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Acknowledgments

We would like to thank the community members of National City who participated in and facilitated the research, including the City of National City; Brad Raulston, Executive Director of Development; Dr. Jessica Barlow, Director of the Sage Project; Dr. David Larom, of International Securities and Conflict Resolution; and the students from ISCOR 310 Our Global Future during the Fall 2013 and Spring 2014 semesters.

Sage Project Directors and Staff

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The Sage Project

The Sage Project is a partnership between San Diego State University (SDSU) and a city or government entity in the San Diego region, which strives to engage students from across the University in assisting a local government with projects that address its smart growth, quality of life, and sustainability goals. In the Sage Project, students have the opportunity to engage in meaningful real-world projects and make positive contributions to a community in SDSU’s service area. The program’s vision is to connect SDSU students and faculty with high-priority, high-need community projects, thereby generating interest and fresh ideas that create momentum and provide real service to the community. The Sage Project embodies the University’s commitment to serving local students, engaging alumni, and contributing to the public good by focusing thousands of hours of course-based student involvement with high-impact activities. The program is based on the highly successful and award-winning Sustainable City Year Program (SCYP) at the University of Oregon and is a part of the SCYP network. National City, California, is the Sage Project’s 2013-2015 partner city. Participating courses come from a variety of disciplines, including: Anthropology; Audiology; City Planning; Civil Engineering; Communication; Geography; Graphic Design; Homeland Security; International Security And Conflict Resolution; Marketing; Political Science; Public Administration; Public Health; And Speech, Language, and Hearing Sciences.

National City

National City is a highly urban community of about 60,000 residents in south San Diego County. It is the second oldest city in the county and boasts a rich history and diverse community; it is also known as one of the most walkable cities in San Diego County. Located just south of downtown San Diego and just north of Chula Vista, a US-Mexico border city, National City is flanked by freeways and is home to large-scale industries. National City is a small city that faces big city challenges, and, like many municipalities, the city is challenged to meet community needs and new demands of sustainability. By providing new ideas and human capacity, this partnership with the Sage Project will help National City incorporate sustainability concepts and practices into projects that will improve livability.
Executive Summary

International Security and Conflict Resolution 310: Our Global Future, taught by Dr. David Larom, is a dynamic overview course of the resource and social crises that beleaguer the world, which range from overpopulation, urbanization and migration, to ecosystem services and biodiversity, to food and water security, to fossil fuels and Peak Oil, to waste, pollution and toxicity. The fall 2013 and spring 2014 students of Our Global Future participated in the Sage Project and its partnership with National City by conducting a two-week sustainability project in National City’s Kimball Park. Dr. Larom incorporated the project into the course for students to inventively and practically apply principles of sustainability—for example, recycling a former “waste” product of rainwater runoff from urban hardscapes—they conceptualized throughout the semester on the basis of interdisciplinary thinking.

The project, titled “Rainwater/Runoff Garden for A Avenue Project“, required the students to develop a rainwater collection and restoration scheme that could irrigate proposed gardens along A Avenue and in Kimball Park. The mission of the project was to reduce storm-water management costs and runoff, redevelop or restructure the park with a low-to-zero water bill, and turn Kimball Park into a shady and food-producing park that is watered mostly by rainwater, and that is drought-tolerant, low-maintenance, a practical contribution to material security, and a center for community building.

The class divided into groups of 3 to 8 students; each group then created a PowerPoint presentation of a demarcated zone of the park that rendered various proposals of sustainable developments.

The overall purpose of this project was to generate a whole-systems approach to sustainability, namely to: 1) provide students with a real world project to investigate; 2) enable students to apply their training; and 3) provide real service and movement to a local city ready to transition into a sustainable future. Joint ventures typified by the Sage Project are not only beneficial to the community in question, but are also integral to redefining higher education for the public good and catalyzing broad community change towards sustainability.
National City’s Challenges

As one of the most diverse and impoverished cities in San Diego County, National City is beset with crime-related, development and ecological challenges; the latter aggravate the former. National City is mainly flat, with an average elevation of 72 feet above sea level and is subject to warm, dry summers and mild winters with an average temperature above 70 degrees Fahrenheit that rarely drops below 50. Virtually all the city’s annual 9 in. of precipitation falls between mid-November and mid-April, with January-March having the heaviest rains at about 2 in. per month each, as illustrated in Figure 1.

As with most deserts, the total rainfall varies considerably from year to year. Thus, water conservation is critical to both National City’s and Kimball Park’s sustenance and survival.

National City’s ecosystem comprises the California Coastal Sage Scrub Plant Community, a plant community primarily found in California. This community is made up of drought-resistant shrubs. The Sage Scrub Community is highly fire-prone. The consistent flammability and lack of frequent rainfall of the native plants requires irrigation to maintain the land. With a small budget for the park’s renovation, and the nearly unaffordable cost of water, National City faces the quandary of water conservation. National City’s environmental and socio-political conditions necessitate a new culture of water recycling and, overall, an alternative environmental policy infrastructure.

Figure 1 Monthly Rainfall in National City
(Source: http://www.clrsearch.com/National-City-Demographics/CA/91950/Weather-Forecast-Temperature-Precipitation).
National City’s A Avenue Green Street and Pedestrian Pathway Project

The Sage Project, which supports the sustainable development of cities, is a city-funded grant program housed within San Diego State University’s Center of for Regional Sustainability. National City’s A Avenue Green Street and Pedestrian Pathway Project serves as the basis of ISCOR 310’s involvement with the Sage Project. The city received a competitive $2.5 million Proposition 84 Storm Water Grant in October 2012; the City Council approved $800,000 in matching funds for a total project cost of $3.3 million. The ISCOR 310 project therefore focuses on storm-water runoff abatement and rainwater treatment.

The city’s primary objective for the project is to create a “Green Street” that implements Low-Impact Development (LID) infiltration measures to improve water quality of (or as the students recommend, to categorically eliminate) urban runoff entering the storm drain system, which discharges downstream into Paradise Creek at Kimball Park. Concurrent objectives are to construct a safe, environmentally friendly walking path along A Avenue to connect Historic Brick Row, Morgan Square and the 8th Street Revitalization District to City Hall, National City Public Library and Kimball Park, and to provide educational opportunities through the implementation of interpretative signage and Paradise Creek-themed art throughout the park.
Ultimate Goals of the Students

Our Global Future’s course project required the students to undertake direct research through coordinated site visits to the park, engagement with park constituents and on-site critical analysis of proposed ideas. The students set out to detail ways to resourcefully and prudently transform Kimball Park into the city’s microcosm for quality of life development, environmental “smart growth”, and a sustainable ecosystem. The overall course objective was to create a low-maintenance park that is self-sustaining through water collection, groundwater replenishment, solar harvesting and energy-reducing practices, and which produces resources for public consumption (food, groundwater recharge, shade, beauty, art, construction materials, etc.).

The students organized presentations of plans to transform: 1) the park’s landscape; 2) the park’s water, energy, and waste systems; and 3) the park’s educational and communal development. The latter point underlines the needed social transformation and the significance of social issues that range from community building to education about the park’s ecosystem and sustainable programs, to social justice issues such as gentrification of the park and consequent displacement of its homeless dwellers.

The conclusion of this report highlights the students’ most compelling designs and solutions to meet the needs of National City’s Kimball Park into a restructured and revamped sustainable park. Proposals need not be adopted as comprehensive plans; rather, individual aspects from the varying plans can be implemented to ensure a bright future for the city and its residents.
Kimball Park’s Sustainable Future

Location, Landscape and Utility

To provide focus, each student group was encouraged to concentrate its effort within one of five loosely-defined “zones” (Figures 2 and 3). Heading southward from 8th St. and A Ave, the zones are as follows:

![Figure 2](http://www.nationalcityca.gov/modules/ShowDocument.aspx?documentid=7521)  
*Figure 2* Zones in northern section of Kimball Park.

![Figure 3](http://www.nationalcityca.gov/modules/ShowDocument.aspx?documentid=7521)  
*Figure 3* Zones in southern section of Kimball Park.
Zone A (Figure 4) extends from its southern boundary at East Plaza Blvd., up A Ave., across East 9th St., and ends at Plaza Blvd. The entire zone slopes downward to the south, from 8th St. toward the park. The northern section of the zone (to the left of the traffic circle in Figure 2) is lined on both sides by trees planted in metal water catchment systems. The southern section (Plaza Blvd to 9th St.) is closed to traffic on the south side. The east side is lined by brick sidewalks interspersed with foliage. Rain flows southward down the streets and sidewalks to the storm drains and discharges in Paradise Creek. The landscape contains numerous grassy patches, a line of hedges, and over a dozen Thunder Cloud Plum Trees. The zone’s surrounding built environment includes a bank, a market undergoing construction, Brick Row houses, the Frank Kimball House, and the Elizur Steel/Crandall/Ennis House. Historic buildings, museums, businesses, residential buildings and street parking make prime usage of the zone.
Zone B (Figure 5) occupies only one block of A Ave., from Plaza Blvd. to 11th St., but runs 3 blocks east-west from C Ave. down to National City Blvd. A Ave. forms a shallow ravine, sloping gradually downward to the south and defining the bottom of every east-west transect along the way. Rainwater and runoff enter the gutters along East Plaza Blvd. and down B Ave., but flow downhill along A Ave., eventually pooling at the intersection of A Ave. and East 11th St., finally entering the storm drain system. With the current design of Zone B, little water is retained and nearly all flushes into the drainage system. Water-guzzling grass scatters along A Ave. and B Ave., with few trees to provide shade and reduce evapotranspiration from the grass. The zone’s built environment is almost entirely residential, with some businesses existing along East Plaza Blvd. and B Ave. Most buildings are smaller, single-storied houses, with several apartment complexes and small shops along B Ave. Important foliage exists along A Ave.

Figure 5 Zone B.
Continuing south on A Ave., Zone C (Figure 6), Part 1 runs between 11th and 12th Streets, with a multi-story apartment complex on the east side of A Ave. and a construction zone on the west. Continuing south to Zone C, Part 2, we enter Kimball Park from the north, with the park’s main buildings (including the Martin Luther King Jr. Community Center and the A Reason to Survive (ARTS) Center) atop a grassy hill. Containing the park’s highest elevations, Zone C is optimal for water collection, drainage and harvesting. During downpours, an urban river flows westward down 12th St. where it joins the southward flow along A Ave. Water runs west and south from the park buildings down the grassy hill until it is blocked by a cement wall encircling the area. The hill’s vegetation currently consists of grass, brush and a few dispersed trees. There are also several areas of bare spots and dead foliage. South of the hill is Kimball Park’s central parking lot.
Zone D (Figure 7) incorporates the space between the parking lot in Kimball Park and the National City Public Library, which includes the baseball fields, the basketball courts, the tennis courts, the library, the parking lot, and a shaded area of plants and trees. Paradise Creek runs through the zone from the southwest and exits into an underground culvert on the park’s edge. Level in the baseball field and shaded areas, Zone D abuts A Ave.’s natural decline suitable for water collection. Rainwater accumulates at the bottom of A Ave. and channels into the drainage system where insufficient shade fails to reduce evaporation at the collection site. The park comprises both the built environment and the utility of Zone D.
Zone E (Figure 8) comprises the back trail from the library along the baseball diamond to the corner of 16th St. and B Ave., as well as the open area along 16th St. from the parking lots to B Ave. Within this zone are the library, City Hall, Paradise Creek and Bridge, surrounding parking lots and public bathroom facilities. Its recreational areas include a children’s playground, baseball and softball fields, an enclosed skate-park, and an open basketball court. The zone’s topography is level with a sharp dirt slope in the southeast area of the park adjacent to the amphitheater. The topography of the zone renders perfect for terracing, and its susceptibility to direct sunlight offers an ideal environment for farming. The water accumulates at the bottom of the slope and floods into a cement drainage ditch. Zone E and D are unequivocally the most dynamic and verdant.

Figure 8 Zone E.
Park Diagnostics

Kimball Park, located in the middle of a flood zone, is a recreational resource and water collection center for the National City community. Surrounded by city buildings under the civic center umbrella, the park is a significant community asset, widely and disparately used by constituents for purposes of fitness, recreation, social gatherings and city-sponsored festivals. The skate-park, baseball fields, soccer field, basketball courts, public library and war memorial bowl all cater to dedicated park-goers, surrounding schools, residents and visitors. However, it faces complex ecological and sustainability challenges, all of which relate to water collection, restoration and conservation. In the report below, students provide proposals addressing the following concerns in the park: 1) sloping streets and hills that flood water runoff and pollutants into storm drains and the ocean; 2) riverbed waste runoff water; 3) eroding hillsides; 4) grass and foliage that consume too much water; 5) excessive asphalt and concrete surfaces around buildings, sidewalks and parking lots that prevent water from seeping into the ground; 5) unclaimed facility waste water; 6) a lack of rain for irrigation and potable use; 7) wasteful systems of irrigation; 8) little to no shading; 9) unsavory restrooms; and 10) outdated and inefficient lighting, which compromise the park’s security. The challenges of individual facilities, recreations, and unique landscapes within each zone are implied or underscored in the students’ proposals. In this report, students offer recommendations of ways to improve the landscape to generate a sustainable, self-maintained, and ultimately regenerative park.
Summary of Report

National City, in partnership with the SDSU Sage Project, aims to lead San Diego County in its conceptualization and application of sustainability. Sustainability, vis-à-vis Kimball Park, requires the cultivation of existing natural resources, a restructuring of the park’s layout to landscape a regenerative system between the surface, ground and periphery, and developing sustainable systems for the sustenance of new resources. Currently, the root of the impediment to Kimball Park’s sustainability lies in the park’s internal and external water waste. During downpours of rain and spates of storms, water cascades down the streets without proper collection and restoration. The wasted water could be utilized for regeneration of the park’s natural resources and reserves; this is the key to the park’s sustainability. All designs proposed for the park thus center upon rainwater/storm-water abatement and treatment for water redirection and use. Predicating upon this understanding of the park’s potential sustainability, National City holds tremendous opportunity to create a plan for smart growth and quality of life development for the park’s community. Summarized in this report are different proposals from SDSU students for restructuring and landscaping Kimball Park in keeping with sustainable practices and needs of the city. National City collaborated with students enrolled in David Larom’s International Security and Conflict Resolution 310, Our Global Future, course to gain insight into how the park’s potential can be fully realized.

This report summarizes the students’ system-restructuring, landscape development, and social proposals that intend to regenerate the park’s ecosystem, to build a sustainable model community that brings together and improves the quality of life for National City residents, and to promote sustainable ways of living and prioritization of the environment for both policymakers and the citizenry.
Zone Initiatives

In the summary of proposals per zone, every proposal is qualitatively synthesized and syntactically sorted into common initiatives and themes. As you will see in the following proposals, students proposed ways to accomplish water restoration and conservation, energy, waste, soil regeneration and flora cultivation, quality of life and community development goals.

Zone A

Water Collection and Provision

The proposals for Zone A predicate upon water collection and restoration and the environmental challenges produced by the current storm-water scheme. In addressing those challenges, we propose that the city council construct a storm-water runoff passageway to divert all drainage and excess water from street and park slopes currently funneling through the sewer system into the sunken garden beds, trees and community garden. Subsequently, we suggest installing rock beds in curb trenches to allow water to filter from the street into the planter beds.

Two groups recommend the installation of WARKwater towers (Figure 9) that collect dew to harvest for potable water, drip irrigation to sunken garden beds, and animal drinking water. Shade canopies placed above towers could serve as rainwater directors to maximize rain harvesting.

![Figure 9 WARKwater tower for Zone A. (Retrieved from http://www.architectureandvision.com/projects/architecture/84-projects/art/492-073-warkawater-2012)](image-url)
To avert pollution from storm-water or rainwater runoff and aid in groundwater retention, we recommend permeable sidewalks: fragmented concrete sidewalks within and surrounding the park. The construction of permeable sidewalks comprises interlocking concrete pavers with small gaps to allow rainwater runoff to drain into a storm-water storage system or the soil beneath the pavers (Figure 10). As a further advancement, replace the parking lot’s concrete pavement with porous asphalt.

![Figure 10 Permeable sidewalks for Zone A.](http://www.icpi.org/node/4006)
Vegetation

With the ultimate goal of regenerating the park and sustainably utilizing collected water, the students in each zone focus substantially on park vegetation. To collect otherwise wasted runoff water, we suggest installing raised planter beds for shade in between tall trees and developing sunken garden beds on the park’s landscape (Figure 11).

Figure 11  Raised planter beds for Zone A.

Expanding on concerns of water waste, we recommend developing green roof landscapes with water efficient plants atop major buildings. The green roofs will insulate buildings, reduce greenhouse emissions, filter pollutants from rainfall, and reduce heat transfer from buildings’ roofs. To produce similar results, a living wall against a building on A Ave. north of 9th St. could be constructed.

As recommended by nearly all students, the cultivation of a bio-diverse communal garden is integral to regenerating the park. We recommend planting a community garden of native, drought-tolerant, and edible vegetation; placing stepping-stones in and around the garden; and constructing water catchment pools encircling the stones to irrigate the garden. Suggested plants and trees for the garden include the jujube, dragon fruit, goji berry, mulberry, guava, artichoke, lavender, western redbud, rosemary, strawberry bush, white sage, and aloe vera. In conjunction with the community garden, the city could organize a weekly farmer’s market for park constituents to collectively grow, voluntarily manage, and eventually sell produce grown in the community garden.

Throughout the park, we recommend planting an assortment of strawberry trees, coastal live oak trees, pomegranate trees, and desert indigo trees. Addressing regeneration and sustainability goals, we propose a composting system inside the garden, whereby volunteers collect mulch as fertilizer for both the community garden and park vegetation. Lastly, we predict that educational plaques on the plants and trees in both the garden and throughout the park will promote community engagement and interest in the environment and sustainability.

**Lighting**

To curb the park’s energy consumption and cost, we suggest placing solar panels on top of various community and administration buildings, baseball field bleachers, reflectors surrounding the baseball field, and the National City Public Library. Throughout the park, we suggest installing (3-G) solar coach lights, which operate sustainably and reduce light pollution by directing the light rays downward to the ground.

**Additional Ideas**

Student initiatives for Zone A’s infrastructural renovation and community engagement include: installing recycling bins; building a welcome arch in front of the park’s entrance; constructing a mosaic-ornamented creek with image submissions by the community; and restructuring the skate-park into a bowl-shape made of cornet with a drainage system that directs water into Paradise Creek.
Zone B

Water Collection and Provision

To prevent storm-water runoff, we propose an underground rainwater cistern built with a pipe to direct water for irrigation. Rainfall and storage use will vary, in the wetter winter months relying on irrigation by rainfall, and in the drier summer months utilizing water stored in the cistern. Provisionally, we suggest employing an evaporation-based system of measured irrigation bearing a tank water, which may contain rainwater, bore water or gray-water. Measured irrigation prudently controls the volume of water delivered to each sector and to each plant within the sector. Operating by solar pumps and requiring minimal maintenance, the system could redirect water flow from existing collection points to planter boxes and a garden. The measured irrigation system will subsequently direct the excess rainwater to the cistern. A drip irrigation system for the park’s landscape and garden can serve as an ancillary provisioning scheme.

On the streets, we recommend building gravel trenches along the driveways to slow down water runoff and enable the water to absorb into the park’s ground-soil.

To increase water retention and widen the sidewalk for greater pedestrian access, we suggest replacing the concrete material on existing sidewalks with permeable pavement. Permeable pavement blocks are made of concrete or cut stone that lay atop a base layer of sand and gravel, and seeps water through the spaces between the blocks. We recommend concurrent grids made of recycled plastic or concrete in a honeycombed or lattice pattern, as patterned grids contain open cells in which grass can grow.

Vegetation

Addressing water waste, soil degradation and land erosion concerns, we propose installing fescues grass, a seasonal grass ideal for northern climates that absorbs water well after a drought. Fescues grass is suitable for Kimball Park due to the minimal rainfall and grass location under shady trees. We further suggest replacing the grass from certain sections along A Ave. with less water-intensive plants and shrubs. Atop the bathroom facilities and other public buildings, we suggest developing green roofs to reduce heat and deflect sunlight, in addition to serving as a filtration medium for rainwater. The excess water could filter through an integrated sand filter on the roofs.

To create a regenerative and useful park landscape, we propose the following plan: repurpose the zone’s main vacant land expanse into a community garden with food-bearing plants, and utilize compost bins to turn plant waste and droppings into fertilizer for the garden. Garden water supply will derive from redirected street runoff water and rainfall. The garden will initiate community engagement, generate a continuous and sustainable source of fertilizer for the community via compost bins positioned in the back of the garden, and enable the park’s constituents to use the rainwater captured in and around the garden to grow their own fruits and vegetables. The vast garden will require some professional attention, but such requirement could be drastically lessened by
empowering the local community to assist in maintaining and cultivating the garden and the surrounding area in exchange for access to the plants and collected rainwater. Although the garden will require attention, its plants require significantly less maintenance and water usage. Moreover, the garden provides an opportunity for the local community, particularly children from the nearby elementary school, to congregate and practice sustainable permaculture. Under the intention of cultivating a biodiverse ecosystem, the recommended succulent plants for the garden include: aloe vera, torch aloe, and jade plants; edible plants include grape vines, sunflowers, fig trees, orange trees, lemon trees, and pistachio nut trees. Recommended trees include the African sumac, gold medallion tree, and crape myrtle.

Inside the community garden, we recommend employing an aquaponics system—a food production system that combines conventional aquaculture with hydroponics in a symbiotic process to break down by-products into nutrients for plants. The water then re-circulates back to the system, producing 100% conservation and regeneration.

Finally, we suggest supplementing the community garden with a small, gated children’s garden containing polycultural plant beds, synonymous with the plants in the community garden.

**Lighting**

To cut electric utility, cost and pollution, we recommend the installation of solar powered street lamps along the park’s street perimeters. The long-term savings of solar lamps, powered by free and clean solar power, in addition to the nature of their construction requiring less maintenance, offset any initial investment. Additionally, a potential solar-paneled barbeque pit could replace the food stand near the bathroom facilities. (Note: the permeable pavement, recycled benches and solar-powered lamps require virtually no maintenance or upkeep. Only cursory, semi-regular inspections by city workers are needed to ensure that the benches and lamps are not damaged or defective).

**Infrastructural Renovation**

Expanding on our goals for water runoff prevention, we suggest constructing a translucent pyramidal canopy above the skate-park designed to provide shade, sun protection, and collect rainwater into plant boxes underneath. The canopy will comprise oval floors acting as independent modules in order to allow absolute access. For water collection and structural sustainability purposes, we recommend renovating the skate-park floor with recycled metal. Finally, we suggest replacing the basketball court’s concrete asphalt floors with “cool pavement” made from similar concrete materials, but with lighter colors that reflect heat back to the sun.
New Structures and Sustainable Systems

The Zone B groups developed the following innovative proposals to develop a walkway, a walking trail, and an open plaza. For the walkway, we suggest to overlay a lightweight composite bridge with railings made of recycled plastic lumber on the adjacent streets’ pedestrian crosswalks. Subsequently, we propose installation of solar or LED footlights on the bridge.

For the walking trail, we recommend installing benches made of recycled material for resting areas, maintenance reduction, and educational application of sustainability. Afterwards, the interior sidewalks should be rerouted to allow for shaded seating areas across from the community garden.

The last infrastructural redevelopment proposal is to develop the historical neighborhood between Plaza Blvd. and 9th St. into an open plaza for a community-gathering locus (see example in Figure 12). Accordingly, we suggest refitting the facilities in the proposed plaza with LED or solar lighting, placing planters with enveloped seating made of recycled material, and constructing a gazebo purposed for cultural performances.

![Figure 12](http://www.east-centricarch.eu/projects/evriali-ecological-park.html)
Zone C

Water Collection and Provision

To remedy the flooding of runoff and pollutants into storm drains and into the ocean from streets, we recommend installing an aboveground storm-water harvesting cistern with a filtration system to collect and store runoff water for irrigative use. A typically overlooked water source, unclaimed facility water should be leveraged and reused to compensate for insufficient rainwater supply. Under this premise, we propose constructing a supplemental gray-water cistern that collects water redirected from apartment complexes and surrounding buildings for park irrigation and toilet flushing.

To avert the wasteful irrigation systems in the park, we propose replacing the unrestrained sprinkler system with an underground drip irrigation system to deliver water slowly and immediately below the surface to plants, trees, and particularly dry landscapes in the park. The underground drip irrigation system minimizes water loss by storing and reusing water runoff, avoids the adverse effects on cultivation from wind and evaporation, and can effectively operate by solar power.

Expanding on the rainwater collection plan, we suggest building a sunken median bio-retention trench on 12th St. and installing porous pavement down A Ave. to be transferred to the cistern for drip irrigation and other water-provisioning systems. Subsequently, permeable rocks underneath the pavement could be positioned to form a filtration system for flood prevention and sustainable water distribution. Along park sidewalks, we recommend replacing the concrete pavement with porous pavement for water to filter through and for sediments to be naturally extracted, allowing for high-quality water to recharge the ground-soil.
Finally, we propose creating a visually appealing “Green Street” that mimics a natural water system to filtrate storm-water runoff with low impacts that include lowered curbs, bio-retention trenches, and permeable sidewalks (Figure 13). Excess water could sieve sediments through a natural filtration system and flow into small cisterns for storage and subsequent landscape use. Additional curbside rain gardens could be installed along the parking lot, street perimeters and medians.

Figure 13  “Green Street” for Zone C.

Vegetation

The vegetation throughout the park consumes water profligately, while hillsides erode due to undirected rainwater from downpours. To conserve water and prevent erosion, we recommend the following: 1) planting an assortment of drought-tolerant trees for water conservation, climate change alleviation and soil and topographical landscape regeneration; and 2) replacing dead shrubbery on the zone’s downward slope with new water-intensive plants, trees and food-bearing plants ideal for Kimball Park’s semi-arid climate. In particular, we propose planting edible, drought-resistant, and gravel-enclosed trees along pedestrian walkways, while concurrently phasing out eucalyptus trees dispersed throughout the park. The new trees would provide shade, which in turn would cool adjacent buildings and reduce electric utility. Proposed trees include the jujube, pomegranate, Meyer lemon, strawberry, and pineapple guava. Suggested erosion-control plants along the hill include the California fuchsia, hummingbird sage, common yarrow, and lantana.

For energy cost savings and climate change alleviation, a living wall across the elevated side of A Ave. could be constructed. We recommend that the park vegetation be managed and monitored by the Martin Luther King Jr. (MLK) Community Center and participating community members.
Lighting

To conserve energy utility and preclude major ecological degradation caused by conventional electricity, we propose that all extant lighting be removed and replaced with an assortment of solar lighting throughout the park. Specifically, we recommend installation of LED solar-powered lights along the walkway at the bottom of Zone C and outside the public bathrooms. Also, arranging an array of solar panels on top of the bathroom and MLK Community and ARTS centers has the potential to generate revenue for the city by selling power into the grid. Solar energy lighting is sustainable, cost-effective and a mitigation tool for disasters and blackouts. National City is prime for solar energy due to its irradiance (5,894 KWH per year) and south-facing location (see Figure 14).

Figure 14  “Irradiance.


An initial large investment will be needed for the solar lighting and array systems in the park, including maintenance contracts, but will be offset by long-term cost benefits. The benefits to the solar initiative include all-encompassing energy efficiency, independence from fossil fuel based energy, avoidance of future utility costs, and the provision of a safe oasis for the National City residents.
Infrastructural Renovation

We propose various structural redevelopments throughout the park that address storm-water runoff, pedestrian access, and park waste challenges. First, we suggest a termite-resistant deck leading to the MLK Community Center, gently sloping to direct rainfall into a drain for eventual irrigation. Second, we recommend building ADA-compliant ramps made of recycled metal all around the park, including on walkways to the Community Center and on the proposed deck. Third, we recommend installation of recycling bins for cans, bottles, paper and organic material to keep the park clean, reduce trash and clutter in the neighborhood, and reduce the materials that may flow into street runoff.

We also recommend establishing an open dog park or walking area with a replenished lawn, and an entrepreneurial “Green Cart” to encourage nutritive recreation.

Zone D

Water Collection and Provision

Our water collection proposal outlines an aboveground rainwater cistern and under-ground gray-water cistern, as follows: First, channel rainwater at the bottom of A Ave., the street’s low point, into an aboveground basin, enclosed, shaded and supplemented by water collection from the library roof and creek; second, construct sidewalk basins to slow down runoff streams, change all drainage systems, bar trash and debris from entering and accumulating in and near the storm-drain system; and third, add taller cross-sections to the storm drain for water to sit longer and recharge. Concurrently, employ a rain-water-catchment system and a fog catcher atop the library roof to supplement the water collection at the A Ave. low point.

Next, install an underground gray-water cistern that will collect rainwater, recycle gray-water from onsite and neighboring facilities, and provide a source of water for sustainable irrigation. Incorporate a purification system, chlorine or UV light, into the cistern to sanitize the water, and simultaneously install gray-water filtration systems at all trash receptacles and in the bathrooms. Excess gray-water from water fountains could be dumped into stand-alone low-cost filters and then eventually be added to supplement the collected water supply. Gray-water recycling from surrounding buildings will decrease waste water discharges, prevent pollution, save energy by recycling water, and lower the demand of processed water and energy used for water treatment. Nearby residents, business owners and government facilities should participate and modify their buildings to gray-water recycling for the purpose of irrigating Kimball Park. The City of National City could offer tax incentives to compliers (e.g., property tax reduction). (Note: Similar gray-water recycling projects throughout California have boasted an estimated 70-90% reduction in water usage).
To assist the rainwater collection system directed into the cistern, we propose constructing a bio-swale storm-water runoff conveyance system to absorb or direct heavy runoff to the rain gutters that connect to a drip irrigation system – namely, a Pepsee irrigation system (Figure 15) to cultivate the newly planted community garden and park vegetation. The drip irrigation system will deliver water at low pressure and volume to intentionally targeted areas. To maximize the water-provisioning scheme, we suggest preserving and frugally irrigating at low-point collection spots.

Figure 15  Pepsee micro-irrigation system.

Permeable sidewalks, as outlined in previous proposals, enable water to seep through pavement and recharge ground-soil. We recommend replacing all concrete pavement atop the sidewalks and adjacent streets with grasscrete, a man-made material created from purely recycled plastics found in landfills. Grasscrete would thoroughly collect rainwater, provide protection against flooding, and recharge ground-soil. As an alternative to grasscrete, we suggest replacing all concrete sidewalks with porous pavement to reduce runoff, recharge the groundwater, and provide slip-resistant surfaces to pedestrians. The permeable surfaces underneath either pervious pavement or grasscrete will enable rainwater to filter into the ground for absorption and recharge, preventing overall water runoff, erosion and drainage clogging.

Finally, we suggest adding shale (haydite) to areas of the park that need the most water consumption. Shale absorbs water as the soil dries, and mixing the shale with soil prevents the soil from drying or eroding. However, shale added to sloping areas must remain unsaturated since houses and topsoil can slough off.

Vegetation

Critical to landscape regeneration is the cultivation of a community garden. We propose growing an organic community garden wherein residents rent plots and grow bio-diverse, drought-tolerant, low-maintenance, food-bearing and medicinal plants. The garden will acquire irrigation by both the rainwater basin and gray-water cistern. The planting scheme will consist of raised garden beds, which yield up to four times the amount of crops than planting seeds in rows, and which create more space to be used for paths. It is recommended that the community garden be gated and require a library pass to enter to encourage greater constituency interest in the library. Within the gates would exist a storing shed, a canopy, wheelchair-accessible raised planters, an herb garden, open soil and ollas—clay pots installed directly where seeds are planted wherein water seeps out from the pot in the exact amount needed. To provide power to irrigation pumps and light for the garden, we propose installing solar panels on the storage roof and overhead canopy.

To encourage community engagement, we propose tasking volunteers and employees to preserve and monitor the garden, and allowing attendees to pick edible plants and crops free-of-charge to promote a sense of community and sustainable living. We also suggest arranging educational programs through the park’s various centers to cultivate the garden, teach sustainable practices and permaculture, and underscore the significance of food and water security. Community programs could include classes about water conservation and sustainable irrigation, indigenous plants to the greater San Diego area, and composting. The programs could additionally include youth fieldtrips that afford students a practical education on sustainable agriculture.
Suggested garden plants include asparagus, kale, oregano, blueberries, loquat fruit, goji berry, parsley, rosemary, thyme, redbud and California lilac. Suggested trees for the garden include the strawberry, dragon fruit, apple, guava, apricot, jelly palm, natal plum, and pomegranate. These plants and trees are usable by humans for health and instrumental purposes.

We highly recommend eliminating water-guzzling grass throughout the park’s landscape and installing drought-resistant Bahia grass, which retains significant moisture during the rainy season and demands relatively low maintenance during the summer. Comprehensively, we suggest planting native, drought-tolerant trees, succulents and other plants useful to humans around the park, and replacing old water-dependent plants with drought-tolerant plants to aid threatened and endangered native species, such as fuchsia flowers for the struggling bee population in California. Suggested vegetation include the California oak tree, coastal sage shrub, cactus plant, strawberry tree, jujube tree, jelly palm tree, olive tee, Torrey pine, bottle tree, sea lavender shrub, and aloe vera. Educational placards could be placed on trees and plants, and espaliered trees or potential yellow orchard vines. Finally, planter boxes could be placed below the bridge and bio-retention planters could be terraced atop the sloping hills beneath the Community and ARTS centers for resourceful water collection.

One group delineated a plan to build an “edible corridor” that will invite constituents to pick fruit from trees and edible shrubs that align the pathway. The structure would render shade, enable flourishing biodiversity, and provide botanical education through plant signage. The group suggested growing a garden at the entrance and exit of the corridor to serve as a water filtration system for treating storm-water runoff, and installing surrounding solar bollards to illuminate the path at night.

Most groups included a proposal to develop a green roof atop the library for the vegetation to insulate the roof, which would prevent the building from fluctuating in temperature and thus keeping air conditioning and heating costs down. Rainwater storage devices would not be needed to supply the green roof, but runoff could be collected from the roof to provide water to areas around the library. The groups propose instead the installation of a solar water heater to generate power and store water simultaneously, and the utilization of a joint-volunteer program with the community garden for the green roof’s maintenance. The sloping structure of the library may render a rooftop garden impractical, however. As an alternative, other groups recommended painting the library roof white to keep the building cool and installing solar panels to operate the library’s electricity.
Lighting

We propose a lighting scheme for Zone D, utilizing motion-sensor LED lights and solar panels. First, we recommend installation of motion-sensor LED stadium and tree lights throughout the park pathways, and replacement of the floodlights in the baseball fields with motion-sensor LED stadium lights. Motion-sensor LED lights emit less carbon dioxide, use 80% less electricity, and give off less heat than traditional incandescent streetlights. Second, we recommend building solar panels for a solar-covered parking lot, wherein panels align in row formations as shade coverings for cars. The parking lot should also contain electrical and hybrid vehicle charging outlets.

Infrastructural Renovation

We propose renovating the library by building a second entrance along the library’s north wall. In addition, to accommodate a much-needed connector between the library, park and parking lot, we recommend replacing the children’s playground with the second park entrance marked by a community-designed sign. Then, we recommend the construction of a pebble or stone-made walking path leading to the library, and replacement of existing weeds surrounding the library with drought-tolerant plants.

We recommend renovating the bathroom facilities with high-efficiency toilets, high-efficiency faucets, and waterless urinals. Exterior renovation could be as simple as painting public facilities throughout the park, particularly the bathroom building, in light colors for sunlight deflection and natural building cooling.

We also suggest redesigning a multipurpose skate-park with novel features strategically placed in utilization of the site’s topography (see example in Figure 16). The design will be organized with skate paths that serve as concrete draining canals, permeable concrete as the floor, and ramps constructed by recycled metal. The park’s shape will direct rainwater into a concave basin for collection and subsequent filtration.

![Figure 16 Multi-purpose skate-park](https://www.globalgiving.org/projects/tony-hawk-watts/photos/)
To introduce advantageous infrastructural developments that address water conservation, quality of the park’s condition, and park security, we propose individual initiatives separate from the aforementioned plans. Regarding water conservation, we recommend the development of a greenhouse in a practical location, away from the library, with plants irrigated by direct rainfall and filtered water from the gray-water cistern. We suggest varied installation of tree-enveloping benches made of recycled material, a gazebo made of recycled metals to minimize sun exposure and bring traffic to the park, a multi-purpose sports field to deter young constituents away from criminal activity, and four-step recycling receptacles by existing landfill garbage receptacles. Two groups also recommend altering existing bleachers surrounding the baseball fields into safer and streamlined aluminum, and utilizing the bleachers for an outside theater for the community. Lastly, one group proposes installing a street sign over Plaza Blvd., with a smart crosswalk underneath the sign for pedestrian safety and traffic control, to augment pedestrian access and build community character.

**New Structures and Sustainable Systems**

To address concerns about organic waste, we propose a compost “cycle of sustainability” that establishes an interactive animal farm as an educational tool and manure producer, demarcates a dog park off of A Ave. in between the library and children’s playground for manure collection, and installs compost bins landscaped around the park for mulch, manure and other compost material. The collected compost could then be used as self-sustaining fertilizer for the community garden.

As initiatives to encourage greater physical activity in the community, we propose an outdoor parcource or calisthenics workout station, with ADA-compliant ramps. Extended from the parcource would be a running area and a separate gravel trail that outlines the perimeter of the entire park to accommodate cyclists and walkers and provides route-accessible areas for people with disabilities. Additionally, we recommend constructing ADA-compliant swings in the children’s playground, and replacing traditional see-saw playground equipment with a pulley-connected see-saw used to pump water from the underground gray-water cistern.
To encourage sustainable transportation in the community and greater community connection to the park, we recommend carving a bicycle route and constructing auxiliary racks. One group in particular proposes a bike path and rentals program modeled off of New York City’s Citi Bike system (Figure 17), wherein bikes are available 24 hours per day every day and stations are located based on population/transit needs and selected through a participatory public input process. Each station has a touchscreen kiosk, a map of the service area and a docking system. Wooden arches, fences made of recycled material with espaliered trees, and sustainable plants could be installed along the bike path.

![New York City’s Citi Bike system, recommended for Zone D.](http://www.nycbikemaps.com/spokes/citi-bike-nyc-bike-share-finally-ready-to-launch/)

*Figure 17  New York City’s Citi Bike system, recommended for Zone D.*

Assisting water collection, the city could install a cloud harvester (Figure 18) to catch and condense fog into water droplets, which run down a stainless steel mesh into a gutter-type extrusion leading to a water storage container. The efficient and inexpensive fog/dew collection system would be used for irrigation of the park’s community garden, vegetation, and green-roof. The harvester is a notable advancement in water collection efficiency and is ideally suited for poor, coastal regions with little to no freshwater.

Figure 18  Cloud harvester

(Retrieved: https://www.behance.net/gallery/Cloud-Harvester/9025321)
With the intention of recycling water innovatively and engaging children in the process, several groups proposed developing a “splash pad” water playground that utilizes little to no standing water (Figure 19). The splash pad filtrates water through a UV light and a chlorinator, and then re-circulates it into the emission systems. To efficiently and economically operate the playground, the group recommends installing stainless steel within the splash pad in addition to utilizing nearby solar panels.

![Figure 19](http://www.cityofbartlesville.org/page.php?page=1093)
The council could alternatively or additionally construct a musical playground or “free-note harmony park” with a pervious floor (Figure 20).

Figure 20  Free-Note Harmony Park for Zone D. (Retrieved from http://www.nspx3.com/our-products/site-amenities/)

Community Engagement

To provide educational and community development opportunities for constituents, the civic center could organize community projects of interpretive signage and creek-themed art, and various art projects sustained through the ARTS program. Suggested projects include art walls and a wall of tiles in front of the ARTS center to invite community engagement for collaborative story telling and to decriminalize art around the park.
Zone E

Water Collection and Provision

Consistent with water collection proposals in Zone D, we recommend for Zone E an underground cistern of gray-water reclaimed from park facilities and neighboring apartment buildings located underneath the amphitheater and abutting D Ave. The cistern would be fastened to a filtration system that will sift unusable waste to an outside processing facility, and then would be processed as soon as it was generated to minimize standing time. The gray-water must be used quickly; otherwise it can spoil nesting too long in storage. As such, the system would transmit needed irrigation water twice a day to drought-tolerant plants throughout the park, to the community garden, and to the park’s bathroom toilets. For security, ball valves should be placed at specific choke points in case of pipe damage. Collected from sinks, showers and laundry machines in proximate apartments and auxiliaries, the processed water could be pumped by solar power and hand-pumps uphill to the main garden for high-use water plants.

Due to the high salt content in the gray water, plants would need to be irrigated by a mix of diluted gray-water and runoff water. Gray-water is a safe and beneficial source of irrigation water. If released into rivers, lakes or estuaries, the nutrients become pollutants; however, to plants gray-water nutrients are a valuable fertilizer. Without touching the edible parts of the plants, gray-water can be used directly on vegetables. Aside from the obvious benefit of saving water, reusing gray-water keeps it out of the sewer or septic system thereby reducing the chance that it will pollute local water bodies. As a point of reference, the Santa Monica Public Library in Santa Monica, California, has employed a successful gray-water recycling system.

Regarding storm-water runoff, flooding, and drainage that are especially likely at low points, we recommend a modular, underground rainwater-harvesting cistern for water reuse, separated from the gray-water cistern due to mineral and contaminant differences. Rainwater accumulates at sunken areas of the park and creates puddles, and therefore would need to be directed into the cistern using catch basins and grates. For greatest productivity, we suggest locating the cistern at the lowest point in the park, underneath the large baseball field. The collection and filtration process would work as follows: the street runoff that typically flows into the storm drain inlets and street sewers would divert into a vault spun through a vortex filter to separate fine debris, and then run through a basic filter to remove oil and waste. To ensure maximum filtration, the harvested water should be extracted from the cleanest part of the cistern, just below the surface of the water, situating a floating filter and utilizing a pump.

Continuing with the water collection process, we recommend constructing a water channel that protrudes from Paradise Creek into the runoff cistern, and a natural filtration system of rocks, gravel and sand to clean the runoff water from the channel and Paradise Creek’s fragmented riverbed. Overflow of the channel and Paradise Creek could stream into a succulent garden through a newly constructed porous riverbed.
After the filtration process, the water would flow to a recharge station for redistribution. Retrieved from the cistern through a re-routed underground pumping system and a drip irrigation system, the recharge station would water the park’s vegetation, operate mechanical systems, and serve other non-potable uses on which potable water is wasted. To sustainably water groundcover, we highly recommend replacing the profligate sprinkler system with drip irrigation, which uses on average 30-50% less water while discouraging weed growth. The underground pumping system could be powered by solar panels placed atop the amphitheater and restroom facilities. Regarding rainwater accumulated atop buildings, we suggest placing several rain catch tanks near the side of each building facility and applying rain gutter systems to the solar panel shades above the parking lot. This water would be dispensed at a later time for irrigation of the community garden via drip irrigation, and as a result would require no extensive pump or electrical system. We also recommend constructing a drip-edge structure on top of the amphitheater solar panels to capture runoff and preclude waste by dripping into plant boxes.

Alternative to separate cisterns, some students propose employing a water collection system of gray-water from park lavatories and sinks, and rainwater from rooftop and solar panel runoff. With rainwater collected through an underground pipe system, a single processing system would filter both the gray-water and rainwater sources to a water quality standard suitable for irrigation.

To divert water away from the cement ditches and into park soil, we recommend installing rain gardens and bio-swales where the storm drainage ditch currently situates. The bio-swale, a landscape filtration system designed to absorb water runoff and purify water intake, can be made naturally or mechanically. It enables soil absorption of rainwater, recharges the soil, and thus adequately irrigates plants. A bio-swale is cheaper than a storm drainage system, requires negligible space, and can work alongside a sidewalk or road. Furthermore, installing rain gardens where the drainage ditch is located would decrease the degree of runoff water wasted, reduce flooding and stream erosion, minimize water pollution, and support summer stream flows.

Expanding on rainwater diversion from street and park cement, we aim to totally prevent water wasted on the cement. We propose replacing asphalted sidewalks with pervious pavement to prevent runoff and enable water percolation for ground-soil recharge. The pathways, installed with ADA-compliant ramps, could be connected to existing pathways for greater accessibility for individuals with limited mobility.

During downpours, water falls from the roof through a series of gutters to the planters in front of the library. The planters are barren and level with the concrete sidewalk bordering them, preventing the water from remaining in the soil. To solve this, we suggest a gutter system made of recycled materials placed on the outside library wall, and raised planters to capture water from drain outlets outside the library.
Further ideas we developed to maximize water recycling include: 1) permeable street pavement to filter the rainwater runoff before it infiltrates the water table; 2) a pump-and-play as a potential way to pump the water from the underground cistern(s); 3) pump stations under the skate-park and parking lot behind City Hall to collect, store and pump rainwater; and 4) water fountains that drain recycled gray-water into the proposed garden and park vegetation.

Residential Incentives for Water Conservation Efforts
To incentivize local residents to conserve water on the same level as the park, the city and state could coordinate to promote rebates, tax credits and grants for local residents and businesses to implement solar power, rainwater catchers, drought-tolerant yards, home insulation and other efficient conservation initiatives. The subsidization of rain-catchment systems, particularly for the homes located on A Ave., and use of the water to irrigate the gardens in front of the residents’ homes could ensure a permanent water conservation partnership between residents and the city. Residents who live near Kimball Park could also receive free utilities if they allow the city to connect auxiliary park utilities to their homes. Free utilities in exchange for the city’s use of the residents’ water could adequately irrigate the southeast park area near 16th St. and C Ave.

Vegetation
As suggested for the other zones, the cultivation of a community garden will produce several regenerative and social advancements to the park. Accordingly, we propose a community garden of drought-tolerant, organic and native plants, optimally located on the vegetative landscape across from the amphitheater, extending to the southern hill of the community center. Alternatively, the garden could occupy the unused, bare lot on A Ave. The garden would be irrigated by water from the gray-water cistern, the rainwater cistern, and a garden well. A well could serve as a low-cost, untapped source of natural, fresh water to irrigate the garden and balance the mineral content and contaminants of the gray-water. Manual hand-pumps would power the well, and hosing would route the well water to necessary locations. To maximize water conservation, we recommend placing porous sidewalks in a formation mimicking a river throughout the garden to seep runoff water into the soil. Suggested plants for the garden include strawberry trees, oregano, garlic chives, bronze fennel, sage, goji berry, sugar bush, jujube trees, Kei apple shrubs, jelly palms, cherry trees, pomegranate trees, fig trees, persimmon trees, lemon tree, and pineapple guava trees.

To make use of the fallow land across the creek, we suggest planting a succulent garden with drought-tolerant plants, such as the dragon egg and dragon fruit, irrigated by the gray-water cistern. A succulent garden of edible vegetation requires no additional irrigation other than during fruiting season, which can derive from the rainwater cistern. To mitigate erosion and surface runoff, we recommend terracing the garden and placing the more water-demanding plants at the bottom of the slope. The garden could extend to the southeast hectare adjacent to 16th St., an undeveloped land prone to fires from dis-
carded cigarettes and other human-causes. We recommend the arrangement of a volunteer program to cultivate both the succulent and community gardens, wherein volunteers are rewarded with produce.

Many students proposed constructing fences, such as chain-link fences, to enclose the gardens. However, the question to contend is: will the fencing look forbidding? In other words, will fencing be necessary or will it contribute to a “security state” feeling that could encourage vandalism? Alternative to fences, perhaps a moat with a living machine (wetland plants that filter the water) or a low childproof wall could provide the necessary security for the garden.

We recommend an assortment of vegetation, primarily tall shading trees, to be planted across the park’s landscape and irrigated by the rainwater and gray-water cisterns. Suggested trees, native and drought-tolerant, include the California bay, coast live oak, big leaf maple, and the Torrey pine. Recommended flora include the South African golden sage, Chihuahua sage, California lilac, fried egg flower, black-eyed susan, and miniature hollyhock. On the sloping hillsides, we suggest planting thickets and drought-tolerant plants to prevent soil erosion. For both the community garden and park-landscaped vegetation, signage of plants parlaying their ecological significance and sustainability will educate park-goers and promote a culture of sustainability.

To introduce vegetation to the park through innovative structures, we propose developing edible pathways along the sides of the park walkways that provide free organic food to visitors, promote higher traffic, and encourage sports activity for people walking in the park. The pathway would manifest in the formation of raised plant beds made of recycled material. Similar initiatives include a plant trail of drought-tolerant, low-maintenance plants; a vine fence around the baseball field generated by drip irrigation; replacement of the cemented bed of Paradise Creek with a rain garden; and green roofs of low-maintenance plants to conserve building energy, filter pollutants, improve air quality, and collect rainwater. Recommended vegetation for these initiatives include the brittlebush, white sage, germander, and narrow leaf milkweed.

Last, we recommend installing a living wall (plant-embellished wall) hoisted upon the library walls and other public auxiliaries, utilizing wire meshing and variant drought-tolerant plant species. A living wall will dampen noise pollution, cut energy bills by cooling the building, and absorb and filter storm-water.
Community Zoo and Compost System

Unique to Zone E’s flat landscape, we propose developing a petting zoo of tame farm animals next to the community center, adjacent to A Ave. Manure production would be used for garden fertilization, the animals would naturally trim the grass, and garden produce could be used to feed the animals. Most importantly, the zoo would serve as an educational mechanism to introduce children to animals. Furthermore, petting zoo keepers could host educational seminars for all park constituents.

Advocating sustainable processes of regeneration and resource recycling, we strongly advise a compost system—a sustainable process of combining brown manure (high in carbon) and green compost (high in nitrogen) to produce the optimum fertilizer—located on the slope behind the Community Center. The compost pile would be supplied by grass clippings, garden waste, manure from zoo animals, dog waste from strategically placed receptacles around the park, human manure from composting toilets placed into warm bins to kill bacteria, food scraps from apartment buildings and a proposed soup kitchen, and community compost donations. Improving soil quality, the compost pile would serve as garden and landscape fertilizer, a sustainable waste destination, and an educational tool for a sustainable waste system. The compost staff could educate locals in domestic composting and fertilizing techniques through formal and informal classes.

Infrastructural Renovation

Accompanying the park’s regeneration are numerous restructuring proposals, the foremost of which is to revamp the inefficient and unhygienic restroom facilities by: 1) installing composting toilets and low-flush urinals, whereby the liquids would flow into the gray-water cistern as the solids from the composting toilets transport to compost bins; 2) constructing automatic hand-dryers operated by solar panels positioned atop the bathroom roofs; 3) reconstructing the roofs for sky lighting during daylight hours and solar lighting at night. (Note: Regardless of innovation, the bathroom composting system must ensure the prevention of fecal bacteria entering the gray-water).

To cater to the widely practiced sports in the park, we recommend revitalizations of the baseball fields, basketball courts, and skate-park. We recommend renovation of the basketball court with resilient and non-chemical flex-court sport tiles. Flex court sports surfaces are resistant to bacteria and mildew, and thus avoid collection of significant allergens and contagions. Following decades of use, the court’s materials can easily recycle into other goods, reducing the ecological footprint. Through applied research, we discovered that the poor conditions of the skate-park promote unsafe skating, attract vandalism and detract visitors. As elemental improvements, we strongly recommend repaving the skate-park pavement. As a more ambitious renovation, we propose replacing the sheet metal skate-park surface with a newly constructed surface made of 100% recycled concrete with a combination of skate-blend, a material made entirely from clean and unprocessed industrial plastic scrap. Additionally, skate-blend comprises “zero heat history”, in which its molecular structure produces an enduring and maintenance-free
skate-park unaffected by rain. To assist in rainwater conservation, a grated trench that runs along the borders of the skate park and basketball court could be dug as a canal for runoff water to flow into for collection and reuse. Some students further recommend an exchange program wherein the library could provide spray paint for constituent use on the skate-park in exchange for book rentals. Concerning the baseball field, we suggest installing artificial turf in place of water-thirsty grass, as the turf permeability will enable water collection.

Addressing the park’s insufficient shade and rest areas, we recommend constructing circular wooden benches around trees in addition to regular benches made of recycled material dispersed throughout the park. Regarding the infrastructure of Paradise Creek, we suggest cleaning up and restoring the creek of all debris for rainwater to durably drift.

**Lighting**

Critical to improving park safety and energy conservation is the park’s induction of sustainable lighting that yields additional uses. The park’s topography renders solar panels optimal energy-producing instruments that could perhaps be paid for with an SDG&E and/or California State Energy Conservation grant. Our recommendation is to install a solar panel lighting system throughout the park to power the pumps for the cisterns, reduce electricity costs, and minimize the city’s carbon footprint. We propose solar panels installed above the amphitheater for shading, with a drip-edge runoff system bordering the panels to capture rain into planter boxes underneath; solar panels atop the bathrooms to supply cistern pumps and bathroom energy; solar panels built over the current skate-park and basketball court that have downspout systems attached; and solar panels constructed atop the library, Community Center, City Hall, and fire and police stations to reduce each respective building’s utilities cost. The panels would be angled southward and have rain-catch systems to divert water collected into the rainwater cistern. Furthermore, we recommend the installation of solar canopies—containing drip-edge panels—atop the parking lot landscapes of City Hall and the Community Center and solar LED lights to illuminate the baseball fields.

Applicable to all of the zones, our landscape lighting initiatives for Zone E include construction pathway structures of solar tiles transected with grass patches (akin to grasscrete) to light walkways; installation of water turbine solar lights, for which water drains to the lighting structure and a water turbine produces street-light energy; and overall, installation of LED lighting throughout the park to cut energy consumption and improve park safety.

**New Structures and Sustainable Systems**

The students who developed proposals for this zone concocted inventive and ambitious physical structures and sustainable systems to meet their comprehensive goal of transforming Kimball Park into a model of sustainability. The first of the structures is a multipurpose field in the open space facing the amphitheater to pay tribute to the
sports-active park constituents and increase the total constituency ambit. Second is an outdoor circuit-training course that includes exercise machines that generate electricity while in use and stations fabricated with rustproof metals to promote physical activity to park-goers. Third, and an extension to solar initiatives in current parking lot locations, is a multistory, dual-usage parking garage with a solar shade structure on the top floor. The parking structure would replace the impervious parking lots that create runoff pollution when it rains, halt heat island effects of parking lots, and keep vehicles cooler. Also proposed (location to be determined) is a solar panel canopied picnic and barbeque quarter, designed with a drip-edge system into troughed planter boxes and a community wood-fired oven made of sustainably produced clay. One student group also proposes a time-demarcating sundial made of rocks, shrubs, drought-resistant flowers and medicinal herbs to irrigate minimally at night with downward-facing sprinklers.

A proposed water playground to innovatively aid in water conservation goals, would be fit with a non-slip surface and various nozzles and features that can emit shower, spray, and mist water. Water on the surface would be collected, filtered, sanitized and recirculated, and the system would be kept clean by a chlorinator and UV light sanitizer, as proposed for the splash pads for Zone D.

Evidenced by the compost system, educational initiatives, and community engagement programs, we established numerous variations of sustainable systems rooted in both environmental and social justice. Predicated upon both is a community recycling center near the end of E. 15th St. by the skate-park to provide a source of revenue for the homeless, encourage cleanliness of the park, and create a source of revenue for the community as a whole. Near the center, we propose placing canopied picnic tables for visitors. The recycling center is critical to the city’s aversion of gentrification by supporting vagrants instead of displacing them to the city boundaries. As such, the city would generate subsistence for homeless people dwelling in the area.

Community Engagement

Intending to cultivate community engagement and character, we contrived a number of programs for the city to consider. To foster community building and provide children with creative outlets, we propose no-cost art installation projects with locals working collectively and utilizing recycled materials. These projects could include developing recycled benches, bench painting, a wall mural designed to curb graffiti obstruction or other initiatives spearheaded by the ARTS Center. Moreover, the ARTS students could help design and build rainwater capture systems embedded in their park art projects. Organized by the city, arts, music and cultural events could be held in the amphitheater to build community camaraderie and inform the public of civic concerns. The city could also arrange a weekly farmer’s market to promote local businesses and sell produce generated by the park’s petting zoo and garden. The Community Center could facilitate garden, compost, animal and sustainability classes to educate constituents and attract tourism. Extending from the Community Center, a soup kitchen could provide community aid and building, as its waste would contribute to the compost pile and volunteers—namely, the park’s
homeless—could be awarded tickets to the kitchen. The Community Center could also nestle an entrepreneurial table for local entrepreneurs to showcase ideas, for children to sell promotional goods, and to generally attract more people to the park.

Supplementing the library-skate-park exchange system, the library could issue free sport equipment rentals for books and could locate a free-of-charge book exchange kiosk made of recycled material. Mirroring the international houses at Balboa Park, the National City Public Library could construct educational plaques or other exhibits displaying information on a certain country’s environmental conditions and sustainability efforts. Lastly, National City could designate a park area for family camping and youth educational experiences; the city could utilize revenue from the minimal fees charged for campground maintenance. The campground could include a shower area accessible only to individuals staying at the campground.

Security

Through actively investigating the park’s landscape and speaking to park constituents, we determined that improved lighting would directly increase park safety and that living walls or other plant-wall structures will discourage unwarranted graffiti. Park security, however, requires additional city protection. We propose to implement a simple camera system on the park structures and nearby buildings, namely the public restroom exterior, library exterior, vehicle repair shops on the south side of the library, near the skate-park and by the amphitheater. The camera system could substitute more costly security cameras with “dummy cameras” for equal effect. Ancillary installation could include call boxes to local police with sirens, similar to university system alarms. These initiatives will mitigate insecurity and criminality caused by gang presence and scarce lighting.
Conclusion

This report compiles thirteen group projects from the 2013 fall semester and twenty-six group projects from the 2014 spring semester generated within the Sage Project-partnered SDSU course, ISCOR 310 Our Global Future. As stated, the goal of the course project was to reduce storm-water management costs and runoff, redevelop the park’s irrigation system, and turn Kimball Park into a shady and food-producing park that is watered mostly by rainwater and that is drought-tolerant, low-maintenance, contributive to material security, and a center for community building. These projects provide progressive and unique ideas to address National City’s water collection, conservation and restoration needs. The proposals suggest ways to improve the park’s landscape and to generate a sustainable, self-maintained, and regenerative park. All projects focused on the elements of water collection and provision, restorative vegetation, sustainable systems, infrastructural redevelopment, and community building and engagement.

The overall water collection and restoration plan points towards a necessity for a basin or cistern. Of all the proposals presented, the gray-water conversion and rainwater recycling systems are the most efficient and produce the highest return on investment, despite a considerable initial investment. The overall park soil and vegetation regeneration initiative features an expansion of plants throughout the park that are all drought-tolerant, nitrogen-fixing, resilient, require infrequent watering and little to no maintenance, and produce medicinal, nutrient or bio-diverse utility. Just as critical to the park’s regeneration is the cultivation of a community garden that would increase a sense of community ownership and stewardship, bring people together, serve as a focal point for community organizing, heighten people’s awareness and appreciation for nature, filter rainwater, restore oxygen into the air, and recycle huge volumes of organic wastes back into the soil. All in all, the students integrated sustainable systems, structures and practices into their infrastructural and energy renovation proposals. The community already uses Kimball Park for many activities, but these initiatives will provide expanded enjoyment and utility, and moreover, will serve as an educational resource for the community about sustainability and our global future.

The individual projects are not intended as comprehensive implementation plans; rather, the most sustainable, revolutionary and viable aspects within each proposal from the five zones should preferably be considered for application. Zone E noticeably contains the most sophisticated and greatest number of proposals, many of which extend beyond its perimeters to the entire park. The major concerns, improvements, and recommendations across zones are addressed through the over-arching themes discussed above that underscore the most important and compelling ideas from the proposals. As a whole, the initiatives increase property value and provide long-term net savings.

The ultimate aim of the project is to transform Kimball Park into a model sustainable community park. Self-maintaining, resourceful, recycling, and ultimately regenerative, a sustainable community serves as a microcosm of a sustainable planet in which human
beings symbiotically live with the earth and the earth flourishes. Transforming the park into a sustainable community will not only provide incredible recreational and material resources for the community, but also render education—an integral component to the park’s sustainability—on sustainability as a requisite to any global future. Through the development of a sustainable community, National City could become a groundbreaking progenitor with which to educate the rest of the world, and could serve to enhance the quality of life of National City residents.

This report most appropriately concludes with the archetype sustainable community that inspired and revolutionized the mindsets and optimism of ISCOR 310 Our Global Future students: Gaviotas. Gaviotas is a designed ecosystem in the forests of Colombia that re-integrated human and planetary systems, created a community built upon fundamental ecological conservatism and the decency of village life in a technical context, and reconciled energy production with feeding human beings and restoring biodiversity. In his 2008 book, Gaviotas: A village to reinvent the world by Alan Weisman, one of Gaviotas’ founders discusses the significance of Gaviotas, which brilliantly encapsulates the planetary impacts of sustainable communities and the subtext of the Sage Project:

“Paolo sighed. ‘You know,’ he said, ‘I’ve never wanted Gaviotas to be some kind of eco-doll house, or pilot project, or some toy for NGOs. I want it to show the world how to fortify an ecosystem. People would be planting, not exhuming energy. They’d be restoring the planet’s living skin…’

Was he dreaming? Could we really have our engines and our world, too?

‘We have to keep dreaming,’ Paolo answered. ‘If you’re not dreaming, then you’re asleep. The real crisis isn’t a lack of resources: It’s a lack of imagination.’” (239)