# Abstract

The urban landscape leaves clues about the society in which it was built and modified. The needs and aspirations of a community can be read in the built environment long after those priorities have shifted. In evaluating the program for a new landscape, not only the past and current desires, but the future we imagine should inform our vision. My conceptual design for lower Park boulevard in Oakland not only uses contemporary understanding of decentralized storm water treatment and complete streets, but imagines them in a city where our relationship to the automobile has radically shifted. Drawing from the natural hydrology and topology of the site, my project develops from a practical approach to storm water processing to a new vision of an experiential landscape that is unique to Oakland. Rather than confining itself to addressing only the the issues of today, this design engages with the potential city on the horizon.

# Dedication

To my family, who instilled in me a life-long love of the natural world.

To Mike Migurski, without whom I would not be here today.

# Acknowledgements

Thanks to the UC Davis Landscape Department, and especially my fellow students who supported, encouraged, and gave need criticism and helpful advice.

Christopher Grampp was my first landscape design teacher at Merritt College, and his skill and love of teaching helped me decide to pursue the design of green spaces.

Kevin Perry's studio on green streets gave me the tools I needed to imagine a more ecologically sound Park Boulevard.

Claire Napawan jumped in at the last minute to advise me.

Nicholas de Monchaux gave me copious and helpful design advice.

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# Preface

I became interested in Oakland's wide residential roads several years ago while bicycling with my boyfriend. "Why do you think this road is so wide?" he asked me one day as we pedaled along east 21st street. I hazarded a guess: "Streetcars." As soon as we got home, I began looking online for maps of Oakland's electric streetcar network, long dismantled. Finding a few maps of the Key Route System, I noticed the similarity to a watershed map, with several long lines cascading down through the hills to the alluvial flatlands around Lake Merritt. More investigation of the local hydrology revealed that many of Oakland's creeks were now culverted under roads. Not only did this show the typical urban development, indifferent to hydrologic systems, but it also showed the convergence of areas as collection and circulation networks. While driving to my classes at Merritt College in the Oakland Hills, I often drove up a nearby street. With four lanes and hardly any traffic, it was easy to speed without concern for the other infrequent users of the road, or the people that lived and worked on it. "Another overly wide street," I would think. "It should really be much narrower so people like me slow down!" This led to a project for my urban ecology class where I suggested that storm water retrofits could not only be part of traffic-calming, but help minimize surface pollutants into the lake. After a landscape studio on green streets at UC Davis, it occurred to me that now I had some tools for a conceptual re-imagining of this street.

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fig. 1: Park Boulevard, Oakland

# Background: the Site


fig 2,3 : more views of the street. Notice the flooded ramp in the bottom left photo.

facing page, fig 4: the former service station adjacent to F. M. Smith Recreation Center


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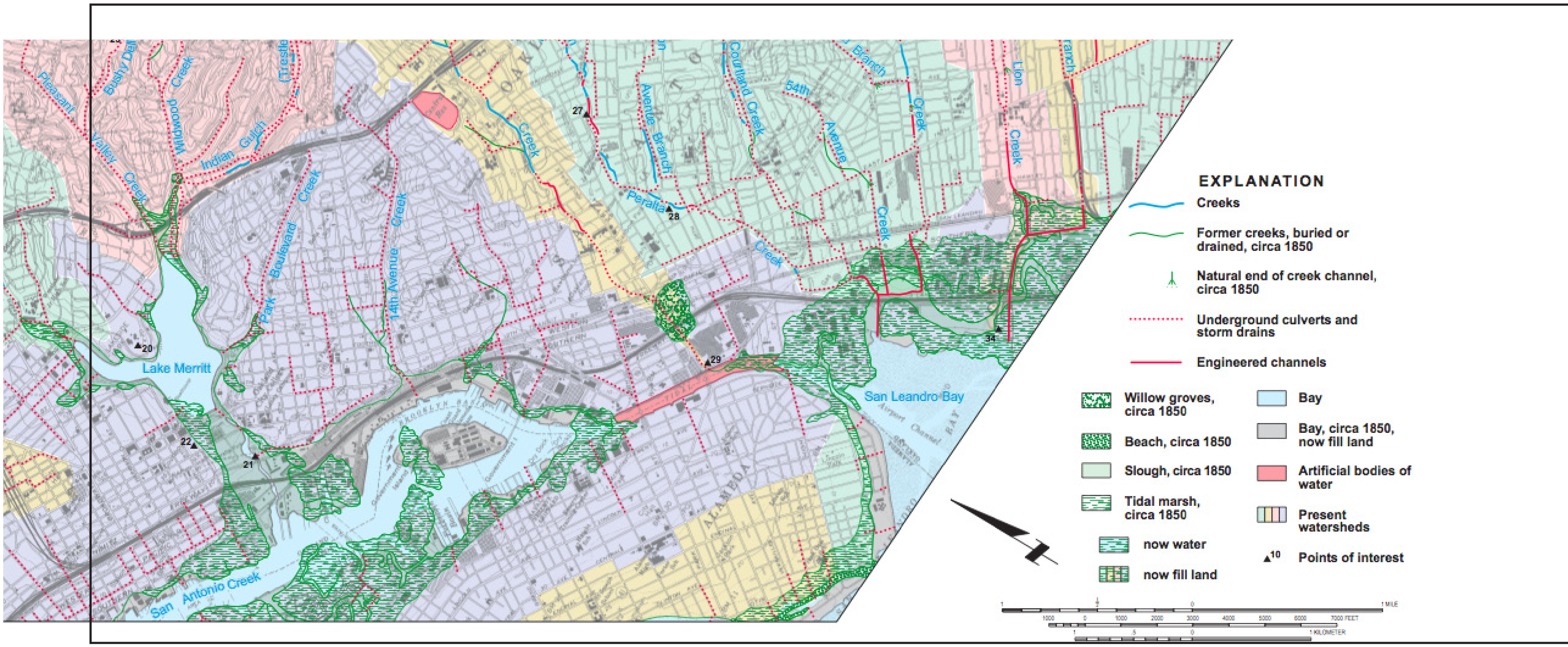
# The Water

Waterways are not only a resource, but have served as wayfinding and transportation elements. Flood plains along rivers were easy to travel and provided a source of water. Wild areas without roads could be traversed by boat.  A creek could be reliably counted on to lead down from the high places into more open lowlands. Settlements, towns and cities grow around places where water, rich soils, plants and animals collect. However, as is the pattern in many cities, Oakland's waterways have nearly all been culverted. Even before this occurred, Lake Merritt was used as a repository for sewage(McFerrin) as the town developed. In 1868 Samuel Merritt proposed a dam at the southern outlet to the estuary, it was to restrict tidal flows that caused a horrible stench at low tide. A sewer system was eventually built, and the City Beautiful Movement helped transform Lake Merritt into the attractive recreational park it is today(Walker 63). However, storm water collected on surface streets is still diverted into the lake, carrying with it trash and pollutants. Excess carbon, nitrogen and other toxic substances are washed into the lake, changing water quality and affecting aquatic life.

fig. 5: partial map of the Oakland-Berkeley watershed. Park Boulevard has a culverted creek below the roadway.

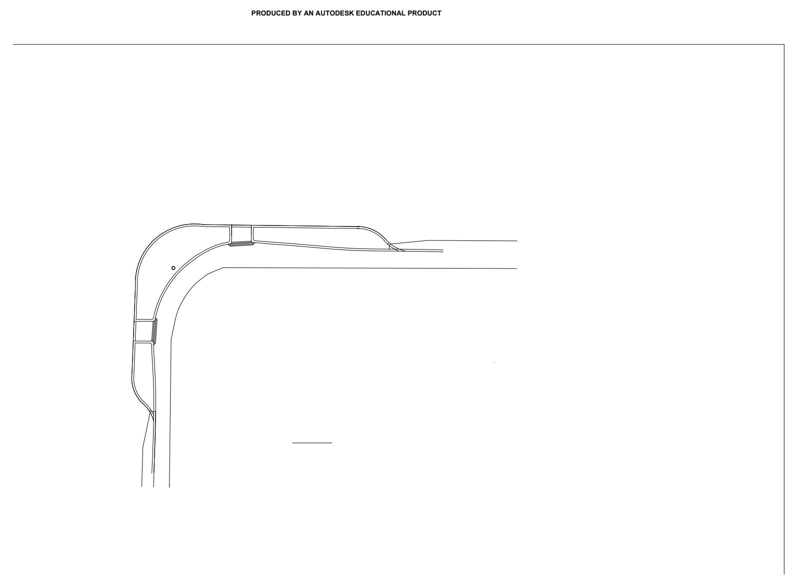


# the Street

The south end of Park boulevard in Oakland, California is a four-lane road lined with single and multi-family residential properties, retail establishments, a high school, and park. The topography of the project site is such that the boulevard slopes downward from 41 meters to nearly sea level, about 115 feet over 2.6 miles. It is bookended on either side by neighborhoods at even higher elevations, and below the roadway is an underground culvert known as Park Boulevard Creek. This culvert directs storm water collected from adjacent neighborhoods into nearby Lake Merritt, a tidal lagoon connected to the Oakland Estuary. Formerly an arm of the Key Route electric trolley system, Park boulevard's width makes for an uncomfortable and unsafe pedestrian experience. Park boulevard currently has no facilities for bicyclists, and has bus service throughout its length. It currently serves as a connection to Highway 580. Sidewalks are of varying width, and often in disrepair. Access ramps for wheelchairs are outdated or non-existent. Catch basins leading to the conventional storm water system are infrequent, and ineffective.

These photographs show the sorry state of drainage on Park Boulevard. fig. 6: a flooded access ramp, fig. 7: a previously flooded access ramp, now covered with debris. fig. 8 a catch basin covered with debris.

fig. 9: Example of a bulbout




# Sustainability

Cities have long used local water ways and bodies at part of their engineered storm and sewer water systems. Awareness of the problems with these often aging, generally environmentally unfriendly systems had led to new techniques for dealing with the polluted water collected on city streets. Pervious paving systems allow water to infiltrate soil directly, minimizing runoff. Green storm water systems utilize natural processes to collect, slow, and/or process pollutants in storm water.  These systems are considered "sustainable" for these reasons: their reliance on substrates, microorganisms, and plants for pollutant remediation and filtration; their slowing of water by natural or engineered topology; and their minimal maintenance and reduction of loads on conventional systems. Planted areas such as curb extensions, planters, and rain gardens collect surface water that would otherwise go directly into conventional storm water drains. The soil in the planted areas can allow for slow infiltration into groundwater, while soil microorganisms utilize nutrients in the runoff and purify the water. Plants help cycle water from soil into the atmosphere, and the heat island effect of large solar collection areas is mitigated. Because many urban areas have overly wide travel lanes and unused spaces along roadways, retrofits of some type are generally feasible in many places.

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"Small amounts of rain throughout a watershed incrementally add up to large volumes of water downstream. Similarly, small changes to storm water runoff treatment in a watershed can cumulatively result in significant improvements to overall watershed health.."

- San Mateo County Green Streets and Parking Lots Design Guidebook

# Preliminary Considerations

Green Retrofit Guidelines: For this project, I used guidelines for retrofit elements based on information from LDA 191 as taught by Kevin Perry in winter of 2012. For our major project in that class, a green street retrofit in Davis, California, we determined the following guidelines:

| | Davis Green Street project | Park blvd. Design |
|---|---|---|
| travel lanes w/o bus | 10'-0" | 10'-0" |
| Travel lanes w/ bus | 11'-0" | 11'-0" |
| bike lane | 5'-0" | 5'-0" |
| 2-lane bike path | N/A | 8'-0" |
| crosswalk | 10'-0" | 10'-0" |
| sidewalk | variable | 7'-0" minimum |
| parallel parking | 6'-0" | 7'-0" minimum |

fig. 10: table of guidelines

Low Impact Development Tools:
This project uses multiple tools to minimize surface water runoff and allow groundwater re-charge:

Permeable surfaces

Pervious concrete has a pore-filled matrix. Air and water can pass through, making this ideal for sidewalks with tree plantings.

Permeable paving set on an appropriate substrate allows water to pass between paving units.

Grass pavers, such as GrassCrete, are load bearing cast concrete systems that allow plants to grow in the voids and do not require curb edges.

Planted areas.

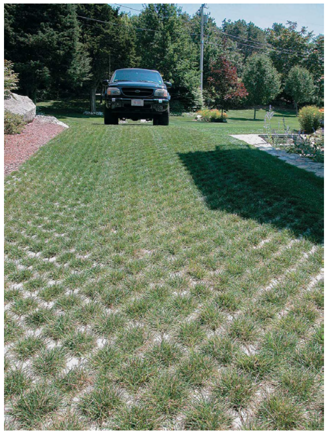
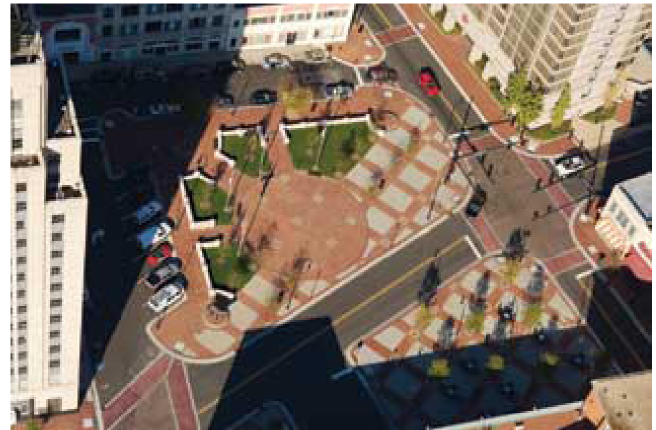


fig. 11: example of planted pavers. These can also be used with drought tolerant groundcovers.

# examples of pervious paving

fig. 12, top right: plaza in Durham, N.C.
fig. 13: multiple paving types with curb graded to street level
fig. 14: cut stone paving



Storm Water Bioremediation:

swales: long, narrow gardens that allow the directed flow of water while removing pollutants, reducing velocity, and processing of nutrients (pollution) via plants and microorganisms. Swales in this plan are no deeper than 6" below grade, and are flat on the bottom.

rain gardens: larger collection areas that allow for slow infiltration.
Rain gardens in this plan are no deeper than 8" below grade.

conventionally planted areas and street trees: plants cycle water from the ground to the atmosphere, cooling the environment on dry days.

grass pavers, such as Grasscrete: when the voids are planted with turf or groundcover.

Large storm systems: an "overflow" system that remains connected to the conventional storm water system takes up any excess water. Placed strategically at the end of swales, these overflow drains still allow for some reduction of water and pollutant load into Lake Merritt.

Rather than use curbs or other strong physical demarcation between "plant areas" and "people areas", I imagine soft edges that allow blending of one area into another. Sidewalks remain raised where water flow is to be directed, and are at grade in other places. Not only do minimal curbs allow for greater sheet flow across surfaces, they create an entire "park" out of Park boulevard as garden areas merge into human circulation and collection areas. The enhanced surface water system becomes part of a larger flow of human movement on the boulevard.

fig. 15: facing page: my design for a rain garden at Cesar Chavez Elementary School, Davis, CA.

# Approach

This project is a conceptual plan for a re-design of Park boulevard. Taking cues from the topography, I envision a design that adds significant green space in the form of sustainable storm water systems, tree plantings, and other amenities. A large part of the concept relies on an assumption about the future of automobile transportation: that high fuel prices, increased density, changes to employment systems and practices, and increased popularity of alternative transportation will have a significant impact on the number of automobiles on the road at any given time. Under current conditions the changes made in this project would require numerous traffic studies, signal studies, and the expectation that changes still allow for the same number of vehicles per day (if not on Park boulevard, then on other adjacent streets). Instead, this report imagines a city where individual automobile use has been radically decreased. The Association of Bay Area Governments predicts a population increase of 14 percent in Alameda County from 2000 to 2020(Summary). New ideas responding to increasing livability of urban spaces as they evolve have lately been contemplating changes to the urban environment that would have been unthinkable just a few years ago. Highway Removal is slowly gaining traction as urban areas seek to increase the mobility of people, availability of recreational activities, and reduction of pollution and heat island effects. In Seoul, South Korea the transformation of the Cheonggyecheon Expressway into a linear park with a daylighted stream led to a reduction of particulate pollution and reduced temperatures in the immediate area (preservenet).

fig. :16 Cheonggycheon Expressway, Seoul, Korea.
Before and after removal and park installation.

The Tom McCall Waterfront Park in Portland, Oregon was built after the removal of the Harbor Drive Expressway in the early 1970's. It now receives about 1.6 million visitors per year and is an example of a city catering recognizing the connection between those who live active urban lives and their acceptance of alternative modes of transportation.

The Olmsted Report, drawn up by John Charles Olmsted (son of Frederick Law Olmsted) proposed many greenways for Portland:

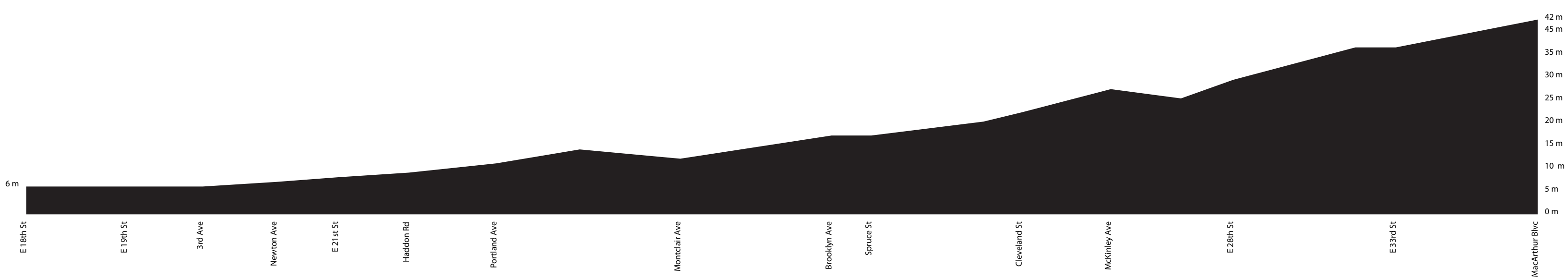
"All agree that parks not only add to the beauty of a city and to the pleasure or living in it, hut are exceedingly important factors in devil oping the healthfulness, morality, intelligence, and business prosperity of its residents. indeed it is not too much to say that a liberal provision of parks in a city is one of the surest manifestations of the intelligence, degree of civilization and pmgressiveness of is citizens." (Olmsted 1) fig. 17: 70 years after Olmsted extolled the virtues of public urban parks, Portland removed the Harbor Drive Expressway.

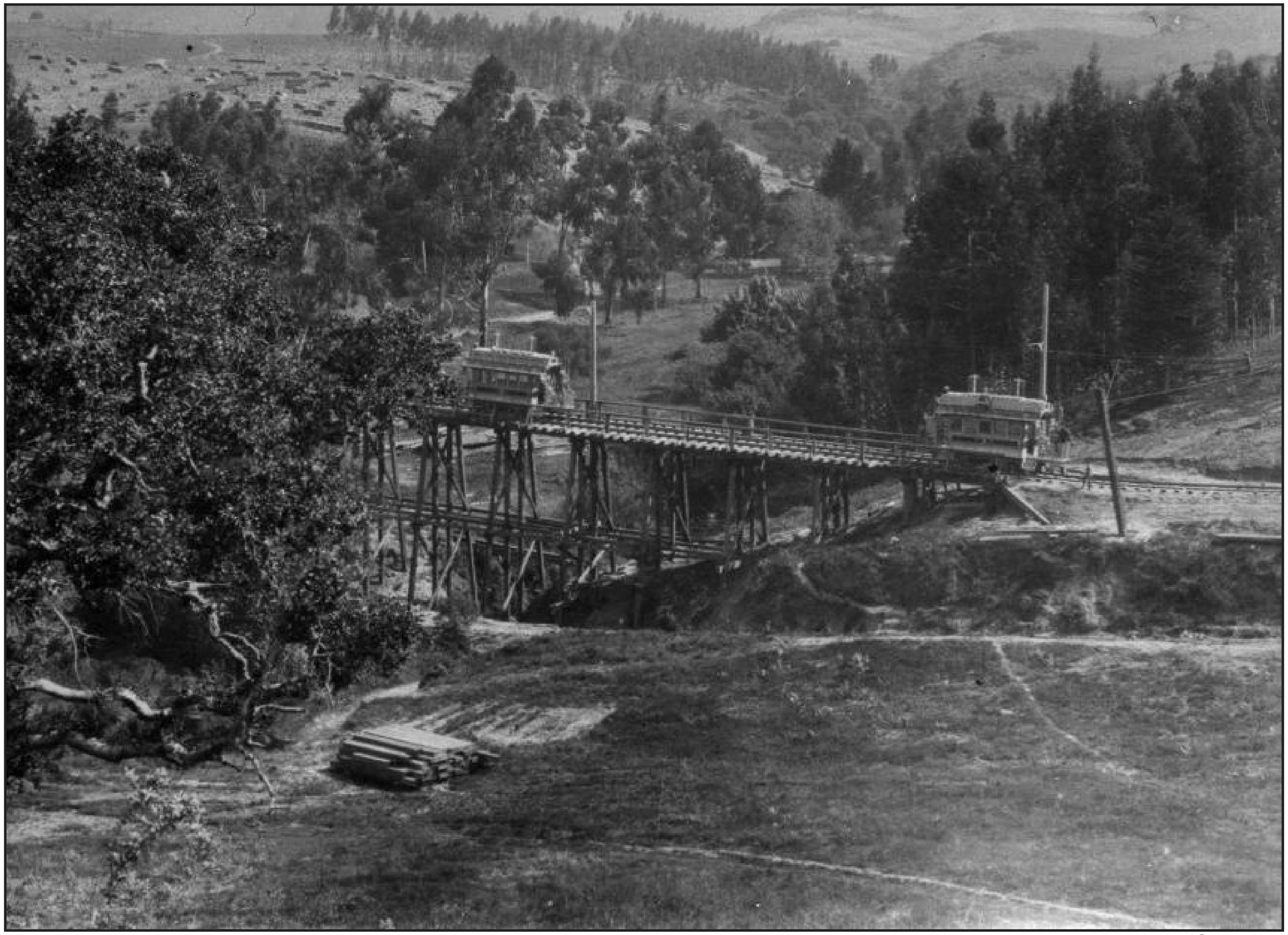
# Oakland

facing page: fig. 19: The historic Oakland landscape with electric streetcars, early 20th century. This site is a mile northwest of Park Boulevard.

It is reasonable to look to the historic and current landscape to create a design that will serve future generations with ever-transitioning demographics. Drawing on the natural topology of the street, I started from the image of a ravine to inform the function and aesthetics of the design. I divided the street into four sections: Source, Narrows, Islands, and Richness.

fig. 18 street profile of Park Boulevard in the ite extent. The street descends from over 40 meters on the northeast end, to nearly sea level. Vertical exageration is 4X.





# Site Conditions

site conditions

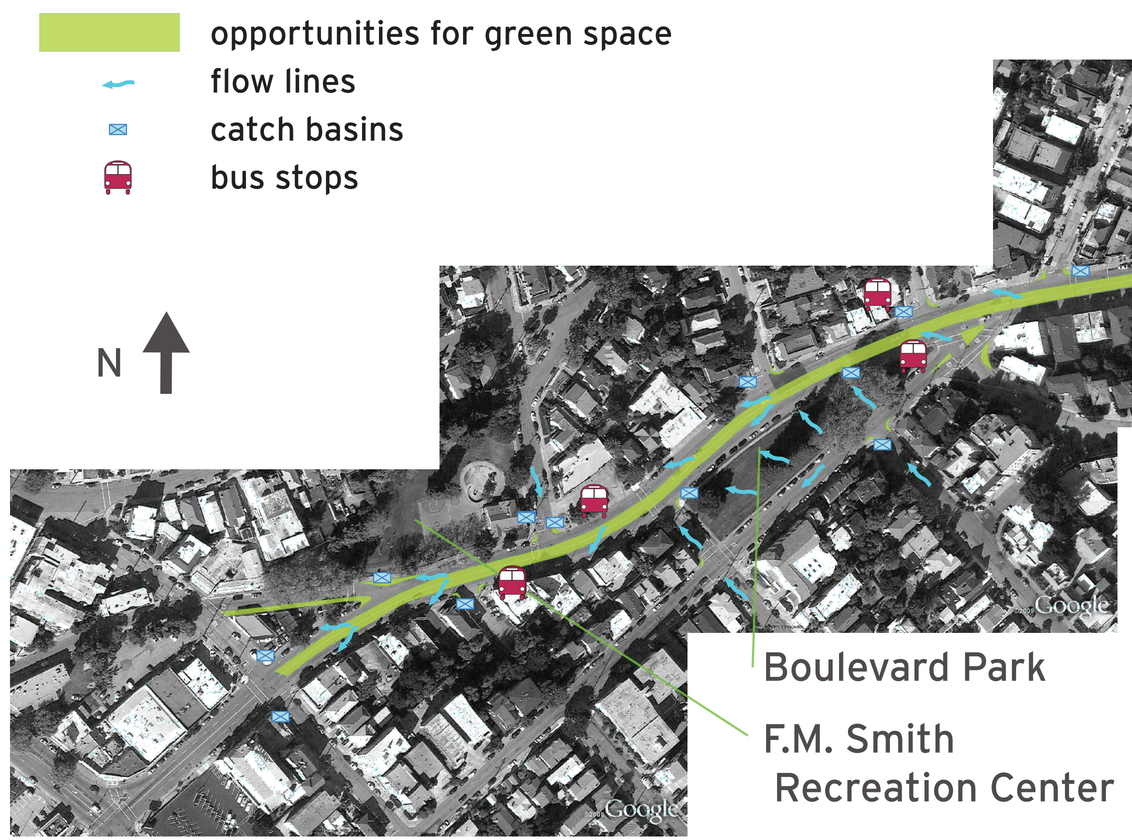
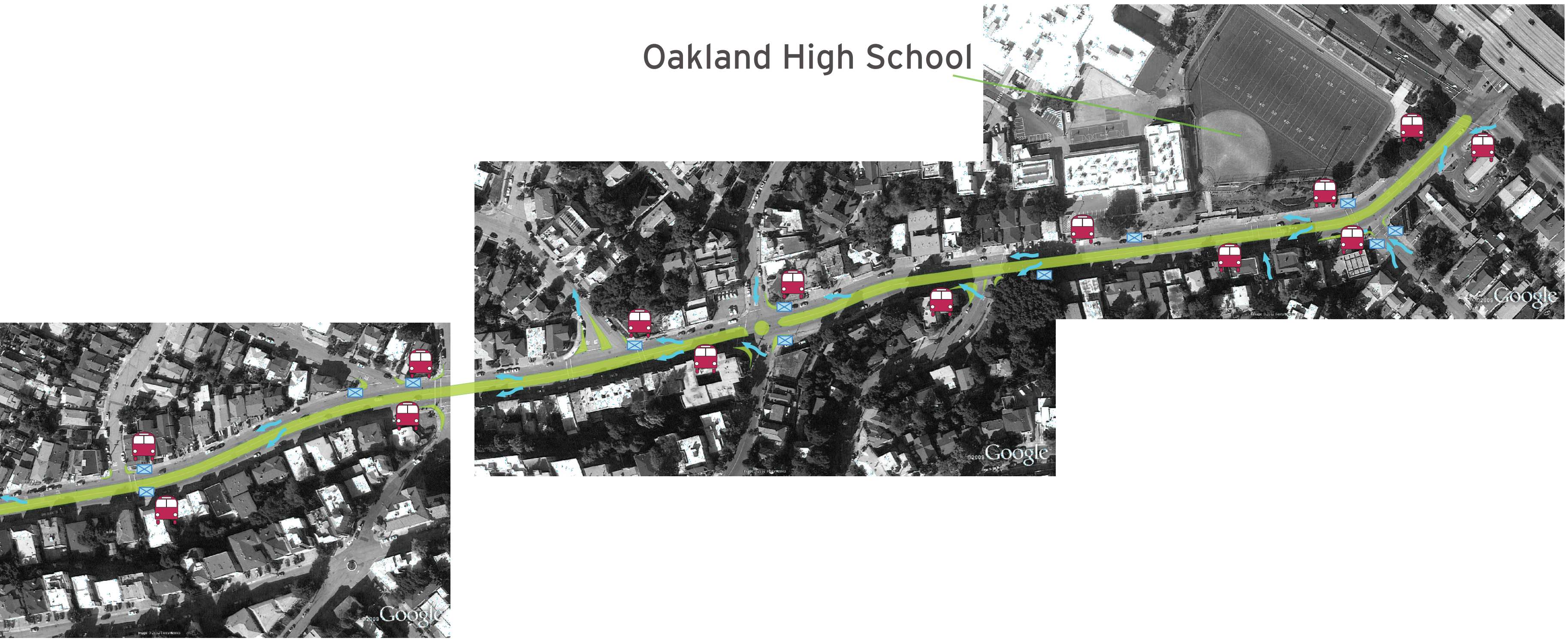


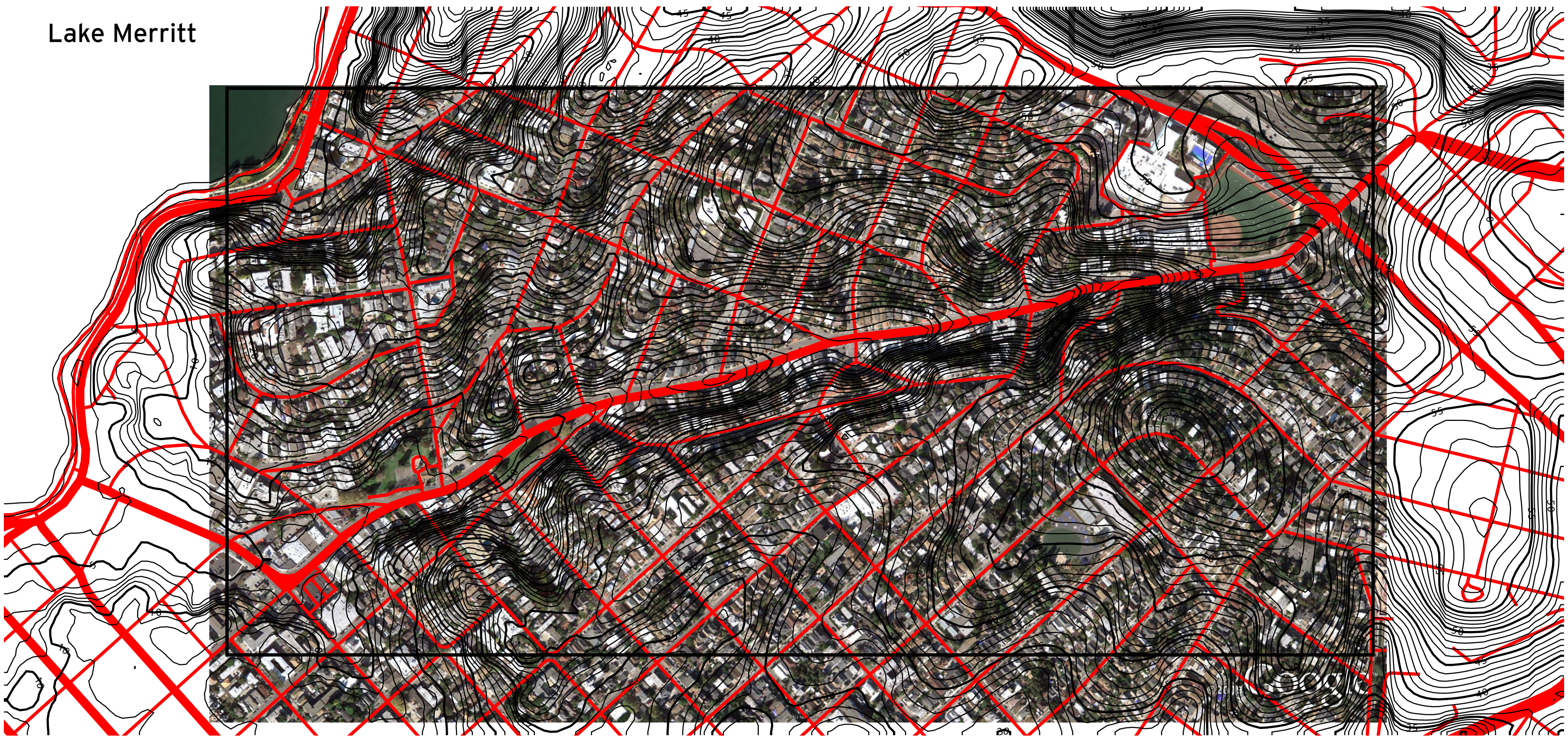

fig. 20: site conditions. There are very few catch basins, and many streets that run down to Park. The green areas are negative spaces where sustainable storwater might be an option.


Oakland High School

# context and topology

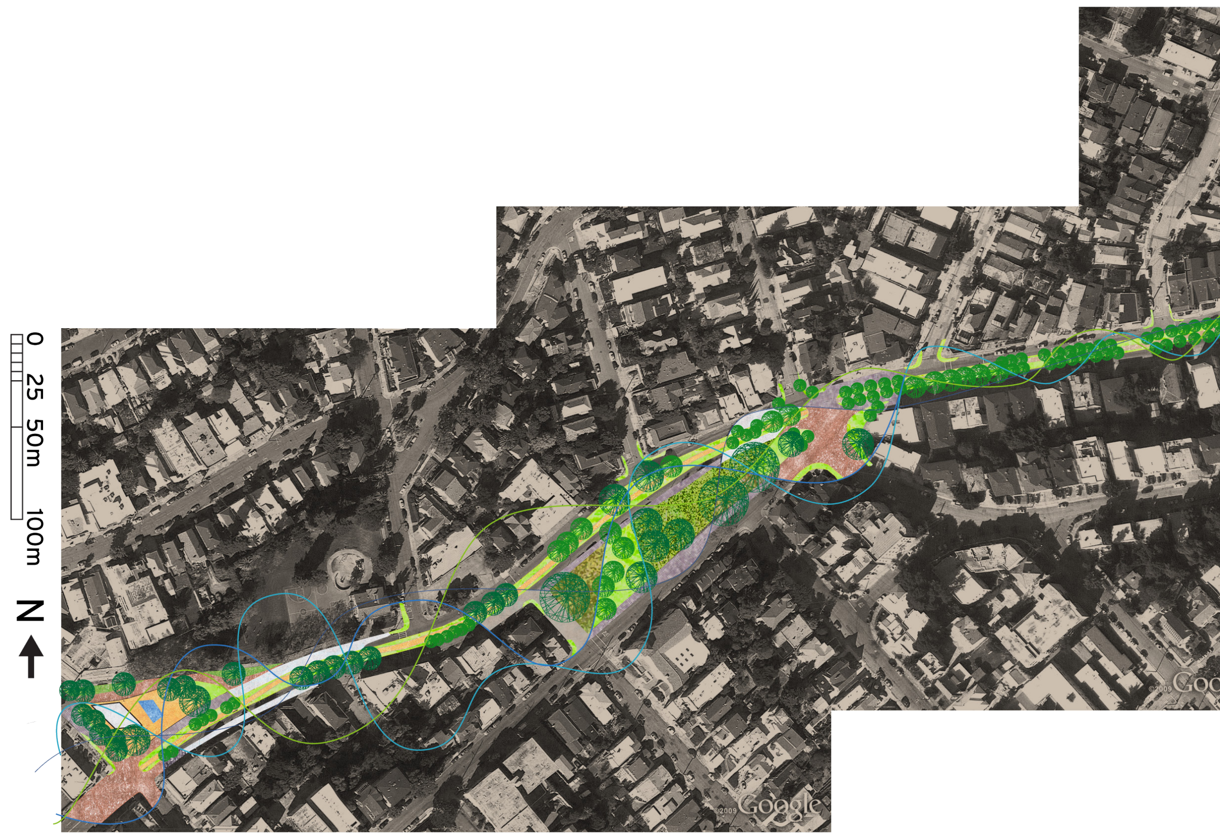

fig. 21: context map of the Bay Area. The site is to the east of Lake Merritt.

fig. 22: contour map of the site
and environs.



# Conceptual Plan

fig. 23: The plan takes shape from imaginary flow lines that are evident in paving patterns and plantings.



The Source is the highest point of the site.
 It is the beginning of the journey, the starting place, the origin, the point where underground water meets the surface, the font.

# Source

Oakland High School sits at the Source. The campus is elevated from the street, and the current entrance is on a side street; however, many students catch the bus on Park boulevard.Originally erected in 1928, the only piece of the original campus which remains is a grand staircase, now disused. I have repurposed the staircase into new landscape of terraced gardens with cor-ten steel retaining walls.

fig. 24: Oakland High School in 1929. It was oriented to face Park Boulevard. The stair-case in the photo on the facing page is the far stair in the photo.

fig. 25: students have decorated the staircase and retaining walls with murals. However, halfway up the stairs they are boarde up with plywood.

fig. 26: plan : SOURCE

For the block along the frontage of the school, the bike lanes are next to traffic lanes, with a dedicated signal that allows cyclists to cross to and from the center dual bike lane on the opposite side. Small storm water swales are on either side of the street.

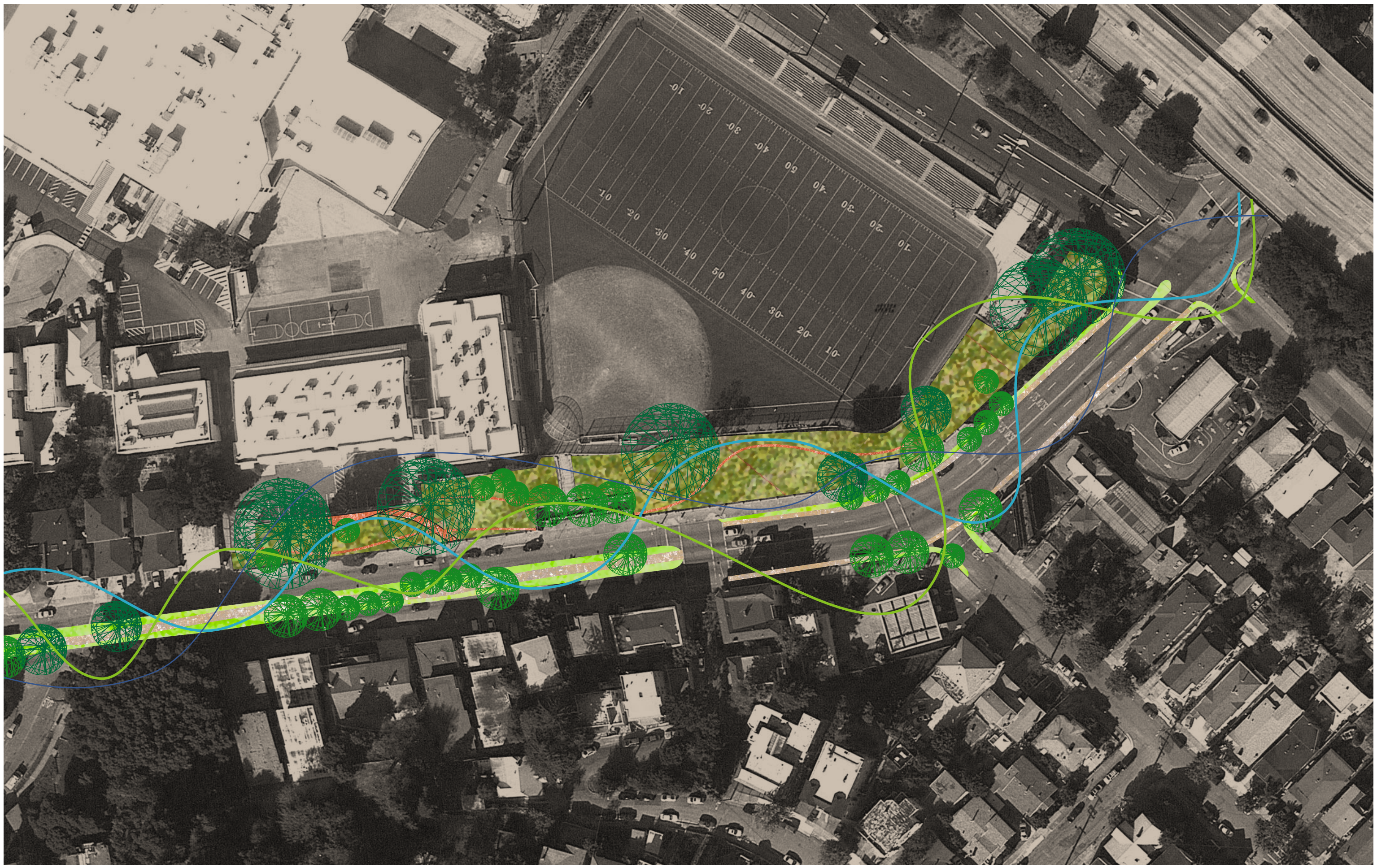


fig. 27: perspective

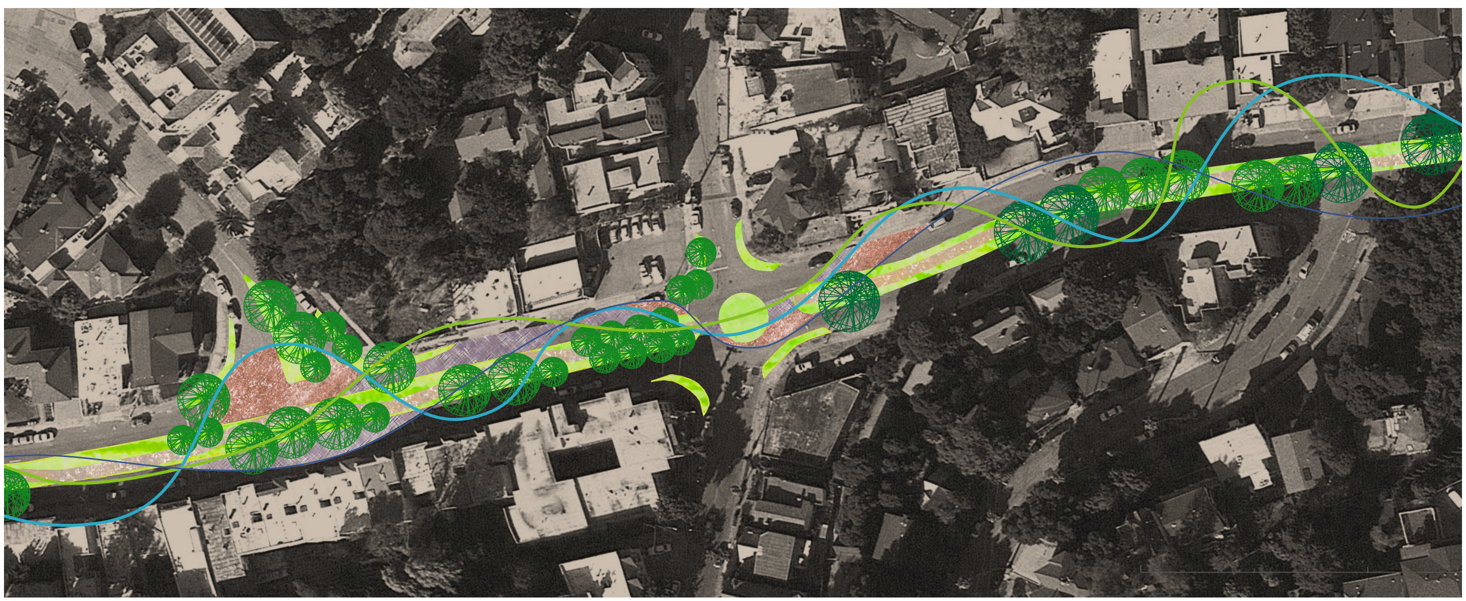
These garden areas  are planted with plants tolerant of Mediterranean climate conditions. Oakland High is currently a closed campus, surrounded by cyclone fencing. No entrance currently exists on the Park Boulevard side of the campus.  This garden renovation includes new path from the street that follows the contour of the hillside up to a curvilinear plaza.

# Islands


This part of the street is fairly narrow and steep, however it has quite a bit of negative space for storm water processing. Some of these areas are in the middle of the street, creating opportunities for collection of sheet flow. Curb extensions collect a lot of water from adjacent streets, minimizing sheet flow onto Park.

The protected bike lane in the center of the street rides between and over storm water swales as flow conditions dictate optimum swale placement; the bike lane has its own "flow". Not only do the curves make the ride more

fig. 28: plan
ISLANDS



interesting, they slow bike traffic in this relatively steep area.
The major signaled intersection has a large traffic island with a "soft" edge of permeable paving, literally blurring the line between planted and paved areas. From these streets, you can occasionally catch a glimpse of the Ninth Avenue Palms, a local landmark. The fan palms were planted to mark the drive of Arbor Villa, home F.M. "Borax" Smith, the progenitor of Oakland's Key System. California fan palms are planted throughout this design.

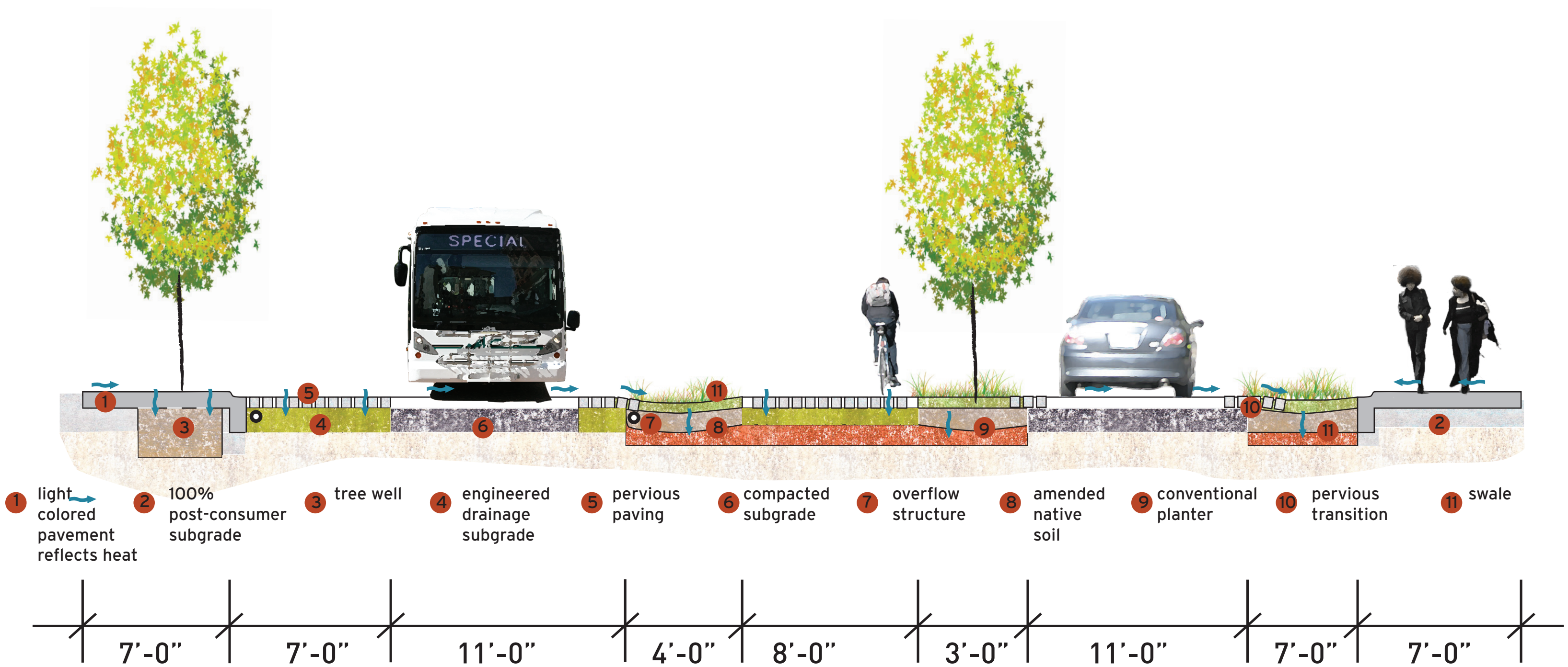
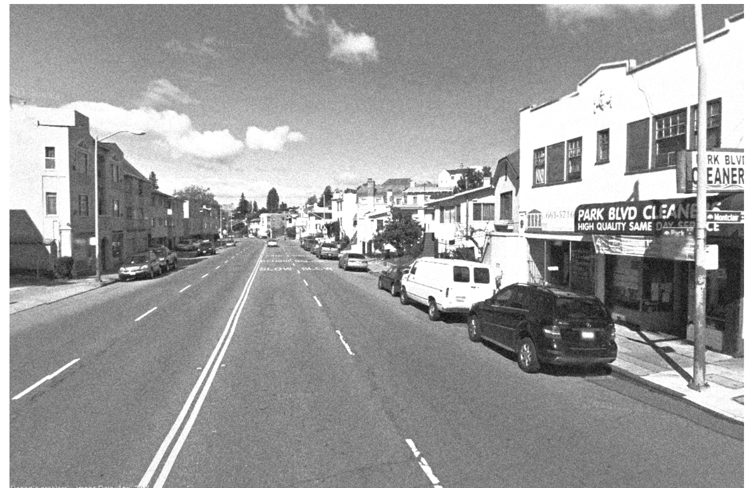



fig. 29: section showing integration of pervious surfaces.

# Narrows

Here the street traverses a relatively flat area. In contrast, the median bike lane is planted with alternating rows of narrow trees and the paving pattern reflects imagined flow lines. In some of the flatter areas, the areas on either side of the bike lanes are conventional planters at grade.
Where possible curb extensions collect sheet flow.



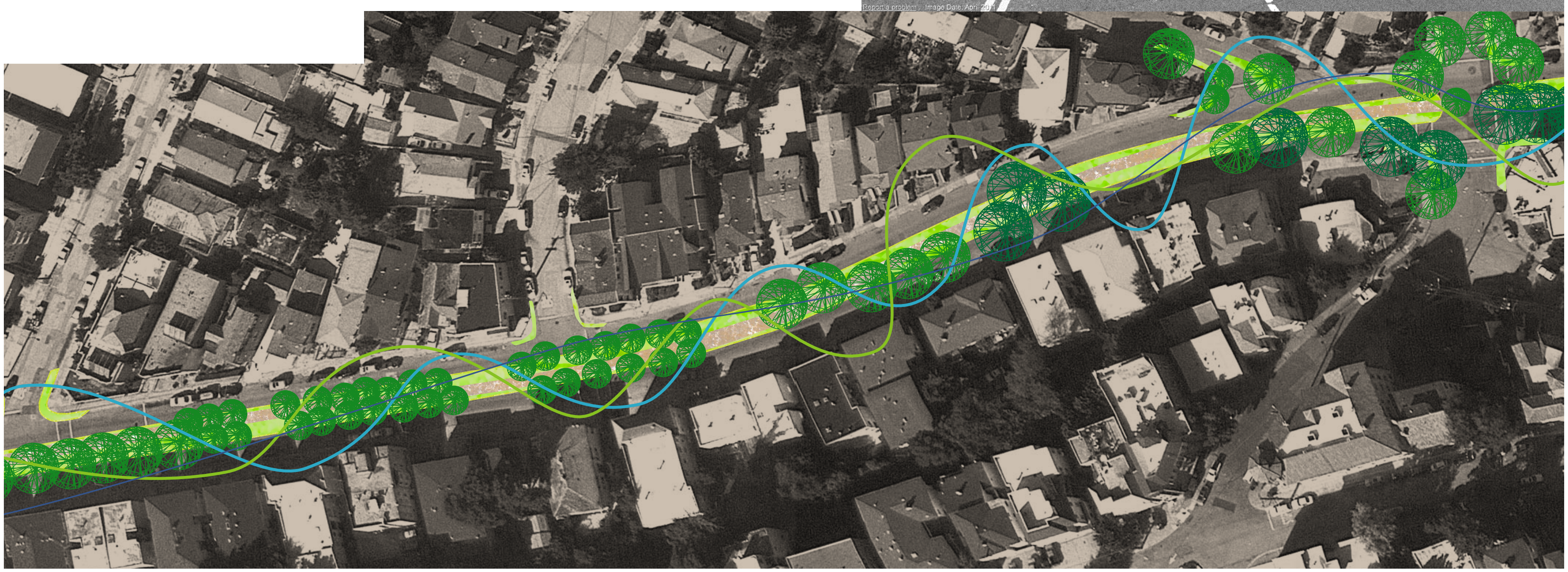


fig. 30: plan NARROWS

fig 31: previous page: the street today.

fig. 32: the bike lane between trees.

# Richness

A larger number of species enjoy the resources of this area of de   position. Boulevard Park and F.M "Borax" Smith Park are gathering places for the community.  (MAP) This is the  most retail oriented part of the site, and sees quite a bit of activity. Extensive pavement pattens help unify the area while textured paving helps slow traffic.

At Boulevard Park, some lawn area is changed into a rain garden. Existing trees are saved and remain at grade. additional plantings of dawn redwoods and  deciduous oaks help retain the pastoral look of this park while creating more shade in summer. The short section of street between the two halves of the park are removed and converted into more plant space.A few blocks further south, the triangular space created by the Key System right-of-way is incorporated into a broad pedestrian zone with public open space and a small stage. This stage has a rectangular fountain that doubles as a backdrop or movie screen for outdoor films. A smooth sheet of water down the face keeps tagging at bay.  The stage utilizes the footprint of the former service station, and the shelter that housed the pumps is re-purposed as a shade structure. A mix of grass pavers, pervious and reflective paving mingles with garden areas, allowing free circulation through nearly this whole area. The gate to the children's playground now opens onto a calm thoroughfare instead of a quick shortcut. Vehicle traffic to the Adult Care Center at the end of the block and park drop-offs can continue, but through traffic is discouraged through planting at the entrance and rougher paving on the vehicle lane.

fig. 33: color study

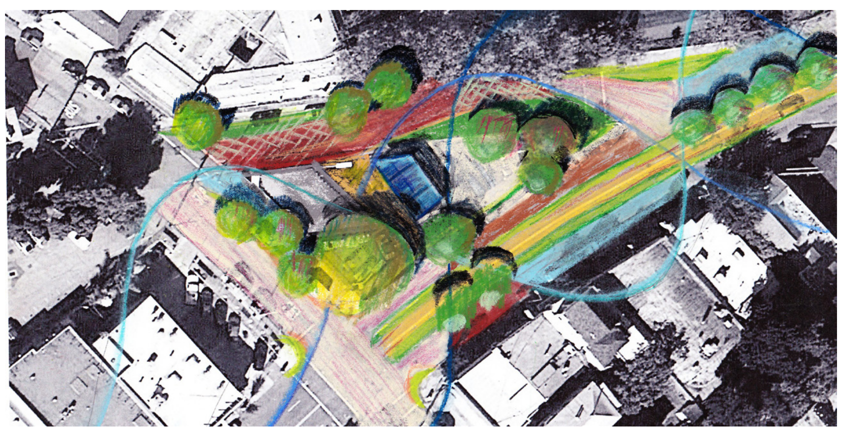


fig. 32: detail of a 1912 map of the Oakland Key System Streetcar lines. Arbor Villa is F. M. Smith's large estate to the southeast of Park. The recreation center down the boulevard is named for him.

fig.35: sketch of a swale with a soft edge.

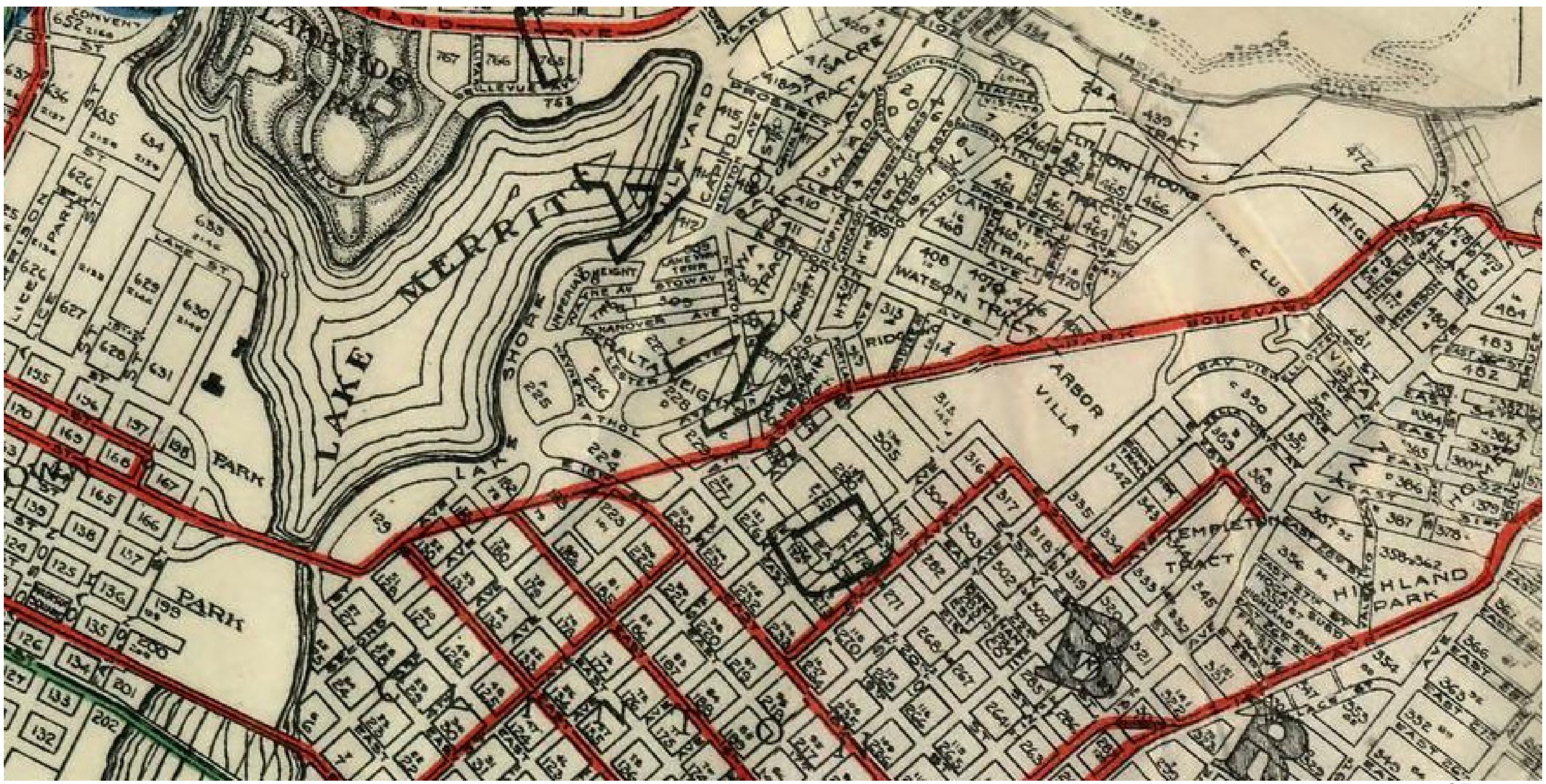



fig. 39: stage and fountain sketch

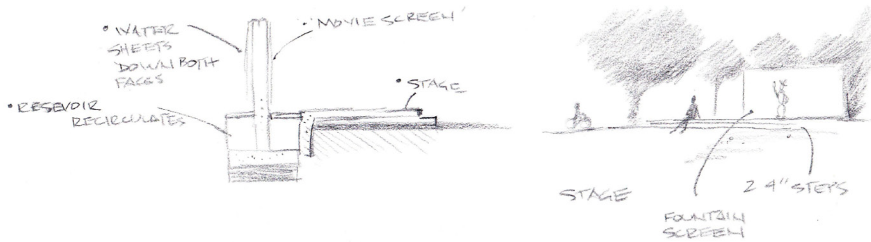



fig. 36: plan RICHNESS

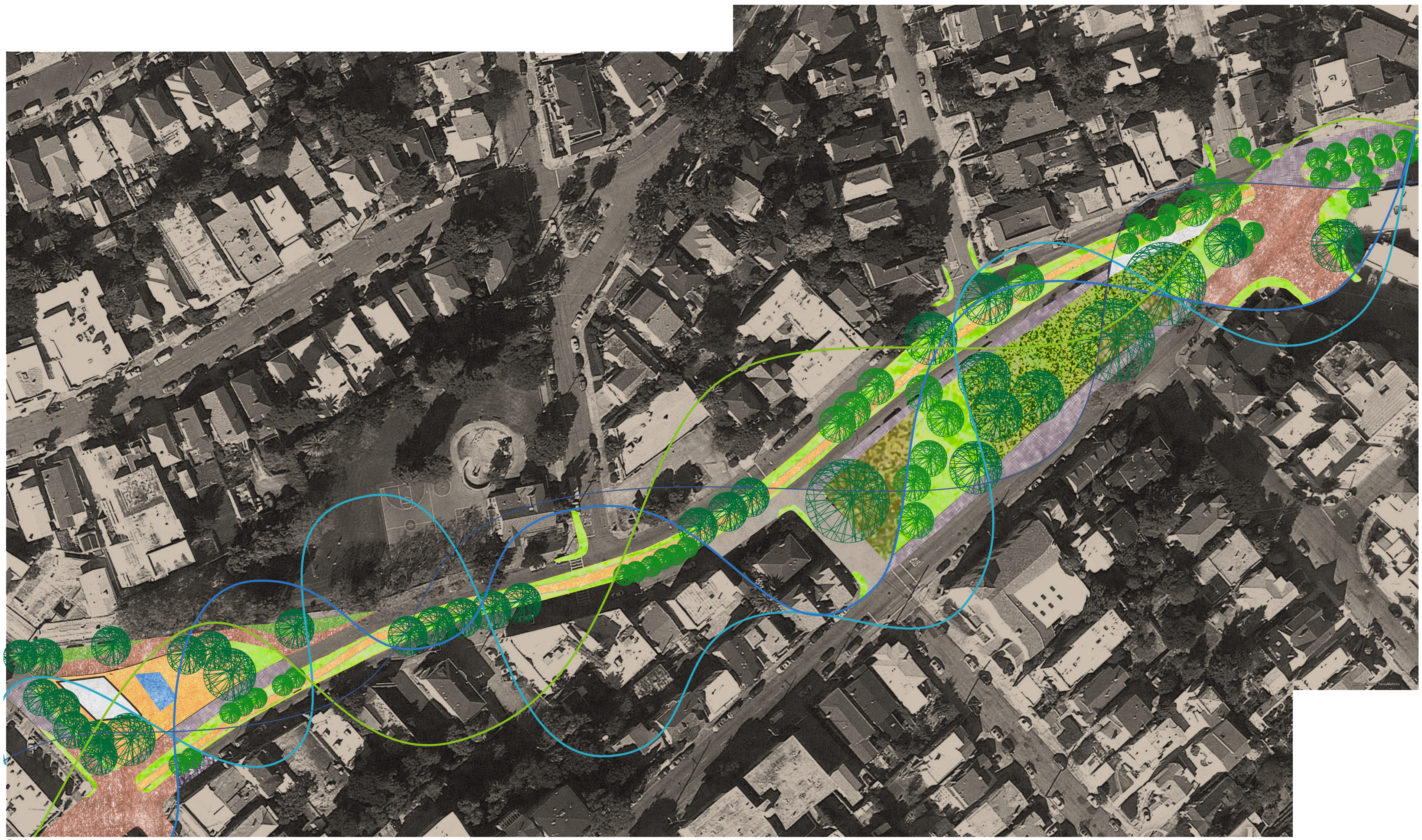


fig. 37: a former service station

fig. 38: an open plaza is much more inviting.

# Final Thoughts

This project envisions that the bio-engineering techniques used to create green streets can develop into a boulevard concept that transforms the entire street into a new landscape. The application of a complete revision to circulation management imagines a city of the future in which transportation needs are redefined and the greening of urban spaces accompanies new bike, bus, and pedestrian infrastructure.

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