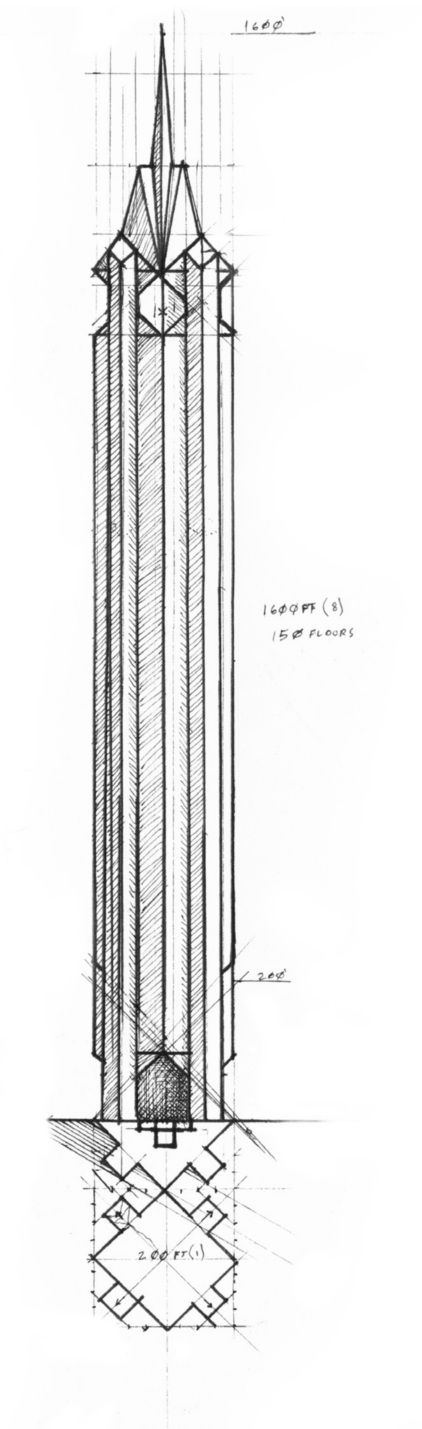

Tall

Soft Waterfront Renewal & Skyscraper Design Thesis Research Monograph
M.ARCH Thesis Prep | Urban Architecture at University of Oregon in Portland
Monograph: 2014 September to December | Professor: Gerald Gast, Architect

Richard H. Wilson - www.rhwdesigns.com

Reader Notes & Sketches

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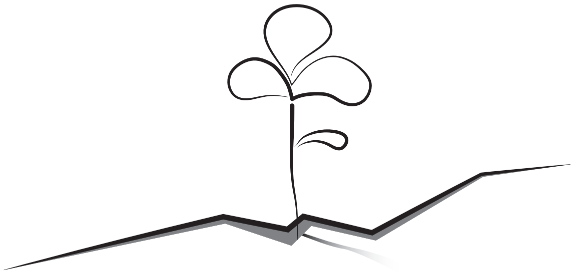
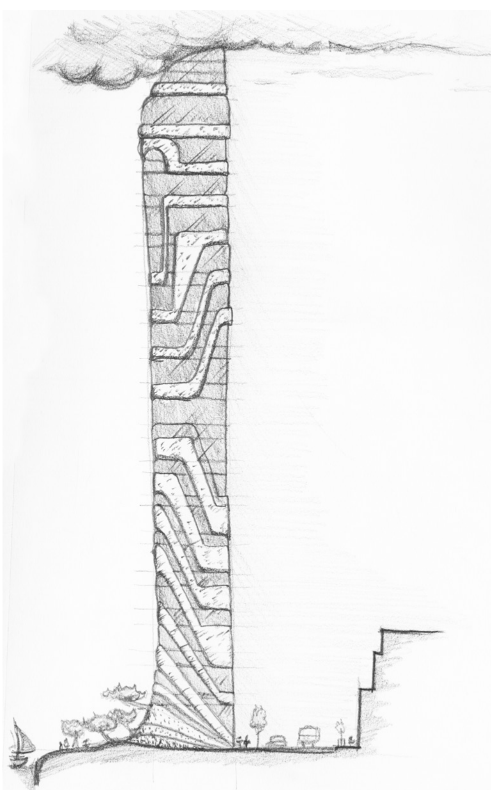
Abstract



1) Resiliency | Concept diagram.

2) Mission | Reclaim lost waterfront.



3) Compact Development | Skyscraper building type.

This monograph outlines the initial steps and program research for the following six-months of architectural thesis design.

Water - easily the most important resource for life on Earth. Its might has shown to be a force that human kind may be unable to control. In New York City, for example, preparations must be made for coming floods and rising sea level. With world cities such as these, the inhabitants are unable to just pack up and leave for higher ground.

This situation is similar in the San Francisco Bay Area, where space is limited. The result is a rising housing crisis with little available land to develop. This lack of land may be the cause for high housing costs, and may be pushing out the mixed workforce that keeps economies strong.

This thesis project will respond to these issues in three ways:

1) Resilient Design
2) Waterfront Reclamation
3) Compact Development

The chosen site is Alameda Island, California. The northwestern-most area, Alameda Point, is a large zone that may serve as a testing ground for how to handle the above issues. It is an abandoned Naval Air Station, practically a clean slate, flat, and just a few feet above sea level.

This project should encourage sustainable design strategies, and provide an innovative approach to the future built environment. As a guiding design principle, Vitruvius' three main tenants will be followed (see Appendix A-6).

Utilitas - Venustatis - Firmatis

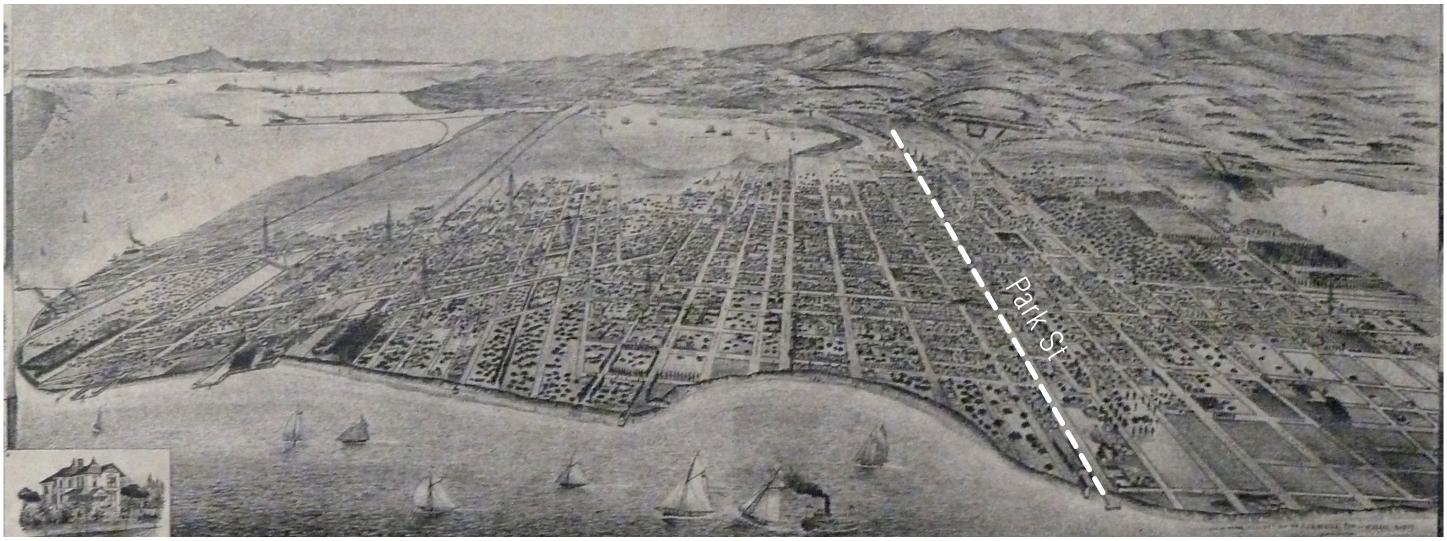
Commodity - Delight - Strength

Context - Site Location

California, USA | Projections
Sea Level Rise: 3.4mm/yr
Year 2100 Tide: 6.7m (22ft)

San Francisco Bay Area | 7.44 Million residents.
Alameda Island Population: 74,000 (2010)
Dashed area represents Alameda in 1854.

Alameda Island Point | Comparison of compact cities.
Land Area: 66,080,000 square feet (1,500 acres)
Polluted Waterfront: 37,000 linear feet (7 miles)



Park St | Walkable.

Alameda Island, once a peninsula, as may be seen in this historic bird's eye perspective above, has changed in accordance with the water's edge. In some places, shore line was actually added to accommodate the need for more land.

Before settlement, The East Bay of San Francisco, now Oakland, was a vast landscape of oak trees. "Alamada" is Spanish for, 'poplar grove.' However today Alameda has been deforested, and re-planted over time with a suburban development pattern since 1854. Its success may be attributed to the railroad that terminated, from New York, at Cohen's Wharf starting in 1864. This allowed wealthy inhabitants to take refuge from the city life to live in this relatively secluded and quiet area. Later in 1869, the connection between Sacramento and Alameda prompted an additional surge of commerce in the area.

This railroad at one point continued up through Park Street shown above, providing vital street life, and encouraged development along the line. The "Key System", operated between 1903 and 1960 served the Bay Area to provide vital transportation. Seen to the left is a sketch of Park St in 1910. So although today the streetcar no-longer exists in Alameda, reintroducing it may be the *key* to invigorating Alameda Point.

Today Alameda is a quiet suburban island (see Appendix A-1 for a more detailed description), and seen as a retreat from the city bustle. The Naval base, which currently remains largely unused, historically provided both ship-building jobs and aircraft functions. However its lack of use and residual contaminated soils are an issue that must be resolved, see A-2.

As may be seen in A-3, almost half of the island is residential zoning, most of which is single-family detached homes. A major issue that these residents and low-rise developments face will soon involve the rising tide. A-4 shows a report that details the expected areas of flooding on Alameda Point (the focus area of this thesis). Although flooding and rising tides are a concern, there may be ways of handling the problem with the existing land reuse. Solutions to these issues will be investigated and proposed during design.

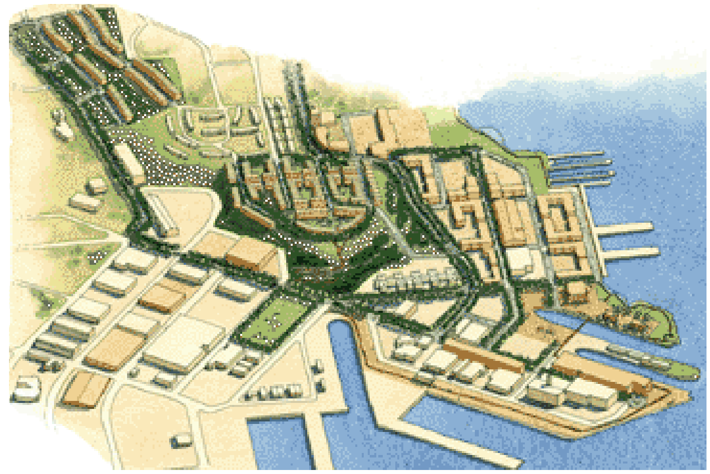
Client & User Groups

It will be assumed for this thesis project that the City of Alameda has partnered with a national master planning development firm that is well known in the Bay Area. They have completed massive dock-land redevelopment plans for San Francisco that today are thriving centers of commerce and livelihood. An example illustration of this plan may be seen to the right.

As mentioned earlier, market analysis in the Bay Area shows that residents are currently in the midst of a housing crisis. With the dwindling availability of developable land, and the scarcity of housing, this thesis shall focus on the housing sector while developing a waterfront design strategy in response to the rising tides. This means that the housing type selected must meet these challenges while also following the initial goals set out earlier on. The specific goal in respect to housing type is Compact Development.

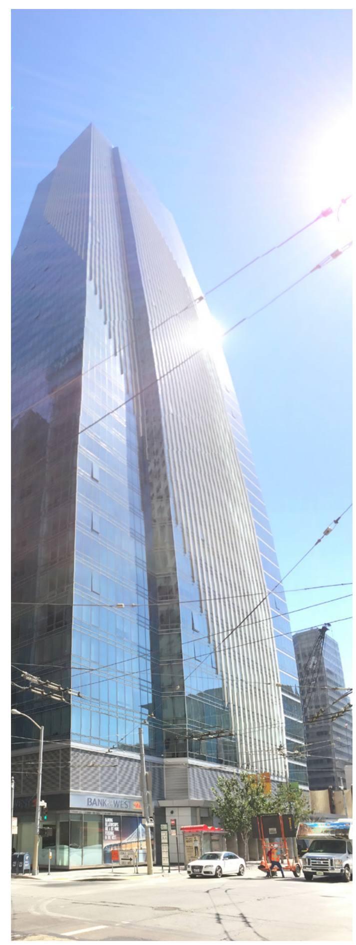
Although it is recognized that the need for housing should accommodate low to medium income households (left: brick building), this thesis will focus on a high-income housing type (right: glass building) that will serve as a catalyst for the rest of development. However the building to be designed should allow for some market-rate housing and mixed-use space (see Appendix A-5 for further explanation).

The building type selected for this thesis is the Skyscraper. For an in-depth analysis, describing the reasoning for this choice, see A-7.1 and A-7.2.



Masterplan Developer | Example design in the Bay Area.

- 702 Acre Bownfield Redevelopment
- 320 Acres of Parks
- Residential: 10,500 units (32% affordable housing)
- Commercial: 2.5 Mil SqFt
- Retail: 3.7 Mil SqFt
- 13,000 + Jobs



Low & High-rise | Low & High-income

Site Program

Alameda Point | Half & Half

Site Documentation:

- Designated Site Area: 36,026,197sf; 827 acres.
- Waterfront Linear Distance: 21,944ft; 4.2 miles.
- Hardscape - gray (concrete / asphault): 438 acres; 53% (19,084,000sf).
- Softscape - green (soil ground surface): 389 acres; 47% (16,942,000sf).

Site Goals:

- Waterfront and landscape long-term remediation strategy.
- Skyscraper as catalyst, and compact development

The following is a matrix that outlines the major program spaces and uses for the property. See A-8.1 to 8.3 for the process that lead up to this matrix. The below figures are not final however, since there is still study to be performed in terms of how to handle the concrete runways and brownfield soil treatment. During further design, these issues will be resolved.

Site Program Matrix | Note: Percent adds up to the total available site of Alameda Point.

Program Space	Acres	Percent	Comments
Alameda Point	827	100%	43,560 SqFt = 1 Acre.
Hardscape	438	53%	Existing 4ft-thick concrete runway.
Landscape	389	47%	Existing brownfield soil.
Restoration/Habitat	292	35%	75% of existing Landscape for non-human use.
Parks & Public Space	97	12%	25% of existing Landscape for human use.
Streets	197	24%	45% of existing Hardscape, the rest goes to buildings.
Industry	182	22%	

Commercial and Housing | Note: Percentages below are a distribution of housing types based on Appendix-5. It is assumed below that there may be as many as 60 typical, 200ft x 200ft, 12-story, multi-use buildings.

Program Space	Acres	Percent	Comments
Commercial - Retail	176		Three floors of retail average.
Commercial - Office	264		Nine floors of retail average.
Housing - Luxury	100	38%	High income.
Housing - Market	45	17%	Moderate income.
Housing - Subsidized	45	17%	Moderate income.
Housing - Assisted	74	28%	Low income.

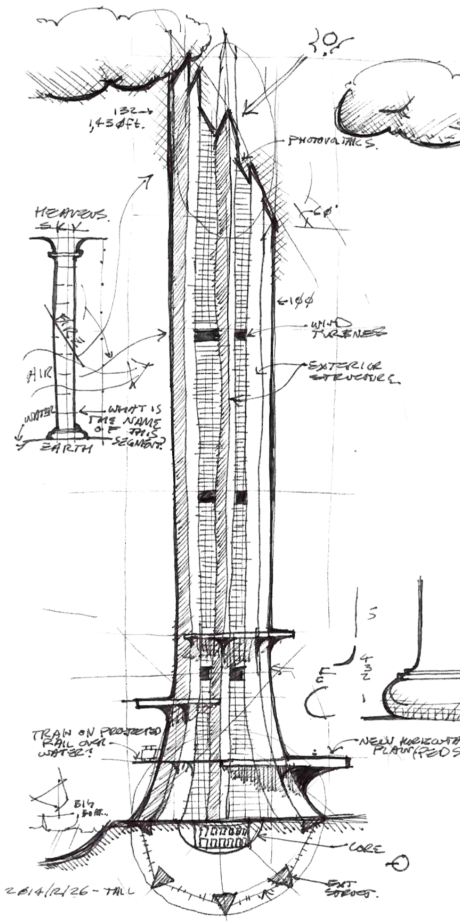
Building Program

The high-rise building type was chosen in order to handle multiple issues regarding the context:

- Rising sea levels
- Construction type to withstand flooding
- Sprawl
- Lack of housing
- Unused, but still valuable land
- Potential for on-site energy resources such as wind and solar collection
- Reconnection of transit system
- and more

Appendix A-9.1 to 9.7 describes the research behind selection of the high-rise building type for this project. There is a major question involving high-rise building type and land use - that is whether these expensive buildings actually preserve space. This thesis shall argue that high-rise housing does preserve natural land.

A comparison between low-rise and high-rise may be found in a paper mentioned at the end of A-7.2. The paper compared a specific high-rise development type to a loft-type development. It was found that for an equivalent amount of residential units as a high-rise, the lofts would require 520% more land.



Tower Concept | Rising Tide & Sustainability

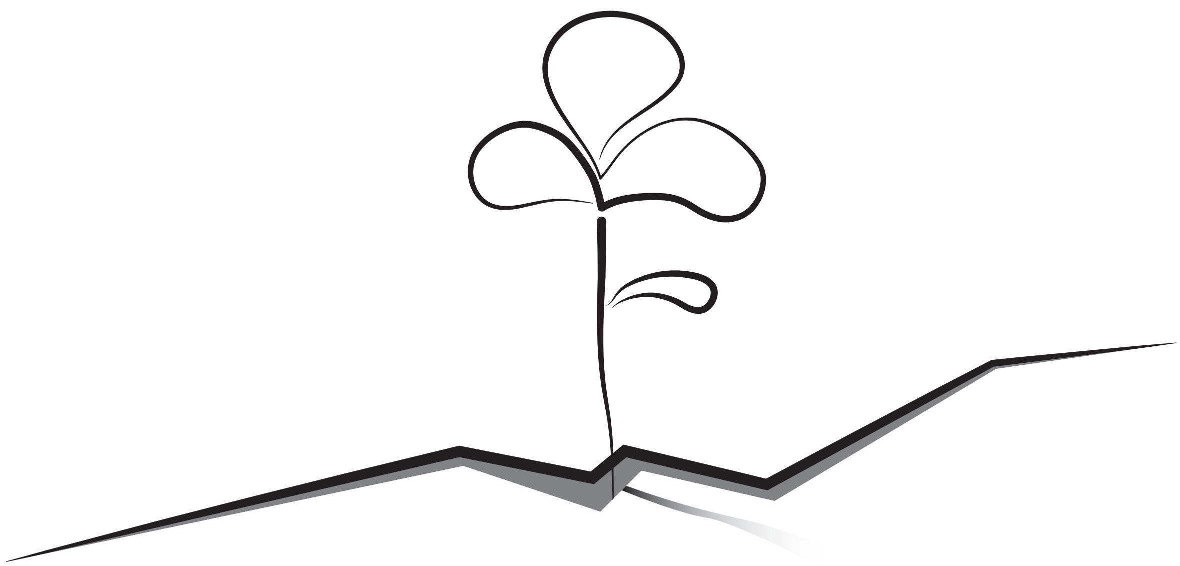
Building Program Matrix

Program Space	Value	Percentage	Comments
Building (Gross)	550,000 SqFt	100%	At $900/SqFt = $495,000,000
Floors (Total)	50		
Occupiable Height	540 Ft		
Commercial	170,500 SqFt	31%	Floors 01-08. Office & Retail.
Residential	264,000 SqFt	48%	Floors 10-48. 3-Bed 1,700sf; 2-Bed 1,200sf; 1-Bed 800sf; Studio 600sf.
Structural/Elevator Core	99,000 SqFt	18%	2,000sf per floor.
Skylounge/Restaurant	16,500 SqFt	3%	Floors 49 and 50.

Next Steps

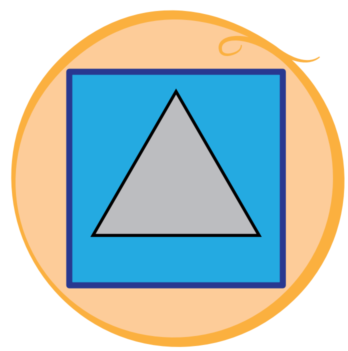
This thesis research monograph has helped flush out major considerations for the next six months of design. It involves developing a soft waterfront improvement master plan, anticipation for future sea level rise, and the construction of a skyscraper that works with these two intentions along with a proposed compact development district.

The next steps of the project will involve pinning down the quantities for program areas, and required functions for both the Alameda Point soft waterfront and the spaces required for the skyscraper compact development areas. This will involve interviews with developers, general contractors, and other professional organizations that have interacted with the issues described in this thesis monograph.

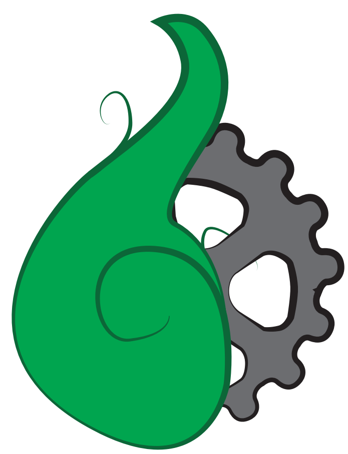


Appendix

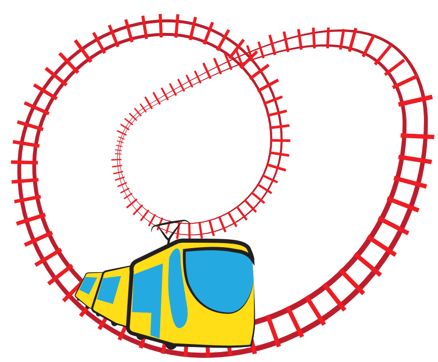
1) Resilient Design
Vitruvius' Three Main Architectural Tenants:
- *Utilitas* (Commodity)
- *Venustatis* (Delight)
- *Firmatis* (Strength)



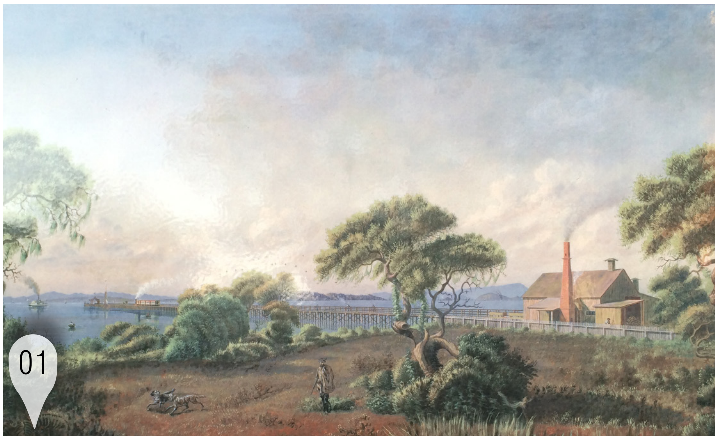
2) Waterfront Reclamation
Master Planing Strategies:
- Organic Growth
- Mechanical Development



3) Compact Development
Transit Oriented Development Plan:
- Re-introduced Key System



A-1 | The Waterfront of Alameda

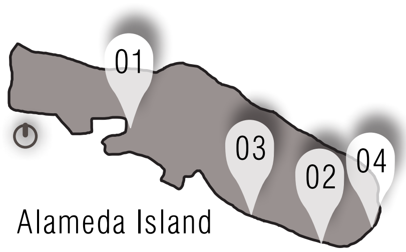


Early settlement in Alameda was spurred here mostly by railroad, which injected people directly onto the once peninsula.

The waterfront of Alameda has some wonderful aspects. From the west coast, one may practically reach out and touch the skyline of San Francisco. The vantage point from the Alameda beach is particularly marvelous closer to the Summer Solstice, because the sun sets just behind the skyscrapers of the city across the bay.

All along the shore are places to play for humans and non-humans. With beach access on the south side, indicated by point marker 03 below, people may enjoy the unusually warm water of the Estuary, and mild tides that lap the shore. The wind speeds along the shore are generally high though, which is why this beach has become a successful wind surfing destination, seen in the photo to the left.

Some non-human habitat exists in Alameda as well. One of the first habitat restorations in the United States took place at marker 02. The Elsie Roemer Bird Sanctuary created in 1979, and maintained ever since. This sanctuary makes up about 16 acres of shore that comes and goes with the tide, and is inhabited by no less than 14 different birds. Other animals were spotted in this area too, such as crabs and clams (which the birds probably find rather tasty).



A-2 | Abandon Navy Military Base

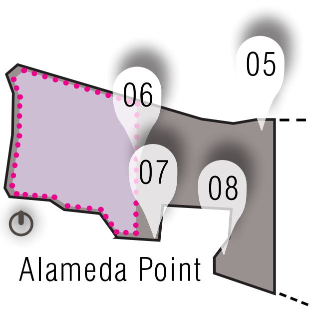
There is regular freight access for industry to the north on the Oakland side of the harbor. However this has remained largely neglected for years. This area serves a large population of Ferry service to San Francisco's AT&T Park on the east side of the city. But this is only accessible to pedestrians wishing to avoid the heavy traffic on Giants baseball game day.

The opportunity for development at Alameda Point is un-resistably ripe however. The distance from the edge of the "bird habitat" fence edge at map marker 06 to the water directly west is 1.2 miles. Then another 3 miles to the skyscrapers across the bay.

At one time, as with most of the world's coastline, Alameda was a lush and healthy environment. Today development has replaced all of the wild land. Some of the waterfront was actually added by feats of engineering. The abandon Naval base at Alameda Point has since been converted into another bird nesting sanctuary. This partially constructed land accounts for an additional 800 acres of non-human habitat (outlined in purple below). However the reason for this so-called habitat designation may actually be due to the potential radioactive contaminated soils - unsuitable for human use (see map marker 07).

Some of the existing buildings at the base are currently being used by businesses, such as a brewing company, winery, and fitness clubs. These uses can benefit from the long-span airplain hangers that populate the hardscape.

Some Americans take pride in the ships that sit docked at map marker 08, which were converted into a Naval museum. Residents may opt to explore the ships for a weekend activity, while tourists may also find this to be an interesting side trip from the other sights in the Bay Area.

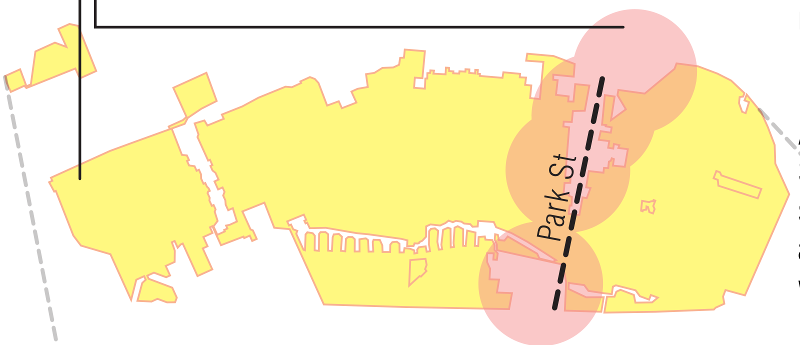


A-3 | Sub/Urban

Alameda Island has a land area of roughly 5000 acres.

Yellow Residential Zoning: 2,258 acres (45%)

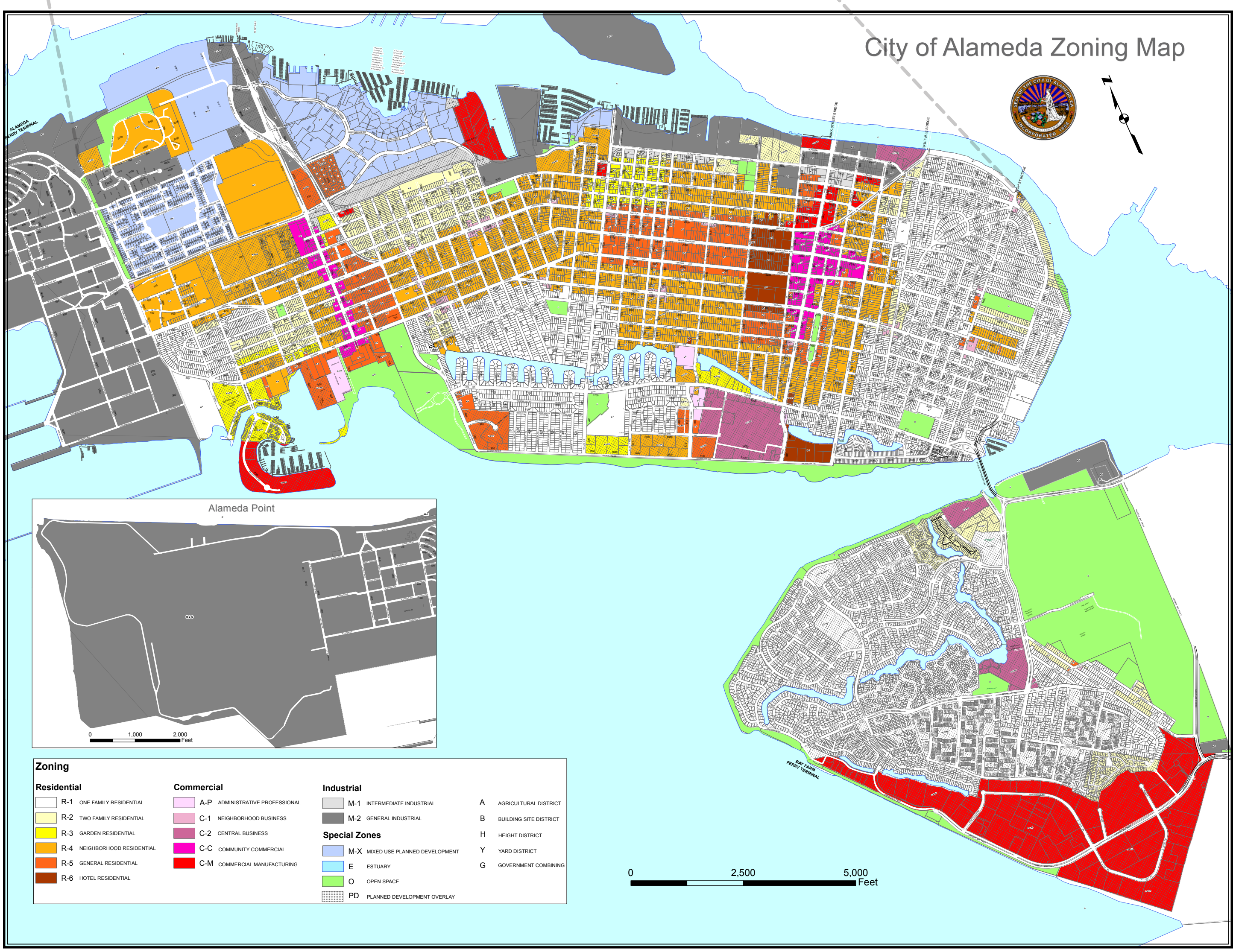
Red circles indicate 1/3 mile radius around Alameda's grocery stores (reasonable walking distance). This excludes mini-markets, which do not stock healthy food options such as vegetables.



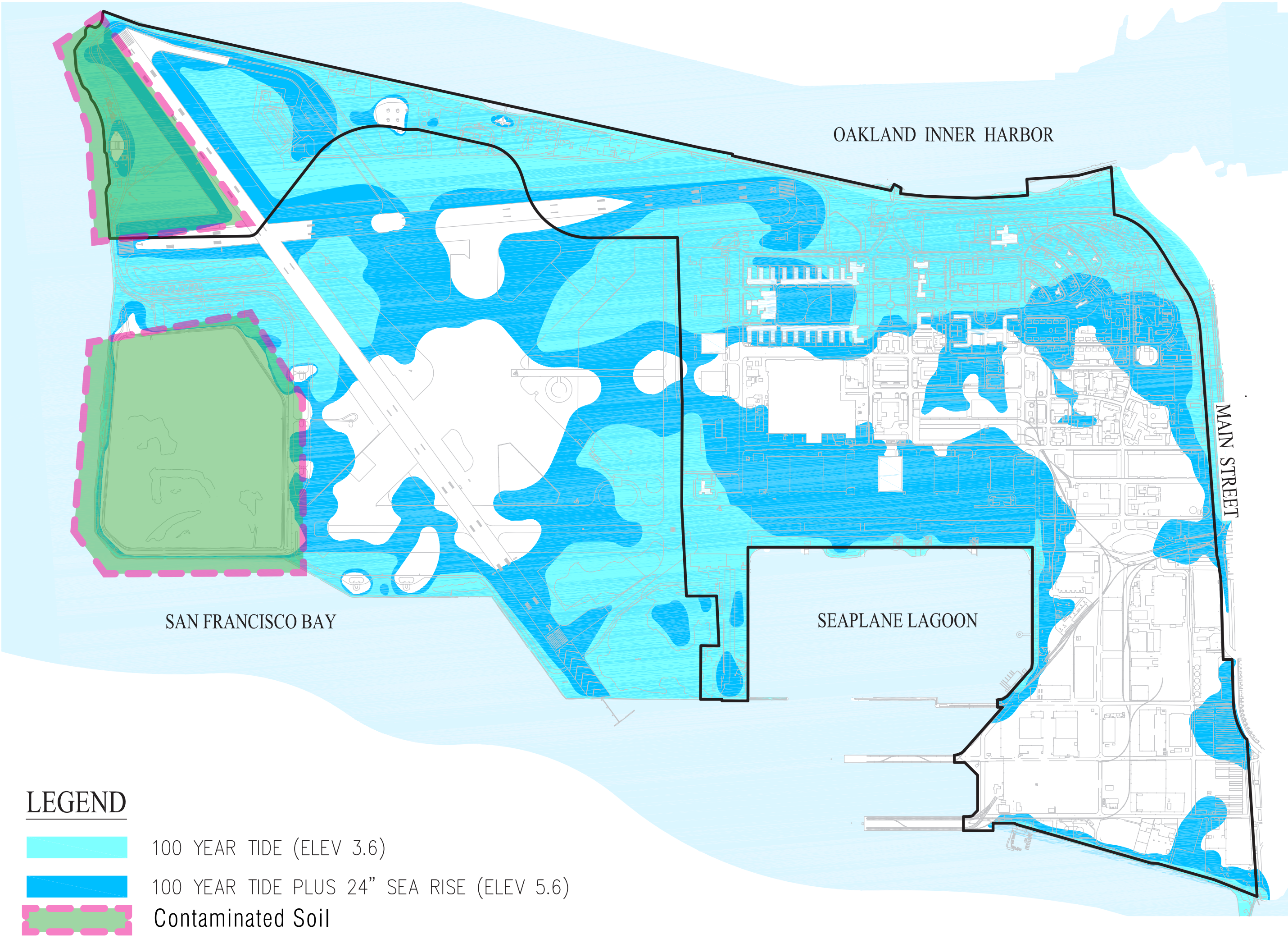
This thesis project will primarily investigate the main island of Alameda, seen below as the northern land mass.

A major issue that America currently faces is the post Suburban residential development pattern. This is mainly due to the excessive reliance on cars for individuals to reach basic amenities. Although suburb communities are still being developed, and many more are planned to come, the "suburb" may be hurting the United States in unexpected ways.

About 50% of Alameda Residential zoning is Single-Family detached housing. However only a small percentage of the residents on the island have access to the grocery stores within a reasonable walking distance.



A-4 | Rising Tide



The reality of residing on an island is the risk of tidal waves. With recent scientific research on the developing topic of climate change and sea level rise, Alameda is at high risk of being permanently flooded due to its low elevation of 33ft (at its highest) above sea level.

Seen above, a prediction of the 100-year tide. This map shows that most of Alameda Point will be under water in a major tidal wave event. Planning is already under way for what to do around the world in regards to the rising sea level. In New York for example the easy solution seems to be a new sea wall. Although they are exploring other options to stave off the rising tides. The reality is that humans are contributing to the increased temperatures on Earth, which cause melting of existing ice, glaciers, and other frozen mass around the globe. The question remains of what to do exactly. Although the answer is not so clear, and is much more difficult to act on, there are solutions to this problem. The solution requires commitments to change by human kind.

Another existing problem at Alameda Point, is the contaminated soils that continually leach into the San Francisco Bay Estuary. Again the authorities seem to think the best solution is to plow large metal sheets into the water's edge, creating a barrier of sorts, to prevent any further leaching. As an immediate $13mil solution, perhaps this is the best for saving sea creatures and the environment. The unrevealed reason behind preventing additional sea contamination is related to what happens when those chemicals get into the water. Speculatively, they raise the sea temperature, worsening the problem of ice-cap melting, and global climate change. It is easy to see that Alameda has a responsibility to the environment, and for saving the island from being plunged into the sea permanently. Although Alameda was left to deal with this problem, most of the contamination was due to Navy operations.

A-5 | User Groups

It has been reported in journals, and passed around by word of mouth, that the San Francisco Bay Area is in the midst of a housing crisis. The reason for this crisis is the tech industry boom which takes place in and around the Bay Area. Employees and entrepreneurs of the tech industry (referred to as Tech Class) see salaries in the six figure range, putting them easily within reach of affording housing at much higher costs than the Working Class. Developers and property owners see the value in raising rent and building higher. However this is an expensive building type that this influx of tech money can support. This is an issue because Working Class wages cannot afford the rising costs of living such as this. However for a community to stay strong, and competitive in the world market, it must maintain a mix of income levels: Working Class, Middle, and Upper Class. Here is the spread as of 2012 in the Bay Area:

- Low Income / Working Class: <$35,000; 28% of households
- Middle Class: $45,000-$75,000; 34% of households
- Upper Class: $100,000<; 38% of households.

The major question here is whether this spread of income is appropriate? With as difficult as it is for individuals to find housing currently, the answer points to this spread being dysfunctional.

Condos
The Infinity Towers,
Spear St & Folsom St
San Francisco
$3.2 mil; 3-Bed; 2,100sf

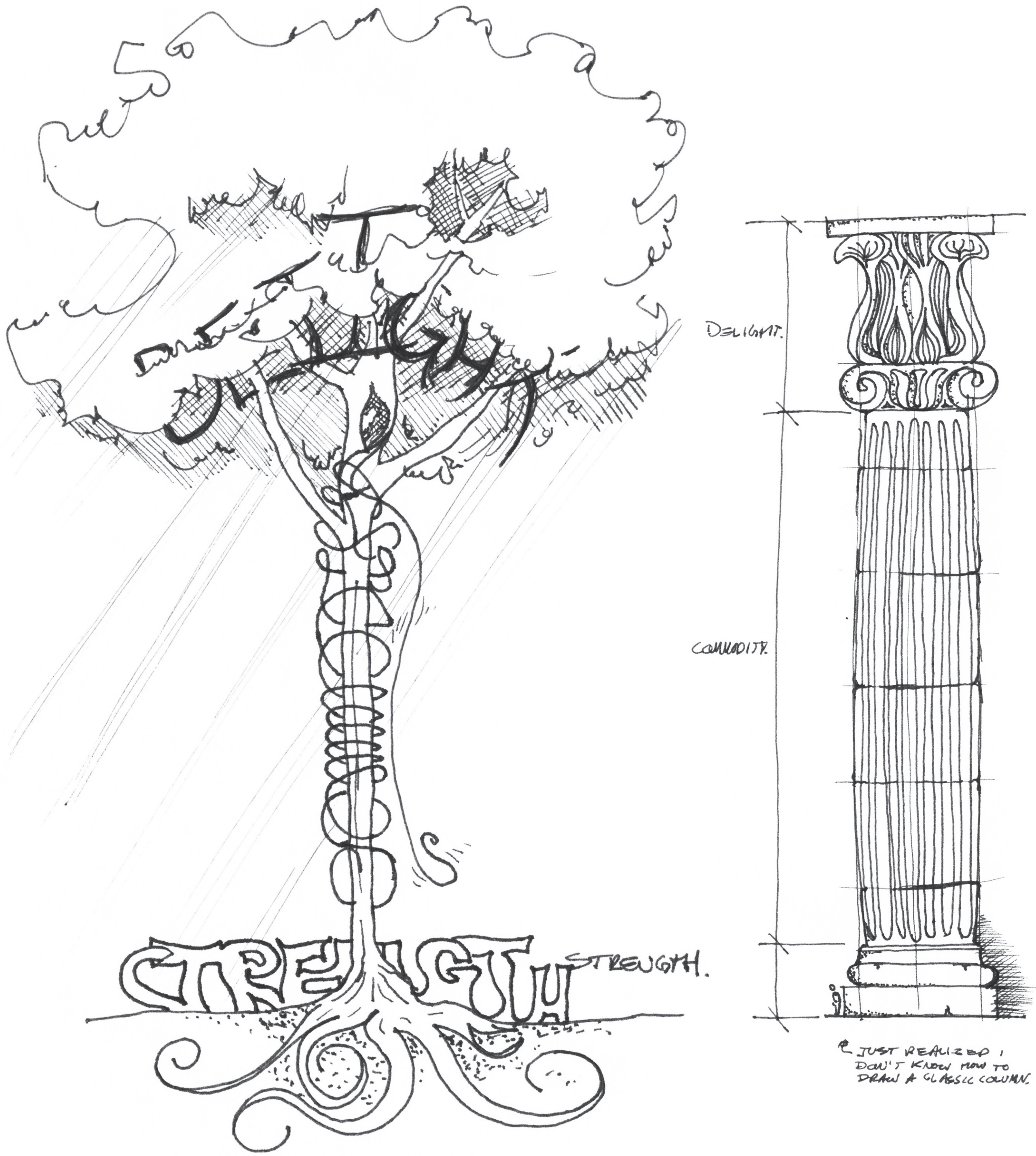
Apartment/Lofts
Cotton Mill Studios Calcot Pl
Oakland
$2,250/mo; 1-Bed; 1,800sf

House / Soon-to-Be Duplex
Alice St & 7th St
Oakland
$456,575; 3-Bed; 1,400sf

Recently raised, to fit a new unit under the existing single-family detached house.

The housing types above give a brief overview of what may be found around the Bay Area. These three represent the intended user types for the entire development of Alameda Point: Low, Middle, and Upper Class. Notice the white house in the image above. Due to limited housing options, and code issues, the single-family house may only be raised slightly to insert housing underneath - an interesting solution, but was it the right one?

This thesis project will make an effort to address this housing issue by proposing a mixed-use compact development district on Alameda Point. The primary building will be a residential tower, with some market-rate housing and mixed-use tenants. However, with the rising sea level, the architecture must take on an unusual form to handle water. This means that the entire development district at Alameda Point will need to be innovative in its use of the horizontal plain. Although it may make more sense to build mostly mid-rise buildings to accommodate the various income levels, the most logical type will be high-rise, in response to rising water, and the need for structural stability.



Utilitas - *Venustatis* - *Firmatis* (Commodity - Delight - Strength)

Marcus Vitruvius Pollio set down, in around 25 B.C.E., basic tenants for architecture and design. Upon critical evaluation of these tenants, one may begin to see the intensely deep connection to all things natural and human-made. In the example above, commodity serves as the primary support, that which produces most of the work for the body; delight is the head, impression, and pleasure; strength is an analogy for roots/base.

By following these tenants, it may be possible to produce a work of architecture that improves the build environment.

A-7.1 | The Skyscraper

At one time, skyscrapers were envisioned as the future of construction. Evocative images show cities rising into the sky to form new horizontal plains that have been regular fantasies for some designers. Le Corbusier provided the most famous examples of tall buildings and revolutionary ideas that involved altering the horizontal plain. Although Corb's high-rise construction type is now seen as unsuccessful, it served as an example of the possibilities.

What many individuals desire though is to live in a quiet neighborhood with plenty of grass to play catch with their kids, for example. This dream is hard to create when the place we live in looks like the King's View of New York on the left. The desire to own a little piece of nature, and have property, was the American dream. This dream generated what is now known as the Suburban development pattern, which proliferated over the past century.

Today people generally resist the idea of tall buildings. There are many good reasons not to construct too high:

- Long, dark shadows,
- Out of human scale,
- Expensive,
- Material intensive,

There is no doubt that building tall has its issues. The value in building tall comes in the form of compact development. So although many individuals want to own property, about 61% of respondents in a recent survey said they wanted to live in smaller homes that result in shorter commute times. The idea of building close may be an uneasy topic for some, inducing imagery of cold, dark alleys, that end in sewer drains, bums and newspapers. This vision does not have to be reality though. With good design strategies, and investment by downtown city centers, these situations may be avoided.

The un-realized fact about development, housing, and construction is that we are running out of space for new construction. It may seem strange that land could run out on a plaint such as Earth, with a land area of roughly 148,940,000 km^2 (29.2%). This monograph researched the developed land in the United States. What was discovered may be seen in the mapped images on the left. Notice first the full view of the U.S. as captured by GoogleEarth, and the bar running through the middle.

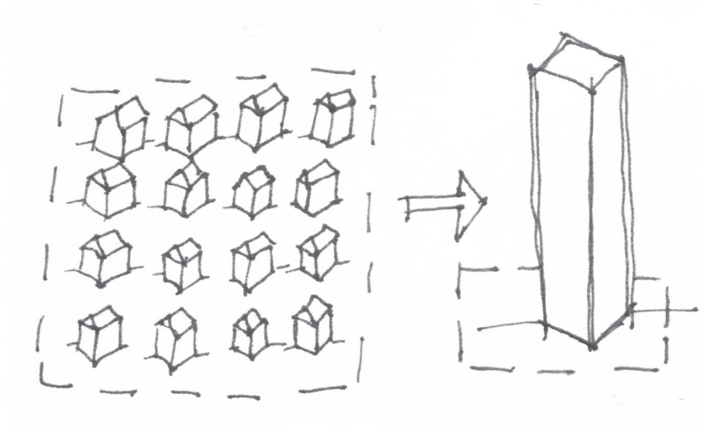
Then see the enlarged bar on its right. Then look closer at the land around Finley, North Dakota - a vast farm land with little remaining natural landscape. The reason for showing this is to delineate that the entire bar shown here looks like the area surrounding Finley. The bar shown has no broken developed land from the most northern boundary of the U.S. to the southern boarder. In other words, the U.S. has almost entirely been farmed, from top to bottom, by one square mile plats.

So that typical idiom, “We have plenty of room to spare,” is simply not true. As has been shown, we have precious little natural landscape left. The area investigated here was farm land, which begs further investigation into what kind of agriculture is being grown - this will not be investigated for this thesis.

This thesis is about reconnecting people to the waterfront, developing a building type designed for the rising sea level, repairing habitat and what damage humans have induced so far. The building type chosen is the Skyscraper, and was selected to mitigate the issue of sprawl. This type was chosen for several reasons:

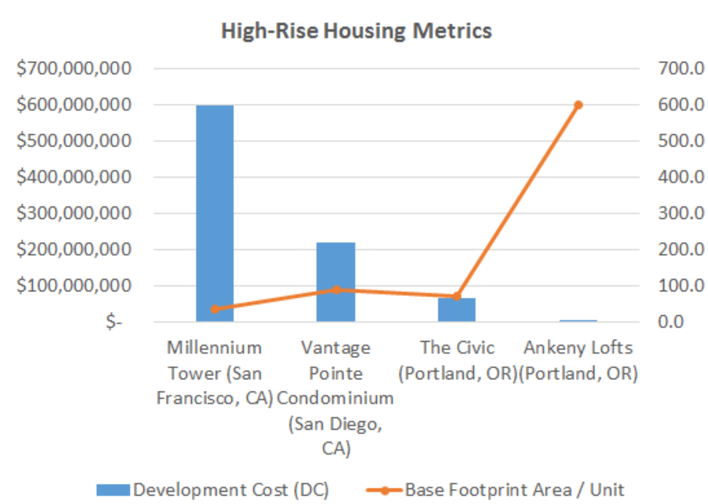
- Standing tall above potential flooding,
- Strong, high quality construction type,
- High quantity of housing per land area,
- Potential to preserve natural landscapes,
- Architectural image,
- High return on investment,
- Infrastructure.

The primary issue with high-rise construction is cost. Seen to the right are four housing types that were chosen for the sake of comparison. Three towers of varying design quality, and one row-house. Although these present a small sample case study, they show some important figures. Each varies widely in cost, and living units provided. The most important item to notice is the orange line graph. This shows units per building footprint square footage. It is clear that the three towers require substantially less land, while also providing more housing units, but all at a higher cost. Notice too the yellow highlighted row, which shows cost of development per building footprint area. This housing cost research may be read in full here:
http://www.rhwdesigns.com/architecture/research/
“The Cost of High-Rise Housing in Portland, OR”



Millennium Tower (San Francisco, CA)	Vantage Pointe Condominium (San Diego, CA)	The Civic (Portland, OR)	Ankeny Lofts (Portland, OR)

High-Rise Housing Metrics	High Quality Design	Mid-Level Design	Lower End	Example Small Scale Case
Name	Millennium Tower (San Francisco, CA)	Vantage Pointe Condominium (San Diego, CA)	The Civic (Portland, OR)	Ankeny Lofts (Portland, OR)
Development Cost (DC)	$ 600,000,000	$ 220,000,000	$ 66,266,200	$ 480,000
Gross Floor Area (GSA)	1150000	750000	279871	4250
Building Cost per GSA	$ 521.74	$ 293.33	$ 236.77	$ 112.94
Height (occupied) ft	593	420	185	35
Average Unit Cost	$ 1,800,000	$ 861,500	$ 250,000	$ 636,770
Units	440	679	261	4
Floors	58	41	16	2
Avg Units per Floor	8	17	16	2
Base Footprint Sqft	15000	60000	18086	2400
Base Footprint Area / Unit	34.1	88.4	69.3	600.0
Built	2009	2009	2007	2012
Construction Type	Concrete	Concrete	Concrete	Wood
DC/Footprint	$ 40,000	$ 3,667	$ 3,664	$ 200
Unit-Footprint / Dev Cost (100000000000) "Score"	5682	40166	104571	125000000
DC per Footprint Area	$ 40,000	$ 3,667	$ 3,664	$ 200
Payback (Unit Cost * Units)	$792,000,000.00	$584,958,500.00	$ 65,250,000.00	$ 2,547,080.00
Structural Construction Cost	$ 34,500,000.00	$ 22,500,000.00	$ 8,396,130.00	$ 127,500.00



Propositions:
Alameda Point will be developed with the intention of compact development as a goal. An important consideration of this site is its bio-contaminated shore, which must be remediated or resolved in the best way possible.

With such a large site - 827 acres - proposed development must proceed in stages. Some of the propositions shall proceed at very long range time scales, such as 75-year, whereas others may be much shorter, perhaps 10-years.

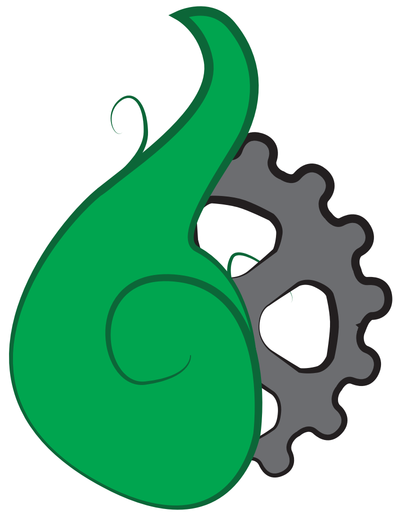
The shape of the newly developed shore and landscape shall be evaluated on two criteria: 1) Organic Growth; 2) Mechanical Development. These will be used as a guide to roughly maintain a framework throughout the design.

Organic Growth:
- Organic diagrams
- Building orientation
- Daylight exposure
- Wind on site
- Natural flow of people through spaces

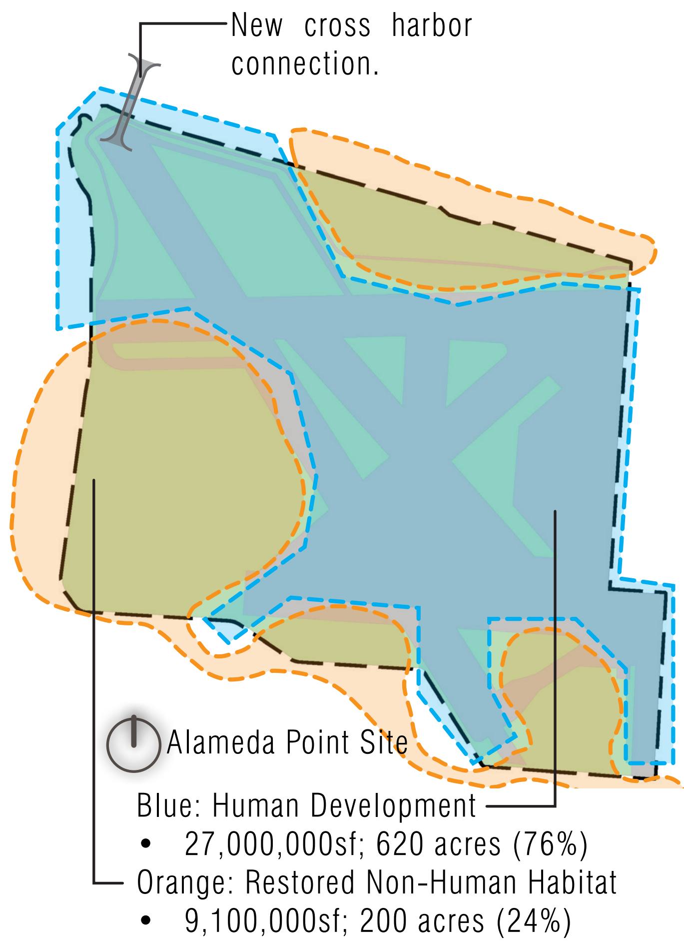
Mechanical Development:
- Linear diagrams
- Roads, grids, and infrastructure as guide
- Systems integration on site
- Vehicular travel
- Productive and efficient use of space

This organic design may help to locate wildlife habitat. Birds have been allowed to nest at the site, bringing a sense of nature directly into one of the most populated regions of the USA. Space will be given to these winged creatures.

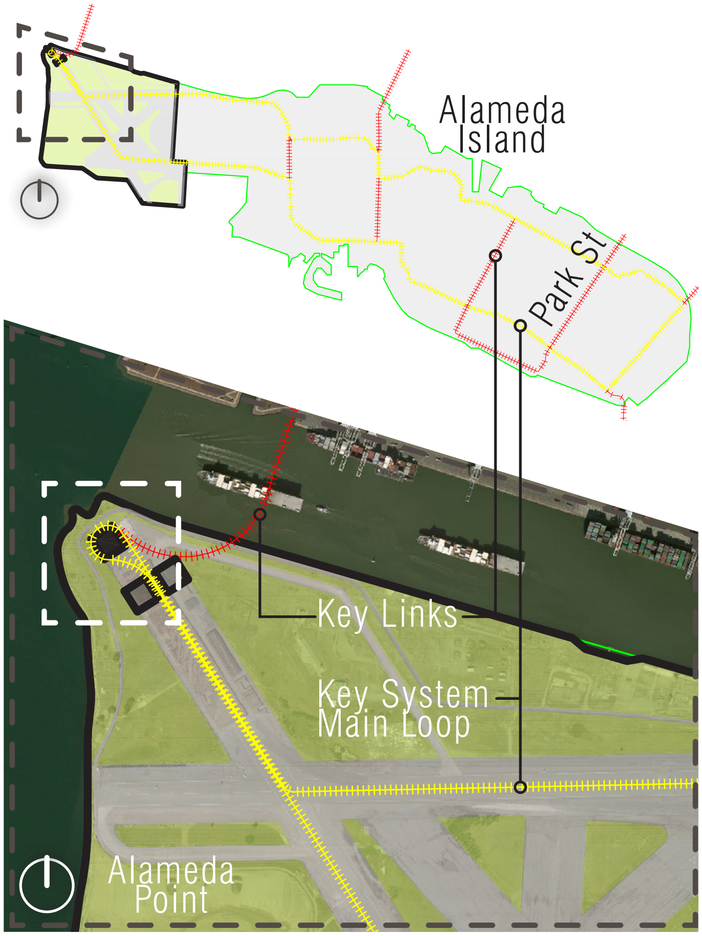
Since Alameda is an island, maintaining enough cross harbor connectivity for people to commute will be a concern. As of now, Alameda has four points of connection to Oakland, and one more to the southeast. It is likely that with this new compact development, one or two more connection points will be needed.



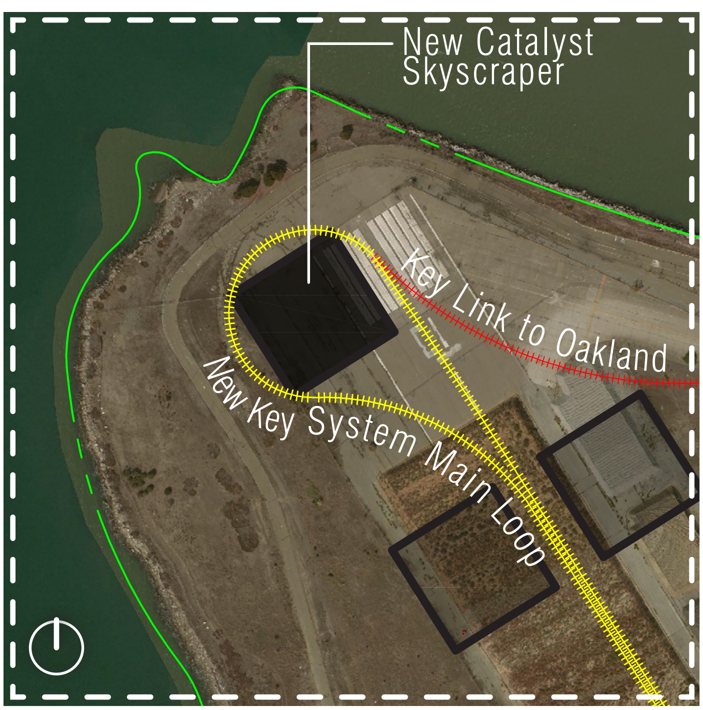
Organic Growth & Mechanical Development



Early Site Program Space Concept



Proposed New Light-Rail Key System



Primary Skyscraper Siting

The proposed re-introduced Key System Main Loop will be an integral component to the overall master plan for Alameda Point, the Island, and the East Bay. Here are some of the potential data metrics for a system such as this:

- 14.7 mile loop,
- 44 stops at 1/3 mile separations,
- 60 minute loop time.

The Loop would be intended to connect the entire island together. The red Key Links would fill in the gaps, shorting the time between destinations, and connecting to Oakland and the East Bay. The yellow Main Loop line shown to the left is accessible within at most a 1/2 mile radius from any point on the Island. This system would not only be popular for Alameda residents, but also for the night-life croud that visits Park St.

Park St is a popular destination for Bay Area citizens looking for a night out in a quiet town. And although it is a very walkable street, it is still dominated by the vehicle. Currently, as was experienced personally by the author, Park St. tends to be a bustling access route with every parallel parking space full during these weekend or evening outings. Re-introducing the Key System Links may reduce the amount of traffic on the popular Park St, continue to encourage its pedestrian walkability, and provide a quick and easy way for people to move around. If an individual wished to see a movie at the gorgeous newly remodeled Alameda Theater, then take an evening stroll along the south waterfront, they may do so easily. By hopping onto the Link at the Theater, then riding to the shore, they may be there within only three minutes, without the need of getting into a car, loosing a sweet parking spot, or paying for another parking spot.

This Key System would be a sustainable development for the Bay Area and Alameda. It would reduce individual reliance on single-occupancy vehicles, and increase connectivity between municipal districts. The BART (Bay Area Rapid Transit) for example, already provides a similarly easy travel option for current residents. The Key System would be a secondary support for this already successful public transit option.

How this system will need to be integrated is the most important solution to be resolved for Alameda. And connecting to the East Bay would require significant cooperation between cities. These solutions however are too complex for this thesis project to resolve entirely, and will not be investigated much further than what has been presented here. What will be investigated regarding the re-introduction of the Key System is how it connects to the new Alameda Point development, proposed by this thesis.

Due to the expected sea level rise mentioned on page 11, and the low elevation of Alameda, the placement of this new light-rail will be a critical factor. This thesis proposes that the solution will be to raise the horizontal plain that people interact on. Since the existing grade will not be completely flooded for quite a long time, the current ground level will still be considered as the primary base elevation.

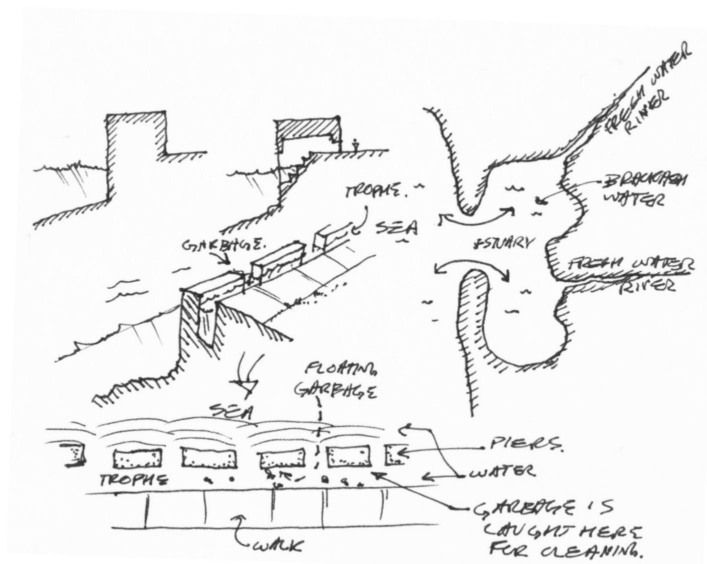
However what this means for the new Key System is gradually raising it above to a new height. The existing ground activity throughout Alameda should be maintained, and the Key System will match this existing grade throughout the island. However at the new compact development on Alameda Point, this light-rail system will need to attain a height that is above projected water levels at some future time. This height above the existing grade will be of particular difficulty to ascertain. Since practically every research investigation into the matter of sea level rise is speculative. The rate, 100-year height, flooding, and all data sets may be incorrect by large margins.

Raising the plain at which people interact will be an unusual task. However the implications for proposing an innovative approach to sea level rise may be valuable to the rest of the San Francisco Bay Area, which may be in similar risk to flooding.

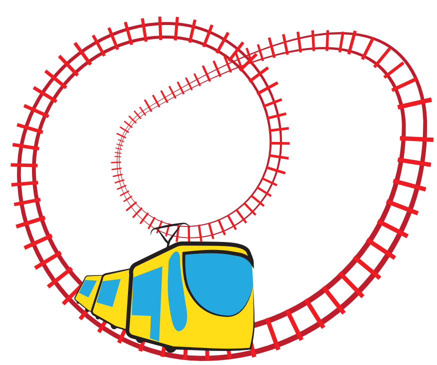
Preliminary program spaces will provide this thesis with the direction needed to develop its landscape. The plan will follow the Organic Growth and Mechanical Development strategy, with the aspirations of creating a successful arrangement of both human and non-human space. The following is an initial attempt at proposing the particular site provisions.

Organic Growth
- Walking/biking/running paths,
- Vehicular roads placed per most natural flow of movement,
- Development to conform and interact with water's edge,
- Contaminated soils cleanup,
- Solar and wind building orientation.

Mechanical Development
- Building placement per logical grid system,
- Sustainable site maintenance systems,
- Maximum re-use of existing hardscape,
- Planted vegetation,
- Connection of new development with existing off-site infrastructure,
- Transit-Oriented Development (TOD).



Thesis Sketchbook - Garbage Collection



Key System Concept

A-9.1 | Building Program

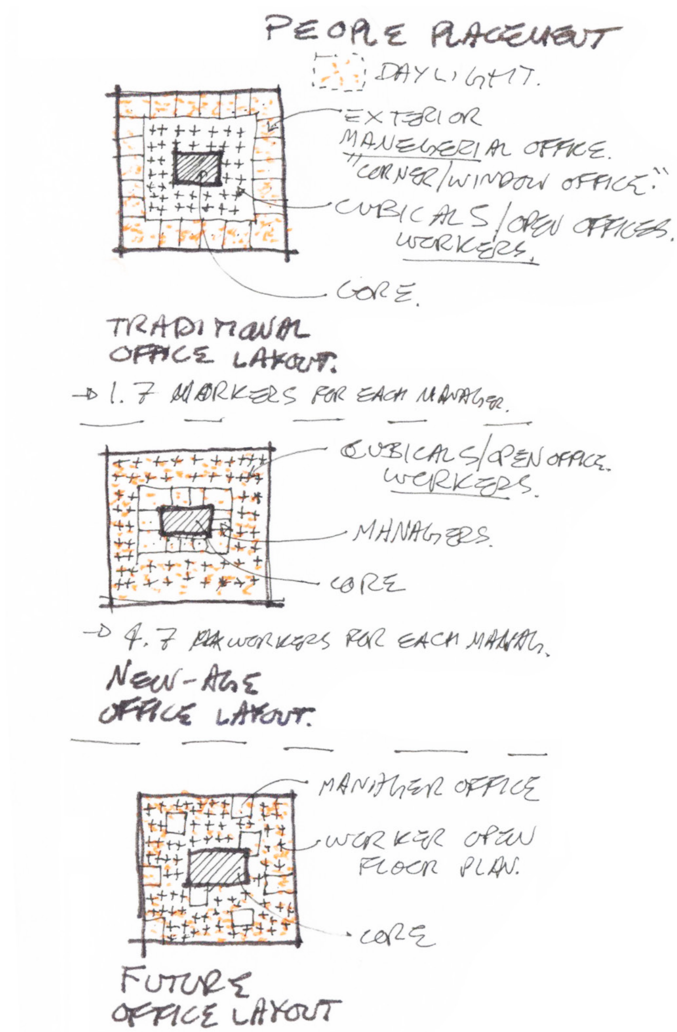
Propositions:
The architectural strategies in this thesis proposal shall promote the idea of healthy built environments. The diagrams on the right of ‘people placement’ delineate traditional placement of employees in a typical high-rise office tower. Notice that the managerial staff occupy the exterior perimeter, cutting off daylight to the interior space. The interior space occupied by “+” symbols indicate the worker areas - they received none of the natural daylight. At a recent lecture held at the University of Oregon in Portland, Kevin Nute described the importance of providing connections between humans and nature. A symbiotic relationship promotes healthy, happy, and productive workers.

The Traditional Office Layout was an imbalance of the three tenants. In this case it was an excess of Commodity. Where the program designers determined that the best option at the time was extreme order of perceived value. Balancing the three tenants should generate good architecture and space planning.

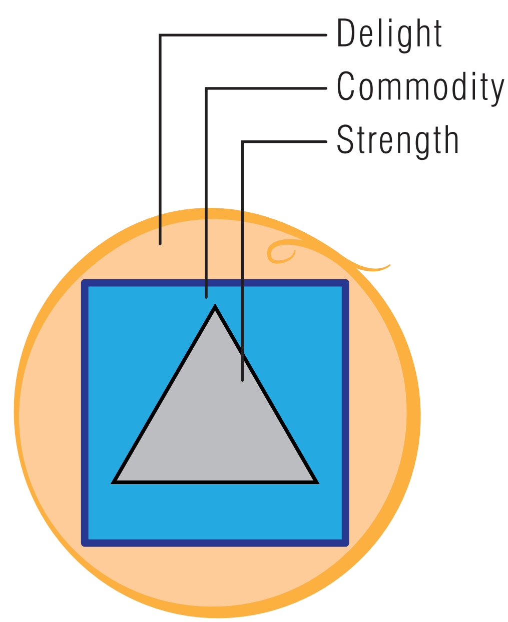
As mentioned before, Alameda faces a rising sea problem. One solution may be to design the base levels to be flooded occasionally. It might even be advantageous to consider permanent flooding.

This rising tide scenario also supports, coincidentally, an additional proposition that may be made for a new type of compact high-rise development. That being new buildings to accommodate for future connectivity between new neighboring high-rises, or ‘coupling’.

The building proposed here will utilize Vitruvius’ guiding tenants, and combine the lessons leaned from the case studies to develop a strong design.

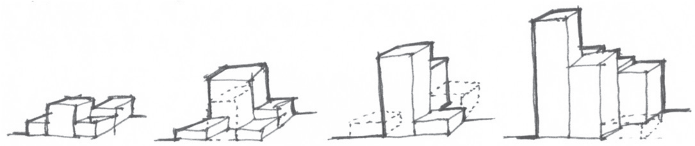


Conceptual Typ Healthy Office Floor Plan



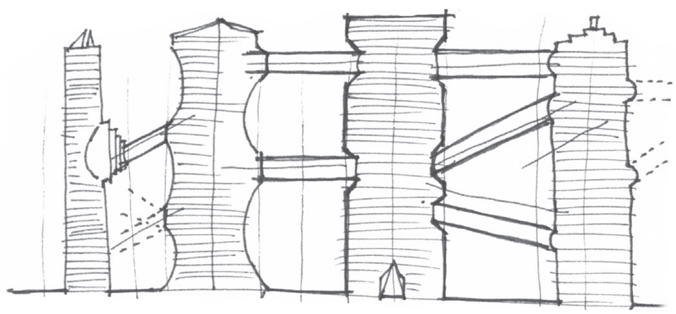
Vitruvian Design Influence

A-9.2 | Building Program



Progressively Taller

One Way Buildings in 3-D Movement



The Realization

Perspective Sketch in the Sky

There tends to be a negative view of high-rise development. Sometimes to the extreme of groups suing a developer to prevent new high-rise development. The reality is however, that over time, buildings creep up, the following generation ages with that height, they resist higher development, and buildings creep up a little more. Then the process restarts with the next generation. Eventually, all human establishments will be tall.

From this tallness a new plain of landscape, or hardscape, will form as a result. This will happen because, as buildings grow together, moving people up and back down to ground-level of each tall building will be inconvenient and inefficient. Connections will be made, and accommodated for in future tall buildings. Developers will find value in providing architectural expression for coupling. The value spurs from rather than people going to ground level, they might travel through their building instead, offering new vitality in three dimensions.

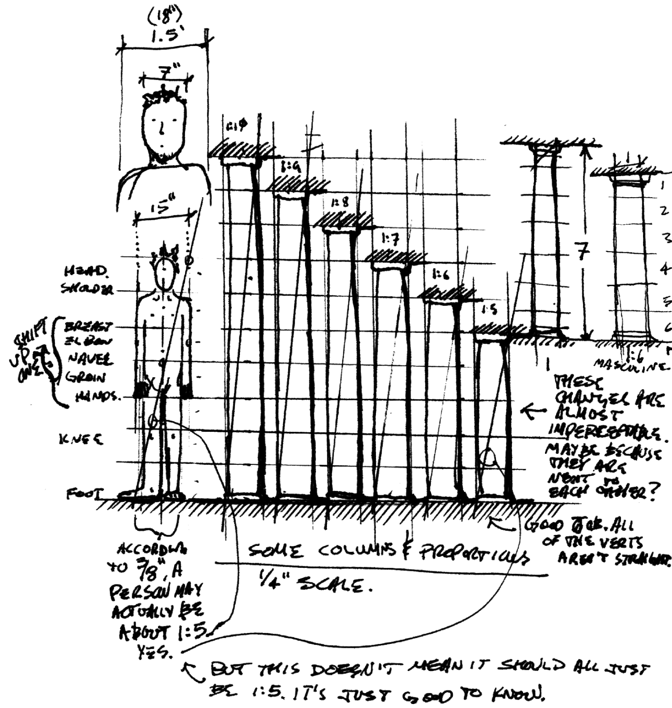
Vitality in 3-D does not exist currently. Although people move horizontally then vertically in current cities, the passage between the vertical movement is non-existent. Even sometimes with buildings that are separated by no more than 1 inch, connection does not occur - a lost opportunity. Plus, most skyscraper property management shun public use, preferring to station a guard at the front door and demand to see a building pass upon entry. This prevents the general public from truly experiencing the city.

The building program for this thesis shall incorporate the needs of a 100-year future:

- Future proofing
- Rising seas due to climate change
- Sustainable energy solutions
- Mixed use, business, residential, retail, light industry
- Healthy work environments
- Coupling
- Platforming for sea vessel

A-9.3 | Building Program

The architectural form will be a serious consideration during this thesis development. This is particularly the case as it will likely involve raising the horizontal ground plain. Meaning that large punctuations of mass and positioning of program space will be dramatically affected. However in order to maintain a semblance of overall cohesive building form, lessons from the great Vitruvius may provide the right kind of guidance. Seen to the right are ratios for slenderness factors, ranging from 1:5 to 1:10. Since this thesis involves both a soft waterfront scheme, and skyscraper as a unified project, utilization of the proper slenderness ratio will create a more attractive building. This is of particular concern due to what happened with Turning Torso – a building that stands alone amongst short buildings. While this thesis seeks to produce a striking architectural expression, correct proportions in relation to its surrounding elements will be one of the many keys to success.

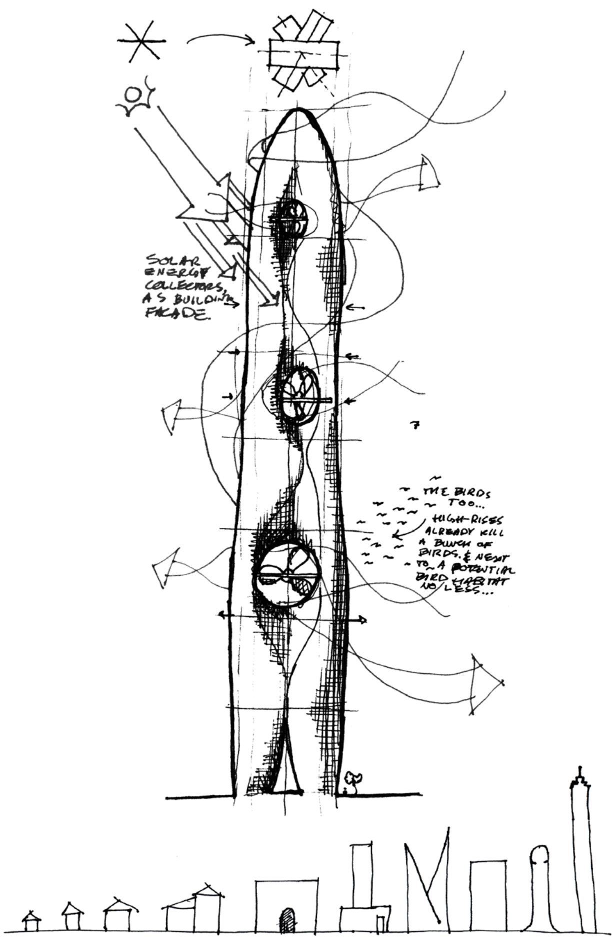


Interpretation of Tallness Ratios

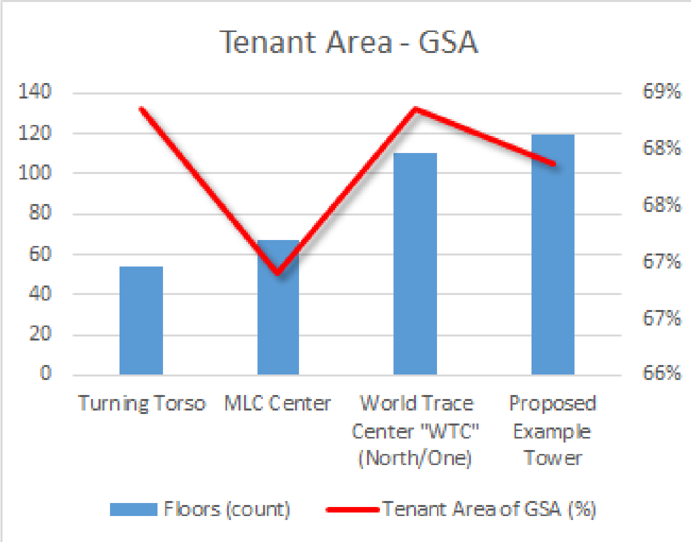
Skyscrapers provide the opportunity for designers to explore sustainable options on the massive scale. As mentioned in the thesis proposal, integrating sustainable systems, whether passive or active, will be integral to this thesis. While maintaining both the proper forms described by Vitruvius, these systems must find their place on the building that still provides maximum payback and function without loss due to poor placement. The natural site opportunities present on the Alameda Point location are abundant, and should not be wasted:

- High winds
- 78% average annual sunshine
- Waterfront access
- Spectacular views

Punctuating the facade with integrated systems, or providing raised platforms may present a different challenge. The overall form of tall buildings has been associated with phallic imagery, as may be inferred from the form to the right. This consideration will be significant in understanding the architectural shapes and configurations that end up forming the new skyline on Alameda Island.



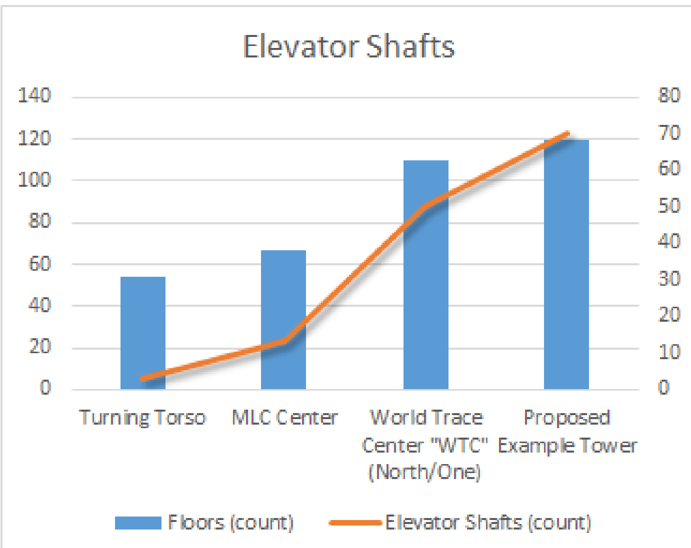
Symbolism



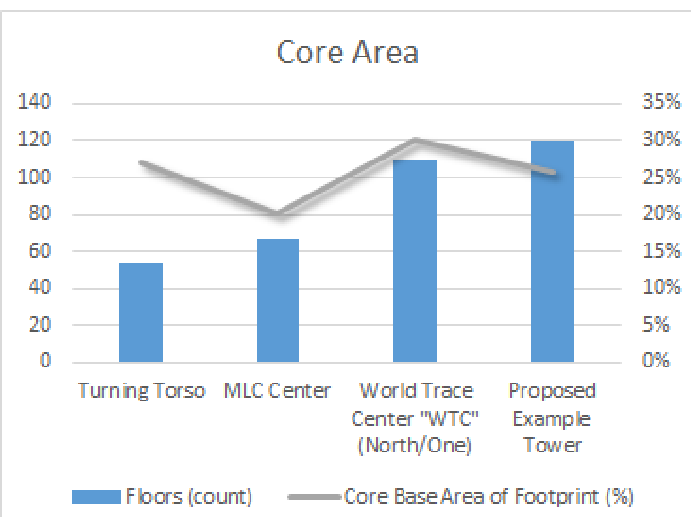
After evaluating the case study buildings on pages 34-39, some interested figures could be generated. These may be valuable in determining the needed program spaces for the proposed skyscraper in this thesis project, which will be integrated with the waterfront.

Seen to the left are graphs that delineate what may be seen in the matrix on the next page. The matrix shows documentation and analysis of the three case study buildings and one Proposed Example Tower to test the generated values. The graphs here pick out the most critical design factors for program determination compared to building floor count:

- Tenant Area of Building Gross Floor Area (%)
- Elevator Shafts (count)
- Core Base Area of Footprint (%)



Some interesting facts were learned from these three case studies which provided values for elevators. These are typically a very high-cost feature in buildings. Other high-cost essentials are fire stair cores, structural choice, and cladding material. For example, the high quality elevators of Taipei 101 (not included in this case study) each cost $2.4 mil, with 45 elevator shafts, this may have been a driving factor in design and cost at $108 mil. Of particular value in the design of a new skyscraper for the Alameda Point thesis project, is how many elevators per leaseable space should be provided. After evaluating the Turning Torso, World Trade Center, and MLC, it was determined by averaging their leaseable tenant space per elevator. This value came out to about 61,000sqft of total Tenant Area per Elevator Shaft.



This provides an easy way to determine the needed number of elevator shafts for a tall building based on these three specific examples. Proposed Example Tower:

- 120 floors
- 230ftx230ft (52,900sqft per floor)
- 68% Tenant Area: 4,309,167sf

This equated to roughly 70 required Elevator Shafts, and a core at 26% of the building footprint.

Some other interesting facts were learned as well, shown on the matrix. Such as the fact that some figures were averages across each building (Tenant Area of Footprint), whereas other figures were exponential (Floors per Elevator).

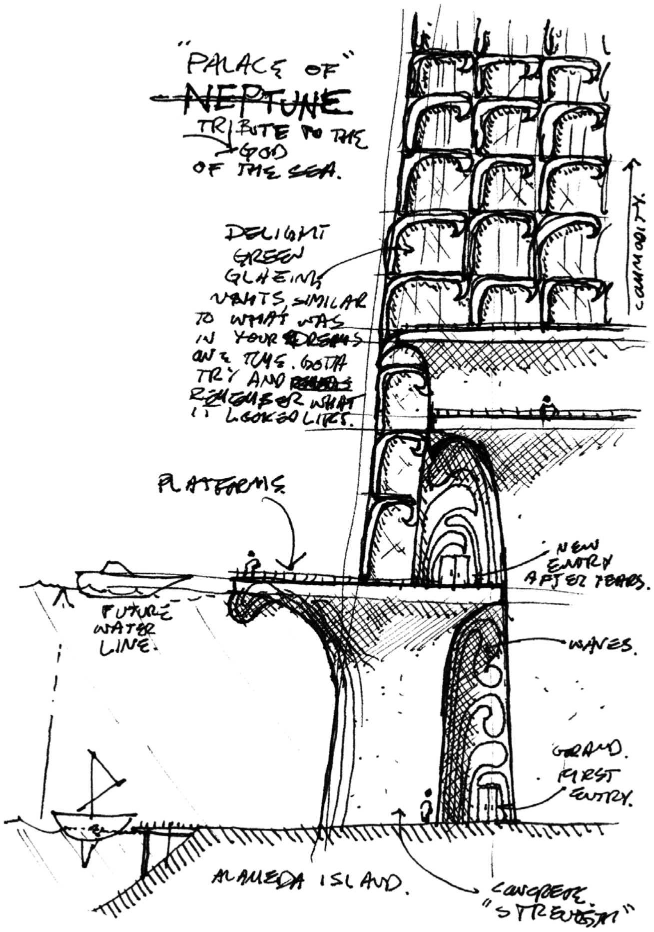
A-9.5 | Building Program

#	High-Rise Metrics Name	Small **Turning Torso**	Medium **MLC Center**	Large **World Trace Center "WTC" (North/One)**	**Proposed Example Tower**
1	Development Cost "DC" ($)	$ 11,700,000	$ -	$ -	$ 3,174,000,000
2	Gross Floor Area "GSA" (sf)	296000	1112000	4300000	6348000
3	Footprint Square Dimension (ft)	90	150	207	230
4	Footprint (sf)	5662	21000	42850	52900
5	Building Cost per GSA ($/sf)	$ 40	$ -	$ -	$ 500
6	DC/Footprint ($/sf)	$ 273	$ -	$ -	
7	Height: Architectural (ft)	623	748	1368	1406
8	Floors (count)	54	67	110	120
9	Height per Floor (ft/count)	12	11	12	12
10	FAR Estimate (1:x)	52	53	100	120
11	Height to Footprint Square Dim (Ratio or 1:x)	7	5	7	7
12					
13					
14	Tenant Area per Floor (sf)	4130	12000	28000	34461
15	Tenant Area of Footprint (%)	73%	57%	65%	65%
16	Tenant Area Total (sf)	202370	744000	2940000	4309167
17	Tenant Area of GSA (%)	68%	67%	68%	68%
18					
19					
20	Core Base Area per Floor (sf)	1530	4225	12960	13646
21	Core Base Area of Footprint (%)	27%	20%	30%	26%
22					
23					
24	Elevator Shafts (count)	3	13	50	70
25	Elevators (count)	5	26	99	
26	Tenant Total Area per Elevator Shaft (sf)	67457	57231	58800	61162
27	Floors per Elevators (count)	10.8	2.6	1.1	
28	Elevator Shaft Base Tot Area (sf)	125	1370	3477	
29	Elevator Shaft Area of Footprint (%)	2%	7%	8%	
30	Area of Each Elevator Shaft (sf)	42	105	70	72
31					
32					
33	Stair Cores (count)	1	2	3	
34	Tenant Total Area per Stair Cores (sf)	202370	372000	980000	
35	Stair Cores per Floor (count)	54	34	37	
36	Stair Core Base Tot Area (sf)	107	205	540	
37					
38					
39	Built (year)	2005	1978	1970	
40	Construction Type	Concrete	Concrete	Steel	Concrete
41	Structural Construction Cost	$ 8,880,000	$ 33,360,000	$ 107,500,000	$ 190,440,000

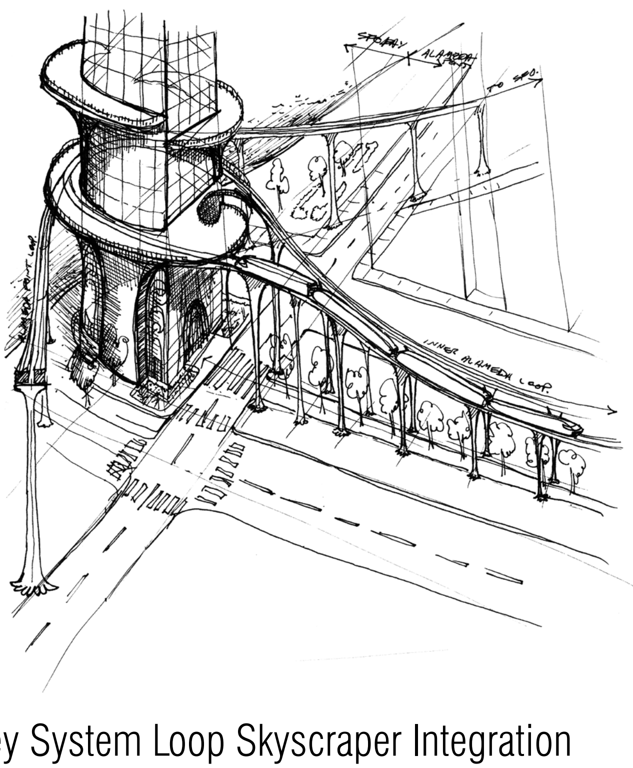
The costs of each project could not be documented. However from previous analysis by the author of other skyscraper projects, the range of costs per square foot could be anywhere between $200/sf (low-quality high-rise) and $900/sf (the new One World Trade Center Tower). Seen above, the Proposed Example Tower was assumed to be about average at $500/sf, putting the project cost of the skyscraper at $3.2bil.

Note that these figures, although informative, were based on three specific examples. They may be used in better understanding skyscraper design, however every project is unique in program and intent.

A-9.6 | Building Program



Water Rising Skyscraper Base Elevation



Key System Loop Skyscraper Integration

The sketches presented here are not intended to show what the resulting skyscraper will look like. They show some of the basic ideas with some flare for interest, in order to 'shake drawings out of the arm'. These are methods for raising the existing horizontal plain to accommodate sea level rise over time. However the internal program functions and external climatic affects will guide the building form.

The program will provide basic building requirements as this thesis develops. Floor plan arrangements will need to respond to obvious constraints such as mechanical, structural, and load factors. It must also respond to solar and wind orientation. And most importantly, provide workable floor plans for the intended building functions - primarily housing. The goal is to include some affordable housing within the skyscraper itself - a challenge with the high price per square foot as discussed on pages 36 and 37. Floor plan arrangement and unit amenities will dictate cost. The units which will be intended for higher income ranges will likely include features that others do not, and placed with the most spectacular views for example. How this will be accomplished will be determined during the subsequent design phase. By interviewing developers of high-rise housing with similar intent, the possibilities will be uncovered. If this intention is unreasonable, it may need to be dropped from the program.

The building, although mostly of housing units, will need to be mixed use. The logic of this stems from the anticipated sea level rise over time. With limited land, compact development, and a rising horizontal plain, shops, light industry and/or business will be dispersed throughout the building. These business functions will likely be at the established new horizontal plain levels. This provides an opportunity to integrate lower-income units into the building, while also bringing residents closer to amenities.

It will be important to provide some amount of lower-priced units within the catalyst skyscraper. Just north of Alameda Point is the Oakland freight harbor. As may be seen on page 30 with the re-introduced Key System, one of the Key Links continues north over the water to the harbor. This connection will be integral for the economy of the Bay Area. The Key Link intends to provide working class individuals with easy access to jobs if they choose to live in the new Alameda Point development. While this connection should link to the existing BART system that travels under the bay, and into the heart of San Francisco.

Because this thesis project is large and complex, developing a common residential unit type floor plan will speed design production. A typical housing unit may take multiple forms, however there are basic unit amenities that the American culture has adopted for years. The usual challenge with developing standard units must conform to facade, core location, egress, exposure to daylight and more. For now, the basic unit program spaces are as follows:

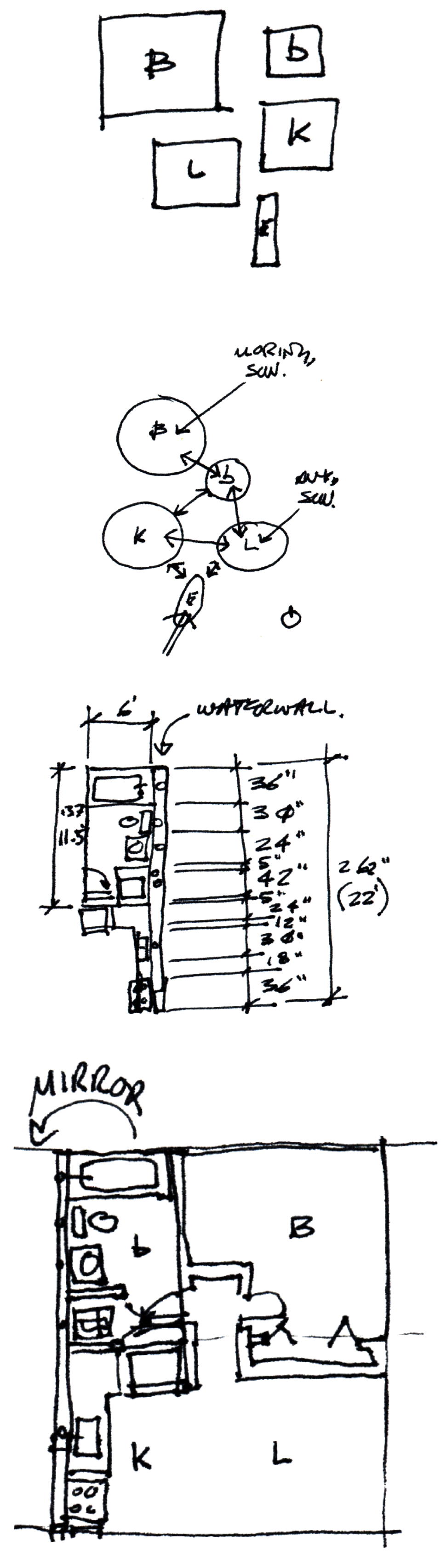
- Kitchen (K)
- Bedroom (B)
- Living Room (L)
- Bathroom (b)
- Entry (E)

How these spaces are arranged can vary widely. To the right is a first program arrangement for a one-bedroom unit with potential mechanical arrangement logic along one wall - the waterwall. Other unit sizes and arrangements will need to be developed in more detail as the project progresses.

The building program should include the following:

- Apartment/Condo housing,
    - 15% affordable,
    - 30% middle-income,
    - 55% high-income.
- Retail/Wholesale,
- Office,
- Hotel,
- Lightrail integration,
- Sustainable systems integration,
- Mechanical space,
- Elevator/Stair/Mechanical core,
- Anticipated new raised horizontal plain platforms,
- Other as determined.

The final major question is height. How tall will this skyscraper be? With the useful tool developed for understanding tenant to elevator core requirement, and average leaseable space, the height will need to be uncovered be trial and error. All of these constraints shall be guided by Strength, Commodity, and Delight.

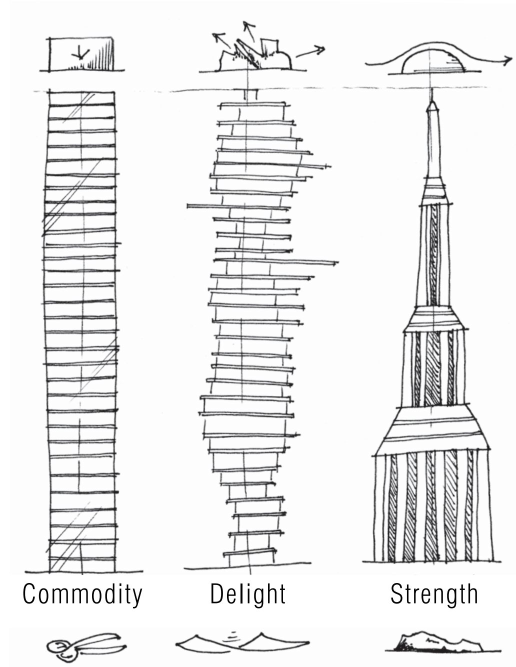


Basic One-Bed Unit Program

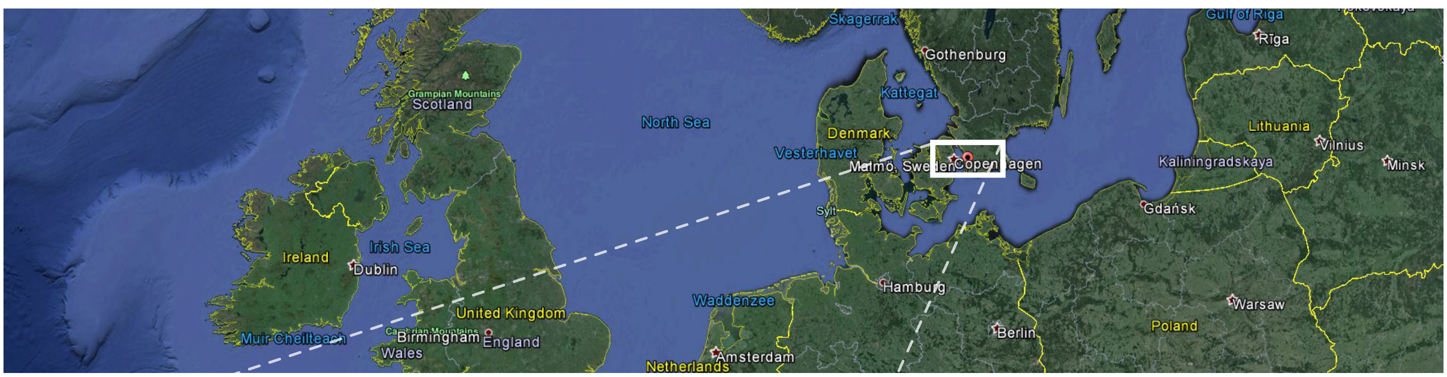
A-10.1 | Case Study: “Venustatis” - “Utilitas “ - “Firmatis”

The following are four case studies. The first and second are combined into one study - “Western Harbor” - since it encountered almost exactly the same issues that Alameda Point faces. These case studies will be evaluated in three ways, based on Marcus Vitruvius Pollio’s (70 BCE to 15 BCE) three main tenants of architecture: Venustatis (delight), Utilitas (commodity), Firmatis (strength).

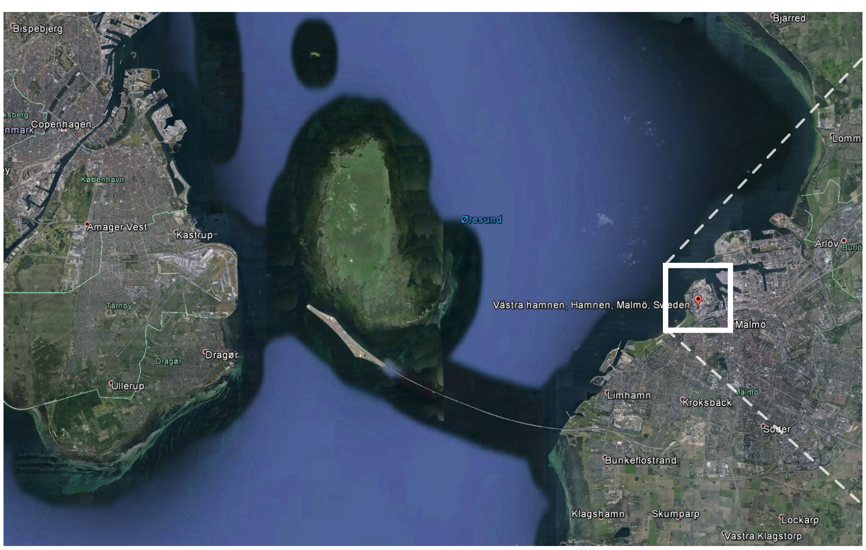
The reason for following these three tenants while investigating site and building type is the belief by the author that all things designed must apply simple guiding principles in order to provide a sense of order in any project. All things must be balanced to be successful; too much of one may create failure due to lack of the other. This being the hypothesis, three skyscrapers will be architecturally investigated for their strongest quality.



Case Study | Western Harbor



Scandinavia



Malmö, Sweden

Västra Hamnen (Western Harbor)

Goals for Western Harbour & Bo01:
- Ecological
- Social
- Economical

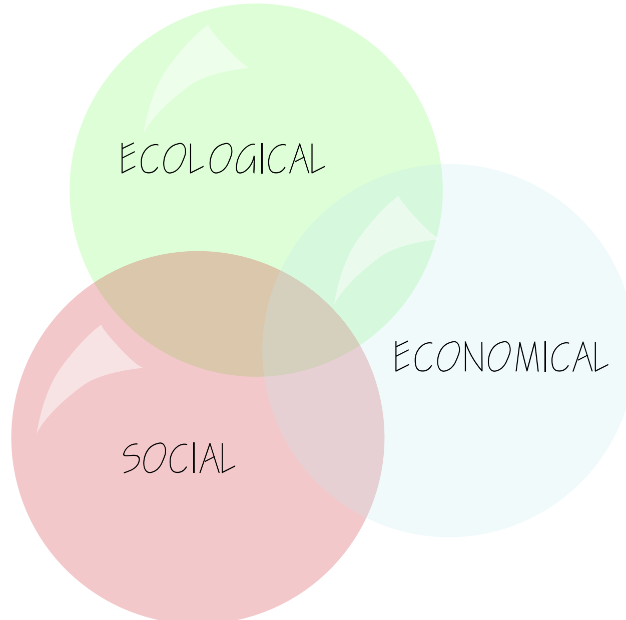
Land Area: 16,600,000 (380 acres)

Waterfront: 22,100 linear feet (4.2 miles)

Project on former contaminated industrial site.

Bo01 neighborhood intended as model sustainable development for Sweden.

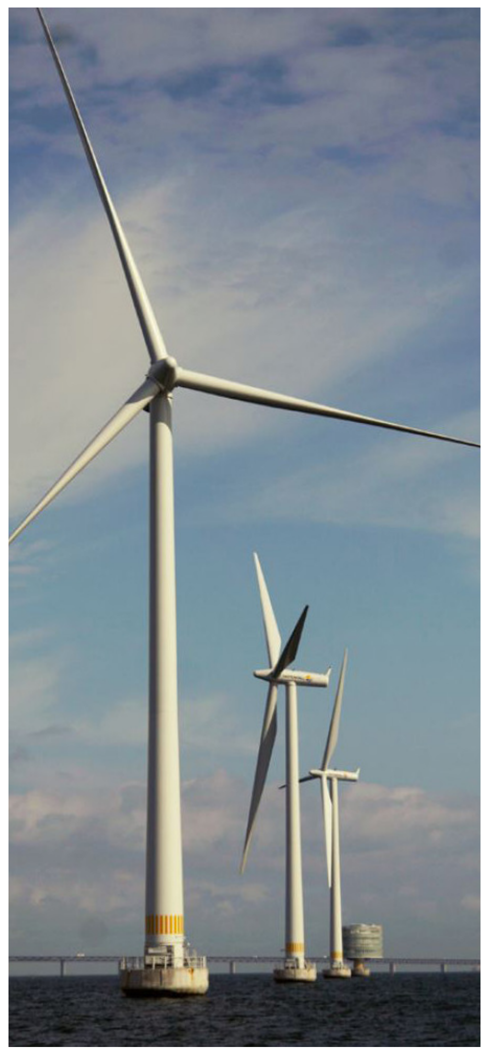
Turning Torso, skyscraper, designed by Santiago Calatrava.



Goals

Ecology

Society



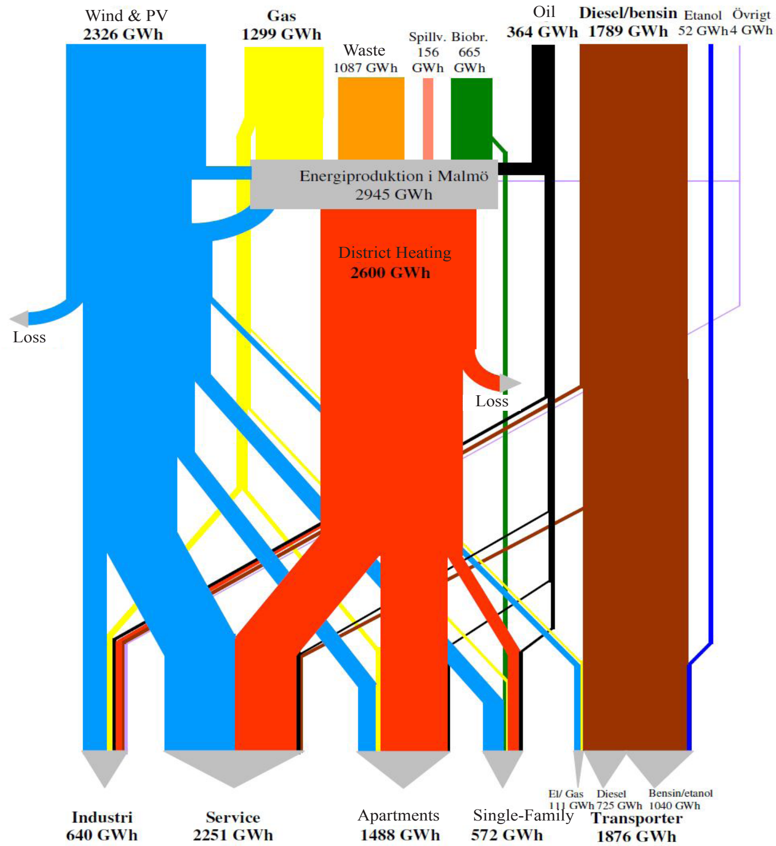
Economy

Human Habitat: 16,590,000sf (380 ac)

Non-Human Habitat: 10,000sf (0.06%)

Future-Proofing - Sustainable Energy

Pedestrian Focus



Take-Aways

Transportation

- Extra car parking added to accommodate car ownership

Ecology/Habitat

- Very little buffer for wildlife
- City left to clean up post-industrial mess

Energy/Buildings

- High cost of living ($ = homogeneity)
- Total energy network failed to meet goals
- Not enough priority or surface area given to solar electric systems

Transportation

- Give priority to pedestrians & cyclists
- Provide attractive and sustainable public transportation

Water

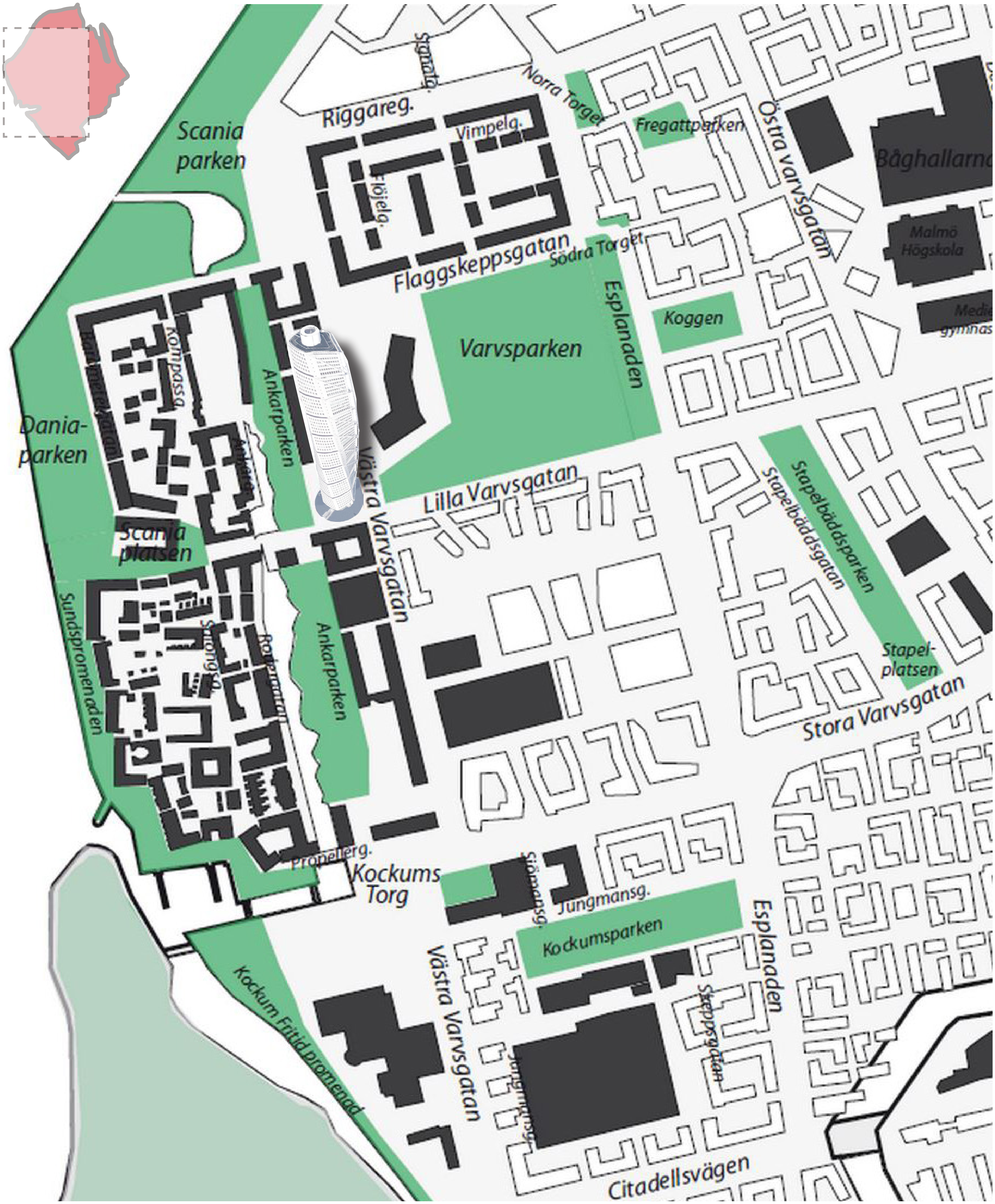
- Water features enhance livability
- Integrated waste system improves efficiency

Ecology/Habitat

- Utilize “Exhibitation” in urban form to educate inhabitants
- Provide as much non-human habitat as possible

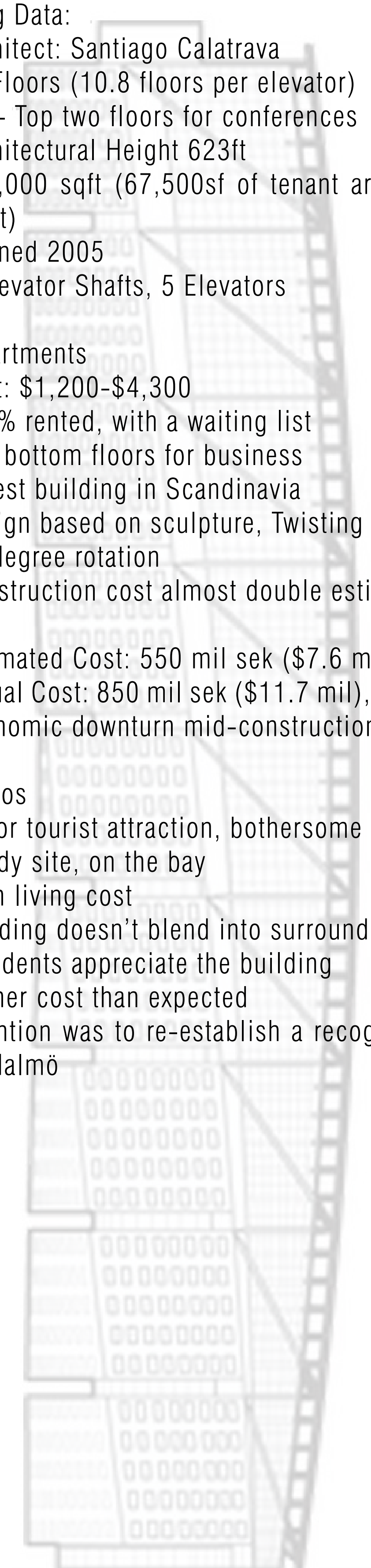
Energy/Buildings

- Plan sustainable energy systems to require 30% additional demand
- Compact walkable streets may take medieval form



Plan Organization - Medieval & European Compact Design Built Planned

A-11.1 | Case Study: Venustatis - Turning Torso



Building Data:

- Architect: Santiago Calatrava
- 54 Floors (10.8 floors per elevator)
  - Top two floors for conferences
- Architectural Height 623ft
- 296,000 sqft (67,500sf of tenant area per elevator shaft)
- Opened 2005
- 3 Elevator Shafts, 5 Elevators

147 apartments

- Rent: $1,200-$4,300
- 100% rented, with a waiting list
- Two bottom floors for business
- Tallest building in Scandinavia
- Design based on sculpture, Twisting Torso
- 90 degree rotation
- Construction cost almost double estimate

- Estimated Cost: 550 mil sek ($7.6 mil)
- Actual Cost: 850 mil sek ($11.7 mil), due to looming economic downturn mid-construction

Cons/Pros

- Major tourist attraction, bothersome for residents
- Windy site, on the bay
- High living cost
- Building doesn’t blend into surroundings
- Residents appreciate the building
- Higher cost than expected
- Intention was to re-establish a recognizable skyline in Malmö

A-11.2 | Case Study: Venustatis - Turning Torso

An example of delight - one of the three tenants discussed by Vitruvius. Turning Torso successfully implemented obvious gestures of elegance, with similar emphasis on strength. The gentile 90 degree rotation was an exquisite architectural design. The steel structure on the back side hints at the semblance of a human spine. The floor plan shape detracted from the typical square of most high-rises, and applied slightly less angular corners. However it suffered in terms of commodity, due to its highly customized components, and unique floor plans.

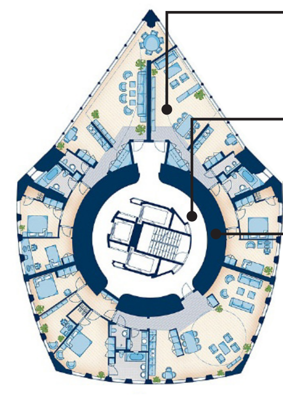
Regardless of its ineffective floor plan layout, the management reported a full house - 100% rented - with a long waiting list. Turning Torso suffered the unexpected housing crash in 2008, causing the project cost (and potentially rents) to almost double. Under normal circumstances though, the fact that a highly designed project created such highly-desirable space is encouraging for architects, and developers alike. Taking this project as an example, if future skyscrapers were to be designed with such care to “delight”, then not only may the built environment be filled with interesting places, but be desired by tenants.

Typically skyscrapers are seen from the bottom - a distasteful view. We look up at them as though we are the insect under impending doom of being stepped on by a large foot. However under these monolithic structures, we may begin to find ourselves walking instead amongst giants of beauty and grace. The value of high-rise living surpasses that of personal property ownership that the suburbs provide. That is, with compact living comes:

- Proximity to amenities, such as grocery, and shops,
- Less reliance on personal vehicles and their expense,
- Ability to simply walk to near-by activities,
- More connection to neighbors,
- Less wasteful use of the precious land we have left.

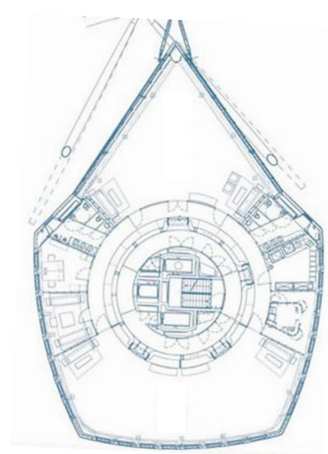
These points, and more, add up to maximum freedom of livelihood for individuals, allowing other personal endeavors and personal satisfaction. This project carries an additional perk for being so close to the waterfront, which provides additional recreational activity opportunities to residence.

Floor: Base



Floor: Typical Apartment

Floor: 43



Floor: Top Conference

A-12.1 | Case Study: Utilitas - New York, World Trade Center

One World Trade Center represented “utilitas”, or commodity. This was decided based on its shape, and intended economic use of floor plate area.

Building data:

- Architect: Minoru Yamasaki, Emery Roth & Sons
- 110 Floors (1.1 floors per elevator)
- Architectural Height 1,368ft
- 4,300,000 sqft (58,800sf tenant space per elevator shaft)
- Construction 1968-1970.

As was mentioned, the World Trade Center Twins were designed primarily with commodity in mind. The typical floor plans intended to provided maximum open offices for tenants, and freedom from columns that would otherwise punctuate the space. This provided tenants with maximum flexibility. One resultant of building so tall, was the requirement for many elevator shafts - 50 on the base level. This high quantity of elevators was needed due to the high occupant count (up to 50,000 in a given day, with another potential 100,000 as visitors at peak hours) and to transport individuals quickly, in a city where every minute means money.

With so many elevators, the amount of available leasable space starts to decline. So although the building and floor plan were intended to provide the highest commodity value, circulation became a major factor in the resulting floor space. See on the next page, the 45th floor plan, and the percentage of leaseable space compared to circulation.

If compared to a low-rise building, the circulation could have been reduced substantially, down to as low as 12%. With the same footprint, and a shorter building, the tenantable space would be much higher, and the land developer could charge for a higher percentage of square footage.

However, in New York City, land value is very high. This is due to the high population, and access for businesses to a high quantity of business interaction, patronage, and access to amenities. These qualities of doing business in a compact development are simply not available in suburb development patterns.

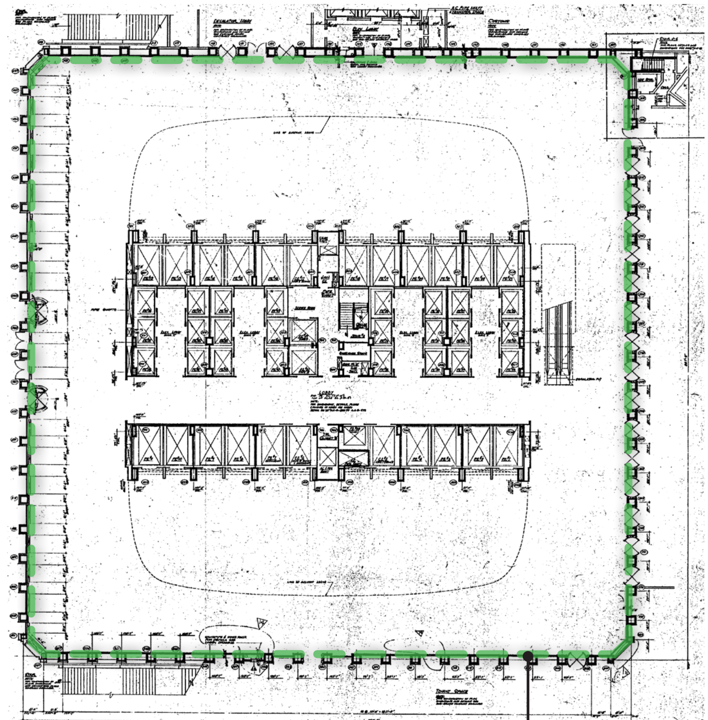
In this case, the obvious reason for building tall has to do with land value and access to amenities. There must be a trade off that allows these buildings to "pencil out" for the developers.

Architecturally, the World Trade Center presented interesting and innovative structural strategies. Being mostly of steel construction, and having utilized very large floor trusses, much longer spans could be exploited. Dispersing the structure partially to the exterior, and the interior core provided the building with a fairly unique and elegant design, lending to the open floor plans. It is obvious from the picture on page 24 however that the aesthetics were not the highest priority. Again, the elegant structural move at the base was successful, but the building took on a brutalist style that created a stark facade.

In the early years of skyscraper design, there was a typical unfortunate result of these high-priced leased spaces. The managerial staff - higher pay grades - often took offices at the perimeter of the building. Unfortunate because although the management staff received spectacular views and optimal daylight, the rest of the workers received almost none. Although the managers may be happy, they only accounted for an estimated 75 people (calculated by the assumption of 75 offices at 10ftx10ft around the perimeter). The workers at the interior were estimated at 400 people (the light blue area to the right divided by 50sqft per cubical). In other words, 16% of the staff in this building received adequate daylight, the other 84% did not.

Today, this office layout typology is changing. Where instead of managers being placed at the exterior, they tend to be placed centrally, with highly-glazed offices. This solution allows for more workers to receive daylight and views, increasing productivity, and general worker happiness.

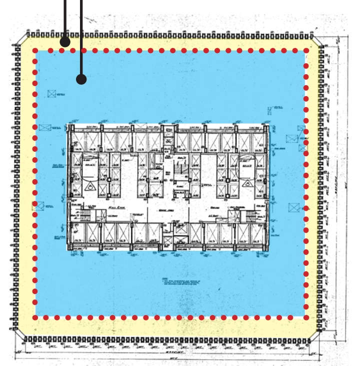
The World Trade Center emulated the specific quality of commodity, as Vitruvius explained in his writings. It was also innovative in its execution of strength, however this was not a high priority. The base was elegant, but the overall design was relatively oppressive and bleak. As this thesis moves forward, it shall utilize lessons learned from this project in terms of commodity.



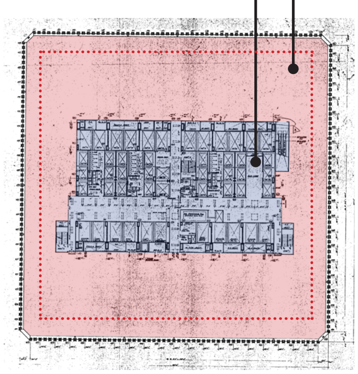
First Floor Plan

- 207feet square (42,849 sqft)
- 50 Elevator Shafts shown here, 99 Elevators.

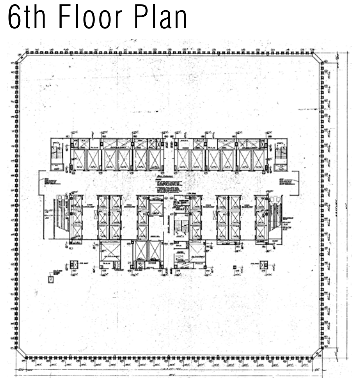
Typ. Leasable Space: 28,000sqft (65%)
Typ. Elevator/Circulation: 13,000sqft (30%)
Managerial: Daylight & Views
Workers: No Daylight, No Views



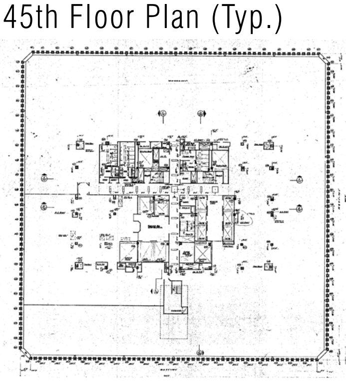
6th Floor Plan



45th Floor Plan (Typ.)



78th Floor Plan - Skylobby



106th Floor Plan

A-13.1 | Case Study: Firmatis - Sydney, MLC Centre

The MLC represents “firmatis” - strength. From its conception, the architect Harry Seidler and engineer Pier Luigi Nervi, discussed strength as paramount. The form, not only emphasized its upward gesticulation, but also its structure with eight exterior columns, that are wider at the base. The thickening of the columns provided stability, like a tree trunk, as Nervi put it. The columns, which may be seen at the base floor plan on the next page, are not typical in form. Their shape is elegant, lending to a delightful design, emphasizing the overall execution of the building.

Building Data:

- Architect: Harry Seidler & Associates
- 67 Floors (2.6 floors per elevator)
- Architectural Height 748ft
- 1,112,000 sqft (57,200sf per elevator shaft)
- Opened 1978

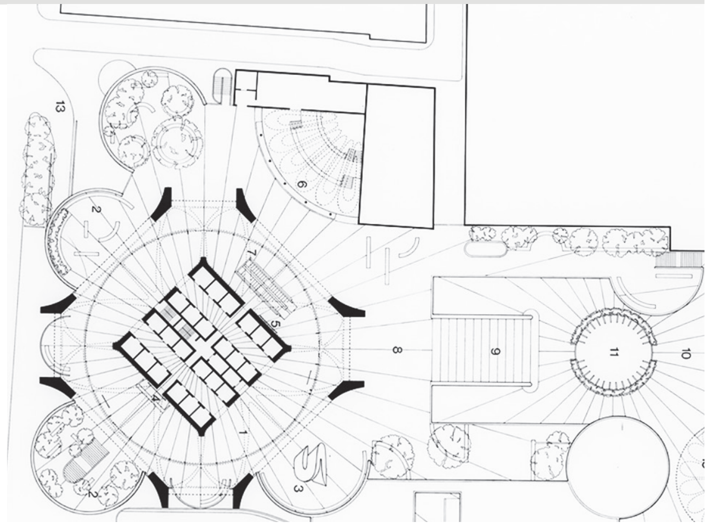
An additional strengthening characteristic were the horizontal facade members, which provide structure, shading, and the resulting aesthetic for the overall building. This architectural move is unique, because often is the case that designers hide the structure, rather than put it on display. In the intense sub-tropical climate of Sydney, and being so close to the sea, buildings should be expected to handle such site factors. The horizontal facade bands allowed maximum flexibility with windows and views from the interior. Continuous bands of windows were achieved. The facade also provides enough shading to mitigate the very hot climate of Australia.

There are some risks to the above strategies however, in that the structure is exposed to the elements, resulting in potentially quicker building degradation. In 2011, a report described plans to renovate the exterior facade. The cost was estimated at $100m. These factors make the issue of skyscraper construction challenging. However, even small projects encounter issues such as these. Regular maintenance is a fact of building. And as long as problems are handled at the appropriate time, serious catastrophe and significant monetary loss may be avoided.

There is an advantage of skyscraper design and compact development, in relation to maintenance, compared to suburban development patterns. In dense cities, such as Sydney, the building management have access to far more trades within a smaller area. So although the cost of renovation may seem high, if coordinated properly, and the resources of downtown are utilized well, then these maintenance issues may be more easily resolved, and more quickly. This regular maintenance, although perhaps cumbersome, adds to the vitality and world-market competitiveness of city life.

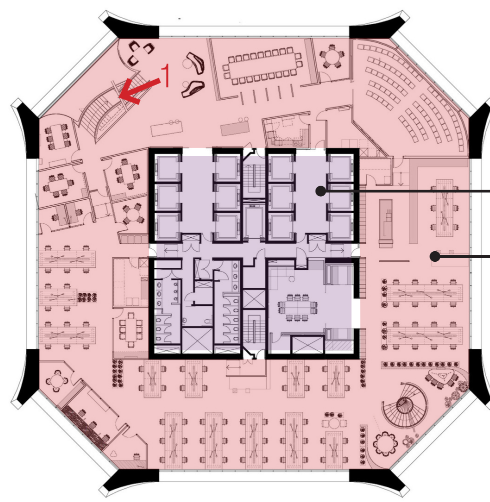
Adding to the life of the city on the ground plain is also vital, where most people interact and retreat to at the end of the work day. The MLC managed to provide a sorely needed public space at its base. Its radiating lines speak of architectural intention and expression. Each of the miniature worlds that enclose various space created pockets of escape from the bustle of city life. The ground plan and set back allowed the tower to rise higher, providing more valuable tenant space to the overall project, and reduced the impending mass that would have otherwise towered over the street below.

The MLC Center reflects most prominently the strength tenant, proposed by Vitruvius. The other elements of good design, commodity and delight, show in other capacities. Commodity is measured in this project by quantity of leaseable tenant space, seen in red to the right. With tenant space at only 57% of floor plate area, the MLC presents a low commodity value as a building. And although likely delightful to architects and engineers, the once again brutalist aesthetic may not be so appealing to individuals of other interests. Apparent at the ground plain and in the famous ceiling of geometrically exquisite form, occupants may find delight in unexpected places in the building, but not in the overall design.

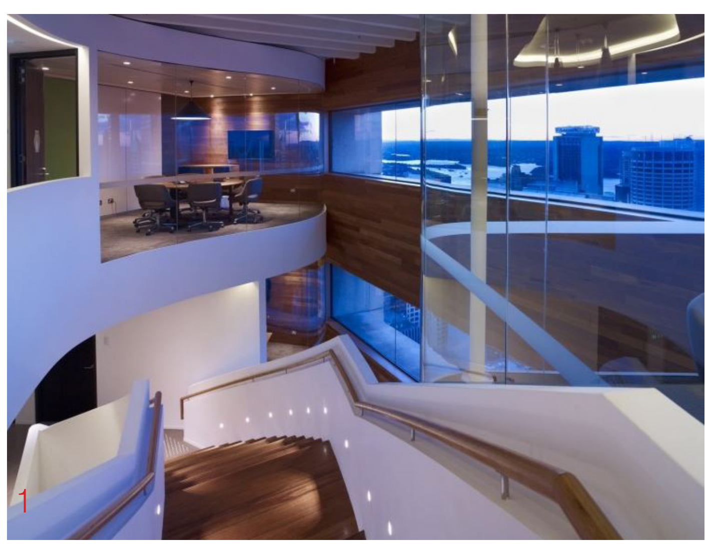


First Floor Plan

Typ. Leaseable Floor Area: 12,000sqft (72%)
Typ. Elevator/Circulation: 4,230sqft (25%)
12 Elevator Shafts, 26 Elevators.



51st Floor Plan/Interior - Occupant: The GPT Group



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