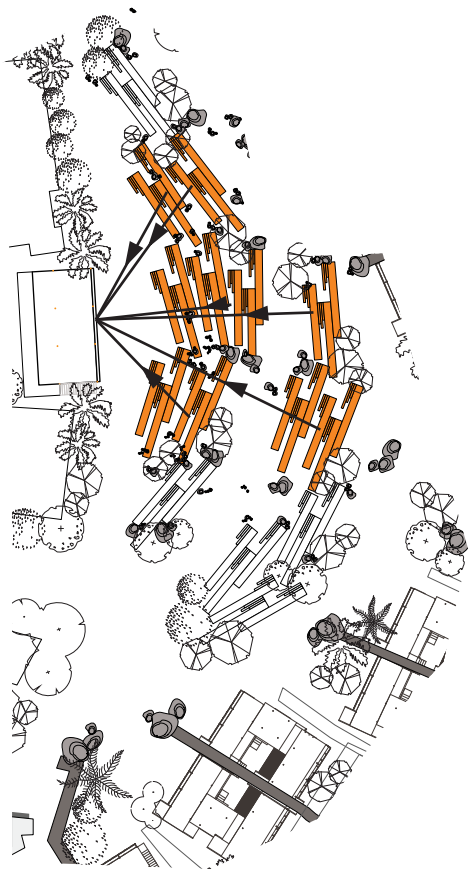
The theater park is set up casually at the center of the expat dorm area, which greets the residents when they return home after work. It serves as a visual release. With the given topography, the residents would have visual access to the park at all-times as they circulate through the site.

One dilemma for the outdoor theater park was to balance human comfort and visual access to the screen. And so, the seating area is programed for two uses at different times. The seating pockets at two ends are densely vegetated and allow for day time use. While the central seating area is less vegetated to allow maximum visual access to the screen from both the seats and the rooftop of the living units.

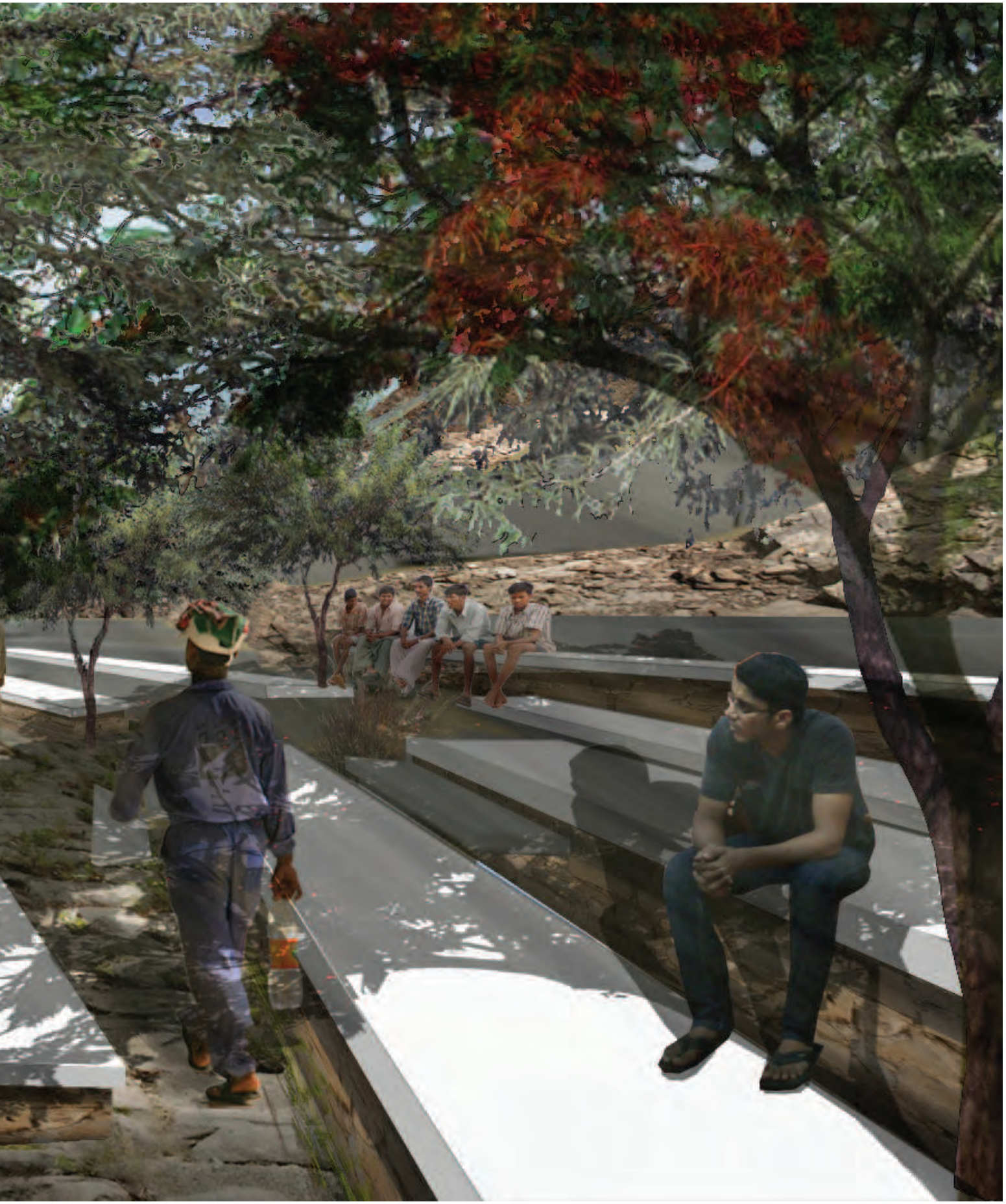
Day Time Use

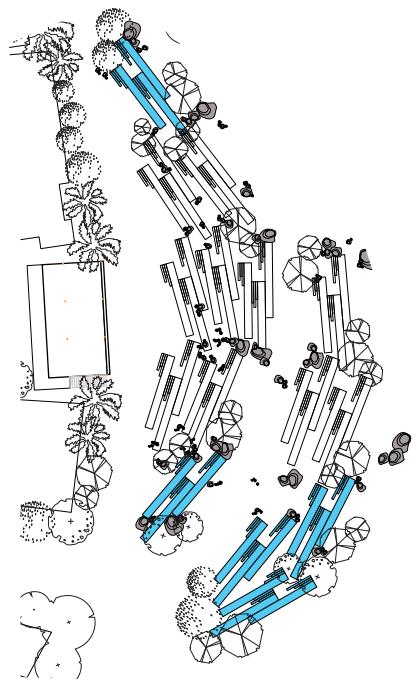


Night Time Use

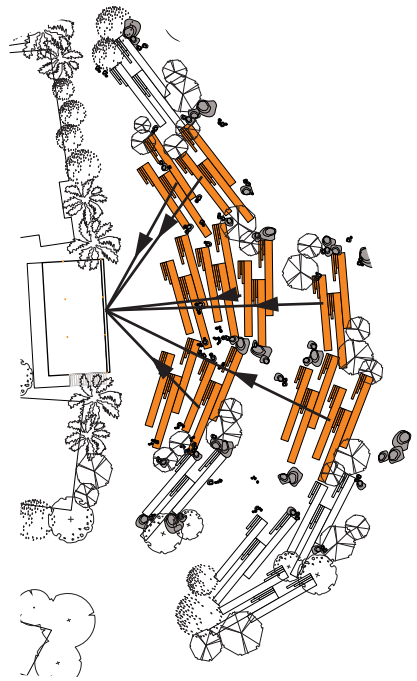


View of the night time atmosphere looking at the central seating area



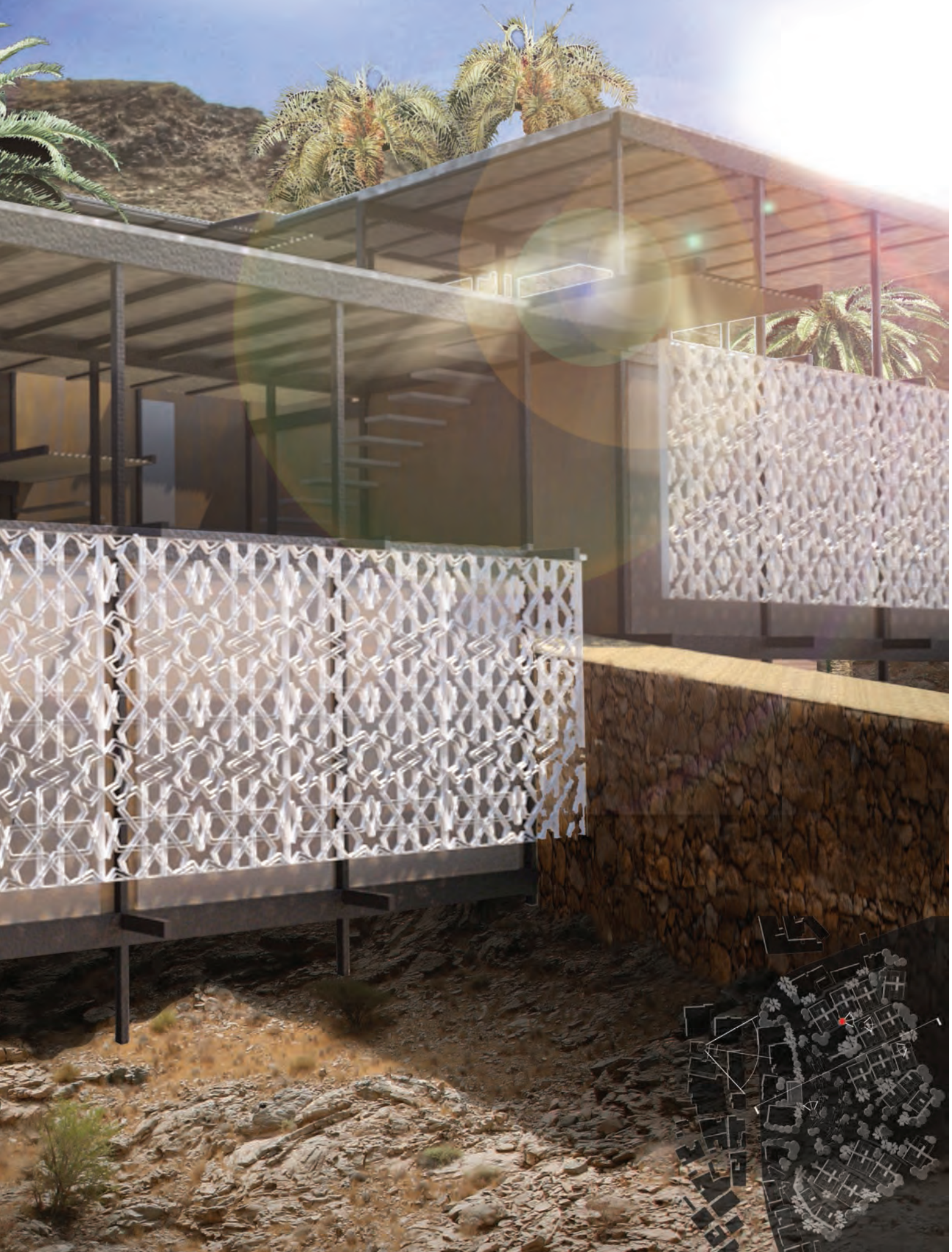


Day Time Use



Night Time Use

Housing Units



DORM DESIGN STRATEGIES

- Create a clustering that employs social adjacency strategies, fostering community within each unit and between adjacent units.
- Capture the great views from the high vantage point.
- Develop a modular housing unit that is versatile to topographical changes.
- Develop local manufacturing of this housing system within Al Hamriya using this site as a prototype for construction in other parts of Oman.
- Organize units about a retrofit utility grid, that minimizes excavation by utilizing above ground site walls to chase all utilities.
- Prevent erosion by maximizing ground cover.

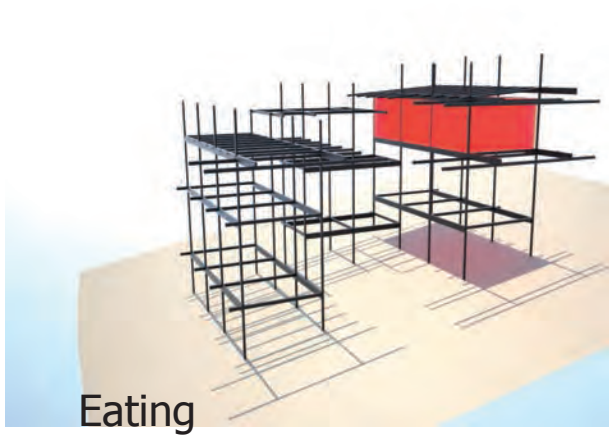
The dorms are a critical intervention in the new design. They are designed on the basis of meeting multiple physical and social needs for workers living and working in Al Hamriya.

The social needs of expat workers differ from those of Omani families, yet are not adequately supported by the built environment in Al Hamriya. The dorms are designed to create expat specific social connections at two distance scales, by creating micro and macro social space. First, each dorm is clustered around a central courtyard that provides a micro scale area for residents to relax. Given the altitude of the site relative to Al Hamriya, the dorms have fantastic views that are captured by two viewing decks on the west side of each dorm, which also provides micro social spaces for residents. Each dorm is connected to an adjacent dorm via the viewing platforms, in order to promote connections between neighbors, promoting macro scale connections within the neighborhood.

This housing strategy stimulates an opportunity for a low income, adaptable, and responsive housing model that can be developed and manufactured locally. It would provide business opportunities, and job opportunities locally and abroad both in the manufacturing process, and construction of this system in other areas subject to similar housing needs.

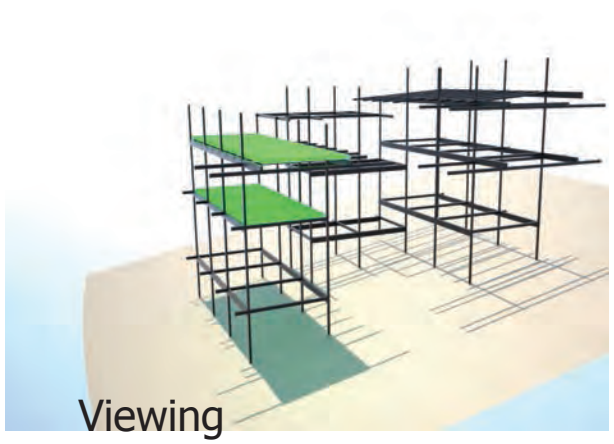
Sleeping

Each side of the courtyard is defined by a sleeping unit. Each sleeping unit houses 2 or 4 people and has direct access to the courtyard.



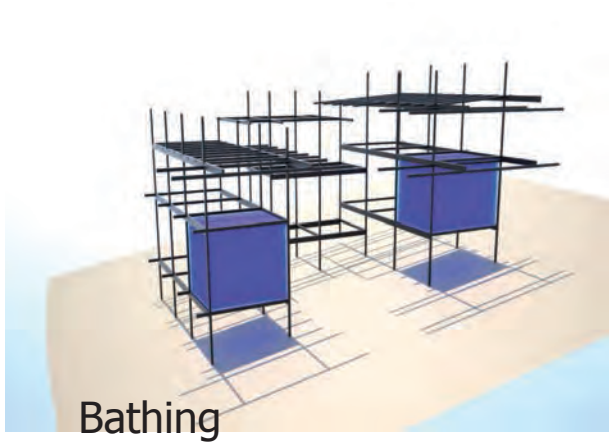
Eating

The kitchen and eating facilities are located on the second floor and provide views to the west over Al Hamriya. This area is unconditioned space cooled only by natural ventilation. When not in use, screens can be swung down to secure it from intrusion.



Viewing

The two viewing decks on the west side provide space for one to sit and watch the town below, they also provide a clear view of the outdoor cinema in the lower park.

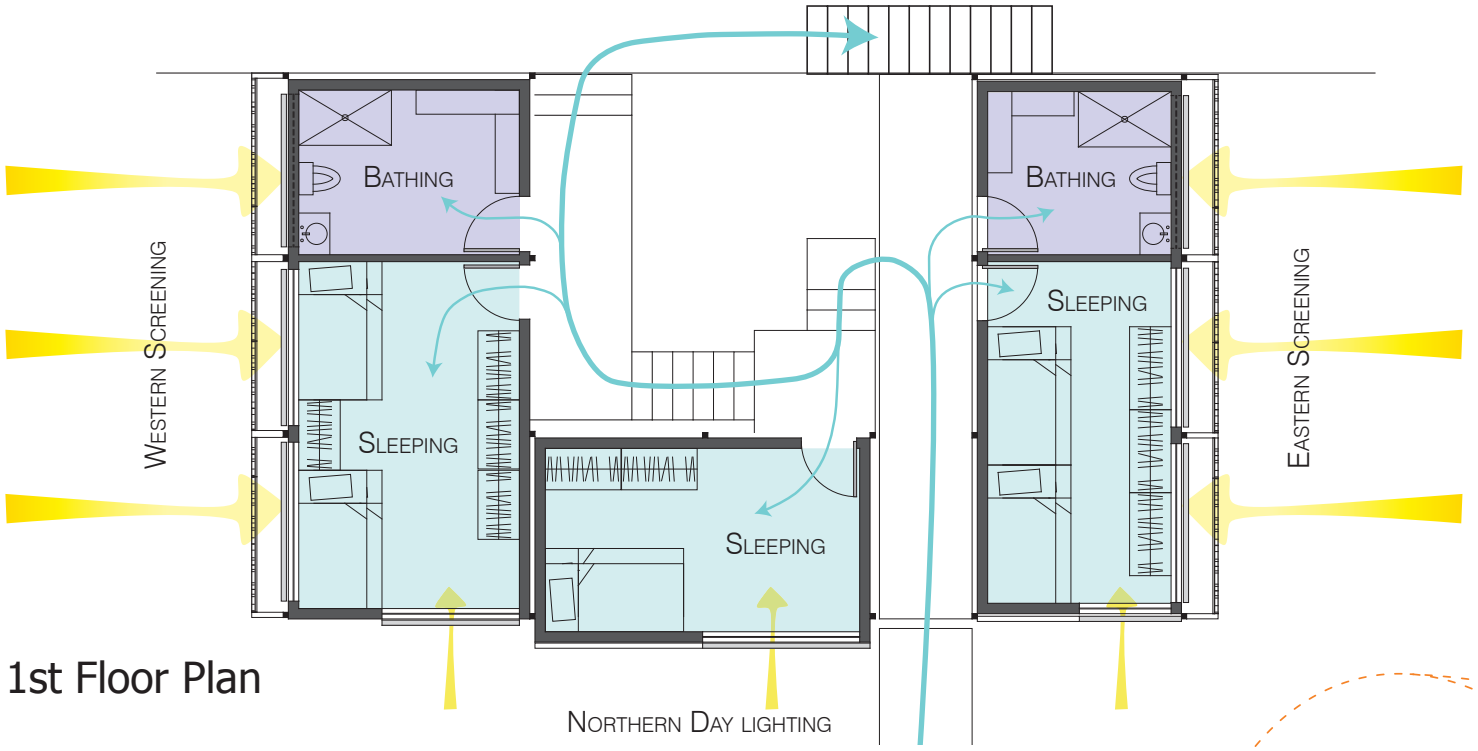


Bathing

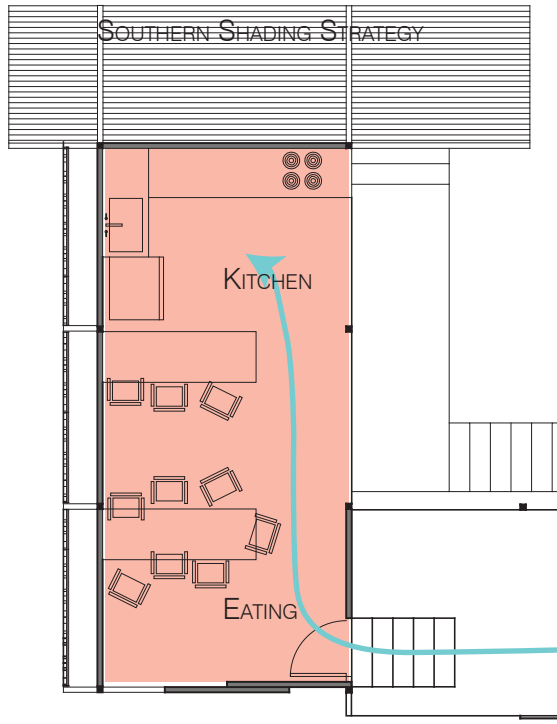
There are two bathing units servicing each of the dorms. They provide modest accommodations for bathing, and small laundry services.

Interior courtyard

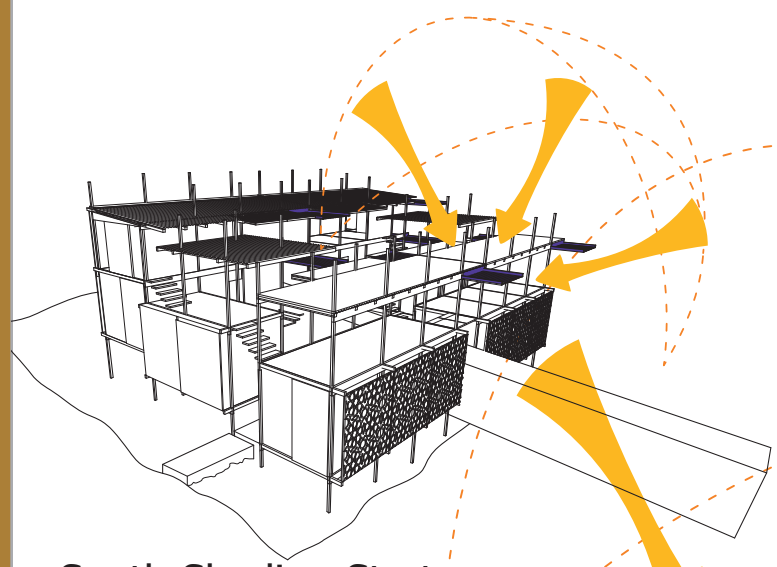
EXPATRIATE DORMITORIES



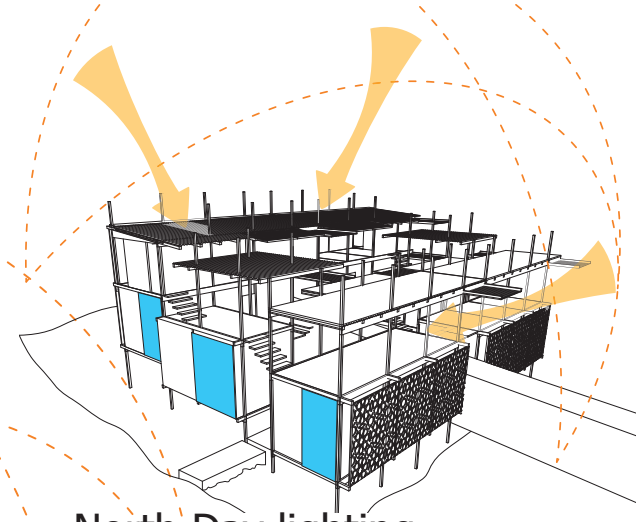
1st Floor Plan



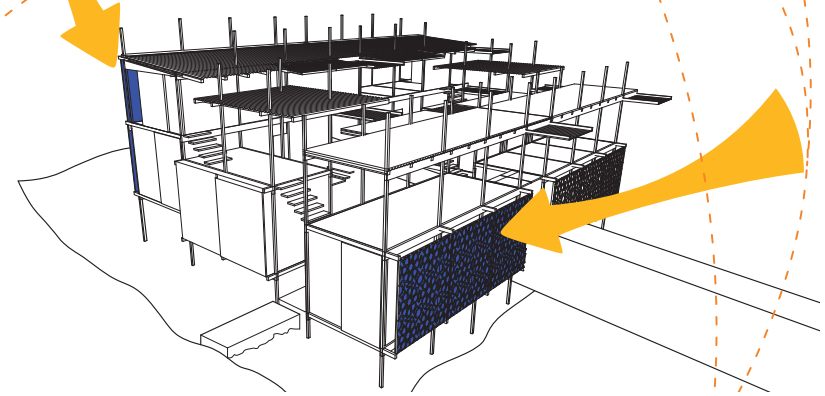
2nd Floor Plan



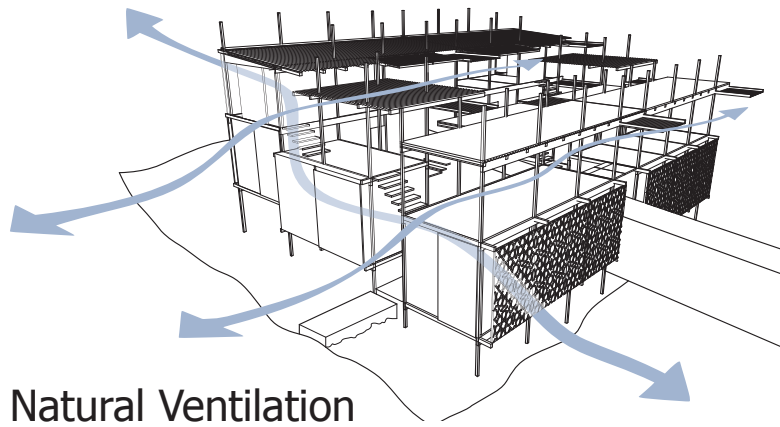
South Shading Strategy



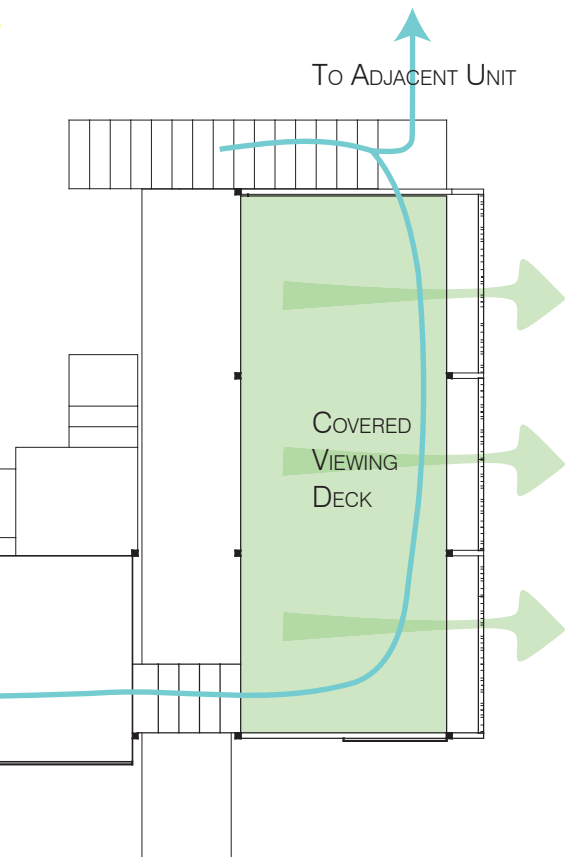
North Day lighting

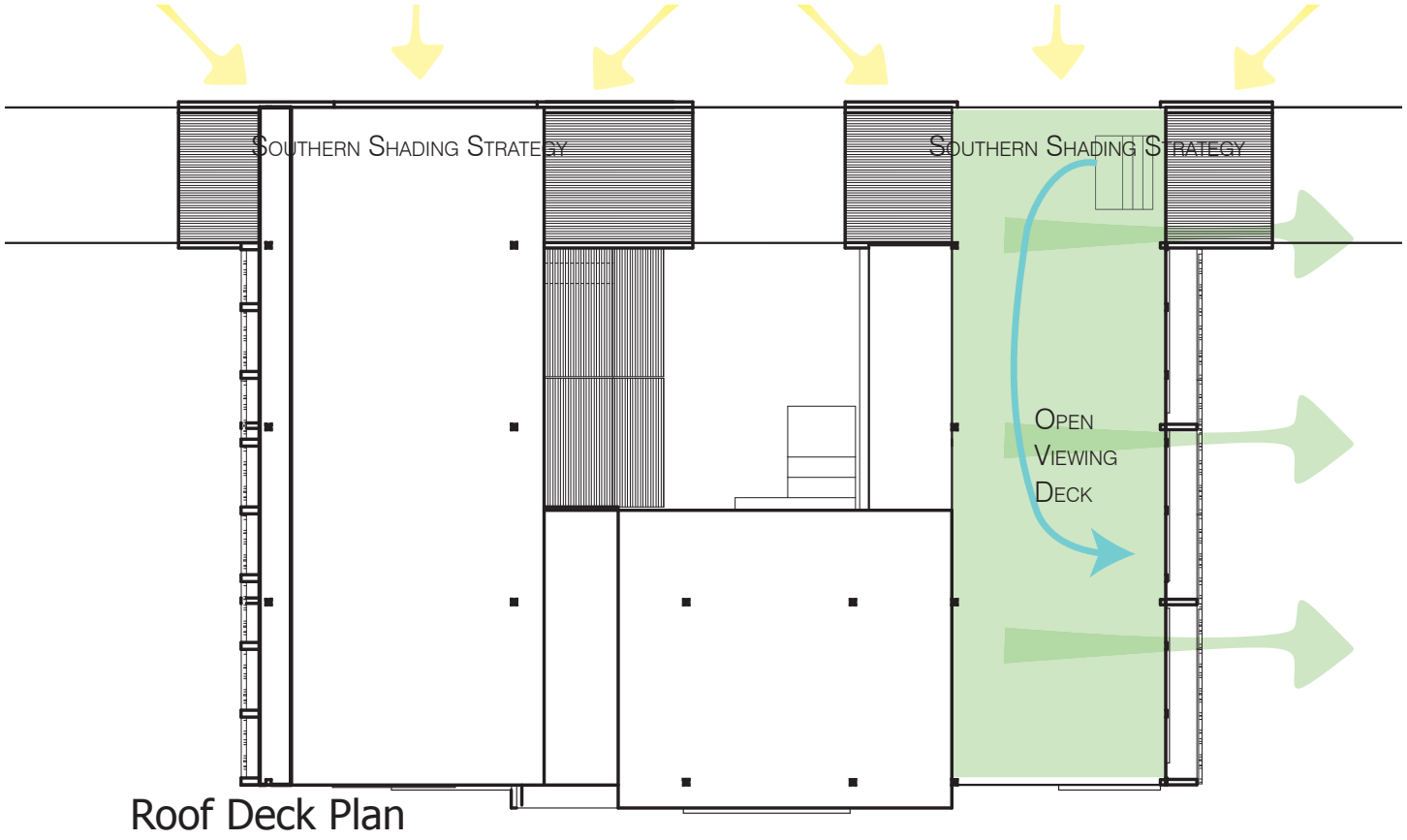


East and West Screening

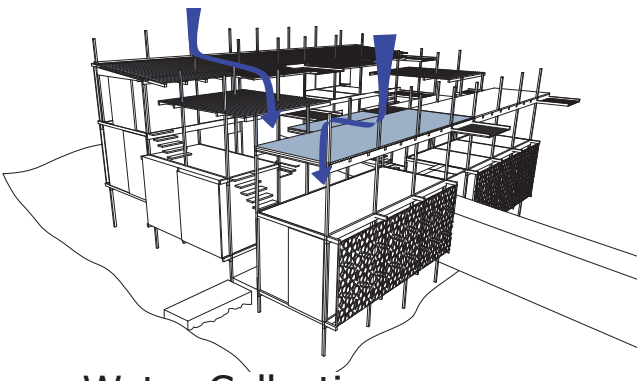


Natural Ventilation

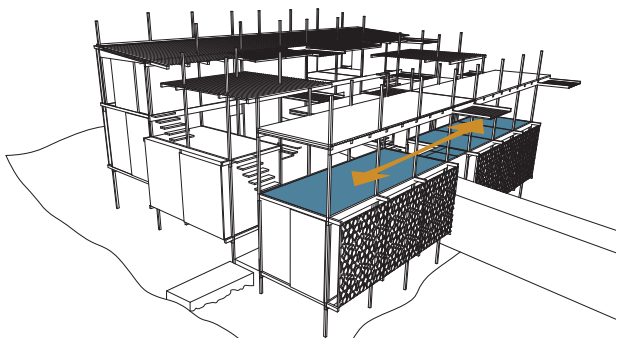




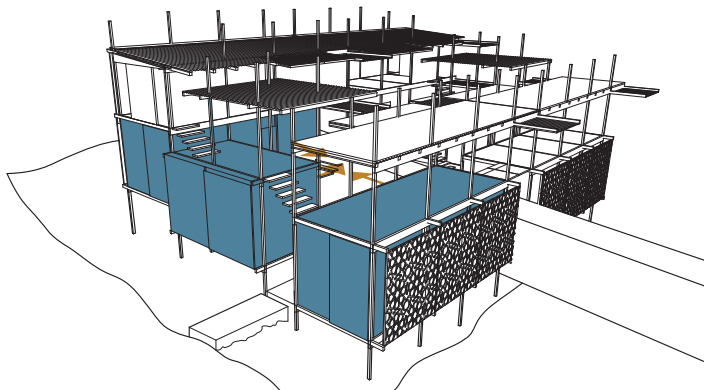
Roof Deck Plan



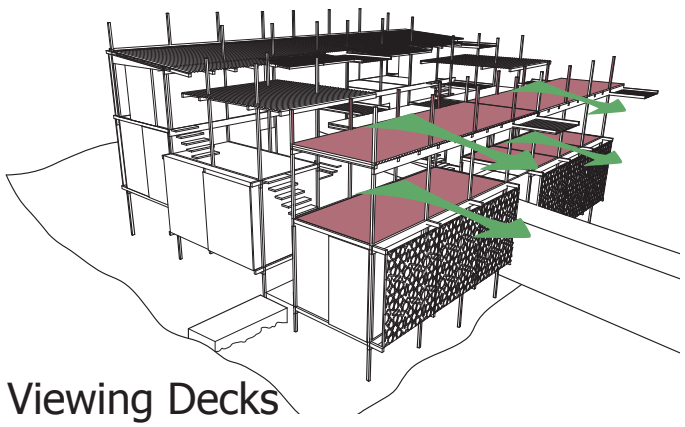
Water Collection



Unit to Unit Social Connection



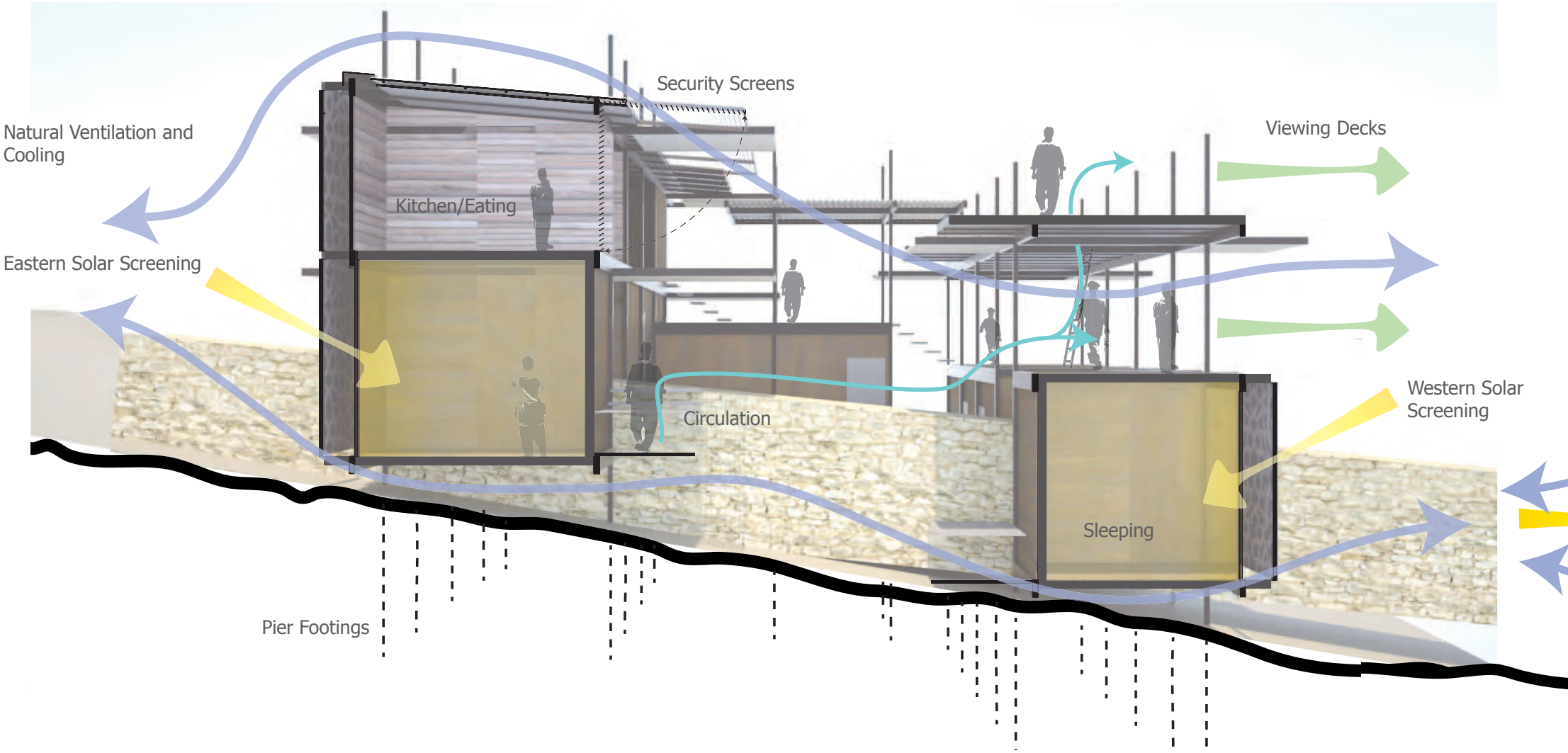
Courtyard Social Space



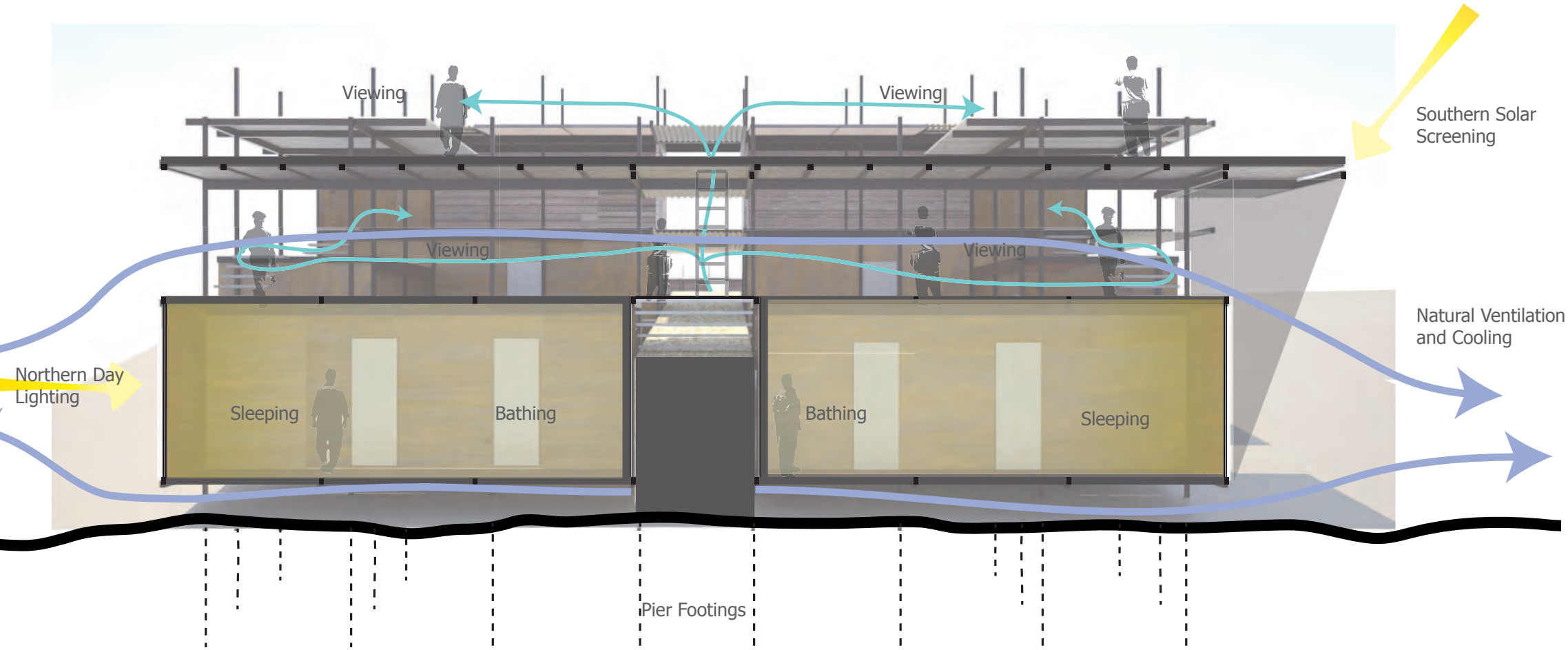
Viewing Decks

EXPATRIATE DORMITORIES

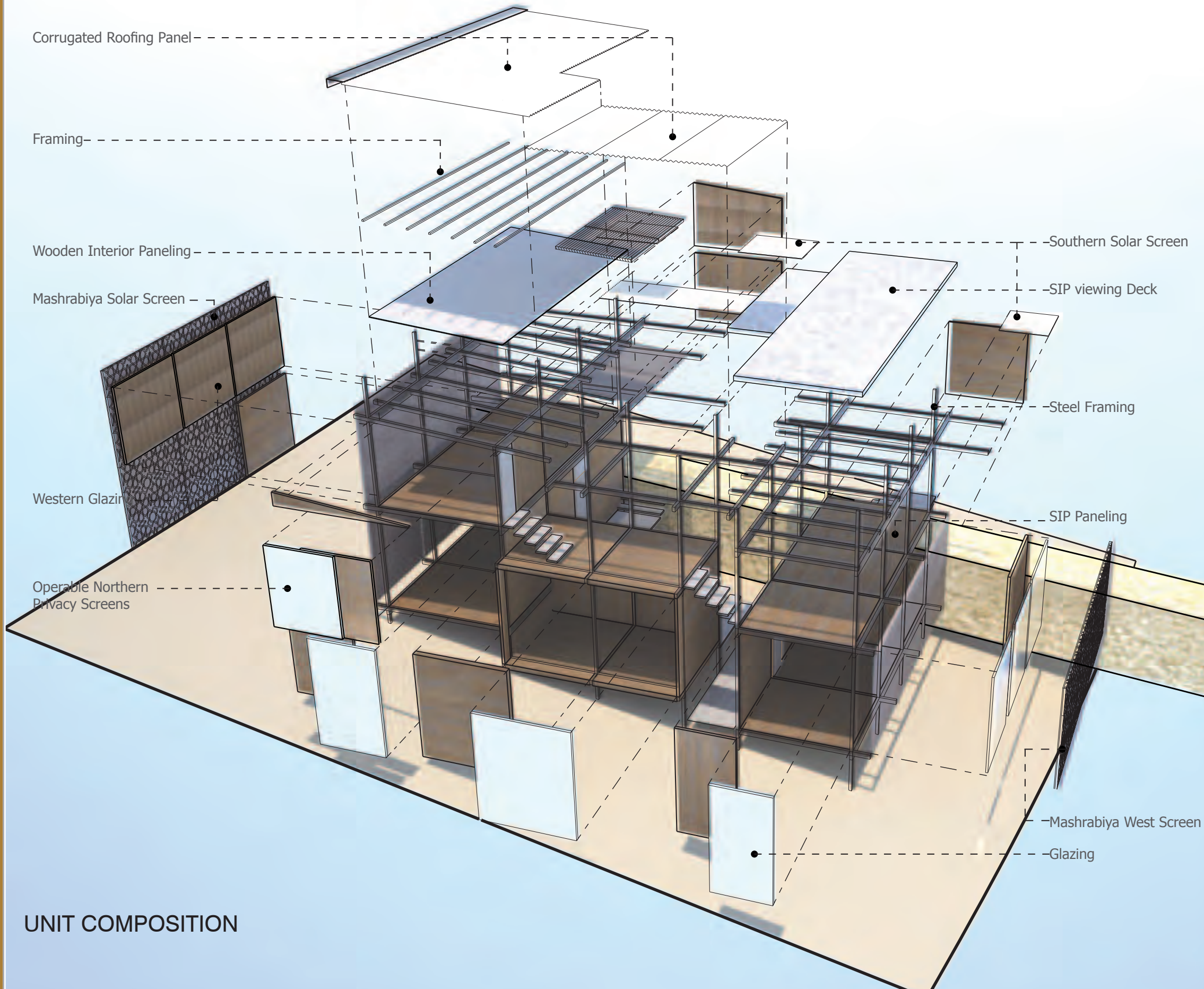
DORMITORY SECTIONS



East West Section

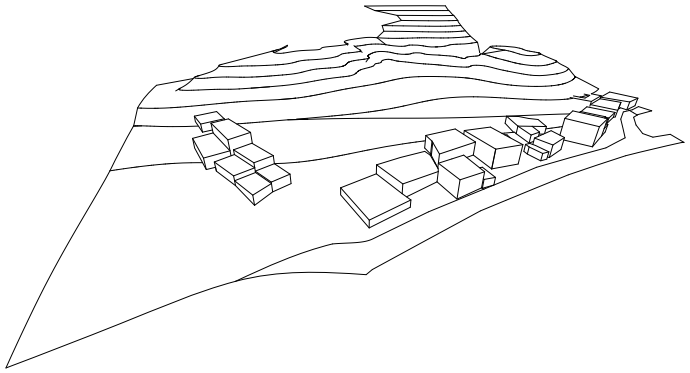


North South Section

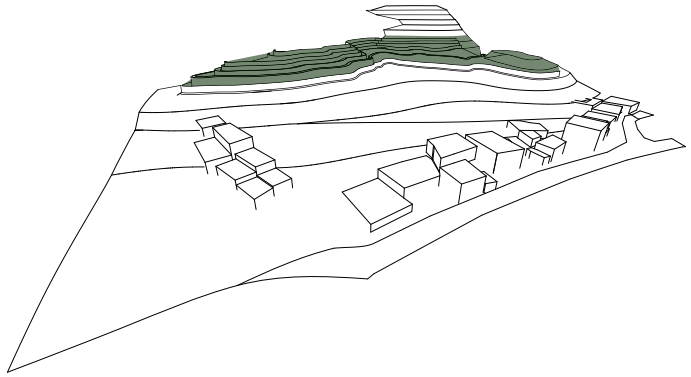


UNIT COMPOSITION

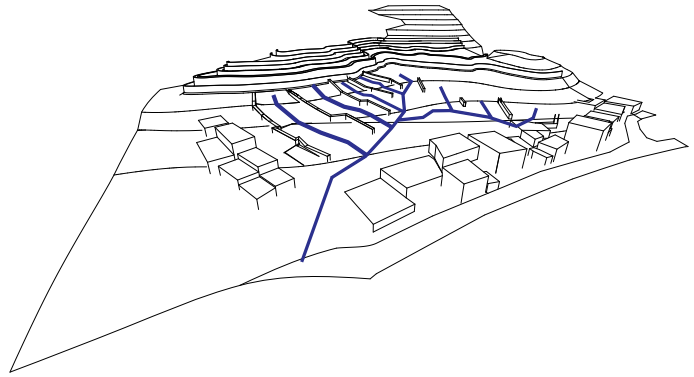
CONSTRUCTION SEQUENCE AND PHASING



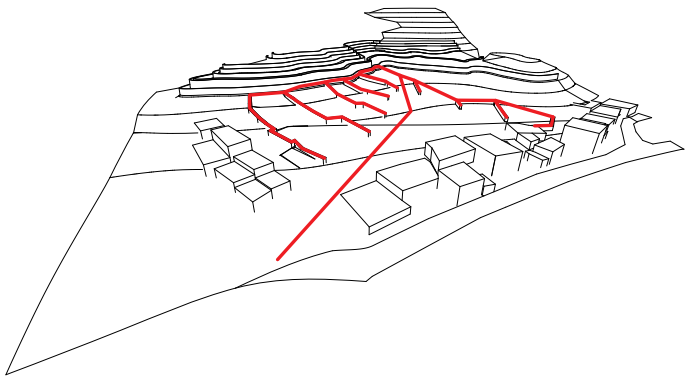
Site work Demolition



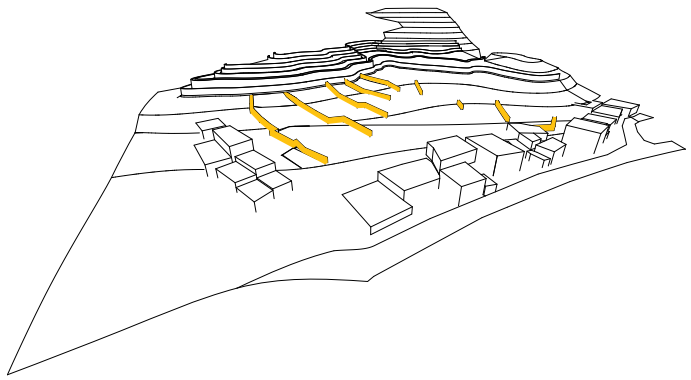
Soil Stabilization



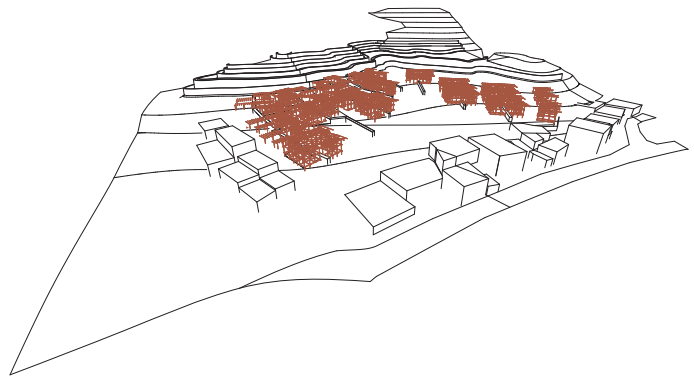
Circulation



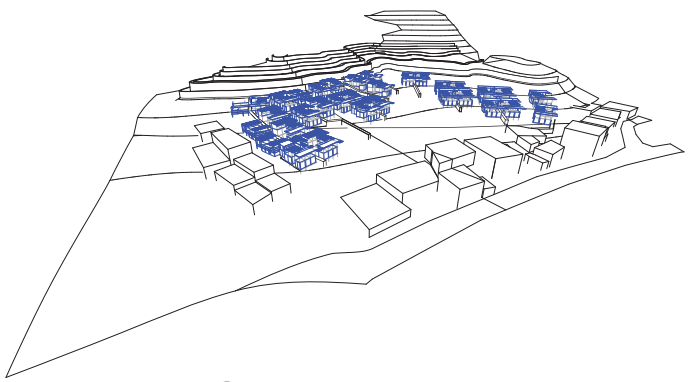
Utility Layout



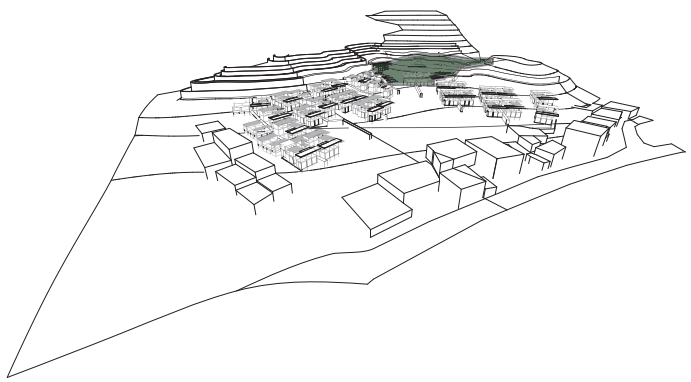
Wall Casting



Pier and Frame Construction



Dorm Unit Cladding



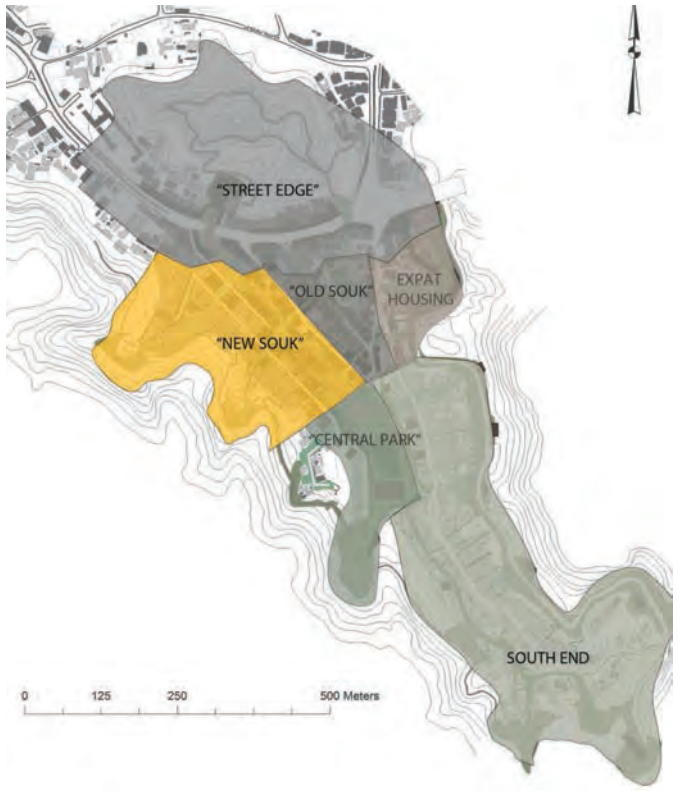
Living Machine

Vegetation

EXPATRIATE DORMITORIES

CINEMA PARK

EXPATRIATE DORMITORIES

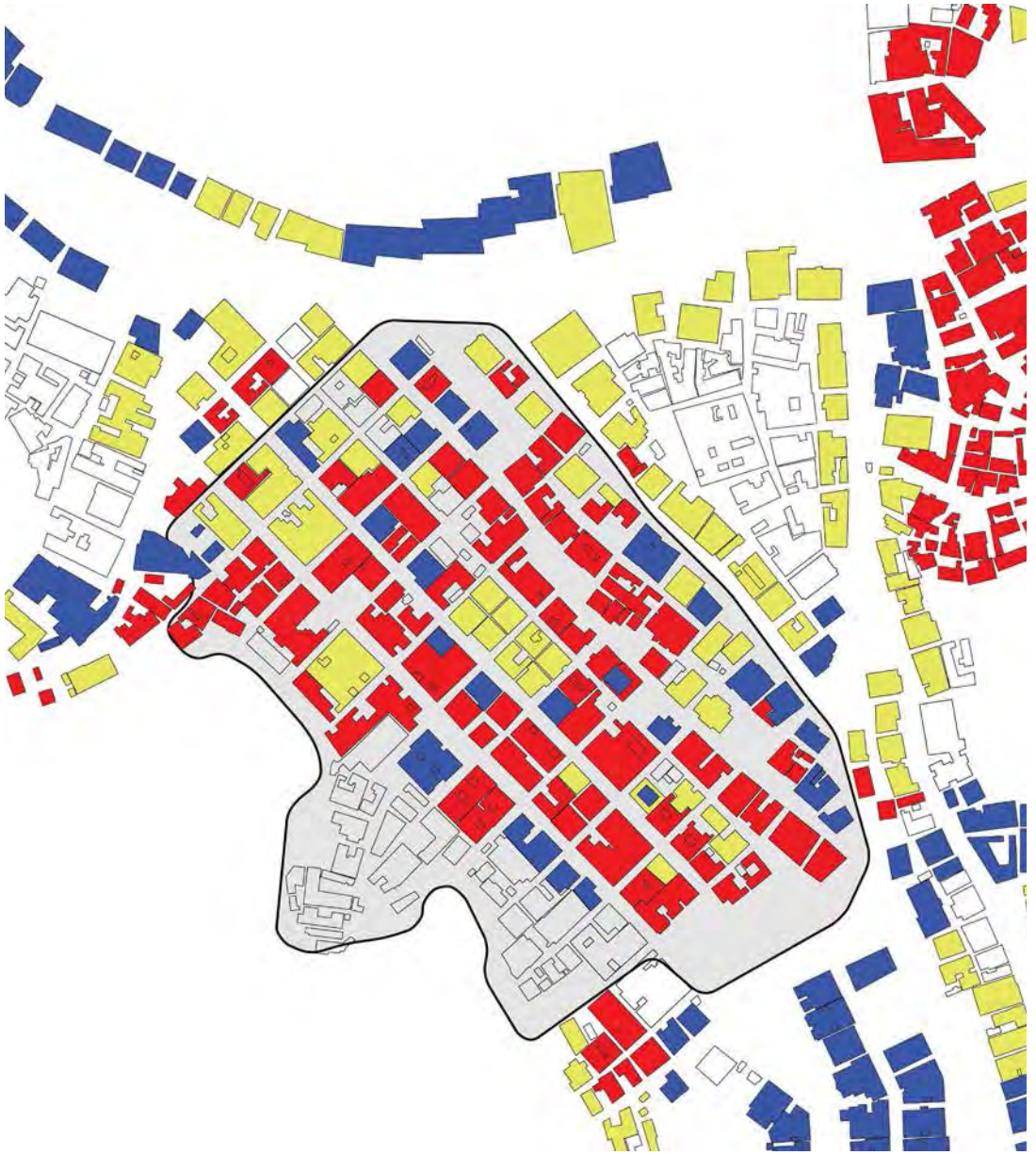


THE NEW SOUK

The new souk brings to Al Hamriya a lively new economic outlet that provides locals with a much needed centralized business, work and shopping district. These ideas stem directly from the ordering systems that the team uses when looking at design and re-development of urban districts. Economically the new souk provides potential for job creation yet also provides new space for existing businesses. Locals will find the convenience that is currently lacking in the area in the new shopping district which will provide home goods, textiles, spices and local produce. Socioculturally the new souk provides open, shaded plazas where all residents of the area will feel safe and comfortable while purchasing goods or enjoying a meal. The newly day lighted wadi addresses several components of the ordering systems; first and foremost environmentally it brings back a natural drainage system, allowing storm water to collect and percolate into the soil, eventually being collected in underground storage tanks. Secondly the wadi may help re-establish lost habitat for smaller fauna found within the area and thirdly it addresses sustainability with the use of native vegetation. Functionally the new provides connections throughout the site, and walkability is enhanced with thought of human comfort and safety being a primary focus. Automobile traffic has been moved to the periphery for safety reasons, yet the souk is still accessible for the delivery of goods with added pull-outs and designated parking. The residents of Al Hamriya will find the new souk a welcome addition and it will surely become a favorite space for the community.

NEW SOUK

DEMOLITION PLAN



EXISTING BUILDING CONDITION

- Bad
- Fair
- Good

DEMOLITION PLAN

- Buildings to be demolished

Total demolished units: 149 unites
Total demolished area: 64,475sq.m

NEW BUILDINGS

- Preserved Buildings
- New Buildings

BUILDING HEIGHT

- 1 - 2 Storey Buildings
- 3 -4 Storey Buildings

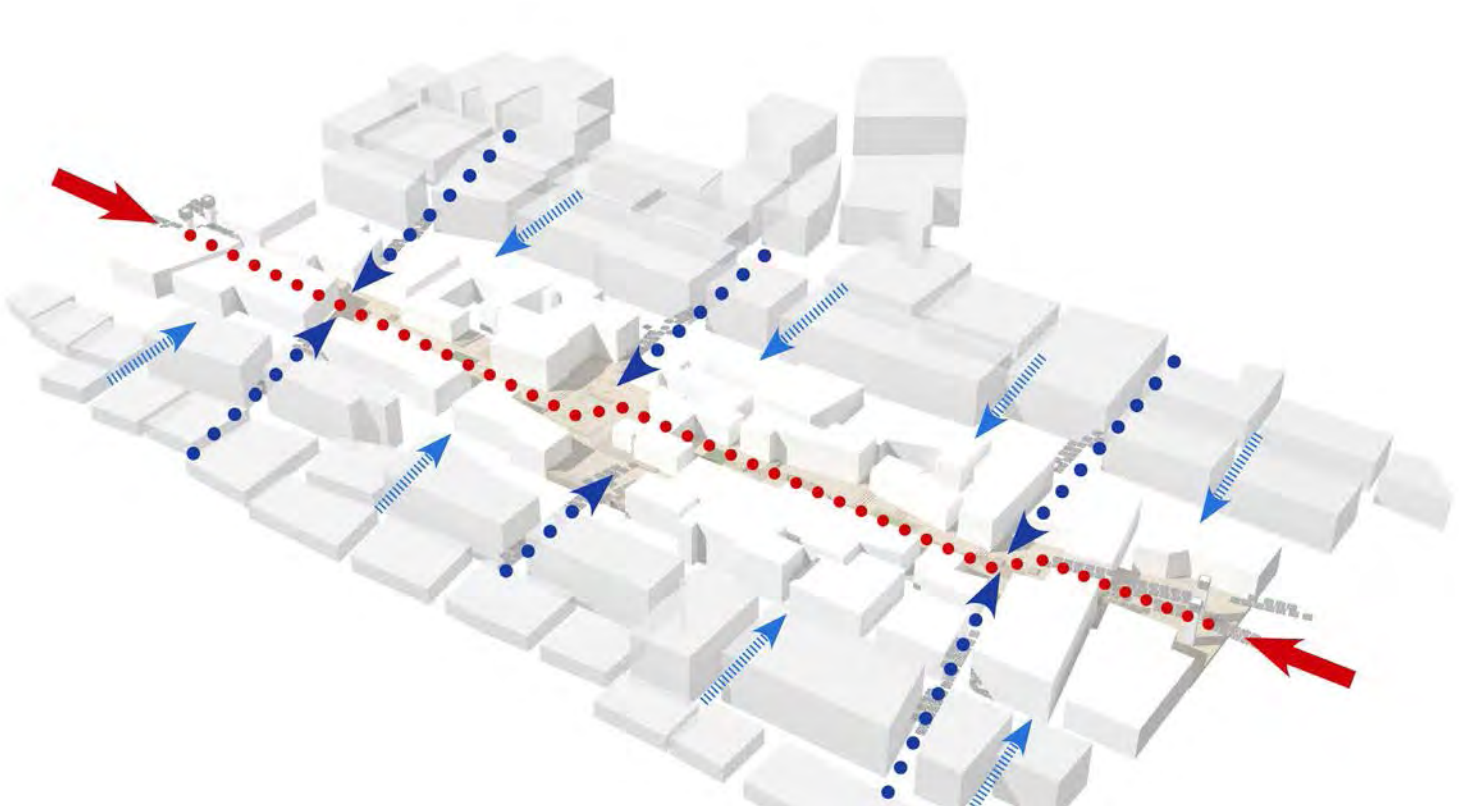
CONCEPT

The concept for the addition of a new souk into the area was driven by the need to address the site's inability to meet the basic needs of the community. The site is lacking basic services, open space, and pedestrian friendly streets. Traditionally souks not only provide goods and services, but are areas for social interactions, are pedestrian friendly and are conveniently located within the community to meet the basic needs of the residents.

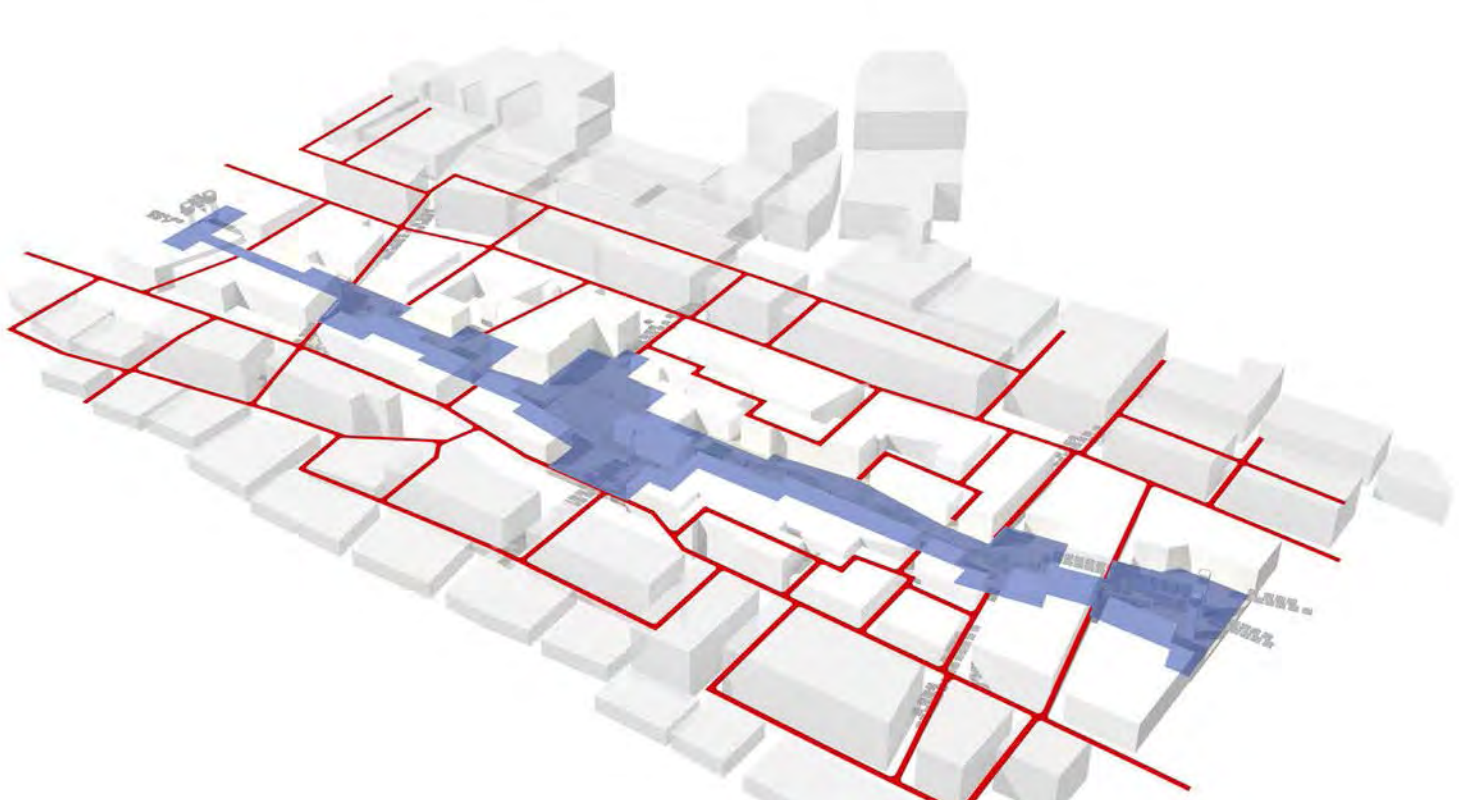
Plan View of New Souk

NEW SOUK

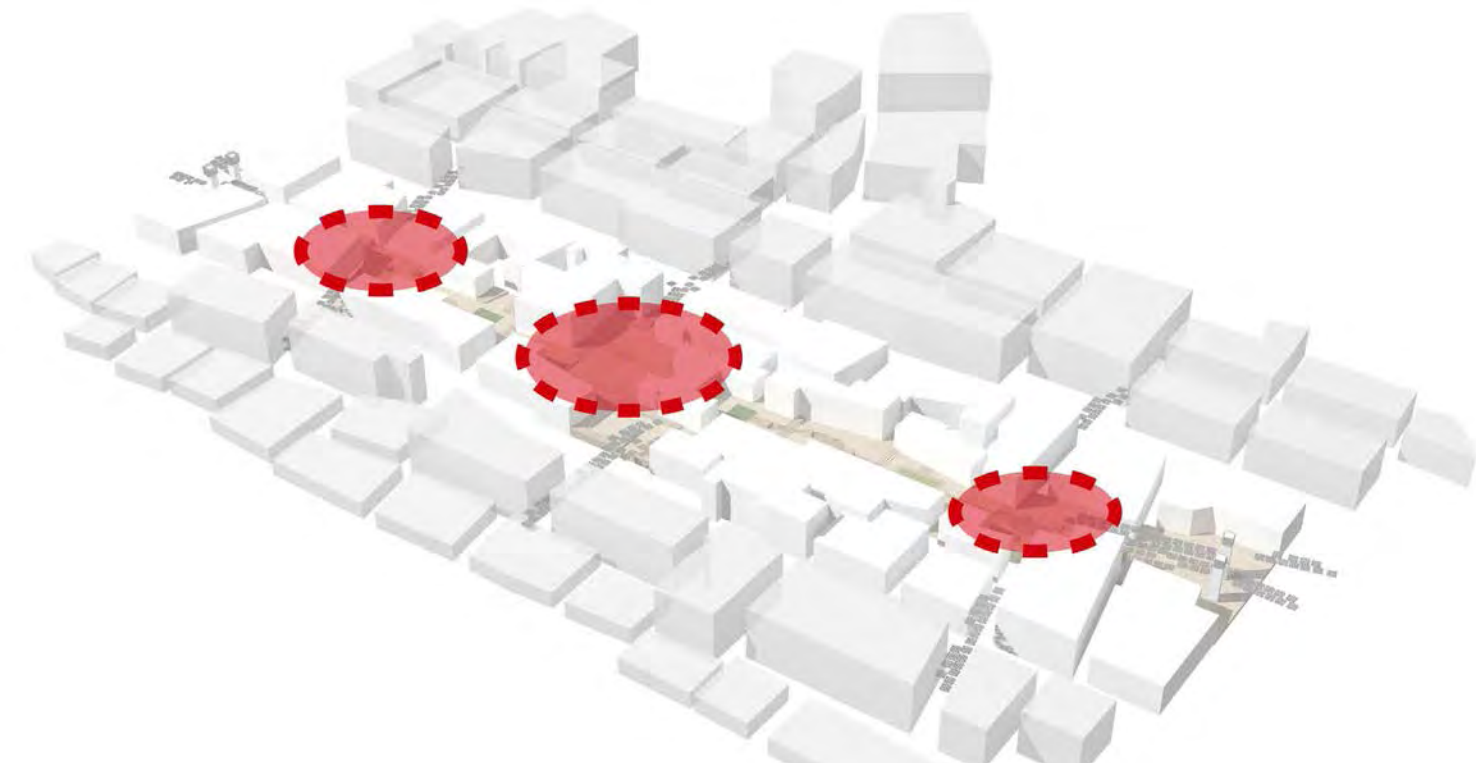
CIRCULATION OF THE SOUK



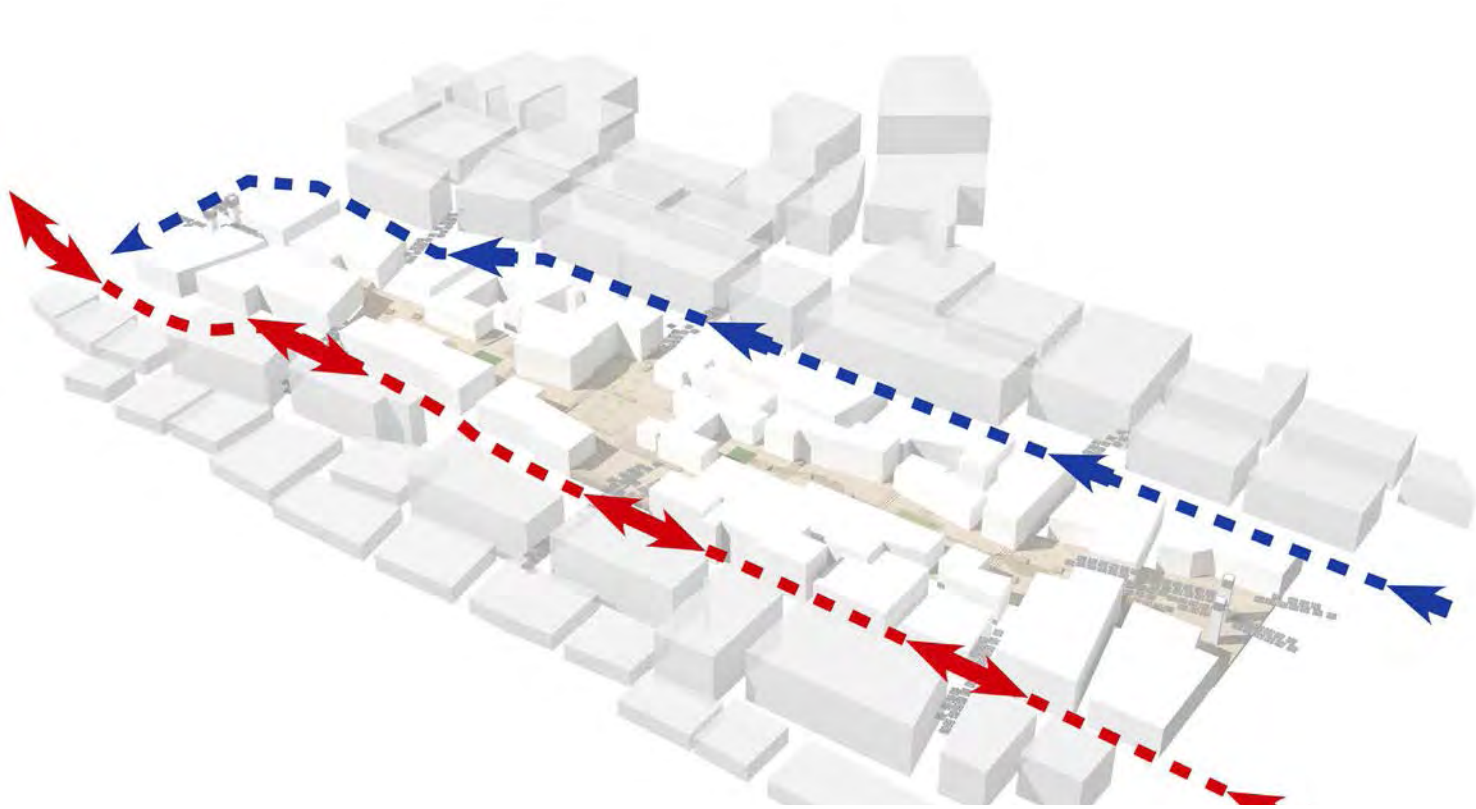
North/South Primary Circulation



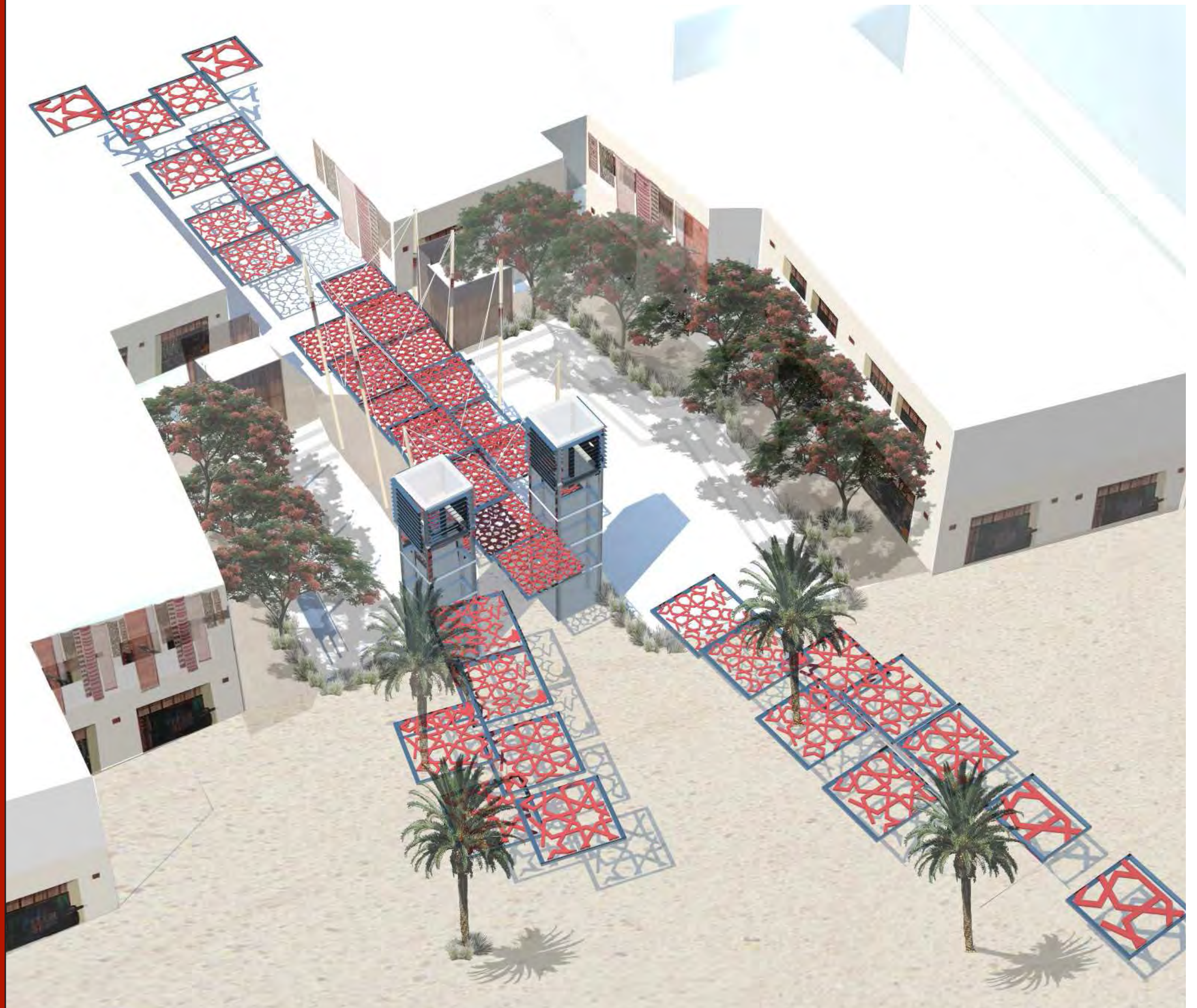
East/West Primary Circulation



Activity Centers/Nodes



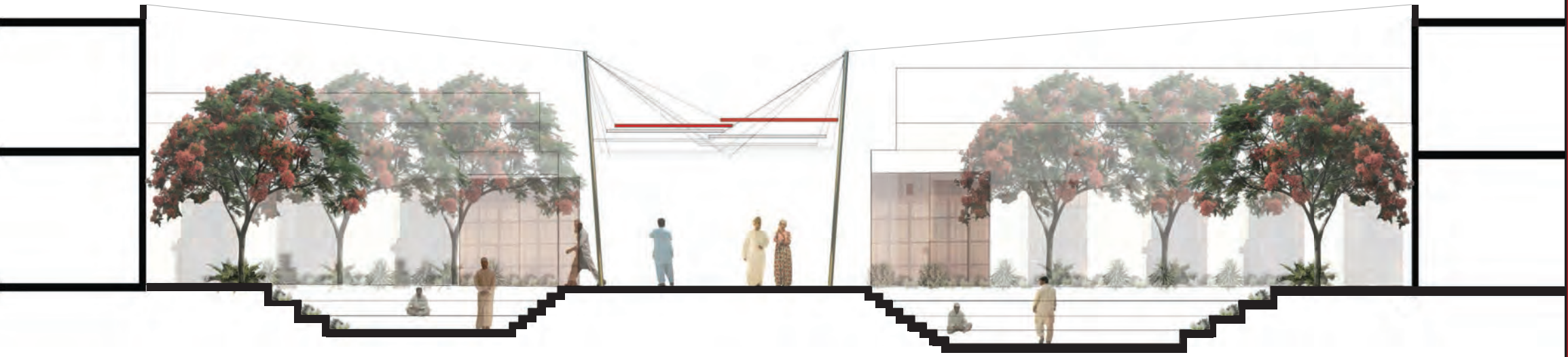
East/West Secondary Circulation



New Souk Threshold

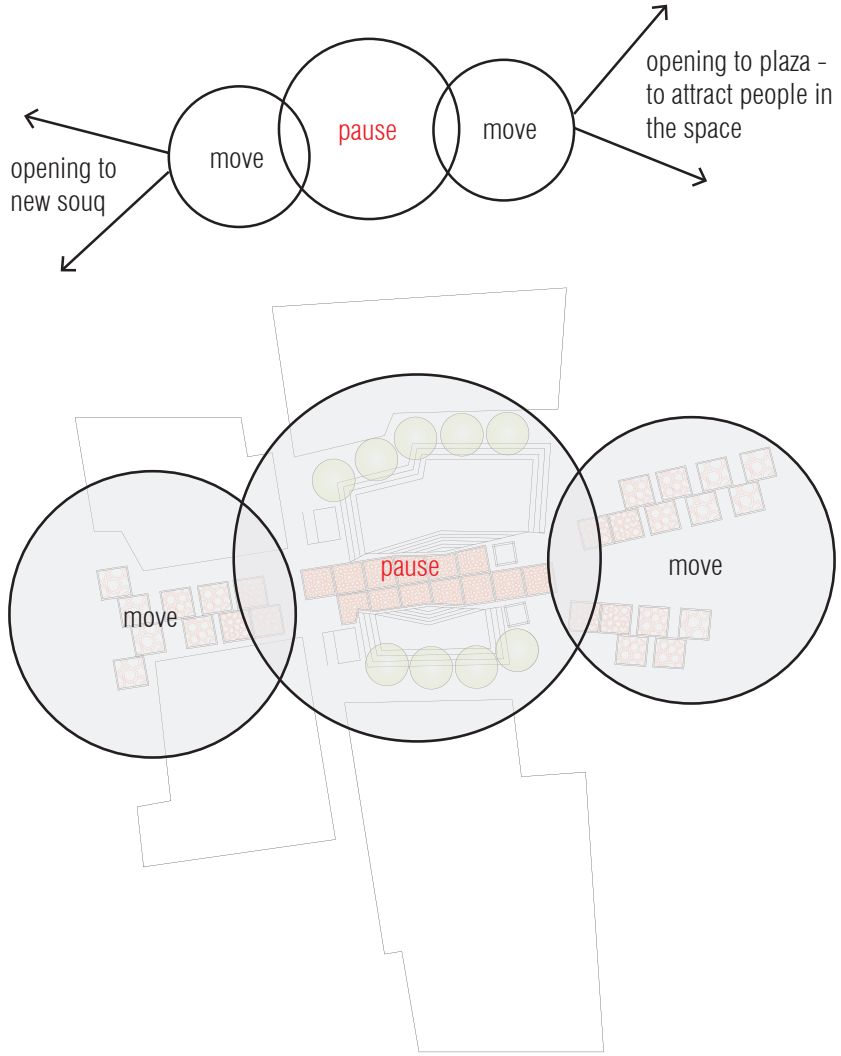
The threshold was a very important part of the new souk scheme because it starts to create a gathering node as well as establish a new identity. The concept was to create a threshold that announces entry into the souk, and in turn becomes a central meeting point in the area. The red shade elements act as identifiers for the new souk. The creation of wind towers with sunken pits below them allows people to wait in a cool shaded space.

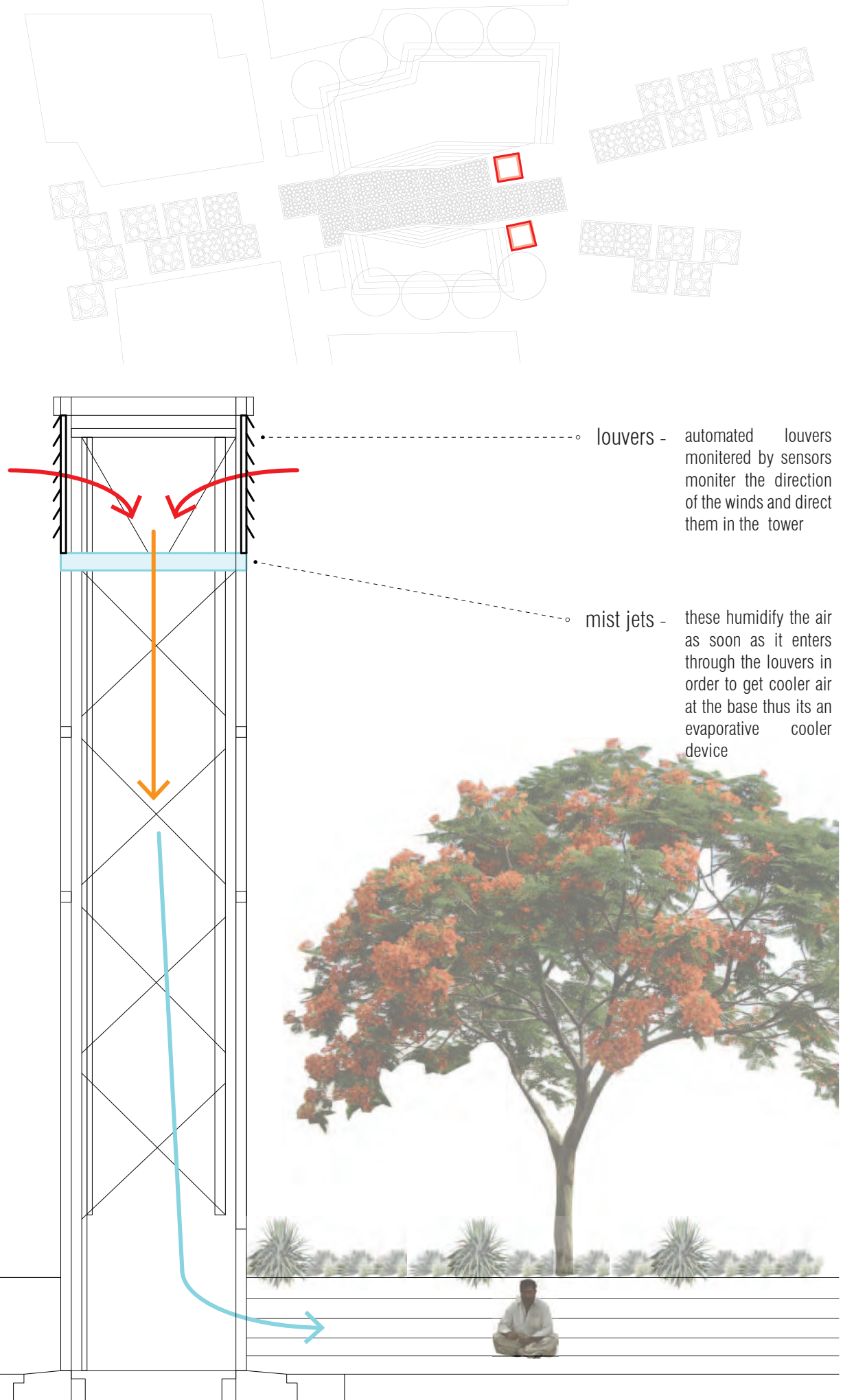
The density of the patterns is intensified at the threshold to the plaza and souk, thereby creating dense shade and a pause in circulation that enables people to use seating within the pits. The patterns in open areas are less dense in order to evoke movement and bring in more light. In addition, the actual shade elements are arranged in more dense patterns closer to the threshold space in order to enhance that pause moment and create a shaded space.



ENTRY FROM UNDERPASS

The central wayfinding concept of the threshold was to be seen from a distance, and it was therefore important to open up this vista from the underpass in order to be seen as one approaches the souk.





Wind Towers and Sunken Pits

The wind tower not only acts as a vertical identifier for the souk, but also helps cool down the outdoor space. The 11 meter towers have both automated louvers which are monitored by sensors that examine the direction of the winds and direct them into the tower.

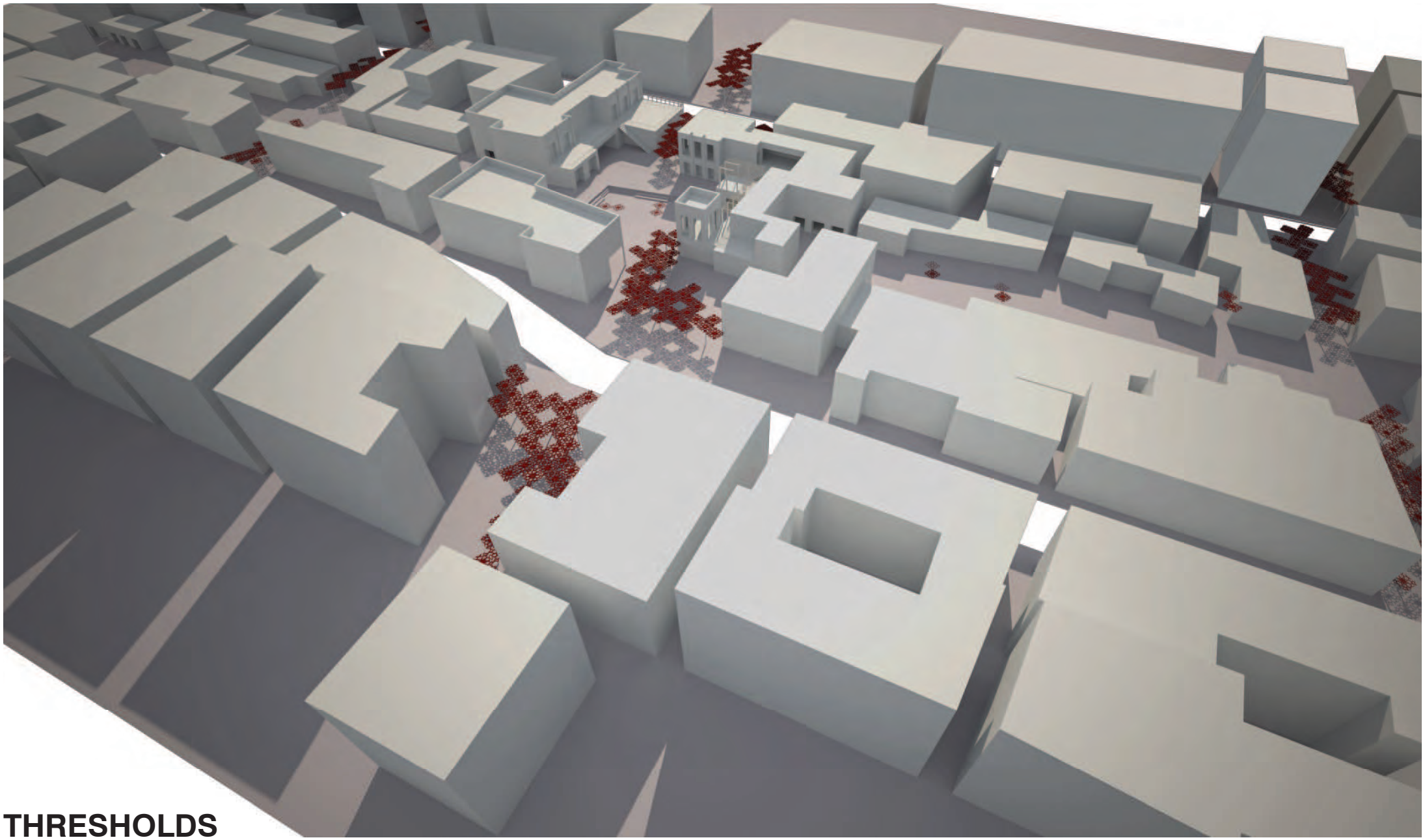
In order to create a cooling effect, we add mist jets inside the tower and these humidify the air as soon as it enters through the louvers in order to get cooler air at the base thus it acts as an evaporative cooler device in the dryer times of the year.

As the air flows down the tower past the mist jets, it becomes cooler at the base and is directed to the sunken seating areas, thereby providing a very comfortable and cool environment for inhabitants of the space.

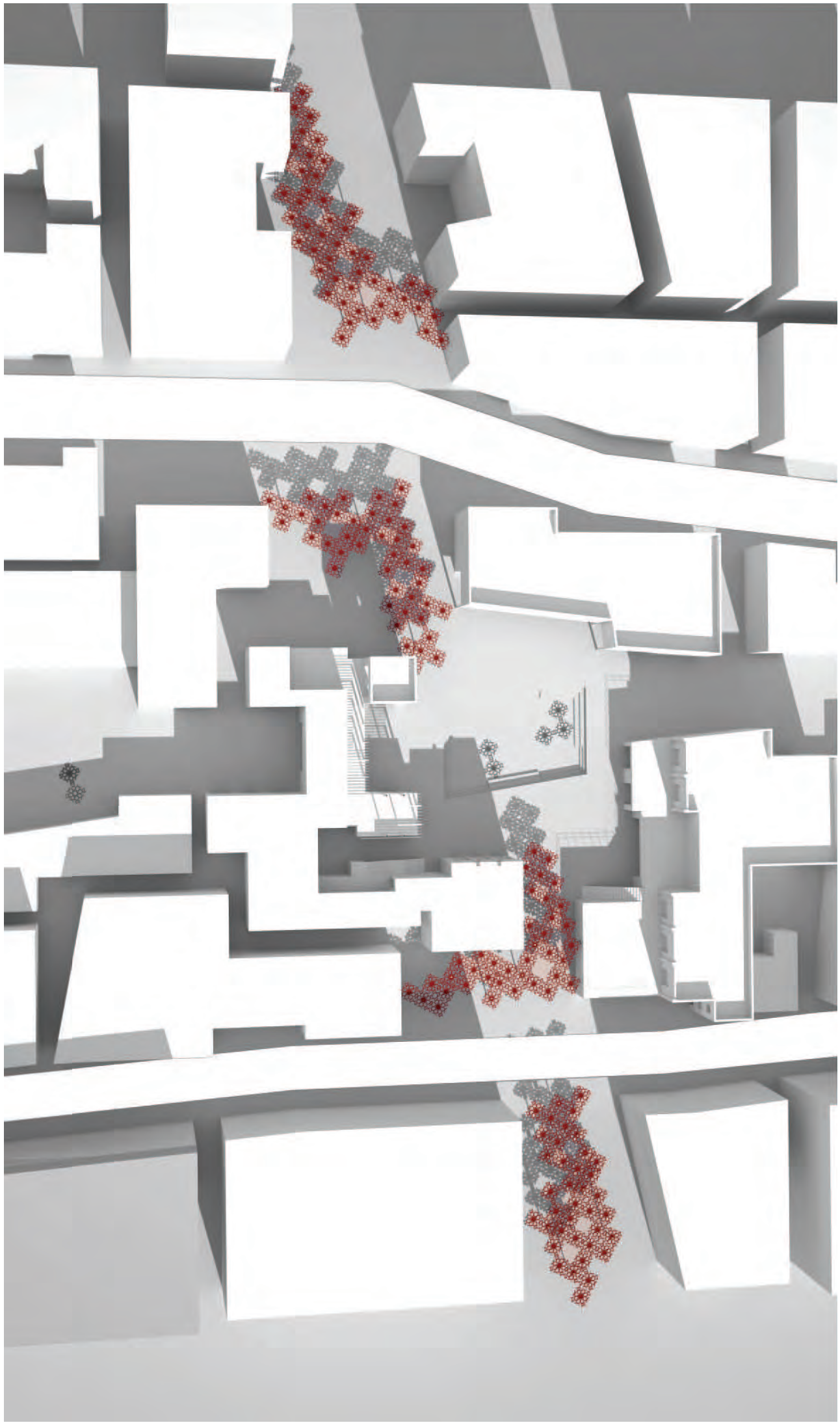
In the Sunken Seating

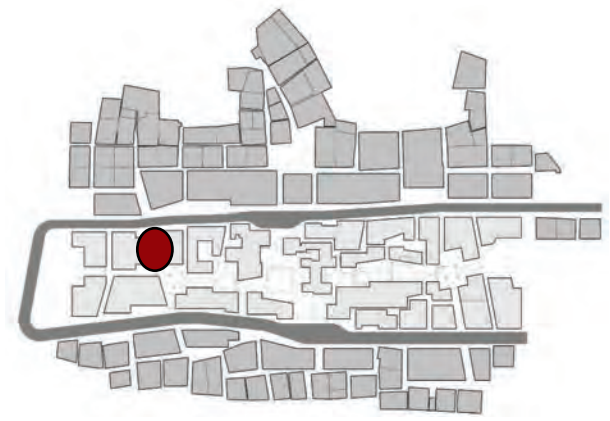
This image is showing the view while in the sunken pits looking at the pathway and the souk. There is a strong socio cultural issue here where people are able to simply sit and watch other people pass by and they can choose whether they want to interact with others or not.

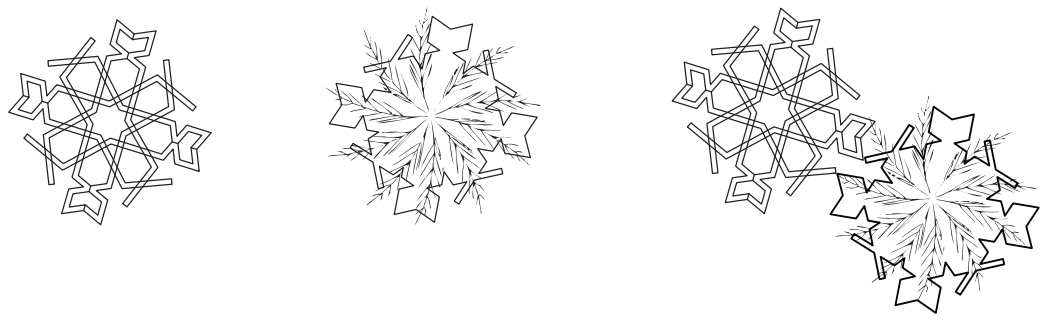
EAST-WEST SECONDARY CONNECTIONS



THRESHOLDS



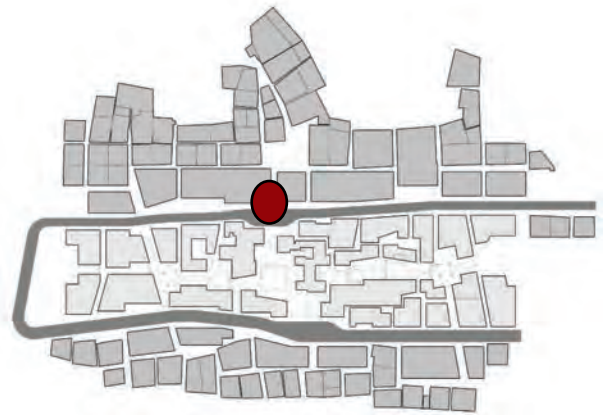




Mashrabiya Shading Structure Strategy

Mashrabiya Shading Structure Strategy

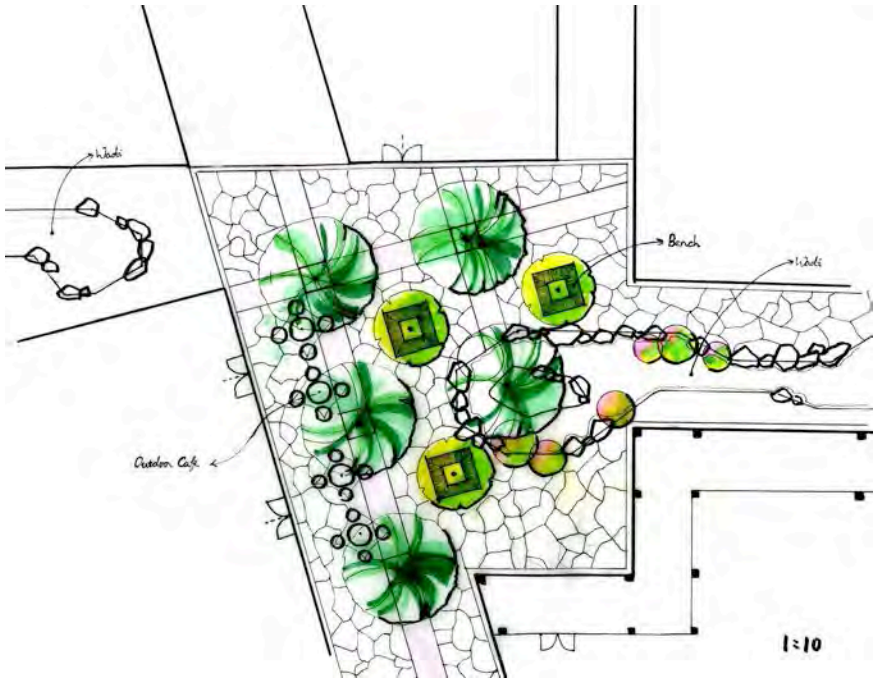
While the north and south thresholds serve as the main public entrances from the underpass and the ‘heart’ of Al Hamriya, the three lateral east to west thresholds connect the souk to the residential area on the west and the old souk and the rest of Al Hamriya on the east. All three thresholds drop into a ‘public node’ that connects to the rest of the souk. Mashrabiya shade structures are used in the three connections as identifiers to the souk and wayfinding elements. There are voids within the structure for palm trees to penetrate and become associated with the structure. While the structure works at a human scale and is visible at a close distance, the palm trees are visible from a farther distance.

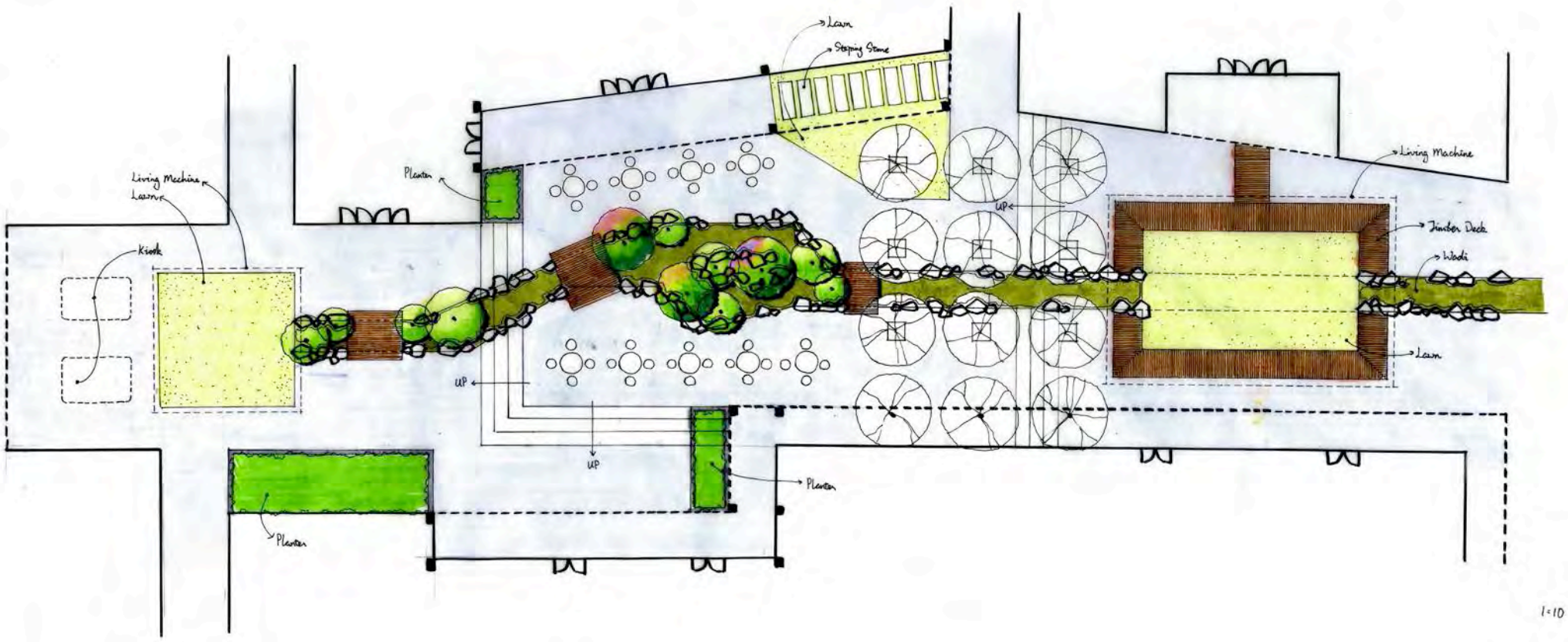


SECONDARY WALKWAYS

Additional connections are found throughout the site in addition to the major connections that have been designed. Yet they are not secondary in their treatment. All walkways address human comfort and safety with addition of landscaping and lighting. The perspective to the left shows a typical walkway with central plantings to provide shade and walkways large enough for ease of movement from space to space.

The whole design process focuses on integrating the wadi with streetscape, integrating wastewater treatment, and providing a range of community amenities.



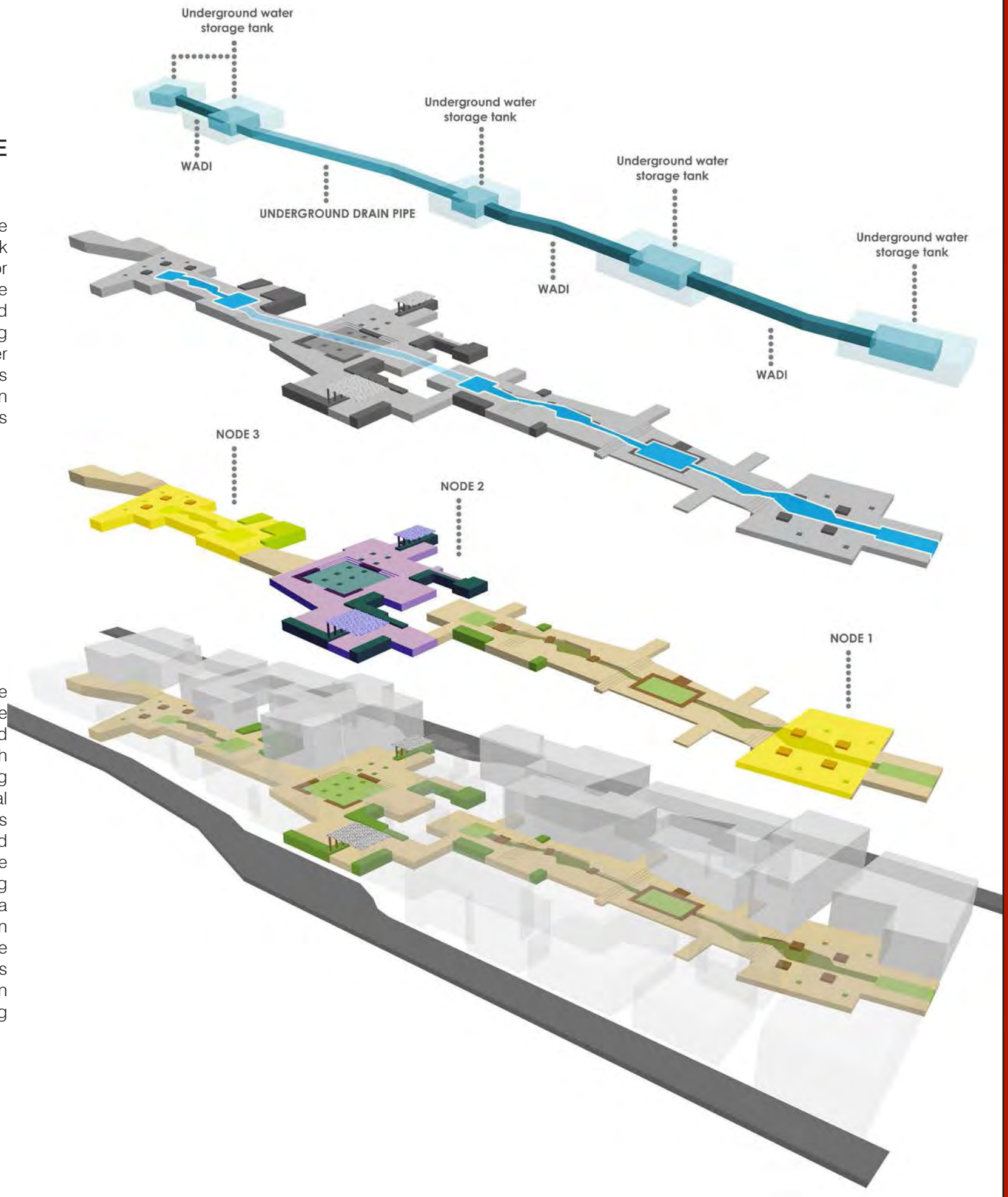


UNDERGROUND STORAGE TANKS

The installation of underground storage tanks will be a great addition to the souk in terms of reclaimed water storage for possible future use. The storage tanks are connected by the wadi and underground drain pipes for removal off site during large storm events. The reclaimed water could be used for irrigation purposes and in the future could be used to enliven the wadi with various fountain strategies during special occasions.

ACTIVITY CENTERS/NODES

Three identical activity centers are located within the new souk. These activity centers can be considered NODES along the linear souk, which offers views for local residents, resting areas for shoppers, venues for social activities, and circulation nodes connecting east and west. Node 1 and 3 are designed with the same landscape elements, including the wadi, planting benches, and a palm matrix. Node 2 is a central sinking garden, which is the main open space within the new souk. The intention of building a sunken garden is to keep other areas free from water when a large amount of runoff happens during the rainy season.

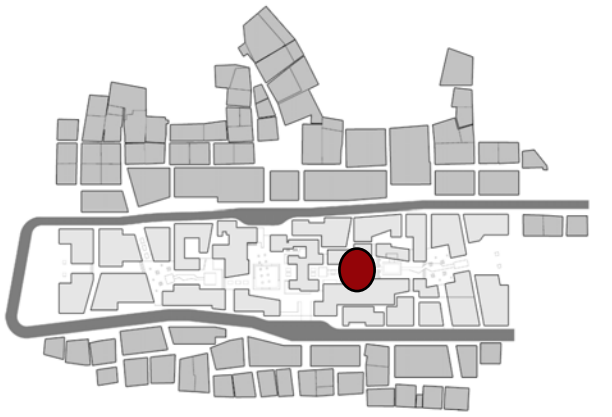


NODES

The nodes that are found within the new souk not only serve as primary connections and activity centers, but also serve as catalysts for economic development and social interactions. As seen here the nodes have enhanced landscape elements that are visually pleasing and provide the much needed shade in this arid environment. The landscape elements found within the nodes are treated differently than the rest of the souk. The use of the Delonix regia in the nodes enhances the lively feeling and helps create an attractive space. The wadi is still a visible element within the nodes and helps create a lush oasis type feeling. The openness of the space is appealing and will help attract shoppers to the local businesses and it also brings a feeling of comfort and safety for the residents.

SOUK WALKWAYS

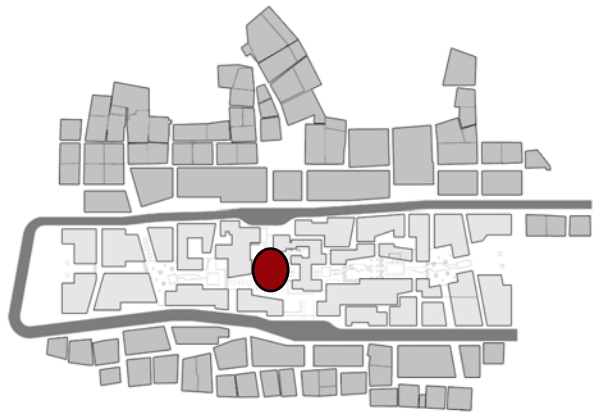
The wadi becomes a central, linear feature that appears and disappears as you move through the souk. As seen here the wadi is enhanced with native vegetation that not only serves its natural purpose of helping to slow runoff, but also provides welcome shade for the pedestrians. With the use of native vegetation water requirements and maintenance is lessened, but the appearence is still lush and asthetically pleasing. This perspective is looking north as you walk through the souk, and with shops located on both sides of the wadi a lively shopping experience is created as seen in the traditional souks.



A WADI IN THE MIDDLE

The perspective below shows how a wadi runs in the middle of the souk, and provide amenities for the shoppers and local residents. The wadi is supported by two living machines, which are located at the two ends of the wadi, and connect to the municipal drainage system. The wadi runs from the south to the north, which follows the existing topography

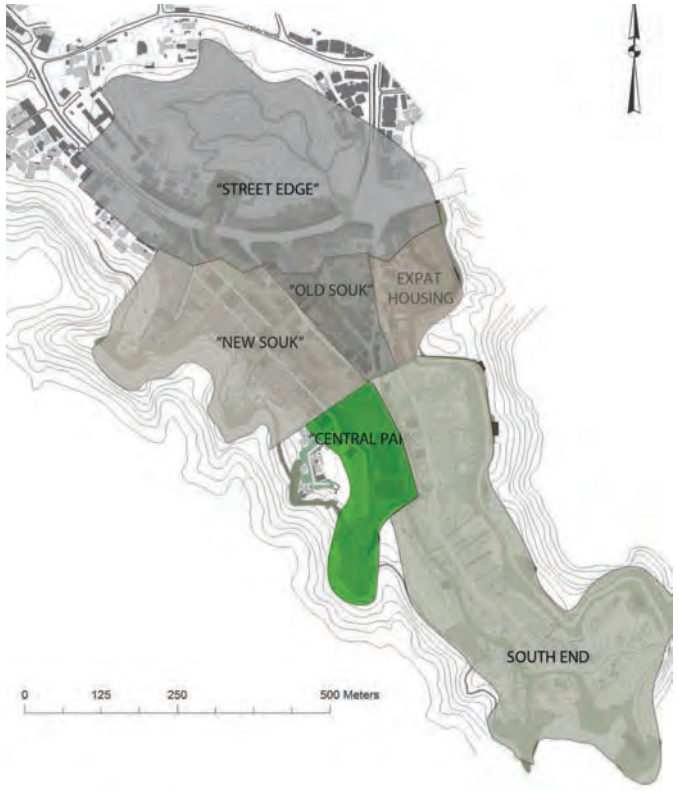
Perspective of Node 1 looking south



CENTRAL PLAZA

The central plaza functions as the main open space within the souk. A sunken garden provides seatings all around it, and is lined with palms to provide shade for resting shoppers. In order to provide more space for group activity, the wadi ends before entering the central plaza, and runs beneath. Pervious paving increase the discharge rate of runoff. The sunken garden helps to detend the water, and keep the walkway around from being immersed during storm events.

Perspective of Node 1 looking south



AL HAMRIYA CENTRAL PARK

According to our final master plan, we proposed this area to be the “community core” of the Al Hamriya area. Since the mosque is considered a community place where men and children go daily, it was the best location to choose and develop a community “heart”. The park is the “lung” for the area as well as give more open spaces for people to use. The strategic location makes it accessible for all the residents of the area and visitors from outside the area. Every neighborhood needs relief from urban congestion to connect them with nature. One primary goal of this park is to bring an important elements of the Oman heritage “the Wadi” which benefits the environment of the area and adds an aesthetic element, as well as a variety of spaces and day and evening activity.

AL HAMRIYA CENTRAL PARK

AL HAMRIYA CENTRAL PARK MASTER PLAN

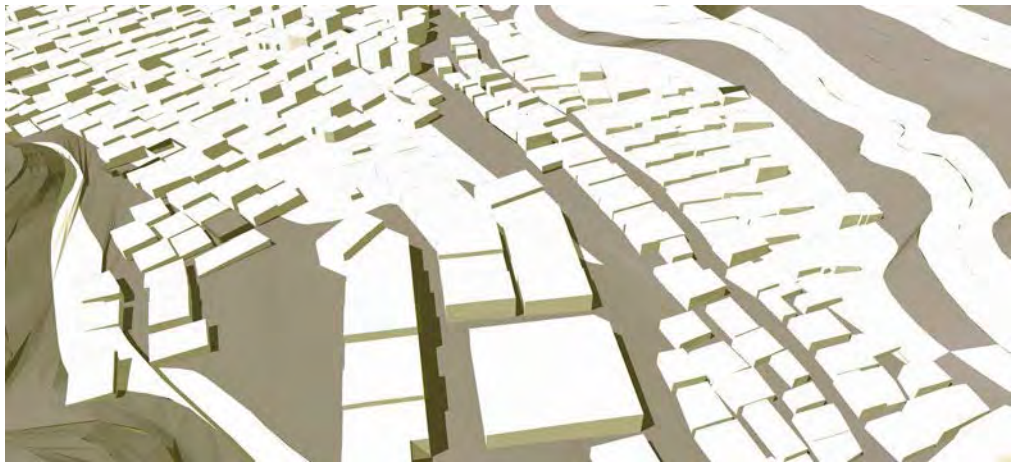
Existing situation site plan “shown in red are the demolished buildings”.

EXISTING CONDITIONS

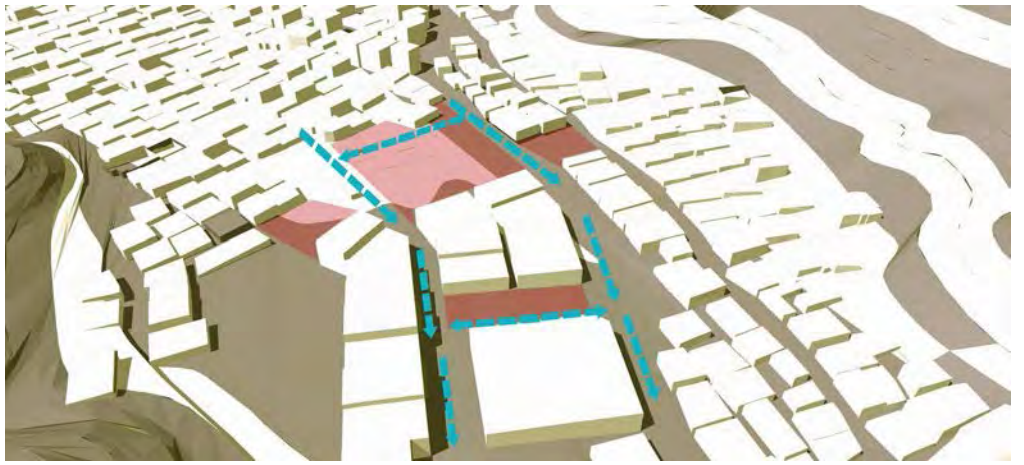
The main concept for this focus area is create an Omani central park with several open areas and activities to be used by many people of all genders and ages. The existing situation on the site is a paid parking lot surrounded by residential and commercial buildings. The design idea is enable open space with through the removal of four residential buildings that allow the creation of the central park. Three commercial buildings in very bad condition were removed to create an open space used for parking that will serve the park. One of the residential buildings in the park was transformed to serve the community heart theme, the function was changed into a restaurant on the ground floor, café on the second floor as a terrace and a library on the third floor. The other existing buildings were kept as a mixed use buildings, with the ground floor is remodeled to accommodate a women’s gym and a cafeteria.

PHASING STRATEGIES

EXISTING SITUATION : -The mosque as a community important node.
-Dense and congested area
-Lack of vegetation.
-Lack of open spaces



THE PROPOSED DESIGN: -Functional circulation
-Demolish buildings in bad conditions to provide
-more open spaces.
-Provide alternative parking



LOW IMPACT STRATEGY: -Create the natural Wadi in the east side of the area,
-Implementation of streetscape strategies.
-Promote natural habitat by using native plants
-Enhance the human comfort of the area.

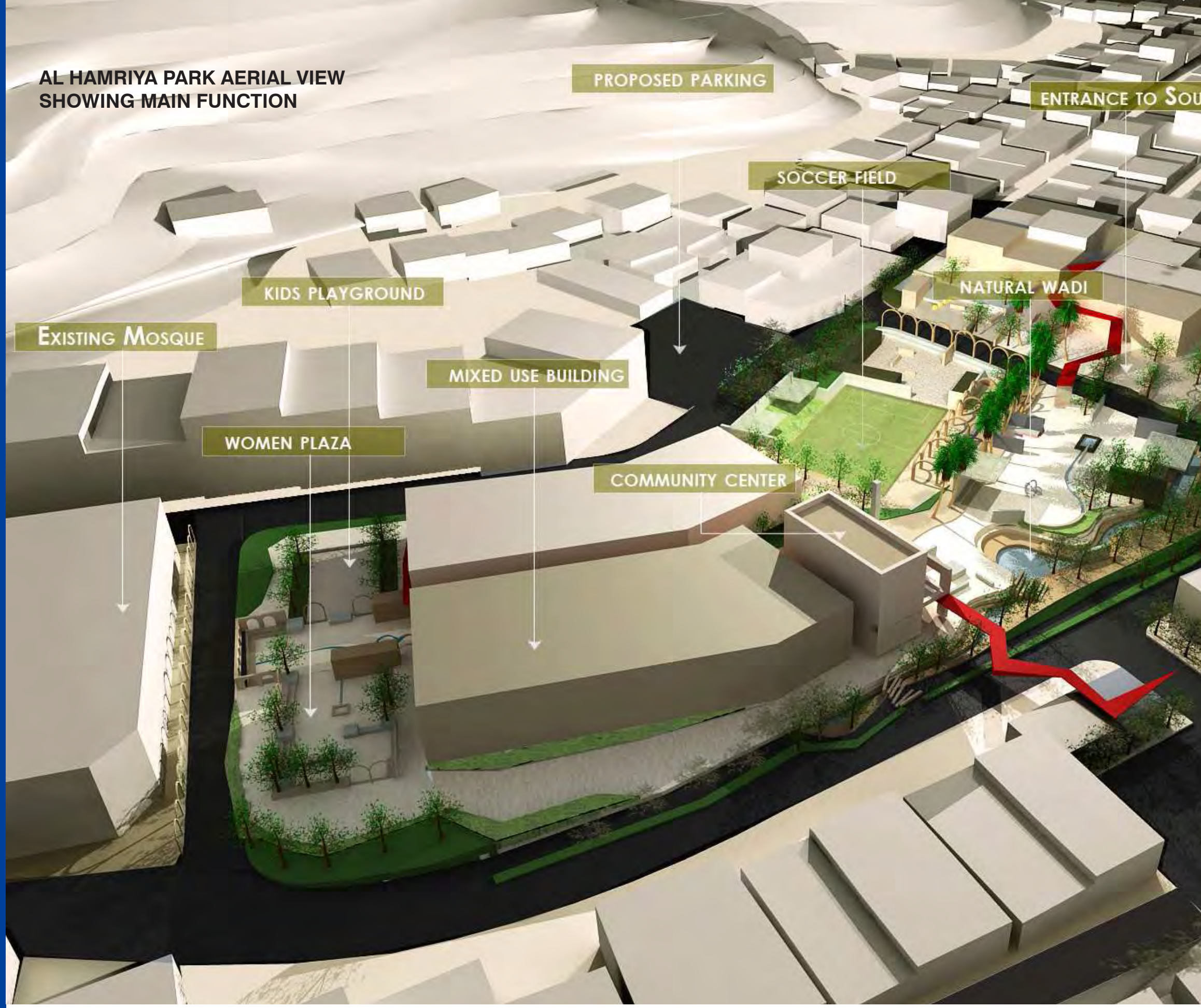
HIGH IMPACT STRATEGY: -Implement the hard landscape / earthen soccer field
-Develop a community center
-Shading devices
-Rehabilitate the residential building into mixed use

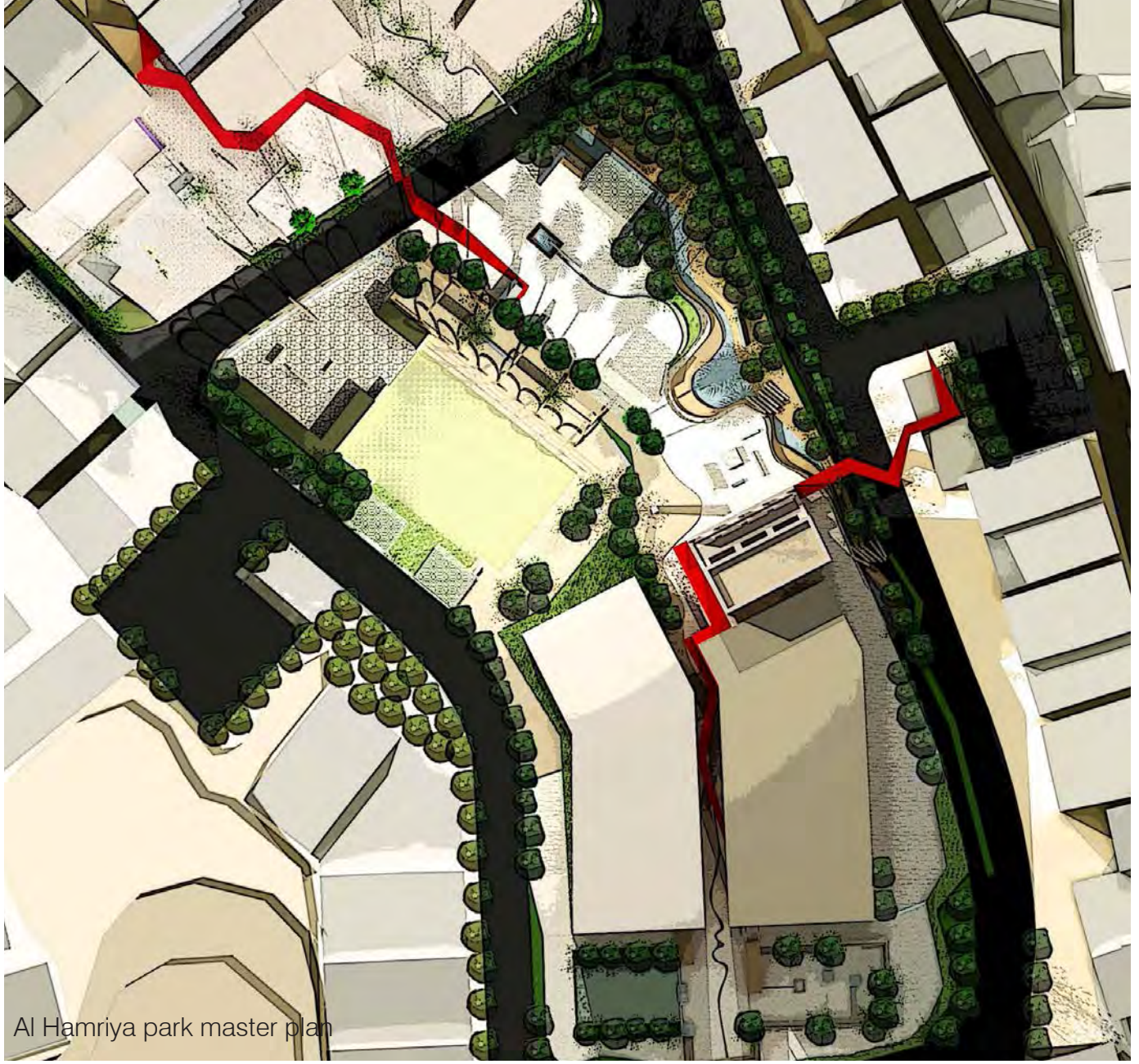
Streetscape strategies:

-Wide pedestrian walkways.
-Native trees with wide canopy
-Bioswales at the edge of the park
-Screens of vegetation and trees to separate the street from the wadi
-Mixed use building for future development aligned to the main streets

east side street section view

AL HAMRIYA PARK AERIAL VIEW
SHOWING MAIN FUNCTION





Al Hamriya park master plan

CENTRAL PARK CONCEPT

The design needs to be compelling - people will visit and the community will form enduring ties to the park. Parks that are designed for local residents often do the best. The Park has many “functional areas,” that serve this concept:

- Terraced and vegetated wash “Wadi” collecting the water from the proposed living machines and the annual floods.
- A Women’s plaza dedicated to use by women and children.
- A playground to be used by children adjacent to the womens plaza.
- Community building.
- Soccer field to be used by children and teens.
- Plaza entering the souk.
- Café’s and restaurants.
- Two surrounding parking lots that serve 50 cars a day.
- Outdoor gathering areas.
- A variety of experience.
- Movable café tables and chairs set under a rich tree canopy and spread around certain plazas that enable people to easily form groups or stay on their own.

WOMEN'S PLAZA

This plaza is situated in the south of the park adjacent to the mosque which gives it a filtered privacy within the tall surrounding buildings. It is dedicated to women in order to let them use the space with the feeling of security and enclosure. This women's plaza has certain criteria to make the Omani women comfortable while they sit and enjoy their time.
It is surrounded by trees and screens called "mashrabieah", characterized by welcoming and culturally relevant arches. It is supported by small kiosks that could also be used on Fridays by sellers to present their products after Friday prayers.
The design focuses on providing different levels of privacy and different group settings. It is adjacent to the children's playground where children play under the observation of their mothers in the women's plaza.

perspective looking through the women's plaza

a perspective of the women's plaza looking into the streets.

MIXED USE BUILDINGS

The existing buildings on the site are redeveloped into mixed use buildings in order to support the park. The ground floor functions as a women's gym, restaurants, and cafés. The alley between the buildings is widened to by two meters in width and supported structurally with arcades that shade the area and provide aesthetically pleasing facades. This alley links the southern with the northern part of the park developing a hierarchy of movements from the mosque leading to the souk through the different a variety of activities. A shading element was added to the alley to offer human scale to the narrow linear access and to add extra shade from the hot climate.

a perspective looking into the alley leading to the north part of the park

a perspective looking into the alley from the playground

The perspective shows the narrow alley from the Wadi area, leading to the mosque and the women's plaza. The materials, plants, and shading elements used work together to provide Omani characteristics within a cohesive design and the respect for human scale.

an elevation of the southern edge of the park, looking from the mosque

THE WADI (WASH)

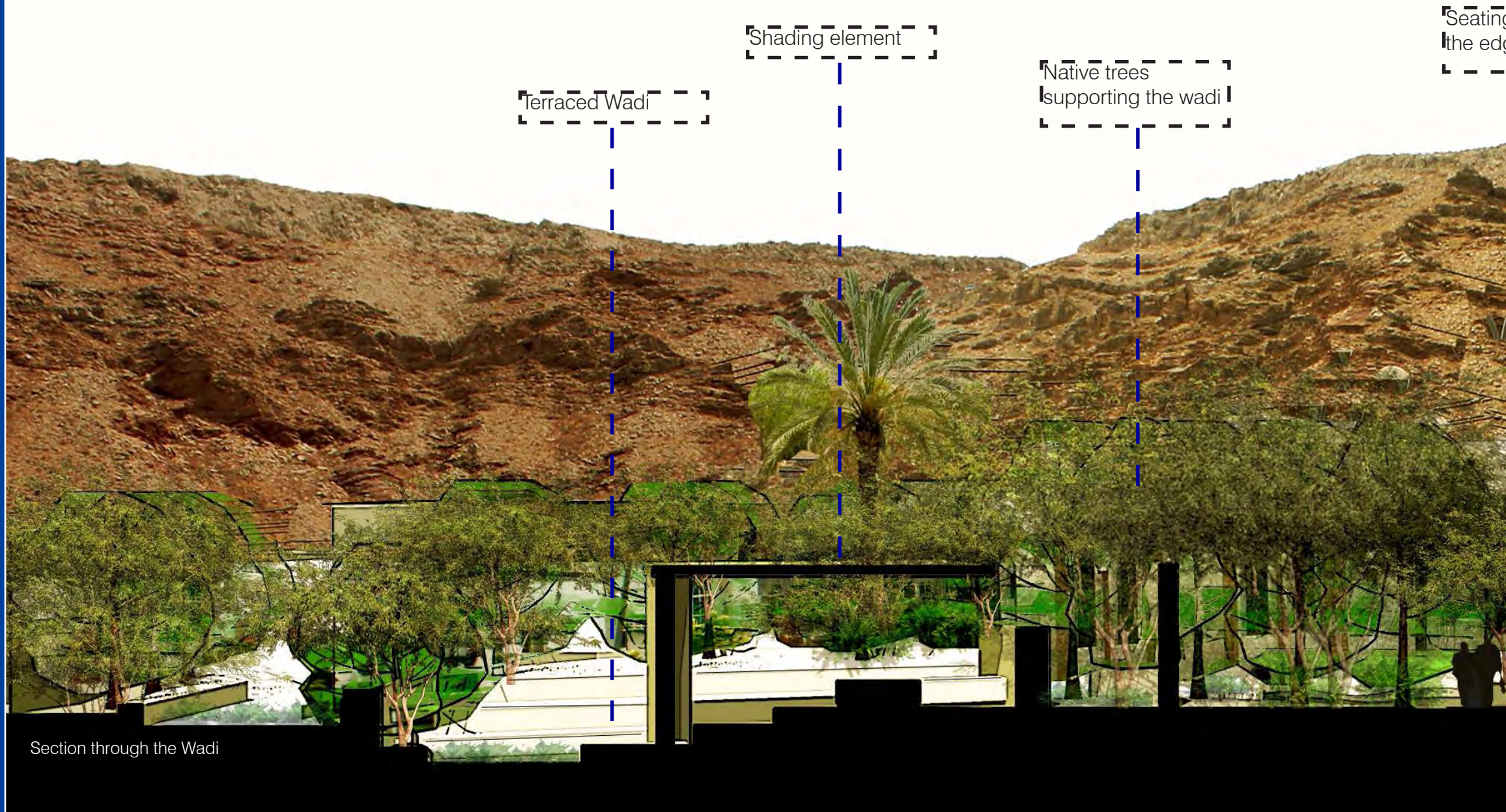
Wadi is the Arabic term traditionally referring to a valley. In some cases, it may refer to a dry riverbed that contains water only during times of heavy rain or simply an intermitent stream. Al Hamriya is considered as an urban Wadi, which floods once yearly during heavy rain and causes a lot of flooding problems in the area. So we proposed a small version of the Wadi that supports the adjacent area around the park. This Wadi goes all along the site, but it is featured strongly here to support habitat and native plants. It is terraced in the sunken area and is surrounded by the vegetation when it is dry thereby supporting a seasonal drainage system for the area.

A view showing the community center with cafe' on the ground floor, overlooking the Wadi that meanders through the site. It shows the different opportunities along the wadi for enjoyment and urban respite.

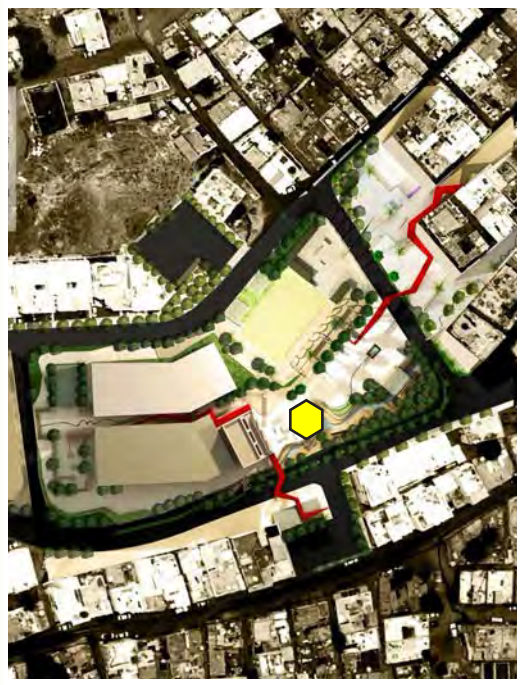
AL HAMRIYA CENTRAL PARK

THE WADI SECTION

This wadi is along the east edge of the park, which does have different experiences by introducing many intimate and public seating areas shaded by the canopy of trees and the mashrabieh shading elements. The paving materials are from the stone coming from the demolished buildings and land cuts.
The section below is across the Wadi and the community building which has a restaurant on the ground level supporting the plaza beside the Wadi. The image on the right shows a perspective of the Wadi.



Section through the Wadi



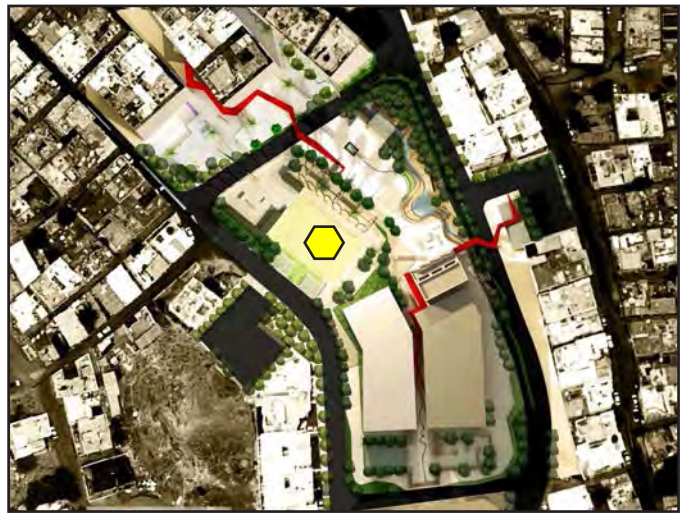
AL HAMRIYA CENTRAL PARK

View of the wadi when it is dry

Design Implication:

- Support native habitat.
- Enhance human comfort by adding more trees and shading elements.
- Respect the Omani culture.
- Recycled materials.
- Water strategies.

MAIN PLAYGROUND

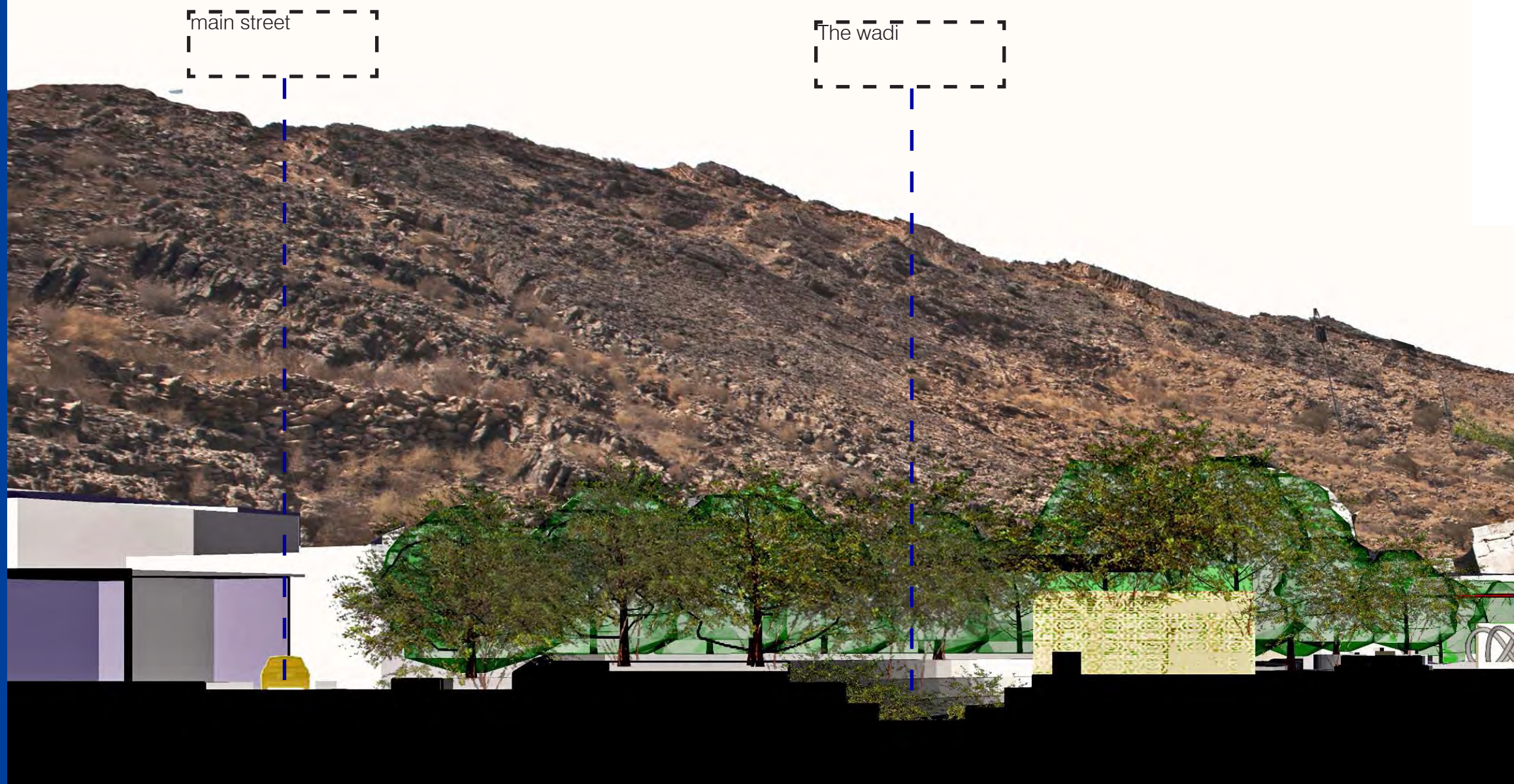


Design Implication:

-It is proposed to create a suitable area for children and young people of Al Hamriya to play and enjoy their time. It is sunken and stepped in order to provide a seating area for people to watch.
-The material is considered to be natural and not paved in order to decrease the urban heat island effect.
-The playground is at a lower level than the main street to provide more safety and it is screened by free standing walls providing shade.

MAIN PLAYGROUND

The different levels in the park offer a number of water strategies where water flow could be controlled and used throughout the site.



water storage & storm drain

Water storage under the field

Diagram showing the playground field and how it is used for collecting water that will assist in irrigation

AL HAMRIYA CENTRAL PARK

ARCADE AREA

This area is considered as a transitional area between the wadi and the playground. It consists of several arches that represent Omani culture and support the seating elements within the area. It provides shade by providing various forms of the mashrabiah screening to give the effect of light and shadow.
It provides an overview of the playground and it could be used for watching children play. It leads to the community building and continues to the women's plaza and the mosque.

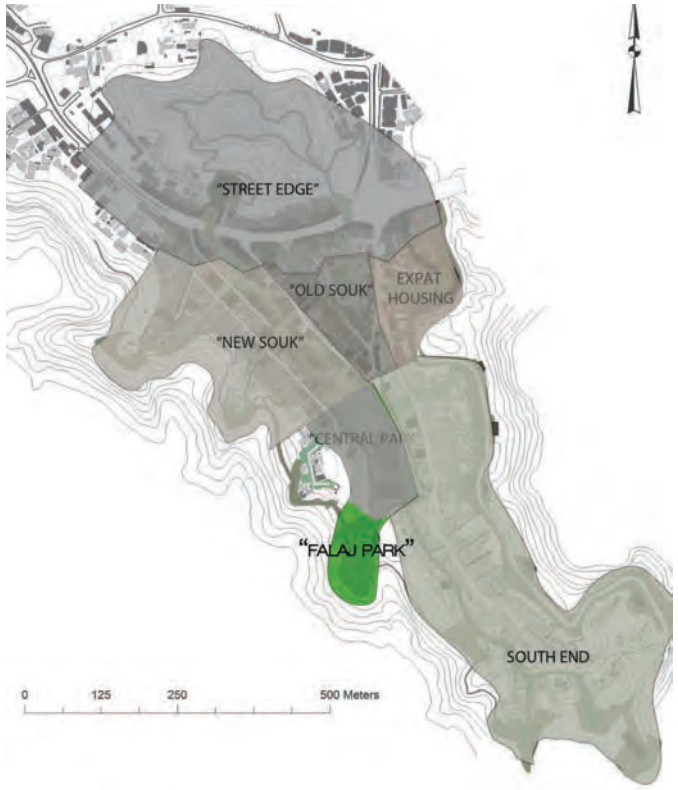
AL HAMRIYA CENTRAL PARK

SOUK PLAZA

This plaza is located at the end of the new souk leading to the central park. It consists of several free standing walls in order to manage the different levels of the area. Several restaurants serve this area and different terraces are proposed to give space for people to eat and rest after shopping.

This aerial view shows the park within the existing context. It is the “lung” of the community and the main open area. It serves the mosque which receives a large numbers of people during certain times of the week. It also works for families on a day off to enjoy and spend time together.

AL HAMRIYA CENTRAL PARK



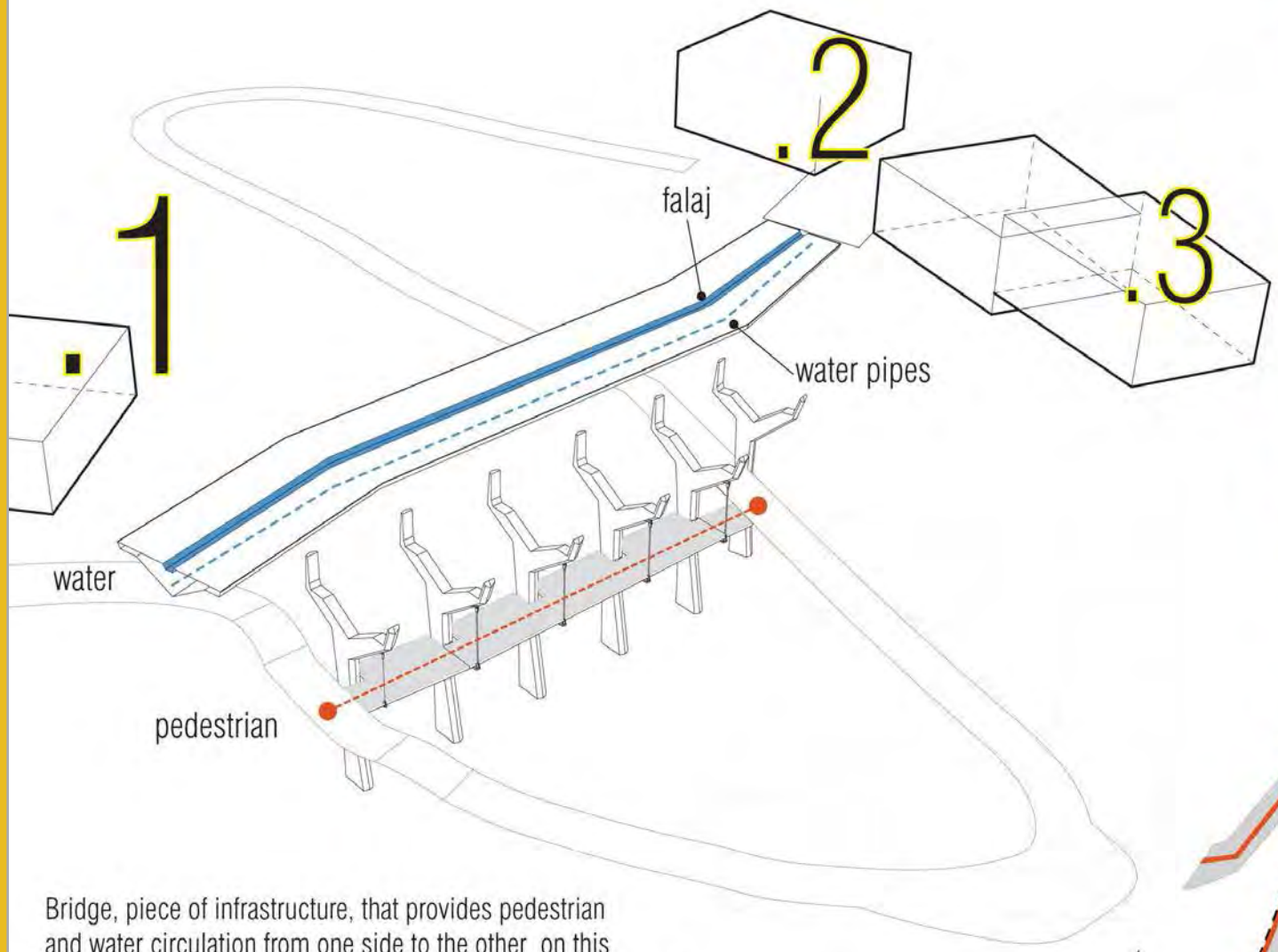
THE FALAJ PARK

Responding to the urgency within Al Hamriya to provide familiar, public spaces that can be used all day, and at the same time provide entertainment, we have created the Falaj park located in one of the edge of the mountains. The site is adjacent to the central park area, which is the largest open space and the central heart of Al Hamriya. The park announces the transition between workers and Omani families. The Falaj park uses topography to provide an open air amphitheater that will allow the community to enjoy dance performances, plays, music and movies at night.

The Falaj park also emphasizes in its design the promotion of environmental awareness and the local economy, by adding a satellite vocational school focused on “Urban Agriculture”, which will educate people in Al Hamriya, create jobs and provide food for local consumption. Adjacent to the agriculture school and food production terraces, we have located a restaurant in which all the food produced on site will be prepared and sold it to the public.

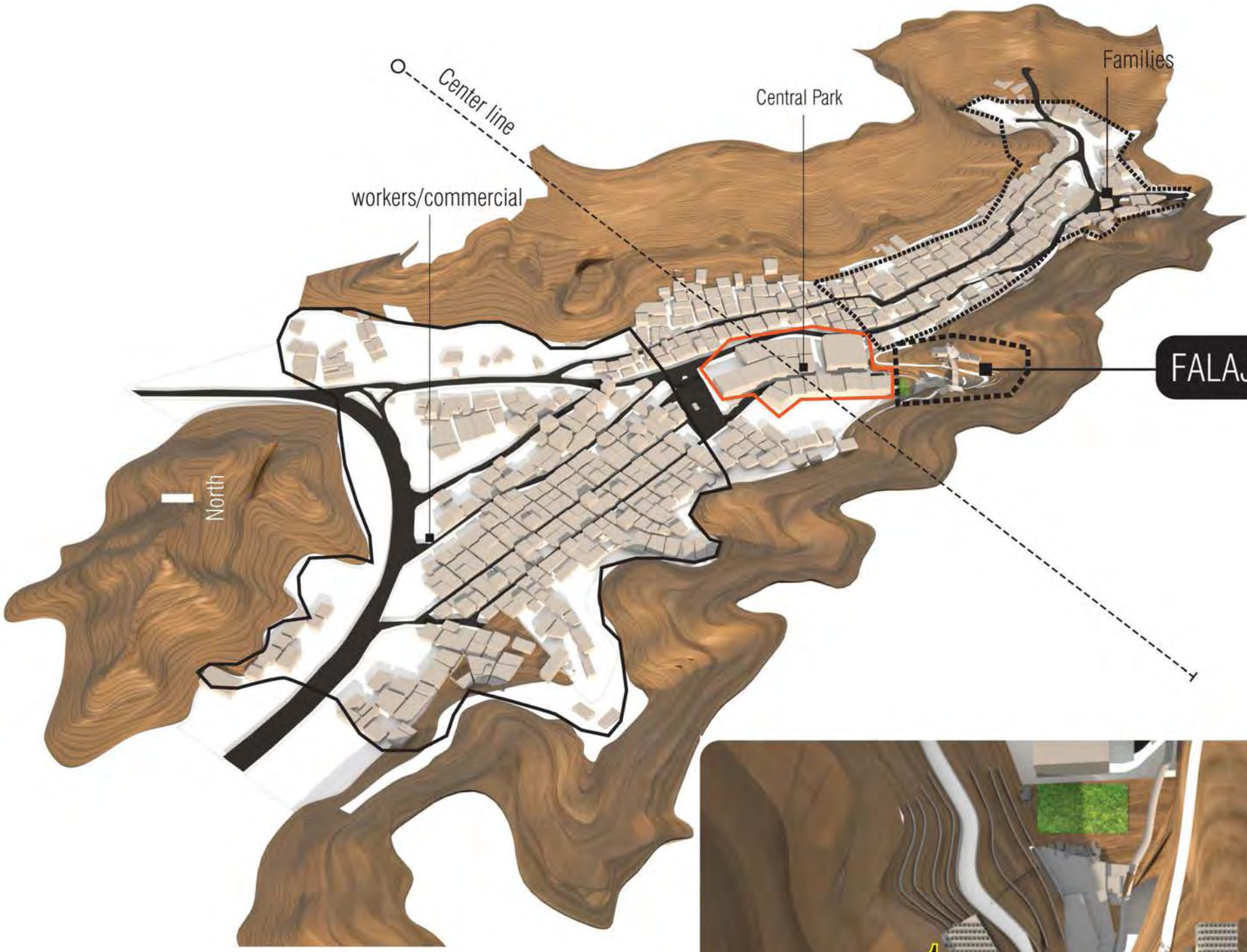
Finally, in order to promote the concept of a self-sustaining urban prototype community, we have added a living machine to purify site and grey water. This part of the program is key to complete an enclosed cycle system for this facility. Water will be cleaned and used for irrigation of the agriculture terraces and the food bi-products will become compost to fertilize the land.

FALAJ PARK



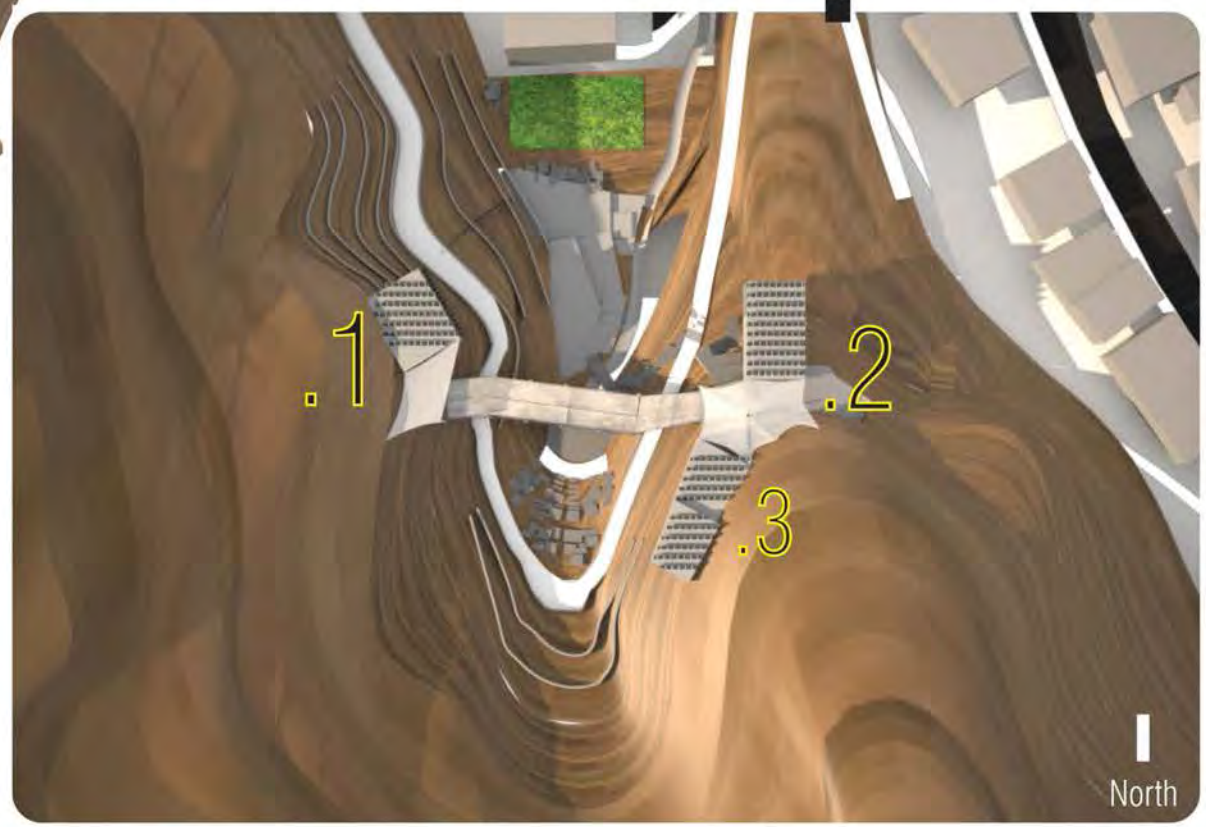
Bridge, piece of infrastructure, that provides pedestrian and water circulation from one side to the other on this natural irregular site.

FALAJ PARK



Falaj_Park provides education to people in Alhamriya, jobs opportunities, a new destination and encourages family time.

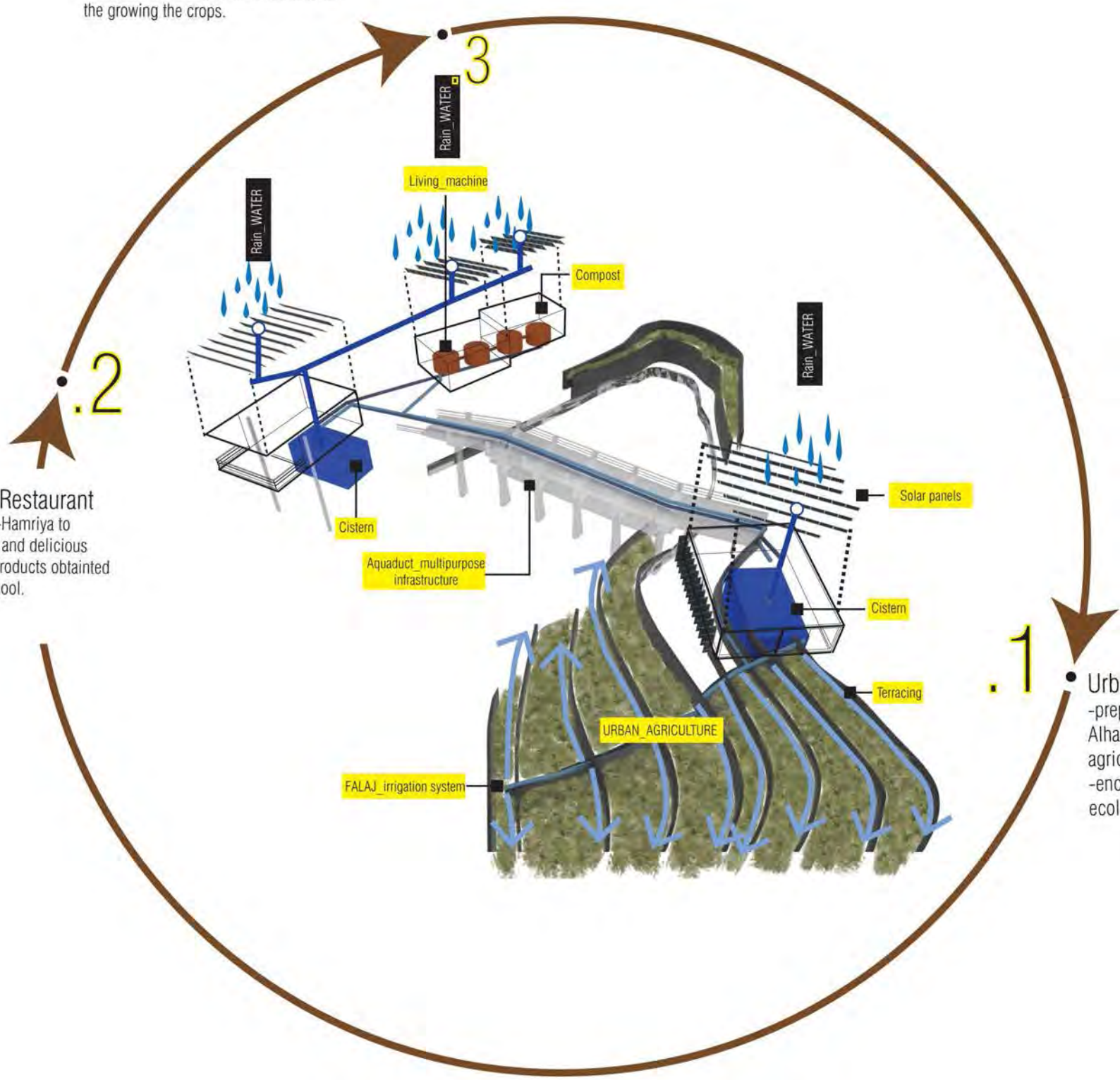
FALAJ_PARK



BIOMIMICRY DESIGN

Closed cycle BIOMIMICRY, following the theory of Cradle to Cradle, where the dispose of one living system becomes the nutrients for others.

Living_Machine/ Compost tank
- process gray and black water used at the restaurant and school through a natural/mechanic process, so it can be recycled and re-used for irrigation of the agriculture terraces.
-compiles all the nitrates and carbon (vegetals) residues from the restaurant.
-compost will be used as a nutrients for the growing the crops.

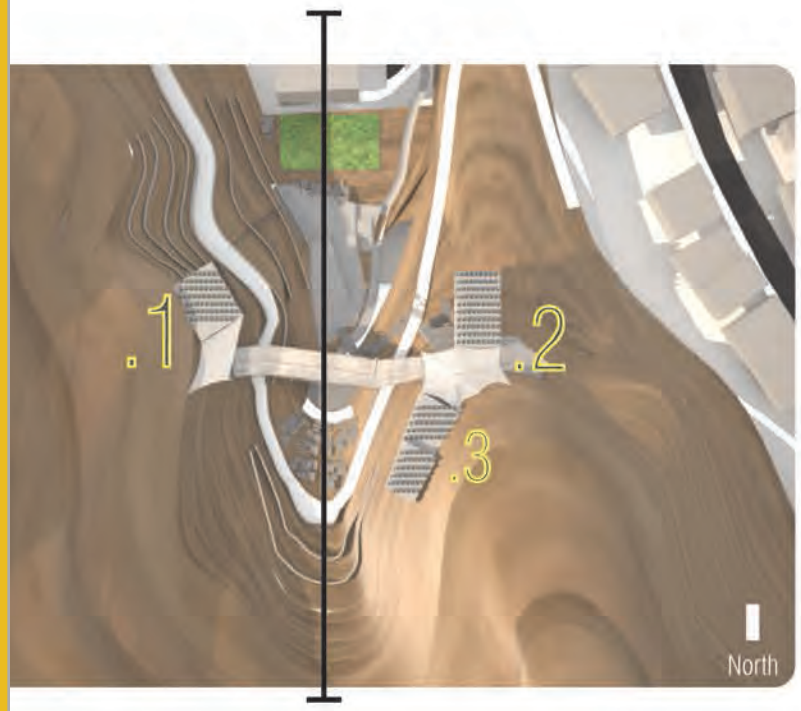


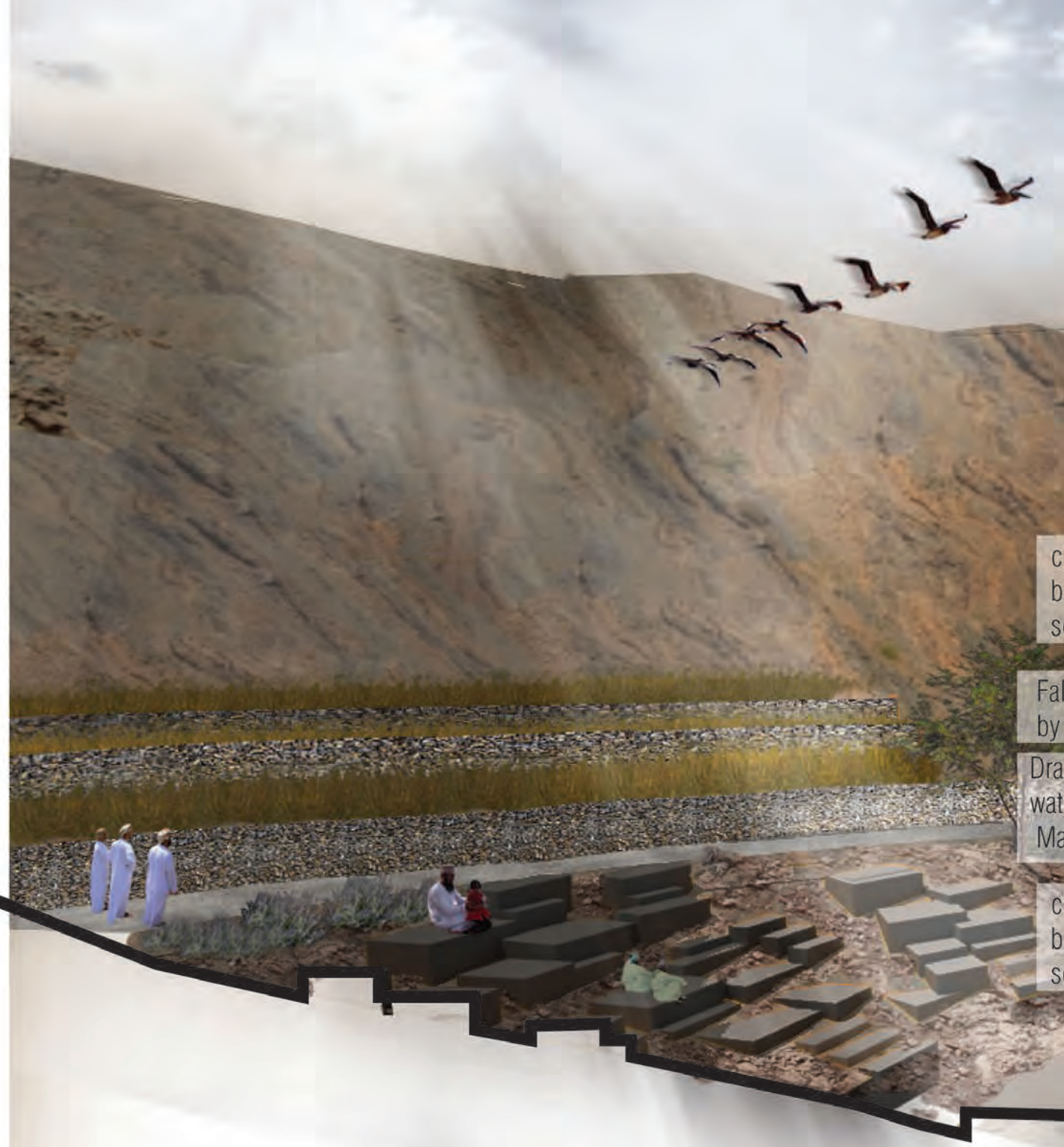
Casual Overlook Restaurant
- Invites people from Al-Hamriya to experience great view s, and delicious food prepared with the products obtainted from the agriculture school.

Urban.Agriculture.SCHOOL
-prepares people from Alhamriya to practice agriculture.
-encourage close cycle ecologies.

MULTIPURPOSE PARK AREA

The Falaj park serves an array of activities throughout the day, making space more efficient, functional, and desirable for families located in the south portion of Al Hamriya. During the day it hosts students and people that work at the restaurant and with the urban agriculture. During the evening, when the sun goes down and children are out of school, they go to enjoy the lighted open green and shaded areas that the park provides for the community. While parents go to work at the restaurant or school, children play in the open green areas while their parents can observe from above. At night, the park becomes in an entertainment and amusement park, where the community can perform, music, dance or theater plays. Utilizing the bridge as a frame to hang a cinema size screen to project movies and enjoy them with the family and experience the nice evening breezes. The distribution of activities throughout the day, allows this place to be constantly active, which leads to the creation of more jobs and therefore stimulates local economy while it provides secure and familiar entertainment, and also encourages environmental education.





Performance amphitheater/Open air movie theater

[NIGHT]


Aquaduct
irculation
etween rest/
chool
aj_activated
gravity
inage of gray
er to Living
achine[pump]
irculation
etween rest/
chool
Particion of area
Connection of space
Learn/ work/play area
[DAY]

FALAJ PARK

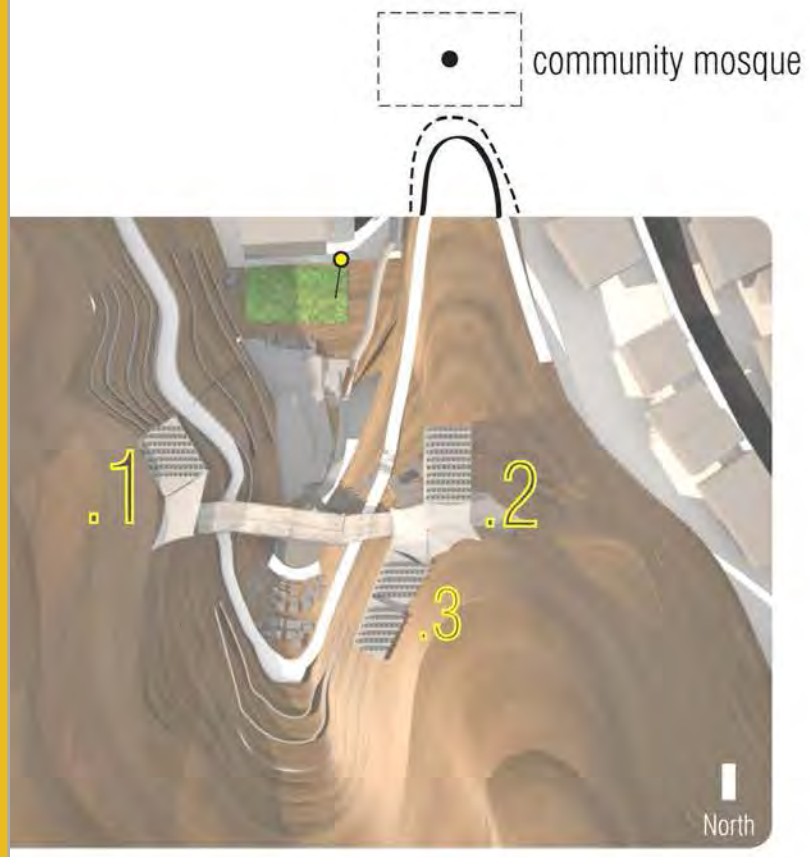
URBAN AGRICULTURE SCHOOL

An Urban Agriculture School, located on the west side of the Falaj park is intended to promote environmental consciousness where local food is cultivated and produced with recycled water, that was initially recollected from rain. This school teaches its students to understand the dynamics of nature and how we can live in this world with a smaller footprint, by living and acting locally. All the goods produced in these terraces by people from the urban agriculture school, will be consumed in the restaurant or sold in a small ephemeral market that will be located according to seasons on the north side of the park. This act of promotion of primary activities within the site is a catalyst of local economies and a spirit of productivity, by creating jobs.

FALAJ PARK

OPEN/PUBLIC SPACE

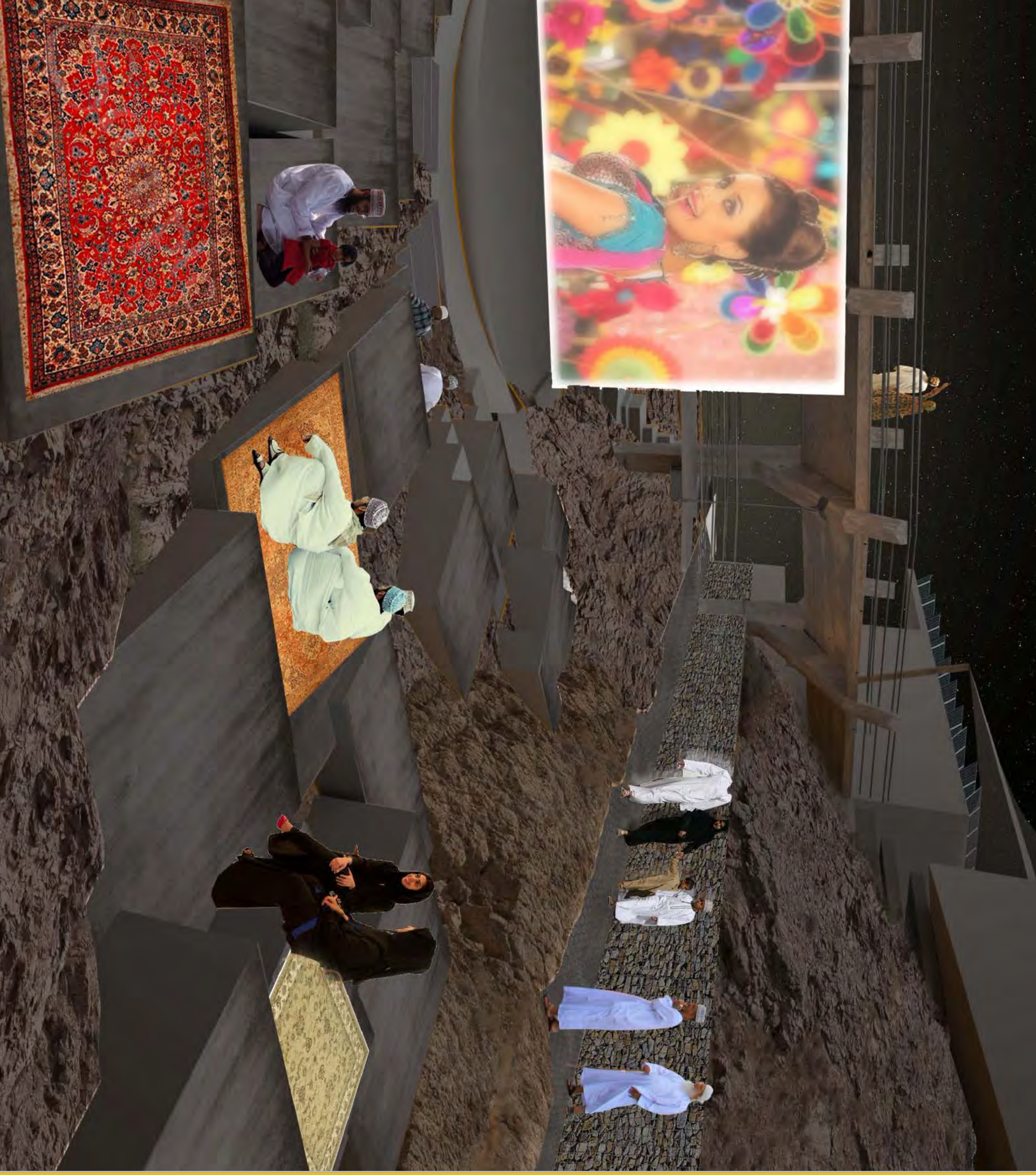
Night entertainment. The intentions of this program of the site are to provide a flexible space to accommodate, dance performance, music performance, plays or movies. The innovative terracing sitting/laying area responds to the site's location and function - to unify families, and encourage family time. The fact that these terraces are dimensioned to fit four family members, provides an informal and relaxed environment where everyone can take their carpets/blankets, set up a comfortable area, eat, and enjoy the family and the movie.



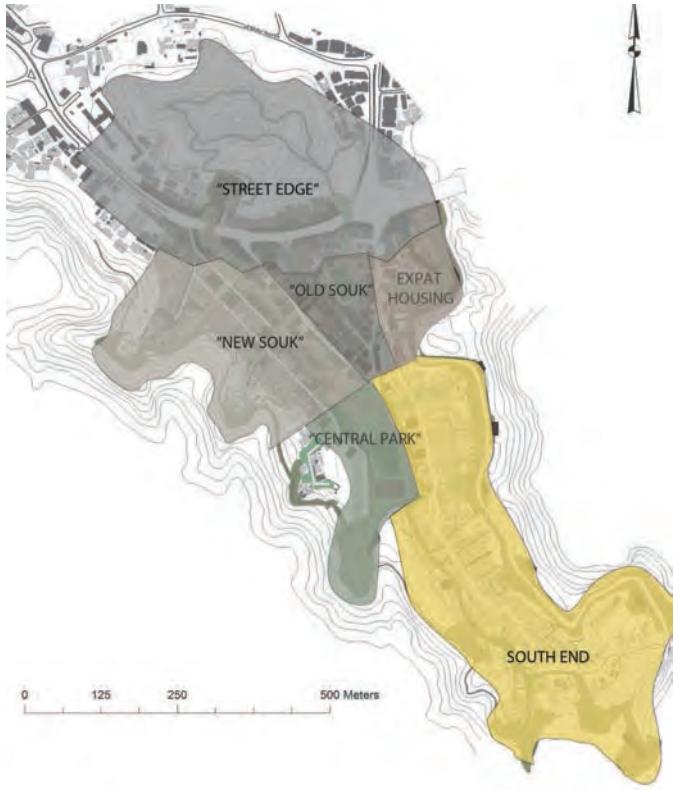
FALAJ PARK

TERRACING/OPEN AIR THEATER

This open area is intended to promote family unity. Since it is located within an interstitial space between the worker areas and the families, the intention is to use the natural features of the site; privacy provided by the canyon like topography and its location within the site. Open space, is a free space, therefore a multipurpose space where the user can do as they please. It allows for opportunities such as seasonal markets and larger community events. The site is located 400 meters away from the central mosque of Al Hamriya, therefore it provides an optional addendum of open space to accommodate Mosque activity overflow.



FALAJ PARK



THE COMMUNITY HEART

This focus area addresses the southern most area of Al Hamriya. As a team we identified this area as being comprised mainly of Omani Families. The gradual blend of dense fabric into the surrounding valley walls embodies some of the most unique qualities of the site. This proposal looks to enhance this relationship and not disrupt the existing character while mediating the connection between the user, site, and place. The introduction of streetscaping, shade, open space outlets, and community work opportunities will bring a sense of unity, and pride to a community, while establishing a safe, enjoyable connective network thereby creating an array of social outlets.

THE COMMUNITY HEART

EXISTING SITE CONDITIONS

CONNECTIVE ALLEYWAYS

Existing:
Currently the main mode of north/ south circulation is by vehicle, and east west is primarily foot traffic. These east west vectors utilize intimate spaces similar to the image on the left. In their current state these spaces, although unique to the place, are not very inviting circulatory routes.

Goal:
Our goal is to take these unique spaces and capitalize on the high traffic of people. A low impact approach will call for a unique adaptation to each alley way, but all will aim to create shade, safety, planting, and cohesion through like-minded xeriscapes.

INTERGRATION WITH VALLEY WALLS

Existing:
One of the most unique qualities of this site is the integration of the built environment to the valley walls. In some locations there is almost a seamless connection to what is natural earth and what has been adapted to man-made structures.

Goal:
This proposal aims to stimulate this connection with the surrounding environment by enhancing the east/ west, wall to wall connection, while utilizing recycled material from the site for construction.

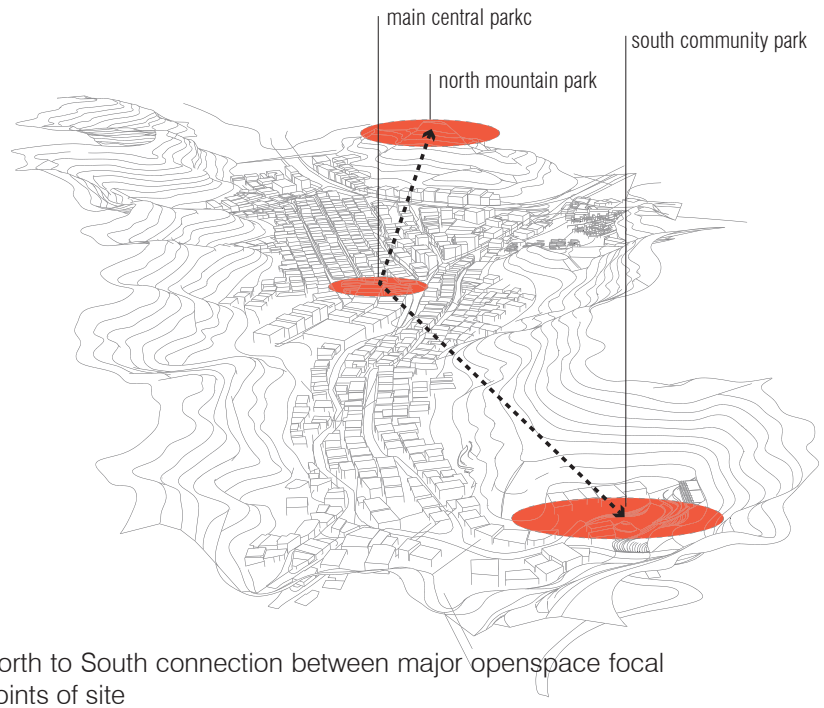
DISTRIBUTION OF EXISTING FABRIC:

Being called the COMMUNITY HEART this proposal looks to enhance the quality of the current living conditions in the area, not to change them. With that it was very important not to disrupt the existing homes and businesses that have formed over the years.
Currently this proposal is displacing four residential units
that through close analysis have been deemed unsafe in their current state.

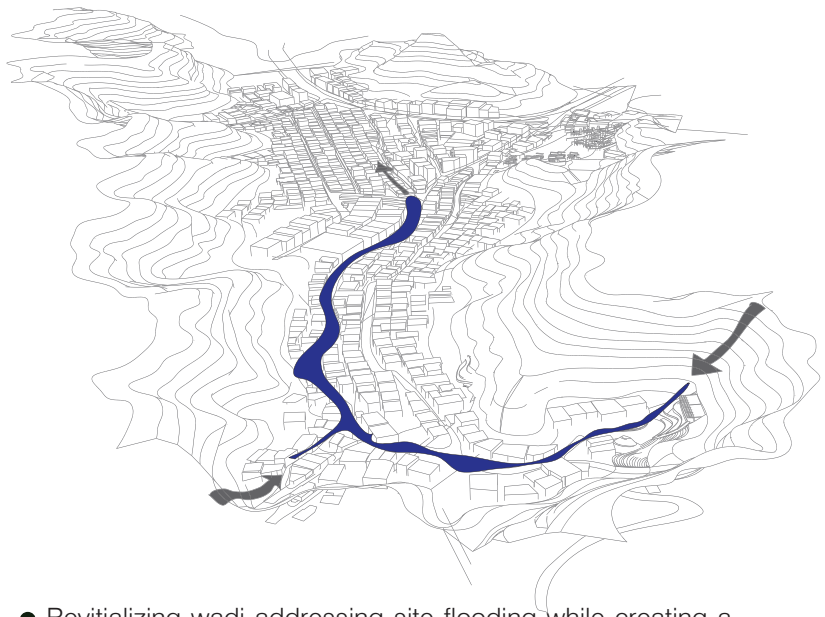
OPEN SPACE

Existing:
In the south end of the city there are currently numerous lots that are underdeveloped. These open- spaces that in the past have become over-crowded with parking for local gatherings, prevent the community from having important daily social outdoor connections.

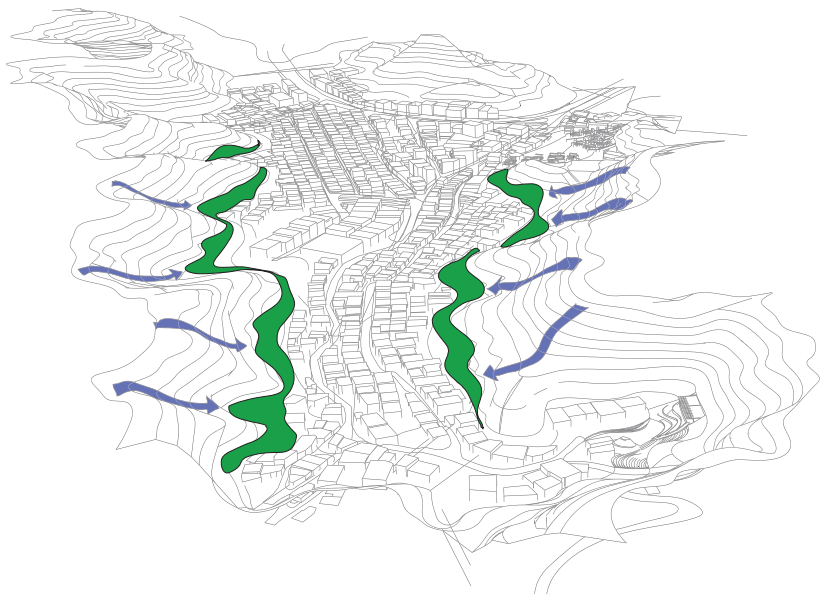
Goal:
With the development of a new parking structure near the newly proposed central park space, we aim to capitalize on these vacant lots. Rather than displacing existing residence we look to infill these types of spaces, creating community outlets, while reducing the heat island effect through the introduction of xeriscaping, and trees.



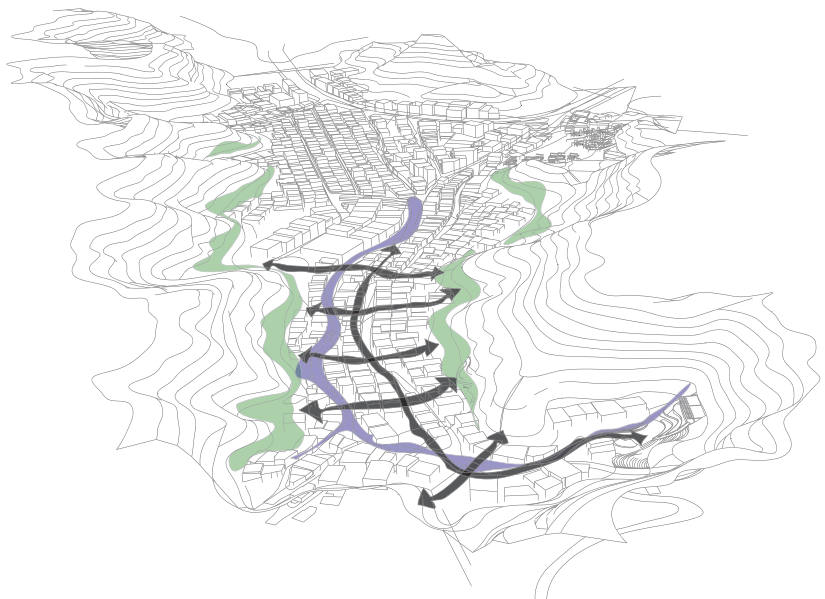
- North to South connection between major openspace focal points of site



- Revitializing wadi addressing site flooding while creating a longitudinal connection within the site.



- Periphery terracing addresses sheet flood while also setting up east/west connectivity

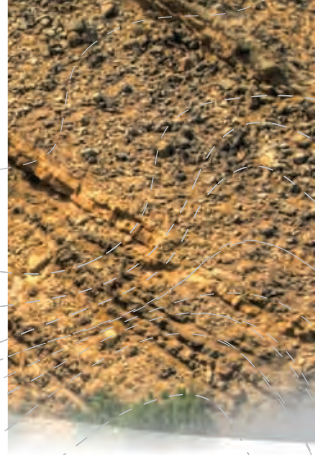


- Stemming from major functional elements a revitalized walkable fabric can now be implemented.

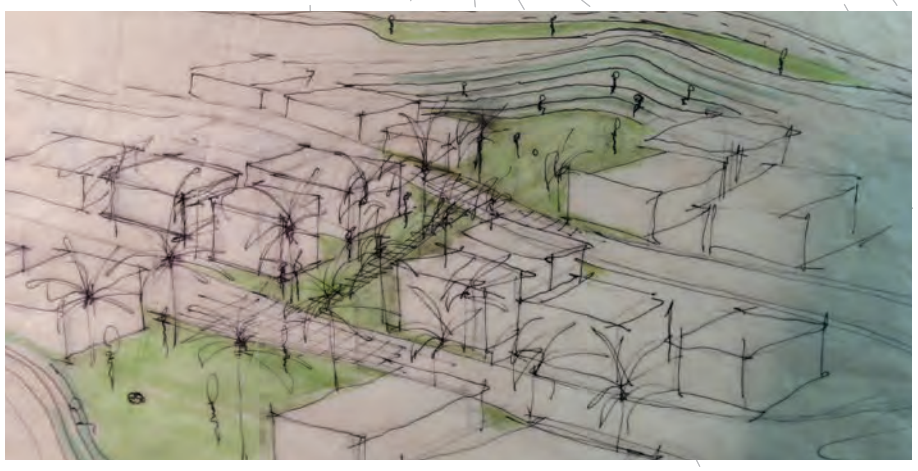
LOW IMPACT FABRIC REVITIALIZATION

These four phases aim to create a linkage from north to south between new nodes of development, enhance the connective tissue east/west between the valley walls, all while addressing the flooding issues that face the topographical makeup of the area. We aim to capitalize on the introduction of a newly constructed wadi not only for environmental help, but also to act as a back bone for social connections. As we introduce terraced urban agricultural parks around the periphery of the site, comes opportunities to enhance the connective tissue between the valley walls to create a safe, enjoyable, walkable network for community unification.

- Phase one: Identify major focal points of entire site and develop.
- Phase two: Activate new wadi implementing proper infrastructure for future development.
- Phase three: Anchor east/ west circulation to functional terraces parks along the periphery
- Phase four: Enhance the everyday experience of these intimate alley ways to stimulate strong social connections.



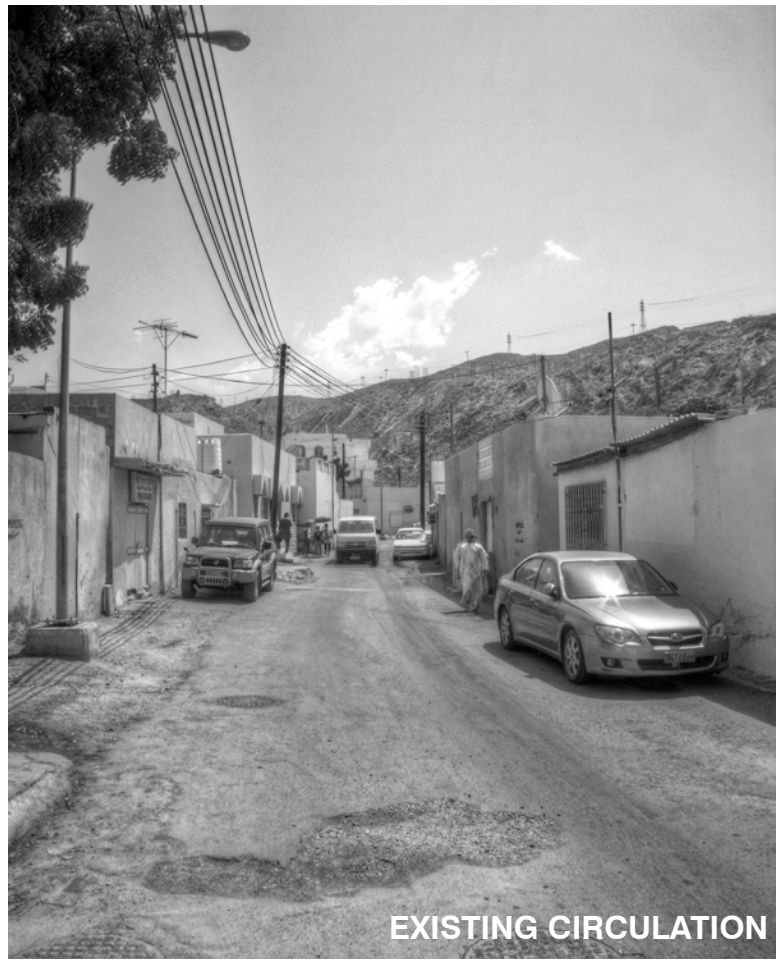
Starting with the first site visit, and carrying through site analysis, the significance of circulatory vectors on site stimulated key social and functional design opportunities. The site's strong topographic characteristics called for enhancement of wall to wall foot paths to create new, safe, social gathering points.



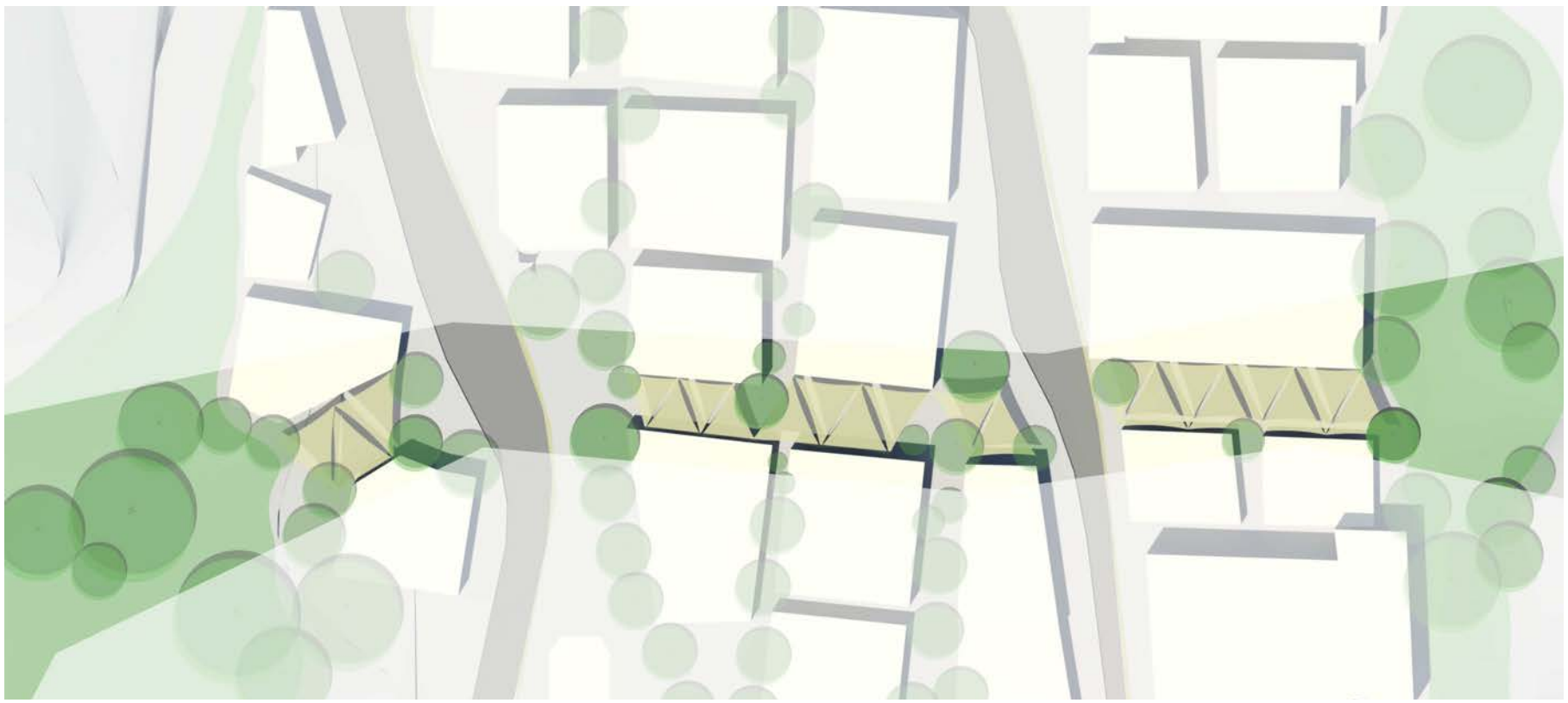
WALL TO WALL GREENWAYS

LOW IMPACT FABRIC REVITIALIZATION

- Functionally: create safe connections, usable by locals to navigate through their unique urban fabric.
- Socially: newly created paths and parkways create social outlets, and allow people to have neighborhood identifiers, creating a common sense of pride within nodes as well as wayfinding elements.
- Environmentally: the introduction of interior parks takes advantage of existing black-top parking lots, reducing the heat island effect. Shade is always appreciated in a hot climates. Also we have chosen to anchor the strong east/ west connections with terrace parks which aim to address sheet flooding, while providing opportunity for urban agriculture development.
- Aesthetically : the use of local materials, and a variety of paving strategies creates strong visual connections between site and place.



EXISTING CIRCULATION

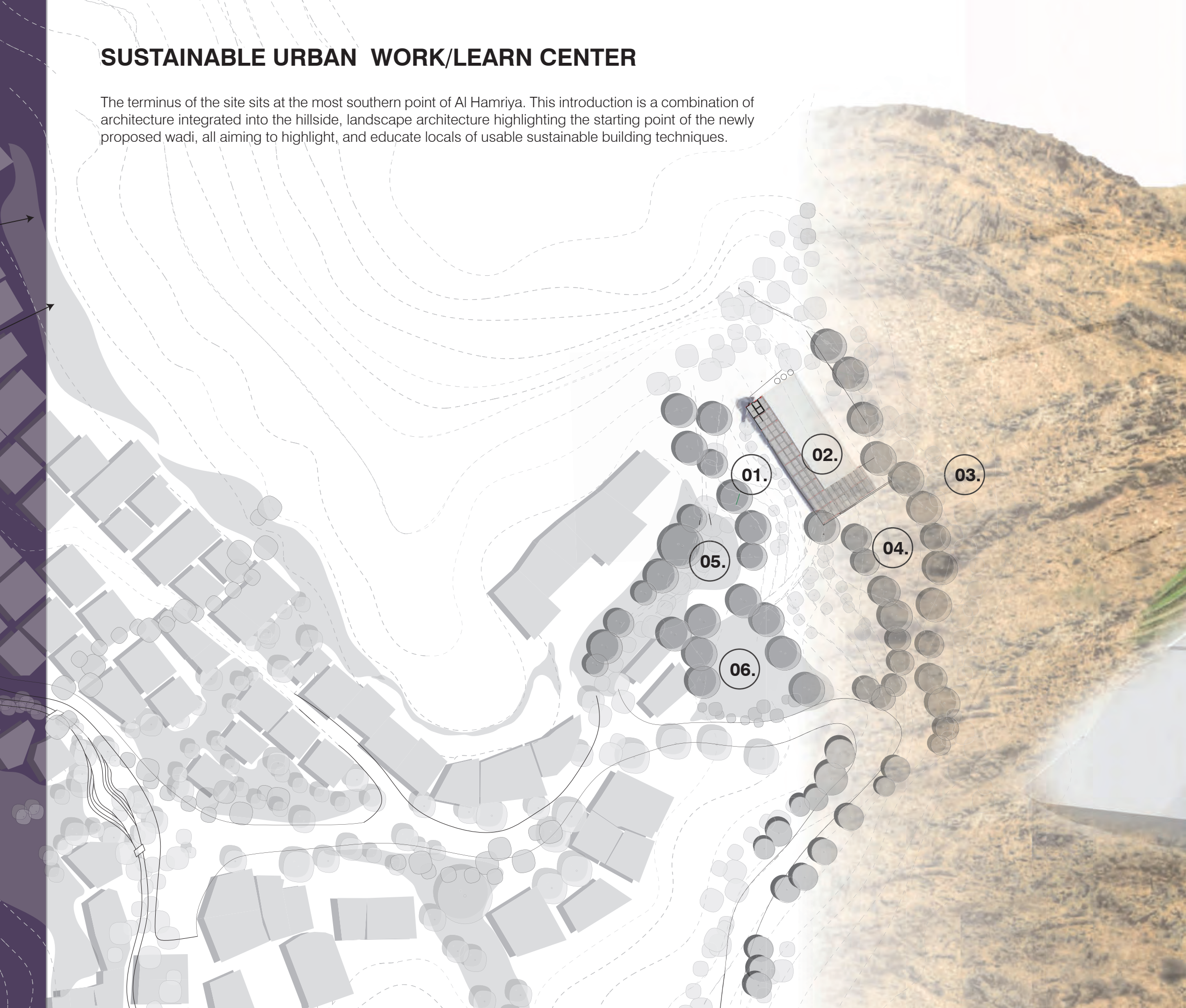


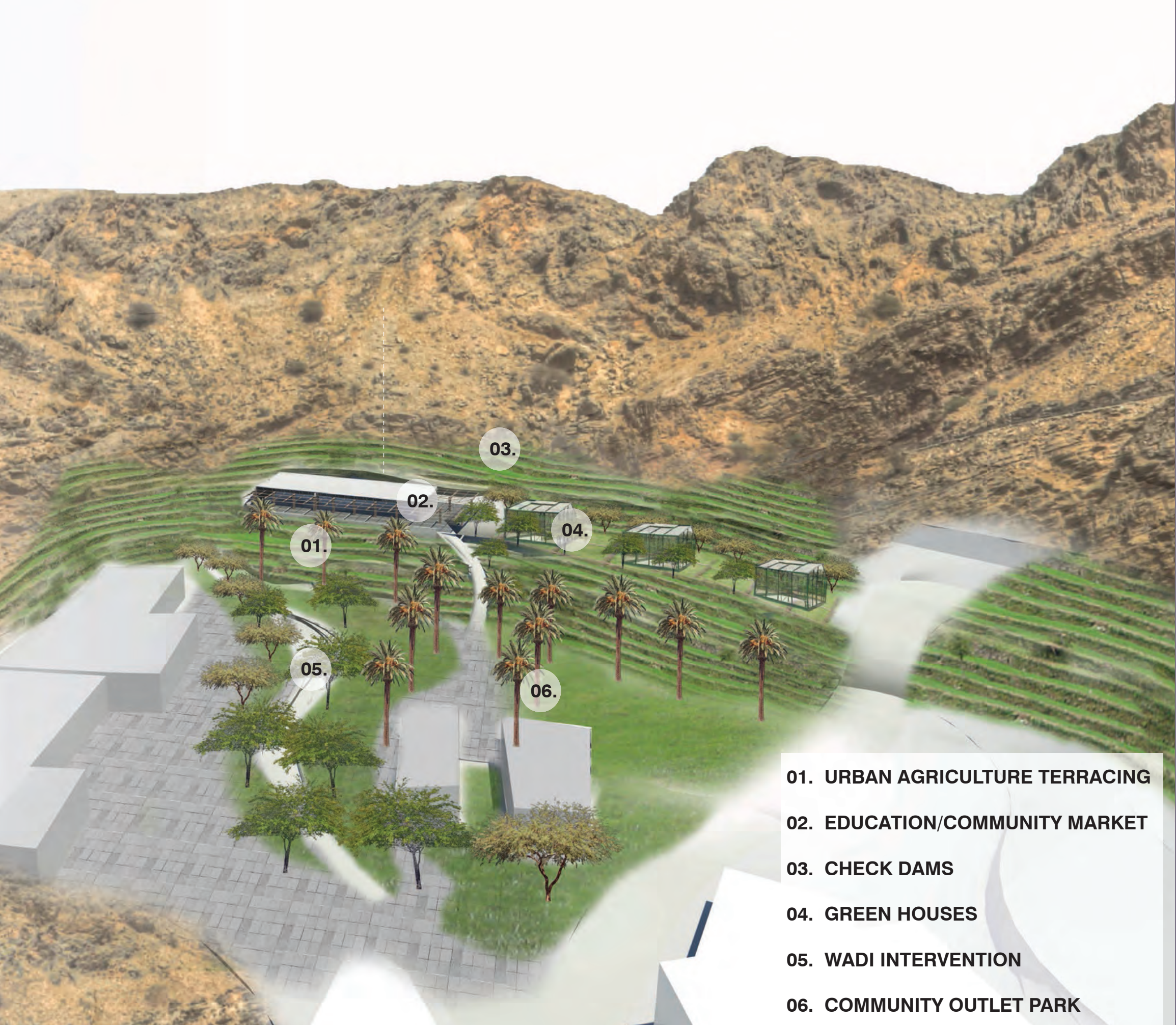
TYPICAL E-W CONNECTION PLAN

PERSPECTIVE OF CONNECTIVE ROUTE

SUSTAINABLE URBAN WORK/LEARN CENTER

The terminus of the site sits at the most southern point of Al Hamriya. This introduction is a combination of architecture integrated into the hillside, landscape architecture highlighting the starting point of the newly proposed wadi, all aiming to highlight, and educate locals of usable sustainable building techniques.





01. URBAN AGRICULTURE TERRACING

02. EDUCATION/COMMUNITY MARKET

03. CHECK DAMS

04. GREEN HOUSES

05. WADI INTERVENTION

06. COMMUNITY OUTLET PARK

SUSTAINABLE SITE STRATEGIES

- Functionally: Development of this area creates a private node for the community to call their own. This facility is a location where people can take pride in the positive advancement of quality of life through a more sustainable future. Also an important aspect is the anchoring of the mountain to mountain concept that creates cohesion throughout the entire master plan.

- Socially: This area is entirely a social hub. Weekdays it provides job and learning opportunities for community members interested in urban agriculture. At night it can serve as a community gathering point for special events. During the weekend this space can open up as a market space selling the products produced on site.

- Environmentally: This proposal looks to address environmental issues on both a site and building scale. The introduction of the wadi, check dams, and urban agriculture terracing deal with flooding concerns. At a building scale this facility utilizes energy efficient strategies to display and encourage a green future development in the entire region.

- Aesthetically: The architecture itself blends site materials with a modern twist. The integration of smart solar design, and advanced rammed earth walls create a contrast with the natural geological valley walls.

CURRENT USE OF SPACE

Perspective of terracing utilizing local materials

Section perspective of community facility

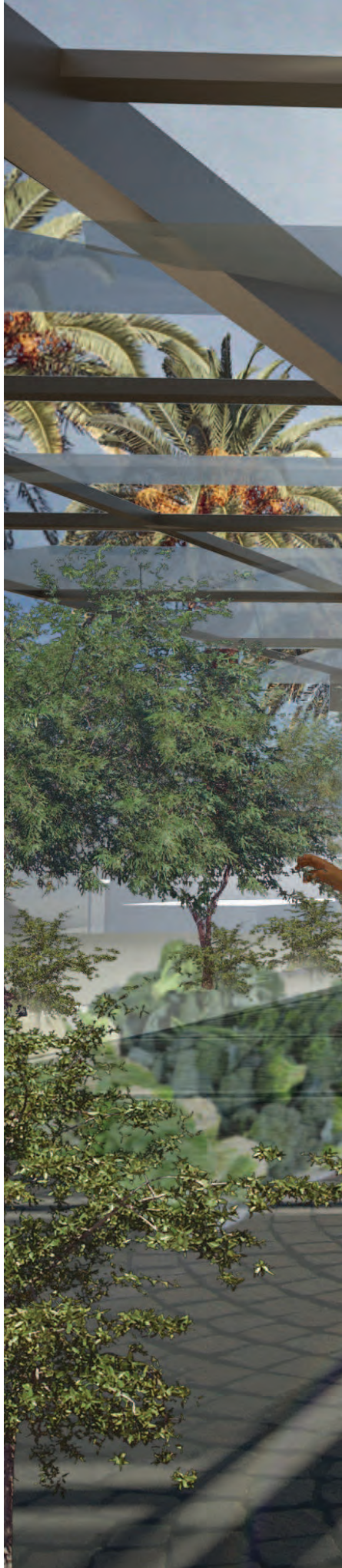
SUSTAINABLE BUILDING STRATEGIES

Creation of corridors and operable panels to optimize prevailing winds in shaded ares of the building.

Utilization of a variety of shading strategies. Trees located on west facade, and permeable photo voltaic field overhead to capitalize on extensive solar exposure.

Create thermal mass, use of recycled building materials, and local labor reduces the carbon footprint of incoming materials, but also creates a strong connection with the surrounding context.

EDUCATION FACILITY OVERLOOKING CITY



PERSPECTIVE OF WEEKEND MARKET USE

WATER STRATEGIES

The water strategies section is about the water issues in the Muscat region and within the site. The main issues in this area are storm water and water scarcity because of the physical location of the city.
This section covers strategies for management of stormwater and grey water reuse in order to irrigate the site.

WATER STRATEGIES

EXISTING FLOOD CONDITION

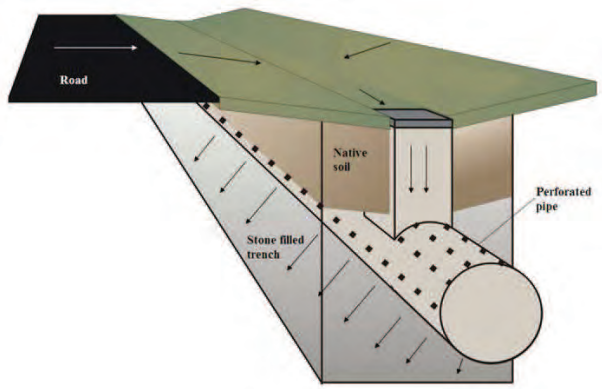
Muscat is a coastal, well-ordered, and immaculate city in Oman. Muscat is featured by sharp steeped topography of dry rocky mountainous areas with flat plains and valleys. The built-up areas of the city had to take place in valleys and on swales connected by main linear arteries.

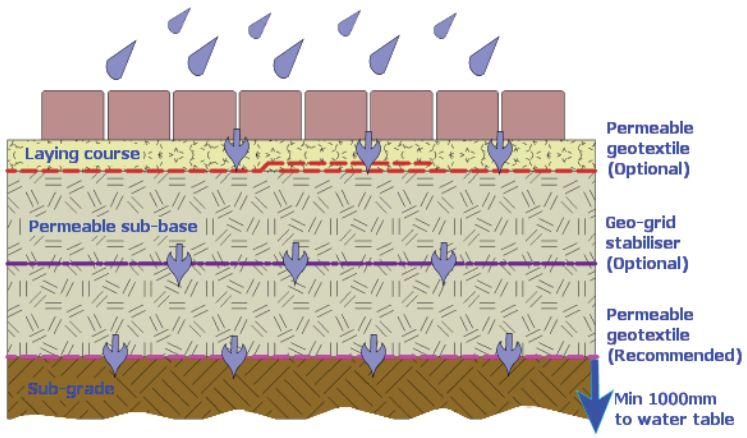
This physical location makes the city somewhat vulnerable to global climate change in the form of heavy rain and cyclones. The heavy seasonal rains, floods and cyclones (Gonu-760 km/hr) recently left a swathe of destruction in these low lands. The floods always cause serious damages to urban elements, amenities and infrastructure.

STRATEGIES FOR STORMWATER MANAGEMENT

Perforated pipe system:

Perforated pipe systems can be thought of as long infiltration trenches or linear soak ways that are designed for both conveyance and infiltration of runoff from roofs and low to medium traffic roads or parking lots with adequate pre-treatment.



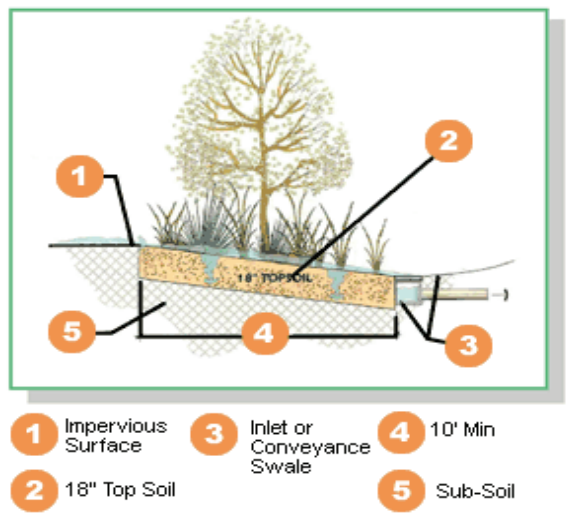


Permeable Pavements

Permeable pavements are alternative paving surfaces that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or filtrated.

Vegetated Filter Strips

Vegetated filter strips are gently sloping, densely vegetated areas that treat runoff as sheet flow from adjacent impervious areas. Vegetation may be comprised of a variety of trees, shrubs and native plants to provide wildlife habitat and aesthetic value as well as water quality benefits.



STRATEGIES FOR STORMWATER MANAGEMENT

Enhanced Swales:

Vegetated open channels designed to express, treat and attenuate roof, road and parking lot runoff from small drainage areas. Enhanced swales should be applied in series with other practices. Vegetation in the swale slows the water to allow sedimentation, filtration through the soil and root zone, and infiltration into the underlying native soil. Incorporation of swales into the site design can reduce impervious cover, accent the natural landscape and provide aesthetic benefits. In our site swales are wadis.

Before

After

Enhanced Swales

N

Legend

- Enhanced Swales, Wadi
- Perforated Pipe Underground
- Vegetated Strips
- Flood Storage Basin
- Permeable Pavement /Parking lot

WATER STRATEGIES

EXISTING CONDITION

Muscat is an arid city with a rapidly developing economy and a high population rate of growth. Together, they have increased the demand for freshwater. Reusing grey water is one in a series of possible solutions to meet this demand. Grey water has been used to promote sustainable development and resource conservation without compromising public health and environmental quality. Grey water can be used mostly for irrigation of landscape which enhances the quality of life and can reduce the urban heat island effect.
Survey results (table below) revealed that, grey water production among households varied widely (high coefficient of variation - CV). Average per capita freshwater consumption was about 195 litter per day, and 82% of this quantity could be classified as grey water. Variability in grey water produced at various households may not constrain grey water treatment and reuse, but the levels of grey water production could. Based on this data, average households of eight occupants would produce approximately 1200 lpd, A significant source of grey water in Oman is the ablution water at mosques. Worshippers wash before each prayer and most mosques have ablution rooms with separate plumbing to drain water separately from black water.

	Laundry	Shower	Sink	Kitchen	Greywater	Blackwater	Garden	Cooking	Total
Mean	13	83	9	55	161	11	10	18	195
Std Dev.	13	51	8	53	90	11	5	14	103
C.V.	0.96	0.61	0.86	0.97	0.56	0.98	0.53	0.76	0.53

Table: Summary of greywater use estimates (l/person/day).

DEVELOPMENT PROCESS

SEASONAL FLOOD

CHECK DAM

- Catch the heavy rain

CISTERN UNDERGROUND

- Water will be restored and mitigated through those cisterns to cater for irrigation

VEGETATED TERRACING

- Productive landscape
- Economic promotion
- Enhance the community life
- Drip irrigation

GREEN HOUSE

- Located in greenhouse building
- Solar power saving energy
- Pipe below the gravel stone
- Filtered effluent

LIVING MACHINE

- Located outdoors
- Aggregated filled with aquatic vegetation
- No visible surface water
- BOD and TSS removal

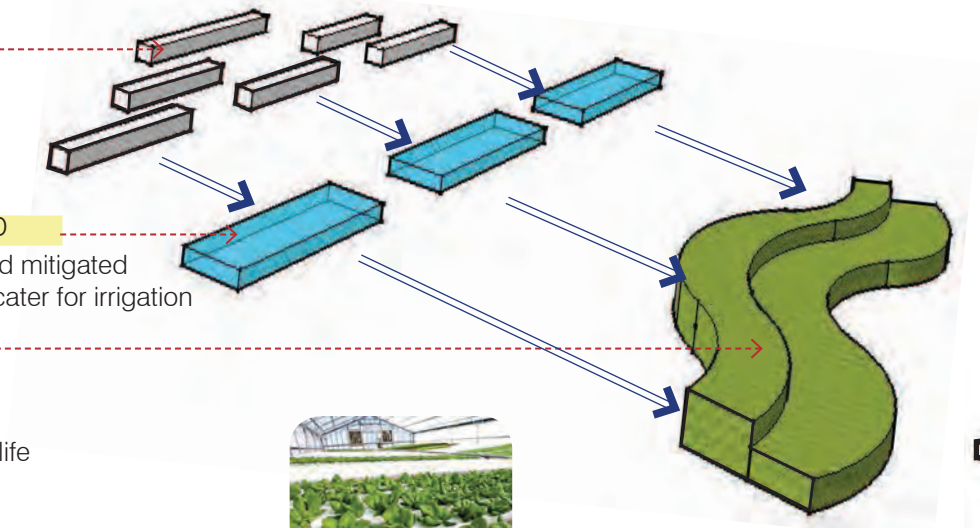
STORAGE ,DAILY GREY WATER TANK

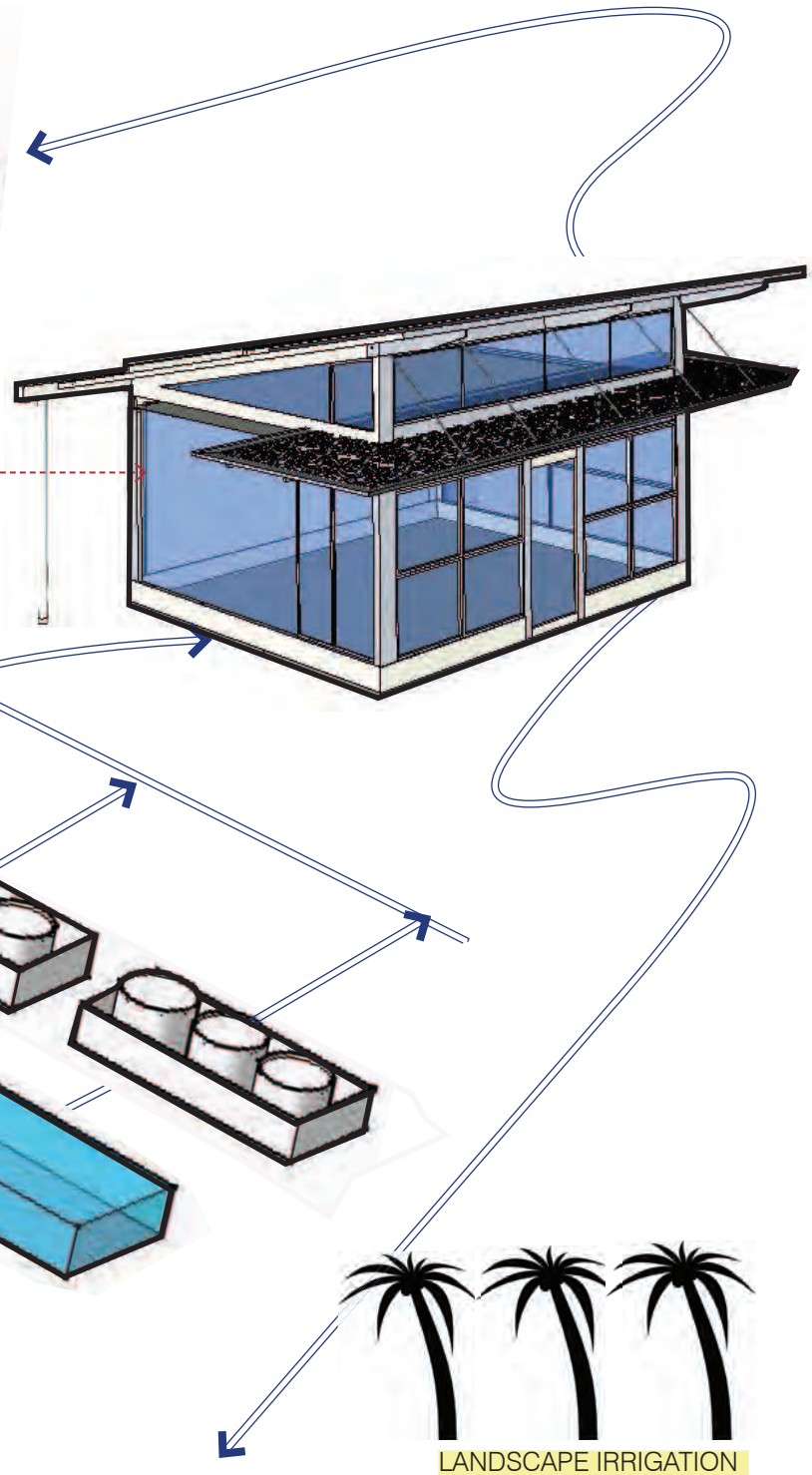
- Flow equalization
- Buried
- Concrete or plastic
- Solids settling
- Filtered effluent

DAILY GREY WATER

BLACK WATER

- Faucets
- Washing Machines
- Dishwashers
- Baths & showers
- Cooling condensate





LANDSCAPE IRRIGATION

WATER STRATEGIES

Canopy Trees

POMEGRANATE

BANANA TREE

DATE PALM TREE

Understory Plants

CORN

OATS

POTATO

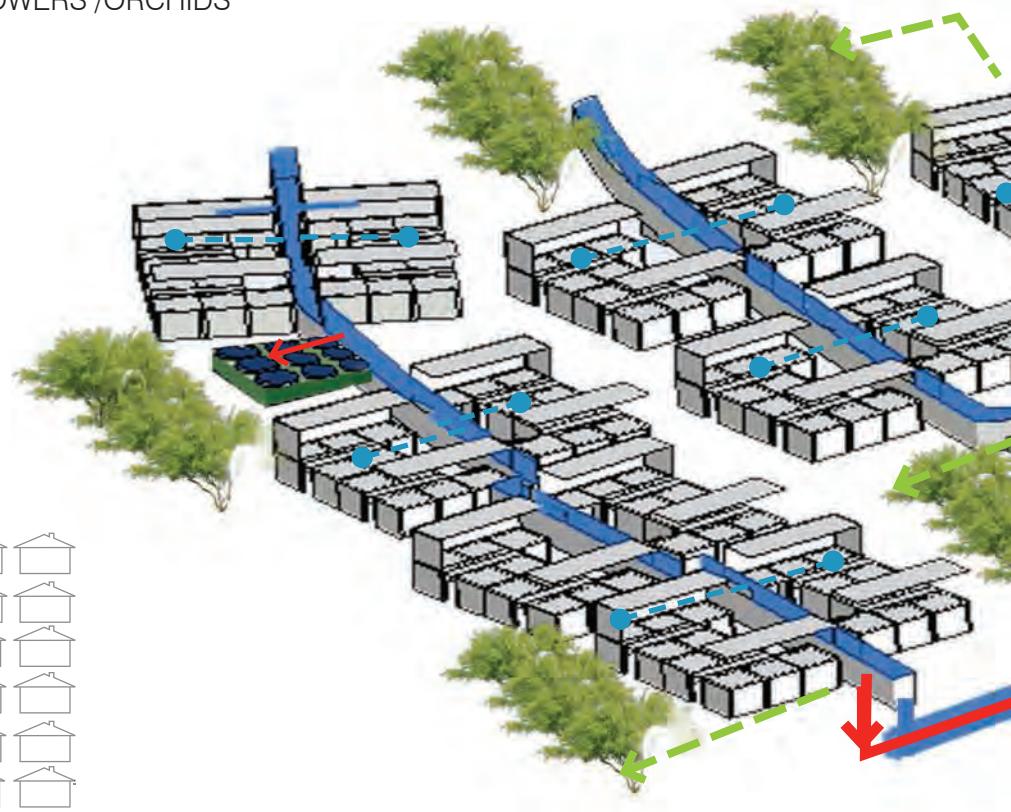
WATERMELON

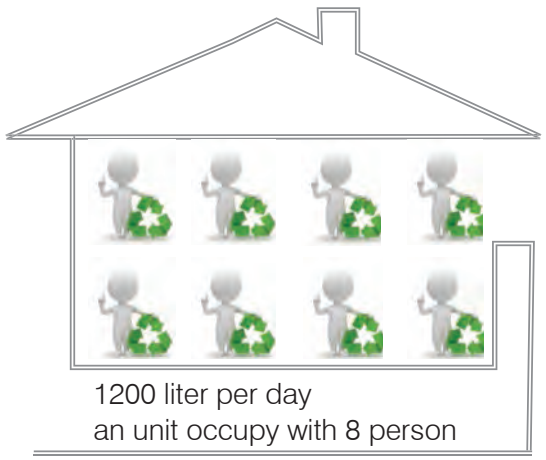
WINTER WHEAT

Green House Plants

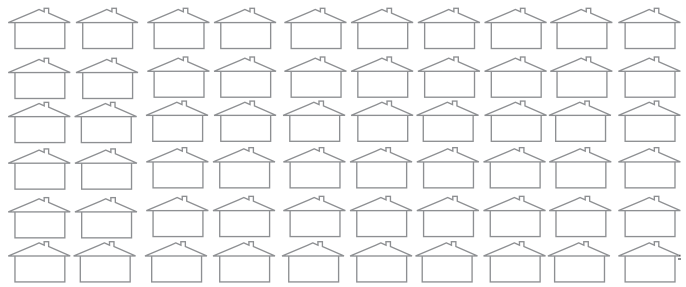
TOMATO

FLOWERS /ORCHIDS



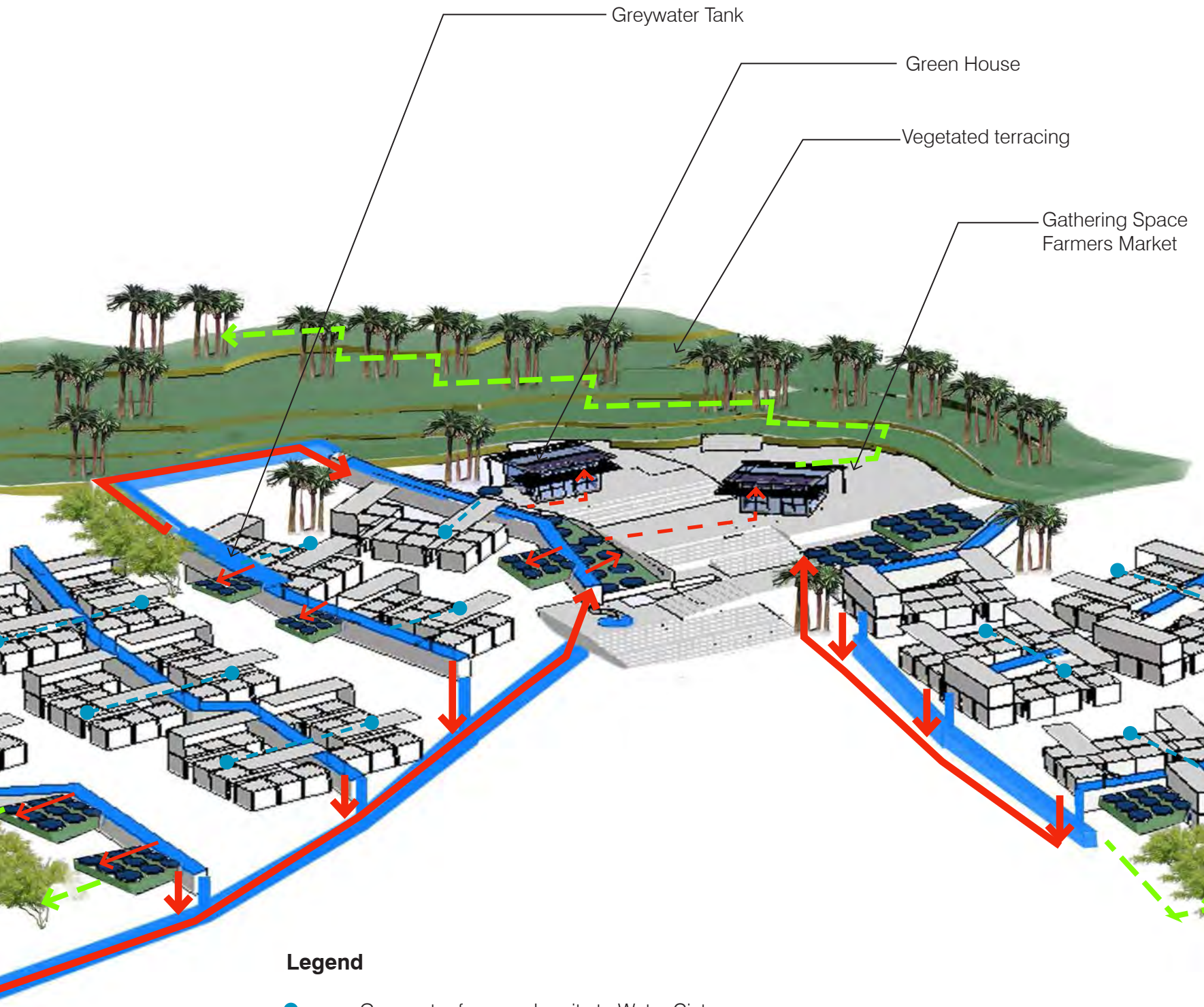


1200 liter per day
an unit occupy with 8 person



1200 X 60 =72000 liter per day

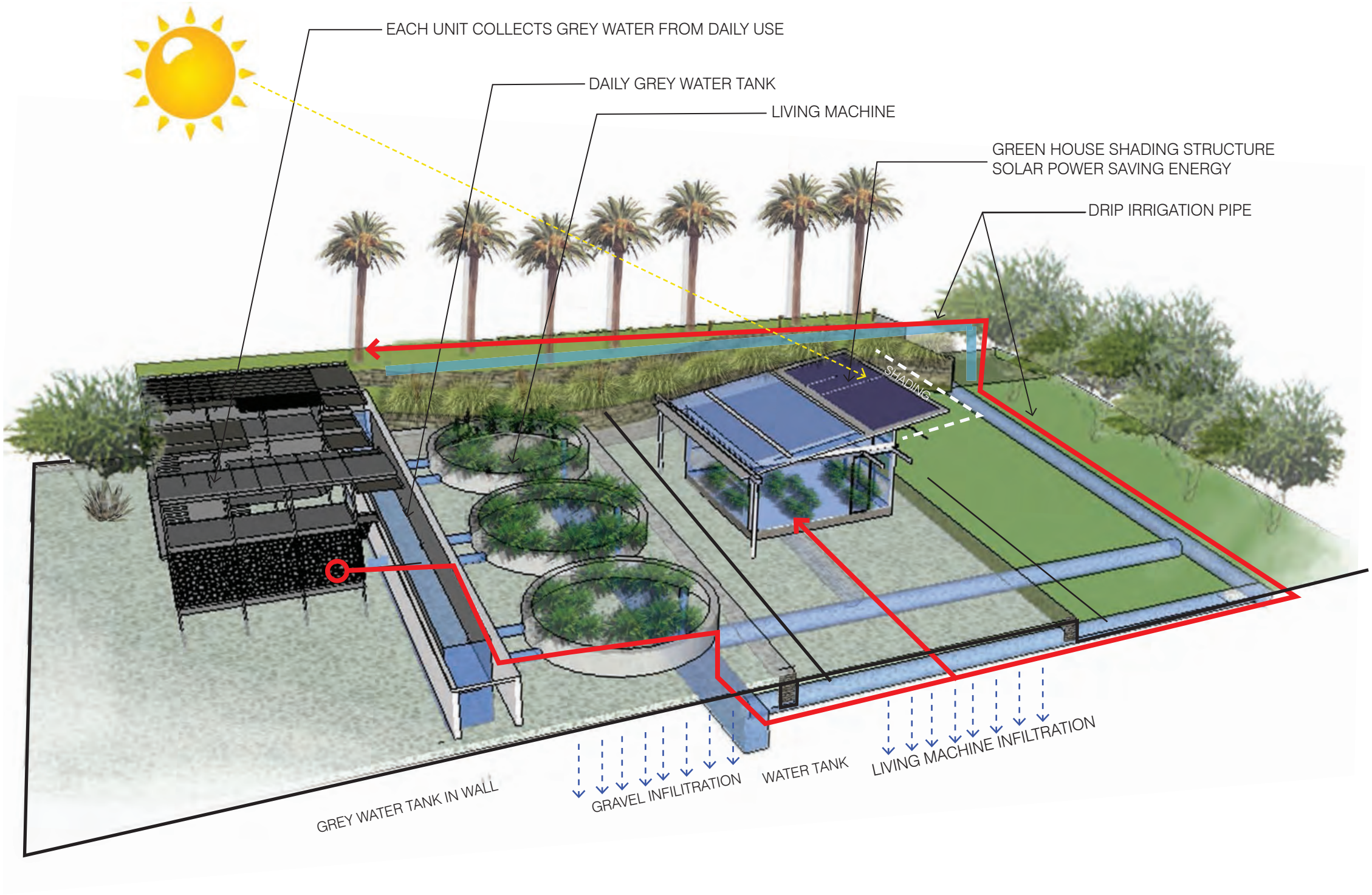
DEVELOPMENT PROCESS FOR A SAMPLE NEIGHBOURHOOD



Legend

- Grey water from each units to Water Cistern
- Grey water to Living Machine
- Water to Greenhouse
- Reused Grey water to Vegetated Terracing for irrigation

DEVELOPMENT PROCESS FOR A SAMPLE UNIT



The design process is to build a productive neighborhood implementing systems that mitigate rainwater and recycle waste water thereby increasing ecological services distributed throughout the community. Also, the project brings together the community as shared through farming production and recreational events. It is also significant that the community will generate an ecological habitat that enhances community activities. It could also become a space for an open farmers market.

Workforce

- Educational
- Volunteer
- Occupational

Food Grow

Food Destination

- Restaurant/ Commercial
- Local Food Bank
- Residential/ Community Use

Overview Urban Agriculture Benefits

Economic

- Employment, income generation and enterprise development
- The national agriculture sector
- Land-use economics.

Environment & Stainability

- Decreasing carbon footprint
- Enriched biodiversity, habitat for wildlife,
- Microclimate modification
- Reduced temperatures
- Increased humidity
- Improved air quality
- Reduces vulnerability to natural disasters
- Landscape enhancement
- Sense of well-being
- Sites for physical exercise
- Shade and shelter
- Noise reduction

Socially

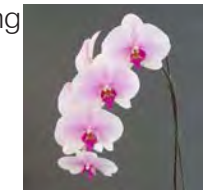
- Helps bring families and communities together by working toward a common goal that will be beneficial for all
- Creates better living environment by greening up the city and making it more productive
- Makes community self-reliant by putting their food security into their own hands, making them more independent and empowered
- Teaches people life skills such as how to be more self sufficient
- Educate people, who have been increasingly removed from food production, to participate in, and respect, its generation

It is clear the large impacts that transportation of food has on food cost and environmental degradation. The reduction of transportation can restructure the agricultural profits to allow farmers to earn a better living wage.
A productive community is one in which food is grown and sold within a city's limits, which has many potential economic, social and environment benefits .

These six urban farms and farmers markets are designed to be sustainable culturally and environmentally. Agricultural production is organic, energy is used efficiently, water is managed on site and waste is recycled. The market is envisioned as a place that serves the local community and aims to draw people from other neighborhoods of Al Hamriya as well as visitors from other areas.

Living Machine

Vegetated Terracing
Banana tree
Date palm tree
Pomegranate



Green house
Gourmet produce
and flowers

Seasonal Farmers Market


Vegetated terracing
Green House
Living Machine
Gathering Plaza
Grey water Tank

WATER STRATEGIES

APPENDICES

WORK CITED:

The great majority of the images in the book are from the team's own personal photos during our visit in Oman.

1) Chand, D., & Ali, M. (2003). Oasis of Oman, Livelihood systems at the crossroads. muscat: Al roya press & publishing house.

2) Damluji, S. S. (1991). The architecture of Oman. a yemen reailty garnet publishing.

3) Grand Bazaar, Istanbul. (n.d.). Retrieved from http://elenaclic.wordpress.com/tag/istanbul/Muscati, D. A. (1991). The sultanate of Oman/wetland. Muscat.

4) Shopping at the Grand Bazaar. (n.d.). Retrieved from http://www.business-with-turkey.com/tourist-guide/bazaar.shtml

5) Jensen, R.A.C. & Saim, R.V. (1992b). Coastal birds in the Sultanate of Oman. IUCN Coastal Zone Management Project, Sultanate of Oman. Unpublished report to the Ministry of Commerce and Industry, Oman.

6) Saim, R.V. (1986). Wildlife of the Capital Area Coastal Environment, Oman.Unpublished report. 26 pp.

7) Anon. (1989). Tourism and Recreation Facilities for Mughsayl. Planning Committee for Development and Environment in the Governorate of Dhofar, Oman.

8)EVALUATION ON THE EFFECTS OF CLIMATE CHANGES AND IMPLEMENTED POLICIES ON MODERN MUSCAT CITY-OMAN, Cemal INCERUH, PhD ,Sultan Qaboos University ,Department of Civil & Architecture Engineering Muscat, Oman

9) Innovative Stormwater Management Practices, General Descriptions Source: CVC & TRCA Low Impact Development Stormwater Management Planning and Design Guide (2010) unless otherwise stated.http://www.iswm.ca/technologies.php

10) OVERCOMING CONSTRAINTS IN TREATED , GREYWATER REUSE IN OMAN SA Prathapar, Department of Soils, Water & Agricultural Engineering, Sultan Qaboos University, Al Khod, Oman

11) Katz, P. 1994. The new urbanism: towards an architecture of community. New York: McGraw-hill,inc.

12) Pazwash, Hormoz. Structural Storm Water Management Systems. Urban Storm Water Management. Boca

13) urban agriculture. (n.d.). Retrieved from http://sidewalksprouts.wordpress.com/ua/

14) Delaware Wetlands. (n.d.). Retrieved from http://www.dnrec.delaware.gov/admin/delawarewetlands/pages/delawarewetlandsconservationstrategy.aspx

15) eco friend. (n.d.). Retrieved from http://www.ecofriend.com/living-machine-nature-helps-out-big-time-in-hydro-clean-up.html

16) livingmachines. (n.d.). Retrieved from http://www.livingmachines.com/Home.aspx

17)sonoraninstitute. (n.d.). Retrieved from http://sonoraninstitute.org/

18) Wild.india. “Indian Roller.” Flickr. Yahoo!, 22 Dec. 2008. Web. 09 Sep. 2012.

19) “Green Bee-eater.” Wikipedia. Wikimedia Foundation, 12 Sept. 2012. Web. 09 Sept. 2012.

20) Brocken Inaglory,”Green turtle swimming over coral reefs in Kona” Photo, http://en.wikipedia.org/wiki/Green_sea_turtlegalleries/72157622617937734/

21) Luc Viatour, “Upupa epops 1” Photo,www.Lucnix.be

22) ”Phoenix dactylifera1” Photo, http://en.wikipedia.org/wiki/File:Phoenix_dactylifera1.jpg

23) Hobb, Frank and Nicole Stoops 2002 Demographic Trends in the 20th Century U.S. Census Bureau.Census 2000 Special Reports. Series CENSR-4

24) alansab wetlands. (n.d.). Retrieved from http://www.haya.com.om/AlAnsabWetland.aspx

25) Qunli National Urban Wetland, china. (n.d.). Retrieved from http://www.duanlianru.cn/eshownews.asp?id=186

26) Shibam in Yemen . (n.d.). Retrieved from http://whc.unesco.org/en/list/192

27) Sustainable underpass:. (n.d.). Retrieved from http://inhabitat.com/tag/underpass/

28) Wadi Hanifa Wetlands. (n.d.). Retrieved from http://www.akdn.org/architecture/project.asp?id=2258

PLANT PALETTE

When choosing plant material for the site the most appropriate selection is to use native species that are adapted to the harsh climate that is found in Oman. The team specifically looked at plants that occur in the drier regions of Oman and plants that occur naturally in the dry river beds known as Wadis. These plants have adapted to the heat and lack of moisture so they will perform without the extra care that non-native plants may need. The trees that have been chosen will provide the much needed shade that is lacking in the area, and the shrubs and groundcover will provide a lush, aesthetic quality for the area. The large shade trees will provide a stunning visual element in the area and help reflect the identity of Al Hamriya. The landscape treatment that was used helps give a feeling of unity to Al Hamriya, giving an overall sense of place for the residents.

Delonix regia

Washingtonia filifera

Ziziphus spina-christi

Pennisetum setaceum

Plants used listed by lantin name:

Ephedra pachclada

Delonix elata

Delonix regia

Pennisetum setaceum

Phoenix dactylifera

Prosopis cineraria

Scheinfurthii papilionacea

Washingtonia filifera

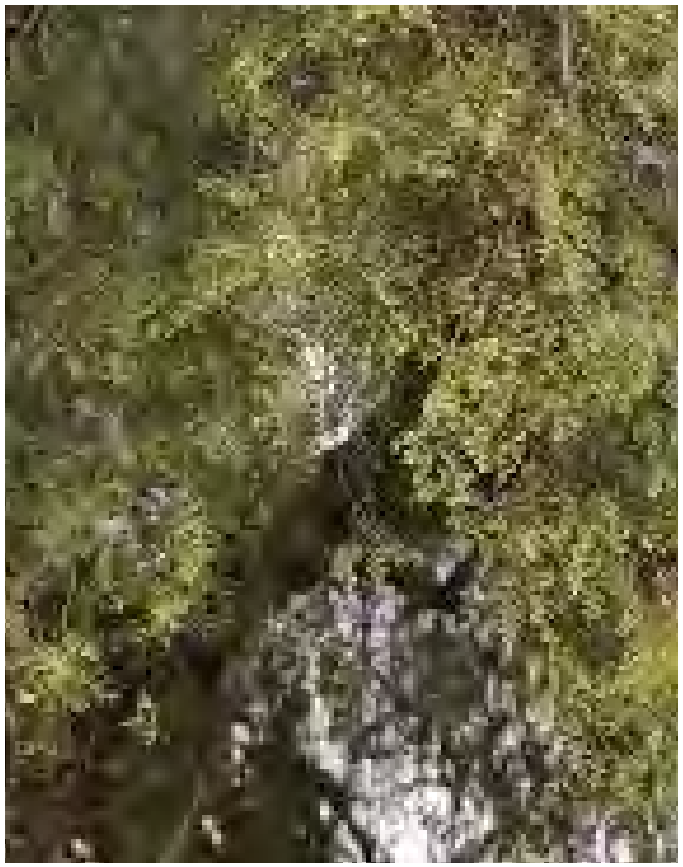
Ziziphus spina-christi

Phoenix dactylifera

Delonix elata

Ephedra pachclada

Scheinfurthii papilionacea



Prosopis cineraria