

Park Park

Fabric Landscape

Landscape Systems Give Form to Architecture



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Abstract

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Today, throughout the world, we are in the midst of a man-made environmental crisis. We must change how we consume and affect natural resources on the planet if we are to retain its richness of landscapes and biodiversity. It is our job as landscape architects to lead the way in changing the human relationship to natural resource consumption and building.

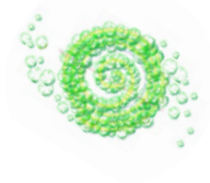
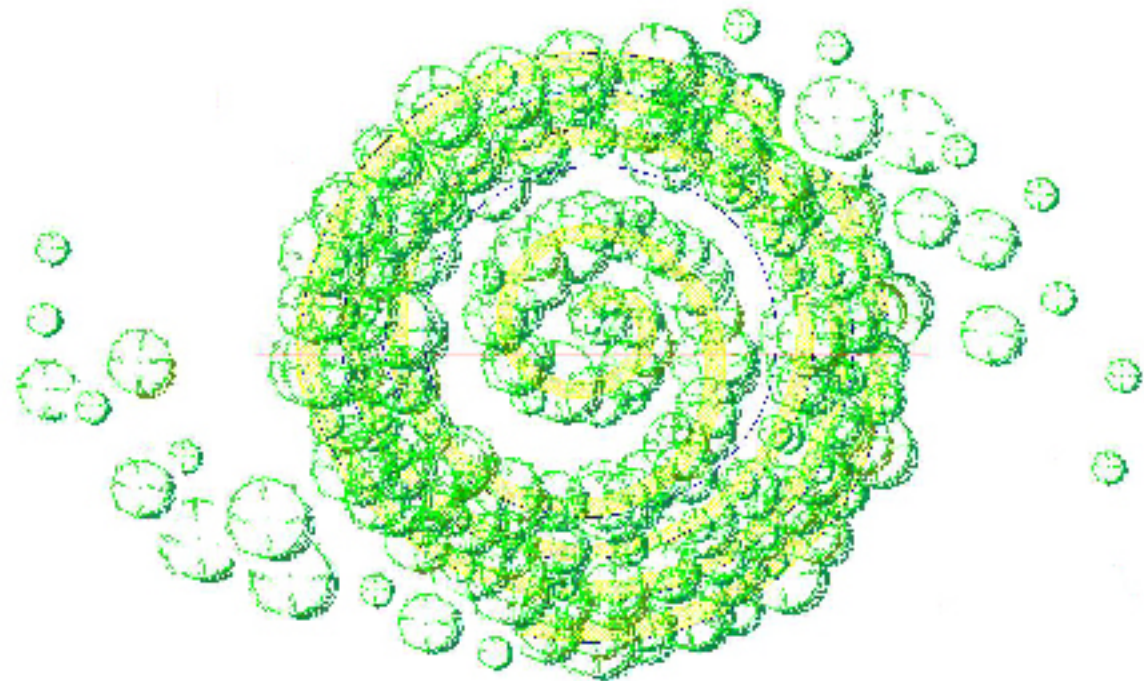
My thesis asks the question, how can an understanding of landscape as a system give form to architecture? In natural systems nothing is wasted, everything is interconnected and self-sufficient at the same time. How can we model our buildings -- our built landscapes -- after nature? Three natural systems are key components to modeling nature: water, vegetation and energy.

The landscapes that we have constructed for cars exemplify the problems we have ecologically. Cars produce greenhouse gases creating global warming. Highways and parking lots denude the vegetative habitat and lead to excessive water runoff polluting the watersheds. Solving the car problem goes a long way to setting an example for ultimately resolving ecological development issues. Cars are both the epitome of freedom and environmental degradation. Joni Mitchell put it eloquently with "they paved paradise put up a parking lot." My studio project is a mixed use parking facility fabricating the natural systems of water, energy and vegetation in order to mitigate environmental problems as well as resolve the practical necessity of where to put cars in crowded urban centers. Park Park puts the paradise back into the pavement.



Dedication

I dedicate this work to life, family & friends...for a better world.



Park Park

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Park Park

Introduction

“The goal is not less impact, but more-life supporting structures that leave a big, positive ecological footprint: more habitat, more clean water, more fresh air, more pleasure, more beauty, more biological and cultural diversity, more fun”

~Michael Braungart

Like skin protects the body or clothing protects the skin, landscape protects the planet. Our goal should be to weave the natural protective landscape back into our built environments. This means we should aim for a sustainable, complete balanced interaction of landscape and architecture, a symbiosis of land and constructed forms, the full interconnectedness of artificial and natural systems. Buildings and nature should be designed and constructed integrally and not as separate entities. Central to a healthy ecology in our modern urban landscape is reapplying the natural systems: vegetative, hydraulic, and energy systems we have too often mistakenly stripped away. This construct for architectural building is here defined as fabric landscapes.

My goal is to construct a building that is self-sufficient, one that is part of an integral sustainable fabric landscape. The idea is that economic and ecological welfare hinge on self-sufficient systems (integral with nature and architectural sustainability.) Self-sufficiency begins at the (micro) individual and home level and expands to include (macro) communities, cities, and countries. The most basic needs of self-sufficiency are water, energy and food. If we design this way in the United States, for example we wouldn't have quite the extreme devastation of property and individuals in need as happened during Hurricane Katrina in New Orleans. A sustainable household would have its own energy source and water source. During a disaster within each given area someone would have power, and someone else would have clean water available in order to immediately help others. Sustainably built urban environments work with natural storm buffer systems, such as preserving coastal marshes in order to mitigate storm damage.



The more we can do for ourselves, the more empowered we are, and the freer we become as individuals, communities, cities, and nations. Independence through self-sufficiency of resources is a vital construct and approach to solving our ecological and economic problems today world wide. This construct of sufficient/interdependence is a model based on nature. Nature is a tapestry of interwoven systems. Everything is connected yet provides as much as possible for its own independence and survival. Animal and vegetative species within a given geographical area utilize and adapt to the vicinities available resources. One species' waste is another species' required treasure. The scarab or dung beetle in Egypt has from the beginning of this ancient civilization, represented life and renewal. The beetle takes animal scatological waste and creates a nourishing home where new life springs forth, as its babies emerge. Nothing is wasted. The more we rely on outside help, the more we are depleting the finite resources of the planet.

The key question is: how can an understanding of the landscape as a system give form to architecture? How can new building construction integrate a water hydraulic system into all development, and how do we integrate energy, solar or wind, agricultural and vegetative habitat systems successfully into architecture?

The construct for this systems methodology I am calling 'fabric landscape.' The idea is that the landscape is the fabric, which is then draped over our built up concrete cities. It conjures the idea of fabrication just as buildings are fabricated; fabrications of landscapes integral with built environments. Fabric systems work with nature to create self-sufficient, economically thriving, safe, healthy, enlivening, rich landscapes.

- *Self sufficient* — run on independent energy sources, provide water needs, and possibly food supplies, vegetative ecosystem needs as well.
- *Economical* — providing own energy and water needs reduces costs (dollars, as well as costs of environmental resources)
- *Safety* — security in autonomy, self-reliance. Not harming the environment today and securing nature, resources and diversity of species for the future.
- *Health* — providing healthy environments for people as well as natural ecosystems. Living sustainably with the planet and its finite resources for future species as well as human development.

Park Park project is a parking facility that incorporates the fabric landscape systems of water, vegetation and energy. It is a high density mixed use facility, maximizing land use economically while balancing ecosystem needs. It is both parking lot and park. It is for cars, people, practicality and paradise.

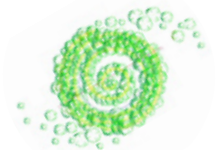
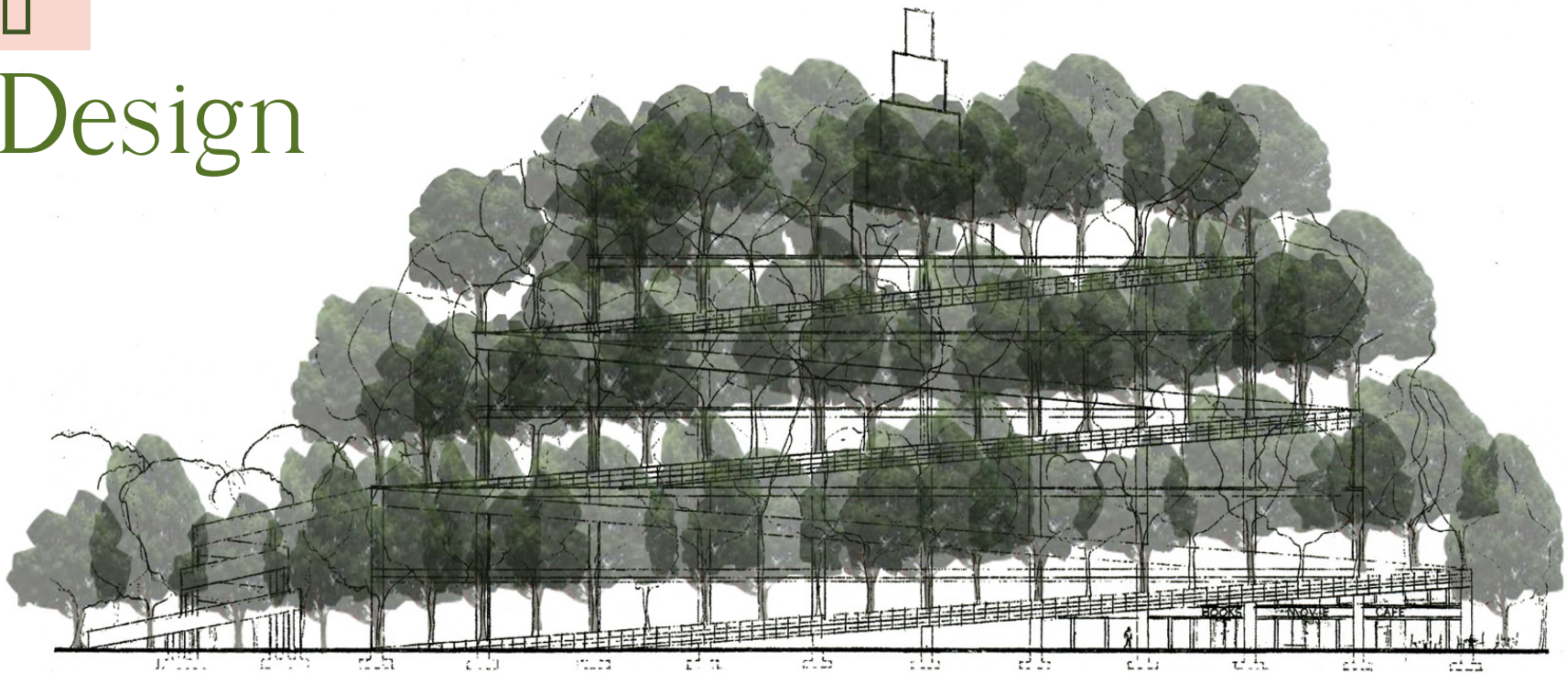


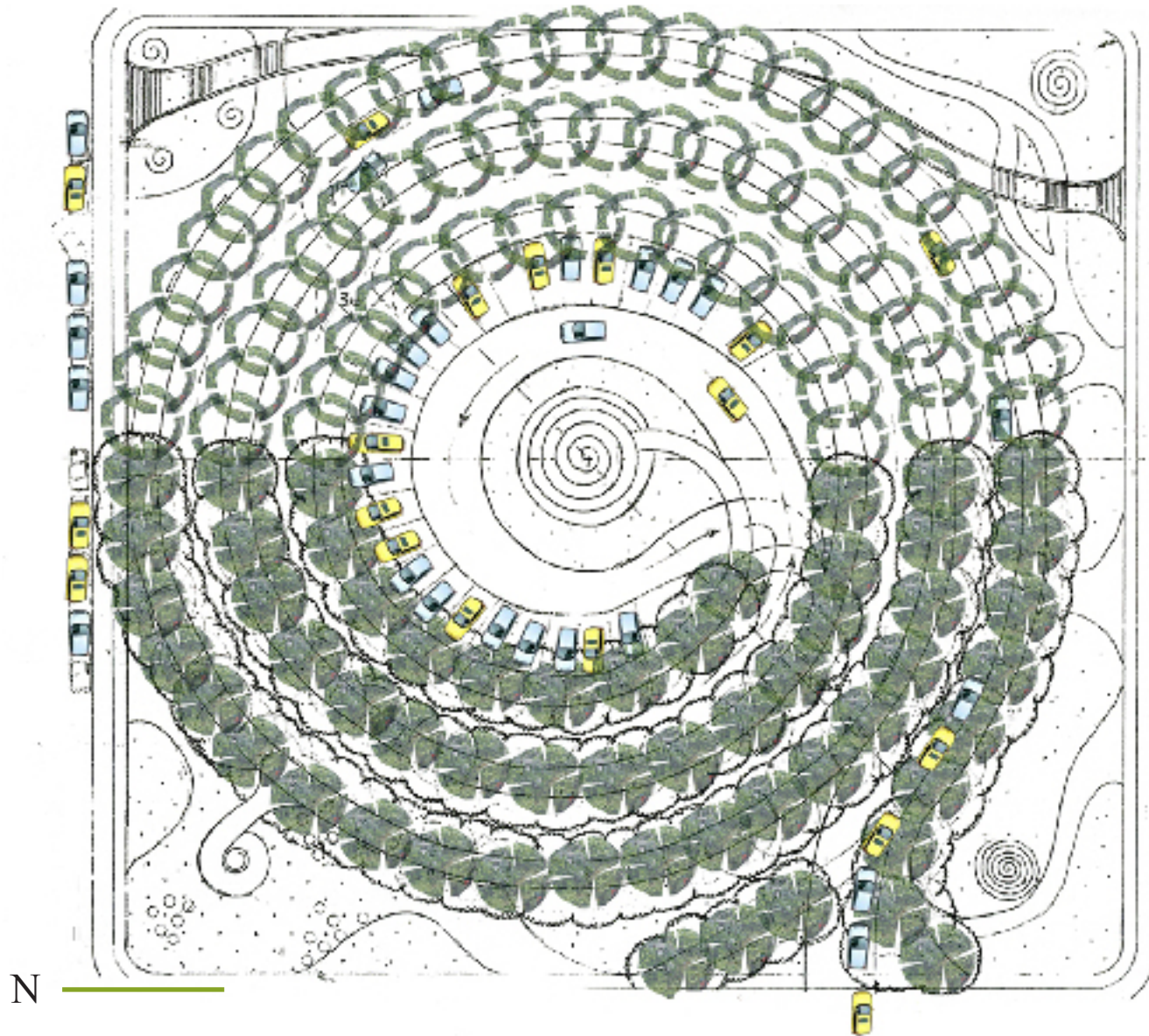
Park Park

Chapter One



Design





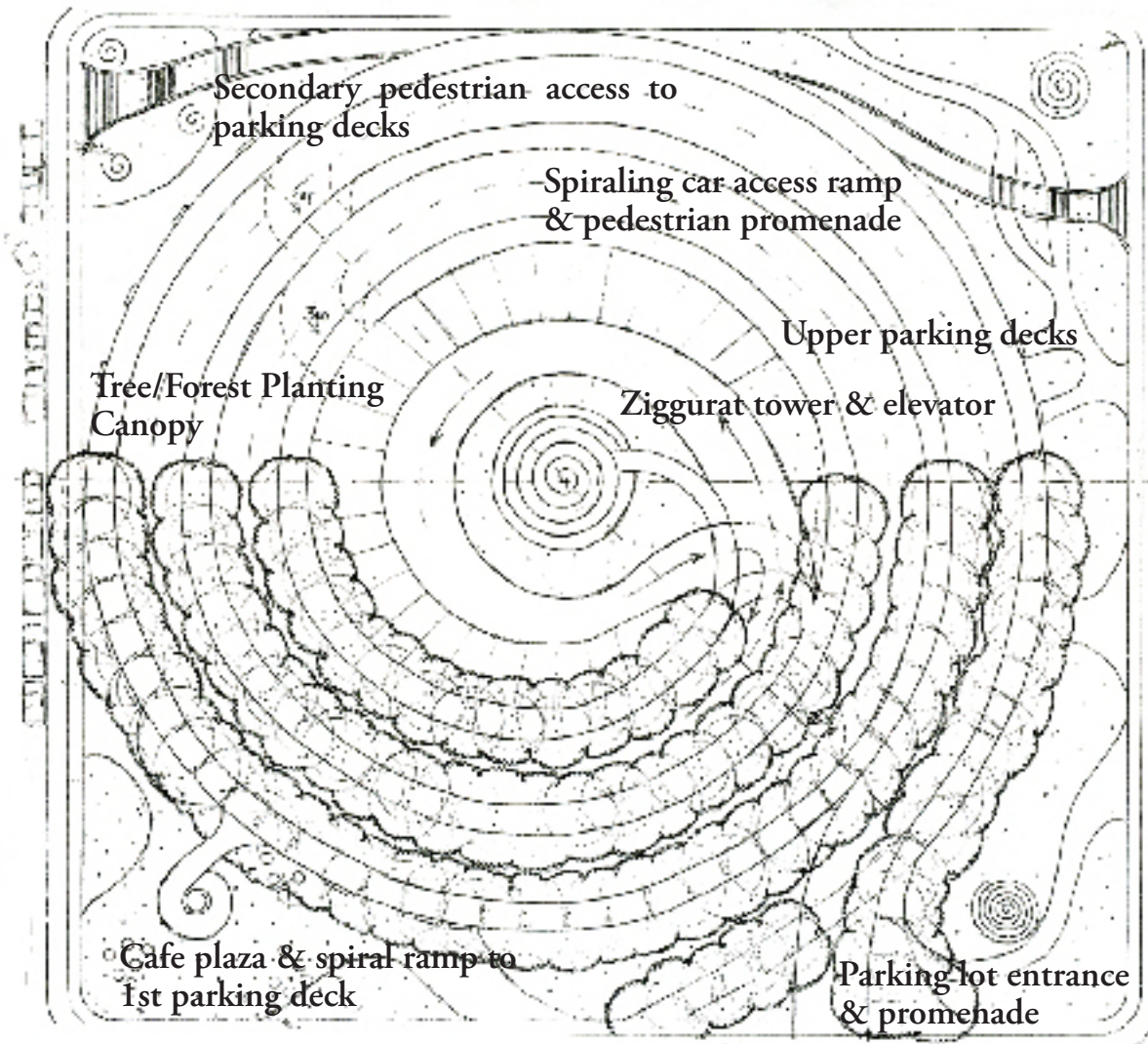
Plan View Illustrative



Park Park is a spiralling ziggurat shaped parking and mixed use structure that is draped with a forest of trees and forest pallet of plantings. A double allée of trees leads the outer promenade path from street level to the pinnacle feature with a ziggurat viewing tower at the top. The ground level is a pedestrian-scaled mixed use development of shops, cafe, plazas and businesses. The second through fifth floors are parking decks.

Water, vegetation and energy are incorporated into the design modeled after natural systems.





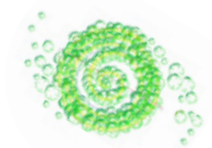
Plan View



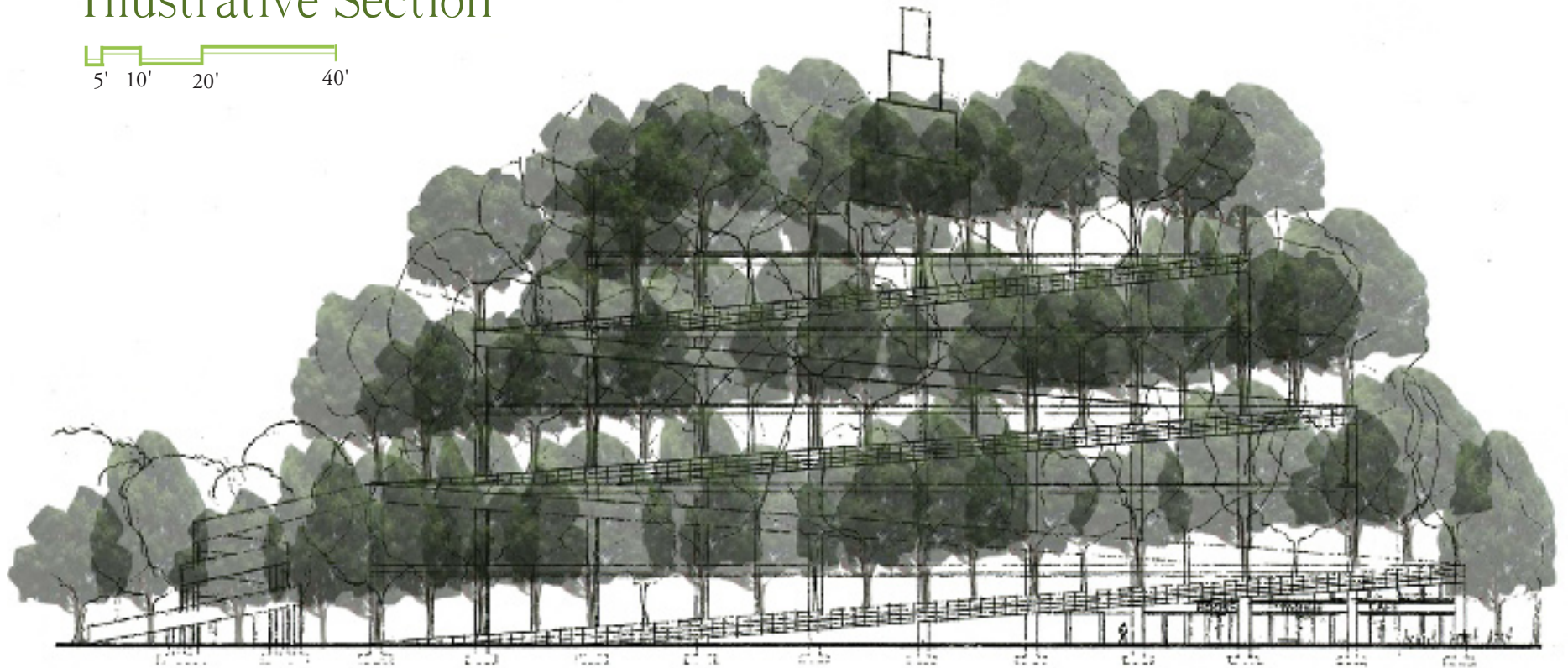
Integrating water, vegetation and energy systems into architecture is not 'rocket science.' It is a re-layering of the natural fabric we have too often mistakenly stripped away. Technology today provides the means for these systems layers to be integrated with modern building operating systems. Just as we learned through Darwin that life is in constant evolution, fabric landscapes systems of water, vegetation and energy are a natural evolution to architecture and building today.

The planting canopy is a diverse palette of more than 150 possible Eastern seaboard forest plants. Because of the plant diversity, the building orientation is not crucial to a thriving vegetative system.

N

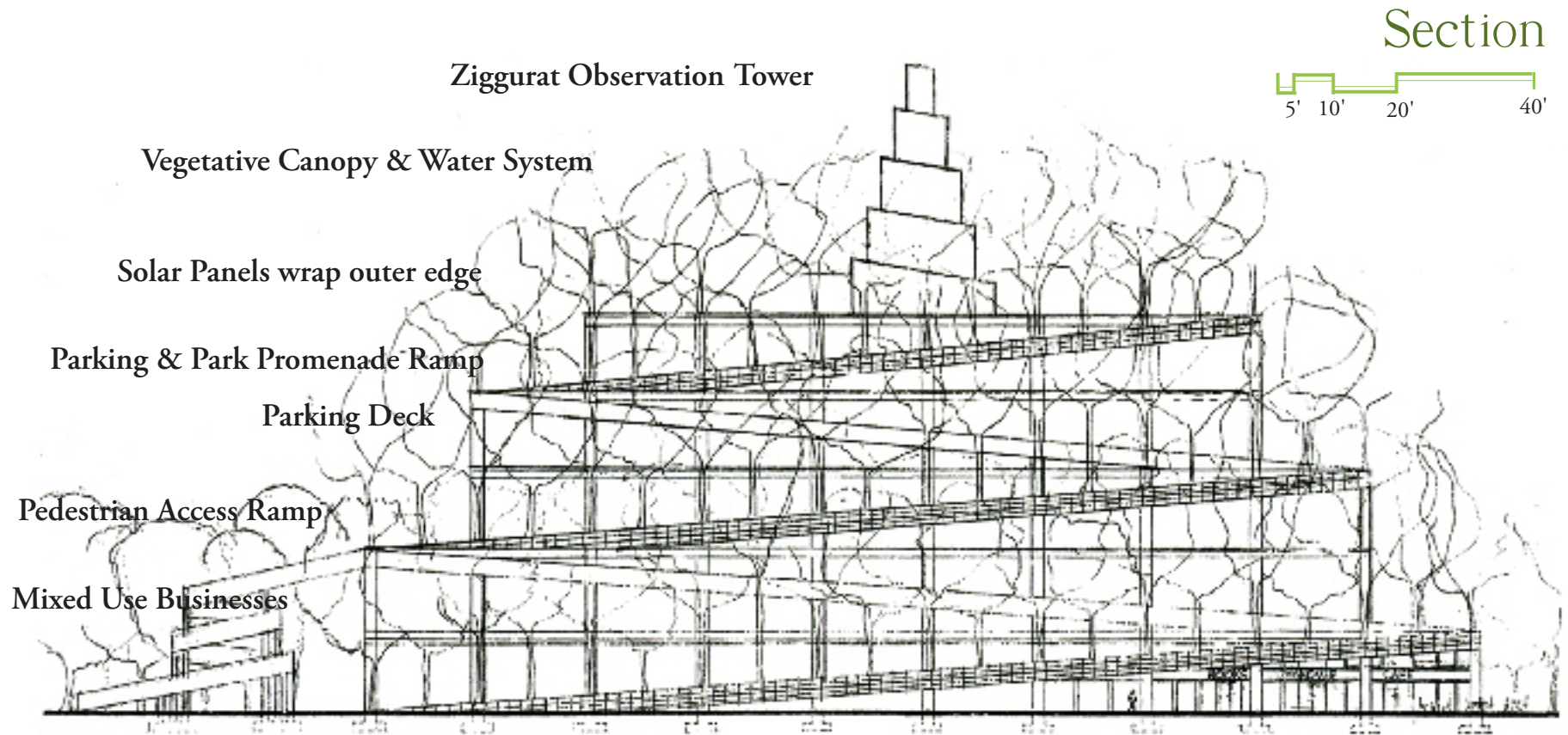


Illustrative Section



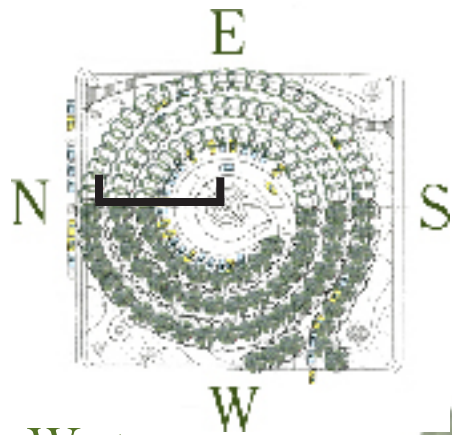
None of the construction causes water runoff. All of the water hitting the structure from rain fall is filtered first through the vegetation then through the porous paved and planted surfaces. After filtration, water is captured in cisterns for re-use, overflow is released (after filtration) into the sewer system. The outer edge is wrapped in solar panels providing electric energy. Thermal energy is used for heating and cooling.





Park Park is a spiral shaped building 300 feet in diameter, . The ground floor is occupied by businesses such as a movie theater, cafe, food co-op, as well as private business offices. The 2nd through 4th floors are parking decks. The 5th floor culminates in a park setting with ziggurat viewing tower, more parking and elevator core.





Vegetation

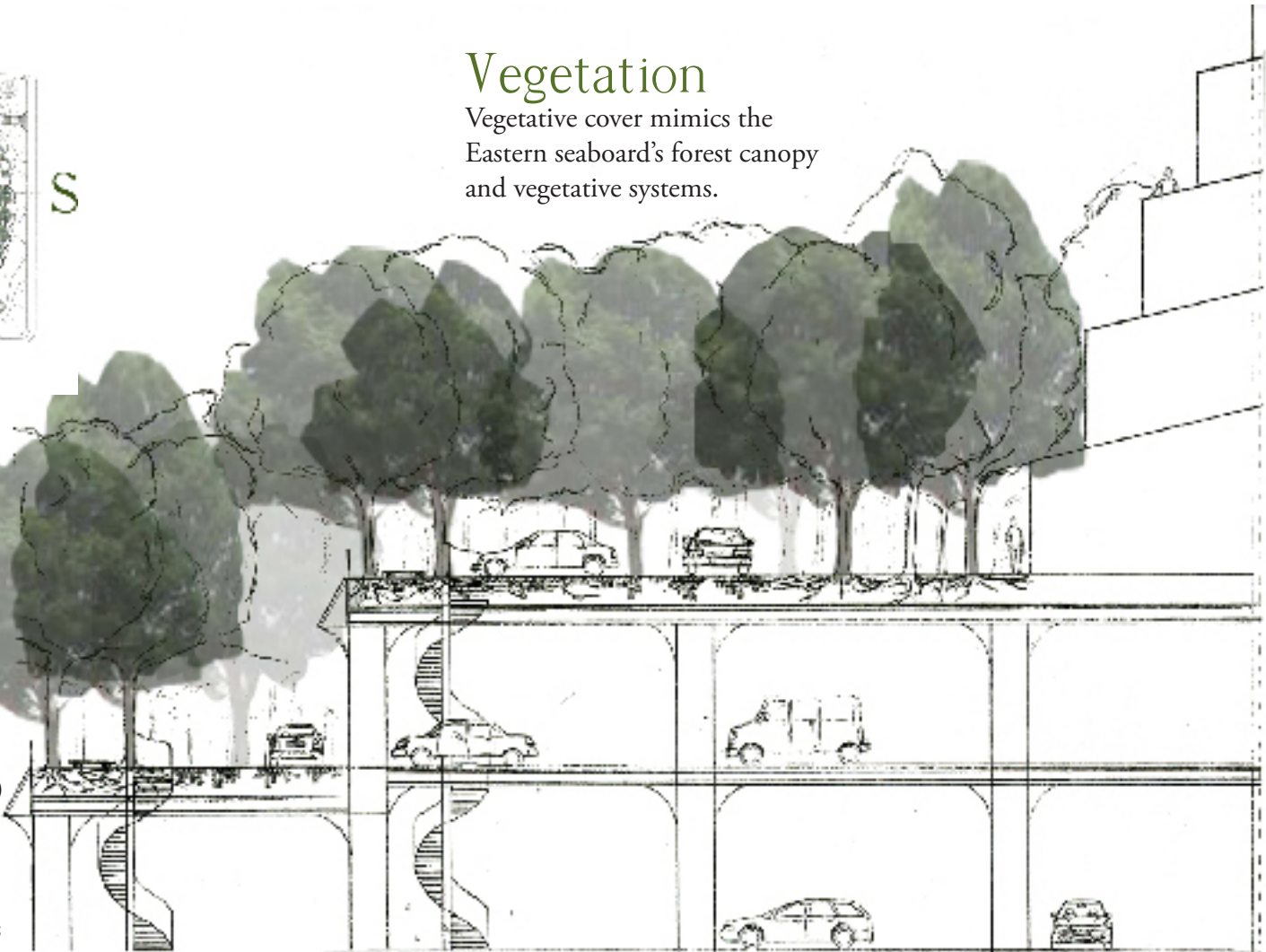
Vegetative cover mimics the Eastern seaboard's forest canopy and vegetative systems.

Water

The porous paved and planted promenade replicate the natural water system by water infiltration and capture water in cisterns as in natural water shed systems.

Energy

Solar panels (photovoltaics) wrap the entire outer promenade building edge providing self-sufficient energy systems, just as trees are entirely wrapped in solar collectors.

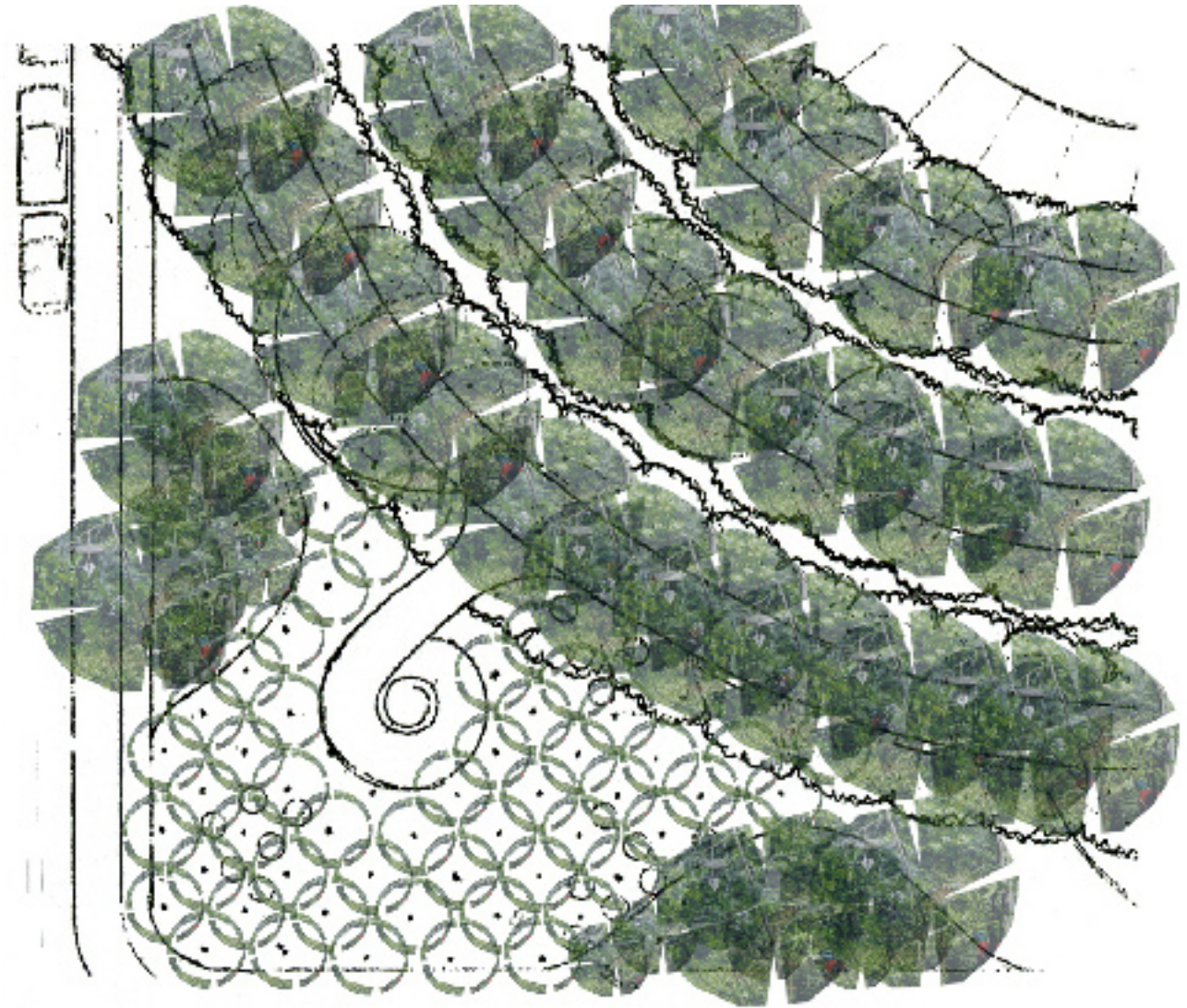


Section





This corner plaza is the main public facing entry to the Park Park complex. The plaza serves the convention center, museum goers and tourists as well as local residents and commuting residents from the metro system. An outdoor/indoor cafe fills the plaza with tables and chairs. The plaza is planted with a grid of iron wood trees, American Hornbeam *Carpinus caroliniana*.

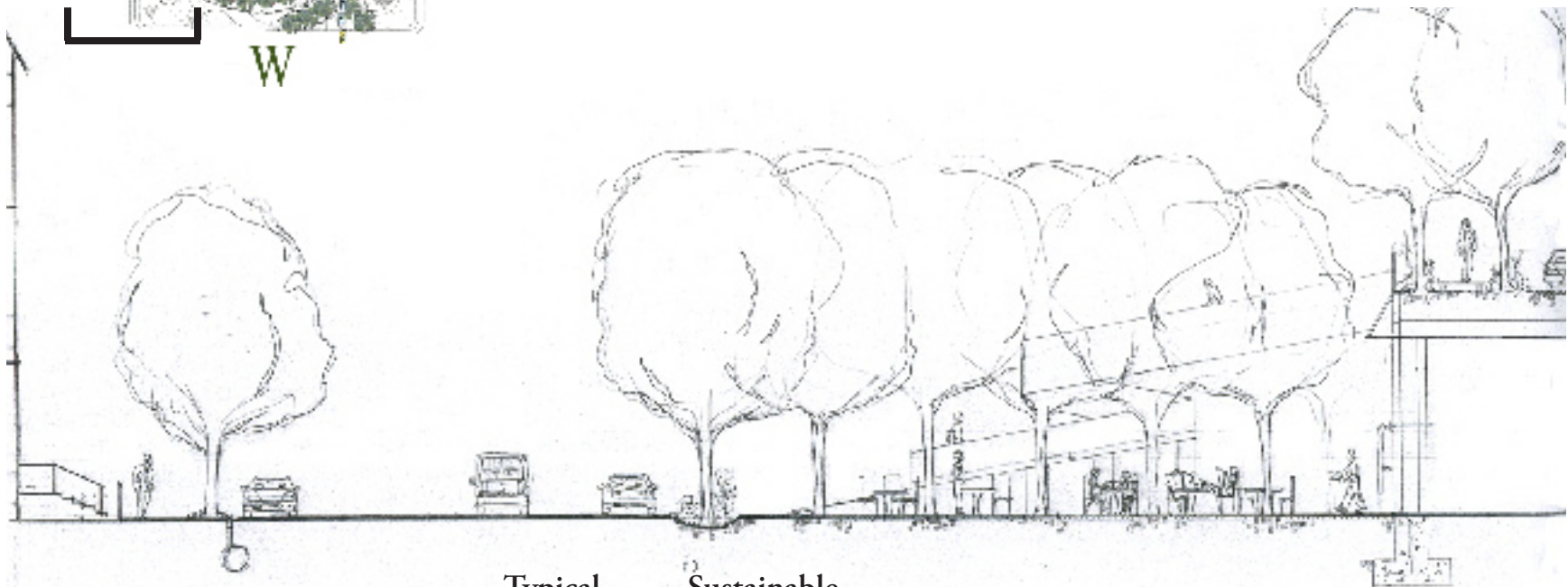


Illustrative Plan View Main Plaza





Section Main Plaza



Typical

Side walk, tree box & sewer drain channels the water runoff from the buildings into the sewer, in turn polluting the watershed.

Sustainable

Porous sidewalk, tree bed and plaza drain and filter water to reservoirs and then filters overflow to sewer drain pipe. Public access ramp/spiral to first parking deck. Cafe & mixed use business occupy the street level.



Section



The eastern corner delineates business/public space and the playground facing the private apartment living space.

This elevation demonstrates the sustainable porous park plaza and traditional sidewalk tree box and sewer drain.

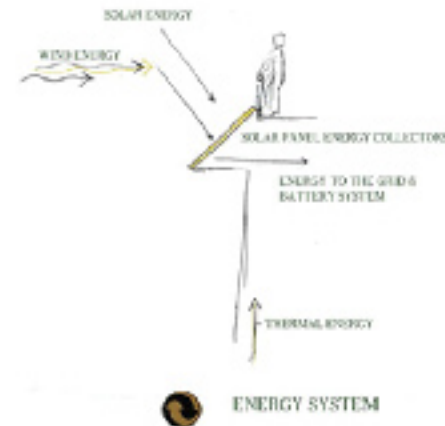
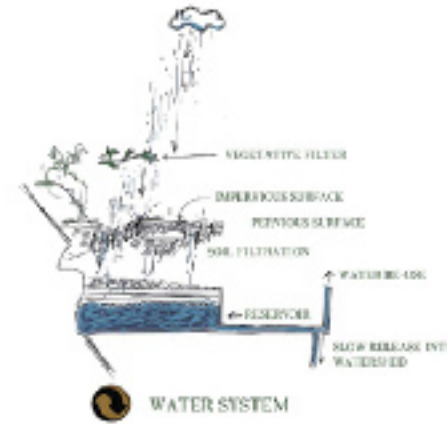


Park Park

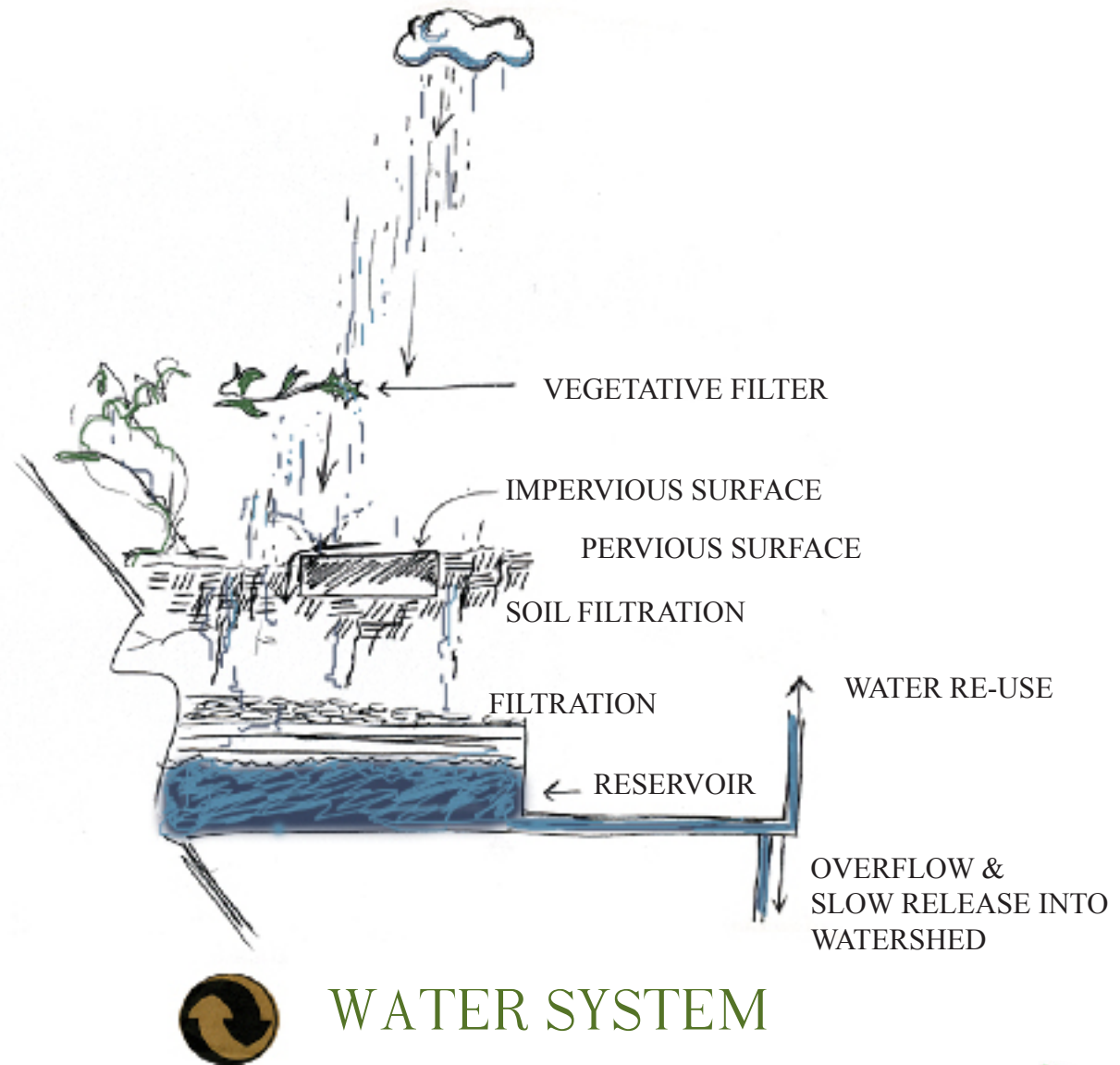
Chapter Two

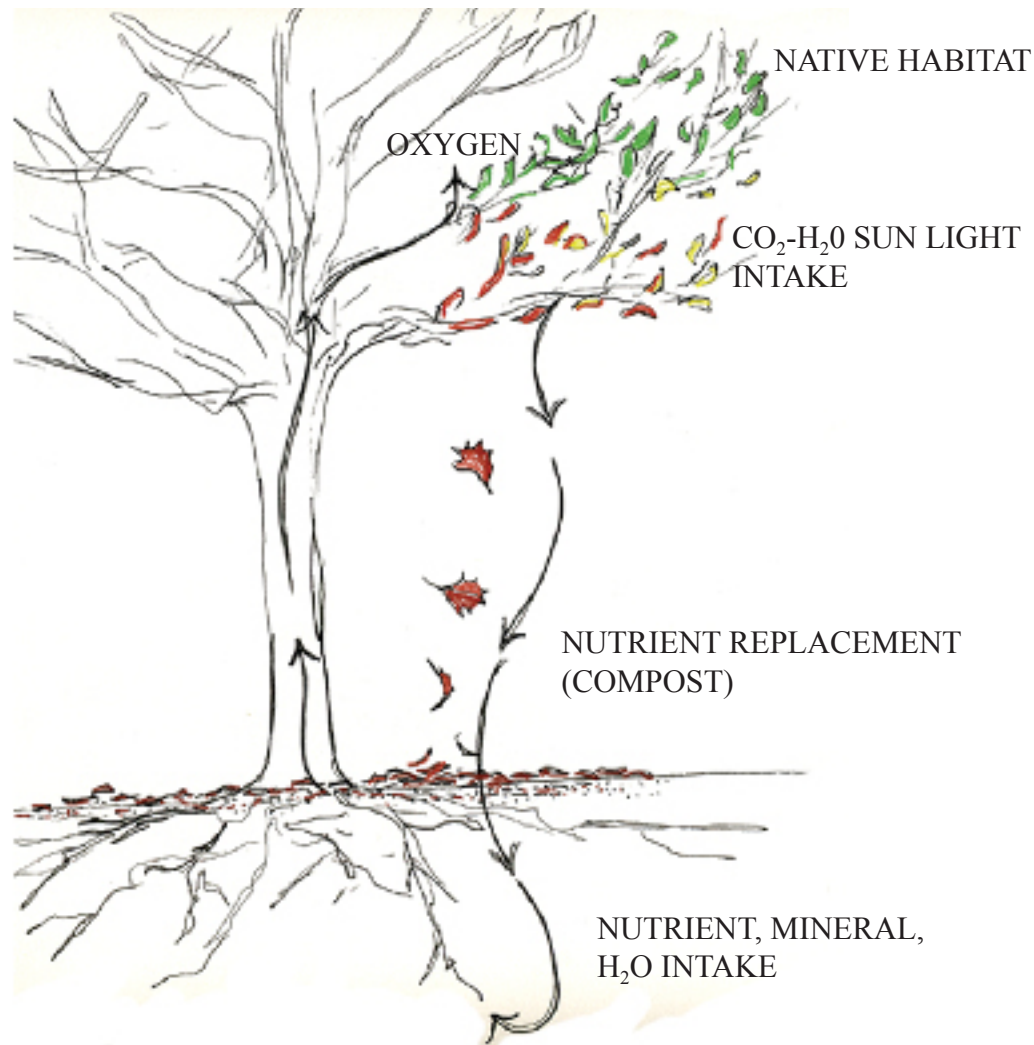


Landscape Systems



Any building construction creates a displacement of natural water systems. The sustainable self-sufficient system is two-fold. The first part reduces the amount of displacement to begin with by maintaining vegetative coverage and infiltrating water that is displaced. The second part is capturing the remaining water that has been displaced and releasing it back into the soil at whatever the normal rate is for that geographic climate. The captured water can be used in many ways contributing to a self-sufficient supply of water for the building.





When we think of the vegetative cycle systems as the services and products it provides, we can better understand the processes as systems and begin to incorporate them into the fabric of our buildings, communities and cities.

Natural systems sometimes called “green infrastructure” by which is meant the forests, wetlands and streams, etc. provide these ‘eco-services’:

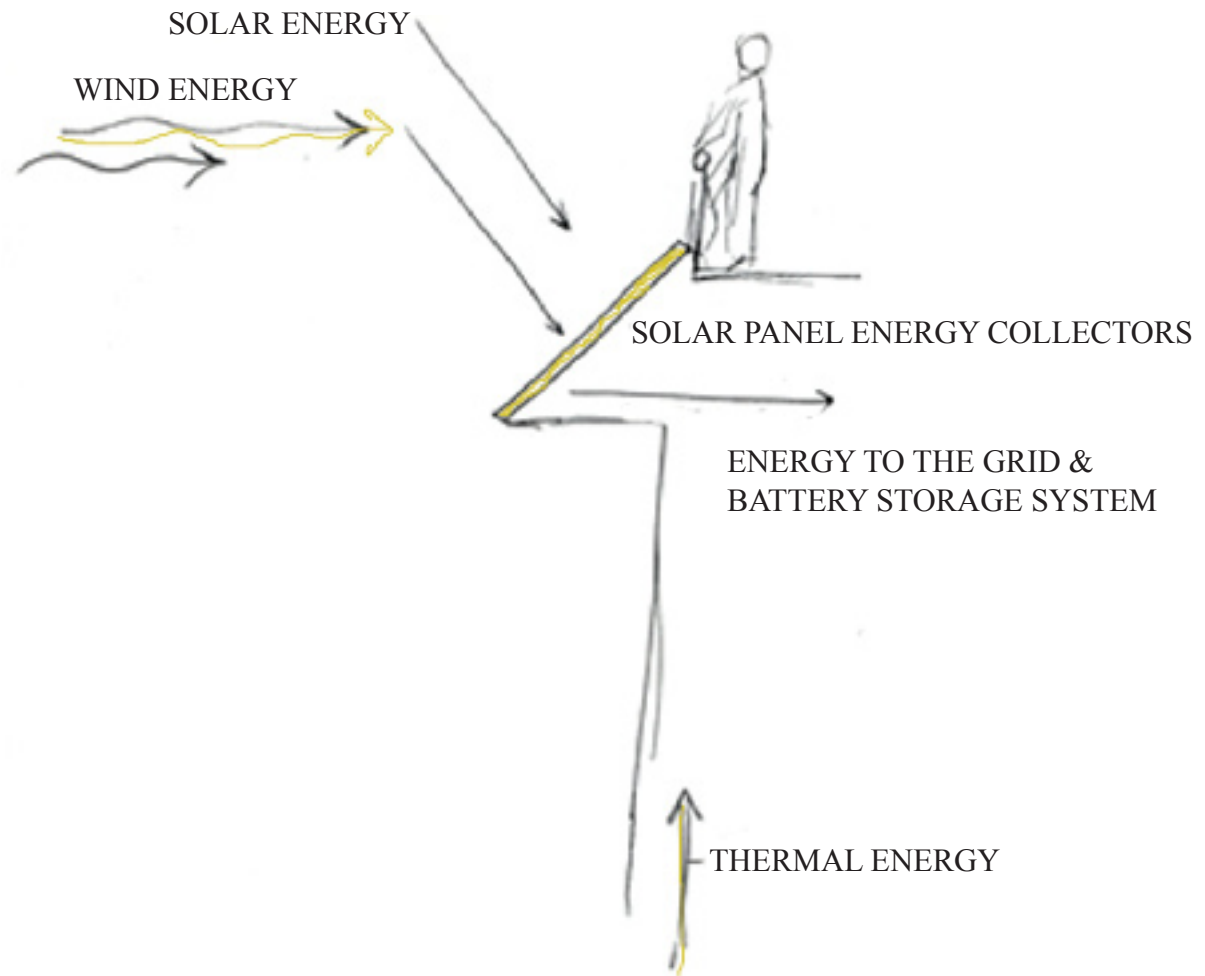
- Air-cleaning
- Water-filtering and cooling
- Goods-forests, woods, medicine,
- Food
- Energy
- Recreation, wildlife
- Storing and cycling nutrients
- Conserving and generating soils
- Pollinating crops
- Regulating climate
- Storm protection



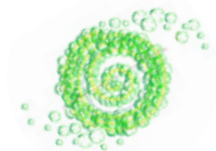
VEGETATIVE SYSTEM

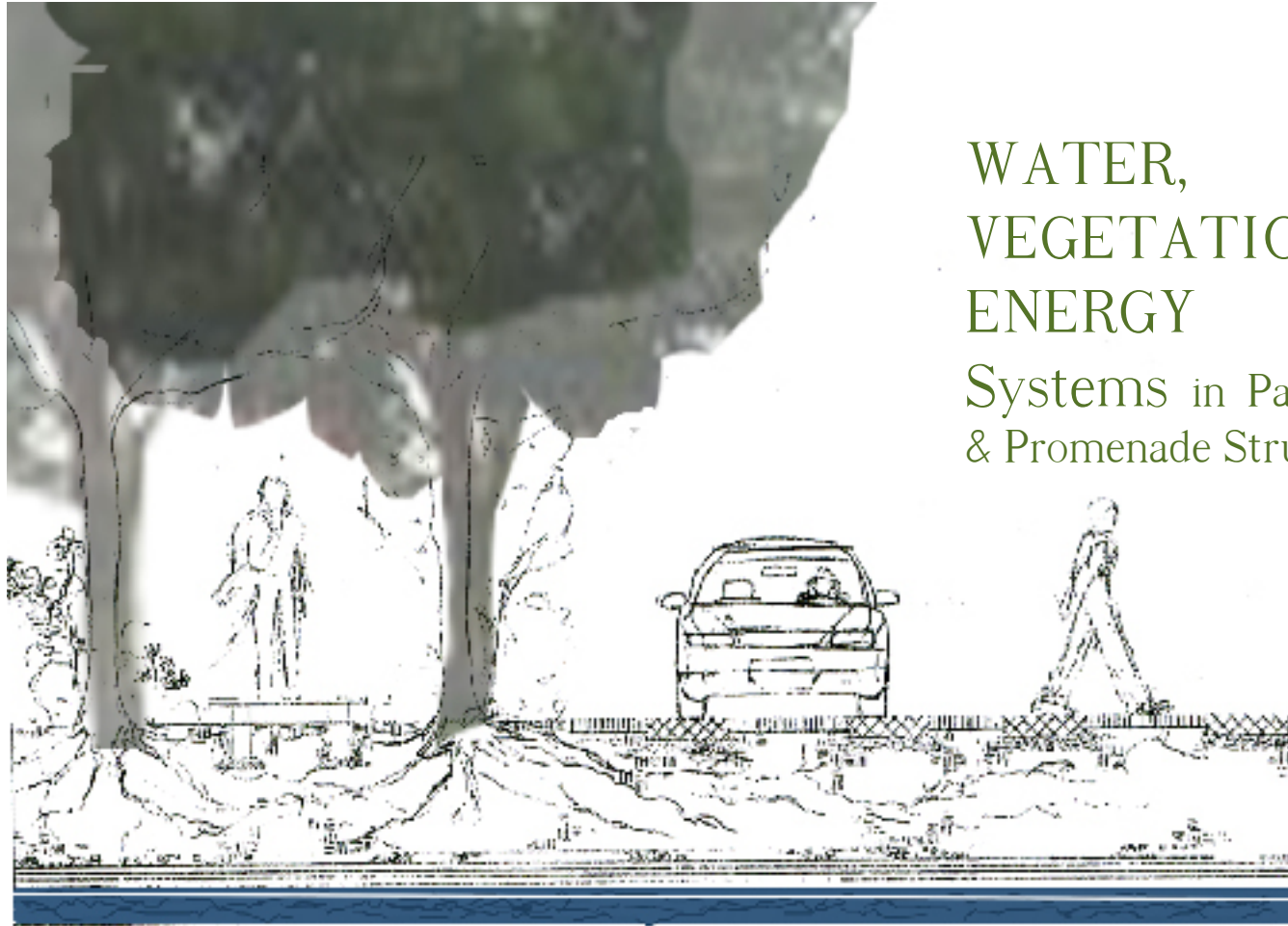


Sustainable development is built from materials that are recycled and recyclable. The way the resource is produced, mined and manufactured must be accomplished with minimal pollution or degradation to the environment. Local materials are used whenever possible. Shipping materials are kept to a minimum in order to reduce energy output and pollution during transport. All materials used impose the least possible environmental harm in their extraction, manufacture and shipping and use. Materials utilize modular building techniques, prefabricated, which allow on-site assembly without polluting the site environment. The building functions as self-sufficiently as possible. It runs off its own energy sources by the collection and storage of solar, wind and thermal energy. Light fresh air and breezes naturally permeate, heating and cooling the building.



ENERGY SYSTEM





WATER, VEGETATION & ENERGY

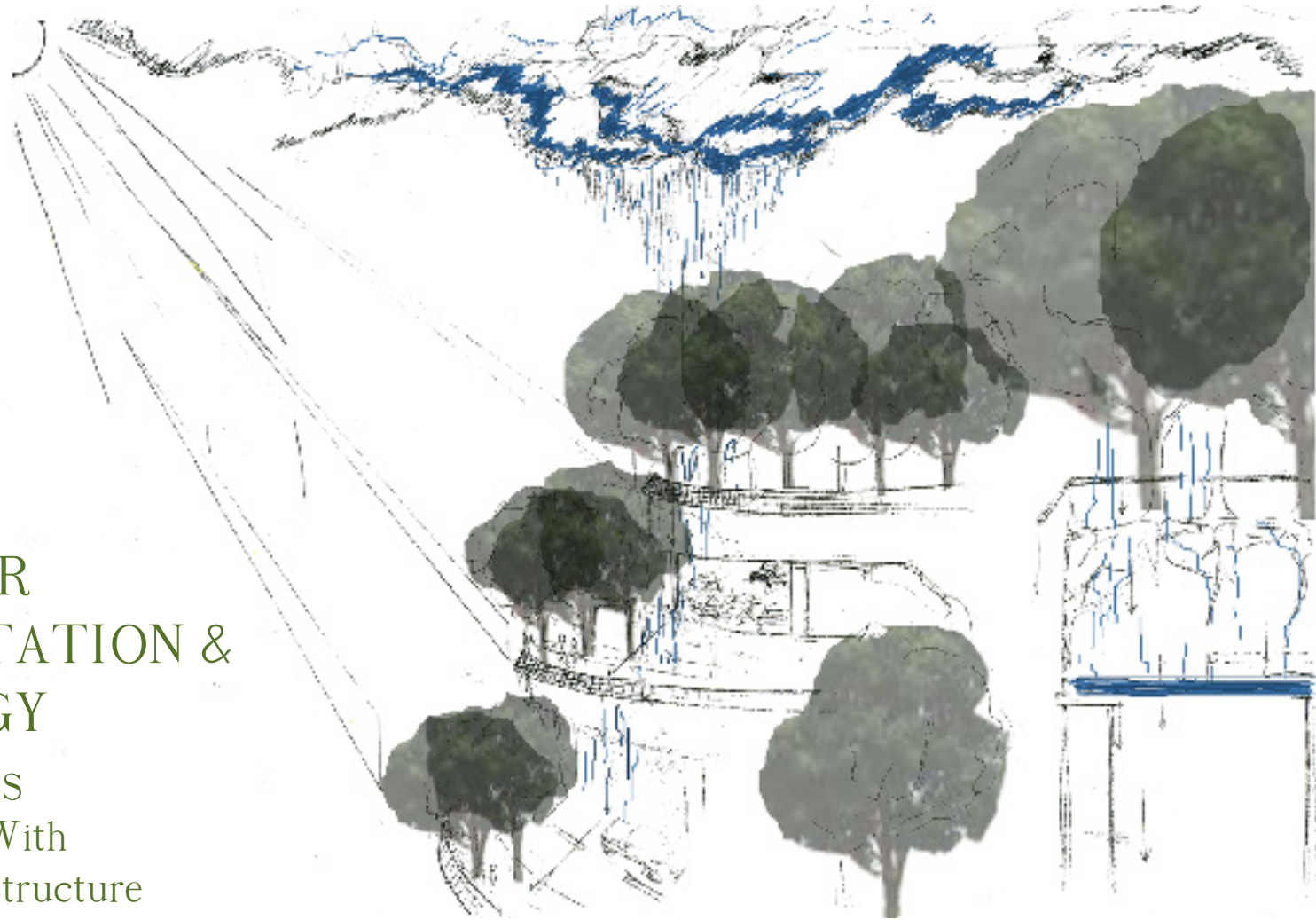
Systems in Parking Ramp
& Promenade Structure

- Porous Paving
- Soil
- Aggregate-Filters
- Water Cistern
- Water Proofing

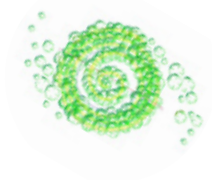
Section



WATER
VEGETATION &
ENERGY
Systems
Integral With
Parking Structure

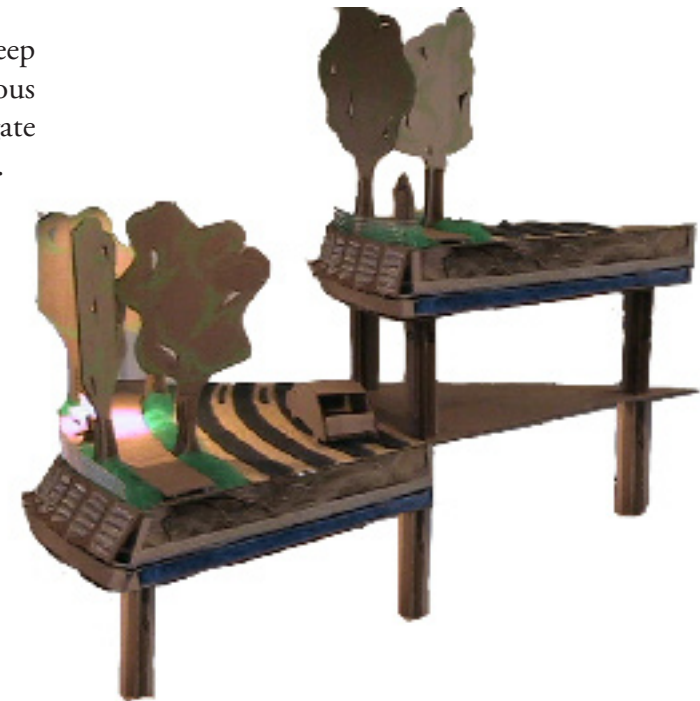


Illustrative



MODEL VIEWS OF WATER VEGETATION & ENERGY SYSTEMS

This model depicts the 5' deep outer system surface. Porous top layer, 3' soil layer, aggregate filter, filter fabrics and cistern.



ENERGY

Solar panels wrap the outer edge of the structure as it spirals up. Thermal systems provide heating and cooling for indoor spaces.



WATER

The outer top surface is faced in porous materials which allow for water infiltration, filtration and capture in cisterns before re-use and being released into the sewer system and water shed.



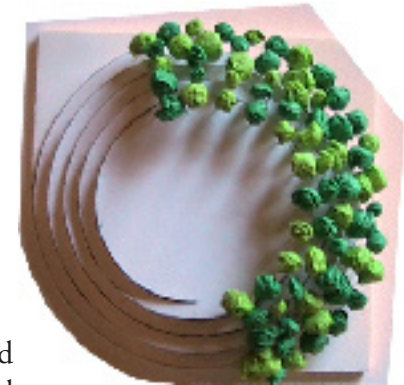
MODEL VIEW

Continued



VEGETATION

3 ft. deep soil planting beds reach 30 ft. across and wrap in one long extended bed from the ground plane to the top parking deck and ziggurat tower. The planting bed itself is 14 ft. wide. A 4 ft. wide raised boardwalk floats above the planting bed to avoid soil compaction by foot traffic. The vegetative canopy acts as a filter for pollutants from cars as well as filtering rain water.



The vegetation plant palette is comprised of over 125 possible woodland plants. This diverse plant palette closely mimics diverse natural vegetative systems.



VEGETATION SYSTEM

FOREST PALETTE

The American Woodland Garden

By Rick Darke

Acer-Maple Tree

Aconitum-Wolfs Bane

Actaea-Buttercup Family

Aesculus-Tree

Agastache

Allium

Amelanchier-Serviceberry Tree

Anemone

Aquilegia

Aralia

Arisaema

Aristolichia-Pipe Vine

Aronia

Aruncus

Asarum

Asclepias

Asimina-Paw Paw Tree

Aster

Astilbe

Betula-Birch Tree

Caltha

Calycanthus

Campanula

Carpinus-Ironwood Tree

Caulophyllum

Ceanothus

Cercis-Redbud Tree

Chionanthus-Fringe Tree

Chrysogonum

Cimicifuga-Black Cohash

Claytonia

Clethra

Clintonia

Cornus-Dogwood Tree

Cotinus

Crataegus-Hawthorn Tree

Cryilla-Tree

Delphinium

Dentaria

Dicentra

Dioscorea

Diospyros

Diphylleia

Dirca

Echinacea-Coneflower

Erythronium

Euonymus americanus-Native bush

Eupatorium

Fagus-Beech Tree

Ferns

Fothergilla-shrub

Fraxinus-Ash Tree

Galax

Gentiana

Geranium-Perennial Wild Geraniums

Gillenia

Grasses, Sedges, and Wood-rushes

Gymnocladus-Coffee tree

Halesia

Hamamelis-Witch Hazel

Henchera

Hexastylis

Houstonia

Hydrangea-Oakleaf

Hydrastis

Ilex-Holly

Iris

Isopyrum

Itea-Virginia Sweetspire

Jeffersonia

Juniperus

Kalmia

Leucothoe

Lilium-Day lily



VEGETATION SYSTEM

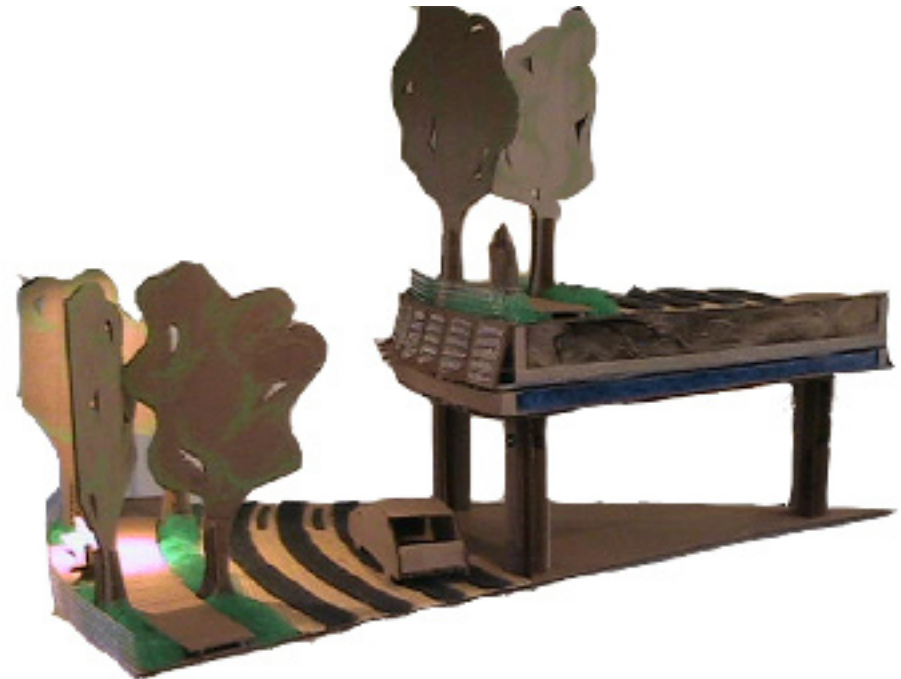
FOREST PALETTE

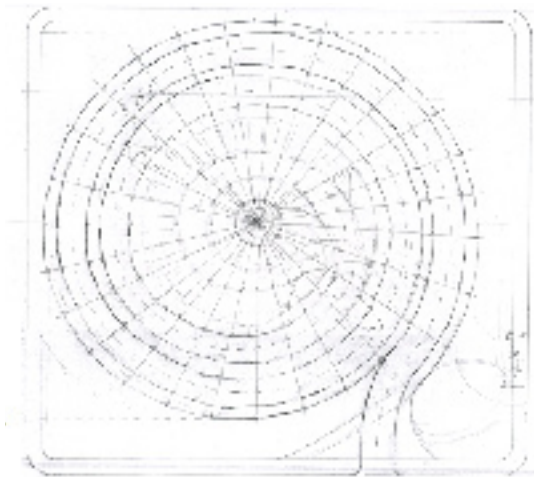
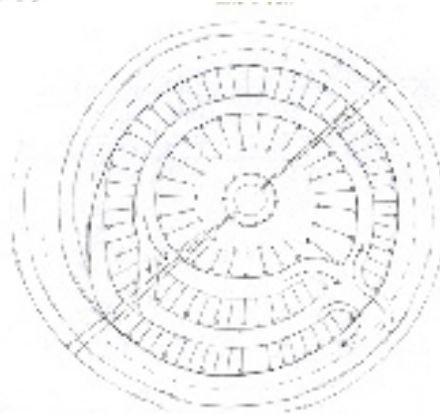
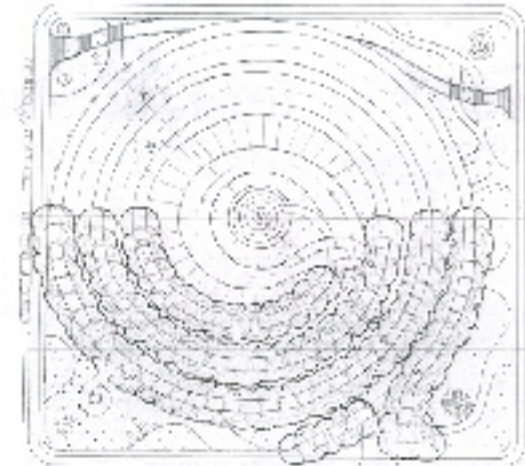
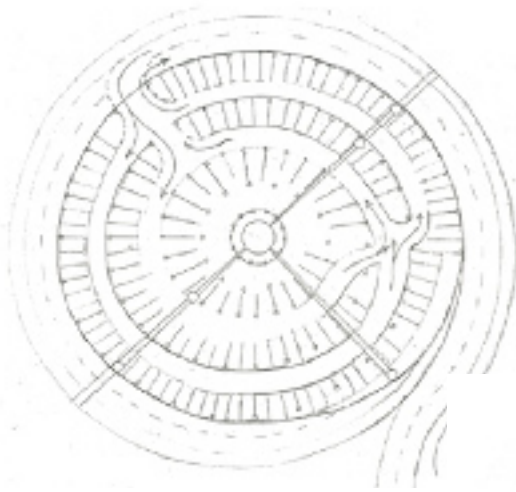
CONTINUED

Lindera
Liquidambar-Sweetgum Tree
Liriodendron-Tuliptree
Lonicera-Honeysuckle
Magnolia-Tree
Maianthemum
Mertensia
Mitchella
Mitella
Monarda-Bee Balm
Neviusia
Nyssa-Tree
Ostrya
Oxydendrum-Sourwood Tree
Pachysandra-Allegheny Spurge-Ground
Cover
Panax-Anerucan Ginseng
Parthenocissus-Virginia Creeper-Vine
Phacelia
Phlox
Pieris-Shrub
Platanus

Podophyllum
Polemonium-Jacobs Ladder
Polygonatum
Quercus-Oak Tree
Rhododendron-Azalea
Rhus
Rubus
Sambucus-Elderberry
Sanguinaria
Sassafras-Tree
Sedum
Senecio
Silene
Smilacina
Solidago
Spigelia
Staphylea
Stewartia-Tree
Stylophorum
Styrax-Snowbell Tree
Symplocarpus
Tiarella
Trillium
Tsuga-Hemlock Tree

Uvularia
Vaccinium
Veratrum
Veronicastrum
Viburnum-Shrub
Viola-Violet
Wisteria-Vine
Xanthurhiza-Yellowroot





Park Park

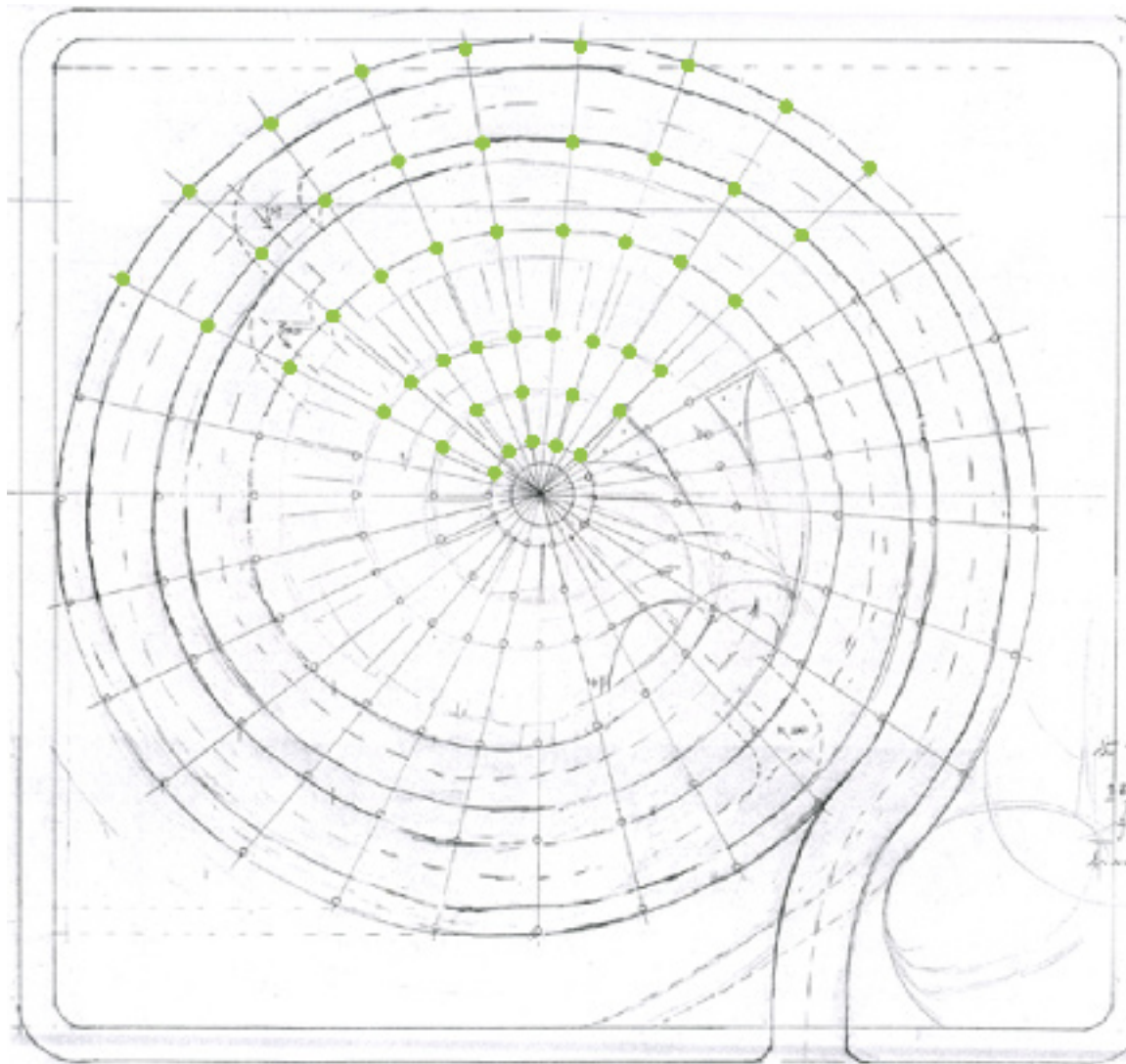
Chapter Three



Parking Layout

Circulation & Construction





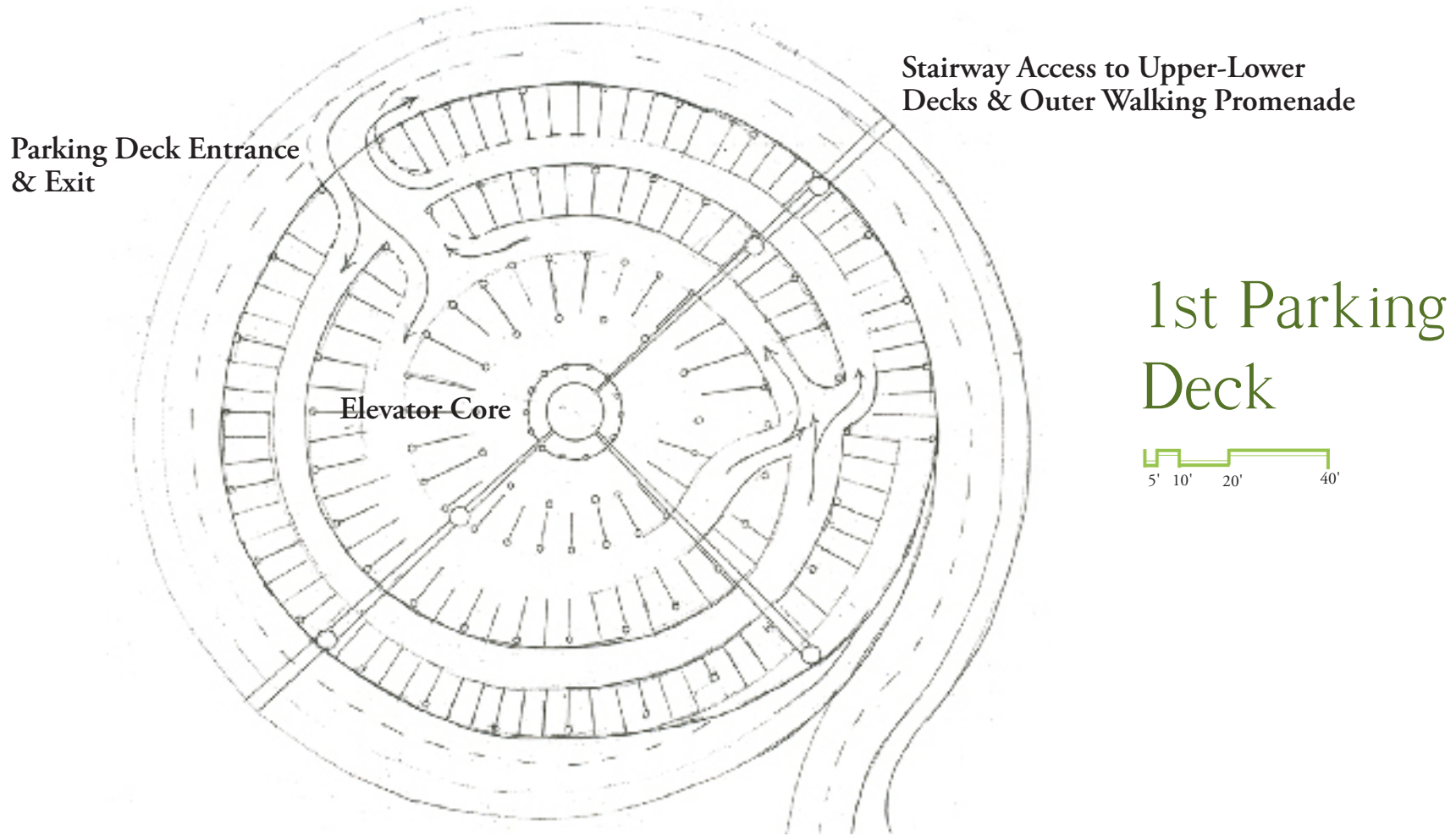
5' 10' 20' 40'

Construction Column Grid

One method researched for constructing Park Park is the use of part precast and prestressed concrete and cast in place concrete. Many parking lots today use precast concrete design construction because they are strong, durable, easy to maintain and cost-effective.

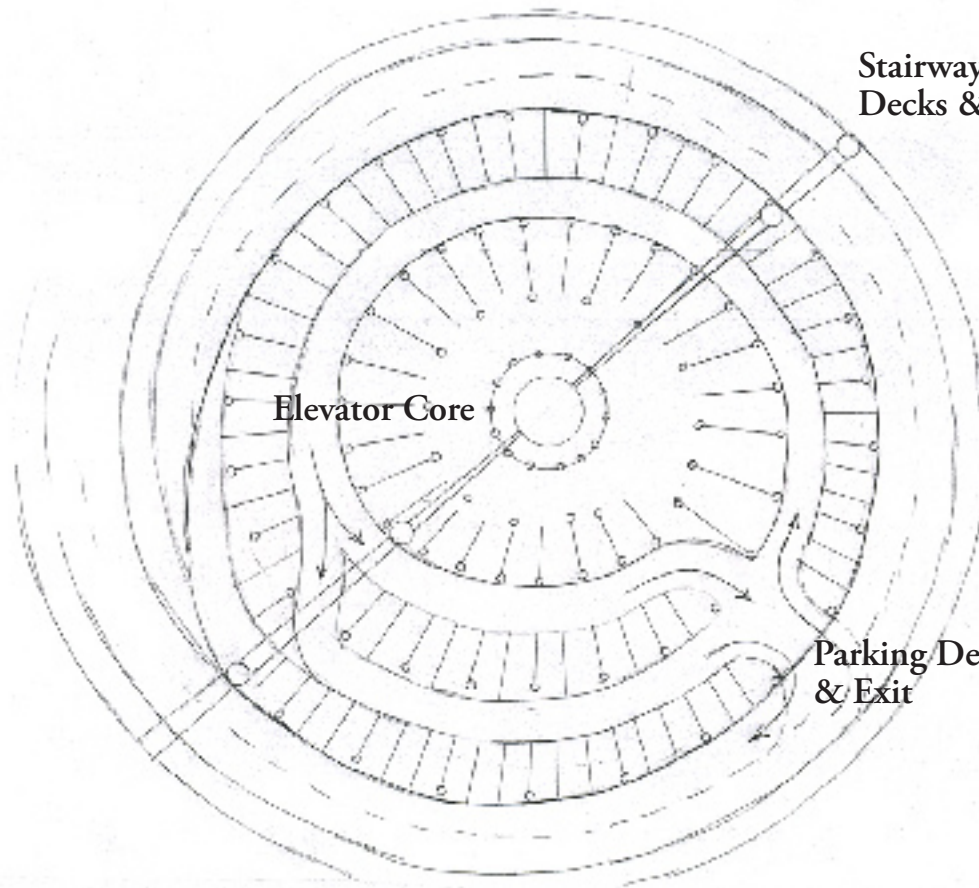
The parking decks could be constructed with two foot, reinforced concrete columns. The columns would be spaced thirty feet, twenty and fifteen feet on center depending on their load positions. The estimated dead loads for the Park Park structure, including vehicles, soil, and water storage, are 500 to 600 pounds per square foot (Setareh, 2006). This load capacity is within range for this cast in place concrete construction.





Parking Layout & Circulation





Stairway Access to Upper-Lower
Decks & Outer Walking Promenade

Elevator Core

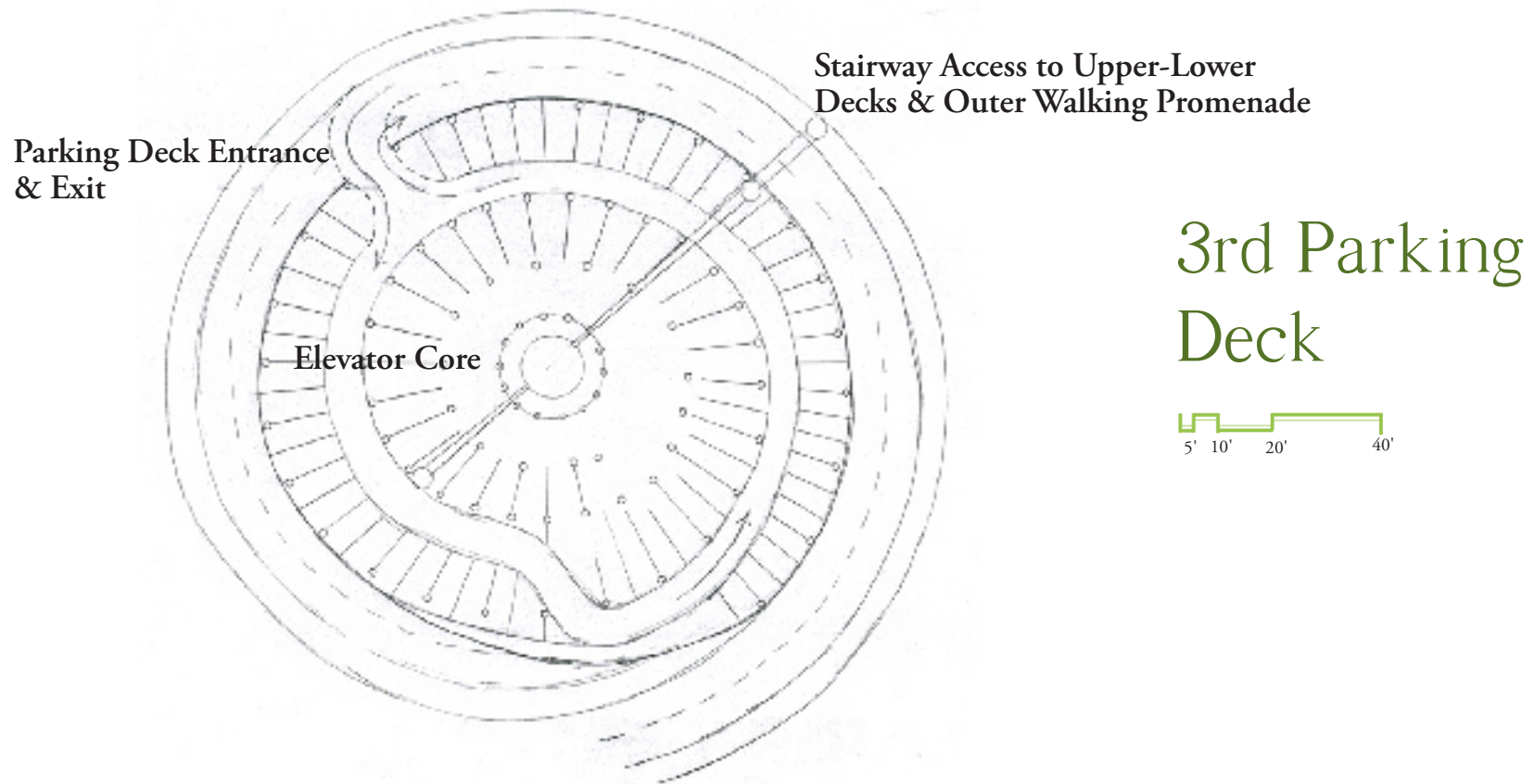
Parking Deck Entrance
& Exit

2nd Parking Deck



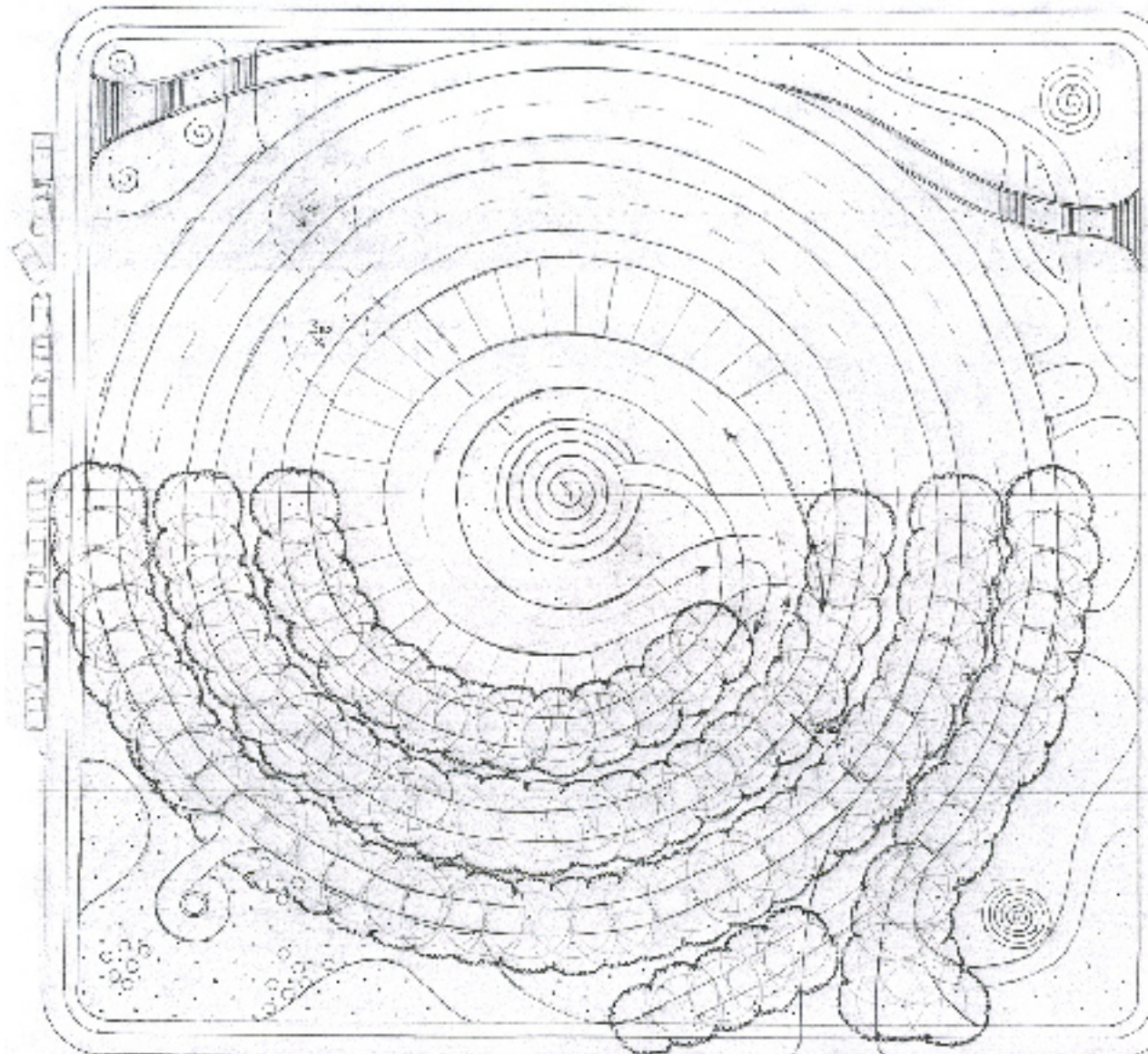
Parking Layout & Circulation





Parking Layout & Circulation



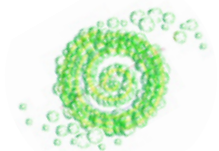


4th Parking Deck & Pinnacle Ziggurat



The parking spaces are 9' x 19'. The structure accommodates 800 parking spaces.

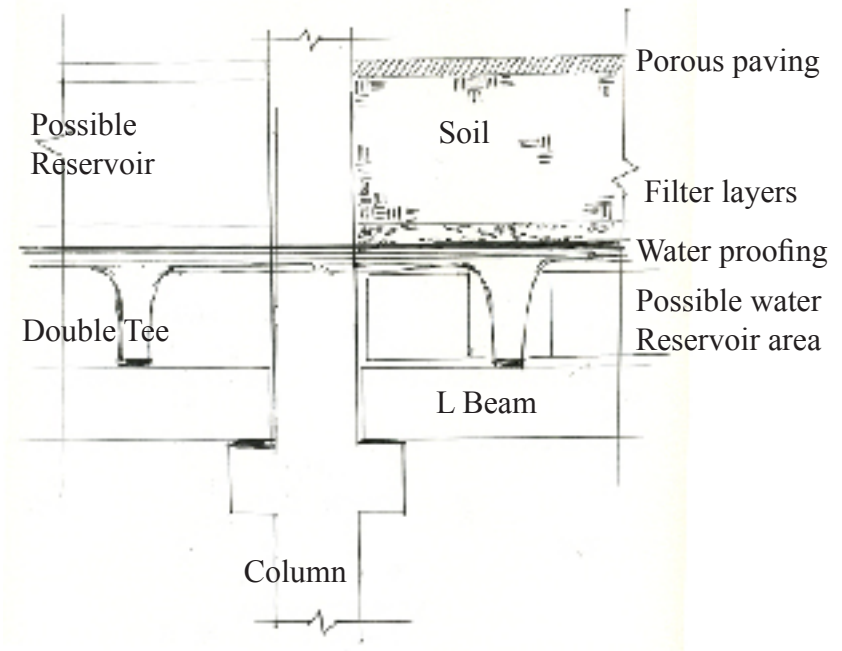
Parking Layout & Circulation



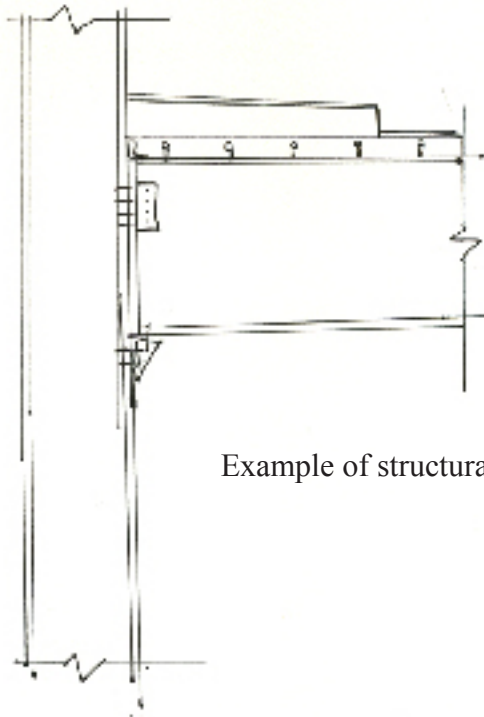
Construction

Precast double tee flooring/ceiling (units) would span twenty and thirty feet depending on column loads. Each double tee is eight feet wide and either 16 inches or thirty-four inches deep depending on the loads. The thicker double tees are used for the planting beds and driving ramps. The thinner double tees are used in the parking lot areas.

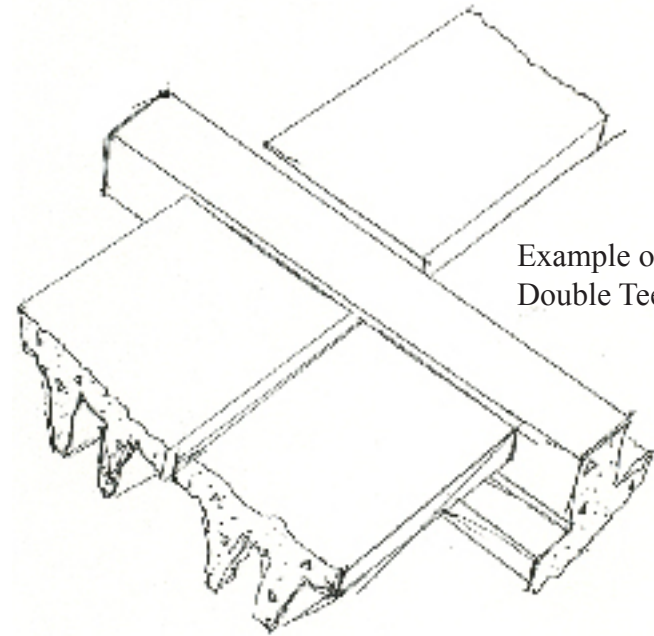
The landscape systems are then integrated into the construction like a sandwich. The systems layers are built up and wrapped around the structural concrete skeleton. First layers of waterproofing, then water storage areas (cisterns), followed by filtration, soil and finally plantings or porous paving. All water hitting the structure will first be filtered through soil or porous paving, soil, and then directed to storage tanks for re-use. Excess water will overflow (after infiltration) to the sewer system. The vegetative system or plants thrive within the extended soil bed, which is one spiraling surface from roof to sidewalk. The energy system, or solar paneling, wraps the outer edge, from bottom to top.



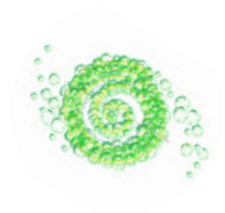
Structural framing could also be accomplished with steel columns and beams as well as a combination of steel and concrete. Exposed steel requires higher maintenance costs due to the need for painting. Precast concrete would be more cost effective and cheaper to maintain.

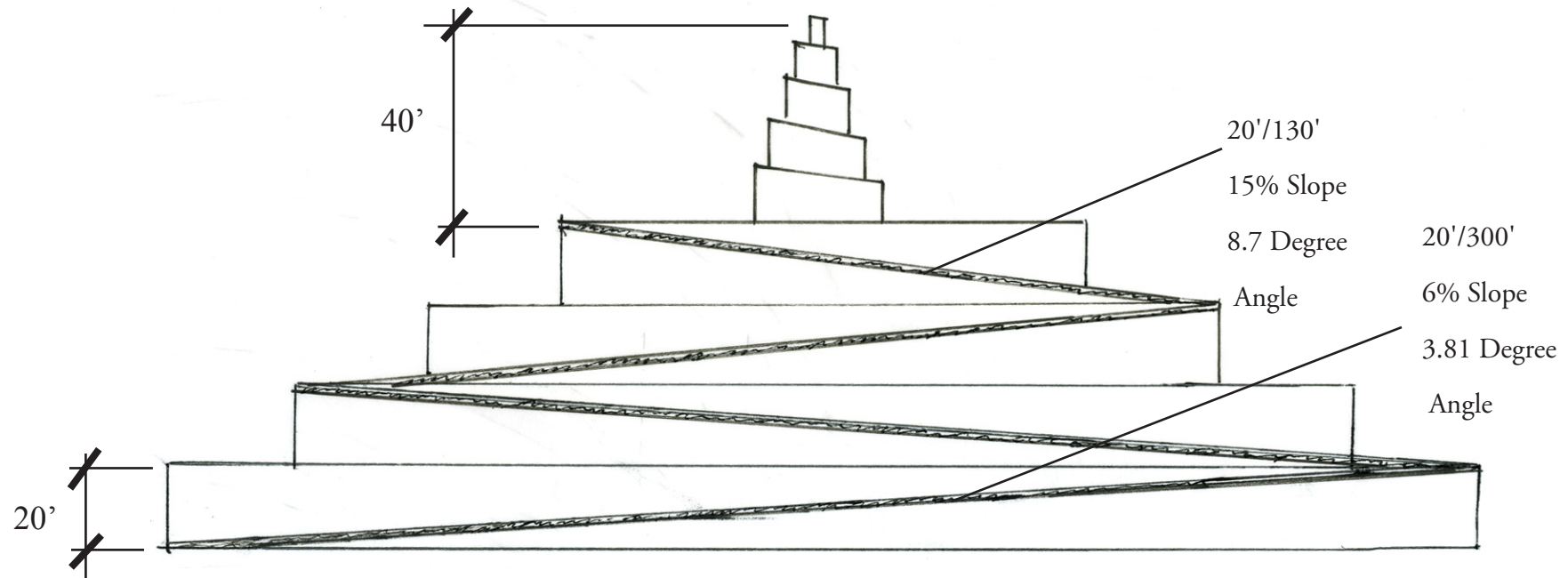


Example of structural steel



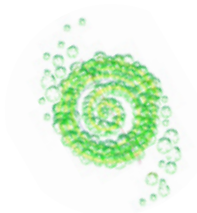
Example of Double Tees

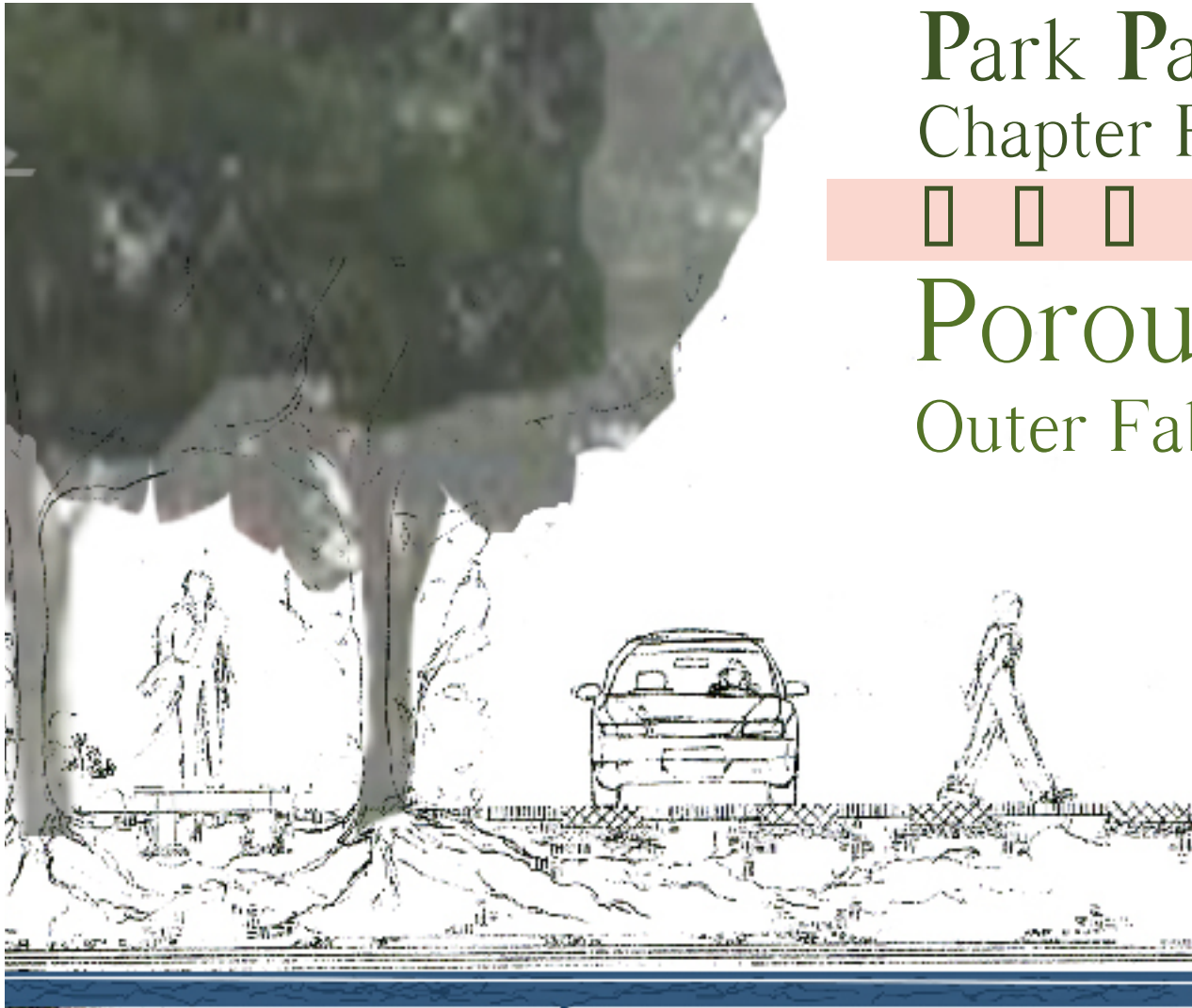




Gradients of Vehicle Ramps & Planting Beds

A 15% slope is the maximum desired slope for a vehicular drive way ramp. The parking garage ramp gradient begins at a casual 3.8 degree slope and rises to the maximum slope of 8.7 degrees or 15%. The entire structure is 80 feet tall, and 300 feet long. The ziggurat viewing tower adds an additional 40 feet, bringing the total height to 120 feet.





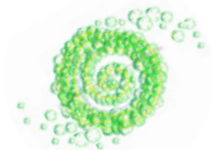
Park Park Chapter Four



Porous Paving Outer Fabric

“Porous pavements treat water quality during water’s infiltration and storage in the pavement structure subgrade. In general, porous pavements are effective at treating the particulates, oils, nutrients, and bacteria that occur in the course of pavements’ normal use and maintenance. The treatment involves the removal of solid particles and their attached ions from water, and bringing oil into contact with microorganisms for biochemical degradation.”

(Ferguson 2005, p.153.)



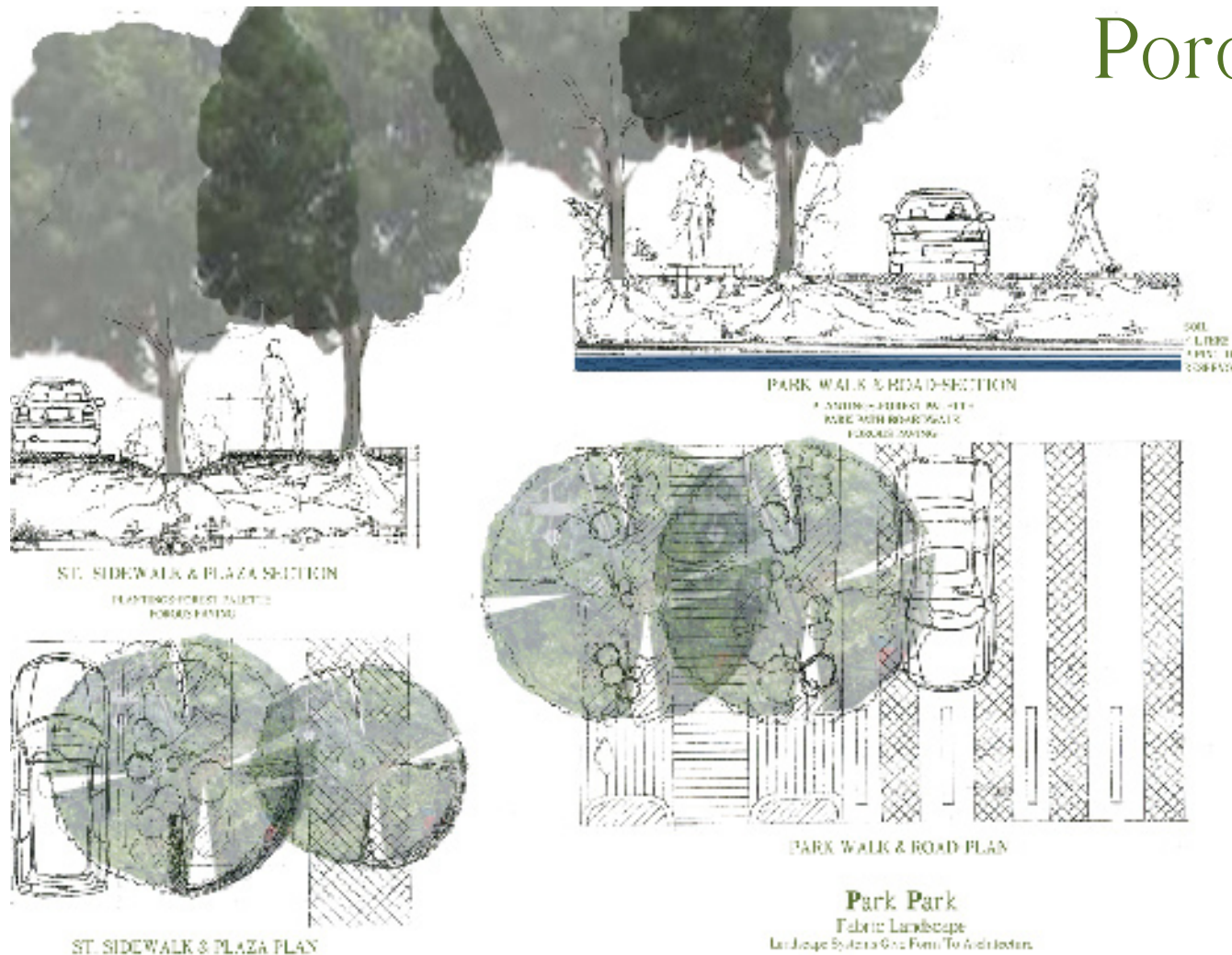
Section 3rd & 4th Parking Decks



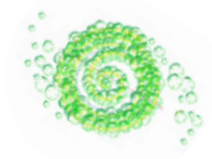
Almost 85% of the outer top surface of Park Park is porous. A fifteen foot wide tree planted promenade wraps the outer most edge of the parking facility. The cars access the parking lot along a 22 foot wide porous paved road adjacent to the promenade.

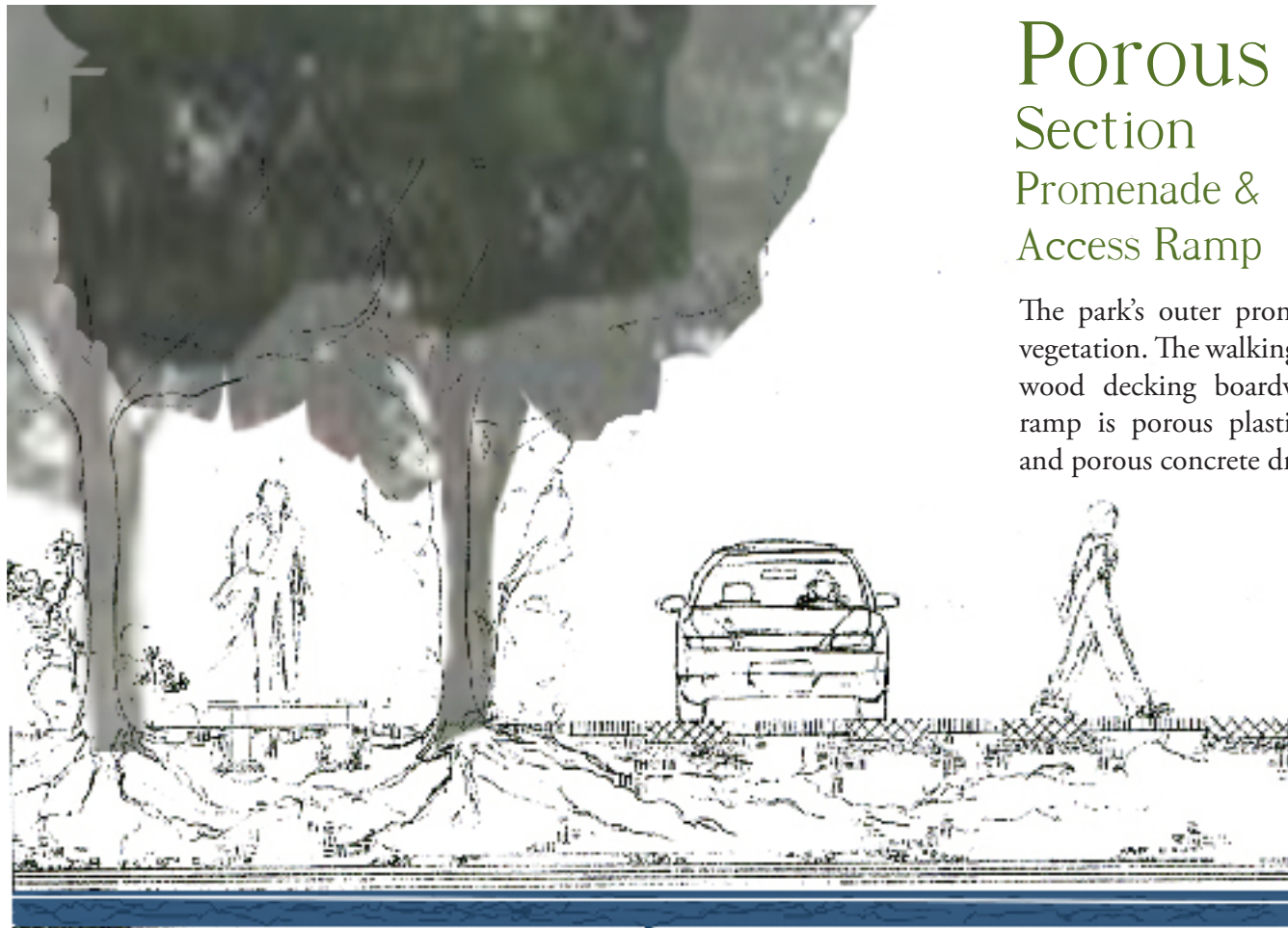


Porous Paving Details Plan & Sections



A study done in Germany compared the water discharged from a porous asphalt highway and non porous typical highway and found half as many particulates in the guttered runoff of the porous surface. *“This indicates that even a thin porous pavement surface layer acts as a filter.”* (Ferguson, 2005, p.158.)



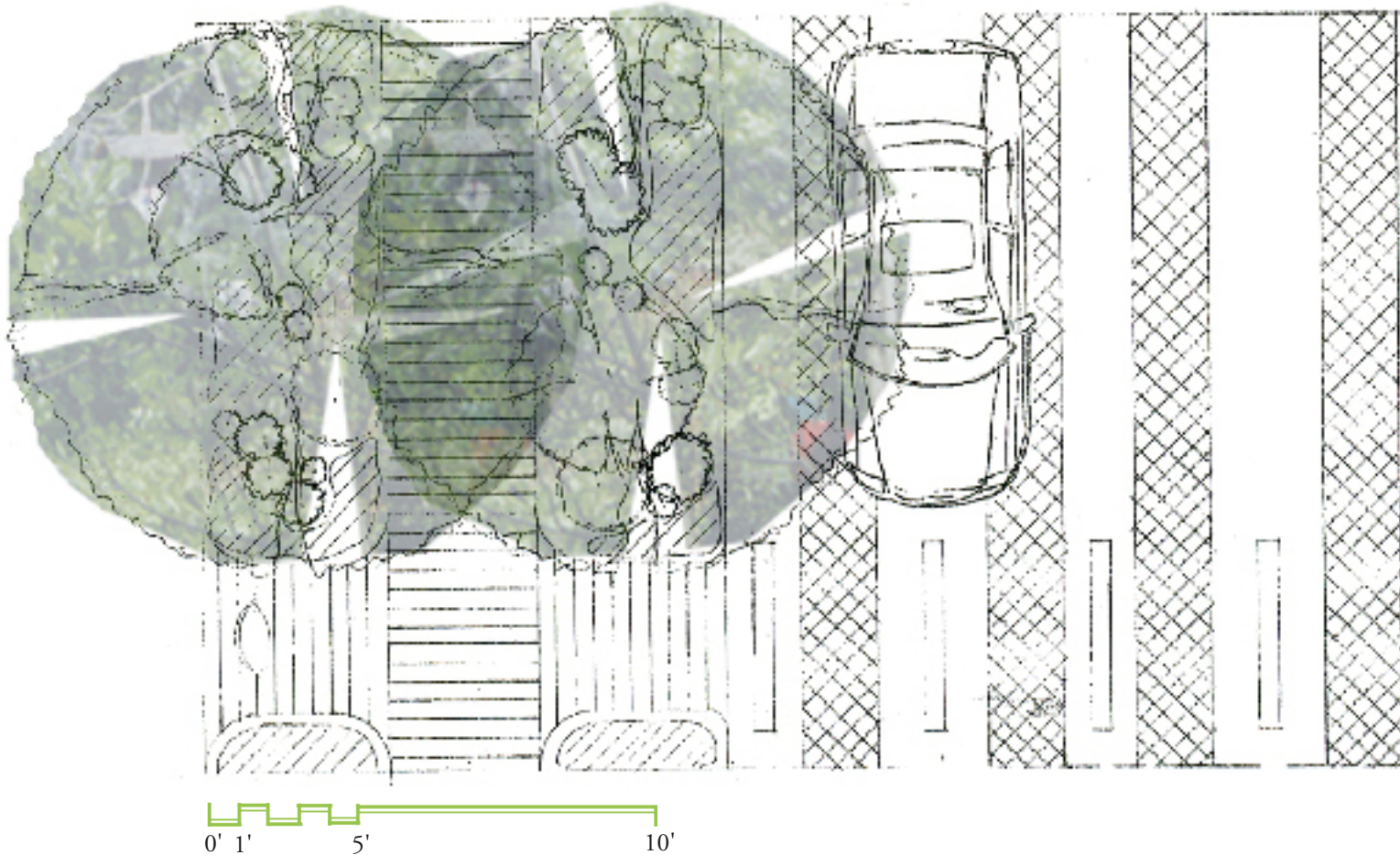


Porous Paving Section Promenade & Access Ramp

The park's outer promenade is porous vegetation. The walking paths are porous wood decking boardwalk. The access ramp is porous plastic geocell paving and porous concrete driving strips.

Porous Paving
Soil
Aggregate Filters
Water Cistern
Water Proofing





Plan View
Promenade &
Access Ramp

Porous paving is advantageous to safe driving in the rain and cold. Water running off dense, non-porous pavements becomes slippery, and during cold weather the wet surfaces freeze, forming a sheet of ice. Porous pavement drains water away, reducing water sheeting effects. Porous paving provides tire grip due to the coarse quality of the surface. Wet porous paving retains its dry friction value (Ferguson, 2005, p.499.)





Section Porous Plaza, Sidewalk & Adjoining Street

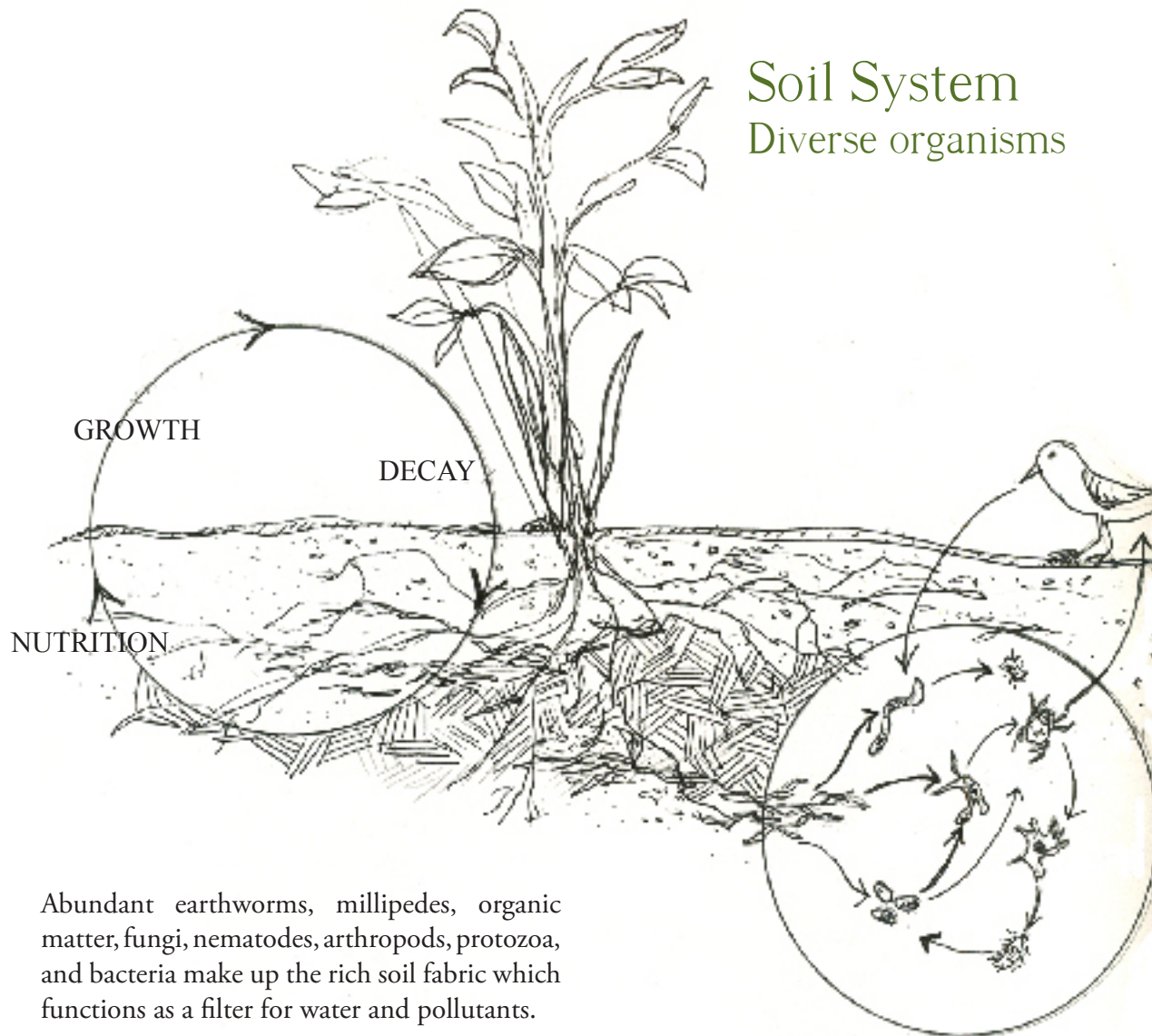
Many materials can be used to form porous driving surfaces. One method for Park Parks driving surfaces could be the use of plastic geocells. These are a lattice of rigid cells that hold aggregate or top soil in place (Ferguson, 2005, p. 45) This product could cover most of the driving surface. The heavier wheel contact points could be surfaced with porous concrete paving. Using two different surfaces would allow for a green carpet or porous turf road stripped with driving tracks.

The covered parking areas are surfaced in non-porous pavement. These surfaces can be periodically hosed off and drained through the porous outer surfaces. In this way pollutants would not accumulate on the parking surfaces.



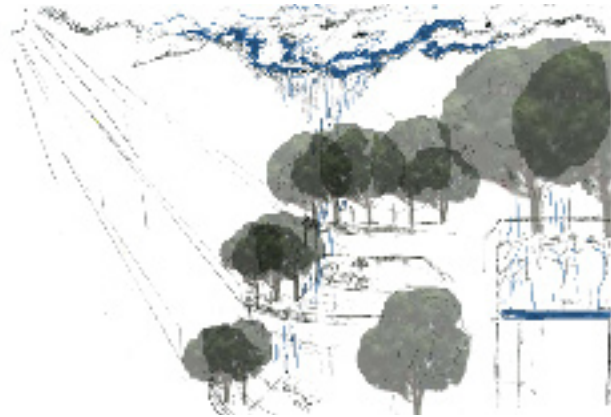
Soil System Diverse organisms

Park Park does not displace rainwater or cause runoff. Water does not move across the porous surface, but soaks downward washing oils and pollutants on the surface down and away. Porous pavement treats water pollutants such as oil by bringing the water into contact with microorganisms in the soil which biochemically break down pollutants. (Plaster, 1992.) Water is then further filtered through aggregates (gravel) or filter fabric layers which trap particulates for further microbial breakdown. (Ferguson, 2005, p.153.) Capturing new buildings' water displacement is paramount to environmental, watershed and human health. Park Parks porous surface, soil, filtering and water capture system replicates the water and soil cycles natural diverse systems.



Abundant earthworms, millipedes, organic matter, fungi, nematodes, arthropods, protozoa, and bacteria make up the rich soil fabric which functions as a filter for water and pollutants.





Urban Tree Water Requirements

Establishing the forest plantings will be the most challenging part of the Park Park water systems. The most critical time for establishing new plantings is the first two years. The nurseryman standards of water needs for establishing new trees are 5 gals of water per week for a 2.5 inch caliper tree. Natural rainfall requirements for establishing newly planted urban trees are 1 inch of rainfall per week. Regular watering of plants twice a week for an average one inch rain fall per week is the Washington D.C. regional norm. Plants require the most moisture during the growing season. Once established plants can endure typical droughts in the Washington area with little additional watering.

The thirty year average rainfall for the Washington metropolitan area is 39 inches per year. The area gets about 100 rain or snow events a year of which 60 to 70 are less than 1/10 of an inch. Approximately 35 times a year there is 2.5 inches of rain in a day. These days with heavy rainfall are what cause the most water runoff damage to the watershed. Using these rainfall averages for any given month, additional watering twice monthly should be enough. Dry sites are often caused by a lack of moisture retention due to soil compaction. The steeper sloping land drains quicker than flat land unless it receives seepage water from upslope drainage (Kimmins 2004, p. 269).

The unique design of Park Park creates one long continuous ground plane, allowing water to seep from the top deck all the way to the ground level. On the steepest sloping access ramps, water walls can be designed to slow the drainage.

The top deck of Park Park is approximately 25,000 square feet, or 1/10th is 2500 sq. ft. With an average rainfall of 32 inches per year, 2500 square foot area can capture 45,000 gallons of water annually, which meets the 100 gallons per day household water needs. (Austin Energy report, 2003). A 2500 sq. ft. landscape requires 1400 gallons of stored water to equal one inch of rain. Ten weeks of rain would equal 14,000 gallons of stored water for every 2500 sq. feet. A total of 10,000 gallons of water storage will be required for an area of 2500 feet for a summer of little or no rain (figures drawn from water collection study Austin report, 2003). A 6 foot deep, by 18 foot diameter cistern will hold 11,400 gallons of water, which is 2,000 liner ft. These cistern capacities can be worked into the Park Park construction in order to create enough available water to sustain the forest canopy.





Park Park Chapter Five



Site Context

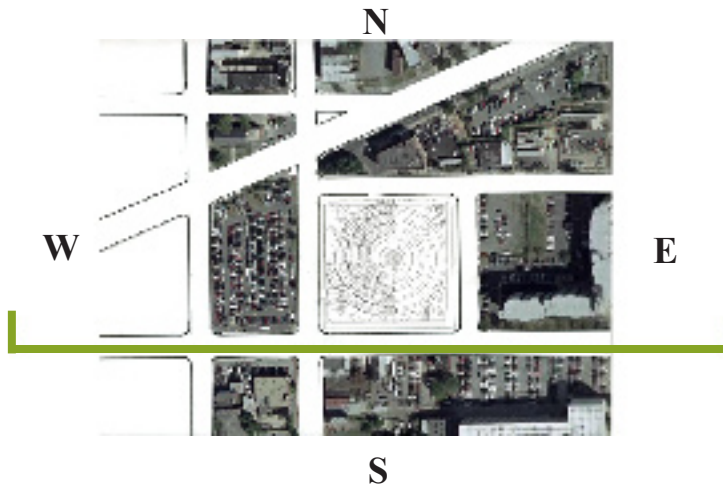


The Park Park project was designed to fit a particular urban setting in Washington, D.C. at 5th Street and New York Avenue, N.W. However, the Park Park parking lot concept can fit many different parking needs in different urban and suburban locations. Like parking lots in general, this is a structure for parked cars. The difference is this parking lot takes an environmentally responsible stance because it recognizes its inherent environmental displacing impact on the world. Therefore it can be designed to fit urban, suburban, or rural developments. Most key and important to the parking lot design are its natural systems considerations and implementations.

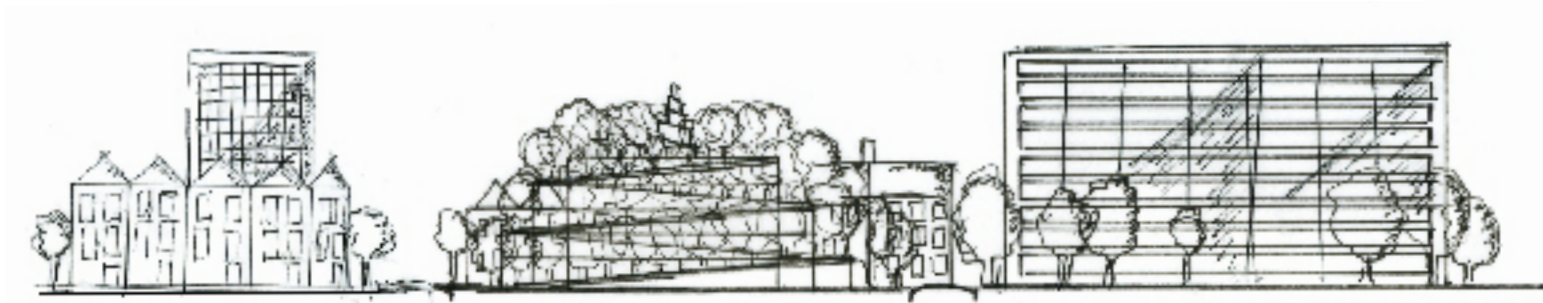


Site Context

Section View Looking North

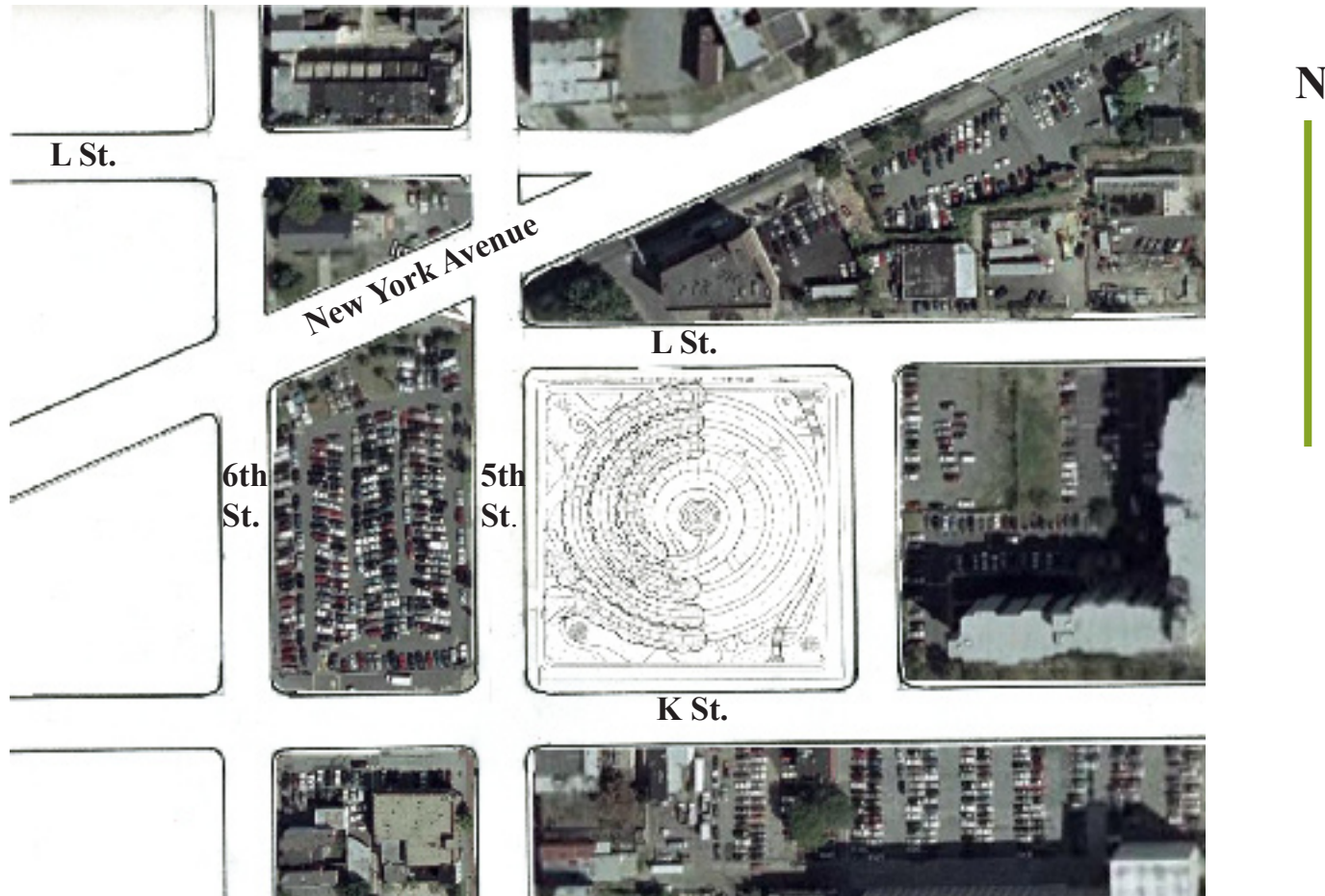


The neighborhood is developing at a rapid pace. New condos and a grocery store will abut the western border of these five adjacent city blocks. The tall building on the east side is an apartment complex. Townhouses can be seen on the northern boundary of New York Avenue. This is a completely mixed use neighborhood that is growing in housing population as well as businesses. The convention center is two blocks away.



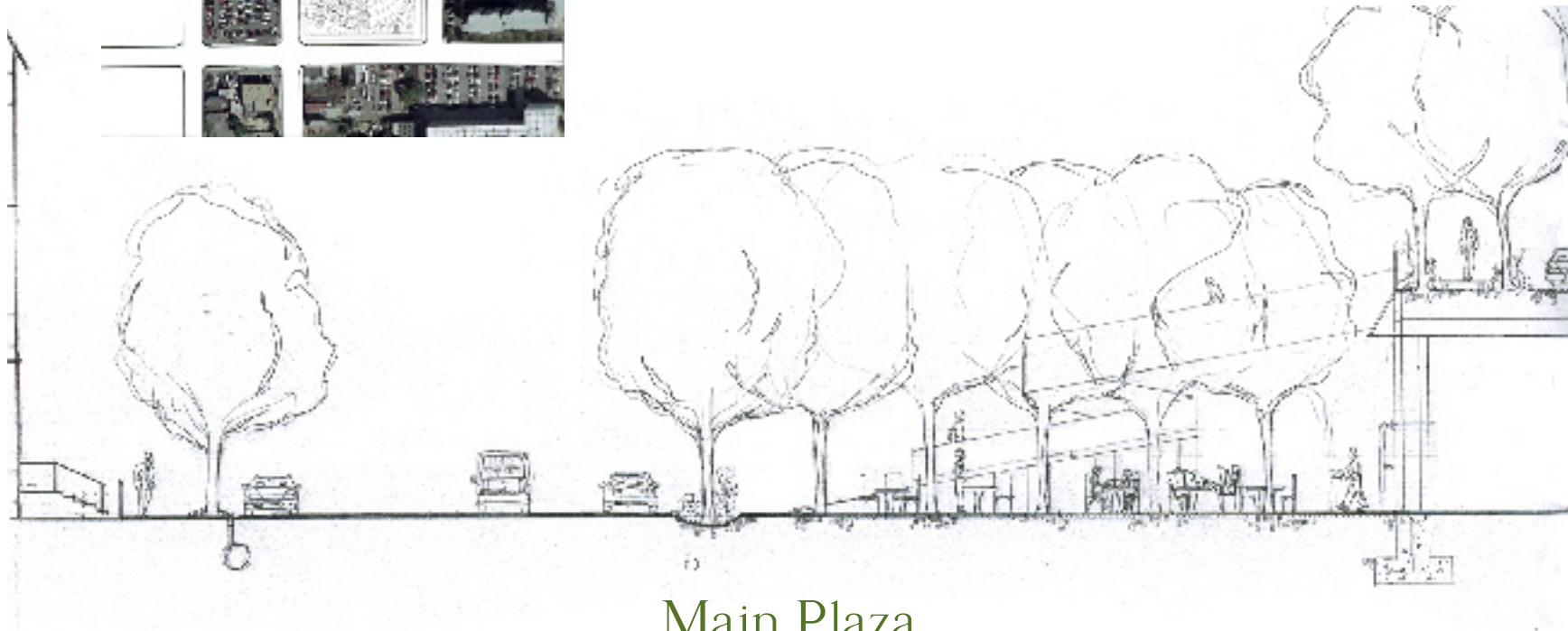
Site Context

New York Ave. & 5th St., N.W.





5th Street Section

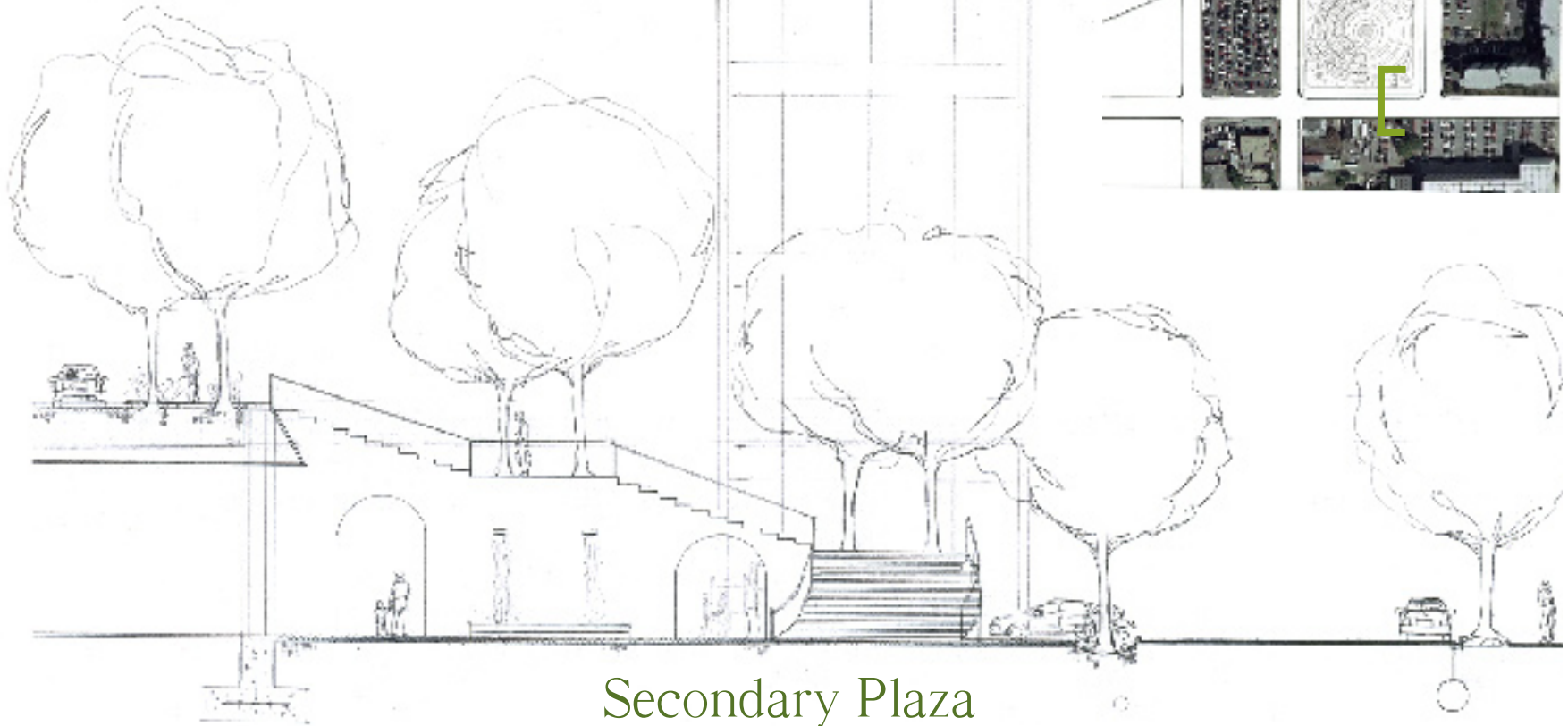


Main Plaza

Mixed use businesses, indoor/outdoor cafe, pedestrian access to park promenade & first parking deck

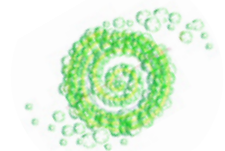


K Street Section



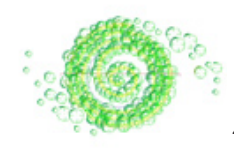
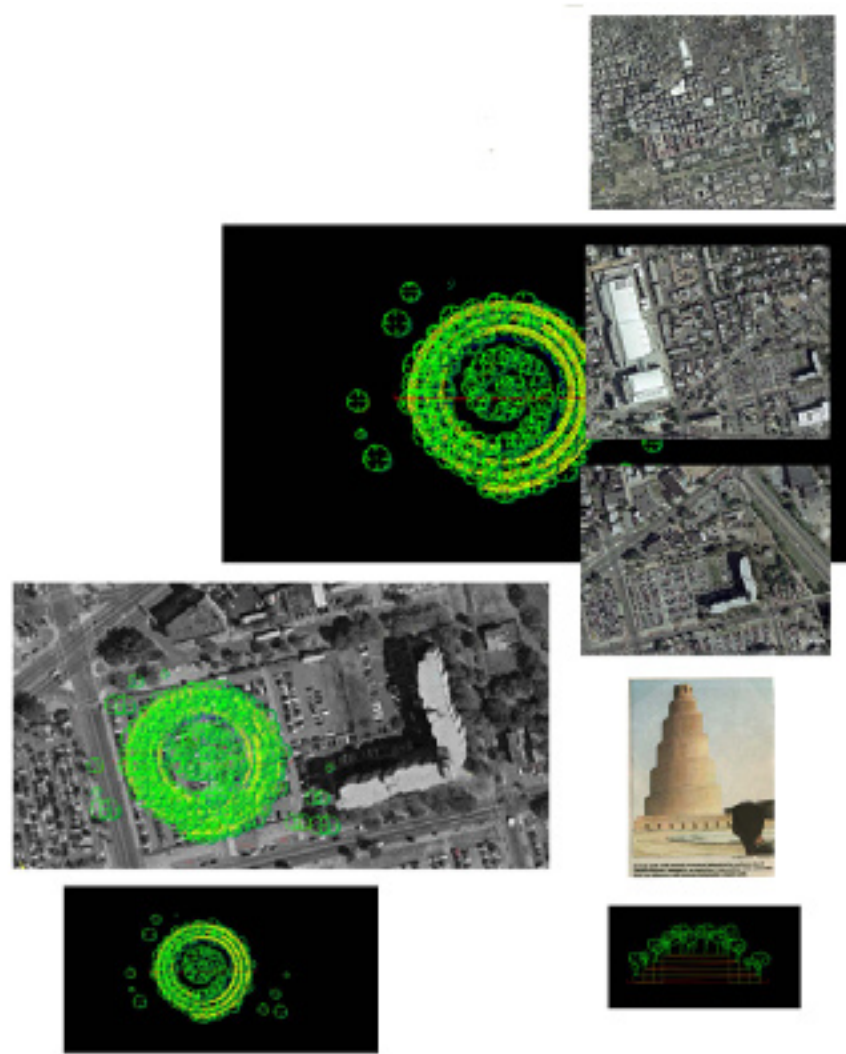
Secondary Plaza

Mixed use businesses, playground, pedestrian access to park promenade & first parking deck



Site Analysis

There is a great need for parking at this busy downtown location. A new hotel will be going up in the next year to accommodate the convention center which is two blocks from the site. There is also a new condominium being built adjacent to the Park Park location. Because the neighborhood is rapidly changing there is a need for mixed use stores such as grocery (co-op) and cafe as well as small businesses. A park would be a great addition to this very barren, treeless part of town. The Park Park roof could also be used for a weekly farmers market, bringing fresh produce to the downtown urban core residence.

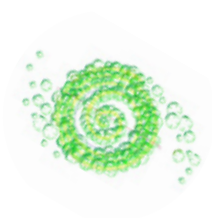


- = HOUSING
- = MIXED USE
- = PUBLIC USE
- = TREE CANOPY
- = NEW DEVELOPMENT



Site Analysis

The large blue building is the New Washington Convention Center. Additional parking is needed to accommodate this facility. The orange block on the left of the Convention Center is the site of a new hotel. The orange indicates new development on the left side of the Park Park location as condominiums. The pink areas of mixed use are primarily businesses, restaurants and stores. Across from the Convention Center at the juncture of N.Y. Avenue and Mass. Avenue is the historic D.C. Library which was turned into the D.C. Museum. The museum venture failed partially due to lack of parking.





Urban Setting

*"They paved paradise
put up a parking lot."*

Joni Mitchell

Park Park is designed to re-vegetate the denuded urban core. The goal is to bring back rich, bio-diverse ecosystems, to create a healthy thriving, environmental system for people as well as urban wild life.





Park Park

Chapter Six



Conclusion

The Park Park project is one example of the application of fabric landscapes, water, vegetation and energy systems integral with building. Is it possible to integrate these systems successfully into architecture? Yes, it has already been done at some level with Freeway Park in Seattle, Washington and is taking shape in various forms all over the world such as at Keyaki Plaza in Japan. This project explores ways of designing these systems into a mixed use parking garage. By using a spiralling ziggurat shape it is possible to separate the inner parking decks and the outer circulation ramps allowing for specialized floor designs. With this design form, the outer park planted pedestrian promenade and car access ramp can be one extended planting bed from the ground plane to the top parking deck and park ziggurat tower. The parking deck floors, suspend in the middle of this lush, diverse, artificially created forest wrapping that winds its way around continuously rising, drawing one to the top or the bottom.



The landscape water system is completely incorporated allowing for the additional use of the water by people, as well as the natural system itself. As rain falls on the structure water is not displaced. Typical construction channels storm water into a storm drain which damages the watershed with overflowing sewage and pollutants. The water at Park Park is filtered through the landscape skin as it would be in a natural system. After filtration, the water is captured in cisterns as it would be stored in the natural water table. After being used by the building systems for watering plants, cleaning or drinking, the water is filtered again before being released into the watershed. During heavy storms where more water is filtering than can be held, the overflow water is released after it too has filtered the most polluted first one to three inches of water. Lastly the water makes its way through streams to the broader watershed area, in this case the Chesapeake Bay.

This design promotes a rich architecturally integrated, diverse vegetative system. The planting beds designed as one continuous system from ground to roof zigurat, allows for a maximum growth potential, especially in an urban environment. The more diverse the vegetative system the healthier the ecosystem. Park Park is planted with Eastern seaboard native woodland plants and with its construction would provide more natural habitats and green park land in the urban environment. This garage design is a minimum 300 foot diameter. With 600 feet the Park Park design could accomodate an orchard on the upper most deck, providing locally grown fruit.

The solar energy system allows the building to provide for its own energy needs. Less energy is required for a parking garage only. As the solar panels collect more than the battery system can hold during the day, the energy is sold back to the electric company grid as credit, and drawn from the grid at night as needed. The technology for economical solar energy comparable to oil and gas driven electric is on the verge of happening. The desire for safe secure independent systems is becoming an additional part of the impetus for renewable energy sources. Using a combination of thermal energy for heating and cooling as well as wind turbines and solar (voltaics) for electricity may prove to be the most balanced approach to solving the energy problem.

The Park Park garage concept could take many design forms. The same ideas could be applied to the traditional rectangle. Car ramps could be located inside the structure allowing for a much larger outer park surface area. It is the simple idea of integrating the natural systems of water, vegetation and energy into buildings, that is the heart of this thesis.

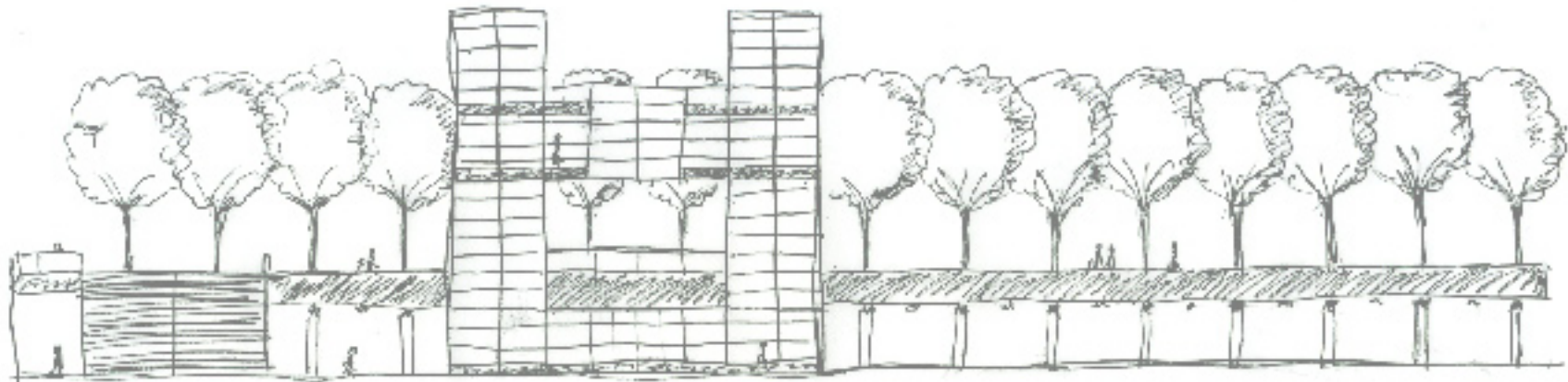
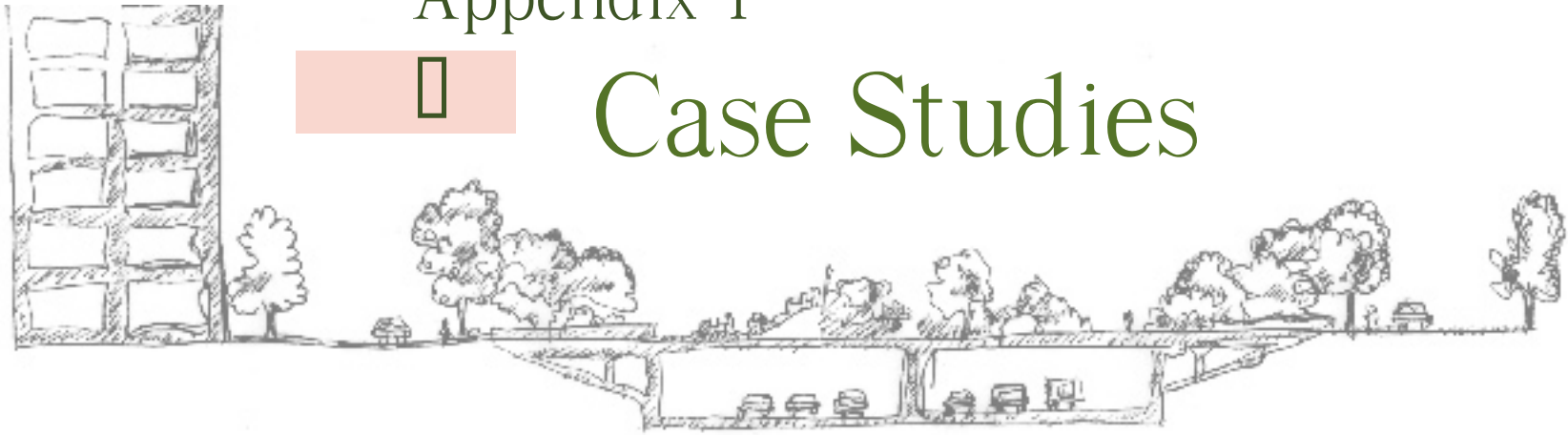


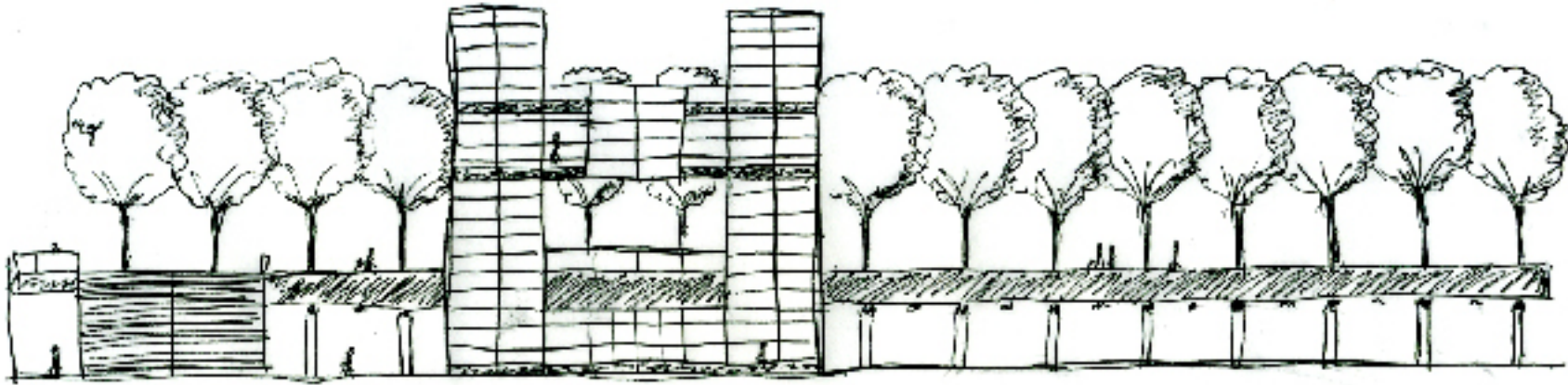
Park Park

Appendix 1



Case Studies





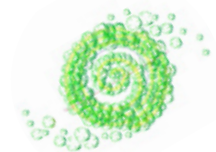
Case Study

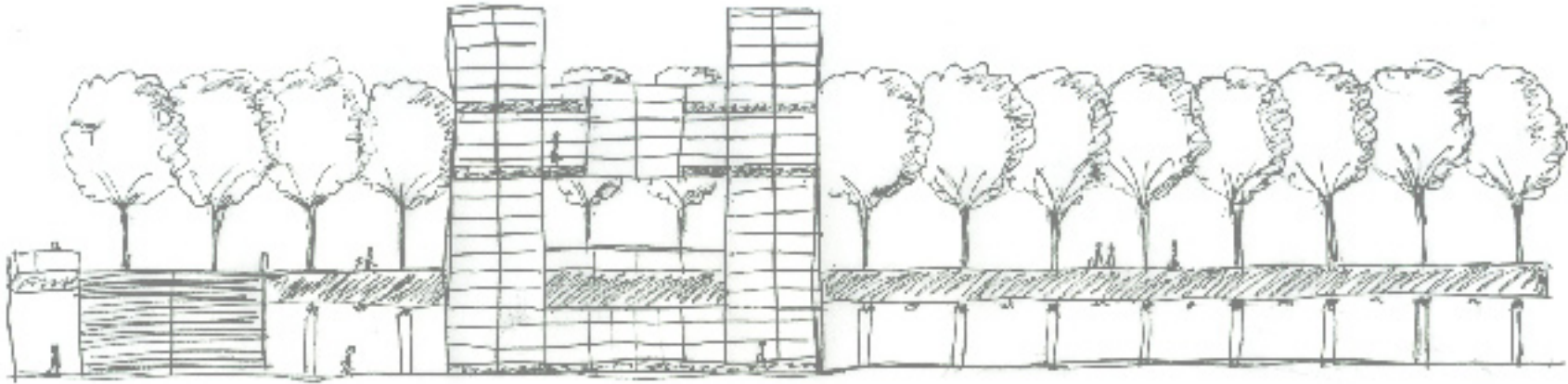
Keyaki Plaza

Saitama New Urban Center, Saitama Japan

Keyaki Plaza designed by Yoji Sasaki and Peter Walker is a roof garden plaza, elevated 27 feet above ground level on top of a mixed use commercial building. The project has been in use since the fall of 2000. The plaza is a main attraction of the new urban core or newly created “town center.” The plaza is a forty minute subway ride from Tokyo through sparsely vegetated suburban development. It is an urban forest surrounded by endless sprawl of “bed towns” extending out from Tokyo.

Spatially the plaza functions as a cross roads linking surrounding buildings. 4200 square feet of roof plaza hold 220 Zelkova trees planted in a 16 by 16 foot grid. The plaza is supported by precast concrete and steel frames. The tree plantings are aligned with the structural columns. The plaza surface is comprised of aluminum grills which are suspended above the planting beds. Rainwater drains directly into the planting beds and the grills protect the planting surface from compaction. The planting beds are comprised of an artificial growing medium. The client





had expressed a preference for a variety of trees. The minimalist design called for the monoculture of Zelkova trees which is a riskier endeavor than a diverse planting pallet. In the past six years not a tree has needed to be replaced.

The precedents of Keyaki Plaza demonstrate the capacity and success of large scale roof top plantings with trees. By suspending the porous paving above the planting beds, the beds are generously extended in all directions. The tree roots are not confined to small containers but allowed as in nature, plenty of room for roots to grow. This open planting bed design concept is also utilized in the Park Park planting bed design.

COMPARISON POINTS IN COMMON WITH PARK PARK PROJECT:

Water

Water drains through a porous surface to the planting bed below and then piped to the sewer system.

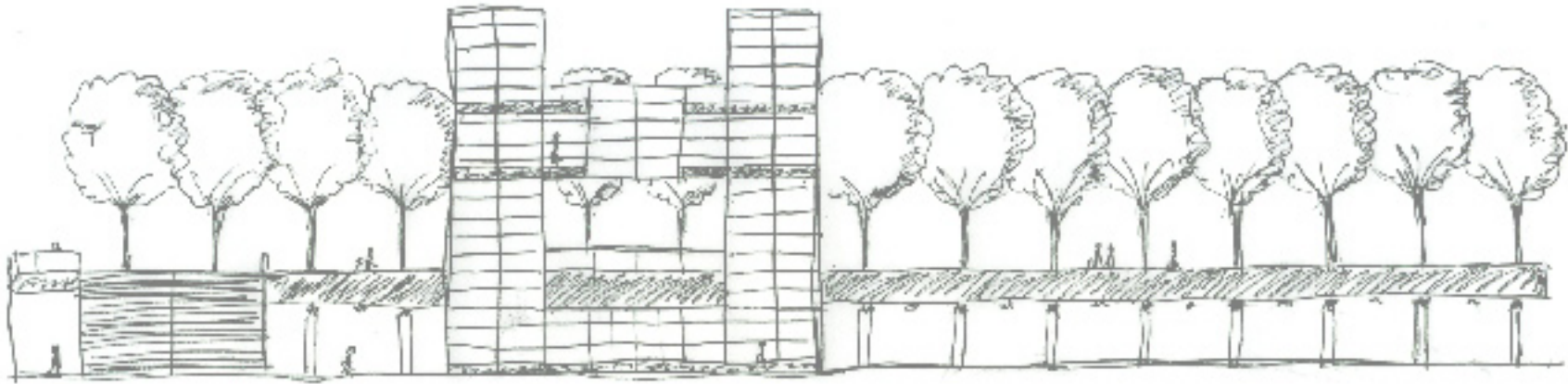
Vegetation

Thick forest like tree canopy thrives above ground on the roof of a modern mixed use building.

Energy

Solar, thermal or wind energy systems are not a consideration.





COMPARISON POINTS OF DIVERGENCE WITH PARK PARK PROJECT:

Water

Water is not captured in cisterns for reuse before releasing into the sewer system/water shed.

Vegetation

Saitama Plaza is a monoculture planting scheme that thrives.

This project demonstrates the flexibility of planting configurations when integrating nature with buildings.

The planting medium is not conducive to biodiversity. Natural top soil is a bio-diverse system.

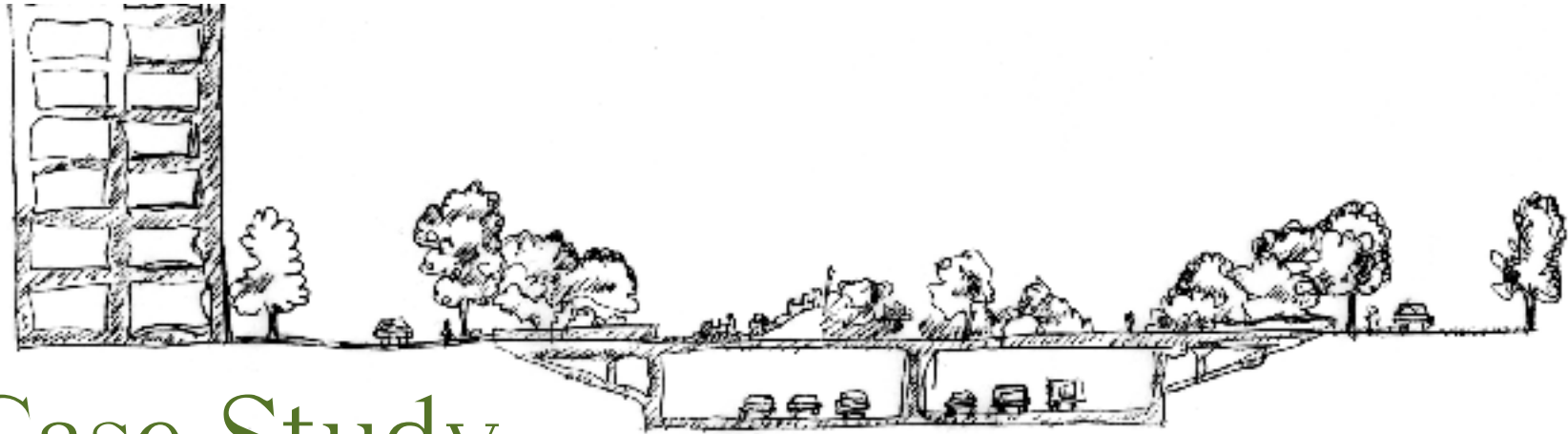
Energy

Not a direct consideration.

“Saitama plaza is a true green heart in a gray world.”

(Clarke 2006, February LAR)





Case Study

Freeway Park

Seattle, Washington, USA

Freeway Park, designed by Lawrence Halprin and built in 1976, is an outstanding example of landscape integrated with built construction. It is a 5.5 acre park built over the interstate freeway. The freeway that divides Seattle in half brings the city together via this forested evergreen and deciduous park bridge. Thirty years later the forest plantings thrive. The trees are so vigorous it is argued that they have exceeded their intended sizes and should be thinned due to differences in park use issues.

Freeway Park is designed as a forested bridge. Parts of it are suspended over parking lots as well as Interstate 5. There are several pathways one can take that make their way over the various roads. It also has a large plaza entrance and giant water feature that mimics waterfalls in the Cascade Mountains. Some 27,000 gallons of water re-circulate each minute through the concrete and steel cascade waterfall structure.





This landscape structure has stood the test of time and exemplifies the ability to achieve healthy diverse landscape ecosystems constructed out of concrete and steel, integral with the urban built landscape.

COMPARISON POINTS IN COMMON WITH PARK PARK PROJECT SYSTEMS:

Water

Freeway Park contains a partially integrated water system. The plaza water runoff infiltrates through planting beds before being released into the watershed/sewer system.

Vegetation

Freeway Park utilizes a diverse vegetative forest planting pallet. The landscape planting system is integral with the built structures. Natural top soils are used in the planting beds which have proven vital to the thriving environment. The planting beds are generously sized.

Energy

Energy systems are not a systems consideration.

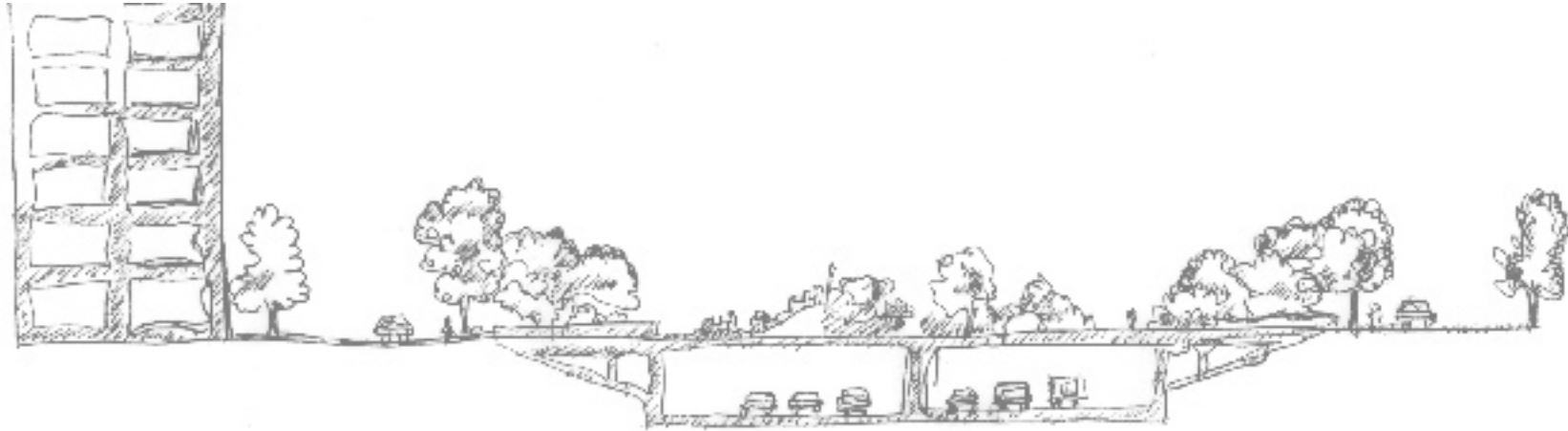
COMPARISON POINTS OF DIVERGENCE WITH PARK PARK PROJECT:

Water

The water system is designed to infiltrate runoff and release directly into the water shed/sewer system.

It is not designed for water collecting cisterns, or systems for re-using the water.





Vegetation

No divergence.

Energy

Energy is not addressed as a systems issue at Freeway Park. Traditional grid fed electricity is used to power any facilities within the park.

CONCLUSION

Freeway Park demonstrates that forest vegetation that is elevated and integrated with concrete and steel building structures can thrive for decades.





Park Park

Appendix 2



Fabric Landscape

Architectural Tapestry (Magic Carpet) of the 21st Century
Landscape Systems Give Form to Architecture

Water

Vegetation

Energy

& Historical Precedence

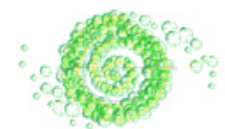


The population of the planet continues to expand. In the 1950's the world population was 3 billion. Today it's 6 billion. In 2050 it is projected to be 9 billion. Today, in order to maintain the world's population at North American standards of living, it would take the energy and natural resources of three planet Earths. We are in great need of a change in our consumption and use of what natural resources we have left. In America alone we have altered 95% of our landscape. Only 5% remains of what took millenniums to create (Smithsonian, 2001). Our biodiversity is being lost at crisis levels of species per day due to habitat loss, invasive species, pollution, and global climate change. Precious resources we never knew existed are being lost. The consumption of non-renewable fossil fuels, carbon emissions and global warming is one of the greatest environmental problems we face today. We must at least sustain what resources we have remaining and if possible restore world ecosystems.

When we do not operate self-sufficiently and rely on fuel, food and goods transported great distances, we are depleting finite resources. It's hard to imagine that the world's resources are finite. Water operates in an endless loop constantly recycling itself. Air too is naturally, endlessly recycling itself through Co2 conversion by trees. Food, as well is seemingly endlessly grown through cycles of agricultural techniques. Habitats and all species are constantly growing, changing and evolving. Even if a resource is agreed upon as finite such as oil and gas, technology it's believed, will prevail and invent new ways of providing the necessary basics we depend on.

I grew up during the 60's and 70's when ecology emerged as a vital issue. Back to earth movements abounded for simpler living. The EPA and Earth Day were founded. Co-operatives and communal living were attempted changes of lifestyles for many. I saw young and old adults looking for something free and pure they could not find. I agree that we had a problem with pollution, energy and waste. I did not believe that we were or ever could run out of energy, water or food. My belief was that science would prevail. We had landed on the moon, and we would and will triumph any landscape; land on Mars, clean up polluted rivers, overcoming all obstacles in our way. I believed, after living through the 70's oil crises, fearing the possible inability to attain my most coveted freedom, the ability to afford driving a car, I believed that we might be better off if we ran out of oil sooner, because, the sooner we ran out of oil the sooner we would convert to a solar powered country. I hated the notion of conservation. I hated turning off lights and turning down thermostats to save energy. When I grew up I was going to keep every light on in the house and regulate the temperature as I pleased because, the sooner we ran out the better!

Thirty years later, we are still dependent on oil. Cars that for a short while became smaller to accommodate energy scarcity have now become ever larger SUVs. We have not yet run out, but we continue to use up finite resources. Our oil dependence has contributed significantly, scientists say, to the newly understandable threat of global warming (Meffe, 2005). Fully depleting any resource, oil, trees, topsoil, natural habitats, or species, is a mistake associated with possible dire consequences.



WATER

Why are water systems in peril?

What to do about water deficiencies?

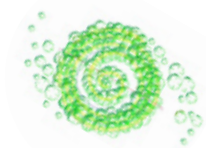
How can water systems give form to architecture?

“To take anything for granted is in a real sense, to neglect it and that is how most of us treat water.”

Robert Raikes

Why are water systems in peril?

Problems with water are becoming more and more prevalent world wide, and in America as well. Fresh water systems are being taxed to the extreme due to population and pollution growth. Water shortages continue to grow due to increased demand, population growth and uneven distribution of water nationally and worldwide. Overall degradation of water quality and supply are being compromised locally, which in turn is causing political and economic stress for water control and use between states and countries. Cities are made of impervious surfaces that cause water to (runoff) collect pollution and quickly channel the water back into the natural water system without (infiltrating) allowing it to filter through vegetation and soil before it reaches streams, rivers, lakes and oceans. Man made changes to natural hydraulic cycles such as damming rivers, and eliminating coastal marshy buffer zones, eliminating natural water cleansing processes.



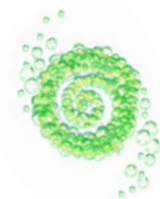
Major sources of water pollution are:

- Agricultural runoff of pesticides and fertilizers.
- Urban runoff of pollutants from cars, parking lots, roads, lawns, gardens, ect.
- Runoff continuously increasing due to development (impervious surfaces.)
- Toxic chemicals released into the water by chemical industries.
- Toxic waste into the water systems by power companies.
- Toxic waste (radioactive) often created by military development, disposed of by injection into the earth, which then leaches into aquifers, and water systems. (EPA is forbidden to investigate or sue the military, which is the major cause of radioactive waste.) (Blatt, 2005)
- Changing natural water systems by damming, altering (channeling) and removing, streams, rivers, marshes, coral reefs, ect.

The amount of industrial pollution dumped into waterways rose 26% between 1995 and 1999. 40% of water treatment plants are often old and do not adequately clean the water. More than half of the U.S. relies on subsurface ground water for drinking. 47% of city wells in the United States contain toxic compounds. Water is being removed from underground reserves faster than it is naturally replenished. 40% of all U.S. bodies of water are unsafe for swimming and fishing due to industrial waste disposal, agricultural and urban pollution runoff. Garbage disposal into landfills as well as toxic chemical disposal by injection into the earth, contributes to contaminated aquifers. It takes groundwater 1,400 years on average to recycle, polluted groundwater is essentially permanent. Chemical contaminants are present in all our major streams. Eight states bordering the Great Lakes restrict consumption of fish due to high levels of mercury, pesticides, dioxins and PCBs found in fish tissue. 150 miles of the Mississippi river is known as the “cancer corridor.” (Blatt, 2005) Bill Moyers research for PBS found 84 synthetic chemicals in his blood. 500 synthetic chemicals have been found in people worldwide. The blood of native Inuit Indians in Siberia tested the highest for mercury and PCBs because their diets solely rely on fish and species highly contaminated. More than half of the U.S. population drinks bottled water (Diamond, 2005.)

What to do about water deficiencies?

We need to incorporate all rainwater displacement by built surfaces, as a natural system. All displaced water must be captured, filtered for reuse, or filtered before being released back into the watershed. We need to decrease water usage, incorporate landscape into buildings wherever possible, use native plantings, and minimize need for pesticides, fertilizers, and watering. Our goal should be to:



- To increase water efficiency, we must use water efficient appliances.
- Decrease water leakage by individuals and municipalities.
- Decrease water runoff by infiltration, which is the use of pervious surfaces or catching the water with basins and re-using it before slowly releasing it back into the landscape.
- Use efficient drip systems for irrigation of agriculture and urban landscapes.
- Properly clean municipal water through up to date technological treatment facilities.
- Properly clean all water used for manufacturing before releasing it back into the environment.
- Dispose of poisonous chemicals through incineration which convert most toxic chemicals into harmless compounds.
- Inject toxic waste as last resort. Carefully chose sites not associated with ground water or human interaction.
- Build landscape into new development transforming urban sprawl.
- Incorporate natural systems such as streams and marshes into the urban landscape.
- Disrupt natural water systems as little as possible.
- Preserve natural water systems as much as possible.

The homeowner must require these self-sufficient systems and government must require responsible building laws in order for these changes to become common practice. Mandatory regulation will require architects, designers and builders to be responsible for handling water displacement. Self-sufficient sustainable water systems will be an integral part of new building just as conventional piped plumbing is the unseen part of the building today. Water storage using built in cisterns will be common place. Rainfall will be captured for building use. Water that is not captured will be infiltrated through the built fabric landscape, i.e. roof gardens and sustainable road and parking runoff buffers.

How can water systems give form to architecture?

Any building construction creates a displacement of natural water systems. The sustainable self sufficient system is two fold. The first part reduces the amount of displacement to begin with by maintaining vegetative coverage and infiltrating water that is displaced. The second part is capturing the remaining water that has been displaced and releasing it back into the soils at whatever the normal rate is for that geographic climate. The captured water can be used in many ways contributing to a self-sufficient supply of water for the building.



Today, when we look at solving the problems of water displacement and run off at the home level, the solutions seem so primitive. All we have to deal with the problems are after the fact, seemingly band-aid solutions including berms, plantings and rain barrels.

At the home scale, fabric water systems are primarily capture and release systems. Rain barrels are the most accessible add on system method today. New construction can incorporate cisterns, possibly located under the porches of houses. These systems can be very basic or highly sophisticated. The basic system allows water to be used throughout the house as 'grey water' for toilets and cleaning before being released into the sewer system. Sophisticated systems will filter the water for drinking use and filter gray water before releasing it into secondary cistern systems that then use the water for irrigation use before it finally infiltrates back into the environment. This latter example best exemplifies a self-sufficient nature system. Use of plantings throughout the built environment is part of the water system I will address in the vegetative system section.

Roads and parking designed for water management have curbless or cuts in the curbs to allow for infiltration rather than channeling the water. Roadside vegetation is dense and primarily native plantings rather than mowed lawn edges, which promote water run off. Parking islands are designed as wetland swales to capture runoff for infiltration and cleansing before releasing it into the surrounding water shed. When retention ponds are necessary, they are incorporated into the landscape with multiple uses as wetlands, fishing ponds, habitats, and parks for recreation. Water displacement everywhere is handled as a natural system.

With new self-sufficient building water system techniques incorporated from the micro, homeowner level to the macro, larger building and community level, we may achieve a greater degree of sustainable water use. We will not degrade the natural landscape and pollute (through runoff and erosion) the ecology and water we depend on.



VEGETATION-AGRICULTURE

Why is vegetation and agriculture in peril?

What to do about vegetation and agricultural deficiencies?

How can vegetation and agriculture systems give form to architecture?

*“We don’t just inherit the world from our parents;
we borrow it from our children.”*

Anonymous

Why is vegetation and agriculture in peril?

Vegetation is the cloth, the covering, which drapes over the skin, the soil, which covers the earth itself. It is the habitat in which humans as well as all species thrive. It is the home, the protective layer, the medium in which all systems flow.

The planet maybe in the midst of its sixth great extinction (Meffe, 2005). The rate at which new species are evolving is far slower than normal rates. This is due to man made factors that severely prohibit the evolution of diverse forms of species specifically, habitat loss (vegetation loss) due to human expansion (over population), urbanization, and suburban sprawl. The same factors that are causing extinctions are also limiting diversity. Rich complex environments tend to be most species diverse. Size of the ecosystem also plays a key role in diversity. The more isolated an ecosystem, such as an island, the less diverse the species are, however there are more indigenous species specific to that isolated environment.



Islands are high risk ecological systems, especially due to human development. Coastlines tend to be extremely diverse (Meffe, et al.1997). These are also the most coveted and developed areas by human kind. Maintaining complex, diverse vegetative and aquatic ecosystems are the goal of fabric landscapes. The greater the diversity the healthier the ecosystem.

Jared Diamond in his studies on the collapse of civilizations addresses the perils of island societies as examples of limited resources due to geographical phenomenon. Every geographic location on the earth has its bounty and challenges for societal inhabitants. Some examples like Easter Island are extreme because it lies so far south that trees take 50 years to grow back rather than the 10 years it would take in temperate climates. It is so isolated that it could not receive help from the outside world. Once technologies such as irrigation and agriculture allow societies to prosper, the population increases to the point where it can no longer sustain itself. The downfall of Easter Island is often used as an analogy for the planet Earth.

Many island countries have had to face their own peril and destruction if they did not address the conservation issues of their day. Japan, during the Shogun era of the 1800s, realized the danger of over-harvesting their wood and by law limited lumber extraction. The Dominican Republic, during the 20th century, through major social detriment, saved a majority of its hardwood forests. Haiti on the other hand did not and is continuously facing extreme poverty and civil unrest due to overpopulation and limited resources. Haiti faces a lack of food due to over fishing and agricultural crop soil degradation, limited fuel due to over firewood harvesting and limited clean water due to runoff and pollution. But, even island countries today such as Japan, which have halted the existing degradation of over harvesting in their locale, still rely on (typically 3rd world) other countries resources for their own subsistence. These imbalances of use in limited resources will not hold out indefinitely.

Rwanda is another current example of the tragedy of over population and limited resources. 800,000 Tutsis and moderate Hutus were killed during the genocide of 1994. Diamond argues that racial prejudice simply ignites, gives reason, to the greater problems of the 'have and have nots'. Specifically, not having the basic needs of shelter, food and water, may then lead to genocide, the need to reduce the population size, a desperate attempt to rebalance population with resources (Diamond, 2005).

Five of the major human causes of mass species extinction in order of significance are:

- Over harvesting-including wood, fish, crops, oil, all natural resources of limited supply. Even seemingly unlimited resources such as water and air can be over used, polluted, and badly managed to the point where an area would become unlivable.
- Alien species-invasive, such as plants, rats, domestic animals, cats, dogs, and snails, ect. The human transport of species not indigenous to an ecosystem causes devastation and rapid elimination of species diversity.
- Habitat destruction-increasing human population and human development.



- Fragmentation-the isolating of ecosystems through human development, fragments habitat and minimizes diversity.
- Pollution-To give just one example, CO₂ emissions from cars and industry are affecting the earth's temperature itself causing global warming.

(Meffe, Carroll, 1997)

Before European colonization of Maryland, 95% of the landscape was forested and 5% was wetlands. By the year 2000, Maryland has lost 50% of its forests and 50% of the wetlands (Weber et al., 2005). Urban sprawl continues to be an ever-greater problem displacing native species, disrupting ecosystem functions, and contributing to high rates of local extinctions.

Fragmentation of ecosystems by development is a growing and primary cause of species loss. Process, function, time and size of habitat are the key factors in ecological habitat preservation. 'Preserve the best, restore the rest' is the motto of ecologists and landscape ecologists. One recommendation is to weave back together the scattered 'patches' of habitats with 'corridors' to sustain functioning ecological matrix systems (Bryant, 2005).

Industrial agriculture today is not currently sustainable, and is a detriment to thriving ecological systems. Agriculture is typically a (monoculture) one-crop form. This model of food production wipes out diversity and is acquired by heavy fertilization and pesticide control. Agriculture erodes biodiversity by habitat loss, contributes to global warming due primarily to transportation energy expenditures, and uses 69% of the world's water consumption, especially in arid environments. However, the largest damaging food industry today is livestock; the meat and poultry industry.

Problems with industrial agriculture and livestock:

- Mono cultures-are eroding biodiversity
- Pesticides and fertilizers are polluting soil, water and air
- Soil erosion, compaction, pollution, overall fertility degradation
- Water consumption beyond sustainable available supplies
- Livestock-manure run off pollution
- Health issues-hormones, growth promoting antibiotics
- Transportation energy expenditures

(Horrigan, Lawrence, Walker, 2002)



It is simply not possible to sustain agriculture with our current methods. Eventual depletions of arable agricultural land will be caused by current techniques and outpaced by the world population. In addition, industrial agriculture contributes to fragmentation and ecosystem loss. Americans' animal-based diet is linked to heart disease due to the excessive fats in meats and colon, breast and prostate cancers due to chemicals and fats, and obesity and type II diabetes.

What to do about vegetative and agricultural deficiencies?

We need to conserve as much of the natural landscape systems left as possible. 'Conserve the best, restore the rest.' We need to restore natural habitats and weave the fragmented ecosystems back together by connecting eco-systems called patches and corridors. We need to reduce as much as possible the impact of development on ecosystems by use of fabric landscapes. Agriculture can be grown sustainably. Meat consumption and production can be reduced and produced more sustainably.

Following is a list of sustainable agriculture techniques using organic farming methods:

- Crop rotation
- Cover crops
- No-till and low-till farming
- Soil management
- Diversity of crops
- Nutrient management-only one third of fertilizers applied are utilized by plants
- Integrated pest management
- Rotational animal grazing
- Localized farming and produce
- Urban agriculture
- Urban farmers markets

(Horrigan et al., 2002)



It is feasible that communities and cities could self sufficiently provide a majority their own food. Severe economic problems in Cuba, since Fidel Castro's dictatorship, and the U.S. economic embargo, have caused harsh living circumstances there. With the disintegration in Cuba of large manufacturing and farming companies, people were forced to provide for their own fruit and vegetable needs. Little plots of land no bigger than an acre were turned into urban fruit and vegetable gardens. Out of harsh necessity, Cuba's agriculture has transformed. Mechanized farming and fertilizers had been ruining their soil. Today Cuba's land is fertile; the small urban plots are worked individually with organic methods. 60% of Cuba's agriculture today comes from these urban gardens. Four hundred thousand people are farmers. Economically, it is more lucrative to be a farmer than a teacher or doctor (N.P.R. March 10th 2003). This Cuban model demonstrates the possibility of transforming our cities and relationship to agriculture, consumption, food and nature.

The ESA Endangered Species Act was established in 1973. Thirty years since the EPA's establishment, a handful of species have been in reprieve from extinction while thousands of lesser known, unknown, or subspecies are rapidly disappearing. Instead of protecting individual species, protecting ecosystems would better protect the 5 to 100 million species on the planet.

How can vegetative and agricultural systems give form to architecture?

When we think of the vegetative cycle systems as the services and products it provides, we can better understand the processes as systems and begin to incorporate them into the fabric of our buildings, communities and cities. Natural systems sometimes called "green infrastructure" forests, wetlands and streams, provide these 'eco-services':

- Air-cleaning and providing
- Water-filtering and cooling
- Goods-forests, woods, medicine
- Food
- Energy
- Recreation, wildlife
- Storing and cycling nutrients
- Conserving and generating soils
- Pollinating crops



- Regulating climate
- Storm protection

Of course, everything we depend on is provided for by the earth, its vegetation and its limited resources. Self-sufficient fabric landscapes that are integral to architecture are broadly known as 'green roofs.' Green roof design today utilizes the least intrusive design systems to architecture. These new roofs are thin skins most often planted with succulents which are low water tolerant plants. Fabric landscape infrastructure (roof) systems are an ecological systems tapestry approach. This approach aims to integrate diverse vegetative ecological environments with architecture, operating as a natural ecological system would. By doing so, and including soils with worms, microbes and water, this rich vegetated built system will begin to re-connect the fragmented vegetative urban landscapes, ultimately providing corridors to preserved ecological environments (parks and protected habitats).

Following are the layers required for the construction of a fabric landscape roof planting that would accommodate trees and shrubs:

- Planting soil
- Filter fabric
- Drainage medium
- Concrete protection and drainage slab
- Protection board (also for insulation)
- Waterproof membrane
- Structural slab

The key to a successful integrated landscape and building system is the drainage and waterproofing. Waterproofing and insulation are added on top of the structural slab. A four inch protective drainage slab is poured on top of the waterproofing layer. This slab gives added protection to the waterproofing layer and is graded at 2% towards the catchment drains. The water is then directed to cisterns built into the structure or added to the roof. More commonly, the water is filtered through the roof layers and then discharged through downpipes into the sewer system. Due to innovations in waterproofing, the additional protective slab can be eliminated in existing structures.

Steel and concrete buildings can usually accept loads imposed by a vegetative fabric roof system. Loads of 250 to 300 psf (pounds per square foot) can generally accommodate the additional design of retaining walls, plantings, water features (dead loads), as well as people, rain, and snow (live loads). The weight of a new installation on an existing structure can be measured in cubic feet calculated by figuring each material's



division of cubic weight on an area added together to get an approximate concentrated load per square foot. Materials for intensive roof construction have come from many different manufacturing systems. Historically, well constructed roof gardens have held up to this day for over 60 years. The Derry and Tom's roof garden in London and the Rockefeller Center roof gardens in New York City were designed by landscape architect Ralph Hancock. Built between 1933 and 1938, both are to this day, structurally sound, non-leaking, beautiful roof gardens (Osmoundson, 1999).

A majority of food supplies can be grown sustainably locally. Providing locally for food needs reduces dependencies, and creates a system for world wide sustainable self-sufficiency. Although vegetative urban environments may never replicate completely the rich diversity of native forests, weaving green corridors throughout our cities will provide a rich healthy continuous ecosystem for all species development. Natural vegetative systems integral with buildings might look more like a natural stand of trees and groves of flowers and ground covers and would be more of a carpet rather than container planting. The vegetative system is integral with the water and energy systems. Rather than continuing to deplete our natural environment of resources causing continual species loss by environmental degradation and pollution, fabric landscapes may weave together the tapestry of natural systems.



ENERGY

WHY are energy systems in peril?

WHAT to do about energy deficiencies?

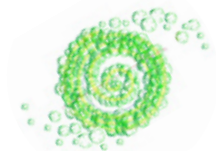
HOW can energy systems give form to architecture?

“The energy required to fuel our economies and lifestyles provides tremendous convenience and benefits. But it also exacts enormous costs on human health, ecosystems, and even security. Energy consumption affects everything from a nation’s foreign debt (due to fuel imports) to the stability of the Middle East. From the air we breathe to the water we drink, our energy use affects the health of current and future generations.”

Janet L. Sawin

WHY are energy systems in peril?

As the world population continues to rapidly grow, non-renewable resources such as fossil fuels are being lost at ever increasing rates. It is now scientifically established that global warming is due to ever increasing man-made carbon emissions. The results of global warming are becoming more and more evident every day. Glaciers are melting, hurricane frequencies and strengths are increasing, and many species, habitat ranges are getting smaller.



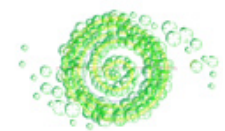
In the process of being built, and in its working lifespan, buildings and homes consume 40 to 50 percent of the world's energy today. Buildings produce 40% to 50% of the carbon emissions, 25% are transportation emissions and 25% are industrial (Gissen, 2002). Energy consumption is measured in energy for heating and cooling, manufacturing of materials, toxic waste producing products, the use of endangered wood products, energy used for waste management and landfills, loss of natural habitats, pollution causing water runoff, and transportation expenditures. These costs may also be referred to as ecological services. Houses are indirect polluters. They consume 36% of the nation's electricity, and 69% of that electricity is produced by fossil-fueled generating plants that collectively cause more pollution than automobiles (Garman, 2004). Energy is not merely measured in gas and heating expenditures. It is the cost of producing every aspect of our material lives. Energy systems are imperiled by the imbalance and impending decline in the resources used to generate that energy and material good.

Education about environmental impacts will be key to the policy, industry, and building changes necessary to maintain equilibrium with our energy ecosystems. When we do reach a balance with nature, cities will become self sufficient to the extent of cleaning more carbon from the environment than they produce. This movement toward environmentally conscious building is known by many names: green friendly, eco-friendly, ecological design, green architecture, green buildings, conservation construction, sustainable architecture, and fabric landscapes.

WHAT to do about energy deficiencies?

The energy crises in California have sparked new building programs aimed at energy-efficiency. The EPA launched its whole-house Energy Star program in 1995, aiming for 30% more energy-efficient building. In 1996 the Energy Department launched its whole-house Building America program, aiming for 50% efficiency. Today 10 % of all new homes will have the Energy Star or Building America Stamp (Salant, 2004). The Energy Department, as incentives to developers, has created the Zero Energy Homes program defined as a home that generates as much energy as it consumes. This goal is ambitious and still difficult to achieve today, so the scaled down goal for a "zero energy" house is achieving a 50% lower energy consumption. The department wants houses to have the capacity to generate clean electricity for their own use and send any excess to the grid for use by other households. When enough houses in a given area can create clean energy, the utility can meet its summer peak load without having to build peak load plants which are highly polluting. The U.S. Green Building Council has developed a certified rating system called LEED (Leadership in Energy and Environmental Design). LEED promotes sustainable building technology. New buildings with LEED credits are provide cost incentives that reduce building expenditures.

Clean electricity can be generated by photovoltaic cells on a roof that converts sunlight into electricity. Photovoltaic panels can be used almost anywhere, including shaded sites. Some states and local utilities will subsidize as much as 50% of the purchase and installation costs. Without subsidy, the cost for a 2,400 square-foot house average about \$16,000 to \$20,000. In California, a 50% subsidy and 7.5% state tax credit,



the cost is about \$7,400 to \$9,250. Homeowners whose local utilities offer time-of-use rates will also save by selling their surplus electricity to the grid during the peak daylight hours and buying back during the off-peak night hours (Salant, 2004). Currently the cost to generate photovoltaic electricity is 20 cents per kilowatt-hour. Grid generated power is 6 to 8 cents per kilowatt-hour. Within 10 years, photovoltaics will fall into the cost range of grid-generated electricity.

While attending a "Green Festival" in Washington D.C. 2005, energy consultants gave estimates of self sufficient energy systems for an average sized home. Both solar and wind representatives gave \$60,000 as the cost of energy self sufficiency. Many energy companies were installing solar water heater systems as well as thermal (underground) heating systems. Any combination of these three major renewable energy systems can sustainably be applied to any home or building.

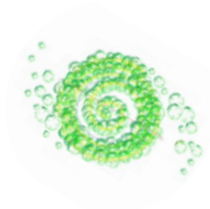
HOW can energy systems give form to architecture?

Sustainable development (fabric landscapes) is based on the following principles as described by the White Pages (Sydney, 2000):

- Minimal energy use
- Minimal water use
- Minimal waste
- Maximizing human health
- Promoting biodiversity

Ken Yeang's views of green development from the Green Skyscraper:

- The practice of ecological design is essentially 'applied ecology'...the understanding of the basic systemic concepts of ecology and their applications
- Ecological design seeks a symbiosis between man made systems and natural systems
- It must seek to repair and restore ecosystems
- Designers responsibility has to be from source to sink including the entire life cycle of the building

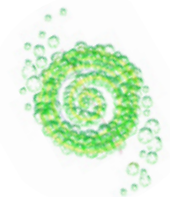


James Wines key views on eco-friendly building as outlined in Green Architecture:

- Smaller buildings
- Use of recycled and renewable materials
- Use of harvested lumber
- Water catchment systems
- Low maintenance
- Recycling of buildings
- Reduction of ozone-depleting chemicals as the greatest threat to human survival
- Preservation of natural environment
- Energy efficiency
- Solar orientation
- Access to public transportation

Sustainable development is built from materials that are recycled and recyclable. The way the resource is produced, mined and manufactured must be accomplished with minimal pollution or degradation to the environment. Local materials are used whenever possible. Shipping materials are kept to a minimum in order to reduce energy output and pollution during transport. All materials used impose the least possible environmental harm in their extraction, manufacture and shipping. Materials utilize modular building techniques, prefabricated, which allow on site assembly without polluting the site environment. The building functions as self sufficiently as possible. It runs off its own energy sources by the collection and storage of solar, wind and thermal energy. It supplies itself with most or all of its water needs, capturing water, reducing displacement and highly polluted run off. It uses non-toxic materials that do not give off (off-gas) toxic vapors (VOCs) replacing today's abundance of carpet fabrics, plywood, and paints that contribute to sick building syndrome. It aims to be the most aesthetically appealing, incorporating the original natural landscape into its structure and providing outdoor habitats for local species as well as its human occupants. The building does not displace the environment but incorporates it within its structure. Landscape weaves its way through the structure in the form of planted terraces and native rooftop plantings. Eco-design conceives of a structure from 'cradle to cradle' or in its entirety from construction to destruction and re-use.

Sustainable design can seem a dauntingly and complicated endeavor. Primarily aiming for self-sufficient systems in energy use for heating and cooling would go a long way in reducing the causes of global warming.



HISTORICAL PRECEDENCE

WHAT are historical natural building systems?

HOW have vegetative, energy and water systems given form to architecture?

*Vitruvius formulated these principles titled 'Vitruvians Triad':
"...everyone deserves an environment that is biologically
wholesome, socially just, and spiritually rewarding."*

Olin

WHAT are historical natural building systems?

The most ancient roof garden still standing today is the Ziggurat of Nanna, now Muqaiyir in southern Iraq, built during the 3rd dynasty of Ur in 2113 BC. It is a stepped pyramid constructed of a mud core and facing brick standing 68 feet tall and accessible by stairs. The terraces were planted with trees and shrubs to offer relief for those climbing the Ziggurat in the excruciating heat (Osmundson, 1999). In 500 BC the hanging gardens of Babylon were one of the Seven Wonders of the World. Hetsepshut's funerary complex in Luxor, Egypt was terraced and planted with trees. The Villa of the Mysteries in Pompeii is a terraced U shaped roof structure, covered by soil and plantings. It has been found that roofs during the Roman Empire were commonly used as outdoor living space. Sod roofs were invented by the Norwegians centuries ago in order to combat extreme temperatures. Turn of the twentieth century roof gardens in major cities became summer entertainment spaces for outdoor theater. In 1938, the Derry and Tom's roof garden opened for special entertainment on top of a department store. This one acre



garden still exists today. Originally planted with five hundred different varieties of trees, shrubs and perennials, today it consists of a Spanish garden, a Tudor garden and an English woodland garden that includes streams and ponds. The Rockefeller Center also supports a notable group of roof gardens still in use for over 60 years. Both the Rockefeller Center and Derry and Toms gardens were designed by landscape architect Ralph Hancock.

HOW have natural systems given form to architecture?

Freeway Park designed by Lawrence Halprin and built in 1976, is one of the most outstanding examples of landscape over built construction. It is a 5 and a half acre park built over the interstate freeway. The freeway, which divided the city of Seattle in half, is united by this forested evergreen and deciduous park.

In Washington, D.C. above the African and Asian art museums is the Smithsonian Institute's Haupt Garden. Designed by the landscape architect firm Sasaki Associates, the gardens were completed in 1987. The museums have an overburden of 5 to 6 feet in planting beds with fully grown shade trees. The allowable weight limits for the ceilings below the garden were 140 pounds per cubic foot. Other average planting depths are one to three feet. The surface is drained to catch basins that pipe to the storm water drainage system (Osmundson, 1999).



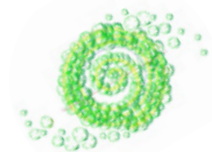
TODAY

“Sustainable architecture...meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

Brundtland

Many ‘eco-friendly’ buildings exist today all over the world, particularly in Europe. New technologies are constantly being designed into future projects. Architects are taking their inspiration from nature to resolve design problems of ventilation, heating, and cooling. New buildings are taking shape that are not limited to industrial, modern, and classic design forms. Veriform Research Project has designed a high-rise with an arching shape to funnel wind through a giant turbine. This design was inspired by rocks that are carved into aerodynamic forms by the wind (Gissen, 2002). Eastgate project, a mid-rise, completed in 1996 in Zimbabwe, took its inspiration from the ventilation process of termite mounds. The building is the largest commercial and retail space in Zimbabwe that does not use air conditioning. It is cooled by the naturally designed ventilation system. Common features of these new buildings are double-layered window systems that allow fresh air in, and provide insulation and circulation for natural heating and cooling. In the Washington metropolitan area, the Tower building in Rockville, Maryland is another environmentally sensitive building completed in 2001. It is a mid-rise building located next to interstate 270 in order to minimize its impact on its lushly wooded site. It uses low-VOC materials, water conservation and reuse, and energy conservation systems.

Landscape architects are designing roof top gardens. Urban renewal projects abound particularly for previously industrialized (brown field) sites. Landfill projects such as Fresh Kills in New York, are proving models for potentially sustainable trash disposal systems. Landscape architects and architects may work integrally with a fabric landscape systems approach to sustainability and self-sufficiency.



CONCLUSION

“If you think you’re too small to be effective, you’ve never been to bed with a mosquito.”

Anonymous

While living our daily lives it is hard to imagine that our environmental ecological natural systems are in peril. We see lush green landscapes everywhere. We see diverse home owner landscapes, lush public parks and well maintained richly planted private institutions. We visit our national parks and see the richness of the American landscapes from mountains, to plains, prairies canyons, and redwood forests to Atlantic beaches. Environmental degradation is a subtle, yet suddenly overwhelming prospect. When we think to our childhoods we remember that perhaps there used to be many amphibians, garden snakes, frogs and lizards, but we haven’t seen any for over twenty years. We remember fishing and eating the fresh caught fish. And then we are struck by the ferocity of natural disasters such as Hurricane Katrina. With expanding development gulf coast regions have diminished natural wetland buffer zones. Our natural protective vegetative landscape layers are continuously being stripped away, with devastating results.

Education and cost effective solutions is key to continuing to inspire developers, organizations, and homeowners to push for building eco-friendly fabric landscape techniques. Health is another common issue, directly associated with our surroundings that will catalyze the need for these new building practices and technologies. Through education people will take to heart and demand change of the many health hazards associated with so many current building and production practices. Many building materials and interior furnishings vent toxic vapors over time, contributing to allergies and cancers. Health issues associated with agriculture and food production will inspire consumers to demand



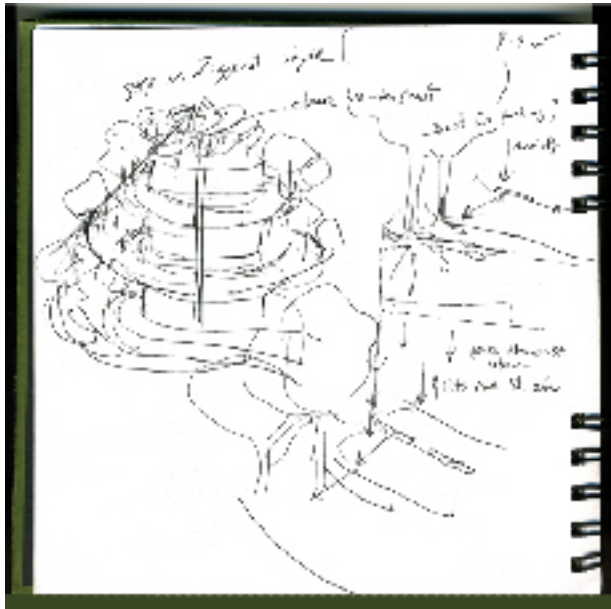
more and more locally, organically, sustainably grown food products. As air quality continues to diminish due to excessive carbon emissions, the need for lush green surroundings becomes even more important. Loss of species and natural habitats to sustain diverse species ecosystems becomes more of an issue as development increases.

Economics is another layer of necessity for a thriving ecological landscape. Re-newable energy now in our technological grasp must be utilized for our energy needs, rather than using up finite resources such as petroleum at ever escalating expense. Petroleum is used to manufacture all plastics as well as innumerable other uses. Rather than the notion of growth as the backbone of economic health, the idea of a 'steady state economy' more closely exemplifies a developing self-sustaining world. Self-sufficiency economic and ecological balance are attainable goals. As the degradation of our world becomes apparent to mainstream America, the demand for safe, healthy environments will become an essential human and natural right. There is security in knowing one can depend on independent systems for energy, water, and food. Will it really be too much to ask for a 28th amendment to the constitution that provides for the unalienable rights of people to nature and its resources in a sustainable manner? As Olin interpreted Vitruvius put it "everyone deserves an environment that is biologically wholesome, socially just, and spiritually rewarding." When air food and water quality become sub standard as the norm, guidelines for human intervention become a necessity for our survival. This paper argues for a natural systems approach to landscape architecture and design. It is an argument for a coexistence of building and ecosystem as the natural fabric of our well-being. Just as we clothe ourselves against the harsh climatic world, we should re-dress the landscape we have too often stripped of its essential, many layered, diverse necessities.

The Earth's limited resources must be used like nature's closed-looped cycles. Building systems must operate as synchronously as ecosystems. In this way, through what is most often called sustainable development, we will change our relationship to nature from that of poor understanding of the long-term consequences to one of understanding, stewardship, and an integral coexistence with the natural world. The aim then, is not merely to sustain what we have left, but to continually develop, to provide a safe, healthy, beautiful world today and in the future.

Fabric landscapes are a designed and constructed way to re-integrate building with the natural landscape in a balanced sustainable way. Fabric landscape is the integration of landscape (ecological systems) into architecture, both figuratively and literally. We need to re-blanket the denuded cities, suburbs and buildings everywhere in the world with a tapestry of landscape, a magic carpet as it were, of today, in order to protect ourselves, our precious resources, and the planet as a whole. Freedom is self-sufficiency and can be achieved by integral sustainable fabric landscapes.





Park Park

Appendix 3

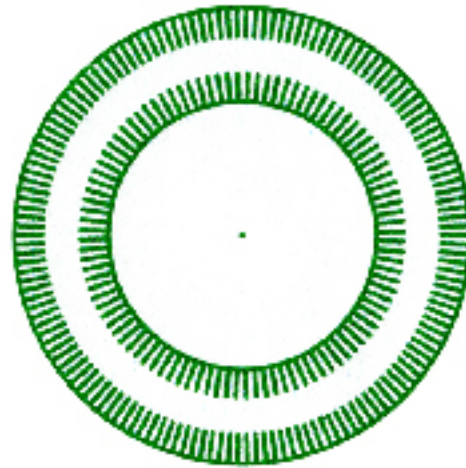


Design Studies

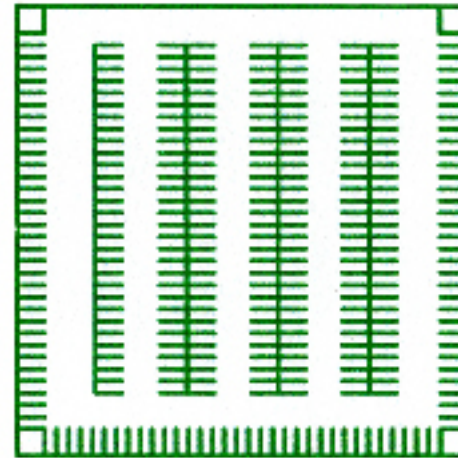
Architectural Tapestry (Magic Carpet) of the 21st Century
Landscape Systems Give Form to Architecture



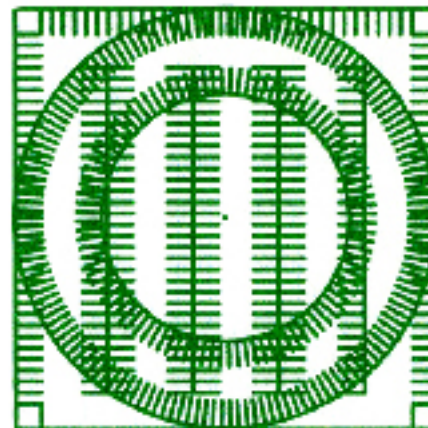
Study Parking Configurations

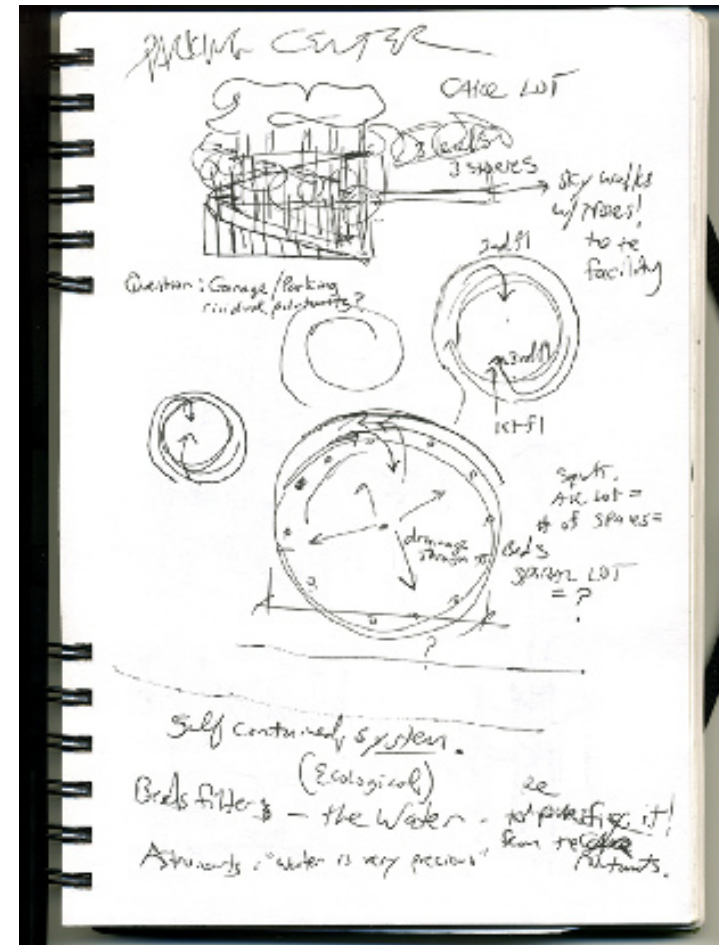


300 Foot Diameter
250 Parking Spaces



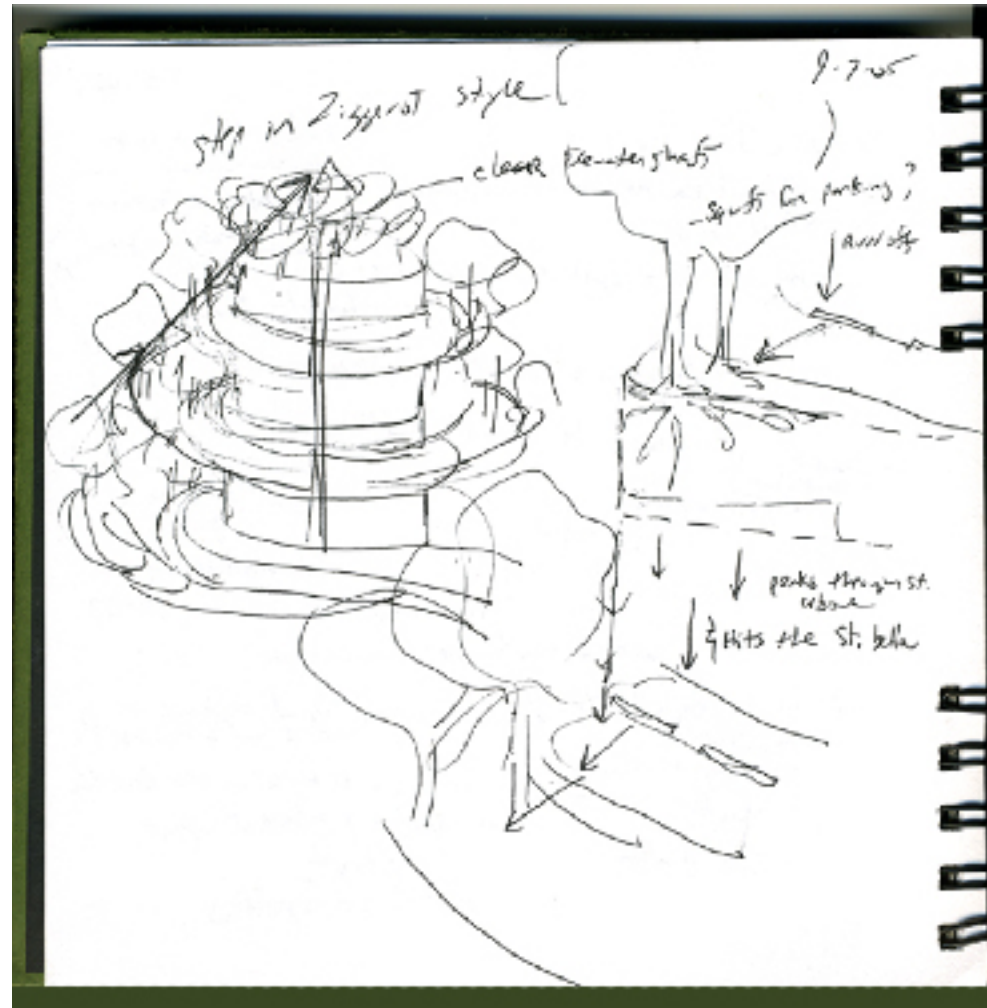
300 Foot Square
300 Parking Spaces



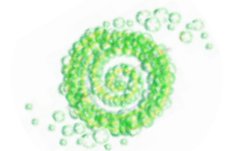


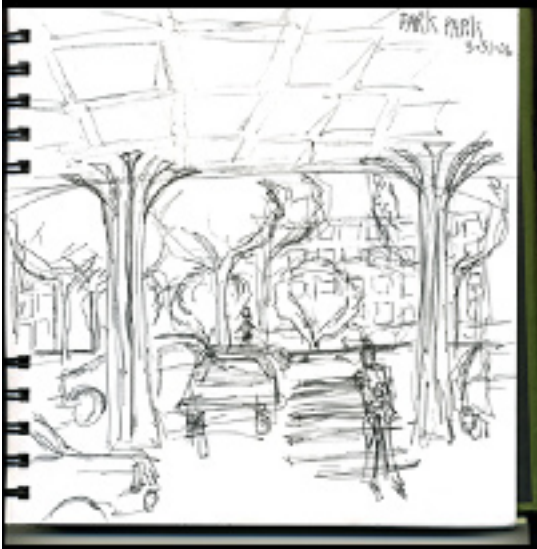
Study Sketches





Studies





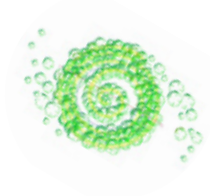
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