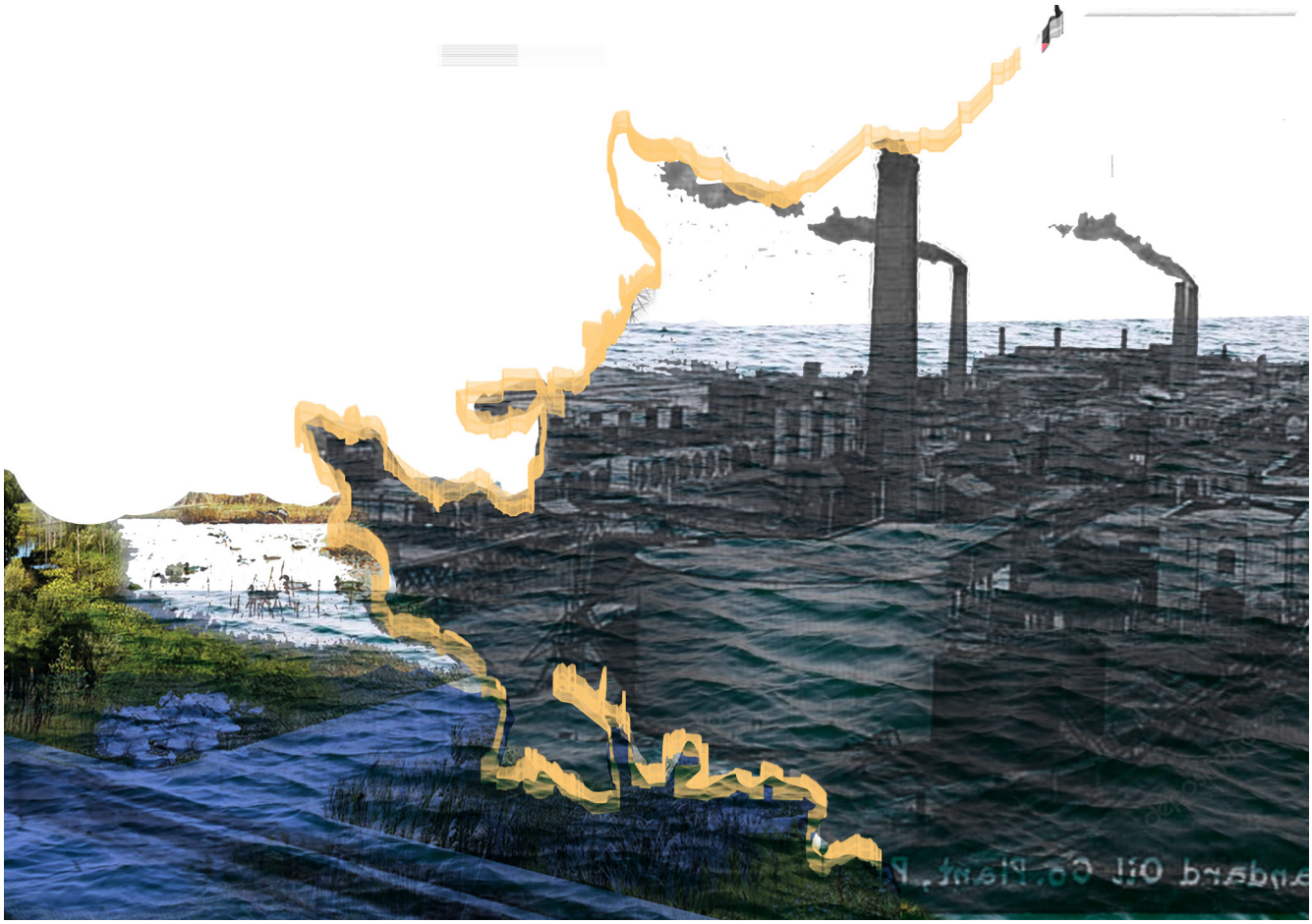
SEA CHANGE // SEE CHANGE



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Master Thesis:

Sea Change / See Change : a walk to the bay

Dec 2017
Graduation studio: Flowscapes
Landscape Architecture
The faculty of Architecture
TU Delft

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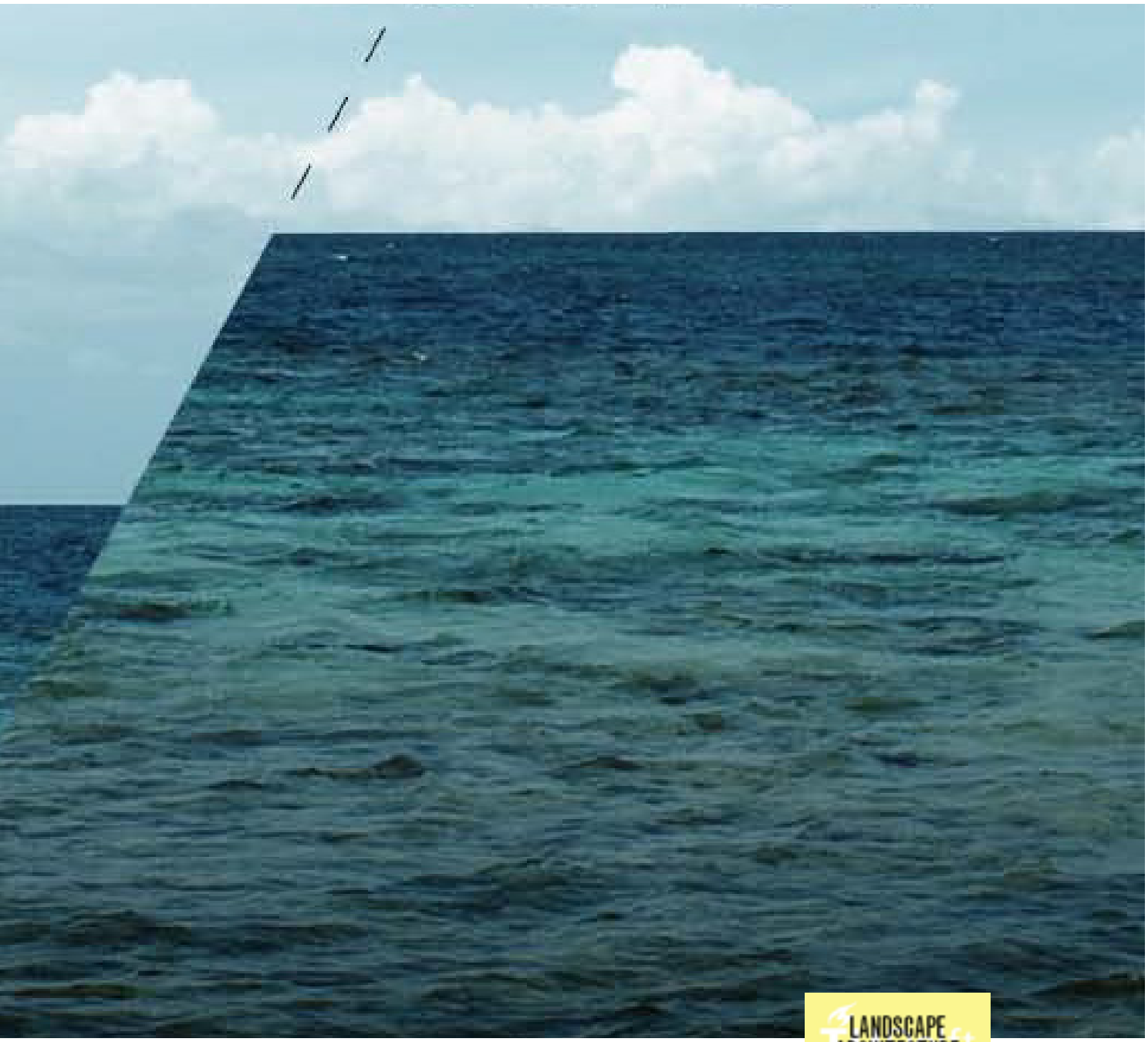
LANDSCAPE
ARCHITECTURE

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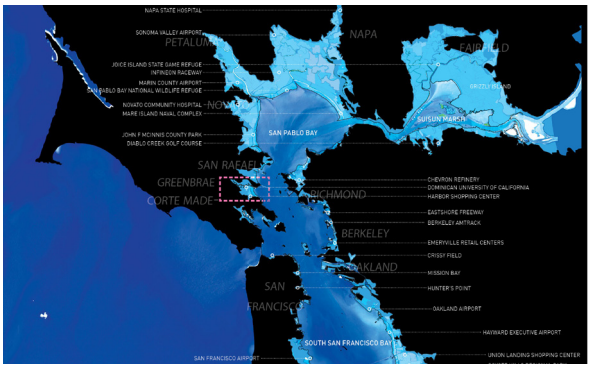


lake mosaic patter

industry

urban shrinkage

Migrating elemet

When whales travel thounds of miles
back to Antarctic, in the spring,
we know, they migrate.

when butterflies flew from south Africa to Brazile,
in the autumn,
we know, they migrate.

When your car starts up, the fuel burns,
CO2 release to atmosphere,
from liquid to gaseous state,
the Carbon element, it migrate.

When river shifts it channel,
when the drought season arrived,
water migrates.

When Tycoon Ford moved its factory to developing countrial for lower labor cost,industry migrates.

When migrate happens, it leave marks on landscape.
like writing on a paper, it tells stories.

The sea is rising and cities are being flooding,
because carbon migrate.
the lake has mosaic wetland landscape,
because water migrates.
The city of Detroit is shrinking,
because industry migrates.

Migrating Landscape

Fascination

What is Migrating Landscape – Why?

The act of migration is inseparable from the material and spatial dynamics in which a living thing or group of living things interact; rendering migration as "a complicated, challenging and diverse phenomenon involving changing statuses and multiple geographic trajectories."
— Michael Samers, Migration (2010)

When speaking of migration, we imagine migration as the movement of isolated things (birds, fish, people) against a fixed background. For example, brent geese Branta bernicla migrating from the Taymyr Peninsula to the Wadden Sea

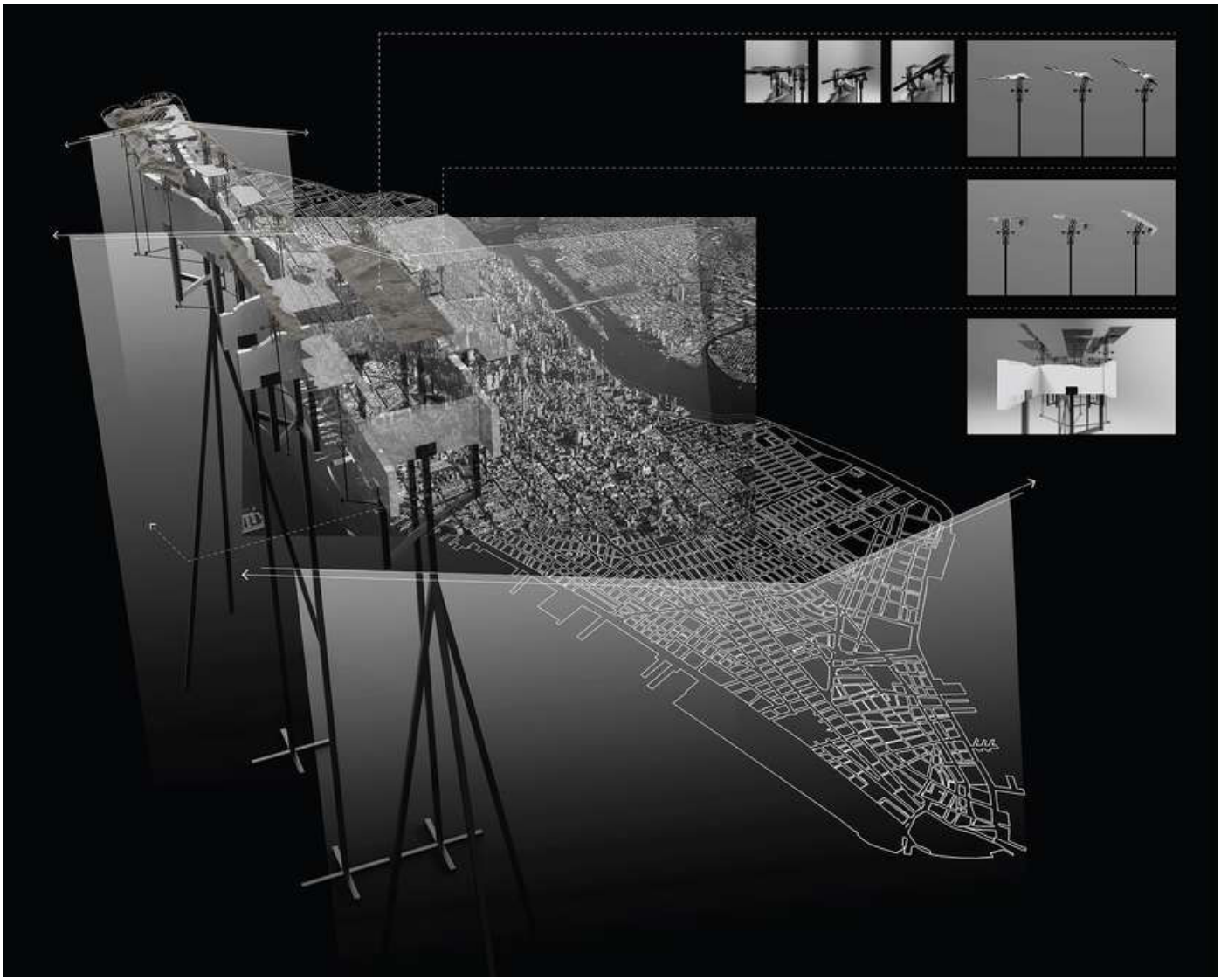
At a planetary scale, we know that landforms migrate through plate tectonics. Scientists are always visualizing, monitoring, and anticipating earthquakes, volcanic eruptions, and other geologic events. The San Andreas Fault in California is a tangible artifact of these processes: a trench bordered on both sides by jagged hills where the North American Plate rubs against the Pacific. Aerial views reinforce the fact that material in motion creates qualitative difference. If we accept the idea that the entire surface of the earth is migratory, then why not landscapes in particular?

A landscape — as a scene, landschap, ecosystem, and socio-political territory — is a material assembly of moving entities, a dynamic medium which changes in quality and structure through the aggregate movements or actions of the things that constitute it.

In this case, landscape are no backgrounds or supports, just like things and beings, they migrate across time and space. We know that environmental conditions are always changing, but we allow us the fiction of background stab333eee1ility. As Brett Milligan proposed, we can view migration as a patterned movement across space and time. Then look beyond the movement of individuals and species to the migration of landscape. A landscape migrates when its unique assembly of components- the materials, entities and actors that define it- shifts over time, then a new assembly forms. Just like plate tectonics, landscape migration is both spatial and qualitative.

Introduction

A new representation of Manhattan uses deep-time as a tool to recalibrate the relationship between the city and the rock - FUTURE ARCHITECT PLATFORM,



The starting point of this research are the concept of Anthropocene and the "migration landscape" and their relation to landscape architecture along with a very specify site of interest- Richmond city in San Francisco.

we are living in the age of Anthropocene, where we, as human, have become a geologic force of change, but we struggle to grasp the consequence of that.
By Anthropocene, it refers to the contemporary geological epoch in which human have become the dominant geologic force altering the planet. we move more than twice the earth and soil than all oceans, seas, rivers and lakes together. We change the atmosphere way up high, the rock deep down and everything in between.

How attuned are we- as species and agency- to the consequences of our changes? Can Architects and landscape architects stop being just a reaction to change to become also a propositional dialogue with the many world beyond humanity? Richmond in San Francisco, once an industrial city relying on its shipping industry are now facing the crisis both from natural aspect and economic aspect. The shifting of shipyard resulted in city's unemployment and commute problem, along with increasing threat from sea level rising. The channel supporting old shipping industry require heavily maintenance continuously yet it failed to bring up economic beneficial as planned.

To approach the site, the research starts with an understanding of landscape migration, of how, a landscape assembly arrived at its present state, by which processes, what are their martial and affective outcome. This involved examine Brett's concept of landscape migration , urban ecology and assemblies. Next to this, idea of Anthropocene and new materialism are exploded to provide a renew view on infrastructural landscape and on thinking about landscape as a "plurality of forms, then belief in a fixed criterion of optimality disappears" where enable a boarder spectrum of choice and possibilities .

Problem statement

In Detroit and other shrinking cities, we witness the emigration of the human population and the emergence of feral urban lands. Like many migrations, the Rust Belt exodus is "driven by the transitory availability and shifting location of resources." De-industrialization is not the disappearance of industry, but rather the migration of industrial production elsewhere. Detroit's transformation is part of a board, complex set of economic processes, yet not so complex that we fail to see the spatial patterns. Richmond is also an example of a city encountered with migrating natural landscape as well as shifting industry. Its natural shoreline is along with the rising water level from Pacific Ocean, locating on artificial filled land. The city not only have to face the erosion from tidal impact but also threaten by crustal movement underground. Due to the relocating of shipyard and manufactory industry, as well as the dramatic fall on limber economic, city of Richmond is in urgent.

In short, the historical research showed that from Golden Rush to Silicon Valley. Richmond have been bounded tightly with regional to global economic and environmental

transition.

Not every migration is one of return. The most promising design and planning strategies for shrinking cities work opportunistically and protectively with emergent conditions, rather than trying to counter or reverse the trajectories of change.

Problem statement

THREATEN BY SEA LEVEL RISES

Due to landfill and channelization and other human intervention,the constructed bay edge has lost the exchange with the nature dynamic and is no longer economically, ecologically, or socially relevant. So the problems statement were made.

There have been significant advances in the scientific understanding of the risk of accelerating sea level rise (NRC 2012). Present sea level rise projections suggest that global sea level in the 21st century will be much higher due to both the expansion of the oceans by warming and, increasingly, by the melting of land-based glaciers and ice sheets. These projections are summarized in the recent National Research Council report on West coast sea level rise (NRC 2012) which provides estimates of regional sea level rise for San Francisco. By 2030, the mid-range projection for sea level rise is 5 inches with an upper projection of 11 inches and by 2050, the mid-range projection is 11 inches with an upper projection of 24 inches.

Industial zone disconnected city from the bay

Due to over 100 years of heavily industial development along the shoreline of Richmond, the city of Richmond are segregated from its waterfront life style. More over, the industial site also leave the its waterfront with water polution and soil containmination. Continuely dredging and channelization alone the shoreline to maintain its navigation function has cause huge marsh land loss.

Social Problem

Historically,Kaisher Shipyard was the 3rd biggest navy shipyard in war time, which construct ed on the landfill of the original tidal marshland that protects lands from erosion.Over the past century, landfill and nevigation matainance (dredging and channelization) has cause huge marsh land loss. After the war, Kaisher shipyard retired from its military service and now is occupied mainly by commercial port and oil refinary. Yet with the falling of heavily industry, this industrial hard land is no longer economically, ecologically, or socially relevant. The city has suffer from high crime rate and

Research Objective

By examinate of the concept of landscape migration and the Anthropocene in the specific case of Richmond redevelopment project , rethinking of the common way of landscape design for stability but to acknowledge the migrating phenomenon both in the design process and the design result.

Research Question

- How to reconnect Richmond, a city segregated by its industial history, to its shoreline for new opportunities and new life ?

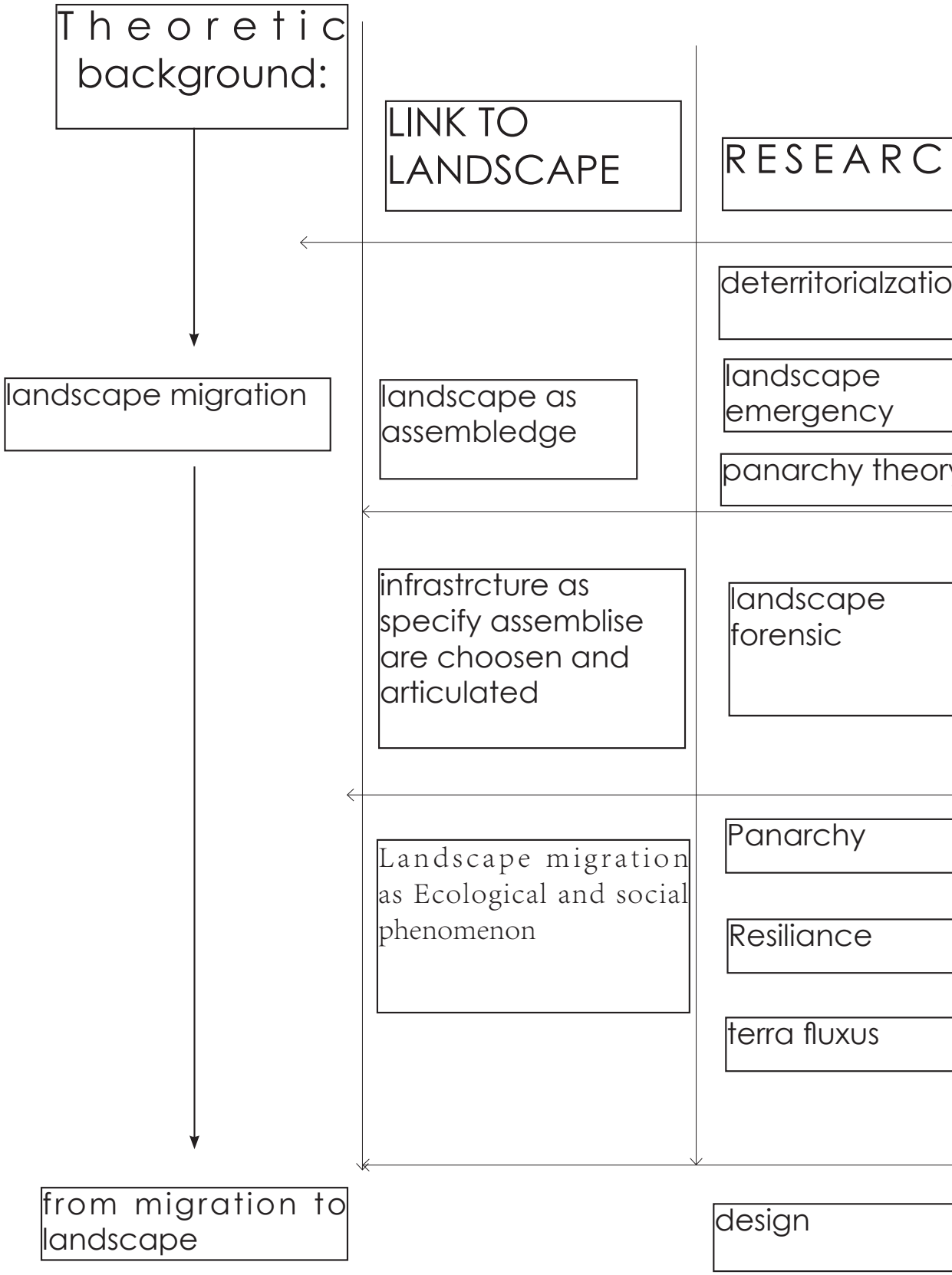
-How was richmond developed and what is the driven force behind its landscape pattern movement? What are the consequense on Richmond today?

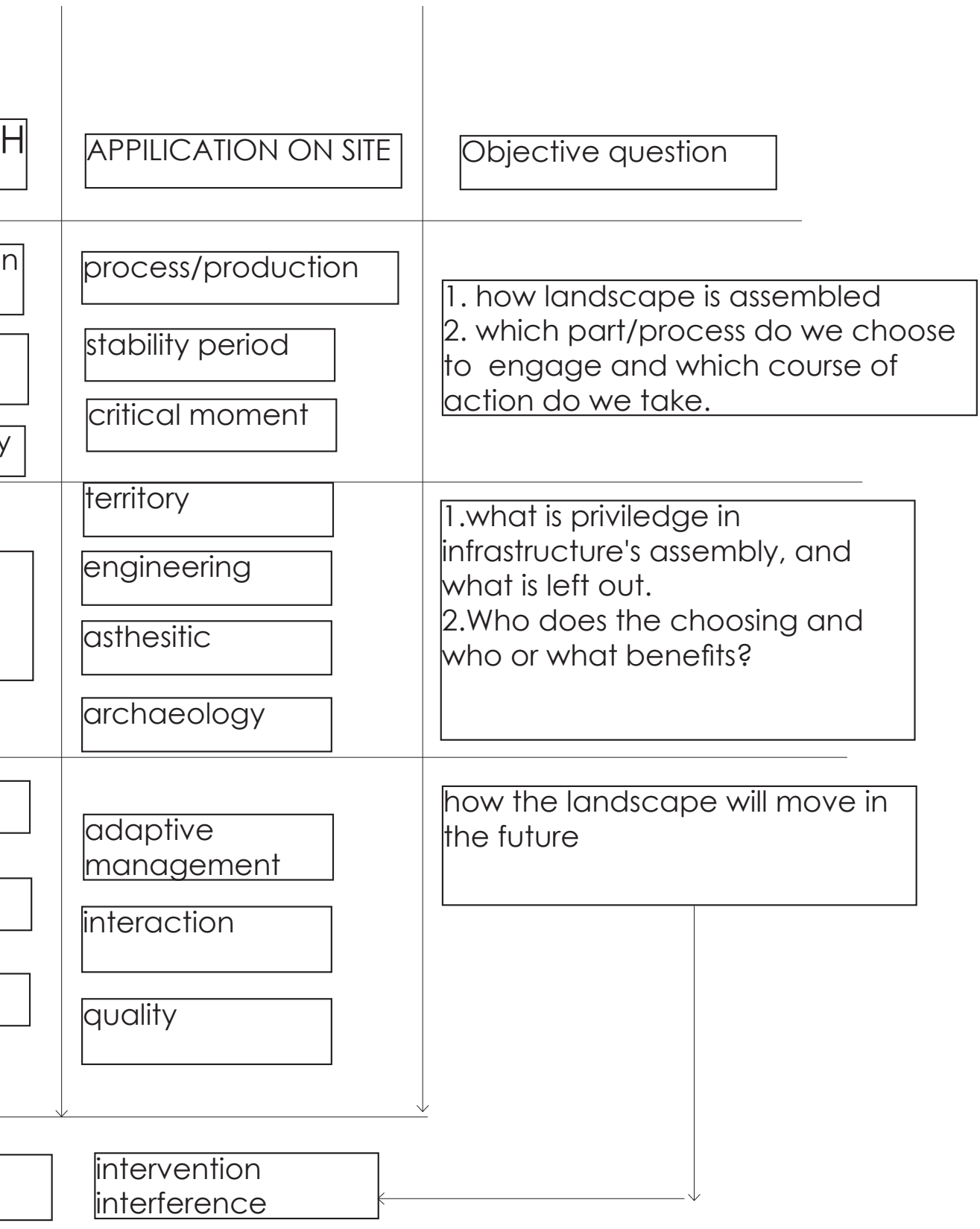
-Which infrustructure can we choose and articulate on to guide the landscape process?

-How can Richmond local residents benefits from landscape migration without being leftover?

-How to adapt Richmond for future instablility?

Methodology




APPILICATION ON SITE
Objective question
process/production
stability period
critical moment
1. how landscape is assembled
2. which part/process do we choose to engage and which course of action do we take.
territory
engineering
asthesitic
archaeology
1.what is priviledge in infrastructure's assembly, and what is left out.
2.Who does the choosing and who or what benefits?
adaptive management
interaction
quality
how the landscape will move in the future
intervention
interference

Methodology

In definition, Brett Milligen articulated landscape as – "a scene, landscap, ecosystem, and socio-political territory – it's a material assembly of moving entities, a dynamic medium which changes in quality and structure through the aggregate movements or actions of the things that constitute it."
He applies the concept of migration – patterned movement across space and time – to landscape by three strands of theory: ecology, assembly and infrastructure. Then How can be practice these theory to landscape analysis to design?
Following the theory of Landscape Migration, several are the concrete element we can deduct and used for approaching the site.

Firstly, to understand the process and production of current landscape assemblage, its necessary to identify patterned movement and critical moments of site. Landscape architects uses landscape reading to provide answer to such question. Gathered data is most commonly communicated through mappings or diagrammatic representations of different layers that together form a piece of landscape.

It looks into nature factors: natural factors (geology, soil, topography, vegetation, animal life, climate), historical factors (development, cultural significance, heritage) and human factors (social aspects, landscape experience, spatial and visual quality).

By approaching to the site, examining the landscape along a historical trajectory, we can observe period of stability as well as critical moment or bifurcation when the assemblage is rapture and a new assemblage is formed.

As city of Richmond in research particularly, its necessary to understand the landscape in regional scale. what drivers of change are most relevant to the development of regional choreography?This part of analysis will answer the following questions: First, which are the crucial processes will be involved in different time period? Second, Which are the crucial factor to affect others within layers?
The analysis of the landscape first focuses on the driving forces of the delta area. Including natural processes(crustal movement, sea dynamic, terrestrial alluvium) and human intervention(diking, reclaim the land, landfilled.)

According to Panarchy's theory, the next step is to identify drivers of change, based on the former research following key drivers of change are identify:
Dams 2. Levees 3. Channels 4. Dredging 5. Flood Control 6. Availability of mined and/or Excavated sediment 6. Technology 7. Investment 8. Policy, Regulations, Plans, and Incentives 8. Accelerated erosion 9. Climate Change 10. Water Exports

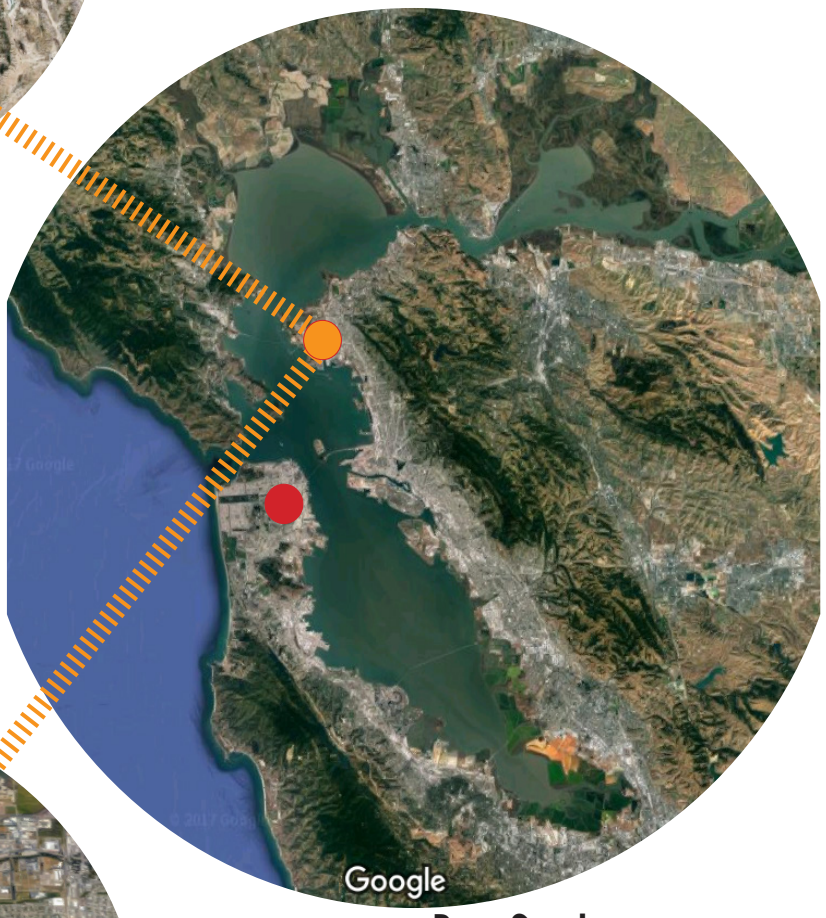
Patterned movement are also being investigate as the production of change agent. In Richmond in paticular, patterned movement are focusing to answer following question:

1. What is the typology
2. What cause the pattern movement in Bay/Richmond

Infrastructure is where specific landscape assemblies are chosen and articulated, and it is here that design can play its most influential role .In my case the sediment itself have been the crucial infrastructure in Bay-Delta as well as in Richmond. Unlike the critical infrastructures of previous generations of design—dams, levees, channels, and so on—intentional sedimentary infrastructure is capable of aggregating, expanding, and adapting to novel conditions. This flexibility will be needed as we seek to adapt to and mitigate anthropogenically-accelerated change.

Location & Site Visti

San Francisco Bay-Delta



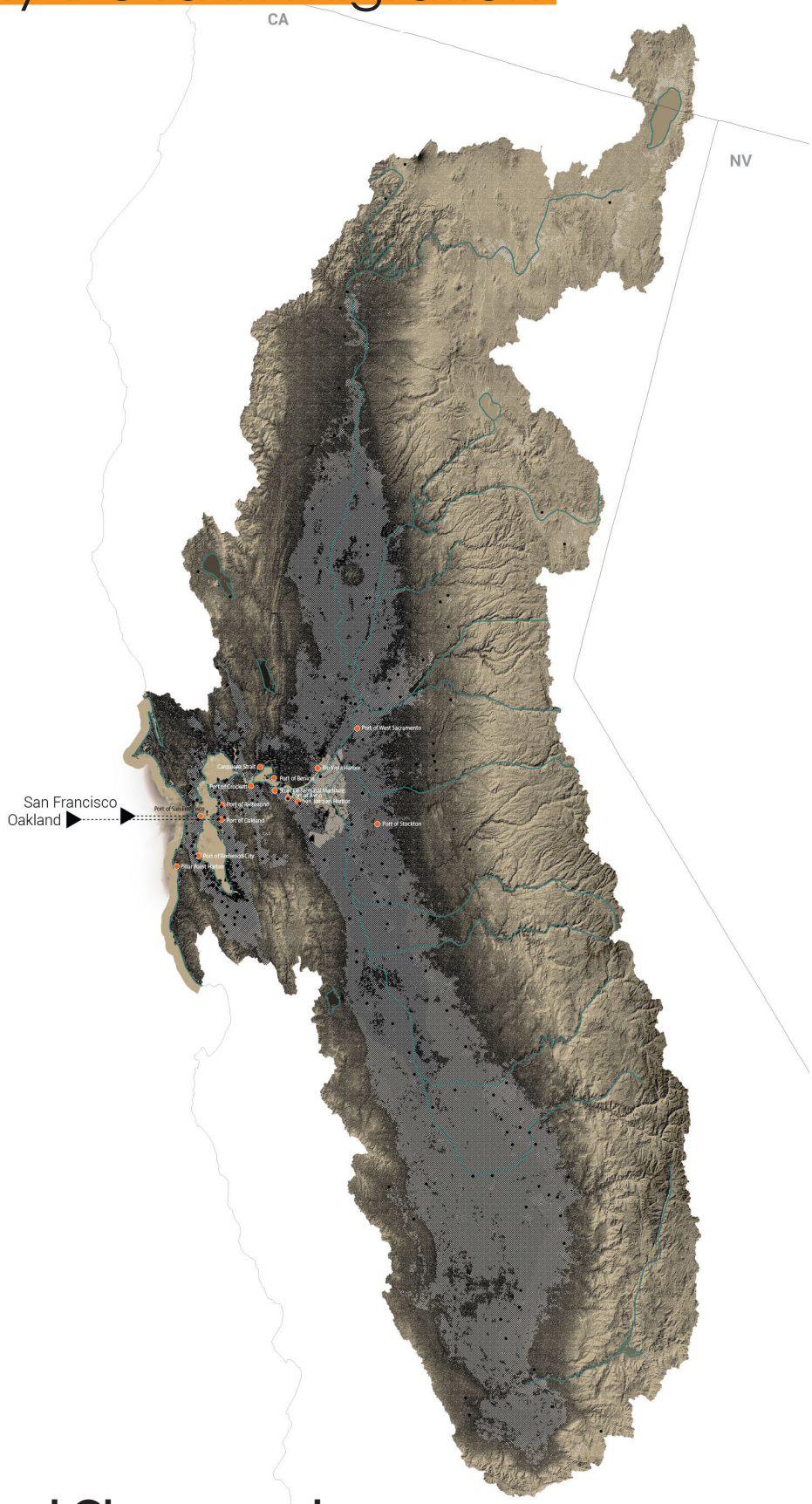
Bay Scale

Richmond

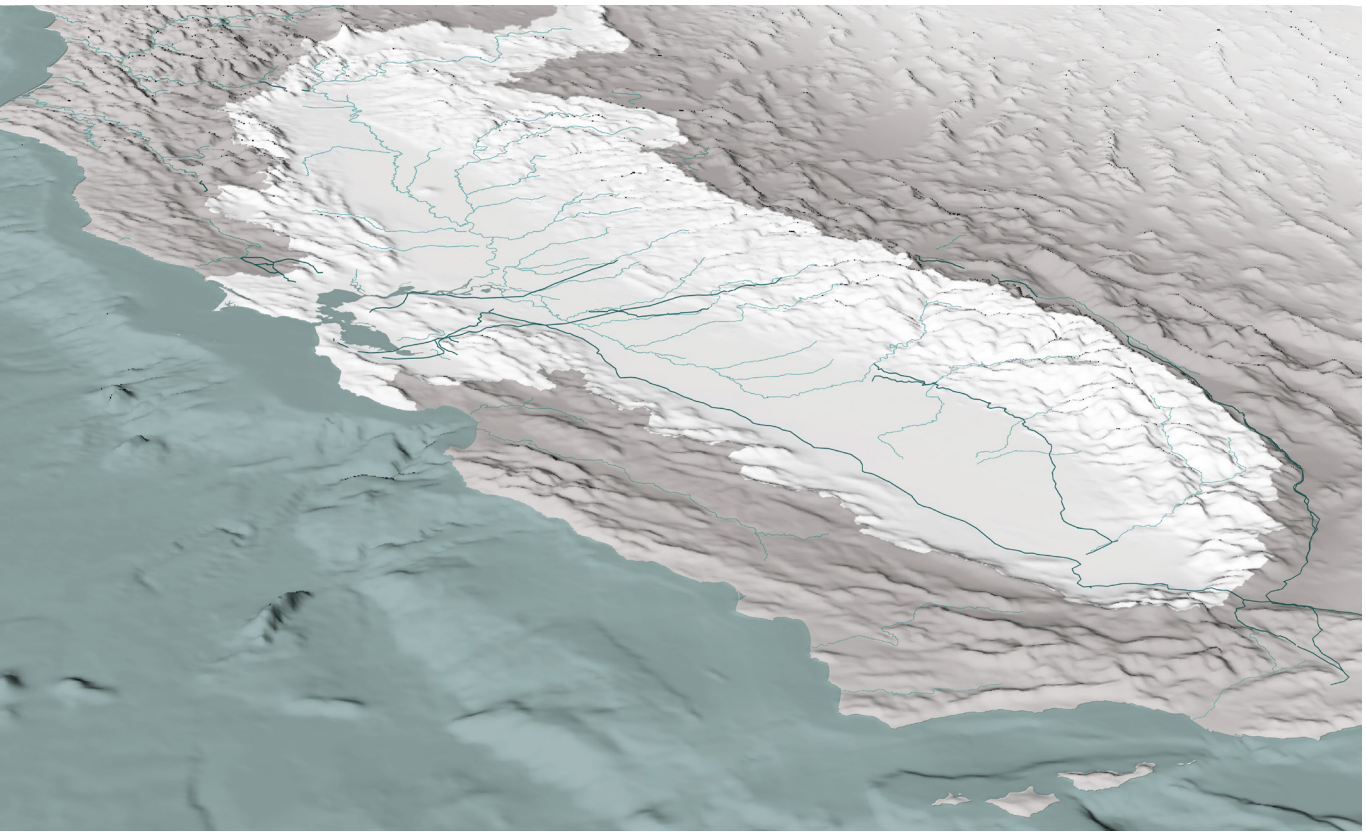
The city of richmond in Contra Costa County is just a 10 minute drive across the San Rafeal Bridge but its also a world asway. It is a city of 100,000 people with merely more that 10 percents of residents works in the city. With over a 100 years history of heaving industrial production and construction, resulting in soil/air/water pollution.
With threat from globla warming and sea level rising, the city is in need of costal management and protection.

A dialog is needed here, between city and citys ,between urban context and natural environment, giving the opportunity to urban redevelopment. Not only creating an platform for public to enjoy the wonder of Bay, but also protect the home of the precious flora and fauna species from sea level rise and other environmental crisis.

Bay-Delta in migration

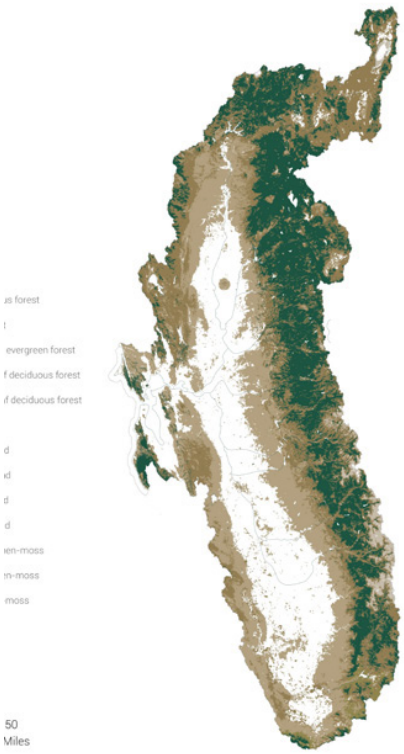


Regional Choreography



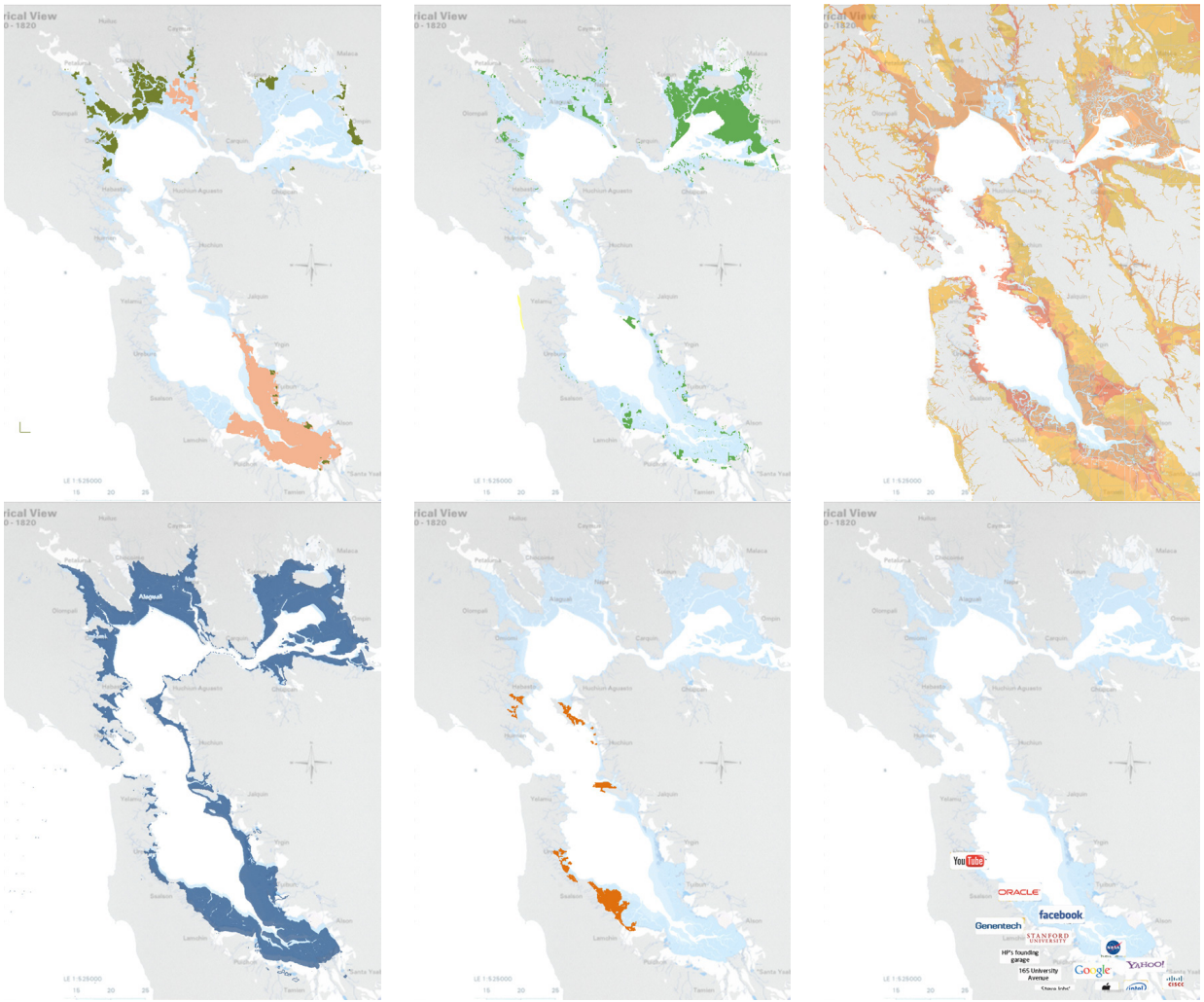
Agriculture

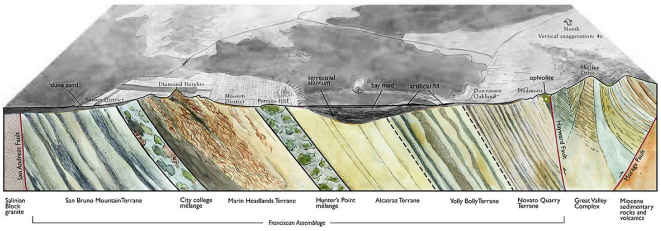
Urban Areas



Vegetative Cover

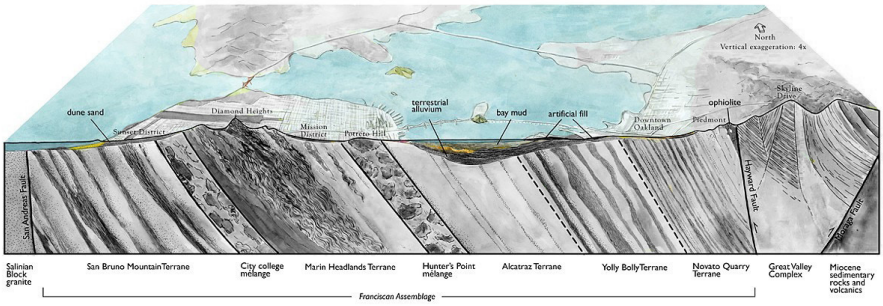
Bay in migration





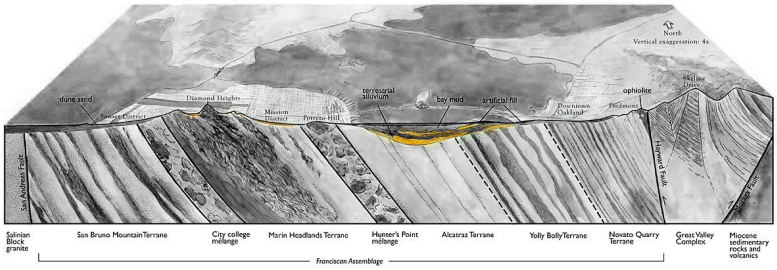
Geologic Cross-section of the San Francisco Bay Area

Crustal Movement



Geologic Cross-section of the San Francisco Bay Area

Sea dynamic



Geologic Cross-section of the San Francisco Bay Area

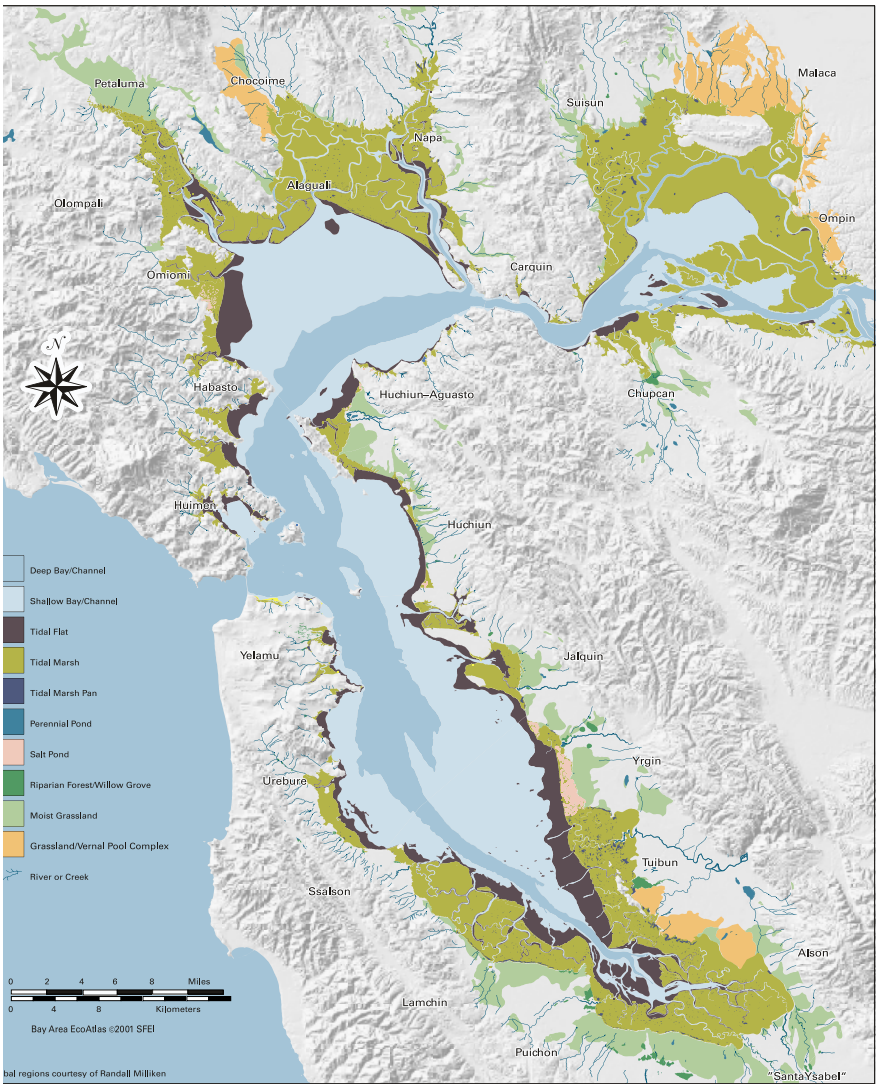
Terrestrial Alluvium

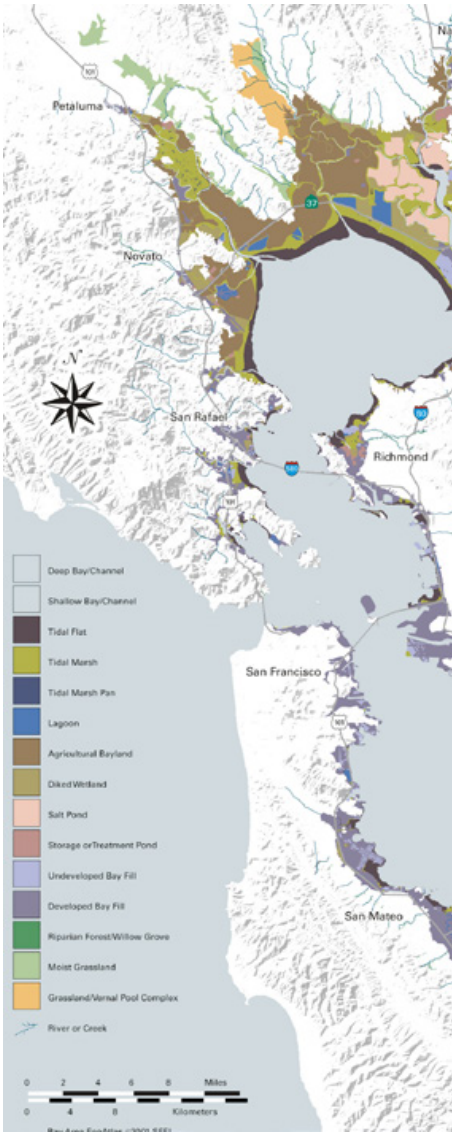
Geologic Cross-section of the San Francisco Bay Area

Anthropocenic activities

natural resources

anthropocene activ





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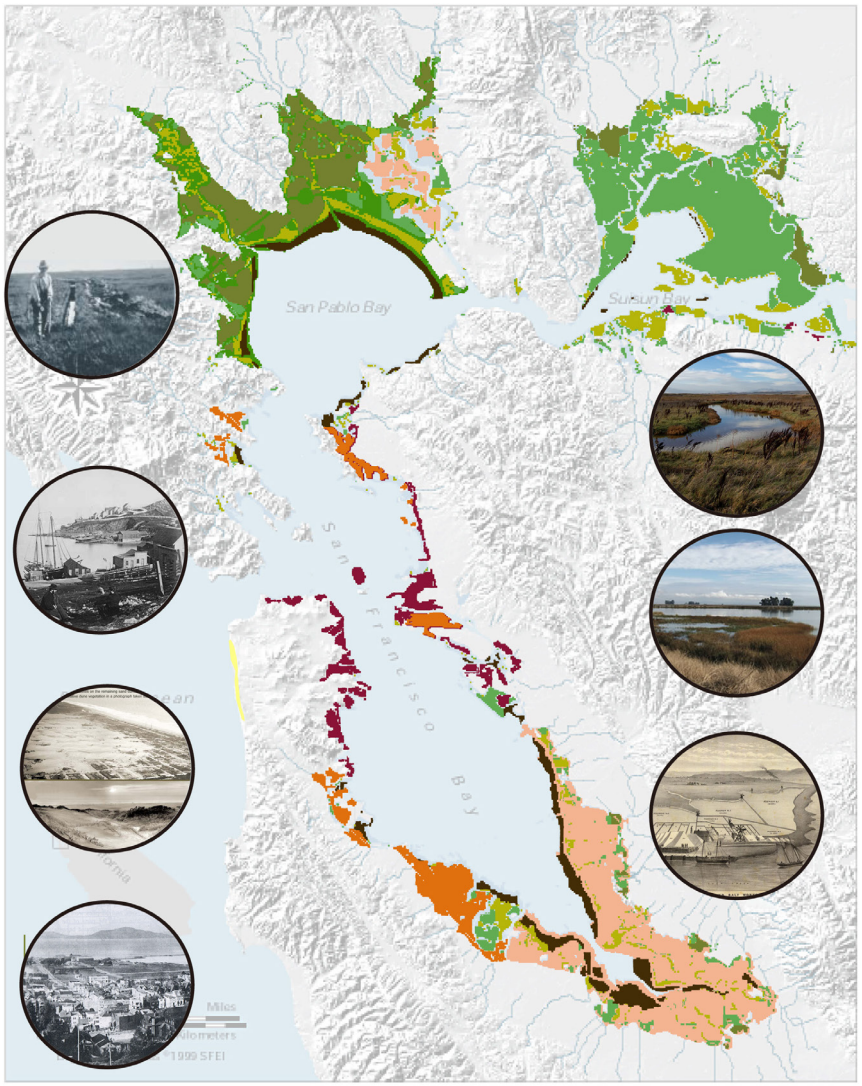
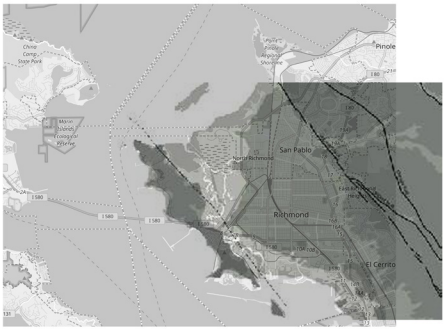
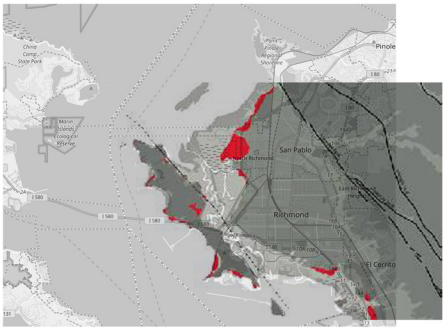
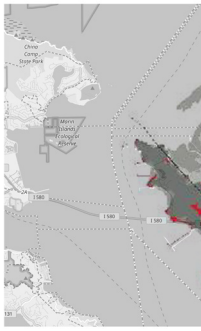
landscape patterned movement



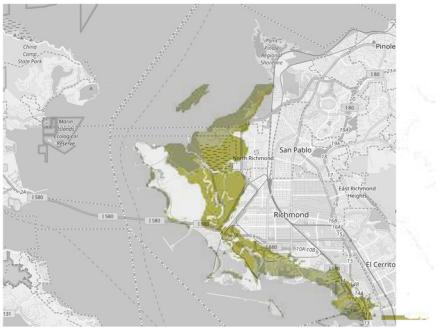
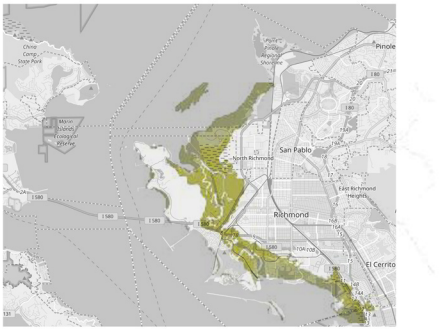
Forming Richmond

By mapping the historical pattern of llanfill, marsh land and sedimentation auumination. This analysis aim to understand the forming process by both anthropocenic and natural forces . The analysis also point out the natural resource and natural shoreline loss in the landfilling.v

landfill

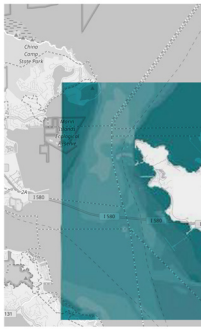




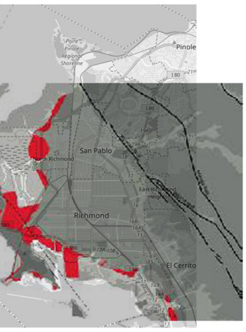
marsh land


sediments accumulates



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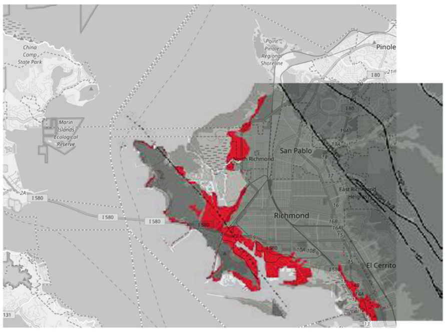
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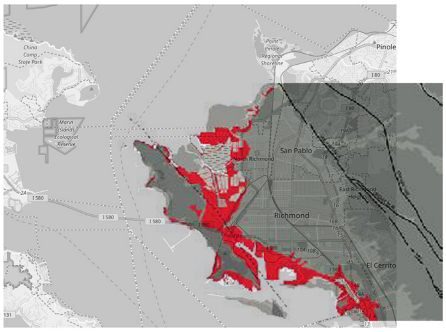
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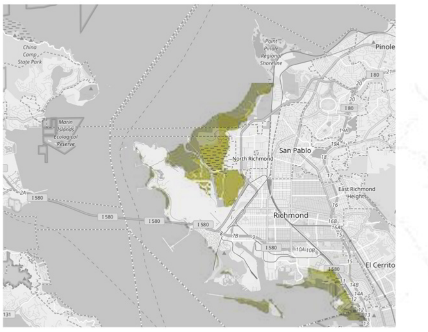
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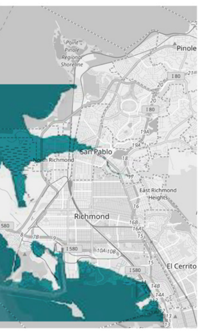
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history of richmond

BC2500

Ohlone Period

The earliest inhabitants were the Ohlone Indians, who settled here an estimated 5,000 years ago,with a culture based on strong community ties, spiritualism, and rich artistic creativity. The Ohlone were hunters and gatherers that built extensive **shell mounds** along the Bay. Amid the coming of the Europeans, the Ohlone way of life gradually came to an end and was destroyed.

1821

Spanish Era

Spanish explorers Pedro Fages and Reverend Juan Crespi, who passed through the East Bay in 1772. After Mexico won independence from Spain in 1821, large tracts of land in California were granted to military heroes and loyalists. The city of Richmond was established on a portion of Castro's land grant about seventy years after his death.

1895

Rail Terminal&Ferry

In 1895, Augustin S. Macdonald visited Point Richmond and conceived the idea of a transcontinental **rail terminal and ferry service** to provide a direct route from Richmond to San Francisco. 1899 the railroad established its western terminus in Point Richmond. The first overland passenger train arrived in Richmond from Chicago in 1900.

1901

Early Industry

In 1901, Santa Fe moved its shops to Richmond and the Standard Oil Company built its refinery.

1905-1920

Industrial Growth

When Richmond incorporated as a city in 1905 it an established industrial town. The city charter was adopted in 1909, and by 1910 substantial industries locate to Richmond: Winehaven, Pullman Palace Car Shops, American Radiator, Standard Sanitary Company, Stauffer Chemical Company, and several others less well known.

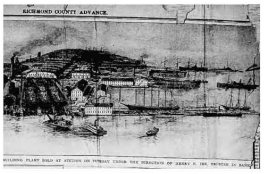
Rice Field Lost

Town sites began to emerge around these industries, as Rancho San Pablo's **vast grain fields were subdivided into uniform city lots.**

1920-1930

Harbor Construction

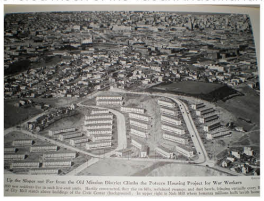
As the City grew during the 1920s and 1930s, Construction of **shipping port terminals** began in this period. By 1907 harbor construction was being promoted and major dredging and terminal construction was authorized by bond issues in 1912 and 1920. **Tideland filling as part of the harbor dredging in the 1920s** made possible the opening of the Ford Motor Assembly Plant and the Felice and Perelli Cannery in 1931. The prohibition era forced the closing of Winehaven.



1940-1945

World War II and the Shipyards

The next chapter was by far the **most dramatic and earth-shaking** in Richmond's history. World War II began, and the Kaiser Richmond Shipyards, one of the biggest wartime shipbuilding operations on the West Coast, sprang up on Richmond's South Shoreline in January 1941. The shipyards covered much of the vacant industrial land



Public Housing

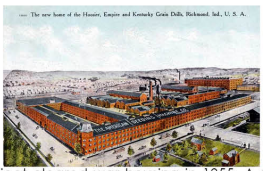
The result was explosive growth, a "boomtown" atmosphere, and profound long-term effects on the City. Richmond's population increased dramatically.Much of the new population was **housed in temporary structures.** Dormitories, demountable houses, and apartment buildings were built; more than 60,000 persons lived in public housing. **Many "temporary" housing units remain today.**

1945

Chemical Industry

At the end of the war, the shipyards closed in 1945. Industrial production rapidly declined and the population decreased in 1960. A number of **new industries** moved in to occupy vacated shipyard structures. Among them were Kaiser Aircraft, Garwood, Butler, Southwest Welding, Pacific Vegetable Oil, United Heckathorn

1955



Redevelopment Warehouses

The Harbor Gate Redevelopment Project cleared war housing in 1955. A strong growth in warehousing, distribution, and chemical and research facilities were evident among the post-wa developments. Throughout this history Standard Oil, now called Chevron USA, have grown steadil and have remained the **City's major industry and employer**.Land annexations by the City between 1953 and 1957 to the east, north and northwest resulted in a **geographically enlarged but barel contiguous city.**

A throught out historical research of Richmond history was carry to identify in seperated era, what is the driven forces in the change of landscape pattern and what could be the sociao/economical/ecological consequences for the change.

early-1970s

Downtown business declined

major retailers (Macy's, J.C. Penney's, Thrifty, and Woolworth's) all either moved to Hilltop or closed their Richmond operations entirely.

mid-1970s

Harbour Redevelopment Project

on the city's South Shoreline led to the transformation of the old Inner Harbor Basin (the site of the wartime shipyards) into the Marina Bay development, a 350-acre master-planned waterfront community that will eventually comprise 2,100 residential units, 650,000 square feet of commercial space, several restaurants, a 1,500-berth pleasure boat marina, and a chain of lagoons, parks, and waterfront promenades.

1976

Hhilltop Mall Center

Opening in 1976, Hilltop Mall Regional Shopping Center had a major impact on Richmond's economy and its old downtown area in particular. Hilltop is a 1.3 million square foot enclosed shopping center located in the northern corner of the City along Interstate 80.

1978-1985

Hoffman Freeway

(now the Knox Freeway, Interstate 580) was designated a part of the Interstate freeway system, thereby ensuring its construction. The new freeway passes across Richmond's South Shoreline and connects Interstate 80 with the Richmond-San Rafael Bridge. The freeway provided seven new interchanges along the South Shoreline, and has made it a very attractive corridor for new high-tech industrial, business park, and commercial development.

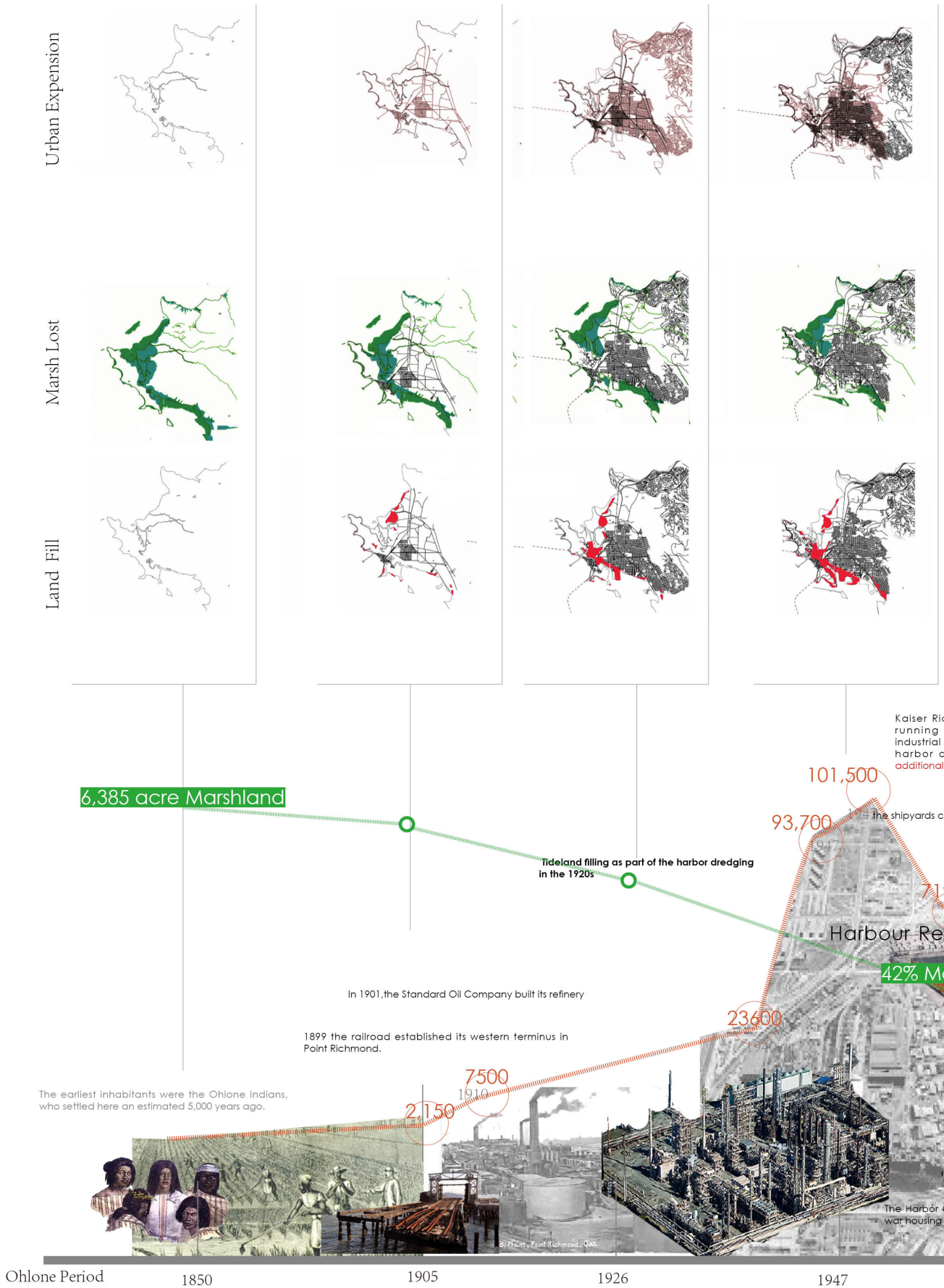
1994

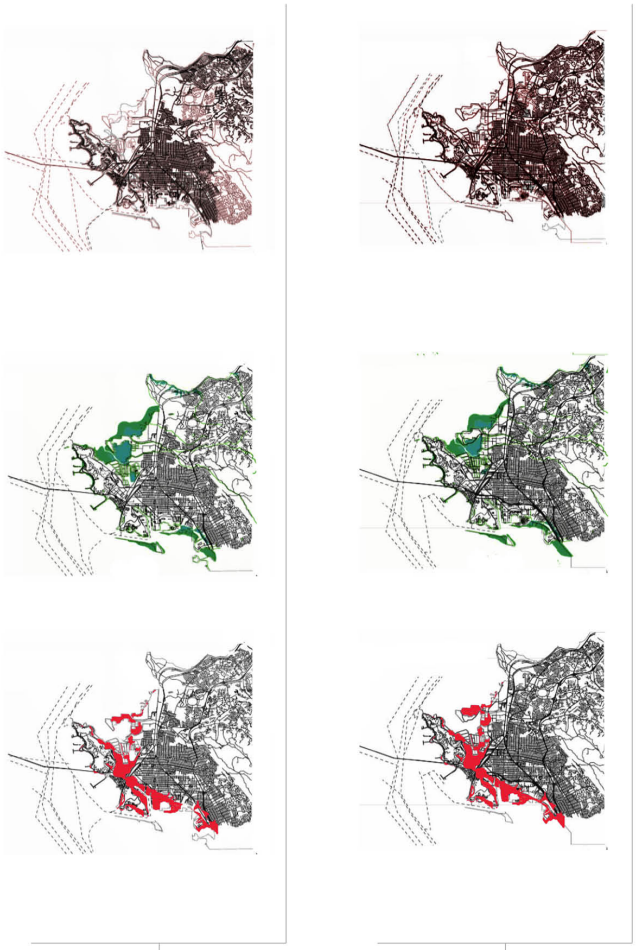
Richmond Parkway

The Parkway is a 7 1/2-mile, four lane scenic expressway providing a speedy link between the northern edge of Richmond (Interstate 80 at Hilltop) and the City's southwest corner (the new I-580 freeway and the Richmond-San Rafael Bridge). The Parkway has fostered development of a large industrially zoned area in northwest Richmond that has historically remained largely underdeveloped, due to poor access.

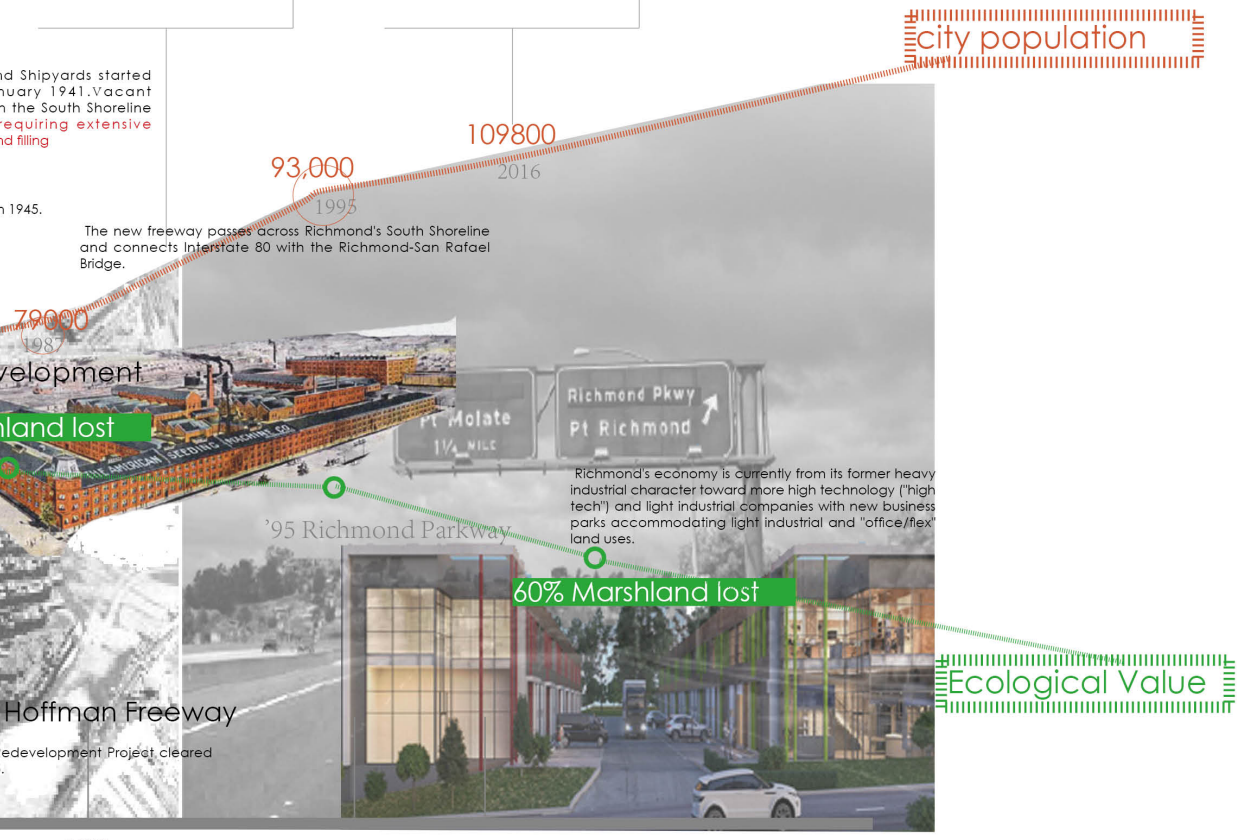
now and future

Richmond covers 56 square miles and has a population estimated at 103,468 (source: CA State Dept. of Finance as of January 1, 2006). Richmond's economy is currently undergoing a major transition from its former heavy industrial character toward more high technology ("high tech") and light industrial companies with new business parks accommodating light industrial and "office/flex" land uses. Biotechnology, in particular, has developed as an important new "niche" in Richmond's growing economy.


Urban Expension
Marsh Lost
Land Fill
6,385 acre Marshland
Tideland filling as part of the harbor dredging in the 1920s
Kaiser Richmor
running in Jar
industrial land i
harbor area,
additional tidelar
101,500
the shipyards closed in
93,700
947
71900
Harbour Redev
42% Marsh
In 1901,the Standard Oil Company built its refinery
1899 the railroad established its western terminus in Point Richmond.
23600
7500
1910
2,150
The earliest inhabitants were the Ohlone Indians, who settled here an estimated 5,000 years ago.
'70s
The Harbor Gate R
war housing in 1955
Ohlone Period
1850
1905
1926
1947
Spainish Era
Early industry
War time booming

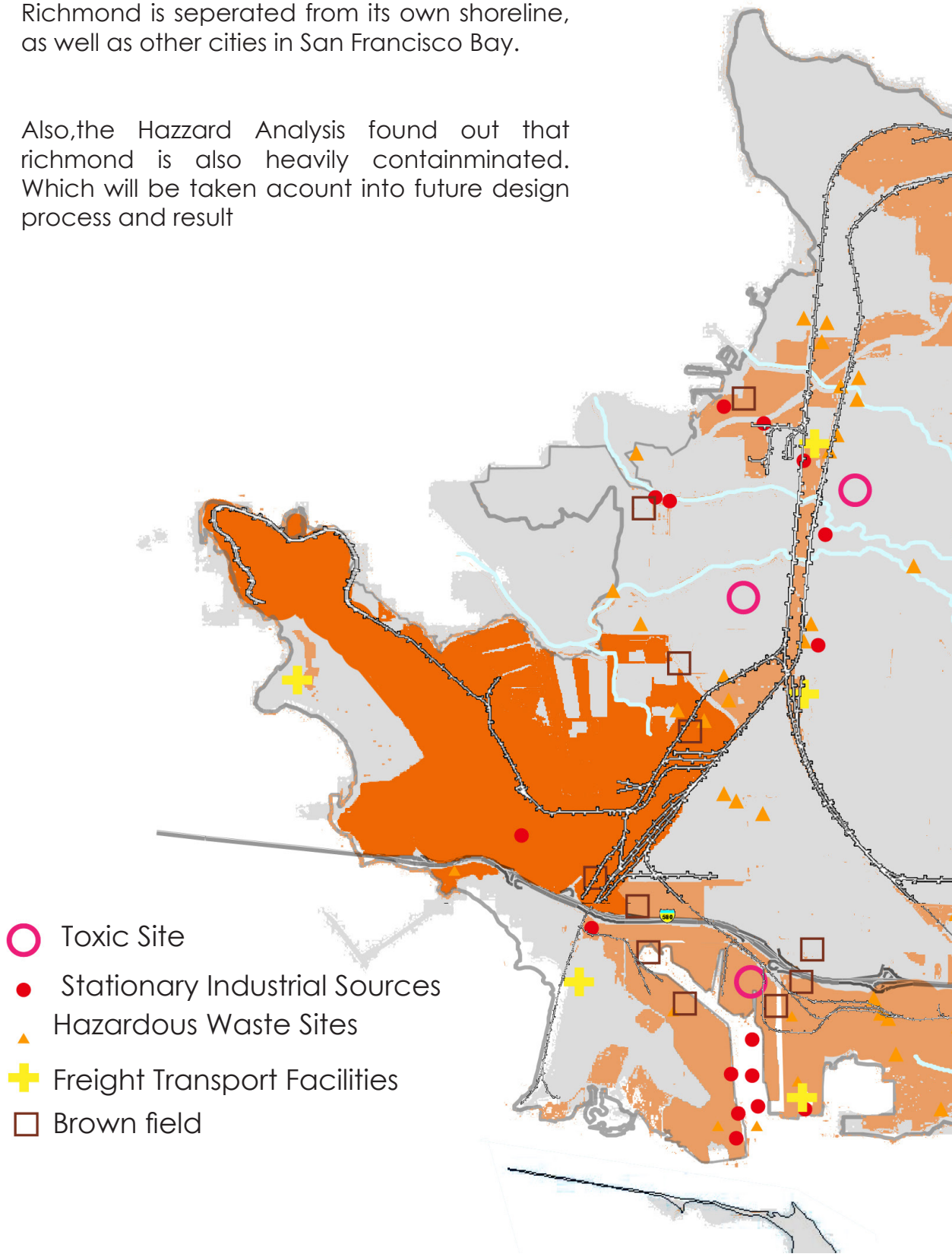


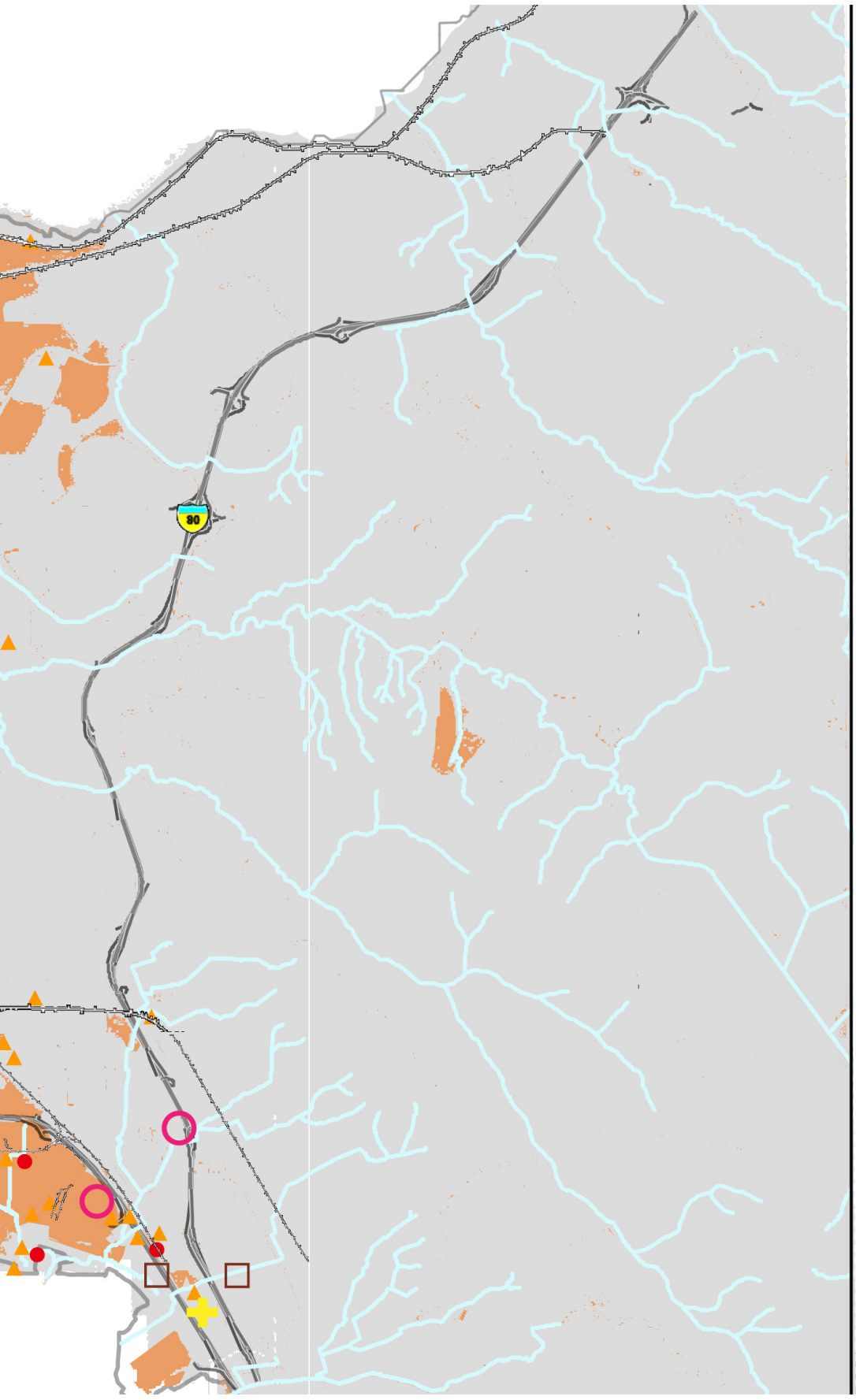
The cross mapping from the patterned movement and the history of Richmond clearly show that. In the process of landscape migration, we can always observed a moment of stability and a critical moment. Thus moments was determinded by its driven forces.
In City of Richmond we can found out that the critical moment for the city vast development is the Kaisher shipyard. And yet in the past few decaded, the city is also supported by heavy industry and its ports.

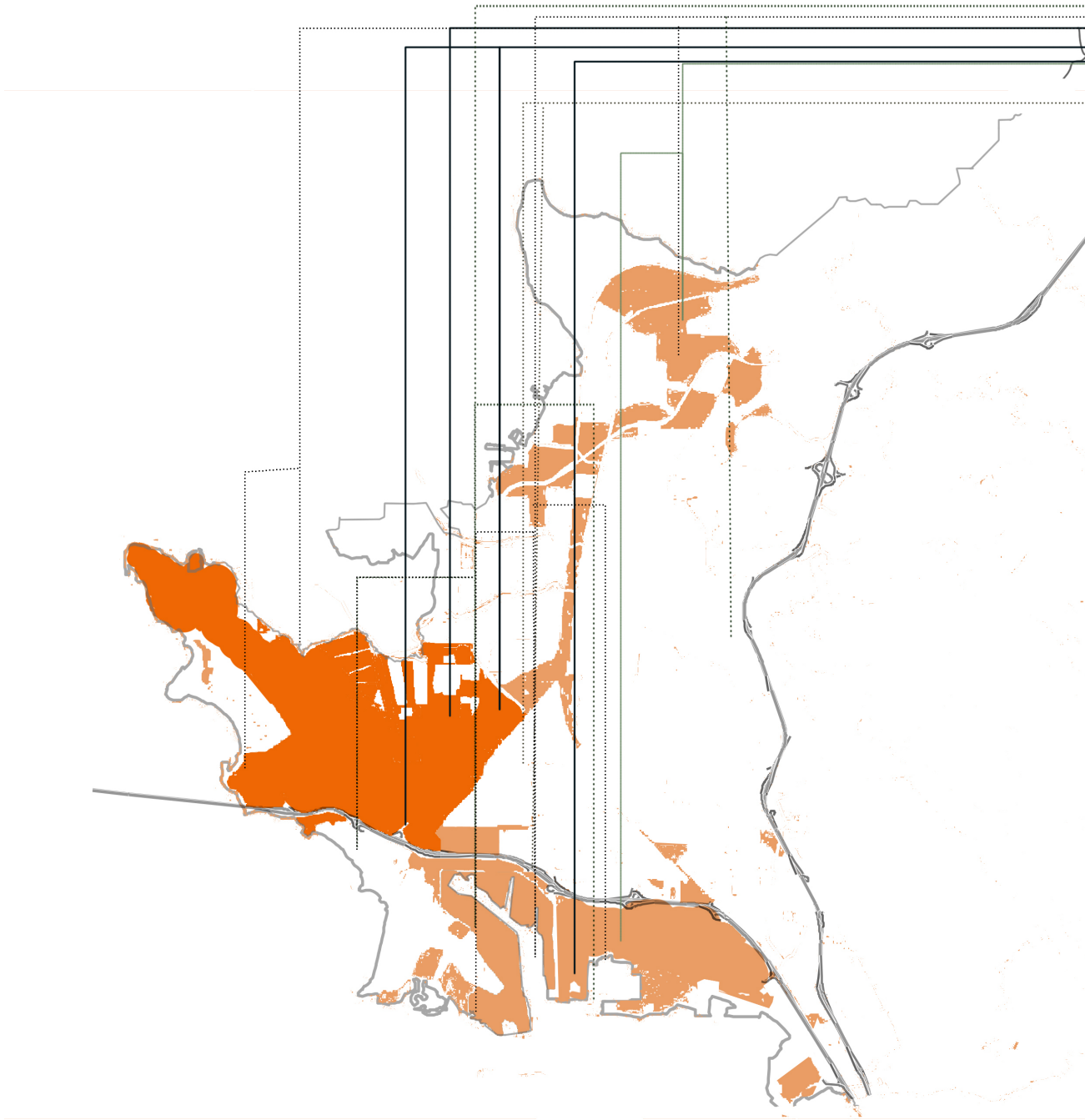


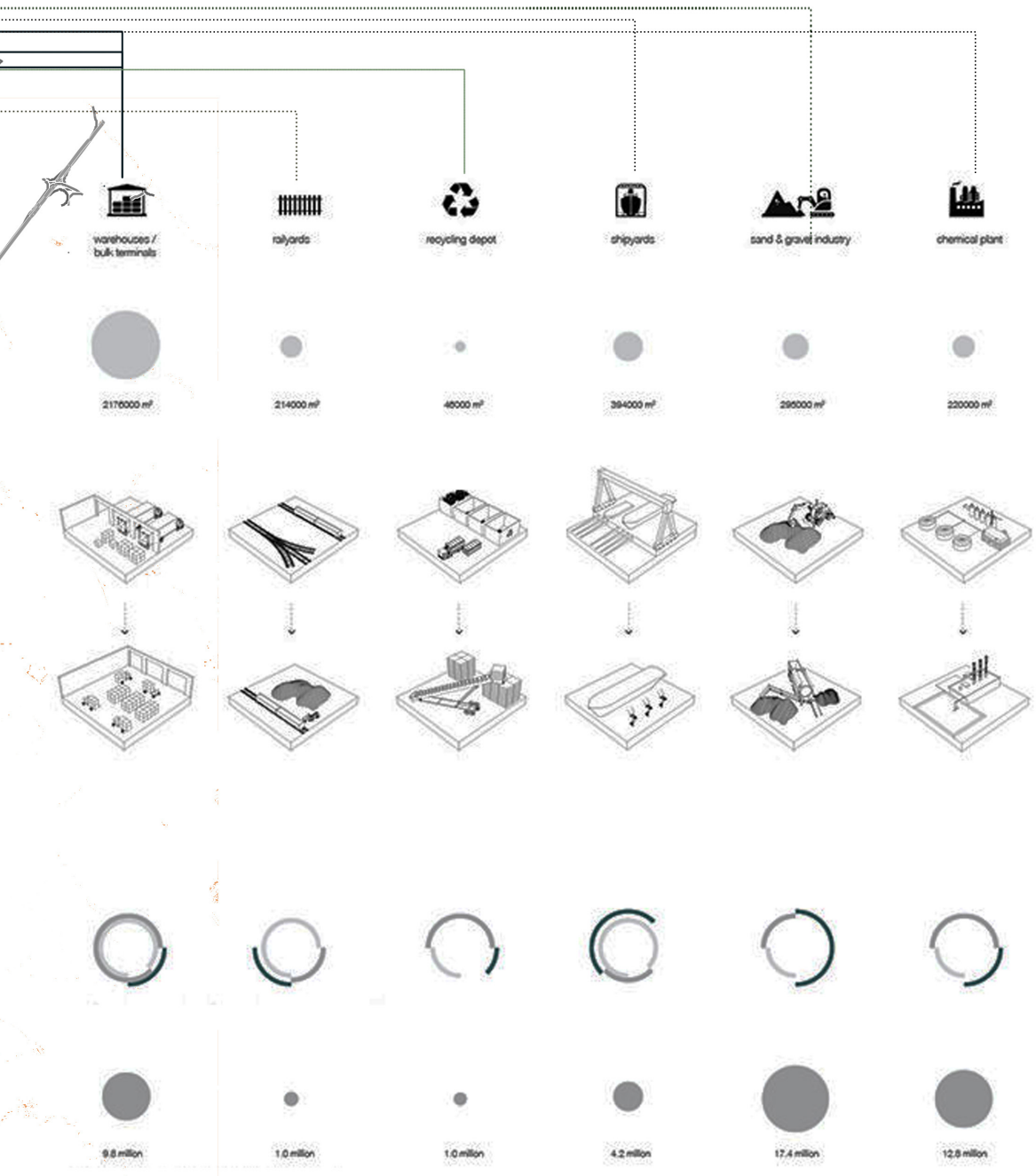
As a city had over 100 years of industial history, Industrial land had cover 1/3 of Richmond. From the anaysis we can see that the city of Richmond is seperated from its own shoreline, as well as other cities in San Francisco Bay.

Also,the Hazzard Analysis found out that richmond is also heavily containminated. Which will be taken acount into future design process and result

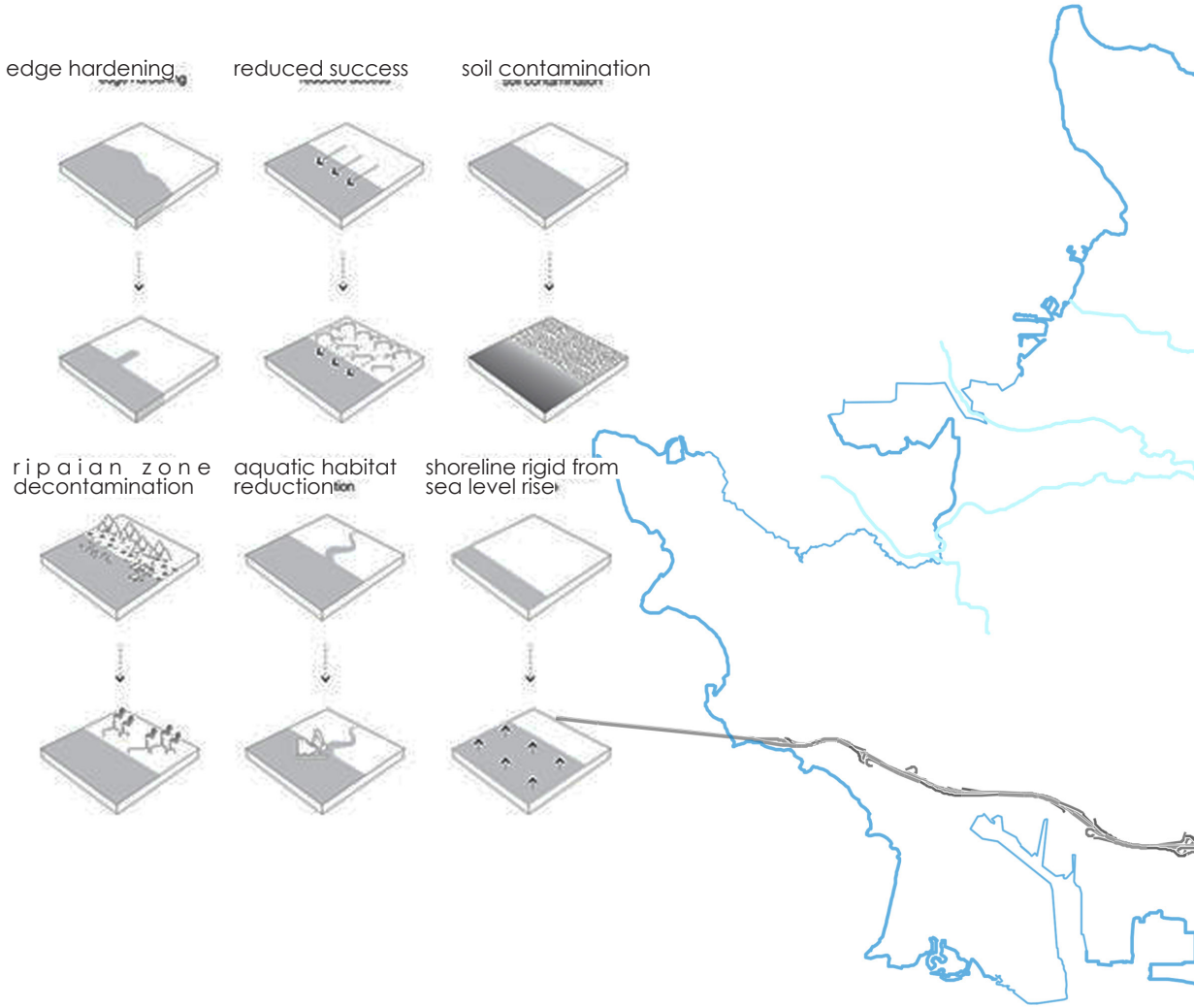


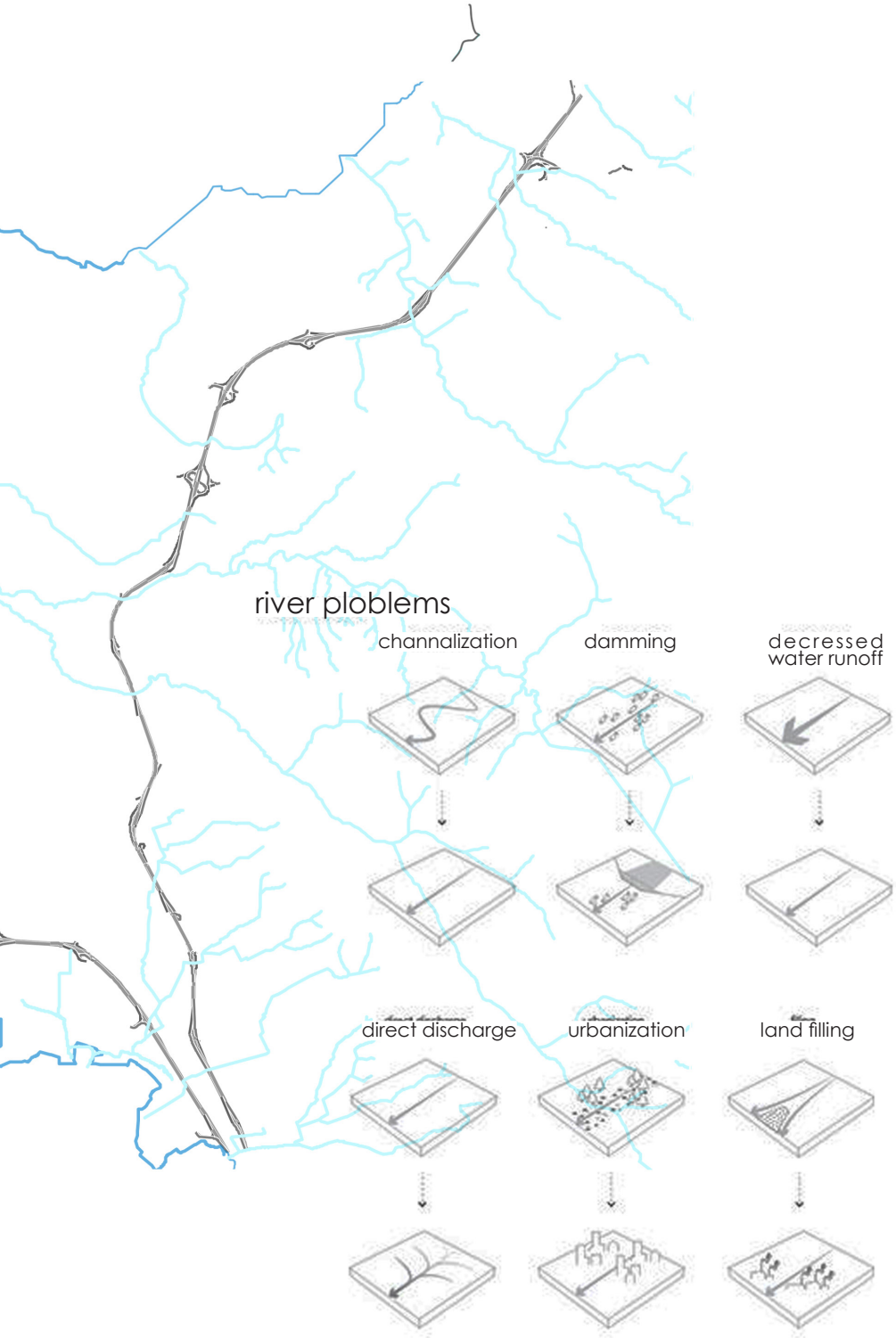

80




warehouses / bulk terminals
railyards
recycling depot
shipyards
sand & gravel industry
chemical plant
2176000 m²
214000 m²
46000 m²
394000 m²
290000 m²
220000 m²
9.6 million
1.0 million
1.0 million
4.2 million
17.4 million
12.8 million

costal problems



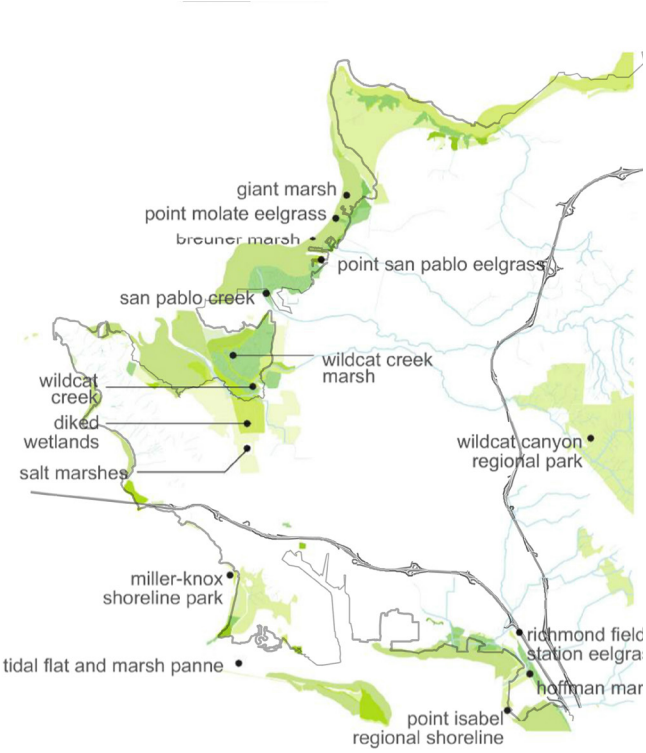

river ploblems
channalization
damming
decressed water runoff
direct discharge
urbanization
land filling

Problem statement

By mapong Richmond and cross mapping data from ecological, historical , industrial structural and demograpgical aspect.
We can see that the city of Richmond is facing the following 5 problems:

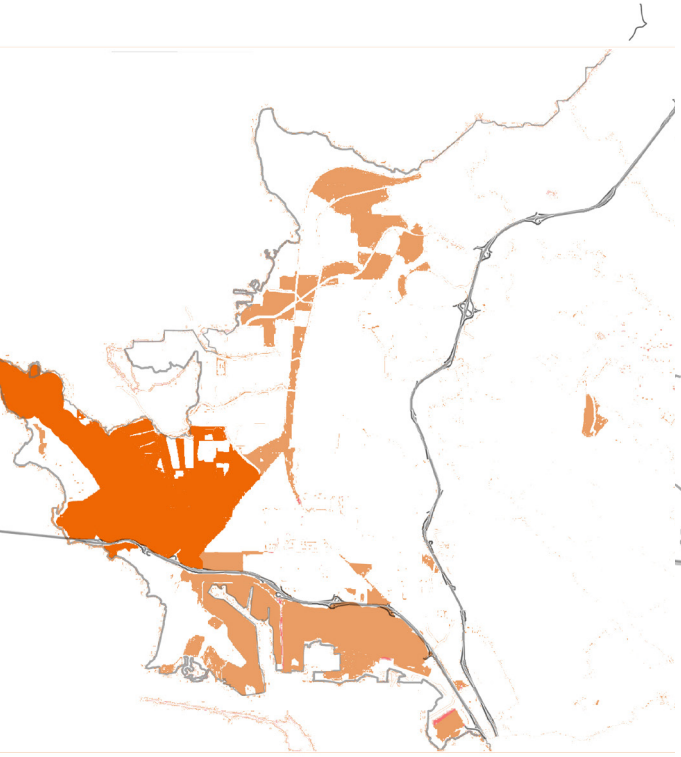
- ecological value lose
- threat of sea level rises
- spatial and ethical segregation
- connection to the bay and to other city
- Industial remains and polution remediation

exsiting ecological value

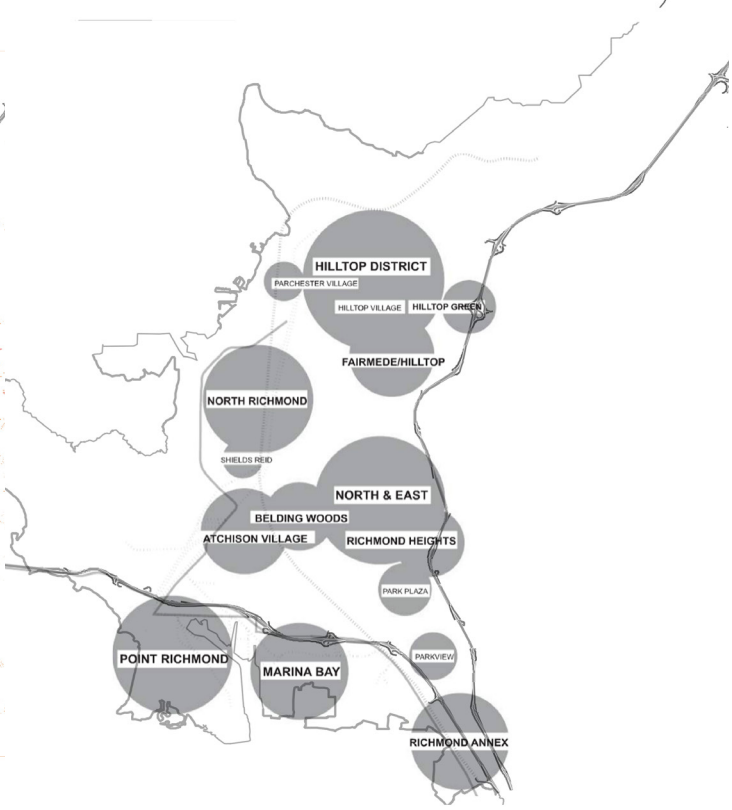


Historical city center

industrial site

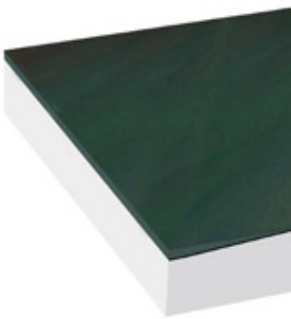


exsiting seperated neighbourhood



Richmond Spatial Quality Analysis

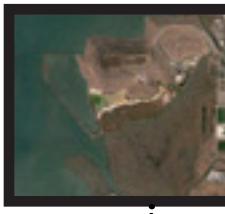
bayland industry
North Richmond + Castro Cove: Richmond, Ca



1905

1959

Current

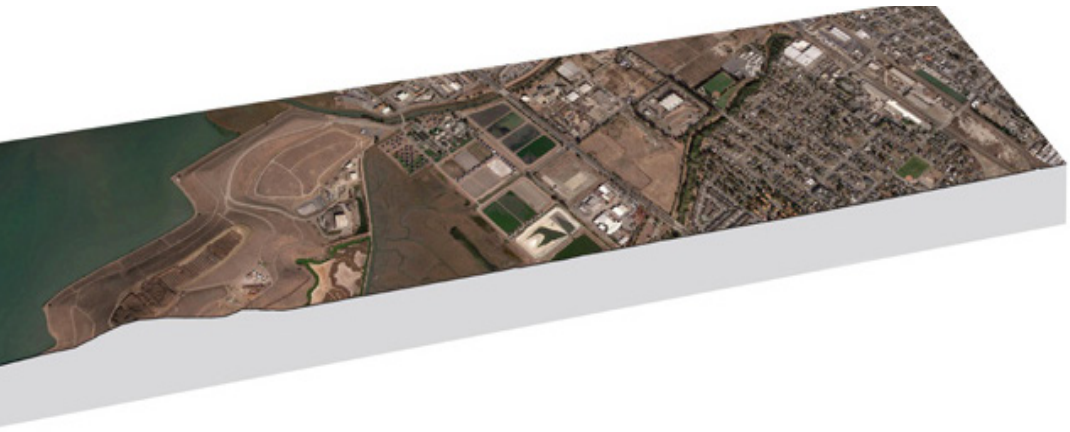


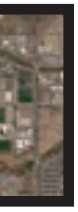
2007

Castro Cove marsh restoration

2012

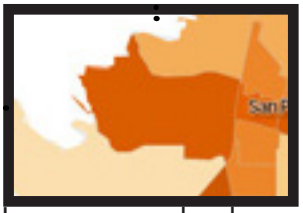
Chevron fire





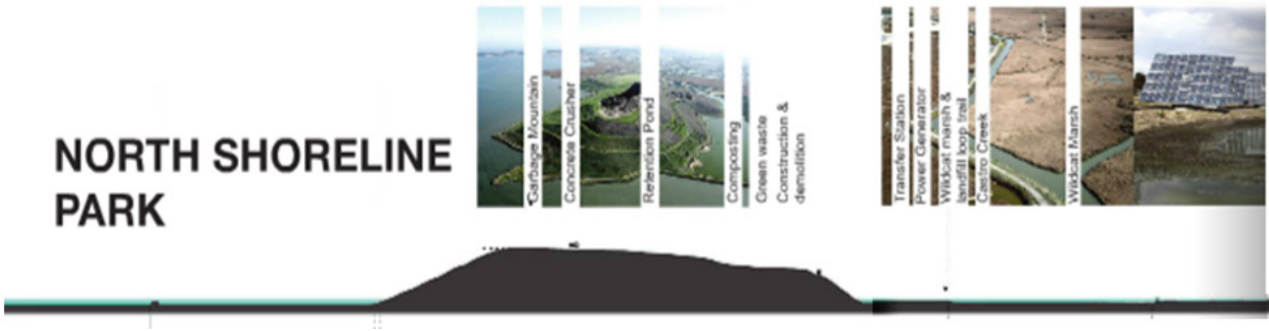
North Richmond

2013

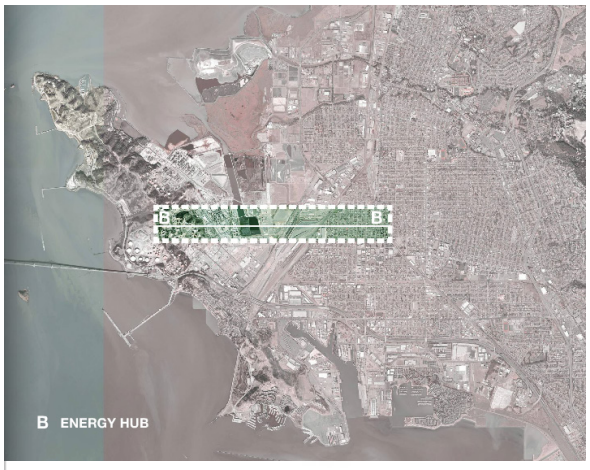


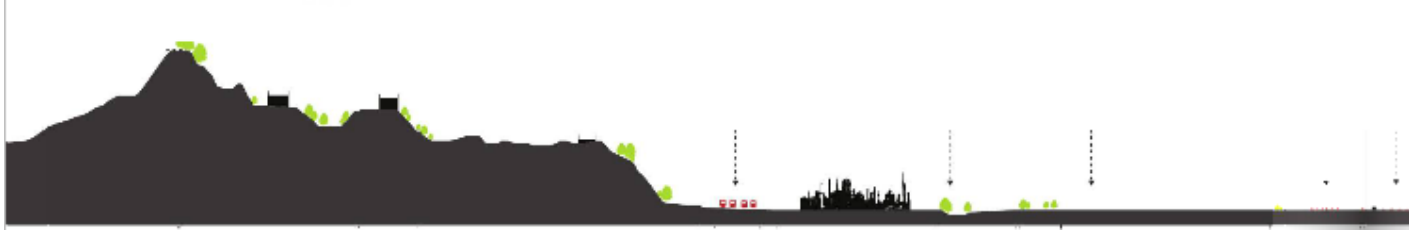
Income below poverty level

NORTH SHORELINE PARK



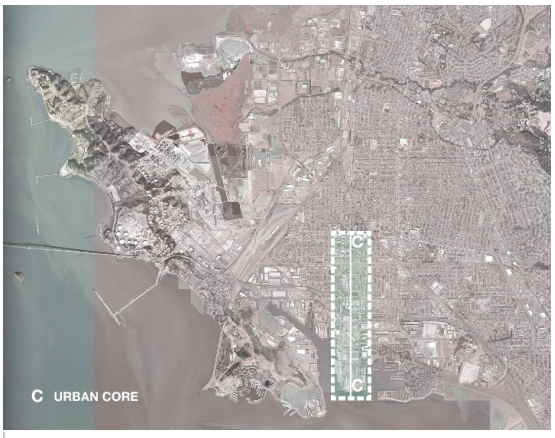
West County
Waste Water
Richmond Parkway
Metal recycling
Vacant Land?
West County
Resource Recovery
North Richmond
Ballpark
Verde
Elementary School
Widcat Creek Trail
Dove Distributors/
Brownstone Furniture
STOP
Pick - n - Pull
Food Market
San Pablo
neighborhood
Dover
Elementary School


B
B ENERGY HUB




INTERSECTION OF 580 AND BNSF YARD

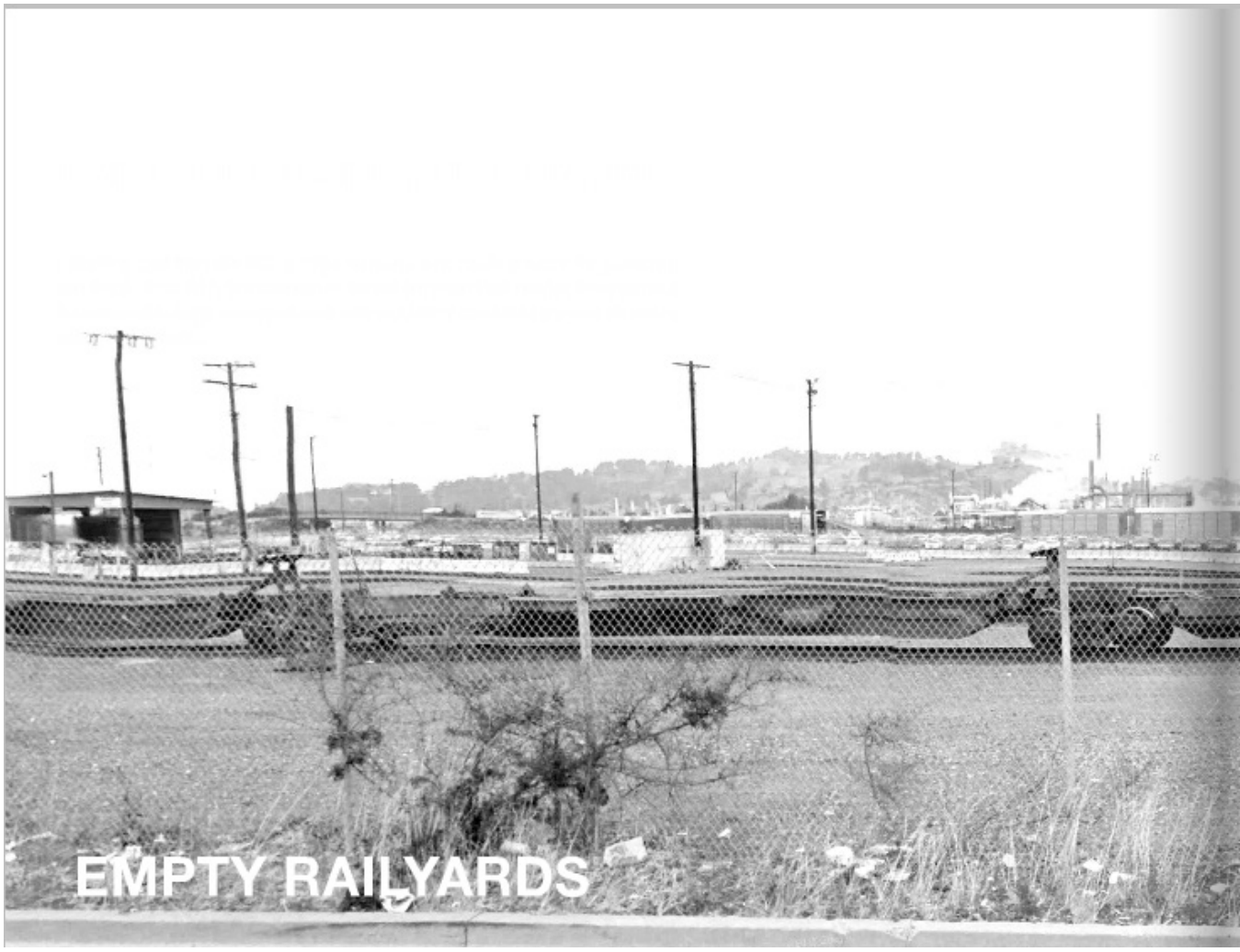
Major Threshold
BNSF Railway
Intermodel
Large
Paking Lot
Transportation
Infrastructure
Major Threshold
Peres Elementary
School
Elin Park
Greater Abundant
Life Ministries
TTransportation
Clnfrastructure


C URBAN CORE

URBAN CORE

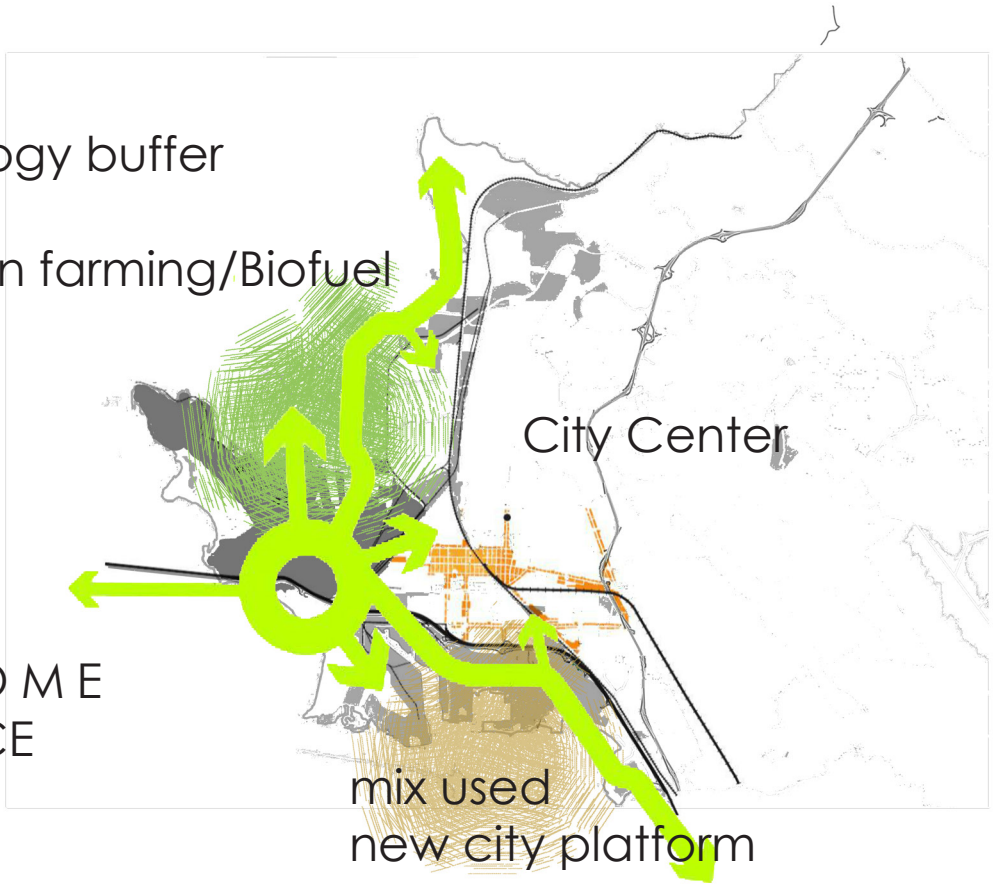

WWII Ropak The Rivitar
Ford Assembly Plant
Parking Lot


Port Facilities
Port of Richmond Engineering


EMPTY RAILYARDS

Shipping Facilities
10 minutes
Freeway
Businesses
MLK PARK
Nystrom Elementary School
Leadership Public Schools
Richmond Greenway
American Laboratory Supply
West Contra School District
Memorial Park
Full Gospel Temple
Bart Station
Vacancy
Kaiser Hospital
Full Gospel Temple

The shoreline view analysis bring to the conclusion that , not only the shoreline has been occupied by industial facilities, but also in visually the richmond are totally block. The city lack quality platform for reaching out to the bay.



play

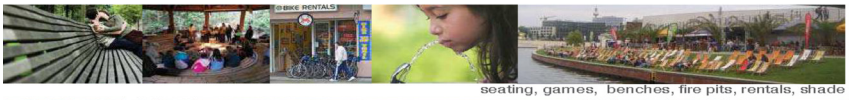
play grounds, sports courts, game tables, dog runs

learn

monitoring, testing, experiments, restoration, environmental technologies, nurseries, test plots

eat

stands, kiosks, picnics, groups, cafes, restaurants, markets



amenities

seating, games, benches, fire pits, rentals, shade structures, drinking fountains

culture

festival, memorial, historic, music, regional gatherings, local groups

art

large-scale, environmental, dynamic, media, local, international, integrated

gardens

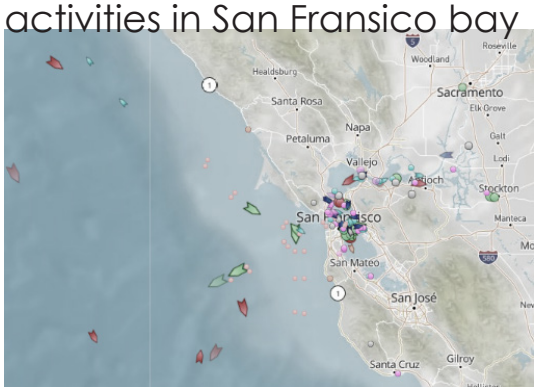
community, native, food, stewardship, public

services

park programing, restrooms, information, poilce, first aid, bike repair, community center

Sedimentation as infrastural resources

incresing trading are demanding for more and more dredging activities in San Fransico bay

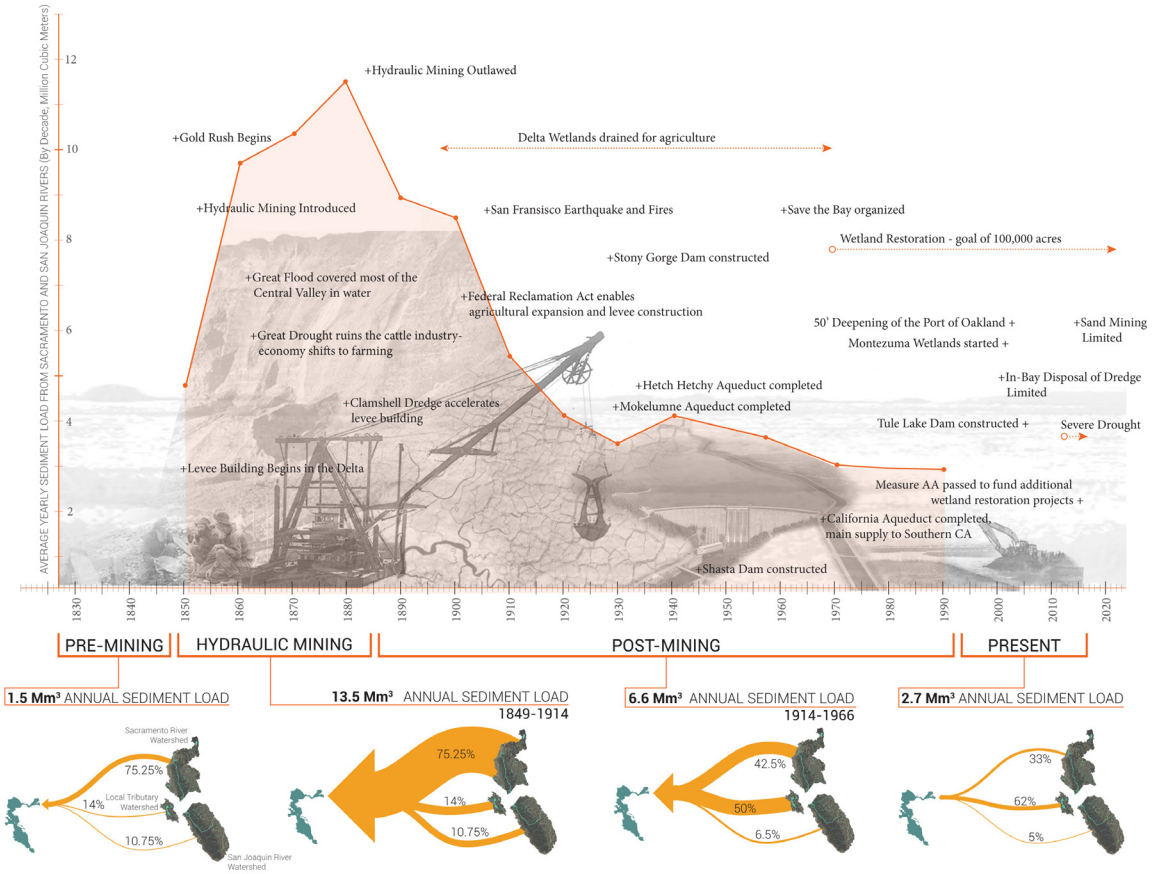


real time marine traffic in San Francisco Bay

incresing trading are demanding for more and more dredging activities in San Fransico bay

It's time more people talked about dredge. The techniques of dredging—and the galaxy of technologies that surround it—constitute perhaps the greatest unrecognized landscape architecture project in the world. Dredge shapes our beaches and waterways, it plays a key role in global shipping networks and in coastal real estate. Silt is scooped from sea floors to deepen underwater highways for container ships, it is diverted from river basins to control flood-prone urban waterways, it is collected, sorted, managed, and moved to cap and treat contaminated grounds. Anthropogenic action now moves more sediment annually than geologic and natural processes—yet this reshaping of the earth's surface is invisible to the average observer, and under-explored in contemporary design practice.

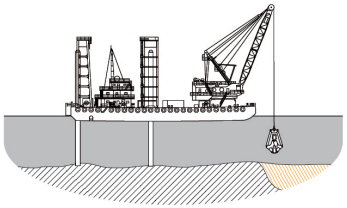
In short, sediment is critical infrastructure to our nation's economic and ecologic health. Though invisible, sediment infrastructure (like much American infrastructure) is in crisis. Dredging budgets are dropping, navigation channels are filling up, sediment extraction expenses are rising, environmental regulations are tightening, dams are backing up, and disposal sites are at capacity. A lack of sediment is causing lower Louisiana to disappear. Too much sediment required NYC to conduct a massive dredging project to ensure that trade with Asia could continue. Any human settlement near a river or shoreline must grapple with erosion control.



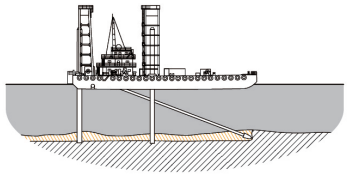
Thie analysis cross mapping reveal that after the golden rush, Sedimentation is Delta-Bay area are facing a down fall. The sediment resources should be treated as valuiable material that could inplementing the shoreline erosion.

Even more disturbingly, sediment is treated as a waste product or 'spoils'- a material to be dumped rather than a life-giving resource and ecological asset. At a national scale, sediment management is broken, a one-way system of extraction and deposition that reveals its weakest points during disasters like Hurricane Katrina, where sediment starved wetland buffers and engineered hydrologic control structures failed catastrophically. In this context, what is the future of sediment management, and how can designers engage in crafting productive sedimentary futures?

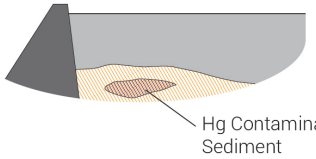
Sediment Sinks



Clam Shell Dredge
$10.46/CY

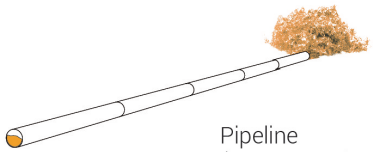


Hydraulic Dredge
$8/CY

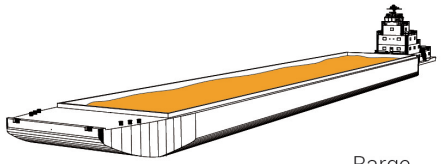


Removal of Sediment Behind Dams
$10.50/CY

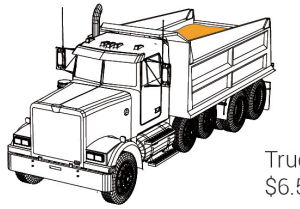
Conveyance



Pipeline
$0.05/CY/mi

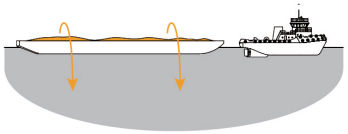


Barge
$1.14/CY/mi

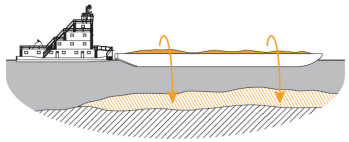


Truck
$6.50/CY/mi

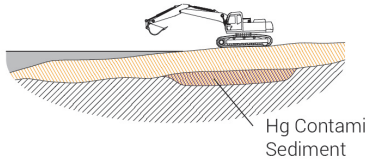
Sediment Sources



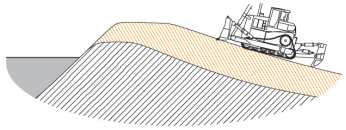
Deep Ocean (8,200-9,840') $23-25/CY
Open Ocean (36-47) $11/CY



Near Shore (29-46') $11/CY
In-Bay (12-372') $9-11/CY



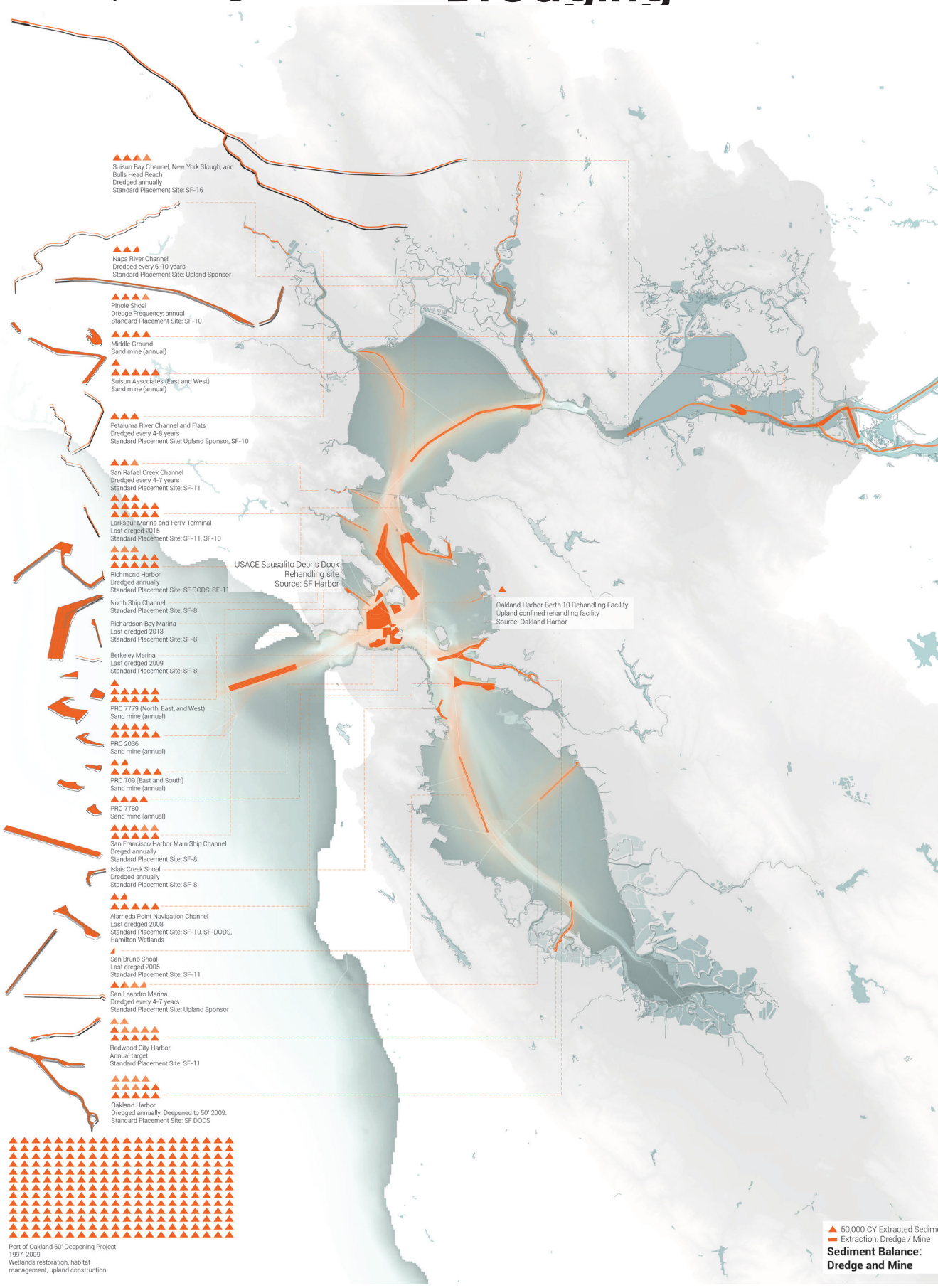
Wetland Restoration $25-30/CY
Contaminated Sediment Disposal $31-55/CY

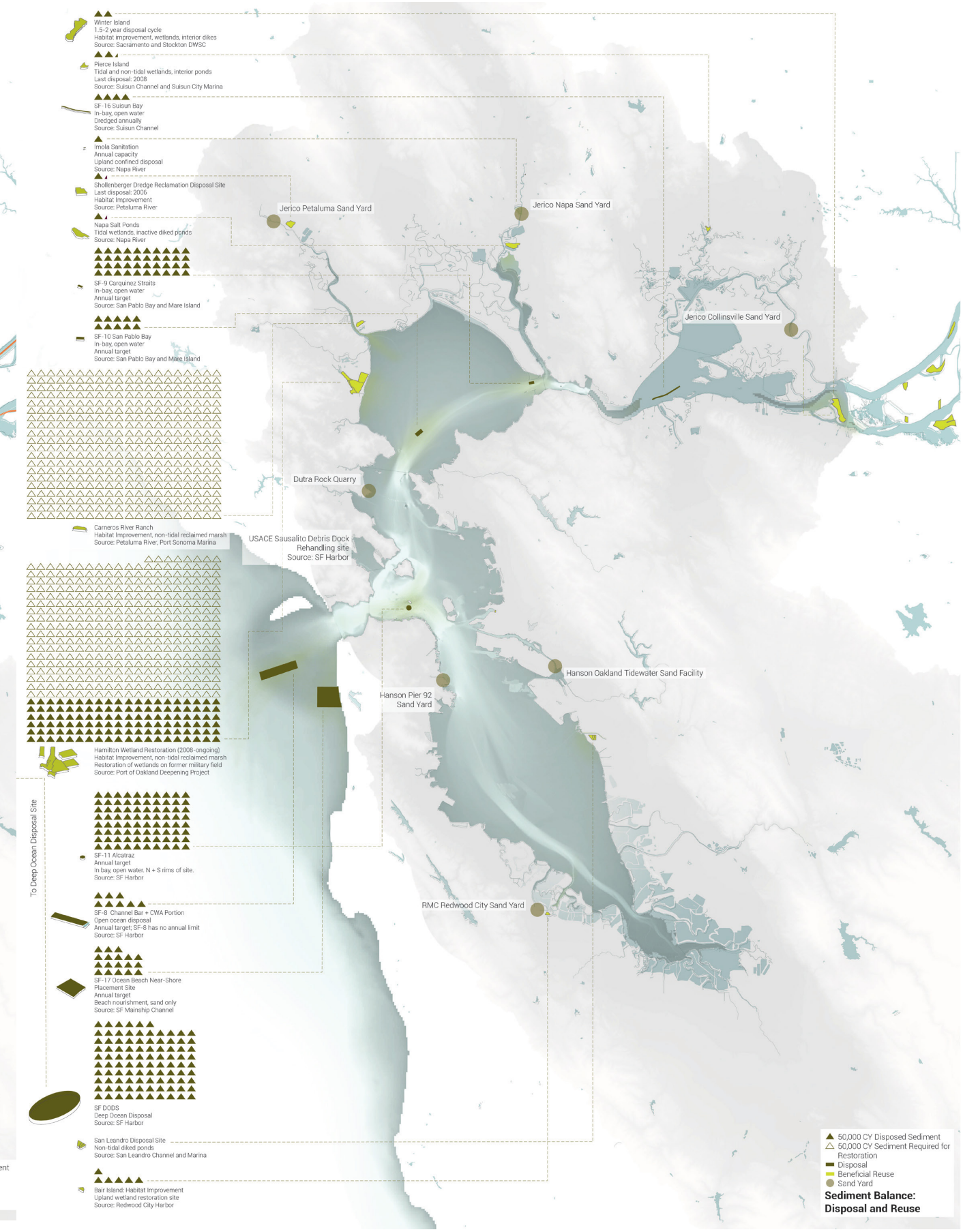


Levee Maintenance $24/CY

Landscape Migration

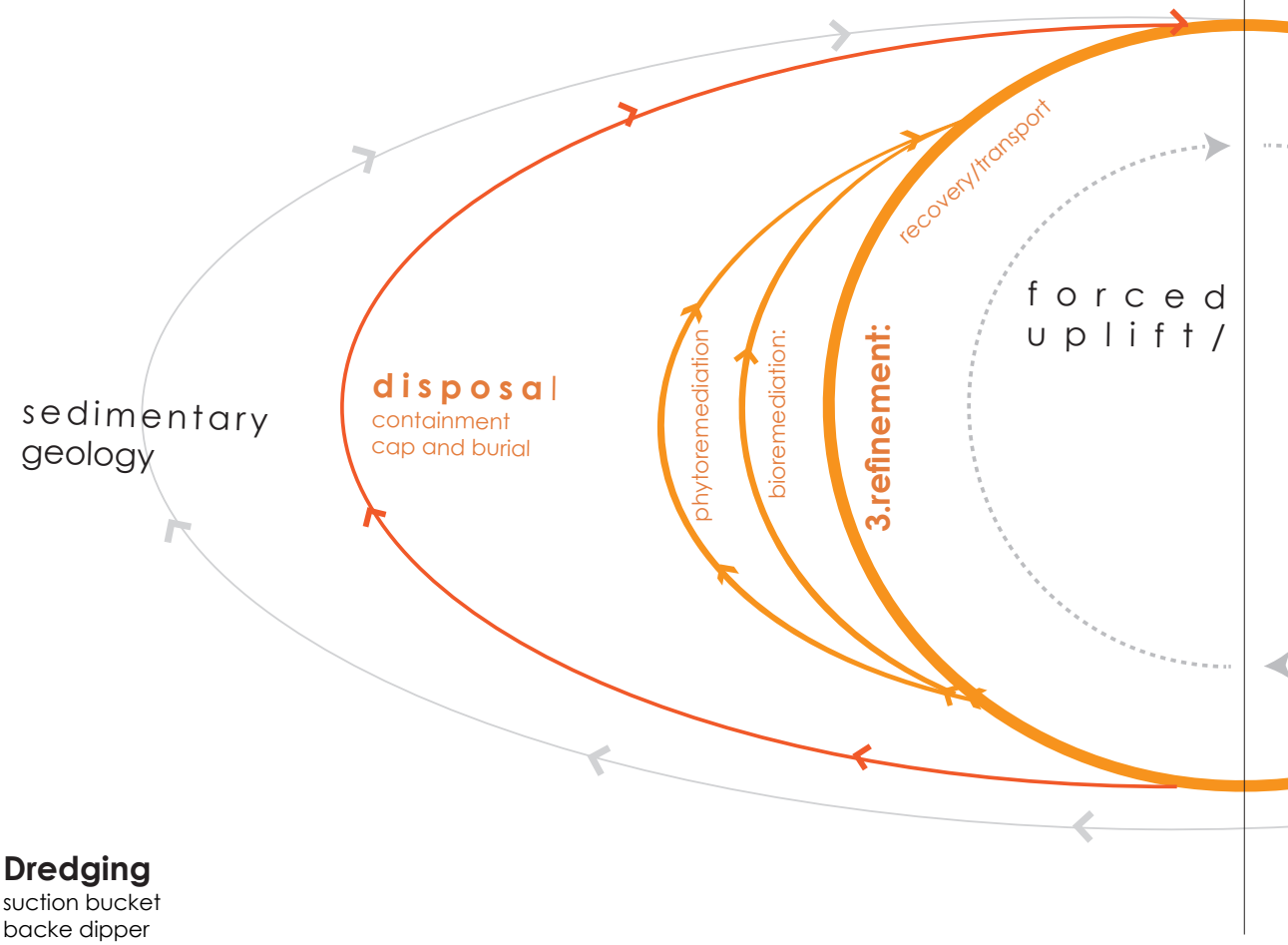
Dredging




Winter Island
1.5-2 year disposal cycle
Habitat improvement, wetlands, interior dikes
Source: Sacramento and Stockton DWSC
Pierce Island
Tidal and non-tidal wetlands, interior ponds
Last disposal: 2008
Source: Suisun Channel and Suisun City Marina
SF-16 Suisun Bay
In-bay, open water
Dredged annually
Source: Suisun Channel
Imola Sanitation
Annual capacity
Upland confined disposal
Source: Napa River
Shollenberger Dredge Reclamation Disposal Site
Last disposal: 2006
Habitat Improvement
Source: Petaluma River
Napa Salt Ponds
Tidal wetlands, inactive diked ponds
Source: Napa River
SF-9 Carquinez Straits
In-bay, open water
Annual target
Source: San Pablo Bay and Mare Island
SF-10 San Pablo Bay
In-bay, open water
Annual target
Source: San Pablo Bay and Mare Island
Carneros River Ranch
Habitat Improvement, non-tidal reclaimed marsh
Source: Petaluma River, Port Sonoma Marina
Hamilton Wetland Restoration (2008-ongoing)
Habitat Improvement, non-tidal reclaimed marsh
Restoration of wetlands on former military field
Source: Port of Oakland Deepening Project
To Deep Ocean Disposal Site
SF-11 Alcatraz
Annual target
In bay, open water, N + S rims of site.
Source: SF Harbor
SF-8 Channel Bar + CWA Portion
Open ocean disposal
Annual target; SF-8 has no annual limit
Source: SF Harbor
SF-17 Ocean Beach Near-Shore
Placement Site
Annual target
Beach nourishment, sand only
Source: SF Mainship Channel
SF DODS
Deep Ocean Disposal
Source: SF Harbor
San Leandro Disposal Site
Non-tidal diked ponds
Source: San Leandro Channel and Marina
Bair Island: Habitat Improvement
Upland wetland restoration site
Source: Redwood City Harbor
Jerico Petaluma Sand Yard
Jerico Napa Sand Yard
Jerico Collinsville Sand Yard
Dutra Rock Quarry
USACE Sausalito Debris Dock
Rehandling site
Source: SF Harbor
Hanson Oakland Tidewater Sand Facility
Hanson Pier 92
Sand Yard
RMC Redwood City Sand Yard
50,000 CY Disposed Sediment
50,000 CY Sediment Required for Restoration
Disposal
Beneficial Reuse
Sand Yard
Sediment Balance:
Disposal and Reuse

Dredge Circle as Design Stretagy

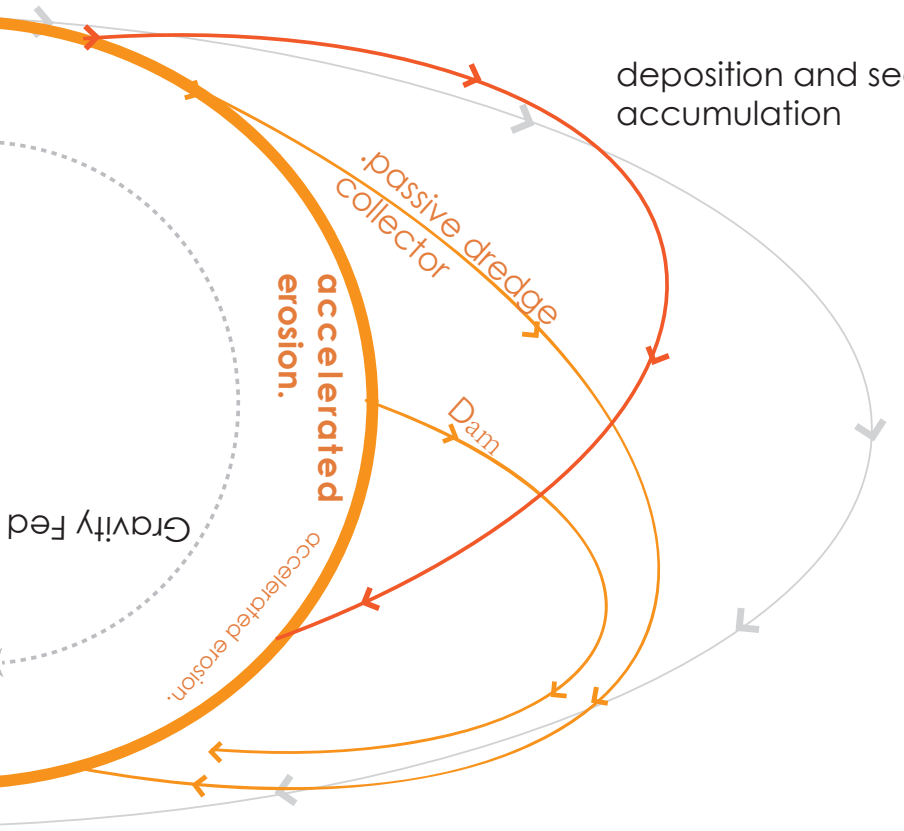
bioremediation: Bioremediation is a waste management technique that involves the use of organisms to remove or neutralize pollutants from a contaminated site
phytoremediation:use plante to clease water\soil\ air\.....



Dredging
suction bucket
backe dipper
water injection
pheumatie
belevler
krabbelaar
snagboat
amphibious
submersible

iagram of the Dredge Cycle. The natural paths of erosion and sedimentary geology (white) are overlaid by the
anthropogenic inputs. The diagram is divided between gravity-fed erosive paths on the right and forced uplift on the le
the orbits are from the center, the slower they are. At the bottom, dredging is the key moment at which sediments shift fr

.erosion control:
cellular confinement
systemsslit fences
ringnets
detention basins
sand bags
(failure/lack of maintainness)



RE-USE/PLACEMENT

containment area
aquaculture
construction material
decorative landscape products
topsoil
shore protecrion
fish and wildlife habitats
fisheries improvement
wetland restoration
beach nourishment
born creation
capping
lad creation
land improvement
replacement fill

alternately accelerating and decelerating paths (orange) produced by various
eft. Distance from the center of the diagram abstractly represents time -- the farther
rom being under the influence of gravity to defying gravity.

http://inframanage.com/urbanization-1950-2050-economist-magazine-interactive-timeline-infrastructure-management-perspective/

Dredging event in San Francisco Estuarine

SAN PABLO BAY+ SAN FRANCISCO BAY

Harbor deepening projects abound, exposing aquatic habitats to salinity intrusion

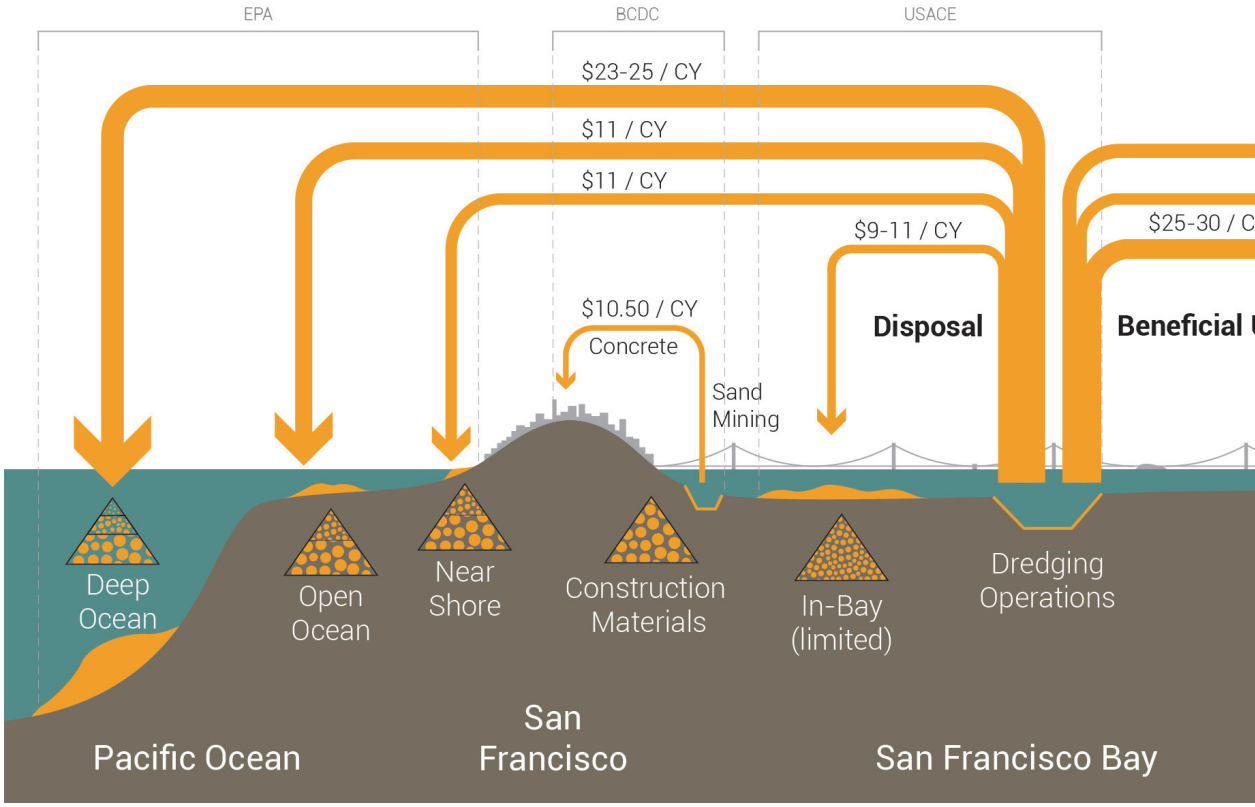
CHANNELS + DREDGING
Clamshell dredge were used to build levees and deepen channels for navigation

RESIDENTIAL AND INDUSTRIAL AREA
Increased Metal Usage and Chemical Sources of Waste Discharge to the Bay due to Urbanization and Industrialization

SEDIMENT SOURCES

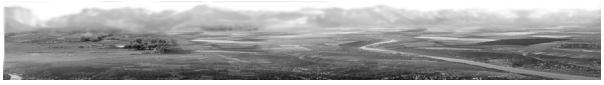
River flows provided water fo agriculture
but also threatened livelihood with flooding.

ISLANDS + LEVEES
In the 1850's, homesteaders dredge channels and used the material to build u levee edges.
By the 1950s, the bay delta began t experience net erosion, as sediment input vanished.
Farm land is subsiding and levees are at risk o failure.



SACRAMENTO RIVER
Basin : 27,580 sq mi

SAN JOAQUIN RIVER
Basin : 31,800 sq mi

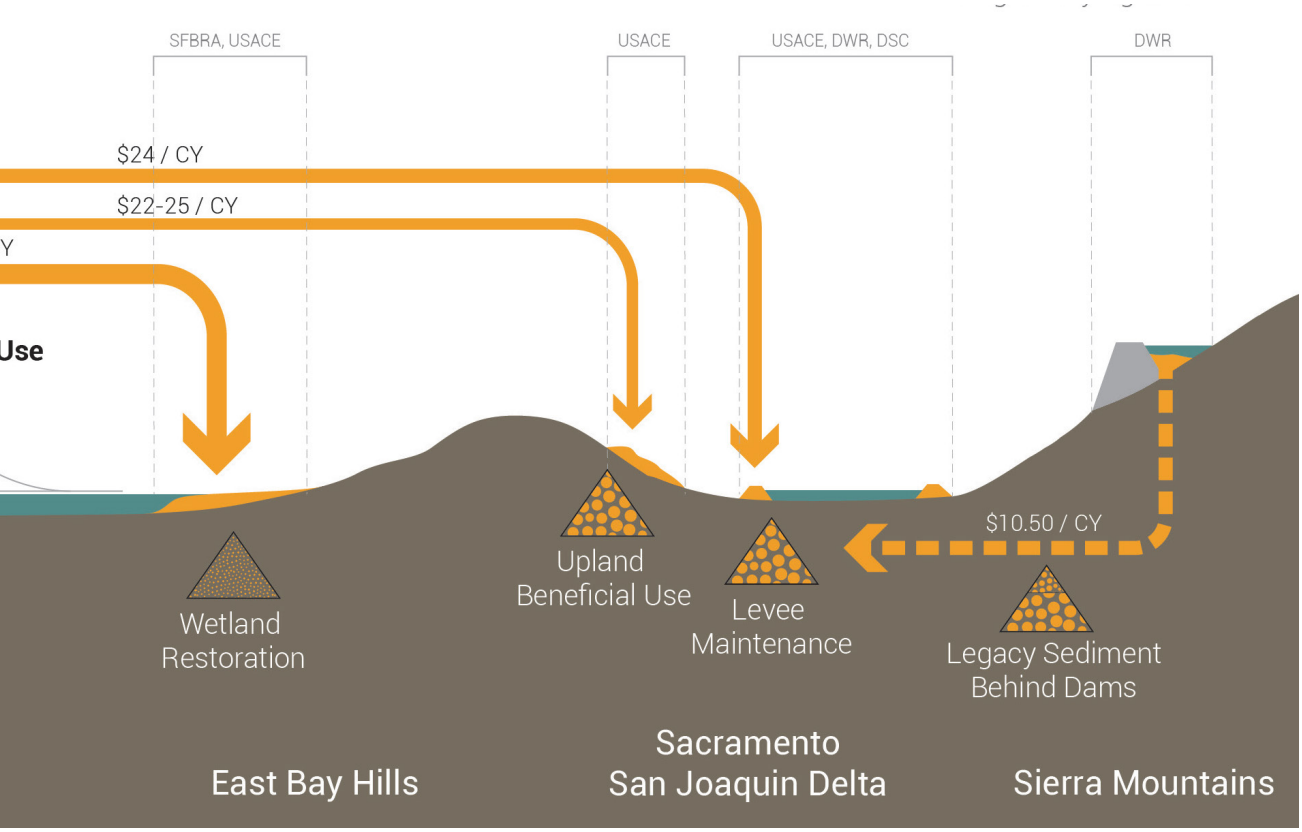


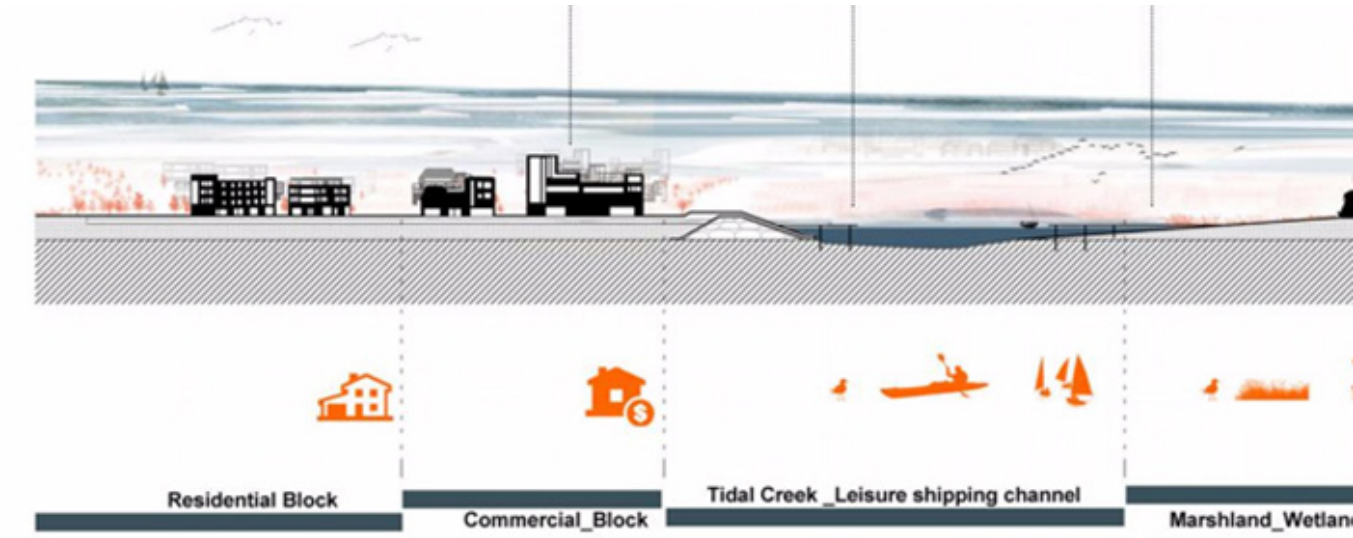
SEDIMENT SINKS + SOURCES
Agricultural Use

Kings Canyon National Park
SEDIMENT SOURCES

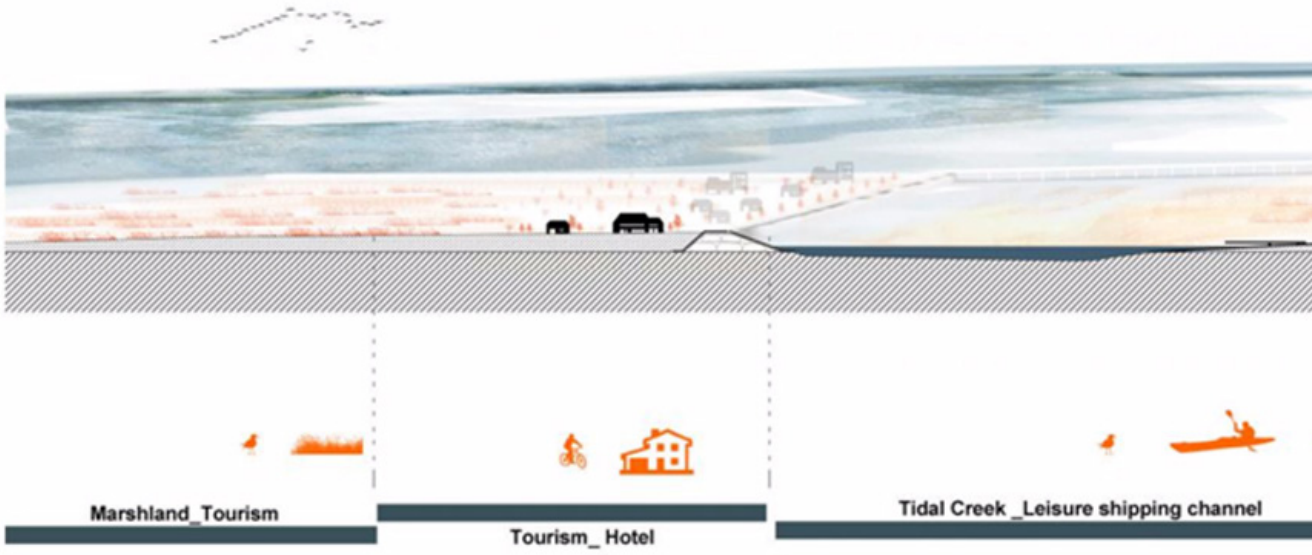
Hydraulic mining in the late 1800's generated huge sediment runoff from the Sierra Nevadas. Today, sediment inputs come from urbanization and snowmelt.

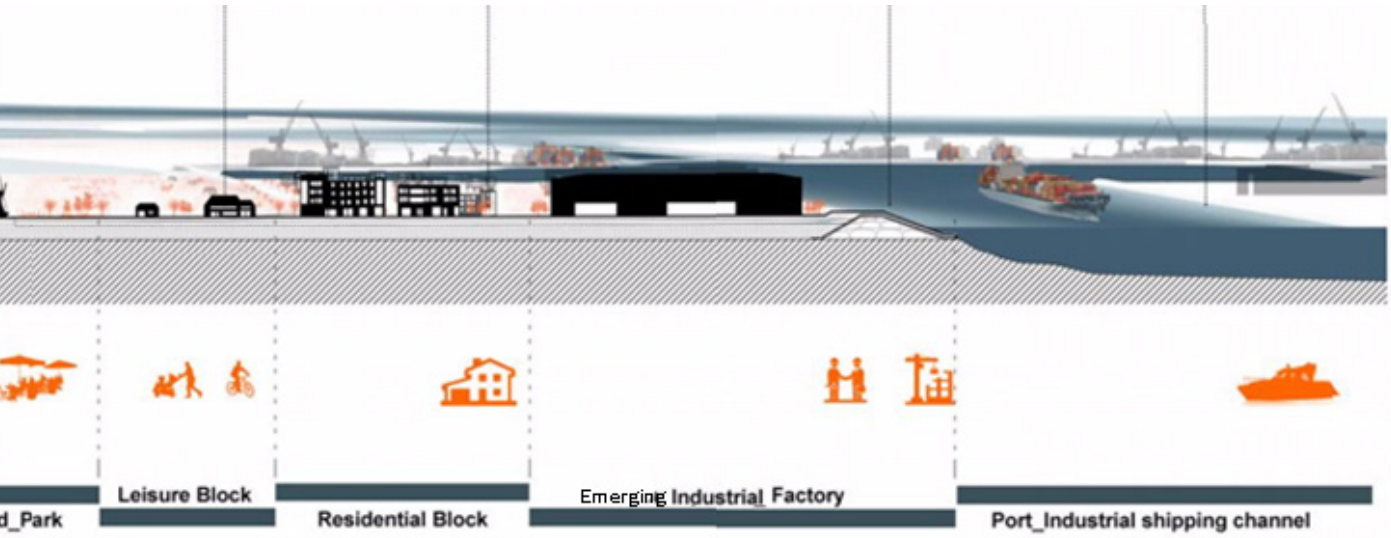
WATER INFRASTRUCTURE IN THE FOOTHILLS
However, sediment inputs are limited today, as dam and water infrastructure projects trap sediment upstream.



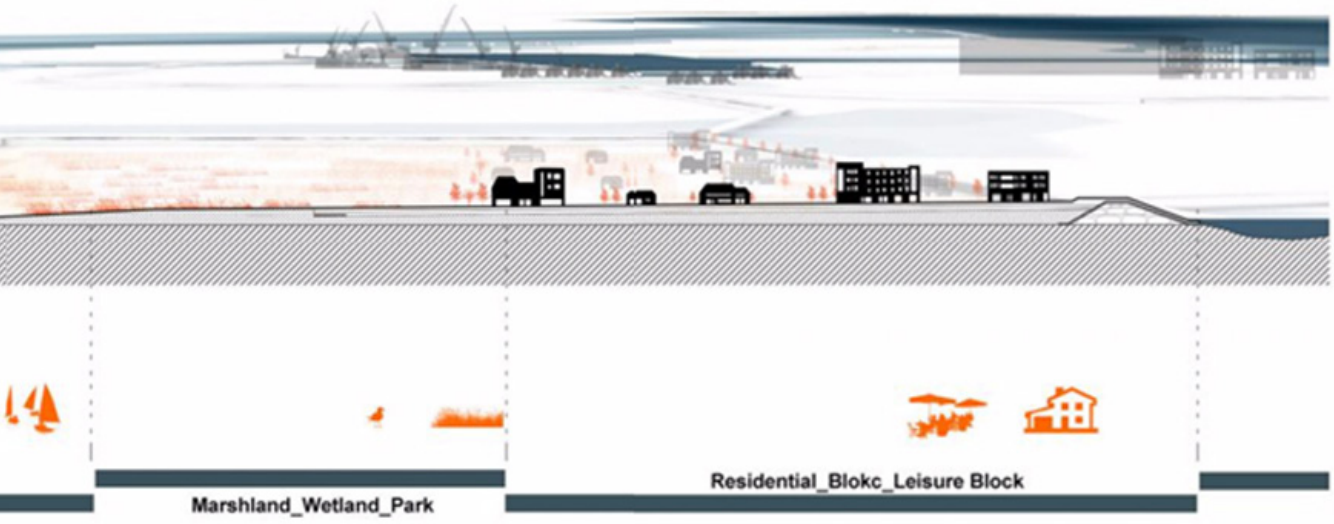

Residential Block
Commercial_Block
Tidal Creek _Leisure shipping channel
Marshland_Wetlan


Residential Block
Industrial_Factory


Marshland_Tourism
Tourism_ Hotel
Tidal Creek _Leisure shipping channel


d_Park
Leisure Block
Residential Block
Emerging Industrial Factory
Port_Industrial shipping channel

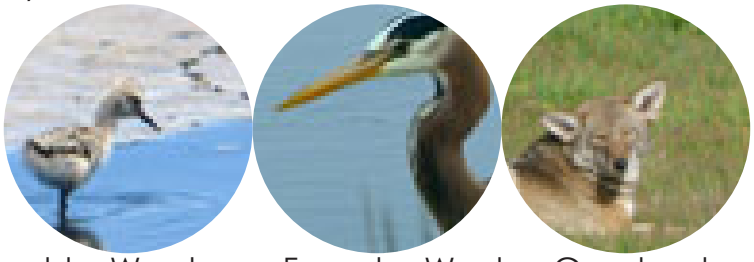

Port
Warehouse
Industry Area_ Factory
Main shipping channel


Marshland_Wetland_Park
Residential_Blokc_Leisure Block

Dredging impact on Ecosystem

Pacific Ocean Coastal Scrub Sand Dunes

San Francisco Bay Oak Woodlands Riparian

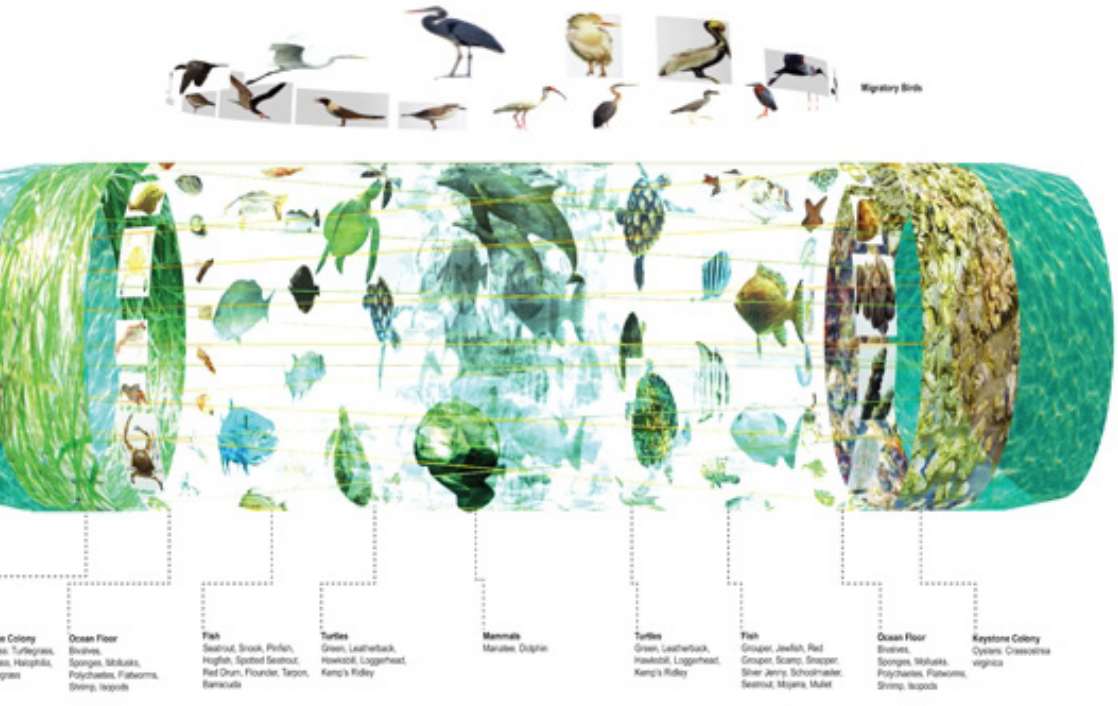


Salt Water Wetlands Fresh Water Wetlands Grasslands

people

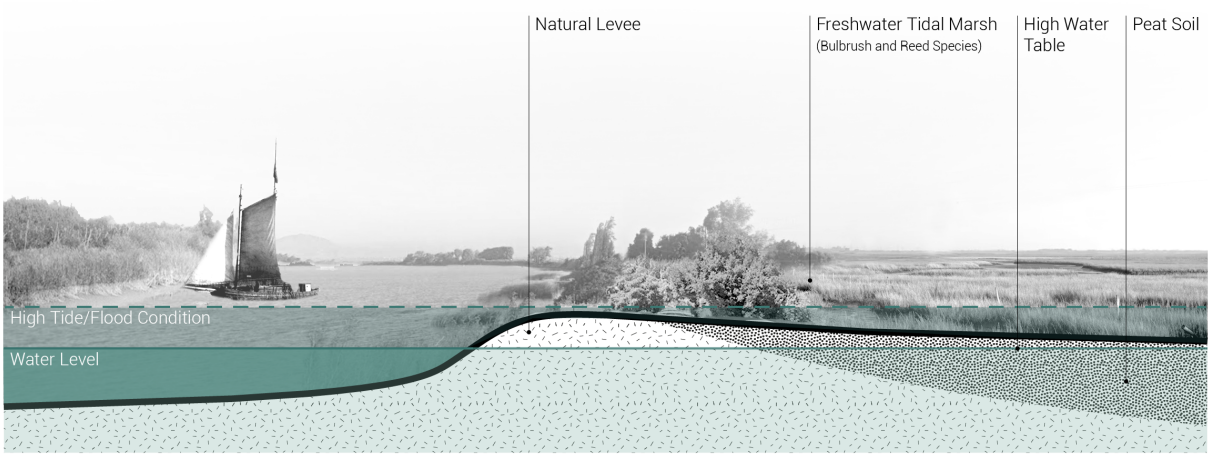
environment

flora and fauna



Tampa Bay Food Web

Historical leevee study

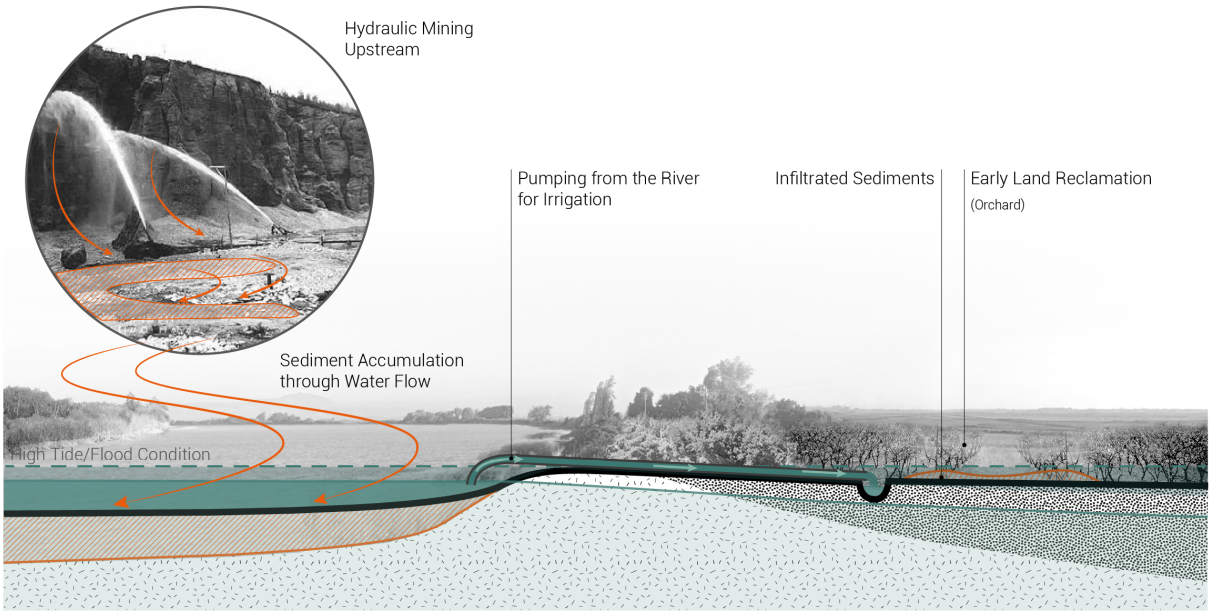


NATURAL LEVEE

Formed by sediments deposited during floods and stablized by vegetation

FRESHWATER TIDAL MARSH

The historical landscape of the central delta was tidal islands vegetated with freshwater emergent wetland of tule and willow



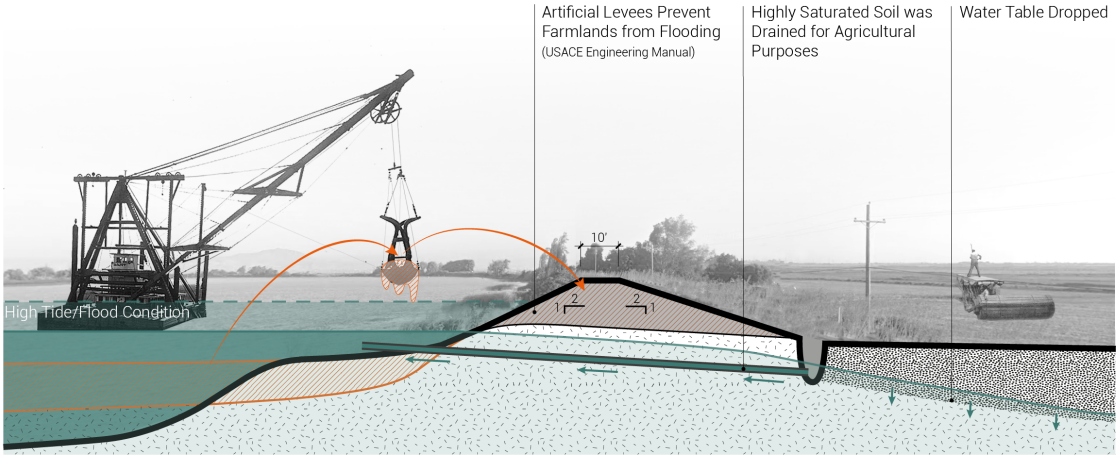
Not to Scale

GREAT SEDIMENT PULSE -1852

Hydraulic mining debris, particularly in the Sacramento River, dramatically elevated the river bed and reduced tidal influence to 2 inches

Overwashed Sediments

Some of the hydro sediments overwashed into the tracts by flooding, damaging the fertility of the soil



CLAMSHELL DREDGING -1880s

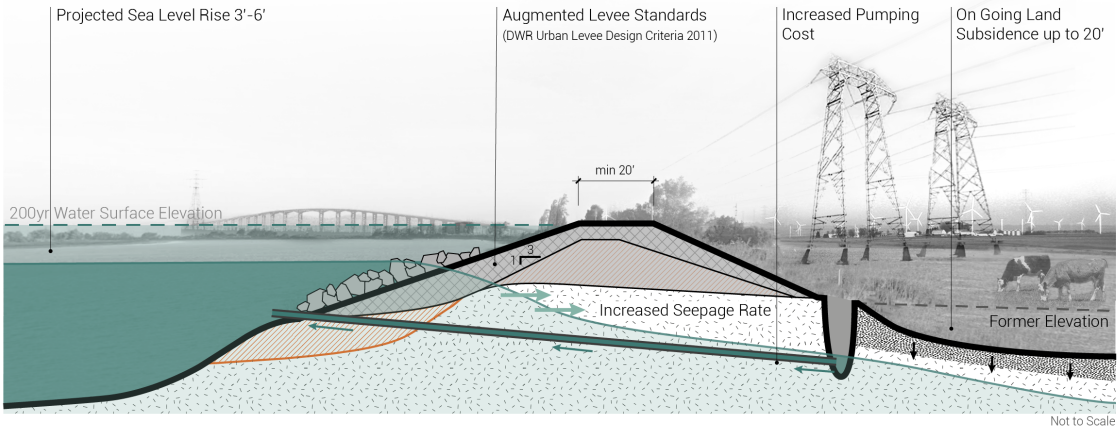
Clamshell dredge invented to deepen shipping channels

LEVEE CONSTRUCTION

Development of levee system to prevent tidal inundation of land in central delta

LAND RECLAMATION

Reclamation started in the 1850s, and was encouraged in the 1860s-70s. By the 1930s, the delta was almost reclaimed.



SEDIMENT SHORTFALL

Dams, river bank protection, and flood management contribute to the deficit of sediment supply to the Bay-Delta Esturary

LEVEE AUGMENTATION

Rising flood levels, frequent failure of old levees, and sea level rise demands the reinforcement of levees to protect farmland and infrastructure

ELEVATION DIFFENCE BETWEEN LAND AND WATER

Surface elevation of the land significantly lower than the water level

Fase 1: De sawabodem bestaat uit schoon zand, samen met regenwater een voedselarme basis.

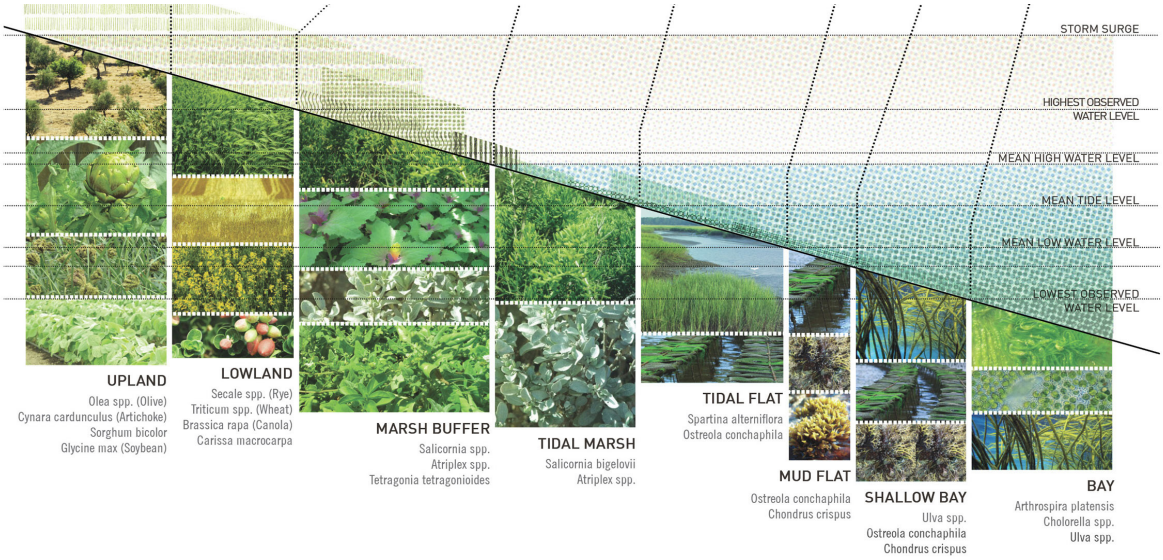
Fase 2: In de sawa verzamelt zich water. In deze natte basisomstandigheid wordt riet uitgezaaid. De rietvegetatie ontwikkelt zich zodanig dat een dichte worteimat ontstaat.

Fase 3: Het water wordt opgezet, door afbraak van organische materiaal ontstaat methaan waardoor grote delen van de rietzode gaan drijven.

Fase 4: De drijvende vegetatiemat wordt vervolgens steeds dikker en steviger en zal de waterlaag steeds meer opvullen, zodat uiteindelijk een veenlaag ontstaat.

Containmination Treatment

The study about Volgermeer polder provide a new perspective on how to deal with the polluted soil in a long term. By growing vegetation on top of the polluted soil,peat development in four phases.



Conceptual ecological leeve in Richmond waterfront

buildings

We need to design for rising seas at multiple scales. From floating apartment buildings to floodable parks, designers and engineers around the world are imagining and constructing resilient solutions to rising sea levels. Flexability and adaptability are at the core of resilient design. This thinking will allow our buildings and infrastructure to bounce back from a storm or adjust to rising tides.

Spaulding Rehabilitation Hospital

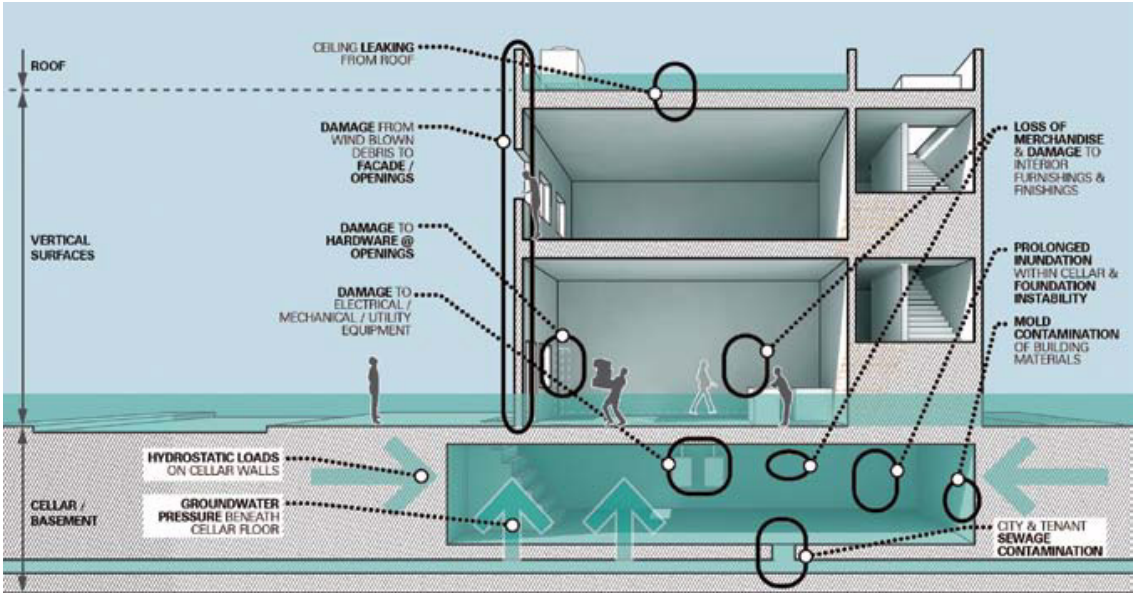
Amphibious Homes

How can we build for rising sea?

Port Richmond's future architecture should build to a new standard of flood protection and flood accommodation. Existing buildings, including historic residences and commercial properties, will need to be retrofitted to keep water out. New buildings will provide the opportunity to take a different approach, built to adapt to changing water levels.

Floating Houses, IJburg

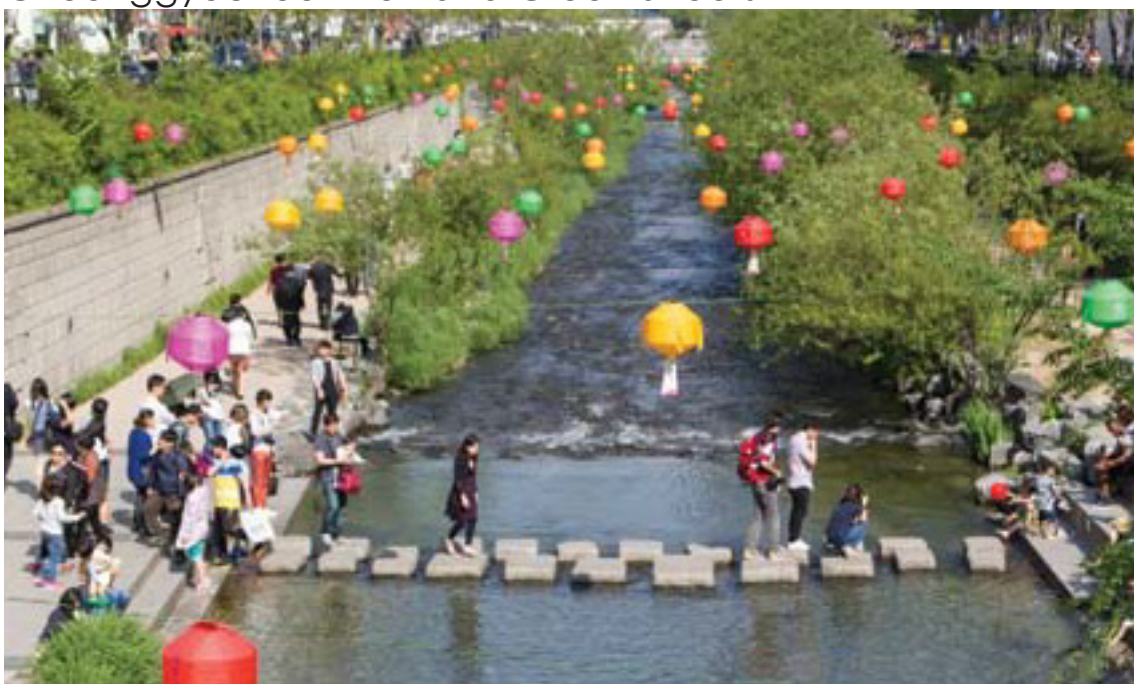
Rebuild by Design, Coastal Commercial Resiliency



public space

The Greater New Orleans Urban Water Plan

Cheonggyecheon Portland Green Streets



How can we adapt existing open spaces to accommodate water? Close to the Richmond city core, there are barely no open space. Rather than trying to keep water completely out, the city can leverage this existing space by designing areas that periodically accommodate flooding,stormwater, and high tides. These public spaces can be constructed to be absorbent or to withstand submersion when flooding occurs. In dry or wet conditions, they can serve as desirable amenities to the city.

Watersquare Benthemplein

Portland Green Streets

shoreline

HafenCity

Rebuild by Design, Asbury Park Boardwalk + Dunes

How can we adapt the Richmond shoreline to rising seas? Richmond city's coast was long time segregated from its residents by industial developments. The future reopening comprises public space, islands, beaches, backyards, and industrial facilities.
bulkheads, seawalls, and revetments, these are the inflexible structures make it difficult for Richmond to gradually adapt to rising sea levels. Alternative edge conditions like terraced public space, floating neighborhoods,
floodable open space, and absorbent parks are more responsive to changing water levels—and provide engaging community amenities

NYC Special Initiative for Rebuilding and Resiliency (SIRR)

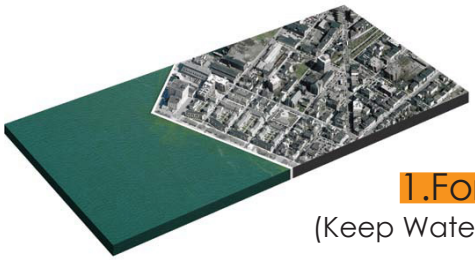
Masonville Cove Urban Refuge

TOUGH QUESTIONS

We need to weigh the costs and benefits of all our options.

In the face of rising waters and increased stormrelated flooding, communities will have to decide what to do with their flood-prone areas. Continually repairing storm damages and providing services to these vulnerable neighborhoods demands significant government resources. For these areas, cities have three major options to consider: keep water out, adapt to live with water, or move to higher ground. Unfortunately, there are no clear answers when it comes to these options—they all have pros and significant cons.

Storm barriers can be effective, but at agreat cost.
To protect the Richmond from incresing risk of sea level rises, one strategy is to construct a storm barrier within Richmond Harbor. Storm barriers cannot protect the city from permanent sea level rise, but they can be effective in protecting key areas during a major storm. Unfortunately, storm barriers can be expensive and time intensive, and can have negative impacts on the local ecology. With both significant pros and cons, building a barrier would
require a rigorous cost-benefit analysis.

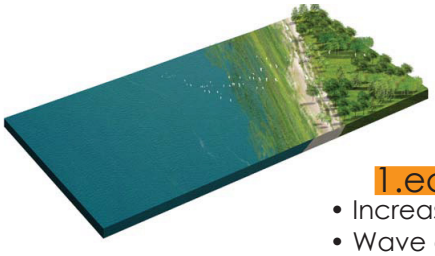


1.Fortify
(Keep Water Out)

2Adapt
(Live with Water)

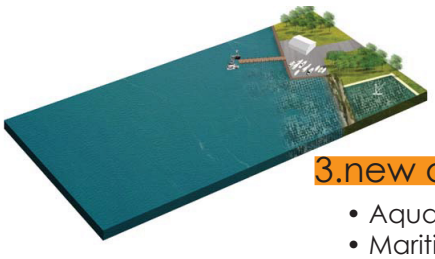
3 Retreat
(move to higher ground)

what are alternative uses for rigions that are threaten by sea level rises?



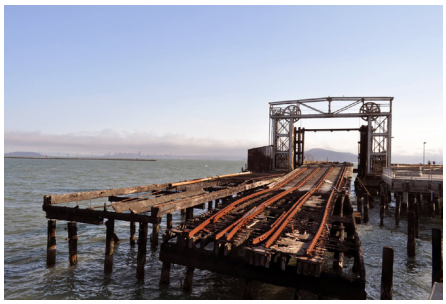
1.ecological
- Increased habitat
- Wave attenuation
- Pollutant filtration

2.open space &
- Floodable parks
- Cultural amenities



3.new opportunities
- Aquaculture
- Maritime industry

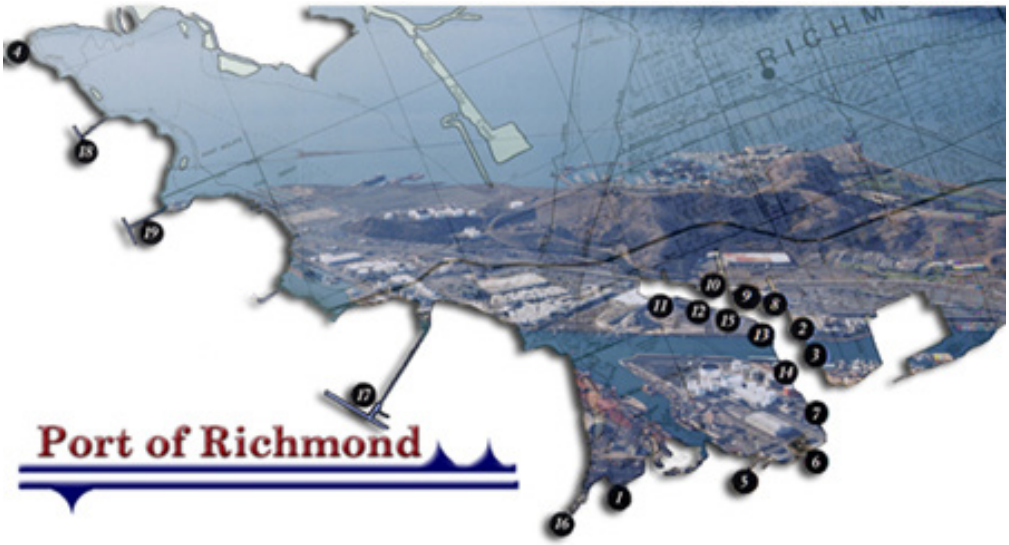
The Port of Richmond encompasses five (5) City-owned terminals and ten (10) privately owned terminals for handling bulk liquids, dry bulk materials, metals, vehicles and break-bulk cargoes.



abandon

Address: 1145 Harbour Way South, Richmond, CA 94804, USA
Use: Storage and distribution of liquid bulk
Land Area: Approximately 8 acres
Physical Data: Draft: -35' MLLW
Concrete Wharf: 50' X 45'
Timber Wharf: 225' X 45'
Berthing Length: 720' with two dolphins at north end
Warehouse: Two totals 140,000 SF
Rail Services: Connection to terminal (BNSF/UPSP)
Cargo Handling Equipment: None

Address: 1411 H
Richmond, CA
Use: Impo
distribution of l
cargo, and conta
Land Area:
20 acres
Physical Data:
MLLW
Concrete Wharf
Berthing Length
dolphins at nort
Warehouse: 80,0
Rail Services:
adjacent termina
Cargo Handling
Two (2) 37 sh
(wharf side cont



Harbour Way South
94804, USA
rt, storage and
break bulk, project
ainers.
Approximately

Draft: -35'

f: 1,009' X 105'
n: 1,250' with two
h
000 SF
Connection to
al (BNSF/UPSP)
g Equipment:
ort ton Portainers
ainer crane)

Address: 2101 Western Drive
Richmond, CA 94804, USA
Use: Pending
Land Area: Approximately 37 acres
Physical Data: Draft: -28' MLLW
Timber Wharf: 1,000' X 25'
Berthing Length: 1,000' with two dolphins at north
Warehouse: 12,000 SF
Rail Services: Connection to terminal (BNSF/UPSP)
Cargo Handling Equipment: None

Address: 1301 Canal Blvd
Richmond, CA 94804, USA
Use: Import, storage and distribution of autos, break bulk, dry and liquid bulk.
Land Area: Approximately 130 acres
Physical Data: Draft: -35' MLLW
Concrete Wharf: 2,300' X 135'
Concrete Pier: 2 (550' X 50')
Berthing Length: 1,620', 300' & 400'
Warehouse: Two total 170,000 SF
Basin (graving dock): 4 (575' X100'), 1 (750' X100')
Rail Services: Connection to terminal (BNSF), eleven rail car spots
Cargo Handling Equipment: None

View analysis from Port Richmond (Kaisher Shipyard)

Port Richmond
's Island
Oakland
ansico
Bay Bridge

1930
Kaisher shipyard is still tidal marshland

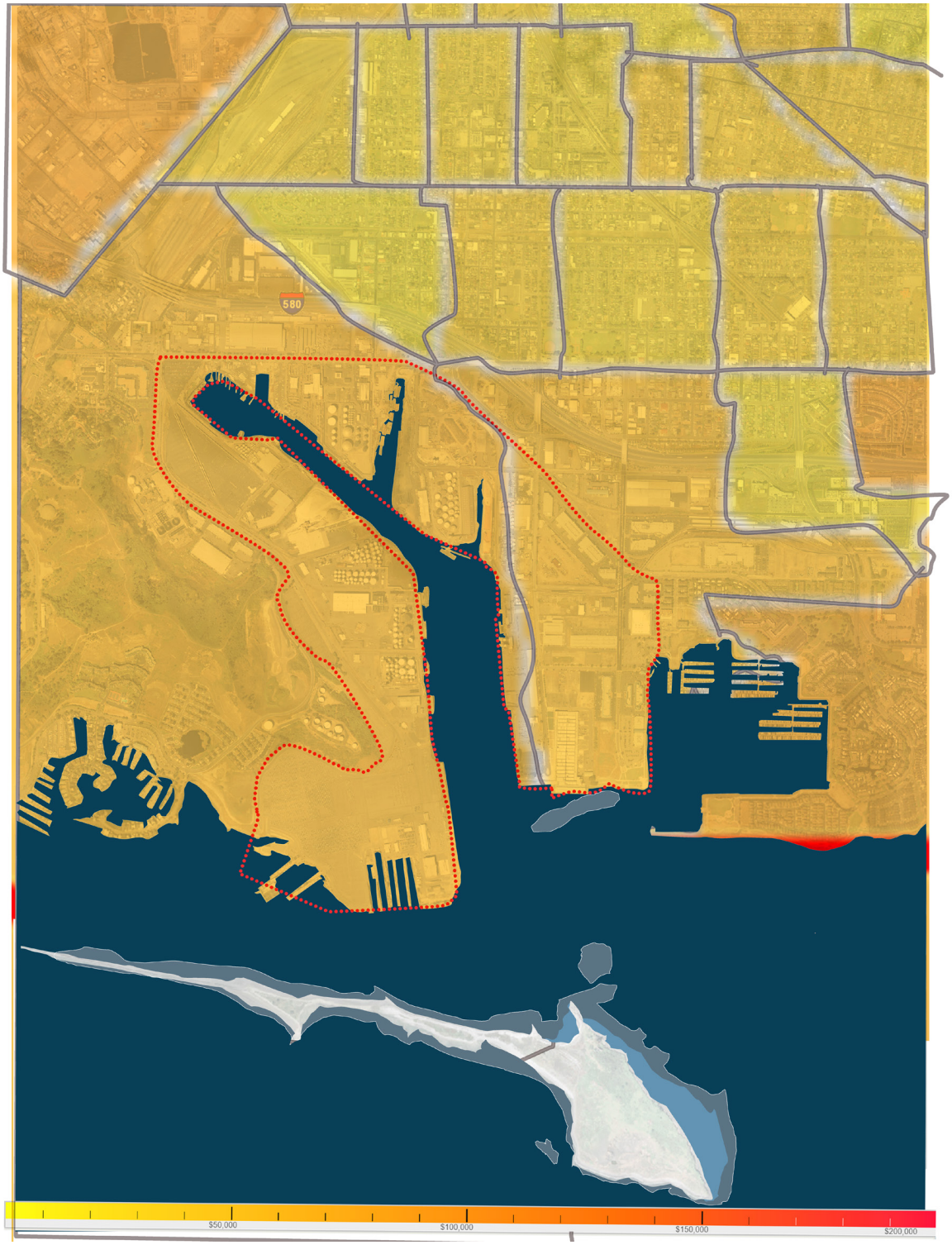
1943 first construction

1944 complication and retire from military service

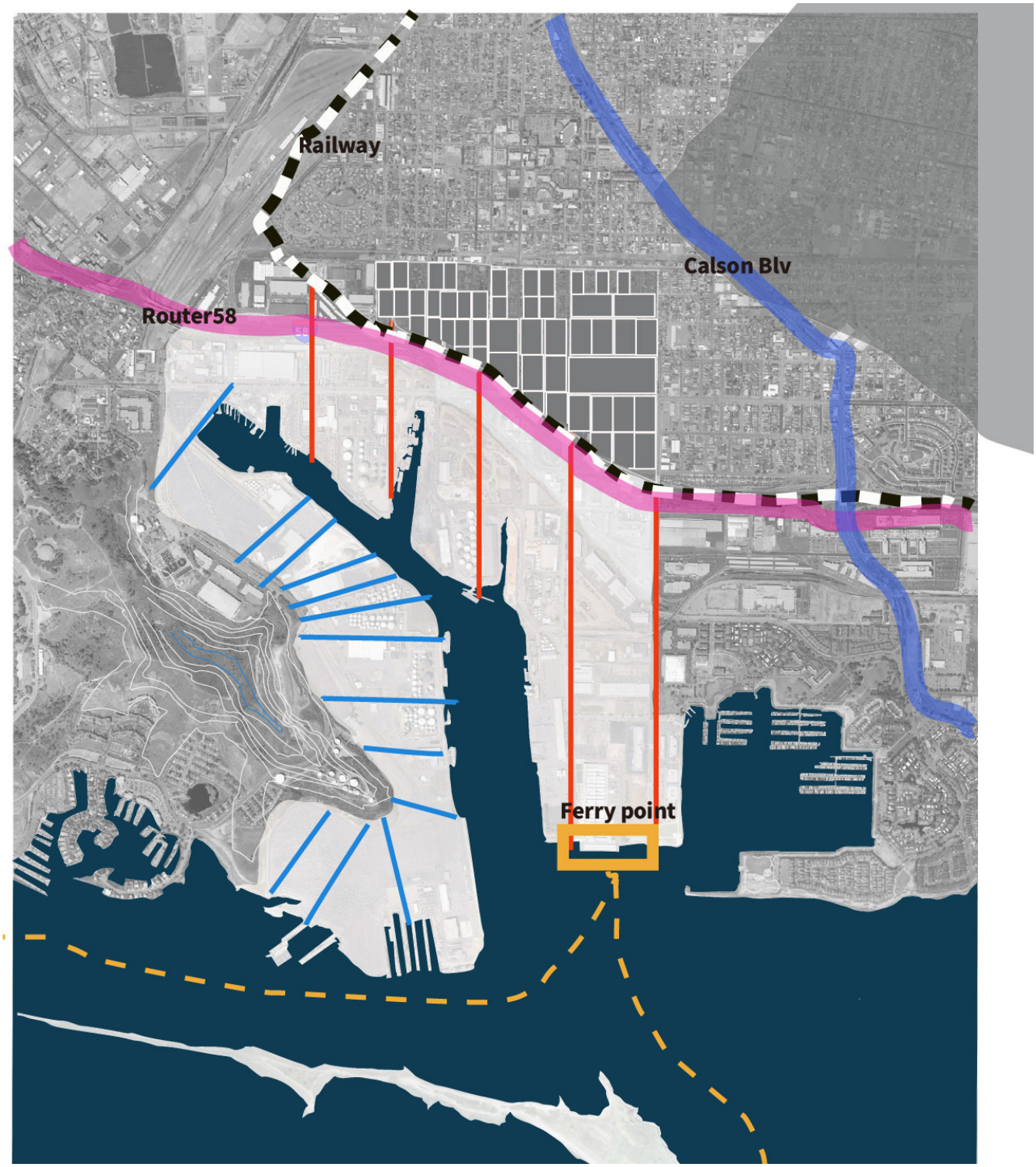
Richmond nowadays is being used by Fort Plant and Oil Refinaory company

current land use

Income map



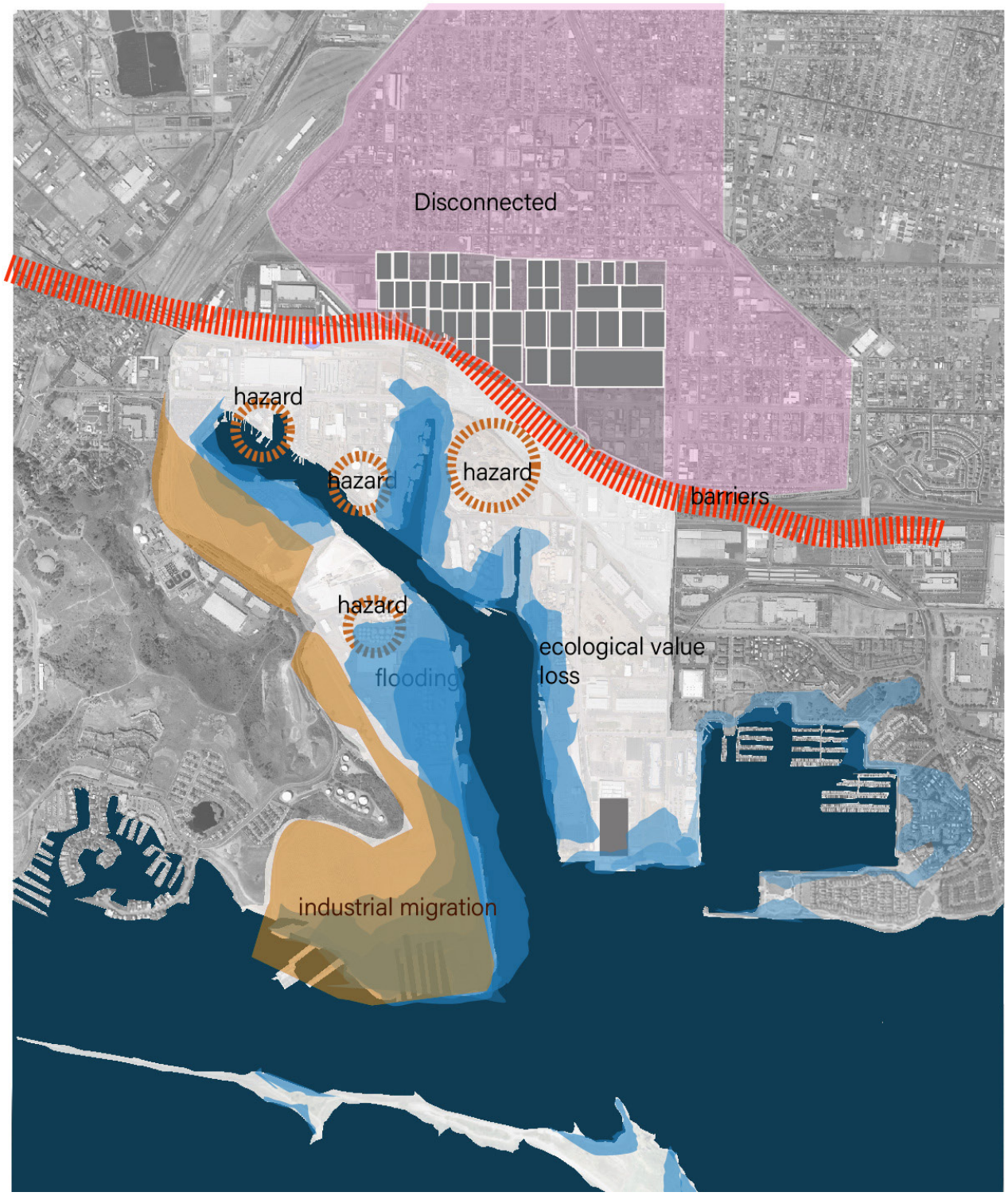
Infrustructure and urban grid

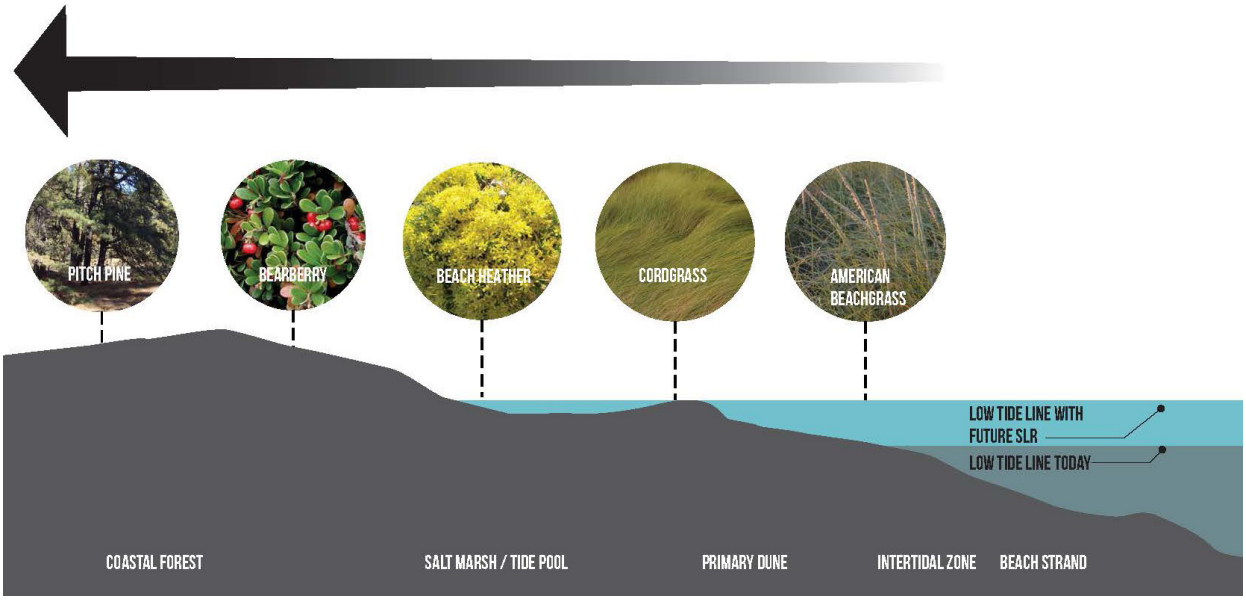


Natural resources and historic heritage

Tideal and bythy

Ploblem conclusion map





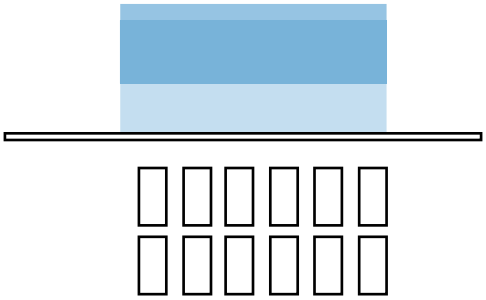
Some of the ways that urban development impacts natural systems are by impeding plant migration, altering the hydrologic cycle, and exacerbating coastal erosion due to man-made infrastructures.

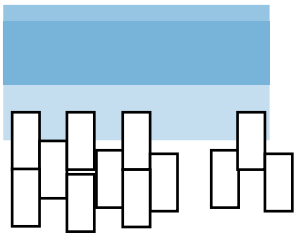
From floating apartment buildings to floodable parks, designers and engineers around the world are imagining and constructing resilient solutions to rising sea levels. Flexability and adaptability are at the core of resilient design. This thinking will allow our buildings and infrastructure to bounce back from a storm or adjust to rising tides.

But our city and region are still vulnerable.
The strategies and case studies exhibited here illustrate an array of tangible solutions for how the Richmond region can protect its edge while introducing greater vibrancy, connectivity, and economic opportunities along the water. Layered together, all of these strategies provide more holistic opportunities for protection.

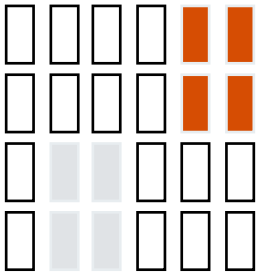
Design Concept

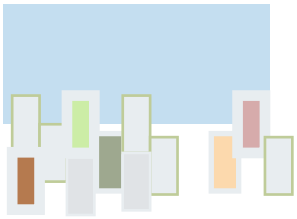
Incremental pixelation

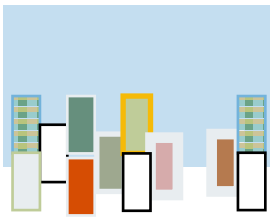


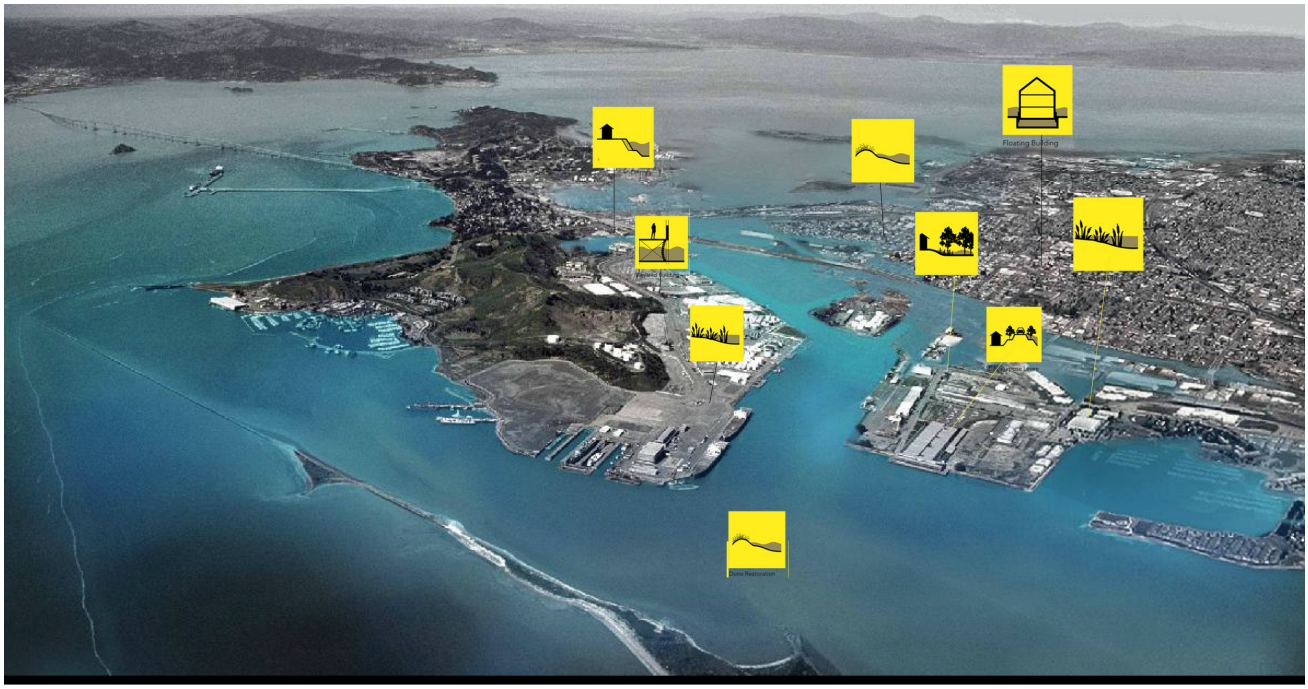


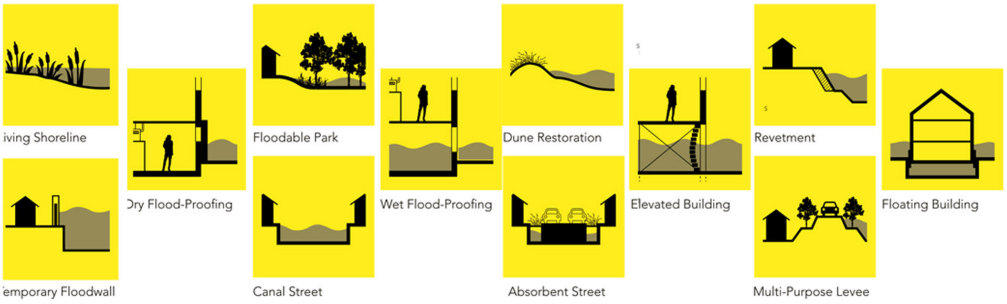
embrace the city to its water front





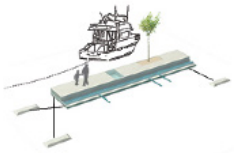



Floating Building
Dune Restoration

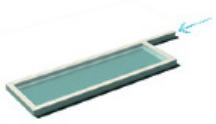

iving Shoreline
Dry Flood-Proofing
Floodable Park
Wet Flood-Proofing
Dune Restoration
Elevated Building
Revetment
Floating Building
emporary Floodwall
Canal Street
Absorbent Street
Multi-Purpose Levee

Function of the new leeve system

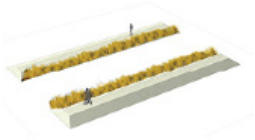
Moderate



Communicate

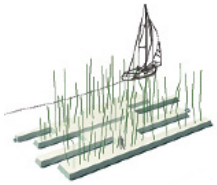


Collect

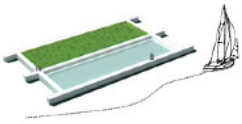


Remediate

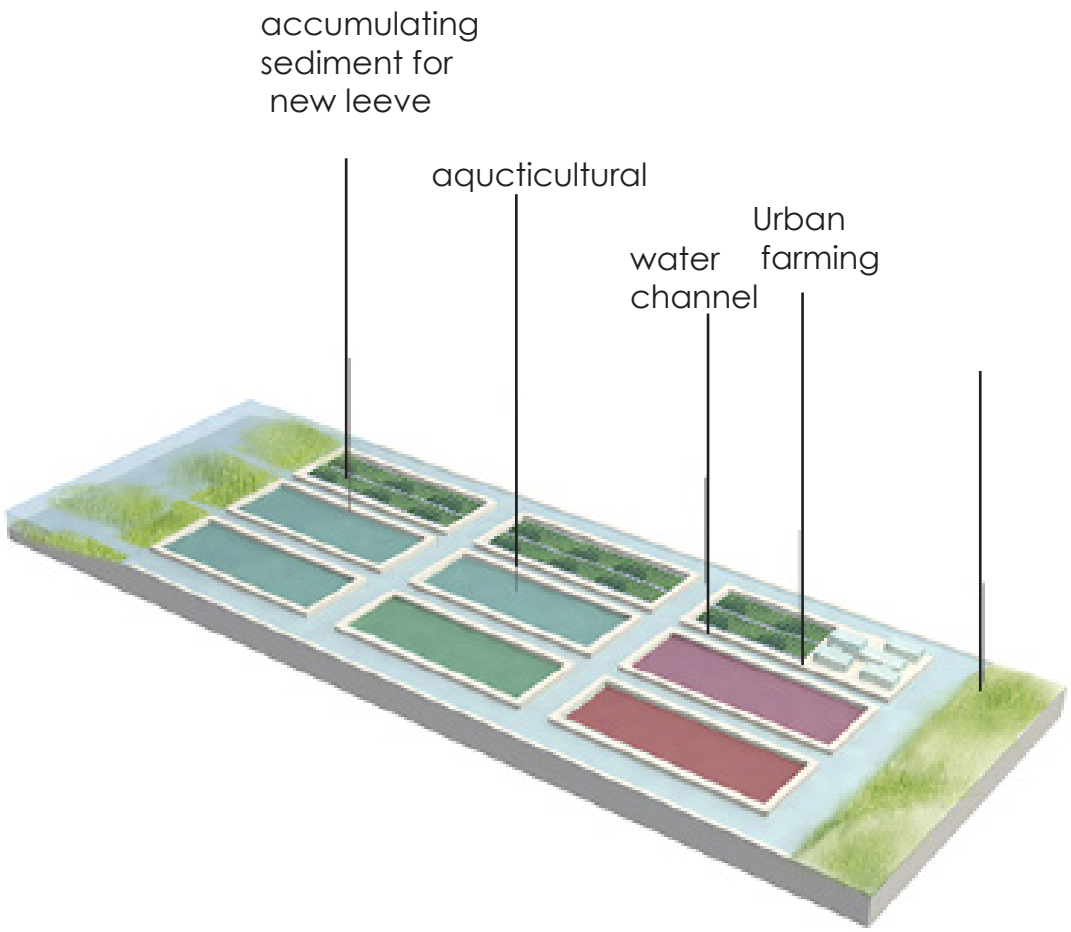
Flexible

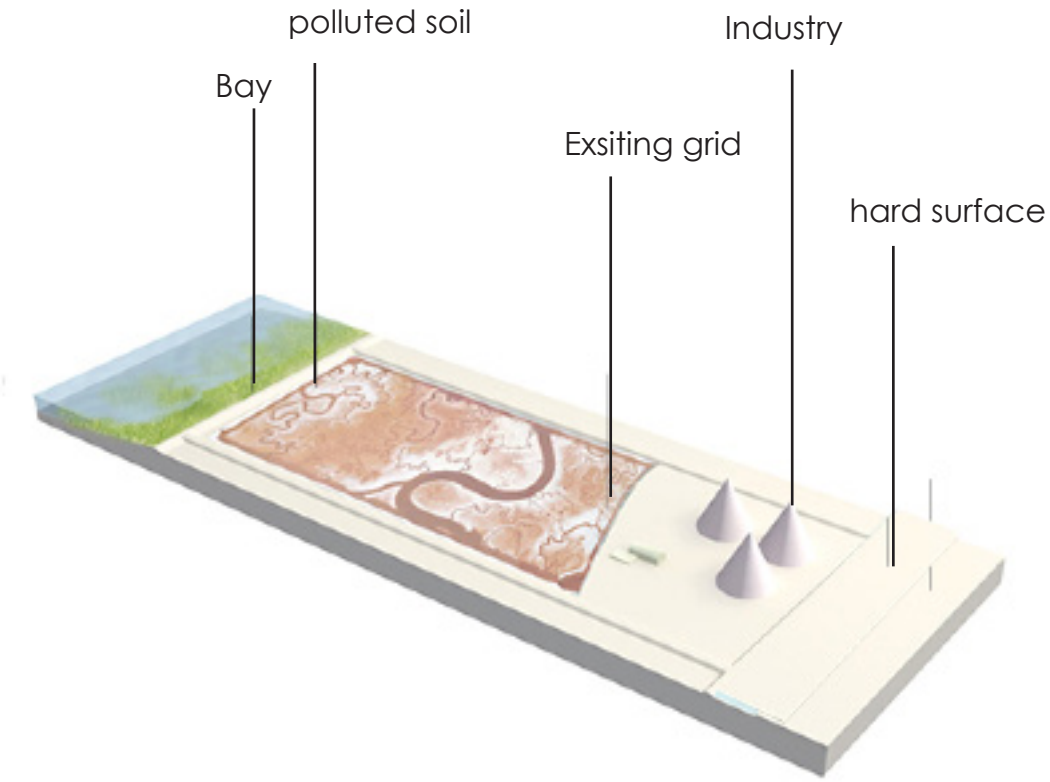


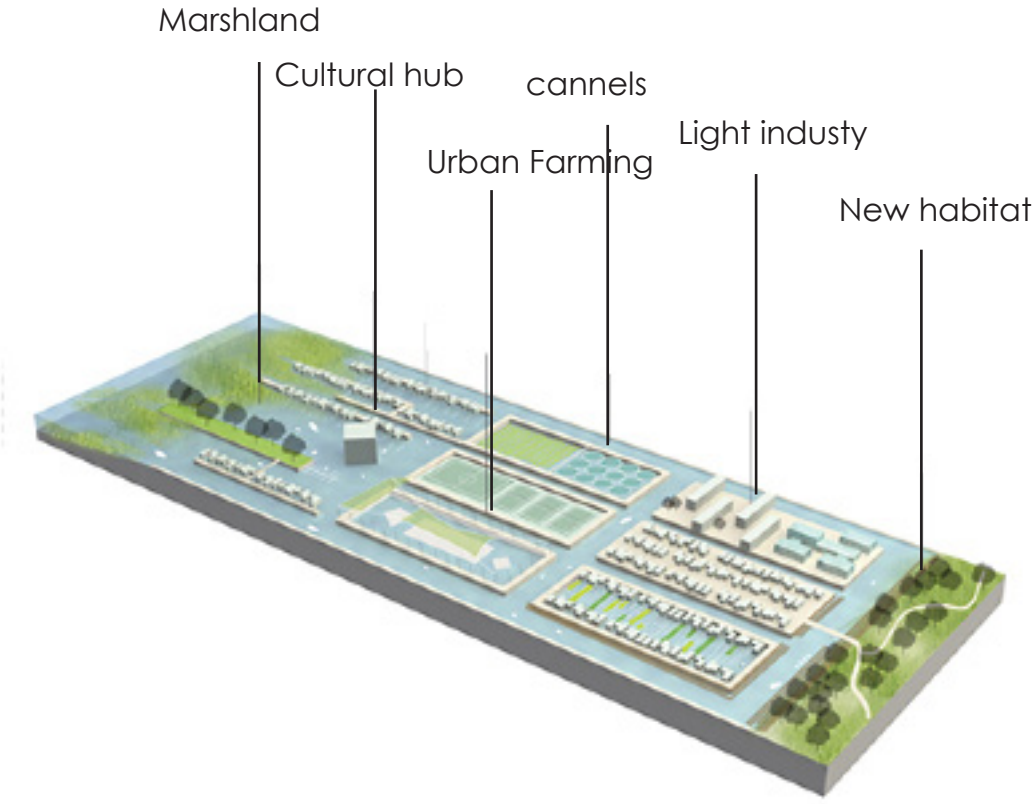
Digest

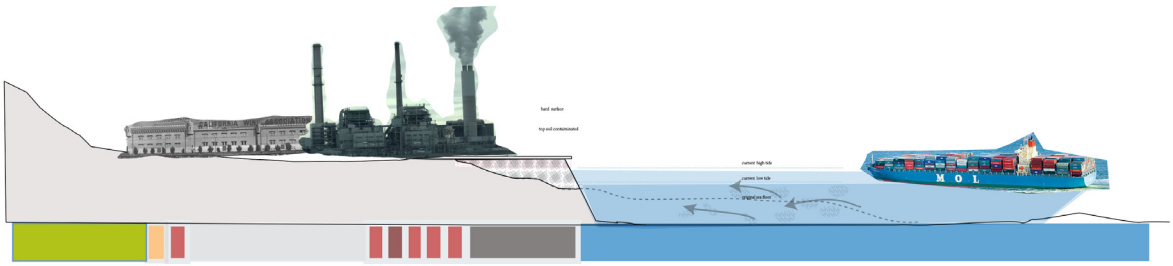


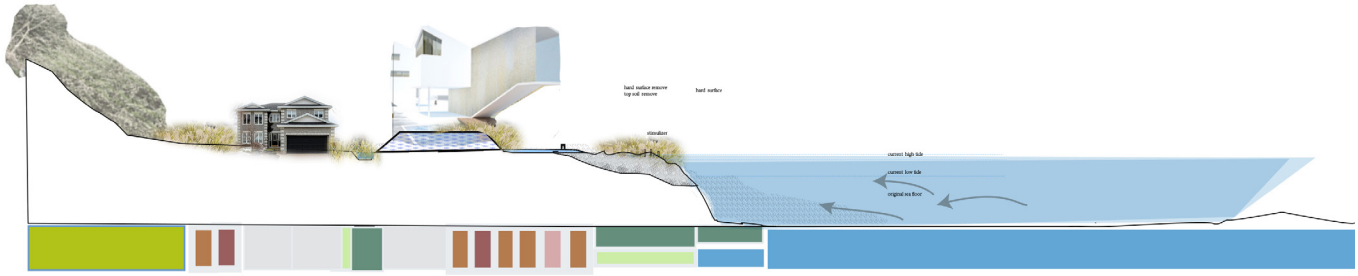
Production

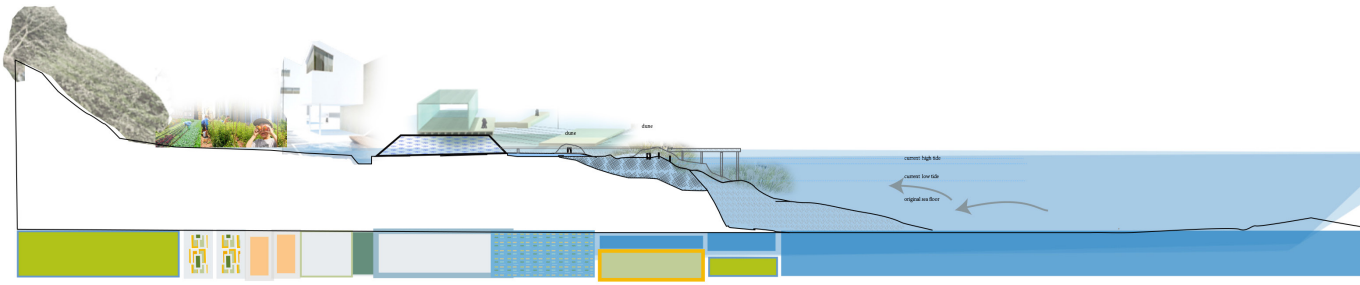



polluted soil
Industry
Bay
Exsiting grid
hard surface

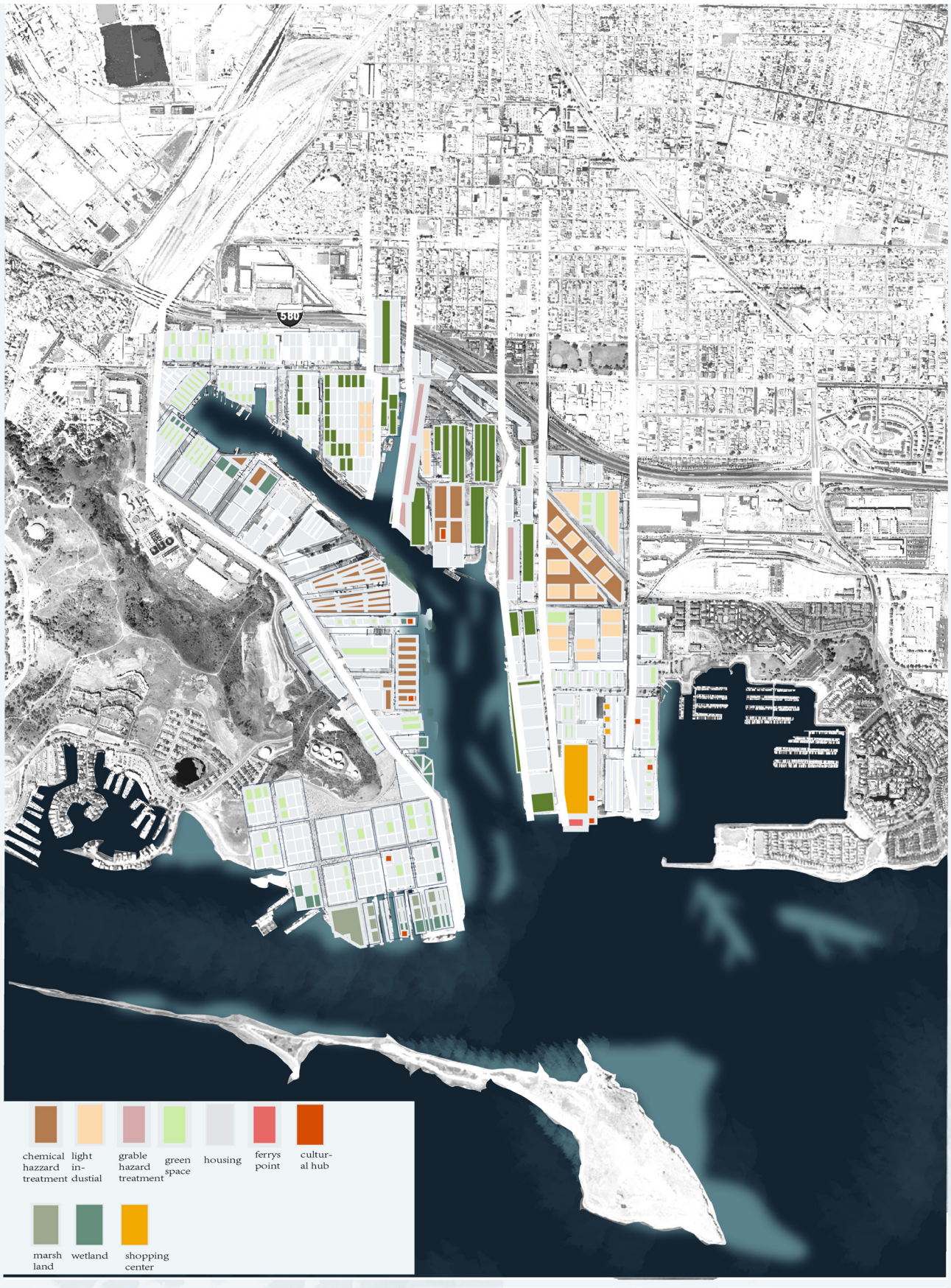

Marshland
Cultural hub
cannels
Light industy
Urban Farming
New habitat


hard surface
top soil contaminated
current high tide
current low tide
original sea floor
M O L


hard surface remove
top soil remove
hard surface
current high tide
current low tide
original sea floor


dune
dune
current high tide
current low tide
original sea floor


Reg
chemical
warew-
grable
port
build
ferrys
green
SLR
SLR
SLR


580
chemical hazzard treatment
light in- dustial
grable hazard treatment
green space
housing
ferrys point
cultur- al hub
marsh land
wetland
shopping center

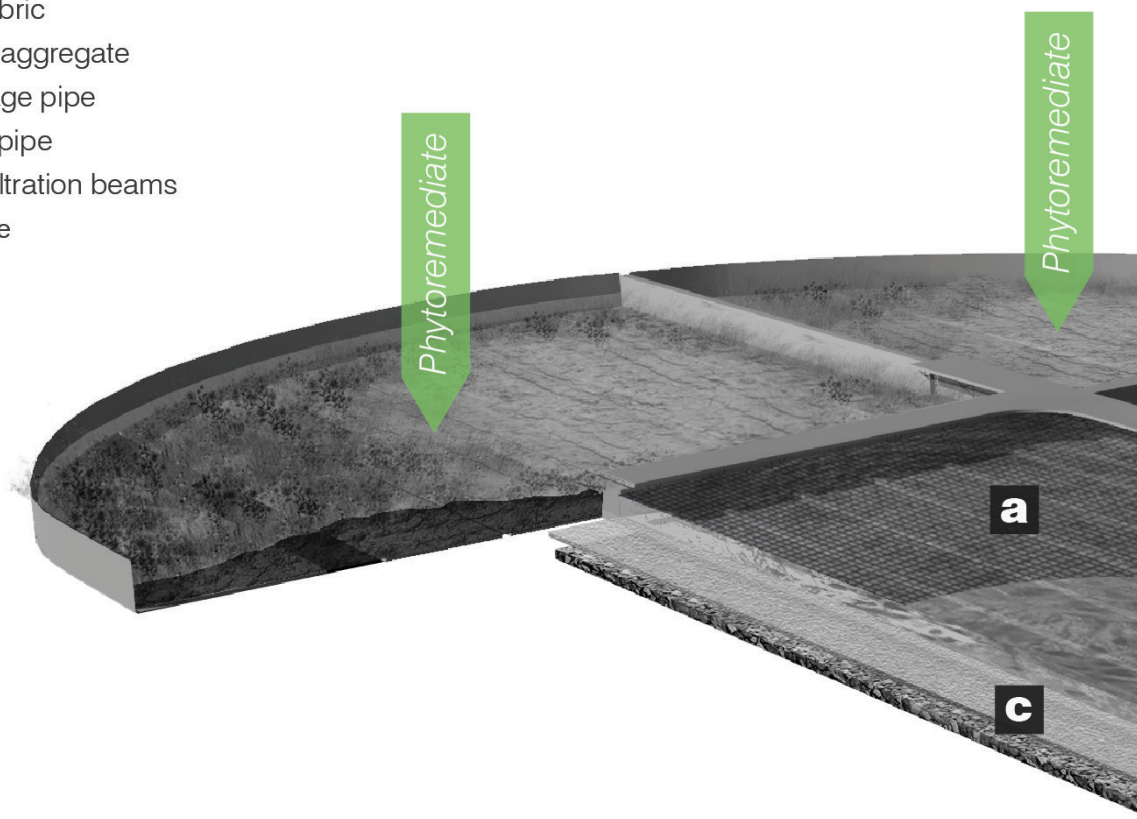

580
880


580
aquatic
argricul-
tural
light
in-
dustial
urban
farming
green
space
housing
ferrys
point
cultur-
al hub
SLR 1M
marsh
land
wetland
shopping
center
floodable
park
flooding
house
dune
flooding
house
SLR 1M


580

Dredge Container Typology dewater + phytoremediate + app

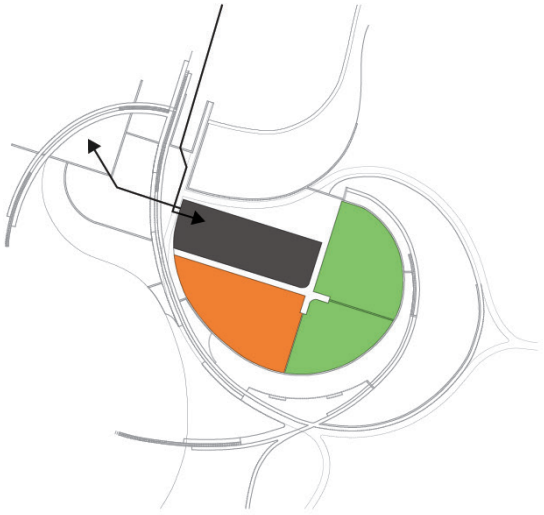
a sealed drainage mat with polymer membrane
b dredge slurry input @ 80% water content
c geotextile filter fabric
d coarse drainage aggregate
e perforated drainage pipe
f hydraulic dredge pipe
g internal water infiltration beams
h dump truck/crane



1 Little Bluestem *Andropogon scoparius*
2 Pennsylvania Sedge *Carex pensylvanica*
3 Joe Pye Weed *Eupatorium fistulosum*
4 Blue Lobelia *Lobelia siphilitica*
5 Swamp White Oak *Quercus bicolor*
6 Sunflower *Helianthus annuus*
7 Common Cattail *Typha latifolia*

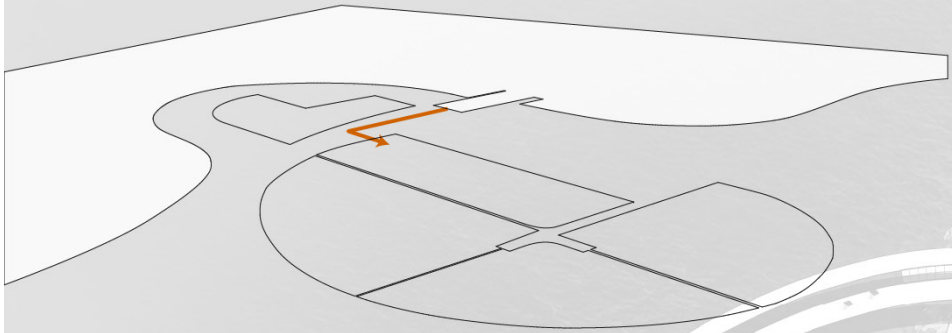
species list: *raised planting beds*

ply admixtures



species list: *phytoremediation + rhizofiltration*

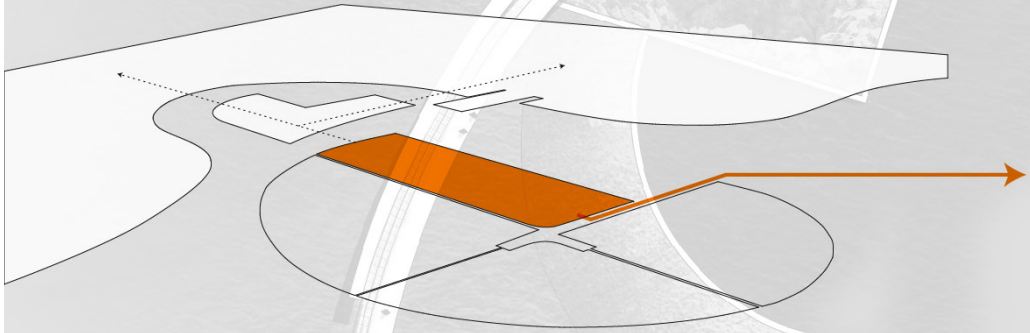
Dredge, hydraulic input
via barge, from shipping channel - 20% solid, 80% water

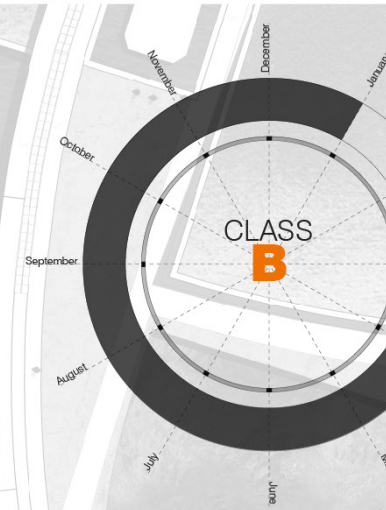


Remediated

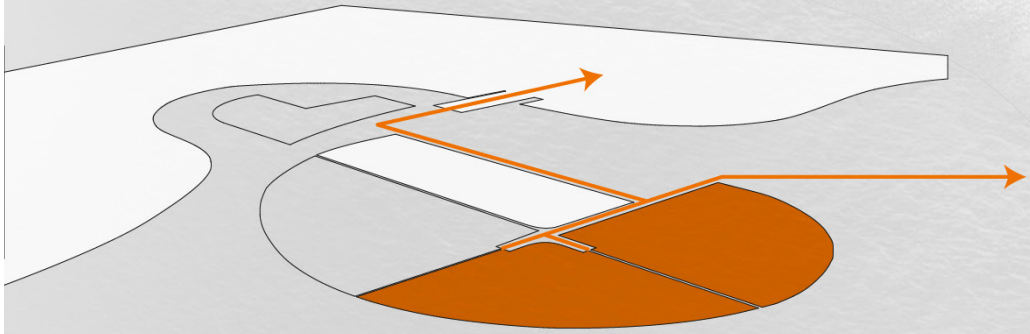
annual output c

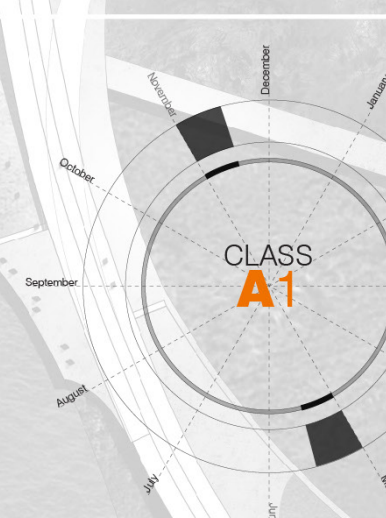
Dredge, hydraulic dewater + retain + output
21,950 cu.yd. fill capacity



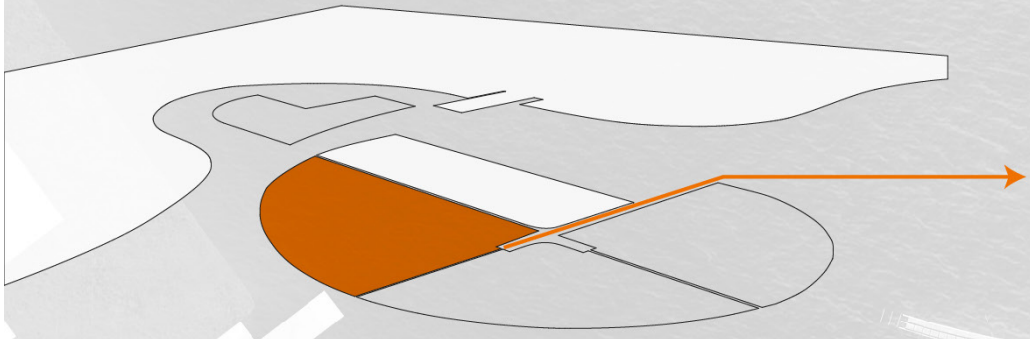


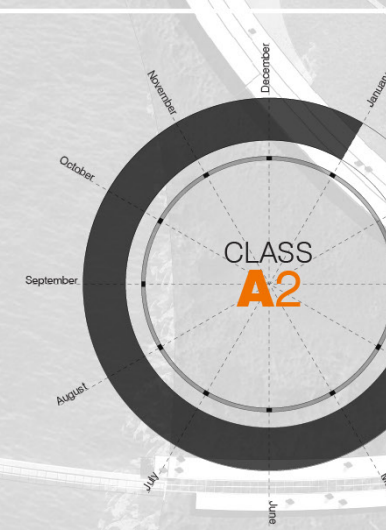
Dredge, dewatered phytoremediate + output
37,600 cu.yd. fill capacity





Dredge, dewatered apply admixtures + output
25,500 cu.yd. fill capacity





l Soil Output *Calculations of Remediated + Processed Dredge*

ycle — dredge output calculations

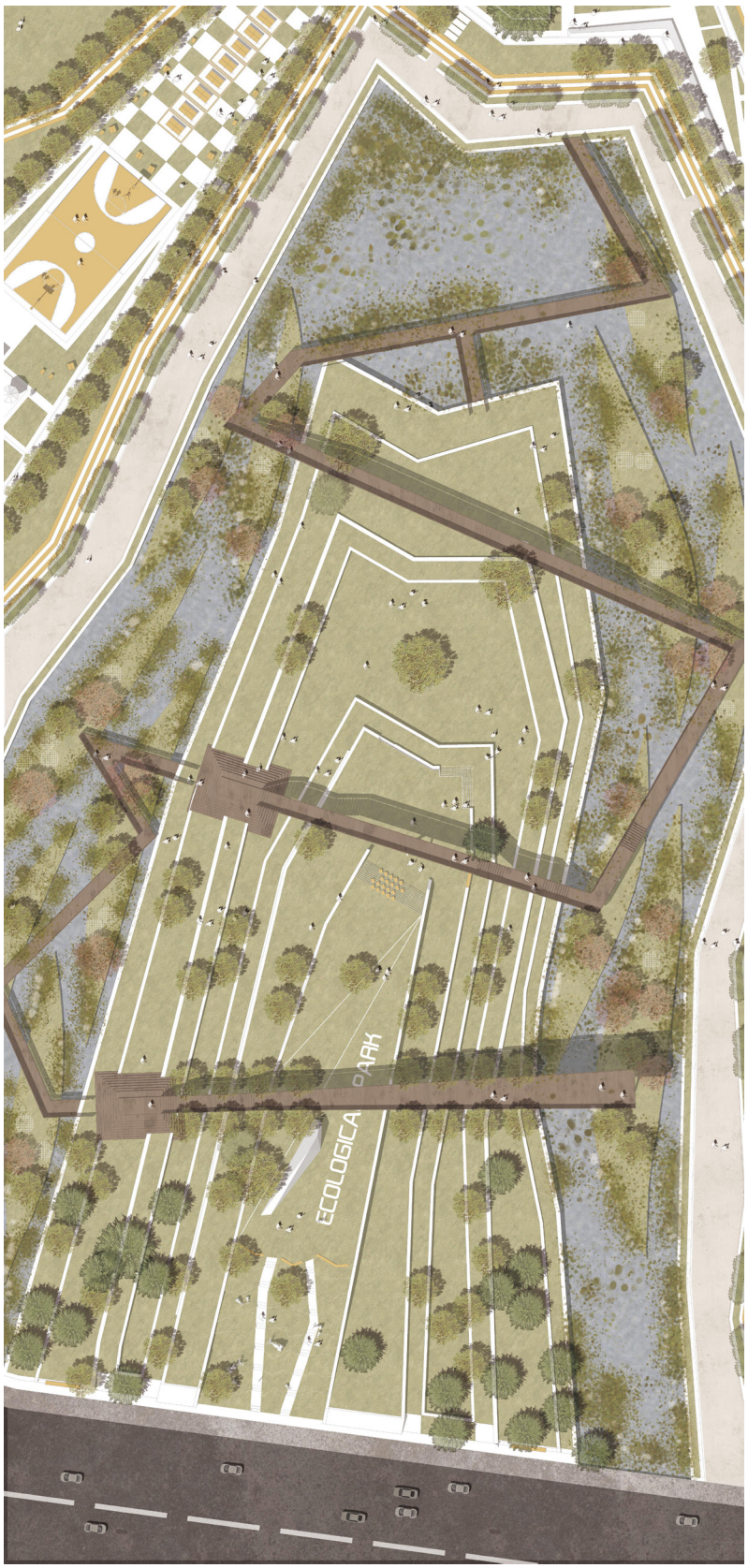
typ.	cycle length	output: amount per *in cu. yd.*	output: # per year	output: total annual output *in cu. yd.*	beneficial re-use strategy
release (water)	*continuous*	*continuous*	*continuous*	*continuous*	*Water removed from hydraulic dredge is rhizofiltered and released into the Maumee River.*
retain (see below)	2 weeks	15,8831[1]	22	349,426	*The majority of the de-watered dredge material is retained on-site and transfered to other cells for phytoremediation and admixture application.*
*output (class **B**)*	2 weeks	3,704	22	**81,488**	*The remainder of the material is trucked off-site for use as a base construction material for wetland restoration projects. (see Harborlands site)*
*output (class **A1**)*	*6 months*	*37,600*	1	**34,463**[2]	*Phytoremediation processes will be applied to the dewatered dredge material via the use of sunflowers and the introduction of microbial populations. Sunflowers will be culled and harvested upon seasonal cycles.*
*output (class **A1**)*	*6 months*	37,600	1	**34,463**[2]	
*output (class **A2**)*	*4 weeks*	*25,500*	11	**280,500**	*Following admixture application, this material has increased drainage and bearing capacities. It is most suitable for brownfield remediation, landfill capping, and construction fill projects.*
total annual remediated dredge output				**430,914**	

[1] *this number is determined by the turnover rates of 6 months and 4 weeks for the phytoremediation container and admixture container, respectively*

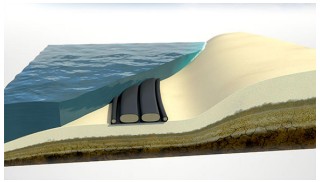
[2] *An 8% reduction from the maximum allotted dredge volume leaves room for the attenuation and removal of organics*

In the connection to the city gride. In order to creat a new leisure platform for residents and enterpuer in Port Richmond Neighbourhood. A wet land park is created.

Thus, from the formation of it land and natural habitat, you can see the changing dynamic of daily wonders.

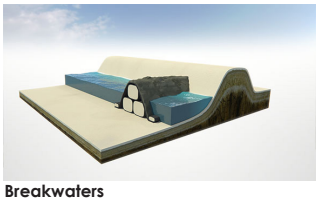


Geotube - engineering structure



Breakwaters

Breakwaters reduce water forces offshore before they reach land thus preventing erosion.
TenCate provides a wide range of geotextile and containment solutions depending on the type of breakwater being constructed.



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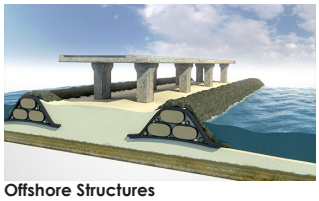
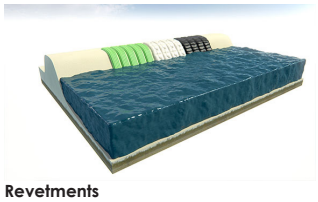


Offshore Structures

TenCate provides a range of geotextile and containment solutions to prevent erosion around offshore structures and to provide ballast weight to offshore pipelines.

Dykes and Levees

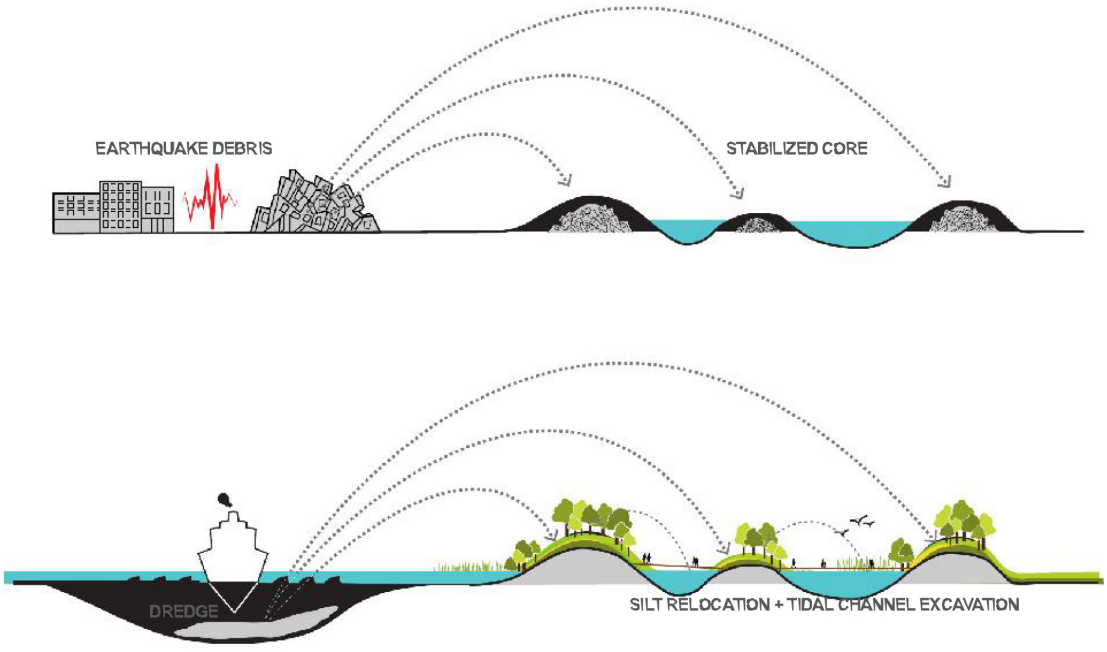
Dykes and levees are used to prevent flooding, enable construction to occur within calm water and protect from storm activity.
TenCate provides a range of containment solutions for the cores of dykes and levees.



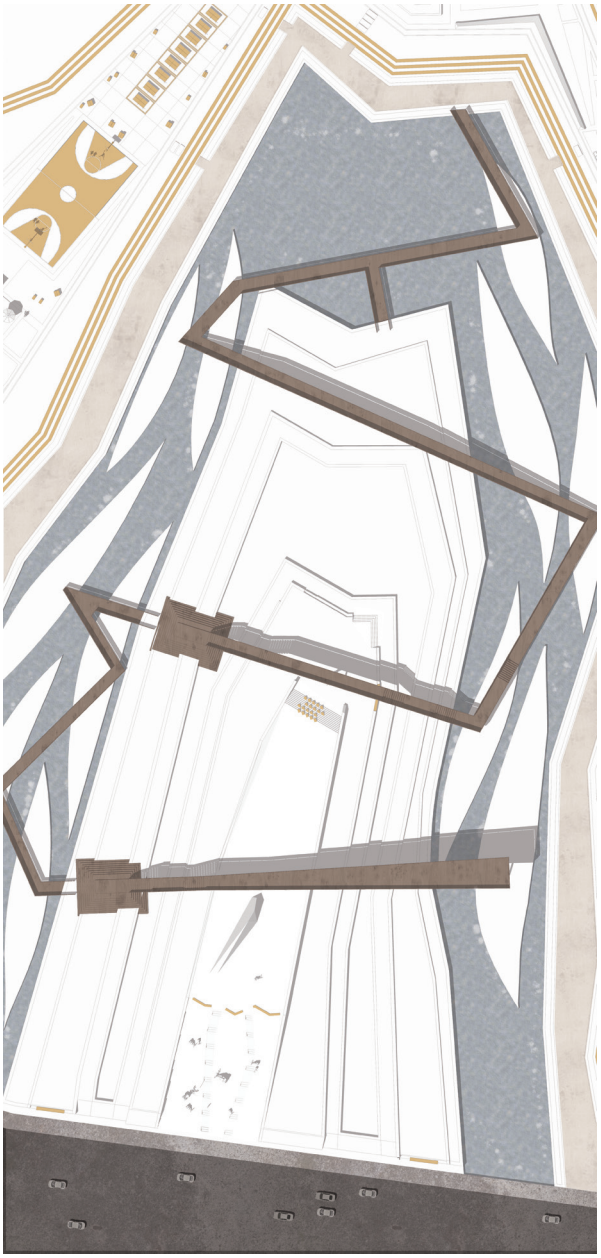
Revetments

Revetments are used to provide permeable surface protection to exposed soil surfaces.
TenCate provides a wide range of geotextile and containment solutions depending on the type of revetment being constructed.

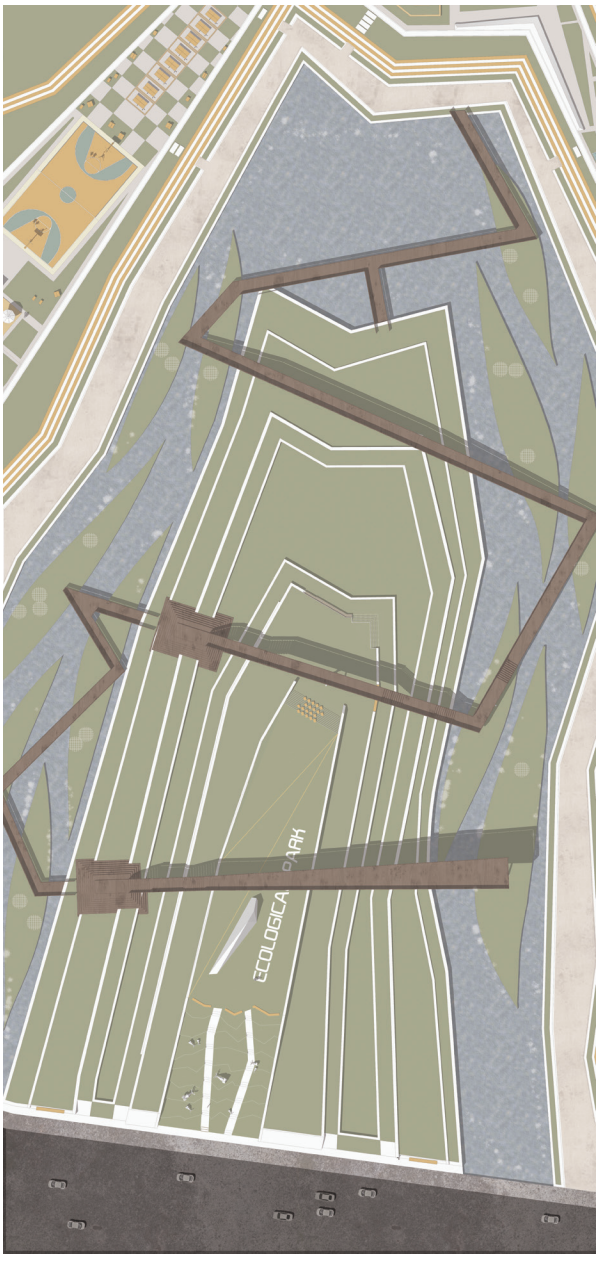
use dredge material as infrastructure



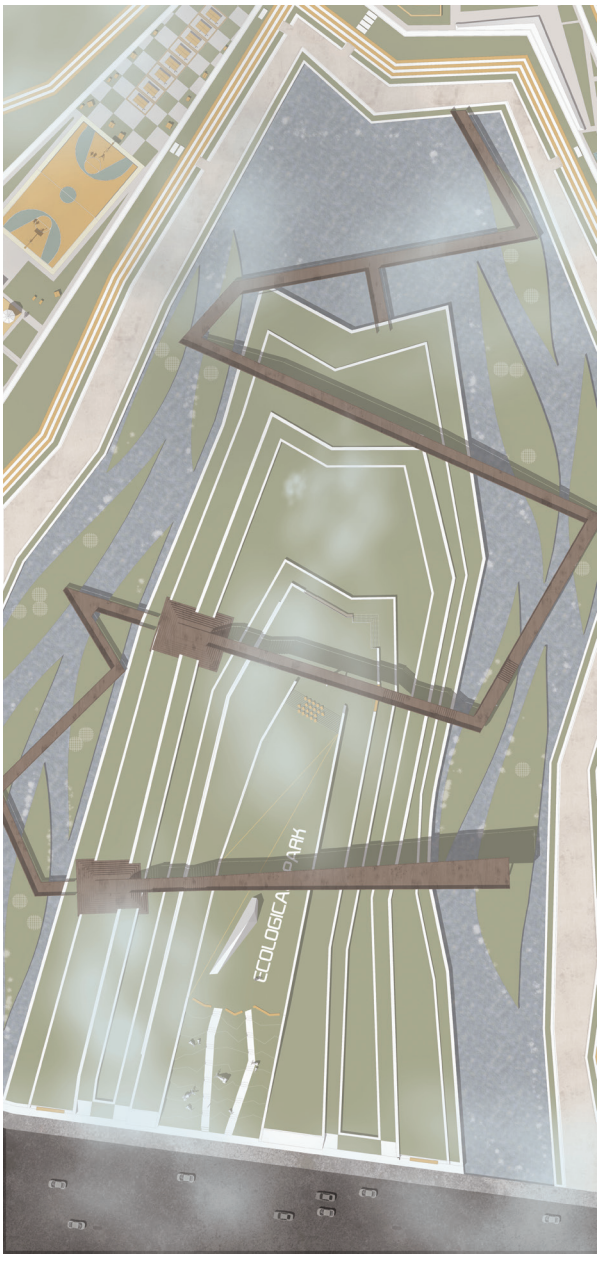
phasing of the wetland park



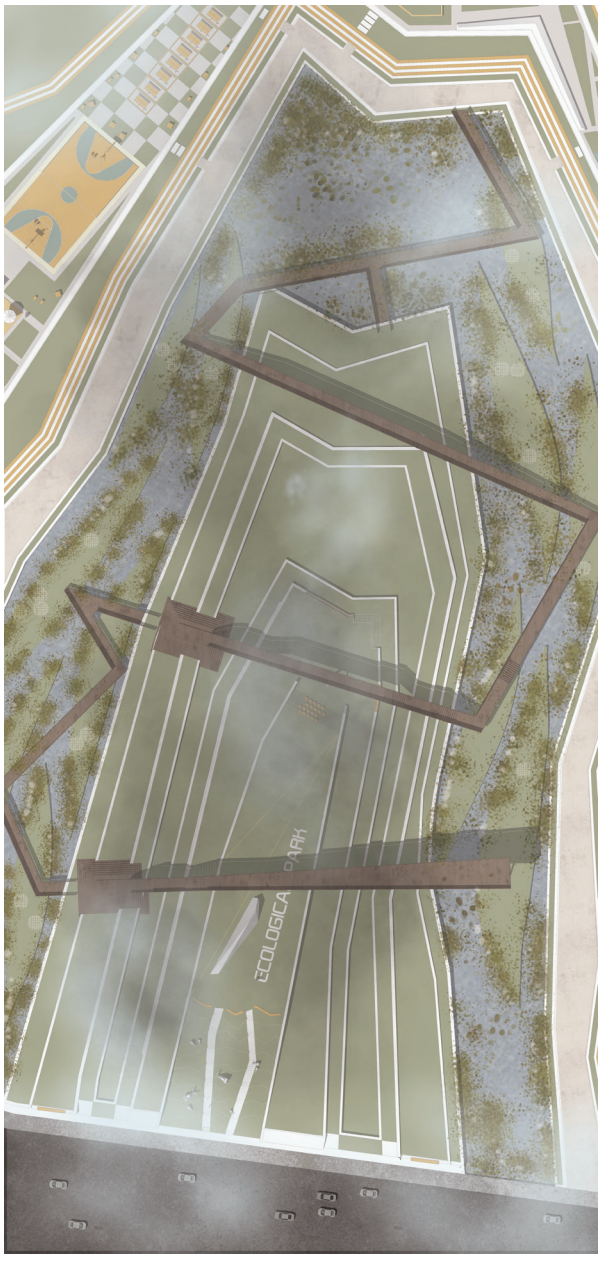
1. geotube and dredge material as base construction



tidal and wave graduall



ly bring in materials

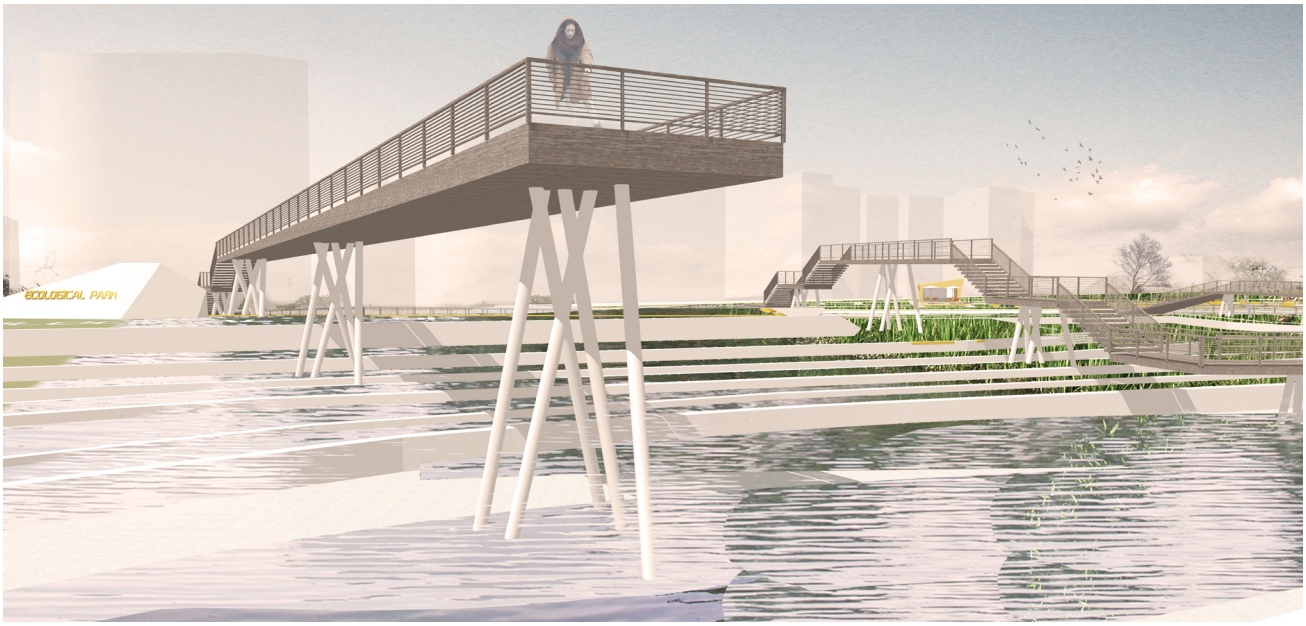


Marsh land start forming and natural success began

Phasing prspective

1. geotube and dredge material as base construction

phase 3 frontier plants starts to grow on tidal flat land



phase 2 high tide brings in sedimente and starts to accumulate

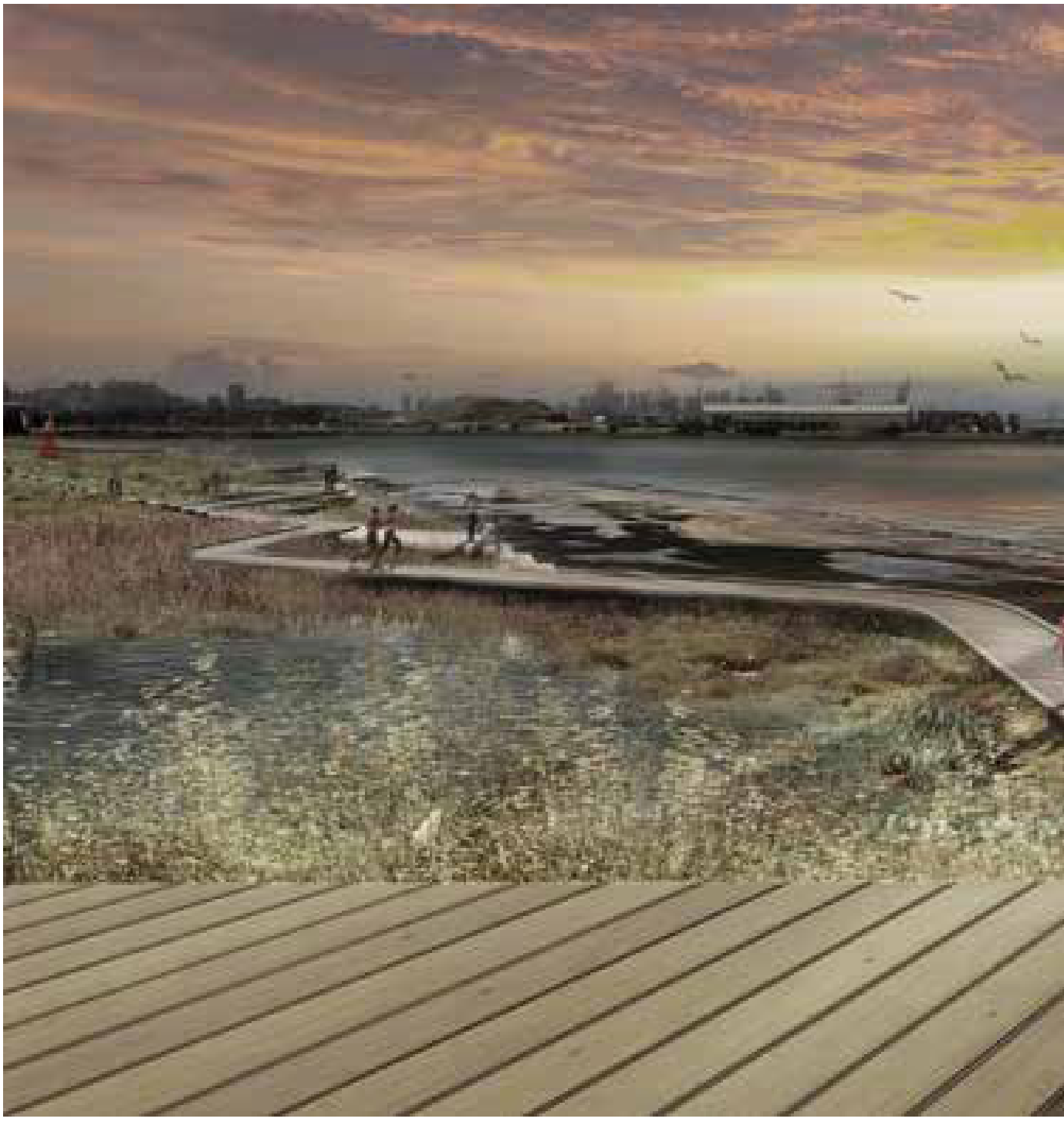
phase 4 habitats starts to establish. local fraun and flora settle in.

Floodable park

now

high tide

sea level rises



Reflection

relationship between the theme of the graduation studio and graduation project

The graduation studio of landscape architecture has established the concept of Flowscapes. "Flowscapes explores infrastructure as a type of landscape and landscape as a type of infrastructure. The hybridisation of the two concepts seeks to redefine infrastructure beyond its strictly utilitarian definition, while allowing spatial design to gain operative force in territorial transformation processes" . It suggested that "when conceiving landscape as infrastructure, landscape is treated as an operative field that defines and sustains the urban development and ecological and economic processes are employed as formative design tools". On the other hand, "considering infrastructure as landscape, the infrastructure is treated as an interdisciplinary landscape design brief with emphasis on the scapes" (Nijhuis and Jauslin, 2015)

The core of Flowscape lays within two dimentions: rethinking the landscape and infrustructure and appreciating the dynamic movements in natural, socio-economical and spatial aspects.

Following the core of Flowscape, the project site is located in Richmond, San Francisco Bay.
The formation of bay area was once influenced by natural processes such as wind, erosion, and wave, not to mention the crustal movement that generate bay area millions years ago — resulting in a landscape constantly in flux. Over the past century, the bay shoreline has become amore static, constructed edge. This landscape was formed over time through the deployment of a complex framework for saltation and accretion.

San Francisco bay area, which is a combination not only influenced by different natural forces but also by the human intervention(dike,dredge,landfill, reclamation). The project location of Richmond as a specific case not only presents the consequence of human intervention on landscape performace but also reveal the how social/economical aspect play crucial part in the landscape experience and sptial quality. Booming industial developemnt in Richmond costal region brings opportunity to develope Richmond from a native america settlement to a city of over 10,000 of population, it also results in poor connection from the city to the bay as well asheavy pollution.Just like everything else in this world that is always in motion, heavy industials , the no. 1 tex donater migrates away, leaving the city in ergent with a change. The site of Richmond Kaisher Shipyard is chosen, due to 3 aspect: location; historical/economical conte xt; dynamics of natural processes.

Historically,Kaisher Shipyard was the 3rd biggest navy shipyard in war time, which construct ed on the landfill of the original tidal marshland that protects lands from erosion.Over the past century, landfill and nevigation matainance (dredging and channelization) has cause huge marsh land loss. After the war, Kaisher shipyard retired from its military service and now is occupied mainly by commercial port and oil refinary. Yet with the falling of heavily industry, this industrial hard land is no longer economically, ecologically, or socially relevant.

The Kaisher Shipyard was constructed as an military infrastracture and continuously serve as transpotation facilite.And in the design, I proposed to a redevelopent project transforming the old shipyard infrustracture as a new platform for future development and new lifestyle for Richmond people, also the highly dynamic natural processes gives the site multiple potentials of engaging the natural processes and the urban process. In this project dredging and construction site wast materials are also being revaluated as resources that become infrascturcture as well By engaging the natural processes and resiliance strategy, creating a new waterfront landscape that incubates new hybrid uses and long term urban development which can also fit in the t heme of “Flowscape”.

From Research to Design
Method, context, application

When landscape was conceived as a infrastructure, an operative field for spatial designers, the next crucial question for designer to answer is what is landscape. In the research of Brett Miligen, he articulated landscape as - “a scene, landscap, ecosystem, and socio-political territory- itDs a material assembly of moving entities, a dynamic medium which changes in quality and structure through the aggregate movements or actions of the things that constitute it.” He applies the concept of migration - patterned movement across space and time - to landscape bythree strands of theory: ecology, assembly and infrastructure.

In order to read the site, understand the process and production of current Richmond assemblage, its necessary to identify patterned movement and critical moments of site. By mapping the patterned movement and identifying the crucial movements, I can understand the main driven forces that changes Richmond landscape is shifting in time.

This historical research also reveals that from Golden Rush to Silicon Valley, Richmond have been bounded tightly with regional to global economic and environmental transition, working and understanding through scales stressed the fact that economical and historical context is not only the background story, but in the age of Anthropocene, it become more that ever important. The research on understanding the natural processes and dynamics in given area provided design tools and principles.

The question is which parts and processes of landscape do we choose to engage, and which course of action can we take.

Following the research of migration landscape, in this design, shipyard Infrastructure as well as the sedimentary infrastructure are the specific assemblies chosen and articulated by spatial designer to act upon

the transformation of a given landscape, fixed the materials and socio-ecological constriction. The city of Richmond will benefit from the new opportunity of reconnection, both in the sense of reconnect to waterfront, reconnect to other cities. It also brings me confusion, who will be left out?

The old industry construction supplied the most of employment for Richmond locals, it also brings in the unstated fact that most of the locals, as industrial working class, not necessarily becapable for creative and intelligent-challenging works such as coding. when it drifted away, and upgraded high-technology industry move in, what would happen to the residents? The speech from Adria Lahoud on Floating Bodies, bring in the idea that we do not presupposed a common regime of intelligibility but instead starts with a proposition that embodies a kind of original asymmetry. By studying the demography of Richmond, such as income and educational attainment, ethical and criminal demography, in the design, the urban farming and biofuel are in troduced taking account of the essence characters of local residents. With the new opening of the city shoreline, downtown historical center and herritige is also being embraced, tourism became a new opportunity for jobs.

The project in a wider social context

The case of Richmond in San Fransico Bay is facing with the common threat, sea level rises, like all other cities in Bay area, or to say all costal cities in global range. With most of population located in costal cities around the world, how a city can be resilient and adapt to future climate change becomes an urgent problems. By the rediscovery and application the forgotten sedimentary infrasturature, woking with natural dynamic and processes,this project present an alternative possibility or coastal defence and engineering.

The other objective of this projects is to explore the idea of Anthropocene, a time that changes in both natural and social aspects are accelerating in an unprecedent speed and how designer can act on this specific context. Richmond as an old industrial city, examinating the idea of industrial migration. Just like the city of Detroit, when Ford move to other low labor cost country, the supporting industry migrates away, the city ends up shrinking and desperately needs a change. By acknowledging migration phenomenon, this design and planning strategies for shrinking cities work opportunistically and protectively with emergent conditions, rather than trying to counter or reverse the trajectories of change. In the specific case of redevelopmenting of Kaisher Shipyard is a beginging point to upgrade the city's industrial structure and an attraction for tourism. So in the functional transforming the Kaisher Shipyard, these social problems,such us high unemployment rate and long commute time for local residents,will also be considered. After the intervention^ hybrid landscape on an integrated surface will be developed ,and different conditions which can provide jobs and also the accesses to the recreational function will be developed. Also, anthropocenic activities has become the driven force for the migration of sediment and marsh land, which is just a pacel of the whole picture. Instead of bring the costal back to its prehistoric stage, a ballence need to be find coexisting. By taking use of the force of natural process(tide, wave, erosion, sedimentation, wind setup, etc) and take the product of the natural process as material for the urban development.

As a result the landscape transformation design plays a significant role to also develop the spatial quality

which people can have a totally different experience of the whole new platform of life.

Lesson learned

One of the important lession I have learn in the process of developing my graduation project i s to always stand in a position of a landscape architect. The fascination of for dredging proces s bring me in the theory of migration phenomenon. The richness in the natural and anthropoce ne processes is obsessingly interesting. Ecology, as I would now understand as a method to descripe interrelationship within a landscape assembldge, once become the mainly focus point of my research. I study throughtly how engineering and global trading changes the underwater world and coastal/river cities, as well as fauna and flora living consitions. But it also limited my vision as a spatial designer. Understanding infrastrcture is merely enough to conduct the design, more importantly is to build up connection on its impact on spatial.

And also, interdiscipline study brings me different view points. For example, when ecologist will argue by remedying the nature enviroment, we should retrive from it and let the natural succession take care of itself, which looks like an utopian idea. Where urban planner brings the idea of upgrading the industructure and attract investors, the natural environment and local labor workers then becomes the left-overs. The project tried to stand on a position by understanding the phenomenon of landscape migration, enbracing the inevitable changes and and provided win-win solution by using mulitidisciplinary criteria and actors.

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