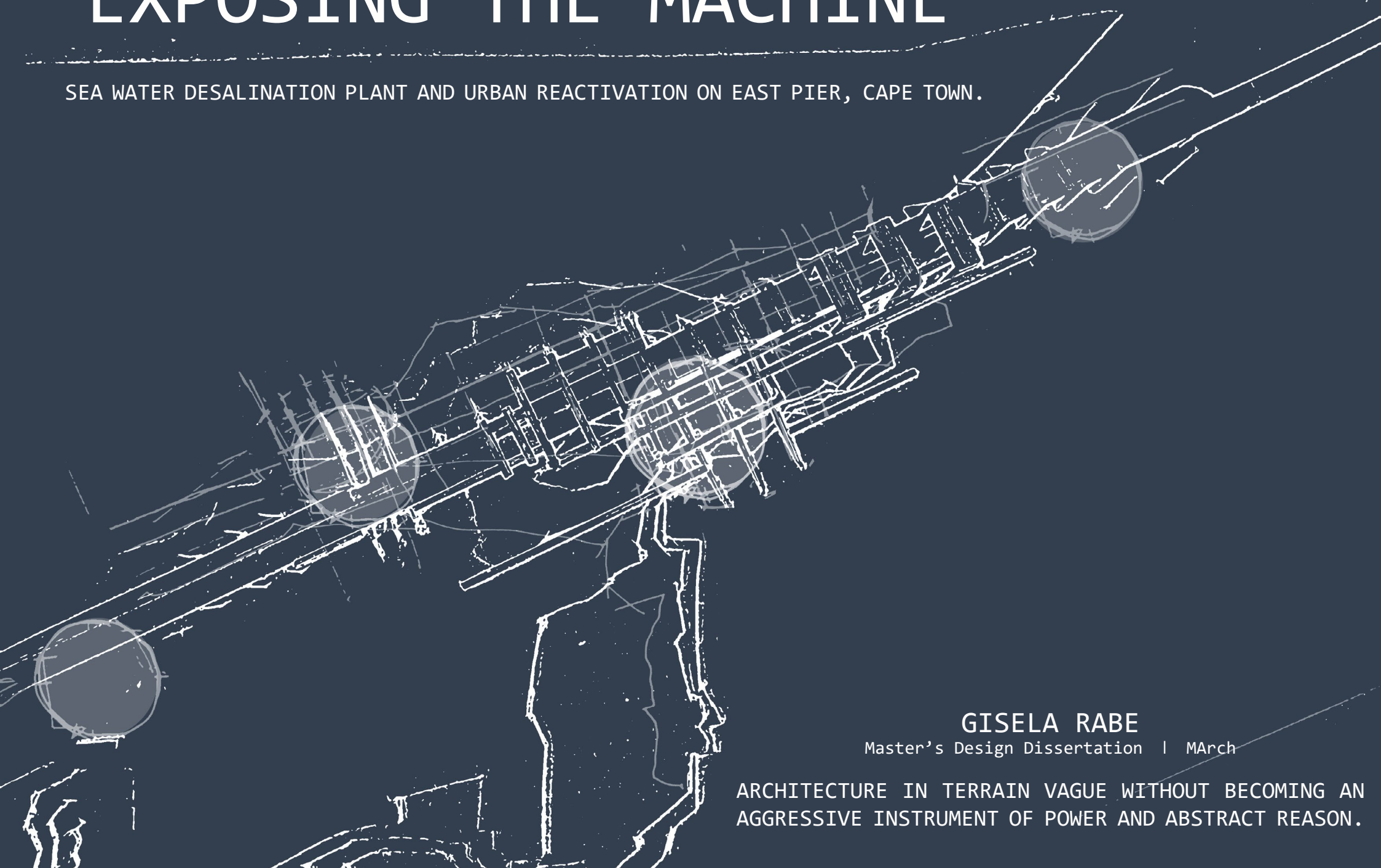
EXPOSING THE MACHINE

SEA WATER DESALINATION PLANT AND URBAN REACTIVATION ON EAST PIER, CAPE TOWN.



GISELA RABE

Master’s Design Dissertation | MArch

ARCHITECTURE IN TERRAIN VAGUE WITHOUT BECOMING AN AGGRESSIVE INSTRUMENT OF POWER AND ABSTRACT REASON.

EXPOSING THE MACHINE

- BEYOND THE BOUNDARIES OF A DESALINATION PLANT -

EXPOSING THE MACHINE

Sea water research and purifying plant for the City of Cape Town on East Pier, within the Victoria & Alfred Waterfront.

This thesis is submitted as partial fulfilment of the requirements of the degree Masters of Architecture (Professional) at the Department of Architecture, Faculty of Natural and Agricultural sciences, University of the Free State.

All the work contained in this document is my own except where otherwise acknowledged.

Department of Architecture, Faculty of Natural and agricultural Sciences,
University of the Free State.

12 June 2018

Gisela Rabe | 2012021875

The work contained in this dissertation have been submitted for proofreading and/or editing by Mrs A. Steynberg.

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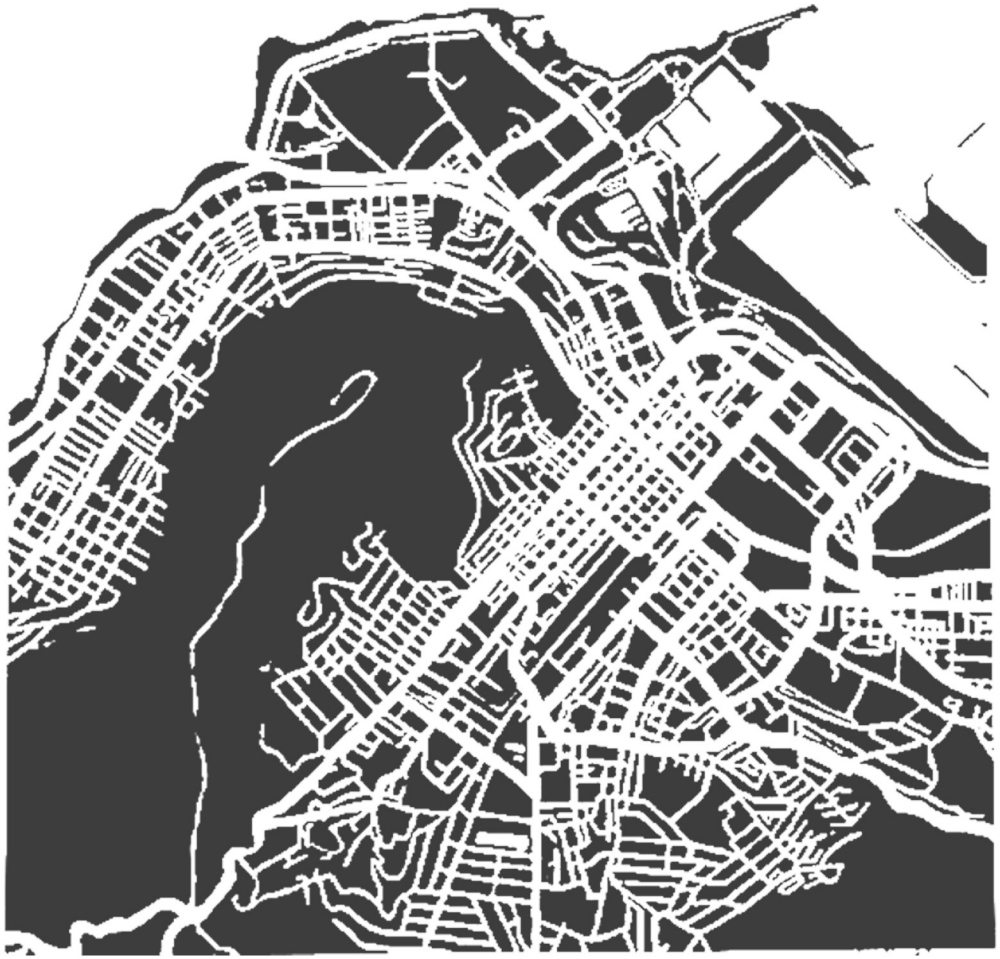

Figure 01

P R E A M B L E

Thesis Title: Sea Water Desalination Plant and Urban Reactivation on East Pier, Cape Town.

"The past decade has been witness to a resurgence of interest in ecologically sustainable thinking about the design and management of reclaimed, post-industrial landscapes" (Berger, 2008: 25).

This dissertation investigates and describes the concept to reintroduce abandoned space with new meaning. This research will examine the chosen site within Cape Town, "that were not previously considered fit for social habitation" (Berger, 2008: 25), and establish how it could be rehabilitated, redeveloped and reclaimed.

This dissertation engages in a discourse about thoughts on landscape, and investigates "techniques to the task of transforming out dated and disused neglected landscapes through design" (Berger, 2008: 25).

The research topic identifies ways to engage with the terrain vague, different or strange urban spaces which are internal to the city without destroying it. The design will penetrate the dead and forgotten space with a rich history and giving it a new meaning. It will establish and accomplish the city area adopting a new identity of necessity and contribution to the City of Cape Town.

Ignasi de Solà-Morales, a professor of Architectural Composition in Barcelona, stated the question of "How can architecture act in Terrain Vague without becoming an aggressive instrument of power and abstract reason?" (Barron & Mariani, 2013: 29).

This question will be investigated within this dissertation and be applied to the proposed desalination project. This concept of Terrain Vague is still very appropriate within our societies of today and is an important part to understand within the specific site chosen for this dissertation.

PART: 00

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01 PROBLEM STATEMENTS & AIMS

02 EXPLORATION & GROUNDING

03 DESIGN SYNTHESIS

04 TECHNICAL SYNTHESIS

I N T R O D U C T I O N

The development of this investigation came from my personal interest with the city of Cape Town. The Western Cape province is experiencing a drought which had its onset in 2015. This is the result of the dry winters the city has experienced during the past few years. The Cape Town region depends on its Mediterranean climate with warm and dry summers and winter rainfall.

I grew up in Cape Town and it is noticeable how the current water crisis is effecting everyone within the Western Cape region, especially within the city of Cape Town. The city receives its water from six major dams in the mountainous areas surrounding the city. These dams are recharged by the region rainfall period. The absence and lack of these rainfall periods has evolved in a decline in dam levels to a critical low. The city is currently “compelled to take decisive emergency decisions to avert an economic catastrophe” (White Paper for the deployment of emergency & disaster relief desalination plants for the city of Cape Town, 2017:11).

According to an article by Melanie Gosling, a correspondent on News24, Cape Town is expected to run out of water by 2030, unless there is a total mind shift towards the use of water within the city (Gosling, 2018).

Water will become expensive and exceptionally rare. Water supplies to the city will run out within 12 years and this is not only due to the drought. Water and sanitation strategies are not implemented correctly or efficiently and will cost the city a large amount of lost water.

These strategies intells: increasing poluted water sources, municipality water leaks and lack of fixing them, the “water treatment works are in poor or critical condition and South Africa has lost 50% of its ‘water factory’ wetlands” (Gosling, 2018).

BEYOND THE BOUNDARIES OF A DESALINATION PLANT

The city is applying and incorporating new and enormous water saving strategies to remove this threat to the city. One of the many strategies is to incorporate new sea water desalination plants to increase the water capacity of the city of Cape Town. These desalination plants are being positioned throughout the Western Cape region, within areas such as Strandfontein and Monwabisi (Felix, 2017).

The way in which desalination plants are used and applied intrigued me. The first thing I realized with the investigation is that desalination plants are largely private enclosed industrial processes. I am not convinced that this is the only approach for these plants, as one of the sites located for a plant is situated within the heart of Cape Town. The desalination process should become a celebration rather than a strict hidden process. It can become a beacon of new hope and a new future for the city.

The East Pier within Victoria and Alfred Waterfront is the investigated site for a sea water desalination plant and this space is on the doorstep of an area with vibrant energy and great possibilities. This is a perfect site for a desalination plant because of the resources but not for a pure industrial plant that would kill the exciting essence of the space.

This investigation and design will focus on how to make a desalination plant more friendly to the environment and the context it is situated within. There will be investigated how the desalination plant can be celebrated rather than becoming a parasite within its landscape. The research will investigate ways in which the vibrant public life and unique history to the site could be incorporated within this recreational process of purification and desalination.

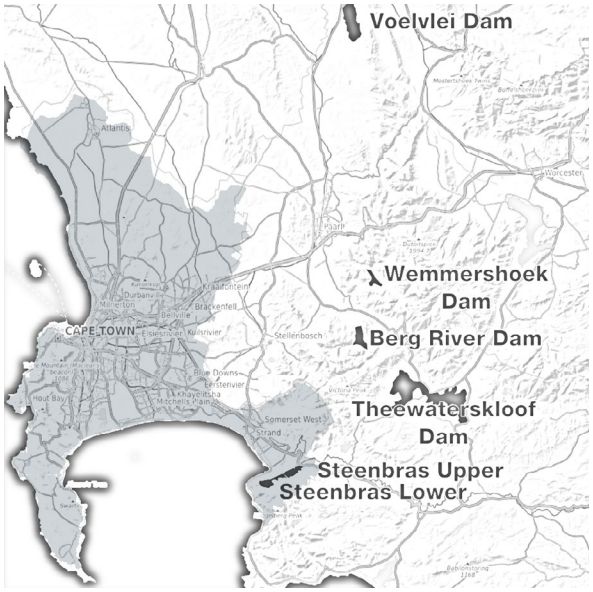


Figure 02: The six major dams in the mountain areas surrounding the city.

DOCUMENT FRAMEWORK

This dissertation is structured into four parts. Each part will address different aspects of the proposed project and it is read as a continuous design process.

Part 1 and Part 2 will be analysed and divided into typology, topology, morphology and tectonics.

Part 3 explains the design synthesis. The explorations of typology, topology, morphology and tectonics are explored and documented through research and conceptual analysis.

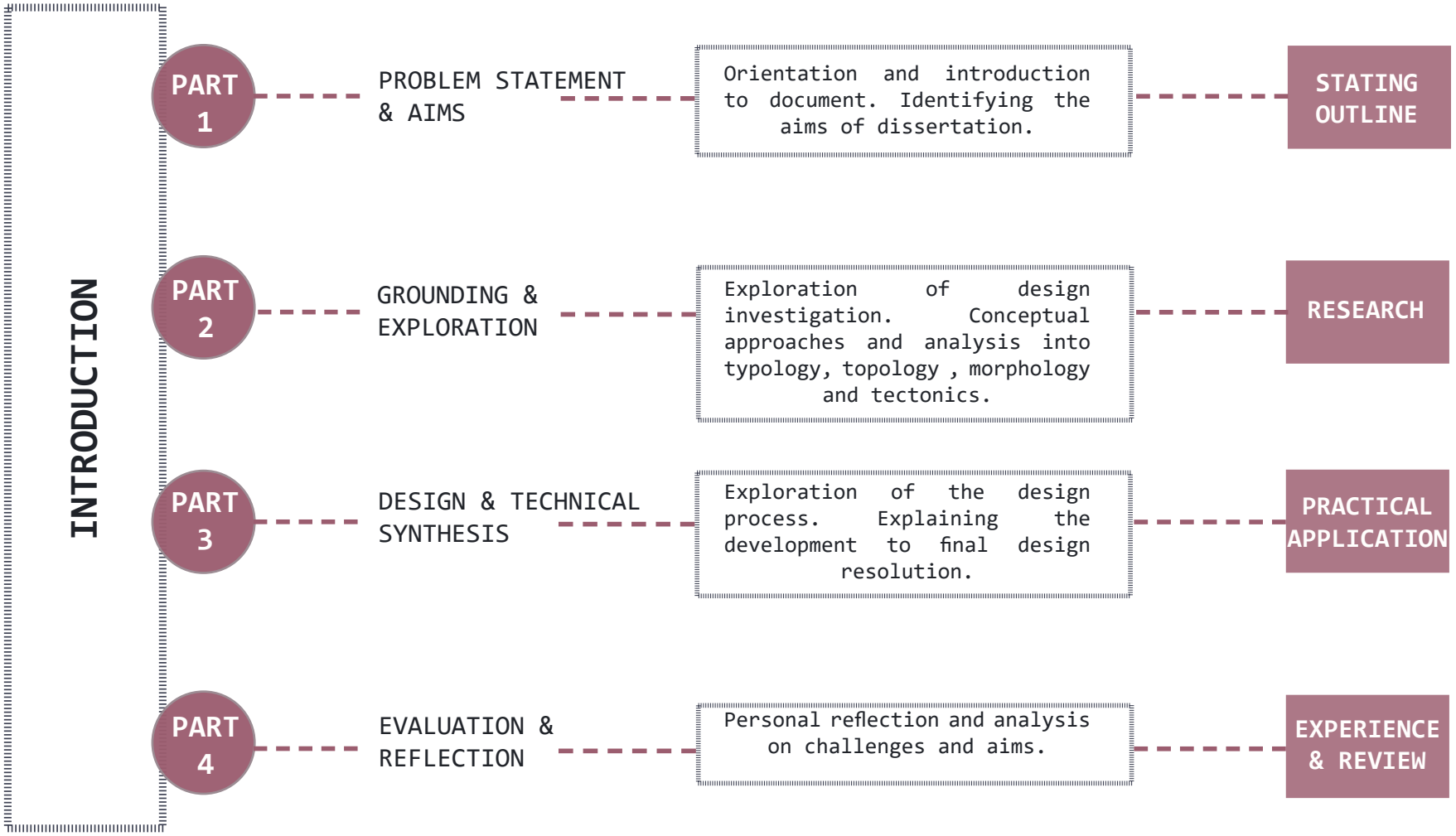
Part 4 reflects and evaluates the dissertation as a process. A critical analysis of the design solution presented in part 3. This part also comments on the challenges and achievements on the document product.

Typology is the study and exploration of architectural building types. Similar or different in terms of the functionality of the proposed project.

Topology is the influences by the existing context and needs of this project. This makes the project site specific and the location contributes to the design development.

Morphology is the study of the form-giving elements of the project. It influences and generates the ‘look’ of the building. A conceptual lens will also be applied to the form of the building.

Tectonics refer to the design methodological approach to structure. It is the ‘art of construction’. It focuses on the physical detailing of the conceptual approach within the design.


INTRODUCTION
PART 1
PROBLEM STATEMENT & AIMS
Orientation and introduction to document. Identifying the aims of dissertation.
STATING OUTLINE
PART 2
GROUNDING & EXPLORATION
Exploration of design investigation. Conceptual approaches and analysis into typology, topology , morphology and tectonics.
RESEARCH
PART 3
DESIGN & TECHNICAL SYNTHESIS
Exploration of the design process. Explaining the development to final design resolution.
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Personal reflection and analysis on challenges and aims.
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01 PART

INITIAL EXPLORATORY RESEARCH

AIMS & CHALLENGES

THEORETICAL QUESTION

Terrain Vague within the City of Cape Town.

The theoretical approach to the design, constituting the research theme and project aims.

How can a desalination plant act in ‘Terrain Vague’ without becoming an aggressive instrument of power and abstract reason on the East Pier of Cape Town?

02

PART

EXPLORATION & GROUNDING

TOUCHSTONE
An abstract representation of the conceptual approach to the dissertation.

CONCEPTUAL FRAMEWORK
A structural method on how the theoretical concepts are transformed to the architectural design approaches, capturing the intended idea.

SITE INVESTIGATION
Investigation of quantitative and qualitative information is conducted in understanding the topography on a macro, meso and micro scale.

PRECEDENT & CASE STUDIES
Example projects that were reinterpreted and analysed with similar design approaches regarding typology, topology, morphology and tectonics.

03

PART

RESEARCH APPLICATION
The research done in part 2 is analysed and applied to the design development.

The *design development* throughout the dissertation and design solutions to challenges.

The *technical development* of the dissertation and the research application towards the technical challenges.

04

PART

CRITICAL REFLECTION
Reflection on design process and critical analysis on interpretation of theoretical stance.

PROJECT RATIONALE

According to Paige Müller, a media reporter for Creamer's Media, Cape Town is suffering from one of the worst droughts in its history (Müller, 2018). The change in dam levels already occurred in 2015, "resulting in a severe water shortage in the Western Cape region" (Müller, 2018). This year the dam levels reached a critical low and Capetonians were warned of Day Zero - where the municipal water supply would largely be shut off.

Enormous water strategies started to be implemented by the government to prevent Day Zero from happening. The City of Cape Town municipality alternative water source projects is groundwater, recycled and seawater purification plants being launched to mitigate the draught's effects (Müller, 2018). The construction and installation of a new emergency desalination plant at the V&A Waterfront, on the East Pier, will be implemented. This desalination plant will have the capacity to provide two million litres of fresh water to Cape Town's residents (Müller, 2018).

The desalination project aims at establishing a two-minimum-liquid-discharge plant (Müller, 2018). This plant will make use of sea water reverse osmosis and multimedia filtration in order to produce the quality fresh water needed. The plant will produce fresh drinking water and will be able to store it in large quantities (Müller, 2018). This will make the water available to the city on demand (Müller, P; 2018). According to the marketing manager, James Preston of the SBS Tanks company, the desalination project will become a "landmark" project for the city and it should greatly improve the lives of the residents (Müller, P; 2018).

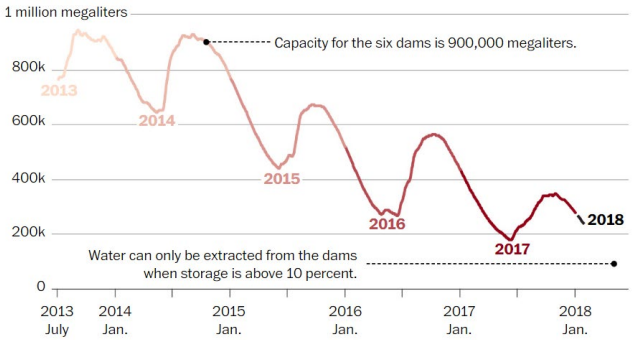
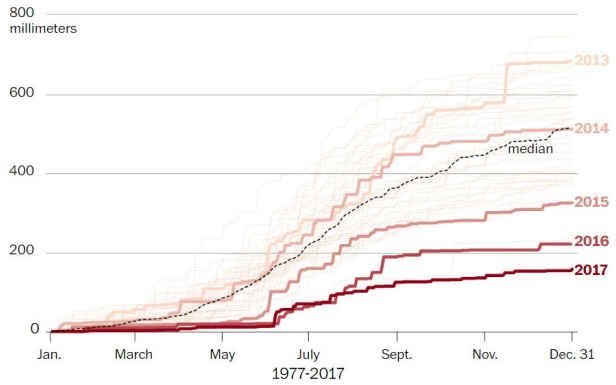


Figure 03: The volume of the water storage reservoirs has decreased year after year, which many climate scientists link to climate change globally (Karklis, Tierney and Soffen, 2018).



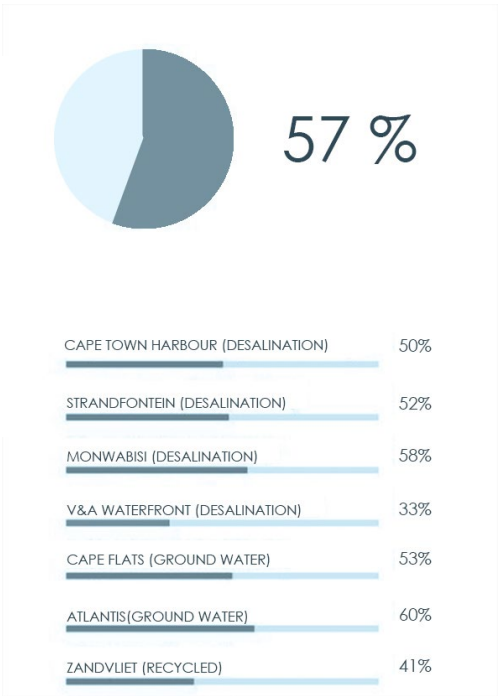


Figure 04: The city progress securing alternative water recources (Felix, 2017).

Figure 05: Accumulated daily rainfall at Cape Town International Airport. In response to its quickly depleting water supply, Cape Town has put in strict water restrictions on its residents (Karklis *et al.*, 2018)

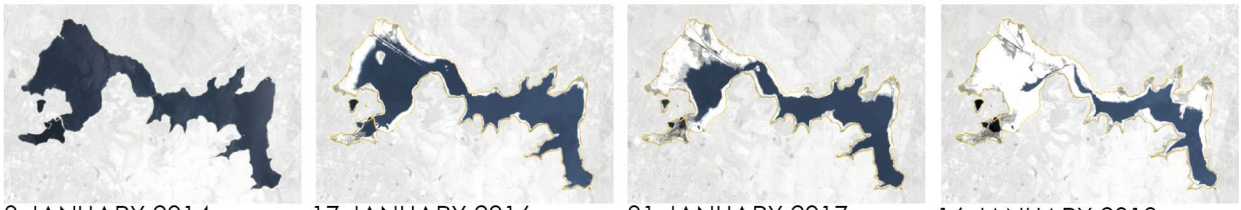


Figure 06: Theewaterskloof water levels on the decline. The drought is most clear when looking at Cape Town's biggest dam (Karklis *et al.*, 2018).

The V&A Waterfront as a workplace and leisure space for the Capetonians is a landmark in itself. To build an enclosed nonresponsive desalination plant next to the waterfront will be farcical. The East Pier currently functions as a walkway and a path of relaxation and enjoyment. The new desalination plant will deteriorate the vibrant essence within the pier.

There should be a relationship between the industrial desalination plant and the community within the surrounding context. This dissertation strives to bring this relationship to life and expose the desalination plant to new possibilities within its landscape. The desalination plant will be great for the future of Cape Town, not only for being an alternative water source but to bring new meaning to a desalination plant.

This desalination plant will become an example for future ways of accommodating large industrial plants without becoming aggressive and nonresponsive within its context.

The desalination plant will incorporate a public interfase, where one can experience the process of purification while still having the opportunity to appreciate the surroundings.

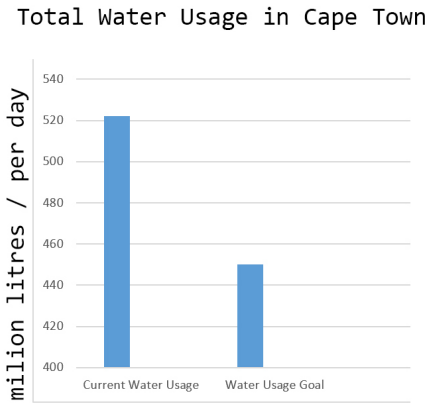
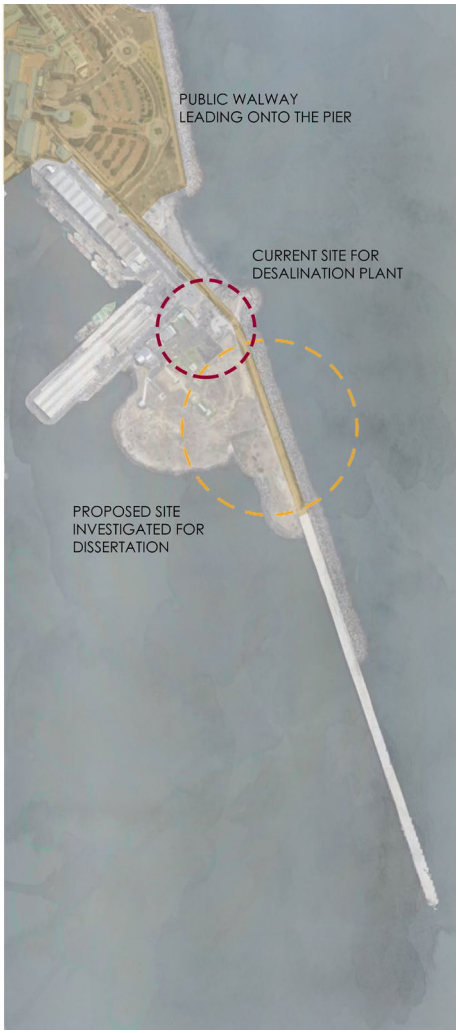


Figure 07: 1ml = 1 000 000l

Current usage of water per capita in Cape Town is 235 litres per day. [The average world wide is 185 litres per day.]

Proposed desalination project produce = 2ml

The plant will be able to supply the 235 litres aquired to 8 510 people within Cape Town.



The current desalination plant location deteriorating the vibrant essence within the pier.

The new desalination plant location becoming part of the pier and forming part of the pedestrians route.

Inviting the social culture present on the site.

Figure 08

TYPOLOGY

[1.1.1] Problem Statement
[1.1.2] Aims
[1.1.3] Clients & users

PART 01

PROBLEM STATEMENTS & AIMS

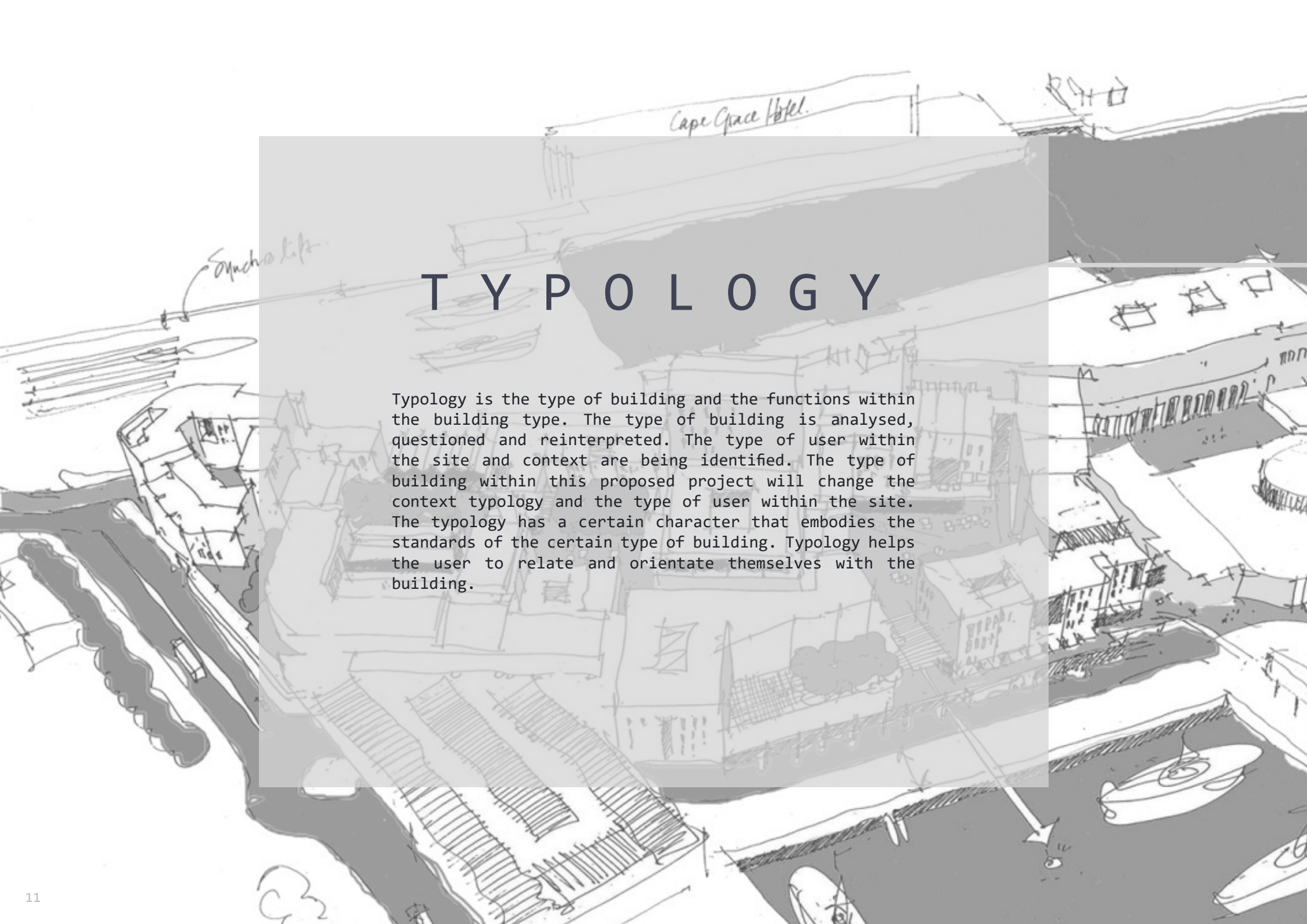
To explore the essence of a desalination plant within the Cape Town Harbour, a thorough investigation is done regarding the clients and users of the proposed architectural intervention. Typological, topological, morphological and tectonic challenges are identified and are addressed within this design dissertation.

TOPOLOGY
[1.2.1] Problem Statement
[1.2.2] Aims

MORPHOLOGY
[1.3.1] Problem Statement
[1.3.2] Aims

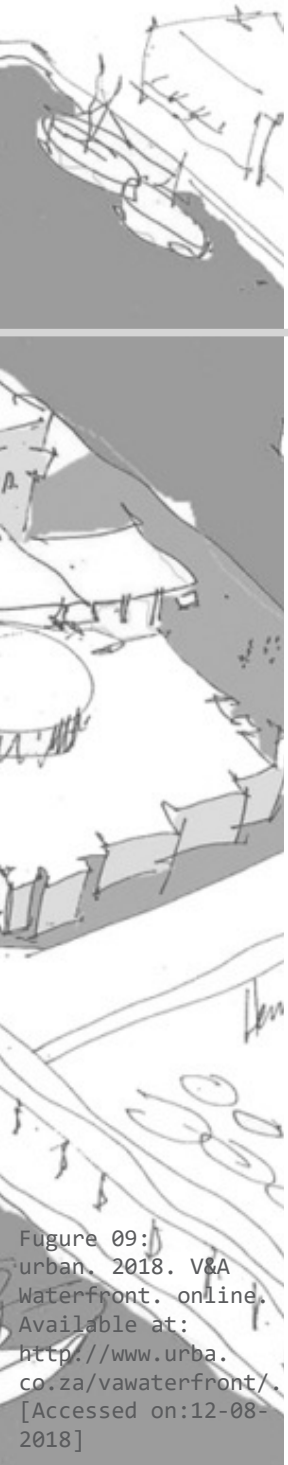
TECTONICS
[1.4.1] Problem Statement
[1.4.2] Aims

RESEARCH QUESTION



TYPOLOGY

Typology is the type of building and the functions within the building type. The type of building is analysed, questioned and reinterpreted. The type of user within the site and context are being identified. The type of building within this proposed project will change the context typology and the type of user within the site. The typology has a certain character that embodies the standards of the certain type of building. Typology helps the user to relate and orientate themselves with the building.



Fugure 09: urban. 2018. V&A Waterfront. online. Available at: http://www.urba.co.za/vawaterfront/. [Accessed on:12-08-2018]

PROBLEM STATEMENT

The area of the Cape Town Harbour is known for its vibrant social energy. The typology of the proposed design will be the desalination plant, a public restaurant, public exhibition spaces, lookout points and water research labs. These typologies focus on the idea of reconnecting and bridging the gap between the abandoned site and the public within the waterfront. In order to understand the hybrid typology within the proposed building, research will be compiled into industrial architecture and what keeps it enclosed and cut off from the public. The research will also focus on design-orientated buildings in order to begin to understand the complexities of such architecture. The investigations will focus on the functions of these typological entities, that will assist this dissertation to accommodate and understand the new typologies within this industrial type of building.

AIM

This dissertation aims to reintroduce the typology of a desalination plant. It will aim to introduce the community to the powers of the ‘machine’ and creating a place that can become a beacon in the urban landscape. The new introduced hybrid typology seeks to extend from the existing functions expected from a desalination plant, joining them with the existing functions in the surrounding context. The typologies will bridge the gap between the industrial spaces and the re-imagined social context.

The typological needs of the city users as well as the proposed clients are investigated to assist with the design measures to be taken. The project's client is the V&A Waterfront in conjunction with the City of Cape Town municipality.

INTRODUCTION TO

THE CLIENTS

WHERE THE CITY MEETS THE SEA

"The V&A Waterfront is a mixed-use development comprising residential and commercial property, hotels, retail stores, dining, leisure and entertainment facilities. Spanning 123 hectares, it's a space where you can work, live, eat and play" *(V&A Waterfront: Overview, 2018)*. Looking onto Table Mountain & wrapped around an historical harbour.

The waterfront is the client of this design dissertation. One moves through the waterfront precinct to access the site. The waterfront extends its water and electrical resources to accommodate the proposed project.

"A mixed-use urban waterfront development seamlessly merging ocean vistas with mountain views, fresh sea breeze and the warm African sun add zest to a cosmopolitan and vibrant atmosphere. More than 80 restaurants bring a fusion of international food, from rustic al fresco fish and chips to starched table-cloth cuisine" (V&A Waterfront: Overview, 2018).

Figure 10: City of Cape Town. 2018. [Online]. Available: http://www.capetown.gov.za/. [2018, August 12]
11: (V&A Waterfront: Overview, 2018)

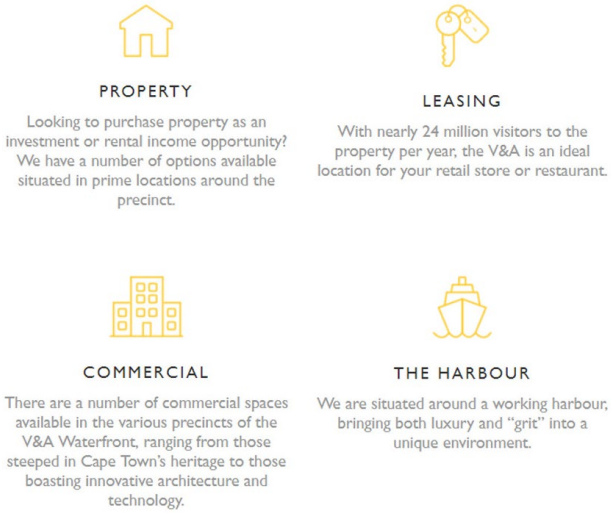


Figure 12: (V&A Waterfront: Overview, 2018)

"Urban waterfronts represent the magic point where the city as a purely human product meets the element of water as a purely natural component" (Hradilová 2012: 262).

The users of the new proposed project will connect the vibrant essence of the V&A Waterfront to the new introduced industrial desalination plant. The users of this dissertation is of importance to the success of the building.

INTRODUCTION TO

THE USERS

THE TOURIST
- FLÂNEUR -

The tourists within the context of the East Pier will activate the site in a social manner.

STUDENTS

This dissertation aims to create an educational environment. Guides will be available for tours through the building, explaining the desalination process.

ARTISTS
-WASHED ASHORE-

The proposed exhibition spaces will be appointed to Washed Ashore, a non-profit organization creating art sculptures from sea pollution and waste. This could also be incorporated with the educational aspect of the building.

LABORATORY PERSONNEL

The laboratory personnel will be a consistent user within the building. Evaluating the water within the plant. [Microbiological Analysist]

DESALINATION PLANT
- STAFF -

The staff within the service process of the desalination plant. Not necessarily part of the public course within the building, but a necessity to the production of the plant and its services.

T O P O L O G Y

The proposed site is on the East Pier, within the Cape Town Harbour, situated next to the popular V&A Waterfront.

This section of the dissertation refers to the location and context of the proposed design. The East Pier within the Cape Town Harbour has a rich history and this is important to consider when redesigning a space with such unique characteristics.

This proposed site was once of importance to the city of Cape Town and with progressing developments within the harbour became a space of void within this vibrant space of the city.

Figure 13

PROBLEM STATEMENT

The vibrant urban fabric of the East Pier is interrupted by the expansion of the harbour. The void within this space forms mental and imagined barriers between the waterfront and the pier. This becomes a challenge to design a project which will reintroduce this site to the public and users within the surrounding context. The site is situated with the best view north towards the Atlantic Ocean and it becomes the end point of the harbour. This point should be celebrated and Cape Town should enjoy this location as it once did.

AIM

How can this dissertation give the site a new meaning after it became an abandoned space? This dissertation aims to reactivate the pier with new meaning. The public should be drawn back into the abandoned space and experience the possibilities of the unique site.

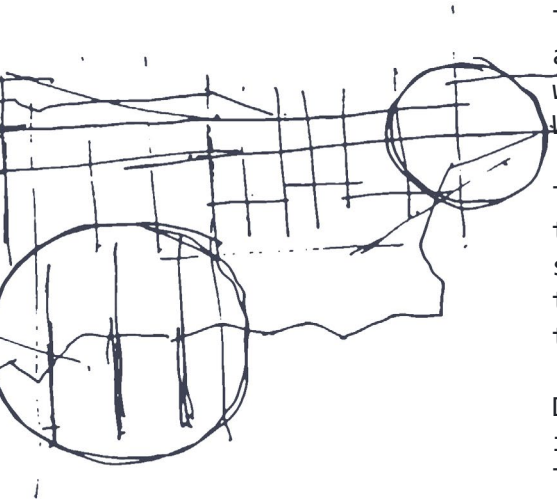
M O R P H O L O G Y

This section of the dissertation refers to the form giving elements to the proposed design. It explains the factors of the typology and topology's influences that will form how the building starts to represent itself in the *terrain vague*. The typological and topological influences will become the starting point of the physical form of the design.

The proposed project will adhere to the conditions and influences of the East Pier and the public/pedestrian-driven functions of the design will influence how the city interacts with the new desalination plant.

Figure 14

PROBLEM STATEMENT



The East Pier acts as an edge to the city and the harbour, the site longs to reconnect with Cape Town and the Victoria and Alfred Waterfront.

The isolated site should be investigated to understand what thresholds within the site contributes to this isolation and how to interact with these thresholds to break these boundaries.

Desalination plants receive its form from its typological functioning and layouts. To introduce a typical enclosed and functional desalination form will not do justice to the social reconnection of the void and abandoned space within the urban environment.

AIM

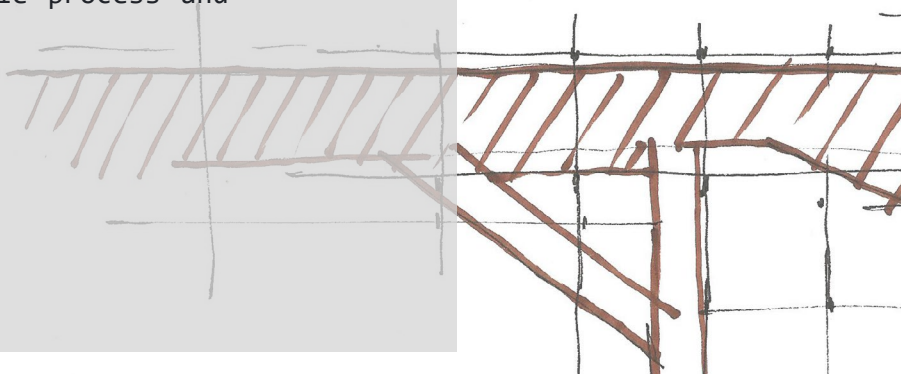
The conceptual lens of this investigation should be applied to the form giving elements of the desalination plant, rather than just the physical functioning form giving elements of a desalination plant.

The aim is to link and bridge the important nodes within the site, becoming a new node within the larger spectrum of the Victoria and Alfred Waterfront as well as Cape Town itself.

T E C T O N I C S

Tectonic’s essence is the ‘art of construction’ as it details and structures the morphology of the design. Influenced by the typological and topological existing elements, it reflects contextual design in terms of details, materials and local construction.

A structural philosophy extends the conceptual framework to the built structure threading the whole process and design together



PROBLEM STATEMENT

The usual structure of a desalination plant is simple and purely functionally driven for the process to create fresh water. This desalination plant challenges this typology of structure to incorporate a user experience within this technical building. The structure should allow different atmospheres, typologies, movement and experiences.

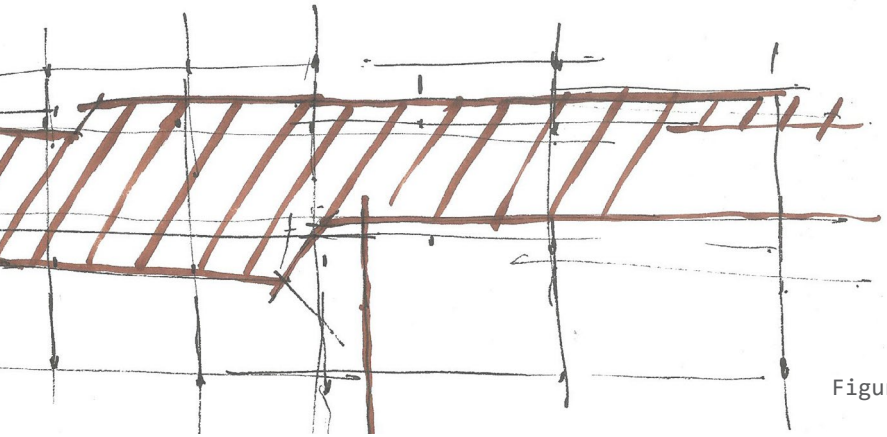


Figure 15

AIM

The aim is to find structural elements that allow the user to feel comfortable within the highly technical building function and to create an existing atmosphere for the user moving through these function-driven spaces.

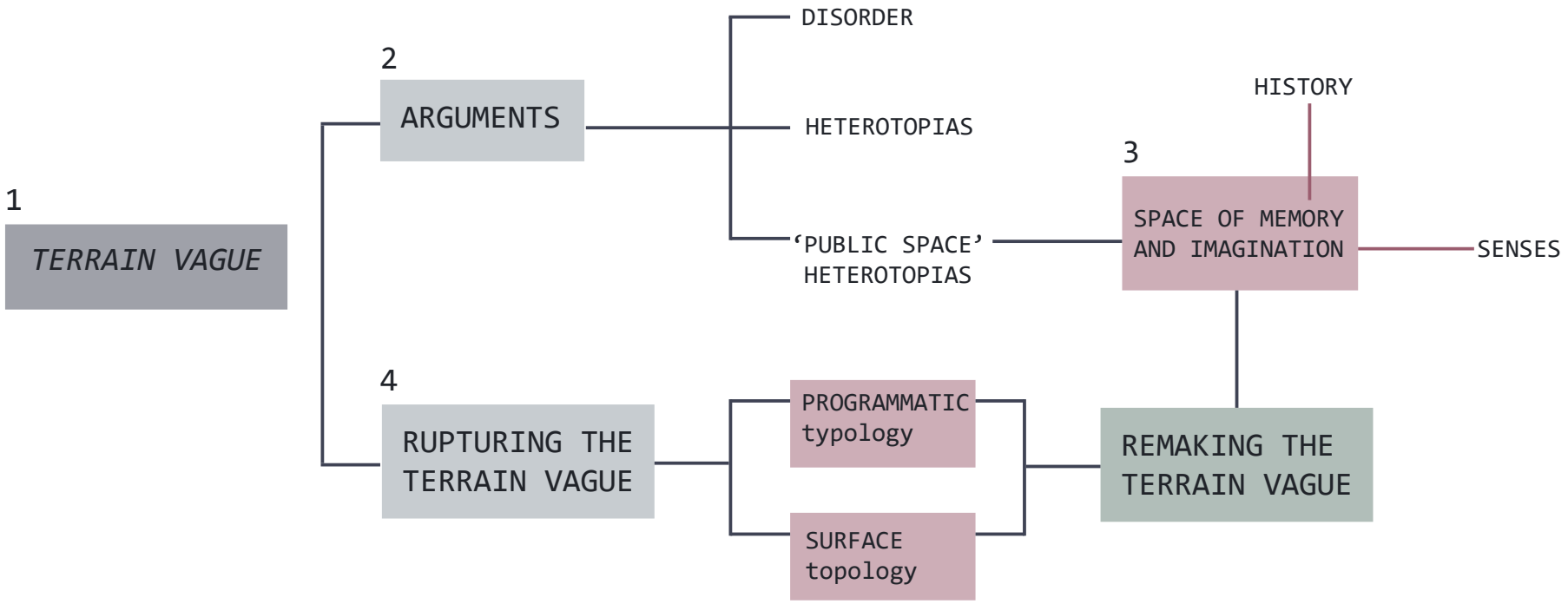
This architecture should propose a structure allowing the functioning of a desalination plant and the movement of public within these spaces. It will incorporate two very different movements within one structure, thus also allowing the different spaces to be unique and change throughout the process and building.

RESEARCH QUESTION

How can a desalination plant “act in *Terrain Vague* without becoming an aggressive instrument of power and abstract reason” (Barron & Mariani, 2013:29), on the East Pier of Cape Town?

Terrain Vague within the City of Cape Town.

- New meaning to abandoned space -



1 TERRAIN VAGUE

The research question focuses on the urban environment. This dissertation studies the *terrain vague*. According to M. Ho-Tong, a student at the University of Cape Town, "the *terrain vague* is a term used to describe different or strange urban spaces which are internal to the city but exist outside the effective circuits and productive structures of that urban system" (Ho-Tong, 2011:8).

The term was first used by architect Ignasi de Sola-Morales. Describing that *terrain vague* can be seen in "the relationship between the absence of use, of activity, and the sense of freedom, of expectancy,… void then as absence, and yet also as promise, as encounter, as the space of the possible" (Jones, 2018). The term is frequently used in architecture and urban design to describe certain spaces with an abandoned history.

The *terrain vague* is explored through an investigation of a specific urban territory in Cape Town, the East Pier, which formed as a 'leftover' urban space and it has abandoned qualities. A site with evocative potential. In part one of this document it clearly indicates the rich history of the East Pier and the new possibilities it once contributed to the city. The harbour expanded and left the East Pier unused and separate from the vibrant waterfront. This research theme will investigate way in which the East Pier, *terrain vague*, can reconnect with the city and become a new space of possibilities.

ETYMOLOGY

The understanding of these two words is of importance to further investigate the quality it possesses. The exploration of its origins is essential to the unravelling of its identity.

Terrain is a Latin word used to describe an extensive portion of ground, in an urban setting (Clemens, 2012:13). It also refers to imprecisely defined areas of territory in a state of expectancy (Ho-Tong, 2011: 18). The word terrain is applicable to this dissertation by referring to the East pier and the possibilities it provides for Cape Town's future. This concept of terrain is more expansive than example the concept of land (King, 2011), which usually indicates a certain space with boundaries.

The word terrain consists of more possibilities and a further understanding than those of marked-off areas. It consists of "more spatial connotations and it explains more the idea of a plot of land fit for construction which by definition has more direct ties to the urban city" (King, 2011).

The word Vague is used to describe a range of ideas. The Latin word "vagus" stems from the English words vacuum and vacant, being empty or unoccupied (Ho-Tong, 2011: 18). Explaining the site with availability and freedom. This could also be explained as: "the sense of indeterminate, blurred, imprecise and uncertain" (King, 2011).

The German word "woge" is tied to sea swells, movement, fluctuation and instability of waves within water (Ho-Tong, 2011: 18). The East Pier is a piece of land with more potential than its current boundaries. It is a strange and uncertain terrain with possibilities.

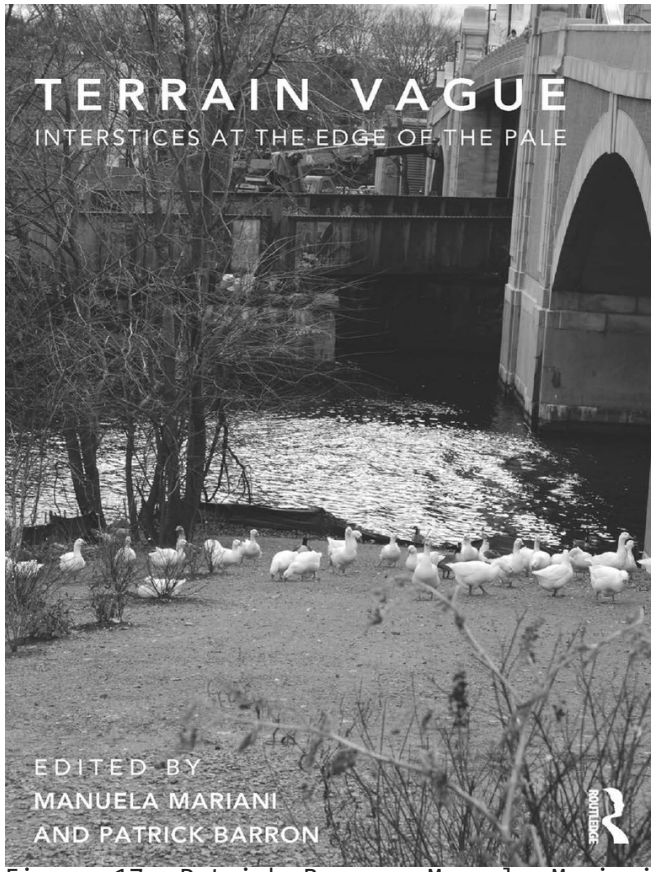


Figure 17: Patrick Barron, Manuela Mariani Terrain Vague Interstices at the Edge of the Pale 2013 (Barron & Mariani, 2013).

TERRAIN VAGUE

"The concept of terrain vague is difficult for it being essentially 'non-design' but it has the ability to theorize the margins of the order-like world we reside in" (King, 2011). The "actions of designers are in contrast to the unstructured configuration of the terrain vague" (King, 2011). Sola-Morales mentions that this is problematic to the role of the architect (King, 2011). "Architecture's destiny has always been the imposing of limits, order and form, the introduction into strange space of the elements of identity necessary to make it recognizable, identical, universal" (King, 2011).

"When architecture and urban design project their desire onto a vacant space, a terrain vague, they seem incapable of doing anything other than introducing violent transformations, changing estrangement into citizenship, and striving at all costs to dissolve the uncontaminated margin of the obsolete into the realism of efficacy" (King, 2011). Introducing order into the chaos of the terrain vague.

Exploring the concept of terrain vague has much more potential in the opportunity to give shape to an existing urban space and phenomenon of indeterminacy, of spatial and social aspects (King, 2011). Terrain vague opens possibilities to learn from existing urban conditions and not trying to create it (King, 2011). Architecture should be looking at the ability to allow disorder and keep from becoming a modernism identity of rationalized and organization of all spaces (King, 2011). The challenge with this dissertation is to design an order-like system within a terrain vague without creating total rationalized and an order-like feeling within these spaces and keep the essence of a terrain vague with opportunities. For this design response to be successful it should incorporate the human experience and the disorder characteristic and ability of the human movement.

"The idea of leaving space unplanned, not programmed in a project or area, faces many obstacles such as the client and cultural expectations" (King, 2011). By incorporating the chaos of the human and the order of the systems there is still a level of indeterminacy within the terrain. The order-like systems new within the site is not a total parasite within the uncertain terrain, a sense of imprecise activity remains within the space.

“Mentally exterior in the physical interior of the city” - lgnasi de Sola Morales (King, 2011)

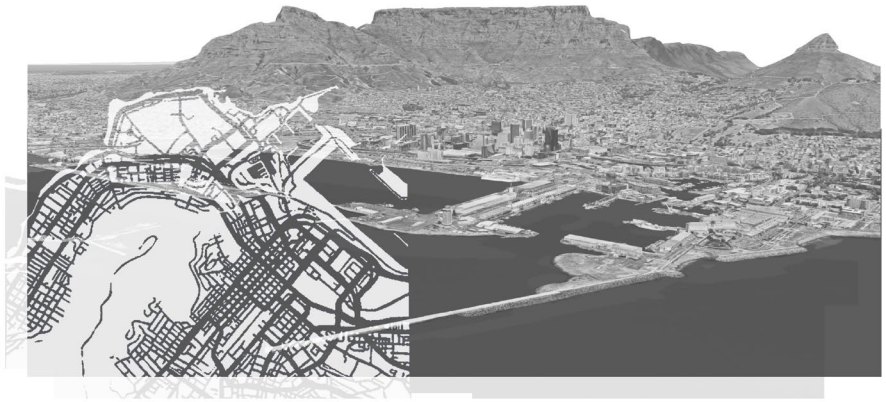


Figure 18

How “can a project, heavily designed and programmed such as a desalination plant, remain relevant as the space, culture and people around it change?” (King, 2011)?

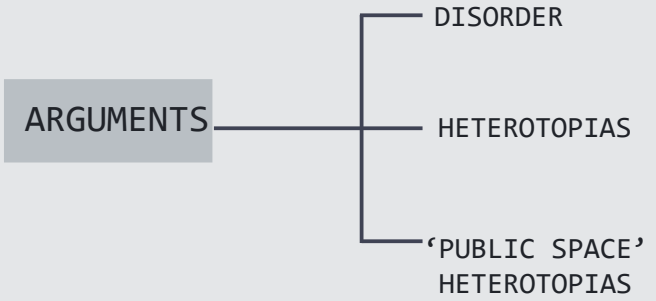
So the question states: How can a desalination plant act in Terrain Vague without becoming an aggressive instrument of power and abstract reason on the East Pier of Cape Town?

Sola Morales argued, *“Undoubtedly, through attention to continuity: not the continuity of the planned, efficient, and legitimized city, but of the flows, the energies, the rhythms established by the passing of time and the loss of limits... we should treat the residual city with a contradictory complicity that will not shatter the elements that maintain its continuity in time and space”* (King, 2011).

2

ARGUMENTS IN DEALING WITH TERRAIN VAGUE

Terrain vague consists of threads and arguments that are tied together with ideas of 'heterotopias' and indeterminate 'other spaces' in the urban environment. There are two conflicting arguments identified towards terrain vague. This research aims to find the link and in-between grounds of these two very different approaches of terrain vague. This research also aims to understand the different characteristics of a terrain vague to ultimately understand the East Pier and the way which one perceives the terrain vague.



CONDEMNATION OF DISORDER

The first argument is terrain vague as a representation of unacceptable demonstrations of the breakdown in current socio-economic conditions (Clemens, 2012:15). It is the antithesis of the idea of a utopian city (Clemens, 2012:15). This is seen in movies portraying future apocalyptic city settings, where the city is in a state of terrain vague, disintegrating and on the verge of collapse. It could also be defined as dystopias (Clemens, 2012:15).

This is a condition within the post-modern society, containing unpredictable futures. These spaces of uncertainty and the consciousness of the blank future create feelings of discomfort and anxiety (Clemens, 2012:15). These feelings are usually overcome by architects creating order within these confused and disorientated spaces.

The utopian city is the ideal city and society.

This dissertation introduces order to the terrain vague, but does not agree with the disposal of the utopian city. The utopian city creates possibilities and this dissertation aims to keep these imaginations alive. Disorder could become a beautiful thing if the users become comfortable within the unpredictable space.

Figure 19 & 20

A SPACE OF FREEDOM - THE HETEROTOPIA

The second argument is when *terrain vague* is experienced as a space with opportunities. The area of *terrain vague* is emancipated from the constraints it once possessed and the constraints it could possibly reclaim (Clemens, 2012:15). It is a space of total freedom without rationality, organization and deterministic programs. It is a space with heterotopian identities.

Michel Foucault introduced the term 'heterotopia' to describe 'other places' (Allweil and Kallus, 2008:191). "Wastelands" and areas such as *terrain vagues* "are explored as sites of promise and resistance" (Allweil and Kallus, 2008:191). The heterotopia consists of "different functions in relation to the dominant order" and these spaces serve as 'steam-releasing' sites (Allweil and Kallus, 2008: 191). Heterotopias accommodate a deviant phenomenon (Allweil and Kallus, 2008:191). The *terrain vague* diverging from the usual standards especially in social behaviour.

This dissertation aims to design a building with order-like systems within the terrain vague, without detaching it from its idealistic heterotopian aura. It challenges to create a place where order and disorder meet to create a space within the *terrain vague* which consist of order and rationality but does not remove the essence of the heterotopian terrain vague.

"Heterotopia is a phenomenological investigation of the 'other places'."
- Vincent J. Stoker (Stoker, 2011)

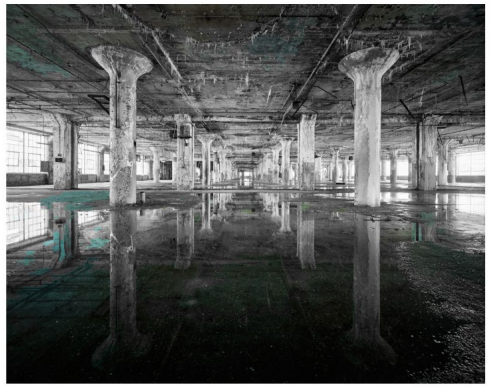


Figure 21: The 'other space' of an abandoned parking lot (Stoker, 2011).

‘PUBLIC-SPACE HETEROTOPIAS’ - EAST PIER

The East Pier is the breakwater for Cape Town Harbour. This is the first visual harbour experience one encounters when entering from the Atlantic Ocean. The pier also becomes the end point of Cape Town reaching out to the sea and creating thoughts of possibilities. Curiosity is sparked and one would like to know what lies beyond the pier when approaching it.

The East pier becomes a space described as *‘public-space heterotopias’*, because it “has a distinctly heterotopian character, although the terrain is fully visible with existence within the urban fabric of public spaces” (Allweil and Kallus, 2008:193). The terrain “resides within the domain of the open-to-all public space and hold no permanent physical borders” (Allweil and Kallus, 2008:193), unlike the heterotopias explained by Foucault (as it is clear in the research about malls and libraries).

“The qualification of ‘public-space heterotopias’ is believed to give these spaces their capacity to sustain insurgent social codes and values that challenges the predominance of convention, while being spatially contained within their detached environments” (Allweil and Kallus, 2008:193).

“‘Public-space heterotopias’, such as the East Pier, operate within the city fabric and allow diffusion between people, ideas and activities. This reverse the assignment of spatial detachment to heterotopias, by Foucault, to control disruptive behaviour” (Allweil and Kallus, 2008:193).

This *terrain vague* landscape can contribute to open space in the city. These spaces provide a breathing space within the city.

The East Pier is an important open space and counterpoint to the built space; a void in the city mass. It is forgotten in a sense that the public does not encounter with the site as they used to; the play and freedom should be brought back to the *terrain vague*.

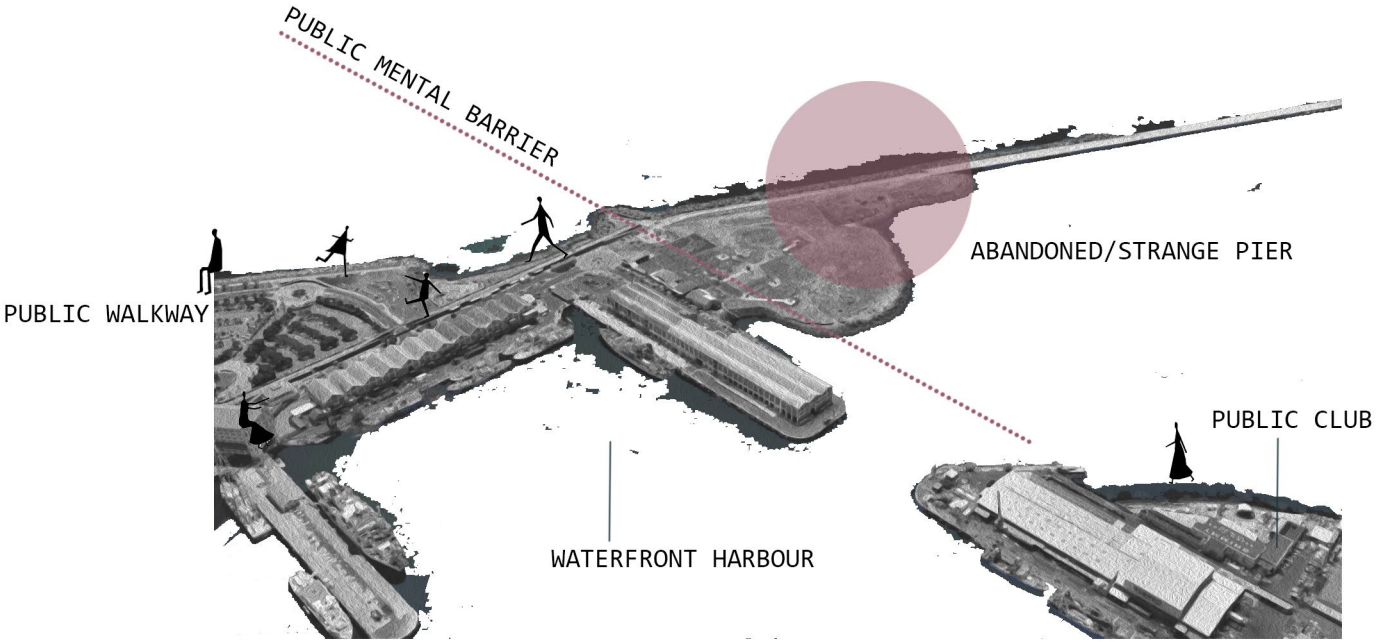


Figure 22

3 UNCOVERING THE EXISTING: SPACE OF MEMORY AND IMAGINATION

“Certain spaces within the built environment” is referred to and defined as “‘wastelands’, ‘derelict areas’, ‘dead zones’ and ‘urban voids’” (MacLeod & Ward, 2002:164). These spaces are not the expected “slums with impoverished but defined communities, nor open public spaces but refer to areas such as disused harbours and train yards, closed industrial yards or empty spaces and lots” (MacLeod & Ward, 2002:164). Through commodification within the post-modern society these spaces are seen as ‘wastelands’ and ‘dead zones’.

These so called ‘dead zones’ and ‘urban voids’ are the spaces mentioned as terrain vague. The history and previous purposes within these terrains influence the identity of the space. The East pier reconcile with these terms. The pier is an empty space and disused jetty for the Cape Town Harbour.

The history of the pier should not be forgotten and should become a medium when reintroducing the new abandoned void. “We have an innate capacity of remembering and imagining places. Perception, memory and imagination are in constant interaction; the domain of presence fuses into images of memory and fantasy” (Pallasmaa, 2006:67).

We have the capacity to enter a “remembered or imagined” space (Pallasmaa, 2006:67). A curious relationship happens when experiencing architecture or forms of art. We project our own emotions, memory and perceptions to the art through the aura it creates. Every individual experiences art and spaces in different and unique ways, according to their memory and fantasy. The terrain vague becomes an open void of new fantasies and memories. The East Pier will become a celebration of the past and possibilities as well as fantasies of the future.

HISTORY OF THE EAST PIER

The history of the East Pier of Cape Town within this section is according to the writings of Brian Ingpen, a writer of several maritime histories.

This section of the research gives the background of the pier to aknowledge the history within the site. The history should be aknowledges to understand the reason for the pier's lost of function and state of *Terrain Vague*.

1854

In 1854 Cape Town were a British colony under the control of a British Governor (Ingpen, 2015). The harbour consisted of three wooden jetties that were the only method for cargo and passengers to access land, Cape Town, from the harbour (Ingpen, 2015).

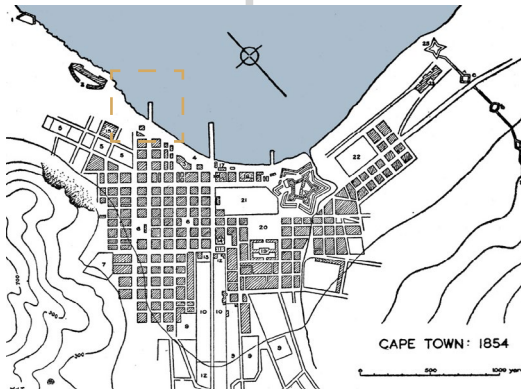


Figure 23: Map illustrating the three jetties in Cape Town, 1854 (Ingpen, 2015).

1860

A harbour for Cape Town was designed because of the increasing demand for facilities (Ingpen, 2015). A breakwater was part of the design to protect the harbour from the prevailing swell (Ingpen, 2015). The construction of the harbour started in 1860 (Ingpen, 2015). Prince Alfred was the first to tip a load of stones to start the breakwater consruction (Ingpen, 2015). The harbour were dug out of rock and the breakwater was constructed from the rock extracted (Ingpen, 2015). During the construction of the harbour, a severe storm struck Table Bay and a lot of damage wes done to the construction process and ships (Ingpen, 2015).

In 1867 the discovery of diamonds in the interior land led to the “diamond rush” that resulted in a large volume of people drawn to the Cape, mainly from Britain (Ingpen, 2015). These events happened during the construction of the harbour (Ingpen, 2015). A fluctuating number of ships were welcomed in the Cape with large numbers of passengers, mining equipment and household items (Ingpen, 2015). The town of Kimberley were established in the Northern Cape as it is known today (Ingpen, 2015).

The harbour was completed in 1870. It included the Alfred Basin, the breakwater, a drydock and a slipway for ship repair (Ingpen, 2015). The breakwater was the start of the East Pier we know it today (Ingpen, 2015).

There was an increase in the numbers of ships that arrived in the Cape and the harbour could not accommodate all the ships (Ingpen, 2015). The harbour had to be extended towards the sea (Ingpen, 2015). Space towards the land were not able to be used as there were developments and additional space was not provisionally available (Ingpen, 2015). The Victoria Basin was constructed and were the cause for more berths for ships (Ingpen, 2015).

1867

1870

1885

1898

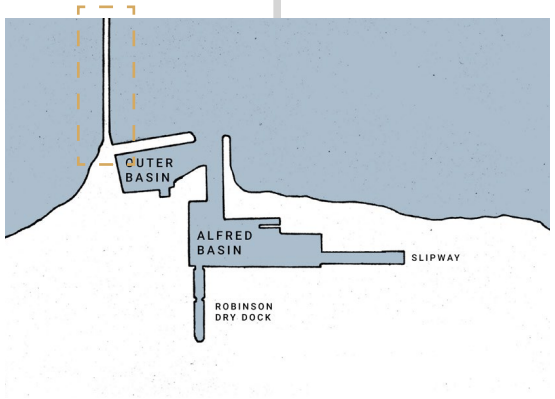


Figure 24: The Cape Town Harbour in 1885 (Ingpen, 2015).

Figure 25: Photograph showing the extension of the Victoria Basin, 1898 (Ingpen, 2015).

Other than more berthing spaces for ships, the harbour had to extend further because larger ships were entering South Africa and the Victoria Basin were too small to accommodate the ships (Ingpen, 2015). Trade also increased and encouraged more ships to Cape Town (Ingpen, 2015).

The harbour authorities decided to extend the harbour along the coast (Ingpen, 2015). They also created a new basin with a loose collection of concrete blocks and rubble to enclose the area with a random mole (Ingpen, 2015).

Convoys of ships were sent to Cape Town during World War II. The New Basin was extended and completed in 1945 (Ingpen, 2015). The new construction project, the Duncan Dock, included the reclamation of large areas that were mostly water (Ingpen, 2015). These areas became Cape Town's Foreshore that currently hosts some of the tallest buildings in Cape Town (Ingpen, 2015).

1920

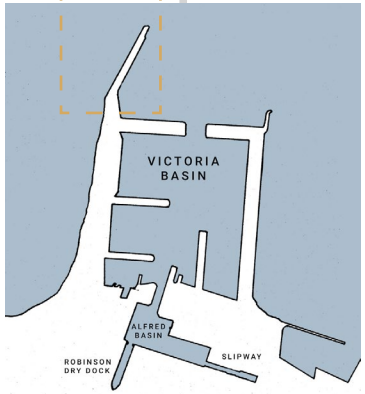


Figure 26: The Cape Town Harbour in 1920, where the Victoria Basin became too small (Ingpen, 2015).

1937

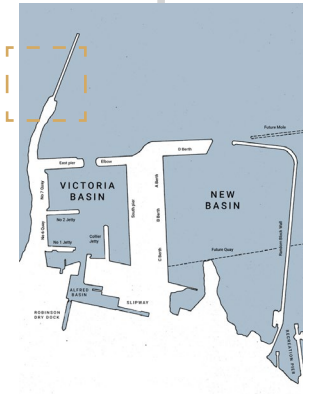


Figure 27: The Cape Town Harbour in 1937, with the new basin (Ingpen, 2015).

1945

The new harbour had berths, an Eastern Mole and Sturrock Drydock that accommodated some of the world's largest ships at the time (Ingpen, 2015).

1962

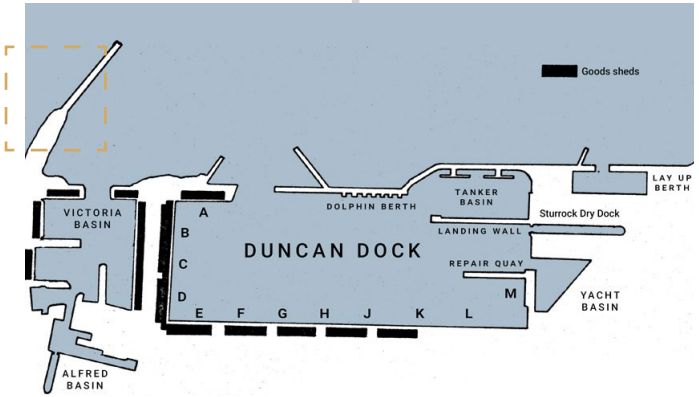


Figure 28: The Cape Town Harbour in 1962 with a tanker basin for the import of crude oil for the newly-built oil refinery near Cape Town (Ingpen, 2015).

The next large development within the harbour was the preparation of container ships that officially began on 1 July 1977 (Ingpen, 2015). A large area was required to stock containers before being loaded onto ships and after retrieving them from ships (Ingpen, 2015). The ships will also be longer and have a deeper draught than other cargo ships usually trading to South Africa (Ingpen, 2015). The new container terminal was built in 1977 (Ingpen, 2015).

1977

Figure 29: The Cape Town Harbour in 1976 when the construction of the container terminal was still under construction (Ingpen, 2015).

The history of the Cape Town Harbour needs to be understood. The East Pier were built and used as a breakwater protection of the harbour. It was one of the first functioning jetties of the city and therefore has a rich historical importance to the city.

Where the Pier was once used for the docking of ships within the harbour, it is now only an open land not regularly used. The desalination plant will be built on the East Pier of Cape Town Harbour. It will give new and different meaning to the site within the vibrant Victoria and Alfred Waterfront. The desalination plant will be part of new and improved systems within the city. The pier once was the starting point of renewal and hope entering Cape Town. This dissertation will encourage this once again for the city in a time of crisis and need. It will be a starting place for renewal and will in effect improve the city - it will give that starting place from history a sense of development again.

- Loss of function does not mean loss of presence -

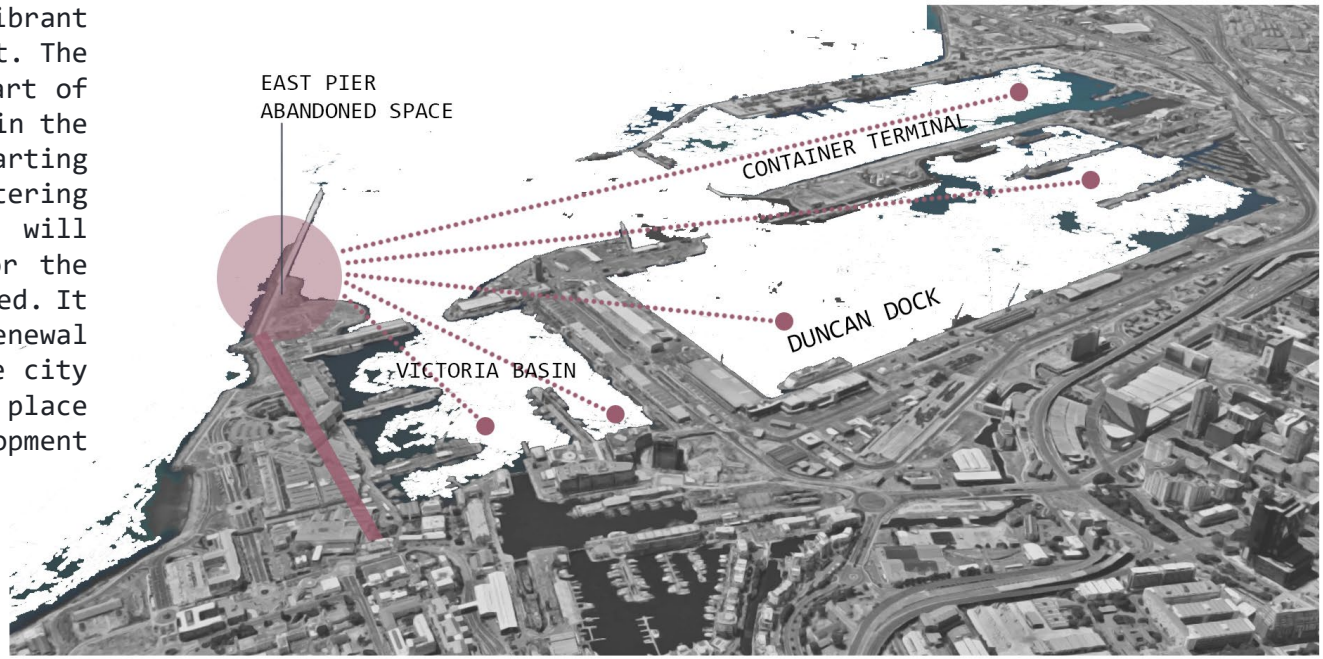


Figure 30

HARBOUR EXPANSION

- leaving the East Pier open and without function, creating the *terrain vague*.

THE POWER OF SENSES TO REACTIVATE THE TERRAIN VAGUE

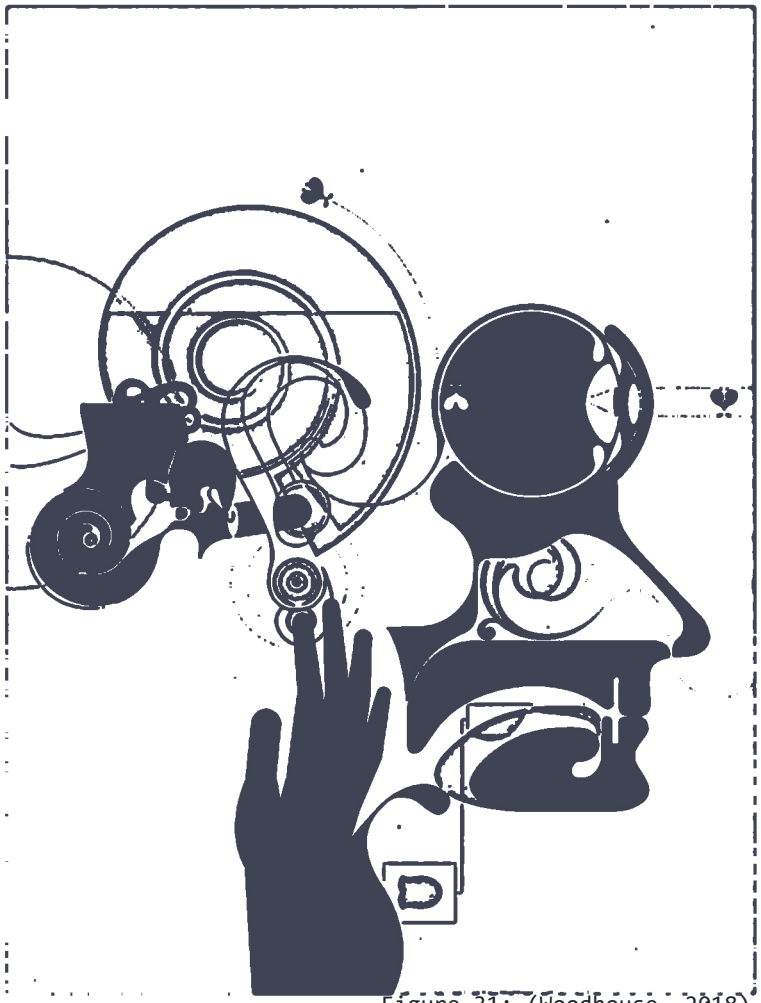


Figure 31: (Woodhouse, 2018)

“We perceive atmosphere through our emotional sensibility – a form of perception that works incredibly quickly, and which we humans evidently need to survive” (Zumthor, 2006:13).

The terrain vague concept includes the atmosphere within space. It is the spaces where fantasies and memories take part in the atmosphere. Peter Zumthor (2006:13) explains in his book that atmospheres and the image thereof could be created through different elements. These elements are the spatial qualities that moves us; this creates the atmosphere within place (Zumthor, 2006:13). He conceptualized these elements by asking the question: What is the “magic of the real”? (Zumthor, 2006:13) How can we as architects create atmosphere with intensity and moods?

This is a theme worth understanding when introducing a project to the terrain vague. The way in which the user perceives the atmosphere through their senses is a way in which he/she will be reconnected to the site. This dissertation embodies people within the terrain vague to create new possibilities.

THE ‘BODY’ OF ARCHITECTURE

1. *The body of architecture*. Peter Zumthor (2006:21) explains this element as the human body itself. Architecture is the same as the body. Architects have the choice to hide certain parts of the body with clothing to give it a certain identity and impression. The truths of our own body could be hidden. One can also see it as the body covering the personality: introverted or extroverted.

The desalination plant will become an extroverted personality, breaking away from the expectation of enclosure exposing the inner workings of the machine. The boundaries of the typology of the building will be blurred. It will show the uniqueness of the building and the different atmospheres within.

The building should become transparent whilst reminding the user of its surroundings, water and the terrain vague. The water should be exposed to the user to enhance the experience of the environment surrounding the building.

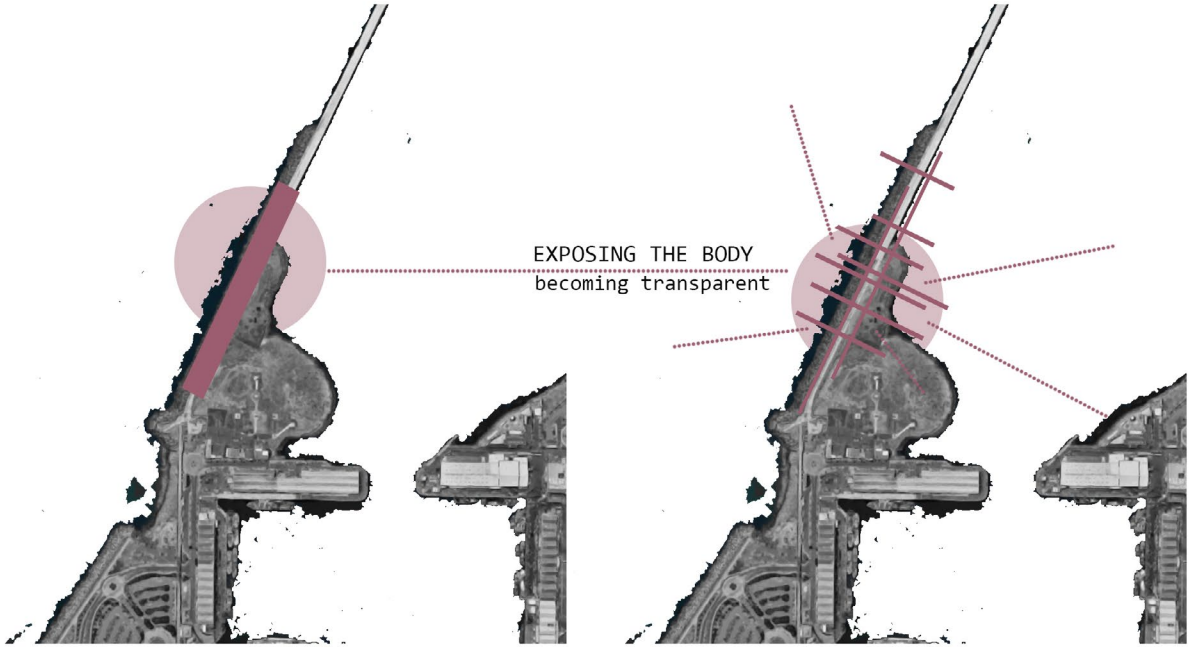


Figure 32

THE MATERIAL - WATER

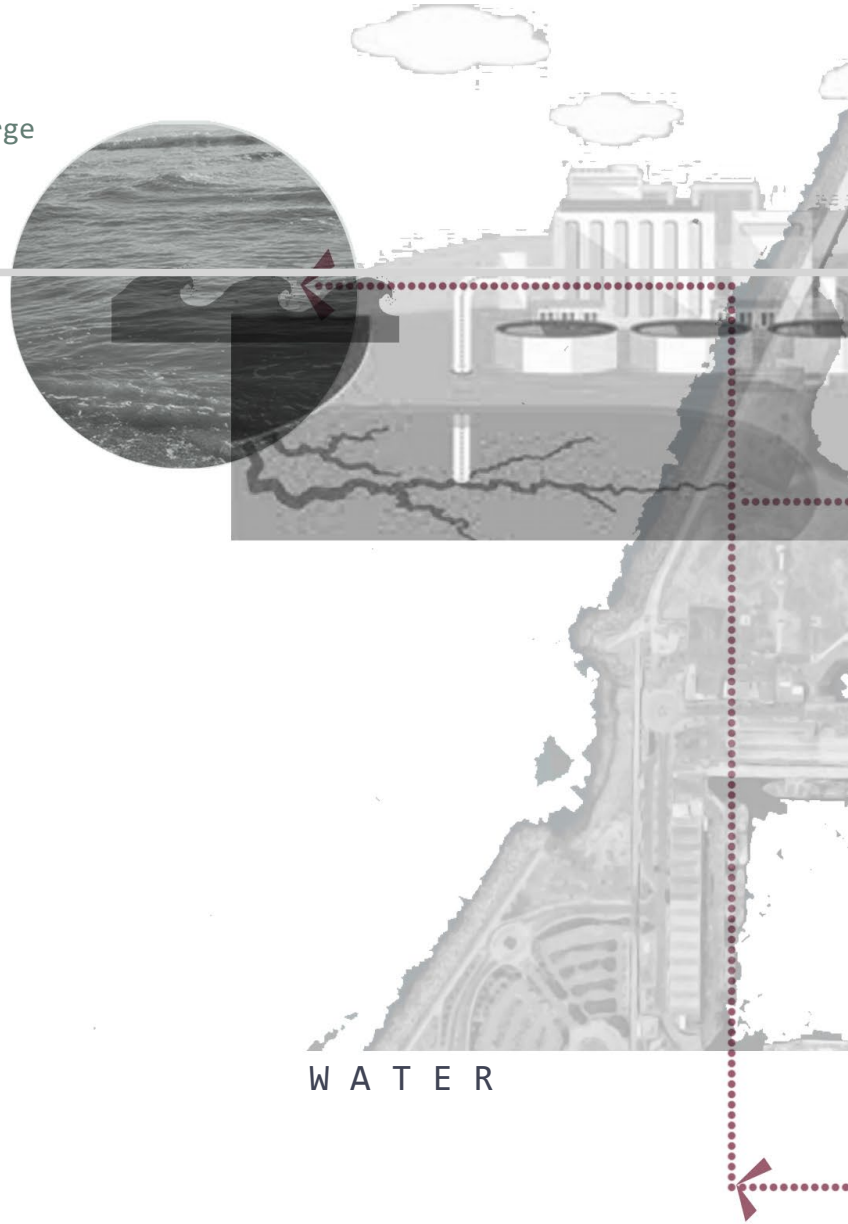
2. *The material compatibility*. Material is endless and materials will always react to one another to create something new. There is a certain mysterious characteristic of materials. Zumpthor (2006:24) explains this through breaking a rock and it will become different from the original. Using the same rock and breaking it again it will have a complete different form from the previous method (Zumthor, 2006:24). The possibilities within one material is endless (Zumthor, 2006:24).

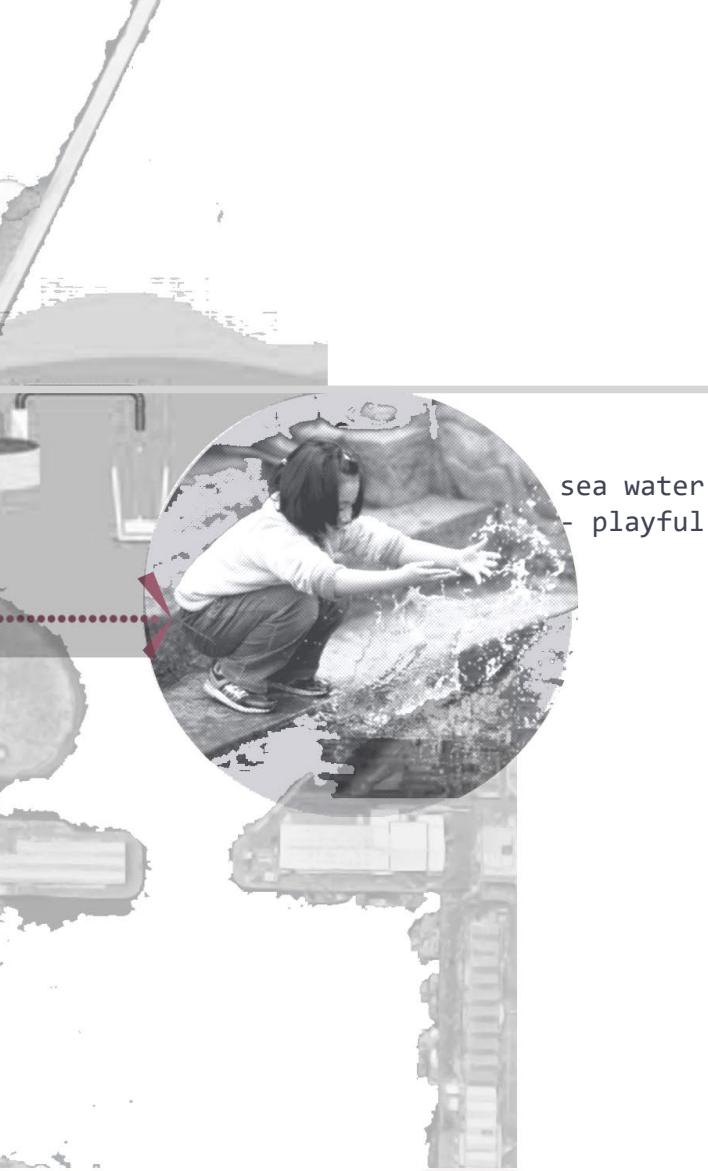
This element is applicable to building materials and using them in structure but it could also speak of water. The water within the desalination plant is a form of material moving through the building and is part of the elements creating the atmosphere. The water changes different forms: sea water, waste water and clear water. The changes will occur throughout the design and will become the creator of different atmospheres within the building. Each of these sections where the water travels through, it will adopt the characteristics of the form of material - water.

The sea water is full of potential and possibilities. It has a certain element of play to it. The certain spaces where the user recognize or is confronted with the sea and unfiltered water, the user should also be confronted with an energetic atmosphere of play.

Through the process of desalination, the user should be aware of his surroundings and the process the water moves through in that certain stage. As the water changes through the building, so should the user phenomenon.

The water is being developed into a clearer and pure form. The user should experience it. The water becomes drinkable from a playing state and the user should experience this transition.



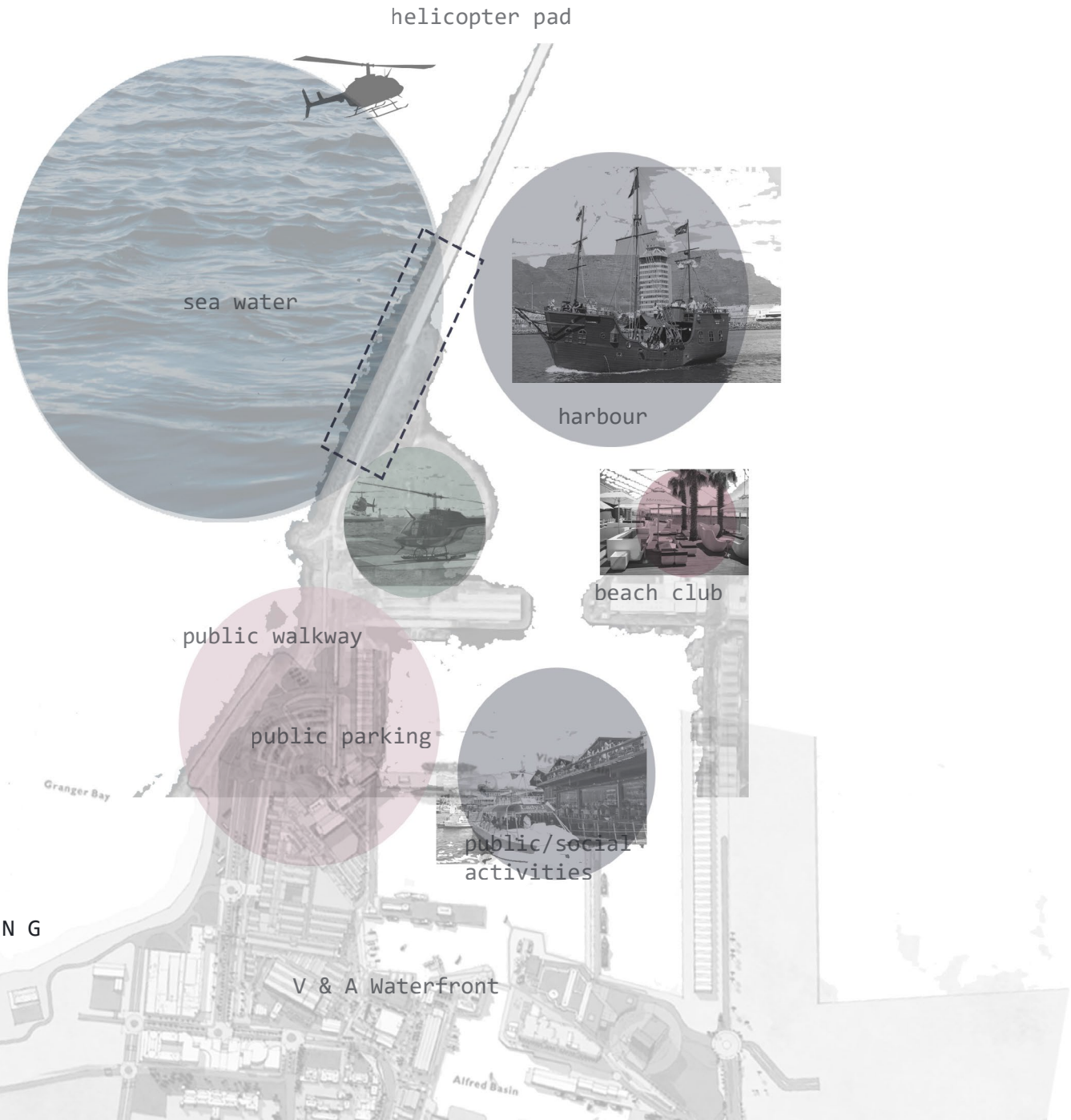


THE SOUND OF SPACE

3. *The sound of space*. The sound within an environment can instantly change the atmosphere of the terrain vague. Sounds remind us of memories, when we heard the same sounds and how we felt within those moments. Sound is an instrument of unconsciously traveling through time. Collecting, transmitting or amplifying sound could influence the atmosphere. Sound is unfortunately not noticed by everyone and people are not always aware of the sounds surrounding them. Some sounds will rise to provoke certain feelings in some people and the same sound will not have any a different effect on other. Has someone ever asked you if you are hearing a noise and then you only realize it? It did not bother you, might not even now, but now you notice it. This is an example of how sounds are perceived differently by people.

The terrain vague consist of sounds reminding you where you are and the harbour will always reconnect to the site by the sounds. The desalination plant will not necessarily remind the people directly of the history within the terrain, but the sounds surrounding the Pier will always stay, creating awareness of the environment and history within.

Figure 33



SOUNDS SURROUNDING THE EAST PIER

Figure 34

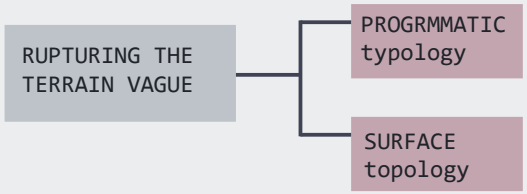
4

RUPTURING THE TERRAIN VAGUE

“The concept of a rupture is applied to the site as a means to occupy the terrain vague in a way that maintains its sense of ambiguity and possibility and acknowledges the delicacy of this specific site situation” (Ho-Tong, 2011:9).

The term “rupture recognizes difference, contrast and otherness in urban spaces and has the potential to intensify, lengthen and prolong inconsistencies” (Ho-Tong, 2011:9). There are two ways in which rupture could affect the terrain vague. The first inquiry is the rupturing of the program within the terrain, when “a foreign activity is introduced to the site” (Ho-Tong, 2011:9). The second inquiry is the rupture of the surface of the terrain vague where the “intervention engages with the terrain without destroying it” (Ho-Tong, 2011:9).

The intention of rupturing within this dissertation is to “illustrate the experimental nature of the design process in this project” (Ho-Tong, 2011:9). The East Pier is “set out with an urban situation with no clear intention of how to intervene within it” (Ho-Tong, 2011:9). This part of the document will explore areas and situations to engage with the terrain vague, creating “thoughtful scenarios” within the design, without disturbing or destroying it (Ho-Tong, 2011:9).



PROGRAMMATIC RUPTURE - TYPOLOGY

Reintroducing new typologies within the current program of a space, which brings a new energy to that territory and must interact with the terrain vague. Lebbeus Woods experimented with “unconventional” architecture. For Woods, “architecture is an instrument, to explore, to invent and to reinvent; therefore, the process of producing architecture is a process for acquiring knowledge” (Köken, 2015:58).

This dissertation is an opportunity to use architecture to invent and produce ways in which people perceive desalination plants. The program of a new desalination plant within the terrain vague could be interpreted by this unconventional architecture, where the desalination plant will be reintroduced with new features and programs to socially embody the plant and change the ways desalination plants are perceived.

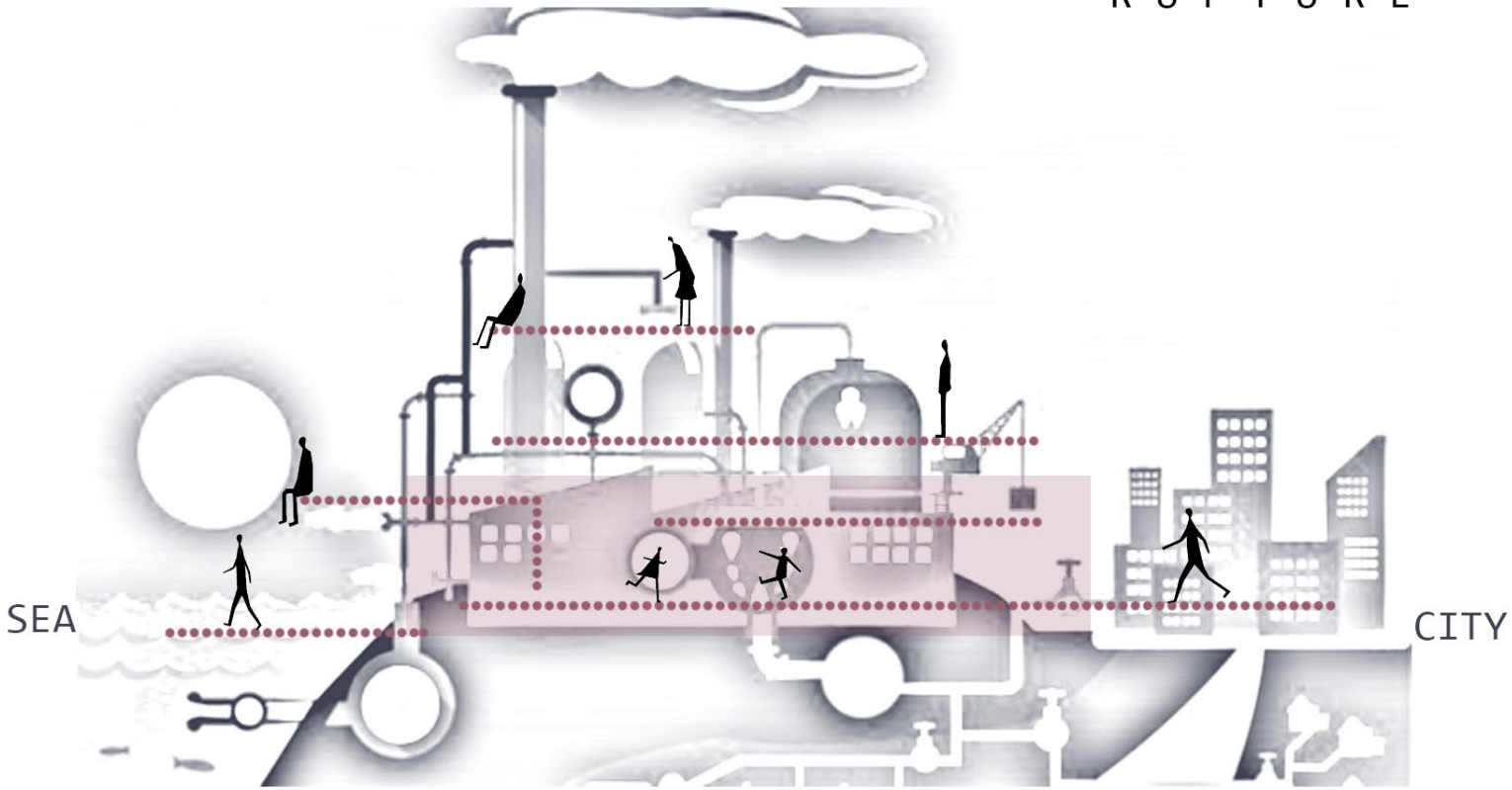
Woods explains the concept of ‘centricity’ which indicates the cluttered notion of the center, overlapping and interpenetrating centres which keeps interfering with one another (Köken, 2015:60). Woods explains this as the “architecture of centricity” (Köken, 2015:61). The “centricity” he refers to is a basis by itself and becomes a rizomatic experience of communication and networks of interactions (Köken, 2015:61).

The desalination plant acts as a network of centricity where the water becomes pure through a process of different centres. The new accommodating structure of social intervention within the plant building also creates new connections and networks within this already complicated centre.

Woods explain the structure as “laboratories of living” (Köken, 2015:61). This experimental hybrid typology constitutes the fundamental concepts of centricity. The entities within the typology acts as the different operators. The knowledge through experience is attained by inhabiting the structures, previously not exposed to viewing. “Beyond the machine aesthetics, centricity is a declaration of an active concept, which architecture continuously performs” (Köken, 2015:61). This concept of centricity is used within architecture as a mechanism and instrument to “experiment and experience” (Köken, 2015:61).

When experimenting with the typological concepts of centricity within this dissertation, the total rupturing of the initial terrain vague could be prevented and the terrain could still maintain a sense of ambiguity and possibility.

P R O G R A M M A T I C
R U P T U R E



DESALINATION PLANT
PUBLIC -PLAY
-EDUCATION
-FLANEUR

Figure 35

SURFACE RUPTURE - TOPOLOGY

The surface rupture is exploring ways in which one can invade the terrain vague with new design projects or possibilities without threatening the unique qualities it possesses. When introducing new surfaces to a terrain vague, there should be careful consideration on how to accomplish a transition between these new introduced spaces and the existing ones.

The terrain vague, the ‘public-space heterotopia’ becomes the in-between space for the Cape Town Harbour. This is the transitioning point from open sea to land and it is the first encounter with the city of Cape Town when accessed from sea. This transitioning space should become a celebration rather than staying a ‘dead zone’.

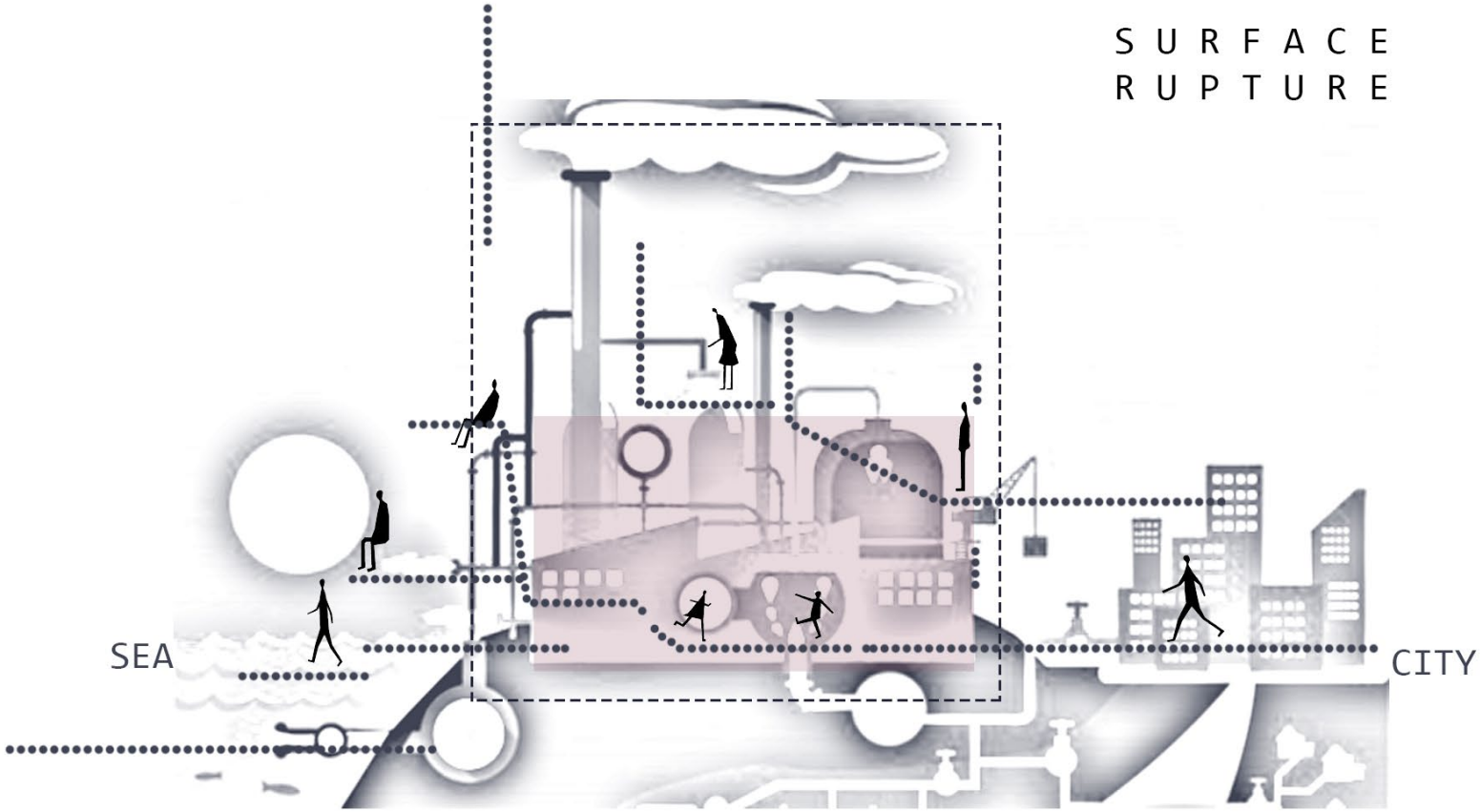
The new proposed desalination plant should be designed in accordance with the site and its surroundings with great care. The desalination plant will become a threshold within itself but should keep the essence of the in-between of the East Pier.

The in-between gives us the sense of envelopment and detachment. In-between spaces are the link between the inside and outside. It is the spaces we move through from one place to another. There will be no in-between space without edges. Edges supply bounds to the in-between and in-between spaces offers a matrix of edges. The area between edges becomes activated.

Edges are the thresholds we move through within a space. These in-between spaces are of huge importance to us. These spaces, as the terrain vague, have a rich quality of movement and interaction. These in-between spaces also act as a shelter that protects us of the unknown, without being totally closed off within the edges created by this project. There could be a clear defined space that acts as the in-between space and in other instances it would not be that defined, but the presence of the in-between space is definitely within existence and felt, creating the atmosphere within a certain space.

These ‘blurred’ in-between spaces have the effect of being in two places at once, or feeling like it. Being reminded of two different spaces, softening the transition between two places or the inside and outside. It softens the landscape which it lies within and the building edges.

THE ‘IN-BETWEEN’ PIER



DESALINATION PLANT
WHAT IS EXPECTED
- ENCLOSED

IN-BETWEEN
- DIFFUSED BOUNDARIES
- THRESHOLDS
EXPOSING THE MACHINE
AWARENESS OF *TERRAIN VAGUE*

Figure 36

REMAKING THE TERRAIN VAGUE

Within this dissertation it is necessary to design order-like and rationalized spaces within the *terrain vague*. This is important for the total functioning of the desalination plant and without order the system will not comply with its duties.

The challenge is to remain and contain a sense of the *terrain vague* within the site. Creating an atmosphere to reconnect the site with human activities. Spaces incorporating the senses of the user to create a connection to the site. Creating an awareness of the site although moving through a rationalized building. Remembering the surrounding landscape and the history within. These are elements to reconnect the site with the public.

The programmic rupturing of the desalination plant. It will be reintroduced with new features and programs to socially embody the plant and change the ways desalination plants are perceived. Creating an unexpected typology of a desalination plant.

The ‘blurred’ in-between spaces to create awareness of the inside of the order-like desalination plant and the outside of the *terrain vague*. The in-between space of the water with a mystery, and so many possibilities, to a clear understanding of it; the rationalized and drinkable.

The process through the building becomes a path of possibilities turned into opportunities. The user within this hybrid typological building will experience these changes within the systems and will experience different elements at different stages. Their experience becoming part of the *terrain vague* essence of the space. Connecting the users and their different experiences to the strange and abandoned urban space of the *terrain vague*, through means of the water experiences.

Using the water to create strange spaces and spaces with possibilities for the user and using the same medium, rationalized through the system, to produce pure water needed within the city of Cape Town.

Figure 37

PART 02

EXPLORATION & GROUNDING

This part of the document incorporates design considerations and approaches based on the research compiled. This part is a reflection towards part 1 of this document, the problem statements and aims, and explores ways in which one can achieve the aims obtained in part 1. Explorations regarding conceptual frameworks, typology, topology, morphology and tectonics will be investigated. The exploration is accumulated to investigate the possibility of the ideas towards a design solution.

TOPOLOGY
[2.6.1] Site Analysis:
Macro, Meso & Micro

MORPHOLOGY
[2.7.1] Form giving elements
[2.7.2] Precedent Study

TECTONICS
[2.8.1] Structural Precedent Study
[2.8.2] Structural phylosophy

CONCEPTUAL DEVELOPMENT

T O U C H S T O N E — TYPOLOGY
CHAOS & ORDER

C O N C E P T S — TOPOLOGY
SITE

L E X I C O N — REINTRO-
DUCING
TERRAIN VAGUE

CONCEPTUAL

DEVELOPMENT AND UNDERPINNING

The conceptual development of this dissertation is mainly influenced and focused on the site, East Pier, and the type of building, the desalination plant. This is the main basis within the conceptual investigation. The application of the concepts will become ways to reconnect these two main threads and elements to each other. The conceptual understandings will furthermore develop in design decisions made and will be analysed through the design development.

T O U C H S T O N E

C O N C E P T # 1
TRANSFIGURATION

C O N C E P T # 2
COMMENSALISM

C O N C E P T # 3
DIFFUSED BOUNDARIES

Figure 38

Architectural System
Organism Machine

Simis Gatenio
Greece

The touchstone is the reinterpretation of a painting called Architectural System Organism Machine, by the artist Simis Gatenio from Greece. His artworks are inspired by architecture, networks, connection, space and time. This specific artwork is a visual representation of "chaos and order" and is made with acrylic and ink. The painting is a series of order-like connections becoming a network of chaos.

The touchstone is steel connections within a board painted with watercolour medium creating a shape of natural and organic flow. This installation is about how chaos and order can connect to each other, pertaining to the site and type of building.

The two mediums used in my installation represent chaos, the watercolour, and order, the steel, within the typology of the building, a desalination plant. A desalination plant is a network of systems, order-like systems. This dissertation connects the desalination plant with more than what it usually entails. Through this process of adding people, experiences and the surrounding context to the desalination plant, I am adding chaos to the existing network. This does not mean that the desalination process cannot work and function as it should. I am giving the industrial order-like structure a new and free meaning and reputation.

The watercolour splits in the center of the installation. This does not only represent the organic flow, but the process through which the sea water will become something new and 'pure'. The site and building become a membrane and threshold between the old and new. The desalination plant becomes a network of flow and purification.

Chaos & Order
Organic & Grid
Rigit & Flow
Resolved & Questioned
Nature & Machine

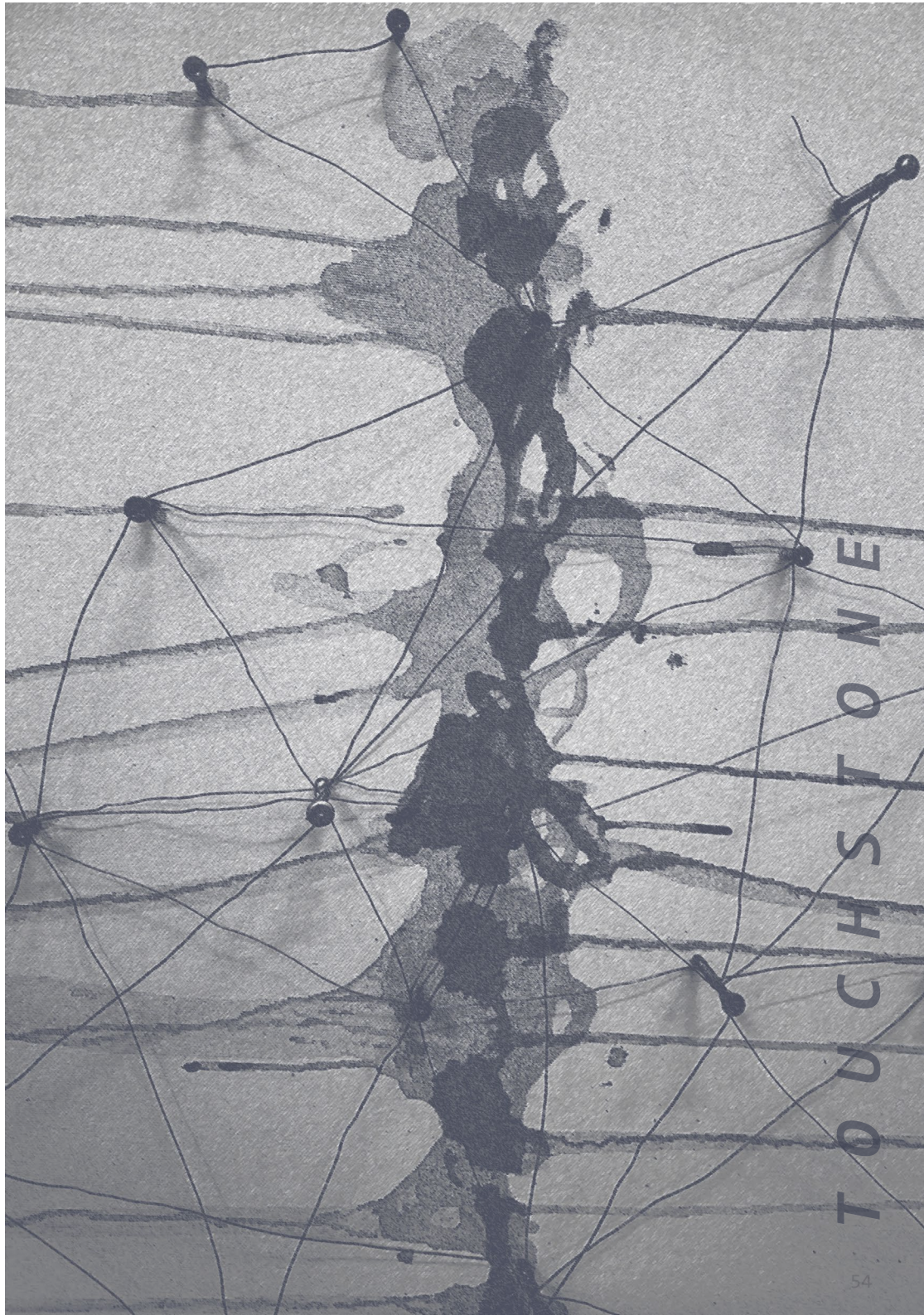


Figure 39

[explorations]

#1 Chaos & Order

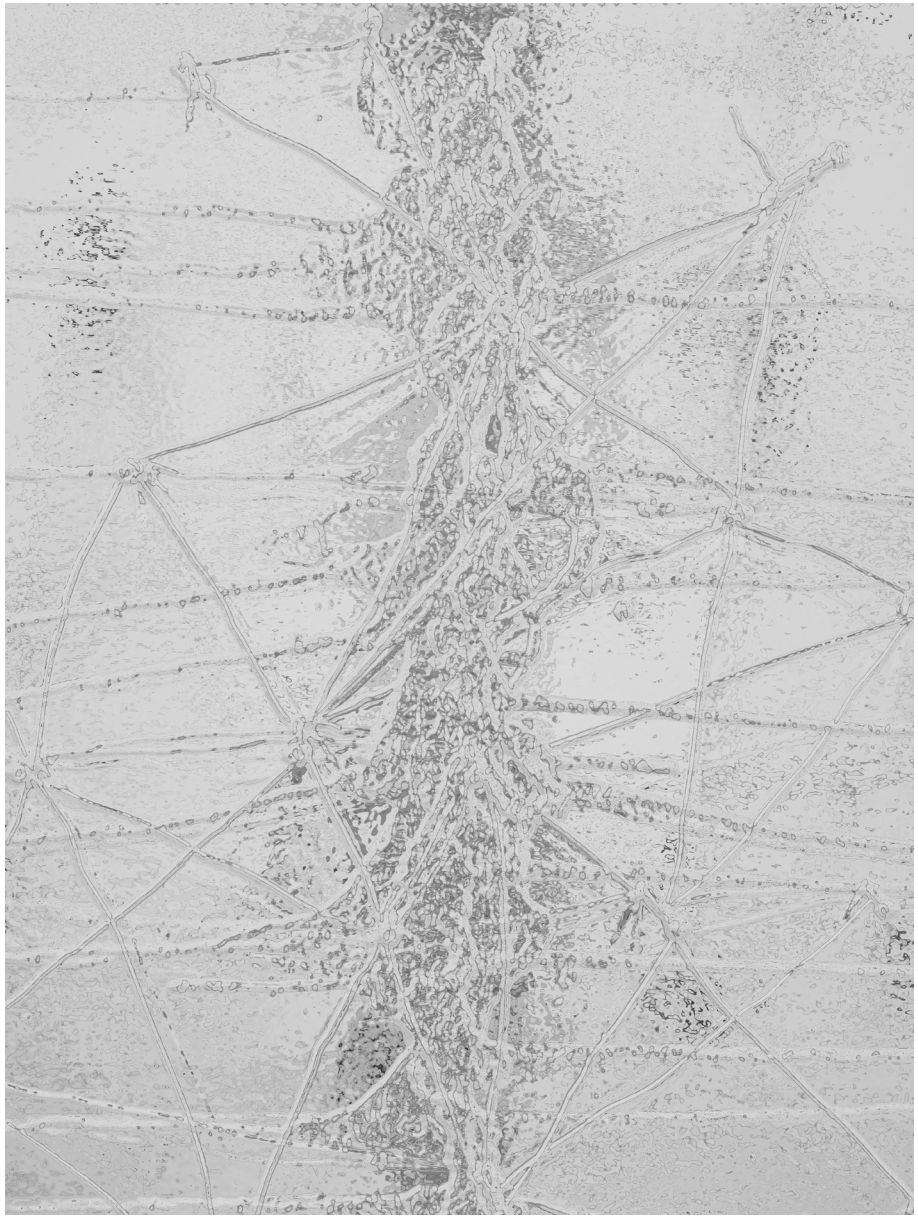


Figure 40: The steel, industrial order, and the water, social chaos, networks connecting with one another and *diffusing boundaries* between the two opposite qualities.

#2 Organic & Grid

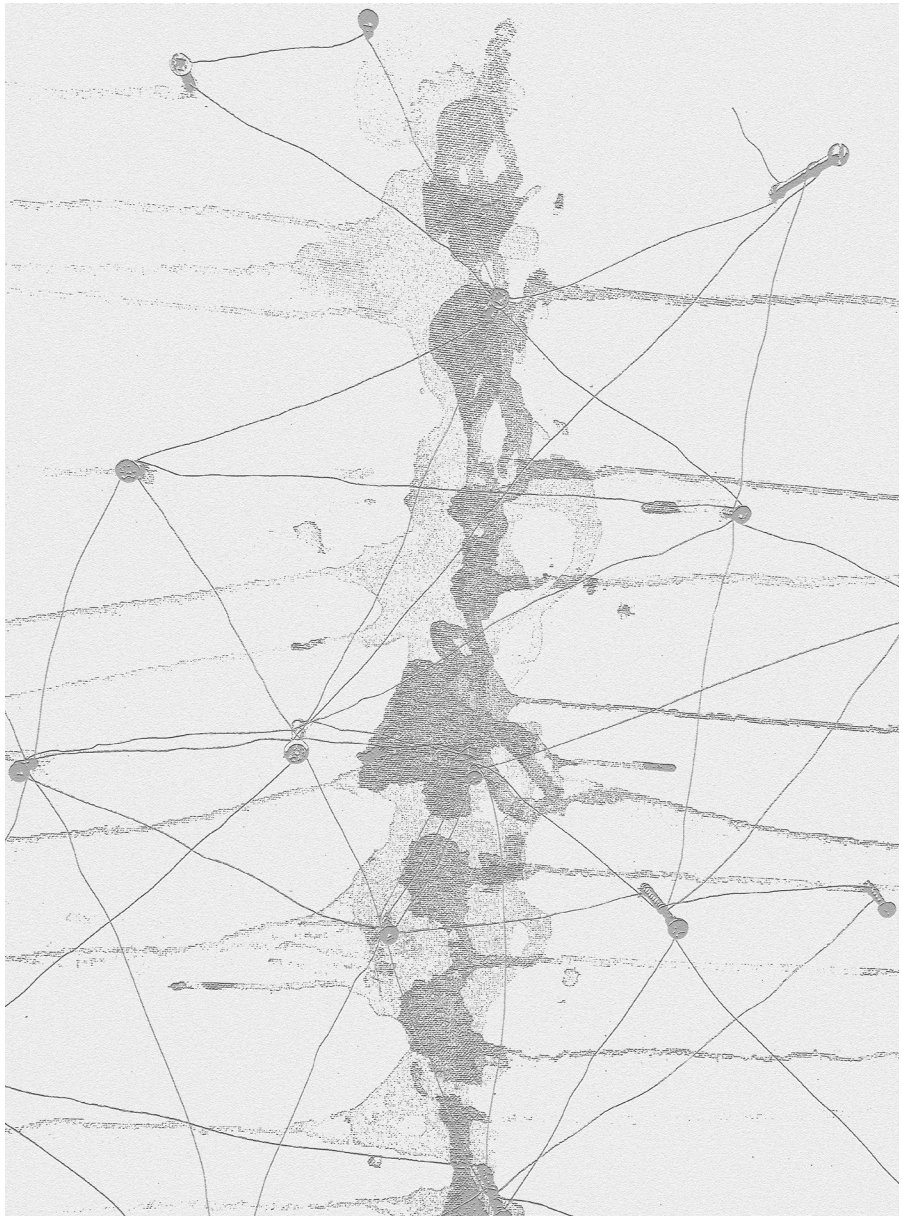


Figure 41: The order grid, desalination plant, and the organic flow of the user joining to become a new reinterpreted *hybrid typology* - transformation.

#3 Resolved & Questioned

Figure 42: The resolved systems within the dissertation - steel structure connections. The questioned spaces where the flâneur will move.[some spaces are more questionable then the rest]

#4 Nature & Machine

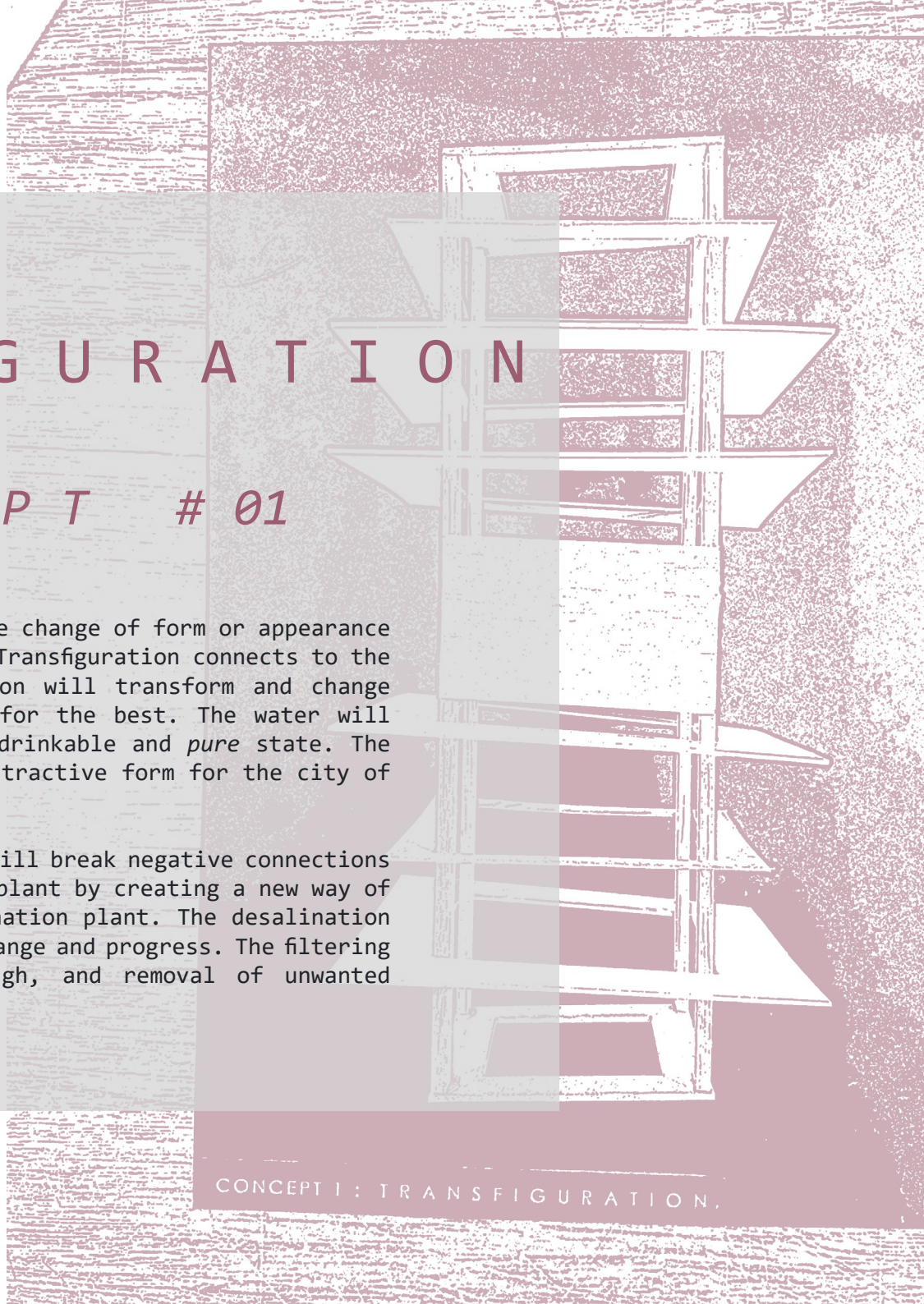
Figure 43: Machine like structure, new proposed building within organic nature of *site*. Natural *water* and *movement* within machine like spaces - mutualism.

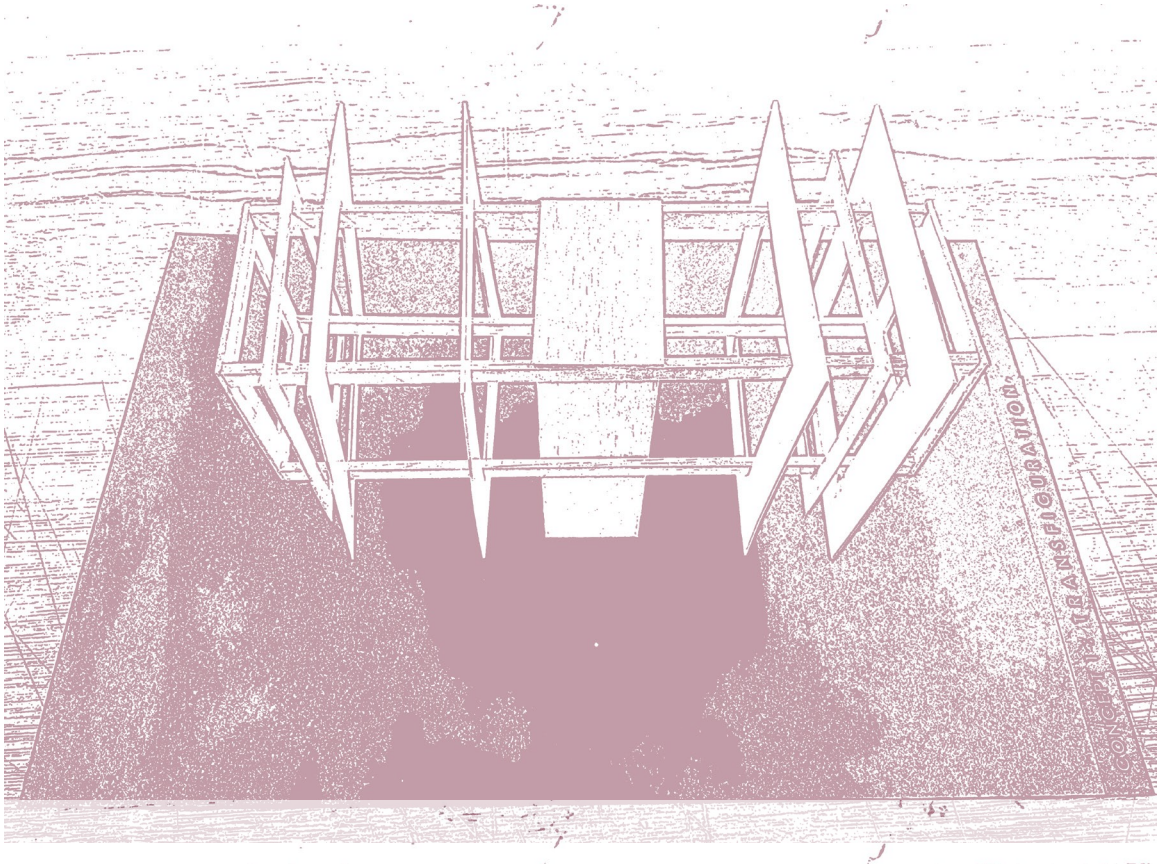
TRANSFIGURATION

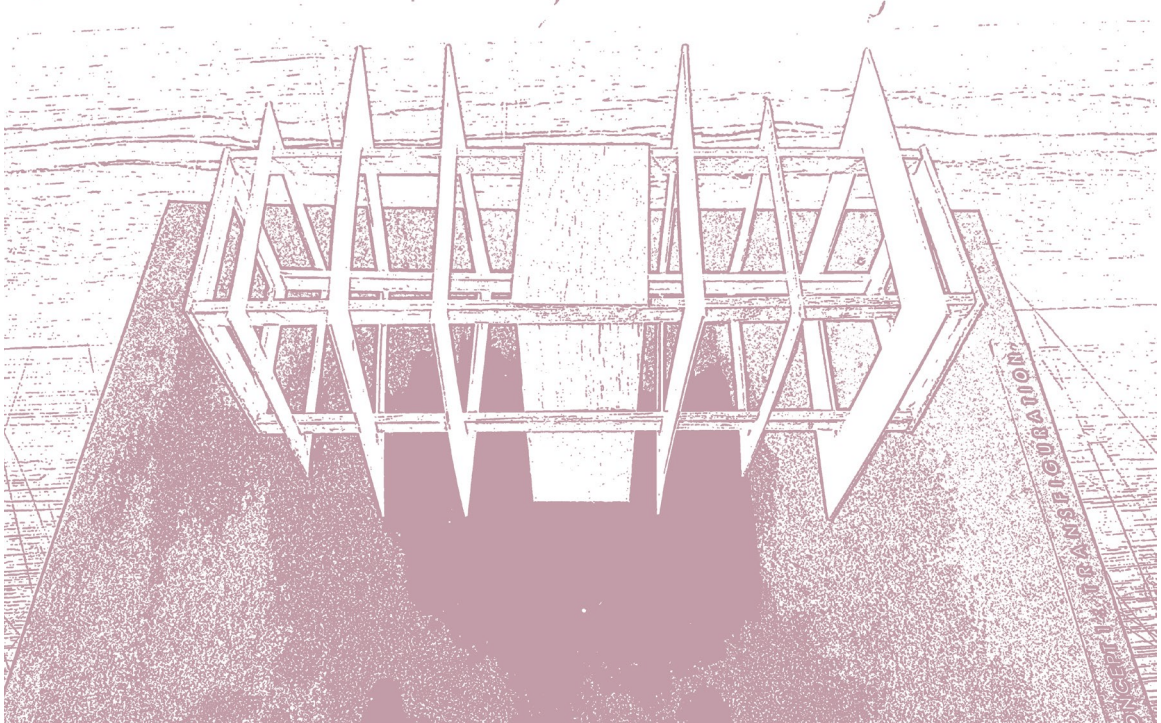
CONCEPT #01

Transfiguration is the complete change of form or appearance into a more beautiful state. Transfiguration connects to the site because this dissertation will transform and change the current site conditions for the best. The water will change from salt water to a drinkable and *pure* state. The water transforms to a more attractive form for the city of Cape Town.

The typology of the building will break negative connections and stigma of a desalination plant by creating a new way of perceiving or using a desalination plant. The desalination plant will become a dynamic change and progress. The filtering of movement, the pass through, and removal of unwanted characteristics.







BOX BEING TRANSFORMED

- negative stigma of *typology* to more attractive form

- *water* being transformed to more pure form.

- *site* transformed to more attractive form and more user friendly.

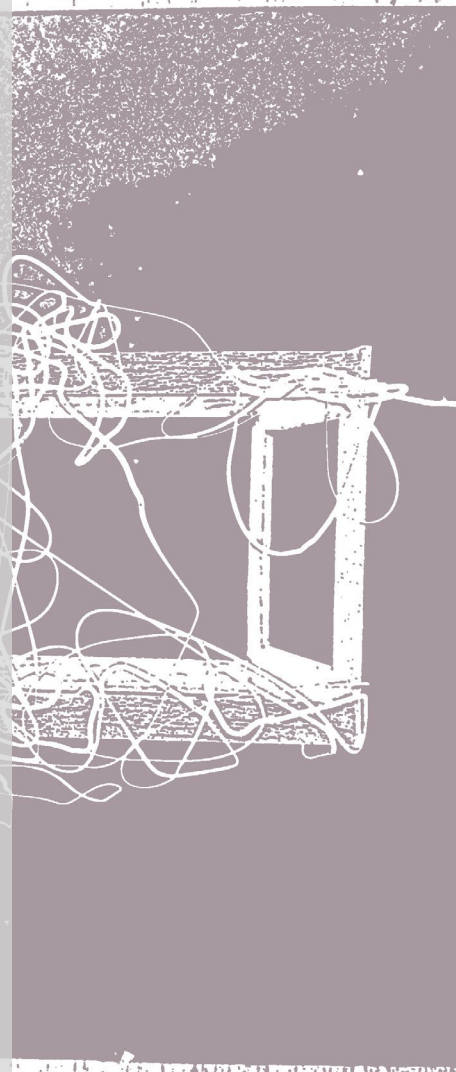
[Structure transforms box]

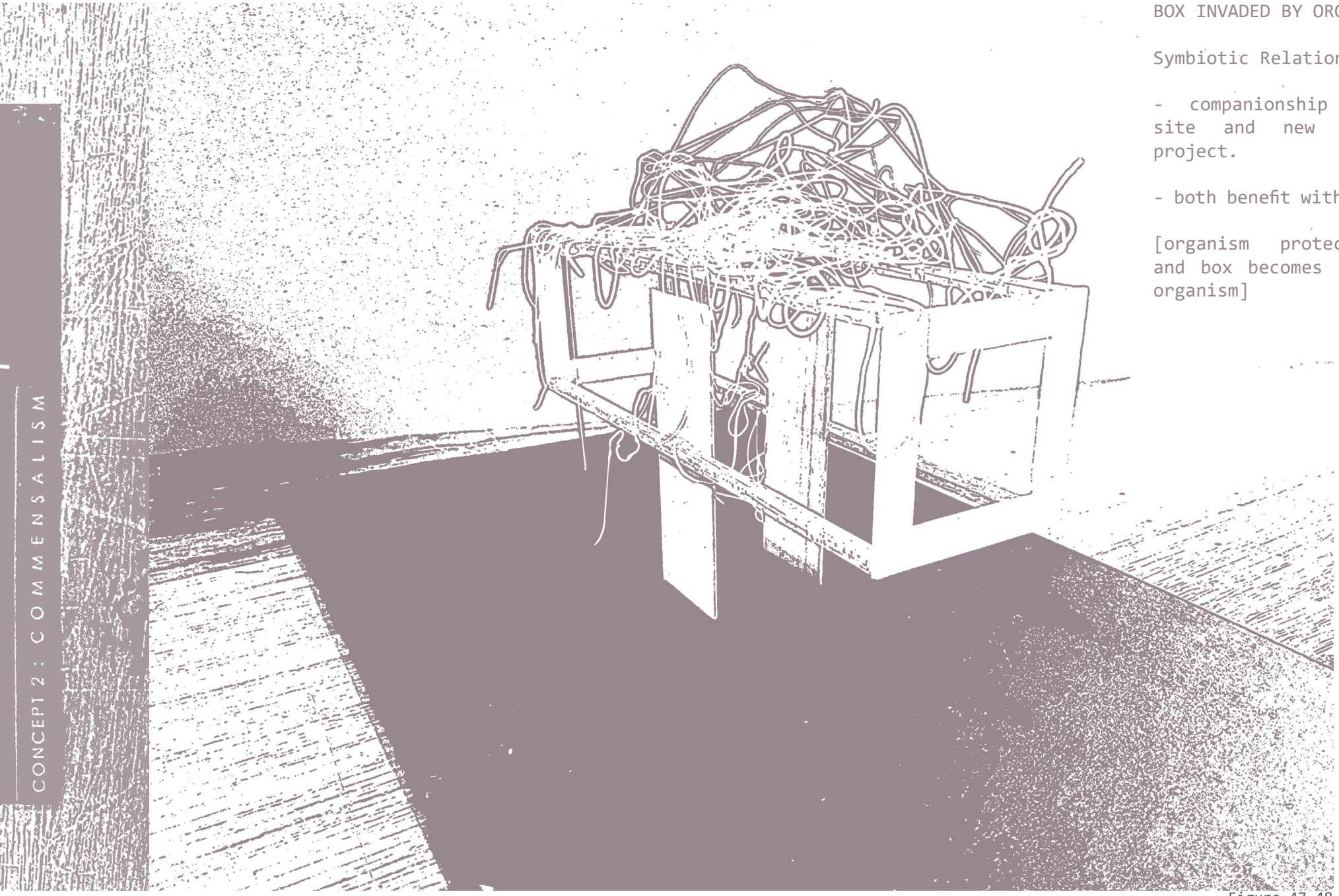
Figure 44-46

COMMENSALISM

CONCEPT #02

Commensalism is a biological term for a symbiotic relationship between organisms. It is an association between two organisms in which one benefits and the other derives, neither benefit nor harm. The desalination plant becomes a *parasite* within the site, invading and infiltrating space without a negative outcome. When looking at the reactivation and new movement within the site, it becomes a Dynamic Mutualism where both of the elements, the desalination plant and site, benefit.





BOX INVADED BY ORGANISM

Symbiotic Relationship

- companionship between site and new proposed project.

- both benefit without harm

[organism protects box and box becomes host for organism]

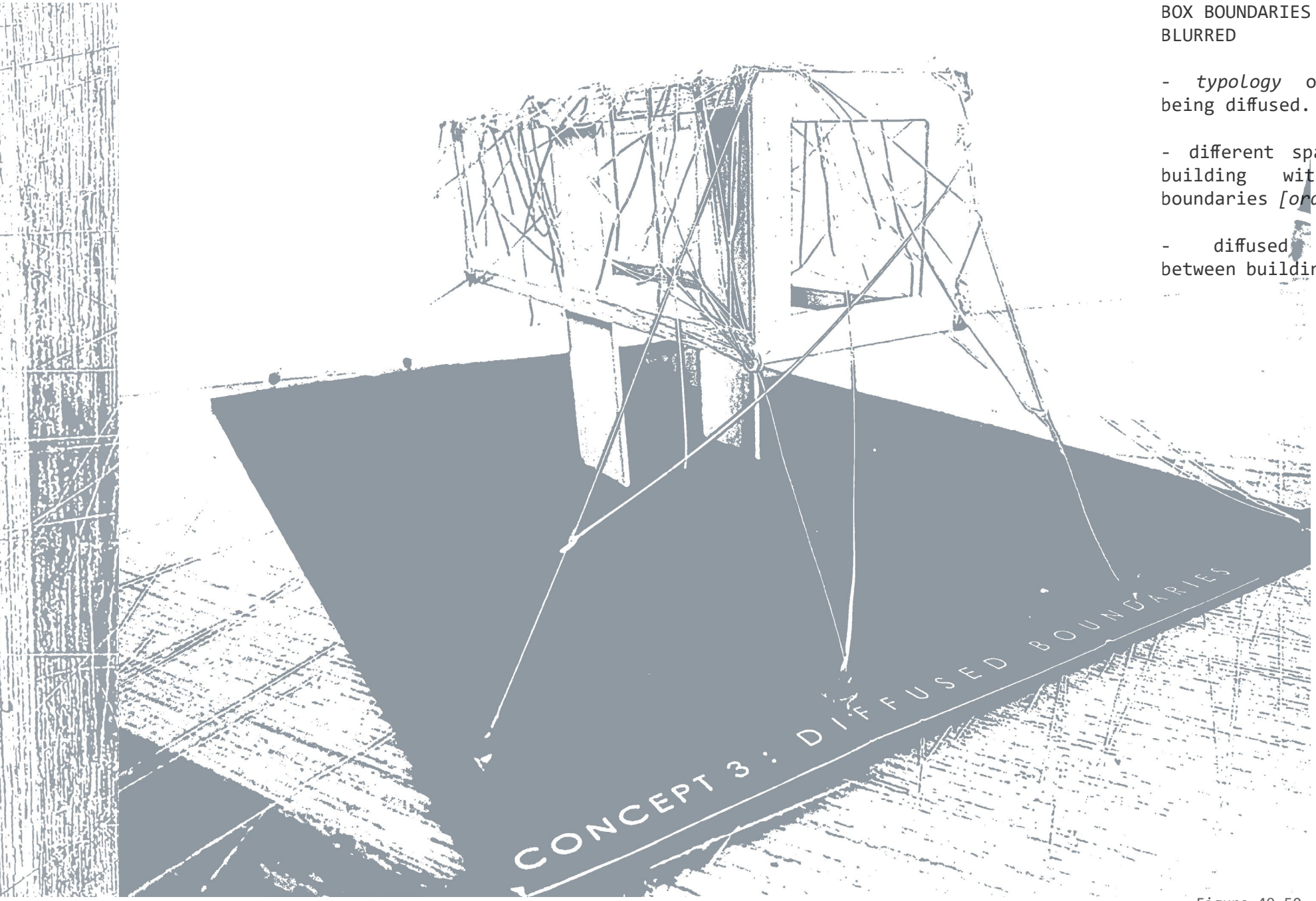
Figure 47-48

DIFFUSED BOUNDARIES

CONCEPT #03

This concept of diffused boundaries will be looked at between the desalination plant and the site. Diffusing the boundaries between the earth and sky, land and sea, new and existing, physical and emotional. This concept contributes to transfiguration with the meaning of change. The concept also connects to the theories explained in part two of this document where the desalination plant becomes the in-between space and threshold. Shared spaces will have different experiences and different spaces could have shared experiences.

The diffused boundaries will also apply to the typology of a desalination plant where there will become a new blur between the expected high technical, industrial, building approach and one of an architectural essence and personal spatial experience.



BOX BOUNDARIES BEING BLURRED

- *typology* of building being diffused.

- different spaces within building with diffused boundaries *[order & chaos]*

- diffused boundaries between building and *site*.

Figure 49-50

T Y P O L O G Y

E X P L O R A T I O N & G R O U N D I N G

Figure 51-52

The proposed project of a desalination plant is an important infrastructure project for the city of Cape Town. The project will contribute to the water self-sufficiency of Cape Town. It will become a new future prevention strategy for water shortages within Cape Town. The plant will be designed to utilize reverse osmosis and membrane technology to treat sea water and supply Cape Town with an alternative water resource.

The design concepts introduce recreation of public use by linking the popular East Pier within the Victoria and Alfred Waterfront to the new proposed plant. Thus, this mono-functional infrastructure of a desalination plant is transformed into a recreational and multi-functional attraction, creating a hybrid typology.

THE CLIENTS

DEVELOPMENT

OBJECTIVES

- The provision of arts, culture and heritage infrastructure (V&A Waterfront: Overview, 2018).
- Attract local and international visitors (V&A Waterfront: Overview, 2018).
- The provision of “residential to commercial property, which includes hotels, retail districts, and extensive dining, leisure and entertainment facilities” (V&A Waterfront: Overview, 2018).
- Develop and conserve “heritage sites and tourism landmarks” (V&A Waterfront: Overview, 2018).
- Contribute to South Africa’s economic sector (V&A Waterfront: Overview, 2018).

As previously mentioned in Part 1, the clients for this project is the City of Cape Town Municipality in conjunction with the Victoria and Alfred Waterfront in the Cape Town Harbour. The proposed project will be situated within the precinct of the Waterfront, but it will be managed by the City of Cape Town. The project should therefore apply and adopt the V&A Waterfront missions, visions and objectives.

The Victoria and Alfred Waterfront is one of the most visited destinations in South Africa. The Waterfront attracts 24 million people every year. The Waterfront is situated within “the oldest working harbour in the Southern hemisphere” (V&A Waterfront: Overview, 2018). Not only does it have a rich and wonderful history as mentioned in Part 1, it has some of the best view within Cape Town. The iconic Table Mountain sets a dramatic backdrop for the harbour and it consists of an extensive view towards “the ocean, city bowl and the mountain peaks of the Hottentots-Holland Mountains” (V&A Waterfront: Overview, 2018).

Any project proposed within the Victoria and Alfred Waterfront precinct will have to take special care and not to hinder these qualities of the Cape Town Harbour, to remain the obtain the same vibrant energy.

Commercial	53%
Retail	12%
Food & Beverages	9%
Hotels	18%
Marina	6%
Enterprise development	2%

V&A Waterfront employment according to business sector (De Villiers, 2016:70).

WATERFRONT BUSINESS SECTORS [APPLICABLE TO PROJECT]

TOURISM

22 heritage sites and tourism landmarks

A mixed-use urban waterfront development seamlessly merging ocean vistas with mountain views, fresh sea breeze and the warm African sun add zest to a cosmopolitan and vibrant atmosphere (V&A Waterfront: Overview, 2018). More than 80 restaurants bring a fusion of international food (V&A Waterfront: Overview, 2018).

COMMERCIAL

"The V&A Waterfront offers a variety of commercial spaces within its various districts, ranging from those steeped in Cape Town's heritage to those boasting innovative architecture and technology" (V&A Waterfront: Overview, 2018).

The over 450 shops and more than 80 diverse eateries and bars are spread over this 123-hectare property (V&A Waterfront: Overview, 2018).

LEISURE

"There is a wide variety of attractions and activities to enjoy on the property. From cultural landmarks such as the Zeitz Museum of Contemporary Art Africa (MOCAA) to more leisurely pursuits such as a sunset cruise on one of the chartered boats berthed here" (V&A Waterfront: Overview, 2018).

THE MARINE

The studies of the sea and environment within the waterfront precinct. The aquarium is situated within this vibrant location and several marine studies gets undertaken here every year (V&A Waterfront: Overview, 2018).

This includes marine plants, animals and other organisms, both vertebrate and invertebrate, in deep oceans, shallow seas and the laboratory (V&A Waterfront: Overview, 2018).

THE HARBOUR

"The Port of Cape Town lies in the shadow of Table Mountain, approximately 120 nautical miles north west of Cape Agulhas – it is strategically positioned almost at the southern tip of the African continent." (V&A Waterfront: Overview, 2018)

The history of the harbour has been discussed in Part 1.

THE USERS

WITHIN WATERFRONT:

The users within the waterfront is divided into two groups namely those employed by companies operating in the Waterfront, the employees, and those who visit the Waterfront for other reasons than for employment, the visitors. An average of 60% of the visitors within the V&A Waterfront precinct is Capetonians (De Villiers, 2016:68).

The figure indicated below illustrates the most important reasons for Capetonians to visit the Waterfront. This is an indication of what attracts visitors to the V&A Waterfront precinct. This should be considered when deciding on the accommodation list of the proposed dissertation. It should accommodate the interests of the users within the Waterfront to attract them to the new proposed project. This will determine the success of the reintroduced typology of the desalination plant.

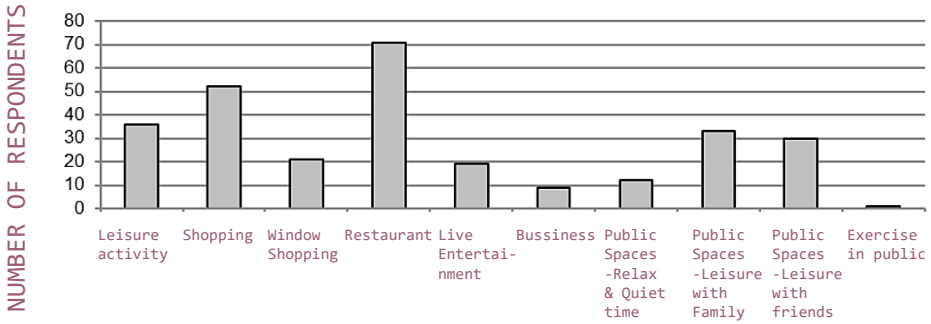


Figure 53: Most important reasons why Capetonians visit the V&A Waterfront (De Villiers, 2016:72).

PROPOSED:

The subcategories mentioned within the client objectives hosts certain individual users specific to their needs. The needs and processes present in the user's everyday rituals and work systems will be investigated and incorporated in the design. This will ensure the design to house the users successfully.

The different client subcategories will be integrated in the proposed project to obtain a social sustainability within the building.

Different elements and users are joined together to celebrate the new project within the existing vibrant Waterfront and to expose the process of the desalination plant to the people of the city of Cape Town.

USER IN PROPOSED BUILDING SECTORS

THE TOURIST
- FLÂNEUR -

- seating
- ablution
- food purchase
- transport
- shade
- guidance

STUDENTS

- seating
- gathering spaces
- ablution
- shade
- guidance/ supervising
- skills development

ARTISTS
-WASHED ASHORE-

- service for sales
- storage
- shade
- ablution
- exhibition space
- advertising space

LABORATORY
PERSONNEL

- private storage
- ablution
- service (water & electricity)
- shade
- skills development
- private workshop space

DESALINATION PLANT
- STAFF -

- private storage
- ablution & lockers
- service (water & electricity)
- private work spaces
- controlled access points

THE DESALINATION

PROJECT DEVELOPMENT

The newest Cape Town desalination plant is due to start producing fresh water this year. This desalination plant is housed at the V&A Waterfront, the town's most popular waterside shopping precinct, as already mentioned in Part 1 of this dissertation. This plant is reintroduced through this dissertation and is expected to add two million liters of water per day to the city's grid (V&A Waterfront desalination plant almost complete, 2018).

This new desalination plant follows the Koeberg Nuclear Power Station's personal plant which was initiated in March of 2018. The Koeberg plant takes care of the power utility's fresh water needs to reduce its reliance on dam water supply which is vulnerable to droughts and severe weather conditions (V&A Waterfront desalination plant almost complete, 2018). This is one of the many strategies applied by the government to counter the drought Cape Town is facing.

The City of Cape Town is planning on completing another desalination plant in Strandfontein in 2018. This plant will add seven million litres to the municipal grid (V&A Waterfront desalination plant almost complete, 2018). These water strategies are important to the city's future water supply together with drilling aquifers and tapping into springs.

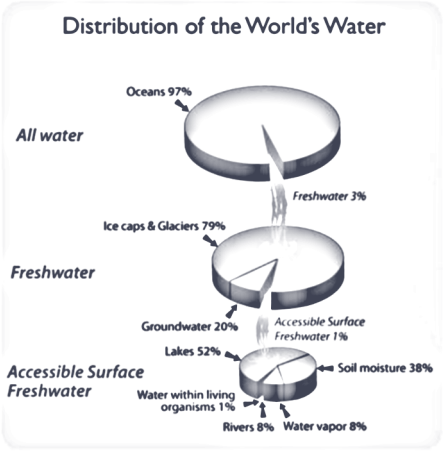


Figure 54

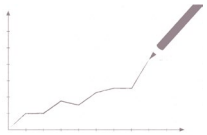
WHY DESALINATION?

According to GrahamTek, a company that manufactures technologies of desalination plants, less than 1% of global water consists of surface water and more than 98% of global water is an available source for portable water through desalination (White Paper for the deployment of emergency & disaster relief desalination plants for the city of Cape Town, 2017:11). They also state that the process of desalination has been improved rapidly through the last decade and can deliver high quantities of fresh water (White Paper for the deployment of emergency & disaster relief desalination plants for the city of Cape Town, 2017:11). Global investments into desalination projects has increased drastically. The capacity of water produced by global desalination processes is expected to double by the year 2030 (White Paper for the deployment of emergency & disaster relief desalination plants for the city of Cape Town, 2017:11). Globally, governments have realized that desalination underpins future water security (White Paper for the deployment of emergency & disaster relief desalination plants for the city of Cape Town, 2017:11).

ADVANTAGES OF DESALINATION

Provides people with portable drinking water

Through the process of desalination dissolved salt and other minerals are removed from seawater to produce clean and fresh drinking water (Pure Aqua, Inc., 2018). This is a solution to areas with “limited resources of fresh water supplies and it is a reliable alternative source of water in times of severe drought” (Pure Aqua, Inc., 2018).



Water quality is high

The process of desalination has been used for decades and the method has been proven to be effective and not dangerous or hazardous to any living thing (Pure Aqua, Inc., 2018). The method to create fresh sources of drinking water with high qualities is considered safe and reliable (Pure Aqua, Inc., 2018). It has been tested by many industries and applications throughout the years (Pure Aqua, Inc., 2018).

Preserve current freshwater supplies

The method of desalination helps to preserve the fresh water supply used within the city (Pure Aqua, Inc., 2018). It removes pressure from the surrounding dams to supply the city of fresh water (Pure Aqua, Inc., 2018).

Unlimited ocean water [source]

Sea water is an almost inexhaustible source of water supply (Pure Aqua, Inc., 2018). It is freely available and the access to a source does not end when the environment experience times of drought (Pure Aqua, Inc., 2018).

Independent of changing factors

The solution of a desalination plant does not rely on anything other than the ocean or sea water, unlike other solutions that need rainfall or snow (Pure Aqua, Inc., 2018).

Safe Locations

The locations of the desalination plants are safely located away from residential areas (Pure Aqua, Inc., 2018).

P R E C E D E N T S T U D Y

CURRENT DESALINATION PLANT

[V&A WATERFRONT-EAST PIER]

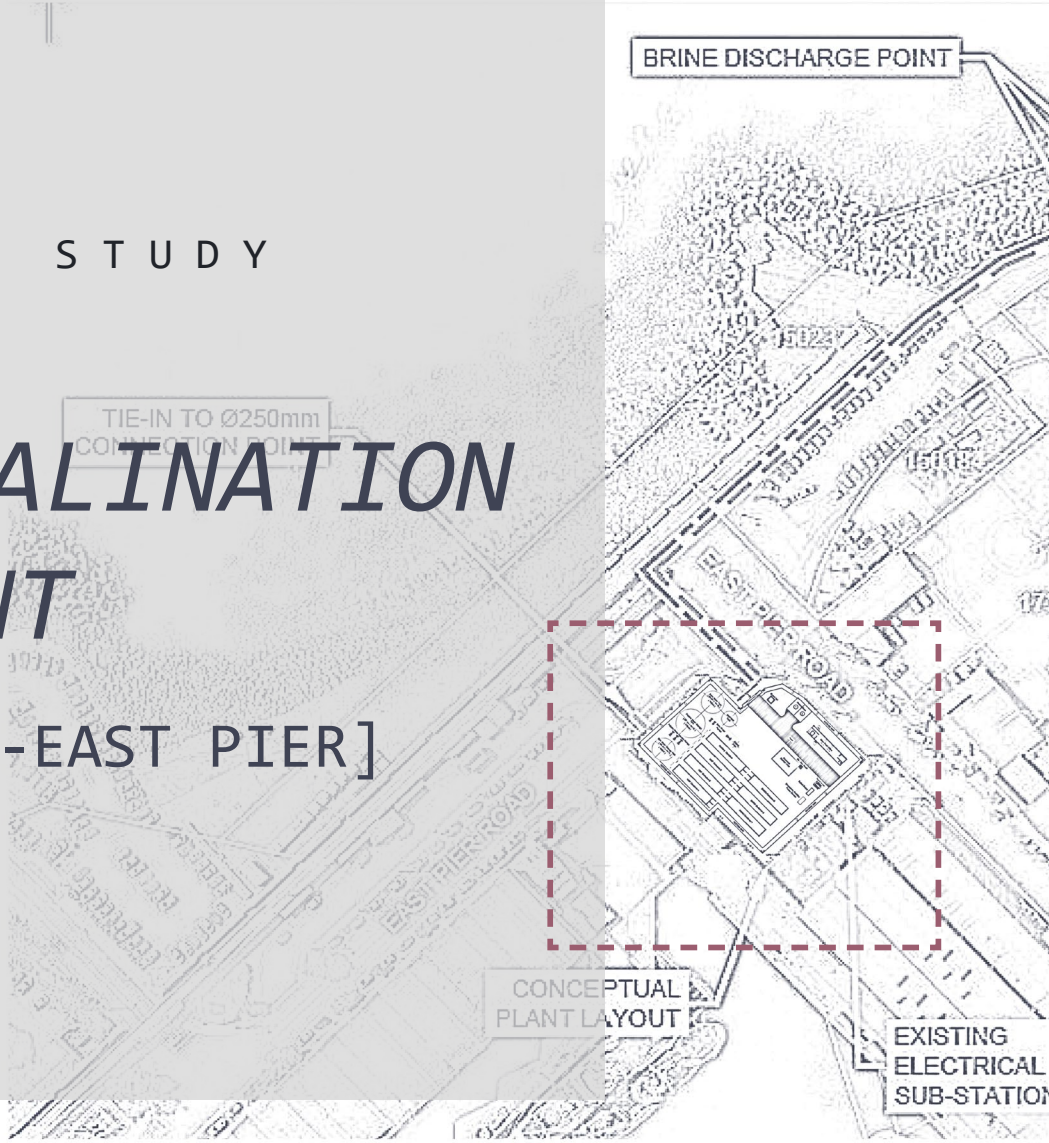
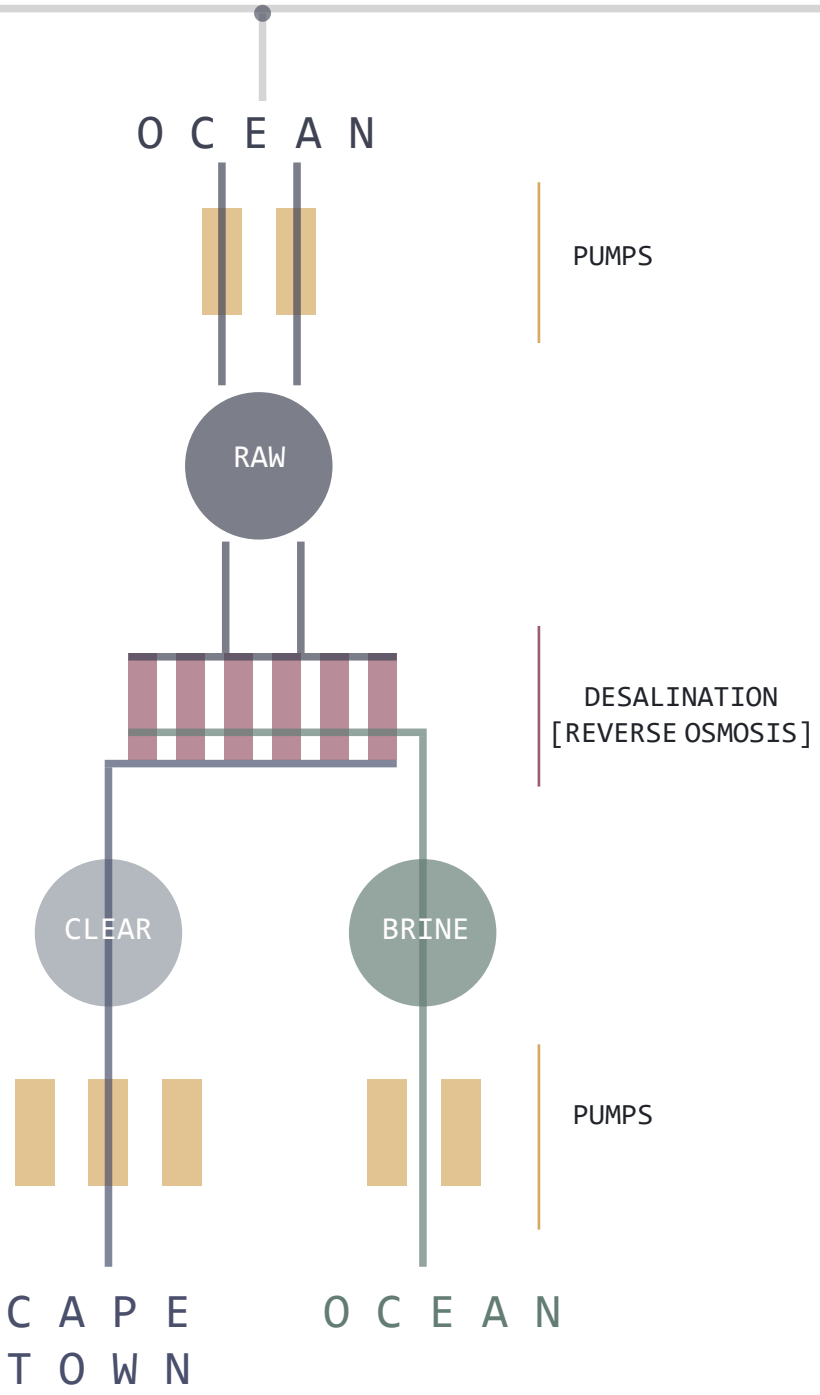


Figure 55

The construction of the new desalination plant within the Victoria and Alfred Waterfront commenced at the beginning of this year, 2018, and is already activated and supplying water to the City of Cape Town. This desalination plant is constructed for a quick solution to the city's water crisis. It is thus constructed in a short amount of time and it is a budget effective solution. The dissertation is proposed to enhance and accommodate the community and surrounding context, which is not considered within this already constructed "box" plant.

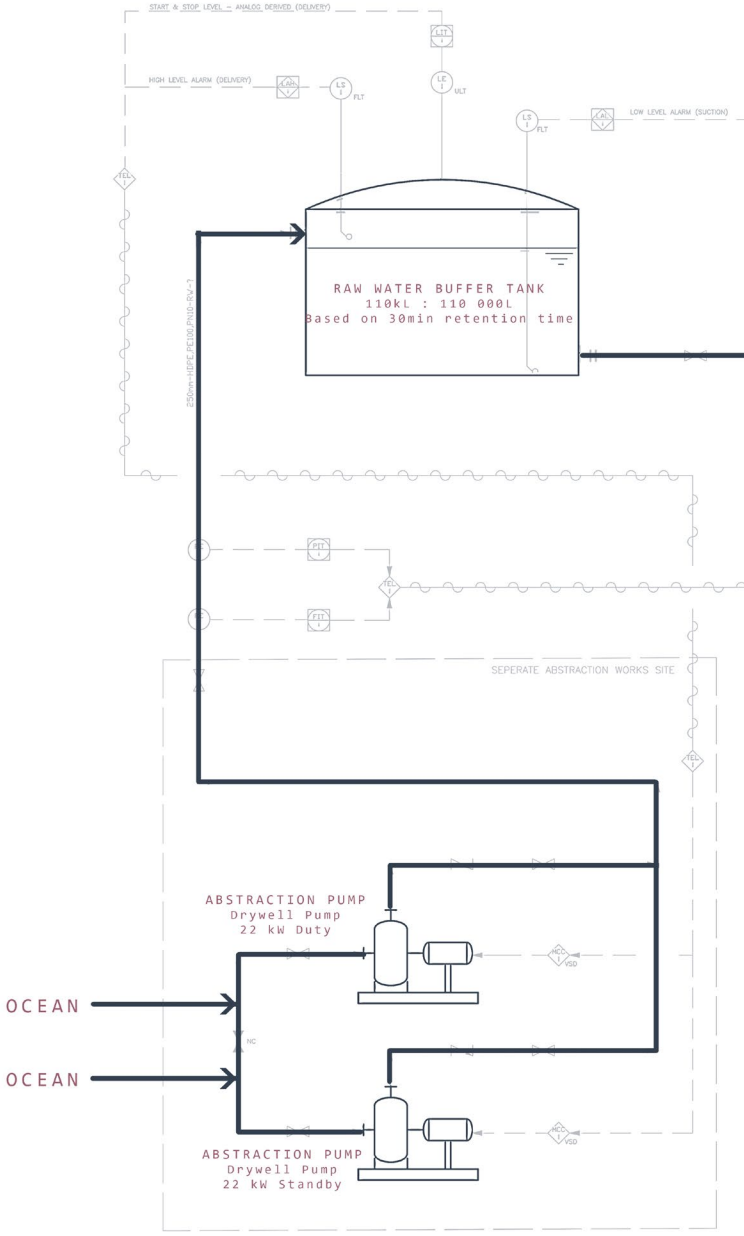
It is necessary to understand the requirements of such plant and the functions required for the plant to work and to be successful. The main aim of a desalination plant is to supply fresh water. Without these requirements the new proposed plant will not be a success. The functionalities are a major part of the design within this dissertation.

Herman Smit, the managing director of QFS (Quality Filter Systems) introduced me to the recourses of the applications necessary within a desalination plant. QFS is the company responsible for the desalination plant and its systems within the V&A Waterfront, therefore his opinion and advise is of great importance to this dissertation. The desalination process is an intricate and delicate system to understand and without the knowledge of the operation systems, the project will not comply with the needs devoted to the project.



DESALINATION PROCESS

CITY OF CAPE TOWN
WATER NETWORK



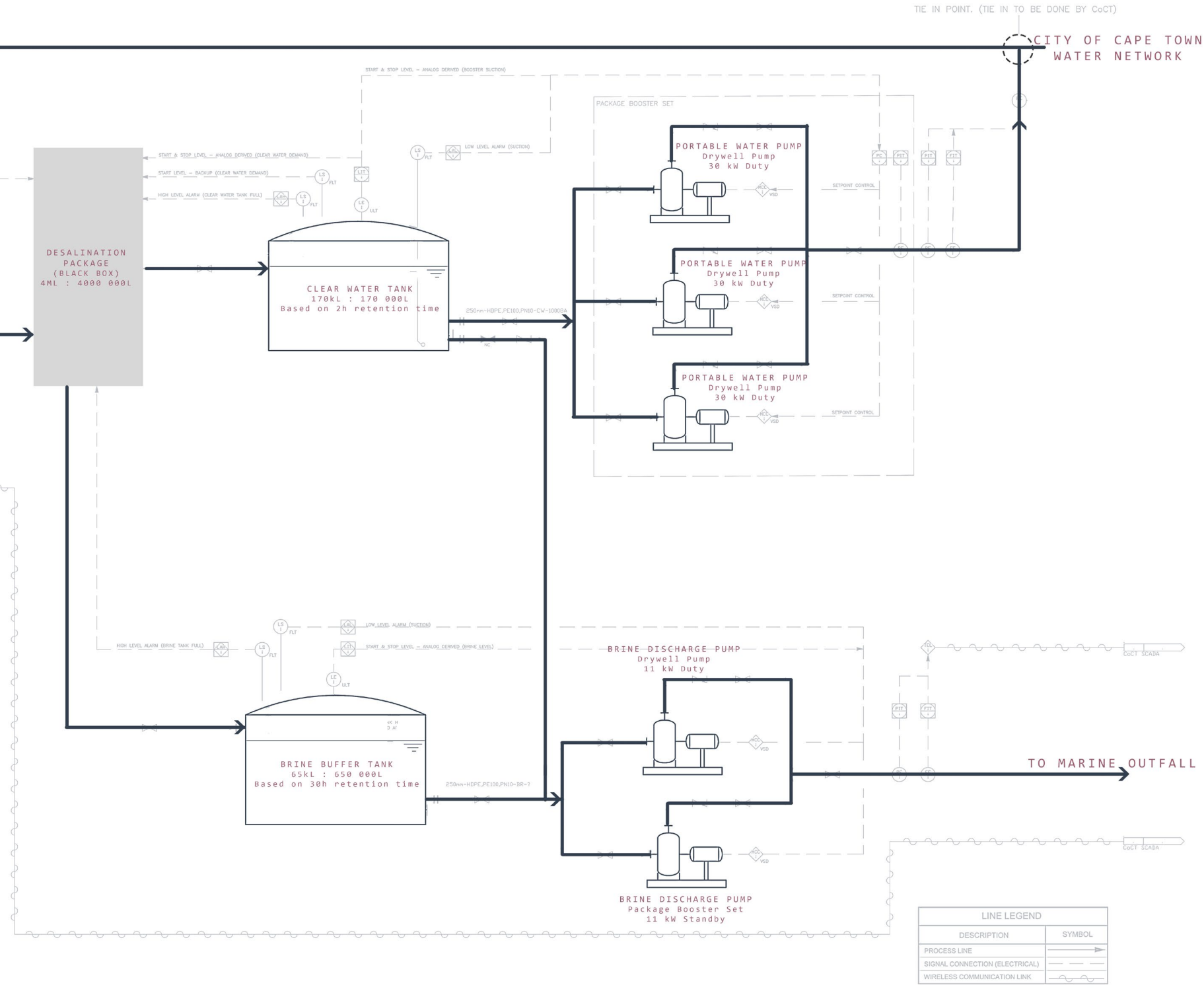
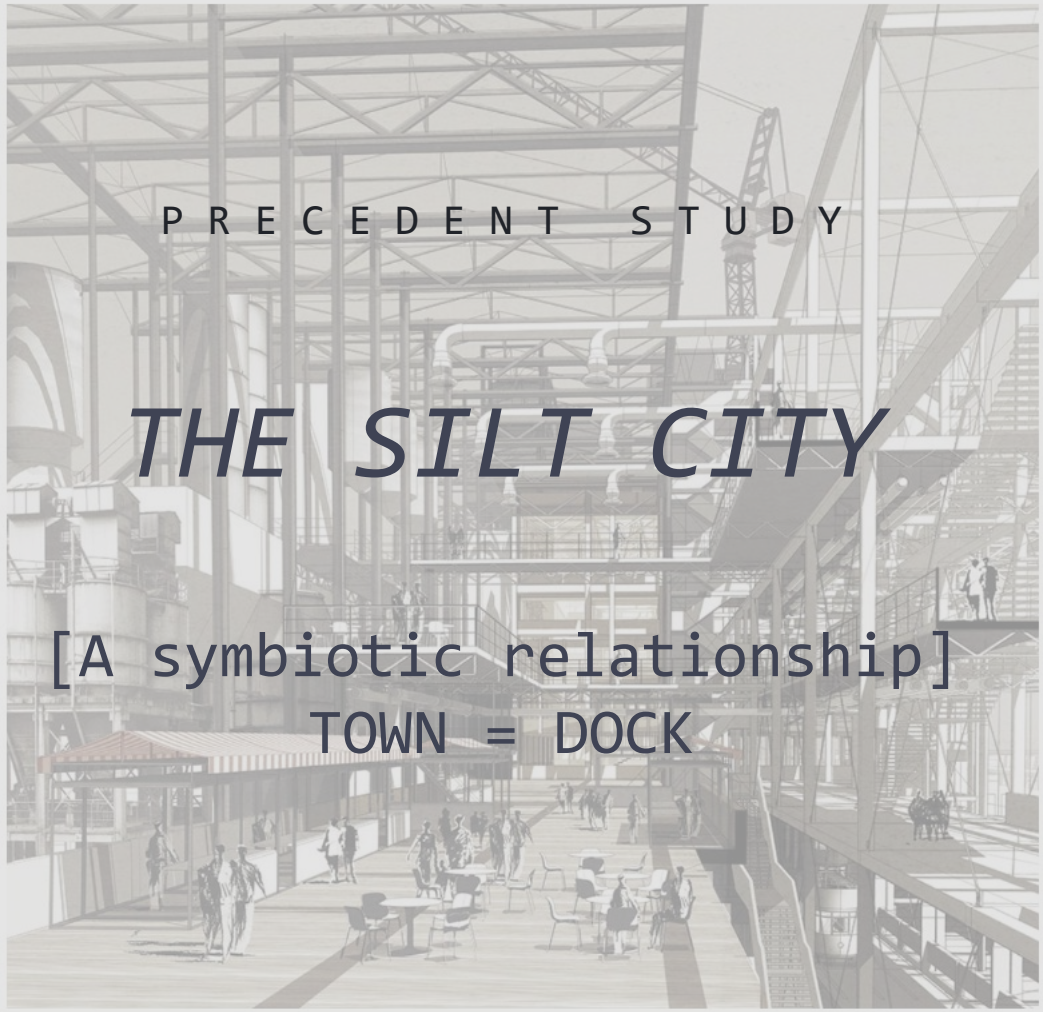


Figure 56: This illustration depicts the desalination process active within the current plant within the Waterfront. The illustration is simplified to understand the main water process from the abstraction point, through the filtration systems, the discharge points and the point where the clean water ties with the existing City of Cape Town's water supply line (Smit, 2018).



PRECEDENT STUDY

THE SILT CITY

[A symbiotic relationship]

TOWN = DOCK

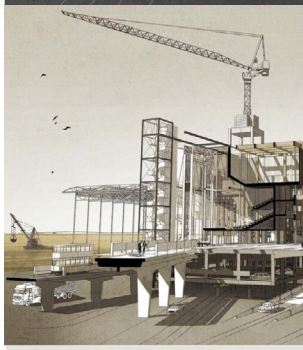
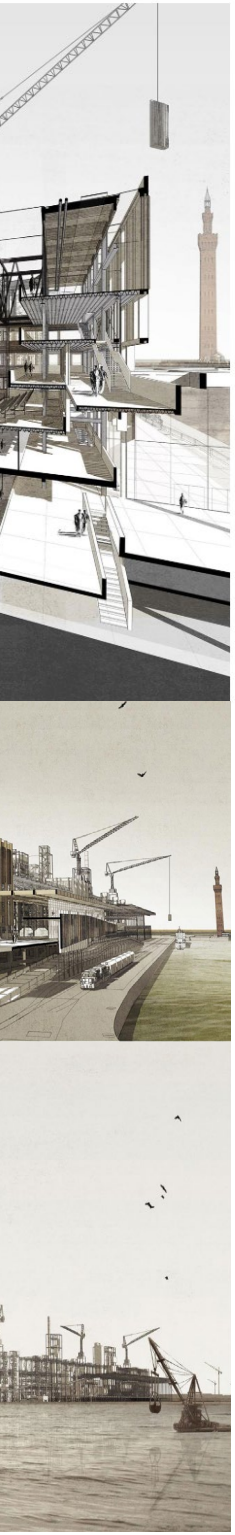


Figure 57-63: (Charman, 2014)



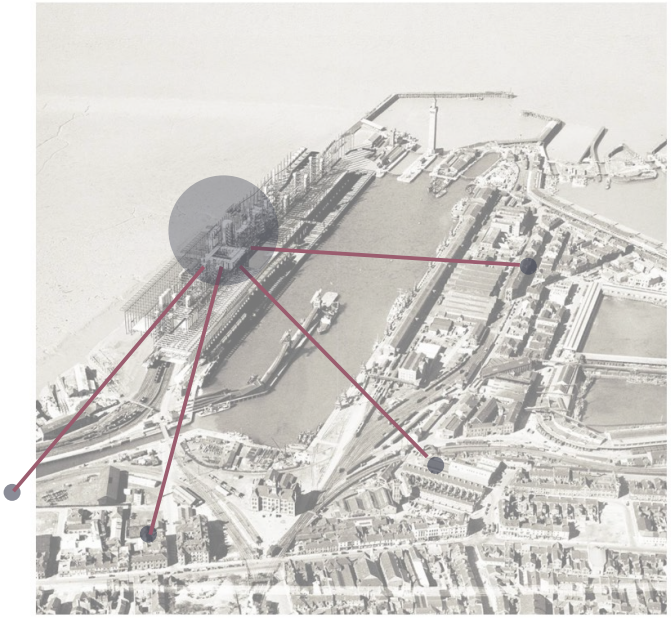
Cities and their growth is largely reliable on the foundation of industry within them. There is a strong symbiotic relationship between the development of a town and the evolution of industry (Charman, 2014). Grimsby Town and its adjoining dock is an example of this mutualism. Also explained as one of the concepts within this dissertation.

There was a decline within the city's industry and dockland processes. This had a correlating effect on Grimsby Town, not just economically, but the built fabric and cultural identity of the town was a microcosm of change (Charman, 2014). The thesis proposal within the heart of Grimsby Docks allows the opportunity of new industrial processes, to break the never-ending cycle of siltation and dredging that takes place within (Charman, 2014).

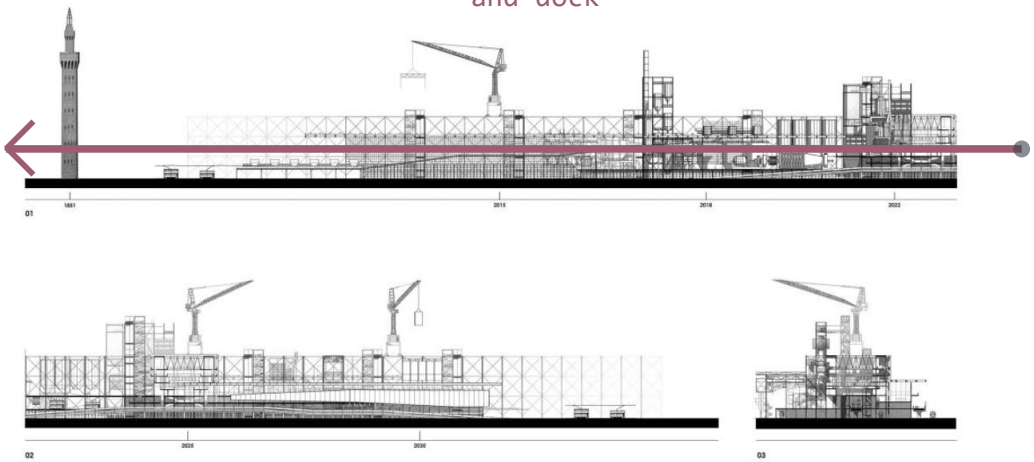
The project explored the unique material properties of the silt located within the site to solidify the local urban fabric of the town and to ***reinforce the cultural identity*** of place (Charman, 2014). This established Grimsby as The Silt City (Charman, 2014). This is a way to ***reintroduce site specific properties*** to a project to reintroduce the identity of a space (Charman, 2014).

The proposal of The Silt City introduces industrial frameworks to create civic spaces and ***public infrastructure between the town and the dock*** (Charman, 2014). The civic spaces act as anchors along the silt roads of regeneration (Charman, 2014). Intertwining public spaces and infrastructure with the intention to physically ***re-establish cultural ties*** between a town and its industrial practices (Charman, 2014). The brief considers the honesty of materiality within its spatial and functional environment. It explores themes such as the spectacle within the post-industrial and time (Charman, 2014).

re-establishing cultural ties - like desalination plant with the V&A Waterfront



public infrastructure between town and dock



"The project also combines infrastructure with urban renewal and the establishment of civic space with mechanised processes" (Charman, 2014).

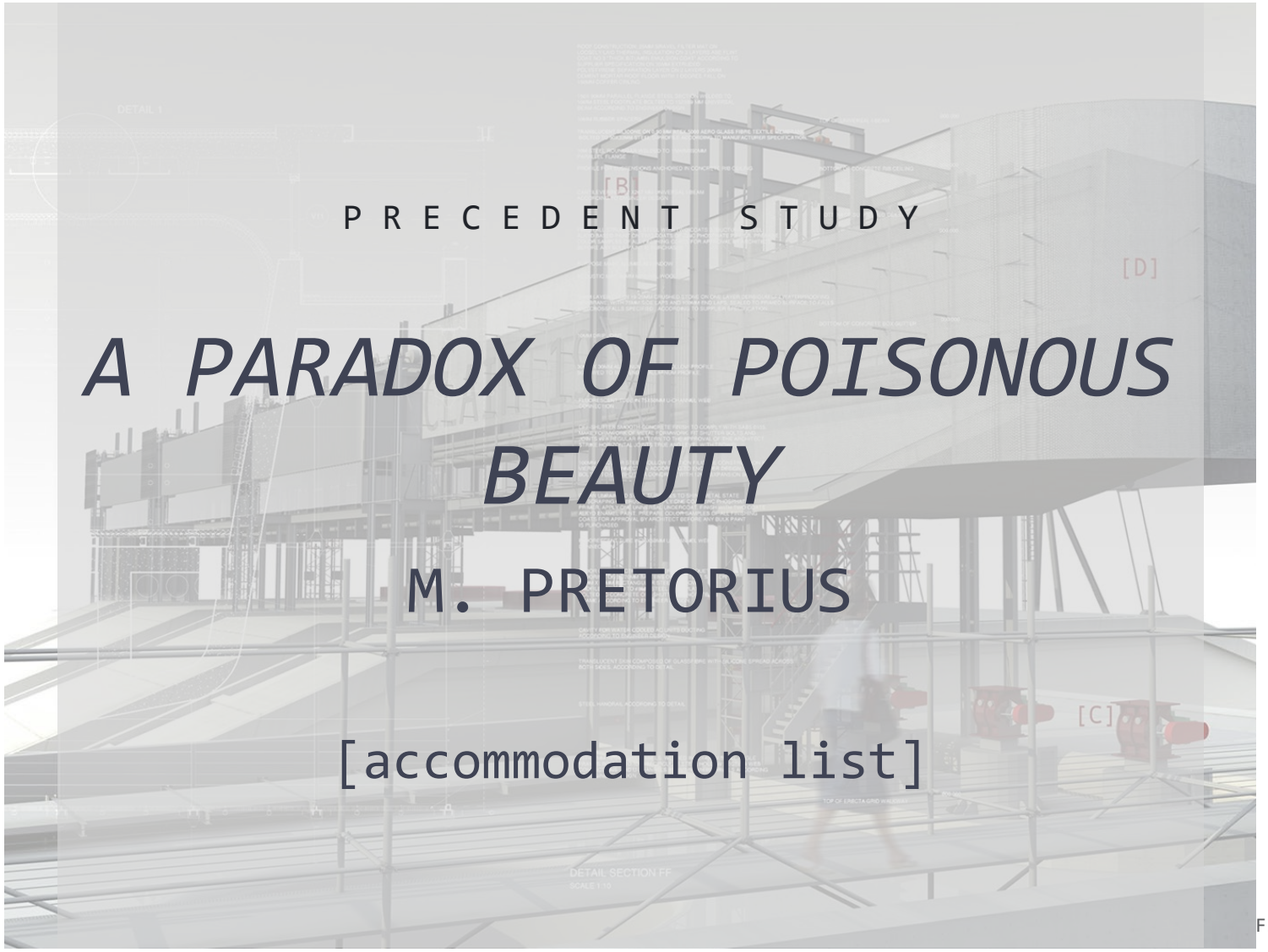

PRECEDENT STUDY
A PARADOX OF POISONOUS BEAUTY
M. PRETORIUS
[accommodation list]

Figure 64

ACCOMMODATION LIST: URBAN WETLAND

Water desalination plant and urban wetland on Main Reef Road, Johannesburg. Marko Pretorius, University of Free State

The study done by Marko Pretorius in his Masters Dissertation is to reactivate the mine dumps and post-industrial ruins within the post-mining site on Main Reef Road. The study confronts the acid mine drainage crisis, while honouring the past of significant accomplishments. The solution to the problems of the environmental reclamation should be environmental and also cultural. The study aims to engage the arts and sciences to have the power to rehabilitate the landscape and involve the community in a healing process.

The study project aims at:

- Celebrating Main Reef Road as a heritage site and valuable commodity.
- Engaging with the site on the premise that architecture and human life is not intended to oppose or cower away from these post-industrial sites, but rather to draw it into an intimate association in order to find union with it.
- Designing a catalyst building and public place that directly addresses the problems associated with acid mine drainage.

The study project creates a platform for research and education that celebrates the dynamic environment it is situated within. The building celebrates and embraces the setting and it works with the surroundings. It serves users of all types.

This new desalination plant within Cape Town aims to serve a variety of users, the stitching together of industrial activity and public activity.

Front of House	
First Floor:	
Foyer/ Event space	340 sqm
Auditorium	160 sqm
Reception	14 sqm
Public restrooms	30 sqm
Basement:	
Machine Exhibition	80 sqm
Back of House	
First Floor:	
Staff Lockers	100 sqm
Staff Cafeteria	65 sqm
Staff Recreation	65 sqm
Project Rooms	25 sqm
Deck outside	60 sqm
Board Room	50 sqm
Informal Workspace	45 sqm
Staff Restrooms	26 sqm
Second Floor:	
Work Stations	100 sqm
Monitoring Labs	15 sqm
Staff Restrooms	53 sqm
Informal Workspace	45 sqm
Deck Outside	60 sqm
Cafeteria	60 sqm
Workshop	100 sqm
Storage	60 sqm
Basement:	
Staff/ service Entrance	70 sqm
Parking	1500 sqm
Desalination Plant:	
Control room	180 sqm
Pump Rooms	100 sqm
Deep Water Pumps	300 sqm
Store Room	25 sqm
Primary Clarifiers	240 sqm
Primary Filters	510 sqm
Mine Water Storage	900 sqm
Reservoir	200 sqm
Educational & Research	
Front of House	
Entrance bridge and access to wetland	1000 sqm
Research Exhibition 1-3	180 sqm
Back of House	
Laboritory 1-3	
Entrance/Reception	20 sqm
Project Room	20 sqm
Work Stations	40 sqm
Clean Room	40 sqm
Staff Lounge	30 sqm
Document Storage	20 sqm
Outside Storage	12 sqm
Store Room	12 sqm
Staff Restroom	30 sqm

DESALINATION PLANT - CAPE TOWN

PROPOSED: PROGRAM

- *DESALINATION PLANT*
- *RESEARCH LABS*
- *EDUCATIONAL ROUTE*
- *RESTAURANT*
- *PUBLIC PLATFORM*
- *EXHIBITION SPACES*

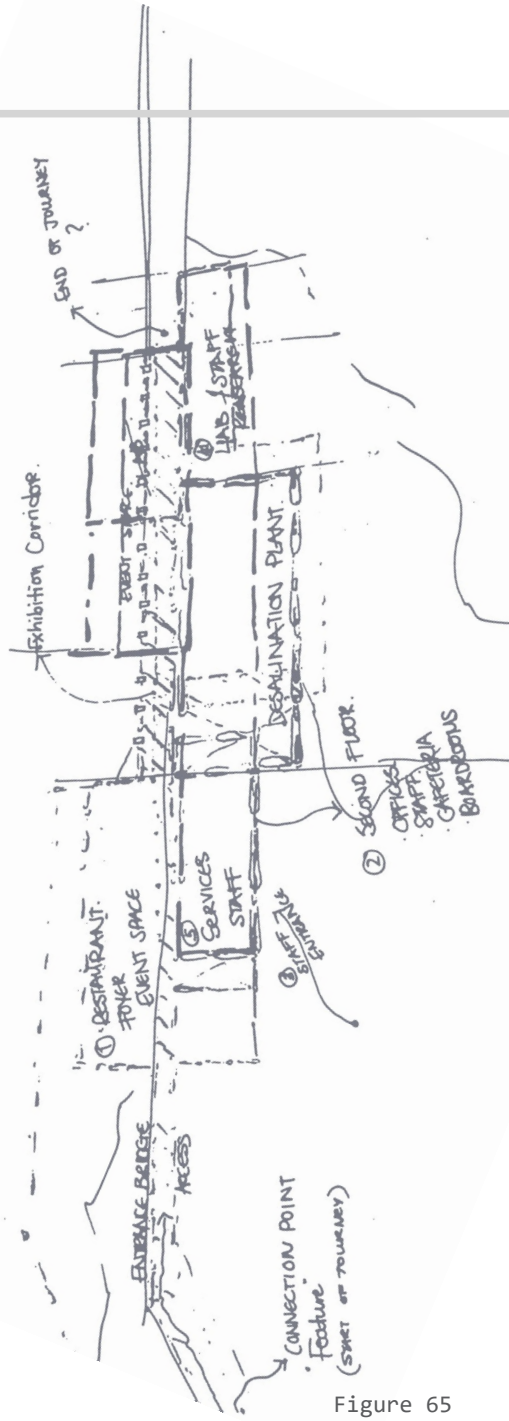


Figure 65

PROPOSED: ACCOMMODATION LIST

BASEMENT

Desalination Plant:
Control room
Monitoring Lab
Machine Exhibition
Pump Rooms
Water Intake - Filter System
Store Room - Chemical
Store Room - Equipment
Access control office
Desalination offices
Maintenance Workshop

Staff/Service:
Entrance
Parking
Boardroom
Staff Lockers
Staff Recreation
Restrooms
Refuse Room
Service Shaft

GROUND FLOOR

Public:
Entrance / Foyer space
Reception
Public Restroom
Outside seating / gathering space

Educational Platform:
Auditorium
Entrance
Guide office
Storage

Staff/Service:
Reception office
Security office
Storage
Service Shaft

Research labs 1-3
Entrance / Reception
Offices
Project Rooms 1-3
Work Stations 1-3
Document Storage
Storage
Staff Restroom
Boardroom

FIRST FLOOR

Restaurant

Public:
Reception
Lounge area
Bar access
Restrooms
Table seating area
Public Ramp

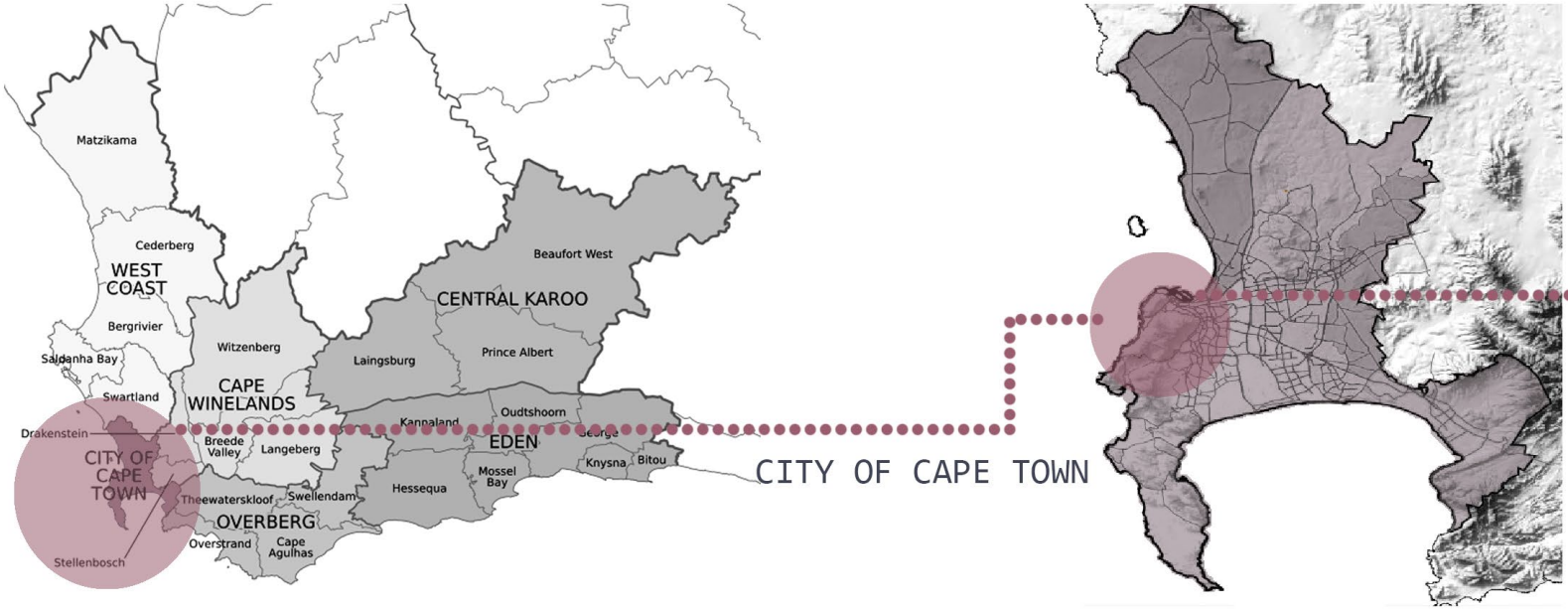
Staff/Service:
Staff Lounge
Offices
Storage
Bar Storage
Bar Wash-up area
Service Shaft

Kitchen:
Prep area
Wash-up area
Waiting area
Cold Storage / fridge
Storage
Refuse room

Exhibition spaces
Walkway

LOCATION OF SITE

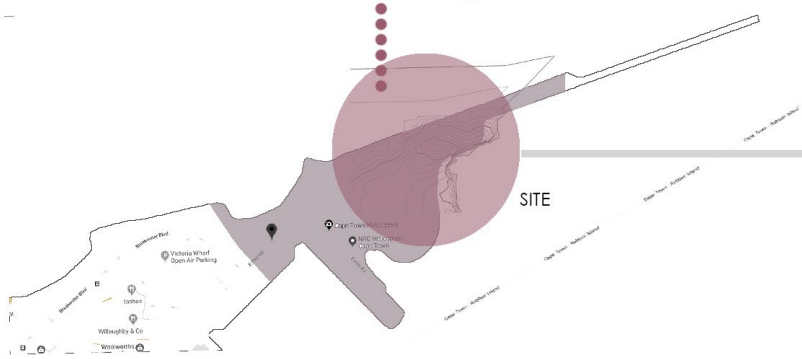
Figure 66

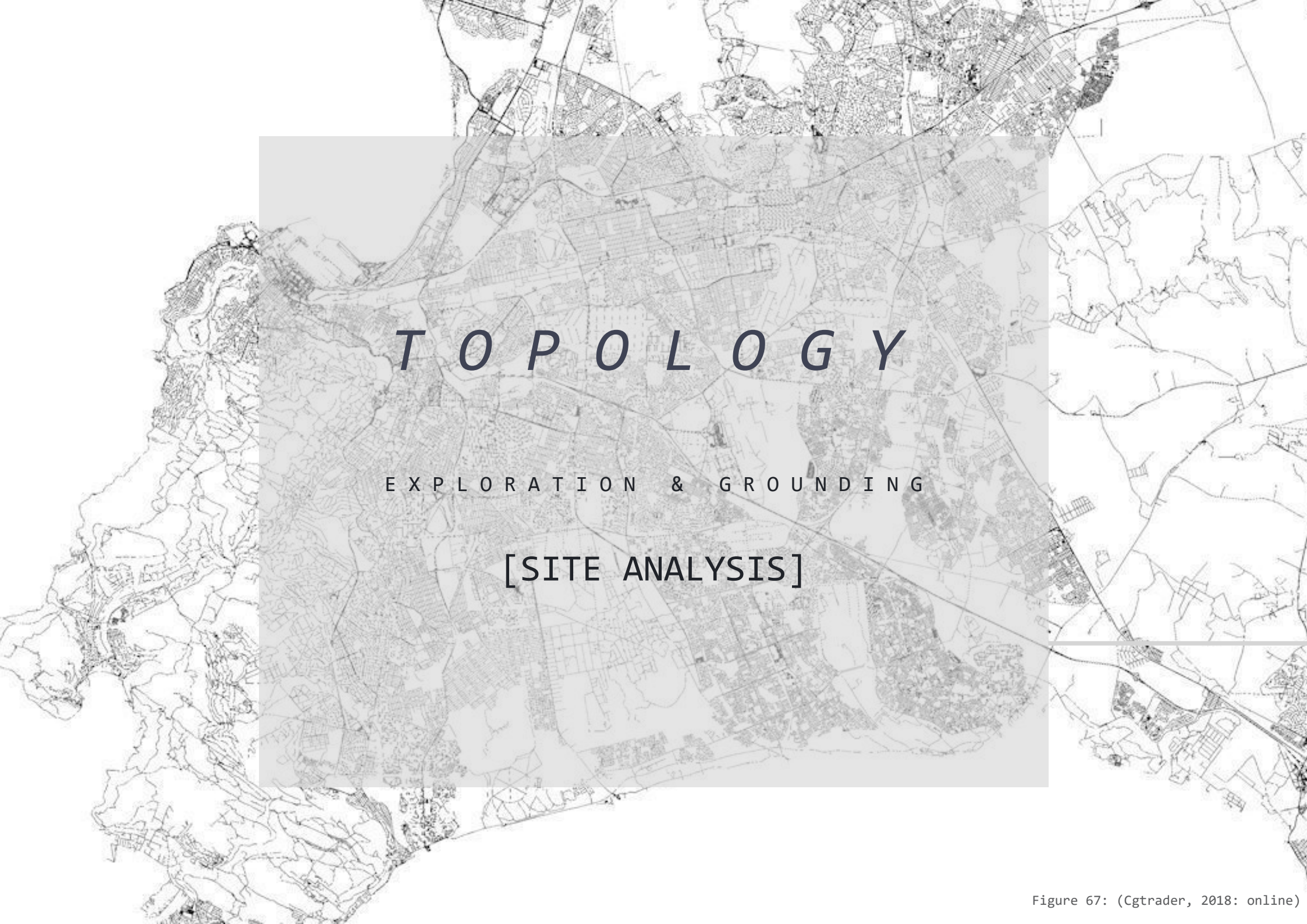


WESTERN CAPE

V&A WATERFRONT

EAST PIER





T O P O L O G Y

E X P L O R A T I O N & G R O U N D I N G

[SITE ANALYSIS]

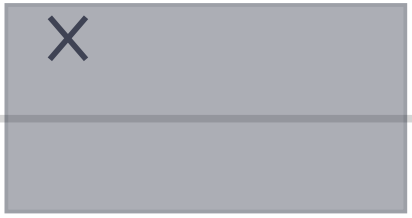
Figure 67: (Cgtrader, 2018: online)

EAST PIER, CAPE TOWN

This part of the document, the site analysis, is investigated within three categories namely: macro site, meso site and the micro site scales.The influences of this dissertation within the surrounding context and site will be mapped and explored. The physical and social regeneration investigated within this part will be accommodated into the design.

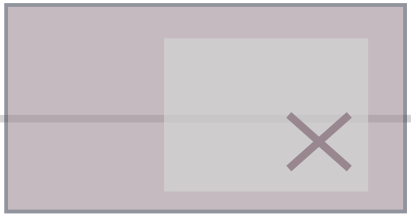
The East Pier is a historical space within the City of Cape Town, as already stated within Part 1 of this document. The site explorations investigates ways to reactivate this unique site.

MACRO



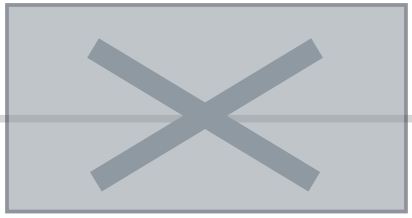
THE CITY OF CAPE TOWN

MESO



VICTORIA AND ALFRED WATERFRONT PRECINCT

MICRO



PROPOSED SITE EAST PIER

[MARCO] SITE ANALYSIS

THE CITY OF CAPE TOWN

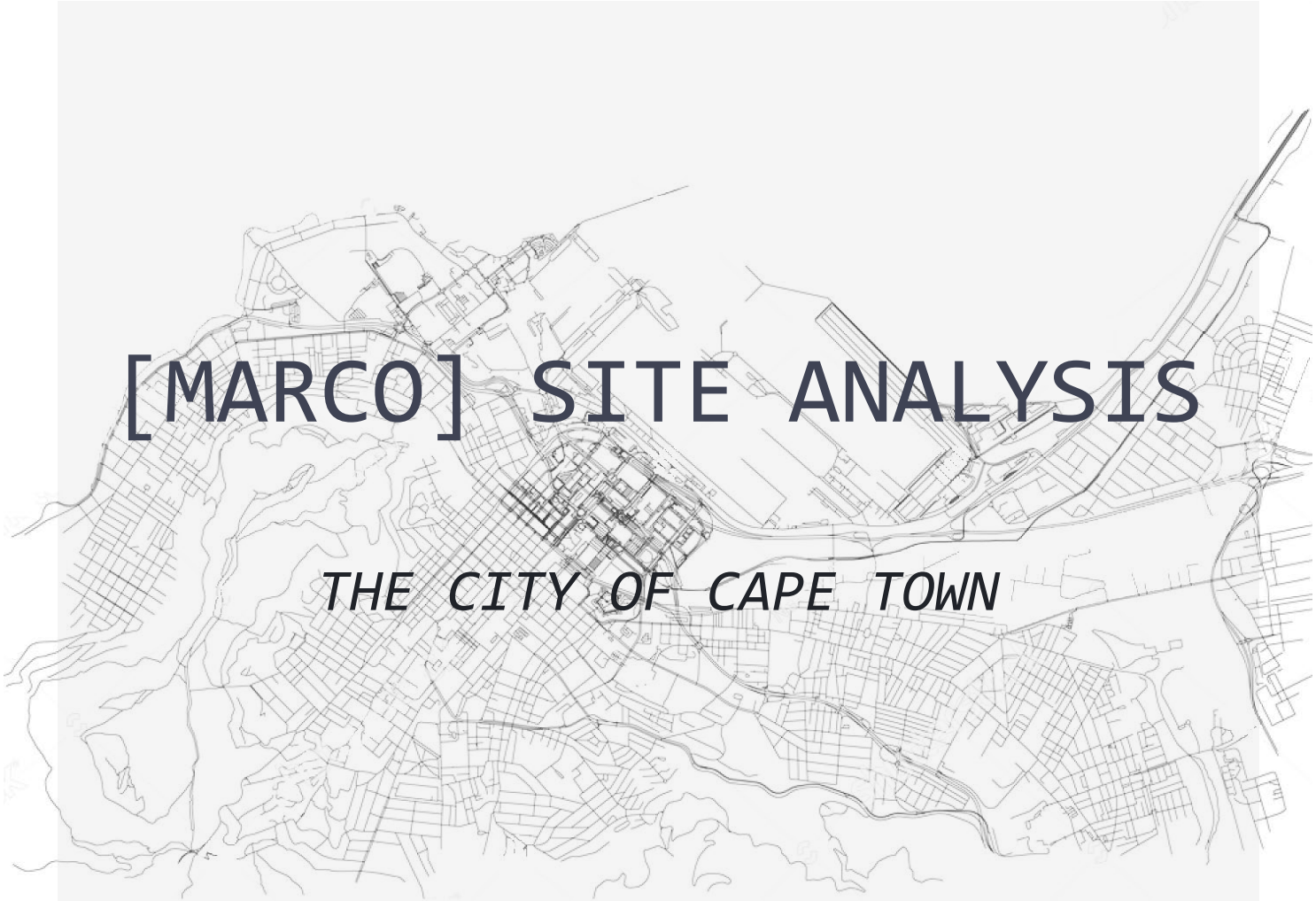


Figure 68: (Cape Town road network and streets 3D model, 2018)

PROPOSED SITE

EAST PIER

THE CITY OF CAPE TOWN

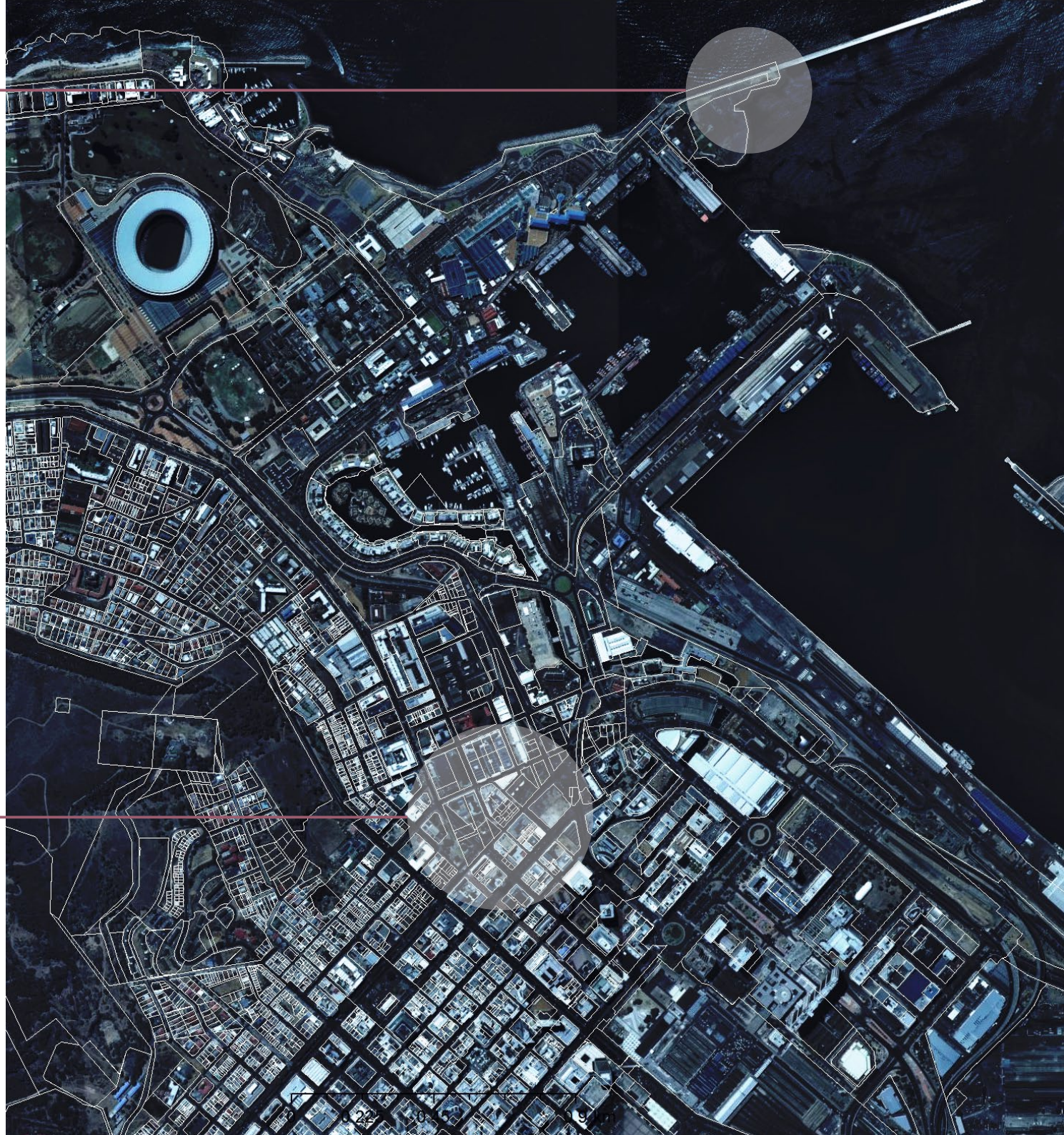


Figure 69

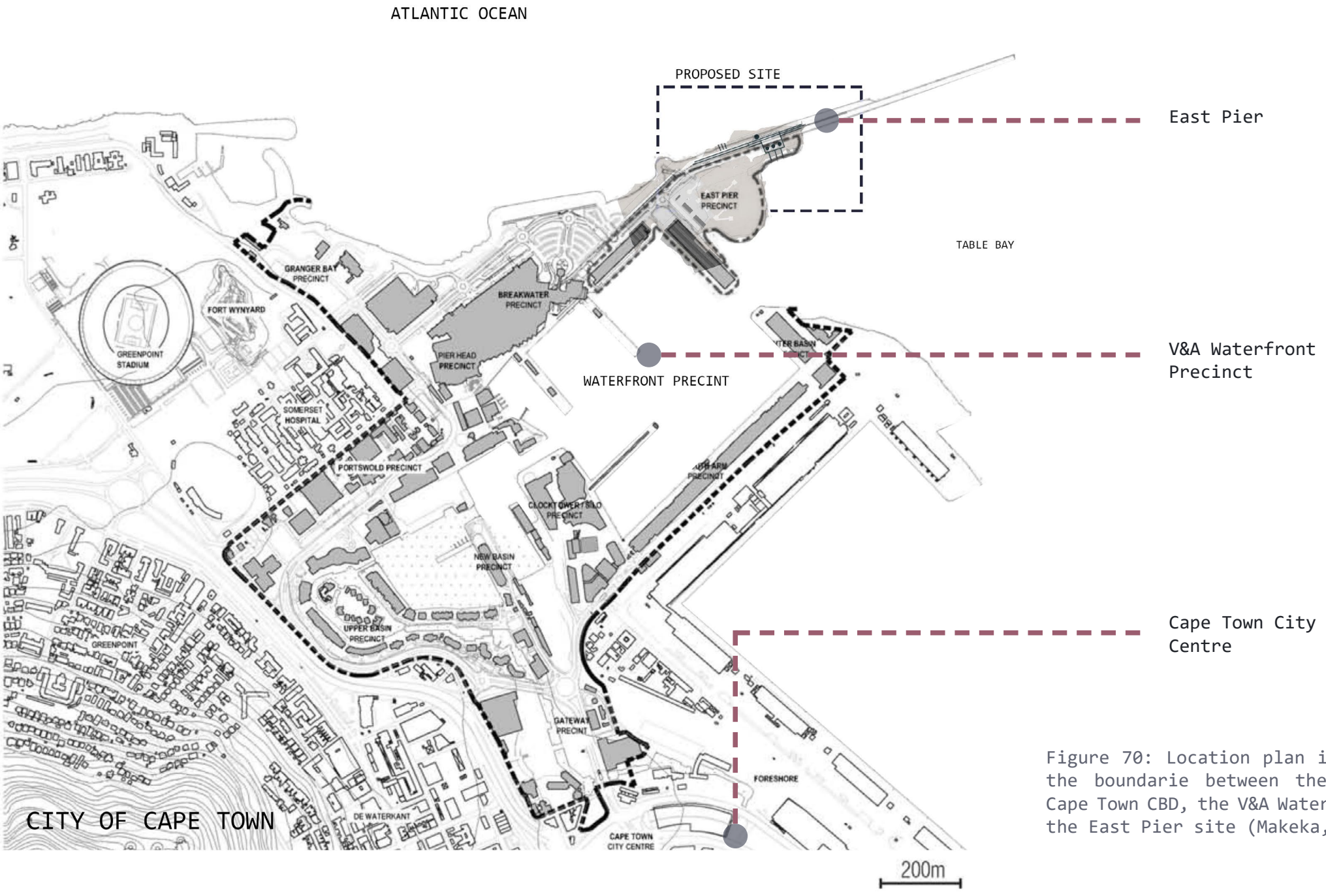


Figure 70: Location plan indicating the boundarie between the City of Cape Town CBD, the V&A Waterfront and the East Pier site (Makeka, 2017).

PIPELINES, CAPE TOWN

MAP OF CAPE TOWN, SHOWING THE MAIN DAMS THAT MAKE UP THE CITY'S WATER SUPPLY.

THE DESALINATION PLANT WILL CONNECT TO THE CITY'S PIPELINES TO REACH THE RESIDENTS AND TO ADD TO THE SUPPLY GIVEN BY THE SURROUNDING WATER SOURCES.

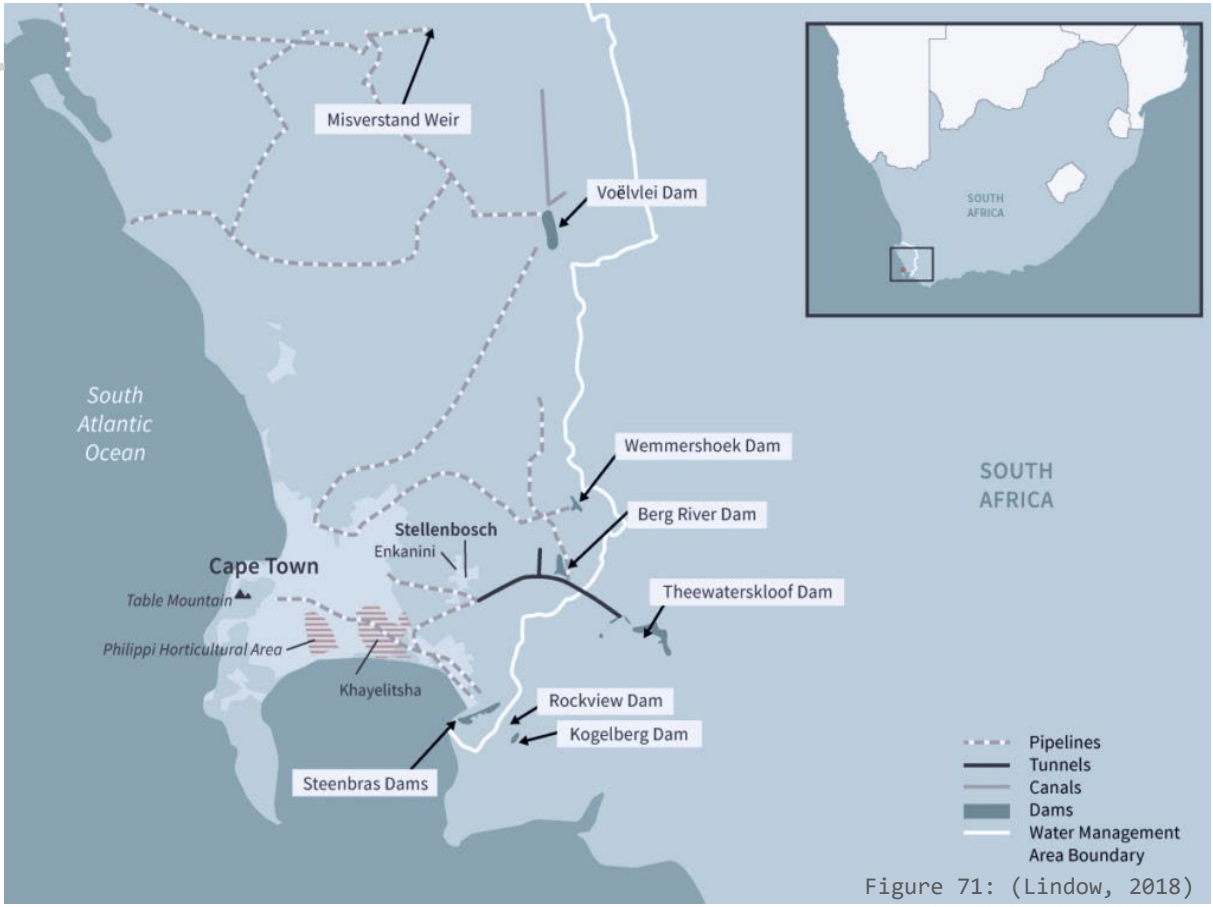


Figure 71: (Lindow, 2018)

MAIN ROADS, CAPE TOWN

N1	National Freeway
N2	National Freeway
M62	Main Road
M6	Main Road
R27	Arterial Route

MAP OF CAPE TOWN, SHOWING THE MAIN ROADS TO THE CITY CENTRE AND TOWARDS THE VICTORIA AND ALFRED WATERFRONT.

MAIN ROADS WITHIN THE CITY LEAD TO THE WATERFRONT PRECINCT. ACCESS TO THE SITE FROM THE CITY WILL NOT BECOME A DISTURBANCE FOR VISITORS.

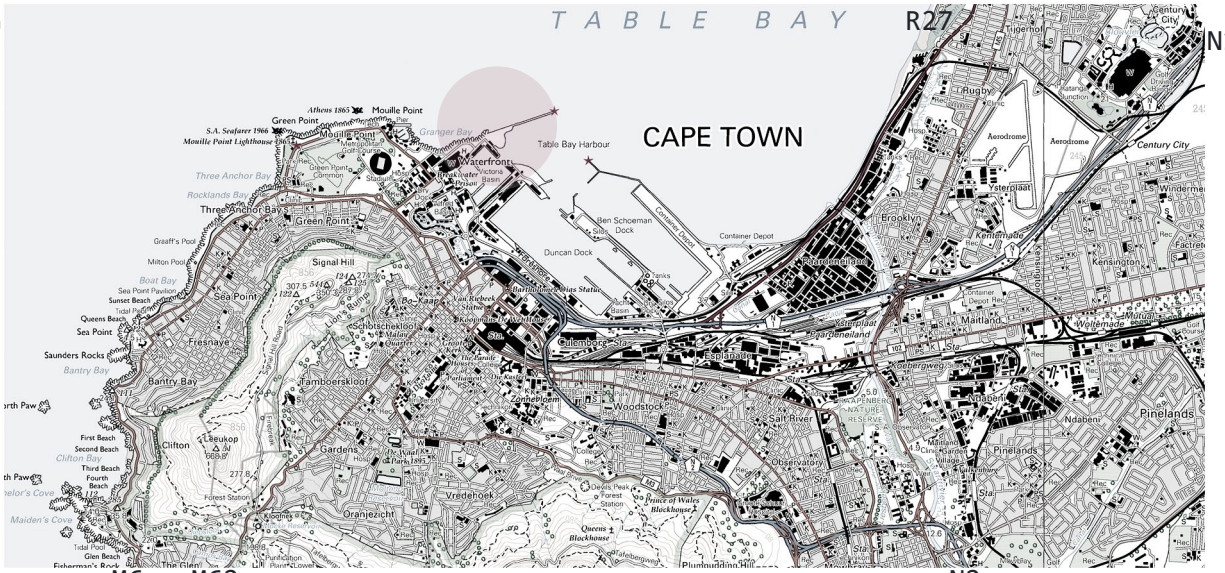
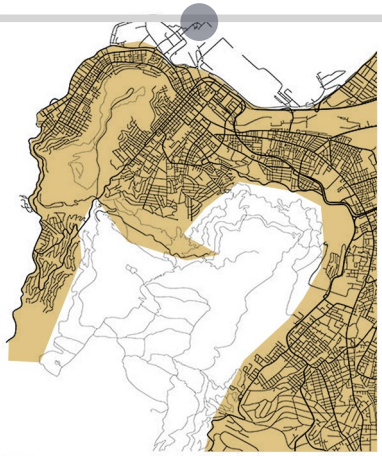


Figure 72: (Open street map, 2010)

URBAN AREAS



The V&A Waterfront forms part of the urban area of Cape Town. The site is not within the central urban area, but forms part of the Cape Town Harbour.

The harbour is part of the urban development of Cape Town. Development within the harbour has a direct impact on the surrounding urban activity. The harbour is the start of the urban activity when entering Cape Town from the sea.

Figure 73-78: (Western Cape Department of Agriculture, 2018)

MARINE PROTECTED AREAS

Table Mountain National Park
Marine Protected Area

The allocated area requires safequarding to ensure continued existence of species and ecosystems. This includes the delivery of ecosystem services: terrestrial and fresh water realms. Great care should be taken with these spaces to ensure sustainable development within the Western Cape Province (Western Cape Department of Agriculture, 2018).

The harbour is a marine protected area, it does not fall under the major protected areas, but great care is taken to any marine space where development commences - such as the new desalination project.

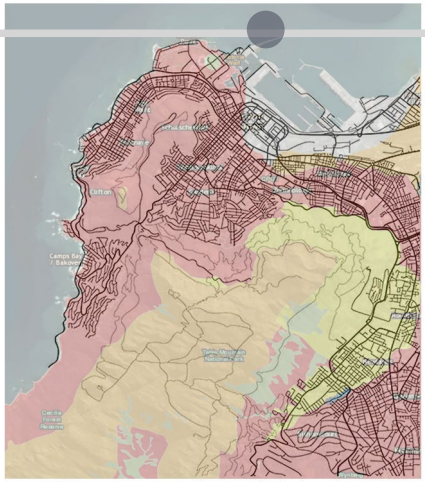
PRESERVING HABITAT

Table Mountain National Park

The allocated area requires safequarding to ensure continued existence of species and ecosystems. This includes the delivery of ecosystem services: terrestrial and fresh water realms. Great care should be taken with these spaces to ensure sustainable development within the Western Cape Province (Western Cape Department of Agriculture, 2018).

These habitats form part of Cape Town’s natural essence. The site is not situated close to one of these spaces, or rather not close enough to impact them negatively.

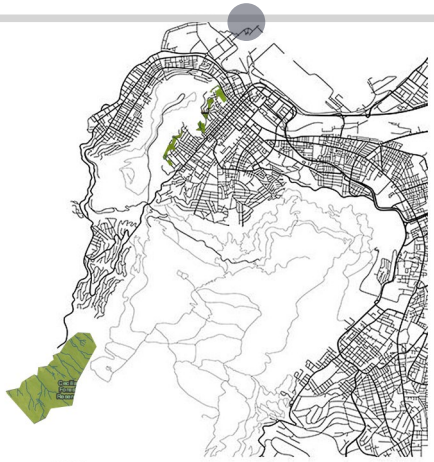
ECOSYSTEM THREAD STATUS



The ecosystem thread status for the most parts of Cape Town is Critically Endangered. It is important for new developments and activities within the city to ensure the impacts of such developments does not impact the ecosystem, unless it is positively influenced.

The desalination plant incorporates labs to ensure that the discharge of plant s does not effect the ecosystem of the city. It should be researched and controlled on a regular bases to formulate a plan immediately if it does not comply with the The Western Cape Biodiversity Spatial Plan (WCBSP) (Western Cape Department of Agriculture, 2018).

CRITICAL BIODIVERSITY

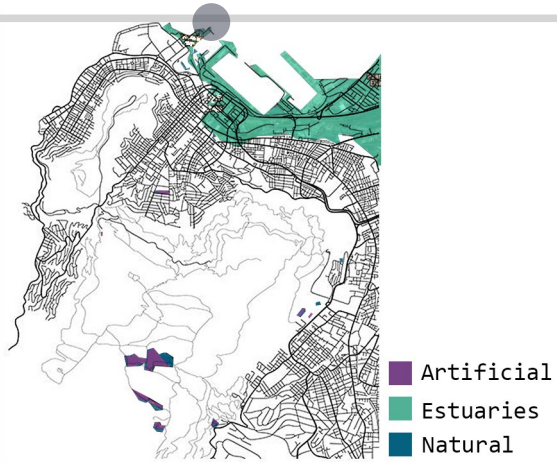


The allocated areas requires safegarding like previously stated to ensure sustainable development within the Western Cape.

The biodiversity within the city will not be influenced by the desalination plant.

The desalination plant incorporates labs to ensure that the discharge of plant s does not effect the ecosystem of the city. It should be researched and controlled on a regular bases to formulate a plan immediately if it does not comply with the The Western Cape Biodiversity Spatial Plan (WCBSP) (Western Cape Department of Agriculture, 2018).

WETLANDS



Estuaries - the tidal mouth of a large water recourse where the tide meets the stream.

Wetland Freshwater Priority Areas (FEPAs)

Irreversible loss of wetlands is expected to be high in some areas, such as urban centres (Western Cape Department of Agriculture, 2018).

The site is within a wetland area. It does not remove the quality of the wetland it is situated within. The decrease in wetlands is one of the main reasons for water shortages within Cape Town and is essential to Cape Town’s water future.

[MESO] SITE ANALYSIS

THE VICTORIA AND ALFRED WATERFRONT

Figure 79: (Cape Town road network and streets 3D model, 2018)

VICTORIA AND ALFRED WATERFRONT

LAYOUT:

1 Granger Bay

2 East Pier - SITE

3 Victoria Wharf

4 Portswood Ridge

5 North Wharf

6 Marina Basin

7 Clock Tower

8 Silo

9 South Arm

10 E-berth

11 Gateway

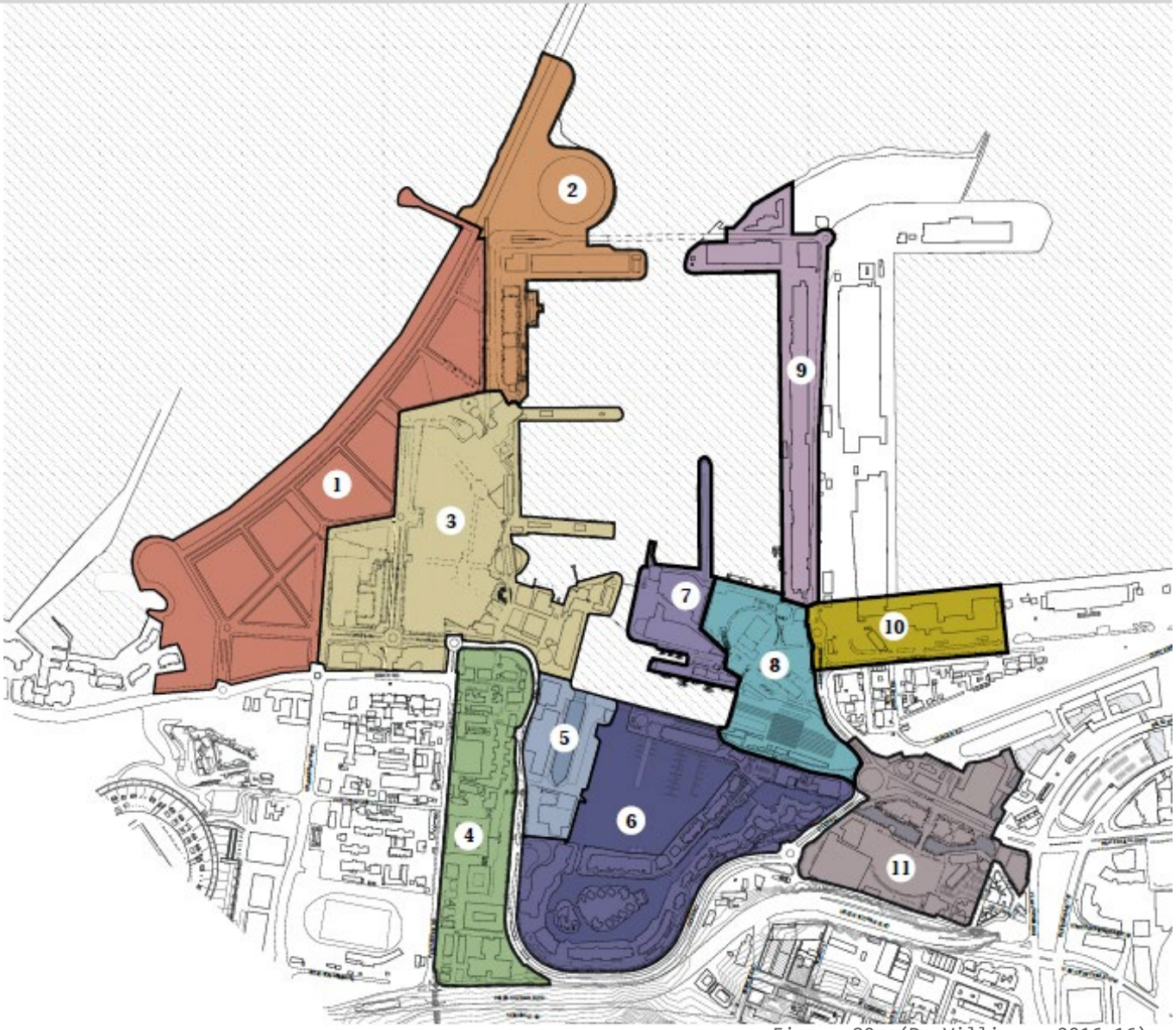


Figure 80: (De Villiers, 2016:16)

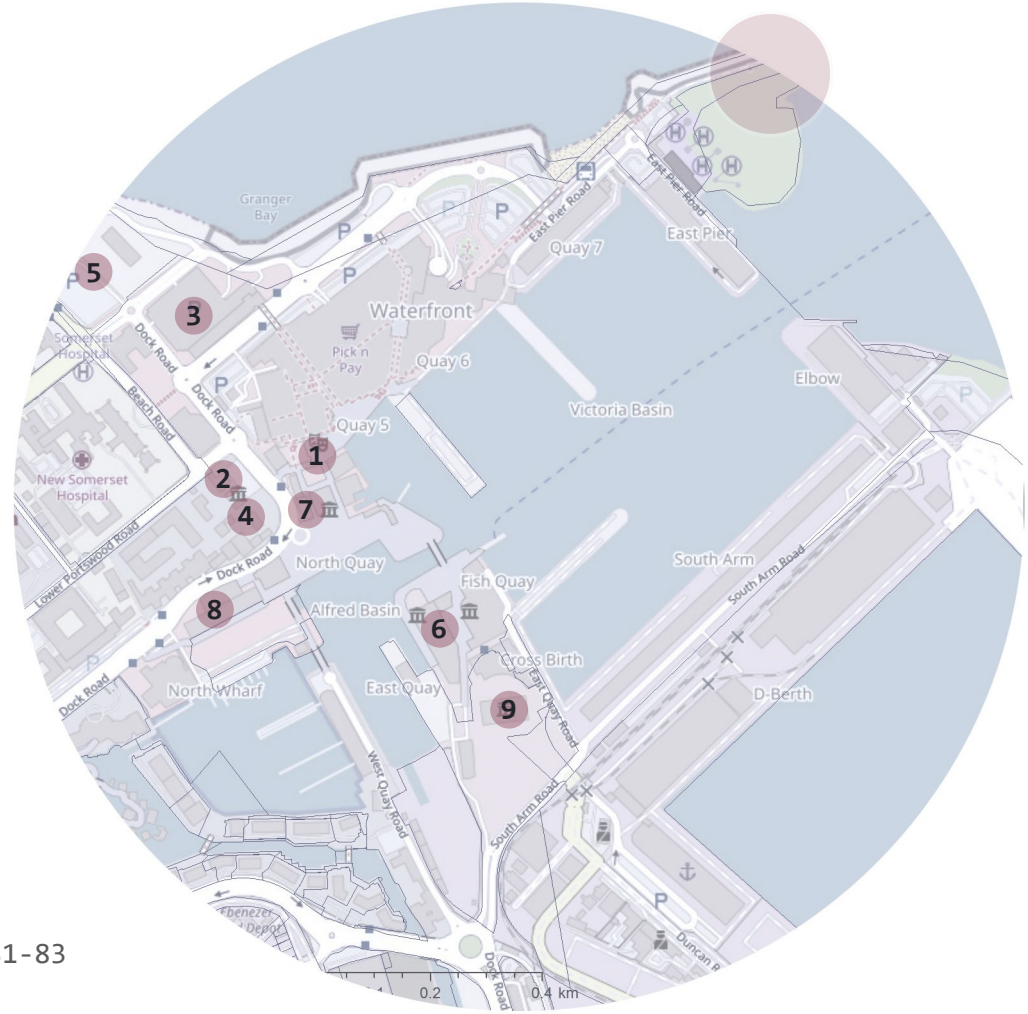


Figure 81-83

1 amphitheatre

2 croquet lawn

3 breakwater parking garage

4 historic tunnel

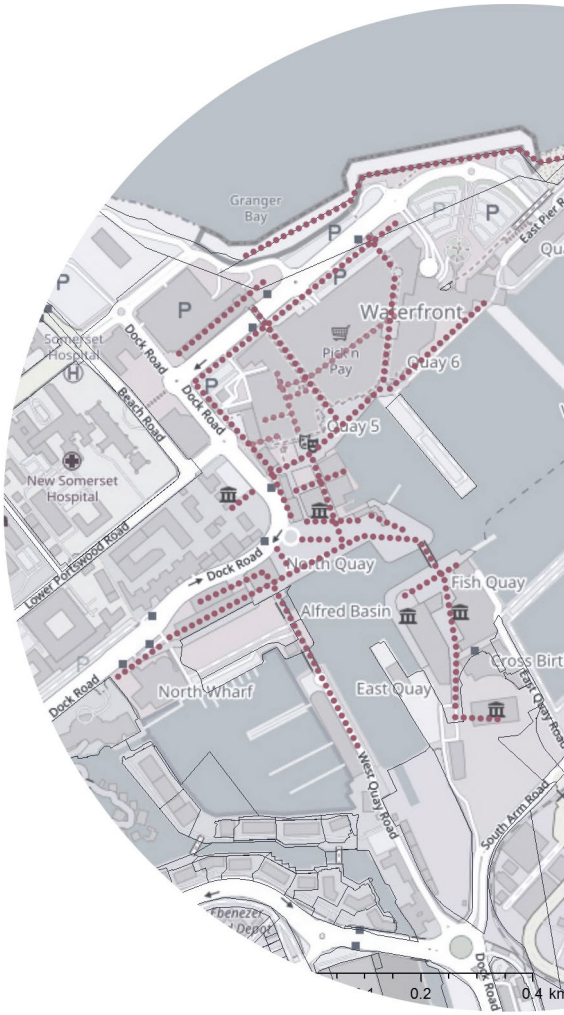
5 breakwater boulevard site

6 clocktower square

7 market square

8 nobel square

9 silos



The main public routes within the Waterfront precinct.

Z O N I N G B U I L D I N G T Y P E S

HOTELS:
1 Cape Grace
2 Victoria & Alfred
3 One & Only

V&A MARINA RESIDENTIAL

SHOPPING CENTRES:
1 Red Shed Craft Shop
2 Victoria Wharf Centre
3 Clock Tower Square
4 Clock Tower Centre
5 Market Square
6 Waterfront Trading Co

LANDMARKS:
1 Information Centre
2 Two Oceans Aquarium
3 BMW Pavilion
4 Portswood Business Park
5 Nelson Mandela Gateway
to Robben Island

BASINS;
1 Marina
2 Alfred Basin
3 Victoria Basin

[MICRO] SITE ANALYSIS

PROPOSED SITE - THE EAST PIER

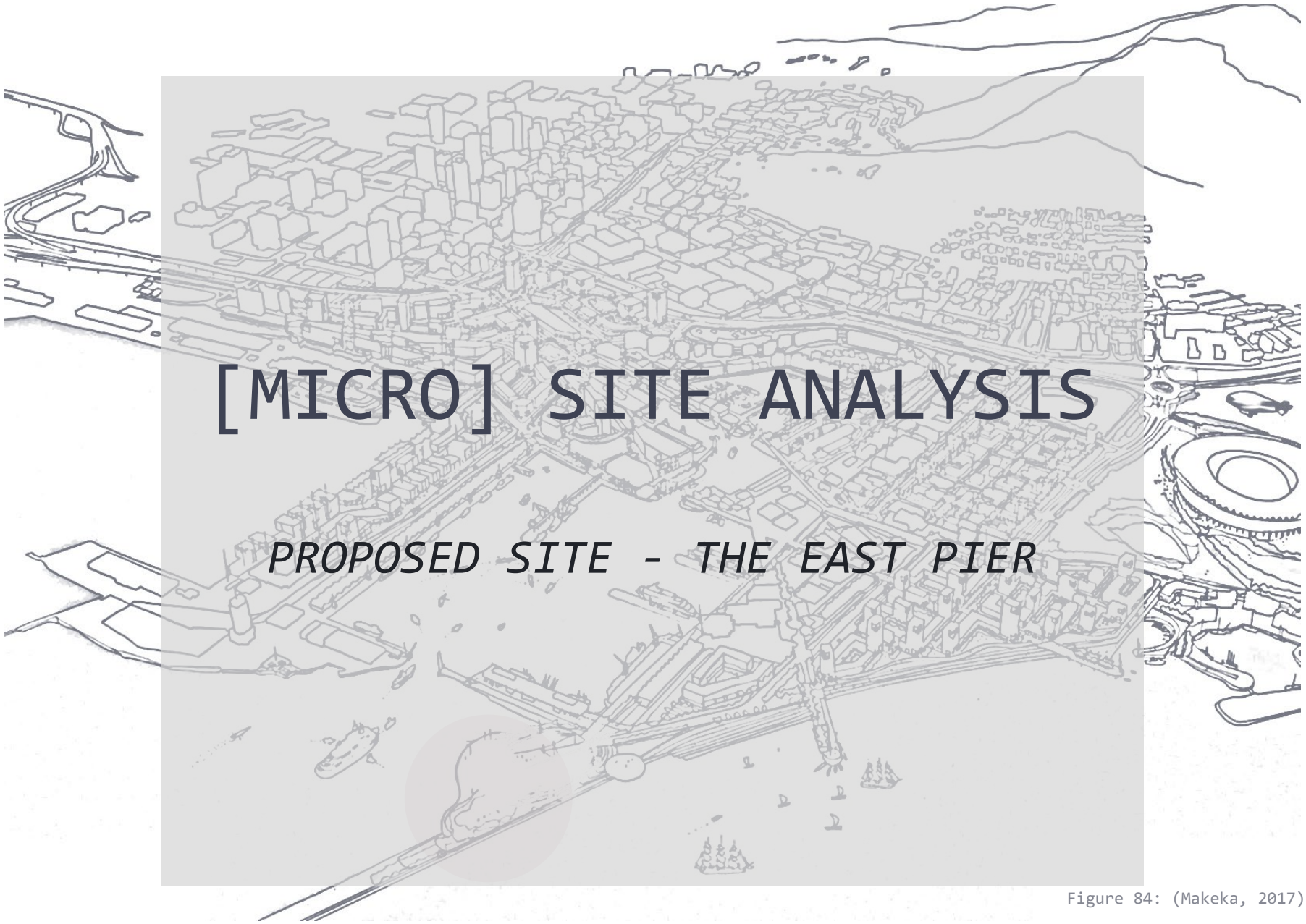


Figure 84: (Makeka, 2017)

PROPOSED SITE

The East Pier is situated within the Victoria and Alfred Waterfront in Cape Town.

This site with its rich history is a vast open landscape without any current activities.

This dissertation aims to reconnect this site to the current urban and social realm of the city and the Waterfront.

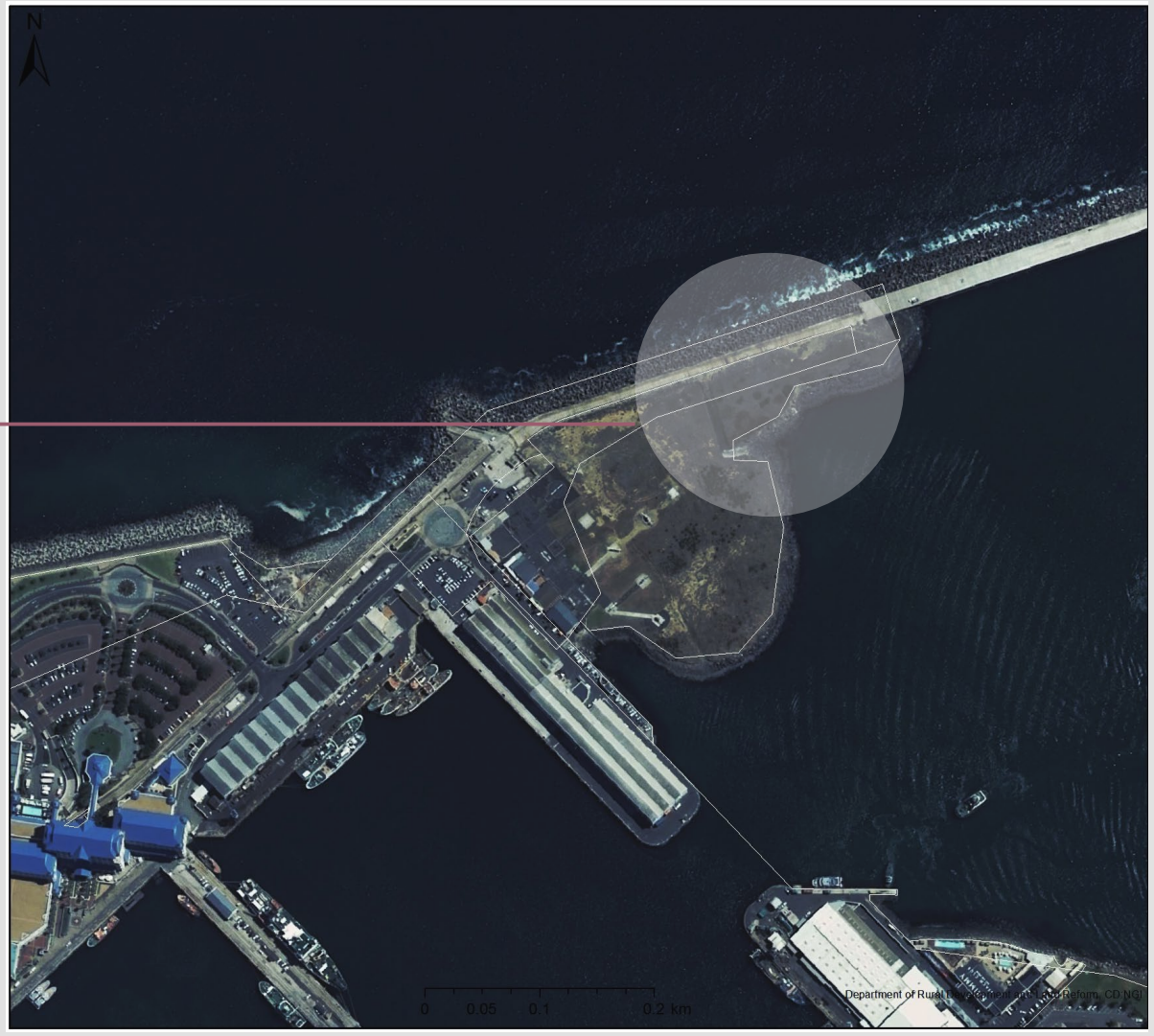


Figure 85

RECONNECT
REACTIVATE
REMEMBER
REDEFINE
RESTORE

EAST PIER, CITY OF CAPE TOWN

ATLANTIC OCEAN

TABLE BAY

WAVE SWELLS

The East Pier is the break water for the Cape Town Harbour. The sea water's energy breaks and the pier becomes a threshold to protect the harbour.

The waves west of the pier, those of the Atlantic Ocean, will have more strength and swells than the sea water within the harbour and Table Bay.

The average swell of the sea waves between high and low tides is 2,5 meters. This is a very important aspect of the site to investigate when designing the proposed dissertation. The different levels for water abstraction and discharges will have an effect on the site levels to accommodate the desalination process.

WIND DIRECTION

This image illustrates the wind directions in Cape Town Harbour within the week of 11 September - 16 September 2018. The illustration is an indication that the average wind direction would be a South/ South-East direction. It is clear though that this is just the average wind direction and within Cape Town one could expect wind from any direction.

Figure 86

CURRENT BUILDING TYPES

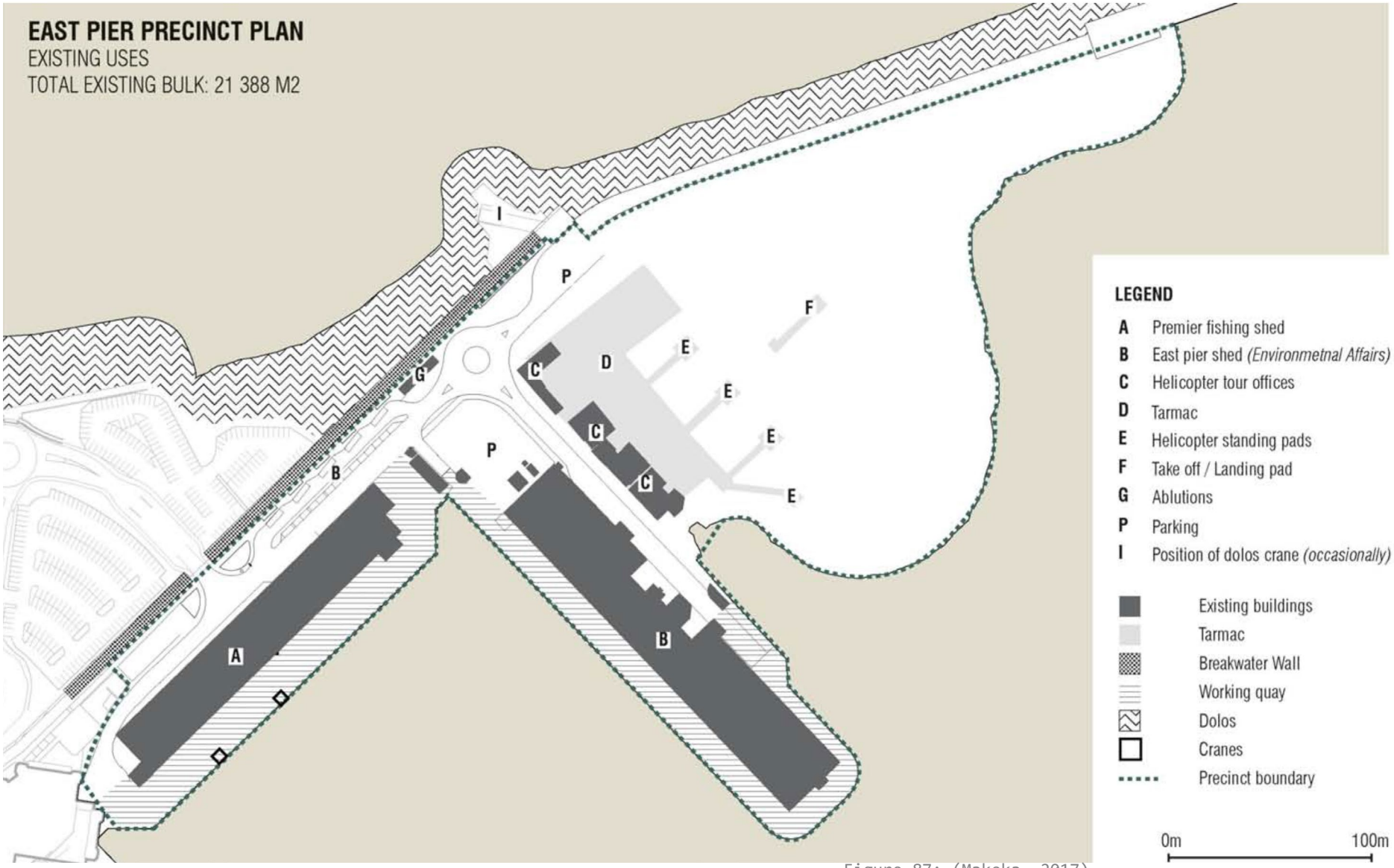
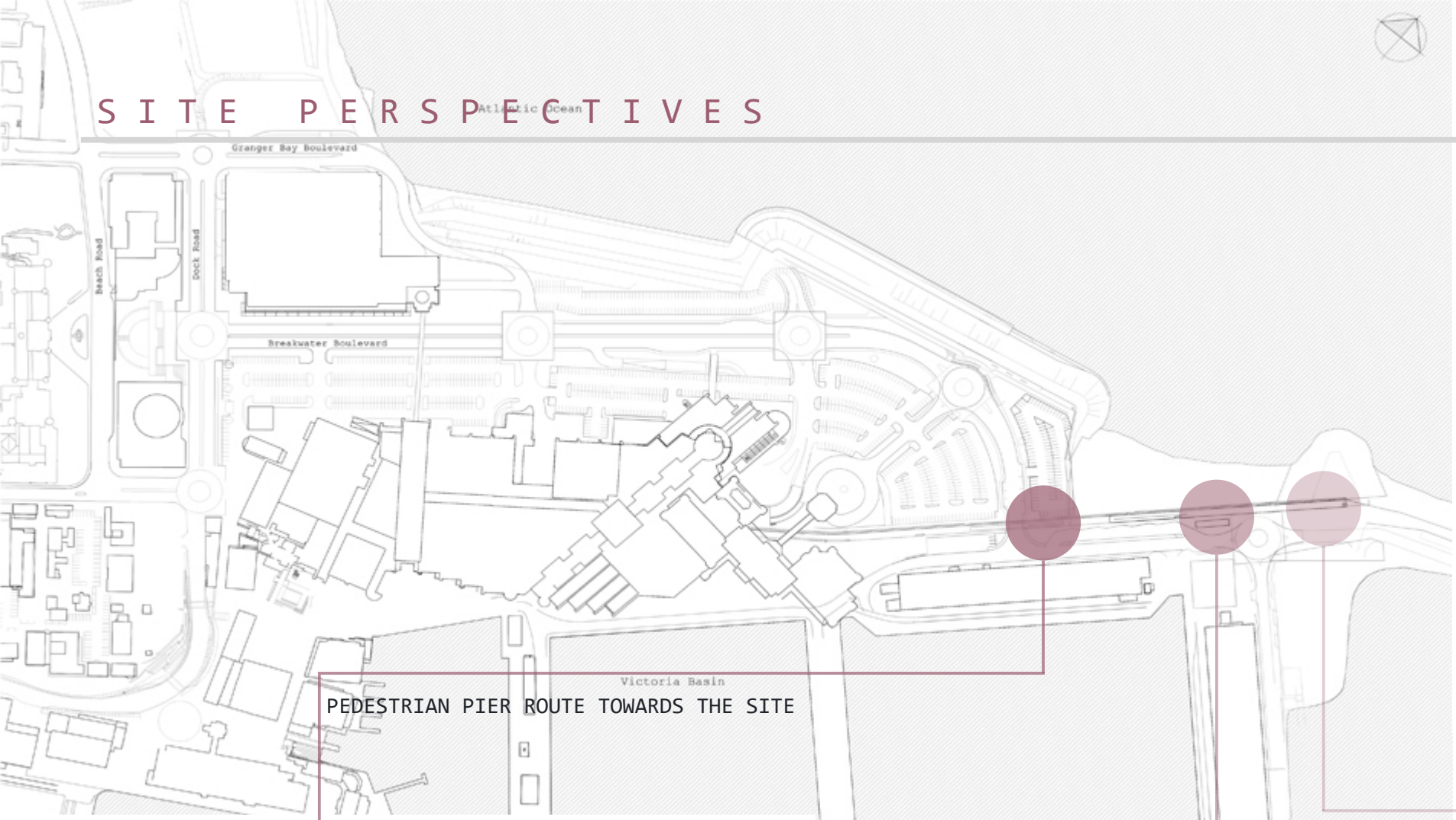


Figure 87: (Makeka, 2017)

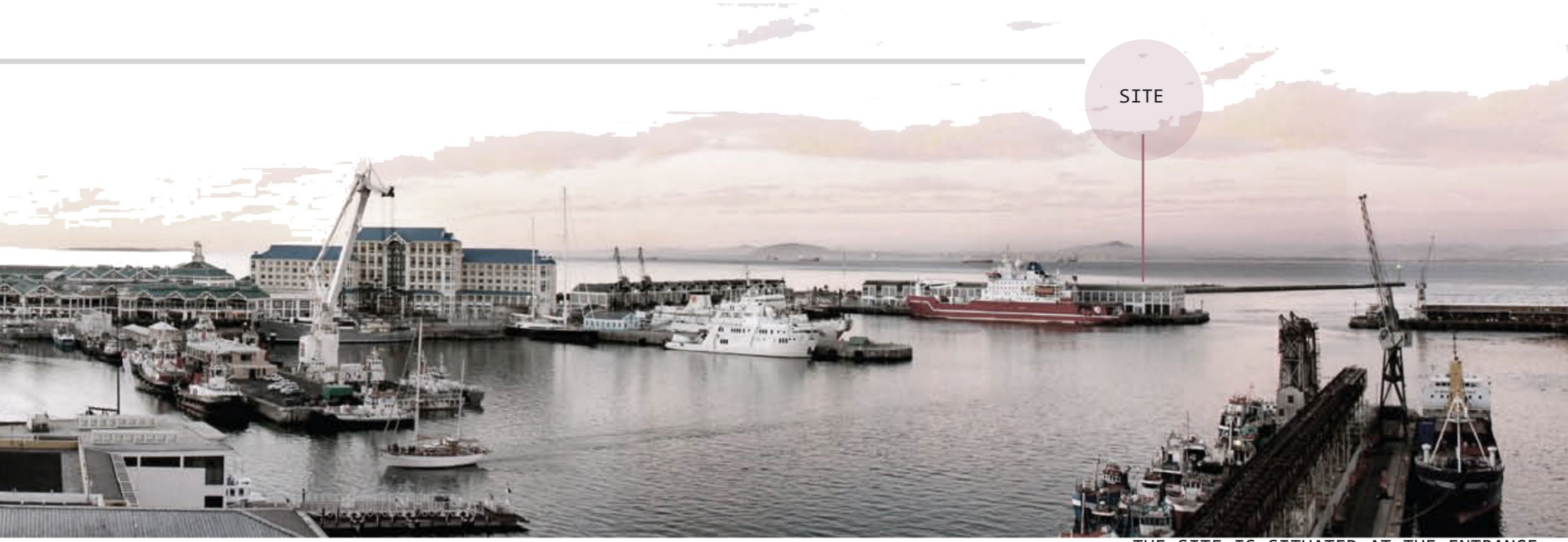
SITE PERSPECTIVES



PEDESTRIAN PIER ROUTE TOWARDS THE SITE

Figure 88-92

HELICOPTER PAD ACCESS AND
END OF VEHICLE ACCESS

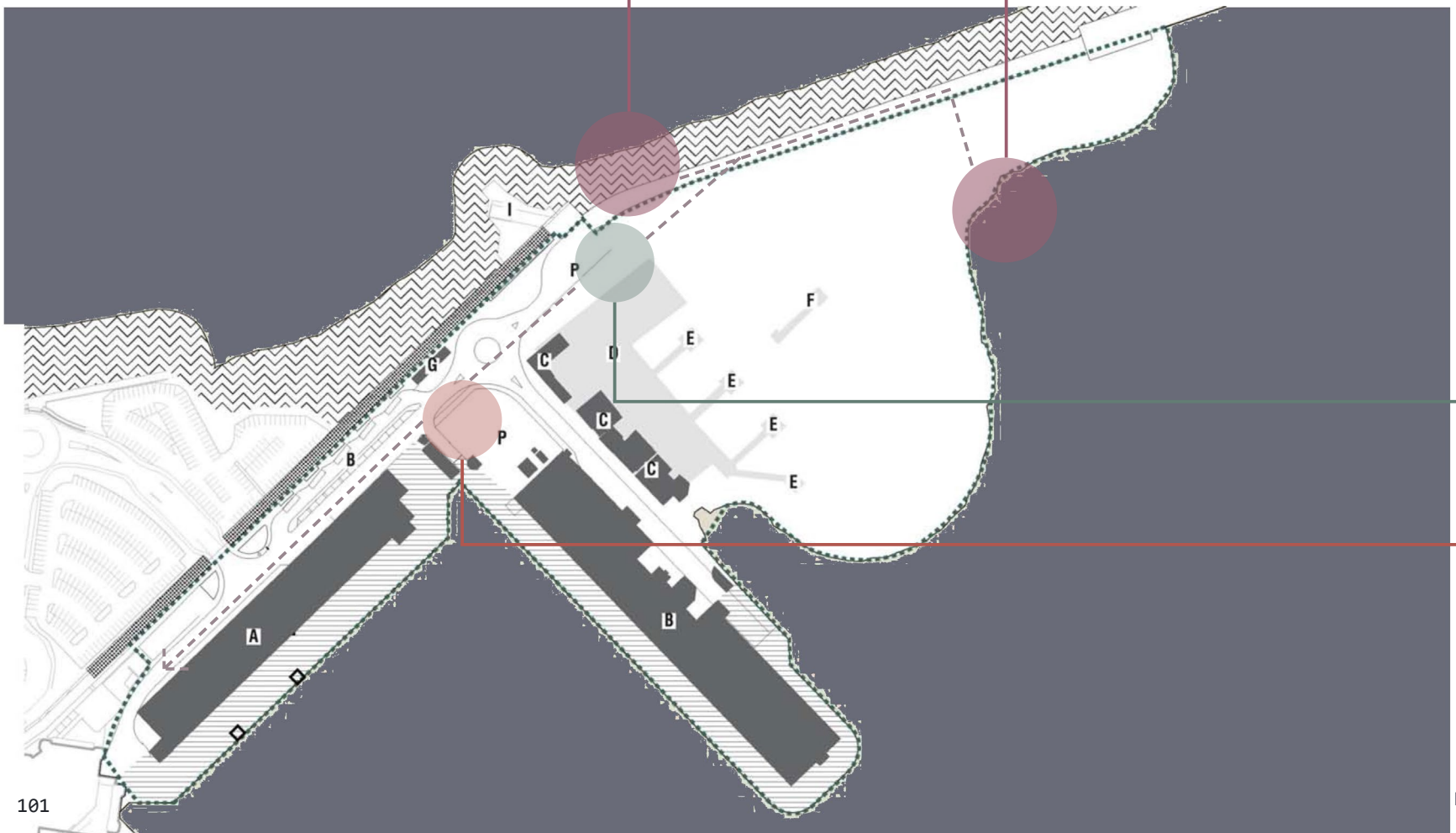


THE SITE IS SITUATED AT THE ENTRANCE
OF THE VICTORIA BASIN/HARBOUR

EAST PIER WITH HELICOPTER PADS

WATER ACCESS POINTS

The sea water abstraction point and brine discharge point for the existing desalination plant will stay where it is originally positioned on site.



The sea water abstraction point is situated within Table Bay where the water is in a less energetic state than the open sea. This allows for the intake processes to occur without extreme sea conditions that can influence the mechanical process.

The brine discharge point is located west of the pier where there is stronger wave currents. The wave currents is a tool to remove the brine water from shore. The pier is far off from the main land; this ensures less maintenance to the brine water and less impact on the shore environment.

PROPOSED MUNICIPAL CONNECTION

EXISTING MUNICIPAL CONNECTION

The fresh processed water of the desalination plant will connect with the municipality water connection of the V&A Waterfront.

Figure 93

SITE SECTIONS: SOIL TYPES

The East Pier was constructed with dumped rock that was brought with ships within the harbour. This was to extend the pier and to have a solid foundation for the breakwater of the Cape Town Harbour.

Therefore, the proposed site consists of rock formations. When excavating the site, this dumped rock will have to be considered. The abstraction of the sea water for the desalination process will have to be below sea level and therefore a large amount of the rock will have to be removed. These rock materials could be used within the building process and create an energy efficient design process, rather than removing the rock from the existing site.

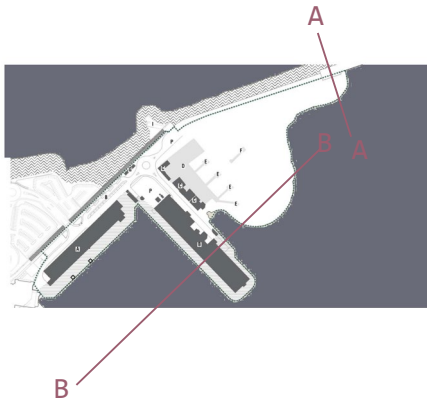


Figure 95-96

Symbol: FA
Class: Podzolic

Soils Description: Soils with a sandy texture, leached and with subsurface accumulation of organic matter, iron and aluminium oxides, either deep or on hard or weathering rock

Depth: >= 750 mm Clay: < 15%
(CapeFarmMapper, 2018)

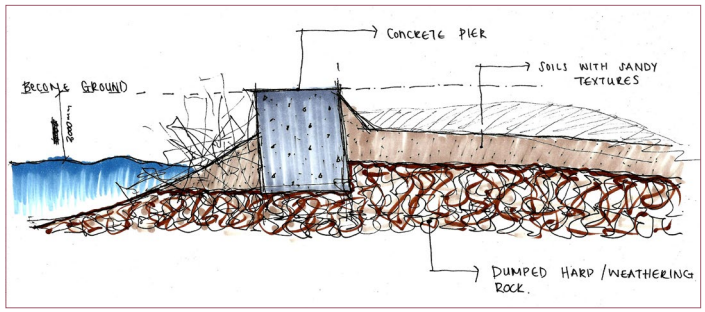
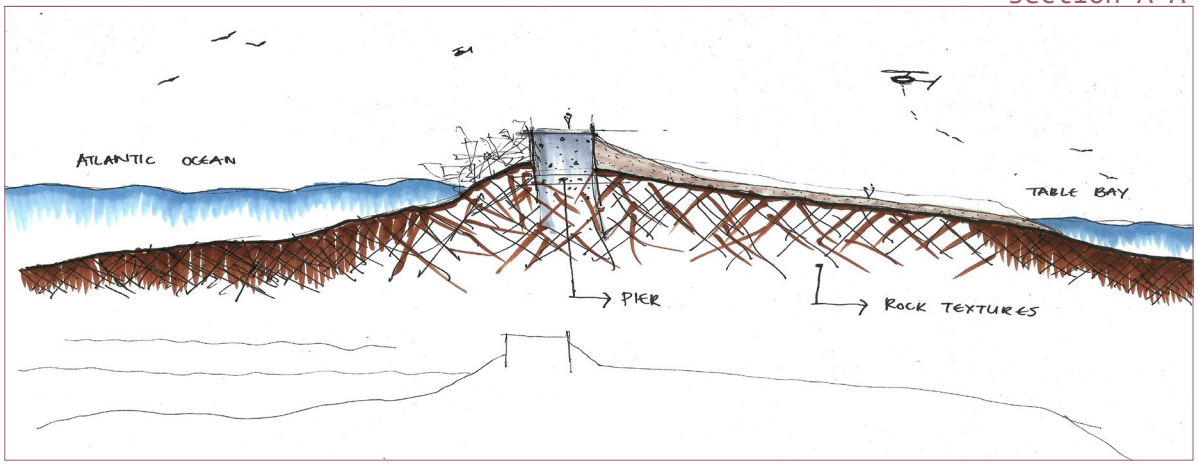
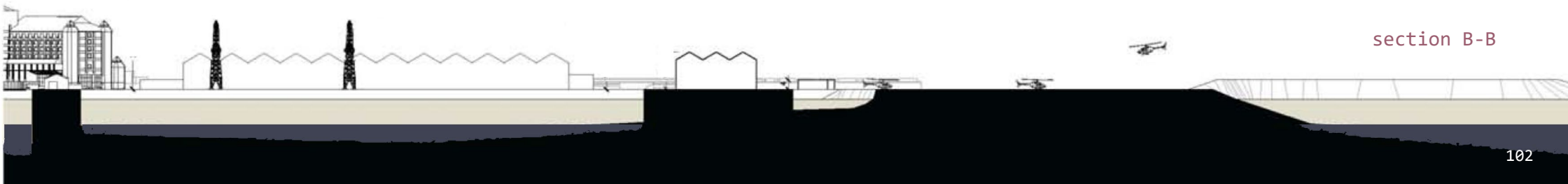


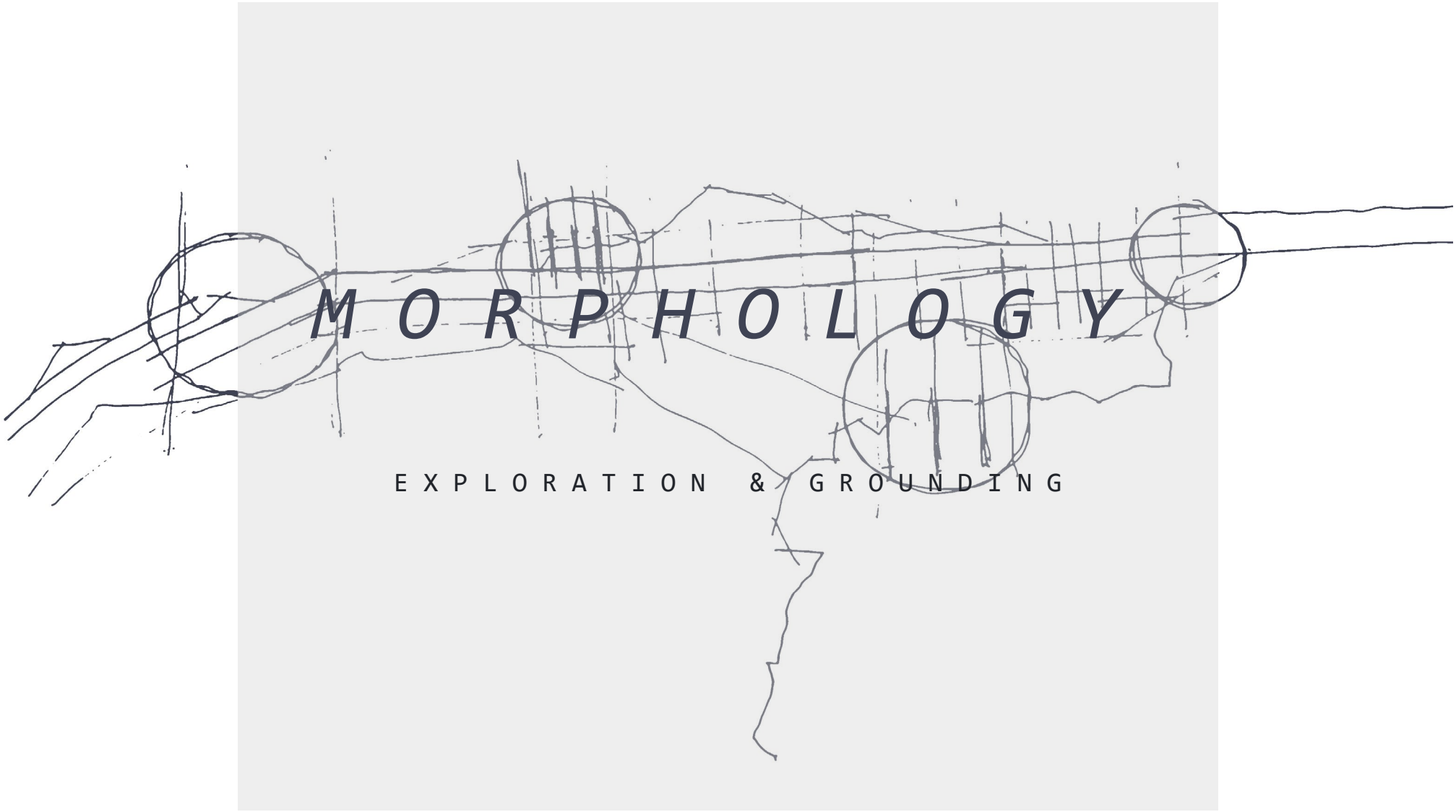
Figure 94

section A-A



section B-B





MORPHOLOGY

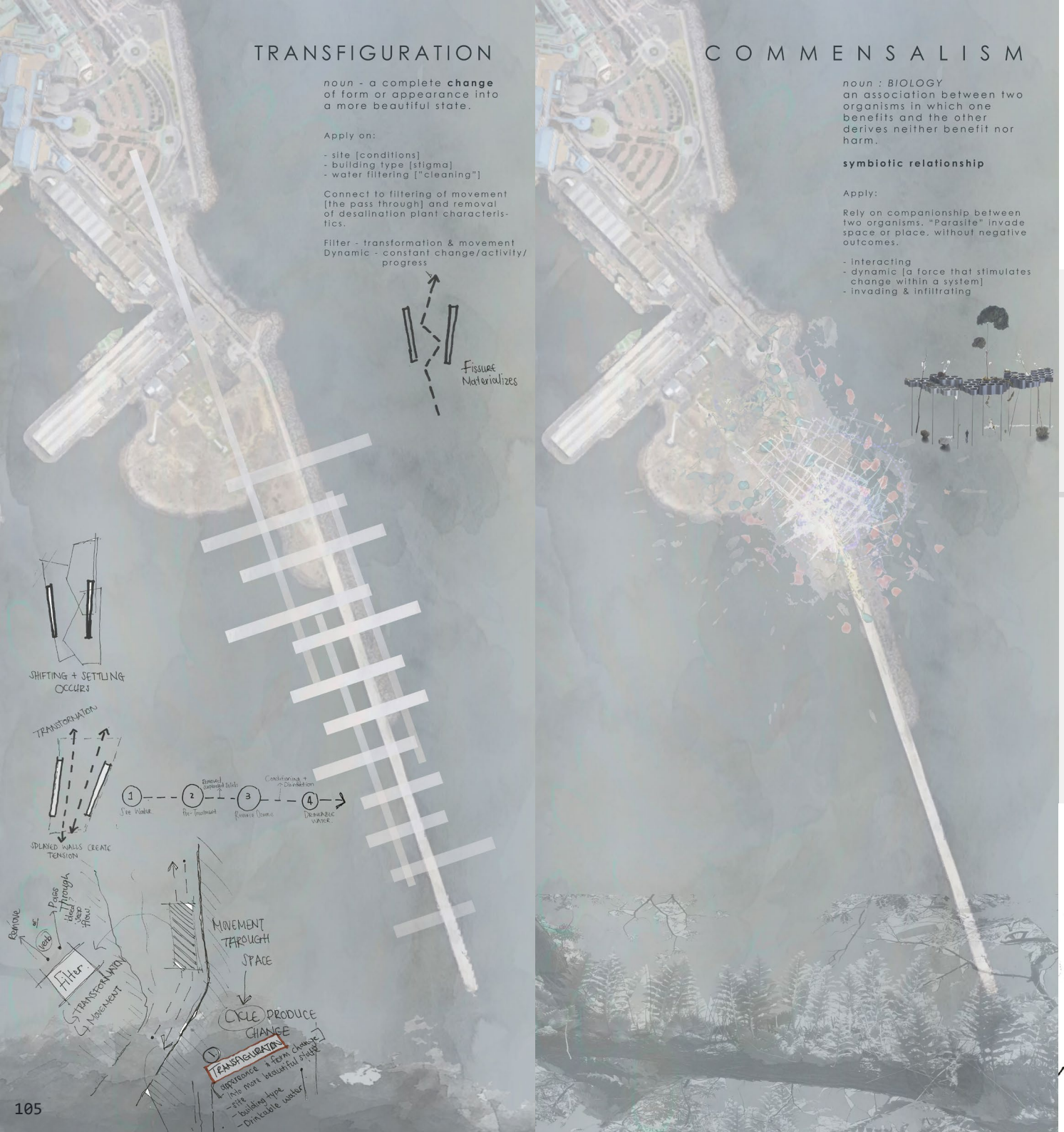
EXPLORATION & GROUNDING

F O R M G I V I N G

The form giving elements of the proposed dissertation is investigated within this section to understand and develop the conceptual thoughts into a more mature reasoning towards the layout of the typological functions.

The *terrain vague* has a fluidity and diversity towards its morphology (Barron and Mariani, 2013), certain processes influence the forms within these spaces, rather than forms itself. The processes and functions of the proposed desalination plant will be one of these influences created within the *terrain vague*.

The morphology of a desalination plant is a functioning of itself, with the investigation of the conceptual lens it begins to get a unique form with topological driven characteristics. Morphing the site with the order-like desalination typology.



CONCEPTUAL APPROACH

Figure 97-99: Illustations explaining how the conceptual thoughts of this dissertation acts as form giving elements and not only as theoretical research.

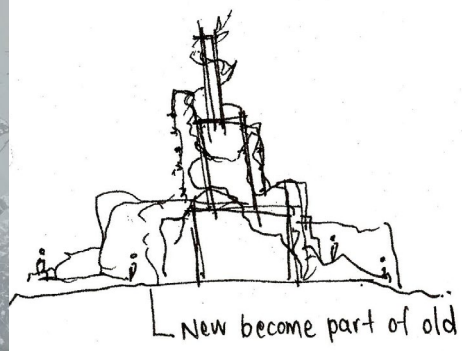


Figure 100

DIFFUSED BOUNDARIES

[physical and emotional | horizontal and vertical]

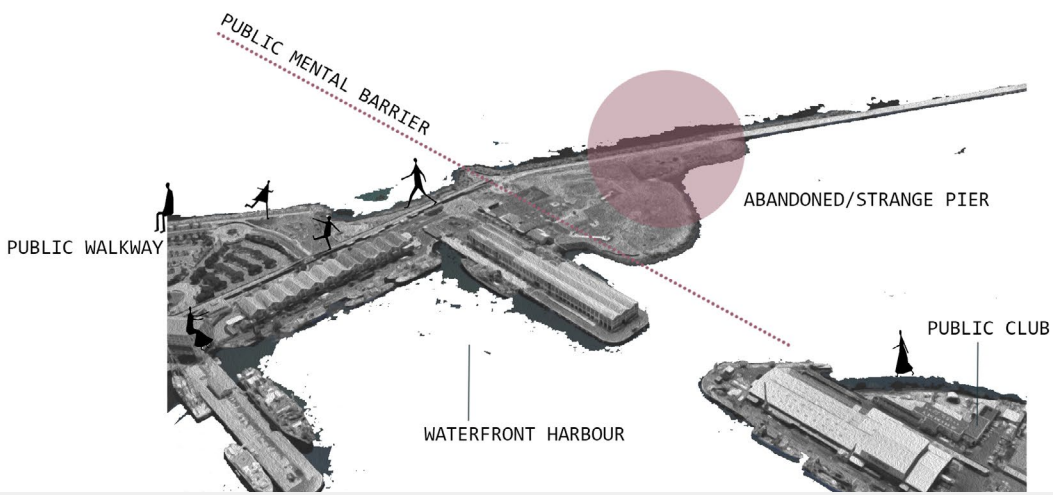
Diffusing the boundaries between:

- earth/sky
- land/sea
- sea/land/sky
- new/existing

Contributing to concept of transfiguration - transformation

Theory connected to the 'in-between' spaces and thresholds.

Shared spaces with different experiences = different spaces with shared experiences



The largest physical boundary within the site is the ocean surrounding it. There aren't many physical boundaries within the open site to refrain the user from accessing the site.

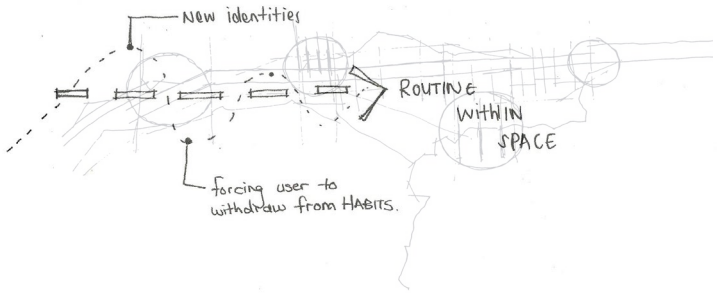
The site is abandoned from the rest of the Waterfront precinct because of its distance from the major public points within this precinct and with nothing to draw the public towards this unique space.

A *mental barrier* exists between the vibrant Waterfront and the lost East Pier. There isn't any form of interest to the user within this unfamiliar space. The proposed design acts as a mental bridge for the East Pier towards Cape Town.

- Recognize how various boundaries are approached by public and soften thresholds accordingly

- Addressing the social boundaries that will lead to public interaction

- Identify why spaces aren't being used and adapt accordingly



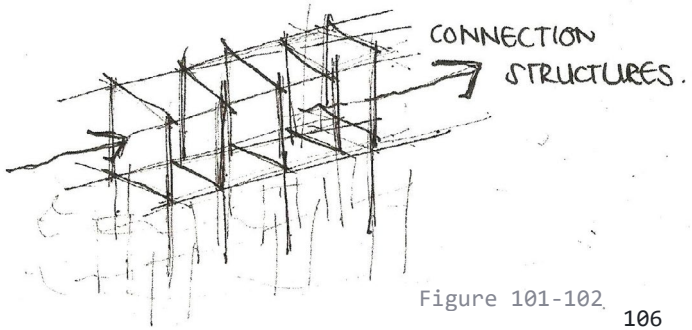


Figure 101-102

PRECEDENT STUDY

RYOTARO SHIBA MEMORIAL MUSEUM

JAPANESE-STYLE RESIDENTIAL AREA OF OSAKA

"The physiological and psychological sense organs in the body can directly feel the corresponding physiological and psychological responses generated by these environmental factors, consequently forming human perception patterns and cultural experiences" (Hsu, Chang and Lin, 2015).

TADAO ANDO
(ARCHITECT)

Figure 103-106: (Hsu, Chang and Lin, 2015)

TADAO ANDO - EMOTIONAL DESIGN

SEE
HEAR
SMELL
TOUCH
TASTE

"The physiological and psychological sense organs in the body can directly feel the corresponding physiological and psychological responses generated by these environmental factors, consequently forming human perception patterns and cultural experiences" (Hsu, Chang and Lin, 2015:457).

Tadao Ando is an architect known for his emotional design theories. His designs "focus on people's emotional feelings and experiences" (Hsu et al., 2015:457). He aims to connect the people and context through the design (Hsu et al., 2015:457). "This allows people to enjoy good emotional design characteristics that is full of fun and beauty" (Hsu et al., 2015:457). We as humans acknowledge our eyes and sight as our main sense to create perceptions, but neglect that there are other senses than visual inputs that contribute to our experiences. Other senses such as hearing, touching, smelling and tasting which can be experienced within our environment.

"The human body connects and operates in a real environment via the body's feelings. The user-friendly design can be achieved by considering the relationship between the two elements: the design form and the human being" (Hsu et al., 2015: 457).

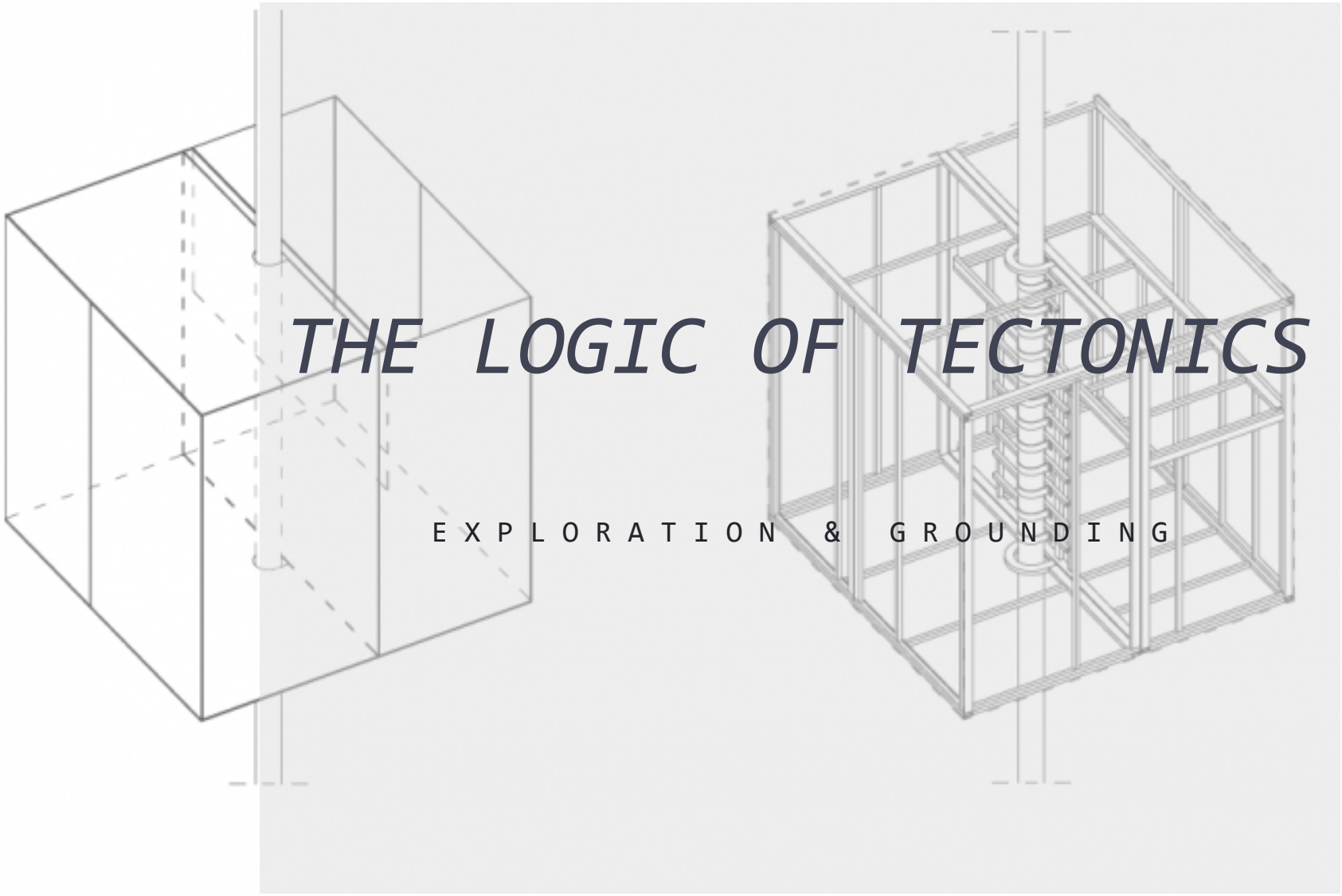
Ando works with a five-senses design mode. He incorporates the essence of nature, "geometry and materials to allow people to use different sense organs to feel the beauty of the building space via vision, hearing, touch, smell and taste" (Hsu et al., 2015: 457).

Ryotaro Shiba Memorial Museum:

"The memorial museum is located in a natural garden, where Ando uses flowers and trees to create an atmosphere of outdoor space" (Hsu et al., 2015:459). He creates the user experience allowing people to "smell the sweetness of the flowers, to listen to the singing birds, to feel the gentle breezes and to appreciate the sky when walking back and forth along the path to quietly enjoy the rhythm and serene ambience" (Hsu et al., 2015:459).

The way Ando uses glass window within the design allows people to see the garden from within the building: the memorial museum. The windows are also used to illuminate certain spaces within the museum and to create a serene and holy atmosphere. "The stair pool is paved with shells to reveal a beautiful image between the mountain and water where people can listen to the sound of venting water and feel the passage of time" (Hsu et al., 2015:460).

The senses of the user drawn to the East Pier is of importance to the success of the design. The desalination plant becomes a place of change for the water, site and city. The way in which the people experience the space should apply to the sense of 'change'. They must sensually experience the change. They must hear the presence of water within the site and being purified within the building. They must be able to see the water change from ocean water to clear drinkable water. People must smell the ocean which creates and contains the essence of the terrain. They should also be able to touch and taste the water as it changes within the building. This will bring a new essence to the user experience within a desalination plant and what is expected within such an industrialized space. Whilst incorporating the senses, the space will be embodied with meaningful and educational routes with a sense of fun and beauty.



THE LOGIC OF TECTONICS

EXPLORATION & GROUNDING

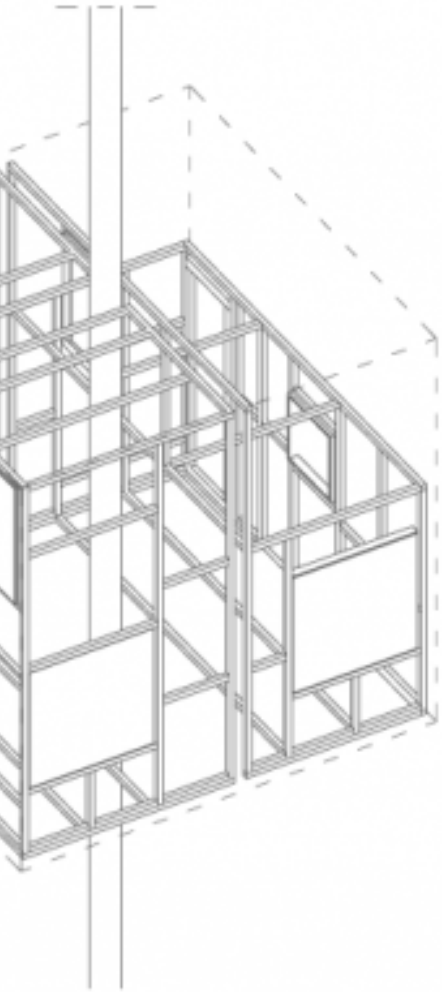


Figure 107: (Mardra, 2017)

Factors of Tectonics

Classic Tectonics

Joint - is the “most fundamental and smallest element of architectural construction. The joint can be regarded as the generator of construction. In various hierarchies, the joint links parts, materials and structures of the whole architecture” (Young, 2017).

Detail - is “the description of the material characteristic of architectural construction. It is also the formation of measurement, placing and making” (Young, 2017).

Material - is “the element that represents the formation of composition of architectural construction” (Young, 2017).

Object – is “the architectural part such as a column, wall, slab, door, window, etc. Many parts go into making the architectural whole” (Young, 2017).

Structure - is “a concept, a unit or a process of transition of force. Structure is also a critical variable that influences tectonics” (Young, 2017).

Construction - is “the operation of realizing the structural concept. Construction is also a hierarchical relational and logic process that places architectural objects in order from small to large” (Young, 2017).

Interaction - is “the correspondence between site and architecture, and between people and architecture, using the capacity of topography and perception” (Young, 2017).

TECTONIC

“relating to building or construction; architectural”

(Young, 2017)

THE MACHINE - THE MOTORCAR

The proposed dissertations aim to create a building with a highly technical function to the surrounding site and city. The project exposes the machine-like typology of a desalination plant to the public and social aspect of the surrounding environment. The structure of the building should allow for the machine to become exposed and accessed.

I consider a car to be the ultimate example of how a machine could function and become aesthetically beautiful. The car consists of many layers to create the simplistic look, but underneath all of those layers there is a chaos only a few could understand. The car as a machine is made out of so many parts and processes to enable the functioning of the machine in total. This is the same within a desalination plant. There is so many layers within the plants process to enable clear and fresh water produce at the end.

The engine of a motorcar is the “heart “of the process to enable the vehicle to move and start, bringing it to life. This is the same with the desalination plant within the proposed building. It becomes the “heart” within the building and structure. The reverse osmosis phase within the desalination process is the “heart” of the purification process. This is where the salt and the clear water is separated from one another.

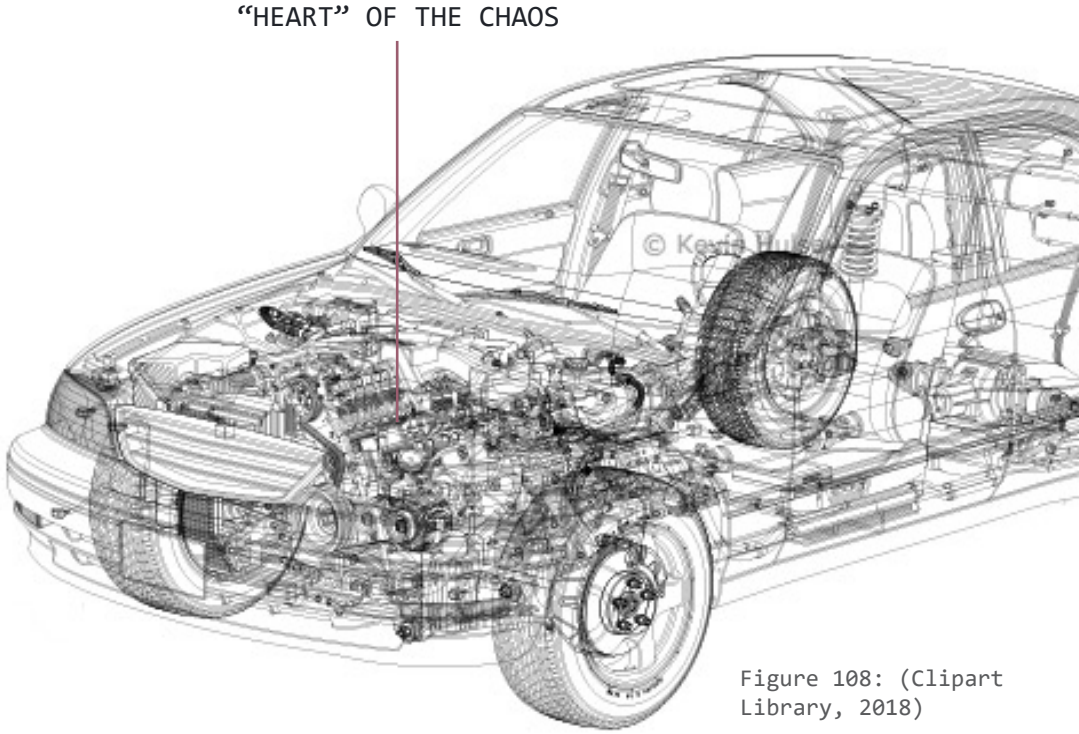


Figure 108: (Clipart Library, 2018)

THE MACHINE-LAYERS

The car and the chaos of its inner workings is an order-like system for those whom understand the process. This chaos and order relationship is investigated through my touchstone process, explain that a system of functions could be chaotic and at the same time have order.

The different layers of a car, the machine, is explored and these will relate to the structural systems used within the design. The machine is mainly constructed with treated steal and this will become the main material within the building structure to allow the exposing of the machine like design.

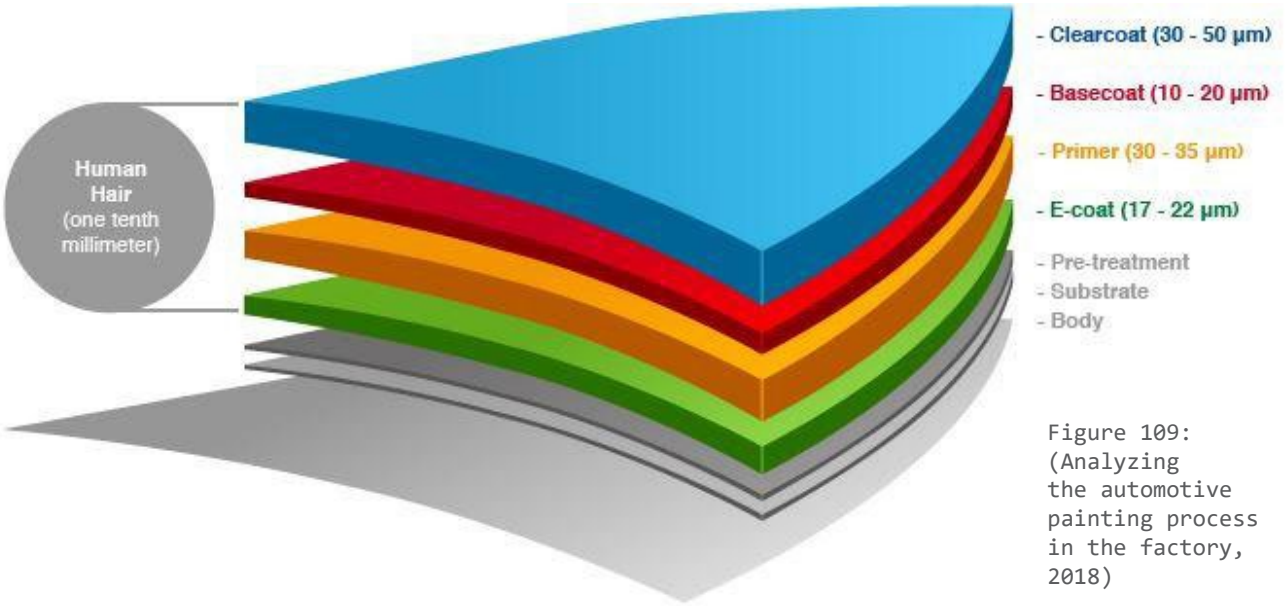


Figure 109: (Analyzing the automotive painting process in the factory, 2018)

Primer: evens out any irregularities of the underlying layer. It can be sanded easily and provides a smooth surface (Analyzing the automotive painting process in the factory, 2018).

Basecoat: gives the main color to the piece, therefore it plays a significant role in establishing the final visual impression (Analyzing the automotive painting process in the factory, 2018).

Clearcoat: seals everything else and is applied last. It protects the car from external elements like snow, UV radiation, dirt, etc (Analyzing the automotive painting process in the factory, 2018).

BARE STEEL - GALVANIZED - ZINC PRE-TREATMENT - SEALER COAT - PRIMER COAT - TOP COAT

P R E C E D E N T S T U D Y

MARITIMT VITENSENTER

ELIAS MOHR JENSEN

(Thesis)

Figure 110: (Jensen, 2015)

CONSTRUCTION

The structure of this house of science is an important part of the expression of the building (Jensen, 2015:96). The technical considerations are thought as aesthetic potentials rather than challenges (Jensen, 2015:96).

The building consists of several layers - conceptually as well as physically (Jensen, 2015:96). Jensen (2015:96) uses different elements of architecture to understand the tectonic nature of the building by use of materials and transitions within the atmosphere.

Jensen mentions that the thoughts of the building are first and foremost a construction, the expressive potential of the structural system (Jensen, 2015:96). “The structure emphasizes the buildings function and identity as a science centre, creating a guiding gesture along the circular flow due to its dynamic shape” (Jensen, 2015:96).

The structure within the desalination plant is function driven and has to have the identity of a desalination plant. A desalination plant is industrial and has industrial qualities and functions. This could not be ignored. The structure should be in such a state to accommodate these functions within the building.

The building is an expressive structural system with the structure emphasizing the inner functions and workings of the plant. The structure should allow visual experiences of the desalination plant, allowing the user to connect with the workings of the building and the surrounding site. The building should become a structural celebration, exposing the true essence of the building.

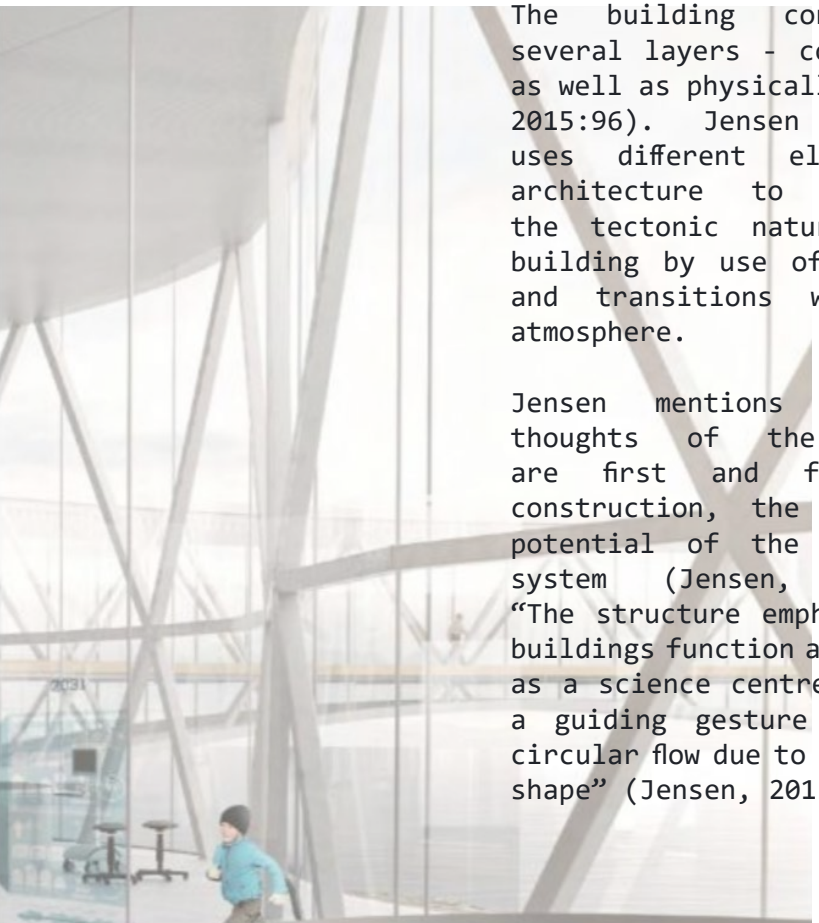
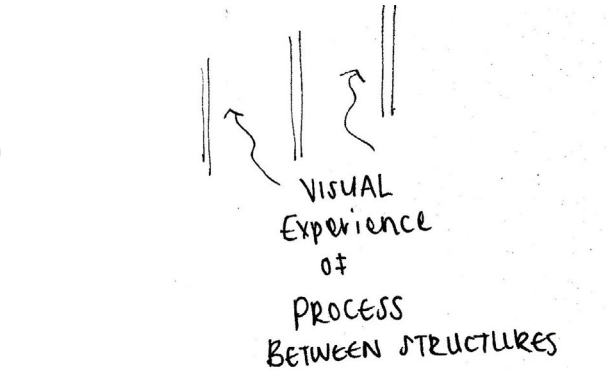
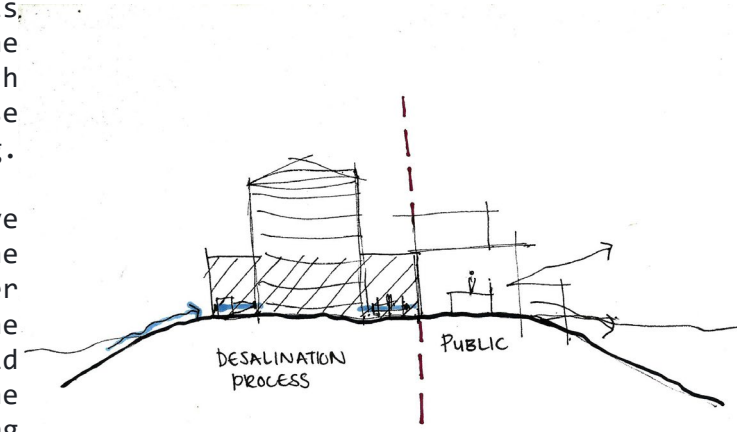
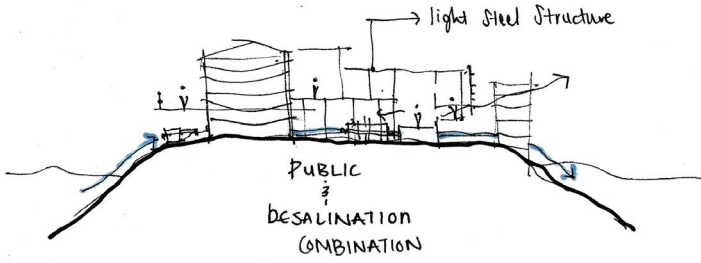


Figure 111: The expressive potential of the structure (Jensen, 2015).







Figures 112-114

MATERIALS

Figure 115: The wood surface between the hard surfaces softening the user experience and guiding them through the building (Jensen, 2015).

The materials of a building are of utmost importance for the experiences created within the space and their atmospheres (Jensen, 2015:94). The atmosphere the architecture of this building aims is to create, is one that draws reference to the maritime in a contemporary manner (Jensen, 2015:94).

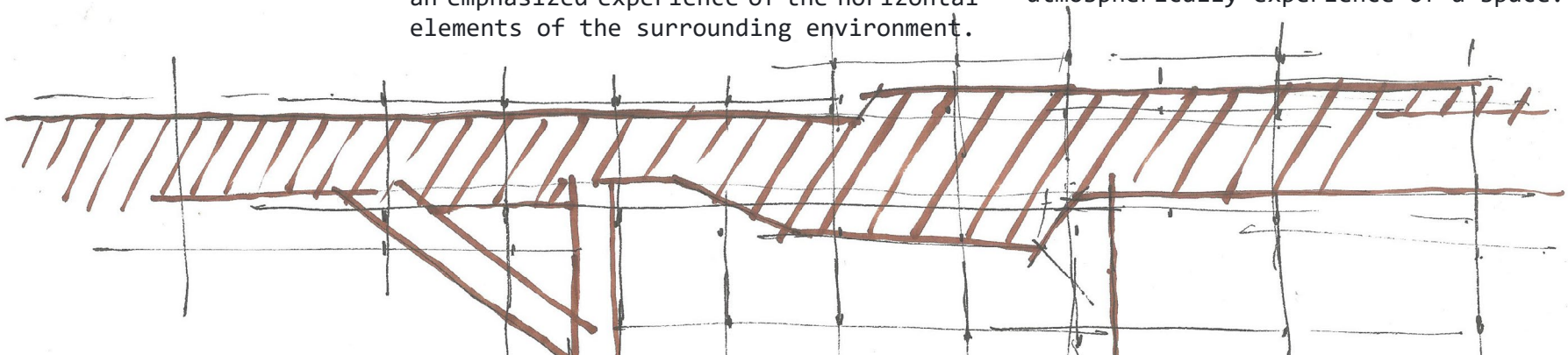
The reference to the maritime construction is clear, since “steel is the most common material in industrial ship building” (Jensen, 2015:94). The roof and bottom planes are created with a hard industrial finish in steel and zinc (Jensen, 2015:94). Jensen (2015:94) uses wood as a floor finish. “Wood, being another maritime material, is used in more refined vessel designs” (Jensen, 2015:94). Wood s used for reference to ship decks (Jensen, 2015:94). The wood also “offers a warmth to the other colder materials used within” the building (Jensen, 2015:94).

The glass facades are used in many places inside the building. This seeks to create an emphasized experience of the horizontal elements of the surrounding environment.

The use of steel construction within the desalination plant creates the visual connection with the user illustrated within the construction part. The steel construction does not interfere with the desalination operations and it allows the user to experience the process.

Using wood as a material within the public spaces of the building is a great way to encounter the steel, order-like elements, and to express the public movement. As Jensen (2015:94) states, the wood floor finish is a maritime material used within refined vessel designs and connects the design to the surrounding context of the harbour and the ships accessing the harbour, while traveling close to the site (Jensen, 2015:94).

The glass facades will allow the user to connect to the environment and they will be reminded of the context they are within. This is also mentioned in the morphology section explaining the importance of glass facades in the atmospherically experience of a space.



The bridge provides a different atmosphere than the larger exhibition spaces with high ceilings (Jensen, 2015:99). Jenson creates a feeling of floating over the water below the bridge (Jensen, 2015:99). This is emphasized by the transparency of the facade and lightness of the structure (Jensen, 2015:99).

The structural system is utilized to its full potential within this space (Jensen, 2015:99). The structure is fully visible and gives a clear understanding of the building physics (Jensen, 2015;99). The structure emphasizes the movement along the bridge and exhibitions.

Within the design of the desalination plant there is an opportunity to provide the user an atmospherically experience other than the functions within the building. The building is situated within a site where one should allow the user to experience the context and not only the building.

The movement of the user through the building should incorporate the opportunity and possibility to experience the outside workings of the desalination plant, because this is where the process of purification starts. It starts within the ocean and the structural experience of the building should allow the user to become part of this process.

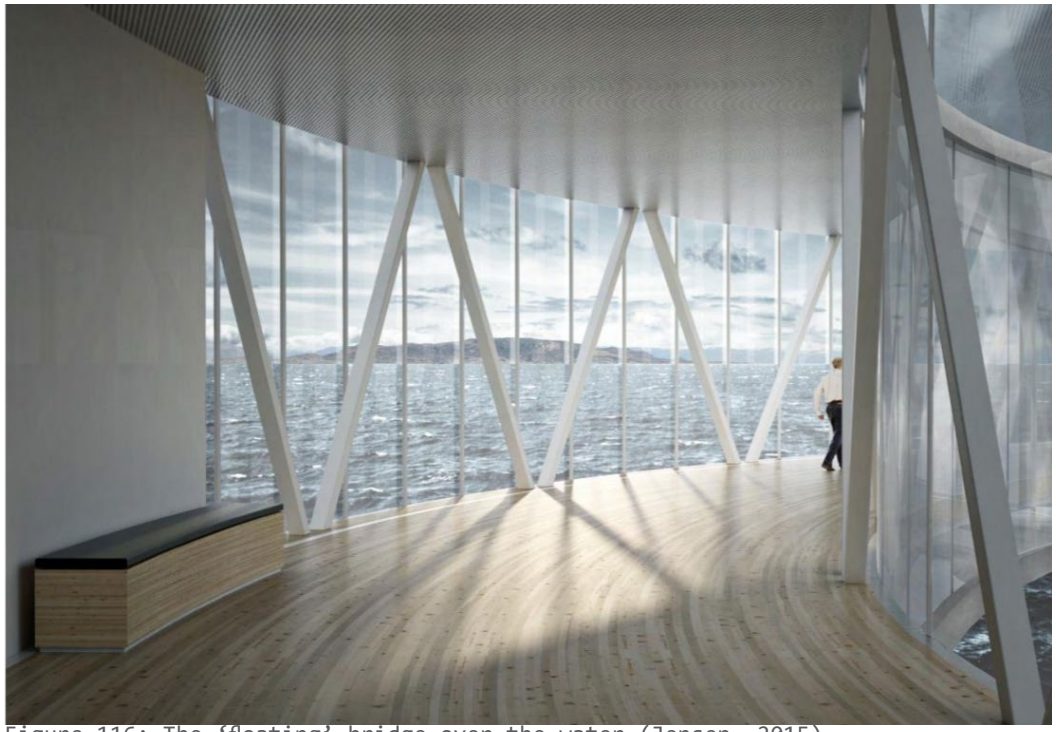


Figure 116: The 'floating' bridge over the water (Jensen, 2015).

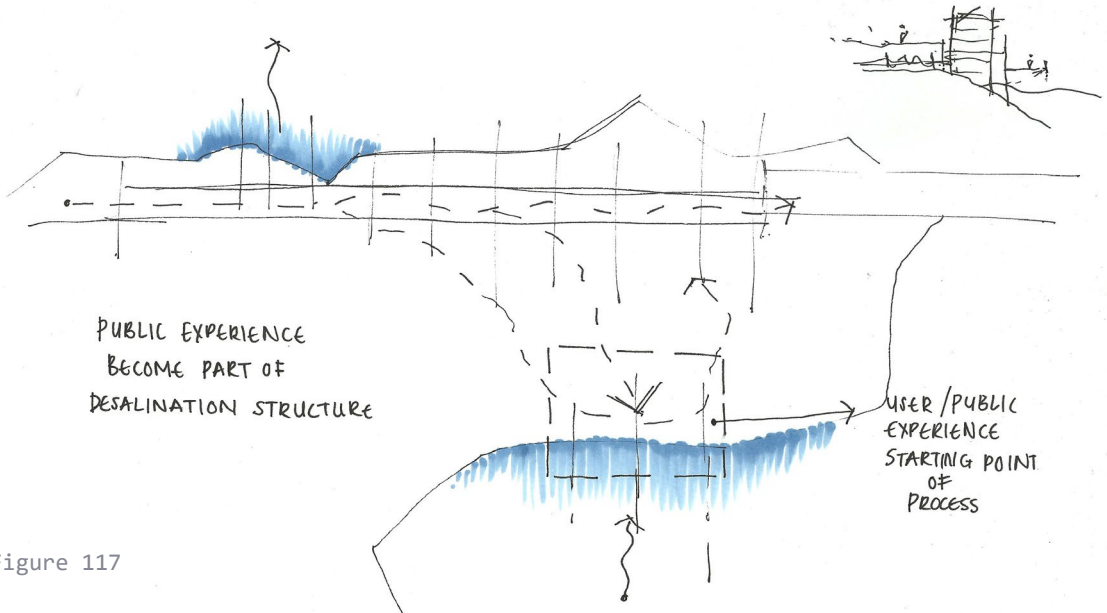


Figure 117

PART 03

RESEARCH APPLICATION

The research done in part 2 is analysed and applied to the design development.

The *design development* throughout the dissertation and design solutions to challenges.

The *technical development* of the dissertation and the research application towards the technical challenges.

DESIGN SYNTHESIS:

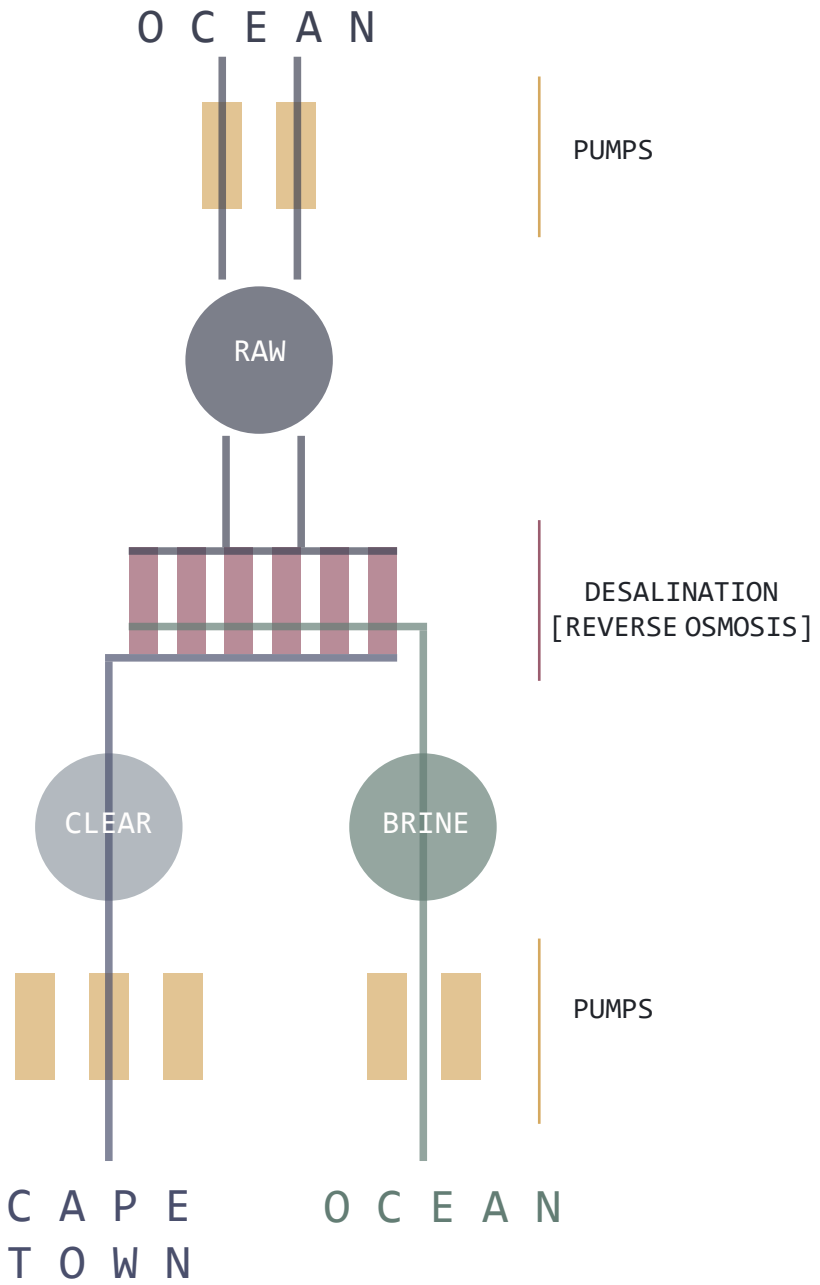
PART 04

REFLECTION & EVALUATION

TECHNICAL REPORT:

DESIGN SYNTHESIS

RESEARCH APPLICATION



DESALINATION SYNTHESIS AND EXPLORATION

The understanding of how a desalination plant works, is important before designing the system to create spaces big enough for the equipment installed and to have the knowledge of the program and process to design spaces that comply with the structural requirements of such building.

This illustration previously explained is the process of the existing desalination plant within the site. This diagrammatical explanation of the process is only to understand the different departments within the desalination program.

The process is far more complicated than this illustration make it to be and the investigation of these processes is the first step to understanding the special requirements needed within the proposed building.

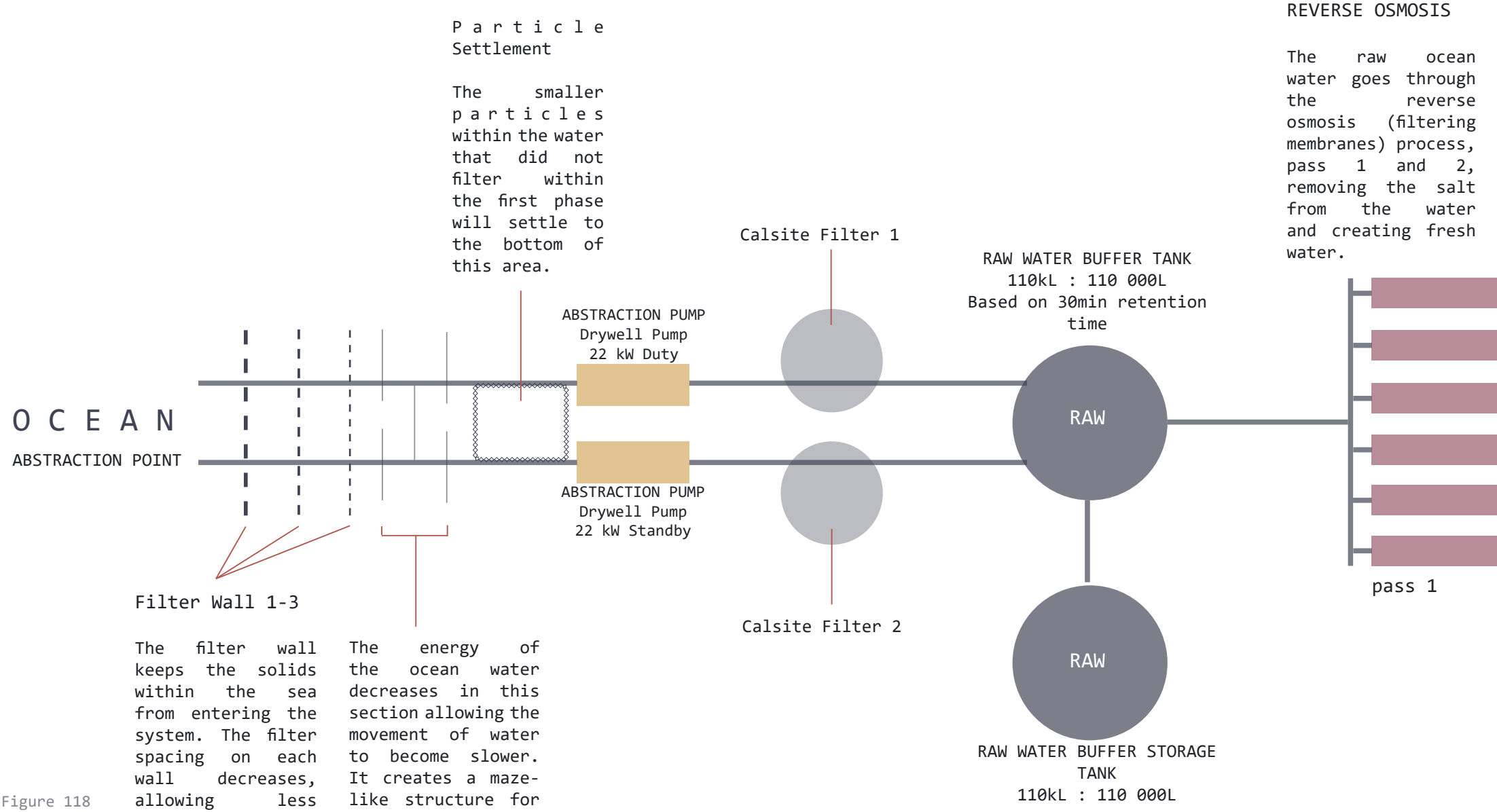
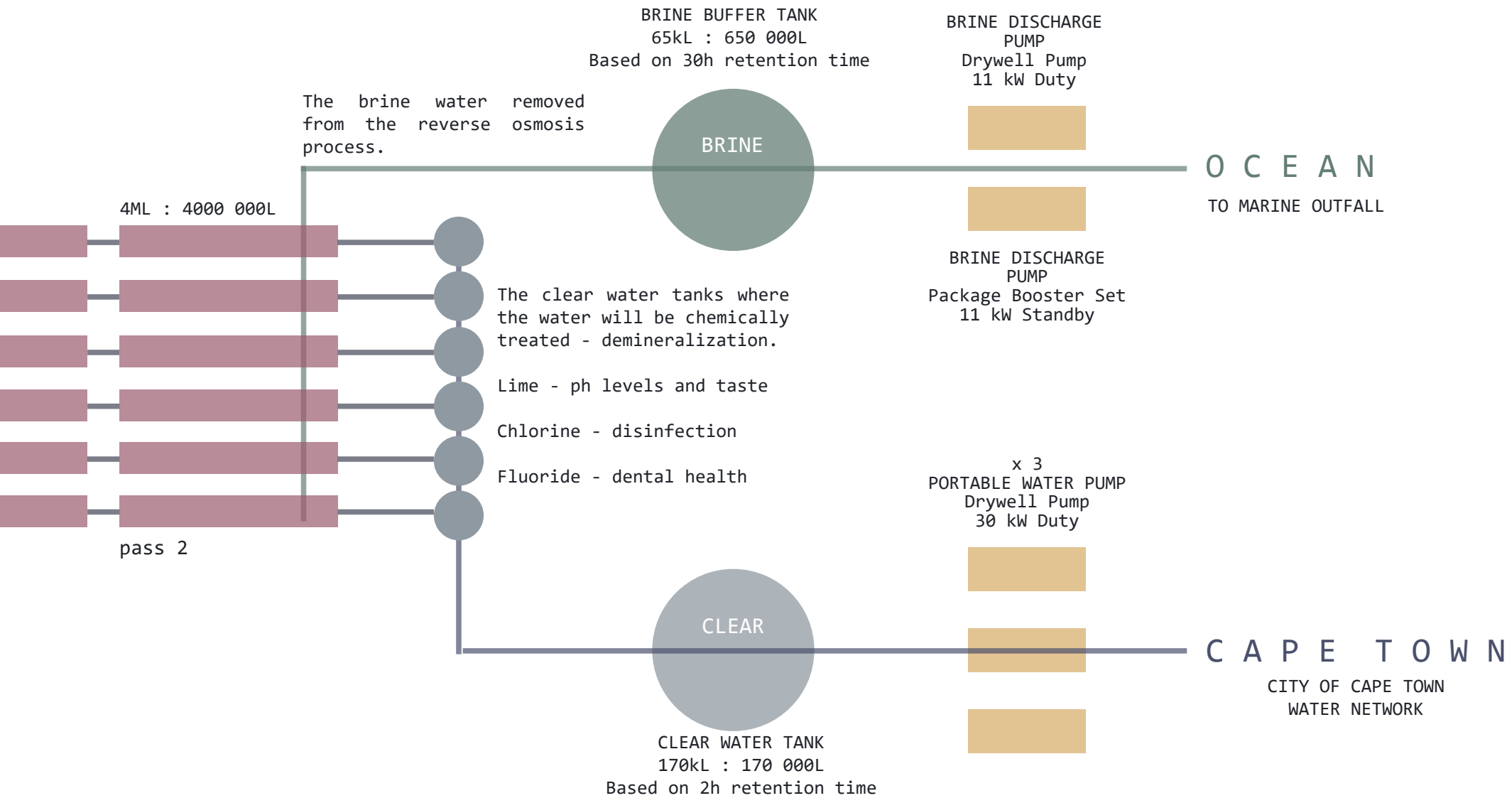
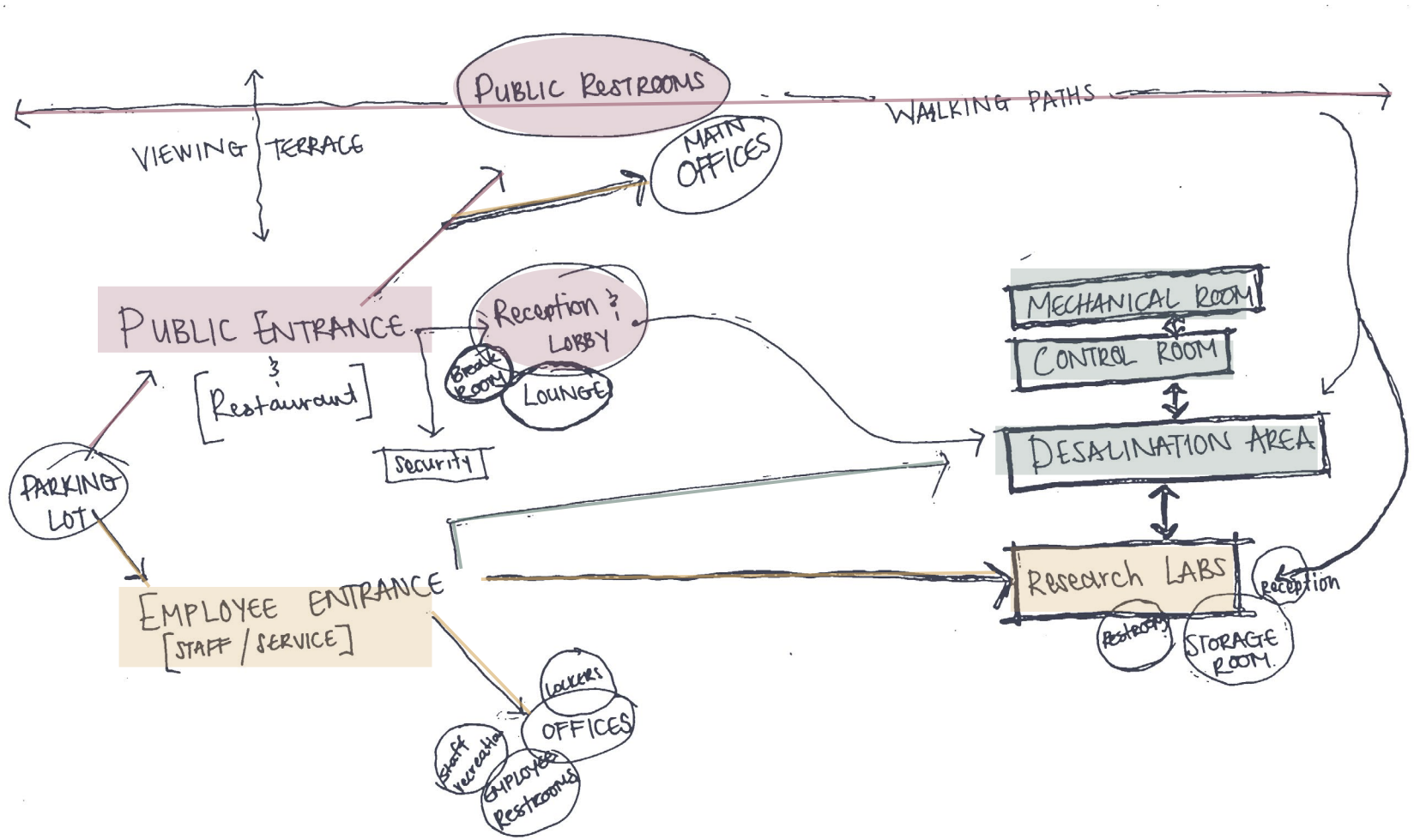

Particle Settlement
The smaller particles within the water that did not filter within the first phase will settle to the bottom of this area.
REVERSE OSMOSIS
The raw ocean water goes through the reverse osmosis (filtering membranes) process, pass 1 and 2, removing the salt from the water and creating fresh water.
Calsite Filter 1
RAW WATER BUFFER TANK
110kL : 110 000L
Based on 30min retention time
ABSTRACTION PUMP
Drywell Pump
22 kW Duty
OCEAN
ABSTRACTION POINT
RAW
ABSTRACTION PUMP
Drywell Pump
22 kW Standby
pass 1
Filter Wall 1-3
The filter wall keeps the solids within the sea from entering the system. The filter spacing on each wall decreases, allowing less access.
The energy of the ocean water decreases in this section allowing the movement of water to become slower. It creates a maze-like structure for the water to move through.
Calsite Filter 2
RAW
RAW WATER BUFFER STORAGE TANK
110kL : 110 000L

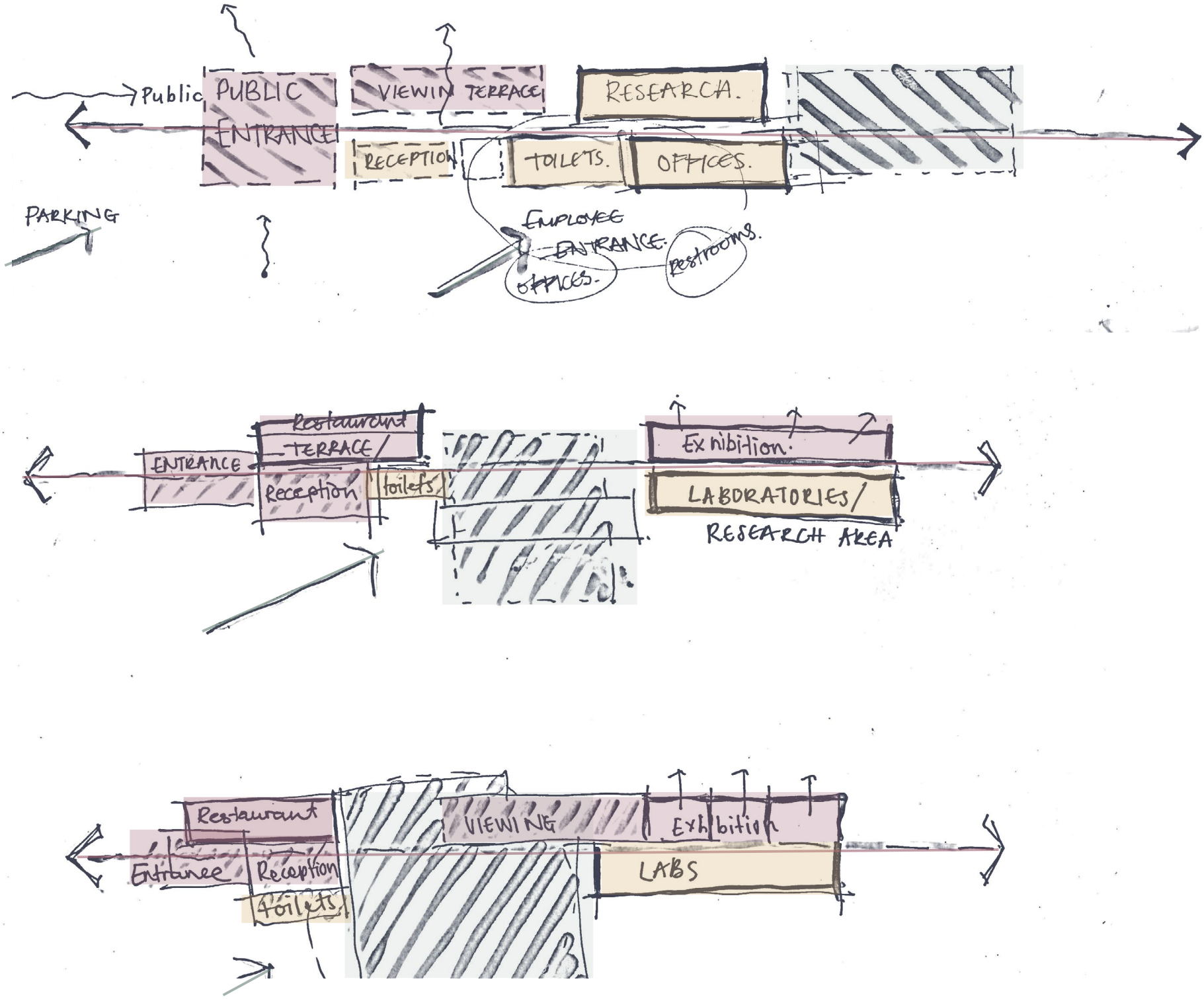
Figure 118


BRINE BUFFER TANK
65kL : 650 000L
Based on 30h retention time
BRINE DISCHARGE PUMP
Drywell Pump
11 kW Duty
The brine water removed from the reverse osmosis process.
BRINE
OCEAN
TO MARINE OUTFALL
4ML : 4000 000L
BRINE DISCHARGE PUMP
Package Booster Set
11 kW Standby
The clear water tanks where the water will be chemically treated - demineralization.
Lime - ph levels and taste
Chlorine - disinfection
Fluoride - dental health
x 3
PORTABLE WATER PUMP
Drywell Pump
30 kW Duty
pass 2
CLEAR
CAPE TOWN
CITY OF CAPE TOWN
WATER NETWORK
CLEAR WATER TANK
170kL : 170 000L
Based on 2h retention time



PROGRAM LAYOUT DIAGRAMS

Figures 119-122



Interpretation

The first sketches investigating the programmatic layout of this dissertation. The thoughts on what services is connected to what functions within the building and where the public and private functions separate and where it becomes one.

This exploration is necessary to understand the workings of movement within the building and the start of the program understanding within.

CONCEPTUAL MODEL #1

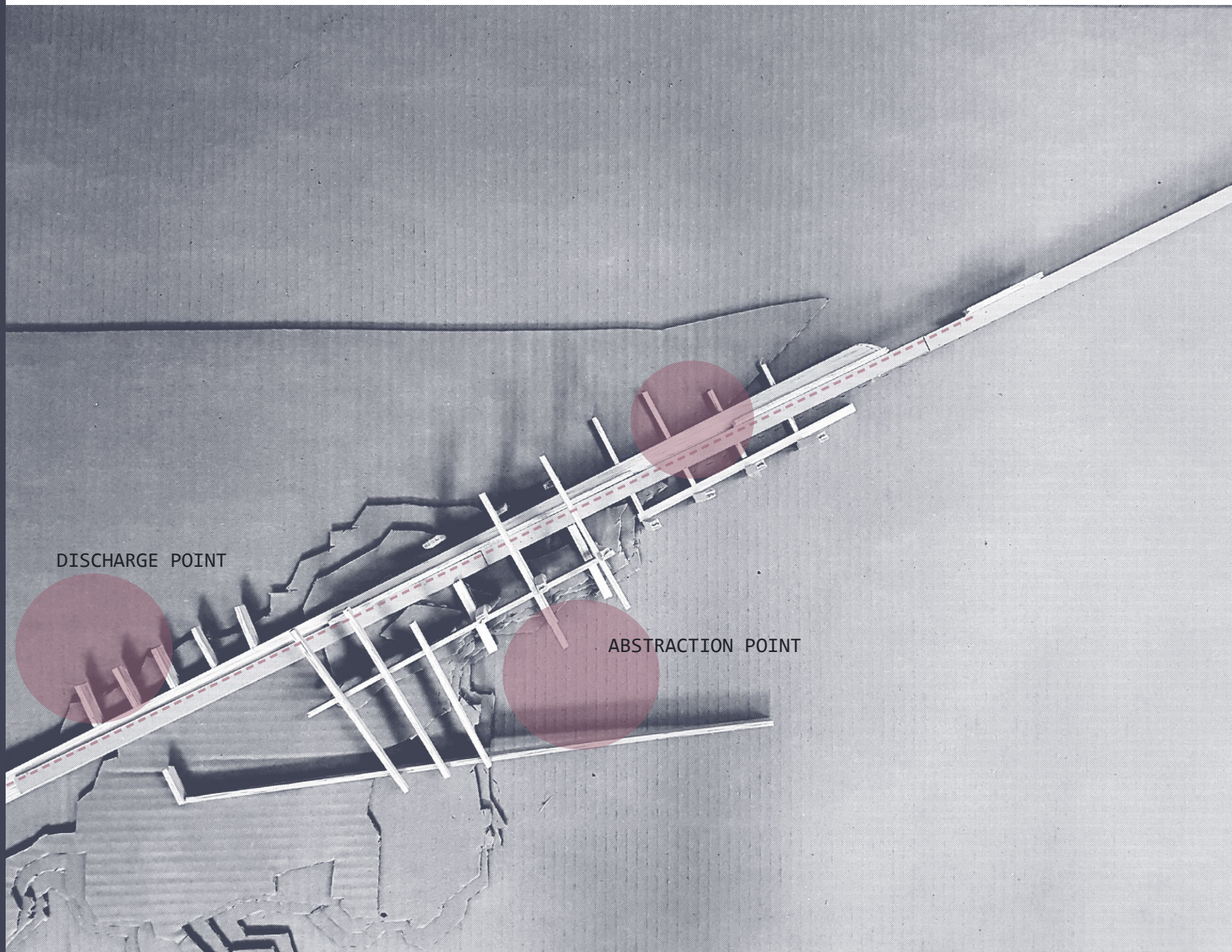
CONCEPT TO FORM

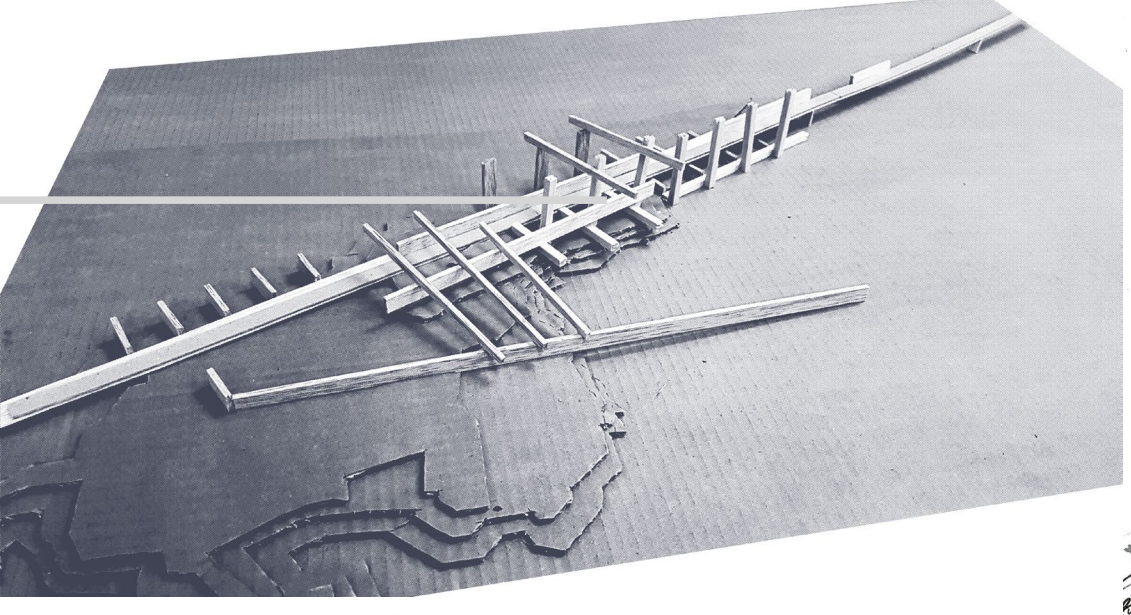
This is the first exploration of models incorporating the site, typology and the conceptual background of the project, with the knowledge of the desalination process and the influences of it to be incorporated within the design layout.

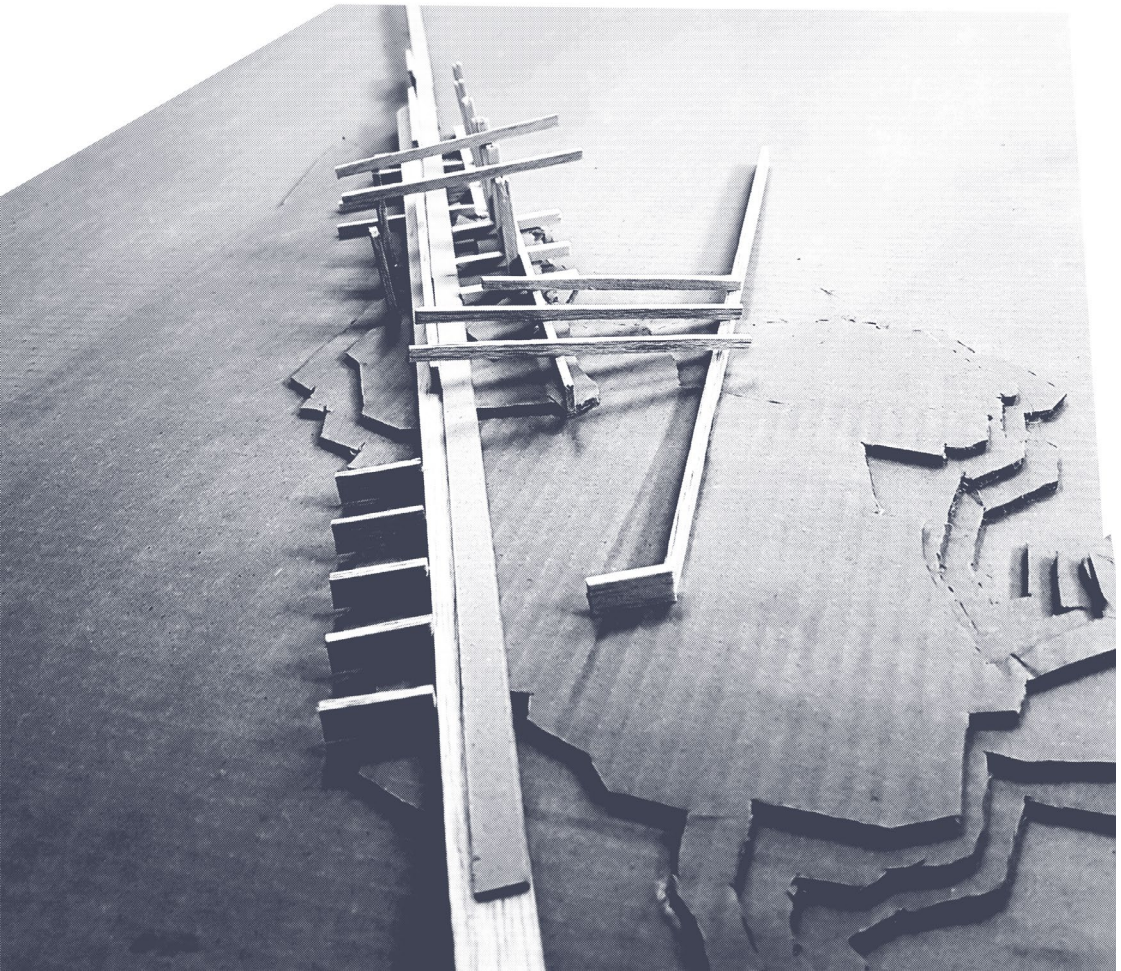
Model interpretation

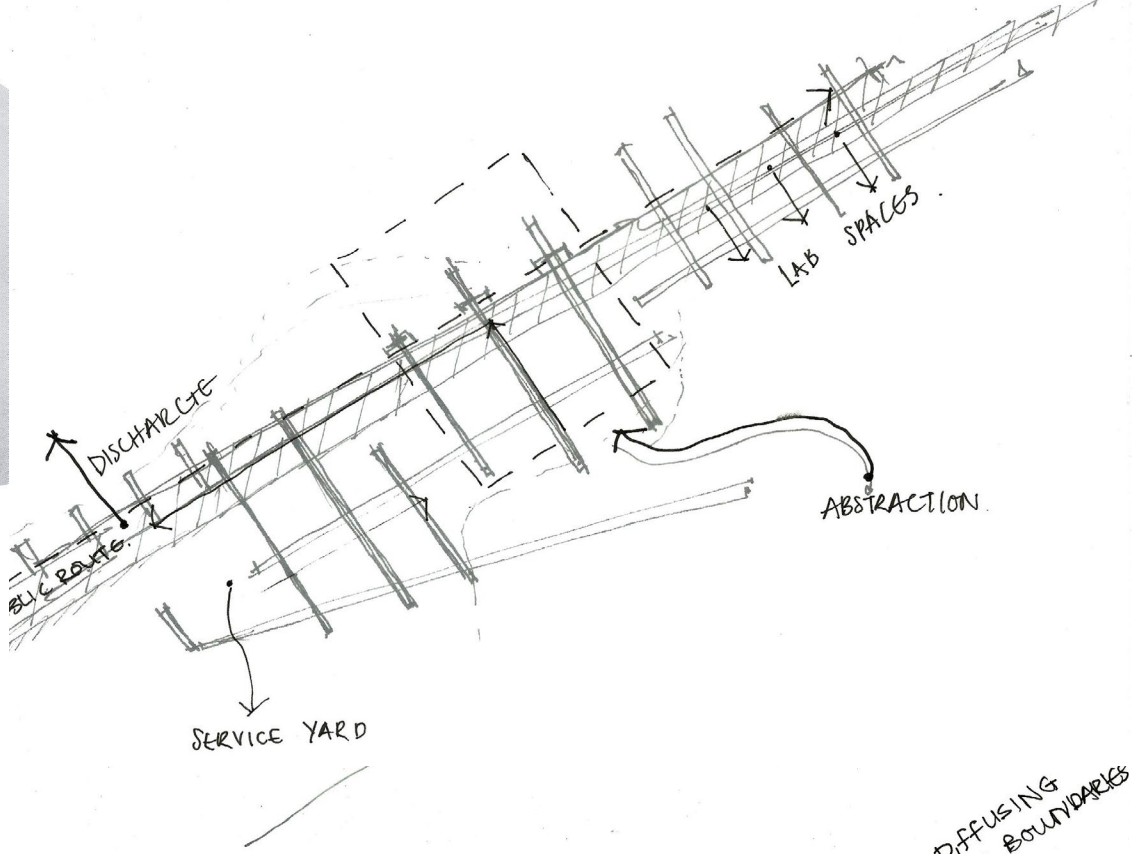
This is also the first site exploration regarding the contours and interaction with the pier itself.

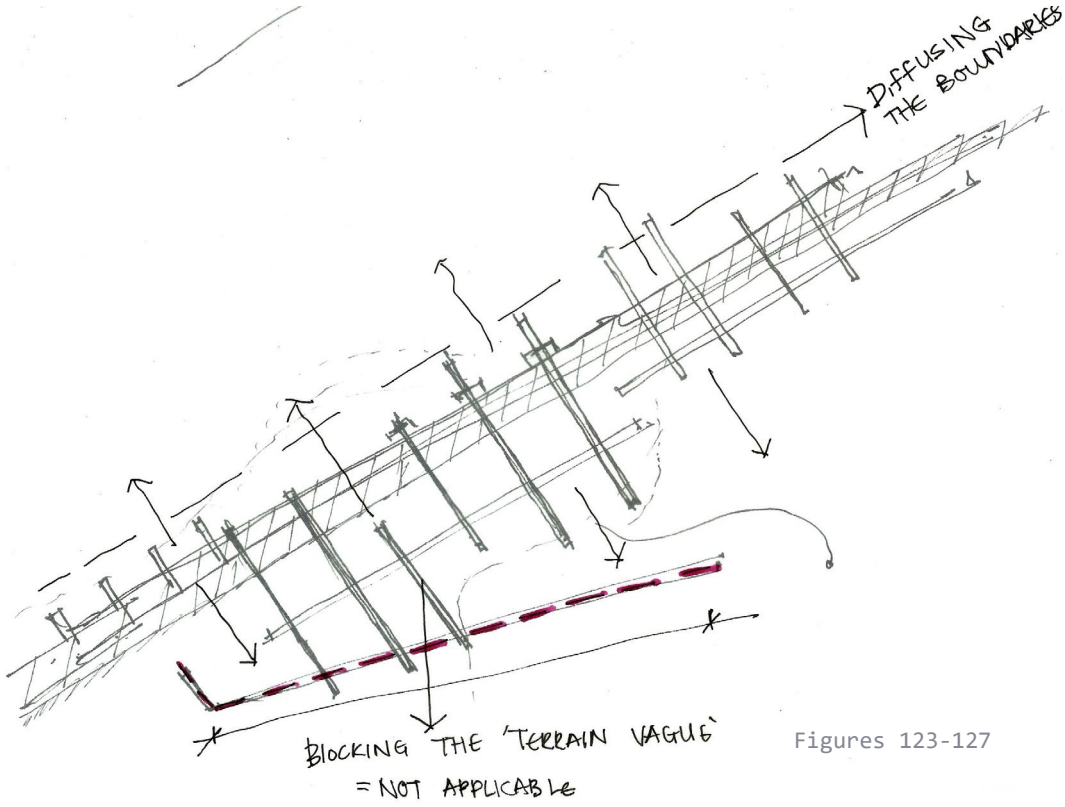
The design aims to diffuse the boundaries between the pier, site and building. This conceptual model is the first exploration of this form, but the form is not allowing the building to connect with the south side of the site. This conceptual model is not successful to reconnect the *terrain vague*.











Figures 123-127

CONCEPTUAL MODEL #2

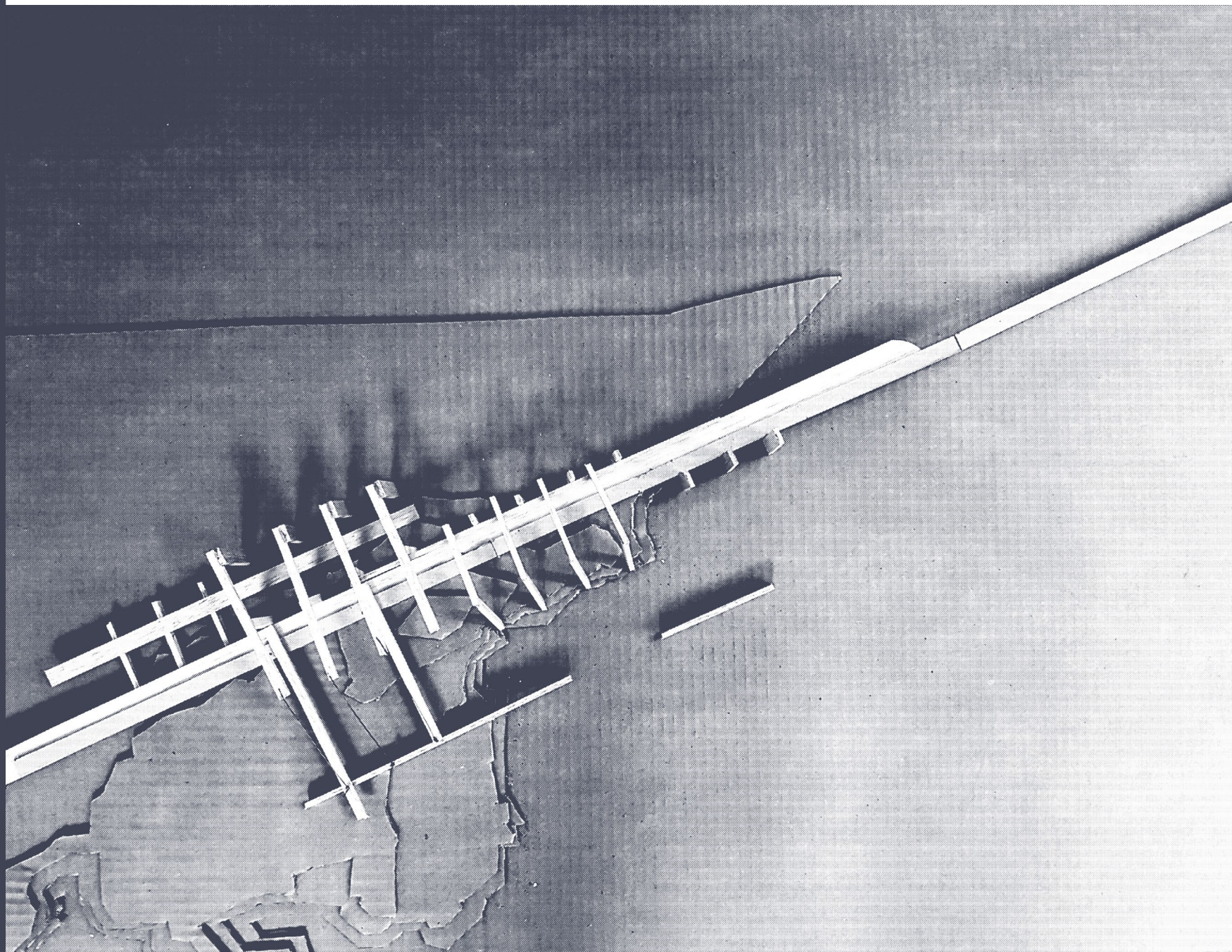
Model interpretation

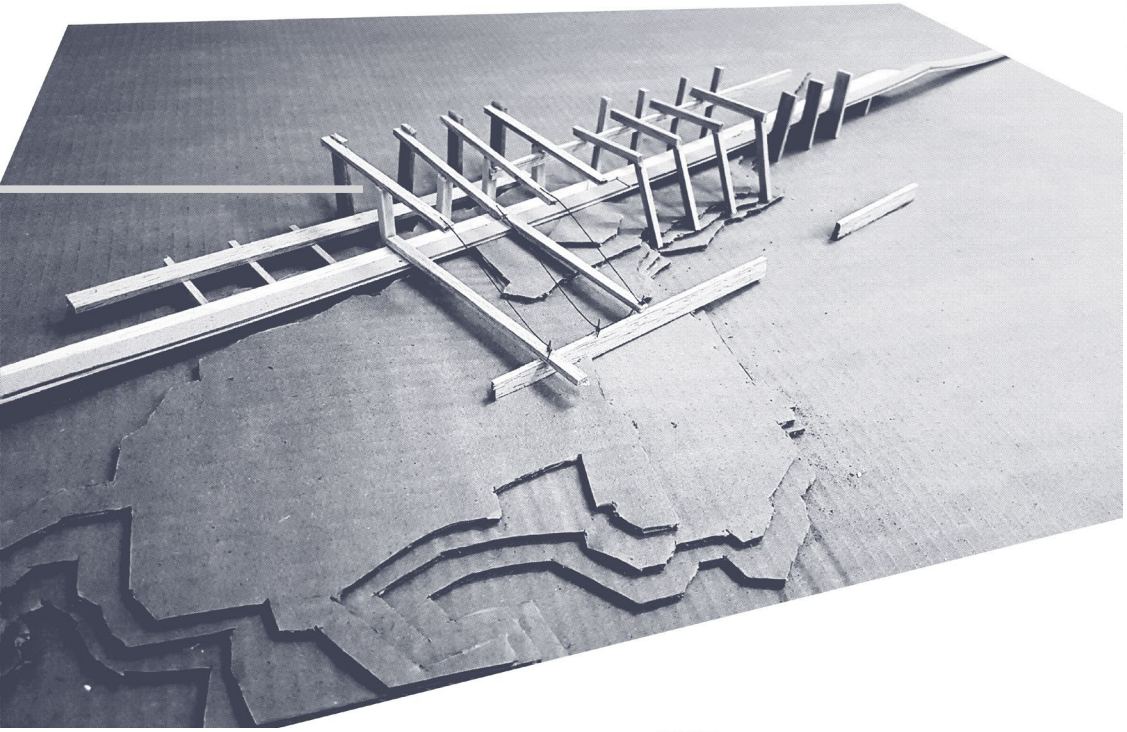
The second model is a correction and exploration of the first. The part that enclosed the building from the site is trying to become less solid by breaking it up. This is still not ideal for there are still elements hidden and enclosed from the *terrain vague*. It also obstructs the water abstraction point and the flow towards the intake area.

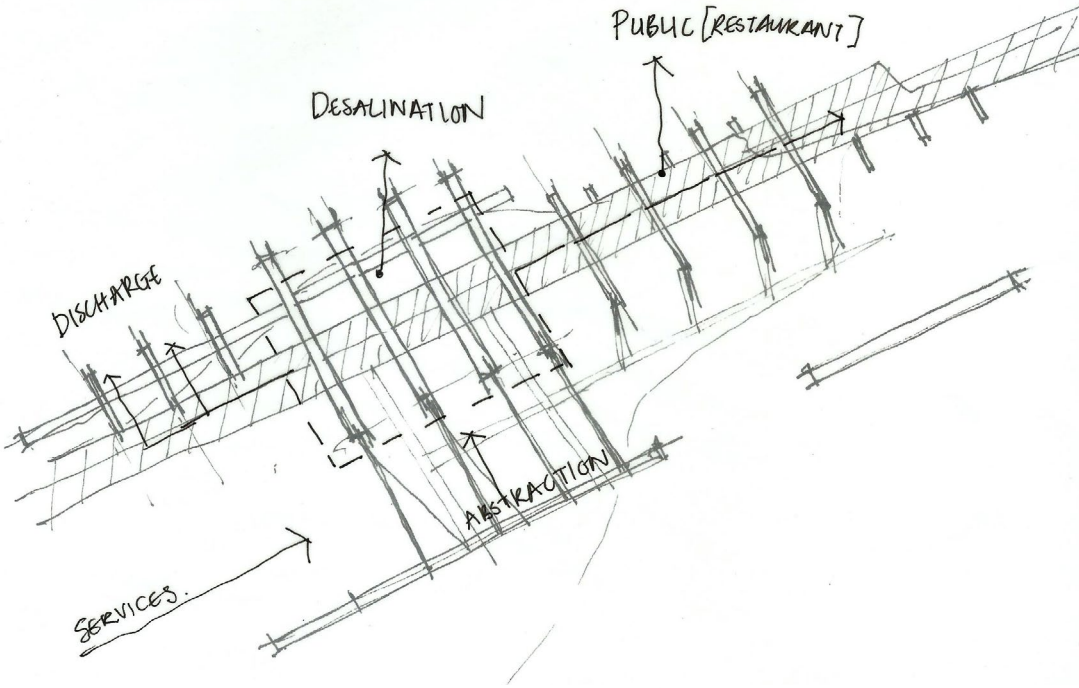
The service area on the south side is more open for access than the first model.

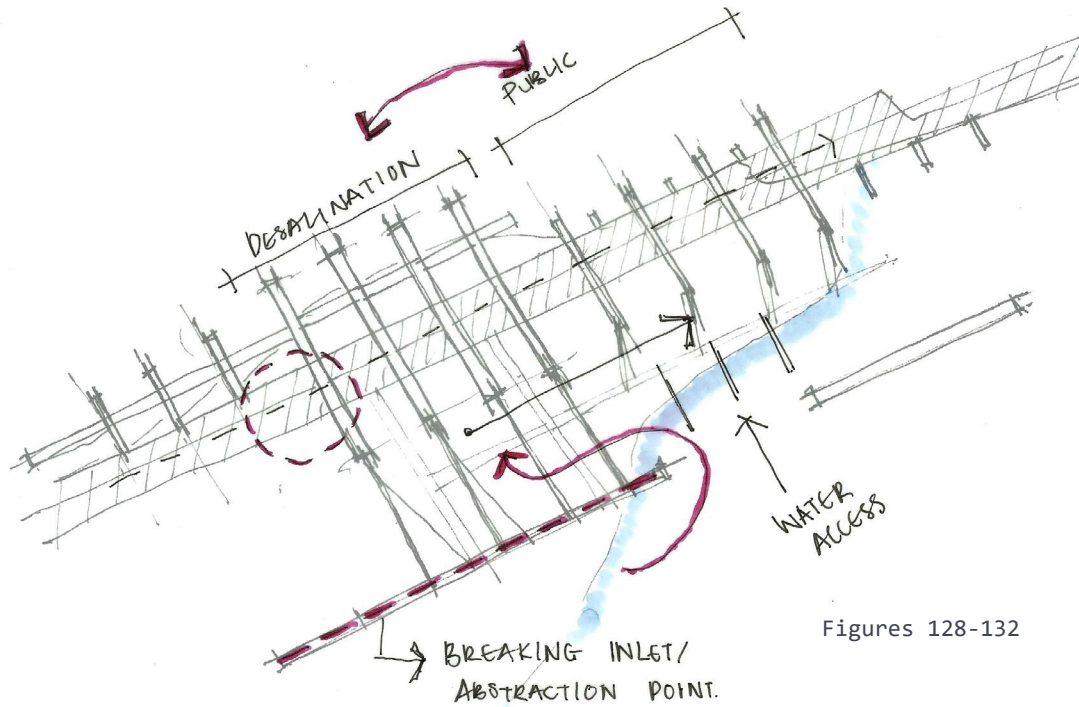
Within this model it will be best to move the desalination area closer to the water where it would be easier for the abstraction point to connect with the ocean when investigating the contours.

The public space should rather become an integrated element within the building and become part of the desalination plant, also explained within the morphology section of this dissertation.









Figures 128-132

CONCEPTUAL MODEL #3

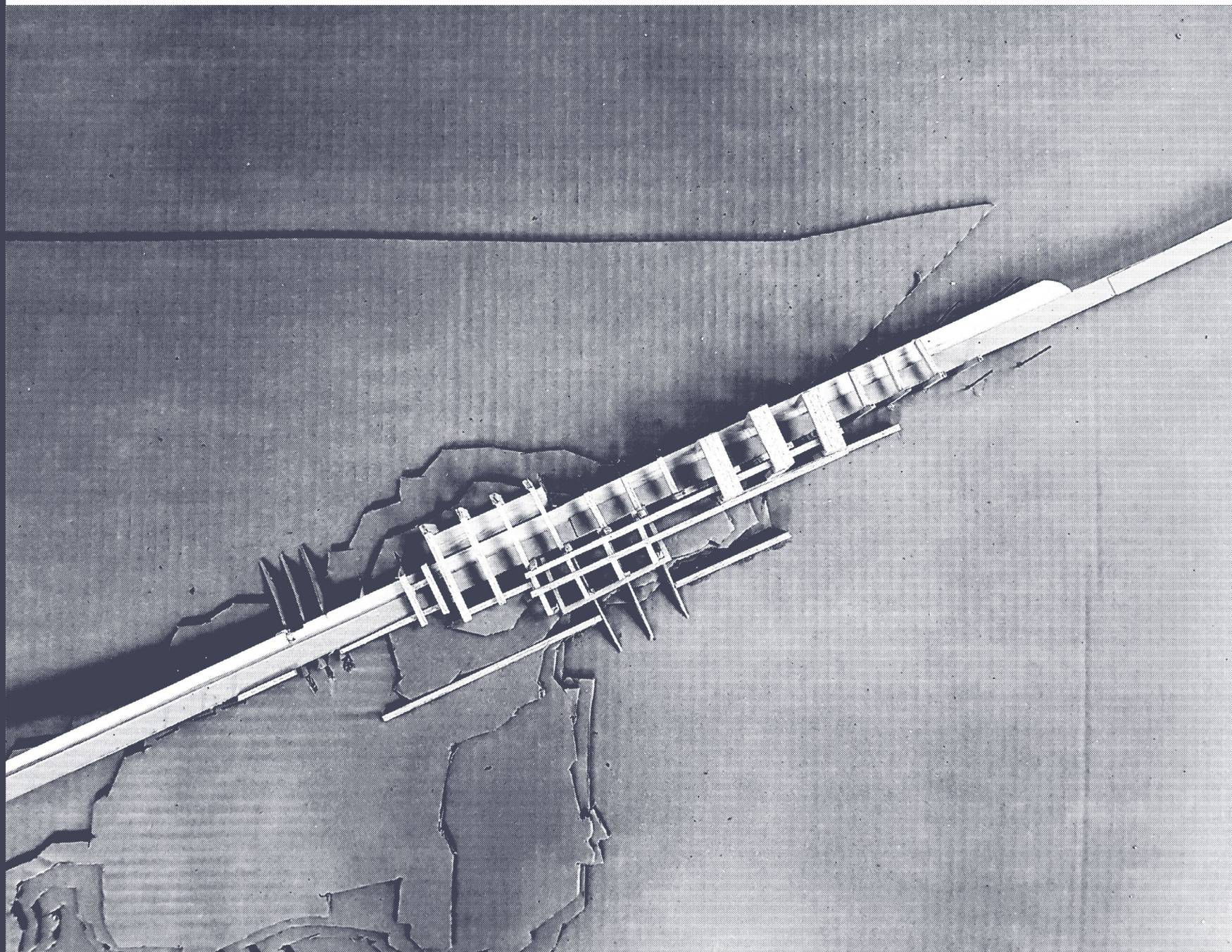
Model interpretation

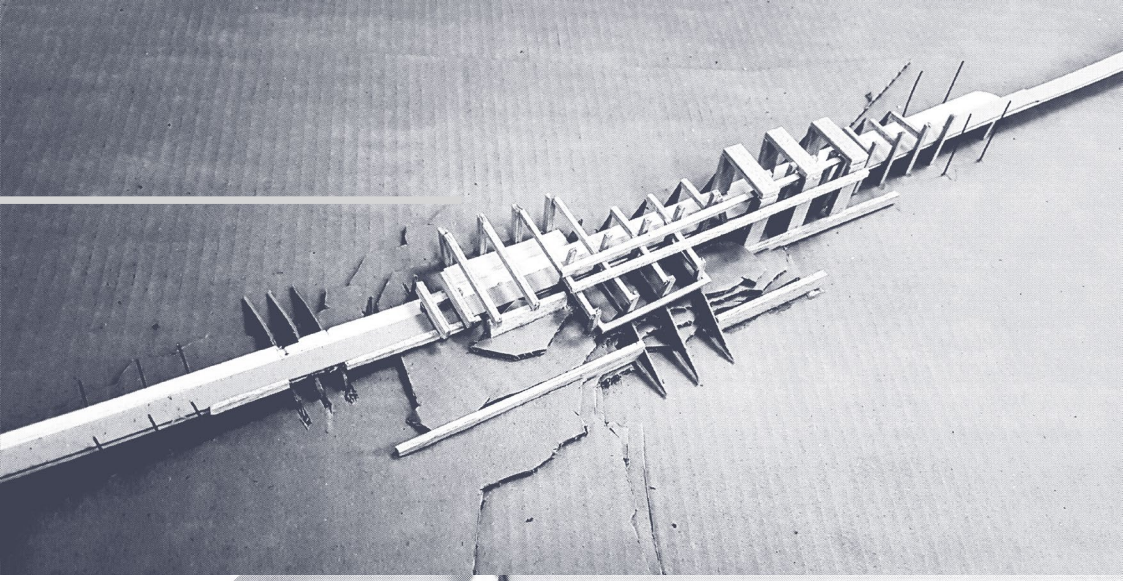
The third conceptual model is a more detailed model regarding the functioning of the building. The model incorporates the public movement throughout the design, reactivating the social impact within the site.

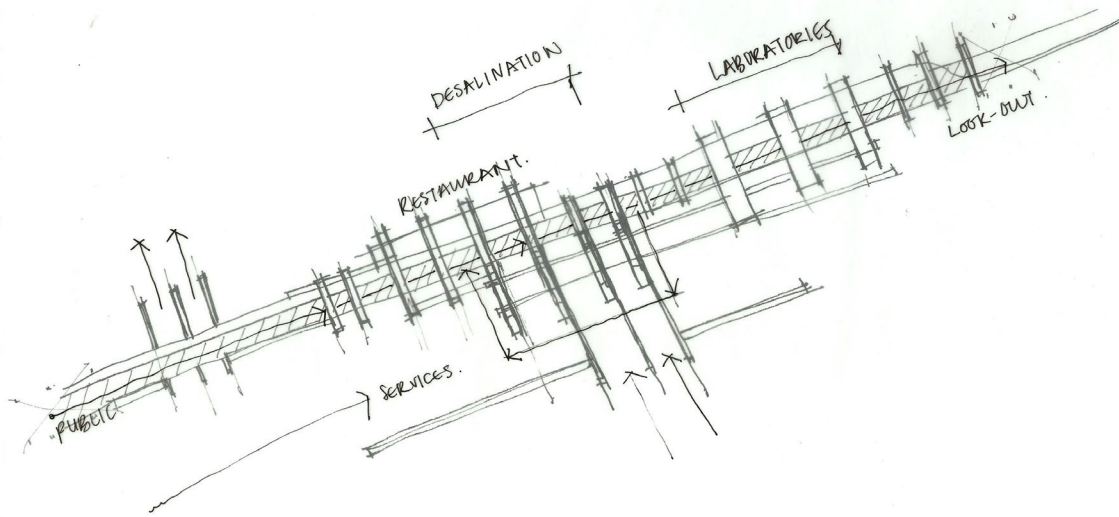
The public movement through the desalination experience is being incorporated within this design and structure. The bridge explained in the morphology section of this document is incorporated within this model.

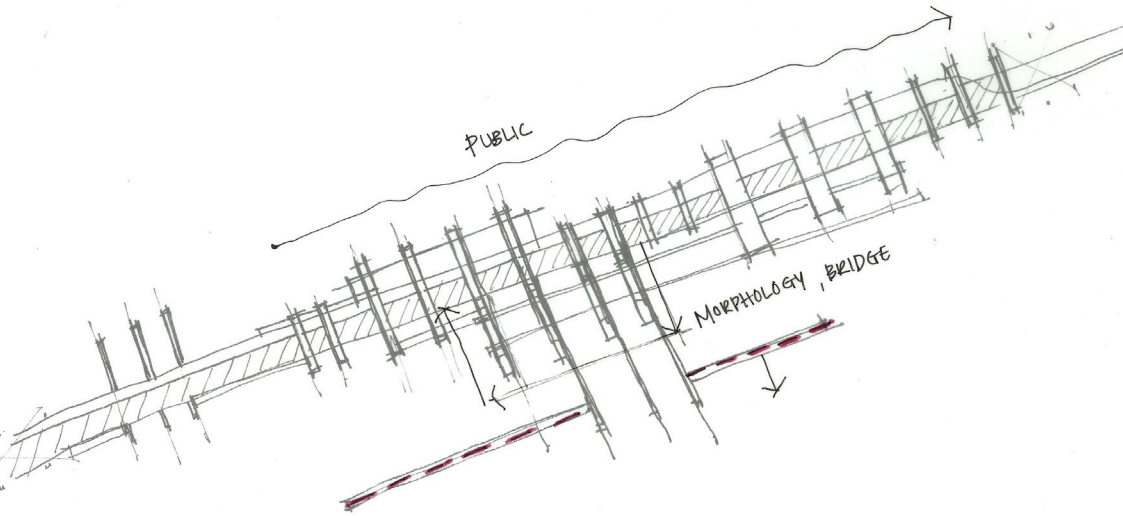
The structural complications regarding the abstraction point of the ocean water is more resolved in this model, although the wall on the south side of the design is still an obstruction towards a visual connection with the *terrain vague*.

The laboratories and look-out point is becoming a clear aspect of the design layout and functioning. This third model is a combination of the previous two conceptual models and becomes a main driven part of the design focus further on.

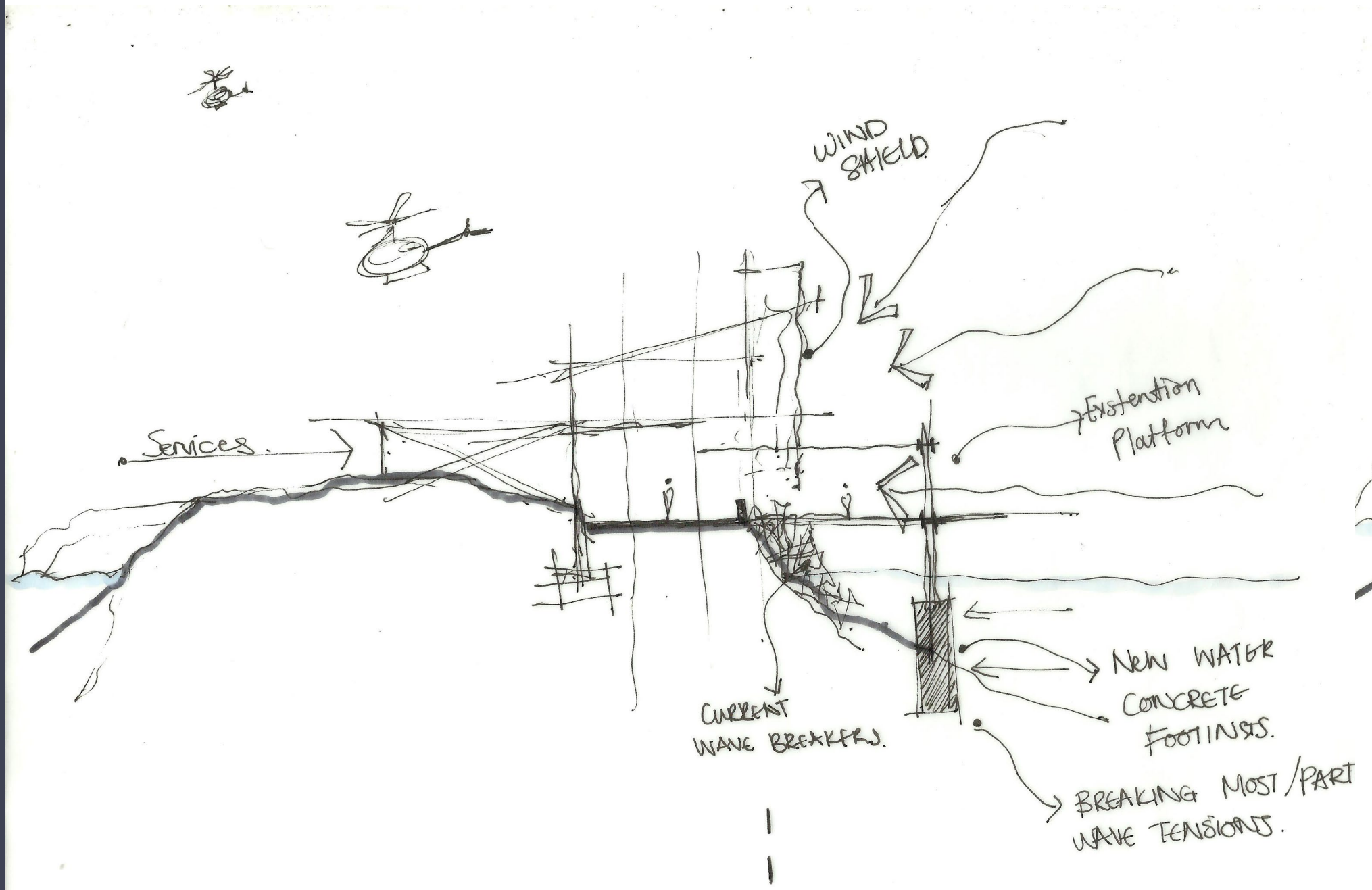




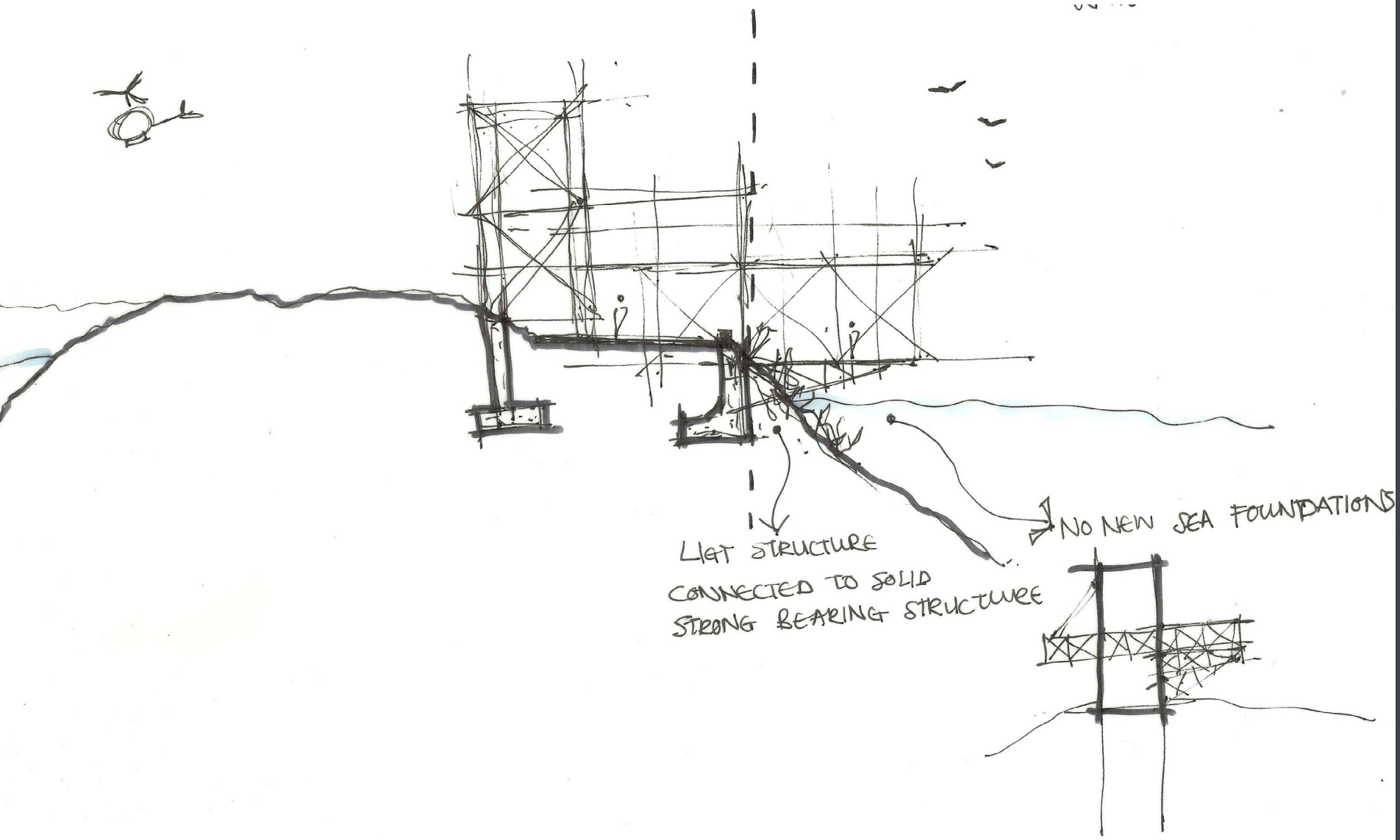




Figures 133-137



STRUCTURE/FOUNDATION EXPLORATIONS



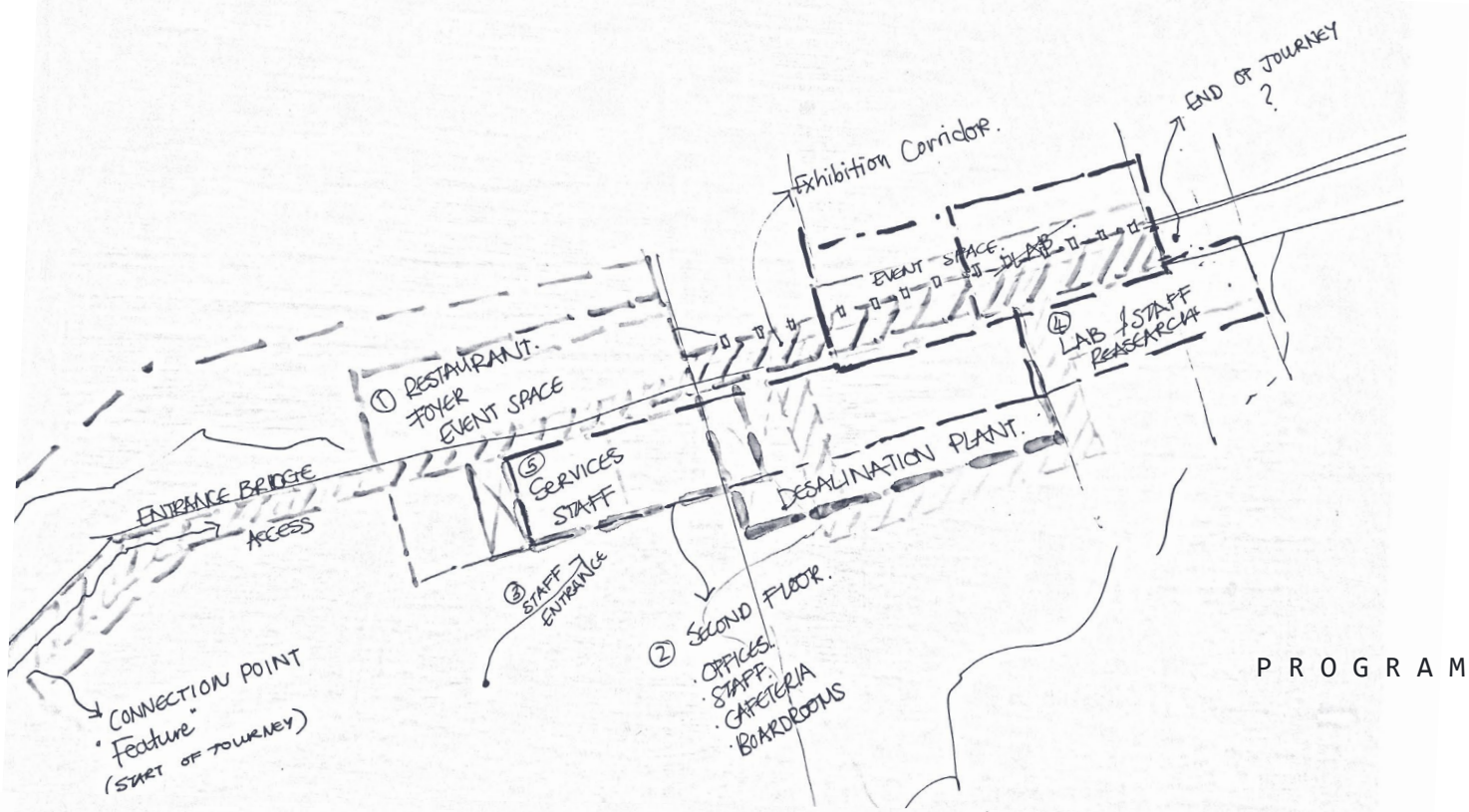
Figures 138 & 139

Interpretation

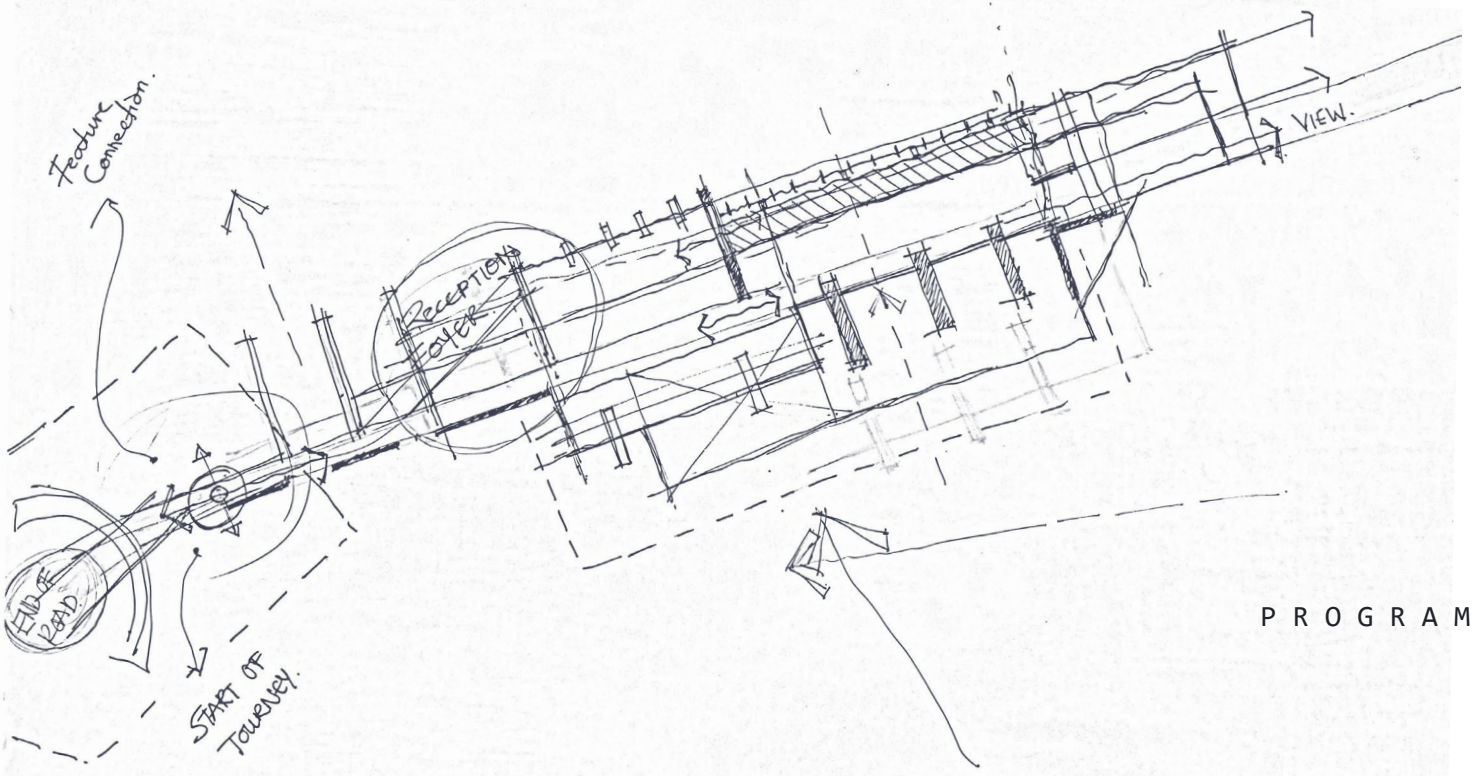
Sections drawn after the concept models, where the structural components are investigated.

New concrete footings could be used within the ocean areas for the structure to allow the public platform over the water.

The pier is an existing structure within the site and the new structure could also latch on to this concrete pier, becoming a light structure floating above the ocean.

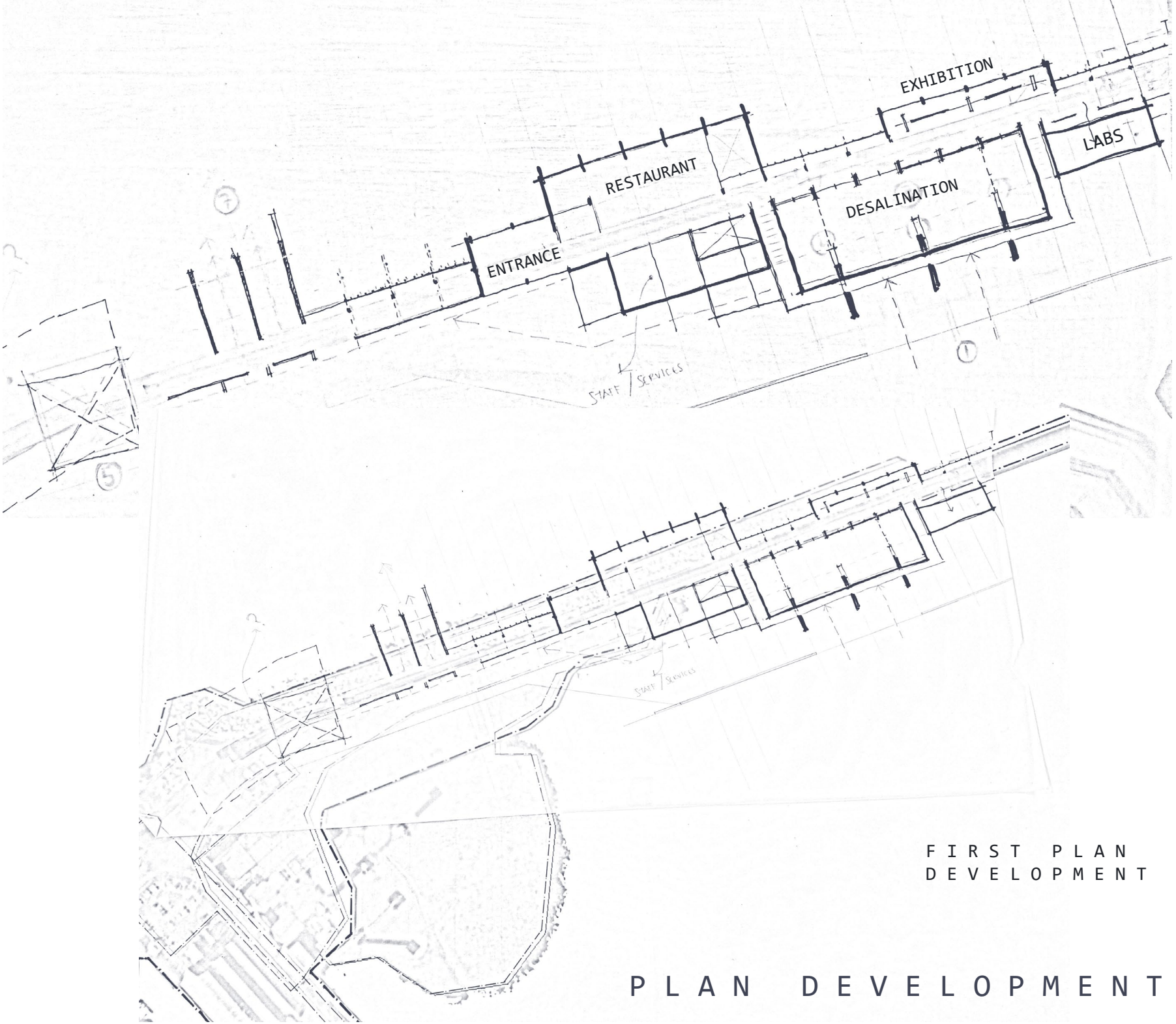


PROGRAM LAYOUT



PROGRAM TO PLAN

Figures 140-143



FIRST PLAN DEVELOPMENT

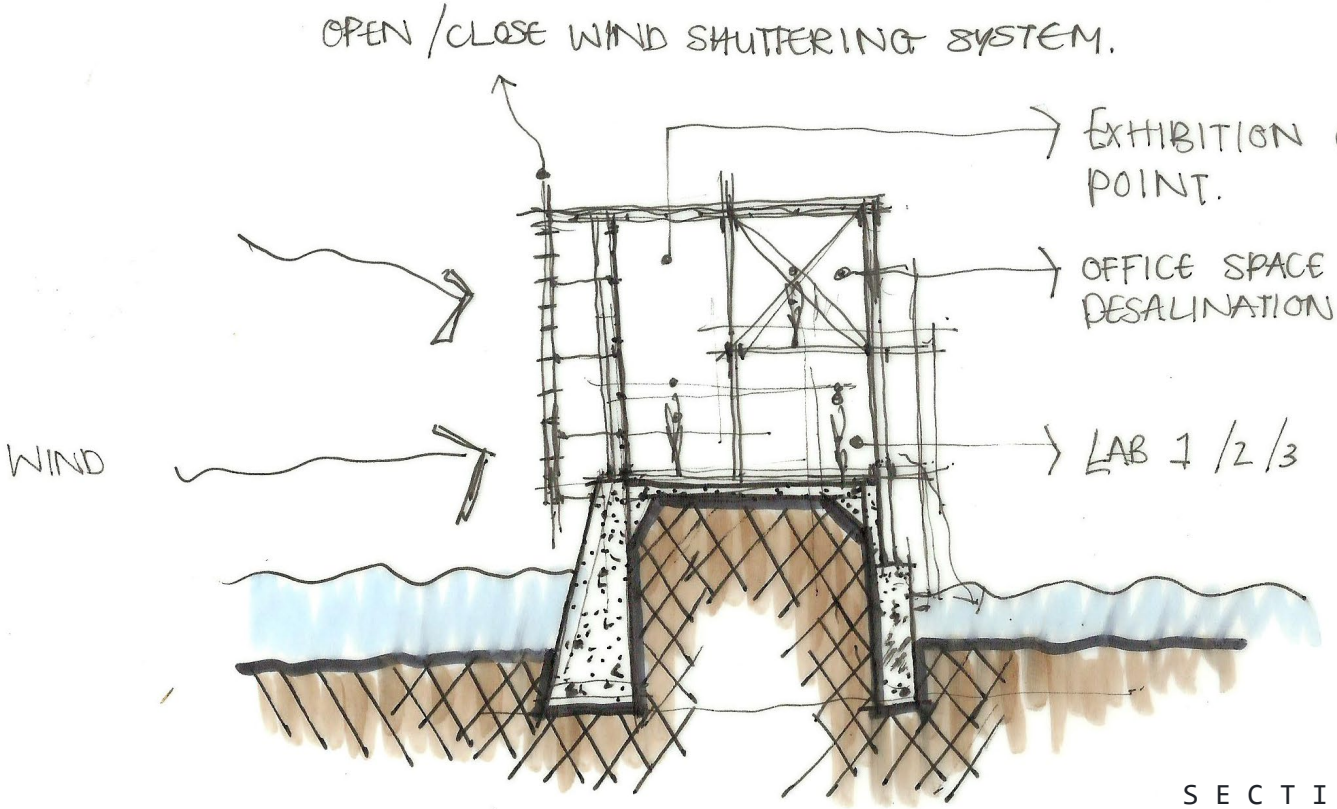
PLAN DEVELOPMENT

Interpretation

The first plan development after investigating the program, the conceptual models and some of the structural elements.

These floor plan developments explain how the program within the building developed the form of the building and the circulation within the building.

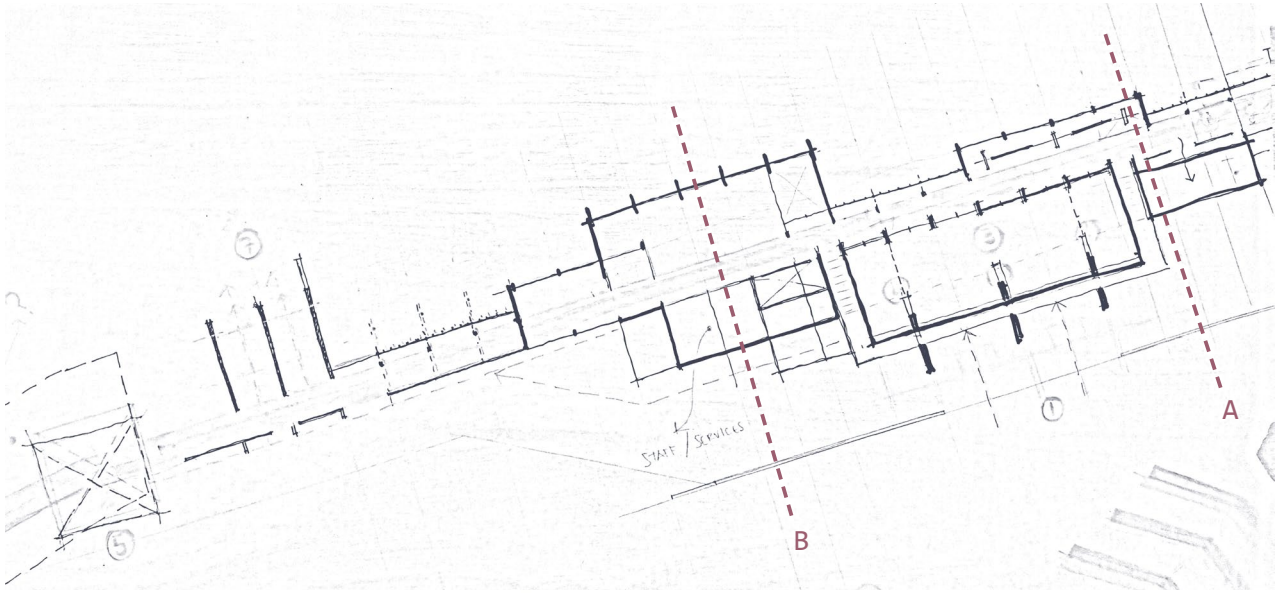
This last diagrammatical plan is a more detailed layout of the spaces and program within the building and it is the start of the structural grid and the influence thereof within the building.

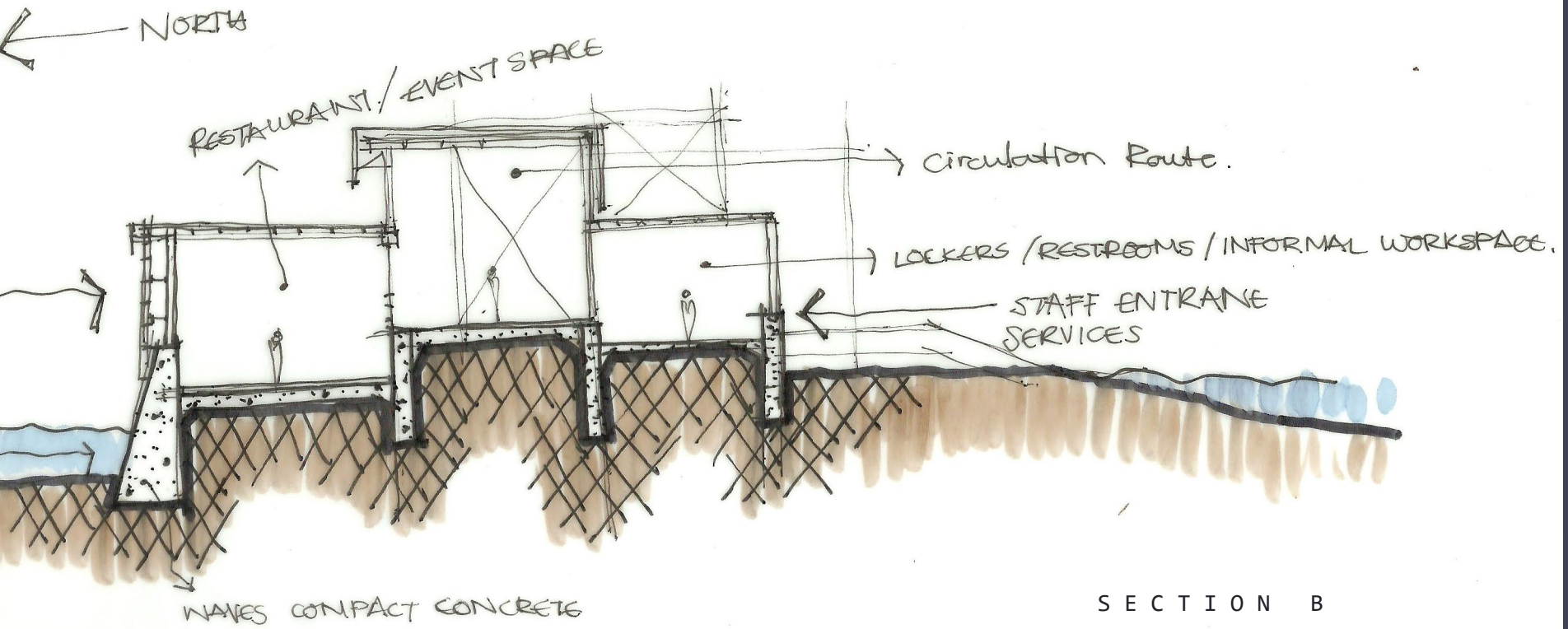


SECTION A

STRUCTURE / FOUNDATION EXPLORATIONS

Figures 144-146





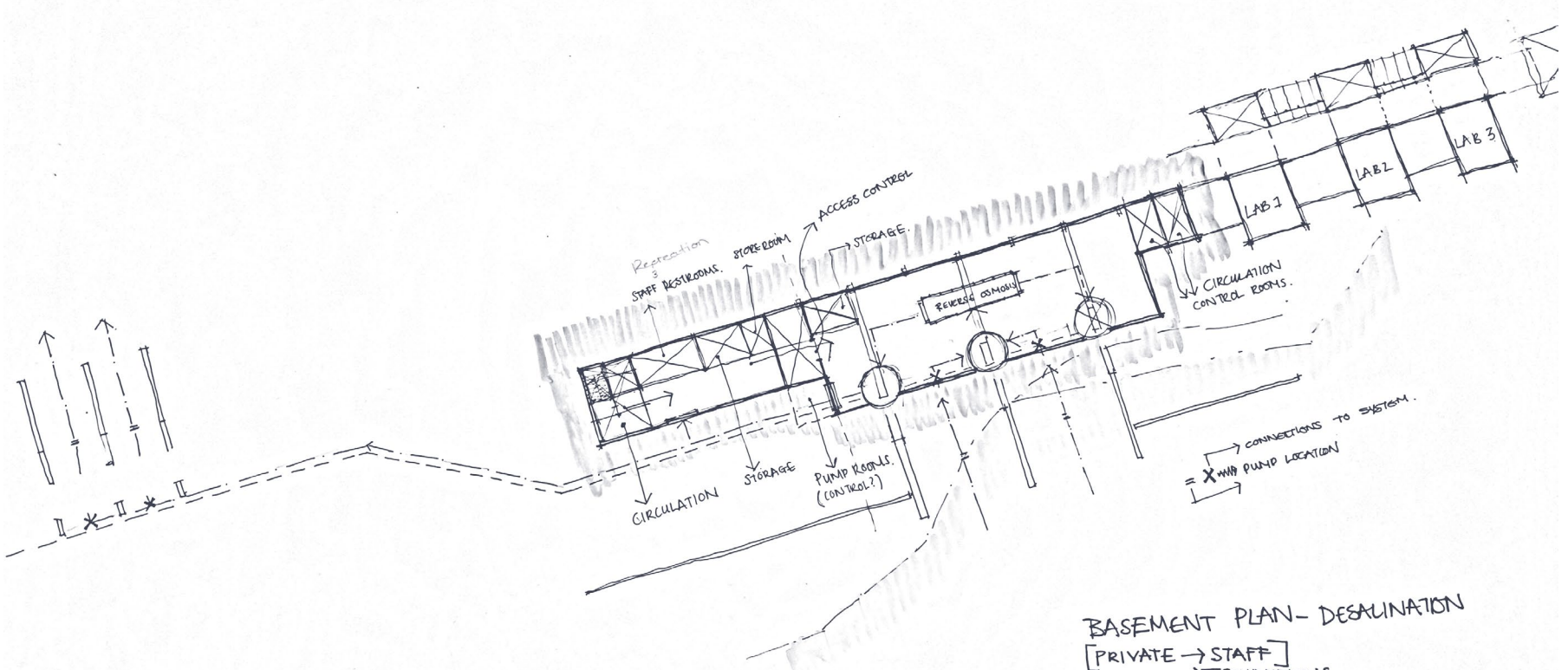
SECTION B

Interpretation

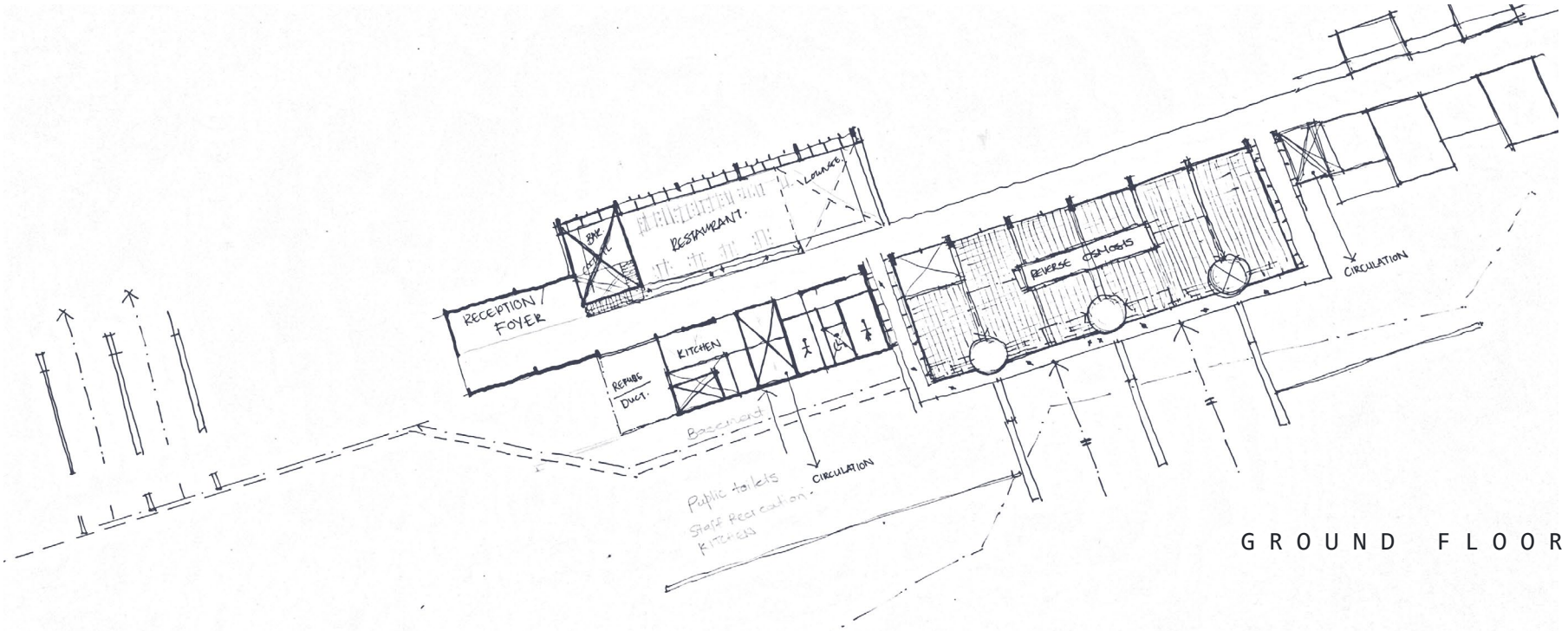
These sections are a further interpretation of the structural development, with new understanding to the circulation of the building plans.

The sections evaluate the facing directions of the spaces and external factors like the sea levels, waves and wind that will have an impact on the design.

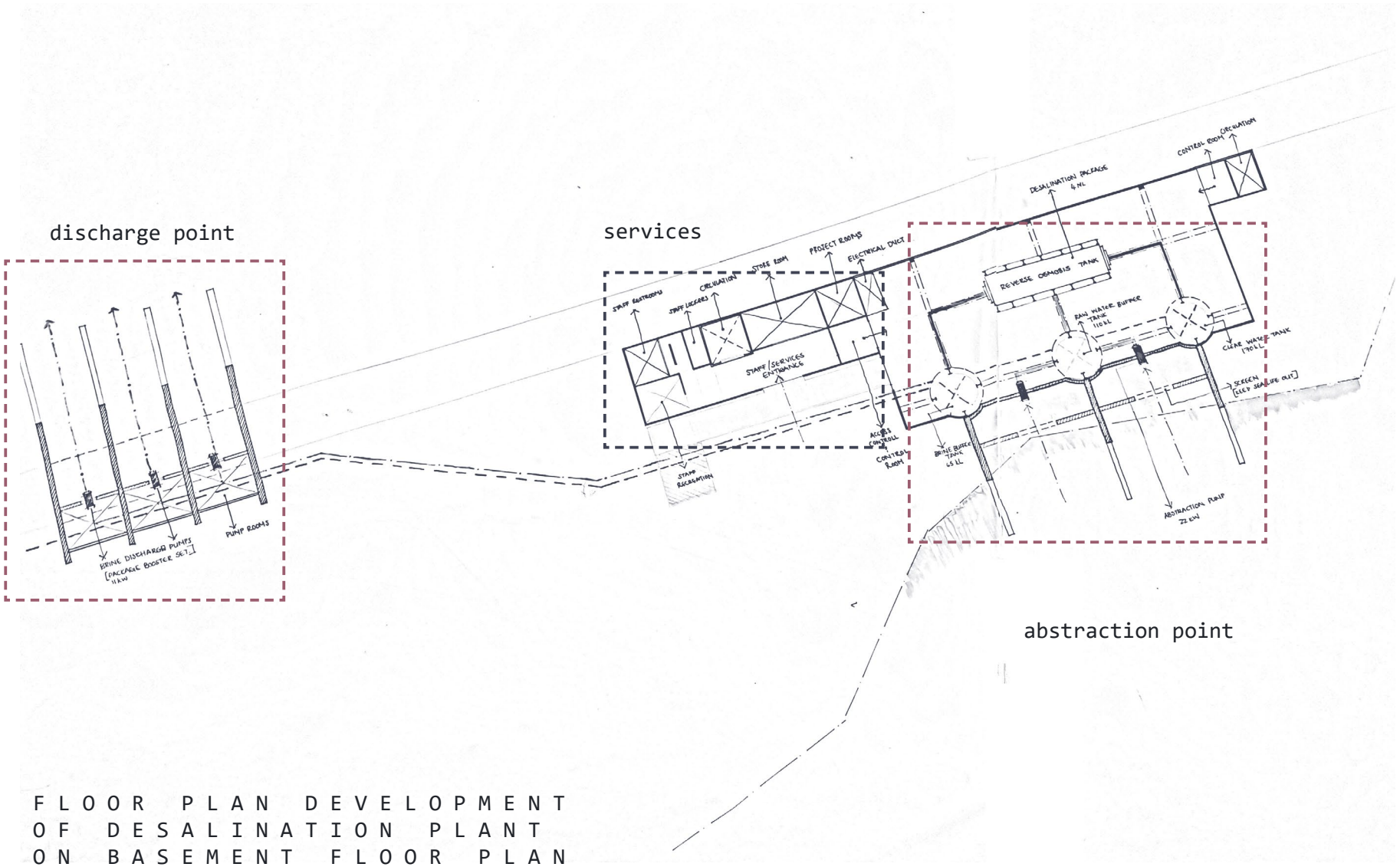
Becoming aware of these factors in an early stage of the design is important to develop the design further within the site and to not forget the environmental impacts of these elements.



BASEMENT
- DESALINATION



GROUND FLOOR



FLOOR PLAN DEVELOPMENT
OF DESALINATION PLANT
ON BASEMENT FLOOR PLAN

PLAN DEVELOPMENT

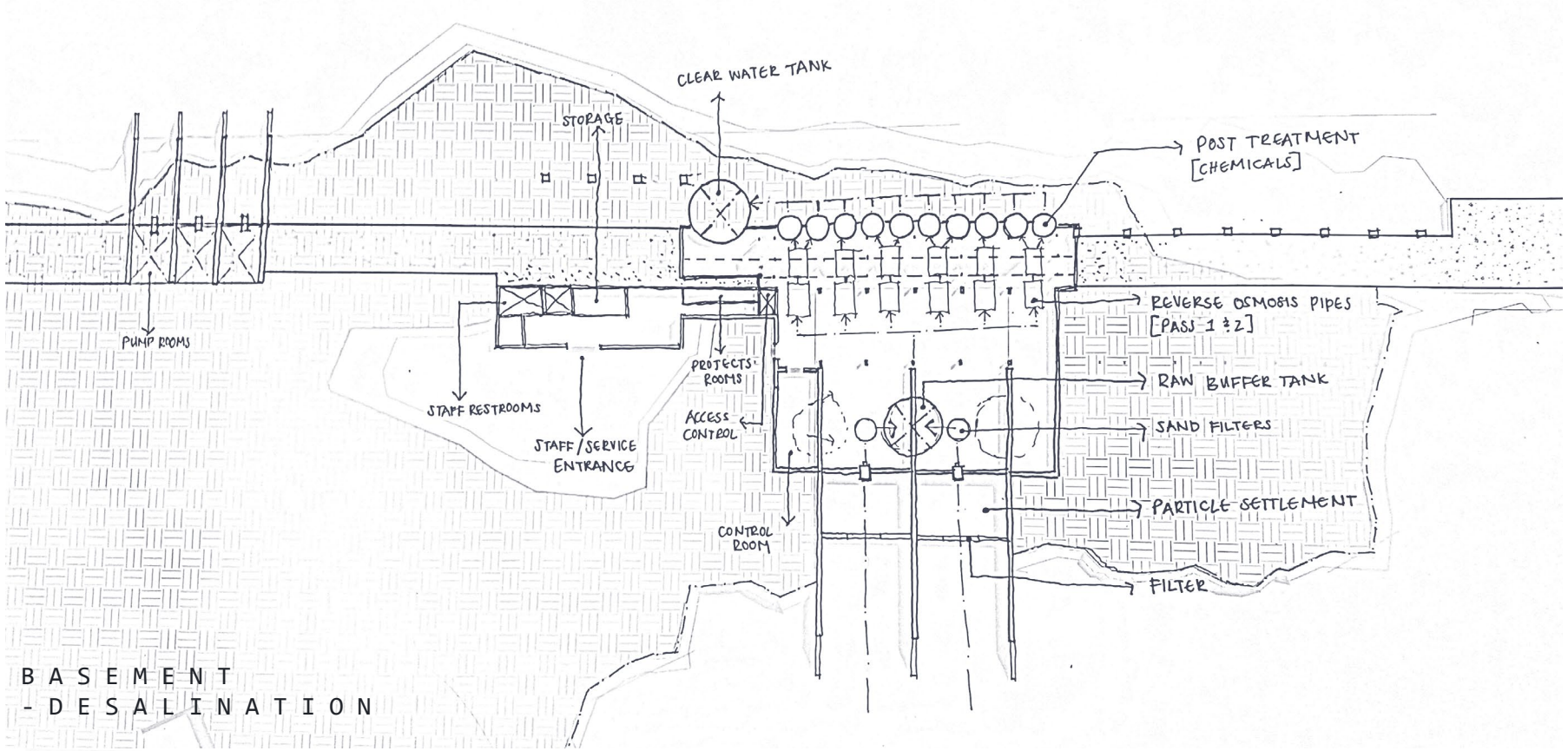
Figures 147-149

Interpretation

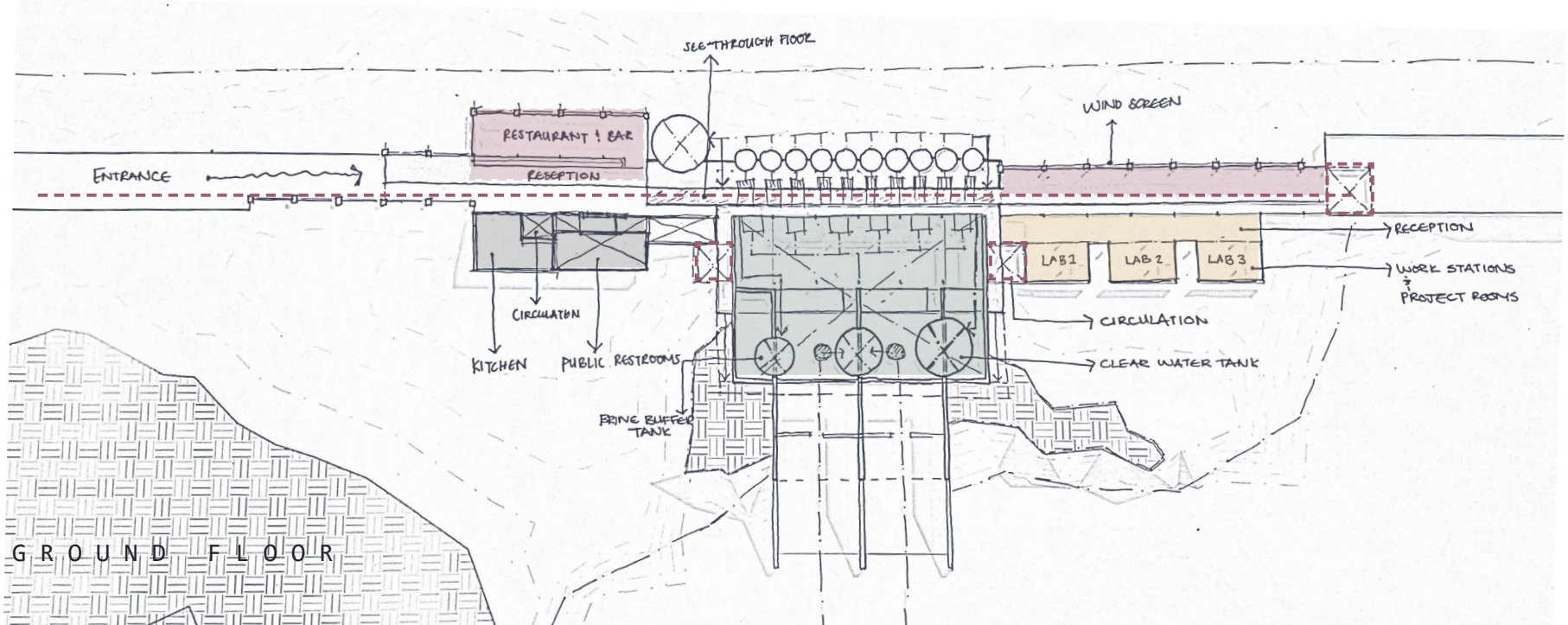
Floor plans developed after the diagrammatical layout of the program and functions within building.

This is the first investigation of the desalination plant within the floor plans and the layout thereof.

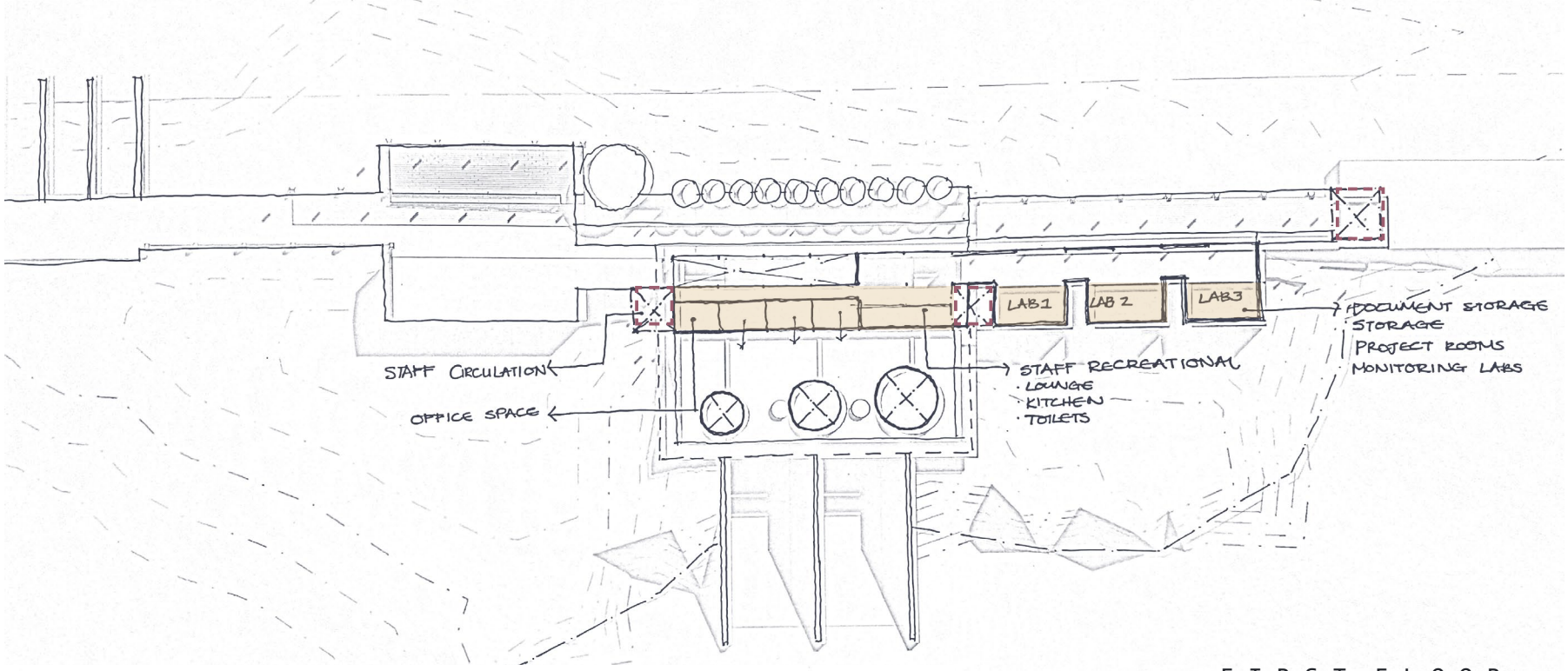
The start of the desalination development within the building and the services required within these spaces.



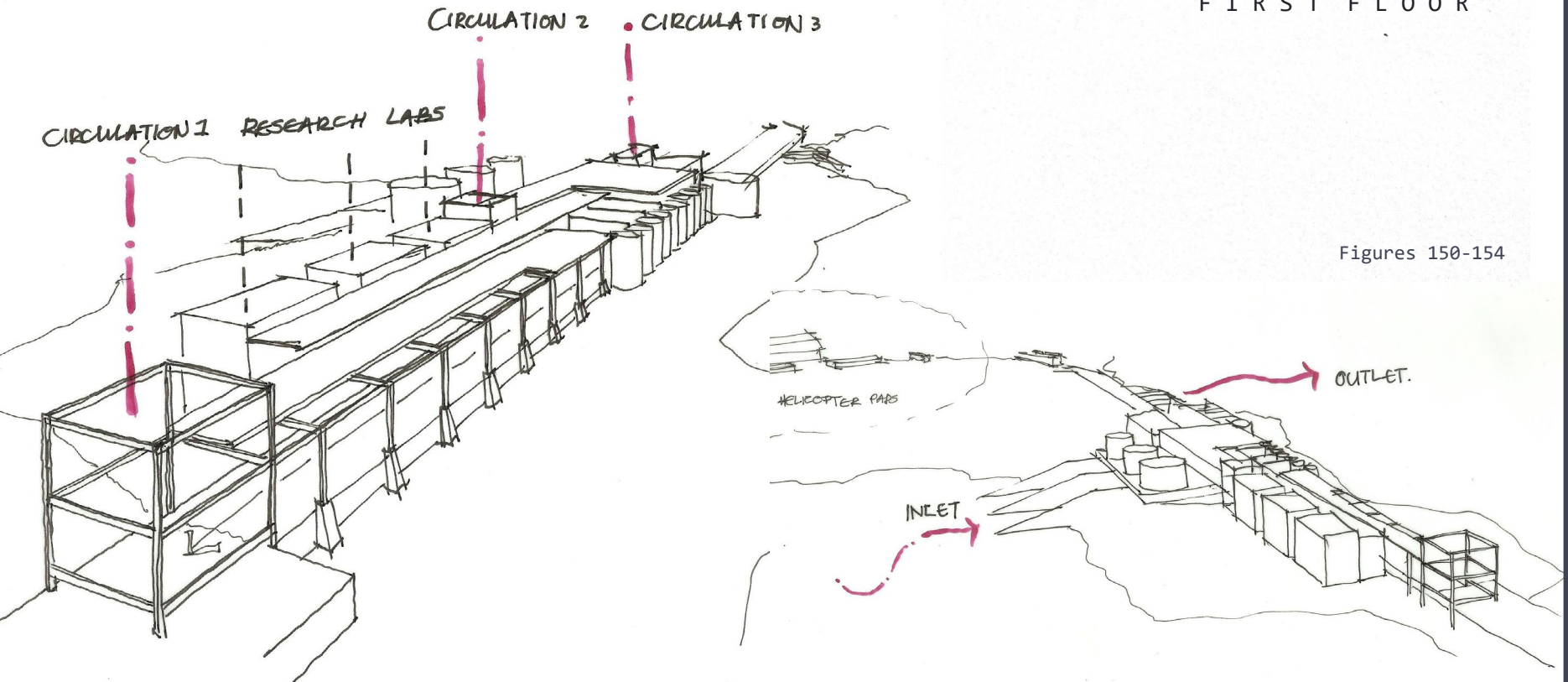
BASEMENT
- DESALINATION



GROUND FLOOR



FIRST FLOOR



Figures 150-154

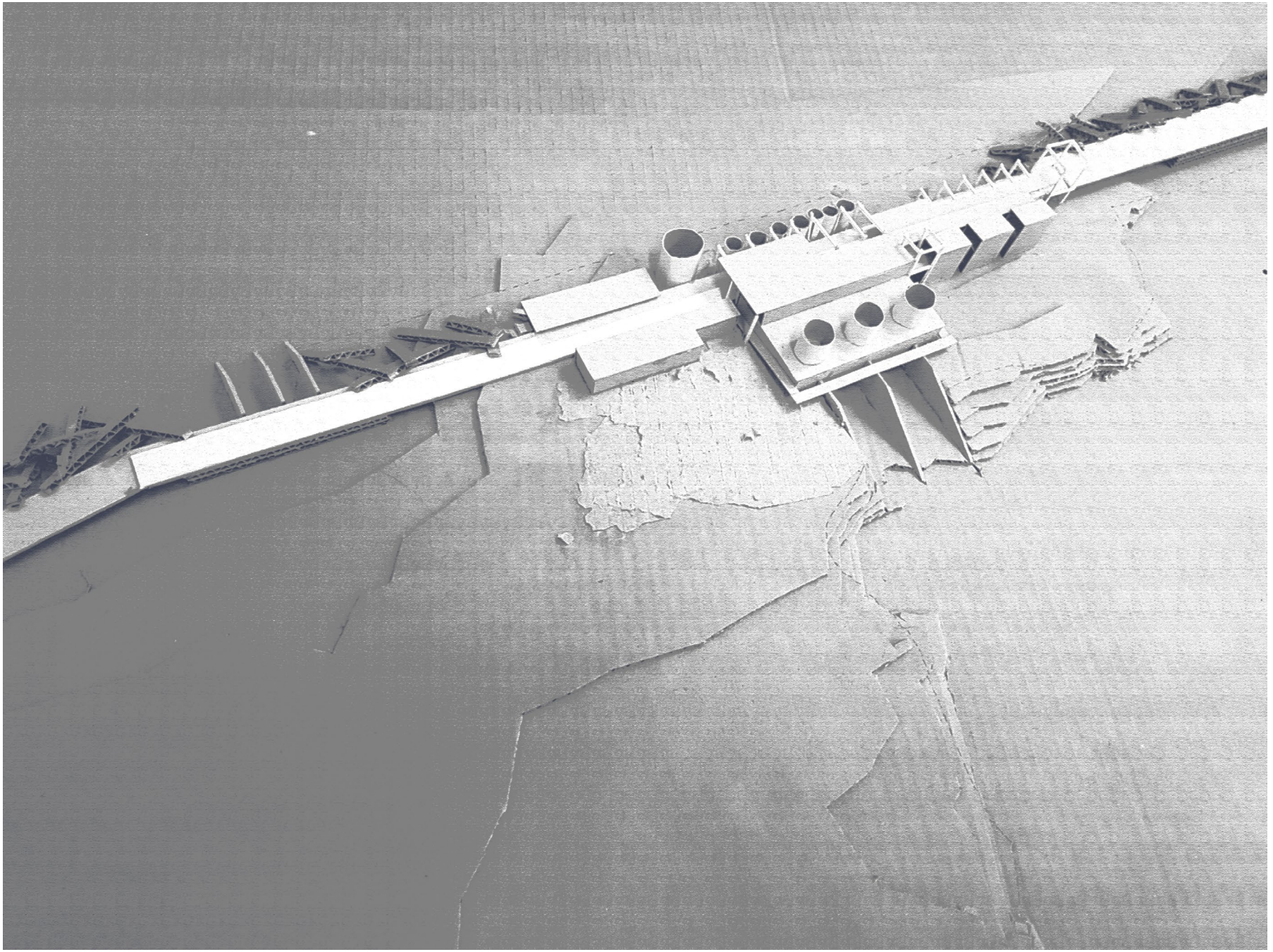
Interpretation

The desalination plant on the basement level has developed whilst the knowledge of the more detailed process has been incorporated.

The public movement is clearly seen on the ground floor and it living out to the Northern side of the site. The public walkway is incorporated over the desalination area for viewing of the processes. The user becomes part of the process and the walkway becomes a journey through the plant.

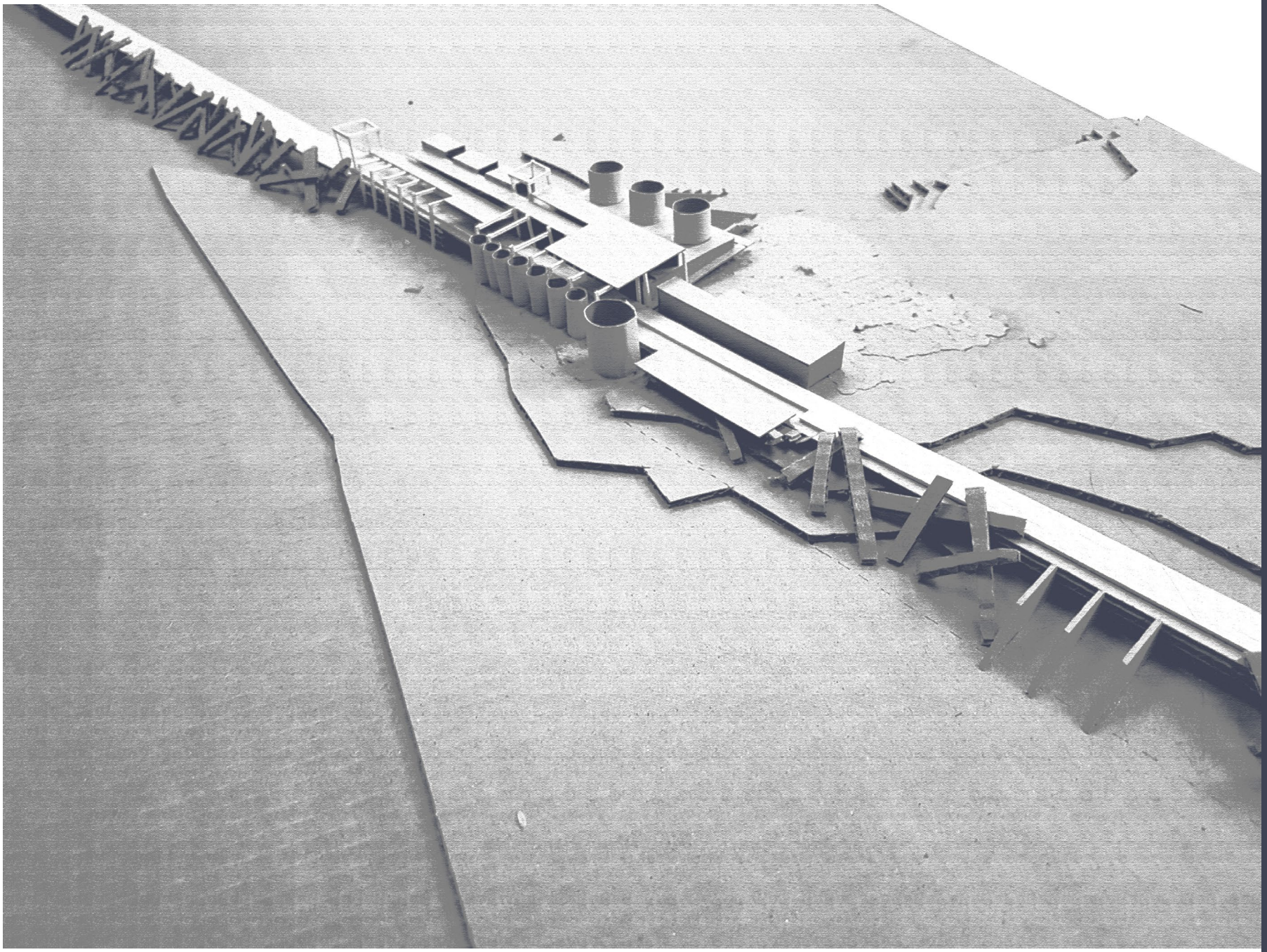
On the firts floor one can observe the development of the more private offices and working spaces, away from the public access points.

Main circulation is becoming a large factor within the building. How the users and public function and move within the building is of great importance.



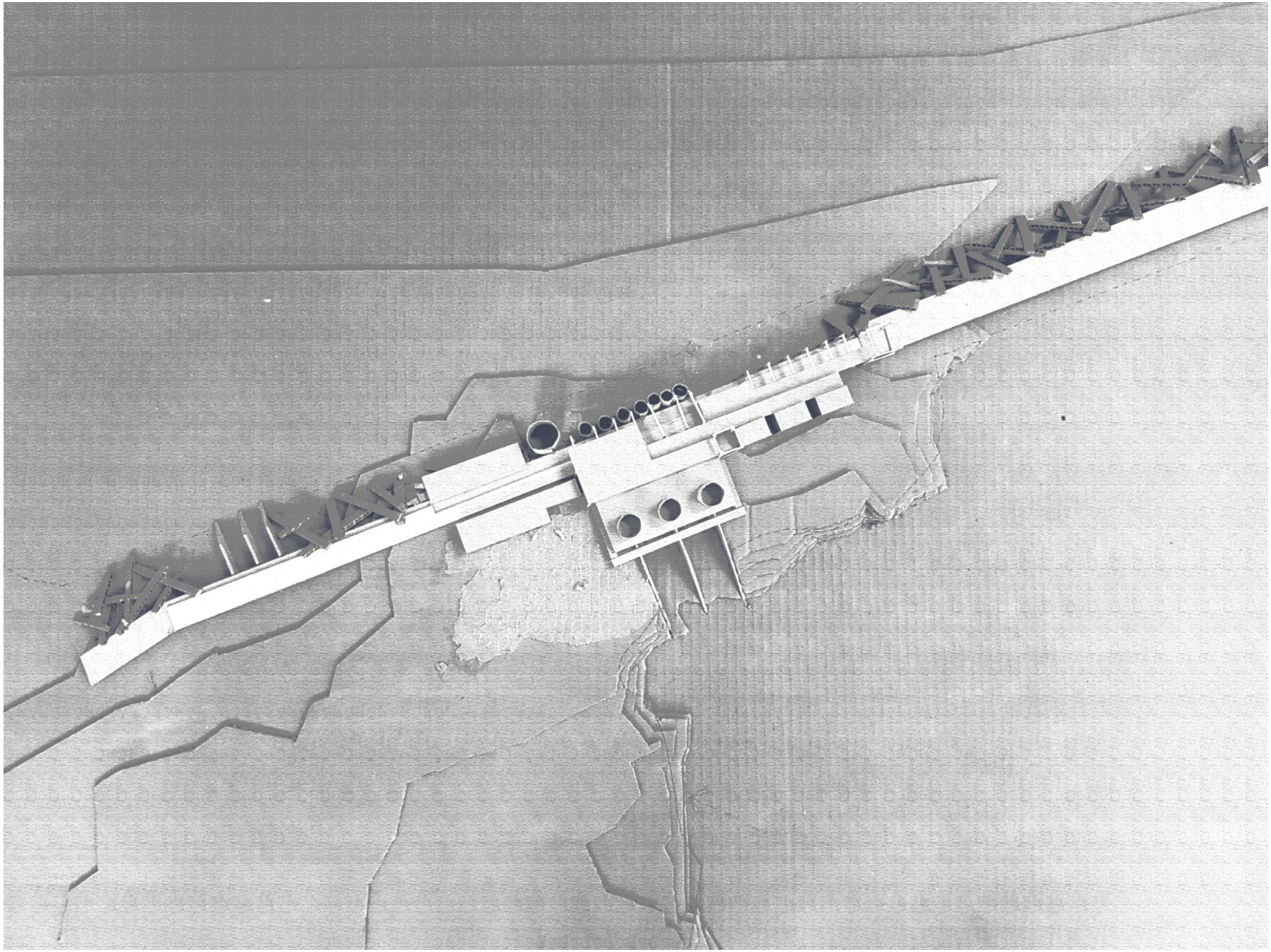
SOUTHERN PERSPECTIVE

CONCEPTUAL MODEL #4

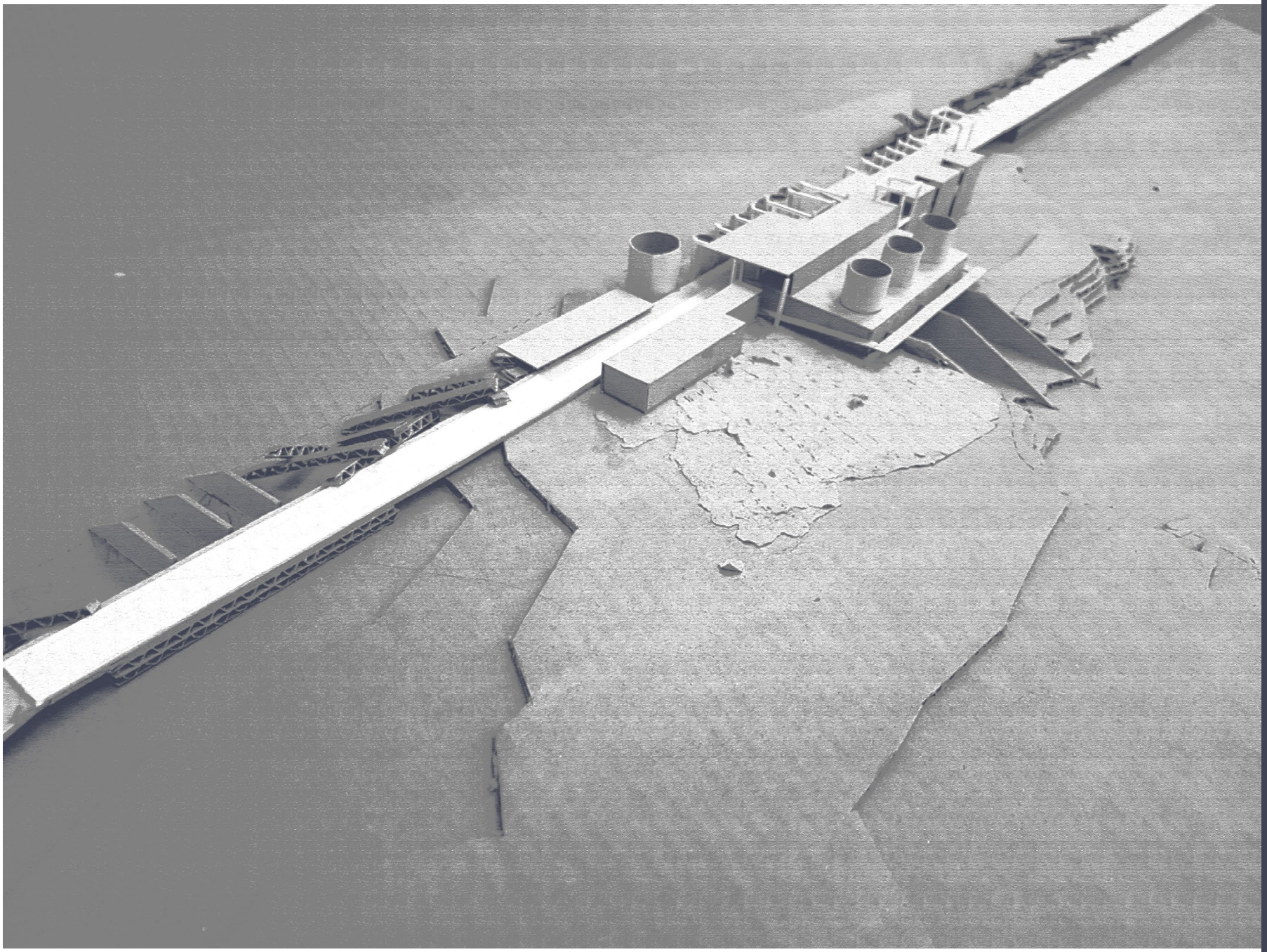


NORTH-WEST PERSPECTIVE

Figures 155-156



PERSPECTIVE FROM ABOVE



S O U T H E R N P E R S P E C T I V E - S E R V I C E S

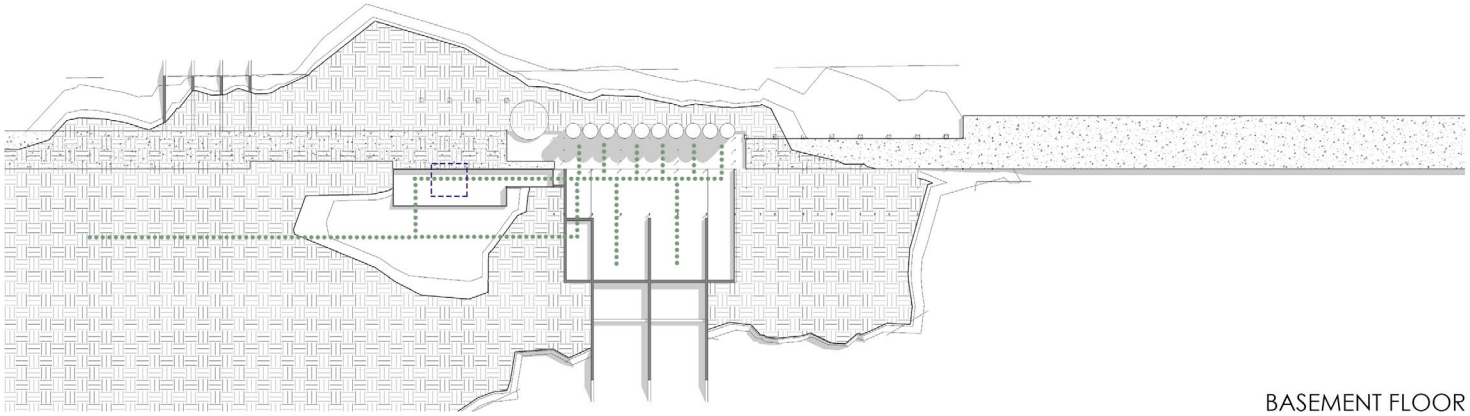
Figures 157-158

Interpretation

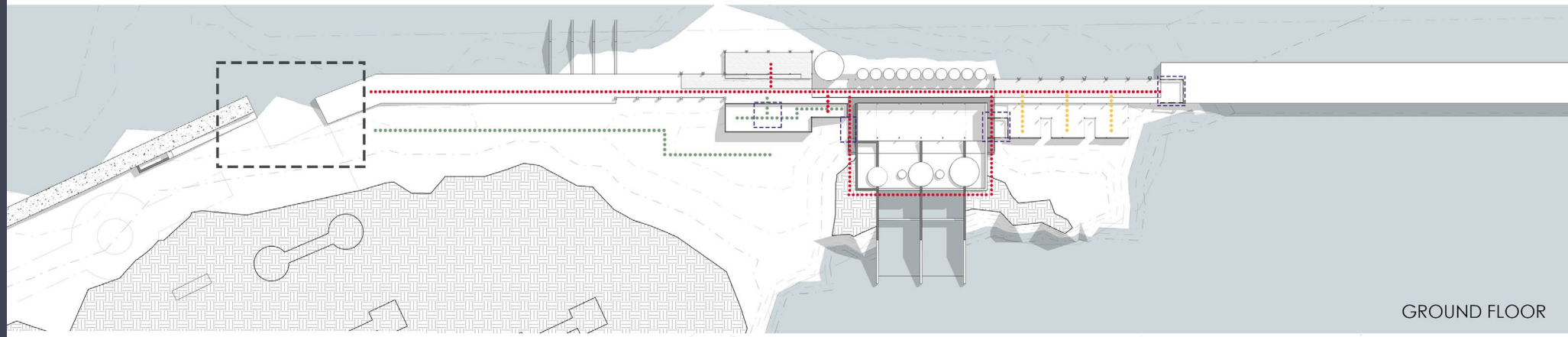
This conceptual model is a diagrammatical visualization of the floor plan development and layout thus far.

It creates an understanding of the levels within the site and the scale of the building within the site. This is also a representation of the form following the functions within the desalination plant. This model helped me to coordinate my plan layouts with the perspectival views created by it.

PUBLIC & PRIVATE CIRCULATION
VERTICAL CIRCULATION
SITE ACCESS



BASEMENT FLOOR



GROUND FLOOR

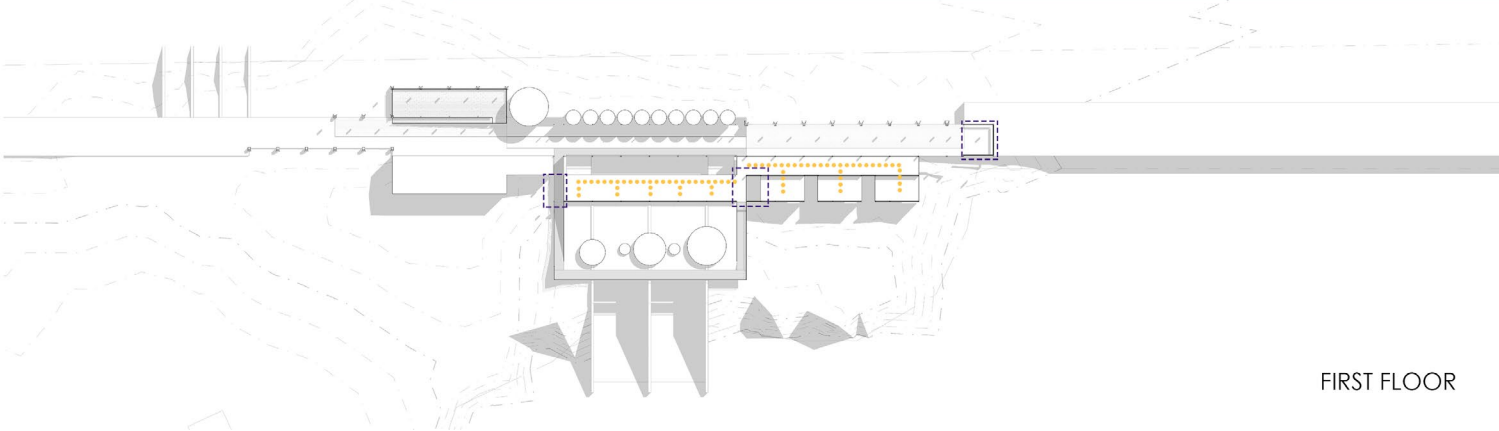
PUBLIC CIRCULATION

LABORATORIUMS & OFFICE CIRCULATION

SERVICE CIRCULATION

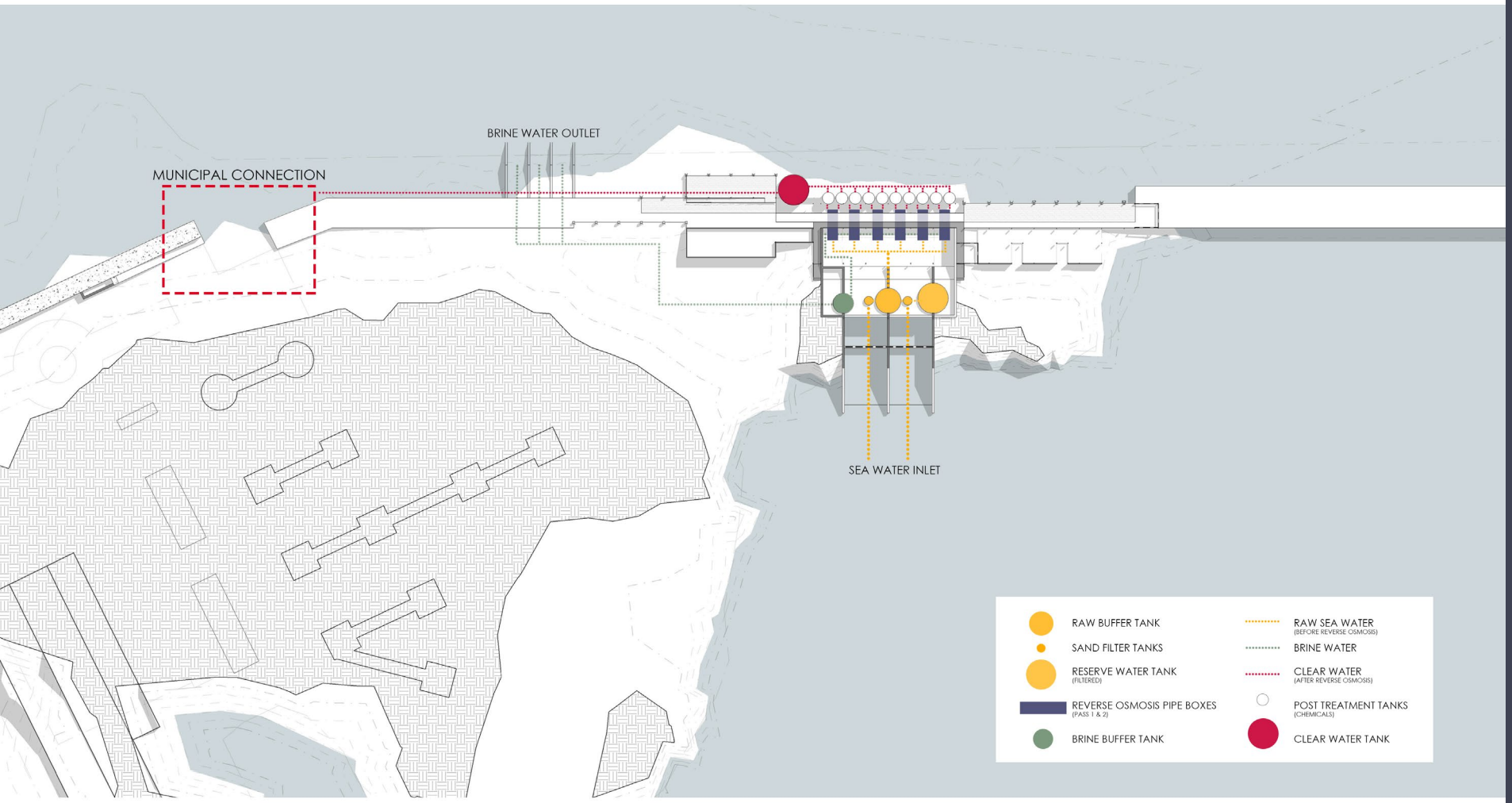
VERTICAL CIRCULATION

SITE ACCESS / ENTRANCE



FIRST FLOOR

CIRCULATION DIAGRAMS



DESALINATION PROCESS

Figures 159-162

Interpretation

The diagrammatical representations of the circulation within the building explaining the public and private movements within the floor layouts.

The second diagram explains the desalination process within the building and its influence on the design layout.

The diagrams also illustrate the access points and where the municipal water connections are on the site.

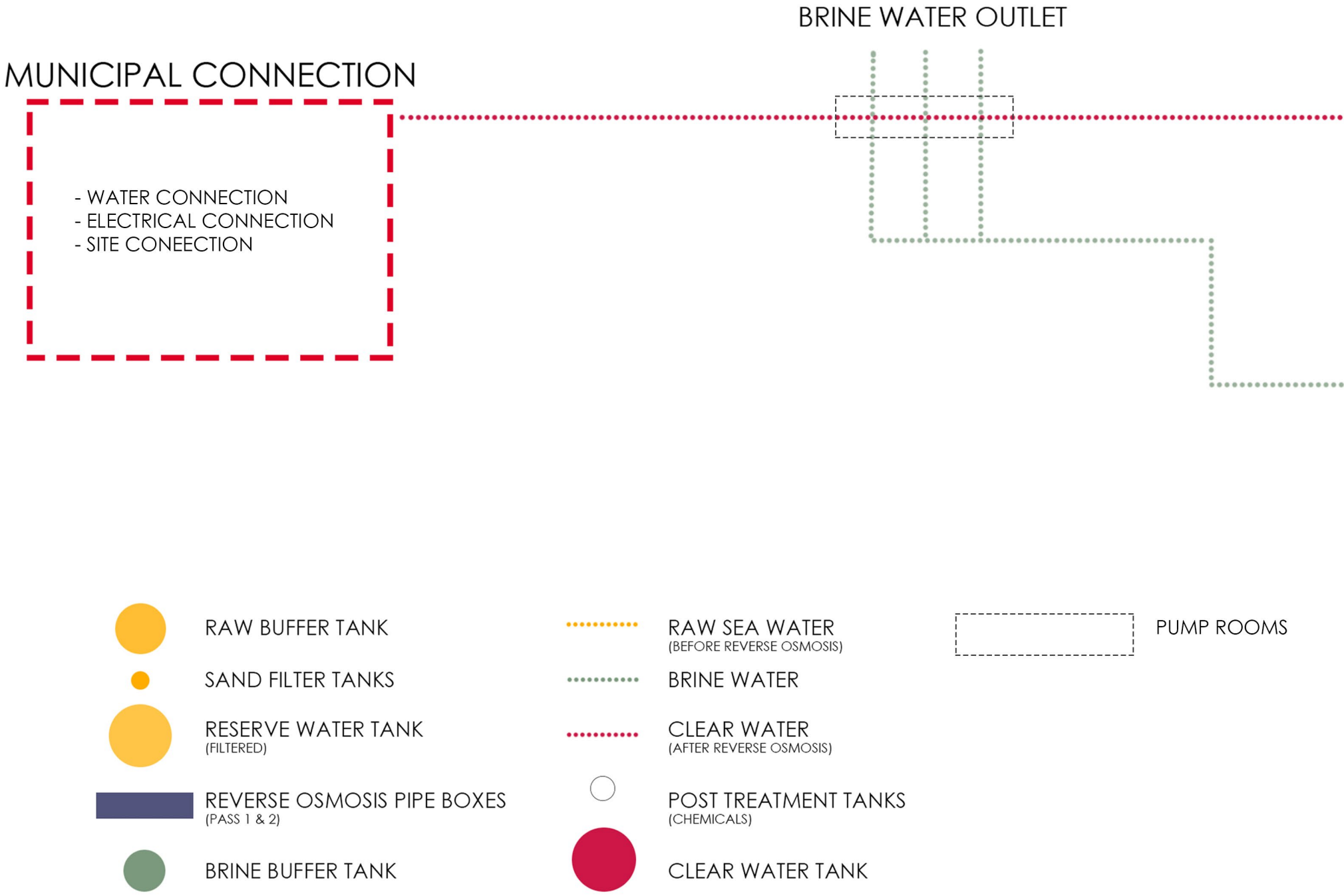
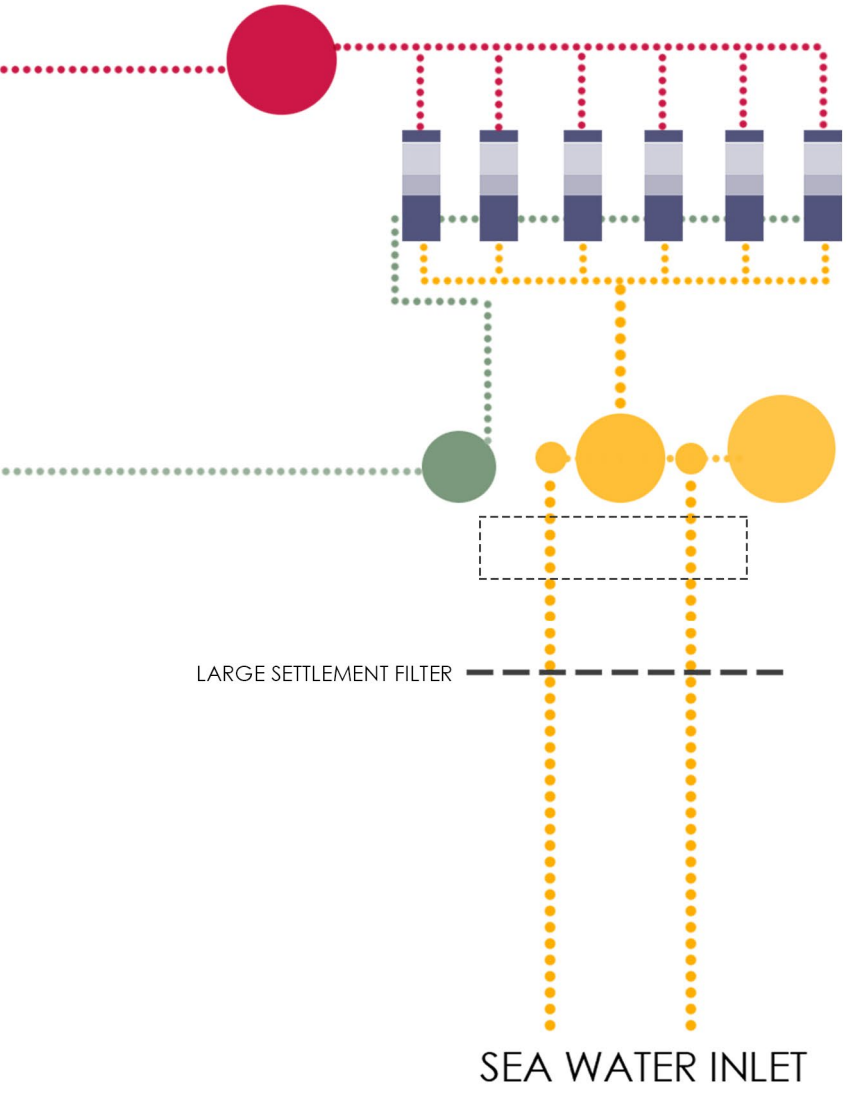
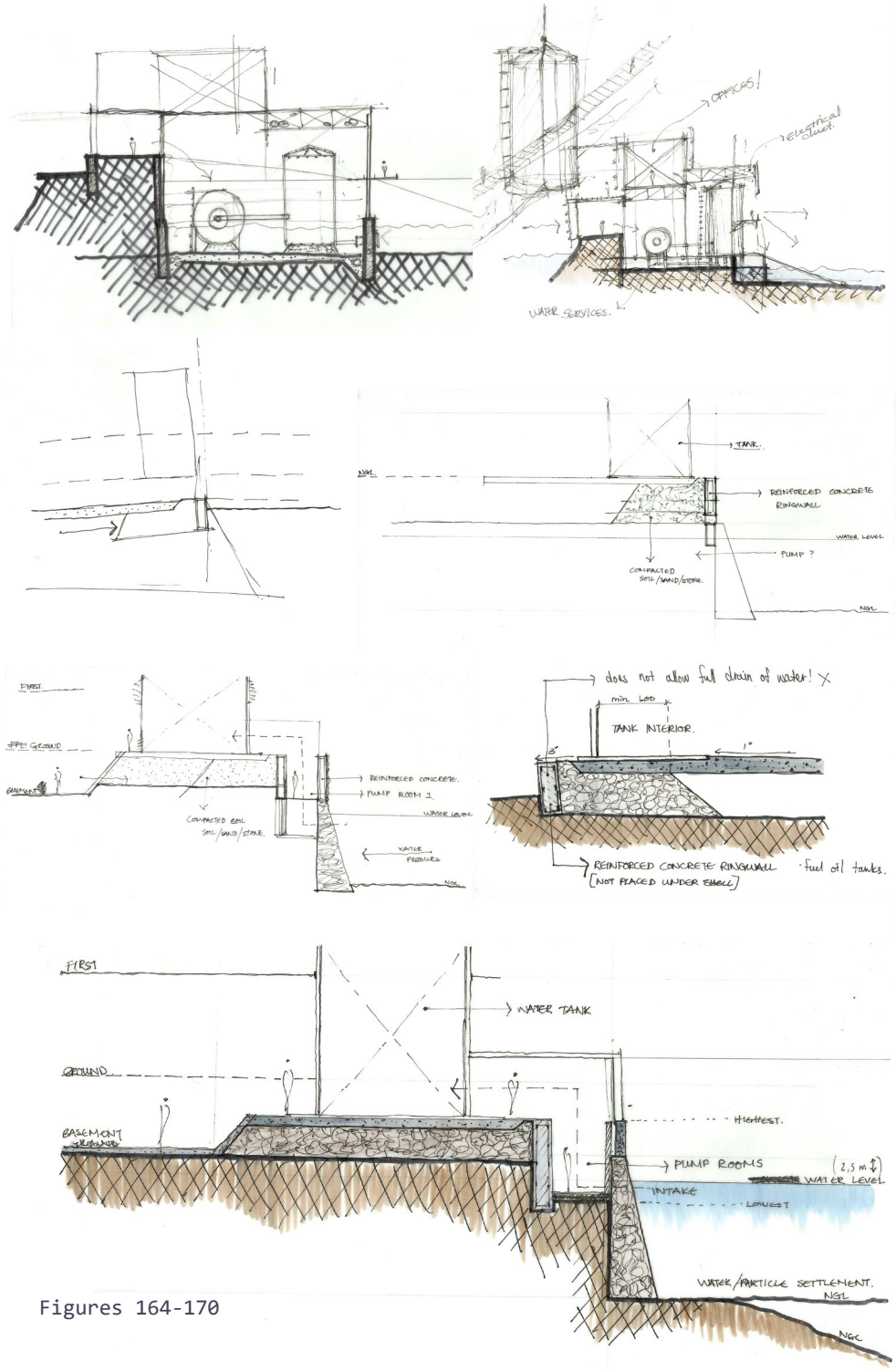

BRINE WATER OUTLET
MUNICIPAL CONNECTION
- WATER CONNECTION
- ELECTRICAL CONNECTION
- SITE CONEECTION
RAW BUFFER TANK
SAND FILTER TANKS
RESERVE WATER TANK
(FILTERED)
REVERSE OSMOSIS PIPE BOXES
(PASS 1 & 2)
BRINE BUFFER TANK
RAW SEA WATER
(BEFORE REVERSE OSMOSIS)
BRINE WATER
CLEAR WATER
(AFTER REVERSE OSMOSIS)
POST TREATMENT TANKS
(CHEMICALS)
CLEAR WATER TANK
PUMP ROOMS

Figure 63



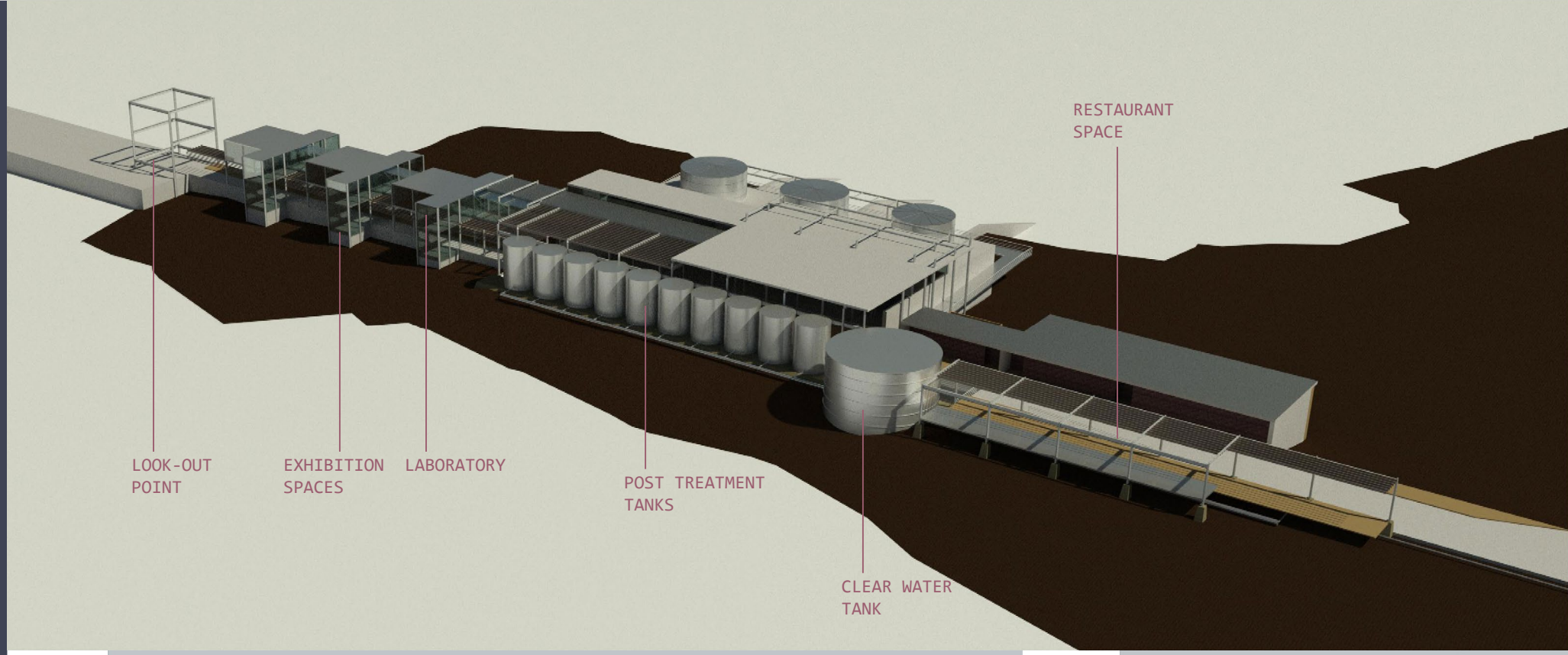


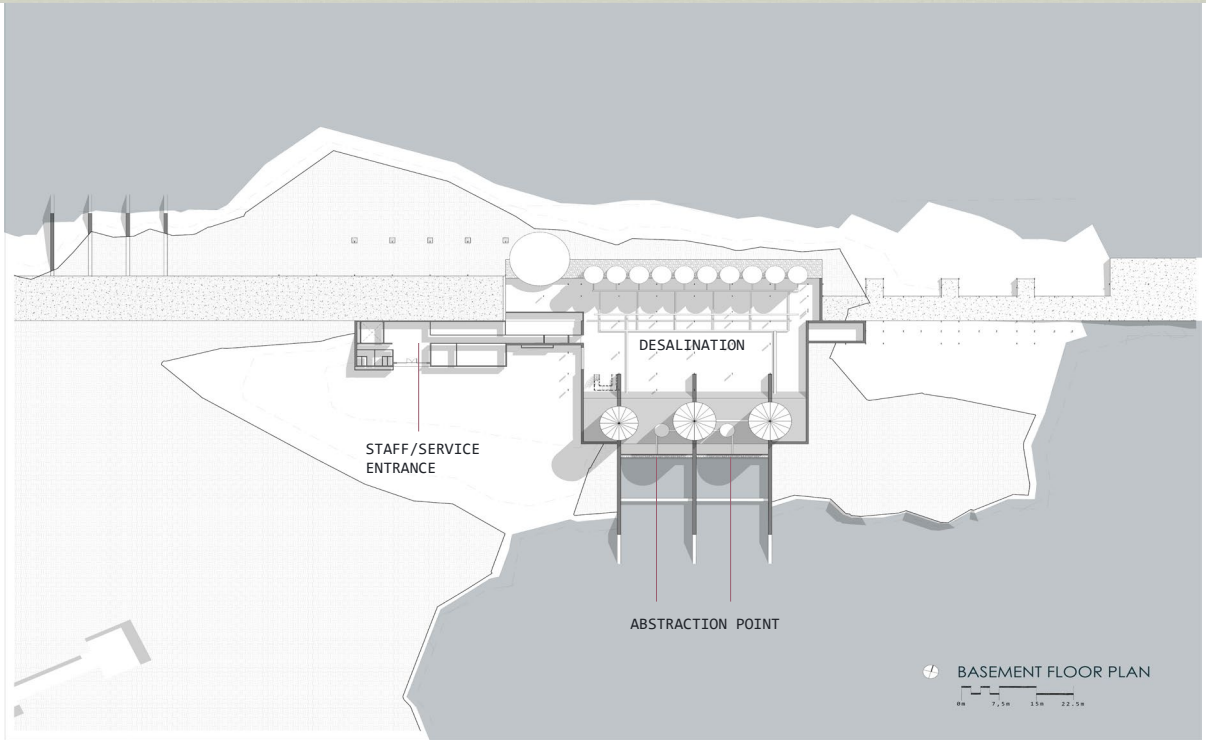
Figures 164-170

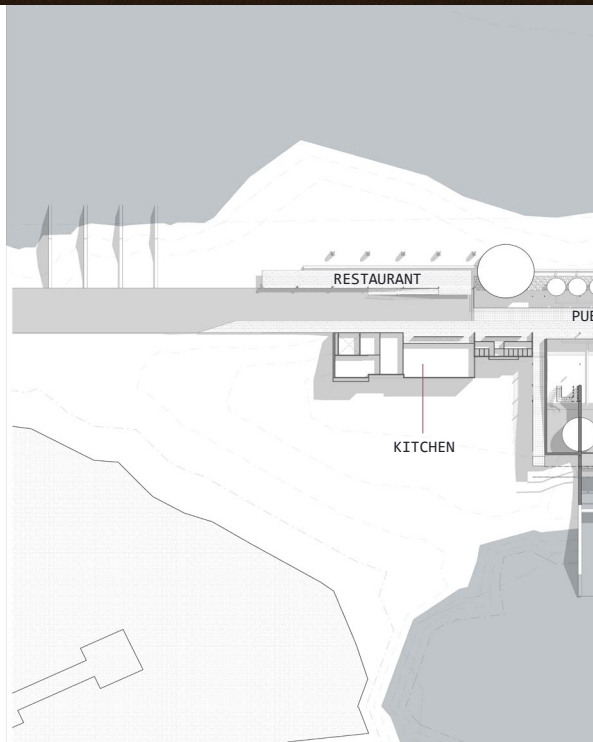
Interpretation

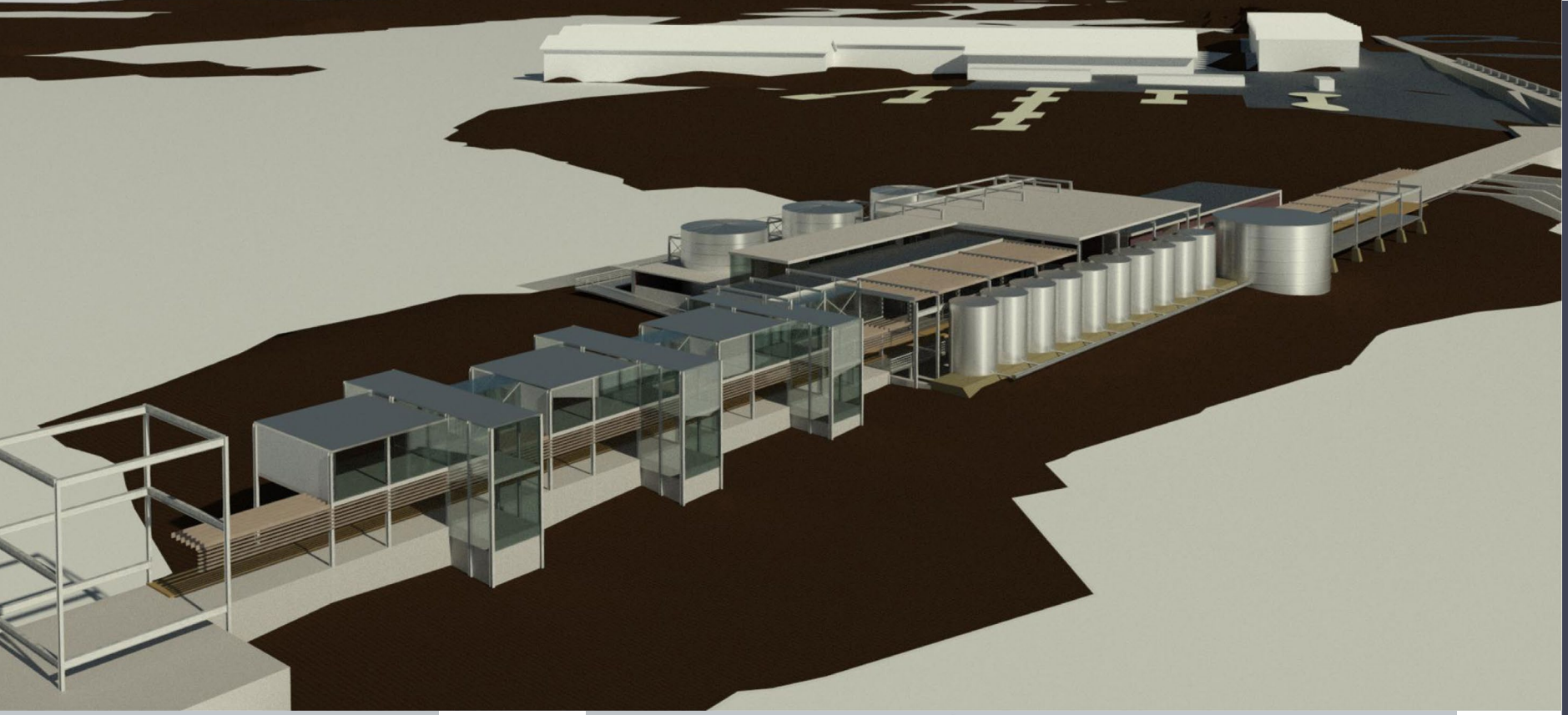
The explorations of structure within the desalination plant. The desalination process is placed on basement level to have closer access to the ocean water. These sketches illustrate the different levels that had to be explored for the water abstraction to take place.

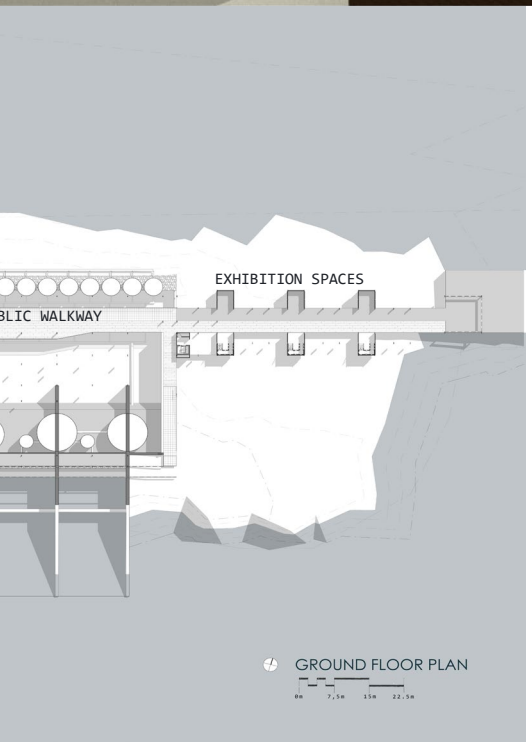
Retaining walls had to be incorporated for the desalination plant to have access to the water levels without it entering the building.

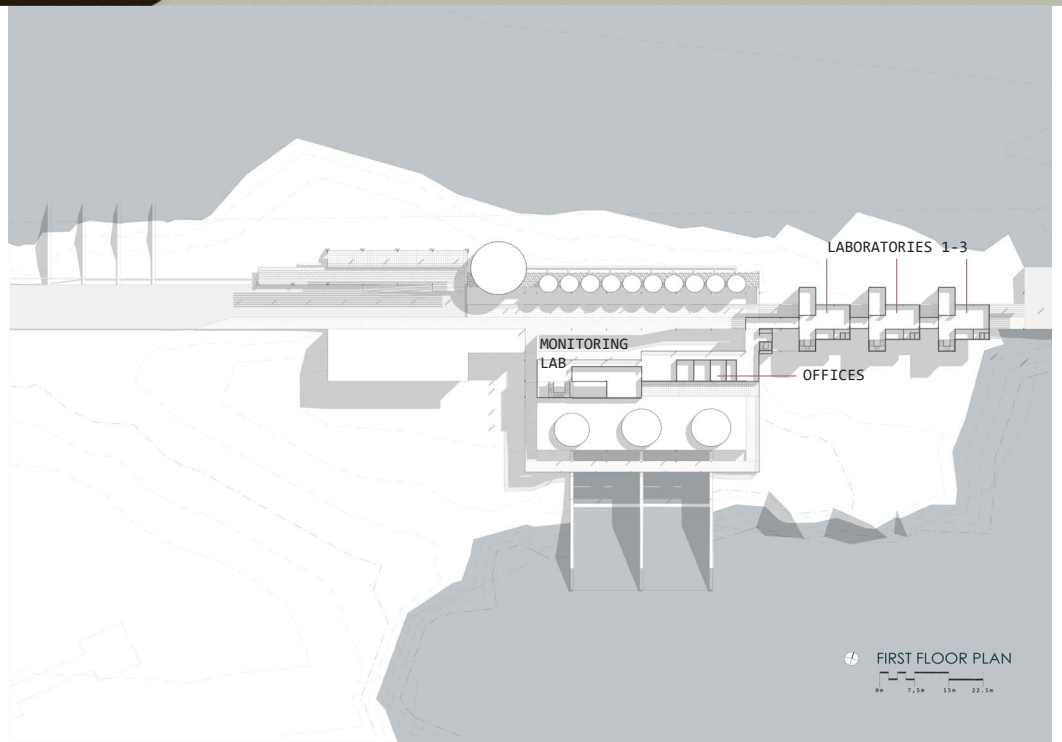

RESTAURANT SPACE
LOOK-OUT POINT
EXHIBITION SPACES
LABORATORY
POST TREATMENT TANKS
CLEAR WATER TANK


DESALINATION
STAFF/SERVICE ENTRANCE
ABSTRACTION POINT
BASEMENT FLOOR PLAN


RESTAURANT
KITCHEN







Interpretation

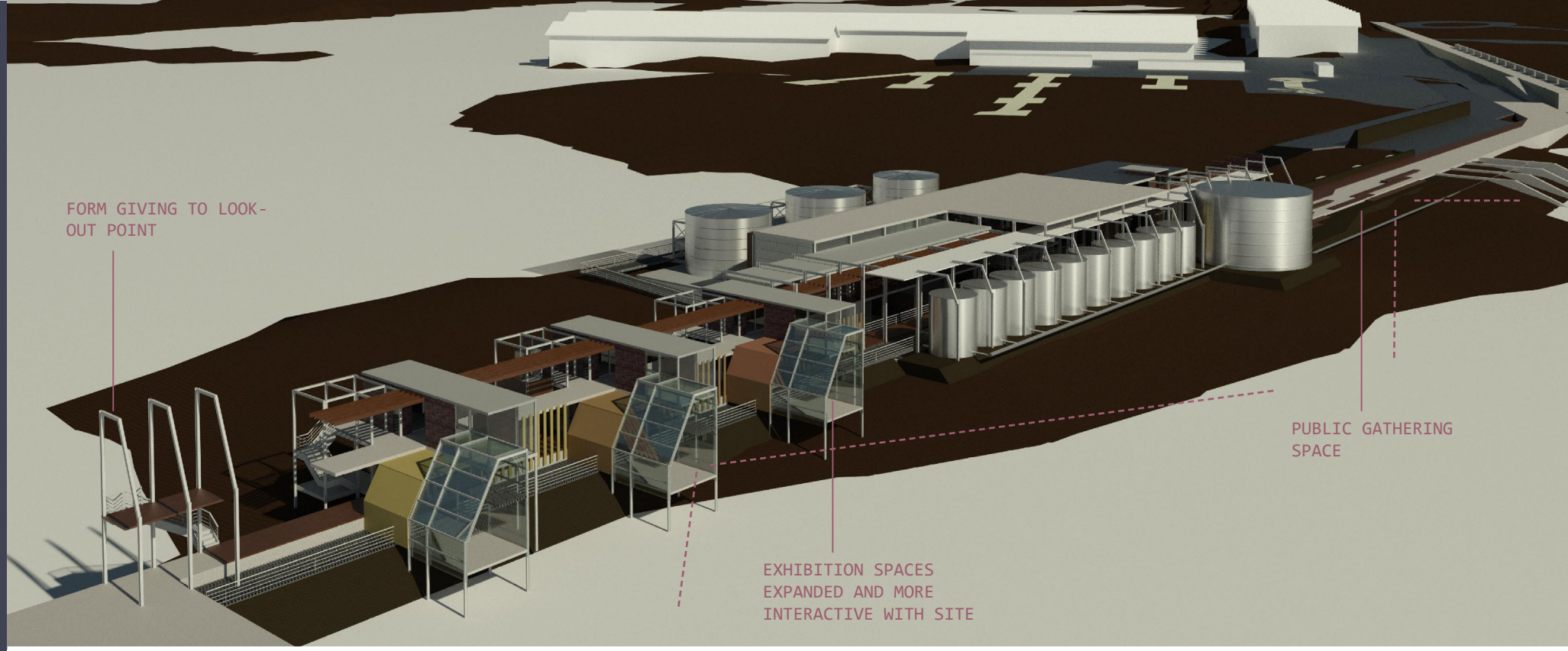
This is still a very diagrammatical phase of the design where certain layouts were questioned.

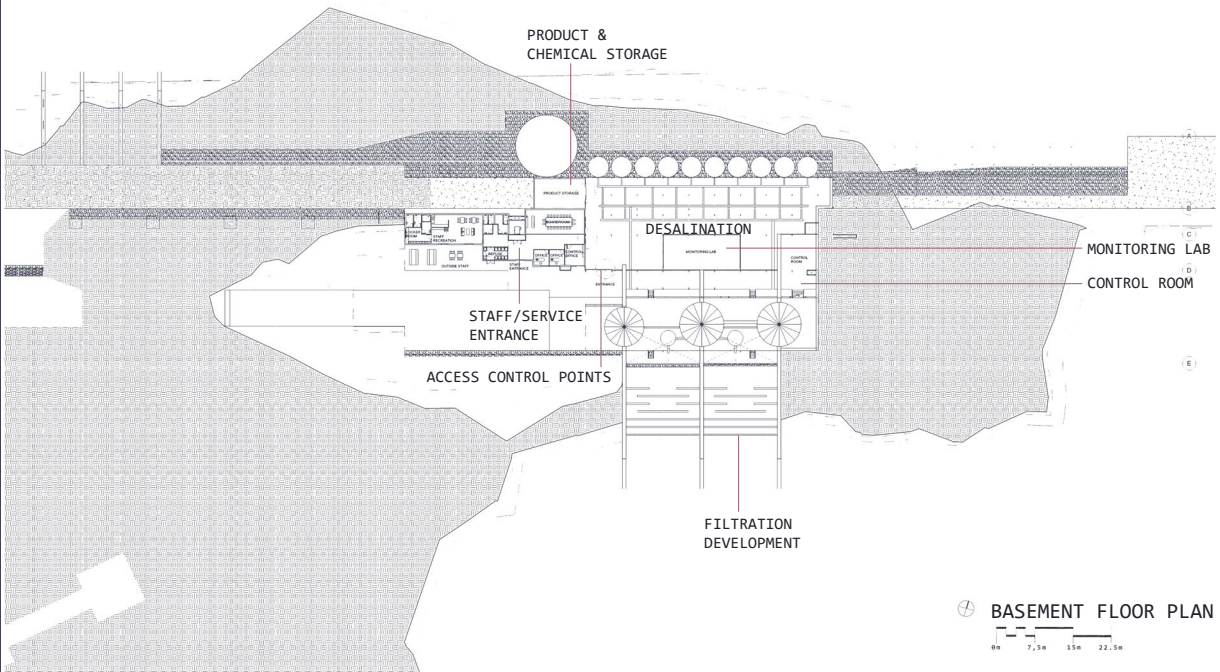
The desalination plant and the services within is busy being laid out and incorporated within the design.

The main problem with the layout of this design is the restaurant area and the functioning within this space. The distance between the kitchen and services is too far apart and the circulation of the restaurant and its services influences the circulation of the public into the building.

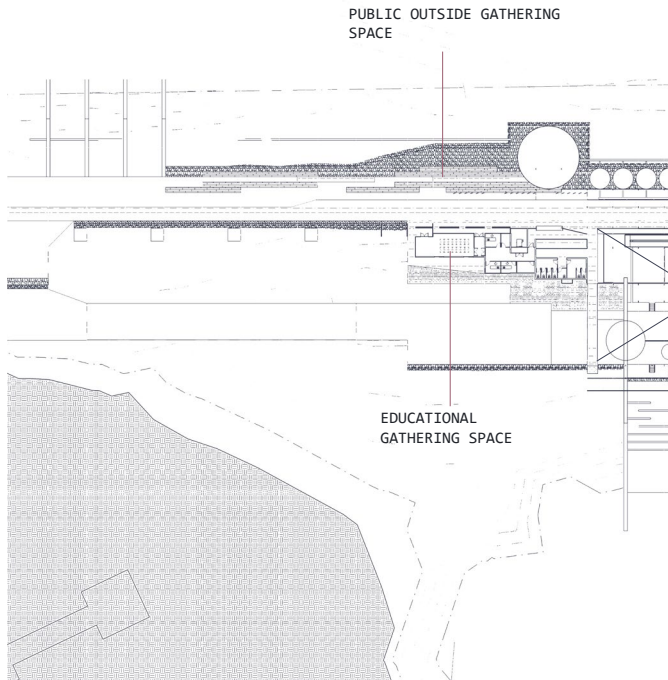
The exhibition and lab spaces still need development and characteristic to them.

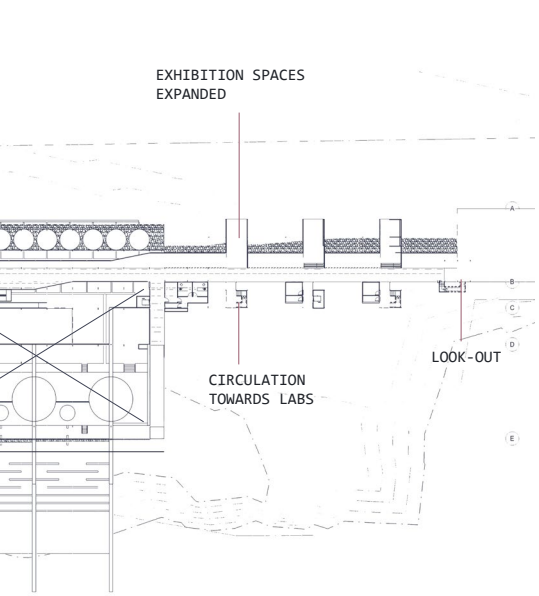
Figures 171-175



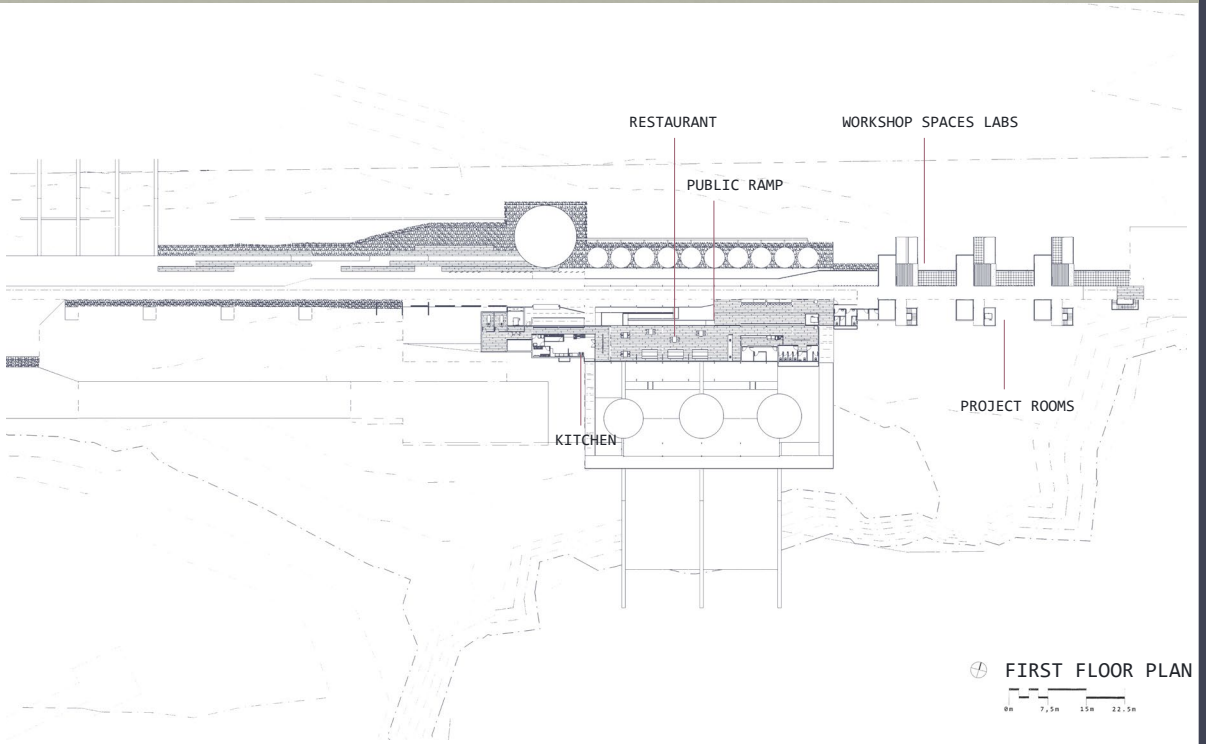


BASEMENT FLOOR PLAN





GROUND FLOOR PLAN



FIRST FLOOR PLAN

Interpretation

The floor plans within this phase of the design is more detailed and the more detailed accommodation list is seen within this phase.

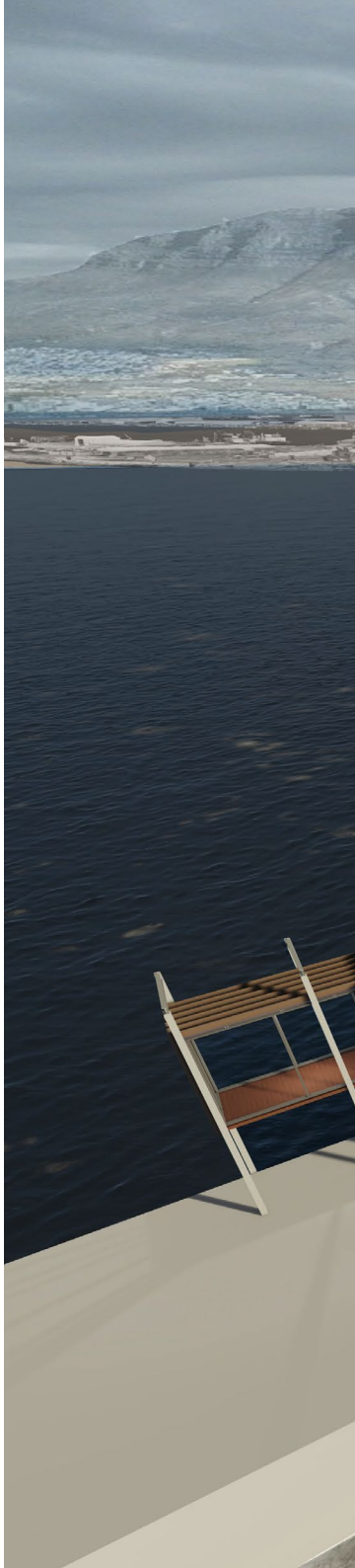
The service within the desalination plant becomes more prominent and developed. The monitoring lab is situated within the desalination plant for closer access to the plant than the first floor.

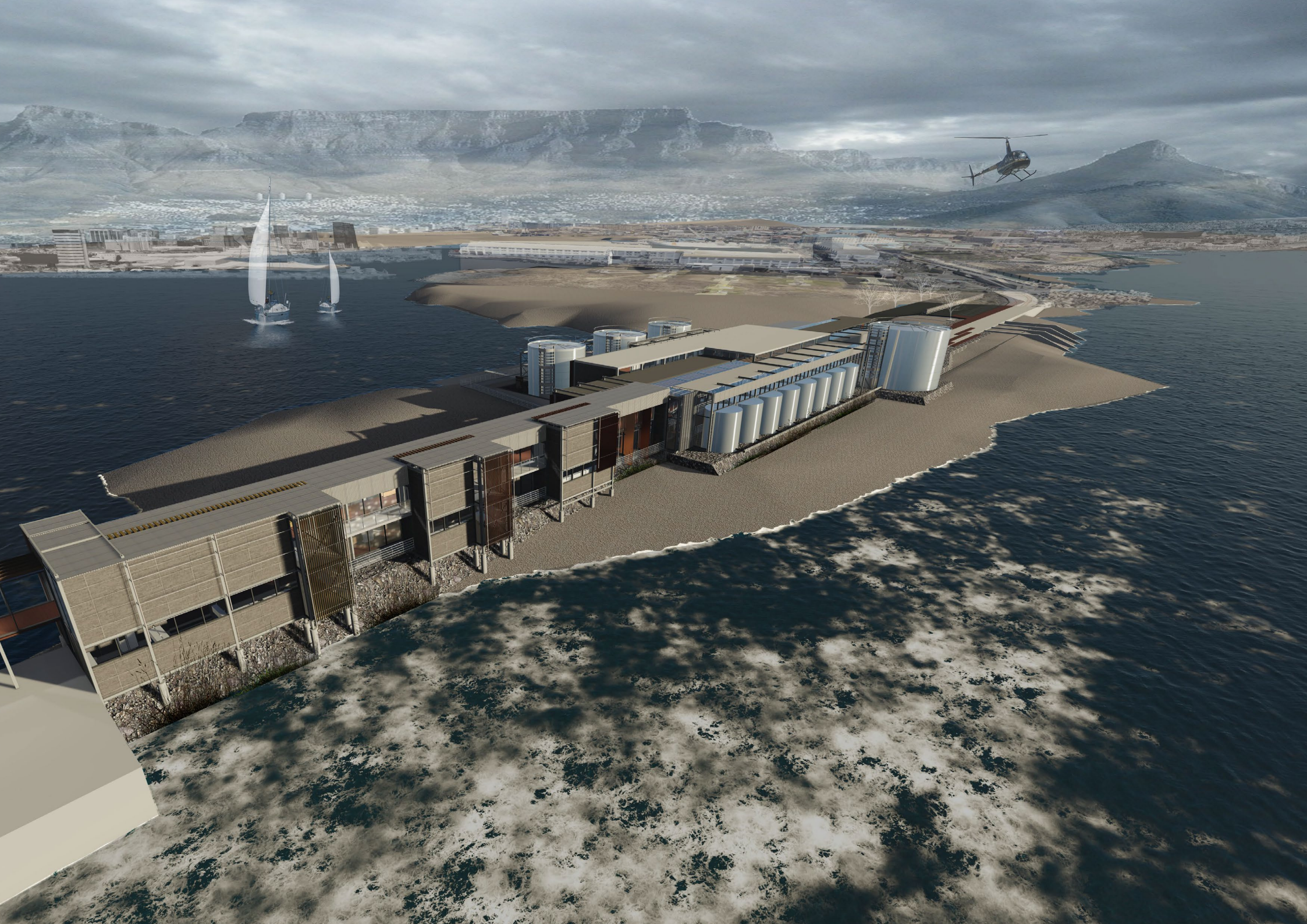
Access control points are situated within the desalination plant and the development of the filtration phases is active within this phase.

The restaurant is moved to the first floor above the desalination plant. The restaurant is a public space where the people are still aware of the desalination process surrounding them. This also allows the public movement through a ramp towards the first floor.

Figures 176-180

F I N A L D E S I G N
S Y N T H E S I S





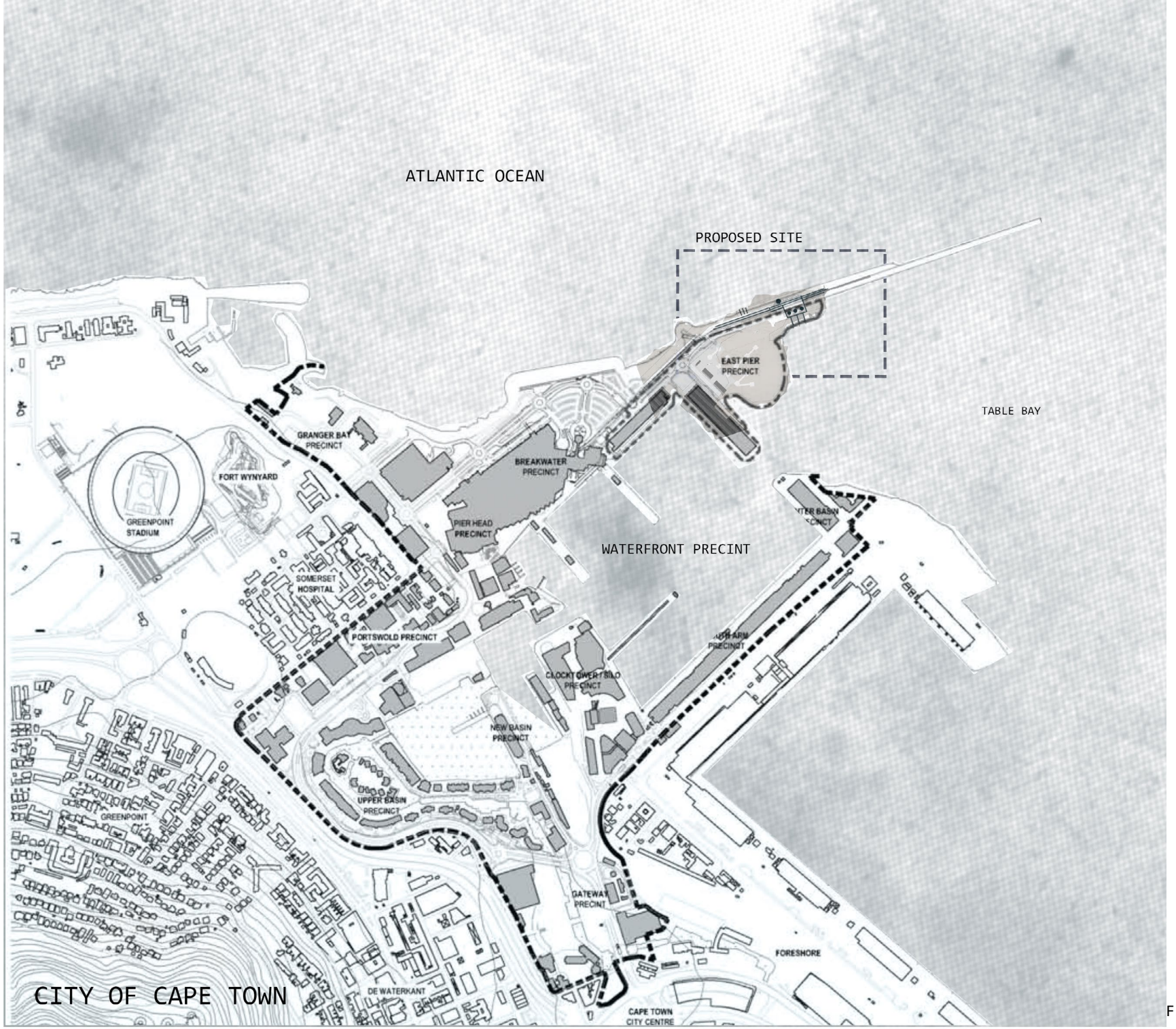


Figure 182

L O C A T I O N P L A N 200m

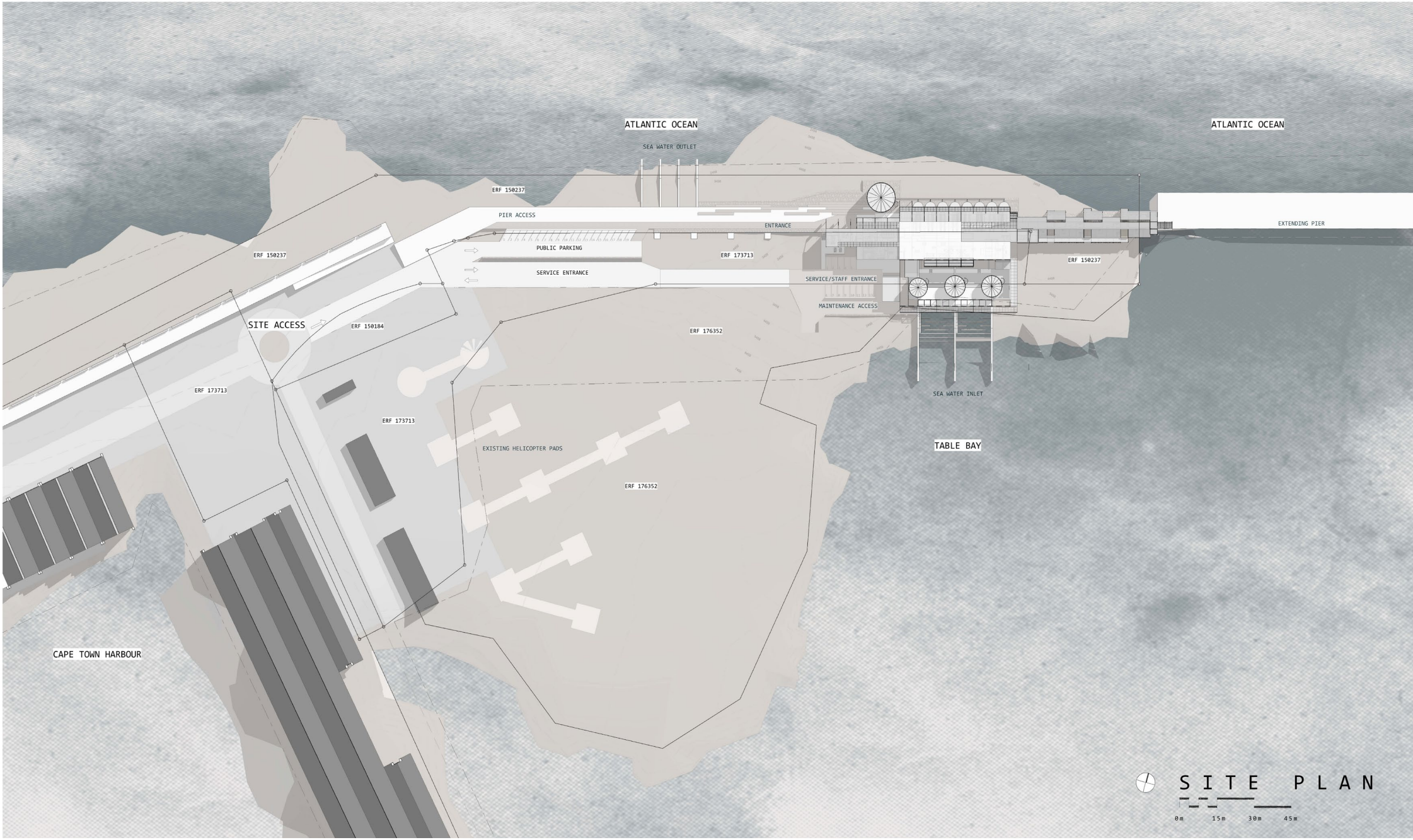
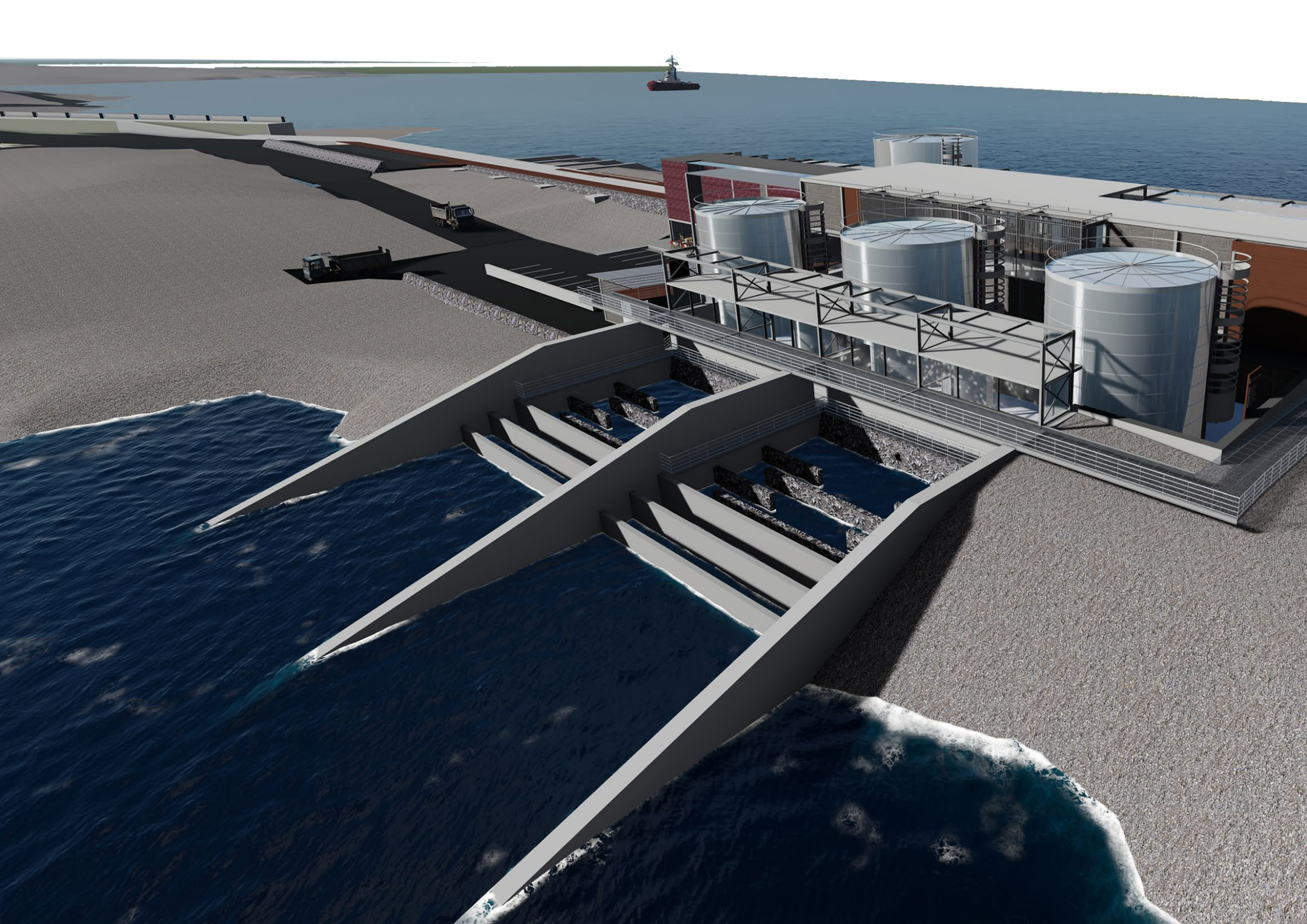

ATLANTIC OCEAN
ATLANTIC OCEAN
SEA WATER OUTLET
ERF 150237
PIER ACCESS
ENTRANCE
EXTENDING PIER
PUBLIC PARKING
ERF 173713
ERF 150237
ERF 150237
SERVICE ENTRANCE
SERVICE/STAFF ENTRANCE
MAINTENANCE ACCESS
SITE ACCESS
ERF 150184
ERF 176352
ERF 173713
SEA WATER INLET
ERF 173713
TABLE BAY
EXISTING HELICOPTER PADS
ERF 176352
CAPE TOWN HARBOUR
SITE PLAN
0m
15m
30m
45m

Figure 183



DESIGN SYNTHESIS
BASEMENT FLOOR PLAN

ACCOMMODATION

BASEMENT

Desalination Plant:

Control Room	60 m²
Monitoring Lab	132 m²
Machine Exhibition	766 m²
Pump Rooms	200 m²
Water Intake	
Filter Phase 1	95 m²
Filter Phase 2	177 m²
Filter Phase 3	94 m²
Store Room - Chemical	9 m²
Store Room - Equipment	47 m²
Access Control Office	20 m²
Desalination Offices	28 m²
Maintenance Workshop	58 m²
Circulation within Desalination Area	30 m²

Staff/Service:

Entrance	17 m²
Staff Parking	164 m²
Boardroom	46 m²
Staff Lockers	25 m²
Staff Recreation	28 m²
Staff Recreation Outdoor	20 m²
Restrooms	25 m²
Refuse Room	14 m²
Storage	4 m²
Service Shaft	10 m²

Figure 184

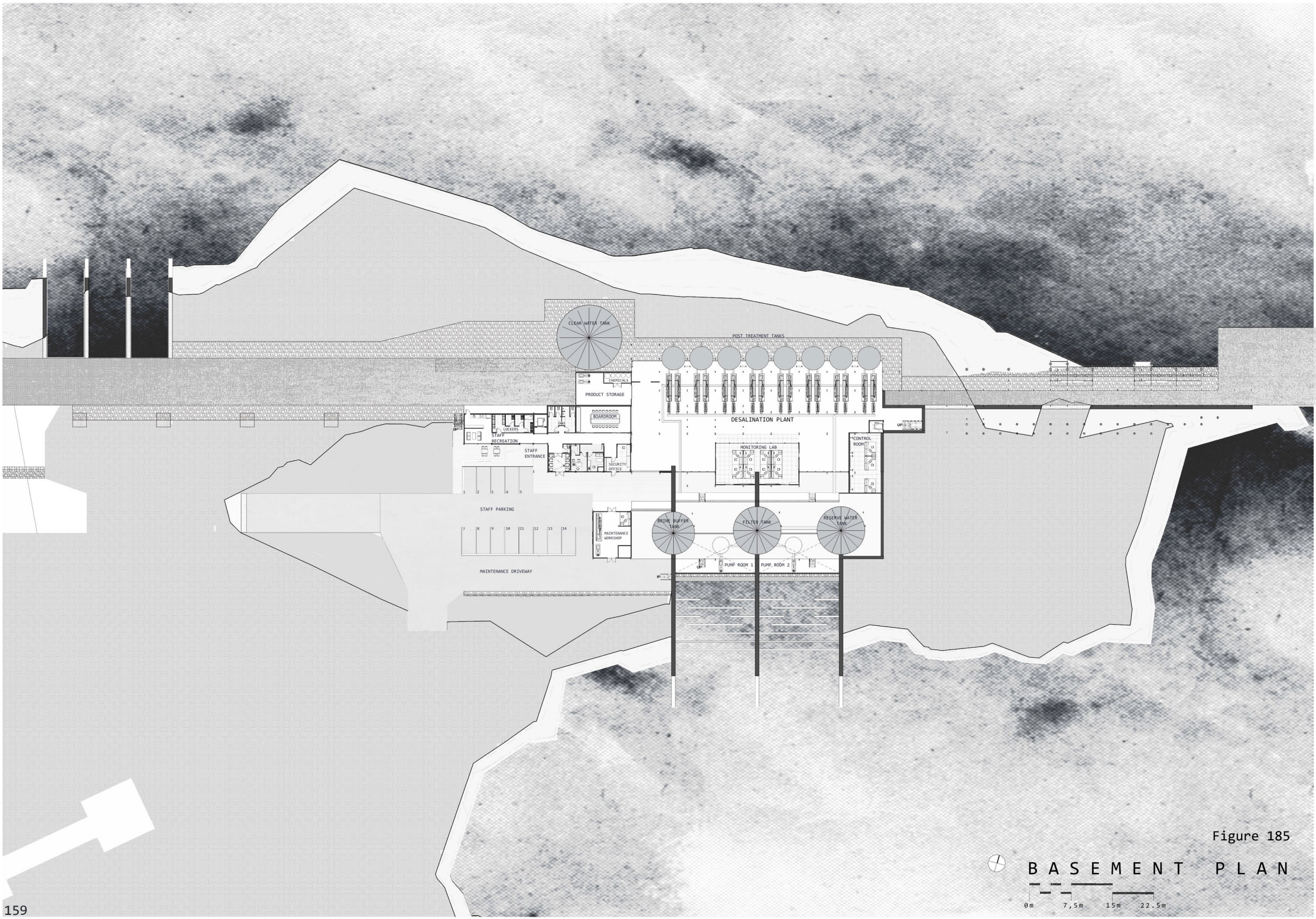

CLEAR WATER TANK
POST TREATMENT TANKS
CHEMICALS
PRODUCT STORAGE
BOARDROOM
LOCKERS
STAFF RECREATION
STAFF ENTRANCE
SECURITY OFFICE
DESALINATION PLANT
MONITORING LAB
CONTROL ROOM
STAFF PARKING
MAINTENANCE WORKSHOP
BRINE BUFFER TANK
FILTER TANK
RESERVE WATER TANK
PUMP ROOM 1
PUMP ROOM 2
MAINTENANCE DRIVEWAY
UP
B A S E M E N T P L A N
0m
7,5m
15m
22.5m

Figure 185

INTERPRETATION

The service entrance to the building is adjusted and the parking is allocated to the service staff. There is enough space for a maintenance vehicle to access the site and to access the equipment that will need maintenance.

The intricate details of the desalination plant and processes are seen within this phase of the design, such as the chemical storage room within the storage of the desalination plant.

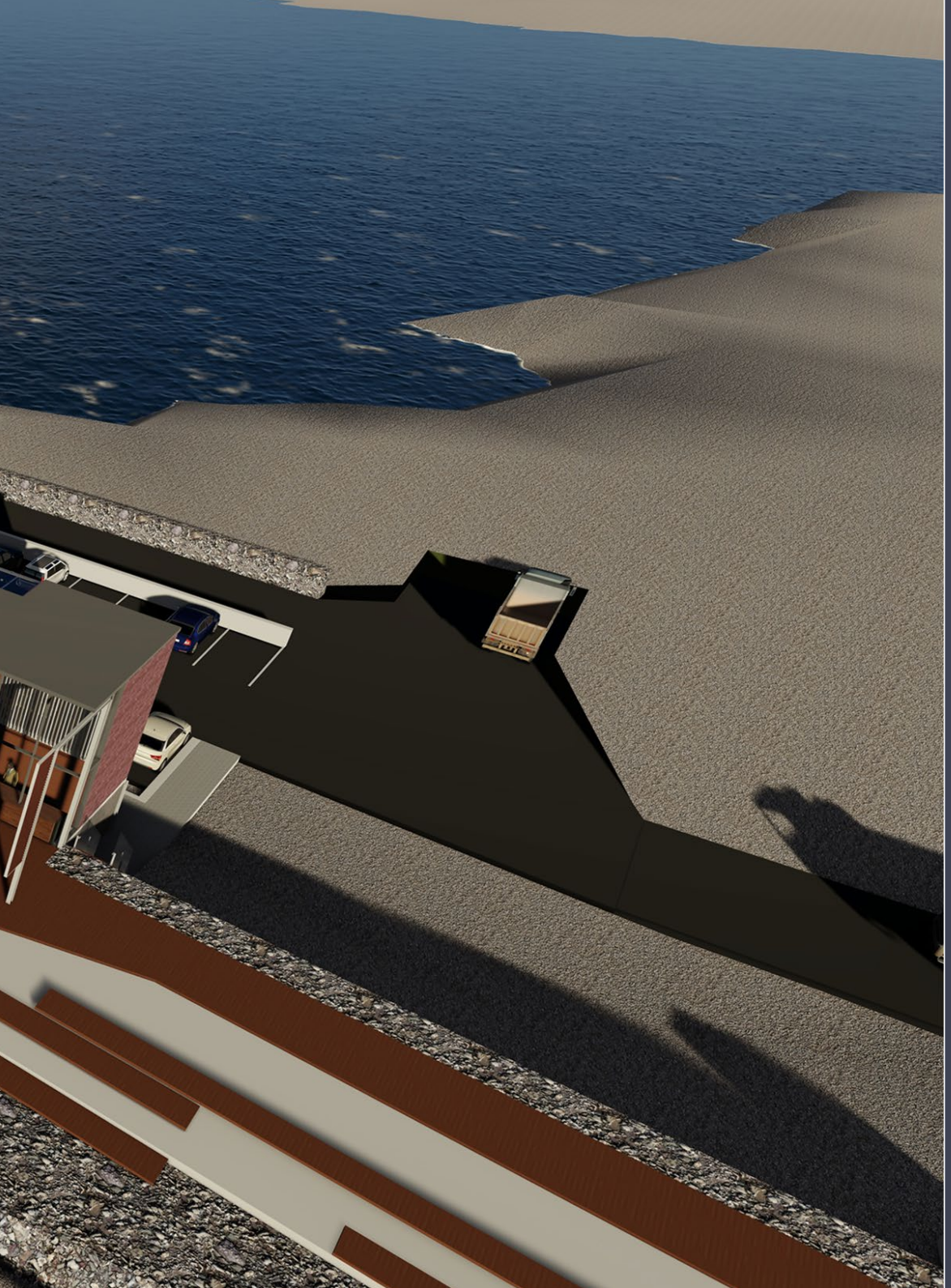
Allocated access is available to the laboratories staff, for the taking of samples within the desalination plant and process.

An exterior maintenance workshop is added for the maintenance of equipment within the plant and the space is large enough for the equipment to be transferred to this workshop.

The main access points of the desalination plant are safely controlled through the control room. This allows access to the authorized personnel within the desalination plant.

Figure 186


SECURITY



DESIGN SYNTHESIS
GROUND FLOOR PLAN

ACCOMMODATION

GROUND FLOOR

Public:

Entrance	90 m²
Reception	30 m²
Public Restroom	75 m²
Public Ramp	48 m²
Outside Seating & Gathering Space	

Educational Platform:

Guide Office	
Storage	18 m²

Staff/Service:

Reception Office	10 m²
Security Office	28 m²
Storage	9 m²
Service Shaft	10 m²

Research labs 1-3

Entrance / Reception	10 m²
Offices	18 m²
Project Rooms 1-3	17 m² x 3
Work Stations 1-3	28 m² x 3
Document Storage	4 m²
Storage	9 m²
Staff Restroom	6 m² x 3
Circulation to Desalination Plant	96 m²

Figure 187

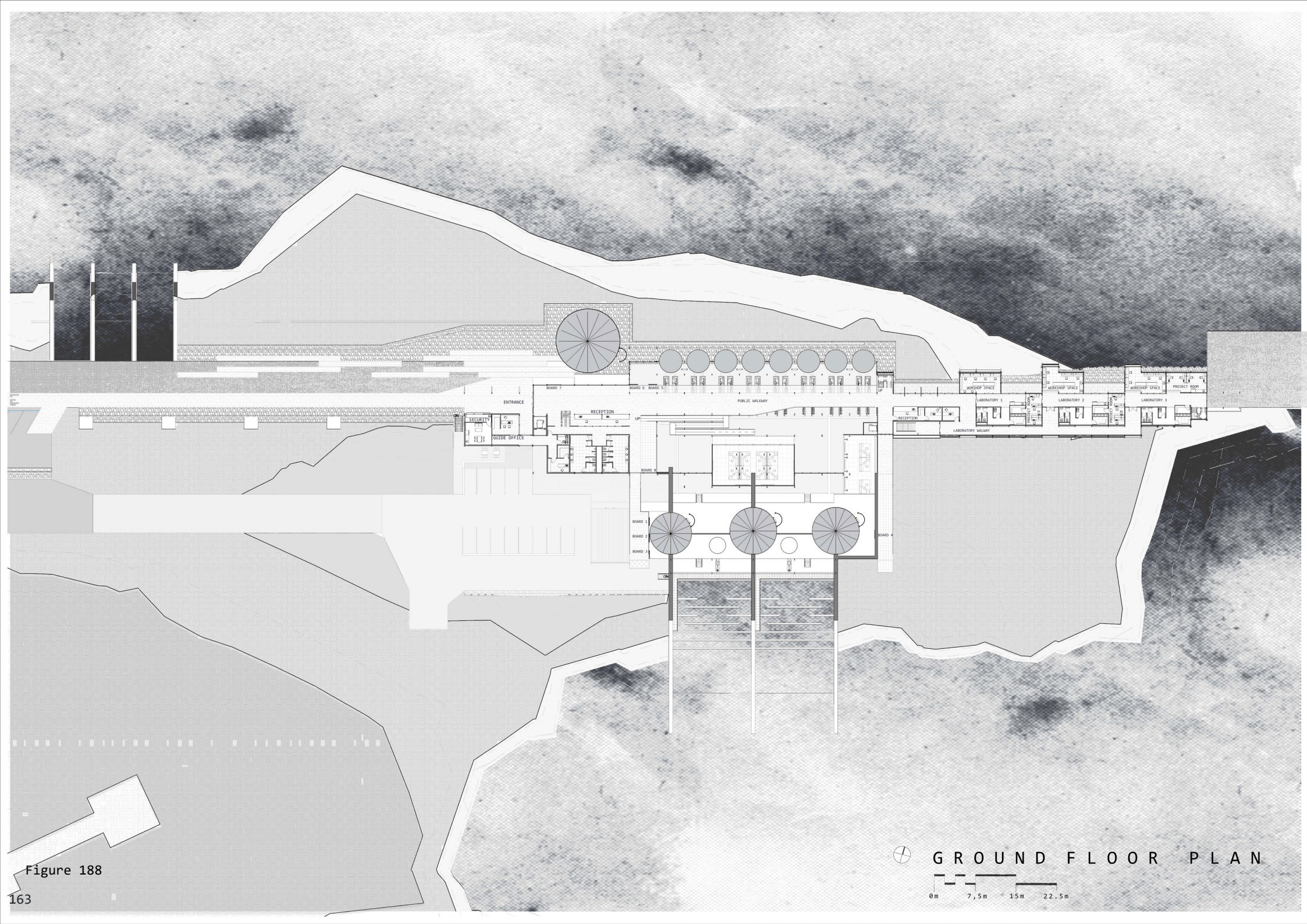

ENTRANCE
SECURITY
GUIDE OFFICE
RECEPTION
UP
BOARD 7
BOARD 6
BOARD 5
PUBLIC WALKWAY
BOARD 8
BOARD 1
BOARD 2
BOARD 3
BOARD 4
RECEPTION
LABORATORY WALKWAY
WORKSHOP SPACE
LABORATORY 1
PROJECT ROOM
WORKSHOP SPACE
LABORATORY 2
PROJECT ROOM
WORKSHOP SPACE
LABORATORY 3
PROJECT ROOM
GROUND FLOOR PLAN
0m
7,5m
15m
22.5m

Figure 188

INTERPRETATION

The public movement through the building is based on an educational structured layout, where the building leads the people through a path explaining the desalination process. This becomes an important aspect of the design incorporating the social entities with the mechanical functions. The experience of the user becomes the connection between the site, water and purification.

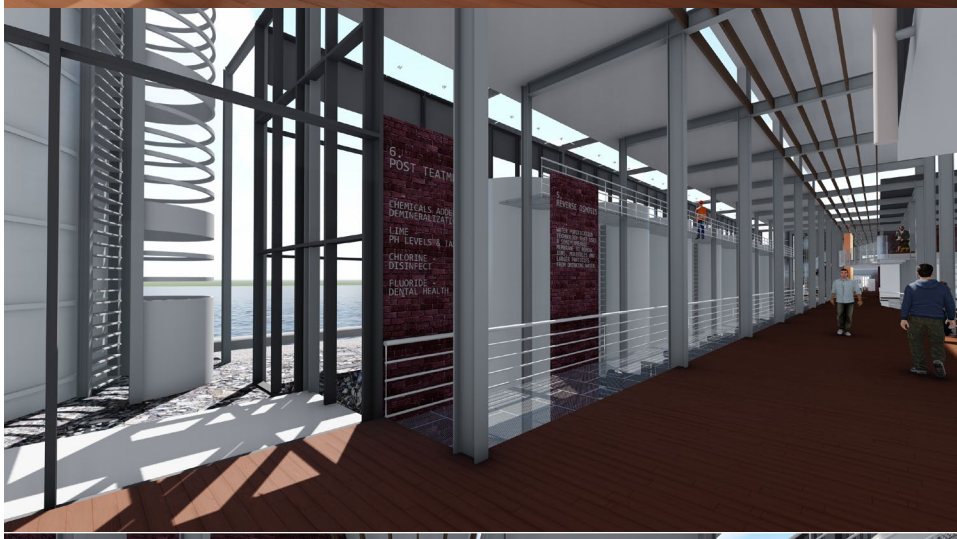
The public will access the building through a security controlled entrance, thereafter information and tickets are available at the reception for a guided tour through the building. After entering the building and moving past the reception area one begins the path of education and exploration. There are boards explaining the desalination process within the public route. The path leads the public toward the abstraction point of the water and the public will experience a different energy than within the building. The people become aware of their surroundings and the *terrain vague* that the building sits within. They will enjoy this unique site as well as the new possibilities it entails.

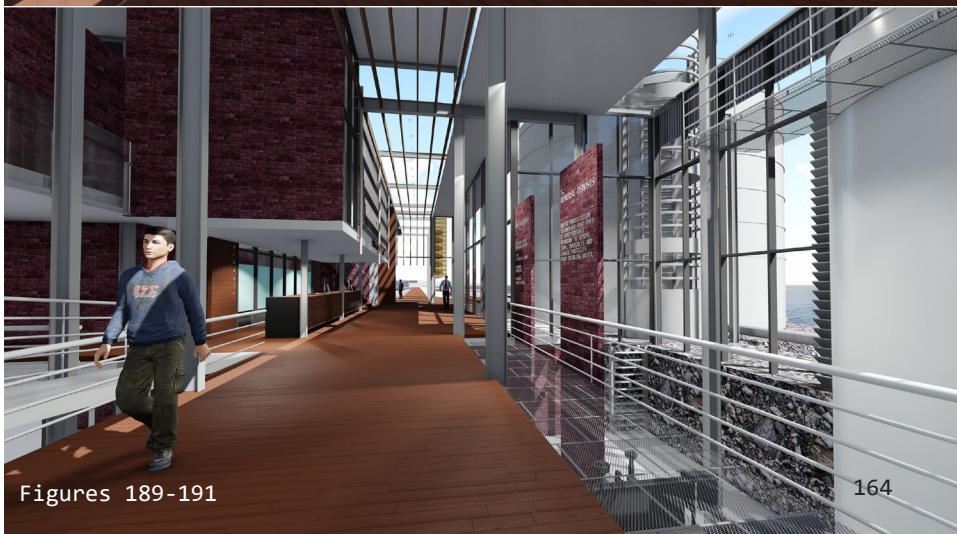
The public is drawn towards the first floor by the open ramp within the main public walkway of the building. This allows the user to experience the building on different levels and view the process from different angles.

The laboratories is moved to the ground floor for easier access to the desalination plant on basement floor. This allows the personnel to take their samples easily and quickly without having to move too far.

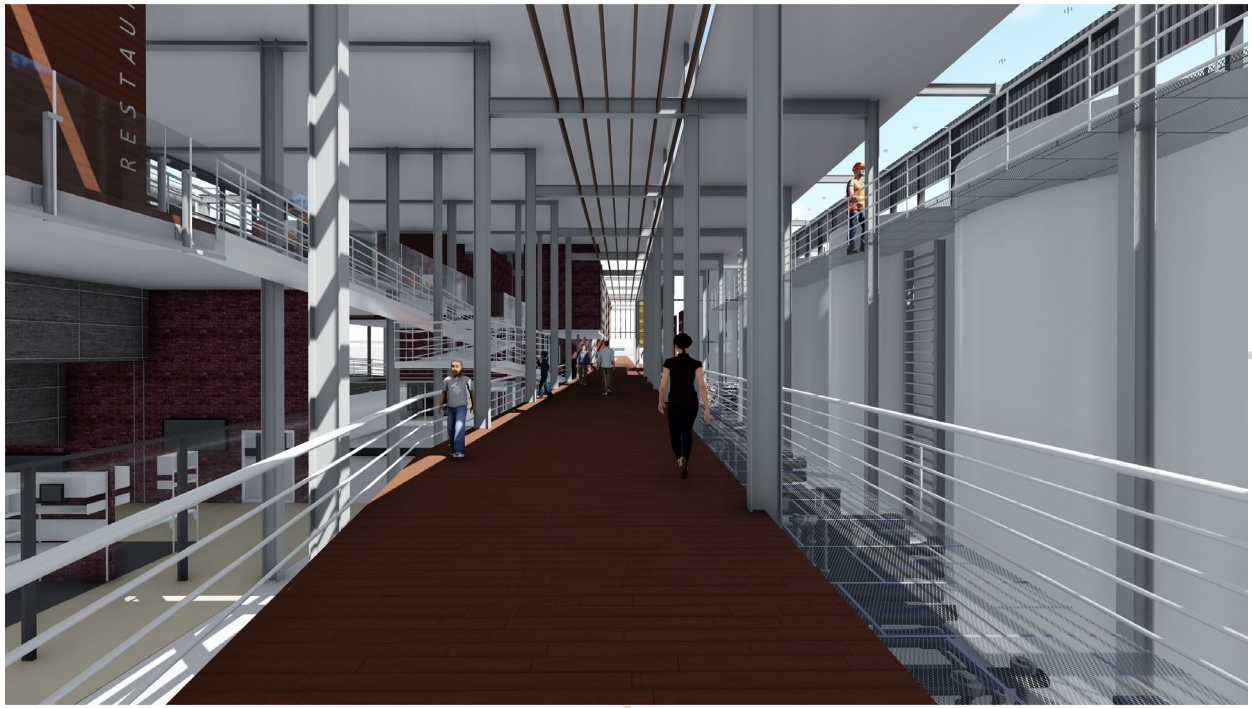
Each of the laboratories is allocated a research typology:

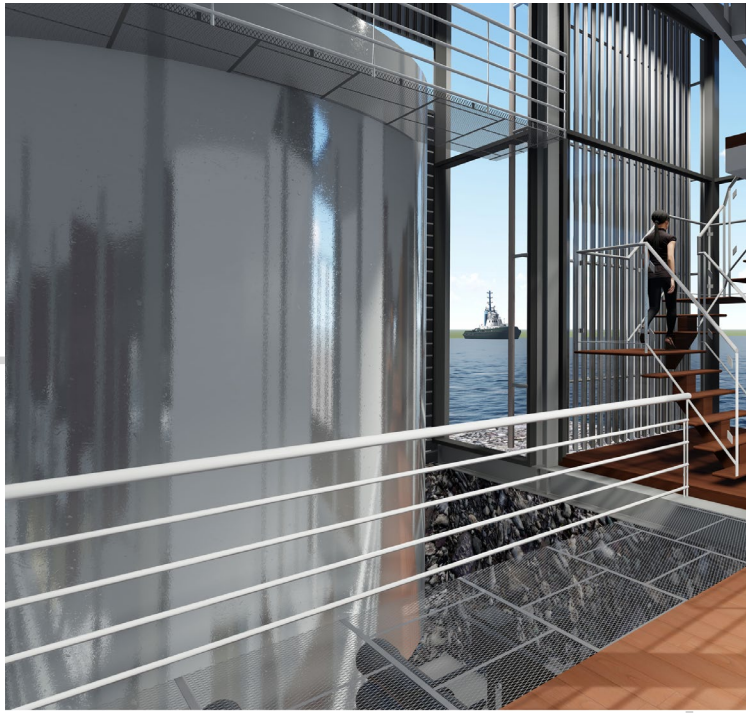
Lab 1: Brine Water Discharge Analyzing and Research
Lab 2: Clear Water Discharge Analyzing and Research
Lab 3: Sea/Salt Water Discharge Analyzing and Research





Figures 189-191





PUBLIC WALKWAY INTERIOR

The walkway within the building is where the people experience the desalination process surrounding them. This walkway is part of the educational route within the building. This perspective also illustrates the ramp towards the first floor and restaurant area.

This perspective illustrates the second public circulation point towards the first floor where the people have access to the restaurant and the exhibition spaces. It also illustrates the transparency of the building structure that allows the user to experience the surrounding environment and ocean views.

Figures 192-194

CIRCULATION TO FIRST FLOOR

This is an interior perspective of the laboratories. Each laboratory is allocated a certain colour that represents the type of water research they implement. These colours are repeated in the desalination process, through different pipe colours for the different stages of the water running through them.

LABORATORY 2 WORKSHOP SPACE

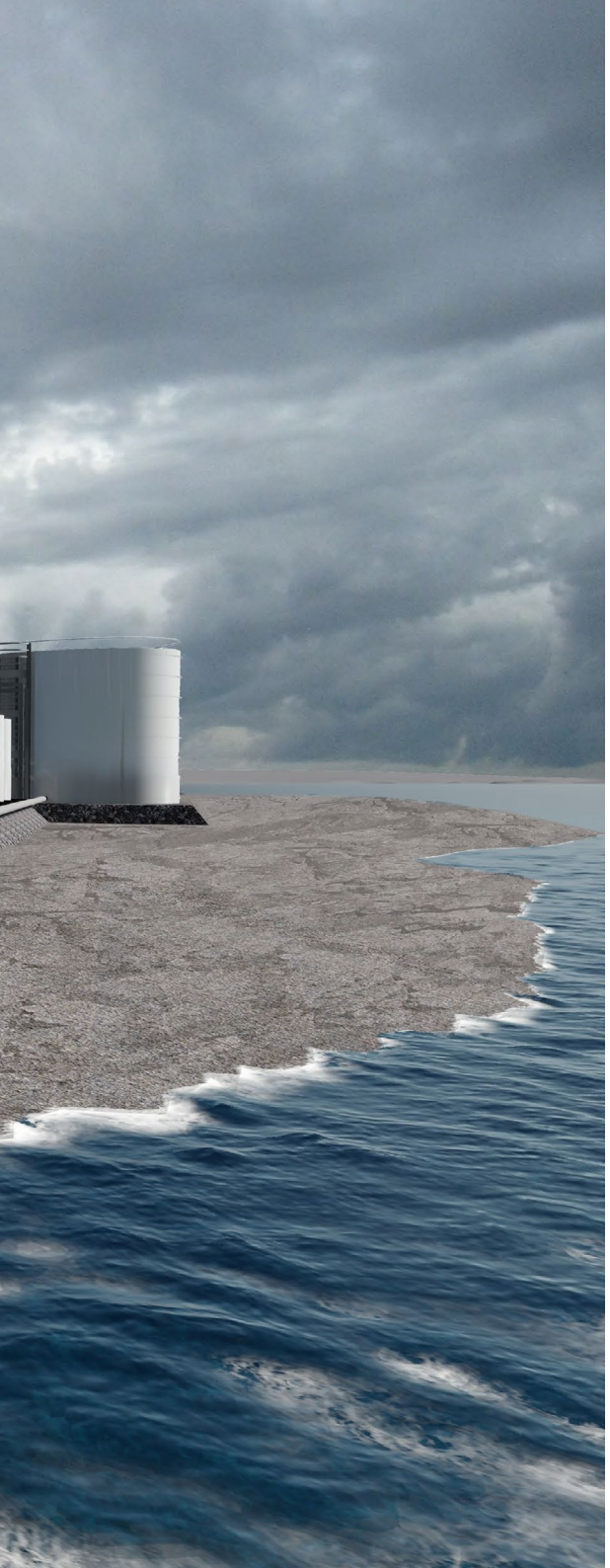


Figure 195

DESIGN SYNTHESIS
FIRST FLOOR PLAN

ACCOMMODATION

FIRST FLOOR

Restaurant

Public:

Reception	12 m²
Cocktail Bar	24 m²
Restrooms	32 m²
Table seating area	195 m²
Public Ramp	48 m²
Educational Gathering Area	64 m²

Staff/Service:

Staff Lounge	20 m²
Office	18 m²
Storage	12 m²
Bar Wash-up Area	12 m²
Service Shaft	10 m²

Kitchen:

Prep Area	17 m²
Wash-Up Area	13 m²
Drop-Off Area	4 m²
Cold Storage / fridge	7 m²
Storage	6 m²
Refuse room	9 m²

Exhibition spaces

Exhibition Space 1	26,5 m²
Exhibition Space 2	30 m²
Exhibition Space 3	57 m²
Walkway	137 m²

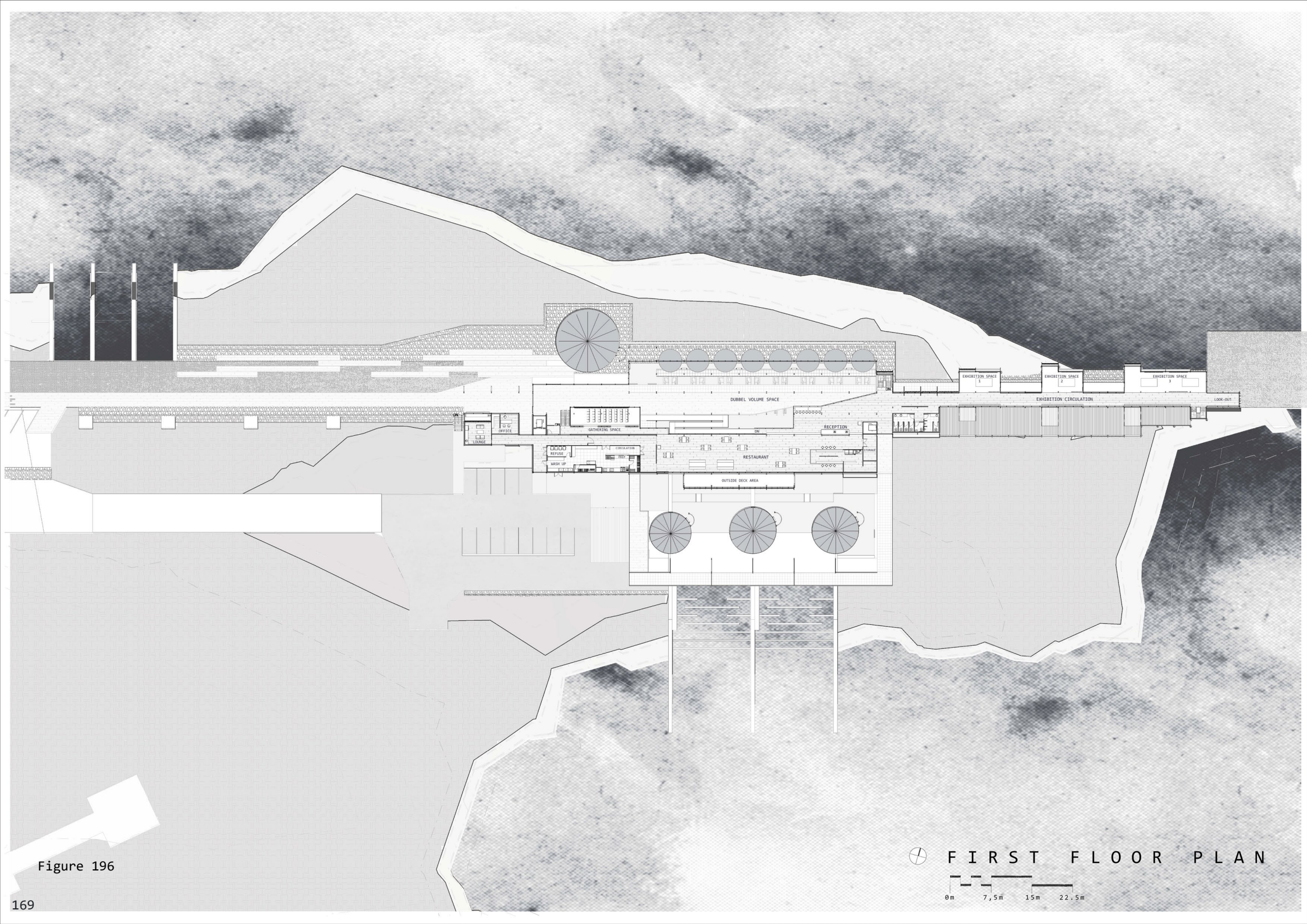

DUBBEL VOLUME SPACE
EXHIBITION SPACE 1
EXHIBITION SPACE 2
EXHIBITION SPACE 3
EXHIBITION CIRCULATION
LOOK-OUT
OFFICE
LOUNGE
GATHERING SPACE
RECEPTION
CIRCULATION
REFUSE
FRY
WASH UP
RESTAURANT
STORAGE
OUTSIDE DECK AREA
FIRST FLOOR PLAN
0m
7,5m
15m
22.5m

Figure 196

INTERPRETATION

The first floor consists of the restaurant area where people can experience the site and desalination plant while relaxing and taking a break from their routines. The first floor also consists of a gathering space where groups visiting the desalination plant can gather and be educated about the process encapsulating them.

The exhibition spaces are moved from the ground floor to draw the public towards the first floor and to experience the site from a different level. These exhibition spaces allow the user to move further through the site and along the linear route of the pier. This route ends with a look-out point where one could experience the end of the pier and its unique views, becoming the final destination of the route, but at the same time the beginning of the ocean and the possibilities it holds. This in effect creates an end open to everyone to experience the ocean that made the building and process of purification for the city possible. It allows the user to feel part of the pier within the *terrain vague*.

Figures 197-199

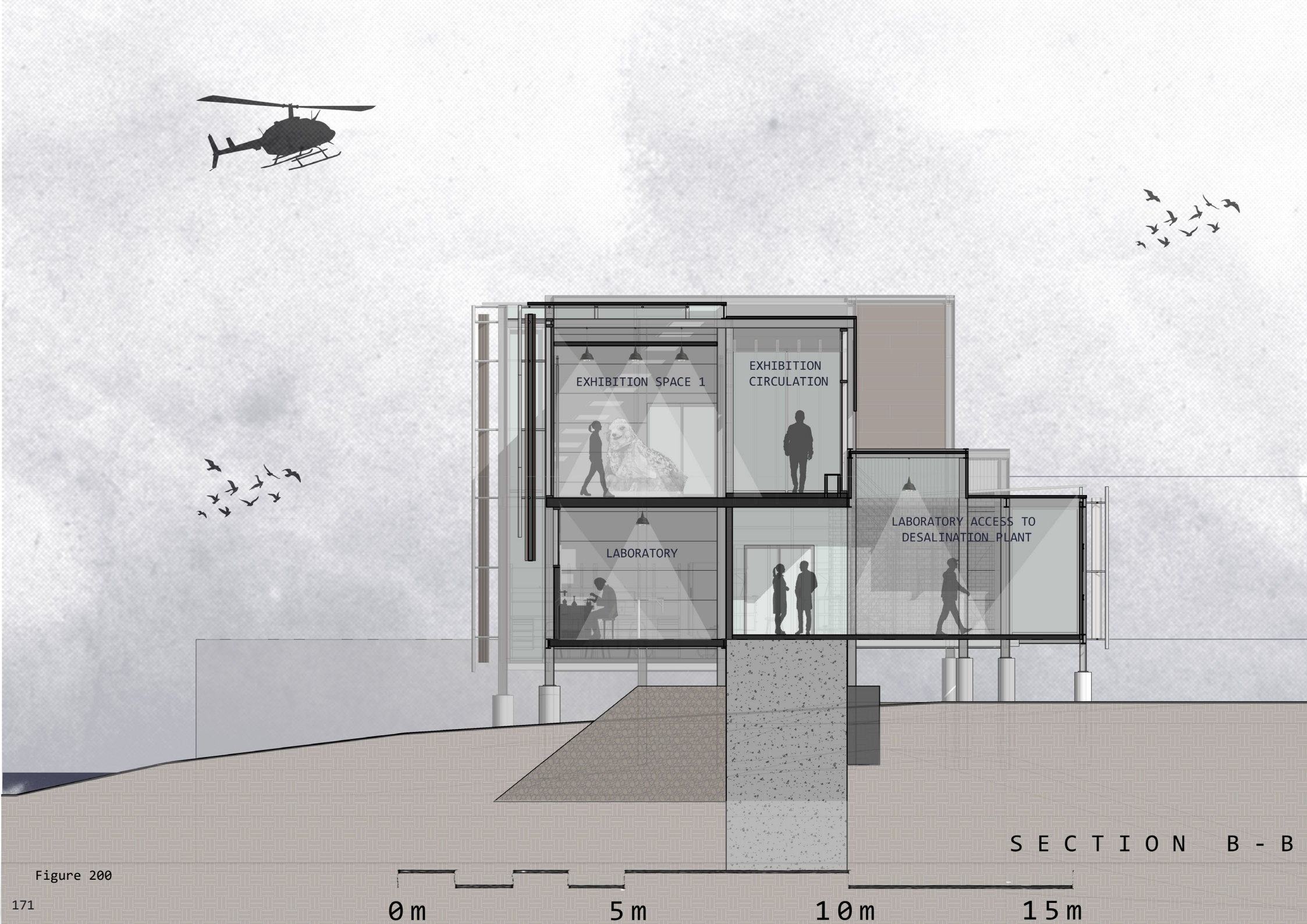
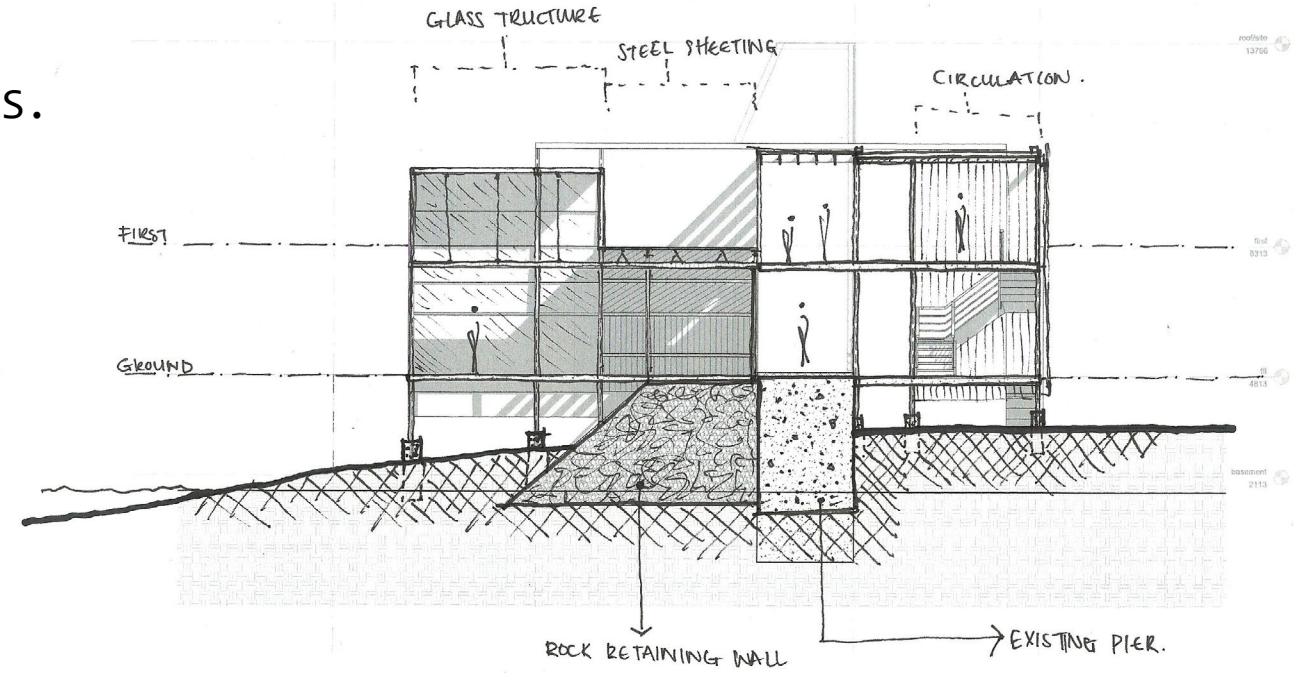
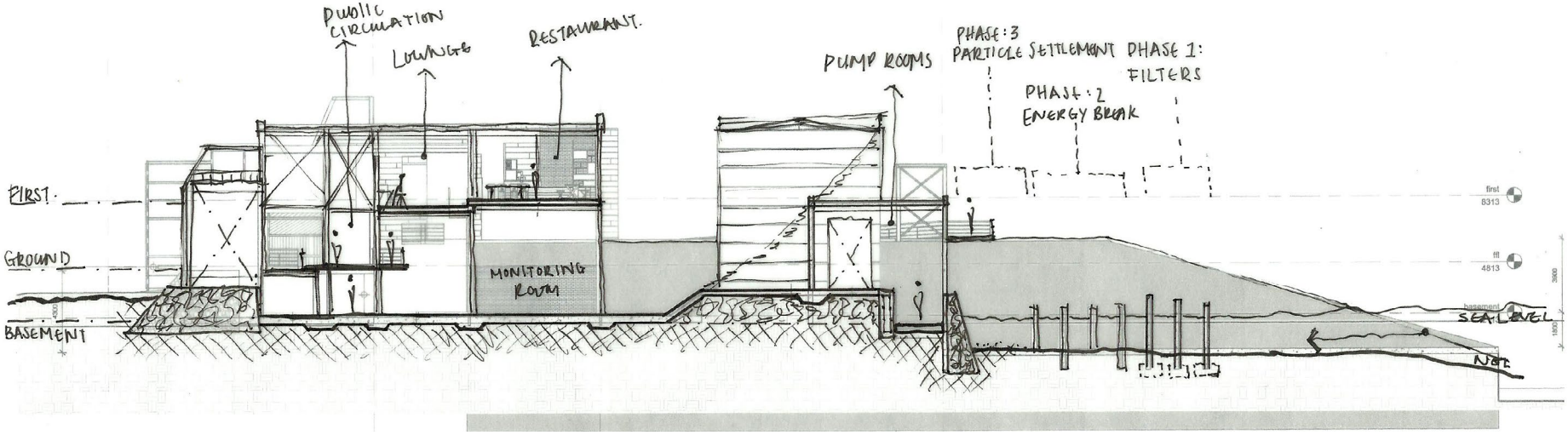

EXHIBITION SPACE 1
EXHIBITION CIRCULATION
LABORATORY
LABORATORY ACCESS TO DESALINATION PLANT
SECTION B-B
0m
5m
10m
15m

Figure 200

SKETCHES EXPLAINING THE DEVELOPMENT OF THE SECTIONS.

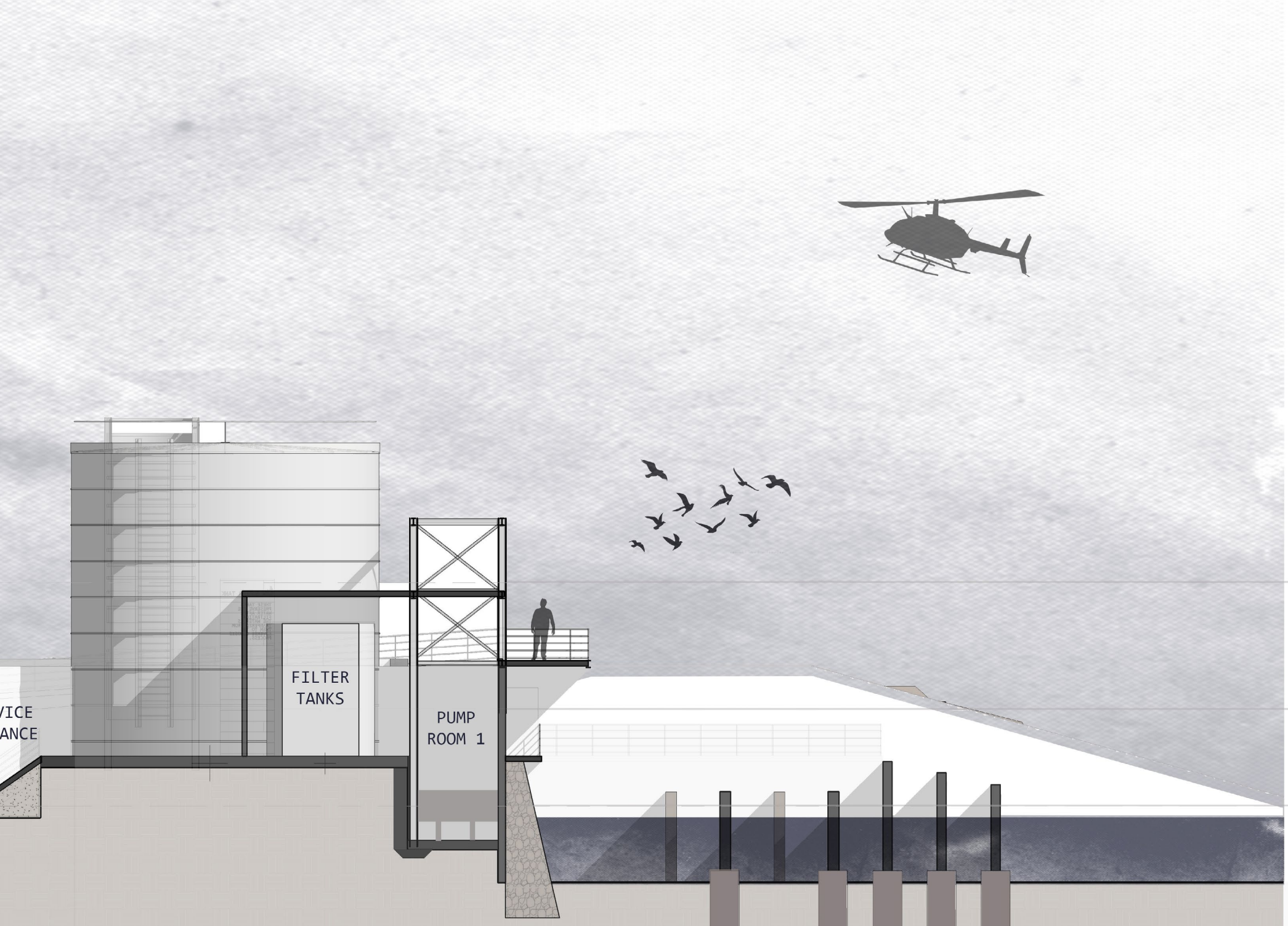
Figures 201 & 202



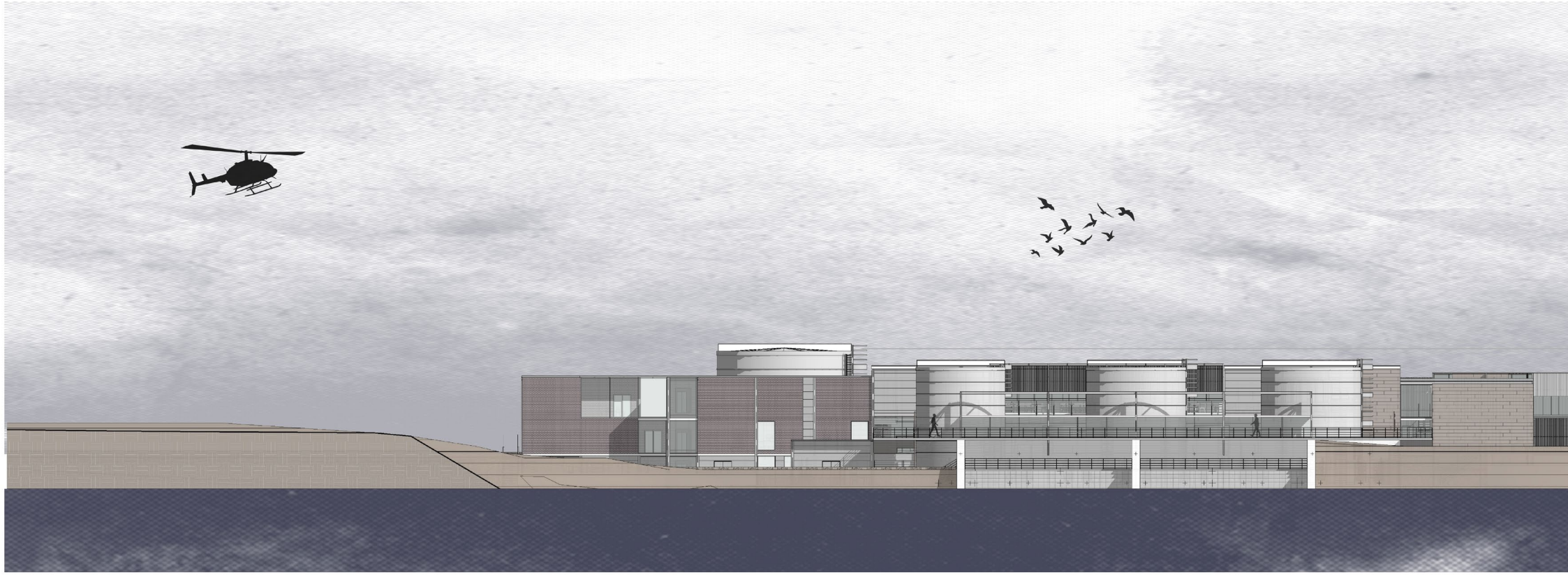


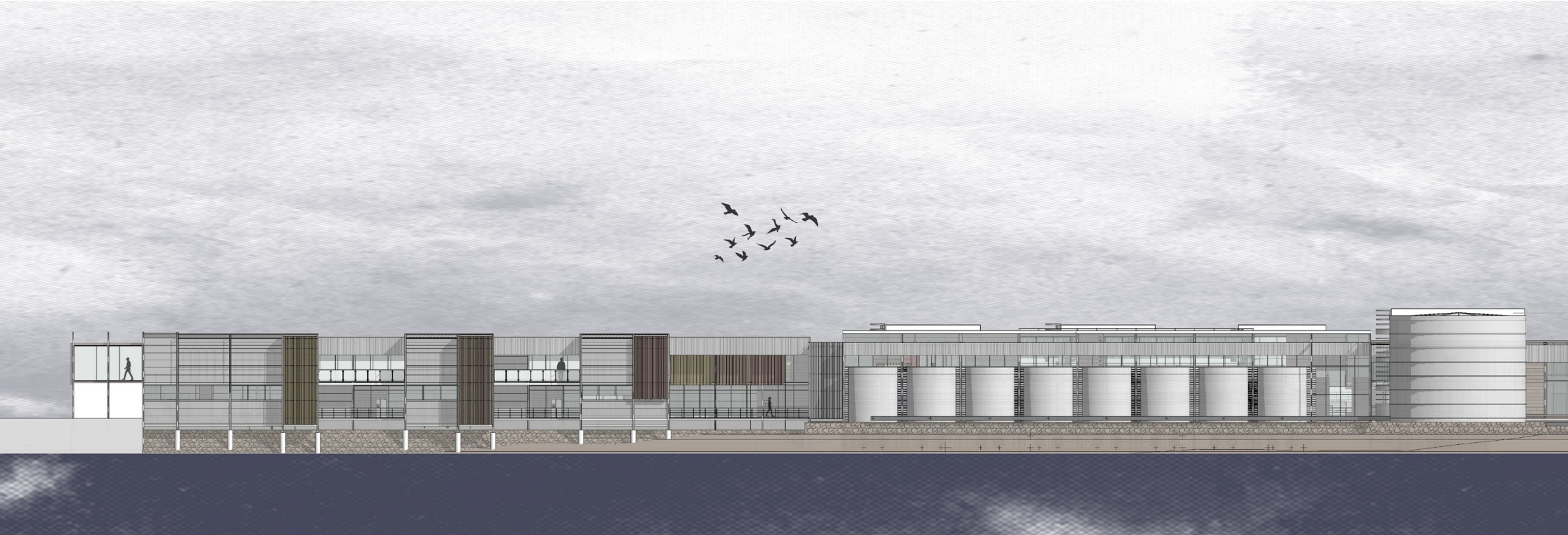

DOUBLE
VOLUME
PUBLIC
WALKWAY
RESTAURANT
OUTSIDE
DECK
DESALINATION
PLANT
SERV
ENTR
0m
5m
10m
15m

Figure 203


FILTER
TANKS
PUMP
ROOM 1
VICE
ANCE
first
8313
ffl
4813
basement
2113

SECTION A-A





SOUTH ELEVATION

NORTH ELEVATION

DESIGN SYNTHESIS
ELEVATIONS

INTERPRETATION

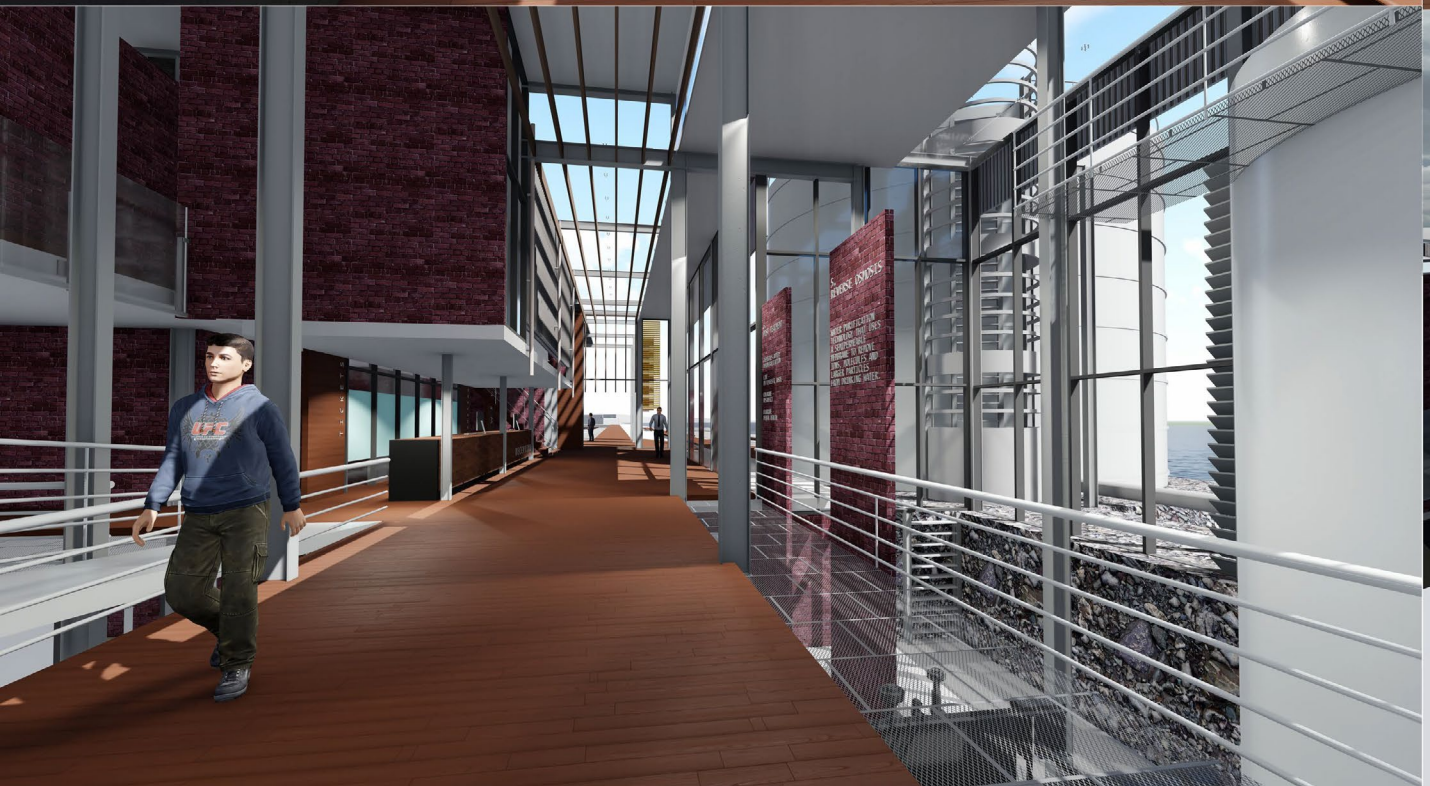
The elevations of this dissertation indicates the way in which the desalination plant sits within its surroundings. The linear movement within the site and pier is kept within the design. The plant is a large, new, necessary entity within the site and certain elements were used not to intrude the total experience of the special pier. The design keeps a sense of grounding within the context with no large hierarchy points. This respects the terrain and it does not become an overpowering element in the surrounding views.

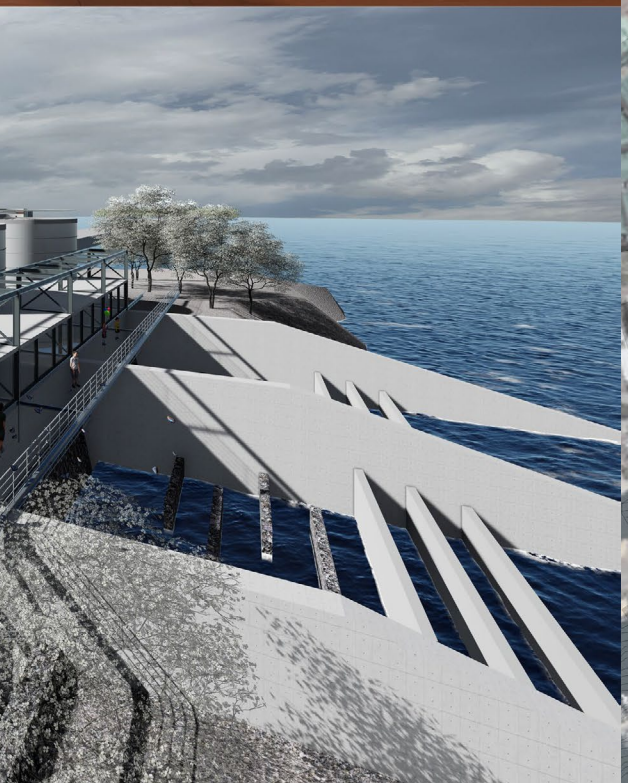
Natural materials are used within the design to keep a sense of the environment other than the water within the building. The building consists of wooden elements such as timber floors and cladded walls to join the surrounding wooden decks. Rock retaining walls are a large part of the design because it is from the site itself. The site consists of rock foundations and therefore it is used to reconnect the building to the site by the materials removed within the building process.

Figures 204 & 205


RECEPTION


5.
REVERSE OSMOSIS
WATER PURIFICATION
TECHNOLOGY THAT USES
A SEMI-PERMEABLE
MEMBRANE TO REMOVE
IONS, MOLECULES AND
LARGER PARTICLES
FROM DRINKING WATER.





ATLANTIC OCEAN

PROPOSED SITE

EAST PIER PRECINCT

TABLE BAY

VICTORIA BASIN

WATERFRONT PRECINCT

ALFRED BASIN

WATERFRONT PRECINCT

DUNCAN DOCK

VICTORIA AND ALFRED PRECINCT
EAST PIER

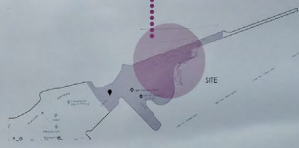
SITE ANALYSIS

VICTORIA AND ALFRED PRECINCT
EAST PIER

WESTERN CAPE

CAPE TOWN

VICTORIA & ALFRED WATERFRONT



EAST PIER

URBAN AREAS

MARINE PROTECTED AREAS

PRESERVING AREAS

ECOSYSTEM THREAD AREAS

CRITICAL BIODIVERSITY AREAS

WETLAND AREAS

SIGNIFICANT POINTS

Figure 81-83

1. amphitheatre
2. croquet lawn
3. breakwater parking garage
4. historic tunnel
5. breakwater boulevard site
6. clocktower square
7. market square
8. nobel square
9. silos

PUBLIC MOVEMENT NETWORKS

The main public routes within the Waterfront precinct.

ZONING BUILDING TYPES

HOTELS:
1 Cape Grace
2 Victoria & Alfred
3 One & Only

SHOPPING CENTRES:
1 Red Shed Craft Shop
2 Victoria Wharf Centre
3 Clock Tower Square
4 Clock Tower Centre
5 Market Square
6 Waterfront Trading Co

LANDMARKS:
1 Information Centre
2 Two Oceans Aquarium
3 BMW Pavilion
4 Portswood Business Park
5 Nelson Mandela Gateway to Robben Island

BASINS:
1 Marina
2 Alfred Basin
3 Victoria Basin

VEA MARINA RESIDENTIAL

R E F L E C T I O N

The compilation of the document served as a reminder of the learning process and its different design stages. The document forced me to put the investigated ideas on paper and document the process of the design, as I have the tendency to mainly focus on the perspective views and forget the detail of plan design.

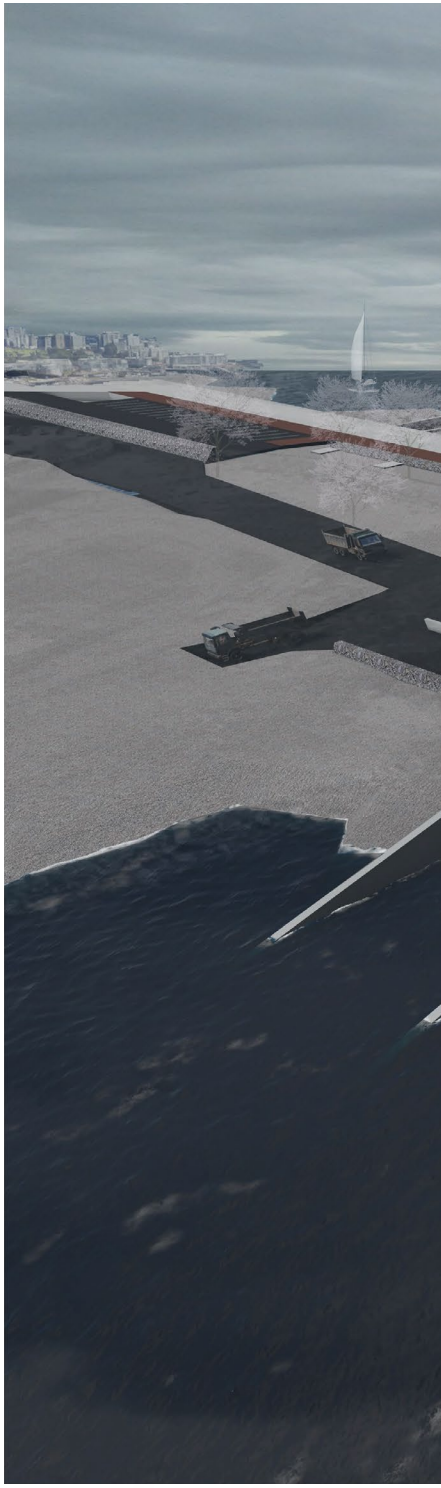
During my previous years of study, most of the sites that I had the opportunity to work at, were located within the city. This site, being situated in the East Pier of Cape Town, served a challenge and learning curve for me as I was mostly used to designing in the city itself. I had to take the surrounding nature into careful consideration and I had to disturb the existing with respect.

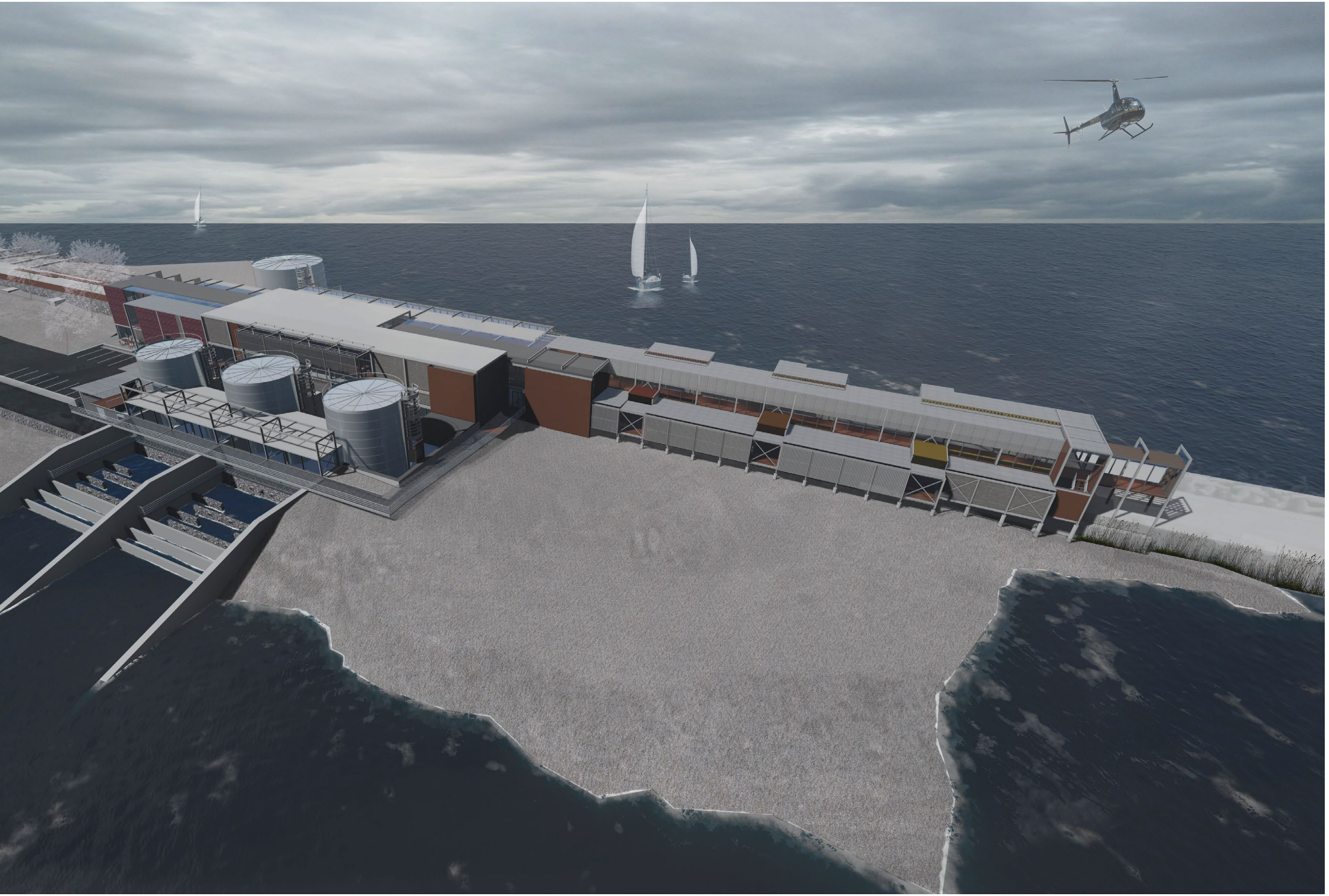
Another challenge for me was to focus on developing the theoretical grounding and construction of the project simultaneously with the functions of the desalination plant.

The mechanical tendency of the building forced me to engage in the project on a more technical level, resolving and designing unique details.

The touchstone and conceptual sketches served as a reminder and allowed me to regain focus on my initial ideas and purpose of the project, keeping the terrain vague in mind, when I seemed to lose fundamental aspects as the design developed.

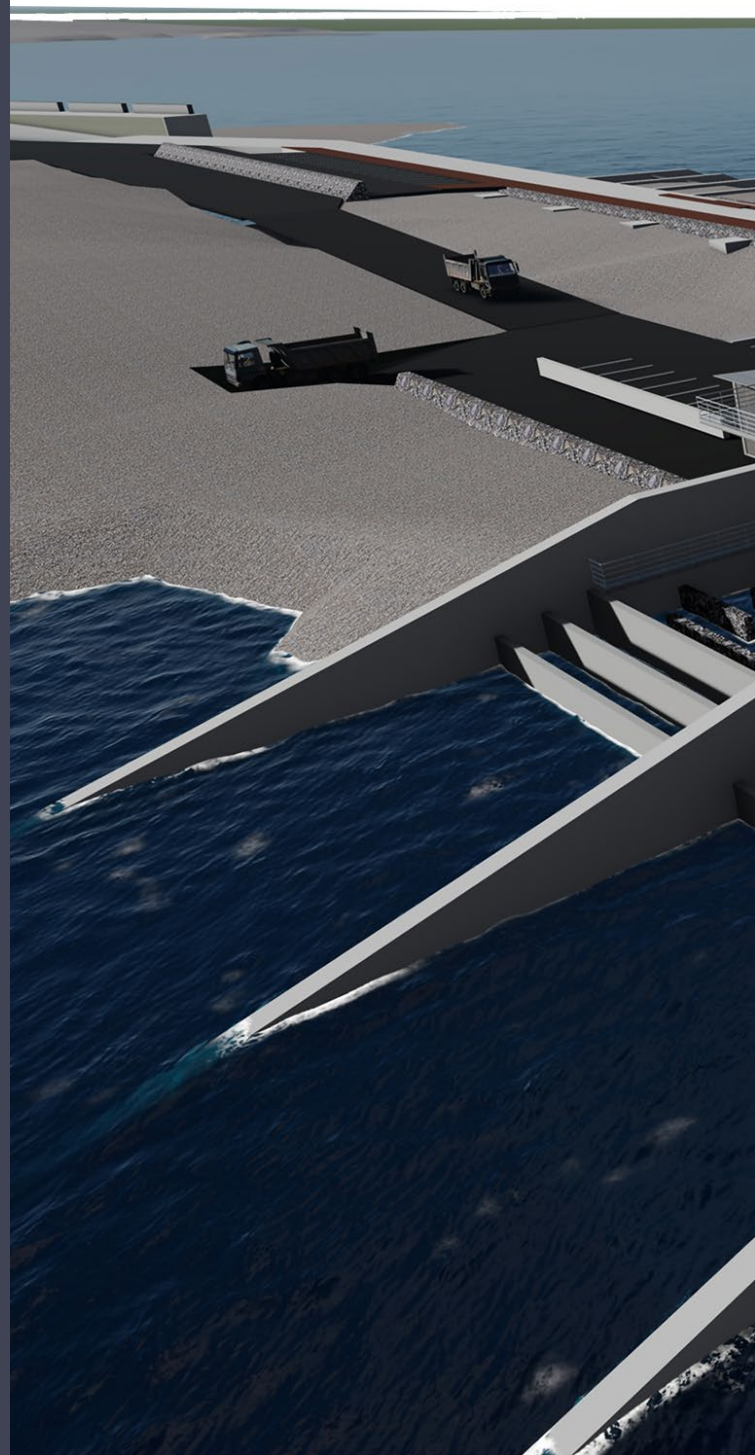
If given the opportunity again, I would propose the same project within the same site. The project posed many obstacles and challenges, but it allowed me to develop and to learn a lot about myself, my design process and the need to create space with an established identity where its users can experience meaningful architecture.

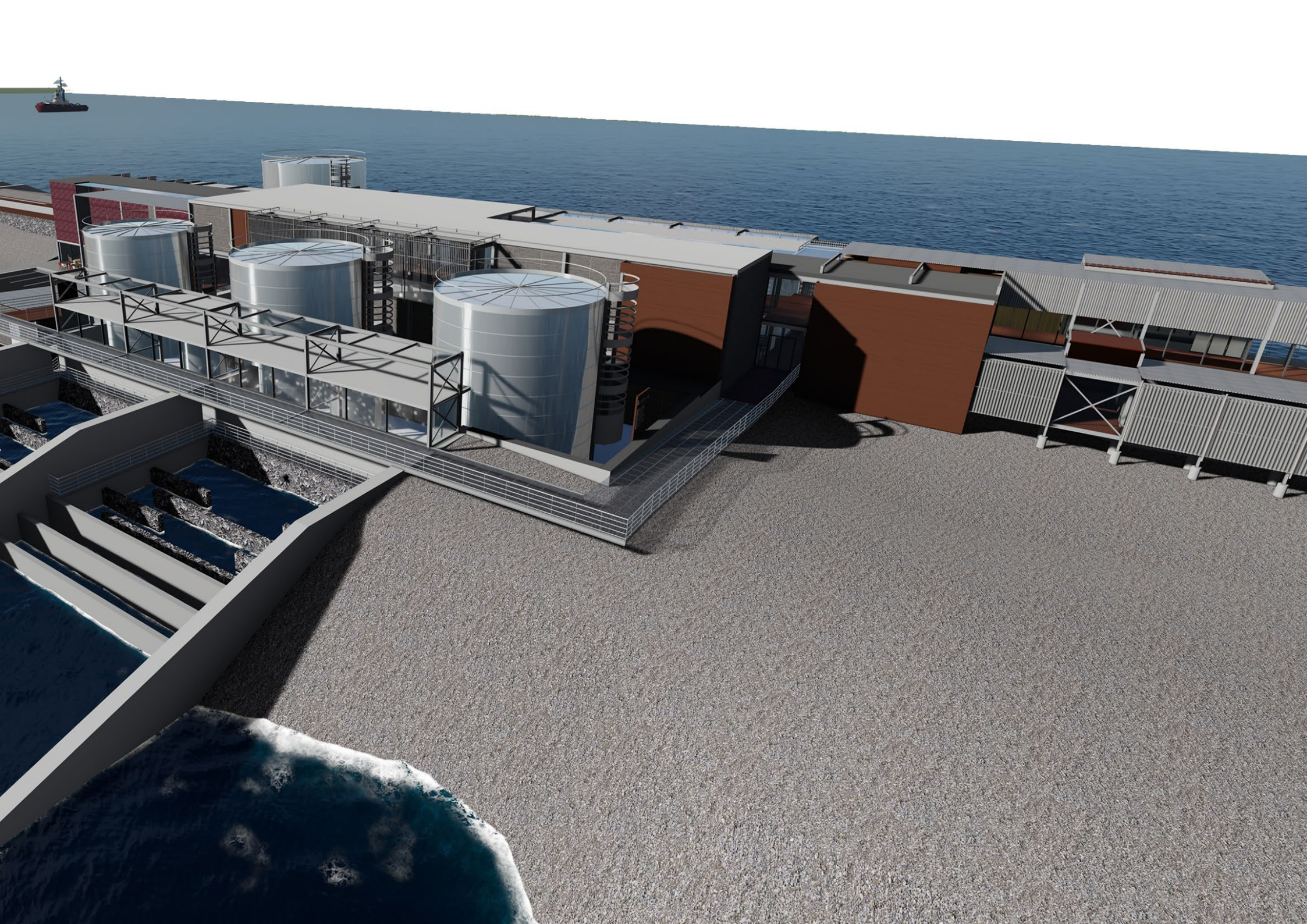




T E C H N I C A L
R E P O R T

The technical report aims to briefly explain the basic structural system and its components used within the proposed design. The report will be divided into sections explaining the different aspects contributing to the structural systems used within the building.





PART 04

TABLE OF CONTENTS

SITE ANALYSIS

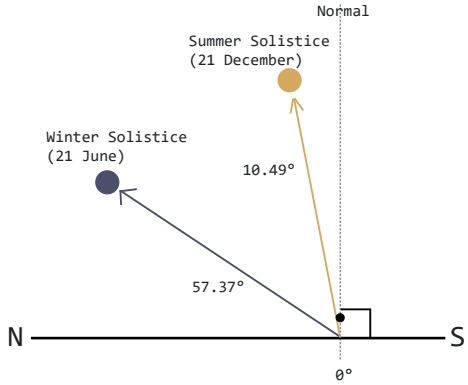
SITE AND CLIMATE

The climater map indicates climatic zones for a building's requirements in general conditions of a region (Muller, 2013: 104). Cape Town is found in the temperate coastal region (Muller, 2013: 104). It is important to consider the climatic conditions of the proposed site's immediate vicinity as this is just a general indication of the climate of the area (Muller, 2013: 104).

MAIN CLIMATIC CHARACTERISTICS (Muller, 2013: 104):
- Low diurnal temperature range near coast to high diurnal range inland
- Four distinct seasons:
summer and winter can exceed human comfort range
spring and autumn are ideal for human comfort
- Mild winters with medium to high humidity
- Warm to hot summers with average humidity and strong winds

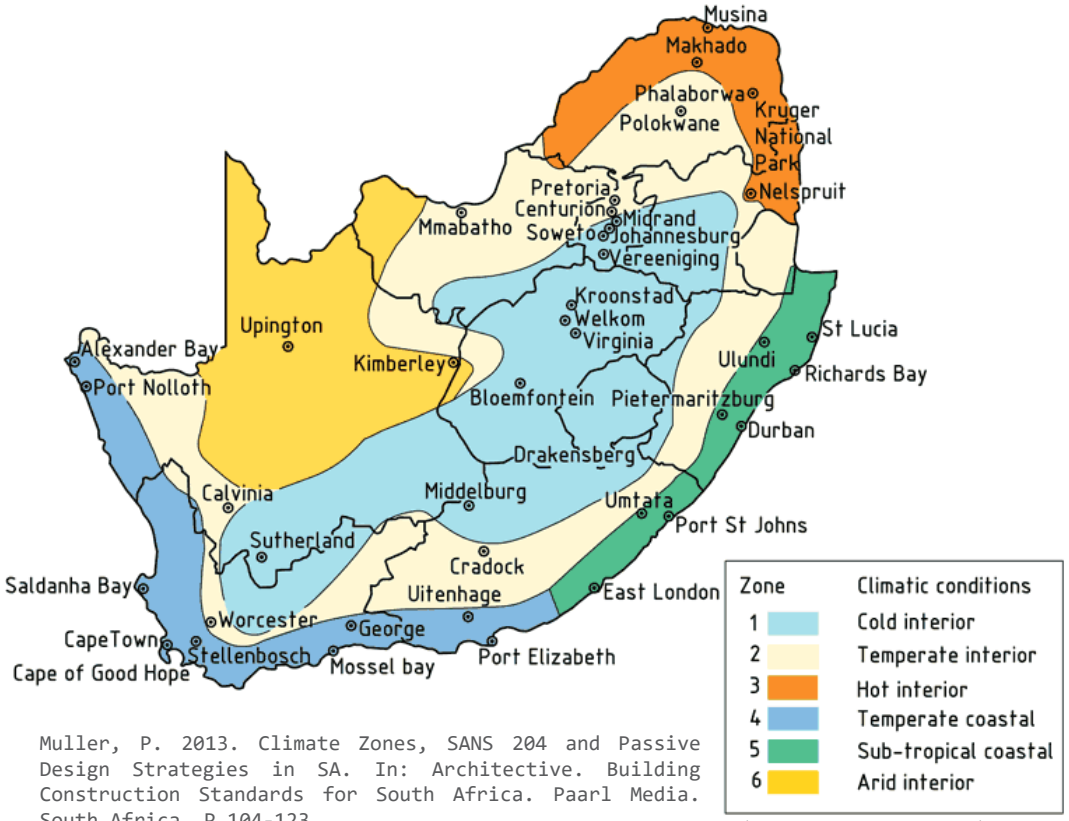
BEST DESIGN RESPONSES (Muller, 2013: 104):
- Use passive solar principals
- High thermal mass solutions are recommended
- Use high insulation levels
- Maximise solar access in winter
- Minimize all East and West glazing, using adjustable shading
- Use double glazing to insulate windows
- Minimize East and West walls
- Use cross ventilation and passive cooling in summer
- Site buildings for solar access and exposure to cooling winds
- Use reflective insulation for summer heat
- Use bulk insulation to ceilings, walls and exposed flor edges
- Draught seal throroughly.

CAPE TOWN CLIMATIC ZONE TEMPERATE INTERIOR



The difference radiation for Winter and Summer Solstice in Cape Town (Conradie, 2010:5).

Conradie. 2010. Maximising the sun. [online] Available from: http://researchspace.csir.co.za/dspace/bitstream/handle/10204/7519/Conradie_2010. [2018, September 24]

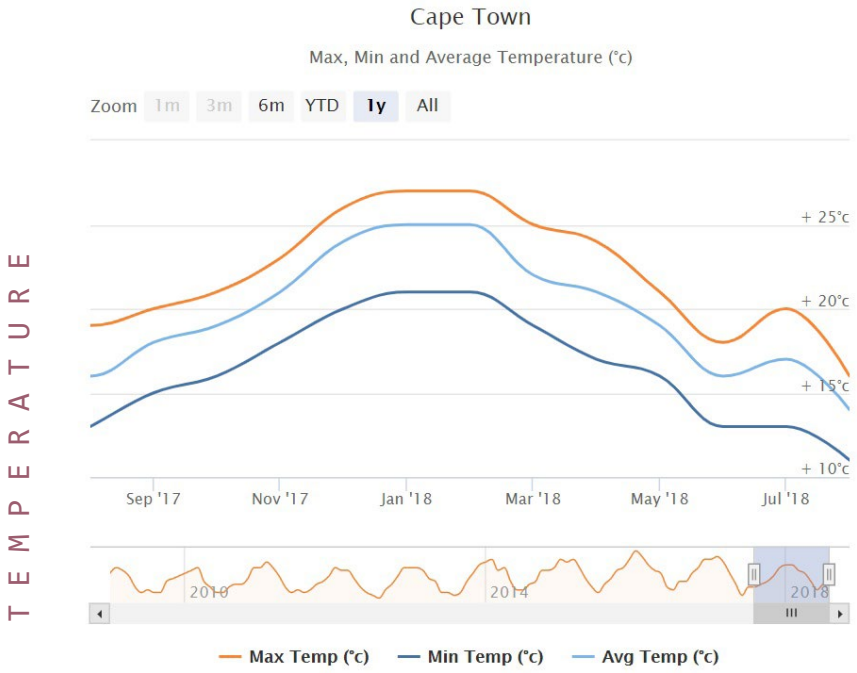


Muller, P. 2013. Climate Zones, SANS 204 and Passive Design Strategies in SA. In: Architective. Building Construction Standards for South Africa. Paarl Media. South Africa. P 104-123

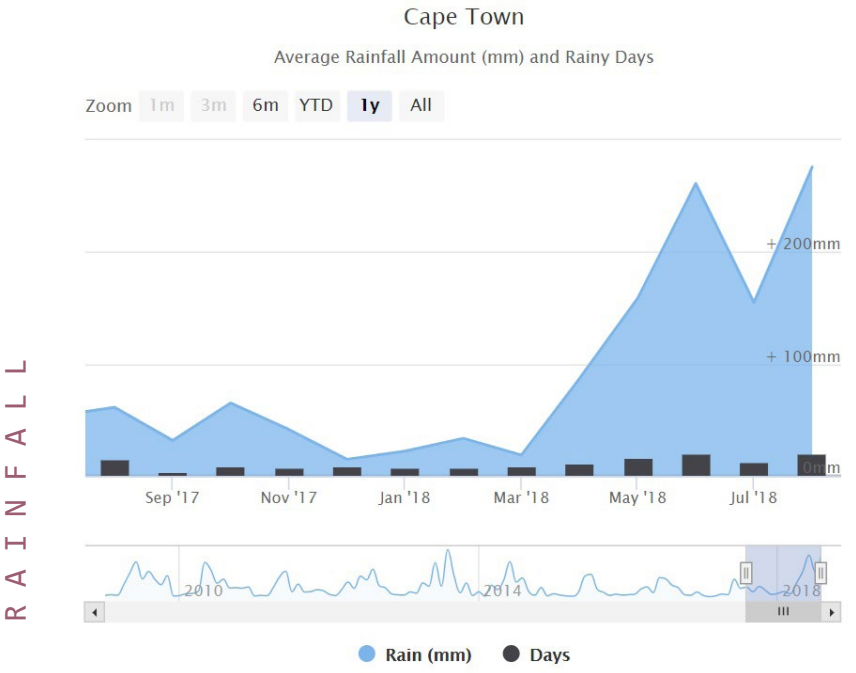
(Muller, 2013: 104)

Wheather charts. Available from:<https://www.worldweatheronline.com/' title='Historical average weather'>Data provided by WorldWeatherOnline.com

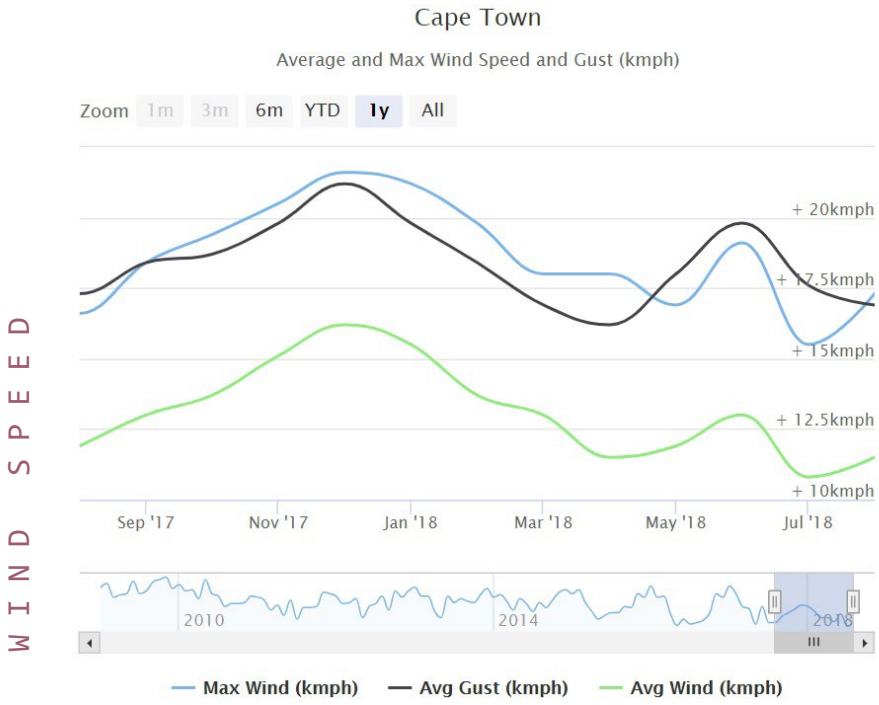
TEMPERATURE



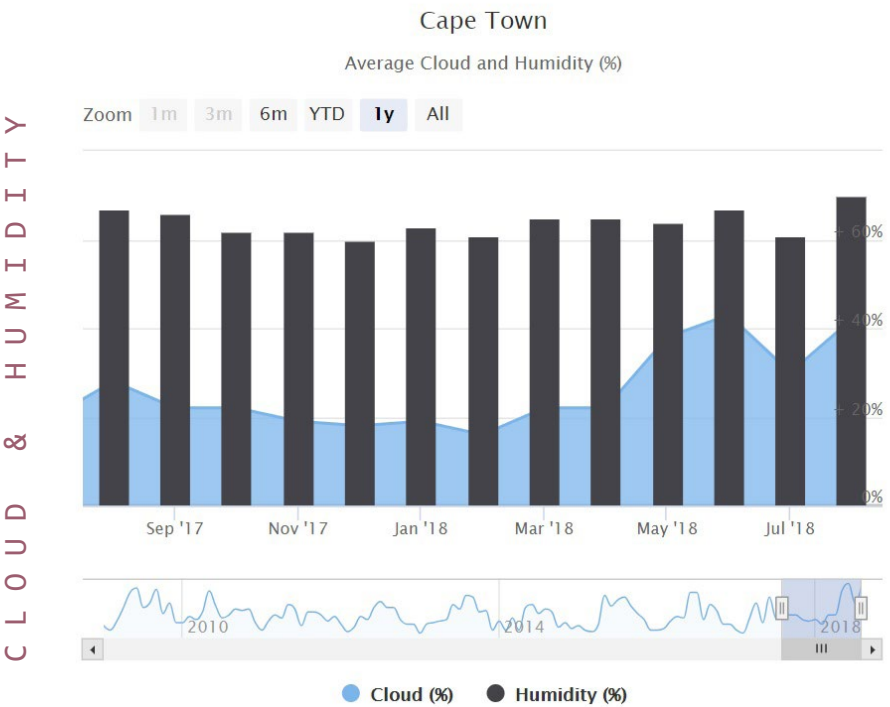
RAINFALL



WIND SPEED



CLOUD & HUMIDITY

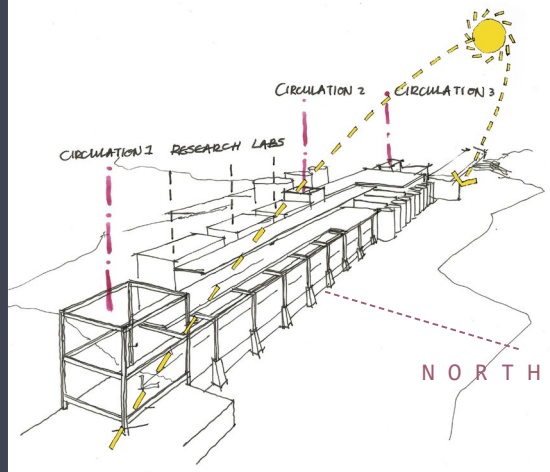


SITE ANALYSIS

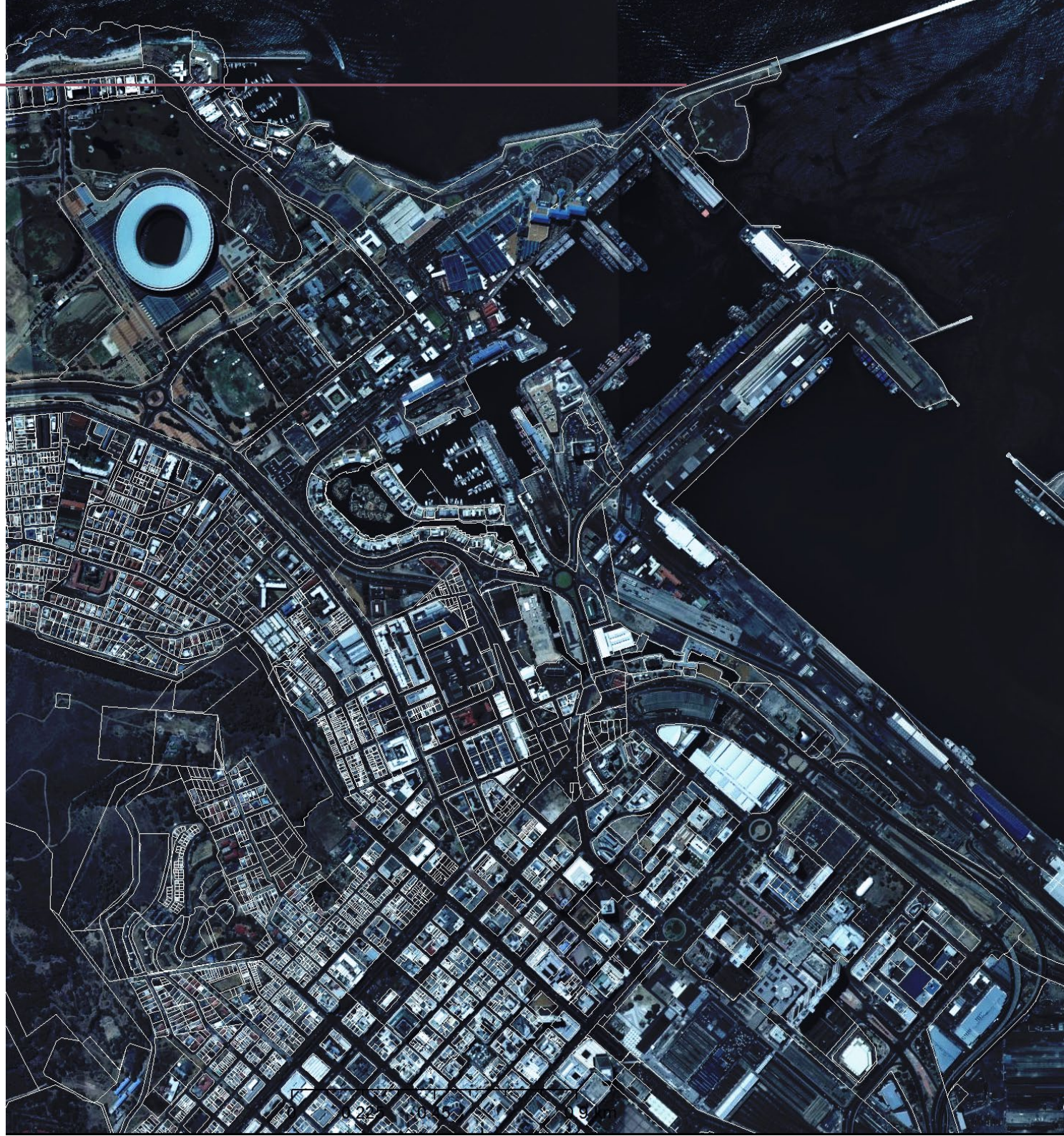
ORIENTATION

PROPOSED SITE

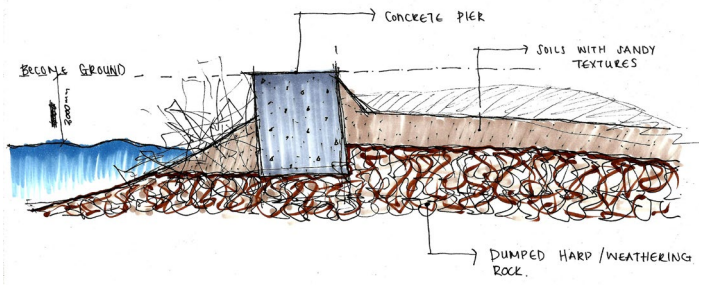
EAST PIER



NORTH



SITE ANALYSIS
CONTOURS & SOILS

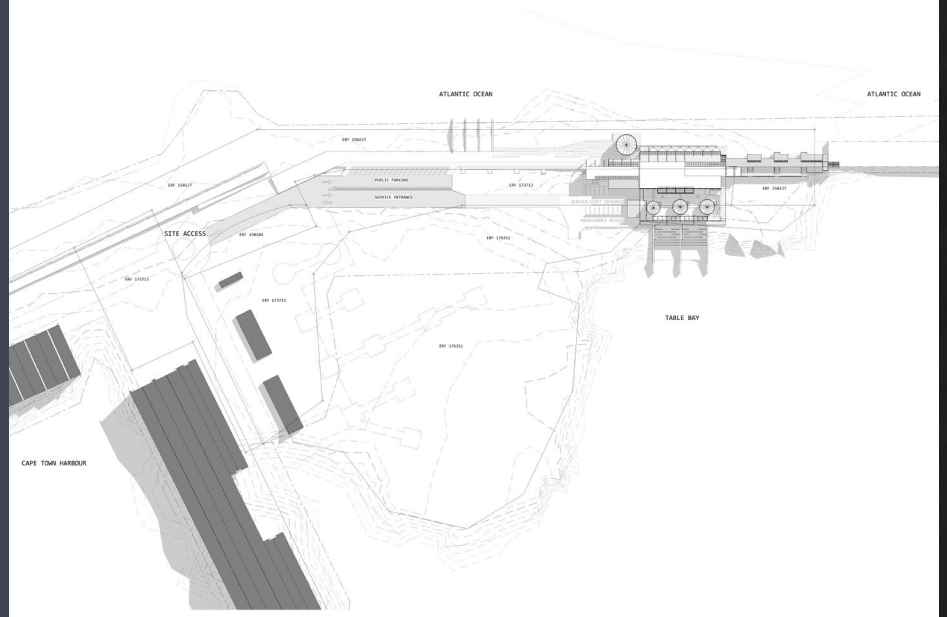


Symbol: FA
Class: Podzolic

Soils Description: Soils with a sandy texture, leached and with subsurface accumulation of organic matter, iron and aluminium oxides, either deep or on hard or weathering rock.

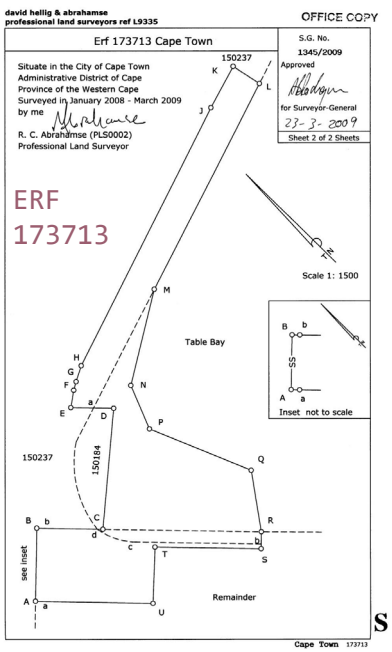
Depth: >= 750 mm
Clay: < 15%

Western Cape Department of Agriculture. 2018. Location Map: Lat: -33.900292 | Lon: 18.426922. [Online]. Available: https://gis.elsenburg.com/apps/cfm/. [2018, September 24].



SITE ANALYSIS

SG DIAGRAMS OF PROPOSED SITE


david hellig & abrahamse
professional land surveyors ref L9335

OFFICE COPY

Erf 173713 Cape Town

S.G. No. 1345/2009

Approved

for Surveyor-General

23-3-2009

Sheet 2 of 2 Sheets

Situate in the City of Cape Town
Administrative District of Cape
Province of the Western Cape
Surveyed in January 2008 - March 2009
by me

R. C. Abrahamse (PLS0002)
Professional Land Surveyor

ERF 173713

Scale 1: 1500

Table Bay

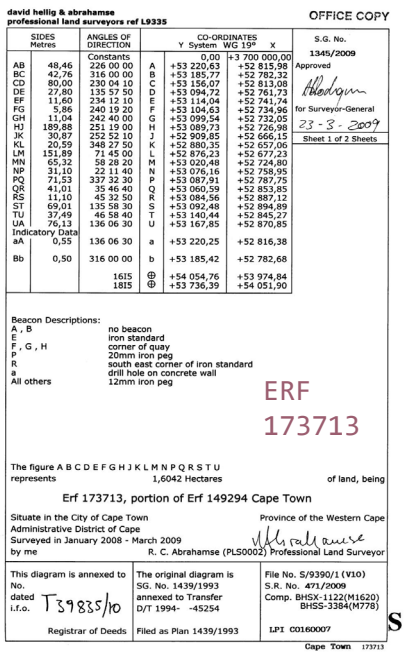
Inset not to scale

Remainder

150237

150184

Cape Town 173713


david hellig & abrahamse
professional land surveyors ref L9335

OFFICE COPY

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES Y System WG 19°	X
		Constants		0,00	+3 700 000,00
AB	48,46	226 00 00	A	+53 220,63	+52 815,98
BC	42,76	316 00 00	B	+53 185,77	+52 782,32
CD	80,00	230 04 10	C	+53 156,07	+52 813,08
DE	27,80	135 57 50	D	+53 094,72	+52 761,73
EF	11,60	234 12 10	E	+53 114,04	+52 741,74
FG	5,86	240 19 20	F	+53 104,63	+52 734,96
GH	11,04	242 40 00	G	+53 099,54	+52 732,05
HJ	189,88	251 19 00	H	+53 089,73	+52 726,98
JK	30,87	252 52 10	J	+52 909,85	+52 666,15
KL	20,59	348 27 50	K	+52 880,35	+52 657,06
LM	151,89	71 45 00	L	+52 876,23	+52 677,23
MN	65,32	58 28 20	M	+53 020,48	+52 724,80
NP	31,10	22 11 40	N	+53 076,16	+52 758,95
PQ	71,53	337 32 30	P	+53 087,91	+52 787,75
QR	41,01	35 46 40	Q	+53 060,59	+52 853,85
RS	11,10	45 32 50	R	+53 084,56	+52 887,12
ST	69,01	135 58 30	S	+53 092,48	+52 894,89
TU	37,49	46 58 40	T	+53 140,44	+52 845,27
UA	76,13	136 06 30	U	+53 167,85	+52 870,85
Indicatory Data					
aA	0,55	136 06 30	a	+53 220,25	+52 816,38
Bb	0,50	316 00 00	b	+53 185,42	+52 782,68
		1615	⊕	+54 054,76	+53 974,84
		1815	⊕	+53 736,39	+54 051,90

S.G. No. 1345/2009

Approved

for Surveyor-General

23-3-2009

Sheet 1 of 2 Sheets

Beacon Descriptions:
A , B — no beacon
E — iron standard
F , G , H — corner of quay
P — 20mm iron peg
R — south east corner of iron standard
a — drill hole on concrete wall
All others — 12mm iron peg

ERF 173713

EXEMPT FROM PROVISIONS OF ACT 70 OF 1970 SECTION 1(4)(a)

APPROVED IN TERMS OF SECT. 25 OF ORDINANCE 15 OF 1985 REF: LM 1469 (174171) DATE: 2009-03-11

The figure A B C D E F G H J K L M N P Q R S T U
represents 1,6042 Hectares of land, being

Erf 173713, portion of Erf 149294 Cape Town

Situate in the City of Cape Town — Province of the Western Cape
Administrative District of Cape
Surveyed in January 2008 - March 2009
by me — R. C. Abrahamse (PLS0002) Professional Land Surveyor

This diagram is annexed to No. dated i.f.o. T39835/10 Registrar of Deeds

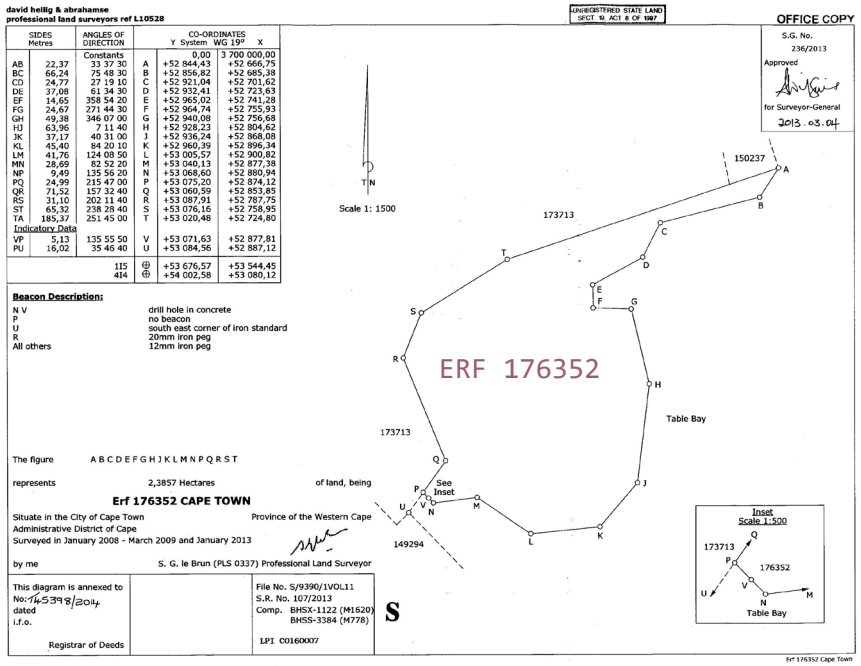
The original diagram is SG. No. 1439/1993 annexed to Transfer D/T 1994- -45254

Filed as Plan 1439/1993

File No. S/9390/1 (V10)
S.R. No. 471/2009
Comp. BHSX-1122(M1620) BHSS-3384(M778)

LPI C0160007

Cape Town 173713


david hellig & abrahamse
professional land surveyors ref L10528

UNREGISTERED STATE LAND SECT. 16 ACT 8 OF 1937

OFFICE COPY

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES Y System WG 19°	X
		Constants		0,00	3 700 000,00
AB	22,37	33 37 30	A	+52 844,43	+52 666,75
BC	66,24	75 48 30	B	+52 856,82	+52 685,38
CD	24,77	27 19 10	C	+52 921,04	+52 701,62
DE	37,08	61 34 30	D	+52 932,41	+52 723,63
EF	14,65	358 54 20	E	+52 965,02	+52 741,28
FG	24,67	271 44 30	F	+52 964,74	+52 755,93
GH	49,38	346 07 00	G	+52 940,08	+52 756,68
HJ	63,96	7 11 40	H	+52 928,23	+52 804,62
JK	37,17	40 31 00	J	+52 936,24	+52 868,08
KL	45,40	84 20 10	K	+52 960,39	+52 896,34
LM	41,76	124 08 50	L	+53 005,57	+52 900,82
MN	28,69	82 52 20	M	+53 040,13	+52 877,38
NP	9,49	135 56 20	N	+53 068,60	+52 880,94
PQ	24,99	215 47 00	P	+53 075,20	+52 874,12
QR	71,52	157 32 40	Q	+53 060,59	+52 853,85
RS	31,10	202 11 40	R	+53 087,91	+52 787,75
ST	65,32	238 28 40	S	+53 076,16	+52 758,95
TA	185,37	251 45 00	T	+53 020,48	+52 724,80
Indicatory Data					
VP	5,13	135 55 50	V	+53 071,63	+52 877,81
PU	16,02	35 46 40	U	+53 084,56	+52 887,12
		115	⊕	+53 676,57	+53 544,45
		414	⊕	+54 002,58	+53 080,12

Beacon Description:
N V — drill hole in concrete
P — no beacon
U — south east corner of iron standard
R — 20mm iron peg
All others — 12mm iron peg

S.G. No. 236/2013

Approved

for Surveyor-General

2013.03.04

ERF 176352

Scale 1: 1500

Table Bay

173713

149294

150237

The figure A B C D E F G H J K L M N P Q R S T
represents 2,3857 Hectares of land, being

Erf 176352 CAPE TOWN

Situate in the City of Cape Town — Province of the Western Cape
Administrative District of Cape
Surveyed in January 2008 - March 2009 and January 2013
by me — S. G. le Brun (PLS 0337) Professional Land Surveyor

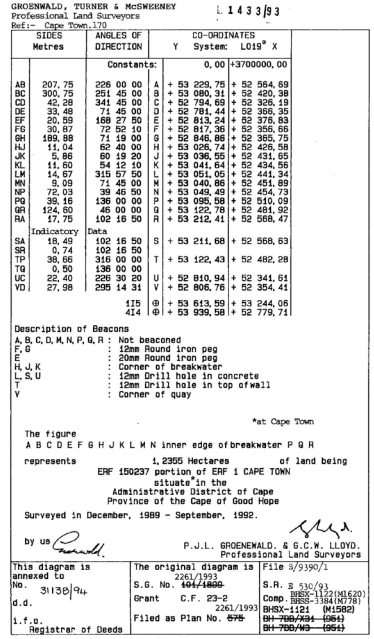
This diagram is annexed to No. dated i.f.o. Registrar of Deeds

File No. S/9390/1VOL11
S.R. No. 107/2013
Comp. BHSX-1122 (M1620) BHSS-3384 (M778)

LPI C0160007

Inset Scale 1:500

Erf 176352 Cape Town


GROENEWALD, TURNER & McSWEENEY
Professional Land Surveyors
Ref:- Cape Town 170

L 1433/93

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES Y System:	Lo19° X
		Constants:		0,00	+3700000,00
AB	207,75	226 00 00	A	+ 53 229,75	+ 52 564,69
BC	300,75	251 45 00	B	+ 53 080,31	+ 52 420,38
CD	42,28	341 45 00	C	+ 52 784,69	+ 52 386,19
DE	33,48	71 45 00	D	+ 52 781,44	+ 52 366,35
EF	20,59	168 27 50	E	+ 52 813,24	+ 52 376,83
FG	30,97	72 52 10	F	+ 52 817,36	+ 52 356,66
GH	189,88	71 19 00	G	+ 52 846,86	+ 52 365,75
HJ	11,04	62 40 00	H	+ 53 026,74	+ 52 426,58
JK	5,86	60 19 20	J	+ 53 036,55	+ 52 431,65
KL	11,60	54 12 10	K	+ 53 041,64	+ 52 434,56
LM	14,87	315 57 50	L	+ 53 051,05	+ 52 441,34
MN	8,09	71 45 00	M	+ 53 040,86	+ 52 451,89
NP	72,03	39 46 50	N	+ 53 049,49	+ 52 454,73
PQ	38,16	136 00 00	P	+ 53 085,59	+ 52 510,09
QR	124,80	46 00 00	Q	+ 53 122,78	+ 52 484,92
RA	17,75	102 16 50	R	+ 53 212,41	+ 52 568,47
	Indicatory	Data			
SA	18,49	102 16 50	S	+ 53 211,68	+ 52 568,63
SR	0,74	102 16 50			
TP	38,66	316 00 00	T	+ 53 122,43	+ 52 482,28
TQ	0,50	136 00 00			
UC	22,40	226 30 20	U	+ 52 810,94	+ 52 341,61
VD	27,98	295 14 31	V	+ 52 806,76	+ 52 354,41
		115	⊕	+ 53 613,59	+ 53 244,06
		414	⊕	+ 53 939,58	+ 52 779,71

Description of Beacons
A, B, C, D, M, N, P, Q, R : Not beaconed
F, G : 12mm Round iron peg
E : 20mm Round iron peg
H, J, K : Corner of breakwater
L, S, U : 12mm Drill hole in concrete
T : 12mm Drill hole in top of wall
V : Corner of quay

*at Cape Town

The figure A B C D E F G H J K L M N inner edge of breakwater P Q R
represents 1,2355 Hectares of land being
ERF 150237 portion of ERF 1 CAPE TOWN
situate in the
Administrative District of Cape
Province of the Cape of Good Hope

Surveyed in December, 1989 - September, 1992.

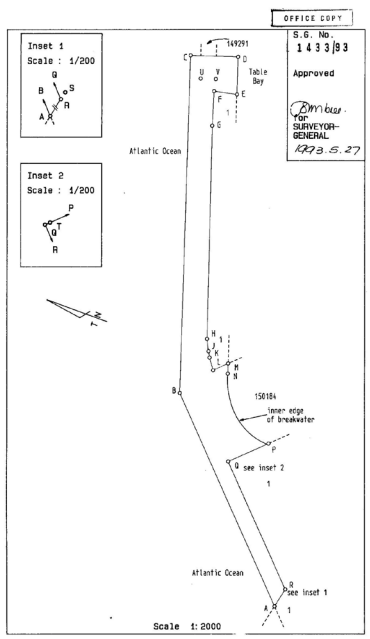
by us P.J.L. GROENEWALD. & G.C.W. LLOYD. Professional Land Surveyors

This diagram is annexed to No. 3138/94 d.d. i.f.o. Registrar of Deeds

The original diagram is 2261/1993
S.G. No. ~~401/1893~~
Grant C.F. 23-2 2261/1993
Filed as Plan No. 575

File 3/9390/1
S.R. 3 530/93
Comp. BHSX-1122(M1620) BHSS-3384(M778)
BHSX-1121 (M1582)
~~BH 788/X31 (M4)~~
~~BH 788/W3 (951)~~

ERF 150237


OFFICE COPY

Inset 1
Scale : 1/200

Inset 2
Scale : 1/200

S.G. No. L 1433/93

Approved

for SURVEYOR-GENERAL

1993.5.27

Table Bay

Atlantic Ocean

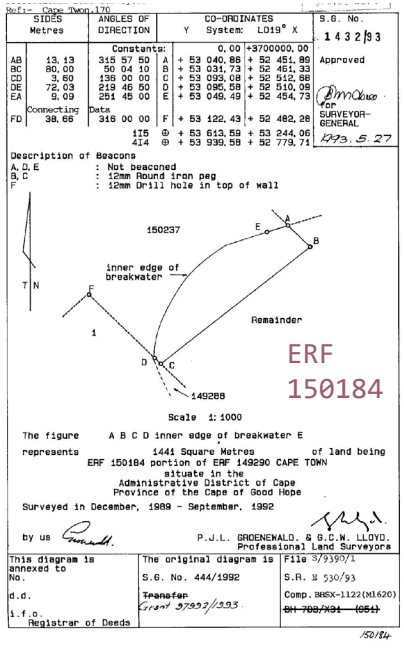
150184

inner edge of breakwater

see inset 2

see inset 1

Scale 1:2000


Ref:- Cape Town 170

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES Y System:	Lo19° X
		Constants:		0,00	+3700000,00
AB	13,13	315 57 50	A	+ 53 040,86	+ 52 451,89
BC	80,00	50 04 10	B	+ 53 031,73	+ 52 461,33
CD	3,60	136 00 00	C	+ 53 093,08	+ 52 512,68
DE	72,03	219 46 50	D	+ 53 095,59	+ 52 510,09
EA	9,09	251 45 00	E	+ 53 048,49	+ 52 454,73
	Connecting	Data			
FD	38,66	316 00 00	F	+ 53 122,43	+ 52 482,28
		115	⊕	+ 53 613,59	+ 53 244,06
		414	⊕	+ 53 939,58	+ 52 779,71

S.G. No. 1432/93

Approved

for SURVEYOR-GENERAL

1993.5.27

Description of Beacons
A, D, E : Not beaconed
B, C : 12mm Round iron peg
F : 12mm Drill hole in top of wall

150237

inner edge of breakwater

Remainder

149288

ERF 150184

Scale 1: 1000

The figure A B C D inner edge of breakwater E
represents 1441 Square Metres of land being
ERF 150184 portion of ERF 149290 CAPE TOWN
situate in the
Administrative District of Cape
Province of the Cape of Good Hope

Surveyed in December, 1989 - September, 1992

by us P.J.L. GROENEWALD. & G.C.W. LLOYD. Professional Land Surveyors

This diagram is annexed to No. d.d. i.f.o. Registrar of Deeds

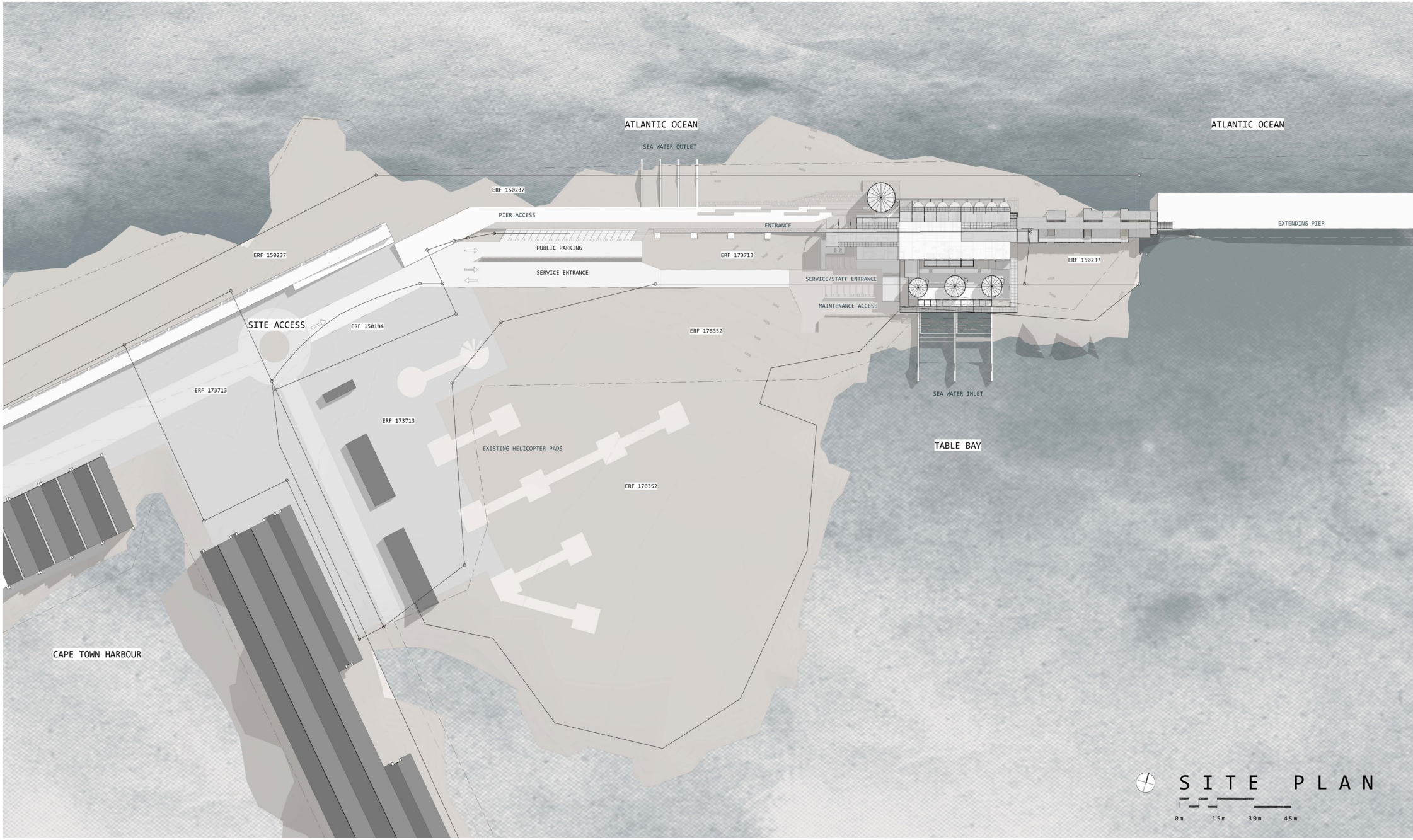
The original diagram is S.G. No. 444/1992
~~Transfer~~ ~~Grant 37952/1993~~

File 3/9390/1
S.R. 3 530/93
Comp. BHSX-1122(M1620)
~~BH 788/X31 (951)~~

150184

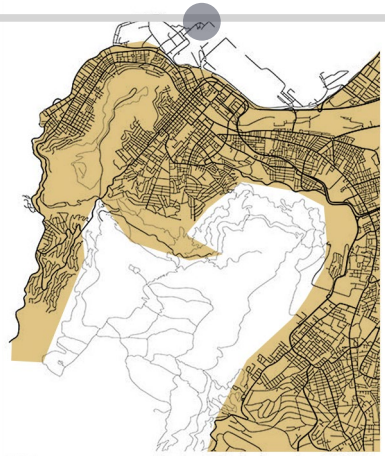
The East Pier consist of more than one site thefore the proposed dissertation is situated within more than one site.

Western Cape Department of Agriculture. 2018. Location Map: Lat: -33.900292 | Lon: 18.426922. [Online]. Available: https://gis.elsenburg.com/apps/cfm/. [2018, September 24].


ATLANTIC OCEAN
ATLANTIC OCEAN
SEA WATER OUTLET
ERF 150237
PIER ACCESS
ENTRANCE
EXTENDING PIER
ERF 150237
PUBLIC PARKING
ERF 173713
ERF 150237
SERVICE ENTRANCE
SERVICE/STAFF ENTRANCE
MAINTENANCE ACCESS
SITE ACCESS
ERF 150184
ERF 176352
ERF 173713
SEA WATER INLET
ERF 173713
EXISTING HELICOPTER PADS
TABLE BAY
ERF 176352
CAPE TOWN HARBOUR
SITE PLAN
0m
15m
30m
45m

SITE ANALYSIS
GEOLOGY

URBAN AREAS



The V&A Waterfront forms part of the urban area of Cape Town. The site is not within the central urban area, but forms part of the Cape Town Harbour.

The harbour is part of the urban development of Cape Town. Development within the harbour has a direct impact on the surrounding urban activity. The harbour is the start of the urban activity when entering Cape Town from the sea.

Western Cape Department of Agriculture. 2018. Location Map: Lat: -33.900292 | Lon: 18.426922. [Online]. Available: https://gis.elsenburg.com/apps/cfm/. [2018, September 24].

MARINE PROTECTED AREAS

Table Mountain National Park
Marine Protected Area

The allocated area requires safequarding to ensure continued existence of species and ecosystems. This includes the delivery of ecosystem services: terrestrial and fresh water realms. Great care should be taken with these spaces to ensure sustainable development within the Western Cape Province.

The harbour is a marine protected area, it does not fall under the major protected areas, but great care is taken to any marine space where development commences - such as the new desalination project.

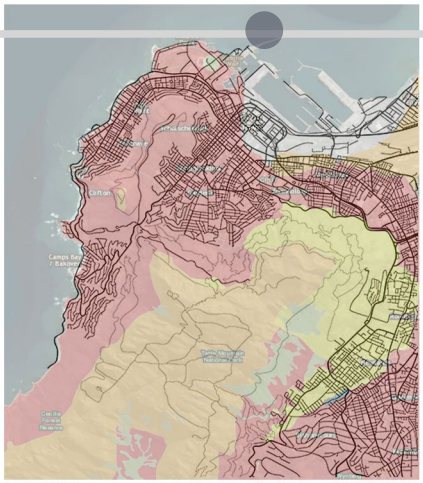
PRESERVING HABITAT

Table Mountain National Park

The allocated area requires safequarding to ensure continued existence of species and ecosystems. This includes the delivery of ecosystem services: terrestrial and fresh water realms. Great care should be taken with these spaces to ensure sustainable development within the Western Cape Province (Western Cape Department of Agriculture, 2018).

These habitats form part of Cape Town's natural essence. The site is not situated close to one of these spaces, or rather not close enough to impact them negatively.

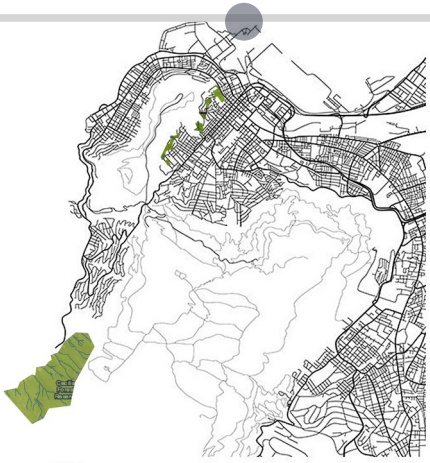
ECOSYSTEM THREAD STATUS



The ecosystem thread status for the most parts of Cape Town is Critically Endangered. It is important for new developments and activities within the city to ensure the impacts of such developments does not impact the ecosystem, unless it is positively influenced.

The desalination plant incorporates labs to ensure that the discharge of plant s does not effect the ecosystem of the city. It should be researched and controlled on a regular bases to formulate a plan immediately if it does not comply with the The Western Cape Biodiversity Spatial Plan (WCBSP) (Western Cape Department of Agriculture, 2018).

CRITICAL BIODIVERSITY

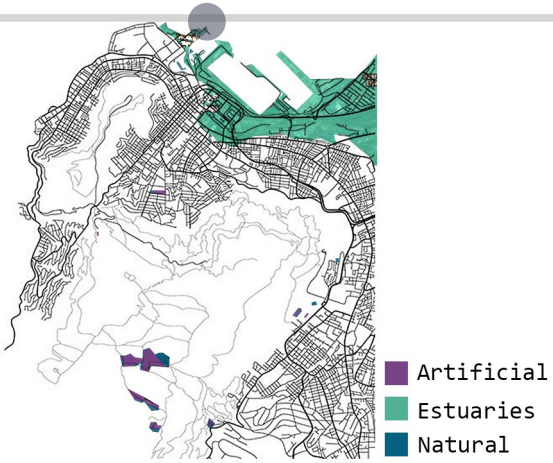


The allocated areas requires safegarding like previously stated to ensure sustainable development within the Western Cape.

The biodiversity within the city will not be influenced by the desalination plant.

The desalination plant incorporates labs to ensure that the discharge of plant s does not effect the ecosystem of the city. It should be researched and controlled on a regular bases to formulate a plan immediately if it does not comply with the The Western Cape Biodiversity Spatial Plan (WCBSP) (Western Cape Department of Agriculture, 2018).

WETLANDS



Estuaries - the tidal mouth of a large water recourse where the tide meets the stream.

Wetland Freshwater Priority Areas (FEPAs)

Irreversible loss of wetlands is expected to be high in some areas, such as urban centres (Western Cape Department of Agriculture, 2018).

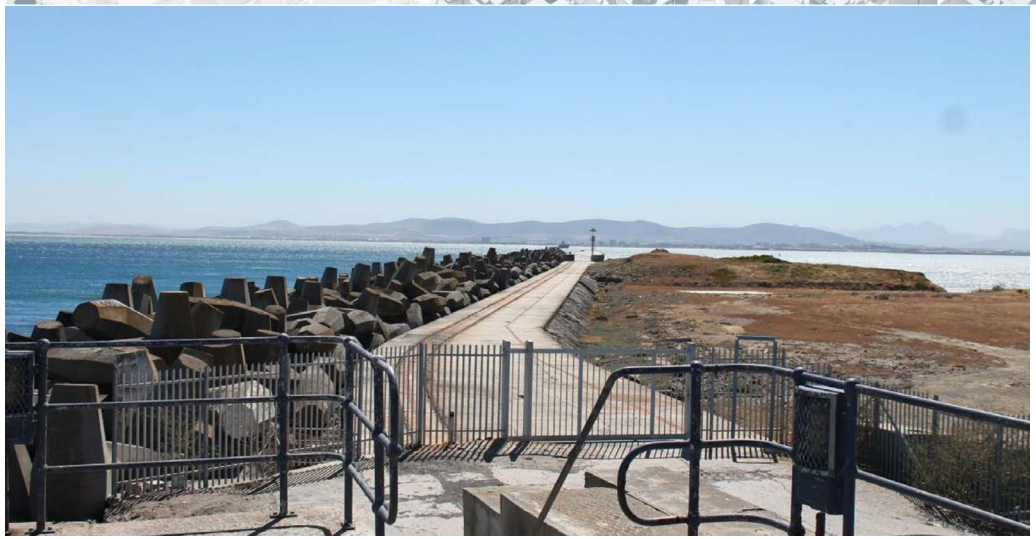
The site is within a wetland area. It does not remove the quality of the wetland it is situated within. The decrease in wetlands is one of the main reasons for water shortages within Cape Town and is essential to Cape Town’s water future.

A NEW "GREEN RIBBON"

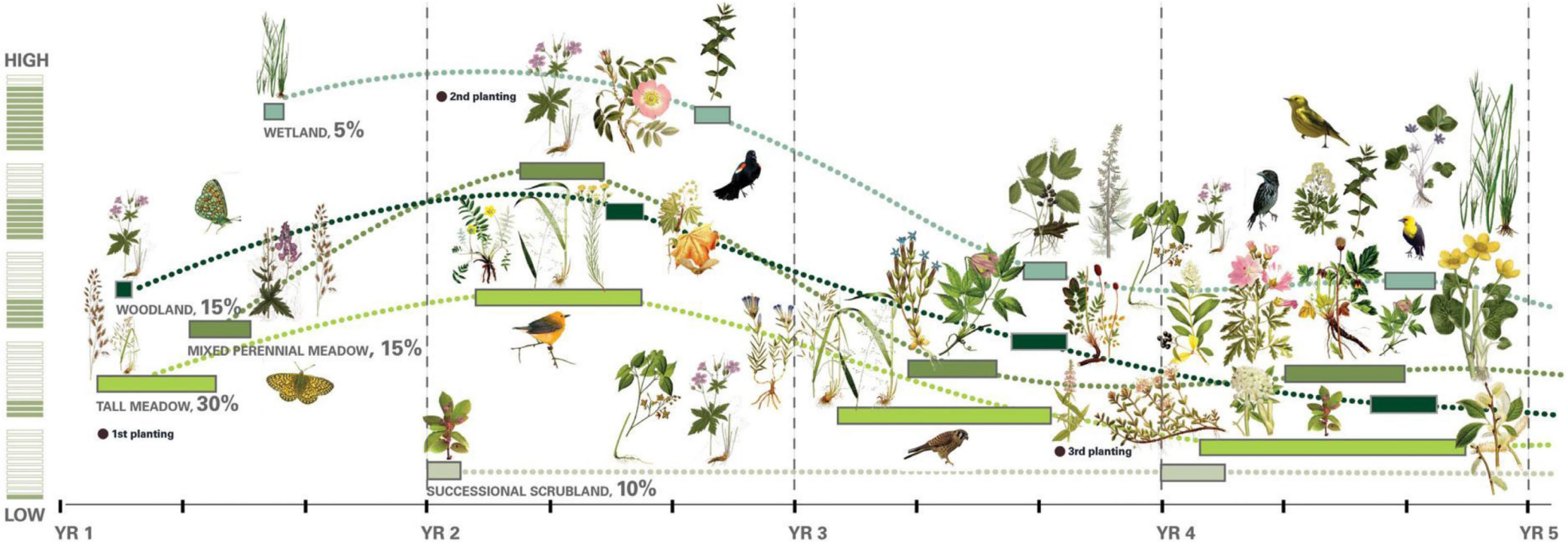
Mokena Makeka, of the Makeka Design Lab company, proposed a precinct plan for the V&A Waterfront which includes the East Pier Road. This precinct plan proposes new green spaces within the Waterfront. The target of this proposal is for 6% of the waterfront precinct to become green spaces by the year 2040 (Makeka, 2017). This will result in 20% of pedestrian zones and green spaces within the V&A Waterfront precinct (Makeka, 2017).

The East Pier is part of this proposed development. This dissertation should aim to integrate the new green spaces and accommodate the vision for the Waterfront. This will be incorporated on the pier by using the fresh water produced by the plant to water the planting. This allows the desalination plant to activate the site on a different scale and reactivating the site and city, other than producing fresh and clean water for drinking purposes.

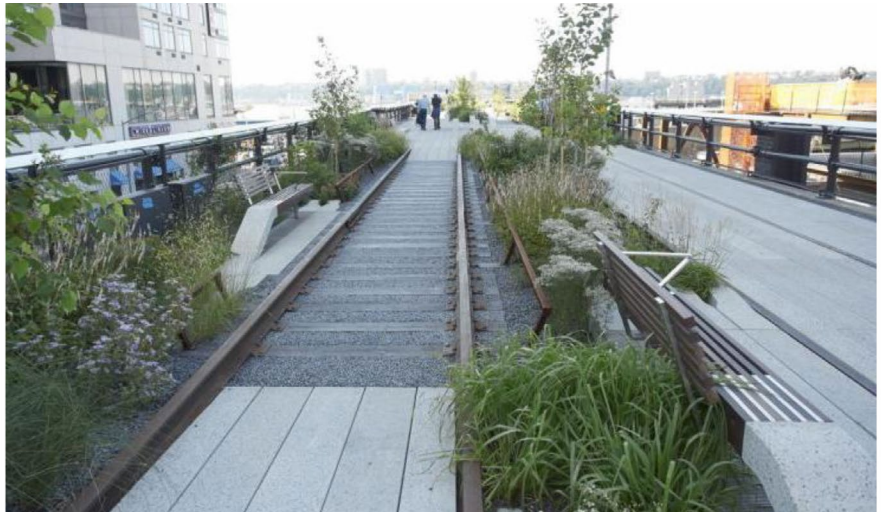
(Makeka, 2017:54)



The existing East Pier and the image clearly indicate that there are not any green spaces within the site. This is a great opportunity to reactivate the site in conjunction with the desalination plant.



DIVERSIFICATION IN TIME [STABILIZED MAINTENANCE / ENHANCED BIODIVERSITY]



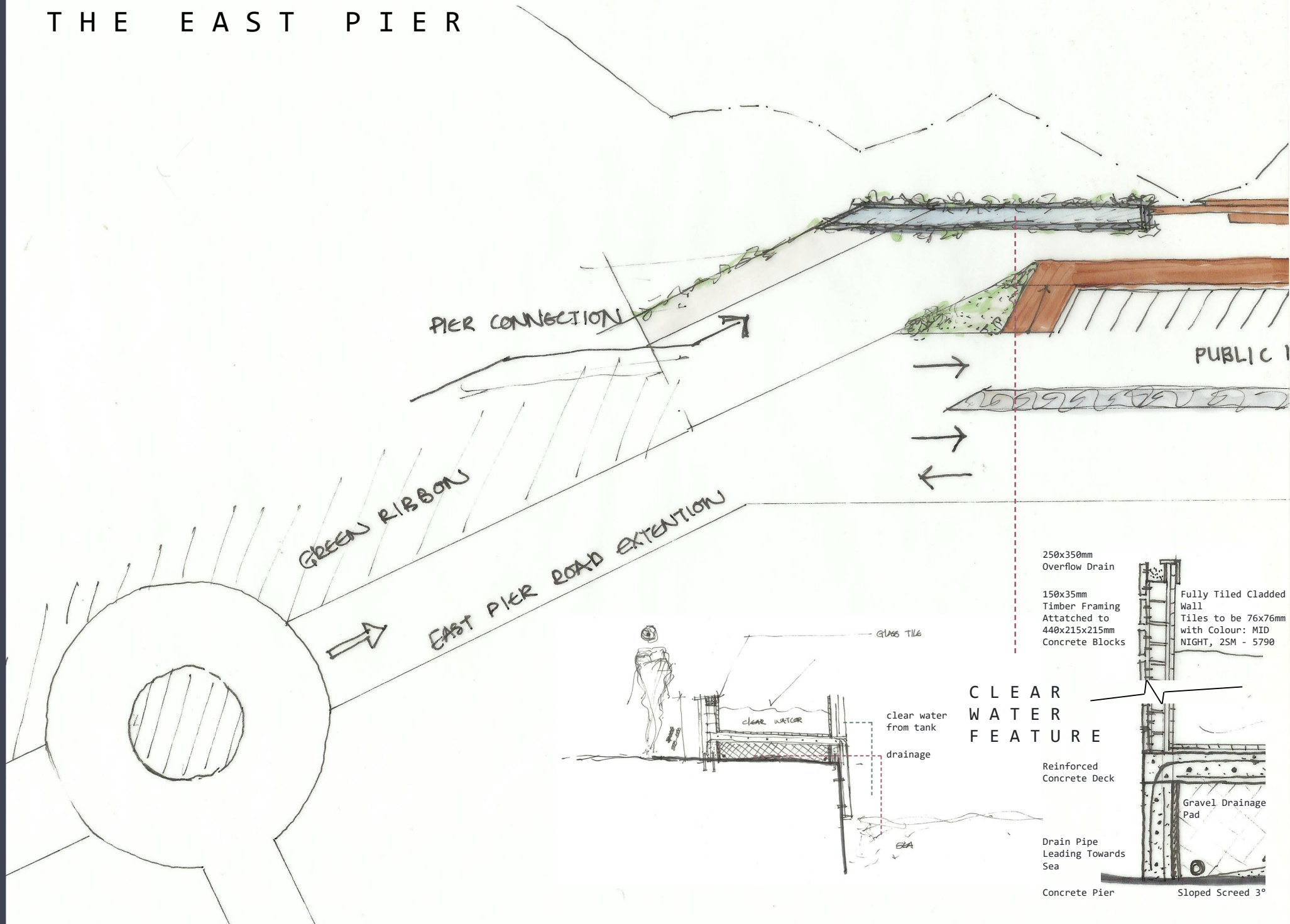
The images is an example of the green spaces aimed by the proposal of the Makeka Design Lab (Makeka, 2017:55).

Illustration explaining the biodiversity within the Waterfront and the different species investigated to be integrated to create the new habitat within the V&A Waterfront precinct (Makeka, 2017:55).

Makeka, M. 2017. V&A Waterfront Precinct Plan 2017: East Pier Road. [Online]. Available: http://www.sahra.org.za/sahris/sites/default/files/additionaldocs/170208_MDL_EPP_CIFA%20presentation_reduced.pdf. [2018, August 3].

SITE DESIGN
LANDSCAPING

NEW "GREEN RIBBON" EXTENSION ON THE EAST PIER



BRING WATER DISCHARGE

CLEAR WATER PONDS

SEATING

ROCK RETAINING WALL

TIMBER DECK

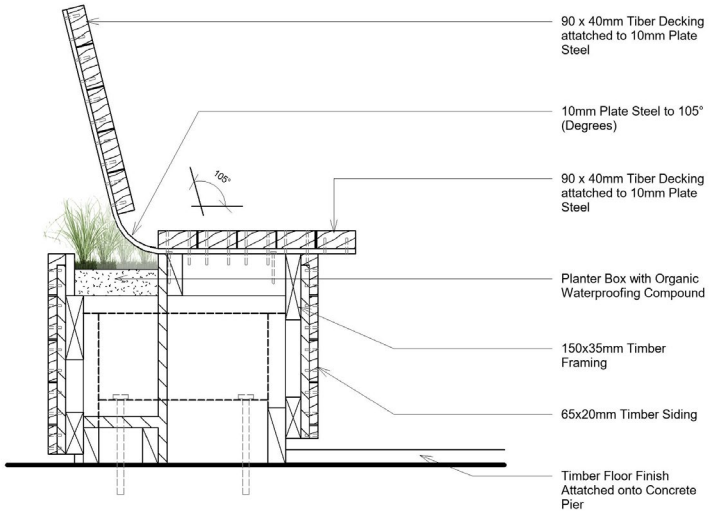
CLEAR WATER TANK

ENTRANCE

PARKING

STAFF ENTRANCE

MAINTENANCE ACCESS

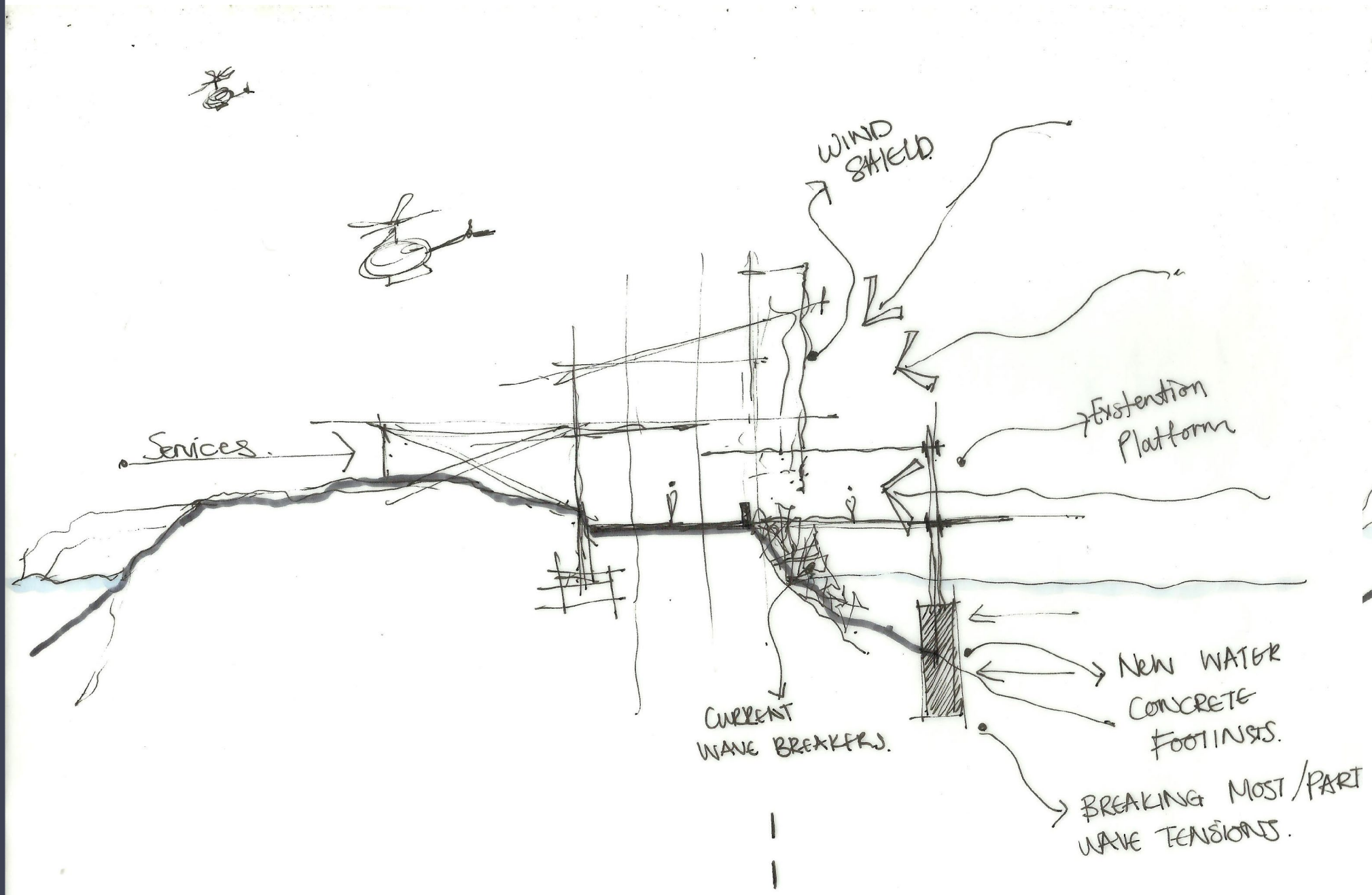


SITE SEATING WITH PLANTER

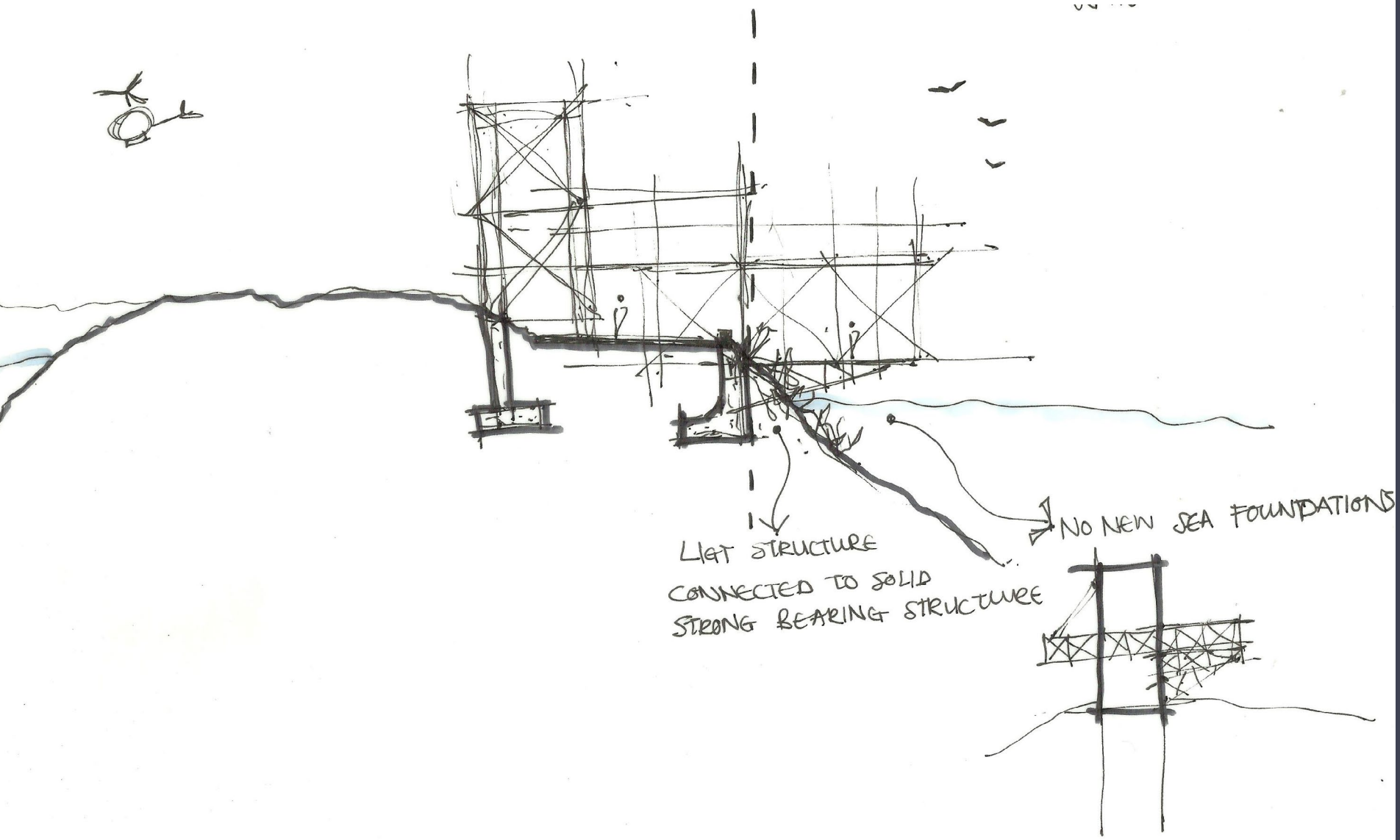
not to scale

Seating developed from: Norega Parklet, [online].Available: http://www.contemporist.com/wp-content/.uploads/2012/11/pp_231112_10.jpg. [2018, October 3].

SITE DESIGN
FOUNDATION DEVELOPMENT



STRUCTURE / FOUNDATION EXPLORATIONS



Interpretation

Sections drawn after the concept models, where the structural components are investigated.

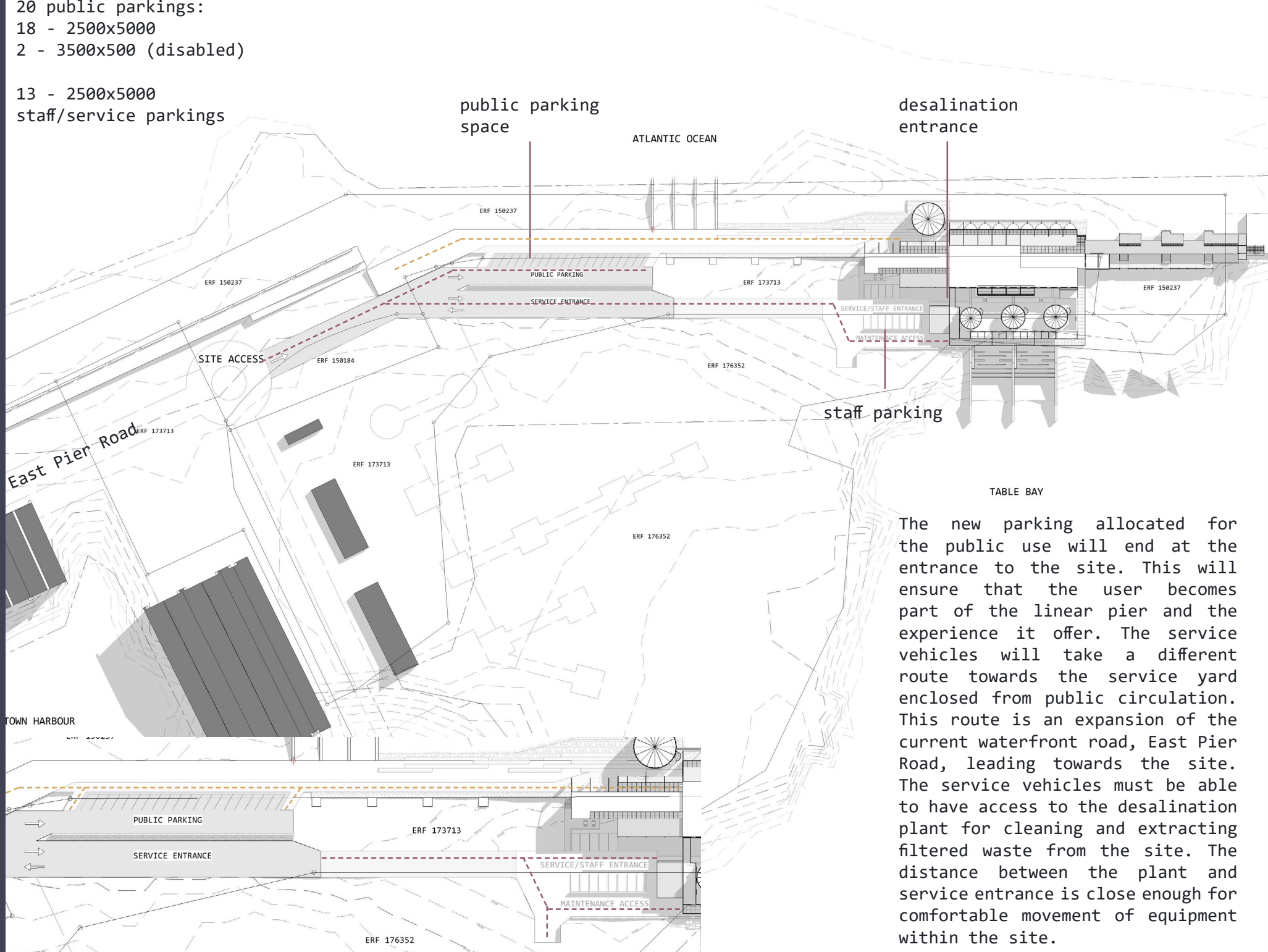
New concrete footings could be used within the ocean areas for the structure to allow the public platform over the water.

The pier is an existing structure within the site and the new structure could also latch on to this concrete pier, becoming a light structure floating above the ocean.

SITE DESIGN
PARKING AND CIRCULATION

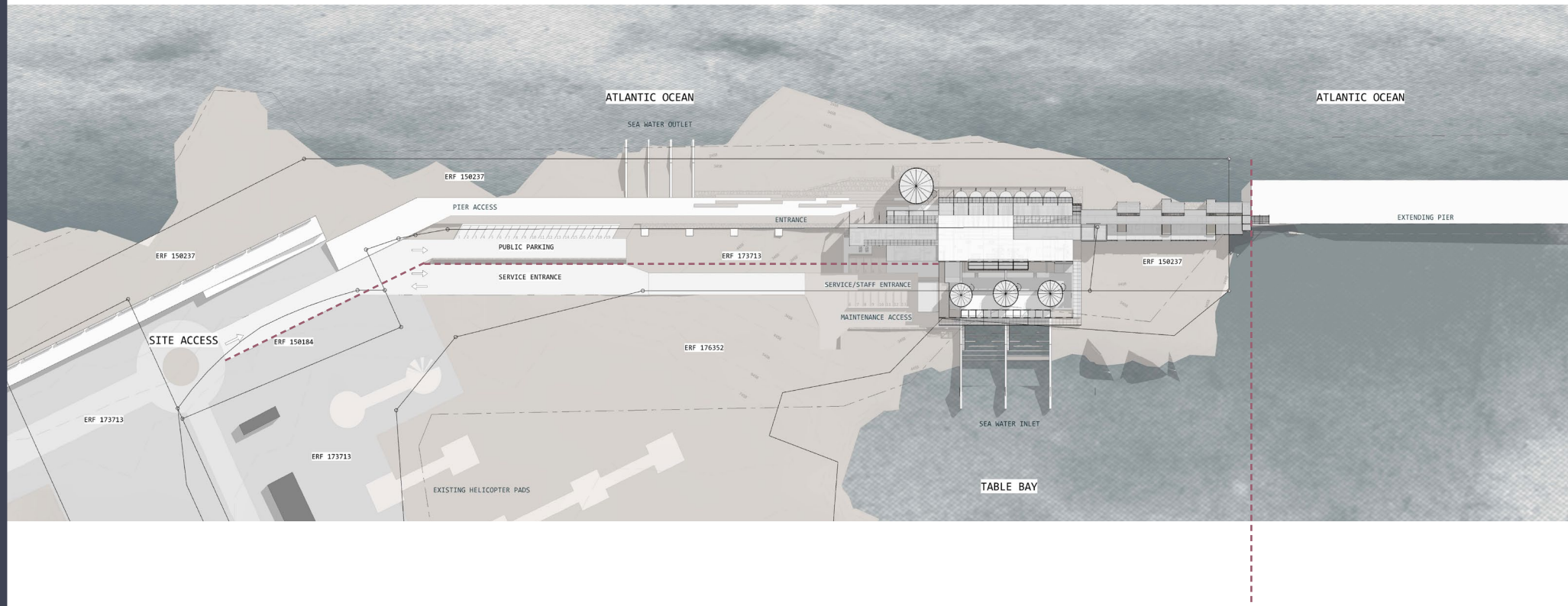
20 public parkings:
18 - 2500x5000
2 - 3500x500 (disabled)

13 - 2500x5000
staff/service parkings



The new parking allocated for the public use will end at the entrance to the site. This will ensure that the user becomes part of the linear pier and the experience it offer. The service vehicles will take a different route towards the service yard enclosed from public circulation. This route is an expansion of the current waterfront road, East Pier Road, leading towards the site. The service vehicles must be able to have access to the desalination plant for cleaning and extracting filtered waste from the site. The distance between the plant and service entrance is close enough for comfortable movement of equipment within the site.

ACCESS RESTRICTIONS



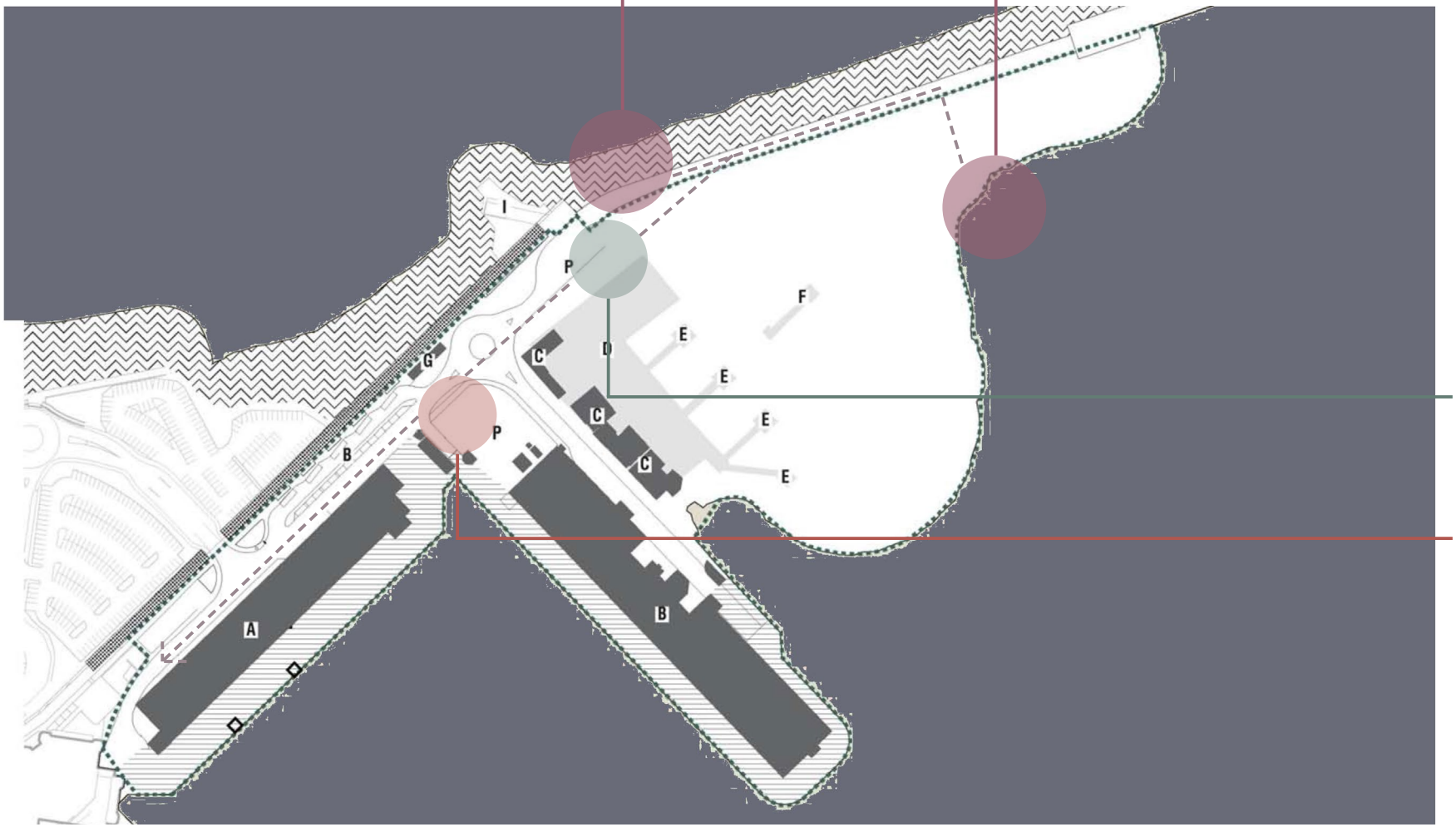
The public should not be able to access the staff entrance and maintenance area of the site. This is for personel safety reasons. Only authorized staff is allowed in this service area, where maintenance vehicles and staff are active. The staff should be able to work without the interruption of visitors.

USER MOVEMENT

Access to the pier further than this point is not allowed. No person may part the allocated section of the pier for personal safety (Smit, 2018). The design repects this restriction and ensure that the user of the building does not pass the point. The main reason for this restriction of the pier is for prevention of injuries from waves when there is a storm of abnormal weather conditions. The only part of the building exceeding this line is the look-out point of the first floor. No movement is allowed on the pier/ground floor of the building past this restriction line.

WATER ACCESS POINTS

The sea water abstraction point and brine discharge point for the existing desalination plant will stay where it is originally positioned on site.



The sea water abstraction point is situated within Table Bay where the water is in a less energetic state than the open sea. This allows for the intake processes to occur without extreme sea conditions that can influence the mechanical process.

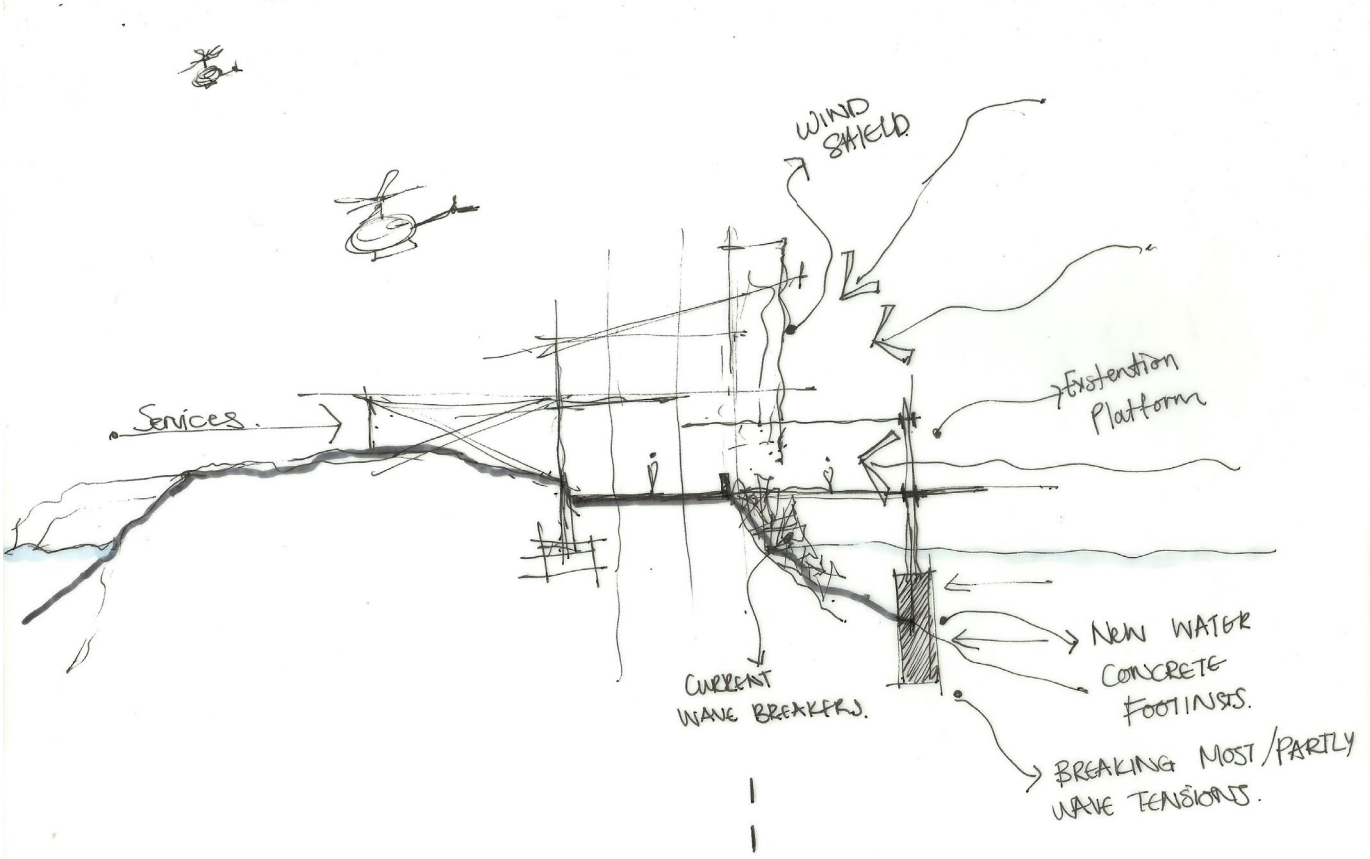
The brine discharge point is located west of the pier where there is stronger wave currents. The wave currents is a tool to remove the brine water from shore. The pier is far off from the main land; this ensures less maintenance to the brine water and less impact on the shore environment.

PROPOSED MUNICIPAL CONNECTION

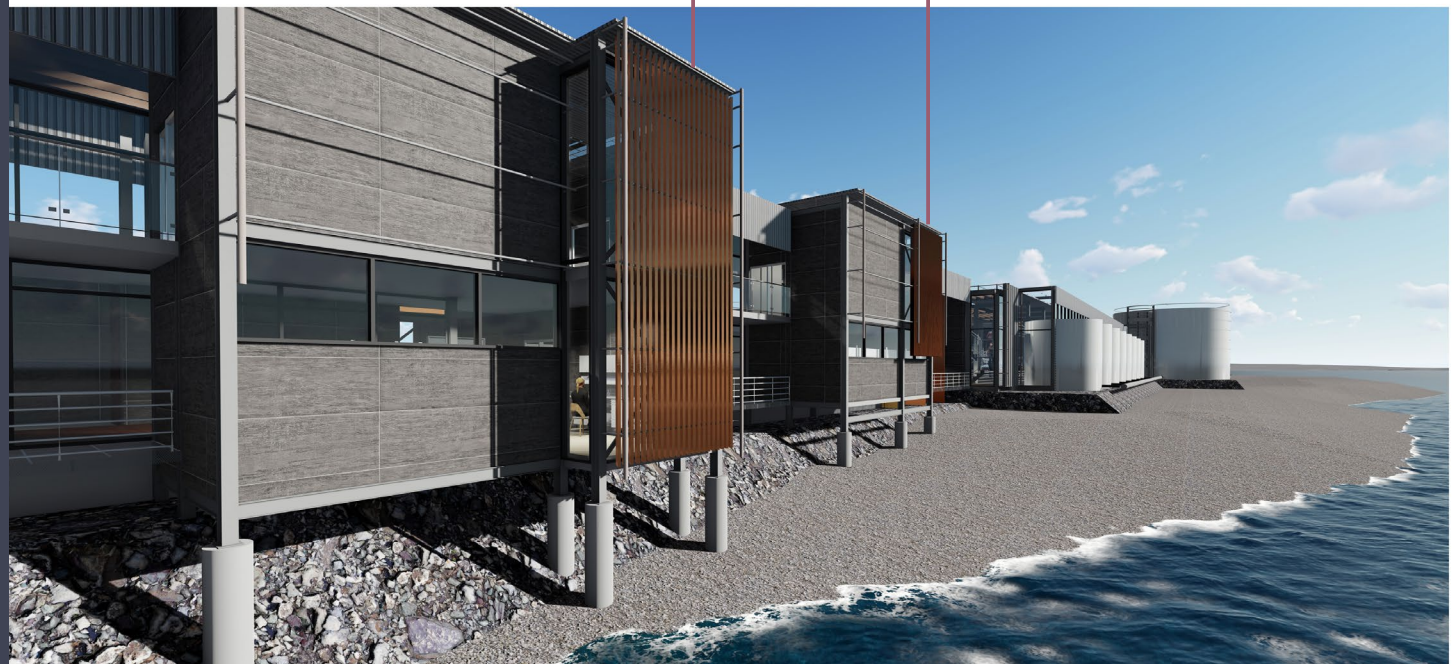
EXISTING MUNICIPAL CONNECTION

The fresh processed water of the desalination plant will connect with the municipality water connection of the V&A Waterfront.

SITE DESIGN
NATURAL ENVIRONMENT



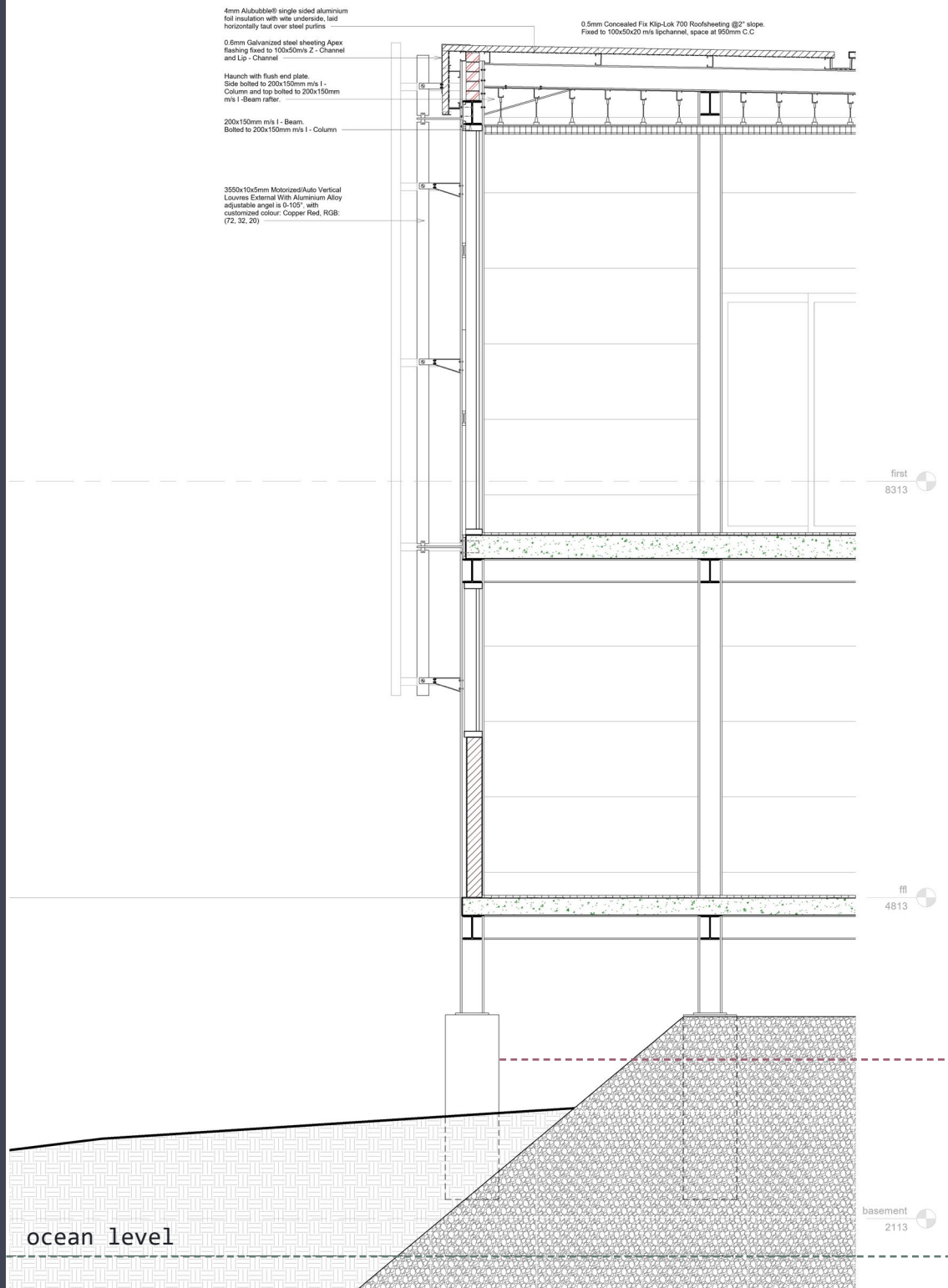
VERTICAL LOUVER SYSTEM



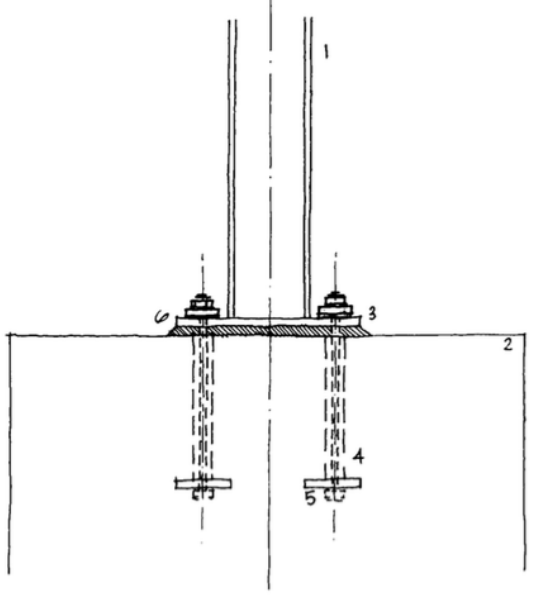
The proposed design aimed to create a safe and comfortable experience within the natural environment. The strong winds within the Cape Town Harbour is a natural occurrence which needs to be taken into account. The building structure creates a safe travel-through experience with help of using different methods to break the wind energy from entering the building. Structural systems such as wind and light shuttering systems is incorporated within the design and the post-treatment tanks are also used to protect the building from the wind speed to n smaller extend.

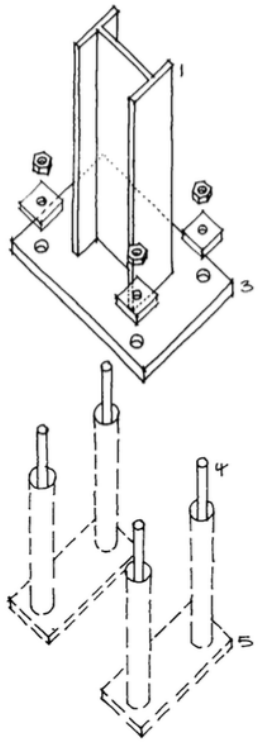
The East Pier acts as a breakwater to the Cape Town Harbour. The influence of tides and swells on the Northern side of the pier is taken into account by adding multiple retaining walls and elevating the building from the natural ground level, allowing the water to pas underneath.

SITE DESIGN
NATURAL ENVIRONMENT



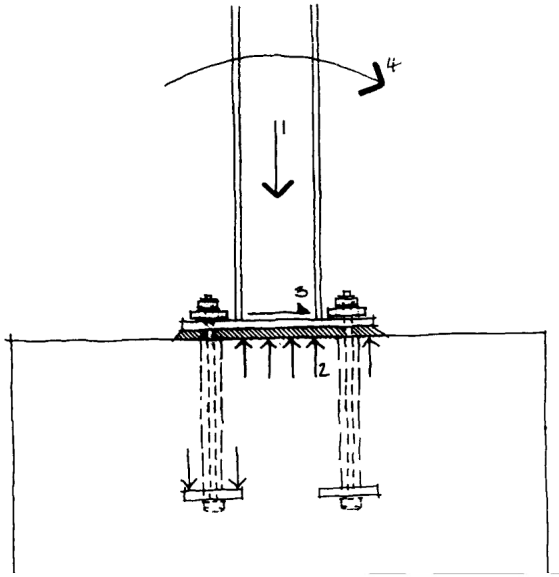
SCHEMATIC ARRANGEMENT





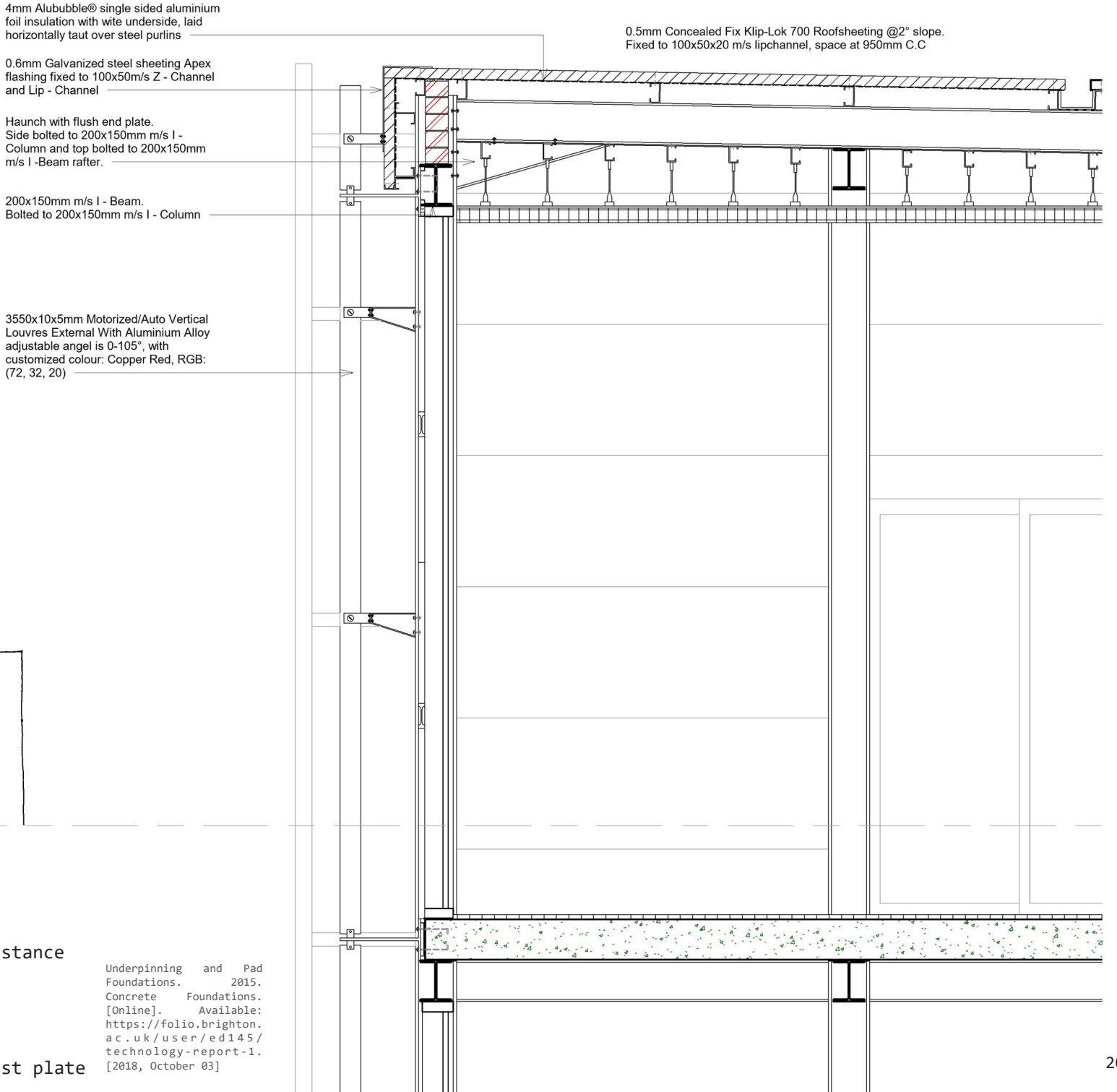
1. Steel Column
2. Concrete base/foundation
3. Thick base plate
4. Bolts set in pockets
5. Normally two plates or angles
6. Grout

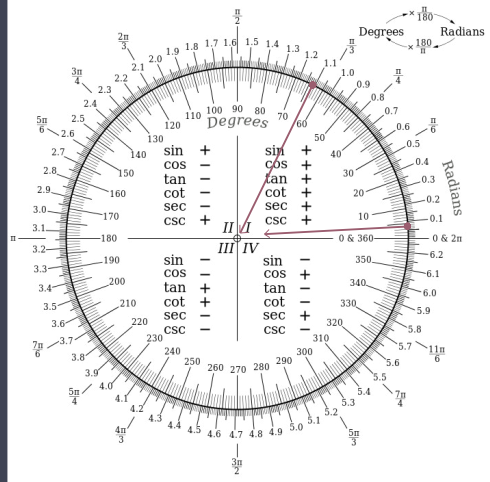
LOAD PATH DIAGRAM



1. Compression of column
2. Bearing
3. Lateral restrain (frictonal resistance and possible shear of bolts)
4. Bending moment
5. Pull-out concrete reaction against plate

Underpinning and Pad Foundations. 2015. Concrete Foundations. [Online]. Available: https://folio.brighton.ac.uk/user/ed145/technology-report-1. [2018, October 03]

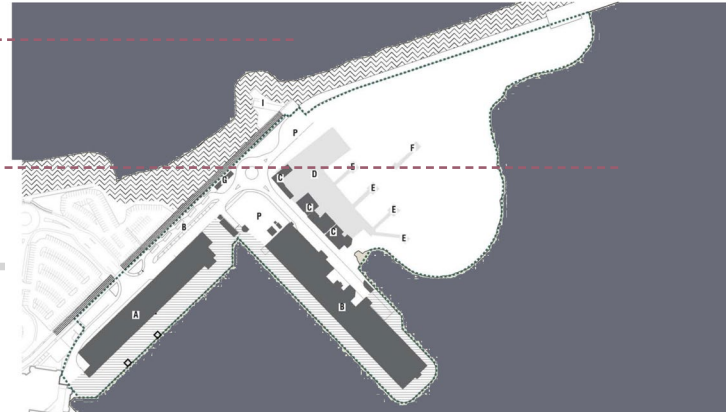




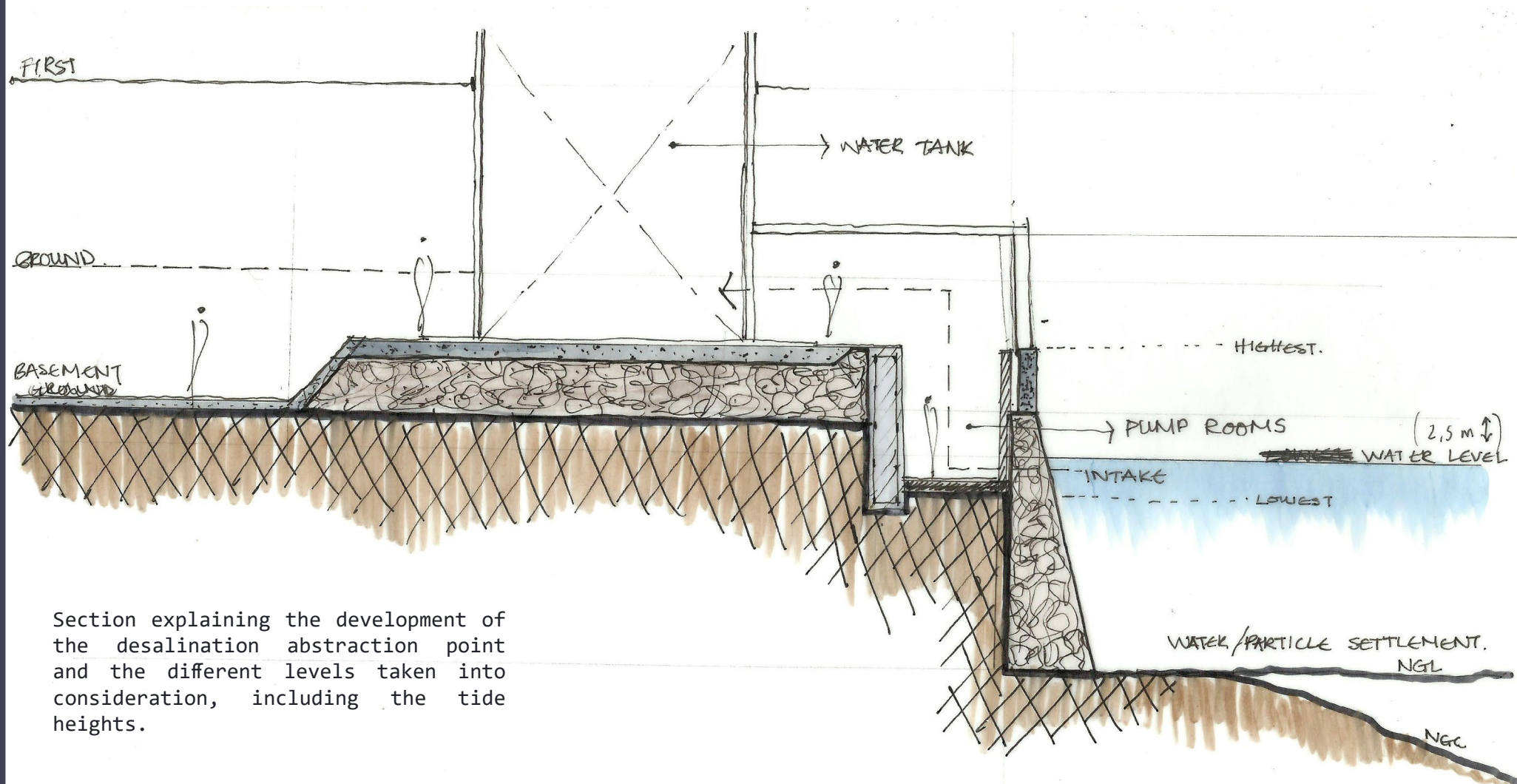
64 Degrees - South West Direction

04 Degrees - West Direction

FLOW DIRECTIONS



(Western Cape Department of Agriculture, 2018)



Section explaining the development of the desalination abstraction point and the different levels taken into consideration, including the tide heights.

WAVE SWELLS

The East Pier is the break water for the Cape Town Harbour. The sea water's energy breaks and the pier becomes a threshold to protect the harbour.

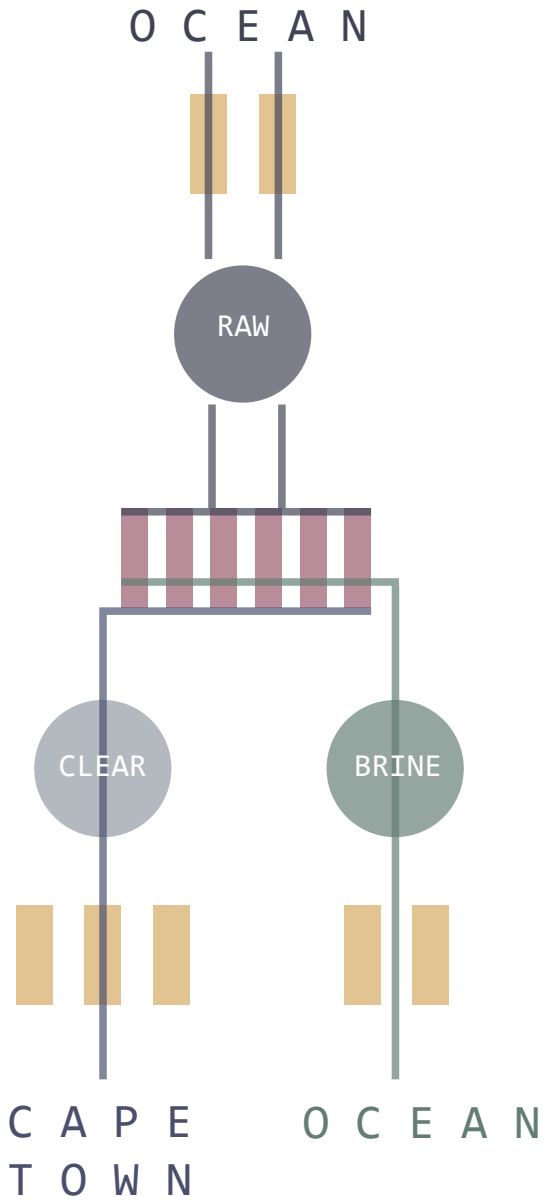
The waves west of the pier, those of the Atlantic Ocean, will have more strength and swells than the sea water within the harbour and Table Bay.

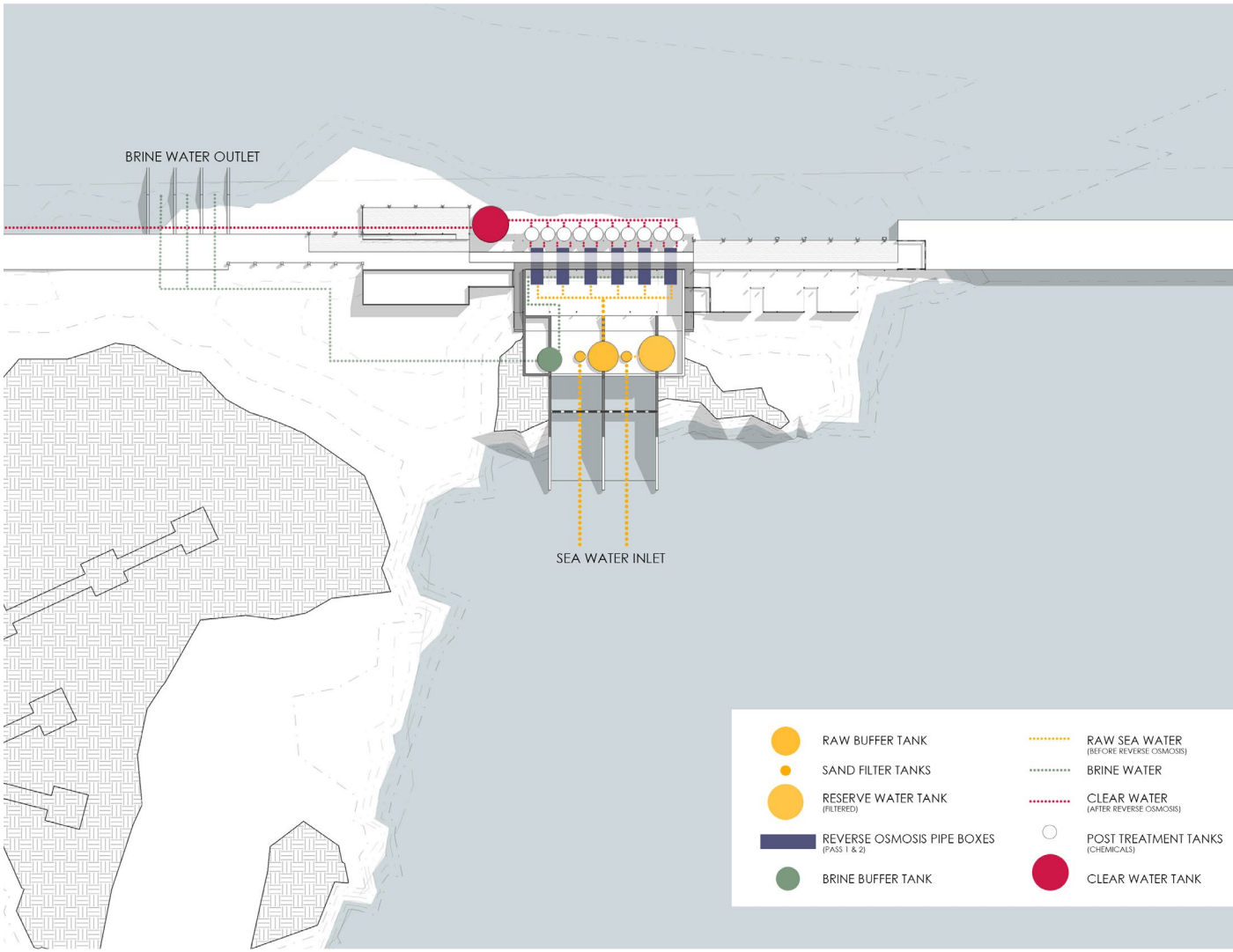
The average swell of the sea waves between high and low tides is 2,5 meters. This is a very important aspect of the site to investigate when designing the proposed dissertation. The different levels for water abstraction and discharges will have an effect on the site levels to accommodate the desalination process.

WIND DIRECTION

This image illustrates the wind directions in Cape Town Harbour within the week of 11 September - 16 September 2018. The illustration is an indication that the average wind direction would be a South/ South-East direction. It is clear though that this is just the average wind direction and within Cape Town one could expect wind from any direction.

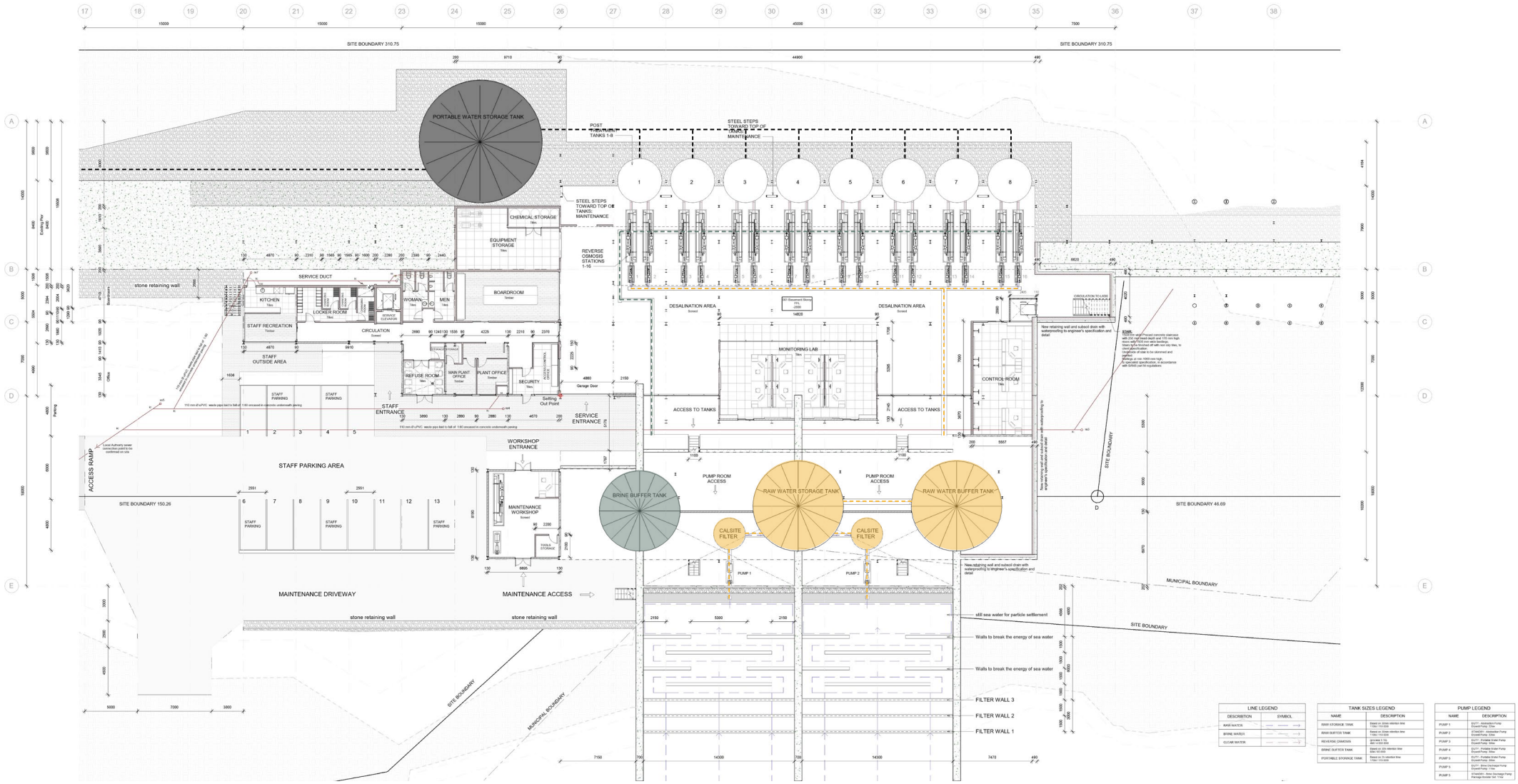
STRUCTURAL MORPHOLOGY



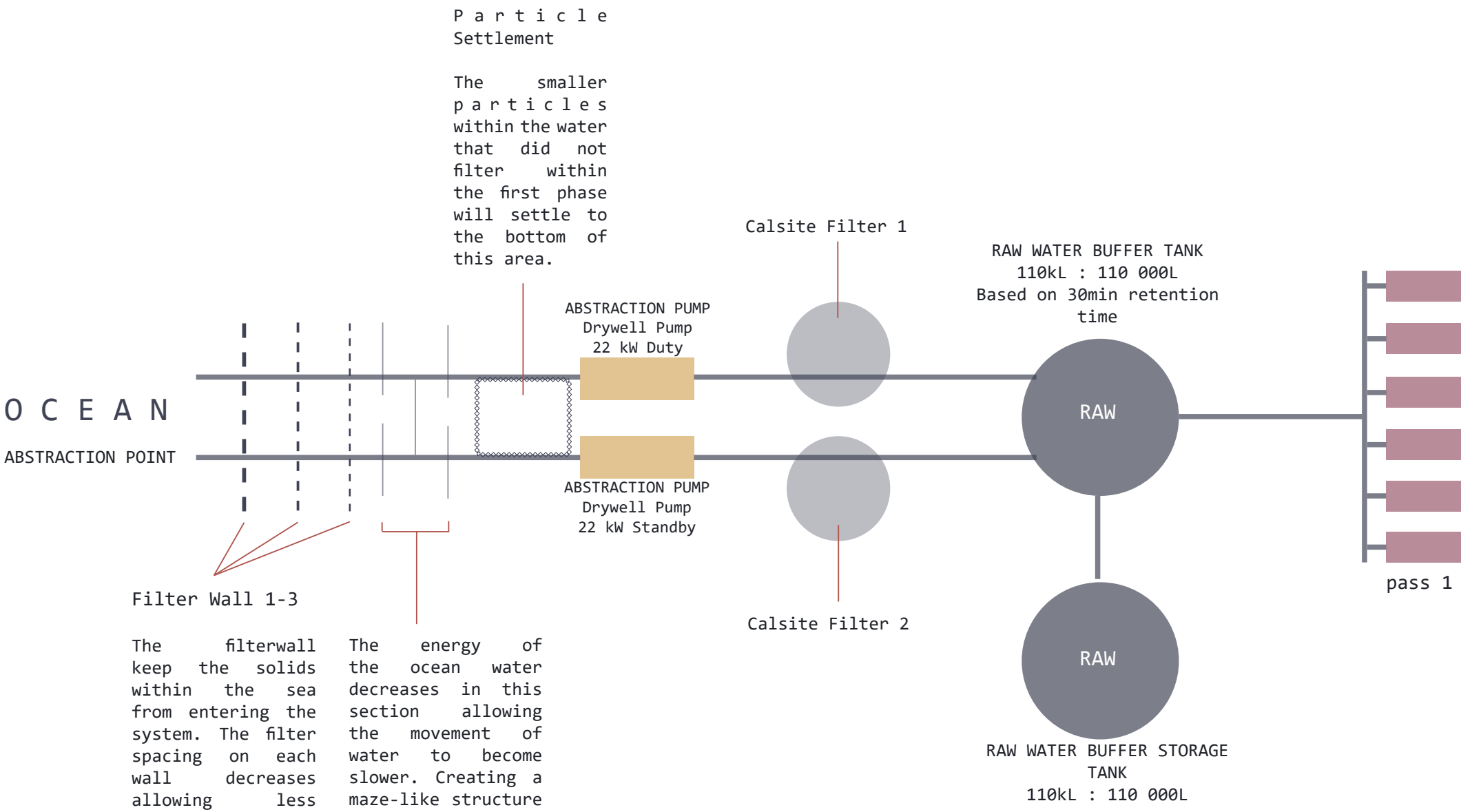


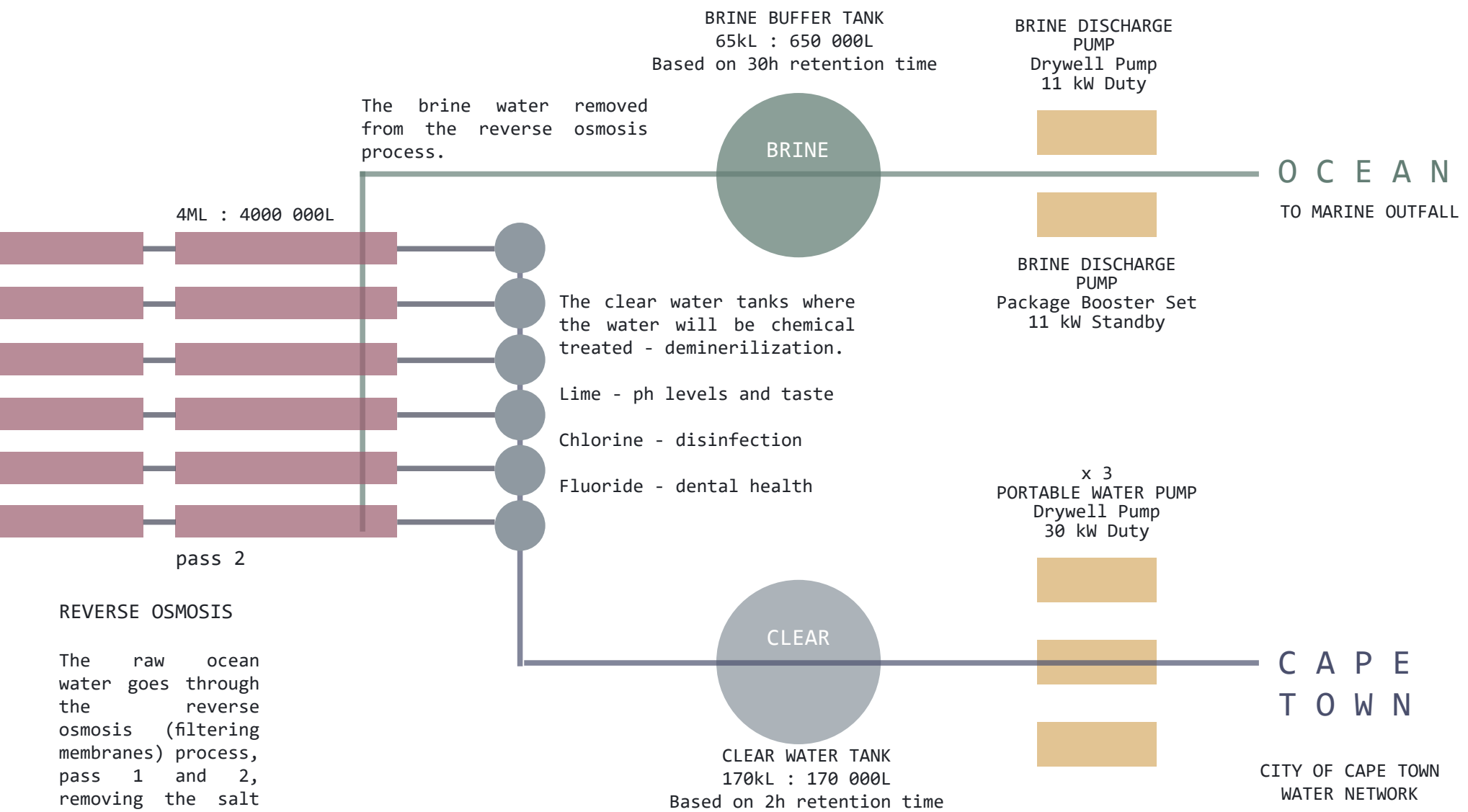
DESALINATION PROCESS

[DEVELOPMENT FROM DIAGRAMMATICAL



L A Y O U T T O D E T A I L E D P L A N]


Particle Settlement
The smaller particles within the water that did not filter within the first phase will settle to the bottom of this area.
Calsite Filter 1
RAW WATER BUFFER TANK
110kL : 110 000L
Based on 30min retention time
ABSTRACTION PUMP
Drywell Pump
22 kW Duty
OCEAN
ABSTRACTION POINT
RAW
ABSTRACTION PUMP
Drywell Pump
22 kW Standby
pass 1
Filter Wall 1-3
The filterwall keep the solids within the sea from entering the system. The filter spacing on each wall decreases allowing less access.
The energy of the ocean water decreases in this section allowing the movement of water to become slower. Creating a maze-like structure for the water to move through.
Calsite Filter 2
RAW
RAW WATER BUFFER STORAGE TANK
110kL : 110 000L

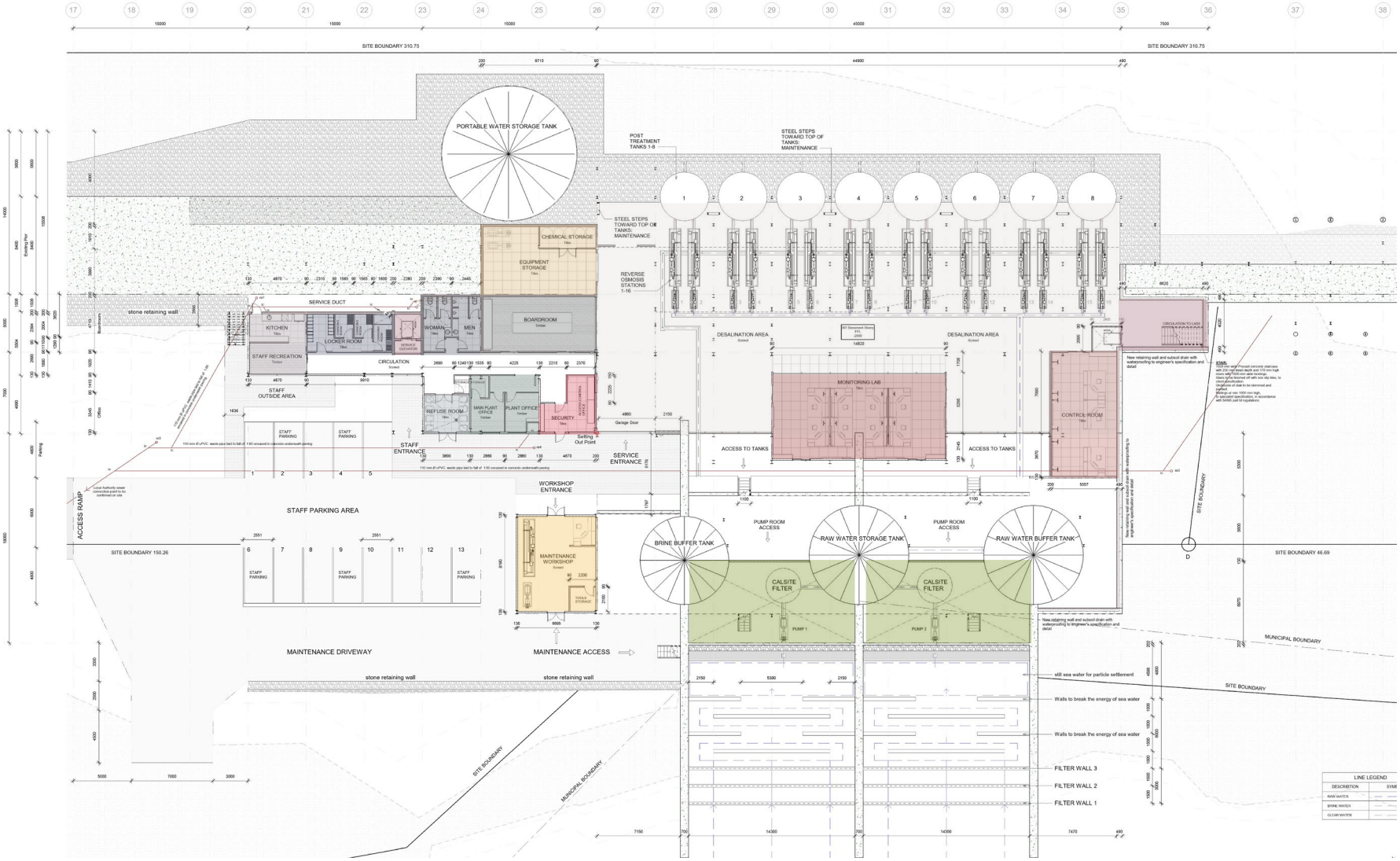


REVERSE OSMOSIS

The raw ocean water goes through the reverse osmosis (filtering membranes) process, pass 1 and 2, removing the salt from the water and creating fresh water.

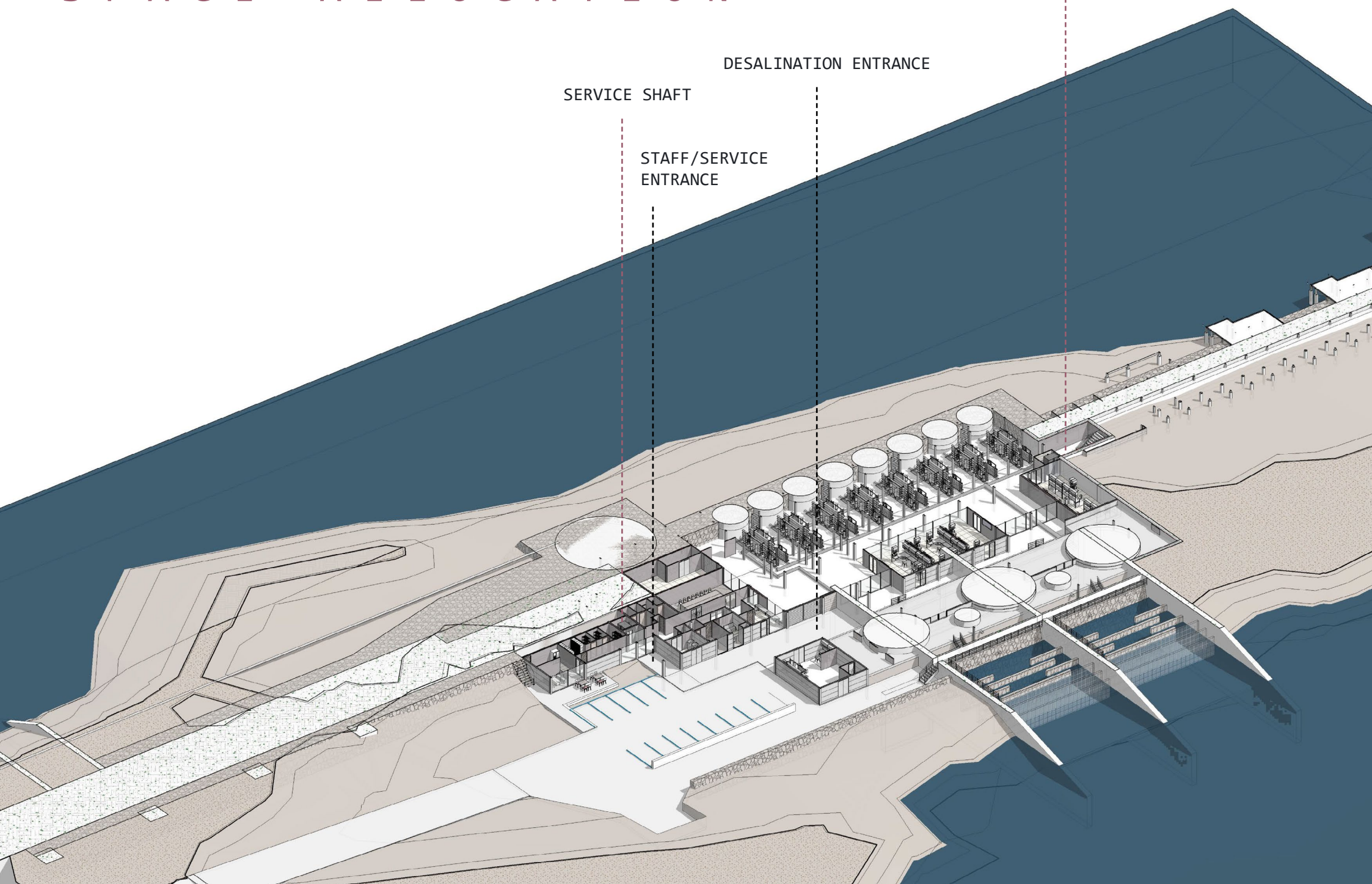
STRUCTURAL MORPHOLOGY

SPATIAL REQUIREMENTS [DESALINATION AREA]

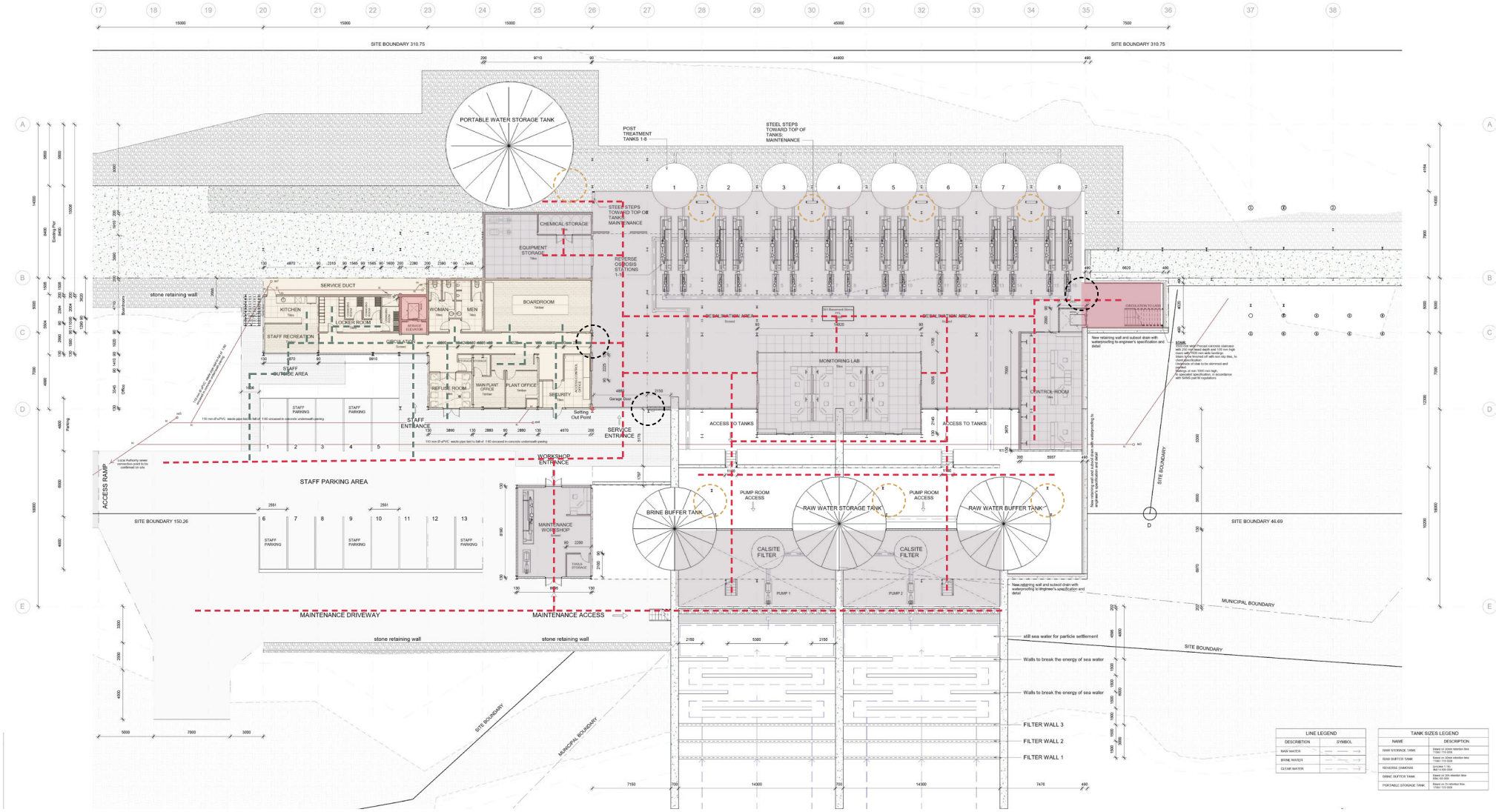


- Staff Recreation
- Staff Lockers
- Staff Restrooms
- Boardroom
- Refuse Room
- Plant Main Offices
- Security & Access Control
- Monitoring Lab
- Control Room
- Filter & Pump Rooms
- Maintenance Workshop
- Equipment Storage & Chemical Storage
- Circulation
- Desalination Area

SPACE ALLOCATION



SPATIAL REQUIREMENTS [CIRCULATION]



CIRCULATION TO OTHER FLOORS

DESALINATION ACTIVITY

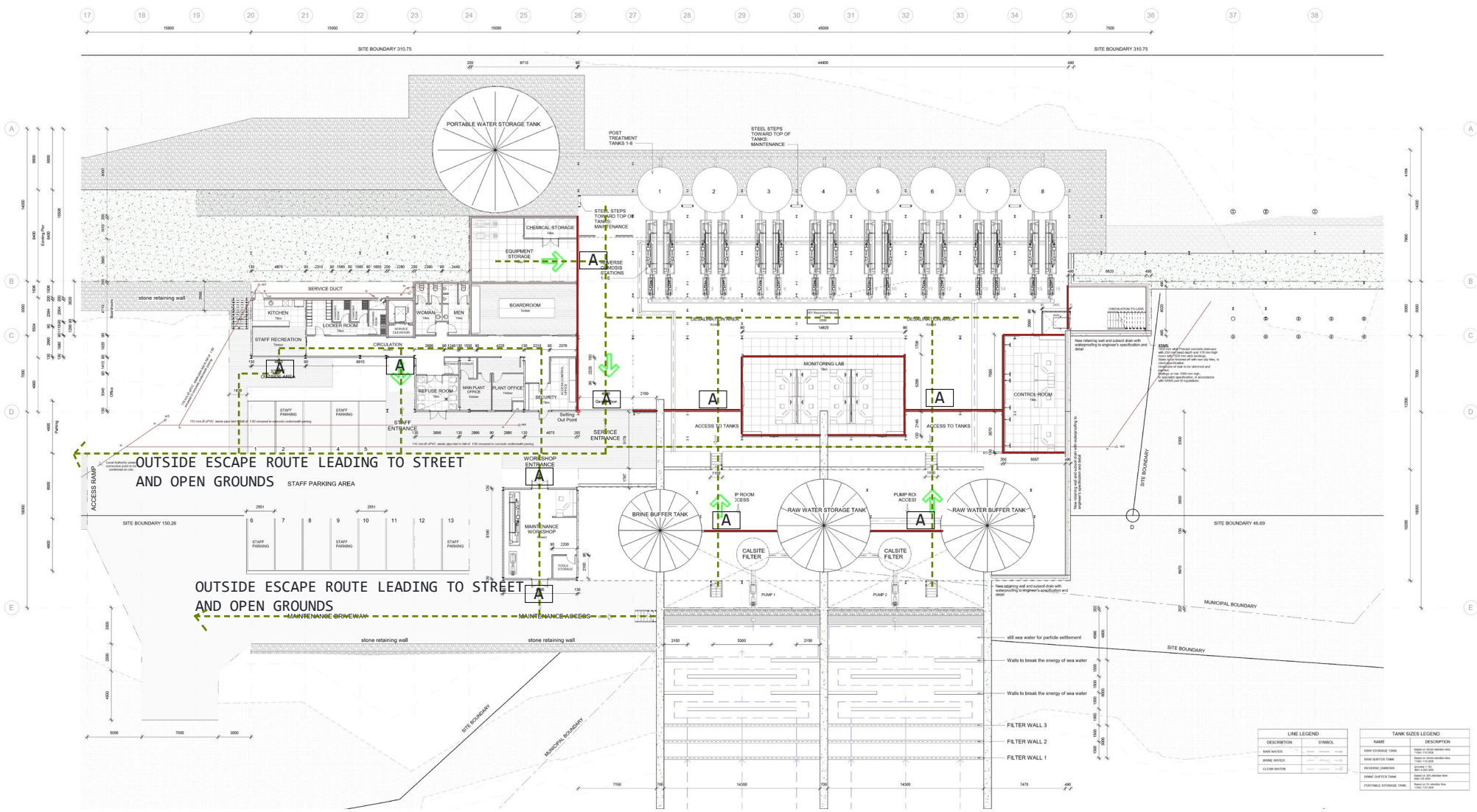
STAFF/SERVICE AREA

STAFF CIRCULATION ROUTES

DESALINATION CIRCULATION ROUTES

ACCESS CONTROL OF DESALINATION PLANT

CIRCULATION TOWARDS TANK TOPS FOR MAINTENANCE



FIRE LEGEND:

Escape routes, doors, wall and fire safety equipment should comply with fire engineers drawings and specifications.

4.5kg or 9kg DCP EXTINGUISHER	
FIRE HOSE REEL	
FIRE HYDRANT	
DIRECTION OF TRAVEL	
E1	
E2	
EXIT	E6
F15	
F18	
F18	

F4	
F5	
F6	
J1	
J2	
J3	
DOOR CLASS: A - 60min : B -120min : F - 30min	
PB - PUSH BAR PP - PUSH PLATE	
SC - SELF CLOSER	
DOOR WIDTH (mm)	

60min FIRE WALL

ESCAPE ROUTE

All escape routes shall be minimum 1,5 meters in width.

Doors within the main escape routes should be a minimum of 1,5 meters in width.

REVERSE OSMOSIS

The raw ocean water goes through the reverse osmosis (filtering membranes) process, pass 1 and 2, removing the salt from the water and creating fresh water.

PERMASTORE

GLASS-FUSED-TO-STEEL FINISHES

Glass-Fused-to-Steel is a unique tank finish. Two materials are fused together to achieve the best of both materials – the strength and flexibility of steel combined with the corrosion resistance of glass. Applied to both interior and exterior surfaces, Glass-Fused-to-Steel is able to provide many years of trouble free service in harsh environments (Permastore: Tanks and Silos - Worldwide Containment Solutions, 2016).

- high performance & hard wearing
- strong & flexible as steel
- inert silica glass
- colour fast/UV stable

(Permastore: Tanks and Silos - Worldwide Containment Solutions, 2016)

PROCESS WATER TANKS

- not require recoating

- water storage for industrial plants (demineralised)

- **Optimum corrosion resistance** of glass-fused-to-steel (safe and secure storage with minimal maintenance costs)

- long life span (improved return to investment)

- modular bolted tank construction
(rapid and cost effective site installation - reducing timescales, cost and on-site equipment)

Standard external colour:
00-A-05 (RAL 7004)
Light Grey

RAW

TRIFUSION@ PLUS

application:
sea water tank

internal colour:
14-c-40 (RAL 7009)
Brown - Grey

BRINE

TRIFUSION@ PLUS

application:
sea water tank

internal colour:
14-c-40 (RAL 7009)
Brown - Grey

CLEAR

ISOFUSION@ V700

application:
portable water
storm water

internal colour:
20-c-40 (RAL 5013)
Grey

MATERIALITY

PROCESS WATER TANKS

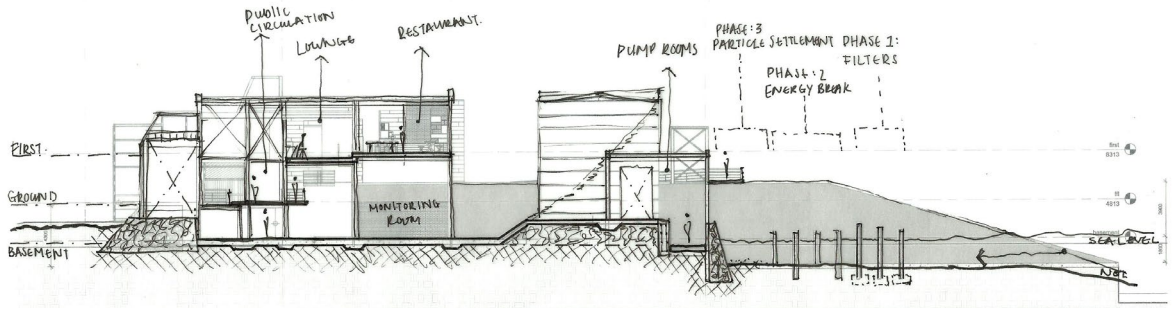
Permastore. 2016. Worldwide Containment Solutions. Available from: http://www.permastore.com/wp-content/themes/permastore/pdf/Permastore-uk-ind-broch.pdf. [2018, April 24]

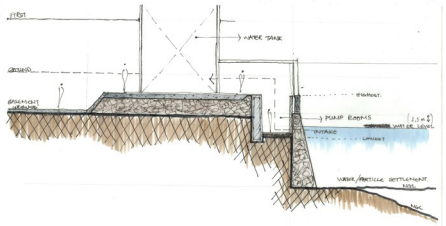
MATERIALITY

RECYCLED MATERIALS

A way to produce an ennergy efficient project is to reuse materials that is collected on site and to recycle materials back to the manufacturing process rather than dumping it somewhere else. The site is composed of stone to form the breakwater construction. At the inlet and outlet areas of the proposed desalination project various amounts of this stone will have to be removed in order to form a space for the pumps to have access to the sea water. These materials could be used within the new proposed project to minimize construction waste.

- creating foundations
- compiling retaining walls
- becoming part of building structure and materials: site specific connections
- walkways paved with stone
- stone wall cladding

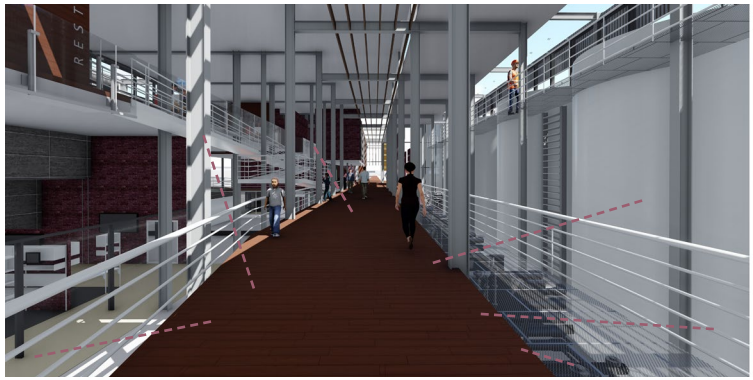




STEEL - TIMBER

desalination plant

public



SITE CONNECTION AND TIMBER CONNECTIONS

The design aims to reconnect the public to the expected enclosed and private typology of a desalination plant as stated in part 1. Exposing the structure and methods of the desalination plant to the public. The use of materials as a method to indicate certain spaces within the building to guide the users through the process. Timber is used within the public circulation and steel is used to identify the infrastructure of the desalination plant. Some spaces consist both material. These are the spaces where public and private are reconnected with each other. The material plays a role of guidance within the building.

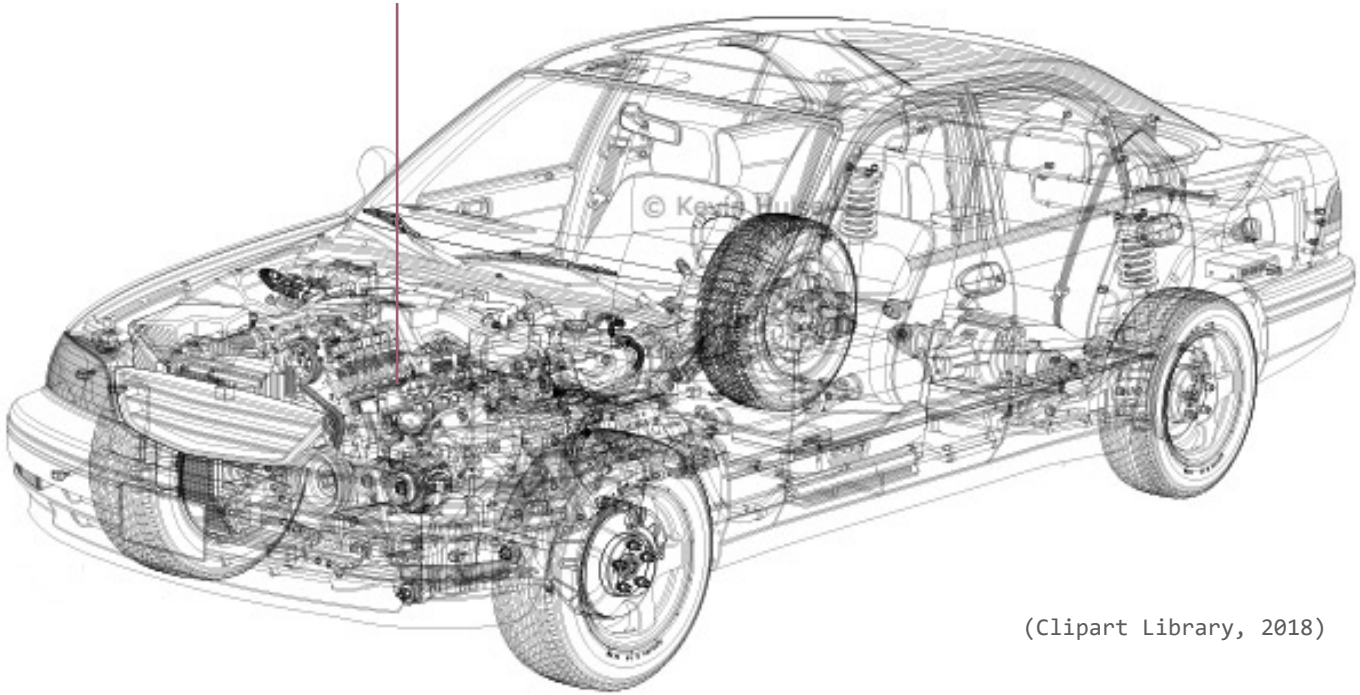
THE MACHINE-LAYERS

The proposed dissertations aims to create a building with a highly technical function to the surrounding site and city. The project exposes the machine-like typology of a desalination plant to the public and social aspect of the surrounding environment. The structure of the building should allow for the machine to become exposed and accessed.

I consider a car to be the ultimate example of how a machine could function and become aesthetically beautiful. The car consists of many layers to create the simplistic look, but underneath all of those layers there is a chaos only a few could understand. The car as a machine is made out of so many parts and processes to enable the functioning of the machine in total. This is the same within a desalination plant. There is so many layers within the plants process to enable clear and fresh water produce at the end.

The engine of a motorcar is the “heart “of the process to enable the vehicle to move and start, bringing it to life. This is the same with the desalination plant within the proposed building. It becomes the “heart” within the building and structure. The reverse osmosis phase within the desalination process is the “heart” of the purification process. This is where the salt and the clear water is separated from one another.

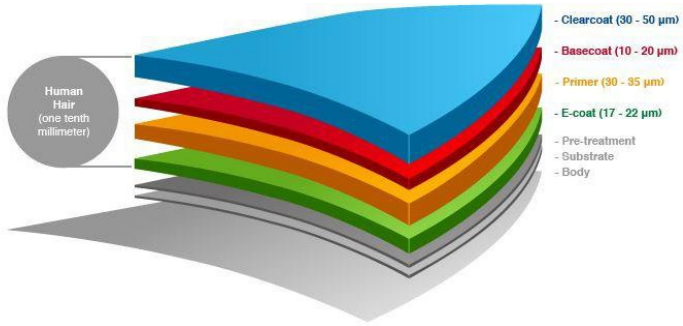
“HEART” OF THE CHAOS



(Clipart Library, 2018)

The car and the chaos of its inner workings is an order-like system for those whom understand the process. This chaos and order relationship is investigated through my touchstone process, explain that a system of functions could be chaotic and at the same time have order.

The different layers of a car, the machine, is explored and these will relate to the structural systems used within the design. The machine is mainly constructed with treated steal and this will become the main material within the building structure to allow the exposing of the machine like design.

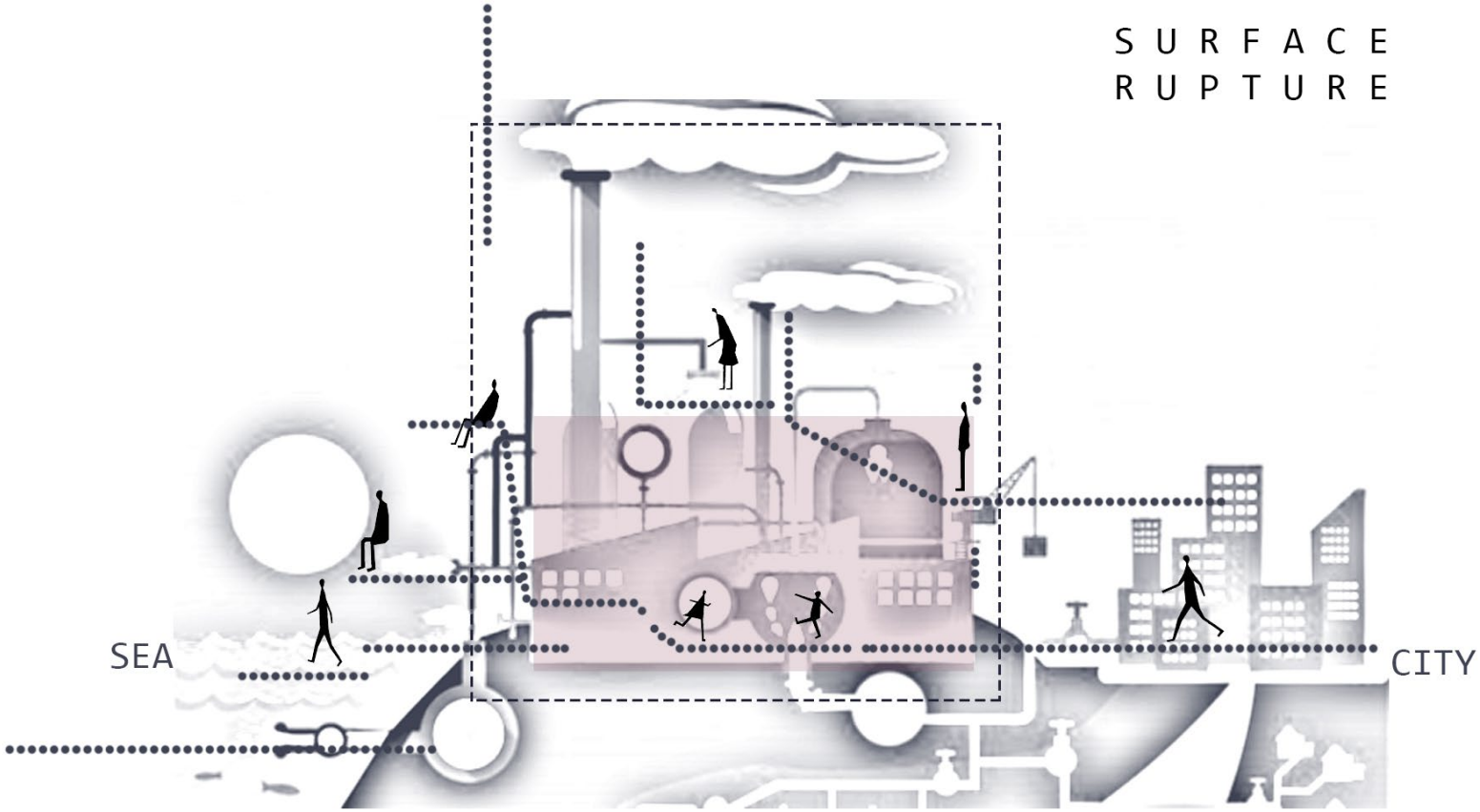


Analyzing the automotive painting process in the factory. 2018. [Online]. Available: https://cabinaslagos.com/analyzing-the-automotive-painting-process-in-the-factory/. [2018, August 24].

BARE STEEL - GALVANIZED - ZINC PRE-TREATMENT - SEALER COAT - PRIMER COAT - TOP COAT

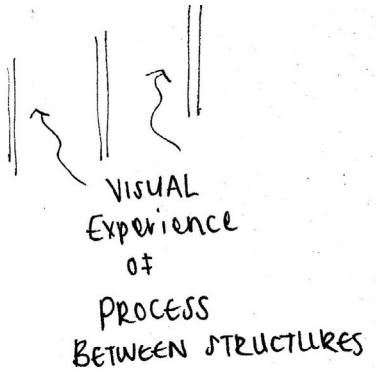
MATERIALITY
[EXPOSING THE MACHINE]

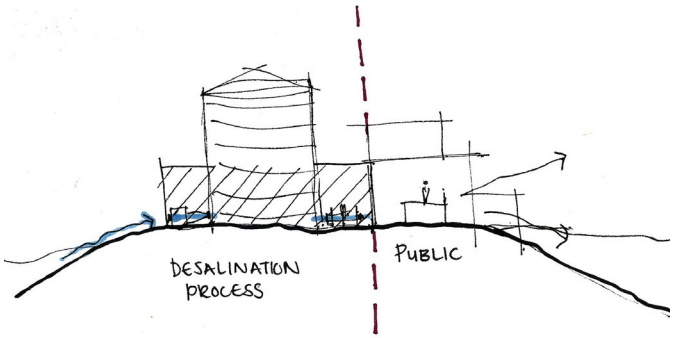
SURFACE
RUPTURE

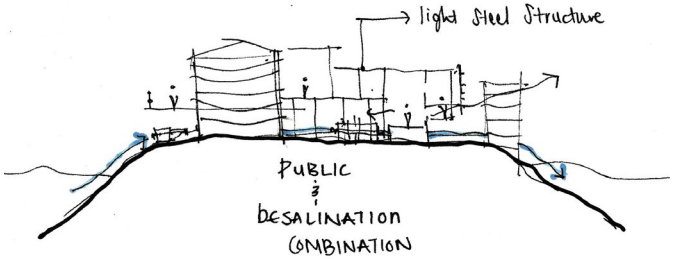


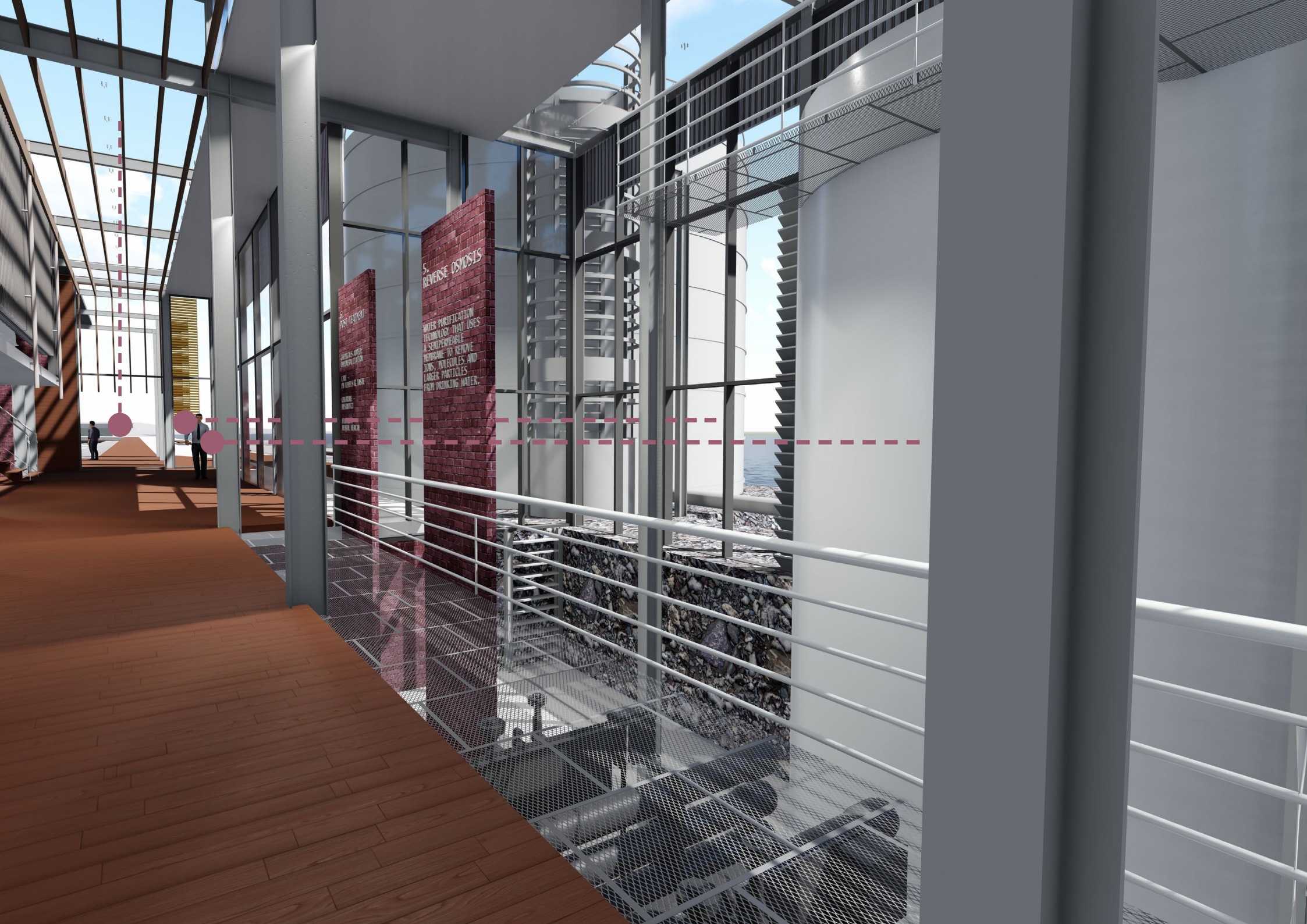
DESALINATION PLANT
WHAT IS EXPECTED
- ENCLOSED

IN-BETWEEN
- DIFFUSED BOUNDARIES
- THRESHOLDS
EXPOSING THE MACHINE
AWARENESS OF *TERRAIN VAGUE*



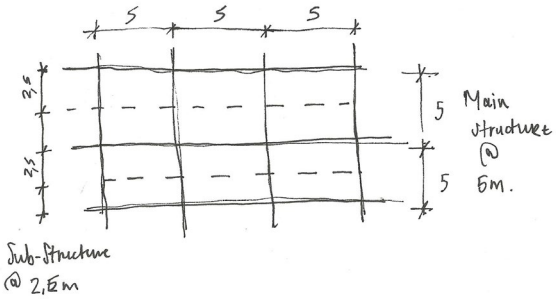





5.
REVERSE OSMOSIS
WATER PURIFICATION
TECHNOLOGY THAT USES
A SEMIPERMEABLE
MEMBRANE TO REMOVE
IONS, MOLECULES AND
LARGER PARTICLES
FROM DRINKING WATER.

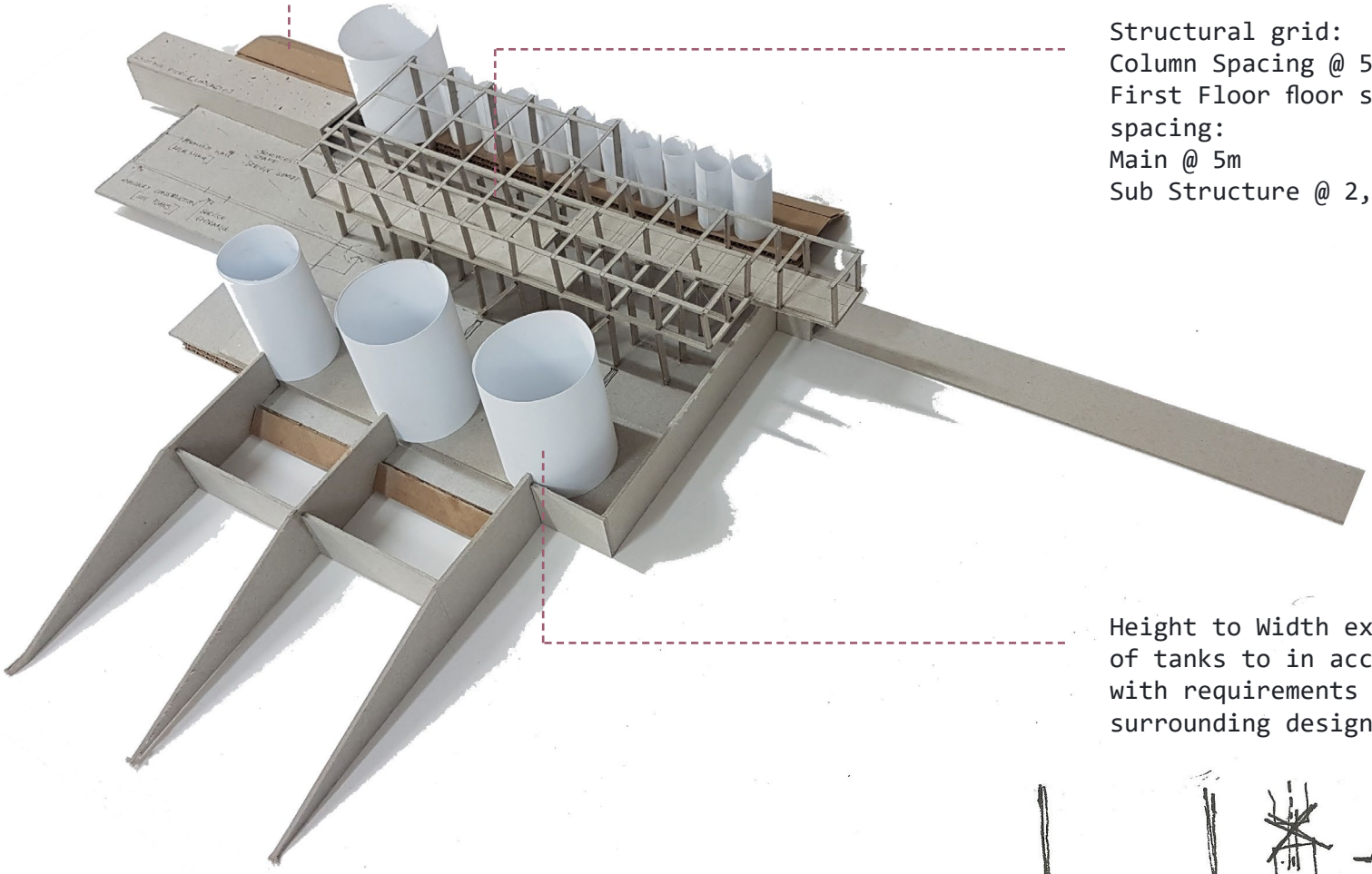
MATERIALITY

[EXPOSING THE MACHINE]

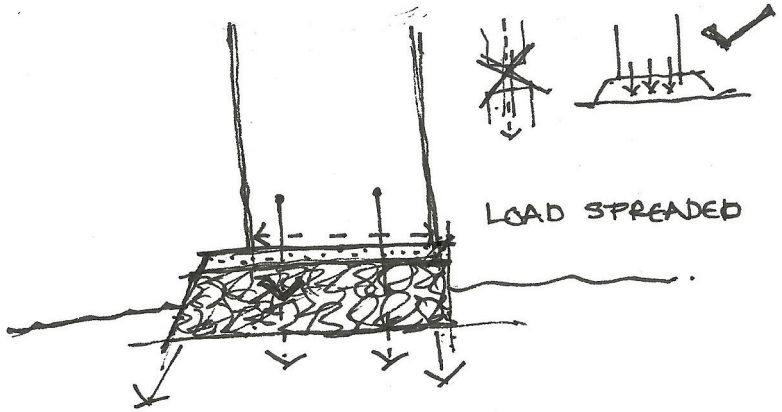


Exploration od re-used materials - rock retaining walls and tank foundations

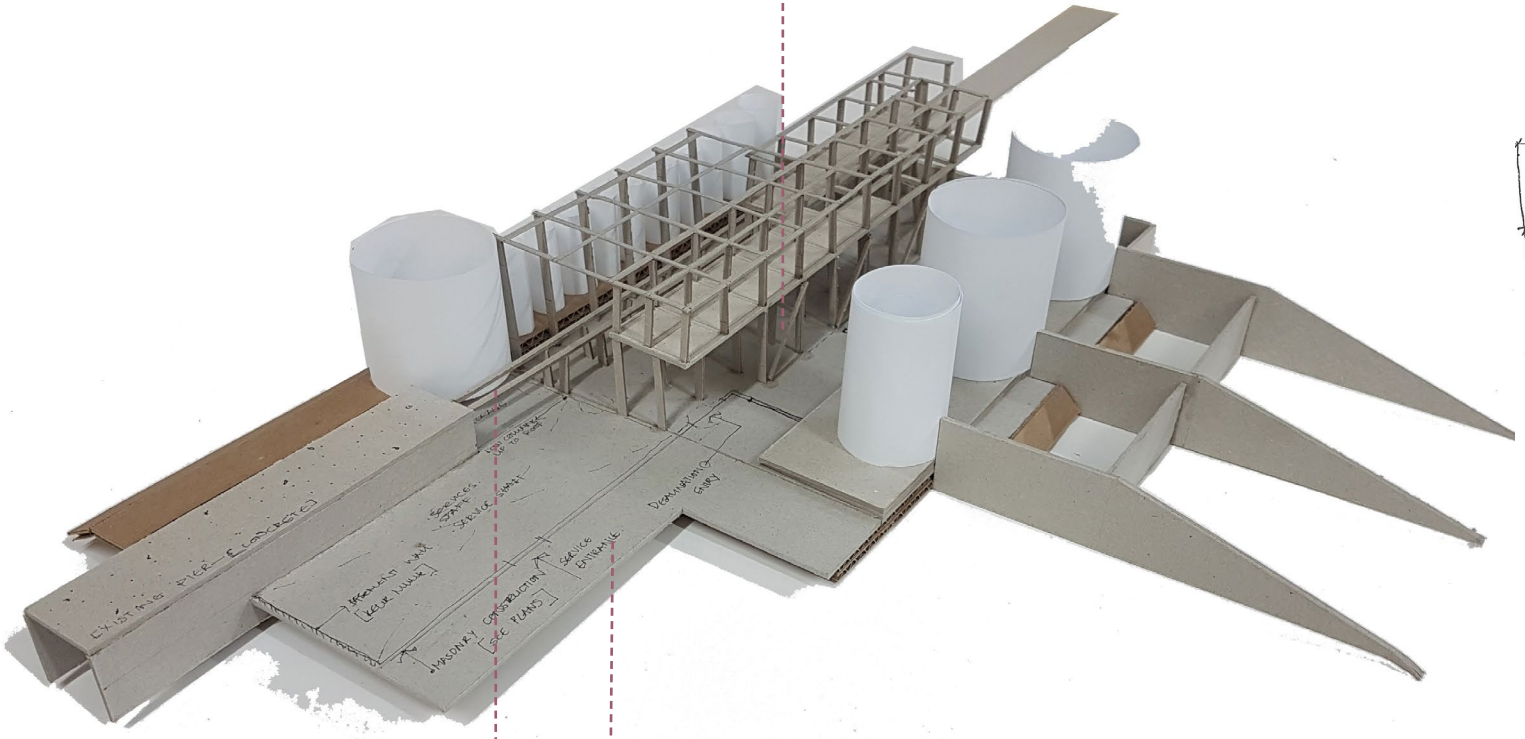
Structural grid:
Column Spacing @ 5m
First Floor floor steel beam spacing:
Main @ 5m
Sub Structure @ 2,5m



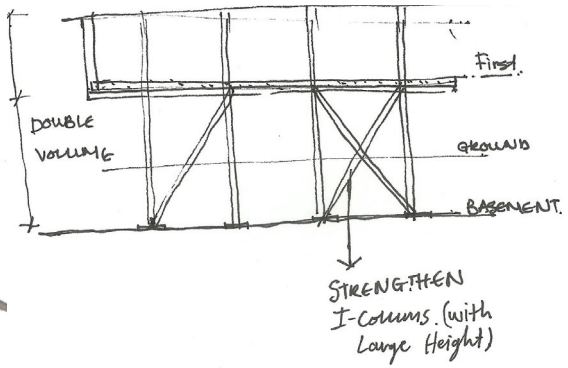
Height to Width exploration of tanks to in accordance with requirements and surrounding design.



STRUCTURAL MODEL

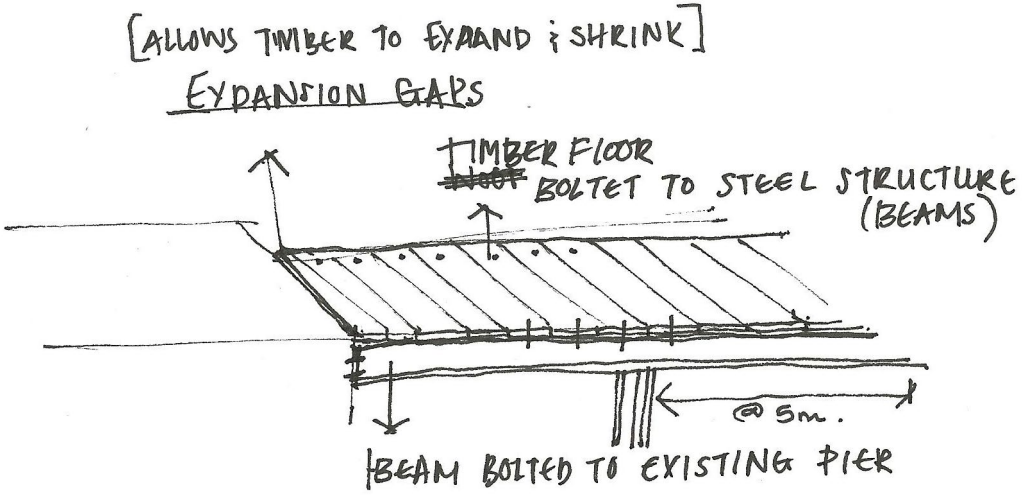


The exploration of cross bracing within the structure to help strengthen the structure especially within double volumes and where the height of structure weakens its strength.



The exploration of service entrance and the access points of desalination plant.

The public Walkway within the building and its connection to the existing pier.



SUSTAINABILITY
[WATER APPROACH]

According to Paige Müller, a media reporter for Creamer's Media, Cape Town is suffering from one of the worst droughts in its history (Müller, 2018). The change in dam levels already occurred in 2015, "resulting in a severe water shortage in the Western Cape region" (Müller, 2018). This year the dam levels reached a critical low and Capetonians were warned of Day Zero - where the municipal water supply would largely be shut off.

Enormous water strategies started to be implemented by the government to prevent Day Zero from happening. The City of Cape Town municipality alternative water source projects is groundwater, recycled and seawater purification plants being launched to mitigate the draught's effects (Müller, 2018). The construction and installation of a new emergency desalination plant at the V&A Waterfront, on the East Pier, will be implemented. This desalination plant will have the capacity to provide two million litres of fresh water to Cape Town's residents (Müller, 2018).

The desalination project aims at establishing a two-minimum-liquid-discharge plant (Müller, 2018). This plant will make use of sea water reverse osmosis and multimedia filtration in order to produce the quality fresh water needed. The plant will produce fresh drinking water and will be able to store it in large quantities (Müller, 2018). This will make the water available to the city on demand (Müller, P; 2018). According to the marketing manager, James Preston of the SBS Tanks company, the desalination project will become a "landmark" project for the city and it should greatly improve the lives of the residents (Müller, P; 2018).

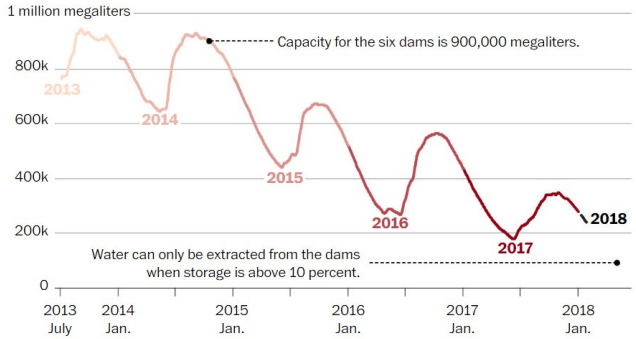
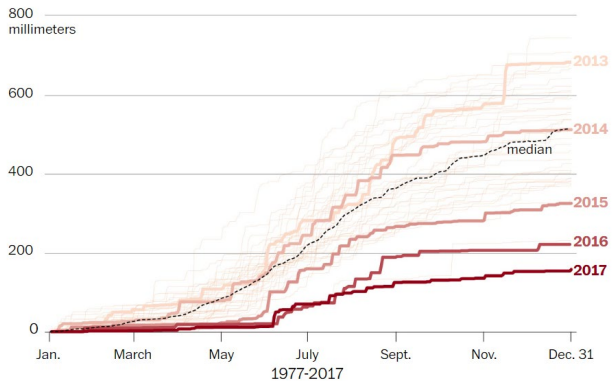


Figure 03: The volume of the water storage reservoirs has decreased year after year, which many climate scientists link to climate change globally (Karklis, Tierney and Soffen, 2018).



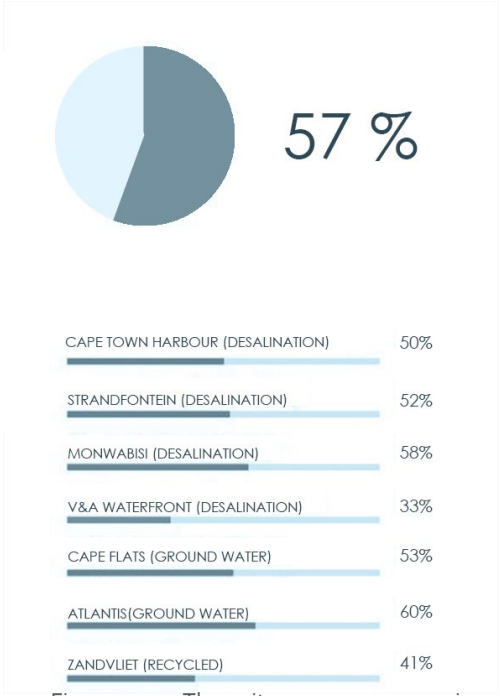


Figure 04: The city progress securing alternative water recources (Felix, 2017).

Figure 05: Accumulated daily rainfall at Cape Town International Airport. In response to its quickly depleting water supply, Cape Town has put in strict water restrictions on its residents (Karklis *et al*., 2018)

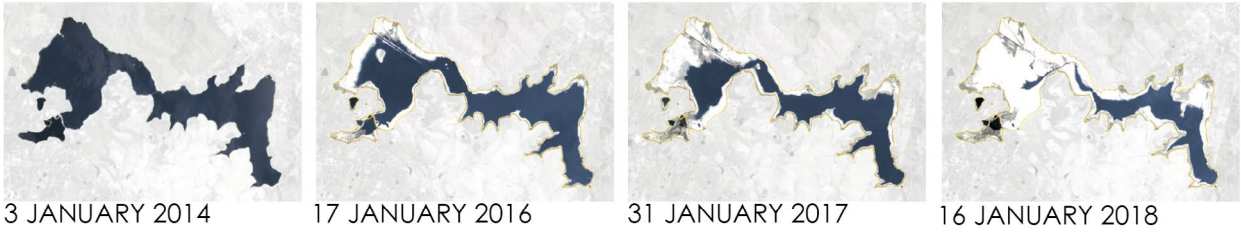


Figure 06: Theewaterskloof water levels on the decline. The drought is most clear when looking at Cape Town's biggest dam (Karklis *et al.*, 2018).

Karklis, L., Tierney, L. & Soffen, K. 2018. After years of drought, Cape Town is about to run out of water. [Online]. Available: https://www.washingtonpost.com/graphics/2018/world/capetown-water-shortage/?noredirect=on&utm_term=.27cd8d574286. [2018, May 2].

The V&A Waterfront as a workplace and leisure space for the Capetonians is a landmark in itself. To build an enclosed nonresponsive desalination plant next to the waterfront will be farcical. The East Pier currently functions as a walkway and a path of relaxation and enjoyment. The new desalination plant will deteriorate the vibrant essence within the pier.

There should be a relationship between the industrial desalination plant and the community within the surrounding context. This dissertation strives to bring this relationship to life and expose the desalination plant to new possibilities within its landscape. The desalination plant will be great for the future of Cape Town, not only for being an alternative water source but to bring new meaning to a desalination plant.

This desalination plant will become an example for future ways of accommodating large industrial plants without becoming aggressive and nonresponsive within its context.

The desalination plant will incorporate a public interphase, where one can experience the process of purification while still having the opportunity to appreciate the surroundings.

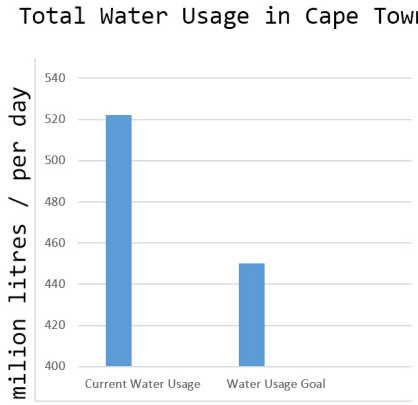


Figure 07: 1ml = 1 000 000l

Current usage of water per capita in Cape Town is 235 litres per day. [The average world wide is 185 litres per day.]

Proposed desalination project produce = 2ml

The plant will be able to supply the 235 litres aquired to 8 510 people within Cape Town.

The V&A plant is expected to add two million litres of water a day to the city's water supply system and forms part of a longer-term plan to build water supplies that do not rely on dams that are vulnerable to droughts. The current average level of dams that supply Cape Town is around 24% due to a prolonged drought in the region.

The proposed desalination plant will make use of its own clean produced water within the building for areas such as; toilets and recreational: restaurant areas

Felix, J. 2017. #WaterCrisis: City's budget adjustments only due in December. [Online]. Available: https://www.iol.co.za/capeargus/news/watercrisis-citys-budget-adjustmentsonly-due-in-december-11795559. [2018, June 10].

Muller, P. 2018. Cape Town finalises new desalination plant project. [Online]. Available: http://www.engineeringnews.co.za/print-version/cape-towns-new-desalination-plant-project-2018-03-28. [2018, August 6].

SUSTAINABILITY

[BRINE DISCHARGE]

BRINE WATER DISCHARGE EFFECT - MONITORED IN LABS:

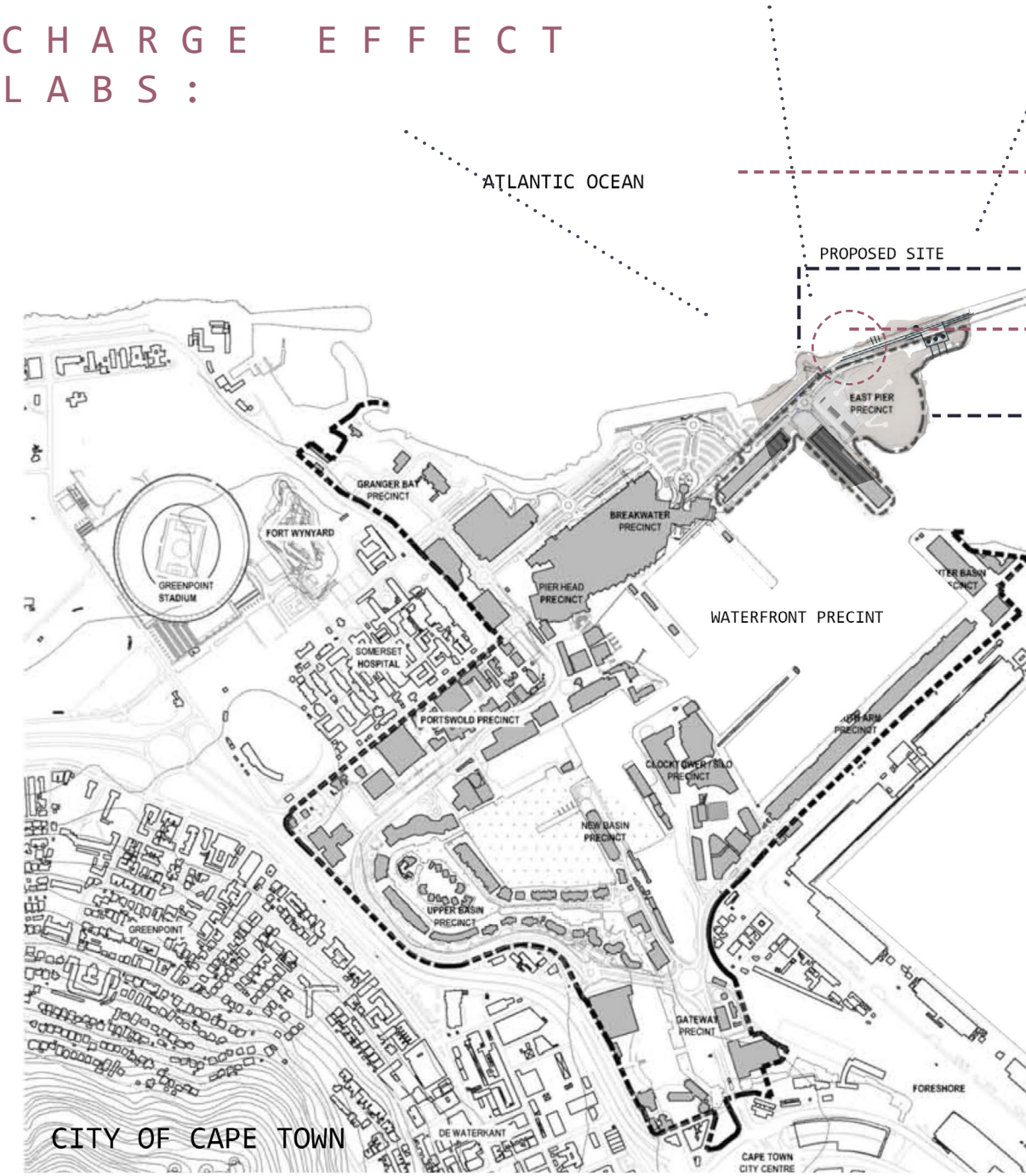
Site is located at the East Pier of the Cape Town harbour. It is therefore farther offshore from the main land. This helps the flow of the brine discharge, because it does not get trapped within a certain enclosed area.

In schemes and projects where the sea water is enclosed and the brine discharge is close to the main land the brine water needs more care and processes before it is discharged back to the ocean. This is for minimal environmental impacts of the surrounding habitats and water content.

The desalination of sea water is a process that creates concentrated brine waste that is usually dumped back into the gulf. This will result in a larger salt percentage in water and the intake:

- need of more effective desalination process
- reverse osmosis membranes need to be changed more
  frequently
- threatens future drinking supplies

This is resolved by discharging brine further offshore and by the laboratories monitoring the brine discharge to ensure there are no major changes in the salt percentages.

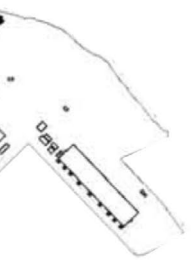


Makeka, M. 2017. V&A Waterfront Precinct Plan 2017: East Pier Road. [Online]. Available: http://www.sahra.org.za/sahris/sites/default/files/additionaldocs/170208_MDL_EPP_CIFA%20presentation_reduced.pdf. [2018, August 3].

The Atlantic Ocean tides and waves removing the brine water, ensuring that the water does not settle within the bay.

The brine discharge point on site.

TABLE BAY



SUSTAINABILITY

[WIND ENERGY]

AEROTURBINE

The desalination plant is a process which use a lot of energy for the efficient working of the water purification process. The pumps within the system is one of the main energy uses within the process and it will therefore be an appropriate place to able an external power generating source for the pumps.

Wind is a natural occurrence within the site and it will be a great opportunity for an alternative power source. Provision is made for wind turbines within the plant to ensure effective use of power generation within the building.

Bite, J. 2009. 520H Aeroturbine from Aerotecture International. [Online]. Available: https://www.architectmagazine.com/technology/products/520h-aeroturbine-from-aerotecture-international_o. [2018, August 06]

"520H Aeroturbine Aerotecture International aerotecture.com Composed of two 510-volt turbines joined horizontally by a shared alternator Can be bolted or ballasted down horizontally Requires a dominant wind direction Custom built to fit the architecture of a building" (Bite, 2009).

PROVISION FOR INSTALLATIONS ABOVE PUMP ROOMS

SUSTAINABILITY [TRANSPORT]

MAIN ROADS, CAPE TOWN

N1 — National Freeway

N2 — National Freeway

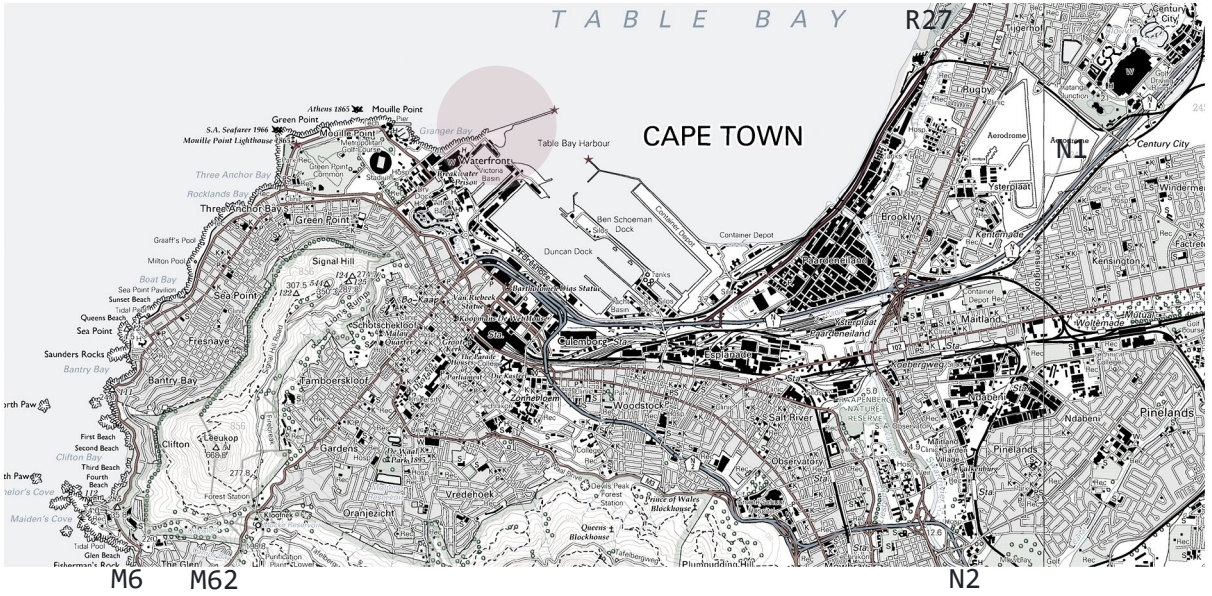
M62 — Main Road

M6 — Main Road

R27 — Arterial Route

MAP OF CAPE TOWN, SHOWING THE MAIN ROADS TO THE CITY CENTRE AND TOWARDS THE VICTORIA AND ALFRED WATERFRONT.

MAIN ROADS WITHIN THE CITY LEAD TO THE WATERFRONT PRECINT. ACCESS TO THE SITE FROM THE CITY WILL NOT BECOME A DISTURBANCE FOR VISITORS.

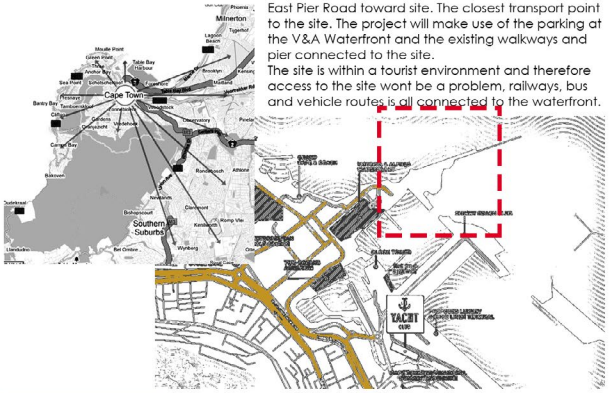


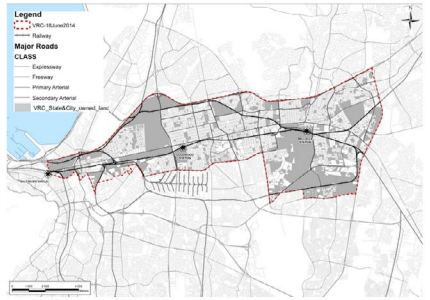
The East Pier Road is the closest road to the site. This road consist of public transport routes within the waterfront which minimizes the need for extra transport towards the site. Public transport is accessable and a great way to minimise the environmental impact of different vehicles.

The project will make use of the parking at the V&A Waterfront and the existing walkways of the pier to connect the site.

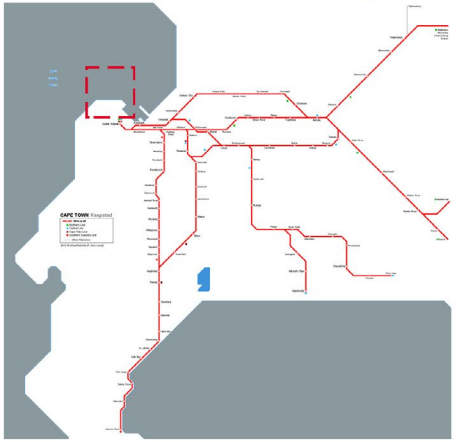
The site is within a tourist environment and therefore access to the site wil not be a problem, railways, bus routes and vehicle routes is already active within the waterfront and connected to the site.

Open street map. 2010. [Online]. Available: https://htonl.dev.openstreetmap.org/50k-ct/#14/-33.9169/18.4393/c2010. [2018, September 18].

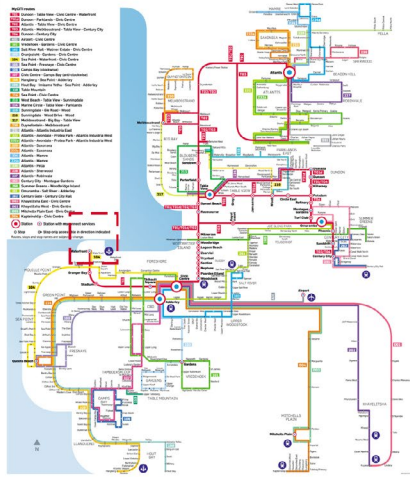




Main Roads & Railways towards central Cape Town



CAPE TOWN RAILWAY ROUTES



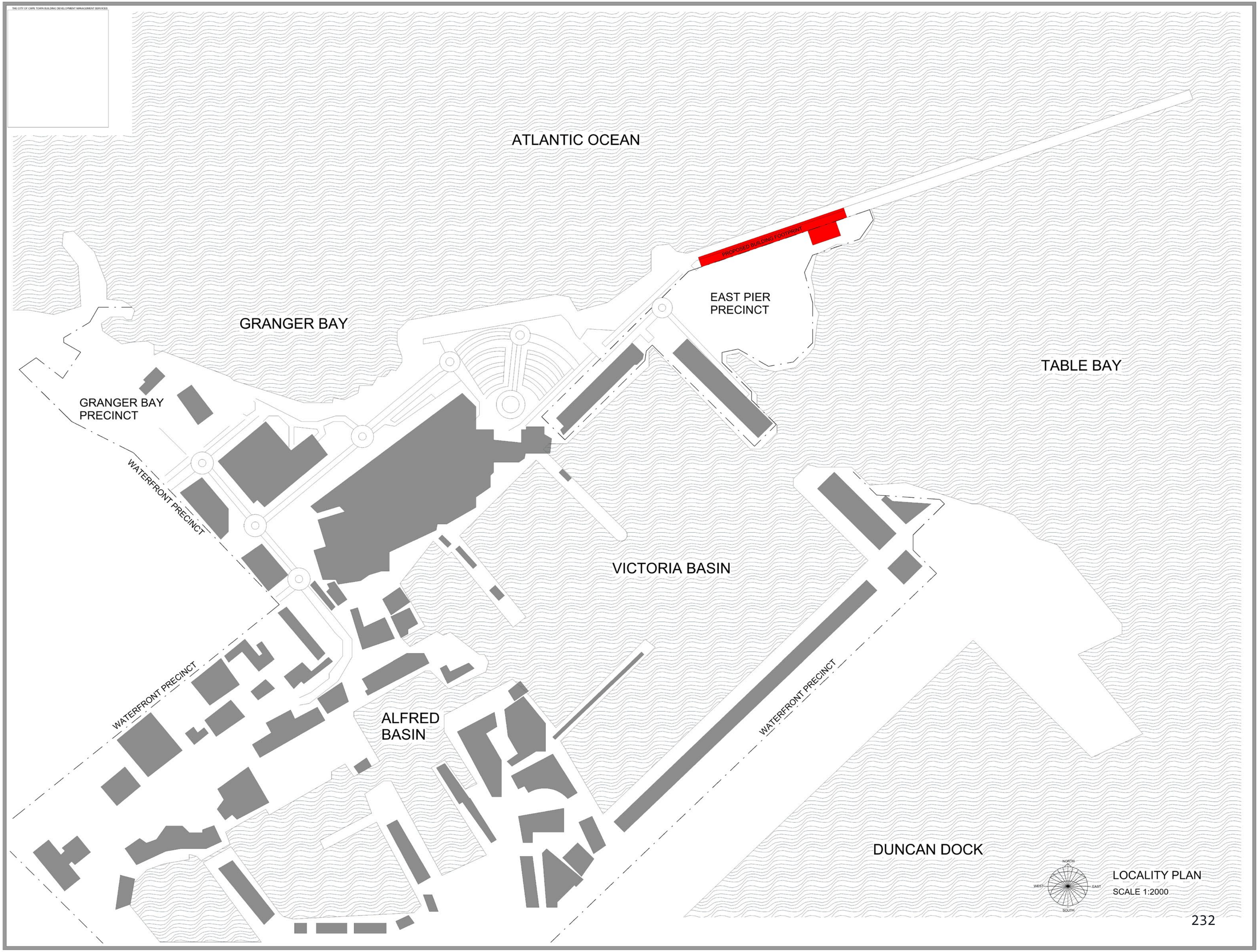
MyCITI BUS ROUTES

R E F L E C T I O N &
E V A L U A T I O N

This structural report is a evaluation of the structure of the design project. The technical report explains the basic structural systems within the design and its components. It is important to understand and evaluate these aspects of the desgin. It forms the detailed quality of the building and it helped me to understand certain building parts. This investigation abled me to explore different ideas and structures that will be best suited for the proposed building.

D O C U M E N T A T I O N

[CONSTRUCTION DRAWINGS]



LOCALITY PLAN

SCALE 1:2000

LOCALITY PLAN

LEGAL REQUIREMENTS
DIMENSIONS, DESCRIPTIONS & QUANTITIES ON THESE DRAWINGS TO BE VERIFIED ON SI
BEFORE ORDERING MATERIAL OR COMMENCING WITH WORK.

ALL WORK TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE NATIONAL BUILDING
REGULATIONS & STANDARDS ACT (ACT 103 OF 1977 & SANS 10400)

ALL TIMBER SIZES & GRADES TO BE VERIFIED & APPROVED BY SUPPLIER'S ENGINEER.

ALL TRUSSES TO BE IN ACCORDANCE WITH SUPPLIER'S / ENGINEER'S DESIGN & APPROV
BY CLIENT.

ALL MATERIALS TO BE BUILT IN / APPLIED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND INSTRUCTIONS.

ALL LOCAL AUTHORITY, UTILITY SERVICE PROVIDER REQUIREMENTS TO BE ESTABLISHED I
ADVANCE AND ADHERED TO.

ALL BOUNDARY PEGS TO BE LOCATED, AND MARKED, BEFORE WORK IS TAKEN IN HAND

ANY DISCREPANCIES BETWEEN THESE DRAWINGS & LEGISLATION, LOCAL AUTHORITY, UTILITY SERVICE PROVIDER & GOOD CONSTRUCTION PRACTICE TO BE REFERRED TO TH
ARCHITECT BEFORE CONSTRUCTION COMMENCES.

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THESE DRAWINGS DO NOT CONSTITUTE A COMPREHENSIVE SPECIFICATION FOR THE WORKS.

NO DIMENSIONS TO BE SCALED FROM THESE DRAWINGS.

DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
D3	RI

Development Logo's:

- [ ] Concept/Design
- [ ] Tender
- [ ] Marketing/ Presentation
- [x] Muni Submission
- [ ] Construction
- [ ] Completion/As Build

Gisela Rabe
MArch Dissertation
University of the Free Sate

Signatures:

Project:
Sea Water Desalination Plant

Client:
The City of Cape Town

Drawing:
LOCALITY

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SACAP		
DATE 10/15/18	DESIGN GR	
SCALE As indicated	CHECKED	
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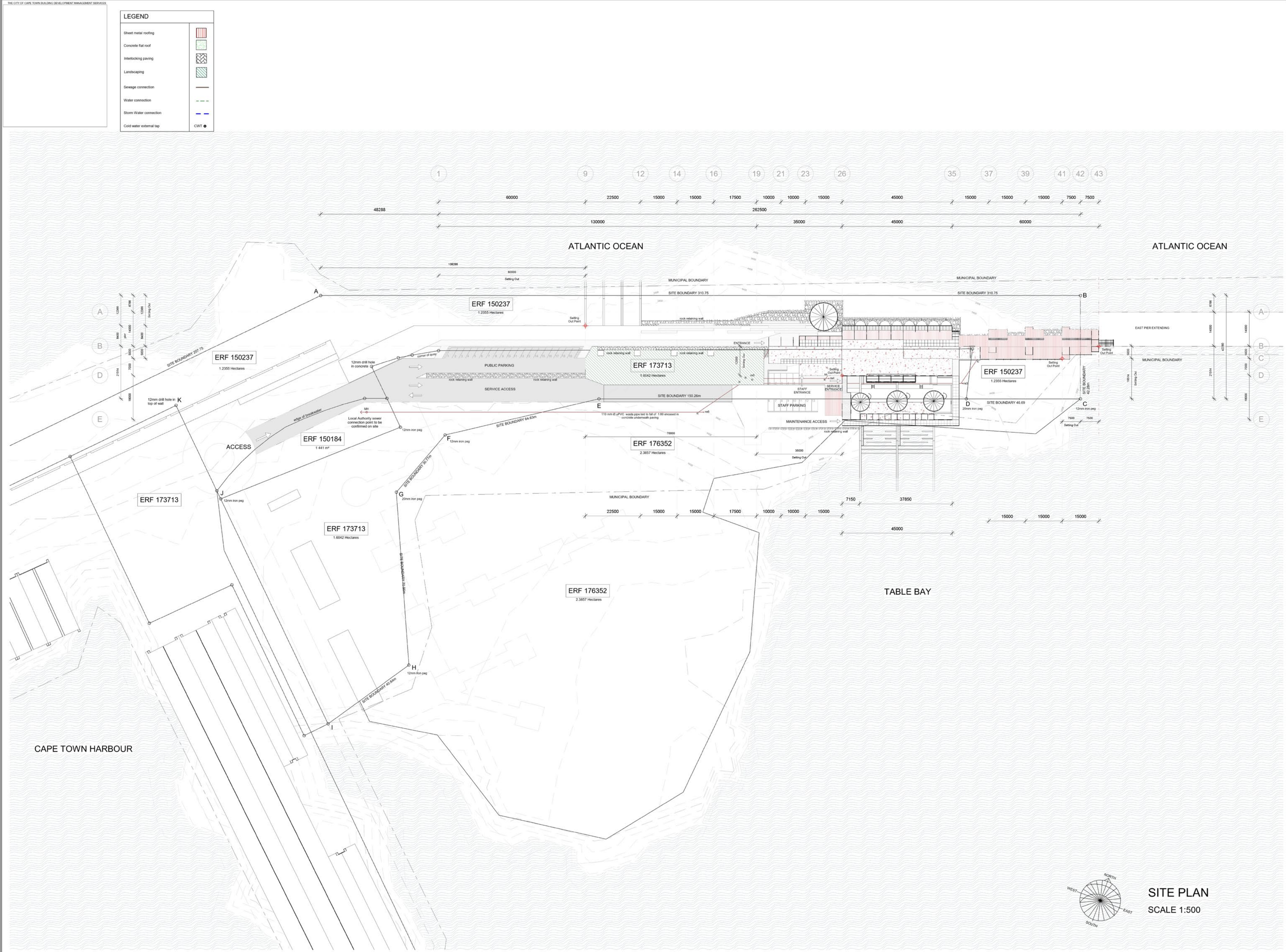

LOCALITY PLAN

DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
H3	GB5

Development Logo's:

- [ ] Concept/Design
- [ ] Tender
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- [x] Mun Submission
- [ ] Construction
- [ ] Completion/As Build

Gisela Rabe
MArch Dissertation
University of the Free Sate

Signatures:

Project: Sea Water Desalination Plant

Client: The City of Cape Town

Drawing: SITE PLAN

Drawn: GR

Date: 08/23/18

Design: GR

Scale: As indicated

Job: 01

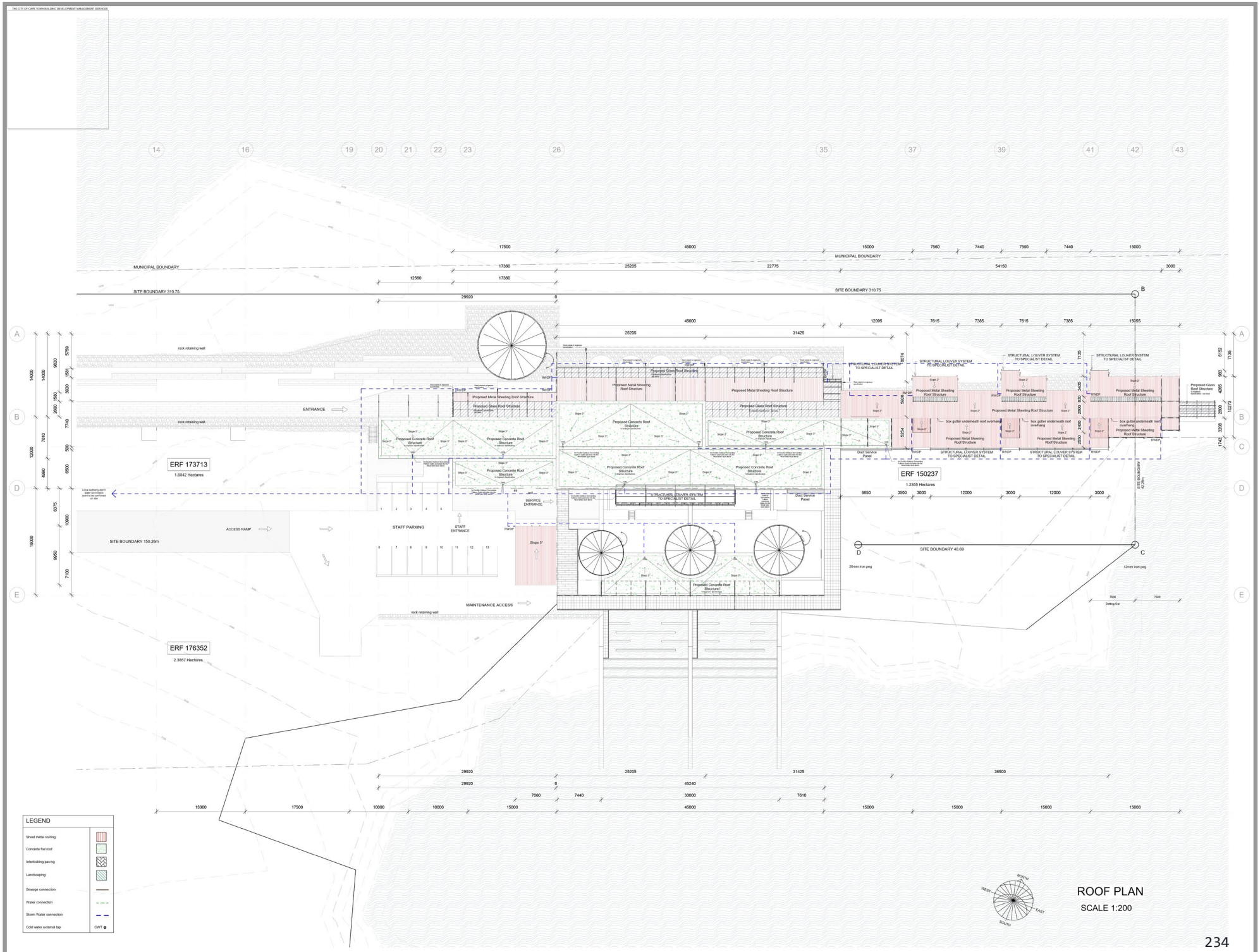
Revision: 001

Printed: 2018/09/12 10:04:25 AM

Drawing No: A101

Paper: A0

THE CITY OF CAPE TOWN BUILDING DEVELOPMENT MANAGEMENT SERVICES



LEGEND

- Sheet metal roofing
- Concrete flat roof
- Interlocking paving
- Landscaping
- Sewage connection
- Water connection
- Storm Water connection
- Cold water external tap — CWT

ROOF PLAN

SCALE 1:200

234

LOCALITY PLAN

LEGAL REQUIREMENTS

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D3	RI

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Cell: 071 257 5554 | www.gisrabe@yahoo.com

Signatures:

Project:
Sea Water Desalination Plant

Client:
The City of Cape Town

Drawing:
ROOF PLAN

SIGHT		DRAWN: GR	SIGNED
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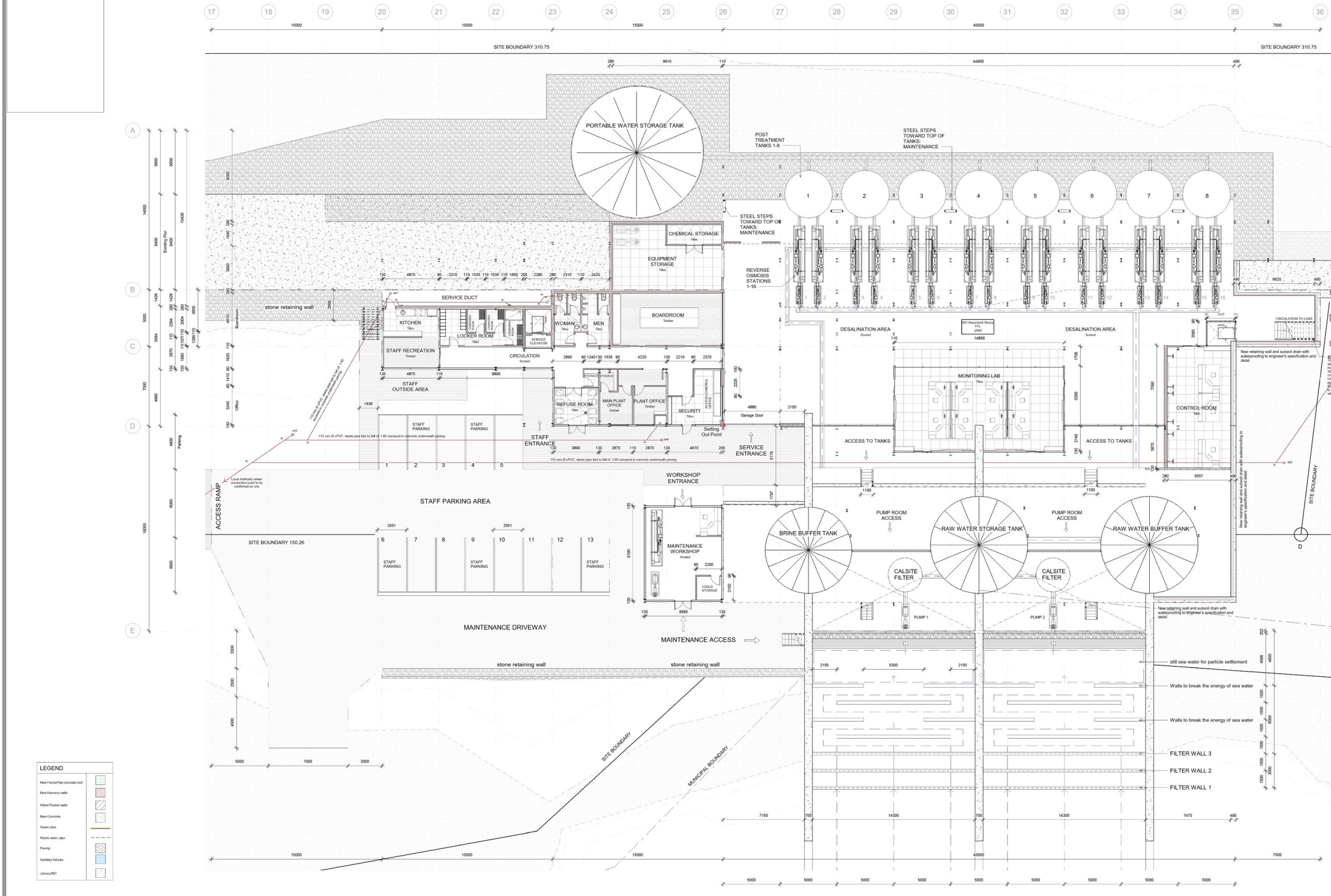
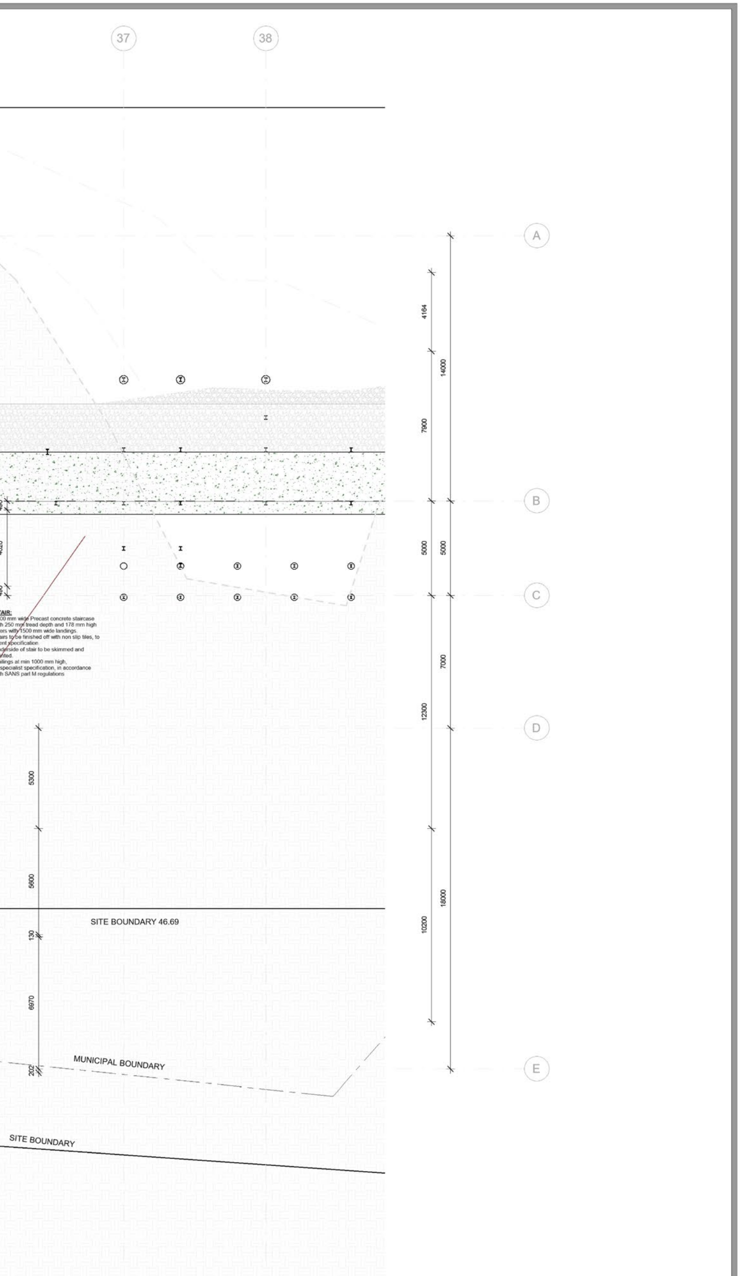

SITE BOUNDARY 310.75
PORTABLE WATER STORAGE TANK
POST TREATMENT TANKS 1-8
STEEL STEPS TOWARD TOP OF TANKS: MAINTENANCE
REVERSE OSMOSIS STATIONS 1-16
CHEMICAL STORAGE
EQUIPMENT STORAGE
BOARDROOM
SERVICE DUCT
stone retaining wall
KITCHEN
LOCKER ROOM
STAFF RECREATION
STAFF OUTSIDE AREA
CIRCULATION
WOMAN
MEN
REFUSE ROOM
MAIN PLANT OFFICE
PLANT OFFICE
SECURITY
SERVICE ELEVATOR
Setting Out Point
STAFF ENTRANCE
SERVICE ENTRANCE
Garage Door
DESALINATION AREA
MONITORING LAB
CONTROL ROOM
ACCESS TO TANKS
CIRCULATION TO LABS
New retaining wall and subsoil drain with waterproofing to engineer's specification and detail
ACCESS RAMP
STAFF PARKING AREA
WORKSHOP ENTRANCE
MAINTENANCE WORKSHOP
TOOLS STORAGE
MAINTENANCE DRIVEWAY
MAINTENANCE ACCESS
SITE BOUNDARY 150.26
Local Authority sewer connection point to be confirmed on site
110 mm Ø uPVC waste pipe laid to fall of 1:60 encased in concrete underneath paving
BRINE BUFFER TANK
RAW WATER STORAGE TANK
RAW WATER BUFFER TANK
CALSITE FILTER
PUMP ROOM ACCESS
PUMP 1
PUMP 2
still sea water for particle settlement
Walls to break the energy of sea water
FILTER WALL 3
FILTER WALL 2
FILTER WALL 1
SITE BOUNDARY
MUNICIPAL BOUNDARY
LEGEND
New Floors/Flat concrete roof
New Masonry walls
Hebel Pronnol walls
New Concrete
Sewer pipe
Waste water pipe
Paving
Sanitary fixtures
Joinery/BIC



LINE LEGEND	
DESCRIBTION	SYMBOL
RAW WATER	⟶
BRINE WATER	⟶
CLEAR WATER	⟶

TANK SIZES LEGEND	
NAME	DESCRIPTION
RAW STORAGE TANK	Based on 30min retention time 110kl / 110 000l
RAW BUFFER TANK	Based on 30min retention time 110kl / 110 000l
REVERSE OSMOSIS	(process 1-16) 4Ml / 4 000 000l
BRINE BUFFER TANK	Based on 30h retention time 65kl / 65 000l
PORTABLE STORAGE TANK	Based on 2h retention time 170kl / 170 000l

PUMP LEGEND	
NAME	DESCRIPTION
PUMP 1	DUTY - Abstraction Pump Drywell Pump: 22kw
PUMP 2	STANDBY - Abstraction Pump Drywell Pump: 22kw
PUMP 3	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 4	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 5	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 5	DUTY - Brine Discharge Pump Drywell Pump: 11kw
PUMP 5	STANDBY - Brine Discharge Pump Package Booster Set: 11kw

BASEMENT FLOOR PLAN

SCALE 1:100

LOCALITY PLAN

LEGAL REQUIREMENTS
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NO DIMENSIONS TO BE SCALED FROM THESE DRAWINGS.

DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
H3	GB5

Development Logo's:

☐ Concept/Design ☐ Tender ☐ Marketing/ Presentation
■ Mun Submission ☐ Construction ☐ Completion/As Build

Gisela Rabe
MArch Dissertation
University of the Free Sate

Signatures:

Project: Sea Water Desalination Plant

Client: The City of Cape Town

Drawing: BASEMENT FLOOR PLAN

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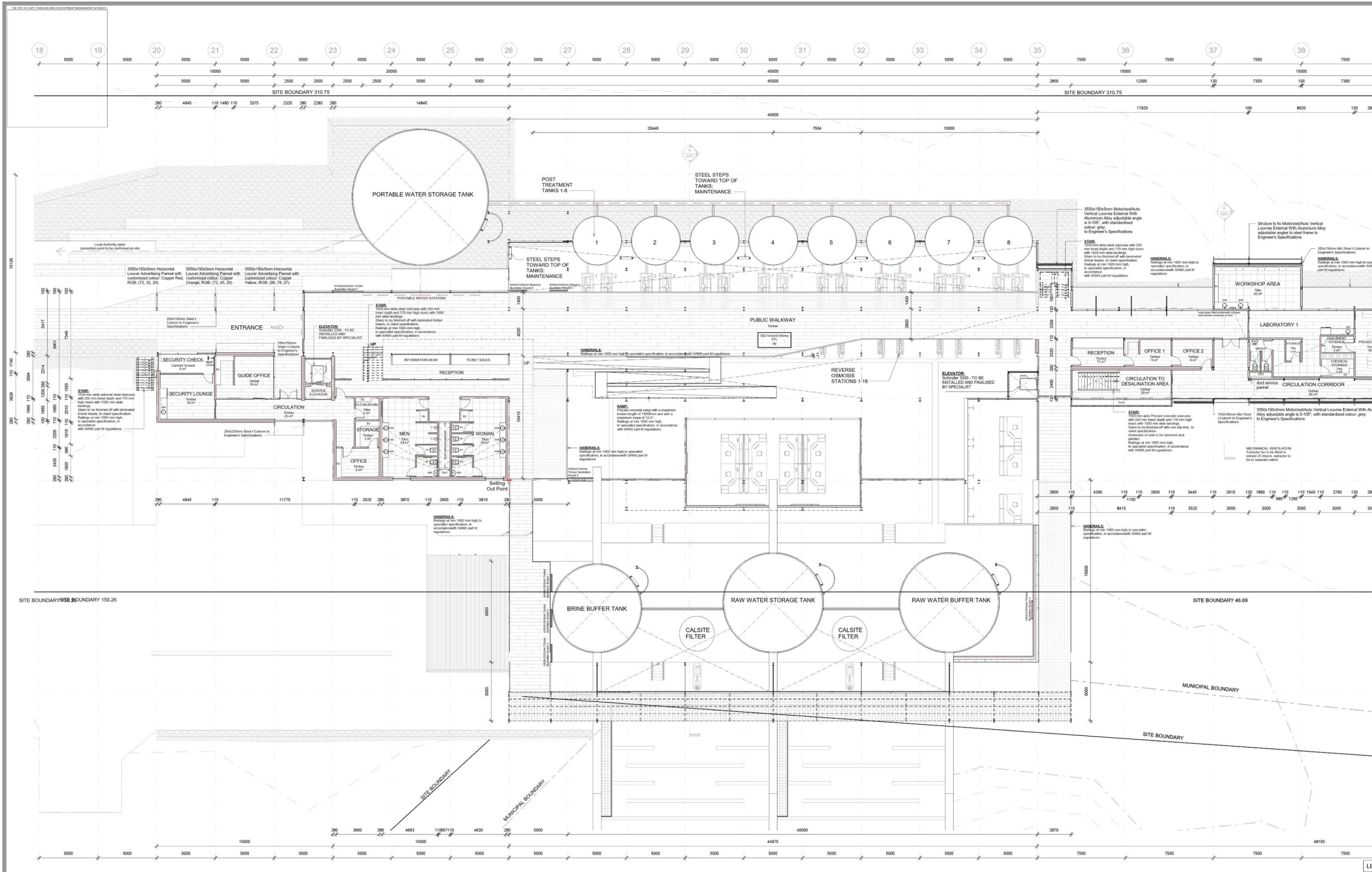
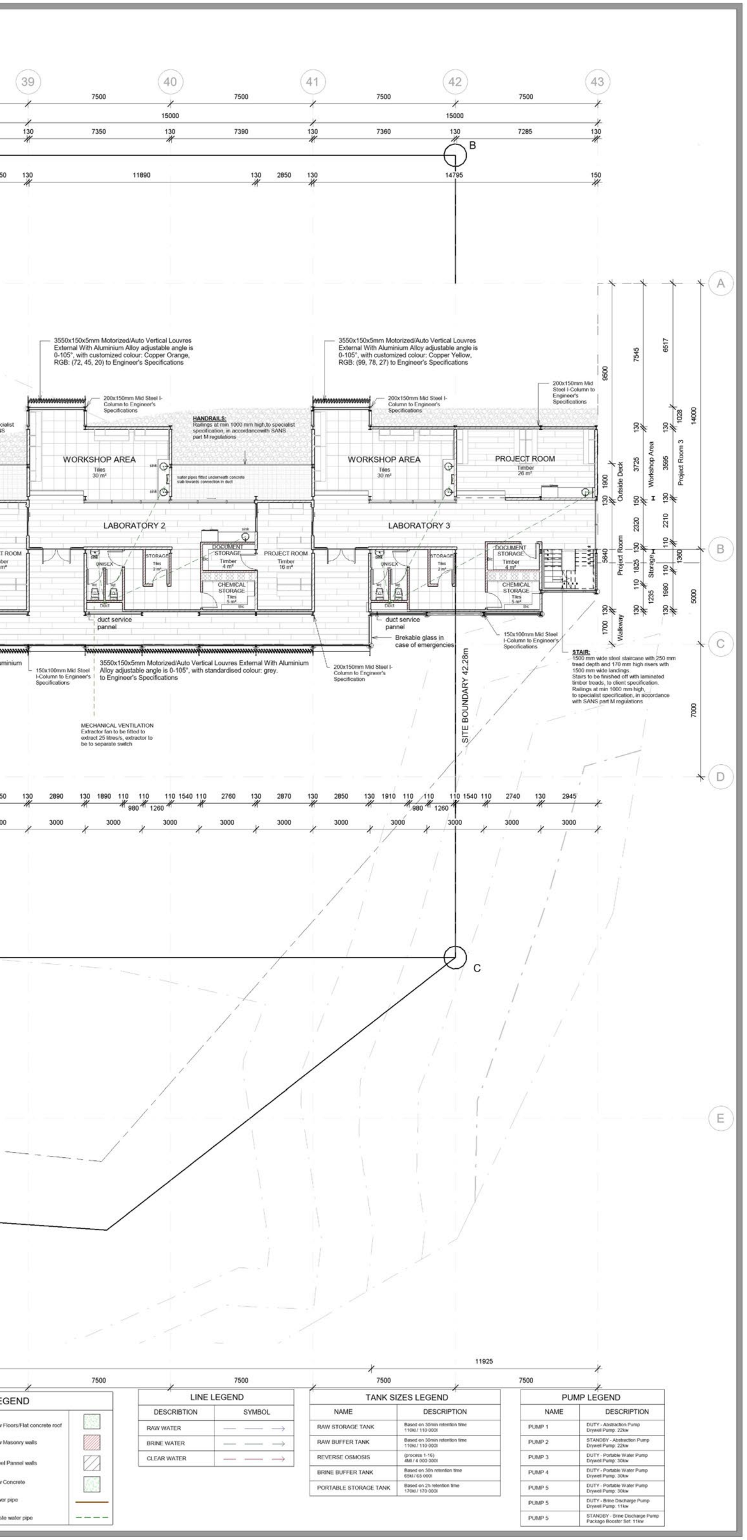
DATE: 09/10/18	DESIGN: GR	
SCALE: As indicated		
JOB: 01	REVISION: 001	
DRAWING NO: A103	PAPER: A0	



GROUND FLOOR PLAN

SCALE 1:100



LOCALITY PLAN

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Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
H3	GB5

Development Logo's:

- [ ] Concept/Design
- [ ] Tender
- [ ] Marketing/ Presentation
- [x] Mun Submission
- [ ] Construction
- [ ] Completion/As Build

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Signatures:

Project: Sea Water Desalination Plant

Client: The City of Cape Town

Drawing: GROUND FLOOR PLAN

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DATE 10/09/18	DESIGN GR	
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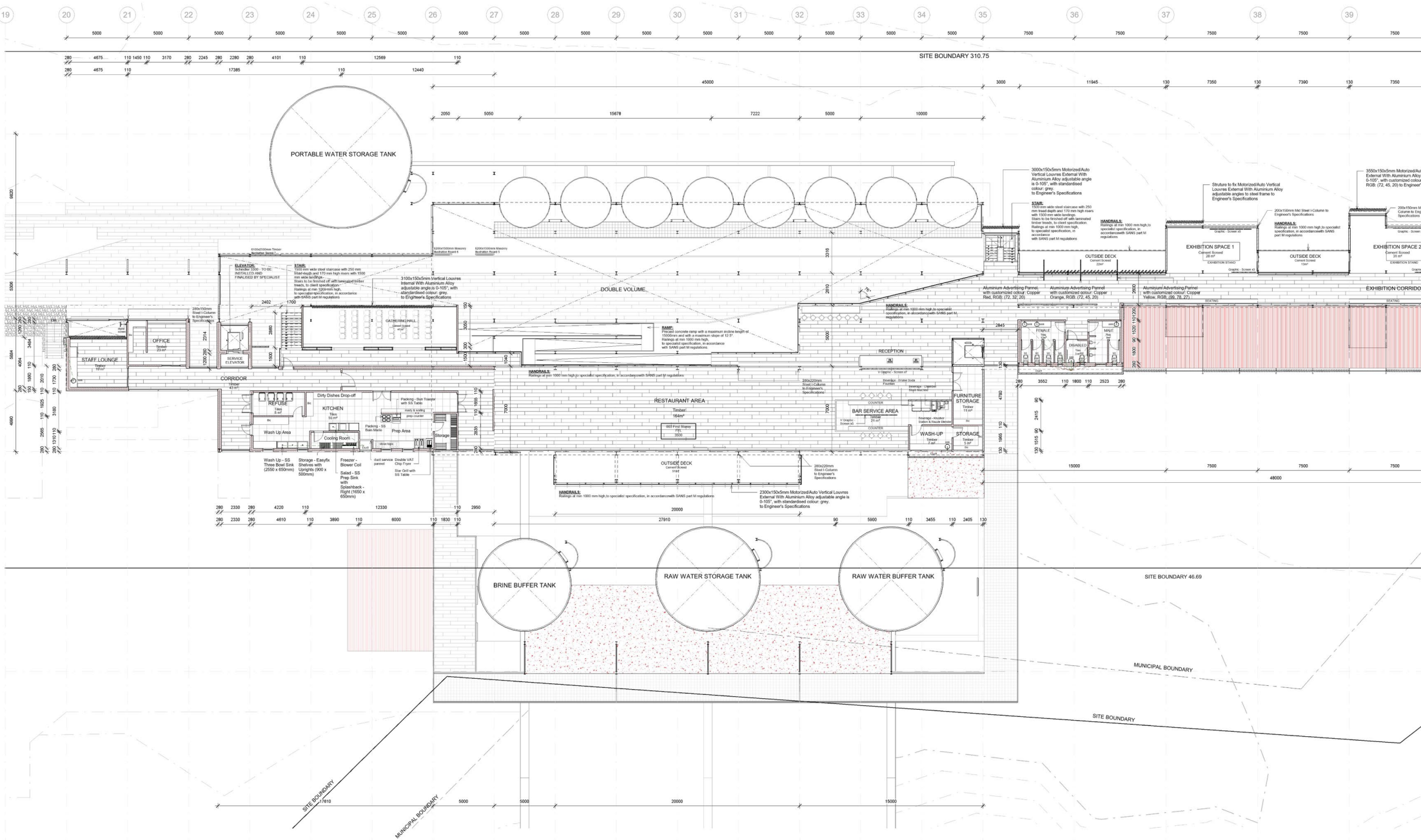

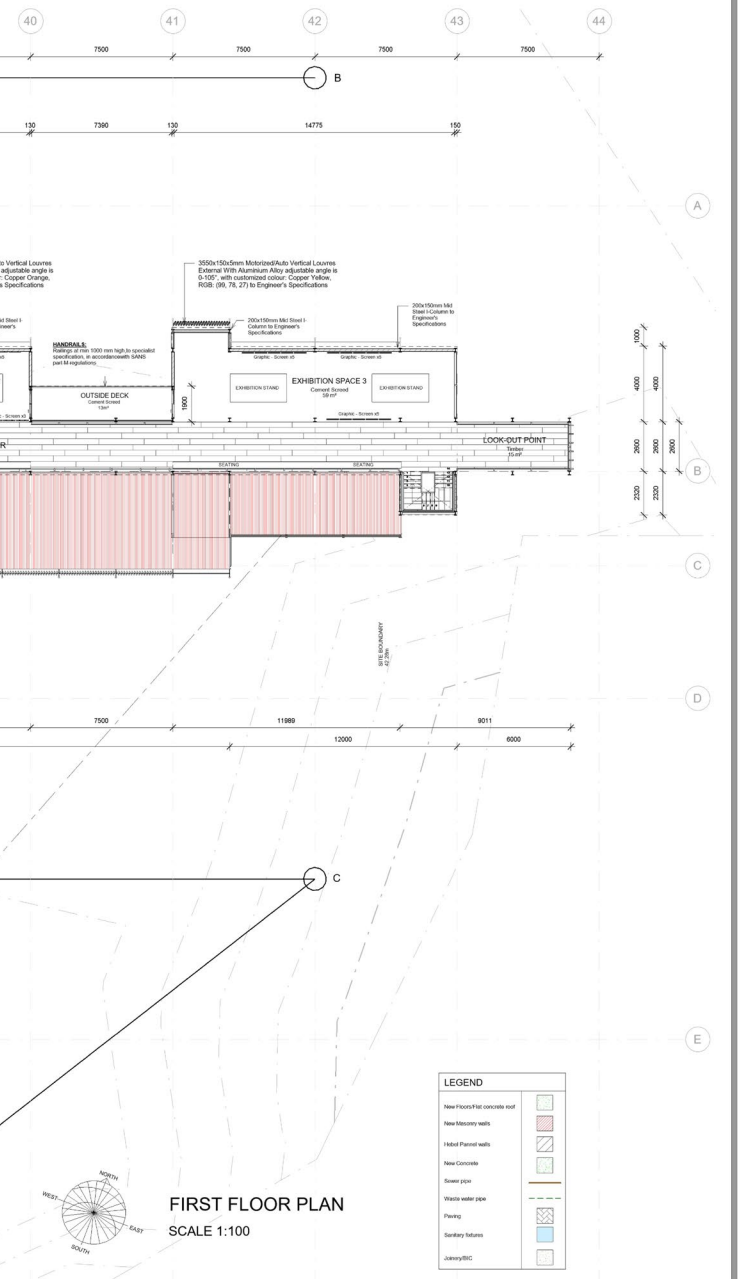

FIRST FLOOR PLAN

SCALE 1:100

LEGEND	
New Floors/Flat concrete roof	
New Masonry walls	
Hobel Pannel walls	
New Concrete	
Sewer pipe	
Waste water pipe	
Paving	
Sanitary fixtures	
Joinery/BIC	

LOCALITY PLAN

LEGAL REQUIREMENTS
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Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
H3	GB5

Development Logo's:

☐ Concept/Design ☐ Tender ☐ Marketing/ Presentation
■ Mun Submission ☐ Construction ☐ Completion/As Build

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Cell: 074 251 7604 | www.. gisrabe@yahoo.com

Signatures:

Project:
Sea Water Desalination Plant

Client:
The City of Cape Town

Drawing:
FIRST FLOOR PLAN

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DATE	10/10/18	DESIGN	GR
SCALE	As indicated	CHECKED	
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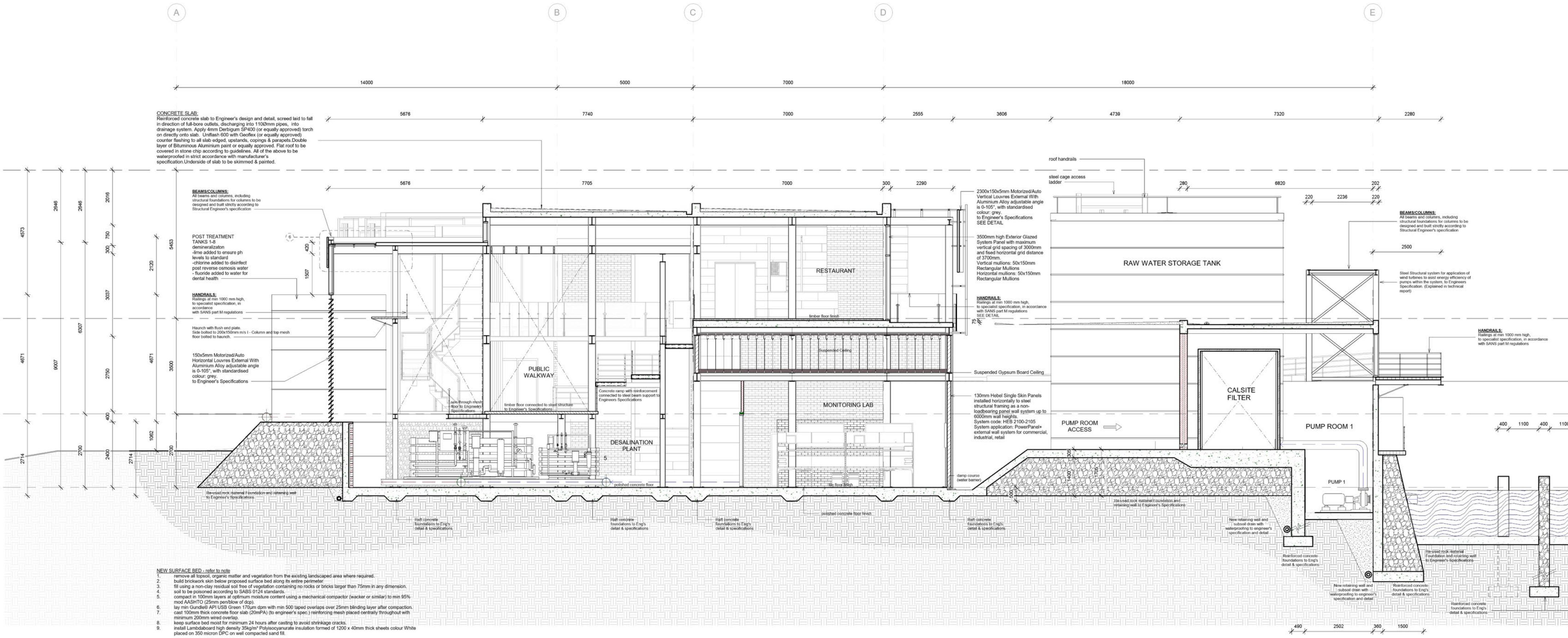
THE CITY OF CAPE TOWN BUILDING DEVELOPMENT MANAGEMENT SERVICES



SECTION A-A

SCALE 1:50

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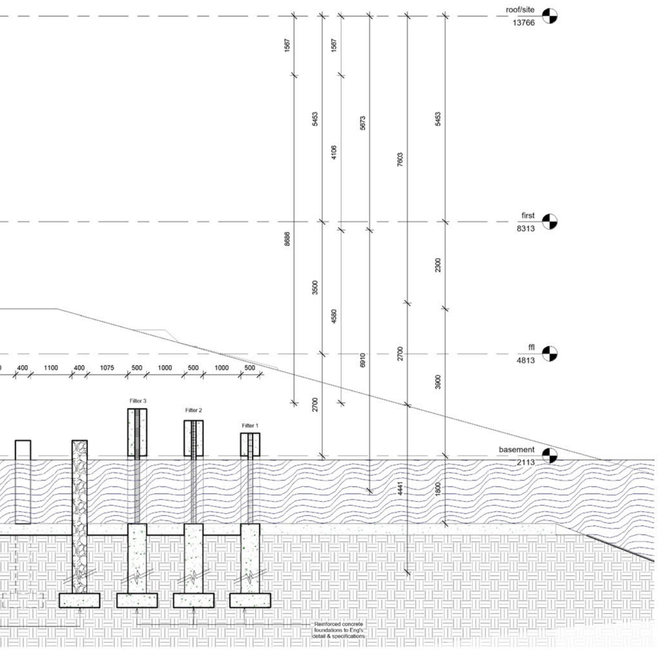

GEND	
oncrete roof	
lasonry walls	
Pannel walls	
oncrete	
Foundations	

LINE LEGEND

DESCRIBTION	SYMBOL
RAW WATER	— — →
BRINE WATER	— — →
CLEAR WATER	— — →

TANK SIZES LEGEND

NAME	DESCRIPTION
RAW STORAGE TANK	Based on 30min retention time 110kl / 110 000l
RAW BUFFER TANK	Based on 30min retention time 110kl / 110 000l
REVERSE OSMOSIS	(process 1-16) 4Ml / 4 000 000l
BRINE BUFFER TANK	Based on 30h retention time 65kl / 65 000l
PORTABLE STORAGE TANK	Based on 2h retention time 170kl / 170 000l

PUMP LEGEND

NAME	DESCRIPTION
PUMP 1	DUTY - Abstraction Pump Drywell Pump: 22kw
PUMP 2	STANDBY - Abstraction Pump Drywell Pump: 22kw
PUMP 3	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 4	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 5	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 5	DUTY - Brine Discharge Pump Drywell Pump: 11kw
PUMP 5	STANDBY - Brine Discharge Pump Package Booster Set: 11kw

LOCALITY PLAN

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DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
D3	RI

Development Logo's:

☐ Concept/Design ☐ Tender ☐ Marketing/ Presentation
■ Mun Submission ☐ Construction ☐ Completion/As Build

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Cell: 074 251 9654 | www. gisrabe@yahoo.com

Signatures:

Project: Sea Water Desalination Plant

Client: The City of Cape Town

Drawing: SECTION A-A

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DATE	09/12/18	DESIGN	GR	
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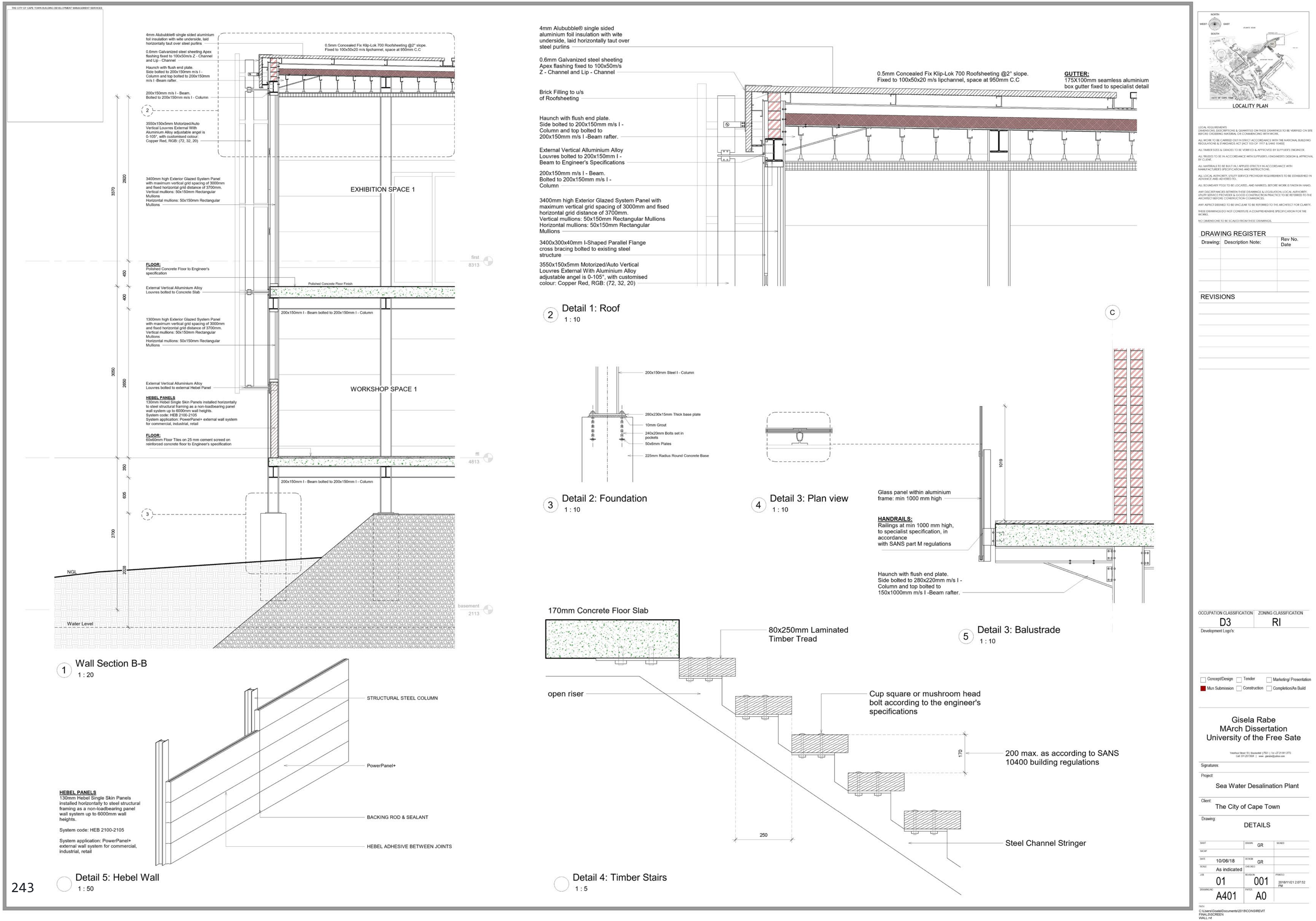

4mm Alububble® single sided aluminium foil insulation with wite underside, laid horizontally taut over steel purlins
0.6mm Galvanized steel sheeting Apex flashing fixed to 100x50m/s Z - Channel and Lip - Channel
Haunch with flush end plate. Side bolted to 200x150mm m/s I - Column and top bolted to 200x150mm m/s I -Beam rafter.
200x150mm m/s I - Beam. Bolted to 200x150mm m/s I - Column
3550x150x5mm Motorized/Auto Vertical Louvres External With Aluminium Alloy adjustable angel is 0-105°, with customised colour: Copper Red, RGB: (72, 32, 20)
0.5mm Concealed Fix Klip-Lok 700 Roofsheeting @2° slope. Fixed to 100x50x20 m/s lipchannel, space at 950mm C.C
3400mm high Exterior Glazed System Panel with maximum vertical grid spacing of 3000mm and fised horizontal grid distance of 3700mm. Vertical mullions: 50x150mm Rectangular Mullions Horizontal mullions: 50x150mm Rectangular Mullions
EXHIBITION SPACE 1
first
8313
FLOOR:
Polished Concrete Floor to Engineer's specification
Polished Concrete Floor Finish
External Vertical Alluminium Alloy Louvres bolted to Concrete Slab
200x150mm I - Beam bolted to 200x150mm I - Column
1300mm high Exterior Glazed System Panel with maximum vertical grid spacing of 3000mm and fised horizontal grid distance of 3700mm. Vertical mullions: 50x150mm Rectangular Mullions Horizontal mullions: 50x150mm Rectangular Mullions
External Vertical Alluminium Alloy Louvres bolted to external Hebel Panel
WORKSHOP SPACE 1
HEBEL PANELS
130mm Hebel Single Skin Panels installed horizontally to steel structural framing as a non-loadbearing panel wall system up to 6000mm wall heights.
System code: HEB 2100-2105
System application: PowerPanel+ external wall system for commercial, industrial, retail
FLOOR:
60x60mm Floor Tiles on 25 mm cement screed on reinforced concrete floor to Engineer's specification
ffl
4813
200x150mm I - Beam bolted to 200x150mm I - Column
NGL
Water Level
basement
2113
3370
2920
450
400
3050
2650
350
635
2700
2028
1 Wall Section B-B
1 : 20
4mm Alububble® single sided aluminium foil insulation with wite underside, laid horizontally taut over steel purlins
0.6mm Galvanized steel sheeting Apex flashing fixed to 100x50m/s Z - Channel and Lip - Channel
0.5mm Concealed Fix Klip-Lok 700 Roofsheeting @2° slope. Fixed to 100x50x20 m/s lipchannel, space at 950mm C.C
GUTTER:
175X100mm seamless aluminium box gutter fixed to specialist detail
Brick Filling to u/s of Roofsheeting
Haunch with flush end plate. Side bolted to 200x150mm m/s I - Column and top bolted to 200x150mm m/s I -Beam rafter.
External Vertical Alluminium Alloy Louvres bolted to 200x150mm I - Beam to Engineer's Specifications
200x150mm m/s I - Beam. Bolted to 200x150mm m/s I - Column
3400mm high Exterior Glazed System Panel with maximum vertical grid spacing of 3000mm and fised horizontal grid distance of 3700mm. Vertical mullions: 50x150mm Rectangular Mullions Horizontal mullions: 50x150mm Rectangular Mullions
3400x300x40mm I-Shaped Parallel Flange cross bracing bolted to existing steel structure
3550x150x5mm Motorized/Auto Vertical Louvres External With Aluminium Alloy adjustable angel is 0-105°, with customised colour: Copper Red, RGB: (72, 32, 20)
2 Detail 1: Roof
1 : 10
200x150mm Steel I - Column
280x230x15mm Thick base plate
10mm Grout
240x20mm Bolts set in pockets
50x6mm Plates
225mm Radius Round Concrete Base
3 Detail 2: Foundation
1 : 10
4 Detail 3: Plan view
1 : 10
C
1019
Glass panel within aluminium frame: min 1000 mm high
HANDRAILS:
Railings at min 1000 mm high, to specialist specification, in accordance with SANS part M regulations
Haunch with flush end plate. Side bolted to 280x220mm m/s I - Column and top bolted to 150x1000mm m/s I -Beam rafter.
5 Detail 3: Balustrade
1 : 10
170mm Concrete Floor Slab
80x250mm Laminated Timber Tread
open riser
Cup square or mushroom head bolt according to the engineer's specifications
170
200 max. as according to SANS 10400 building regulations
250
Steel Channel Stringer
Detail 4: Timber Stairs
1 : 5
STRUCTURAL STEEL COLUMN
PowerPanel+
BACKING ROD & SEALANT
HEBEL ADHESIVE BETWEEN JOINTS
HEBEL PANELS
130mm Hebel Single Skin Panels installed horizontally to steel structural framing as a non-loadbearing panel wall system up to 6000mm wall heights.
System code: HEB 2100-2105
System application: PowerPanel+ external wall system for commercial, industrial, retail
Detail 5: Hebel Wall
1 : 50
LOCALITY PLAN
DRAWING REGISTER
Drawing: Description Note: Rev No. Date
REVISIONS
OCCUPATION CLASSIFICATION D3
ZONING CLASSIFICATION RI
Development Logo's:
Concept/Design
Tender
Marketing/ Presentation
Mun Submission
Construction
Completion/As Build
Gisela Rabe
MArch Dissertation
University of the Free Sate
Signatures:
Project: Sea Water Desalination Plant
Client: The City of Cape Town
Drawing: DETAILS
DRAWN GR
DATE 10/06/18
DESIGN GR
SCALE As indicated
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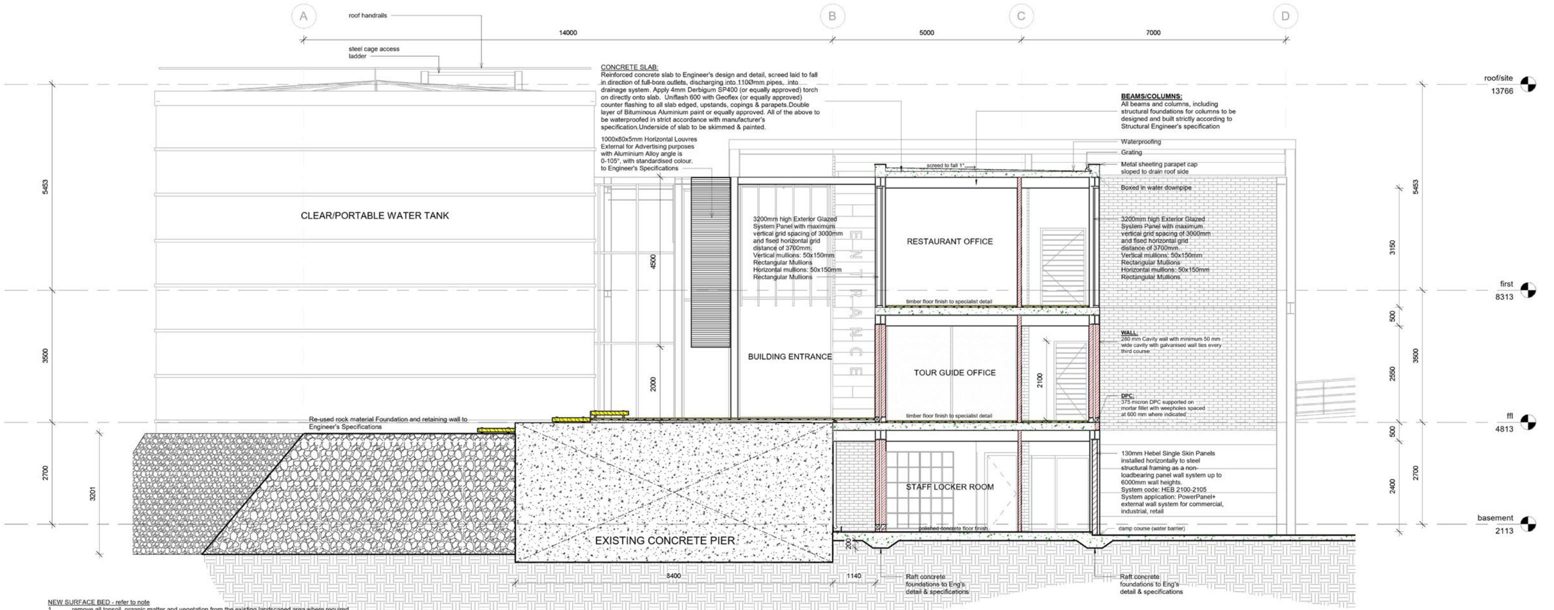
THE CITY OF CAPE TOWN BUILDING DEVELOPMENT MANAGEMENT SERVICES



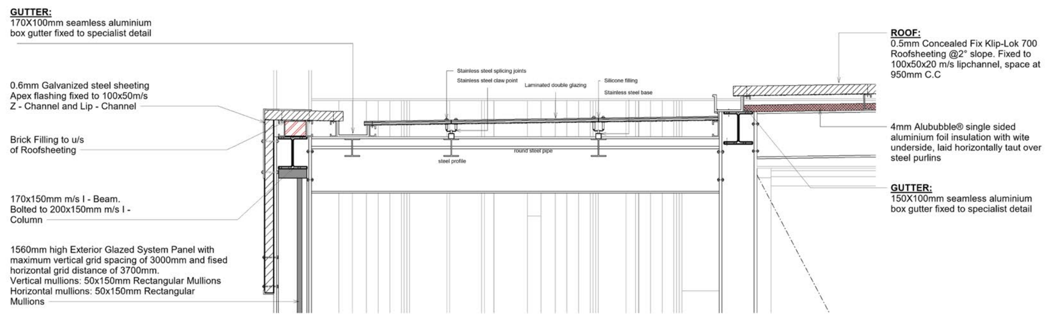
A
B
C
D
roof handrails
steel cage access ladder
14000
5000
7000
CONCRETE SLAB:
Reinforced concrete slab to Engineer's design and detail, screed laid to fall in direction of full-bore outlets, discharging into 110Ømm pipes, into drainage system. Apply 4mm Derbigum SP400 (or equally approved) torch on directly onto slab. Uniflash 600 with Geoflex (or equally approved) counter flashing to all slab edged, upstands, copings & parapets.Double layer of Bituminous Aluminium paint or equally approved. All of the above to be waterproofed in strict accordance with manufacturer's specification.Underside of slab to be skimmed & painted.
1000x80x5mm Horizontal Louvres External for Advertising purposes with Aluminium Alloy angle is 0-105°, with standardised colour. to Engineer's Specifications
BEAMS/COLUMNS:
All beams and columns, including structural foundations for columns to be designed and built strictly according to Structural Engineer's specification
Waterproofing
Grating
Metal sheeting parapet cap sloped to drain roof side
Boxed in water downpipe
CLEAR/PORTABLE WATER TANK
3200mm high Exterior Glazed System Panel with maximum vertical grid spacing of 3000mm and fised horizontal grid distance of 3700mm. Vertical mullions: 50x150mm Rectangular Mullions Horizontal mullions: 50x150mm Rectangular Mullions
RESTAURANT OFFICE
BUILDING ENTRANCE
TOUR GUIDE OFFICE
STAFF LOCKER ROOM
EXISTING CONCRETE PIER
timber floor finish to specialist detail
screed to fall 1°
WALL:
280 mm Cavity wall with minimum 50 mm wide cavity with galvanised wall ties every third course
DPC:
375 micron DPC supported on mortar fillet with weepholes spaced at 600 mm where indicated
130mm Hebel Single Skin Panels installed horizontally to steel structural framing as a non-loadbearing panel wall system up to 6000mm wall heights. System code: HEB 2100-2105 System application: PowerPanel+ external wall system for commercial, industrial, retail
damp course (water barrier)
Re-used rock material Foundation and retaining wall to Engineer's Specifications
polished concrete floor finish
Raft concrete foundations to Eng's detail & specifications
roof/site 13766
first 8313
ffl 4813
basement 2113
5453
3500
2700
3201
4500
2000
2100
3150
500
2550
2400
8400
1140

NEW SURFACE BED - refer to note

1. remove all topsoil, organic matter and vegetation from the existing landscaped area where required.
2. build brickwork skin below proposed surface bed along its entire perimeter
3. fill using a non-clay residual soil free of vegetation containing no rocks or bricks larger than 75mm in any dimension.
4. soil to be poisoned according to SABS 0124 standards.
5. compact in 100mm layers at optimum moisture content using a mechanical compactor (wacker or similar) to min 95% mod AASHTO (25mm pen/blow of dcp).
6. lay min Gundle® API USB Green 170μm dpm with min 500 taped overlaps over 25mm blinding layer after compaction.
7. cast 100mm thick concrete floor slab (20mPA) (to engineer's spec.) reinforcing mesh placed centrally throughout with minimum 200mm wired overlap.
8. keep surface bed moist for minimum 24 hours after casting to avoid shrinkage cracks.
9. install Lambdaboard high density 35kg/m³ Polyisocyanurate insulation formed of 1200 x 40mm thick sheets colour White placed on 350 micron DPC on well compacted sand fill.

SECTION C-C

Scale 1 : 50

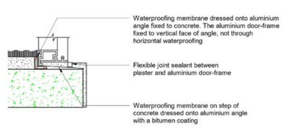


GUTTER:
170X100mm seamless aluminium box gutter fixed to specialist detail
0.6mm Galvanized steel sheeting Apex flashing fixed to 100x50m/s Z - Channel and Lip - Channel
Brick Filling to u/s of Roofsheeting
170x150mm m/s I - Beam. Bolted to 200x150mm m/s I - Column
1560mm high Exterior Glazed System Panel with maximum vertical grid spacing of 3000mm and fised horizontal grid distance of 3700mm. Vertical mullions: 50x150mm Rectangular Mullions Horizontal mullions: 50x150mm Rectangular Mullions
Stainless steel splicing joints
Stainless steel claw point
Laminated double glazing
Silicone filling
Stainless steel base
steel profile
round steel pipe
ROOF:
0.5mm Concealed Fix Klip-Lok 700 Roofsheeting @2° slope. Fixed to 100x50x20 m/s lipchannel, space at 950mm C.C
4mm Alububble® single sided aluminium foil insulation with wite underside, laid horizontally taut over steel purlins
GUTTER:
150X100mm seamless aluminium box gutter fixed to specialist detail

6 DETAIL 6: GLASS ROOF

1 : 10

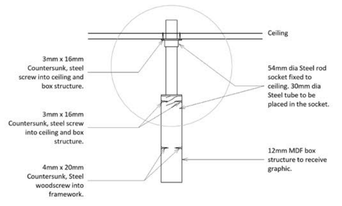
TYPICAL DETAILS:



Waterproofing membrane dressed onto aluminium angle fixed to concrete. The aluminium door-frame fixed to vertical face of angle, not through horizontal waterproofing
Flexible joint sealant between plaster and aluminium door-frame
Waterproofing membrane on step of concrete dressed onto aluminium angle with a bitumen coating

threshold detail

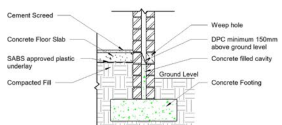
Scale 1 : 10



Ceiling
3mm x 16mm Countersunk, steel screw into ceiling and box structure.
3mm x 16mm Countersunk, steel screw into ceiling and box structure.
4mm x 20mm Countersunk, Steel woodscrew into framework.
54mm dia Steel rod socket fixed to ceiling. 30mm dia Steel tube to be placed in the socket.
12mm MDF box structure to receive graphic.

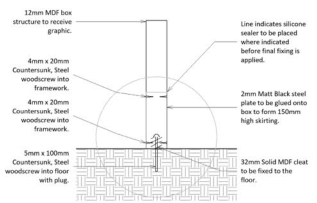
Screen Detail- Exhibition

Scale 1 : 5



dpc

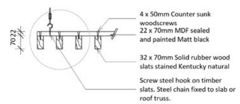
Scale 1 : 20



12mm MDF box structure to receive graphic.
4mm x 20mm Countersunk, Steel woodscrew into framework.
4mm x 20mm Countersunk, Steel woodscrew into framework.
5mm x 100mm Countersunk, Steel woodscrew into floor with plug.
Line indicates silicone sealer to be placed where indicated before final fixing is applied.
2mm Matt Black steel plate to be glued onto box to form 150mm high skirting.
32mm Solid MDF cleat to be fixed to the floor.

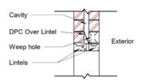
Screen Detail - Exhibition

Scale 1 : 5



Timber Slatted Ceiling

Scale 1 : 10



lintel

Scale 1 : 20

DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
D3	RI

Development Logo's:

Concept/Design · Tender · Marketing/ Presentation · Mun Submission · Construction · Completion/As Build

Gisela Rabe
MArch Dissertation
University of the Free Sate

Signatures:

Project: Sea Water Desalination Plant

Client: The City of Cape Town

Drawing: DETAILS 2

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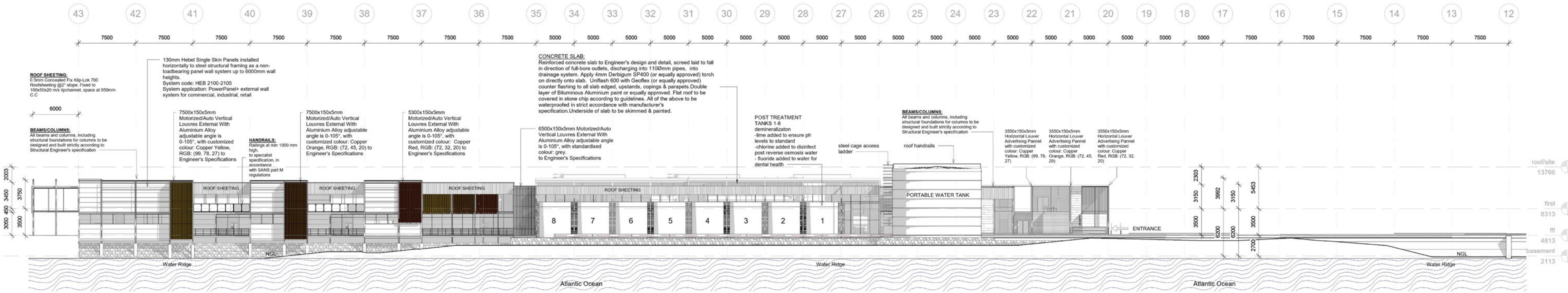
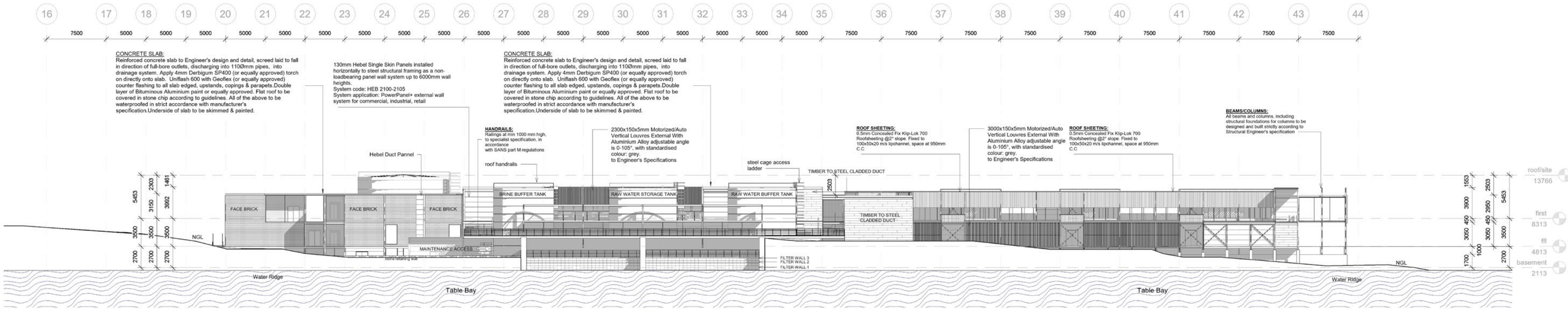
THE CITY OF CAPE TOWN BUILDING DEVELOPMENT MANAGEMENT SERVICES



NORTH ELEVATION

SCALE 1:50



SOUTH ELEVATION

SCALE 1:50

LINE LEGEND	
DESCRIBTION	SYMBOL
RAW WATER	
BRINE WATER	
CLEAR WATER	

TANK SIZES LEGEND	
NAME	DESCRIPTION
RAW STORAGE TANK	Based on 30min retention time 110kl / 110 000l
RAW BUFFER TANK	Based on 30min retention time 110kl / 110 000l
REVERSE OSMOSIS	(process 1-16) 4Ml / 4 000 000l
BRINE BUFFER TANK	Based on 30h retention time 65kl / 65 000l
PORTABLE STORAGE TANK	Based on 2h retention time 170kl / 170 000l

PUMP LEGEND	
NAME	DESCRIPTION
PUMP 1	DUTY - Abstraction Pump Drywell Pump: 22kw
PUMP 2	STANDBY - Abstraction Pump Drywell Pump: 22kw
PUMP 3	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 4	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 5	DUTY - Portable Water Pump Drywell Pump: 30kw
PUMP 5	DUTY - Brine Discharge Pump Drywell Pump: 11kw
PUMP 5	STANDBY - Brine Discharge Pump Package Booster Set: 11kw

LEGAL REQUIREMENTS
DIMENSIONS, DESCRIPTIONS & QUANTITIES ON THESE DRAWINGS TO BE VERIFIED ON SITE BEFORE ORDERING MATERIAL OR COMMENCING WITH WORK.

ALL WORK TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE NATIONAL BUILDING REGULATIONS & STANDARDS ACT (ACT 103 OF 1977 & SANS 10400)

ALL TIMBER SIZES & GRADES TO BE VERIFIED & APPROVED BY SUPPLIER'S ENGINEER.

ALL TRUSSES TO BE IN ACCORDANCE WITH SUPPLIER'S / ENGINEER'S DESIGN & APPROVAL BY CLIENT.

ALL MATERIALS TO BE BUILT IN / APPLIED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND INSTRUCTIONS.

ALL LOCAL AUTHORITY, UTILITY SERVICE PROVIDER REQUIREMENTS TO BE ESTABLISHED IN ADVANCE AND ADHERED TO.

ALL BOUNDARY PEGS TO BE LOCATED, AND MARKED, BEFORE WORK IS TAKEN IN HAND.

ANY DISCREPANCIES BETWEEN THESE DRAWINGS & LEGISLATION, LOCAL AUTHORITY, UTILITY SERVICE PROVIDER & GOOD CONSTRUCTION PRACTICE TO BE REFERRED TO THE ARCHITECT BEFORE CONSTRUCTION COMMENCES.

ANY ASPECT DEEMED TO BE UNCLEAR TO BE REFERRED TO THE ARCHITECT FOR CLARITY.

THESE DRAWINGS DO NOT CONSTITUTE A COMPREHENSIVE SPECIFICATION FOR THE WORKS.

NO DIMENSIONS TO BE SCALED FROM THESE DRAWINGS.

DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
H3	GB5

Development Logo's:

☐ Concept/Design ☐ Tender ☐ Marketing/ Presentation
■ Mun Submission ☐ Construction ☐ Completion/As Build

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Signatures:

Project: Sea Water Desalination Plant

Client: The City of Cape Town

Drawing: ELEVATIONS

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SACAP		
DATE 09/13/18	DESIGN GR	
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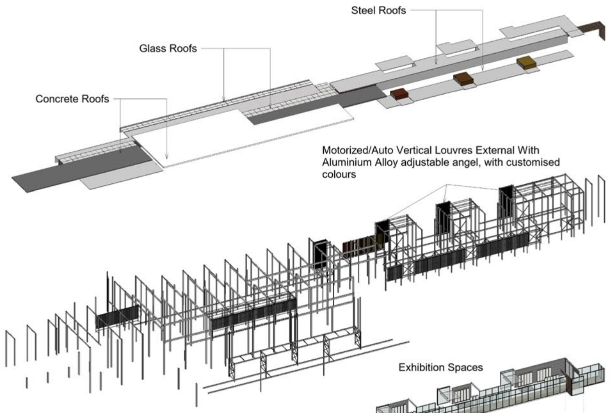
THE CITY OF CAPE TOWN BUILDING DEVELOPMENT MANAGEMENT SERVICES

LAYER 6: ROOF STRUCTURES

CONCRETE SLAB:
Reinforced concrete slab to Engineer's design and detail, screed laid to fall in direction of full-bore outlets, discharging into 110Ømm pipes, into drainage system. Apply 4mm Derbigum SP400 (or equally approved) torch on directly onto slab. Uniflash 600 with Geoflex (or equally approved) counter flashing to all slab edged, upstands, copings & parapets.Double layer of Bituminous Aluminium paint or equally approved. All of the above to be waterproofed in strict accordance with manufacturer's specification.Underside of slab to be skimmed & painted.

STEEL ROOF:
0.5mm Concealed Fix Klip-Lok 700 Roofsheeting @2° slope. Fixed to 100x50x20 m/s lipchannel, space at 950mm C.C

GLASS ROOF:
Laminated double glazing fixed with steel slicing joints and steel claws to steel I-beam structure. Openings filled with silicone as to Specialist Detail. See detail: 6



LAYER 5: BEAN AND COLUMN STRUCTURES

All beams and columns, including structural foundations for columns to be designed and built strictly according to Structural Engineer's specification

Treated Metal:
Galvanized (covering the metal with zinc to protect and insulate it from corrosion) steel with baked on protective coating structures

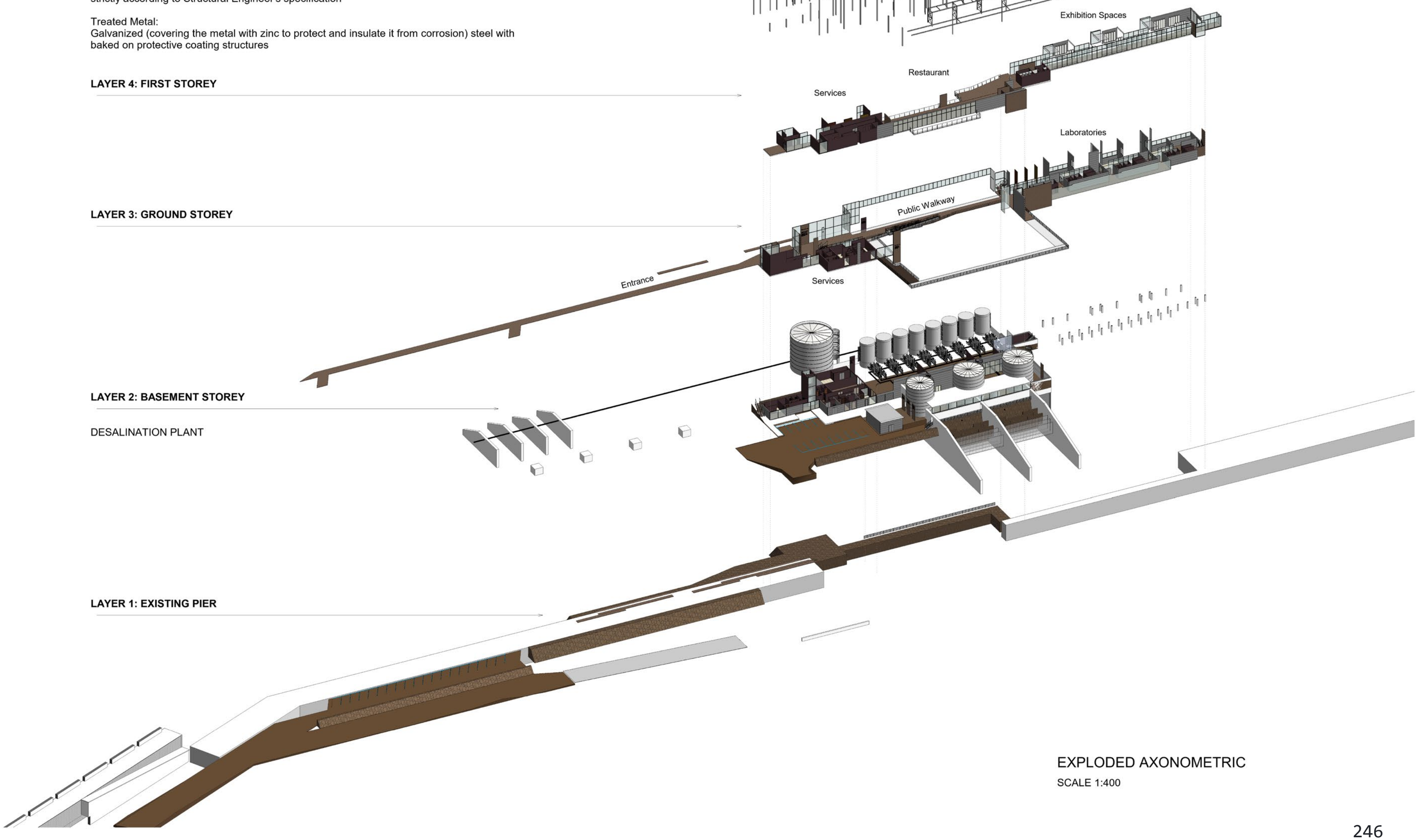
LAYER 4: FIRST STOREY

LAYER 3: GROUND STOREY

LAYER 2: BASEMENT STOREY

DESALINATION PLANT

LAYER 1: EXISTING PIER



EXPLODED AXONOMETRIC

SCALE 1:400

DRAWING REGISTER

Drawing:	Description Note:	Rev No. Date

REVISIONS

OCCUPATION CLASSIFICATION	ZONING CLASSIFICATION
D3	RI

Development Logo's:

☐ Concept/Design ☐ Tender ☐ Marketing/ Presentation
■ Mun Submission ☐ Construction ☐ Completion/As Build

Gisela Rabe
MArch Dissertation
University of the Free Sate

Signatures:

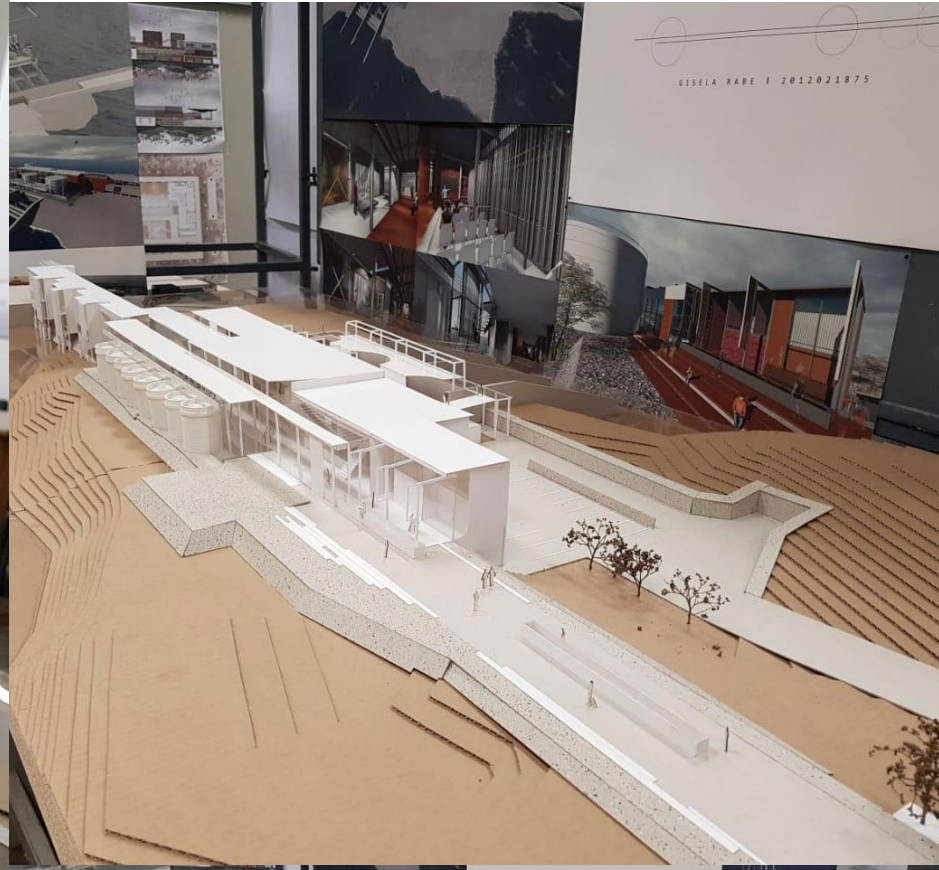
Project: Sea Water Desalination Plant

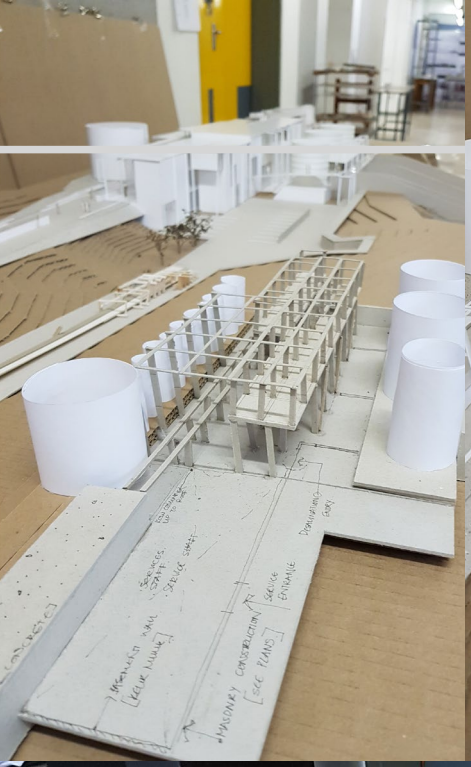
Client: The City of Cape Town

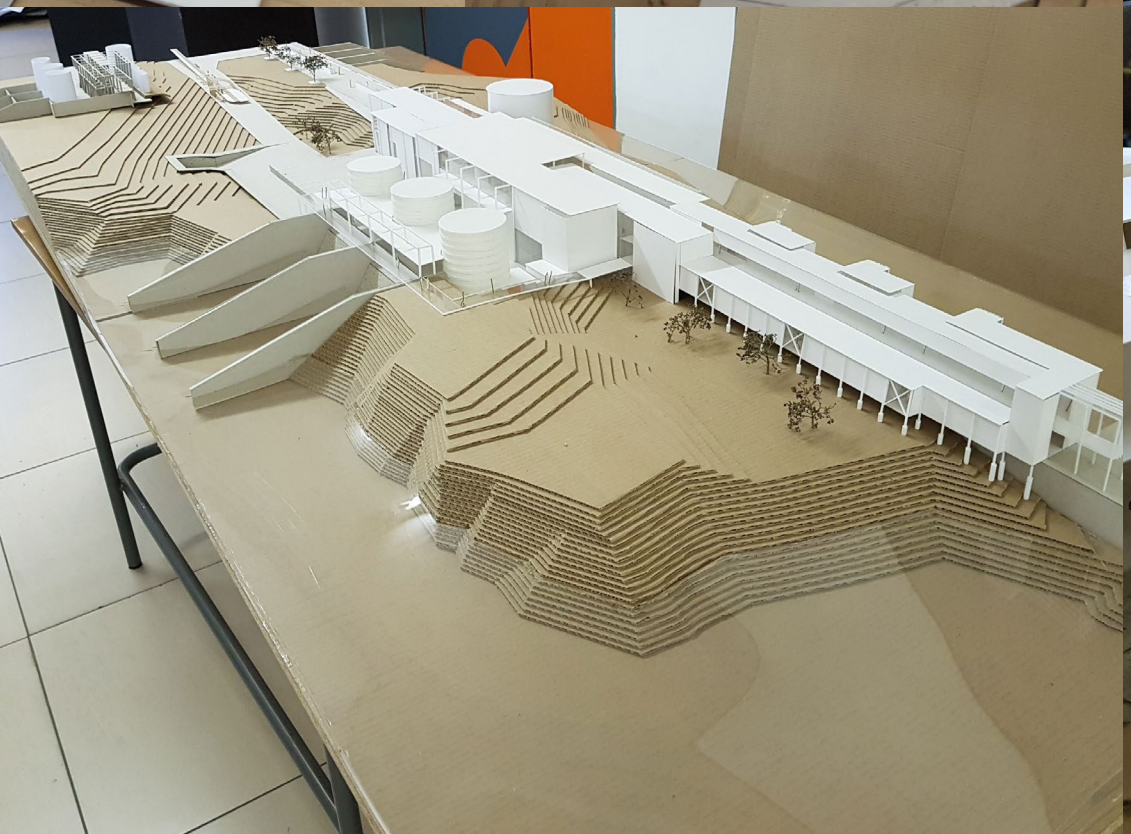
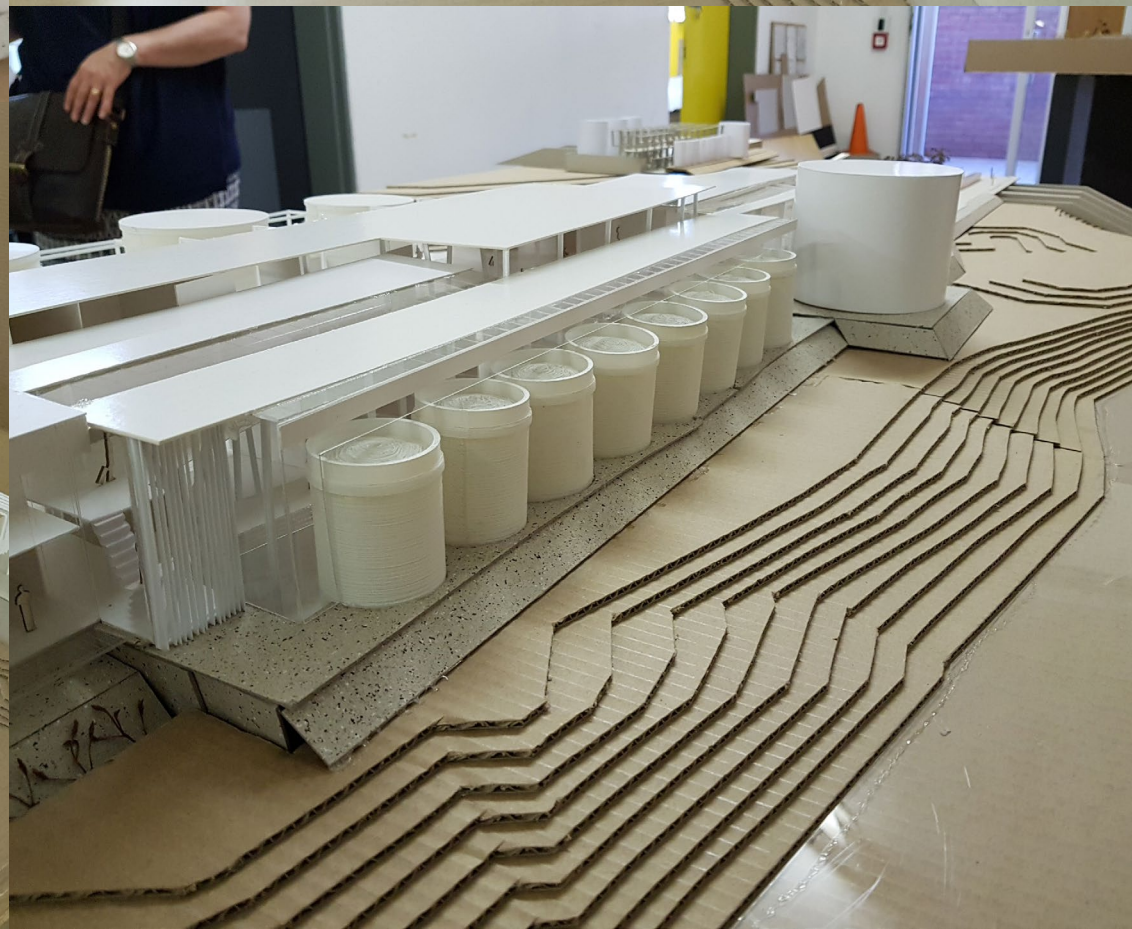
Drawing: EXPLODED AXONOMETRIC

DRAWN: GR	
DATE: 10/18/18	DESIGN: GR
JOB: 01	REVISION: 001
DRAWING: A501	PAPER: A0

FINAL MODEL





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EXPOSING THE MACHINE

GISELA RABE

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EXPOSING THE MACHINE

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