THE GAME PLAN

A SUSTAINABLE APPROACH TO SPORTS VENUES

RAYMOND PAPA

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Presented to the faculty of the Landscape Architecture Department of the University of California, Davis, in partial fulfillment of the requirements for
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sustainable

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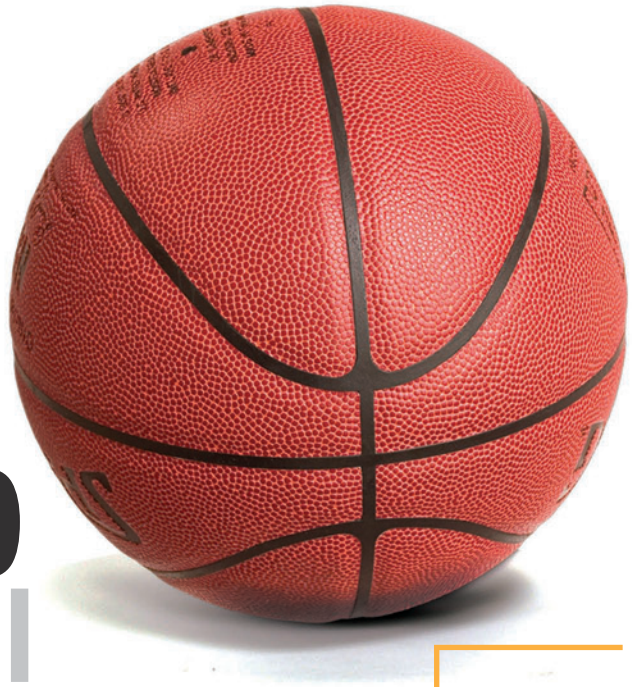

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THE ABSTRACT

Sports venues are regarded as one of the largest gathering places in the world, where thousands of people come to an event to be entertained. Looking past the stage of competitive sports, the glam and the glory, not much attention is focused on the surrounding areas. A venue capable of housing high volumes of foot traffic requires a large amount of space specifically for the use of travel, such as pedestrian pathways connecting public transportation to these arenas and parking. These spaces are filled with inadequate amounts of vegetative surfaces, the majority of the space is comprised of impervious surfaces. This leads to ever increasing problems relating to the environment and other aspects relating to allocating energy consumption, pollutants from storm water, urban heat island effect, and loss of biodiversity. Yet, when a problem arises, there are thousands of solutions relating to design that what affect the sustainability and usability of sports stadiums. The question is: how can sports venues become more productive? Is there a better way to integrate these venues to the neighboring landscapes?

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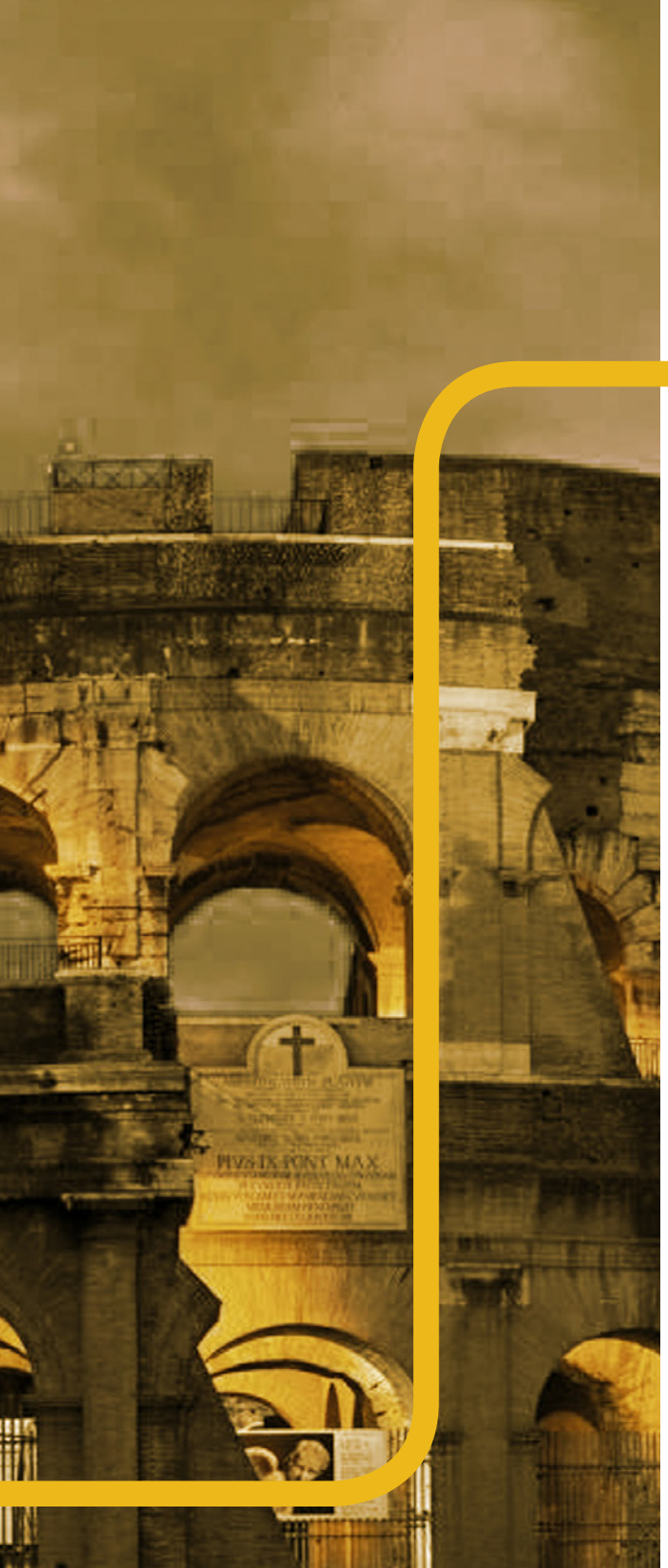
SECTION
01



INTRODUCTION

"If you want to understand today, you have to search yesterday."

~Pearl Buck

01

FIGURE 1.0: A Sports Arenas Landscape

Sports stadiums are important community centers for a lot of cities, regions, states and nations. They connect people to a place where comradery and loyalty is formed for both fans and players. Yet, sports go beyond friendly games between opponents, but a multi-billion dollar business benefitting the individuals, local businesses, community, and owners. It is why so many cities try and lure a team to their own hometown for the hope of becoming more prosperous (For example, Seattle and Sacramento fighting for the rights to own the Kings). With all the attention going to who wins what game and who owns what team, people begin to forget the places in-between point "A" and point "B," which are the roads, sidewalks, parking structures, and other landscapes that can affect our everyday lives. In many cases a lot of design in terms of aesthetics and productivity are neglected and underutilized. This project will look at sustainable methods towards designing sports stadiums and how it can be implemented for both existing and future use.

FROM ECONOMICS TO SUSTAINABILITY

In the last few years, many sports venues were recognized as unsustainable, however a recent push to "go green" has owners of these venues "jumping on the band wagon" for a number of reasons. Professor Paul Griffin, a leading international authority in accounting and financial information at University of California Davis, stated that, "companies that released [positive] information about their greenhouse gas emissions and carbon reduction strategies saw their stock values raise" (Griffin, 2012). Although, sports venues are not on the stock exchange, alot of support and fan opinion can relate in terms of positive public relations. In many cases, fan perception and support of a team does not only base its success on wins and losses, but actions towards what organzations can do outside the game. Many teams across the sporting spectrum are beginning to incorporate sustainability into their infrastructure and operations. It not only saves money, but gives the idea that sports teams care about the environment . With positive PR and the fact that"13 percent of Americans say they follow science, [while] 61 percent identify themselves as sports fans", no wonder why large corporations are sponsoring to have their brand names placed somewhere on the landscapes of these venues (aka Levi's Stadium at $220 million). (ICMA, 2012).

FIGURE 1.11: Citi Field Advertisement

FIGURE 1.12: Levi's Stadium Investment

BRIEF HISTORY

STADIUM

The word "Stadium: comes from the Greek word "sadion" which was used as a greek unit of distance measuring 180 meter (607ft).

STADIUMS OF THE PAST

Compared to today's stadiums with huge parking lots, bright lights, cheerleaders, and special effects being televised for people around the world to witness, a more subtle version of the Stadium can be found where the first Olympic Games were held, Greece. The first stadium or "Stadion" originated around 8th Century BC and was composed of tracks used by athletes shaped in an elongated "U" measuring 192m by 32m (620ft by 105ft) in distance. These structures were constructed by excavating tiers along a slope at certain heights on level with the ground. With no physically built walls, unenclosed and open to the rest of the world, early Greek stadiums created a feeling of being one with nature show casing the natual beauty of the surrounding landscape. The most common sport held in these complexes were horse and chariot races (Spampinato, 2010).

FIGURE 1.13: Origins of the Stadium

FIGURE 1.14, Origins of the Stadium II

THE AGE OF ROME

Soon these stadiums would be adopted by the Roman Empire which created one of the most iconic stadiums in history, the Flavian Amphitheatre or "The Coliseum." Measuring approximately190m by 150m (620ft by 500 ft) The Coliseum would out do all other stadiums, being the largest in terms of size and architectural design. Earlier types of stadium architecture, which would excavate into the landscape giving the shape and support of the structure. The Coliseum became separated from the surrounding landscape using free-standing walls made up of wood, stone, and concrete. On the upper tiers of the structure, awnings were incorporated to shade viewers from the harsh sun. The structure became a central hub for public entertainment where more than 50,000 spectators were able to pack the arena, watching events consisting of hunting animals and gladiatorial combats. To the spectators, a common "slave" could be seen as glorified heros for those who survived the harsh battles and became the talk of the town. By the 6th century AD, change in public perception due to Christianity beliefs along with struggles of the Western Roman Empire and damage dealt by natural disasters, ended gladiatorial combats and soon become abandoned completely (A&E, 1996)

FIGURE 1.15: The Heros of the Coliseum

FIGURE 1.16: The Coliseum Today

FIGURE 1.17: Michigan Stadium

FIGURE 1.18: The Alien Known as the Super Dome

REFLECTING ON THE PAST

Looking back into how the stadium evolved from the juxtaposition of an elongated "U" toward two semicircular shapes creating a venue, not much has changed since the original design; However, since the days of ancient Greece and Rome, the stadium concept has developed and evolved. People of the past would either walk or ride horses to the Coliseum games which had no need of a huge parking lot to cater to specific sports and just like urban sprawl, most stadiums moved away from city centers toward a more secluded part of town during the 1940's-1950's, when automobiles were used by almost everyone.

With so many cars and the ever-growing amount of people especially during the "Baby Boom," architects and planners alike, designed stadiums to hold as many cars and people as possible. Though a good idea, designs like these did not look into solar orientation which would capture natural lighting, best spectator views, or designing with the natural elements of the landscape, but with an egotistic design that alienates the surrounding areas.

The Super Dome built in the late 1960's is located in New Orleans, Louisiana.It is the largest fixed dome stadium in the world. This "alien" like structure was originally designed with no windows making the stadium reliant on artificle lighting and closed off from the outside world. It wasn't until 2005 that Hurricane Katrina damaged the stadium heavily, that

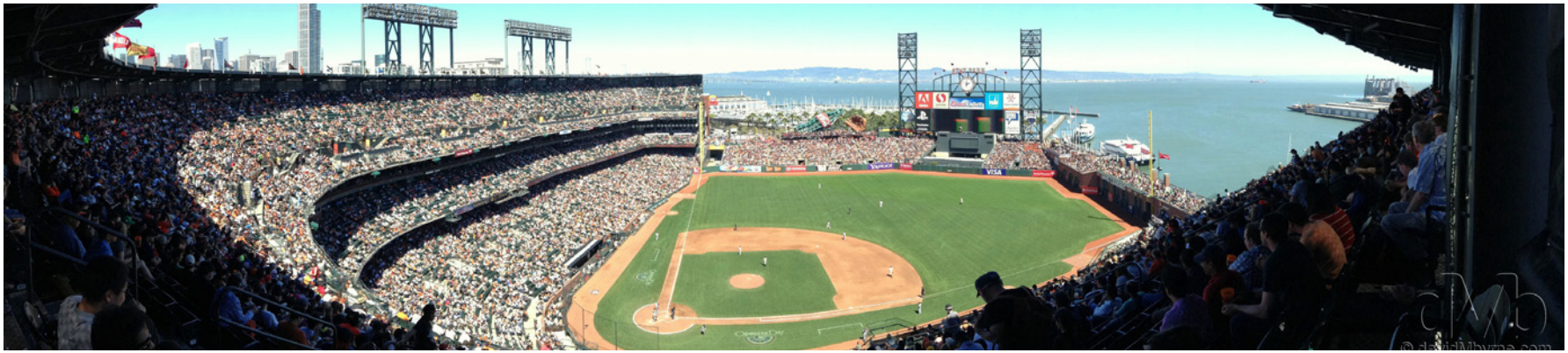


FIGURE 1.19: San Francisco's At&T Park's Views of the Bay

windows were installed to allow natural lighting to shine in. Though a nice gesture in design to allow somewhat of a connection to the outside world, the interior of the dome where all the specticles are witnessed, is still unable to allow natural lighting to occur even on a nice sunny day (Daily Commercial News, 2008).

LET THERE BY CONNECTION

With stadiums being cut in view of the outside world and almost always walled off, what have designers come up with other than adding a few windows here and there? Designs such as a retractible roof like those found in Reliant Stadium which hosts the NFL (National Football League) team the Houston Texans are one of the few stadiums in the US that incorporates a retractible roofing system allowing daylighting. On a hot humid day, roofs can be closed, allowing unconfortable situations to be negated,where as on a cool sunny day, the roofs can be left open for fans to enjoy.

Other stadiums that are more forunite in terms of climate have designed with the landscape instead of against it. San Francisco known iconicly for the Golden Gate Bridge is also recognized by the sports world of having one of most beautiful stadiums in the world. Built in 2000, At&t captures the scenic beauty of the San Francisco Bay by lowering its walls and opening it for fans to experience. Beyond the views however, At&t have brought sparked a new wave of development to San Franciscos China Basin. since its opening more than 10 years ago, the stadium has brought over "$2 million dollars in ticket taxes, and tax revenue on the estimated $70 million dollars spent by fans at nearby businesses." (Chastang, 2010)

STADIUM USAGE

The two types of modern stadiums in terms of usage can be categorized as (a) mono-functional sports facilities which are designed to serve one single sport. These facilities create the most optimal views and provide a theme like feel to the arena (b) multi-functional facilities are designed to handle a wide variety of sports within the boundaries of the area.

(a) MONO-FUNCTIONAL:

FIGURE 1.20: Mono-functional Stadium

(b) MULTI-FUNCTIONAL:

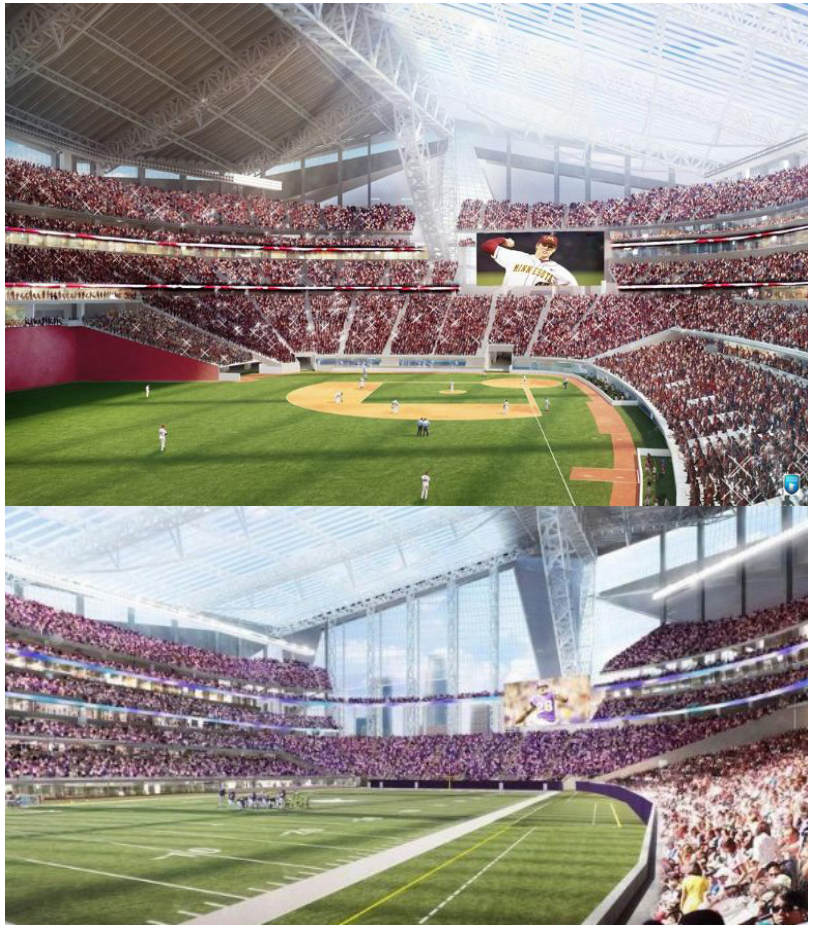


FIGURE 1.21: Multi-functional Vikings Stadium Concept (Designed for Both Football/ Baseball)

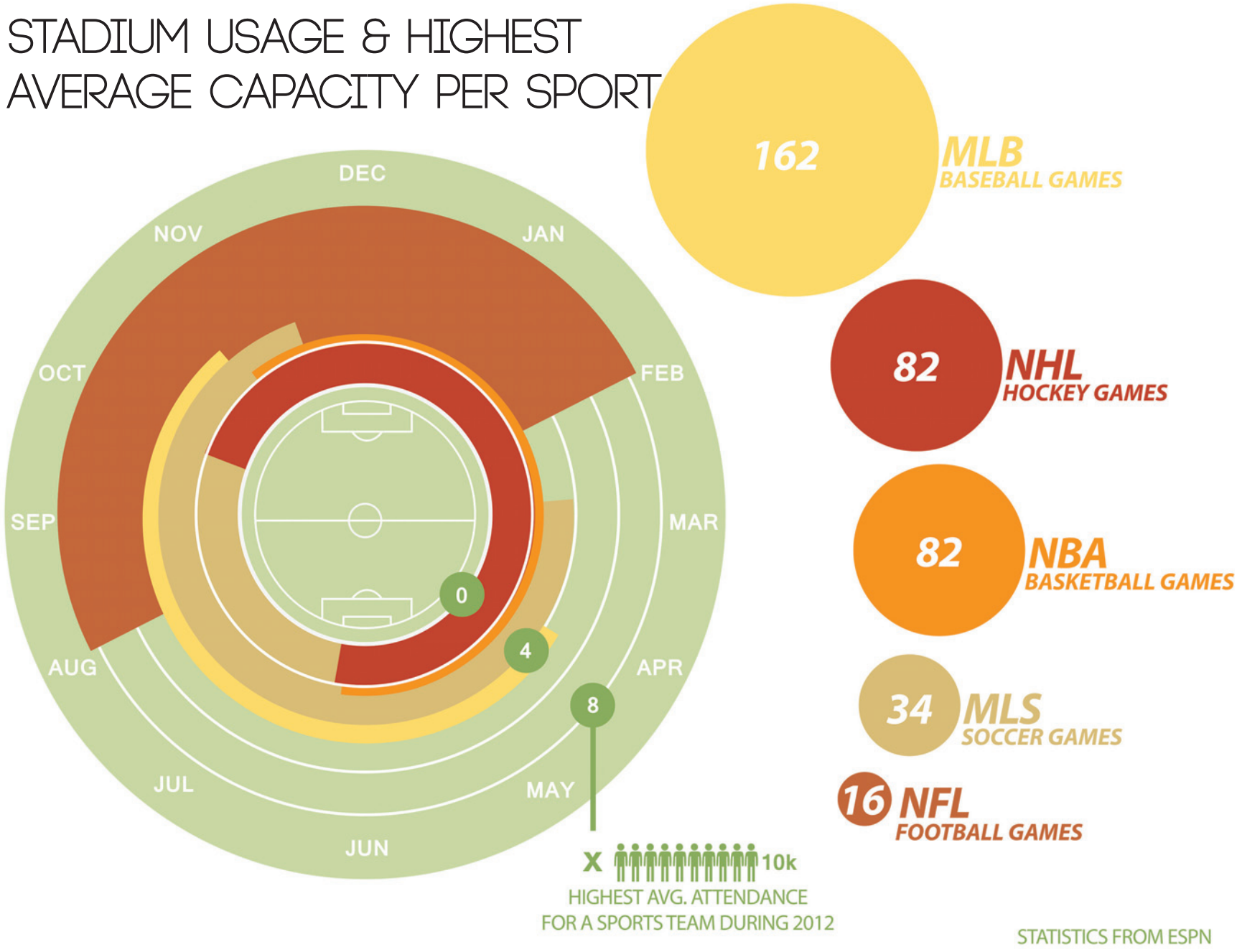


FIGURE 1.22: Self made info-graphic describing the relationship of capcity, time of usage, and number of games per season

TAILGATING

The vibe and energy from fans are not always found in the walls of the arena, but when you take your first step out of your own vehicle. Tailgating is a honored tradition that is most commonly associated with American Football, where groups of fans gather together onto the parking lot to socialize. While players train hard to help them perform, fans train so to speak, prior to the game by getting their spirits and energy amped up by tailgating. Although, the exact location of where tailgating originated remains a mystery, it has spread throughout the United States and even parts of the world. In most tailgates, the act of comsuming alcohol, grilling food, and sitting on lawn chairs is the norm, tail gating has evolved into a must have fan specticle.

FIGURE 1.23: Massive Tailingating at Notre Dame's Parking Lot

The Competition

Just like rivalry between two teams, tailgating too is a competative sport but with cook off competitions. In a episode hosted by Food Network's Guy Fieri entitled *Tail Gate Warriors*, fans representing the San Francisco 49ers and the Oakland Raiders were given a chance to host their tailgating skills based on: taste, creativity, difficulty, and presentation. Each team was given 60 minutes to prepare the food for a group of judges. Food here, just like many modern tailgates go beyond the traditional hotdogs and hamburgers. Food being prepared here is in comparison to any five star resturant such as Lobster, Steaks, Crepes, and more. (Guy Fieri, 2011)

FIGURE 1.24: Guy Fieri, Tailgate Warriors

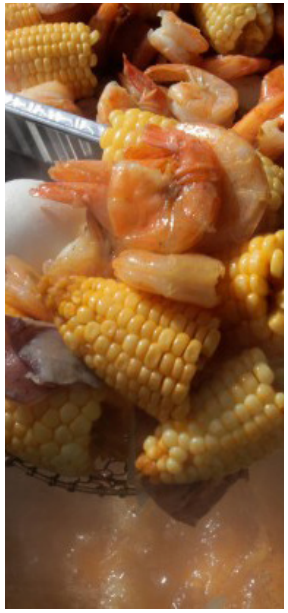


FIGURE 1.25: More Than Just Burgers

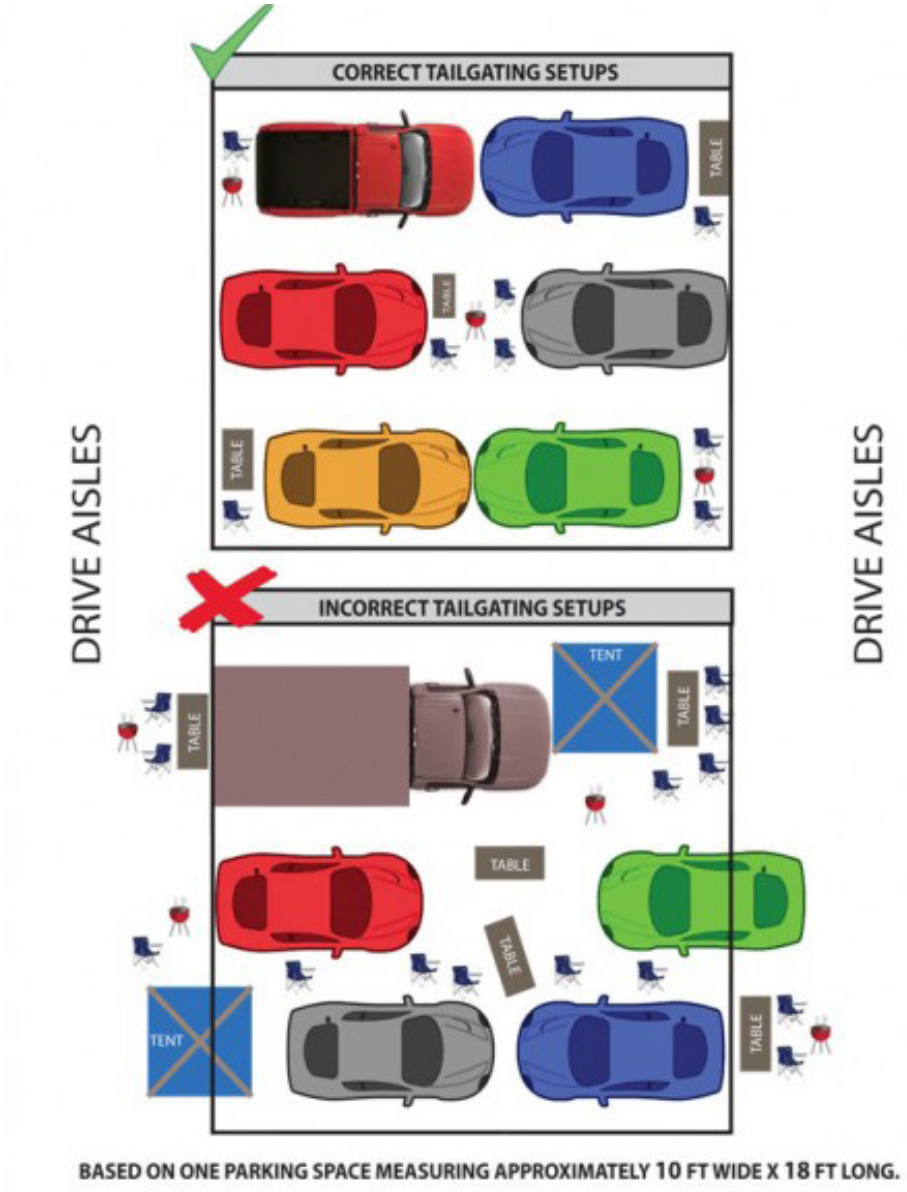


FIGURE 1.26: Correct/Incorrect Ways to Tailgate

TAILGATING SETUP

Each Sports Venue has thier own rules and regulations pertaining on how tailgaiting is displayed. Figure 1.16, displays the correct/incorrect ways to setup Tailgates. Tailgates are displayed in front of or behind the vehicle. Since Stadiums have a set amount of parking stalls, setting up in a empty stall is prohibited just as the tent is set up in front of the truck. The reason to setup within the parking stalls, is to allow enough space for vehicles to move through drive isles and clearance for fire/ambulance trucks to move freely without disruption.

FIGURE 1.17: Example of Unqiue Tailgate Equipment.


SECTION
02

"GREEN" STRATEGIES

"The good building is not one that hurts the landscape, but one which makes the landscape more beautiful than it was before the building was built."

~Frank Lloyd Wright

02

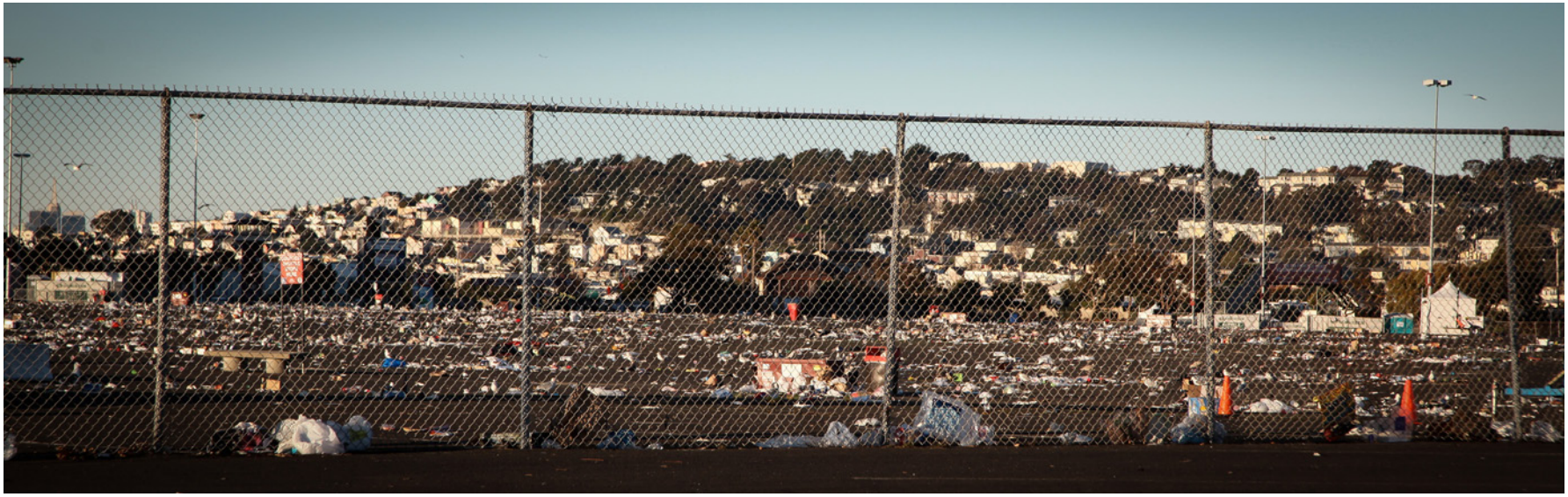


FIGURE 2.0: Sports Stadiums and the Environment

Sports Arenas in comparison to the natural environment are sometimes seen as total opposites due to the negative impacts on the built environment. Large amounts of impervious surfaces are present throughout many sites ranging from the parking lot, pedestrian path of travel, and roof tops. In this section, topics relating to "Greening" fall into four sub-categories: Surface Materials, Water, Energy/Lighting, and Density .The end result of reviewing these topics will hopefully help the alternatives ways of changing the typical Stadium and incorporating facotrs that would lead to a more sustainable design.

SURFACE MATERIALS

The type of material in which you use on a site can make or break a design in terms of how successful the project can be. Factors such as aesthetics, functionality of the material, and longevity play an important role. The following will look at different materials that can help when designing for sports stadiums.

SURFACE MATERIALS PARKING LOTS

Asphalt Pavement:

FIGURE 2.10: Typical Asphalt Parking

- Used typically in heavy traffic. This material is eaier to repair.
- Cost of installing and purchaing is cheaper
- Able to add different patterns if stamped
- May need alot of maintenance in the long run
- Is impervious not allowing the absorption of water to the ground
- Creates warmer temperature due to drak coloring
- Pot holes and rutting is common occruances
- Creates a glare due to the inability to let water through its pores

Concrete Pavement:

FIGURE 2.11, Concrete Parking Stalls

- Smooth surface gives a better aesthetic appeal.
- Lower heat due to the lightness in color
- Much stronger in terms of wear and tear
- Able to recucle concrete material
- Comes in a variety of different colors
- Harder to repair if damaged. Need to permanently uninstall material to fix and major problems
- Joints are required. inorder for concrete to be installed

Pervious Interlocking Pavers:

FIGURE 2.12,: A Parking lot with Pavers

- Pavers allow water to flow through the joints
- This system is widely aplicable to both small and large paving applications offers good design and flexibility
- Repairs can more easily be made.
- Can require more labor to be installed, especiallt to meet ADA requirements

Reinforced Grid Systerm with Grass:

FIGURE 2.13: Grass Cointaining Reinforced Grid Systems

- Renforced grid systems have overall less material to install
- Does offer some flexibility with types of gravel color and low-planting types
- Are limited to low-use areas such as residential driveways and parking lot applications.
- May not be suitable in colder climates where snow plowing is needed
- Very few examples are available to show widespread success

Pervious Concrete Pavement:

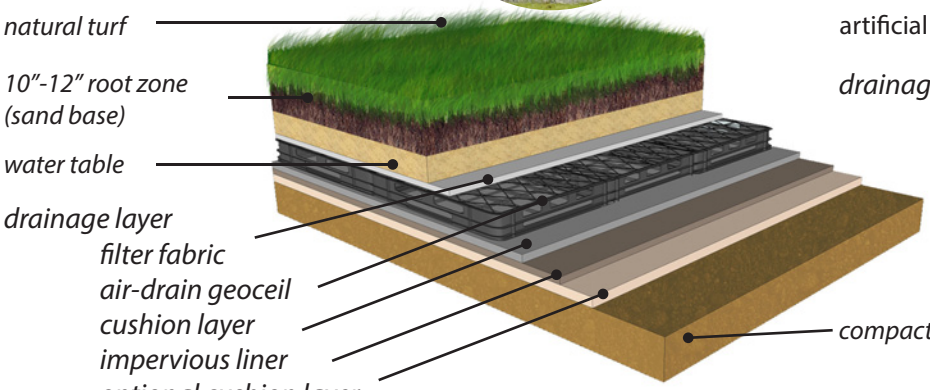
FIGURE 2.14: The Huge Difference of Having Pervious Paving

- Pervious asphalt/concrete is becoming more common and can be used in both street and parking lot conditions
- Pervious asphalt can be prone to rutting
- Both technologies have a higher cost to install compared to conventional paving and require frequent maintainance to limit clogging
- There is little flexibility

(Pros/Cons: Time Saver Standards For Landscape Architects and Perry)

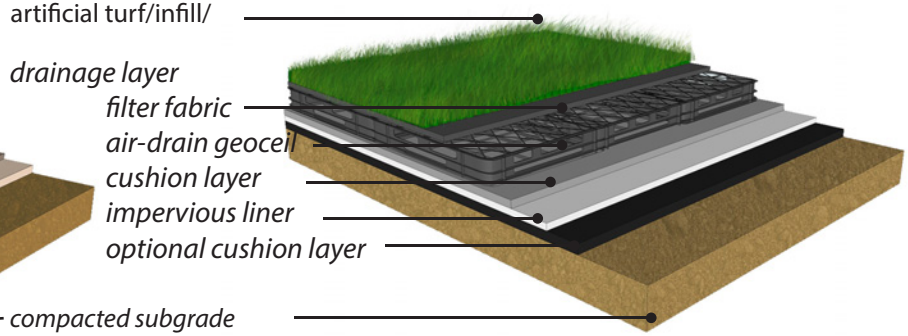
SURFACE MATERIAL: NATURAL VS ARTIFICIAL TURF

NATURAL TURF



- Cost to install natural turf is relatively inexpensive.
- Players prefer the feel of natural over atificial.
- Creates oxygen
- Requires pesticides to prevent insects
- Requires a lot of maintenance and irrigation.
- Green appearence can change depending on weather conditions

ARTIFICIAL TURF



- Cost to install is expensive.
- Requires little maintenance other than watering it every so often.
- Most Players do not prefer the feel of artificial grass.
- Artificial grass gets relatively hot on hot days making it extremely unconfortable to play on.
- Requires chemical disinfectants

FIGURE 2.15 (Top left): Natural Turf on a wet day
FIGURE 2.16 (Top Right): Artificial Turf on a sunny day,
FIGURE 2.17: Different Types of Layering that Make Up Both Turfs

(Pros/Cons: Surface materials, Kathleen Degnan O'leary)

SURFACE MATERIALS: ROOFS

There are many roof types yet, three very distinct roofs styles that can be used in terms of sustainability which are white roofs, blue roofs and green roofs. Typically a white roof is design like most conventional roof types except for the addtion of a membrane coated with white acrylic polymer. The idea of this roof type is to reduce the amount of heat absorbed by darker colored materials. A blue roof is the next step in that it helps detain water but is non vegetated. A green roof is simply a vegetated layer grown on top of roof top. within a site. At the right, we will discuss more in detail of the benefits and lack of between these roof types(NYC, 2013).

(Pros/Cons: Time Saver Standards For Landscape Architects and Perry)

FIGURE 2.18: White Rook On Top of Walmart

FIGURE 2.17: Blue Roof in NYC

FIGURE 2.1: Green Roof on Singapores Covention Center

WHITE ROOF

- Quick and cheap to unstall
- Can reduce summer time energy cost
- Extend the life of a conventional rooftop
- Does noting to reduce storm water runoff

BLUE ROOF

- Cheaper than a green roof
- Detains storm water runoff
- Coupled with light colored material, can provide building colling
- Non-vegetated source

GREEN ROOF

- Creates bio-diversity/urban agriculture
- Good material to cool/heat building
- Reduces storm water runoff
- Produces better air quality
- Cost are high in terms of irrigation/installation

GREEN ROOF: LAYERS

EXTENSIVE

INTENSIVE

- Cost effective due to thin layers of soil being applied which a more complex support is not needed
- Must use drought tolerant plants
- The use of low growing plant material is required
- Thin layer, prohibits walking

- Promotes walkability
- Thicker soil allows larger plants such as trees and shrubs
- Thick layer requires more material
- Complex support costing more money to build

FIGURE 2.19 (Top left): Extensive Roof Academy of Science
FIGURE 2.20 (Top right): Lincoln Center's Intensive Roof
FIGURE 2.21: Parts of a Green Roof

(Green Roofs:Extensive vs Intensive: myplantconnection.com)

SURFACE MATERIALS:GREEN ROOF TARGET CENTER, MINNEAPOLIS, MN

FIGURE 2.17: Minnesota's "Big Leaf"

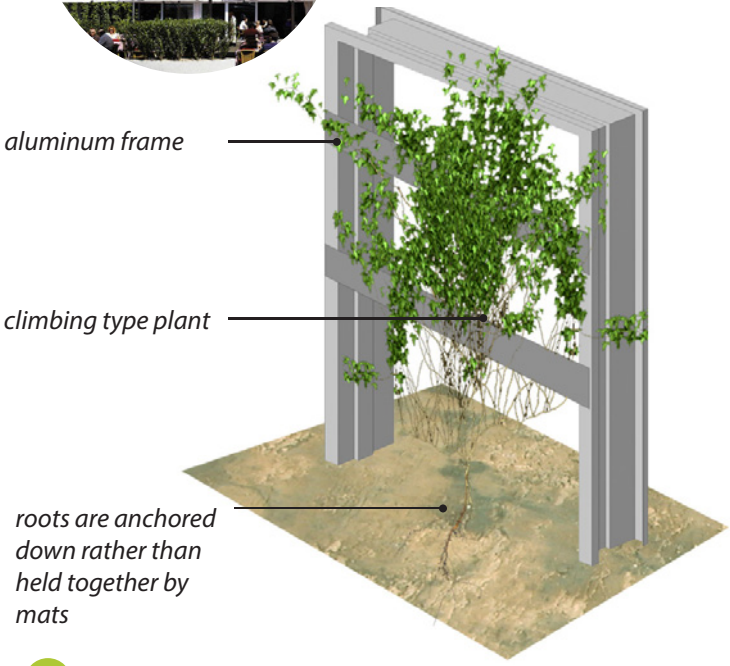
FIGURE 2.17: What Lies Inside the Green Top Arena

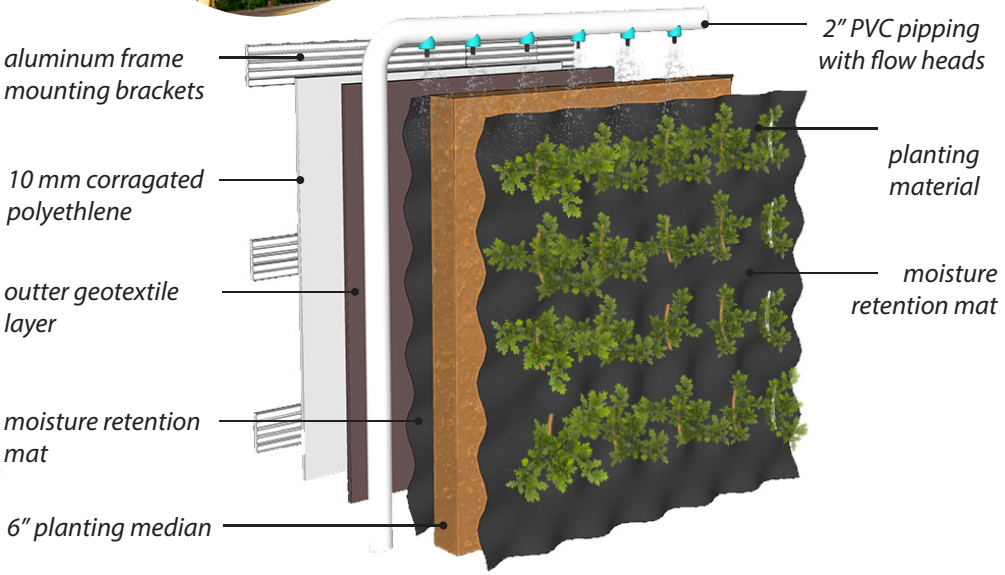
The Target Center sports arena in Minneapolis, Minnesota is a stadium home to NBA's Minnesota Timberwolves and is also the fifth largest green roof in the U.S. (since 2009), and the only green roof implemented in a sports arena. Installed in the heart of downtown Minneapolis, the city decided on a sustainable route rather than the out-dated traditional roof for a number of important reasons: including managing stormwater runoff (about 1 million gallons annually), conserving energy, and reducing the urban heat island in the nearby downtown areas- The roof is planted with plants that are native to the area. These plants will help bring down the roof's temperature. The green roof is expected to last twice as long compared to a conventional roof and while the initial project is very costly, it is expected to be cost effective in the coming years (Greenroofs.com, 2010).

SURFACE MATERIALS:GREEN FACADES VS GREEN WALLS

GREEN FACADE

GREEN WALL





- Easy to construct
- Cost effective way for "greening" benefits
- Low plant palette
- Low design flexibility

- Can create very unqiue shapes and pattern Cost mare than a Green Facade
- Wider variety of plant pallette
- Drought tolerant can be used to save money
- Complex support costing more money to build

FIGURE 2.19 (Top left): The Stucki Shopping Centre
FIGURE 2.20 (Top right): Vancouver Green Wall
FIGURE 2.21: Parts of a Green Wall/Facade

(Concept Idea for the Green Wall from HyGroWall)

SURFACE MATERIALS:GREEN WALLS, DALIAN SHIDE STADIUM, DALIAN, CHINA

FIGURE 2.22: One of Dalian Shide' Stadium Green Walls

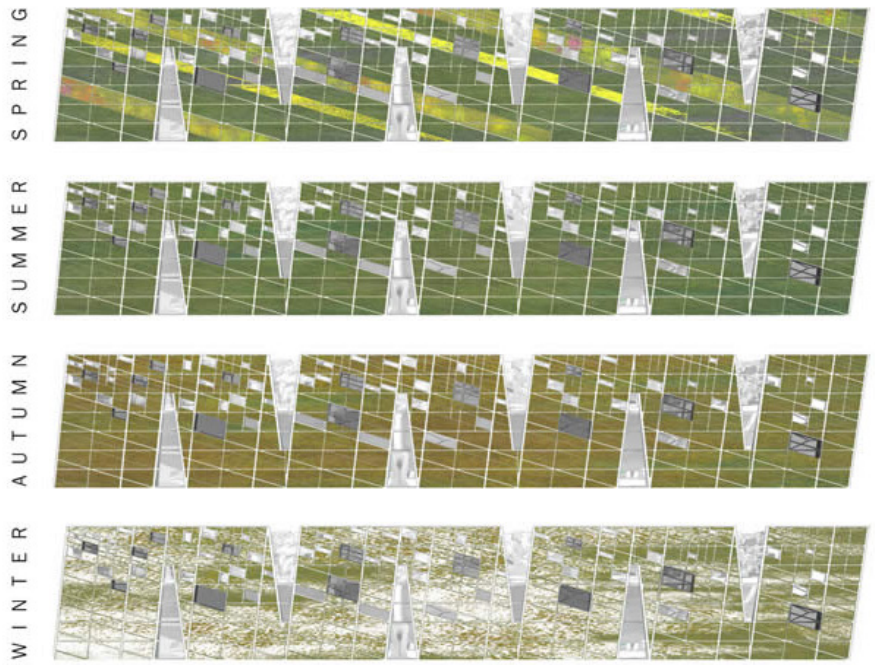
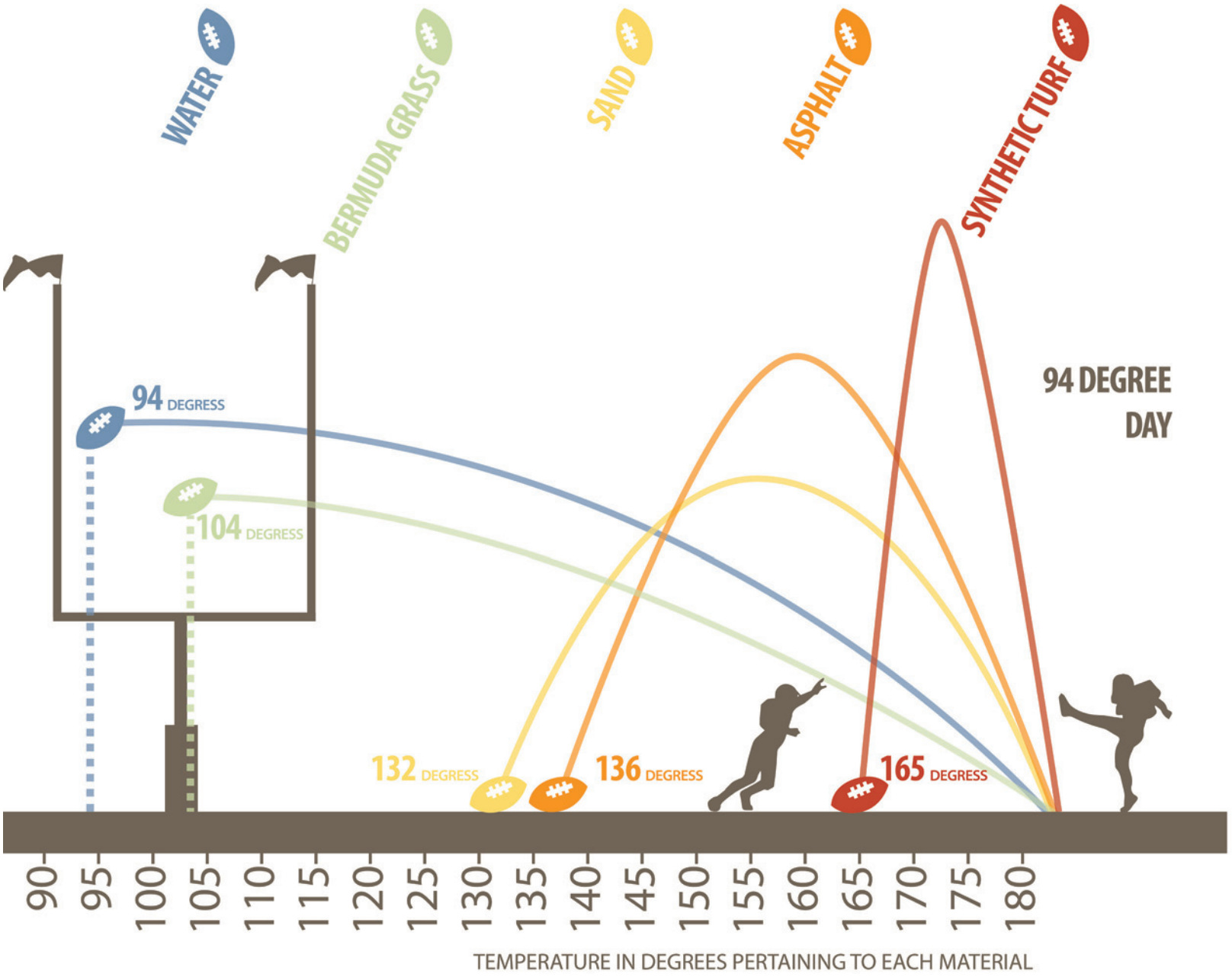


FIGURE 2.23: The Green Walls of Dalian Stadium During Each Season

The Dalian Shide' Stadium located in Dalian, China is something out of the ordinary. Created by NBBJ Architects which is a firm located in Los Angeles, CA has designed a stadium concept for Dalians football (soccer) team where two of the main exterior walls will be covered in grass and plants otherwise known as a Green Wall system. The other two walls are left open to allow more natural lighting and air flow to enter the arena. Opening the walls also allows a sense of connection to the site and city surrounding the stadium, allowing the community to be part of the game. The benefits of having such a wall will not only lower temperatures, reduce energy consumption, filters air pollutants, and increase the amount of bio-diversity, but add an attractive feature. What is unique with the walls' design is the change in appearance during each time of the season. Looking at Figure 2.23, Spring would contain a large range of color and as Winter approaches, a more mono-tone appearance would be left.This would give the stadium, literally a sense of life where steel/concrete beams would normally be found on a typical designed venue (Jordana, 2009).

SURFACE MATERIAL TEMPERATURES



(FIGURE 2.24: Surface material measured on a 94 degree day.

(Test done by the university of arkansas l)

SURFACE MATERIALS: WHAT MATERIALS MEAN TO THE REST OF THE NEIGHBORHOOD

With the vast amount of hardscape and roof top surfaces, the built environment has seen an increase in temperature compared to other surrounding rural areas with temperatures ranging from 68-104 degrees Fahrenheit. Asphalt is a material that contains an abundance of heat due to its low moisture and dark coloring. Heat is then absorbed during the day and eventually released slowly during the night which decreases the rate of nighttime cooling. This is known as the Urban Heat Island Effect. In many cases such a spike increase in temperatures can range from 30 degrees Fahrenheit compared to a forested landscape (Ben-Joseph, pg37).

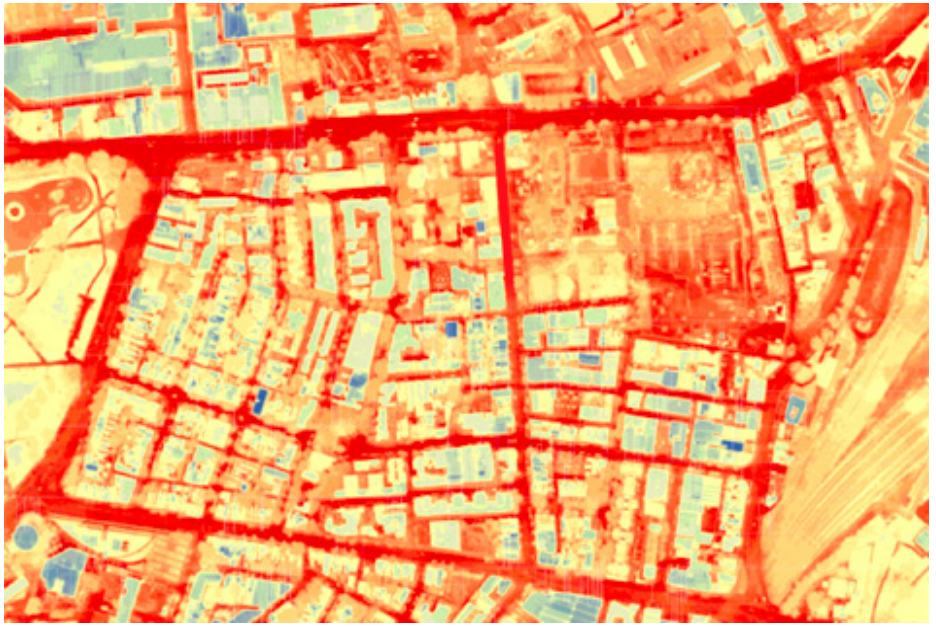


FIGURE 2.25: Heat Reading On a Urbanized City

Many of the problems can be mitigated or solved through the use and design of vegetation. The rate of speed of water through a conventional storm water system would allow water to drain toward inlets in a matter of seconds. Alternatives of controlling water through rain gardens, vegetated swales, planter systems, green gutters, curb cuts, and check dams, would slow water down incredibly allowing water be filtered through the vegetation and then seep through and recharge nearby aquifers. (Perry, 2013).

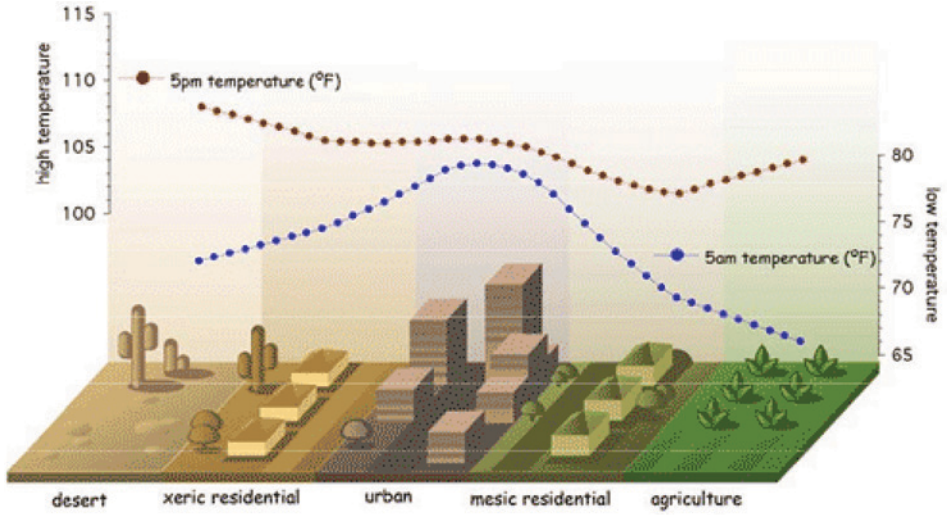


FIGURE 2.26: Difference in Temperature on Different City Based Materials

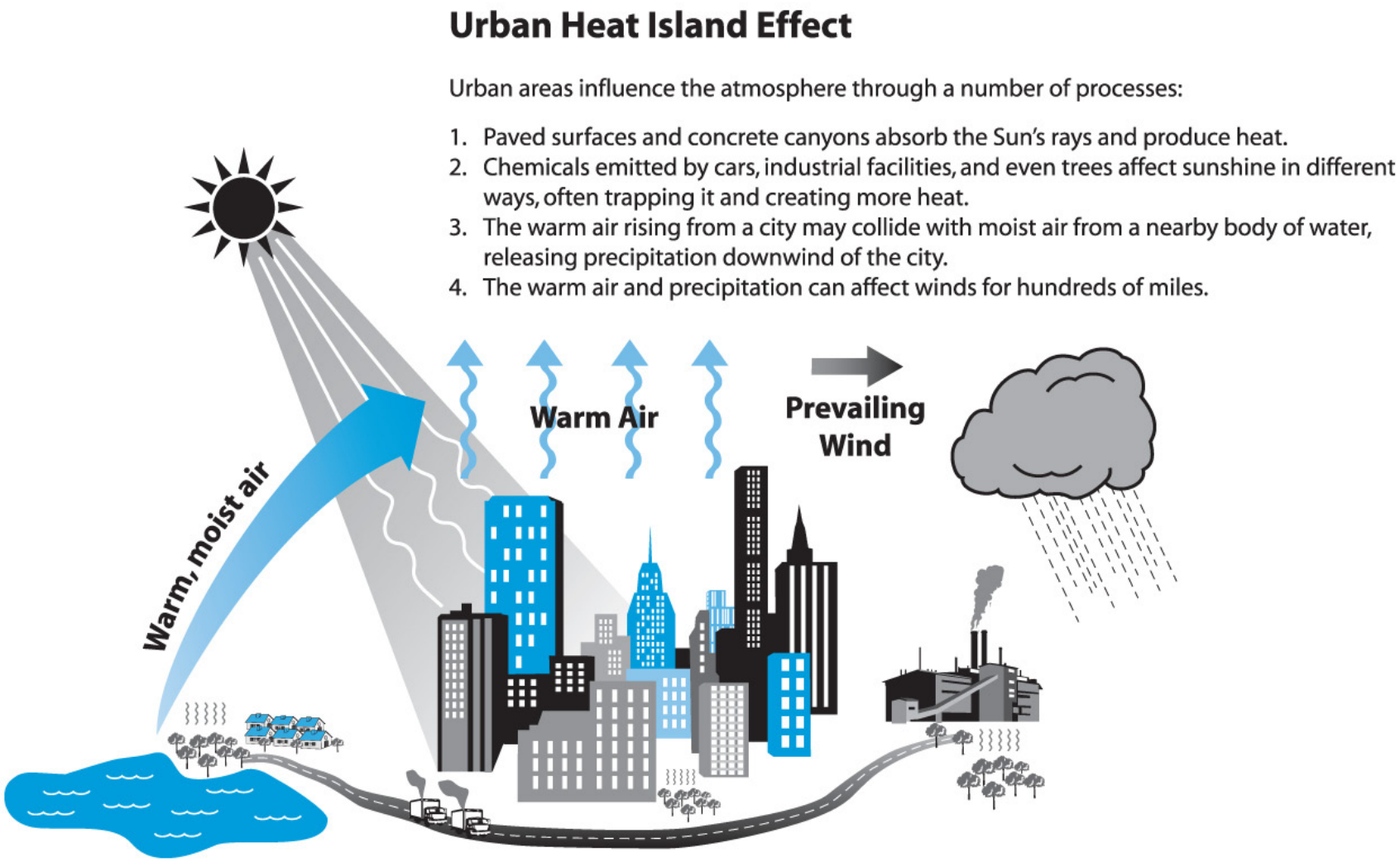


FIGURE 2.27: Diagram Depicting the Urban Heat Island Effect

WATER

FIGURE 2.28: Storm Water Runoff Going Straight to a Drain Inlet

Throughout much of the infrastructure, especially pathways and parking lots, almost every stadium uses concrete and asphalt materials due to the cost effectiveness and longevity of the material. The problem lies in the ability of these materials to handle water. Typically, the spaces that are made from concrete and asphalt are impervious meaning the materials are dense and compacted, not allowing the flow of water penetrate through the surface. Instead of water draining down and recharging aquifers, about "27,000 gallons of water (more than 102,000 liters) are washed away from a one-acre paved parking lot" to a conventional storm drain. (Ben-Joseph, 2012).

As water moves across the impervious surface, much of the surface is covered in both naturally and human made pollutants. This is especially alarming during the first flush (first rain of the year) where accumulation of pollutants are layered overtime and then washed away into storm drains all at once into nearby water bodies, affecting both the aesthetic quality and marine life (NSW, 2013)

STORMWATER FACILITIES STRATEGIES

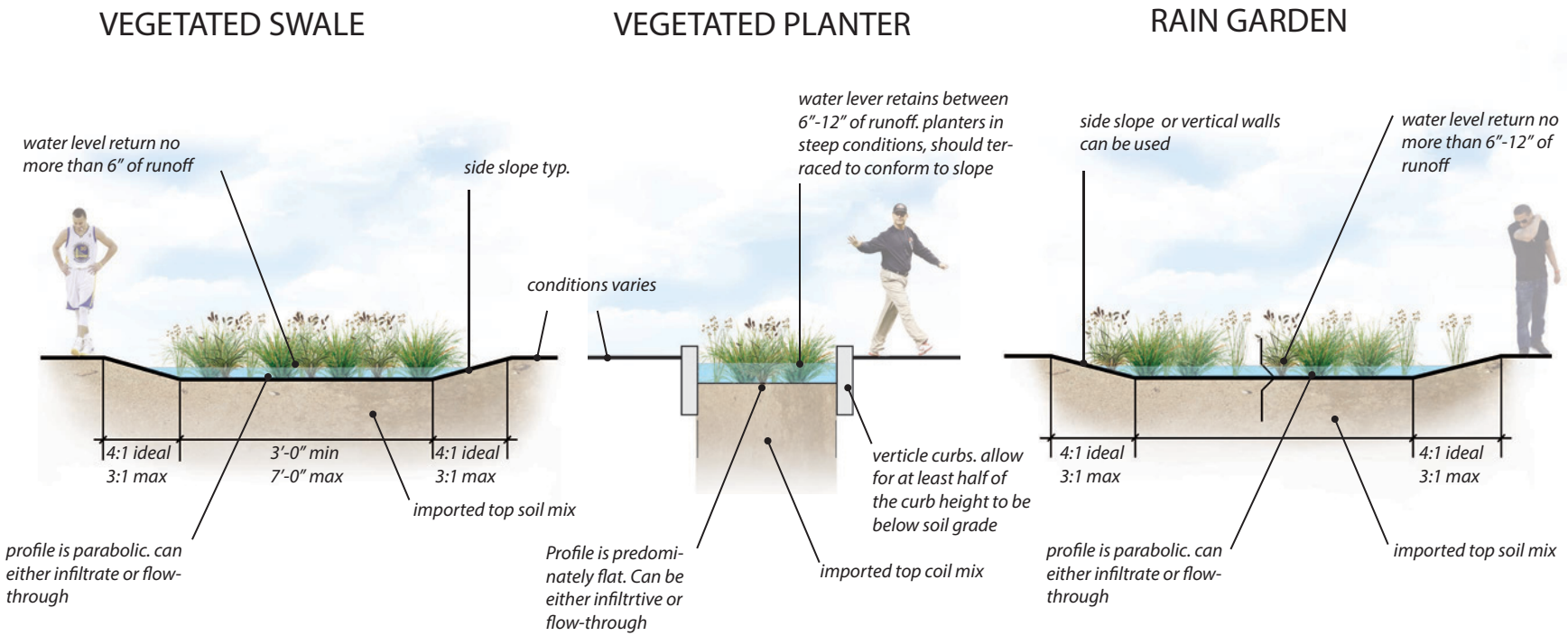


FIGURE 2.29: What makes up vegetated storm water facilities

- Require less infrastructure as a result simple to construct
- Can be easily retrofitted along aerial streetscape
- Swales tend to be too deep, which can be aesthecally un-pleasing
- Are best landscape solution for utra-urban conditions
- Highly versatile in shape and size
- Provides both volume and flow storm water benefits
- More expensive than swales
- Can significantly green a space otherwise left by asphalt
- Can be inexpensive to build depending on material used
- Can provide largest stormwater flow and volume benefit
- Often more maintenance re-quired

(Active Stormwater Facilities Strategies, Kevin Perry Lecture).

VEGETATED PARKING STALLS: SUN LIFE STADIUM, MIAMI, FL

FIGURE 2.30 Miami Dolphines

FIGURE 2.29: Green Stalls When Parking Is Not In Use

FIGURE 2.31: Green Stalls When Parking Is In Use During An Event

In terms of productivity, stadium parking and other infrastructure are only productive during actual games. The problem is that these games or events take up only a portion of the day with games/concert events averaging about 3-4 hours of usage. The other 20 or so hours, these areas are hardly ever used.

The Sun Life Stadium, located in Miami Florida, is home to the Dolphins, a football team in the NFL. The unique aspect of the infrastructure here is that the parking lot has a combination of both grass and asphalt. The main travel pathway is made of typical asphalt where the grass portion which makes up the parking stalls. This is constructed of grass and load bearing wire mesh that help support the weight of the car. Designs similar to this have seen failure due to the constant usage of cars moving in and out of commercial parking lots causing wear and tear, as well as compaction of the roots toward vegetative plants. Football games however, are played every so often during Sundays. This allows vegetation to regenerate from the punishment of vehicle usage and at the same time solves part of the solution of the urban heat island effect (Ben-Josph, 2012).

WATER CAPTURING FOR REUSE

With the ever increasing need to find better ways to maximize the use of water, one particular stadium has thought outside the box. Target Field, home to the Minnesota Twins has teamed up with Penair, a technology company that works with the collection and reuse of water. Penair's system would help collect and purify rainwater throught the stadiums seven acre facility which the company states is "clean or cleaner than most household tap water." The stadium however, will not be independent in channeling its own water supply. The water would be collected from most of the rooftop area of the stadium where it will ten be funnelled, filtered , and stored in a giant cistern located underground. The water would then be used for toilets, irrigation, sinks, and many other activities. About fifty percent of Target Fields water would still need to be provided from Minnesota's minicipality. It is espected that on a annual basis, the stadium will reduce its need of the city's water by about two million gallons (Lombardi, 2010).

FIGURE 2.32: Aerial of Target Field and Its Rain Collecting Roof Top

FIGURE 2.33: Installation of the Underground Cistern

ENERGY

FIGURE 2.34: Light equals Money

FIGURE 2.35: Seahwaks Stadium At Night

With all the special effects, scanning of tickets, displaying a vast array of images on the jumbotron, and most commonly supplying lighting, electricity is a crucial component in the operation and life of Sports Arenas. A big concern with this issue is cost. Currently, there are about 2,463 Stadiums and Arenas in the United States which include a vast array of professional, community oriented, and academically used facilities for every professional stadium. It can consume as much as 10 mega watts (MW) of electricity per usage, which is enough to power 8,000 homes in America (Bietrich, 1). Powering such a site not only means a lot of electricity is being used but a large sum of money is involved to pay the cost associated when powering the stadium. Many alternatives to resolve this issue can be found through a mix of designs and technological advances.

ENERGY FOR THE WORST: COWBOYS STADIUNM, ARLINGTON TX

This space like structure known as Cowboy's stadium is one of the Largest Stadiums in the United States which can hold 80,000 and if need be, a maximum of 100,000 fans. Though the stadium does look futuristic, it is in many ways still living in the past. In fact lighting this structure and its outdoor spaces can cost $200,000 on a monthly basis. The reasoning for the high price tag is a bit shocking. In its stadium environmental initiatives, items such as cutting energy consumption by 20 percent is stated, yet the stadium still uses conventional lighting options instead of other, more efficient lights. Types of lights such as LED's have a payback of about a year and last 10 times longer (Glubiak, 2009).

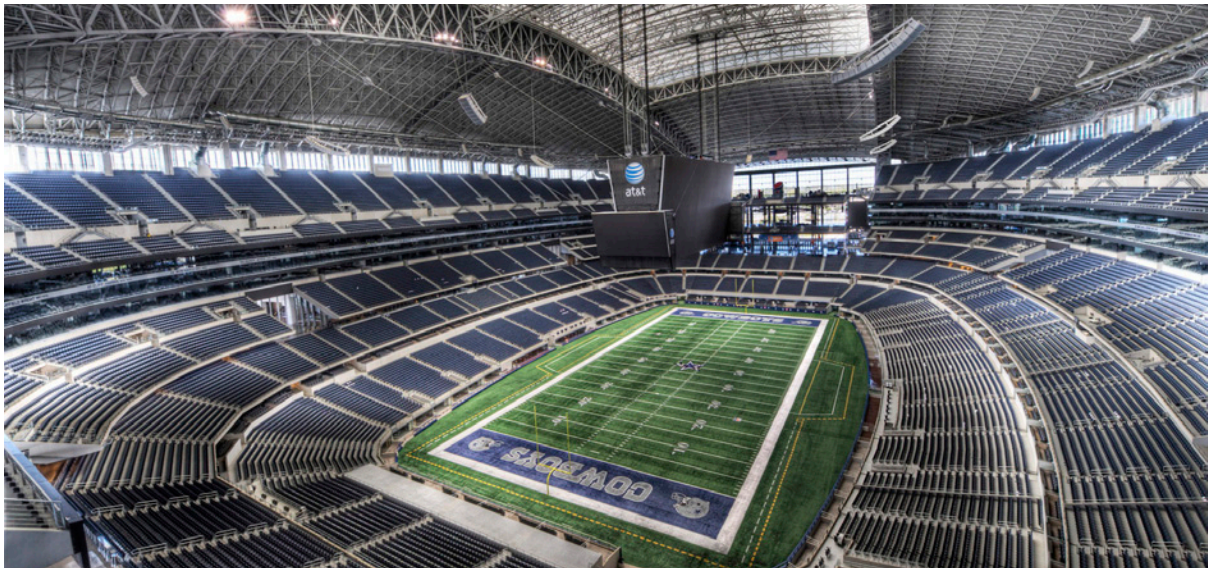


FIGURE 2.36: Cowboys Stadium, So Many Lights On a Bright and Sunny Day

FIGURE 2.37: Things Are Bigger In Texas, Along With Electricity Bills

ENERGY FOR THE BETTER (SOLAR): KAOHSIUNG STADIUM, TAIWAIN

FIGURE 2.38: Up Close Solar Panel Canopy

FIGURE 2.39: Solar Panels Create A Gateway

Kaohsiung World Games Main Stadium in Gaoxiong, Taiwan is a stadium that is ahead of the game in terms of sustainability and savings. Completed in 2009 by Toyo Ito & Associates, this snake like venue has an eye catching blue curvilinear roof shape which encloses up to 45,000 spectators; however, what's more distinctive is not the aesthetics but the function behind it. The roof is made up of 8,844 solar panels which generate more than 1 million kilowatt-hours of energy or which is enough to generate enough energy every year to power up to eigthy percent if the surrounding neighborhood when the stadium is not in use. In an investor stand point, the return is great because the energy absorbed and produced can then be sold to the surrounding neighborhood. Whats also great about the design, is that designed with the building inside of being an after thought that most designers tend to produce, which at times does not aesthetically match the decor.(Gregorski, 2012).

ENERGY FOR THE BETTER (SOLAR PART 2): STAPLES CENTER, LOS ANGELES, CA

Although, solar panels are a great incentive to improve cost, another benefit associated with it is related to CO2 emissions. The Staples Center, home of both the NBA's (National Basketball Association) Los Angeles Lakers and LA Clippers provides solar panels to help power 5 percent of their venue. This may not seem like much, considering only a few solar panels are installed, but even the least bit can help if all stadiums copied this alternative in design technology. According to the NRDC (Natural Resource Defense Council), Strategies of using natural power such as wind/solar energy "would reduce carbon emissions by about 86.6 million pounds a year—the equivalent of taking about 8,000 cars off the roads" (Mcbride, 2010). If stadiums then expanded solar panels toward areas of parking lots, how much more of an impact it would have on lessening the amount of CO2 produced? Depending on the size of the lot and the amount of solar panels used, expanding such devices can multiply more than double the amount of energy produced.

FIGURE 2.40: Aerial View of Staples Center

FIGURE 2.41: The Former Governor Show Casing What Solar Panels Can Mean In the City of Angels

ENERGY FOR THE BETTER (WIND):LINCOLN FINANCIAL FIELD, PHILADELPHIA, PA

FIGURE 2.42: How Wind Turbines Look From the Parking Lot

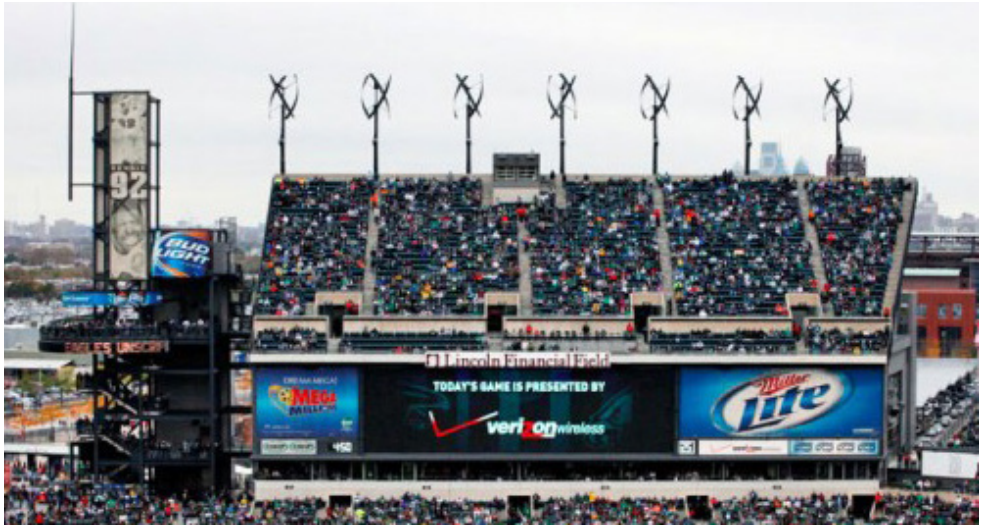


FIGURE 2.43: Wind Turbines Within the Facility

Solar panels are not the only technology that captures natural energy from above, wind turbines when combined with energy from the sun, maximizes the amount of natural energy captured especially on a sunny/gusty day. The Philadelphia Eagles an NFL (National Football League) team, announced that they would install about 80-twenty foot wind turbines, 2,500 solar panels, and a generator using natural gas and bio diesel to supply its on power on game day. (Belson, 2010). The benefits of having more than one technology capturing natural energy within the site is if one fails to produce energy, the other would help mitigate this problem. On a cloudy day for instance, solar panels would not capture enough energy causing the other forms of technologies such as bio diesel, natural gas and wind turbines be the primary producers of power. Although natural gas and bio diesel still produce CO2 pollution, these forms of energy producers are still more beneficial compared to the United States largest used power, coal (Energy.gov).

DENSITY

FIGURE 2.44: Kings New Arena and What New Devolpment Can Bring

With the on-going growth of the urban environment, precious land and resources is becoming more scarce. Building up is one strategy in decreasing the overall ecological footprint (measure of human demand on Earth ecosystems) left by urban delopment. Lower densities mean more sprawled out structures and travel, which requires energy. That energy then translates to gasoline usage which is about twenty percent of the US's carbon emissions that come from a typical home and another twenty associated with vehicle usage (Glaser, 2012).

Although, density is very much associated with city planning, it can also relate to stadium design. Many stadiums are located outside of downtown city centers where public transportation is present. So there is a relation of people needing to use vehicles to travel to games. By densifying areas where stadiums are located and future plans in which they will be built, this would lessen the amount of vehicle usage. Yet, this is not to say that density always means a site will always be productive. A group of design facotors, such as location, aesthetics, mix-use buildings, walkable communities, and economics all play crutial roles in aiding in the success of a densified site.

DENSITY: PARKING

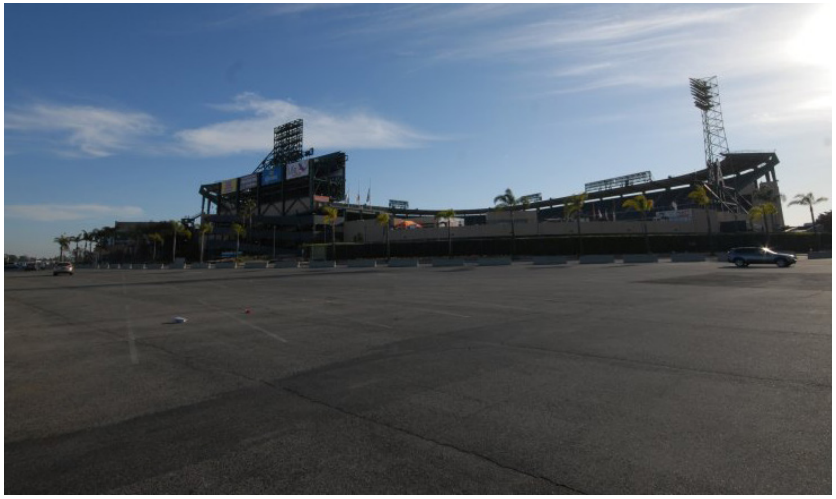


FIGURE 2.45: Typical Stadium Design Parking Lot, Angels Stadium

FIGURE 2.46: A Parking garage with photovoltaic panels at the University of California at San Diego

In many sport venues around the nation, much of the stadiums' land usage is made up of large imperious surfaces designed to meet the needs for parking. Although an efficient way to get in and out of a location, these lot sizes tend to take up precious space, which can be used for other amenities such as mix-use buildings or vegetative landscapes. Parking structures are a good solution in helping to preserve such landscapes to exist. Although price and maintenance can be a headache for some, the benefits does outweigh the negatives especially when designed correctly. The following is a list of suggestions in designing parking structures in a more sustinable way (US Airforcce, 2012):

- Implement green or cool roofs.
- Use high albedo materials for exterior building surfaces.
- Designate the parking structure as a shuttle bus node.
- Provide secure bicycle storage.
- Orientate the structure to make use of daylighting.
- Designate preferred parking for fuel efficient and low emission vehicles.
- Provide charging stations for electric and hybrid vehicles.
- Explore opportunities for solar panels or solar water heaters on the top of the parking garage.
- Consider underground parking

PARKING GARAGE: SANTA MONICA PARKING STRUCTURE

FIGURE 2.47: Street View Of the LEED Garage

FIGURE 2.48: Solar Panels On Top Of the Parking Structure

Santa Monica's Civid Center Parking structure is something a bit different compared to other garages in the US. It is the first "Leadership in Energy and Environmental Design" (LEED) Certified parking structure which provides the public a framework for identifying and implementing "green buildings" meant to be sustainable. This may seem like a contridiction in tjat parking garages help support vehicle use, but the structure does a lot more good than harm. It provides elements of (California Sustainability Alliance, 2013):

- 213 kw photovoltaic panels which are installed on the roof providing electricity for the facility and shade cars parked on the top level.
- Natural light and efficient fluorescent lighting which reflects off white ceiling, to enable lower total lamp wattage for and to minimize light spill in unwanted places.
- Reclaimed water lines for landscaping and tenant space toilets reduce the demand for potable water.
- Storm water management runoff water is treated using an on-site filtration device to reduce total suspended solids and phosphorus.
- Concrete contains locally mined aggregate and recycled flyash.
- Structural steel contains up to 68% post-industrial recycled content.
- Recycled glass material.
- Free bicycle storage lockers promote alternative means of transportation.
- 14 public electric vehicle parking spaces and electrical outlets.
- Education signage to increase awareness about the green building elements of the facility.


SECTION
03

ABOUT

THE SITE & NEIGHBORS

"To succeed...You need to find something to hold on to, something to motivate you, something to inspire you."

~ Tony Dorsett

03

LOCATION:
7000 COLISEUM WAY,
OAKLAND, CA

BUILT:
1966

CAPACITY:
ORACLE ARENA:
19,596

OAKLAND COLISEUM:
63,132

Map of California

The specific location in which I would like to address these problems and introduce "green infrastructure" and other design aspects to help improve productivity are the areas surrounding the Oakland Coliseum and the Oracle Arena. The current condition of the site is a shared 132 acre property consisting of primarily asphalt and concrete material. It has been occupied for entertainment purposes since the 1960's and is home to 3 major sports teams: the Raiders (football), Athletics (baseball), and the Golden State Warriors (basketball). The Warriors are the only major sports team currently occupying the indoor facility Oracle Arena; however, the owner has publicly announced moving the team across the bay to San Francisco in 2017. Assuming that the Raiders and Athletics

SITE AERIAL MAP

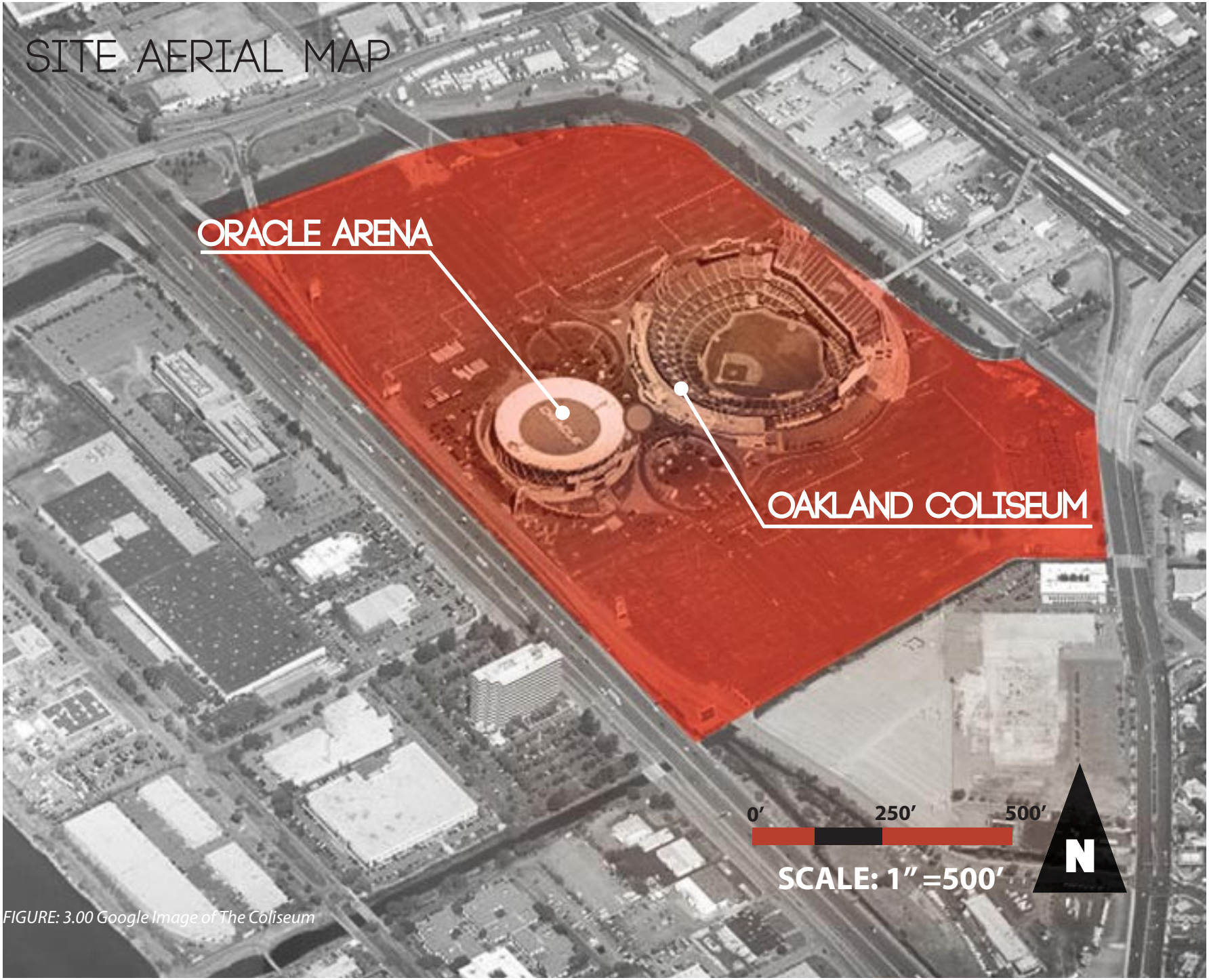


FIGURE: 3.00 Google Image of The Coliseum

HISTORY OF THE SITE

FIGURE 3.1: Newpaper Article Promoting the Stadiums Grand Opening

FIGURE 3.11: Overall Look Acreoss From 880

The Oakanld Coliseum has been home to three professional teams in more than a decade. A feat in which is difficult to do in a small market town. The three teams are the Oakand Raiders, Athletics, and Golden state Warriors, have a rich history dating back to the teams first game in the Alameda County Fair Grounds which would evetually be known as the Oakland Coliseum in 1966. The Coliseum would obtain four World Series Championships by the Athletics (nine total including its stay in Kansas) and two by the Raiders (3 total including Los Angeles). What is impressive about the Athletics is they are one of two teams in Major League Baseball (MLB) to threepeat 1972-1974 (win three World Series titles in three consective year). The Warriors on the other hand have not won a title in Oakland, but contains two titles elsewhere [Philadelphia and San Francisco](Athletics History, 2001)

The Coliseum has seen its teams move away. The Oakland Raiders would leave Oakland for Los Angeles in 1981, but would eventually strike a deal moving them back to their grass roots in 1995. To secure the Raiders but, the Coliseum went into heavy renovations costing$220 million in upgrades which included 22,000 new seats and 90 luxury suites. Due to the upgrading in capacity, the former view of the foothills of Oakland would be covered by seating and in a way disconnecting it from the land scape (aaba, 2013).

WHAT THE COLISEUM FACES TODAY

Currently, the Athletics and Raiders, are open to negotiate and stay with the city of Oakland, while the Golden State Warriors have announced publically that in 2017 the Warriors will open up their state of the art arena on piers 30-32 in San Francisco. Although, the two remaining teams are willing to stay in Oakland, other cities such as Los Angeles (for the Raiders) and San Jose (for the Athletics) have shown great interest in luring these franchise teams into their community by coming up with deals, concept arena plans, and other inititives. The board overseeing the Coliseum are currently also overseeing a study proposal in die-velopment in an entertainment district, yet not much infomation on the study have been made public and the study has only been in process for a few month (San Francisco Business Times, 2013).

FIGURE 3.12 Proposed Warriors Stadium in San Francisco

FIGURE 3.13: Stadium Proposal for Coliseum City for Oakland

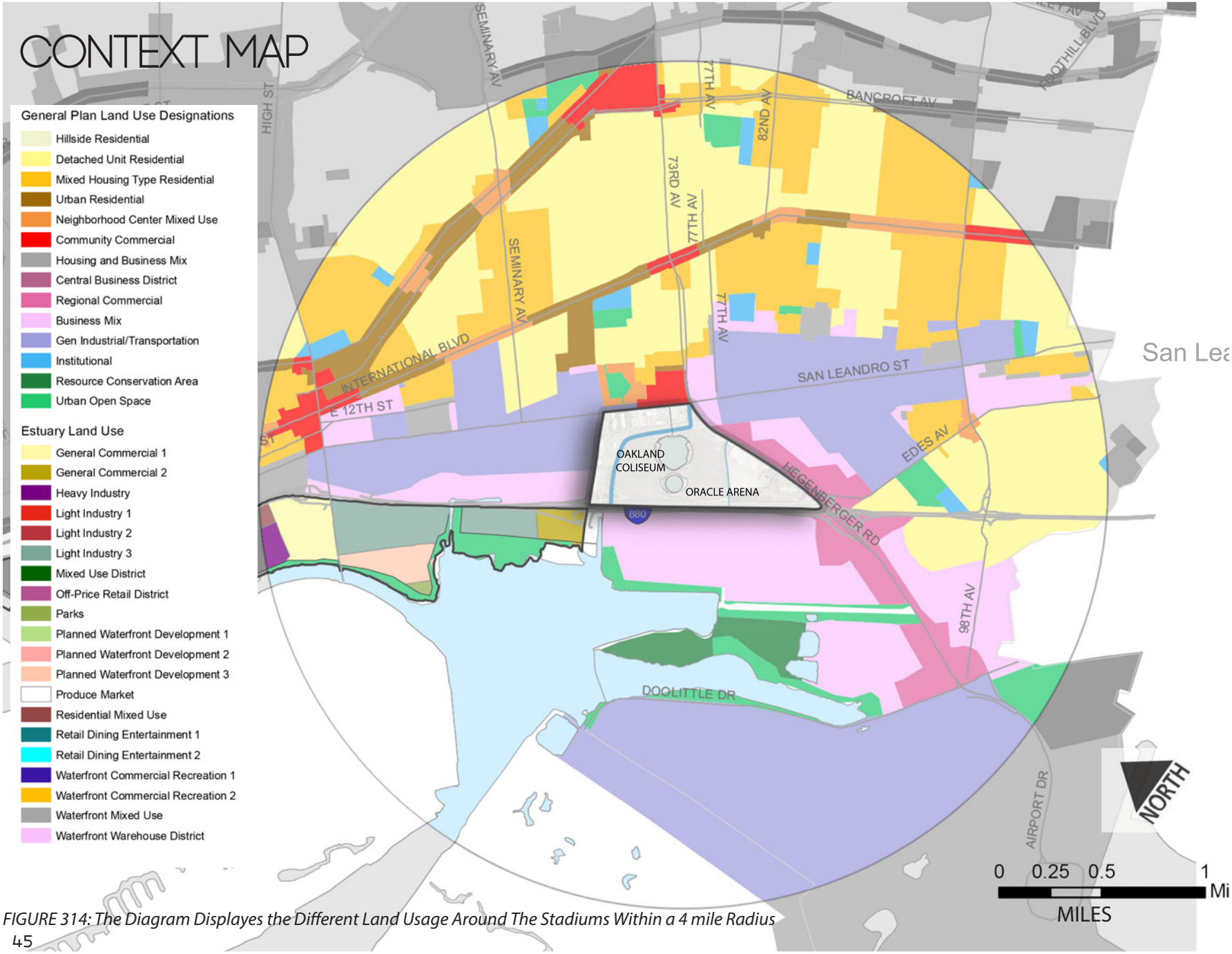


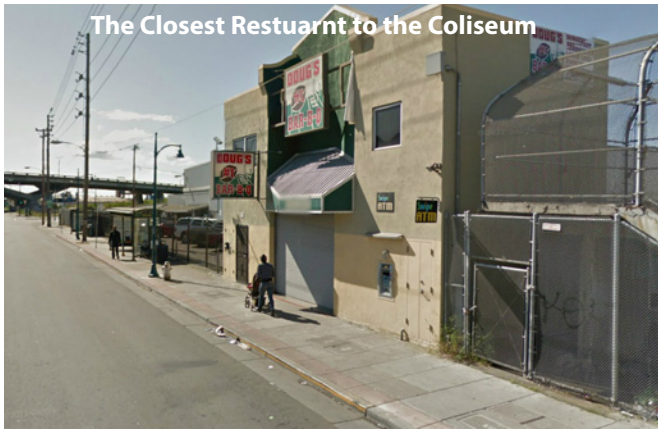
FIGURE 314: The Diagram Displayes the Different Land Usage Around The Stadiums Within a 4 mile Radius

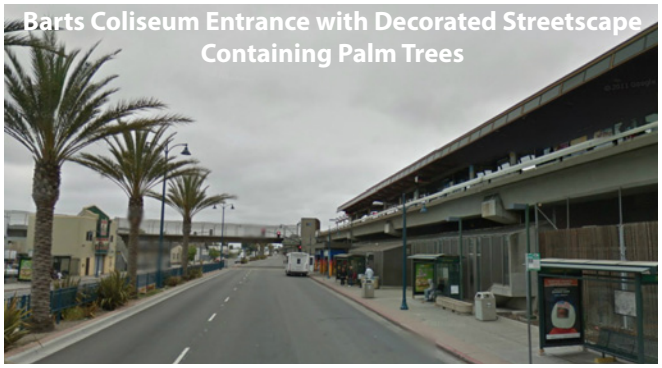
FIGURE 3.15: Located the surrounding transportation medians

FIGURE 3.16: Resturant Within "'Walking Distance"

WHAT SURROUNDS THE EXITING STADIUM

The purpose of looking at areas surrounding the arena, is to look at factors and design ideas that can be taken from the existing landscape that could eventually be included into the concept design. This gives somewhat of a design connection from the community to the revamped stadium design.





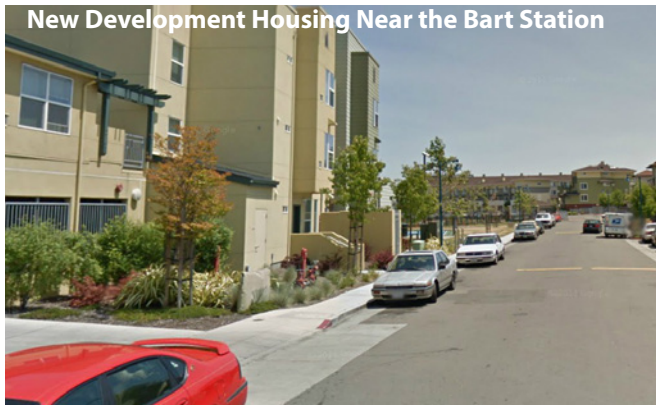
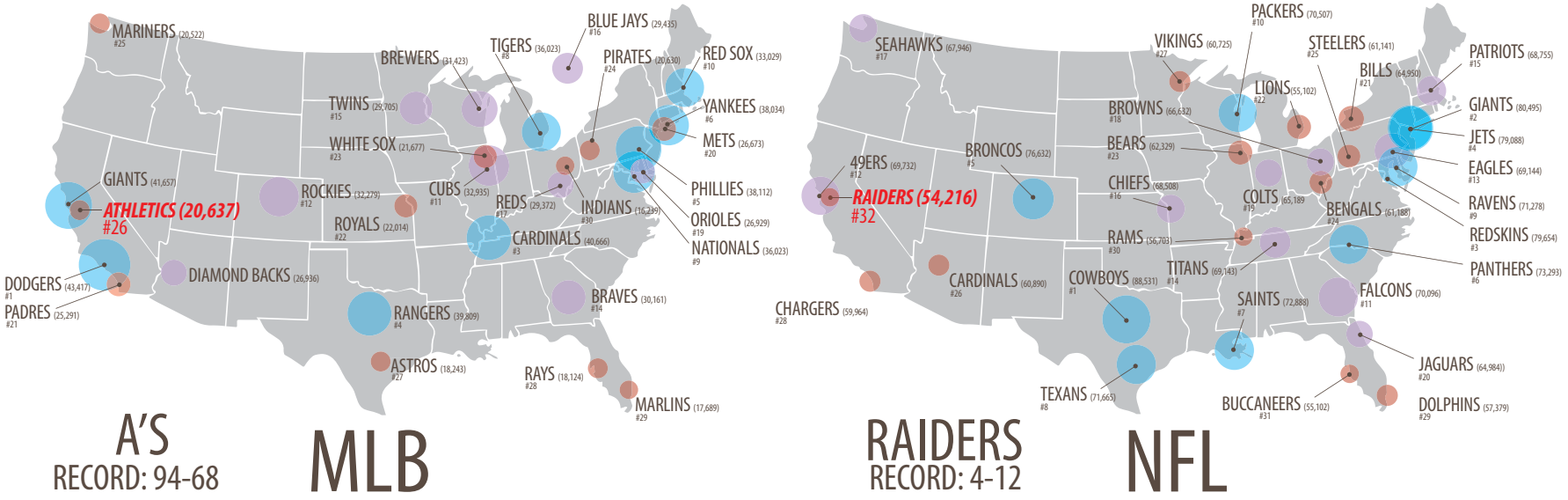


FIGURE 3.17: Resturant Within "'Walking Distance"

WHERE OAKLAND'S TEAMS RANK IN ATTENDANCE



A'S
RECORD: 94-68

MLB

RAIDERS
RECORD: 4-12

NFL

FEATURES THAT ATTRACT

ATTENDANCE OF STADIUMS FROM OLD TO NEW

= 1,000 FANS

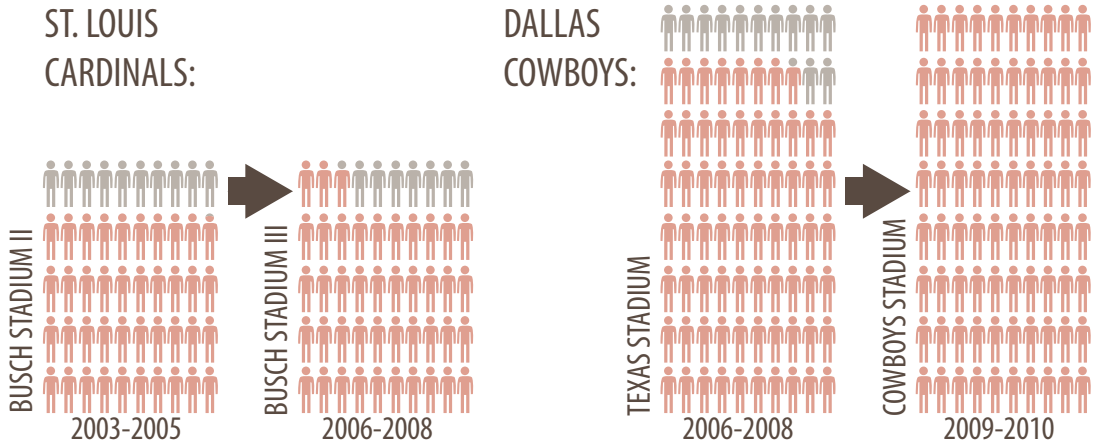


FIGURE 3.18: Possible Connection and Why Attendance Is So Low

POSSIBLE TEMPORARY RELOCATION FOR THE RAIDERS & A'S

FIGURE 3.19: Temporary Relations For Oaklands's Teams

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SECTION

04

SITE ANALYSIS

"The ultimate authority must always rest with the individual's own reason and critical analysis."
~Dalai Lama

04

The Oakland Coliseum contains approximately **10,000 parking stalls** and usage of the stalls do vary deping on which sporting event is being hosted. Not only is the Coliseum considered a multi-purpose venue, but it is the only stadium in the U.S. to host an NFL and MLB team within the confines of its walls.

The Site is surrounded by a water channel which fenced of with chain lnks and is not open for public use.

There are no energy producing technologies such as wind or even solar panels and the surface is largely made up of impervious asphalt.

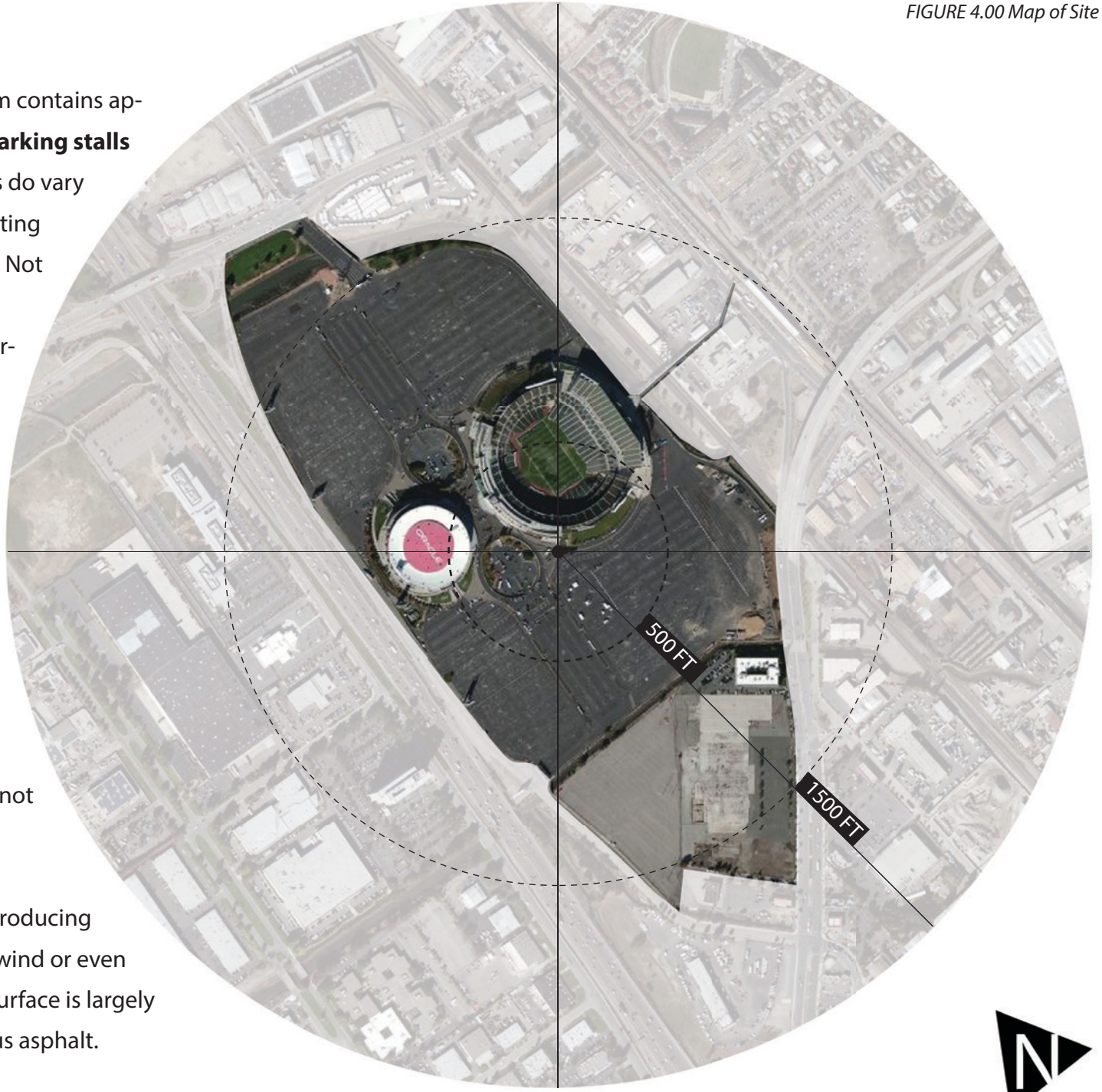


FIGURE 4.00 Map of Site

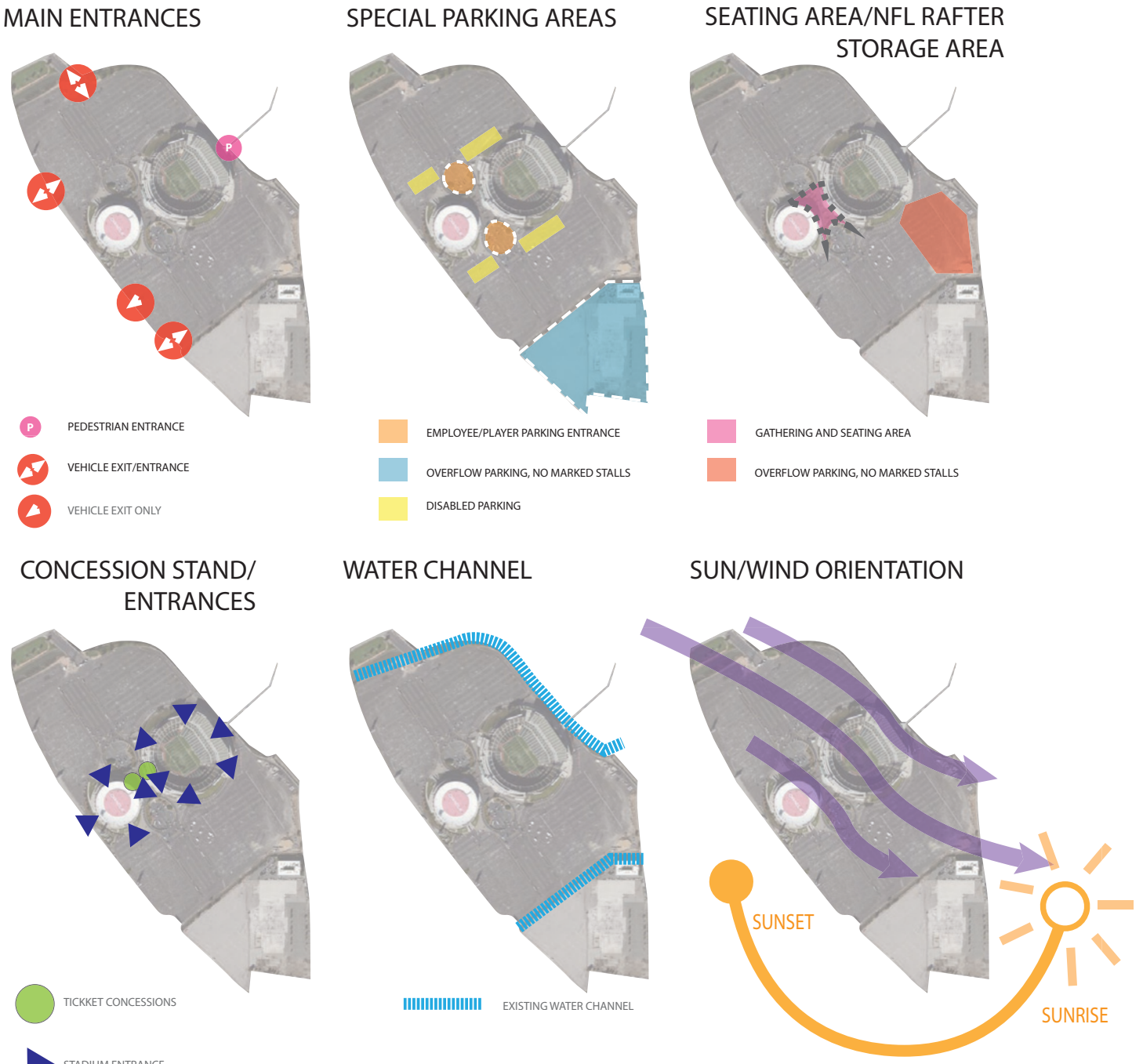


FIGURE 4.10 site analysis of places/conditions

1 **VEHICLE AND PEDESTRIAN CIRCULATION:**

The largest congestion for vehicle use is located on the main arteries of the parking lot where entrances are located. Although some main walkways are assigned, the orientation of the cars faces the stadium causing people to move in between cars, which gives a congestive feeling toward fans.

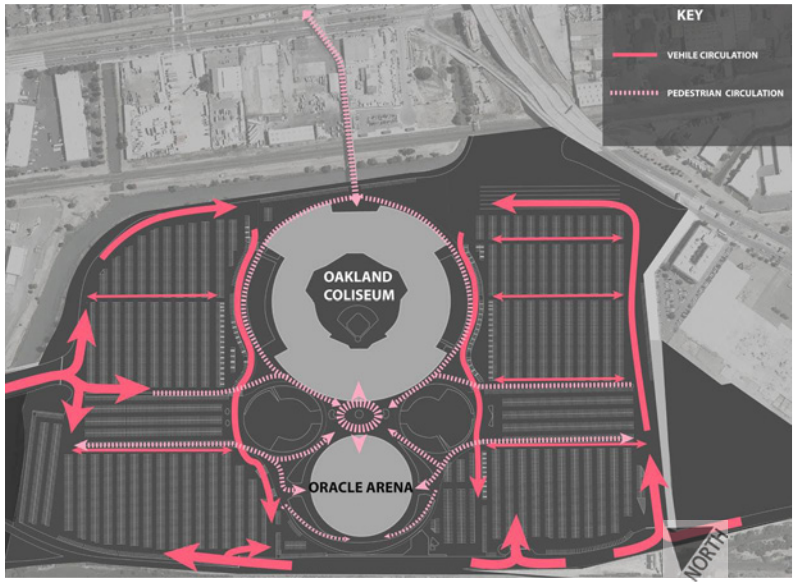
2 **EXISTING LIGHTING/POWER LINES:**

More than 150 light polls take up the space of the coliseum. Major ower lines run across the north east of the lot, which is a constrant for future development.

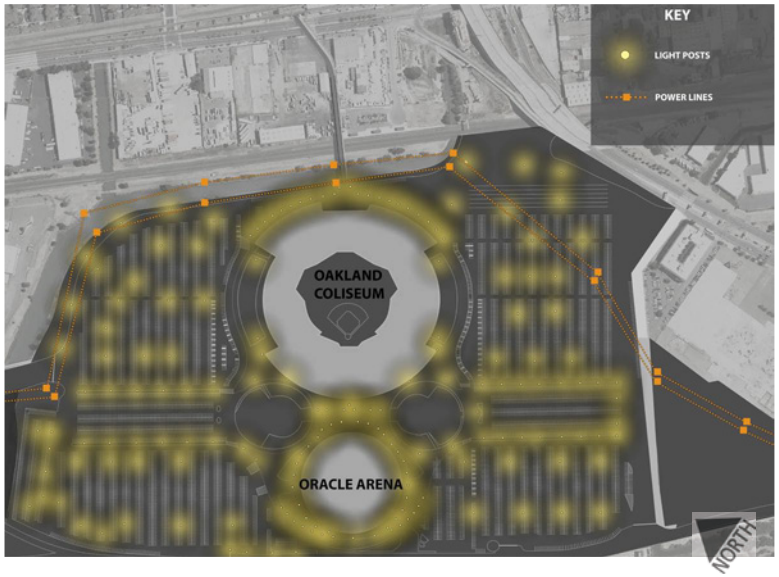
3 **EXISTING VEGETATION:**

Less than 10 percent of the site contains vegetative surface space leaving the site whithout any shaded areas.

1. VEHICLE/PEDESTRIAN CIRCULATION



2. EXISTING LIGHTING/POWERLINE



3.EXISTING VEGETATION

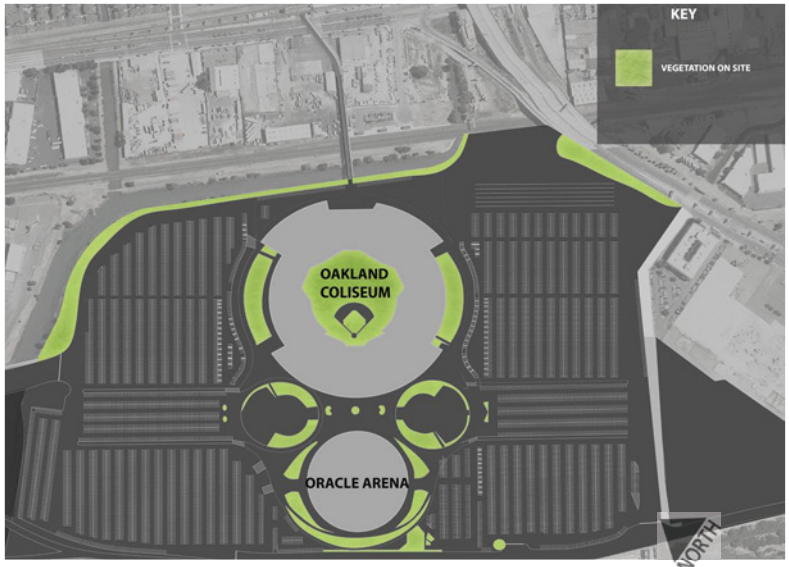
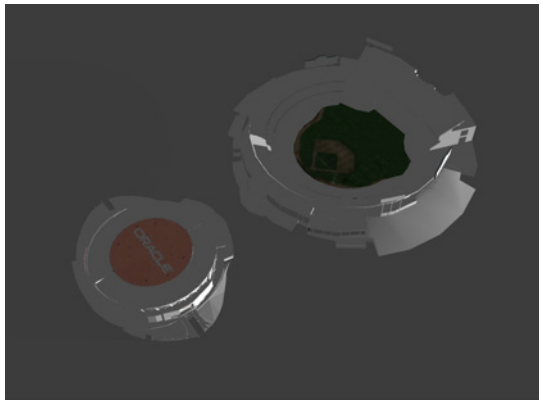


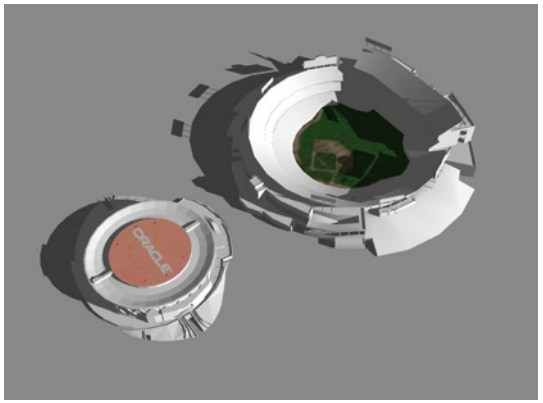
FIGURE 4.11 site analysis of places/conditionsII

THE COLISEUM STADIAM & ARENA SHADE STUDY

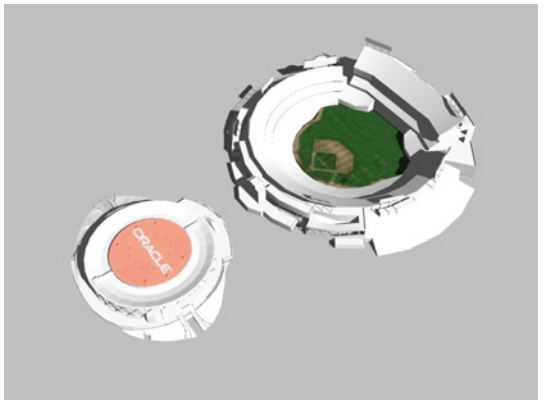
Studying Oakland's stadium and arena allows a look on how to maximize orientation for future designing if a new stadium were to be built in the replacement/reuse of a building. The analysis captured using sketch up and time was set to September 15th. Below displays six images within a two hour interval starting from 6 am til 4pm. The date was set up in this manner due to MLB and NFL games sharing the stadium between August until October.



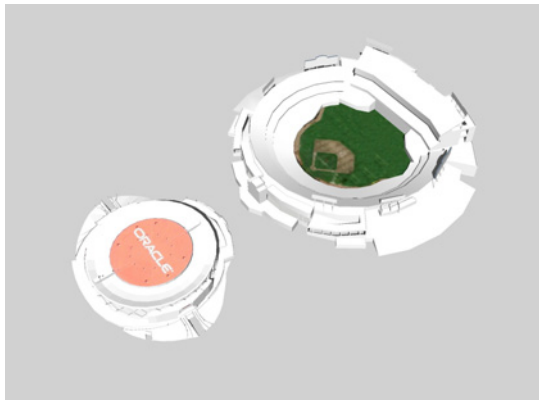
AT 6AM



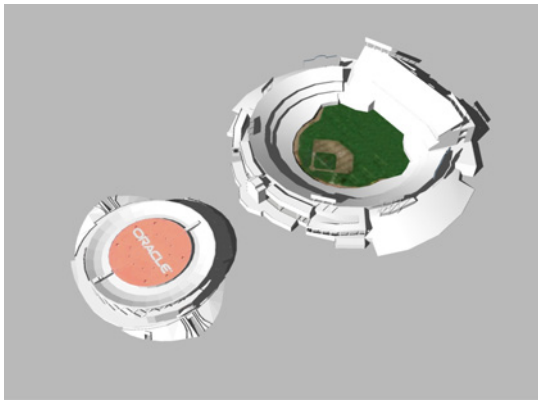
AT 8AM



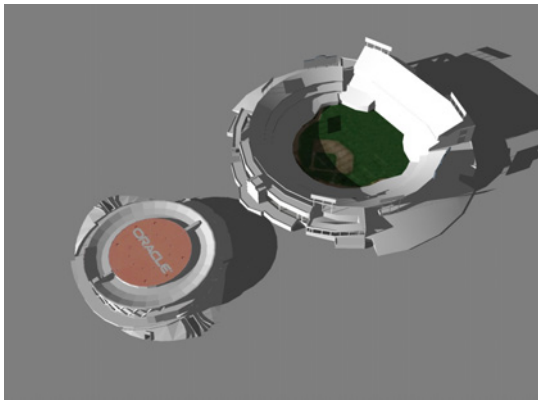
AT 10AM



AT 12PM



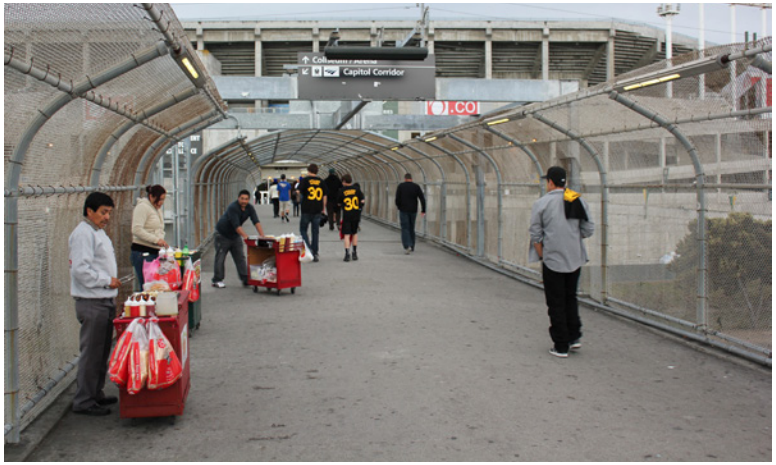
AT 2PM



AT 4PM

FIGURE 4.12 Sun Orientation of Existing Stadium

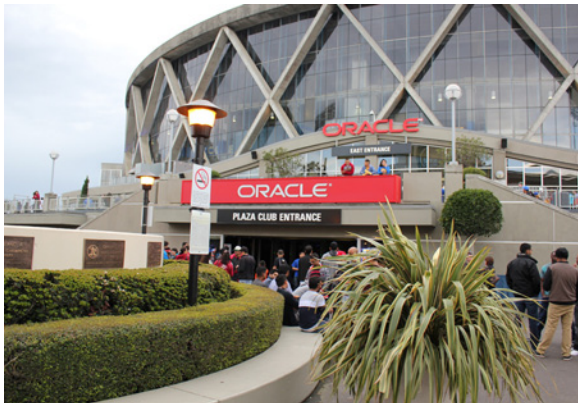
A WALK THROUGH THE WALKWAY



Looking at the conditions of the walkway, a sense of gateway, vegetative surface is not present. A stadium should be an exciting place to be, not resembling that of a prison space.

FIGURE 4.13: Coliseum Walkway

AROUND THE CENTER OF THE SITE




A sense of shading or lack there of, is highly invisible throughout the site. While large amount of asphalt material is found in every single picture listed in this section.

FIGURE 4.14 :Within the Central Area


SECTION
01

THE DESIGN

"Space and light and order. Those are the things that men need just as much as they need bread or a place to sleep."
~Le Corbusier

OT:OVERTIME

Typically, renovating an existing structure is the most sustainable method of design. The Raiders organization however, has requested that in order for the team to stay in Oakland, a new stadium would have to be built. Looking at the context map and design oportunities at the existing site, there is a lot of potential in redesigning the entire site. A solution to keep the organizarion in Oakland and at this specific site is to move the new stadium south. This would allow a design opportunity to reuse part of the exising sports venue as commercial use giving much needed activities, especially before and after games.

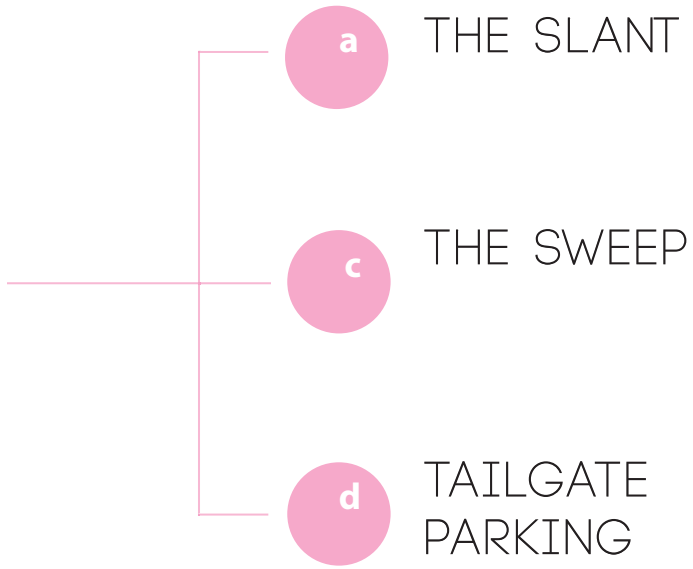
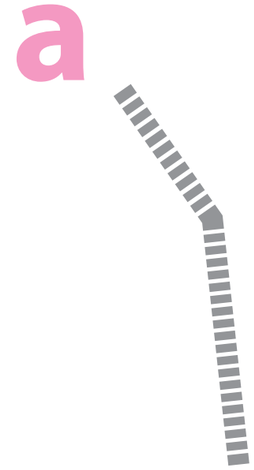


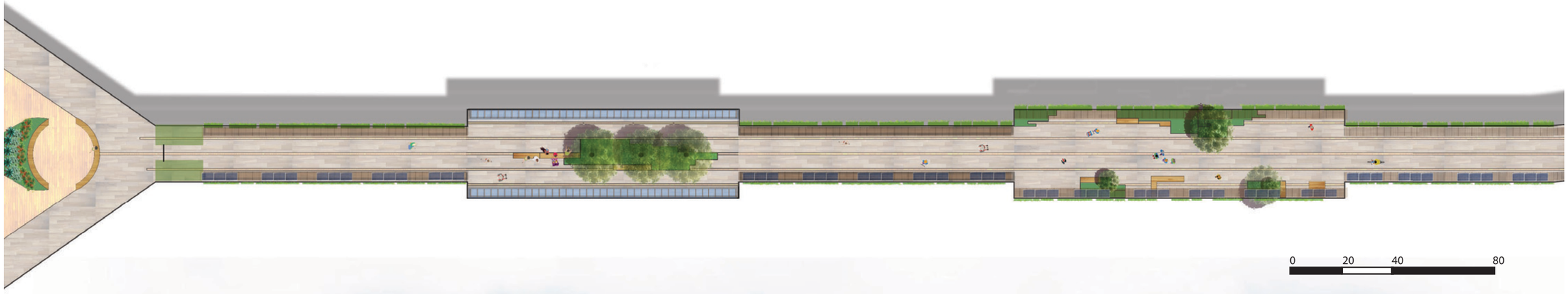
FIGURE 5.00: Master Plan



THE SLANT

THE BART CONNCECTION TO THE COLISEUM

DETAIL PLAN

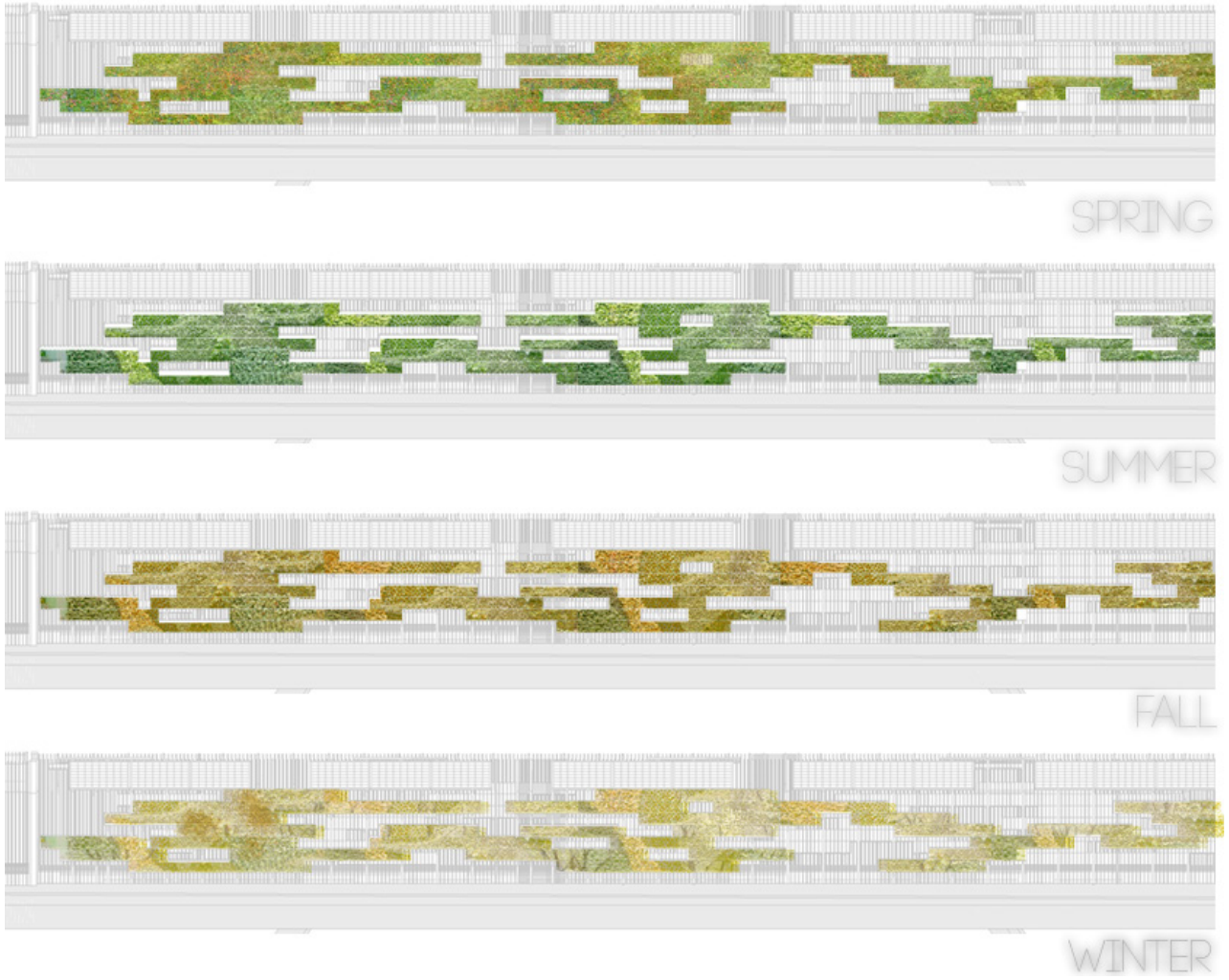


SECTION

FIGURE 5.10: Section/Plan of Walkway

ABOUT THE DESIGN

The purpose of this design is to create a space in which existing food vendors would have ample areas to sell their products to the costumer without getting in the way of traffic. "Pocket Zones" were implemented to create these non-conflicting areas between on-going traffic and people interested in buying items. Within these zones the total width of the structure would widen from about 20 feet to 40 feet. Sitting areas were then added to allow people to rest even eat, instead of purchasing food and eating it as you go.



Stripes of interchanging shapes of Green Walls is based on the concept of "motion" with spaces in between parts of the framing design to be open, allowing views around the existing site. The Green Walls facing the northern side of the wall will contain shade thriving plants, while sun resilient vegetation will be facing the south. Throughout depending on the season, the walls appearance will change giving an interesting, yet poetic afftect.

FIGURE 5.11: Season's of Change, Green Walls

BRINGING WATER BACK TO THE GORUND

To prevent contaminated stromwater runoff from hitting the pavement and flow toward the channels' water, a gutter system will be attached on both sides of the walkway and act as a barrier. The water will then collect onto the system and flow toward the Coliseum entry way and spill onto three platforms connected to the walls of the walkways support. Water would then reach a bioswale allowing the act of filtration and absorbtion of ground water to occur. The system acts as a multi-purpose landscape by containing contaminated water, but work as an art piece installation.

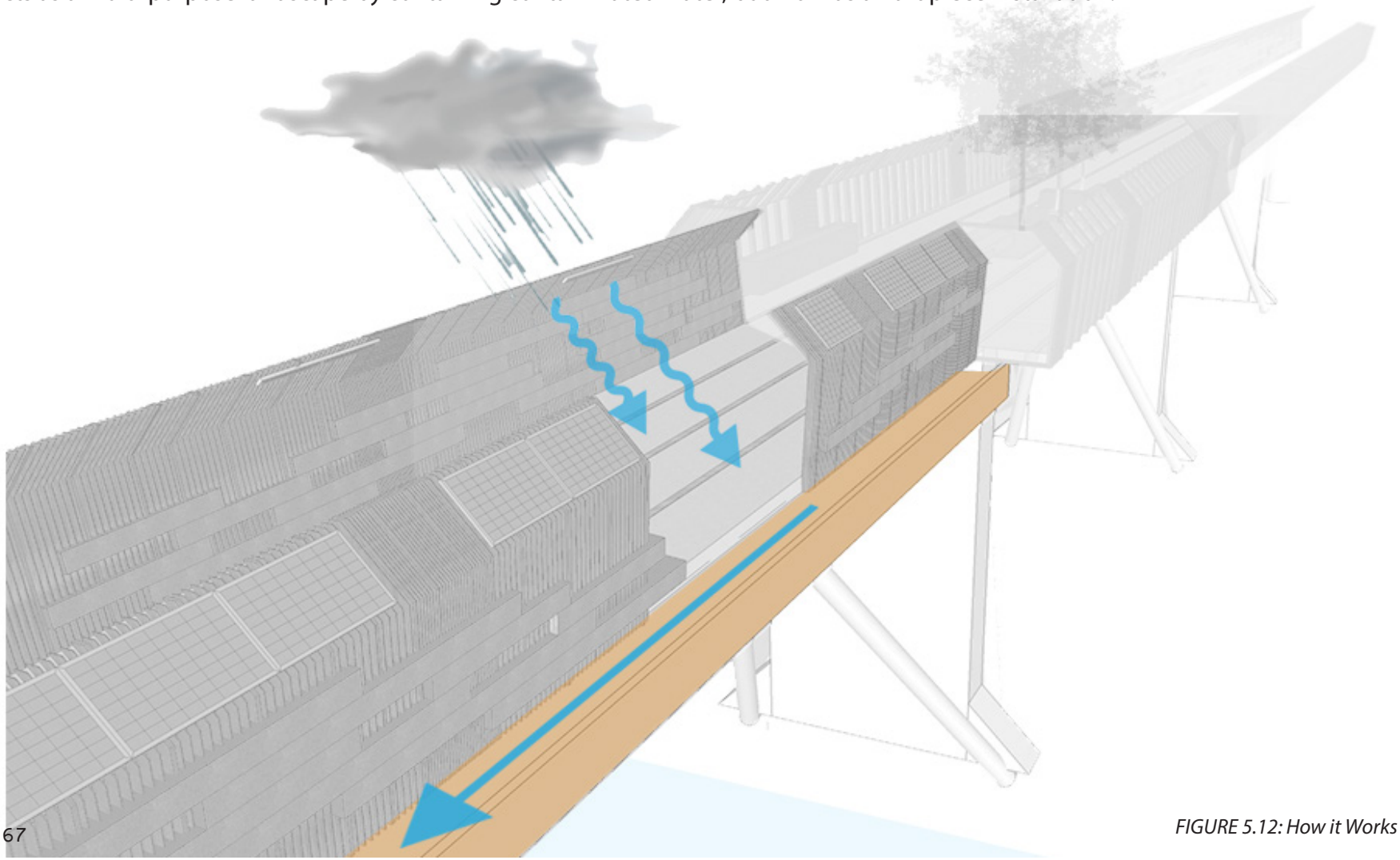


FIGURE 5.12: How it Works

FIGURE 5.13: Sustainability An Art

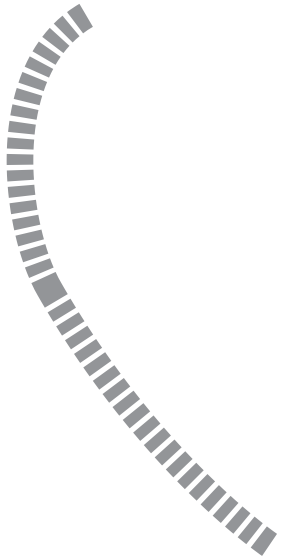
FIGURE 5.15: The Slants Green Wall

FIGURE 5.16: The Slant fromAbove

FIGURE 5.17: Inside the Slant

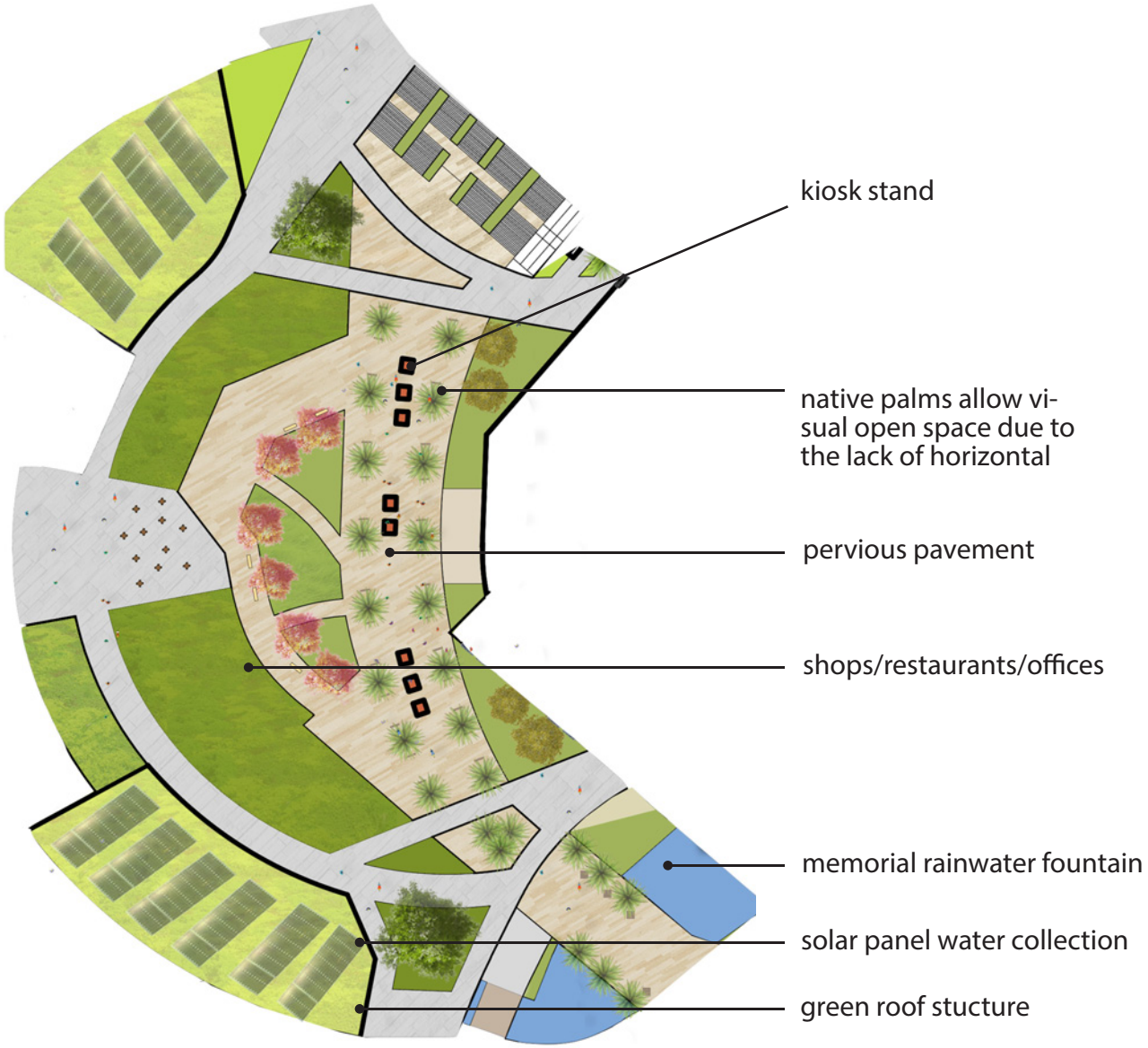
FIGURE 5.18: Entrance of the Slant

b



THE SWEEP

Instead of completely tearing down the Coliseum, there seemed to be a perfect opportunity to re-purposing the building into mix-use. About half the structure will be removed, while the other half will still be remaining. The purpose is to create a promenade area where large people who visit the site can grab a bit to eat before, during or after the game throughout enitre week, instead of just game days. This allows the site to be more productive, instide of a "ghost town" when games are not in session. The reason behind the name "The Sweep" is the related to a football play which resembles the shape the the central plaza.



With the creation of the promenade, The Sweep will not only create a gathering place for people to socialize, but add sustainability strategies which not only lower the costs of electricity, but educate individuals on how these designs can help a site in being more productive and more environmentally friendly.

Memorial fountain displays nine under water light fixtures in which during Raider games will light in threes and A's in nines to relate to theteam's rich championship history. The fountain will act as a water collection center that will be discussed on the next page.

FIGURE 5.19: Plan of The Sweep

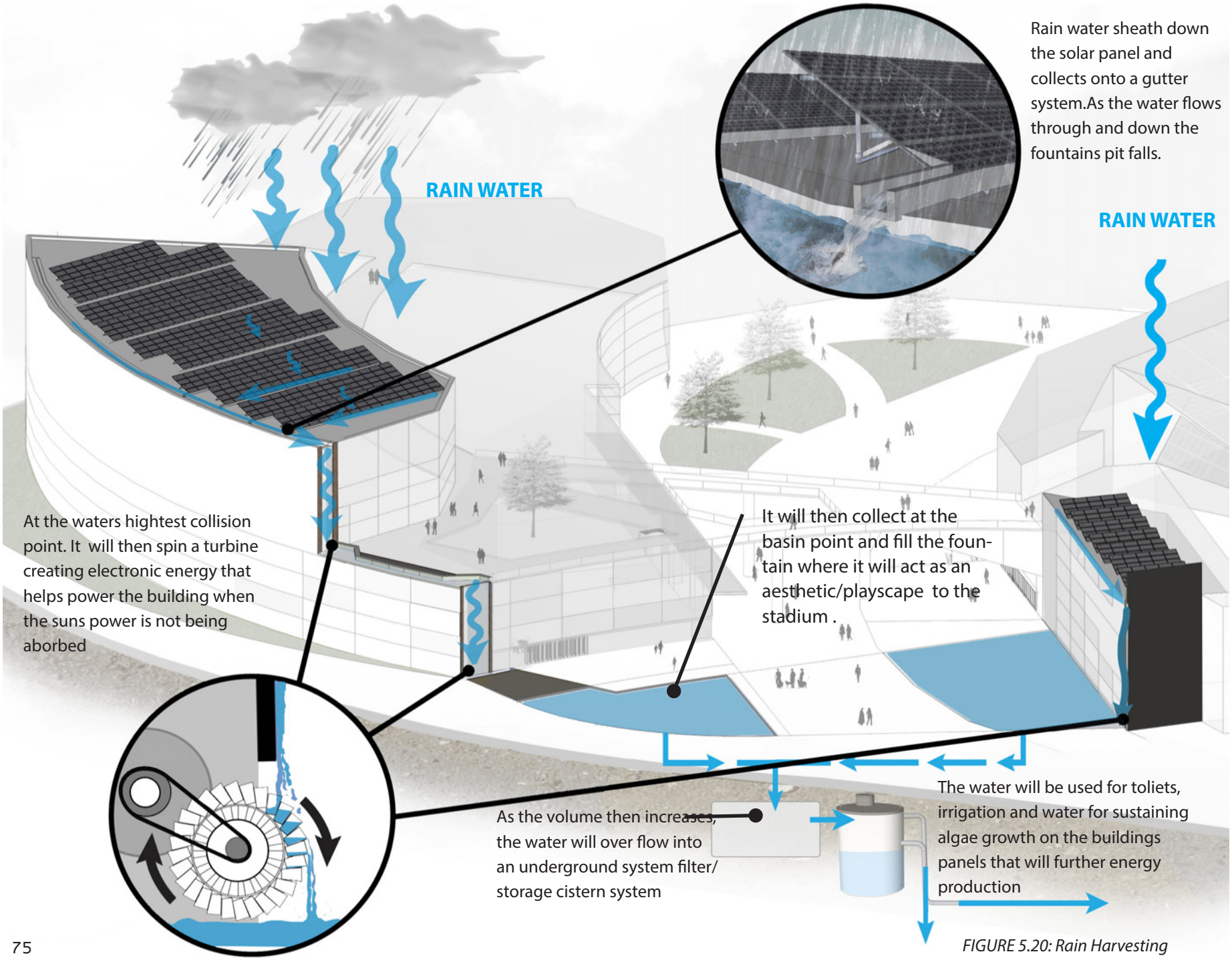
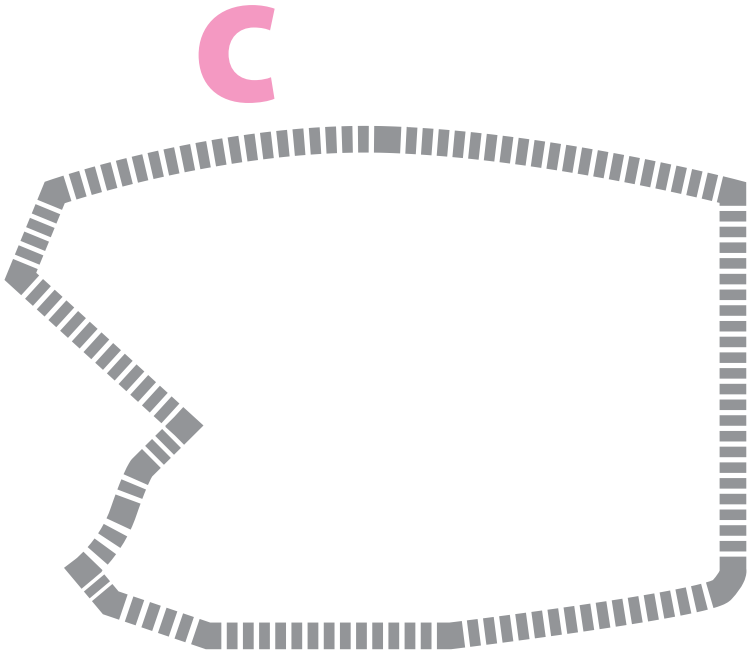


FIGURE 5.20: Rain Harvesting

FIGURE 5.21: How Water Can Create Gathering Spaces



THE TAILGATE PARKING

The tailgate parking area is designed for a more fan friendly environment for those die hard fans wanting to take out the grill and enjoy themselves. Incorporated into the design are trees with wide canopies that help shade individuals from the harsh sun. Trees will also give the once desolate and monotone feeling from the asphalt surface which give a sense of aesthetic appeal to fans alike.

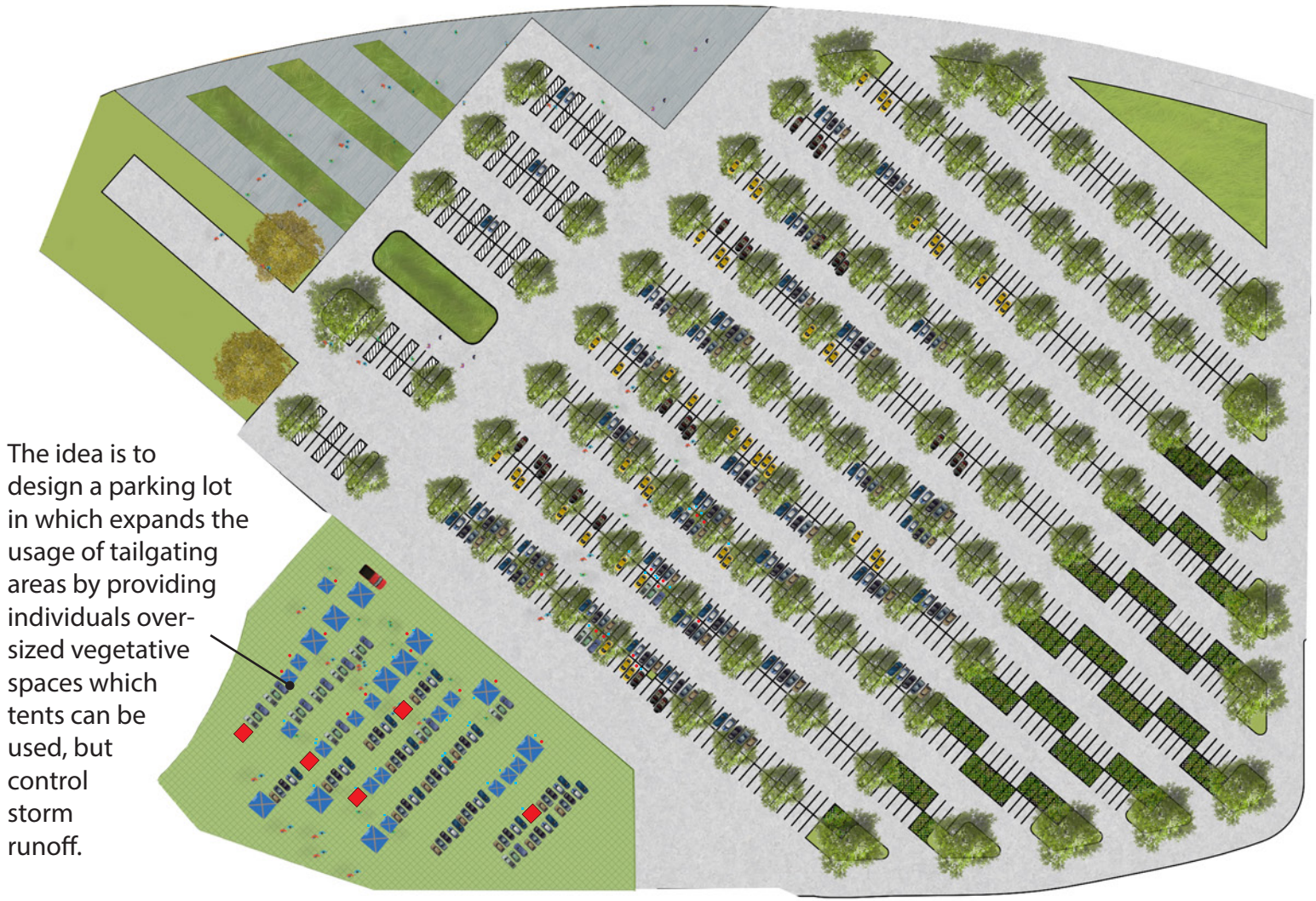


FIGURE 5.22: A Sustainable Lot

FIGURE 5.23: The Lot Alive

PROCESS OF STORMWATER THROUGH THE PARKING

FIGURE 5.24: Storm Water Collection I

The Overall alot is designed to handle water runoff by directing the water toward pervious pavement as well as planter systems.

The three vegetated swales near the stadium, links to one another, cleaning the stormwater before entering an overflow inlet. It also represents the three championships that the Raiders have achieved in winning. By incorporating the system to the tailgate area the goal is to educate audiences about controling runoff.

FIGURE 5.25: Storm Water Collection II

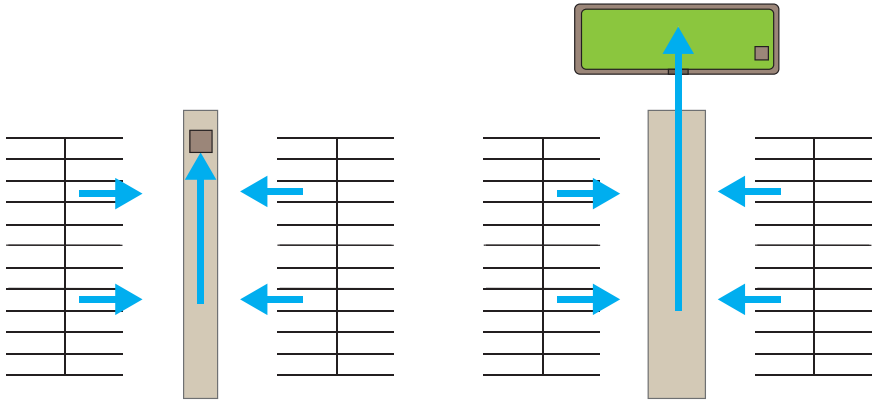
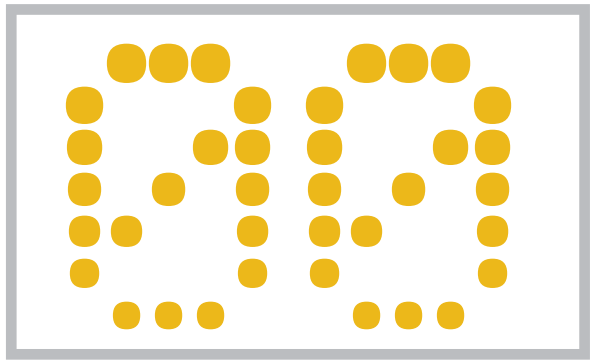


FIGURE 5.26: The Good and the Bad

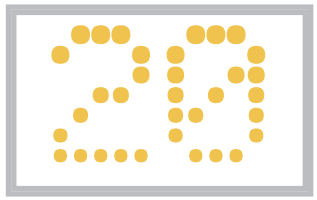

2020
2021

TIME

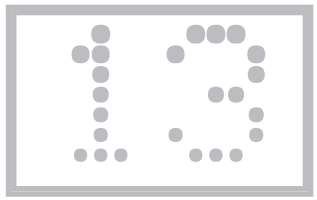


THANK YOU!

SUSTAINABILITY



VISTORS



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