“Keep it Pumping”
Breathing New Life Into Redundant Storage Tanks

Nicola Ransley

What is an appropriate and relevant design for the adaptive reuse of existing storage tanks on Auckland's waterfront, which reintegrates them in a suitable way to their redeveloped environment while still retaining their historical and structural significance?

This research project focuses on the adaptive re-use of an urban tank farm. Tank farms are often located in waterfront locations. With city waterfronts undergoing regeneration for realisation of valuable waterfront land for new purposes, the future of these farms is uncertain.

What is the reuse potential of the tanks, and how can they be integrated into the design of an urban area without losing their historical significance?

The site that provides the opportunity to investigate adaptive reuse strategies is the Auckland Tank Farm, located on Western Wharf, north of the Wynyard Quarter. Working with the councils current concept for the area, an architectural intervention for a group of the largest tanks on this site is presented.
ACKNOWLEDGMENTS

I would like to thank all those that made this thesis possible, especially my supervisor Graeme McConchie who has provided me with invaluable support and guidance throughout the year and has helped me get out of a few tough spots. Thank you for seeing me through this.

I would also like to thank my parents Graeme and Karen for their incredible support over the last five years. As well as my grandparents Don, Helen and Gwen for always believing in me and encouraging me. I would not have been able to get through this degree without them all.

Lastly I would like to thank everyone who helped me in the research and design of this project. Your input has been invaluable.
# TABLE OF CONTENTS

1.0 Introduction
   1.1 Research Question 4
   1.2 Aim 4
   1.3 Objectives 4

2.0 Adaptive Reuse 7
   2.1 Benefits Of Adaptive Reuse 7
   2.2 Trends In New Zealand 9
   2.3 Precedent Studies 11
      2.3.1 Landschaftspark, Duisberg, Germany 12
      2.3.2 Gasometer, Oberhausen, Germany 18
      2.3.3 Tate Modern, London, United Kingdom 24
      2.3.4 El Tanque, Canary Islands, Spain 30
   2.4 Case Studies Summary 33
   2.5 Case For Rehabilitation 35
   2.6 Difficulties Of Reusing Industrial Structures 36

3.0 Site 41
   3.1 Remediation 41
   3.2 The History Of The Auckland Harbour Reclamation 44
   3.3 Auckland’s Current Situation And Future Vision For Site 45
   3.4 Site Analysis And Present Status Of Site 47

4.0 Programme 51
   4.1 Cultural/Arts Centre 51
   4.2 Proposed Function 53
   4.3 Scope And Limits Of The Design 53
   4.4 Building Programme 54

5.0 Design Response 57
   5.1 Recognising Industrial Heritage 57
   5.2 Additional Considerations 57
   5.3 Analysis Of The Tanks As Buildings 58
Contamination: the act or process of contaminating or the state of being contaminated.¹

Contaminating: Make something impure by exposure to or addition of a poisonous or polluting substance.²

The use of the word contamination in this document when relating to the building is used in a positive light. For example: to contaminate a structure with a new function. The act of re-using a structure is the act of contaminating it with a new use.
1.0 INTRODUCTION

Architecturally speaking New Zealand is a young country; no Acropolis, no Pantheon, no Tower of London. Combining that with the pressures of the modern world for development and the demolition of our old buildings it looks as if we are bound to remain a young country in terms of architecture.

The catch here is that any item must endure these pressures before becoming historical, and to endure we have to decide to retain. This is easy when the item is an expensive or wondrous masterpiece of architecture or engineering, but what of the simpler, what some would call not so romantic, structures that make up part of our history?

This study explores how we can preserve a piece of Auckland’s so-called unromantic, but nevertheless iconic, industrial landscape whilst also creating a facility for all of Auckland to use.

Tank farms have been a part of city waterfronts for nearly one hundred years. They are part of our culture and industrial history; however their futures are unclear. When these storage facilities are no longer needed, the question we have to ask ourselves is; what should happen with these redundant structures?

Should they be removed and replaced by a new development, or can they be reintegrated into their surrounding landscape through adaptive re-use and revitalization of their structure?

Tank farms are usually located near waterfronts or waterways, accessible by sea and close to the areas that they service. They are used for the storage of liquids, often petroleum products, and
are a major participant in the fuel process, which we receive for every day activities. For various reasons these tanks are facing a future in which they are likely to become obsolete. Public safety and reclamation of urban waterfront land are two factors that contribute to their uncertain future, resulting in their activities being located elsewhere. When these storage facilities are relocated elsewhere, what is to become of the shells they leave behind?

A common custom in Auckland is to knock a building or structure down when there is no longer a use for it. There are many examples where this has happened: His Majesty’s Theatre, Victoria Arcade, and the Auckland Star building, to name a few. New Zealand is a young country when compared to the rest of the world and Auckland in particular has a tendency to knock down its historical places and build new ones simply because the historical places are not “significant” in world historical terms; that is, something that is only one hundred years old doesn’t seem significant. But of course the problem is that if Auckland keeps knocking down its semi-old buildings then it will never acquire anything of “old” historical significance. The Auckland City Council enforces this view, saying; “the time-span of European settlement in New Zealand is short by world standards. Intact built or other remains from the early periods are scarce in Auckland.”

Auckland is also the centre for early settlement and commercial growth in New Zealand, however a lot of these structures from earlier periods have been lost to redevelopment.

Our attachment to historical buildings comes from a need to understand the origins of our culture and root ourselves in the past; a sense of connection to this heritage is achieved through contact with these remaining buildings.3

However if we keep destroying our history and replacing it with new structures we lose this sense of connection to the past, our city is never able to grow older and we no longer have the connections to each period through architecture.

Therefore we should be trying to preserve a little of everything that has historical significance. Instead of destroying connections to our past and creating further waste, we should be re-using these structures in the design for new development.

By re-using these structures we are reducing our footprint on the environment whilst preserving a part of our history and local culture.

The rising costs of construction and the increasing demand for sustainability in our society today is resulting in the reuse of old buildings and

structures becoming an appealing alternative to a brand new development. Adaptive reuse supports the idea of sustainability; it avoids the creation of additional waste that occurs when a building is demolished and replaced by a new one. The original structure does not need to be destroyed and replaced with a brand new building; it can become part of the new building.

Tank farms provide a new and unusual opportunity for adaptive reuse and restoration. There is a definite challenge to restore these so-called ‘ugly’ structures into something architecturally pleasing and functional.

Tank farms are usually located on prime waterfront land or near waterways close to city centres. Because of their proximity to the city centre and poor integration into their surrounding urban environment they are generally considered to be a blemish on our water fronts.

Recent proposals for the redevelopment of tank farm land have paid little regard to the existing situation and have opted to remove the existing structures, redeveloping sites without any regard for heritage. An example of this is the Auckland Tank Farm. The current proposal is to demolish all of the existing tanks on the Western Wharf and start with a clean slate for the new development. The Auckland Tank Farm has been part of our history for close to 80 years. These tanks have become part of our culture with regard to how we rely on petroleum to do things, and bring a distinct character to the site. The concern here is that if we demolish these structures we are losing a part of our industrial heritage and the character they bring to that particular area.

The significance of these tanks having been on this site for so long is that they could now be considered iconic. Due to their long period of occupation, the land on which they sit has taken on the name “Tank Farm.” We can see that these structures have had a significant impact on this site and are in fact a part of it, rooted to it by history and character.

Therefore, this document investigates the possibilities of revitalizing these cylindrical structures with new occupancies, whilst maintaining their form, structure, and character. It will explore the future possibilities of tanks within their urban fabric and how these structures can be integrated into their changing landscape. This document develops an argument for the adaptive reuse of these storage containers and proposes appropriate re-use occupancies. It includes a critical analysis of relevant architectural precedents in adaptive re-use of industrial structures. It also addresses the issues of contamination.
1.1 Research Question

What is an appropriate and relevant design for the adaptive reuse of existing storage tanks on Auckland’s waterfront, which reintegrates them in a suitable way to their redeveloped environment while still retaining their historical and structural significance?

1.2 Aim

To show that tanks can be successfully integrated into their surroundings, whilst still meeting the needs of the surrounding area, by giving the adaptive re-use of these structures a viable new function.

1.3 Objectives

- To successfully revitalize and integrate these tanks with the adjacent Wynyard Quarter and nearby Viaduct Basin.
- To propose a solution that gives these tanks relevant new functions whilst retaining their cylindrical structures, so as to not detract from their existing qualities and to retain their historical connections.
- To Propose a design that aesthetically fits into the waterfront site
- To create a successful building that meets the needs of Auckland and the waterfront plan.
- To Provide a vibrant and useful public area that the Auckland public can use freely.
Adaptive re-use is defined as the process of adapting old structures for new purposes.⁴ The trend towards adaptive re-use of existing structures has come about due to factors such as sprawl minimization, preservation of materials, and energy conservation as well as a means to revitalize urban life and declining neighbourhoods, which occur with the relocation of industrial activities, leaving buildings vacant.⁵ Reuse has also been adapted as a technique to revitalize and save our industrial heritage as cities change and buildings out live their intended uses.

Adaptive reuse allows a historical building to be converted for a new use whilst retaining its original character and links to the past. Brent Ballamy in his article “A new purpose for old buildings,” states, “With construction costs rising and sustainable design growing in importance, the practice of recycling buildings has become a significant development trend around the world.”⁶ He describes adaptive reuse as “maintaining the structure or basic fabric of the building and repurposing its function.”⁷

2.1 Benefits of Adaptive Reuse

Adaptive reuse has a range of benefits, some of these being heritage, environmental, economic, and social.

---

⁶ Ballamy, Brent, "A new purpose for old buildings." (March 14, 2011)
⁷ Ballamy, Brent, "A new purpose for old buildings." (March 14 2011)
Heritage Benefits

New Zealand Historic Places Trust defines heritage as “those natural and physical resources that contribute to an understanding and appreciation of New Zealand’s history and cultures.”

Every structure can be considered a contribution to Auckland’s heritage; whether it’s a heritage building or simply an industrial structure it becomes part of the city’s identity and links us to our origins. Cultural heritage is irreplaceable; once it is lost it cannot be replaced. “The conservation of heritage places associated with our ancestors, cultures, or past allows people to experience in a small way a taste of how past generations lived and to develop a greater understanding of our history and identity.”

Derek Latham says there are five reasons for adaptive reuse. One being that the structure under deliberation has archaeological value, secondly that it is a visual amenity or a cultural contribution, thirdly that it makes sense economically, the fourth reason is that it has a functional value and lastly that it fulfils psychological needs.

Environmental Benefits

The demolition of a building creates unnecessary waste, pollutes the environment and increases the cost of the new building project. Adaptive reuse helps to lessen these environmental impacts and acts to reduce sprawl and material usage, and conserve energy. Another benefit of reuse is the retention of the existing building’s embodied energy. The energy it took to construct a building is lost when the building is demolished. Thirty percent of the energy used over the lifetime of a building is spent on the initial construction.

Reusing a building reduces the energy costs of construction and avoids unwanted waste from demolition by recycling that building and giving it new life. Not only are you saving the energy used to build the structure you are also eliminating the energy that would otherwise be required to demolish, transport and dispose the building, making reuse an attractive option.

Economic Benefits

“With the value of construction tripling in the last ten years, the reduction of labour and new materials in a repurposed building can result in substantial savings.” Adaptive reuse can substantially reduce
the cost when considering demolition for a new building. Not only are you saving on demolition, removal and replacement costs you are reducing the cost of the building by utilizing the existing structure and materials of the original building. However Derek Latham suggests that you must still assess all matters involved in adaptation versus demolition. Reuse can involve removal of toxic building materials, difficult heating, ventilation, and air-conditioning (HVAC) retrofits and thermal improvements. However, demolition can involve expensive waste management measures and heavy waste can be costly to transport off site.  

Social Benefits

Buildings have their own histories and provide us with links to the past. The demolition of old buildings results in the abolition of cultural heritage. The texture of the suburban fabric is important to people, that sense of continuity and of evolution.”17 Rypkema in his seminar “Rethinking Heritage,” talked about how preserving a city’s heritage lessens the monotonous effect of cultural globalization: “all those identikit mirror-glassed high-rises that are evocative of everywhere and nowhere.”18

It is also important that the re-use incorporates flexibility; in new construction there is the intention that the structure will live beyond its initial purpose, therefore the intervention will need to integrate robust materials, and offer flexible layouts and structural systems.19 “Often at times adaptive reuse means finding the most suitable use or uses for the building rather than tailoring the building to its new use. In other terms, we must learn to adapt to what we have as much as adapt what we have to us.”20

“...The recycling of buildings through adaptive reuse can realise significant economic benefit for property owners, social benefit for communities and environmental benefit for the world in which we live.”21

2.2 Trends in New Zealand

Adaptive reuse has been adopted all over the world and is becoming more and more popular. Not only are factories and houses being adapted, but industrial buildings, water towers, cement silos and many more structures have been added to the list of possible reuse. However, whilst other countries were retaining their historic structures, New Zealand failed to follow this trend and Auckland in particular has

16 Latham, Derek, Creative re-use of buildings. Shaftesbury, Dorset: Donhead, 2000, 4.


seen the demolition of many of its old iconic buildings, making way for new high-density developments.

Demolition has been Auckland’s development solution. There is currently protection for the historically significant buildings; however there are no laws or protocols in place to protect the more conventional buildings, which contribute greatly to our community and character. “The New Zealand Historic Places Trust will continue to identify and register, as appropriate, significant heritage. To make best use of our resources when seeking to add new registrations, we will prioritise the most significant and those places potentially at risk.”

Today, New Zealand is beginning to implement adaptive reuse, due to people becoming more aware of the idea and the importance of retaining our heritage. Once these buildings have been demolished their character and links to our history are gone too. The call for sustainability around the world is also contributing to the rise in adaptive reuse in New Zealand and with more people becoming aware and recognizing its value, it is expected to increase even further. A public survey done every three years has shown an improvement in public awareness and understanding of heritage, along with an increased importance placed on these places by New Zealander’s. A study done in 2010 on the importance of heritage to New Zealanders found that there was a very high level of concern for historic places. “These places provide a sense of belonging to each of us as individuals, as families, as iwi/hapu and as communities.”


26 Building awareness of heritage places is an important step in reducing the loss of heritage through demolition.
2.3 Precedent studies

“Adaptive reuse can produce a beautiful, creative, and socially responsible building.”

Brent Ballamy emphasizes that the spaces and character created through a reuse project could not have been replicated with all-new construction. He uses a concrete grain silo and the London power station now known as the Tate Modern as examples.

The following section will explore and examine examples of adaptive reuse primarily in industrial structures and of circular nature. Although there are very few examples of rehabilitated oil tanks to draw information from, there are other examples of similar industrial nature, which we can analyse. Brief descriptions of other industrial reuse projects can be found in Appendix A.

---


2.3.1 Landschaftspark, Duisberg, Germany

Designer: Peter Latz

constructed: 1901

Former Use: Ironworks

Current Use: Park and cultural venue

Opened: 1994

Landschaftspark is an outstanding example of how an abandoned industrial wasteland can be transformed into an attractive park. The site was closed in 1985 after 84 years, due to the demise of iron production. There it lay abandoned as an industrial wasteland awaiting a new use. In 1989 it became part of the IBA Emscher Park. This development paved the way for many more industrial re-use projects. Demands were made on the park to “provide a local recreational area for the people of Duisberg, opportunities for sports and other leisure activities and a cultural venue for concerts and theatrical performances while, of course, remaining witness to the history of the iron and steel industry at the same time.”

Peter Latz designed the park with a strong association to the industrial heritage of the area. The re-development of this site aimed to retain its existing structures for new use in order to maintain the connection with its industrial heritage. The existing buildings and infrastructure on site are still intact. Locals and tourists from all over the world have visited the park. Divers come to scuba dive in the converted gasometer, climbers make use of the ore bins and the old factory buildings are transformed for events.

The park is also a training ground for specialists from the police, fire service, and military. The

Fig. 1: Inside Lanschaftspark

32 Winkels, Ralf and Gunter Zieling, Landschaftspark Duisberg-Nord - From Ironworks to Theme Park, 25.
33 Winkels, Zieling, Landschaftspark Duisberg-Nord, 35.
The park is fixed with gardens, sports facilities and playgrounds, which make use of the existing structures. These structures, although they have been converted into new uses, still maintain their relatively unmodified forms. The park also accommodates walkers, cyclists and anyone wanting to play or relax in the parklands.\(^{34}\)

The existing blast furnace has been retained as a lookout for the park. You are able to climb up the existing staircases through the maze of steel to the lookout at the top, which gives a great view over the surrounding area. The power plant, which consists of a vast hall, has been utilised as a large cultural venue that hosts cultural events, trade fairs, exhibitions, galas and concerts. The blower house has been used as a space for conventions, operas and concerts. The park also holds a Summer Cinema and a high ropes course amongst the casting houses.\(^{35}\)

Piazza Metallica, once the steel mill, uses slabs of pig iron that previously lined the foundry pits at the site for the design of the piazza. The iron slabs symbolise the ingots that were once produced here and are a symbol of industrial art.\(^{36}\)

The park is a good example of how this industrial landscape can be continually changed over time to suit the community’s growing needs. “In the years following 1994, the Landschaftspark continued to grow and evolve. Numerous parts of the plant were restored and opened to visitors; buildings were repaired and turned to new uses.”\(^{37}\)

The park has been constantly redeveloped over the years. The gasometer at Landschaftspark was built in 1920. It was used for gas storage. Since its decommission it has been converted into a diving centre which holds a 13 meter deep pool with

---

35 Landschaftspark Duisburg-Nord, http://en.landschaftspark.de/the-
casting houses.
36 Winkels, Ralf and Gunter Zieling, Landschaftspark Duisberg-Nord: From Ironworks to Theme Park. (Leipzig, Germany: Offizin Andersen Nexö, 2010), 113
37 Winkels, Zieling, Landschaftspark Duisburg-Nord: From Ironworks to Theme Park. (Leipzig, Germany: Offizin Andersen Nexö, 2010), 28
artificial reef and shipwreck. The dive centre was originally developed as an independent venture but went bankrupt. It then went on to open as a popular novelty destination for divers from around the world. The pool is also used as a training facility by the police and Special Forces divers as well as by dive club members for social diving.

A canteen, wash, and changing rooms were added after the commission of a new administration building. Initially after the closure, the old administration building was used as a Visitors’ Centre. In 2001 the visitor’s centre was transformed into a youth hostel with leisure and meeting rooms. The structure of the casting hall has had a roof installed on the once open roof structure to enclose it for concerts and performances.

Over the years, the iron plant produced and left environmentally harmful substances such as gases, wastewater and sludge. “After the ironworks was shut down, it became abundantly clear that the operation had left a problematic legacy of contamination,” therefore the development of the park meant the issue of contamination had to be dealt with. Latz opted to keep the majority of existing soil on site and used a method called phyto-remediation, which uses plants to treat the contaminated soil along with natural vegetation to aid the process. Polluted water that ran in the canal through the site has now been replaced by a fresh rain water system.

This park has transformed from an iron manufacturing plant into a cultural and leisure spot,

38 Tauchrevier Gasometer, http://www.tauchrevier-gasometer.de

39 en.landschaftspark.de

40 Winkels, Zieling, Landschaftspark Duisberg-Nord, 23

41 Winkels, Zieling, Landschaftspark Duisberg-Nord, 23

42 en.landschaftspark.de
which is available to the public anytime of the day. It is especially known for its sea of illuminated structures at night by a light installation designed by Jonathan Park. “At night, the Landschaftspark is a shining symbol of its reinvention.”

The whole idea of the Park was to show that a brownfield site could elevate itself beyond the perceptions of tarnished steel. The development has successfully transformed this industrial park through adaptive re-use into one of the region’s most popular attractions whilst still maintain its links to its industrial past.

The existing industrial structures have been successfully rehabilitated to accommodate their new uses and the site is no longer seen as a place of decay. The park is a cultural destination that represents the revitalization of a contaminated and declining region. The site has been known to draw people internationally, who are seeking a solution for their unused industrial sites. “The Landschaftspark Duisberg-Nord serves as the best example in the world of preservation and repurposing. Here, they can gather first hand information and perhaps apply it to their own projects when they return home.”

The park is a symbol of how a deteriorating industrial site can be rehabilitated and restored into a successful cultural area. It is a memorial to the areas industrial heritage and a successful example of the redesign and adaptation of an old industrial site.

---

43 Winkels, Zieling, Landschaftspark Duisberg-Nord, 71.
44 Winkels, Zieling, Landschaftspark Duisberg-Nord, 28.
45 Winkels, Zieling, Landschaftspark Duisberg-Nord, 128.
Fig 6: Landschaftspark at night time.
Fig. 7: Center of the Gasometer
2.3.2 Gasometer, Oberhausen, Germany

Designer: Deutsche Babcock AG with IBA
Constructed: 1927
Former Use: Gasholder
Current Use: Exhibition centre
Opened: 1993

In 1927 the Gasometer was the largest gasholder in Europe and was used by the Oberhausen ironworks. It had a height of 117.5 meters and a diameter of 67.6 meters. The Gasometer was hit by bombs in the Second World War and needed repair work, however during this work the Gasometer caught fire and needed to be dismantled to its foundations before being rebuilt. It held gas until it’s decommission in 1988. After it’s decommission, the future of the Gasometer was unclear and demolition was a likely solution. However in 1993 the Gasometer was saved and converted into an exhibition space and is now seen as a landmark for the city.

The Oberhausen Gasometer is an icon in the surrounding flat landscape. It towers above everything around it and can be seen for miles. The Gasometer had a floating disc inside which consisted of a large steel plate, “the gas-pressure disc floated which, depending on the quantity stored, glided up and down the oil-lubricated walls.” This disk still exists in the cylinder today however it no longer moves up and down.

The Gasometer was converted into a cultural space; today you can go inside the Gasometer and experience the large art displays that this cylindrical structure holds. The Gasometer is part of a new entertainment complex. It functions as a gallery and art installation space for Oberhausen. The exhibition changes every year.

On one side is an exterior staircase and lift, which runs up the outside wall of the tank. This access is connected to the structure by bridges at each level. The main entrance is through the side of the tank, which opens into a glass box that acts as a transitional point before passing into the space inside. Upon walking into the tank you are immediately confronted by an impressive colonnade centre, in the very centre of which is a display. The ceiling of this ground level is lit up to express the steel plate construction of the above floor. The lower level is a large exhibition space with café and bookshop. Your focus is immediately drawn to the centre of the cylinder by its lighting display. In some places there is a double height ceiling where parts of the steel plate have

Fig. 8: Bracing around the openings.

Fig. 9: Structure inside the Gasometer.

Fig. 10: Steel roof plates.
been removed. This gives you a glimpse of the exhibition space above. The structure of the ground level is in rings of columns that run from the centre of the cylinder outwards. These rings divide up the exhibition spaces. Displays are hung up on wires, in rows around these circles. Displays are then lit up with lights that hang down from the ceiling.

The size of spaces, use of lights and natural darkness of the tank creates the atmosphere. The industrial nature of the tank has been maintained inside the tank with exposed lighting, and ventilation pipes. However these utilities have been painted black to keep with the darkness of the tank and to not detract from the displays.

Construction of the wall, floors, structure and the ceiling is exposed throughout the tank. Additions have all been done in steel inserted into the existing cylinder. The connections in the steel have been left visible which allows you to see how the structure has been put together. The ceiling and columns in the tank are enhanced and celebrated by illuminating them.

Staircases transport you to the second level of the exhibition. This level is criss-crossed with steel beams that support the displays, upper walkway and upper level of the exhibition. The third floor is where you are really able to appreciate the extent of the Gasometer. Upon arriving at the top of the last staircase you are greeted with a vast space. This space is utilised by large art installations, which your typical gallery would not be able to house.

The enormous volume and towering height of this space is incredible. A grandstand staircase cascades up one side of the tank for people to sit down and appreciate this uncommon but non the less remarkable space. Running around the outer area of the circle is a walkway that enables visitors to get a 360-degree view of the display.

A lift runs up the inside of one side, taking visitors to an upper platform at the top of this 115
meter high tank. At the top you can pass through a reinforced door to the outside of the tank where a small staircase is provided to walk along the roof of the tank and lookout at panorama views of the Ruhr.

Looking down from inside the tank you are confronted with a web of lights and beams. This web like structure which is the criss-crossing beams of the second level creates an interesting visual. (Refer to figure 15). From here you can see the structure of the roof, which has multiple steel beams that radiate out from a point in the centre of the cylinder. (Refer to figure 13.)

Because the strength of the Gasometer is in the concavity of the circle, where holes for doors have been cut into and placed in the walls, bracing has been applied around the holes to reinforce the strength of the cylinder. (Refer to figure 8.)

The Oberhausen Gasometer is a creative use of an old industrial structure that no longer had a use. The cylinder has been converted successfully into an exhibition space and not only works as a display space but also has become an interesting feature in itself. People can come here and experience a part of Oberhausen’s history, see panoramic views of the Ruhr and experience a completely different style of exhibition in this vast cylindrical space.
2.3.3 Tate Modern, London, United Kingdom

Designers: Herzog & De Meuron

Constructed: 1947 - 1963

Former Use: Power Station

Current Use: Art Gallery

Opened: 1994

The Tate Modern, formally the Bankside Power station in London became redundant in 1981. After closure the building remained redundant until it was selected as the site for the Tate’s new art gallery for modern art in 1994. Swiss architects Herzog & De Meuron were appointed to convert the power station into a gallery under the conditions that the power station retained as much of its character as possible. The machinery that inhabited the power station was removed and the building was stripped back to its framework of brick and steel. According to the Tate’s website, the Tate Modern is one of Great Britain’s top tourist attractions and has had more than 40 million people visit the building since it opened in 2000. The Tate has been adaptively re-used and converted into a gallery with great respect for its original character. The exterior of the Tate has remained largely unaltered with minor adjustments in the way of glass entrances and a glass box on the roof of the power station. Inside the building the turbine hall has become the main entrance and a display area for the gallery with many entrances on each side of the building (Refer to figure 16). The section of the power station that was once the boiler house has been transformed into a space for the galleries.

When entering the turbine hall of the Tate one is confronted with a vast empty space that runs the entire length of the building. People can be seen

Fig. 16: Inside the entrance of the Tate.
sitting here on the concrete ground enjoying the atmosphere of this large space with its towering ceiling. There is an unusual but nonetheless stimulating atmosphere created by the unusually large space and set up of light in this hall done, achieved through the addition of light boxes placed along the internal wall of the original structure.

It is unlike any other space one might experience in a typical gallery. The turbine hall has remained mostly unaltered to allow visitors to appreciate the structure of the existing building and in order to retain the buildings original character.

The gallery spaces in the Tate are reasonably large rectangular rooms with holes for doorways cut out of the thick walls of the original structure. These rooms connect to each other to create a continuous flow from one exhibition room to the next. Artificial lights control the lighting of the exhibitions, however the rooms around the perimeter of the building can take advantage of both artificial and natural lighting through the original vertical windows. The vertical windows add dimension to the flat surfaces of the gallery as they allow you small glimpses to the outside world when your focus is generally concentrated inside.

Grates in the floor provide ventilation to the gallery rooms. The walls, doors and fittings are kept simple to not take away from the display and building’s character. A theme of black and white is seen on the levels of the gallery spaces. The structure and services are coloured black. (Refer to figure 17.) The additions are kept simple but have a sense of elegance about them not usually seen in an industrial building.

However one criticism of using this existing building as a gallery is that because it is a re-use project the windows cannot be strategically placed and because of the position of an existing window and placement of a couple of the paintings.
reflections can be seen on the glass of the painting, thereby taking away from the qualities of the picture. This would be easily fixed with minor adjustments to the display location.

In the last year, the Tate Modern has not just become an example of industrial re-use but also an example of tank re-use. The underground oil tanks that were once used for the power station have been converted into gallery spaces.

The tank’s exhibit maintains the industrial underground feel of rawness. This is the one part of the Tate that has been kept as original as possible, unlike other parts that needed refining. Anna Cutler, Director of learning at the Tate says, “The tanks offer a unique opportunity to have a dedicated programme of film, performance and live art. This invites enquiry about and through the past, present and future of these practices, digging deep to understand emergent forms, new spaces and the complex relationships between artworks, ideas and people. The tanks create a different kind of energy in the museum by bringing art and learning together in a new space that re-configures content and method.”

The tank’s exhibit is sculpted from concrete under the ground. They provide a new and unique space unlike any other gallery. They allow a direct encounter with something new and unexpected. According to Cutler, “new spaces invite new ideas as well as new approaches in making or showing art, and the public arrives in such spaces with

---

new expectations and a vast range of different knowledge and understandings.”  

The entrance to the tanks exhibit is through a low, wide, concrete doorway into a wide hallway which branches off into three of the power stations oil tanks (Refer to figure 19). The oil tanks have been converted into exhibition spaces for film and media. One of the tanks measures 35 meters in diameter and provides a huge exhibition area for oversized art installations. The inside of the two large tanks have had concrete shells inserted into their existing structure (Refer to figure 21), the smallest of the three tanks has this shell inserted around the outside of the tank, exposing the steel structure of the inside of the tank. The concrete insert provides support for the existing structures.

The adaptive re-use of the Tate has proven to be a successful conversion of a redundant industrial building. Not only one of the top tourist attractions in the UK, it also offers a variety of spaces from white cubes, spaces for congregation and the raw industrial space of the tanks. This variety of spaces can only be experienced in a building like this. This mix of atmospheres would not be experienced in a standard gallery. It is achieved through the successful mix of the original industrial structure, and architectural intervention. The Power Station with its vast space and high ceilings also makes the display of large art installations possible. The new extension to the Tate successfully relates back to the power stations past and to how the building once was, which was rough and industrial. The Tate Modern is an example of how an old industrial structure in need of a new use can be successfully reintegrated into its surroundings and adaptively re-used for a new function available to the community whilst retaining its original character and not detracting from its industrial heritage.

---

Fig 23: Inside the El Tanque

http://jaumeplensa.com/web/media/k2/galleries/216/01_Tanque.jpg
2.3.4 El Tanque, Canary Islands, Spain

Designer: AMP Arquitectos, Artengo-Menis-Pastrana

Constructed: 1929

Former Use: Crude oil storage

Use: Cultural Space

Rehabilitated: 1997

The El Tanque Cultural Space belonged to Spain’s first oil refinery and was used for the storage of crude oil.\textsuperscript{54} Since then it has been a feature of the town’s waterfront. Due to modernisation of operations, the tank farm became part of the urban regeneration plan. The urban plan for the area was to replace a portion of the refinery’s site with mixed-use functions such as residential, commercial and retail.

The steel tank has been converted from an industrial structure into a cultural space. The tank has a fixed roof with internal structure in the way of columns, which help to hold up the roof. Although the space inside is not free of structure it has still proved to be a successful conversion and a useful space for a cultural venue.

The space inside the tank is ever changing with a variety of art installations occupying this large interesting space. The interior space has been cleaned of contaminants and remains largely unaltered. Lighting is the only additional feature seen in the tank; the lighting is used to illuminate the artwork and the structure inside the tank. The tank provides an exhibition space unlike conventional gallery spaces. This atmosphere could only be achieved in a re-use project like this one.

In the conversion of the tank, there was great consideration taken for the existing structure of

\textsuperscript{54} Espacio Culturale Tanque, http://espcioculturaleltanque.blogspot.co.nz/ (accessed May 25th 2012)
the tank. The exterior of the tank has had little alteration in order to maintain its integrity and structure. The tank is made from steel with gravity walls made from cyclopean concrete for the enclosure. Recycled materials were also used for additions to this structure such as recycled metal for the entrance door and skylights.55

A reception area, lobby and toilets are located between two existing walls. The addition of these amenities has been done in a non-obtrusive manner by using coarse materials to blend in with the industrial feel of the existing structure.56

El Tanque has been retained as a memory of the city’s industrial past. The space has been a successful venue for art installations and events. It “should not only be considered as a material element of the historical period referenced but also as an example of architectural recovery of a space whose initial function is overcome by a shift towards culture and leisure.”57

El Tanque is an example of how a contaminated industrial structure can be successfully rehabilitated and re-used as a cultural centre for the city. The tank provides proof that the re-use of an oil tank is indeed possible, even with the issues of contamination. The conversion of the tank allows people to experience a new and unusual space whilst enjoying the displays within the tank.

2.4 Case studies summary

The review of precedents was invaluable in this research project. The adaptive reuse of industrial storage tanks is not particularly common. Although there were not many examples of tank reuse the review of similar structures was important in the understanding of issues that occur when dealing with a structure of this nature. The study of these precedents helped to inform and influence the design and made me aware of some factors that became apparent in these reuse projects.

It became apparent that when dealing with a group of similar structures such as a group of tanks, it was common to retain only one of those structures rather than the whole group. This is evident in the El Tanque example in Spain. The tank is the only remaining reminder of the refinery, which once existed on this site. The retention of one or a group of tanks is an important consideration in the redesign of the tank farm and the question is raised whether the character of this site is compromised if only one tank is retained.

Another problem of adaptive reuse of industrial structures is the inevitable issue of contamination and how to go about decontaminating an industrial wasteland. Landschaftspark is a good example of how industrial structures are retained whilst the land on which they sit is being remediated. Remediation of this site was done through the use of vegetation and the creating of a park.

Another theme found with these projects is that they have been through a period of abandonment before being selected as a reuse project. This was often due to the challenge of decontamination and the cost associated with pulling down the structures. Once these structures have gone through the reuse process they have become recognised as important parts of our industrial history. However it should be said that a reuse project is only
intervention seems likely to gain approval over a drastic intervention.

These industrial structures are no longer the decaying wasteland they once were. Through adaptive reuse these structures have been successfully reused and have become a valuable component of their surrounding areas. Through reuse these structures have been able to provide a building unlike any conventional building designed for that particular use.

The intervention and conversion of these precedents can be seen as significantly conservative. There is a common theme within this study that the conversion will opt to preserve the structure in its original state. The precedents in the above chapter have all opted to convert the structure with great consideration for its existing structure. The Tate Modern is a good example of this. The architects of this conversion chose to retain the existing facade of the Power station, resisting any big changes and retaining its character. This is the reason the architects Herzog and de Meuron won the competition for the power station conversion. This strategy of limited successful by the people it attracts. The proposed function for the structure is generally influenced by the existing structures location and what would be suitable for that area. This will influence whether the reuse project is used and how successful the project will be.

The intervention and conversion of these precedents can be seen as significantly conservative. There is a common theme within this study that the conversion will opt to preserve the structure in its original state. The precedents in the above chapter have all opted to convert the structure with great consideration for its existing structure. The Tate Modern is a good example of this. The architects of this conversion chose to retain the existing facade of the Power station, resisting any big changes and retaining its character. This is the reason the architects Herzog and de Meuron won the competition for the power station conversion. This strategy of limited
2.5 Case for Rehabilitation

Tank farms were designed and built for the handling and storage of bulk liquids. They are officially known as bulk liquid storage facilities but are commonly called tank farms due to their grouped nature and geometries. Typically made of steel, tank farms are used to store liquids during the handling and distribution stage of products such as petroleum, chemical and non-toxic materials such as vegetable oils. These tanks typically consist as cylinders with welded or riveted steel panels. The use of the cylindrical shape is due to the strength of a circular structure without the need for internal structure to support it.

The spread of tank farms has occurred over the last hundred years with the necessity for fuel increasing to accommodate our every day lives. They are usually located on waterfronts, waterways and ports in order to be accessed by sea, but like the gas tanks before them, the future for many tank farms is coming to an end. Factors such as urban reclamation and the redevelopment of city waterfronts are just a couple of reasons for the removal of these facilities. Although these facilities are still required for everyday activities, there is a growing concern for public safety, which exists due to their close proximity to the city. Although they may have once been built on the outskirts of the city in a zone of industrial activity, due to the expansion of cities, these city centres are now encroaching on the edge of these once isolated sites.

The past has shown us some sobering examples of the dangers of tank farms and their risks to

---

58 Eng, Doug, General Manager Bulk Storage Terminals Ltd, April 4th 2012 and September 17th 2012.
59 Eng, Doug, General Manager Bulk Storage Terminals Ltd, April 4th 2012 and September 17th 2012.
society. In July 2007 an explosion occurred at the Barton Solvents Wichita facility in Kansas. The explosion sent the tank flying into the air landing approximately 40 meters away and resulting in a fire. The incident required the evacuation of 6000 residents and twelve people required medical care.60 October 2009, a week after the explosion of a Puerto Rico tank farm, which took three days before it could be brought under control, another explosion occurred at the Jaipur fuel storage tank farm in India. This explosion like the Puerto Rico incident proved to be too big for fire fighters to control and had to be left to burn down before it could be brought under control.61

Apart from the inherent dangers they impose there is also the issue of the declining oil industry. Today and in the future the demand for oil is expected to increase dramatically, however the earth’s oil is a finite resource, “It is in our best interest to pre-emptively embark on a revolutionary change that will lead us away from oil dependency rather than drag our feet and suffer the ramifications of becoming growingly dependent on a diminishing resource.”62 With a declining resource the future for tank farms is unclear, it is safe to assume that these tank farms have a high chance of being made redundant in the future as their industrial gas tank neighbours once were.

For various reasons tank farms are turning into redundant structures left behind from the activities that once occupied them. They provide a unique opportunity to convert these industrial structures into a building and contaminate them with a new use. Through adaptive re-use, their character and past can be retained and serve as a reminder of our dependence on oil to live. The adaption of these iconic structures will represent a new way of thinking and preserve a part of our history. The re-use of tanks may help to enhance awareness about their presence and industrial heritage.

2.6 Difficulties of Reusing Industrial Structures

There are many examples today of industrial structures being revitalised and adaptively re-used for new functions. In Europe and the United States alone there are numerous factories, gasometers, water towers, power stations and warehouses that have been adapted for a new use. Apart from contamination, tanks present bigger problems to adaptive reuse. Unlike other industrial structures such as power stations and factories, tanks were never intended to be occupied. Their interiors were never designed to be inhabited, therefore they have none of the existing features that a typical building would have. Tanks pose problems for the
inhabitation of these structures, as a new structure would need to be inserted into these spaces in order to create floor spaces.

Storage tanks are generally steel cylindrical structures consisting of welded or riveted steel panels. The panels are staggered when welded to increase the integrity of the tank. In New Zealand storage tanks must conform to certain codes.63 They sit on large concrete pads. In some cases the steel tank is not connected to the concrete pad; it sits on top of a ring beam and relies on the liquids inside to provide support. However petroleum tanks must conform to a certain code. The code in New Zealand is API 65064. This code states that the tanks need to be able to withstand lateral forces. To achieve this, tanks may require “Hold Down Chairs” that attach the tank to a concrete ring beam or full base. If a tank is of a short wide design it may not be necessary to have hold down chairs. The idea is to minimize the likelihood of the tank toppling over in an earthquake or similar event.65 The thickness of the tanks steel wall under this code will be around 5 – 12 millimetres.

The only visible difference seen in steel tanks seems to be their size or construction technique. However there can be variations in their internal structures. Generally storage tanks have no internal structure, relying on the concavity of their form, the liquids they hold, as well as their radial truss roof structure to support them.66 Exceptions to this design do exist and can be seen in flat roof tanks, which have internal structure in the way of columns to support the roof, or floating roof tanks. Floating roof tanks have an unattached roof; this is
generally a steel plate, which moves up and down depending on the volume of contents in the tank. Floating roofs are used to manage and reduce the risk of an explosion that could occur with the build up of fumes within a partially filled tank, pressure imbalance or leaks. Floating roof tanks must have stronger walls than trussed roof tanks to maintain the reliability of their walls. Trussed roof tanks and floating roof tanks rely on the concavity of the tank to maintain their strength.

Therefore it is essential that no part of a tanks wall should be removed without a sufficient amount of bracing around that opening in order to prevent the collapse of the tank. If any openings or cuts are made to the wall of the tank they must be reinforced to prevent the failure of the structure.

However in saying that, the Gasometer in Germany, which uses large panels of steel wrapped around the openings and bolted into the original structure for reinforcement of the doorways, shows that it is possible to reinforce any new openings made whilst maintaining the strength of the tanks.

Although the reuse of these structures poses difficulties in terms of structure and habitation, the importance of retaining these iconic structures should be no less than other industrial structures. Tank farms are still a contributor to our industrial history, although they may not be that old, if we demolish them we are demolishing part of our past and a structure which can contribute to a unique and interesting space and provide an example of what is possible in the future of reuse.

67 Eng, Doug, General Manager Bulk Storage Terminals Ltd, April 4th 2012 and September 17th 2012.
The chosen site and industrial structure for adaptive reuse is located on Auckland’s waterfront, next to Westhaven marina and adjacent to Wynyard Quarter. The site currently known as the “Tank farm” is at the northern end of the Western Wharf. This site has been chosen for this project as the land, on which the tanks sit, as well as the surrounding area, is undergoing redevelopment. The companies that own the tanks have leases on the land, which are due to expire and further applications have been turned down to extend these leases. This is due to the city realising the value of waterfront land and the need to reclaim its waterfront as well as concerns for public safety. Therefore this site provides a unique chance for an adaptive reuse project. The following section will discuss the issues of contamination that are inevitable with an industrial reuse project of this nature, ways in which this contamination can be dealt with as well as analyse both the site on which the tanks sit as well as the tanks themselves.

3.1 Remediation

Industrial activities often leave behind waste. Whether the site and structures are to be re-used or simply demolished the site will need to undergo remediation to deal with the contamination left behind in order for it to be reused for future uses. The nature of tank farms, their location and the possible dangers they pose to those nearby has been a standing argument for the removal of these
structures. Tank farms due to their close connection to petroleum products have an image of toxicity. Their presence is a visible and strong reminder of this toxicity.

Tank farms because of the products they contain make renewal of land difficult. Contamination is an unavoidable issue when dealing with petroleum products. Although tank farms do their best to contain their product, there is the inevitability that accidents such as leaks and spillages will occur. Because of these factors, land around tank farms has become tainted and their sites have proven difficult to de-contaminate.

Land remediation is usually prompted by factors such as the protection of human health and the environment, and redevelopment. There are many approaches to remediating contaminated land and it is not uncommon for two of these approaches to be used in conjunction with one another.

One extreme approach is the excavation of land and the removal to landfills. The advantages of this approach is that contaminants in the soil are completely removed from the site, however this means the contaminants are not necessarily being dealt with, rather they have just been relocated. This approach would mean rapid remediation of the site is achieved as the contaminated land is completely removed from the site and replaced by unpolluted soil. This method can be used in conjunction with a cover system.

Another approach is containment, which prevents any movement of contamination in the soil. According to Nathanail and Bardos in Reclamation of Contaminated Land, “Containment remains the most widely used technique in contaminated land management in terms of the number of sites it is applied to and the volume of land or water managed.” The advantage of containment is that it can provide prompt risk management and incorporates relatively low costs. Containment can be used in conjunction with treatment-based approaches, which are slow to operate. Containment will halt the spreading of contaminants during the treatment based remediation process.

The application of containment can be through lining of the excavated space or by using a layer system such as a cover system. A cover system works to cover the area of contamination and prevents or limits the movement of contaminants.

Cover systems can avoid exposure of harmful materials to humans and vegetation. However, because the contaminants remain on site, a cover system in not an effective long-term solution.

Another form of containment is an in-ground

---

barrier. These barriers can be horizontal or vertical and act to separate the contaminated ground from its neighbouring environment.  

In a situation where the site does not require immediate remediation, natural attenuation can be used to remediate the land. Natural attenuation like its name suggests is a naturally occurring process where bacteria in the soil break down the contaminants in the soil. Planting vegetation on the site can enhance the attenuation process. This process can be combined with other remediation strategies.

Additional methods of soil remediation are solidification and stabilisation methods, which immobilise and capture contaminants. Solidification can be done with cement, pozzolans and lime. Thermal remediation is another strategy where toxic substances are removed through increased temperature of the soil; this removes or destroys these toxins by physical and chemical processes.

It is suggested that where remediation is taking place around buildings and other construction, these buildings can be retained for future renovation and modification on the basis that the continued use should not continue to be a source of land contamination. The remediation work will also be constrained by the presence of buildings.

It is important to note that there will be a number of factors that affect the chosen remediation strategy. This decision can come down to driving forces for the remediation project, risk management, technical feasibility, sustainability, cost versus benefits and sustainable development.

---

75 Hester, Harrison, Contaminated Land and its Reclamation. (Cambridge, GBR: The Royal Society of Chemistry, 1997) 48
76 Hester, Harrison, Contaminated Land and its Reclamation. (Cambridge, GBR: The Royal Society of Chemistry, 1997) 58
78 Nathanail, Bardos, Reclamation of Contaminated Land. (Chichester: John Wiley & Sons, 2005) 144.
3.2 The History of the Auckland Harbour

Reclamation

Due to its potential as a port, Auckland was chosen as the first capital of New Zealand; however the foreshore we see today would be unrecognizable to the first settlers in New Zealand.80

The waterfront, which was then defined by Fort Street, was the commercial area of the city. However Queen Street posed problems for the growth of the city as it was in the dip of a valley. To overcome this problem a reclamation plan was put forward and reclamation of the harbour began.81

The Auckland Provincial Council was given control of the Waitemata Harbour and for many years made improvements to the ports. The reclaimed land of the Auckland port provided an area for important marine and trading services.82

The Auckland Harbour Board. The Auckland Harbour Act saw the transfer of five thousand acres of the Waitemata seabed to the Auckland Harbour Board. The Board completed substantial reclamation work of the foreshore.82 Work was done around Mechanics Bay, Customs Street, Point Britomart and Hobson Street. Development of the area around Bledisloe container terminal was completed between 1904 and 1924. Marsden Wharf was built between 1909 and 1911. The Western Reclamation and wharf extension were completed in 1931.83

Due to the demand of the Second World War

---

additional storage facilities and land was required. Bledisloe Wharf was completed in 1948, Jellicoe Wharf in 1952, and Freyberg in 1961. The area of reclaimed land has become an archaeological significance.\(^{54}\)

3.3 Auckland’s Current Situation and Future Vision for Site

The waterfront master plan states, “The vision is for Auckland to be the world’s most liveable city.”\(^{55}\) Auckland is currently a hub for tourism, and commerce and is the centre for the marine and fishing industry.\(^{56}\) The waterfront is also home to many cruise liners, exporting vessels and ferries and holds one of the largest marinas in the southern hemisphere.\(^{57}\) Over the last four years the Auckland waterfront has seen many changes, with the upgrade of the rail station and development of the Britomart area with new shops and public spaces. North Wharf and Jellico Street have also undergone many changes with new public spaces, restaurants and the addition of the Viaducts Events Centre. Silo Park, once an industrial space, is a new development adjacent to the Western wharf, which has been converted into a public park with a playground and outdoor theatre. These developments are only part of what Auckland has planned for the future of its waterfront.

The master plan has a vision for Auckland to be green, well connected and accessible as well as culturally rich.\(^{58}\) It has placed this vision under five categories; a blue-green waterfront, which sees the waterfront taking on a sustainable approach; a public waterfront which allows for the area to be people friendly with public spaces and access to

---

\(^ {54}\) Silo Park, http://silopark.co.nz/about/ (accessed April 2nd 2012)
Fig. 31: Map of New Zealand. Image from http://www.spraypaintstencils.com/a-zlistings/new-zealand-stencil.gif.

Fig. 32: Location of Site - by Google Maps (www.google.com)

Fig. 33: Location of Site - by Google Maps (www.google.com)
the waters edge, while retaining its character and heritage; a working waterfront that maintains its marine and fishing trades; a connected waterfront which sees the connection of Wynyard Quarter to the rest of the waterfront, a city connected with public transport with new transport plans and ferry services and a liveable waterfront that provides mixed residential space.\(^{89}\)

3.4 Site Analyses and Present Status of Site

Two companies currently own the tank farm: Marstel Terminals Ltd who inhabit the northern end of the wharf and use the tanks for petroleum storage, and Bulk Storage Terminals Ltd (BST) who inhabit the tanks on the southern end that joins Wynyard Quarter, and use their tanks primarily for vegetable oil products. These tanks are currently in use until their company’s leases for the land run out. BST has one of the longest leases meaning they have right over the land until 2025.\(^{90}\)

The size of the Western Wharf is approximately 7 hectares with the tank farm occupying a large portion of that land. The remaining area is occupied by marine activities such as boat building facilities and berthing as well as a car import company.

In 1920 the Western reclamation began and in 1922 the Western Wharf was built with ferro-concrete, (however it needed to be rebuilt due to its collapse shortly after). The oil and timber trade used the wharf and in 1926 the first bulk oil delivery was made to the wharf and pumped into the new storage tanks.\(^{91}\) The wharf was constructed to provide additional berthing for boats and land for port activities.

From 2004 schemes for the development of Auckland’s waterfront and tank farm began and continues on today.\(^{92}\) With Auckland realising new potential for the waterfront land, the importance of connecting its waterfront, the arrival of the Marsden point pipeline (a pipe that now pumps petroleum down from Marsden refinery in Whangarei), as well as the expiration of industrial leases, which have not been renewed, the Western Wharf is becoming an area in need of a new use.\(^{93}\)

Seventy-seven steel storage tanks currently occupy the Western Wharf, 33 owned by Marstel Terminals and the remainder by Bulk Storage Terminals Ltd.\(^{94}\) This research project focuses on the redevelopment of the steel petroleum storage tanks at the northern end of the wharf owned by Marstel Terminals.

The topography of the land on which these tanks sit is relatively flat due to the site being

---


\(^{94}\) Eng, Doug, General Manager Bulk Storage Terminals Ltd, April 4th 2012 and September 17th 2012.
reclaimed land. The approximate area of this site is 2.5 hectares and is bordered by the harbour on three sides. The only current access to the site is via Hamer and Brigham Street. The Western Wharf is largely covered by concrete with little to no vegetation on site apart from a few sparse trees and a small strip of grass that runs along Hamer Street.

**Built form**

In addition to the analysis of the site on which the tanks sit it is also important to analyse the tanks themselves. The oil storage tanks on this particular site are steel cylinders consisting of riveted steel panels. The only visible difference in these tanks seems to be their size. However as they are used to contain petroleum products, as stated previously in section 2.6 they must conform to the code API 650. This code provides us with details on their required construction. The internal structures of these tanks could vary, however judging by their size and roof shape it is likely that these tanks have no internal structure; just relying on the concavity of their form to support them.95 One exception to this however could be the largest tank on site, which is forty meters in diameter. The roofs of these tanks are fixed pointed dome structures supported by trusses.

The tanks dominate other structures on the wharf in terms of their height and overall footprint. Apart from a couple of boat maintenance sheds and offices the tanks are the main structures on the site. The remainder of the site is covered with concrete pads and a car sales yard. The tanks range from twelve meters up to eighteen meters in height and have diameters of five to forty meters.96

The area within and around the tank farm is known for its marine and industrial heritage.

---

95 Eng, Doug, General Manager Bulk Storage Terminals Ltd, April 4th 2012 and September 17th 2012.

Character buildings such as Sailor’s Corner, the Sanford building, and the Auckland Harbour Board boat shed have been preserved to ensure Wynyard Quarter retains some of its character and history.

Transport

Hamer and Brigham Street, provide access for trucks and service vehicles. They are open to the public and it is common to find local fishermen using them to access the waterfront. The only other way to access the site is by boat. There is a deep-water berth for large ships and the Great Barrier interisland ferry terminal. It is possible to walk along the wharf however the majority of it is fenced off for private use. The area has little in the way of pedestrian footpaths. At present there is a tram service, which does a loop around Wynyard Quarter, one bus stop in the immediate vicinity of the wharf and two other bus routes a three minute walk away. The nearest train is at the Britomart train station, which is a fifteen minute walk along the new Te Wero Bridge. Wynyard Quarter has a car park as well as parking on the streets for people wanting to visit. There is definitely an opportunity to improve the transport to this area and increase its usability by way of public transport with more bus and ferry routes passing through the site. Cycle lanes and pedestrian friendly zones would also benefit the area, meaning less demands for private transport and parking. The Auckland master plan is aiming to improve transport to the site and its usability, however this project along with the existing concept for the site could look at enhancing pedestrian access around the immediate vicinity of the chosen site area.

Access

As the Auckland tank farm remains privately owned until its leases run out, the majority of the site is fenced off due to hazardous activities, preventing public access. The tank farm also cuts off the west of Wynyard Quarter from the harbour both visually and physically. Currently seven hectares of waterfront land remains inaccessible for public use.

When considering a new use for an existing structure it is important to consider the existing structures characteristics and insert an appropriate function for these particular characteristics rather than trying to adapt the structure for a function that may not be suitable. As well as the characteristics of the structure, the proposed function must also be appropriate for the context in which the project is located. This is essential for the success of the reuse project.98

Many possibilities were considered for this reuse project but after looking at existing precedents and the intentions of Waterfront Auckland for this area, an arts centre was considered an appropriate and exciting option.

The following chapter provides reasons for an arts centre and the proposed building programme.

4.1 Cultural/Arts Centre

Culture has been found to be an essential element of urban development. A report was published in 1983 called “The Arts as an industry” recognizes that artists, creative industries, and cultural activities play an important part in the creation of a thriving city.99

Evidence obtained from researching Auckland Council requirements, Waterfront Auckland’s proposed master plan for the tank farm, literature about successful cities and waterfronts, as well as...
as research into industrial reuse, supported the idea of a cultural centre on the site. This idea was backed up by Creative New Zealand (CNZ) about the importance of art and culture to a community and the value New Zealanders put towards them. The five key findings of a CNZ survey were; New Zealanders strongly support the arts in their community, there is strong interest in Maori and Pacific arts, young New Zealanders are increasingly involved in the arts, online engagement with the arts has increased significantly, and there is a large market for the arts in New Zealand.

The New Zealand Herald also published an article about the need for a contemporary arts centre in Auckland, with the suggestion being praised by the directors of the Auckland Art Gallery. These findings suggest that an arts centre of a contemporary nature would be an asset to Auckland city and would contribute to the character of its waterfront. Not only is an arts and cultural centre valuable to the community, it is also part of Auckland’s master plan and a big part of what Auckland is trying to achieve in its waterfront scheme.

Although there are many galleries in Auckland City these galleries are mainly focused on fine art, New Zealand and Pacific artwork or historic artwork. The proposed design is based on contemporary art as well as interactive artwork through the use of digital technology and media. The arts centre would not just display artwork but provide for in-house emerging artists. This provides an additional element to the experience of art, as the public would have the opportunity to view the artists at work and observe the process of design rather than just the final result. The artist is able to interact with the public, resulting in valuable feedback on their work. The arts centre would display a range of media in contemporary design. It is not just about selling pieces or displaying historic and well-known artists work. It would display work that represents our technological advancement in the world and allow for interaction with the work.

As mentioned at the beginning of this chapter, the chosen programme should be suitable for its context as well as appropriate for the structures characteristics. That is not to stay that the function must suit the characteristic of the structure, rather that the function chosen should be the most appropriate. In this case, the most suitable use has more to do with the location, however, the arts centre would also benefit from the large adaptable spaces the tanks provide. The tanks would allow for oversized art installations and have the flexibility to be adapted. They would also provide a new and exciting approach in the ways we can display art.

---

100 Creative New Zealand, “New Zealanders and the arts: attitudes, attendance and participation in 2011”. Creative New Zealand, 2011, 8
4.2 Proposed Function

The key purpose for the reuse of this tank farm is to create a cultural precinct that seeks to enhance the access to the site’s industrial heritage and restore public waterfront access whilst providing a facility for the people of Auckland to play and learn.

A cluster of tanks and their immediate surroundings have been identified as suitable for this arts centre. This group will be converted, with the theme of interaction and learning. Arts centres attract both local and tourists. They are one of the most visited destinations in the world.\(^3\) Due to the location of the tanks this would be beneficial, as the site will need a programme that draws people to the end of the reclamation.

The proposed design will be a combination of an arts, cultural and community centre with galleries, display areas, interactive digital artworks, suspended sculptural forms and art installations, public workshops, café and bar, performance space, functions and venue hire area, entertainment space and a place where young and a place for emerging artists. The arts centre aims to stimulate creative thinking, help children’s learning and provide a fun, playful environment for all ages to enjoy.

4.3 Scope and Limits of the Design

It is beyond the scope of this research project to develop a solution for the entire site. Therefore this project will focus on the architectural intervention for the group of largest tanks at the north-eastern side of the site, and a suggestive master plan for the entire site using the existing concepts by Waterfront Auckland. The master plan will indicate functions for the site and tank re-use, access ways and connections to surrounding areas.

\(^{103}\) Orsman, Bernard, “Patron calls for waterfront gallery to showcase contemporary art,” The New Zealand Herald, May 8th 2012.
4.4 Building Programme

Louis Kahn introduced the idea of served and servant spaces in buildings. This was seen in the design of the Richards medical lab Philadelphia in 1961. He recognised that services were to be a major part of the laboratory building and decided to distinguish the mechanical spaces from the laboratories by using a different language for each of these. These distinguished spaces were referred to as served and servant spaces.104 “Served” spaces can be defined as the reason for the building and “servant” spaces are the parts of the building that support the served spaces and enable each to function. Servant spaces are generally stairs, toilets, storage, lifts and kitchens.

Served Spaces

- A large performance space for cultural performances and live shows.
- Multiple functions areas for private and public use.
- Display spaces for a range of different types of artwork throughout the building.
- Public workshop areas for the use of art programmes for all ages.
- Artists work areas, providing a space for emerging artists to work whilst on show to the public.
- Cafe and bar to service the building during the day and encourage people to use the building in the evening.
- Tickets and information centre for exhibitions and activities happening within the arts centre.
- Gift shops that provides space to sell artists work.

Servant Spaces

- Offices for the staff working in the centre.
- Rooftop lookout and seating area.
- Toilets for public and staff.
- Stairwells and lifts to access the upper levels of the building.
- Storage space for artwork, art supplies and art equipment.
- Storage and changing room for performance space.
- A kitchen to service the cafe and bar.
- Truck access for supply deliveries for both art spaces and cafe.

---

Fig. 38: Served and Servant spaces.
5.0 DESIGN RESPONSE

The architectural solution for this project will take a similar approach seen in the examples of reuse in section 2.3. The examples analysed have a common theme of retaining the existing structure whilst having a low impact architectural intervention, to maintain the character of the structure and to not overpower it. The proposed architectural intervention will act to join the spaces in a non-evasive way.

5.1 Recognising Industrial Heritage

Considerations have been made with regard to heritage of the tank farm and its place in the history of Auckland city as an enduring feature of the oil industry in New Zealand. Any additions or architectural intervention seek to honour the tanks, not over power or take away from their existing geometry to a point where the tanks become unrecognisable. Tanks are not currently under heritage protection but their structures and the land on which they sit has heritage value.

The programme is based on a reintegration of the tanks into their new surroundings. It is important to note that any tanks that remain on site but stay unmodified as part of the strategy, need to be adequately maintained and made safe to remain.

5.2 Additional Considerations

A low impact approach is desirable to reinforce
the heritage importance of the tank farm. A low to medium intensity intervention would work well to ensure the tanks are not getting lost in the additional structure. The materials used for the intervention and additions to the tanks should complement the existing structures, not take away from their qualities, but show a contrast between the old and the new.

5.3 Analysis of the Tanks as Buildings

The tanks themselves provide many issues when converting them into a useable space. Due to their previous use, the tanks are not considered buildings, as they were never intended to be occupied. Therefore they present not only the standard issues of a re-use project such as ventilation, layout and natural light but issues to do with their existing structure. The tanks are designed to be occupied with bulk liquids, which help to support the cylindrical structures making them stable. As the tanks will not be supported by the liquids they held, they will need a structure inserted into them that substitutes for the liquid support in order to make them safe to occupy. Another issue with their design is that they are essentially steel drums, which will require thermal insulation to be introduced. The steel shell of a tank also requires fire protection.

As the tanks rely on the concavity of their shells for support any openings made in these structures would need to be braced to maintain the integrity of their structures. Additional structure is also needed for the floors and the spaces between the tanks to create the building.
5.4 Design Process

During the design process, many questions were raised about the reuse of the tanks as a building. Some of these questions along with the changes to the design are mentioned in the following chapter. For the full design process please refer to Appendix B.

5.4.1 Questions and issues that were raised with the beginning of the project and the first stages of design:

- What was planned for the immediate area as well as the surrounding area of Wynyard Quarter?
- Has this reuse been done before? Are there existing precedents to back up this idea?
- What part of the site and tanks will be focused on for the re-use?
- Tank sizes and construction of the tanks?
- What would be a suitable function for that area and what type of function would work with the spaces the tanks provide?
- Urban design for the site?
- What does the site deserve?
- How to go about creating an architectural intervention with the exterior of circular spaces, which are naturally hard to contain?
- Joining without losing the tanks in the interventions?

Fig. 40: Photographs of initial design for tanks.
Fig. 41: Exploring different ways of placing floors within the tanks.
5.4.2 Comments from First Critique - April 2012:

Need to keep the essence of the tanks, can’t completely destroy their existing structure?

Can these tanks be used by something that needs those shapes?

How is the land being decontaminated?

Need straight lines to form outdoor spaces people will stay in and link the cylinders.

How can the tanks be adapted to provide natural light and ventilation to the interior spaces?

Work with the interior spaces.

Intervene with architecture – push pull and puncture the skin of the tanks.

Need to find an architectural language and use it to create design.
5.4.3 Changes from Initial Design:

- After great consideration, I chose to develop the larger group of tanks, as they were more appropriate for what I was trying to achieve.
- New development and technique for architectural intervention – I found a language to use and began to understand how to use it.
- The proposed new development sits into existing master plan better than the previous site.
- The tanks are larger, making the spaces more suitable.
- Chose to enlarge the building – add more floors and height – built up around the tanks without losing their existence in the new design.
- No longer placed under elevated ground. The building has been opened up creating a visual difference between the old and the new.

- New facades for the design intervention that allow transparency.
- Changed the way of treating circulation, the circulation is now inside the building rather than around the tanks.
- Better use of the space available.
- Can relate to initial Auckland scheme.

5.4.4 Comments from Final Critique

– September 2012:

Need to overcome the prejudices of the tanks. They are not seen as buildings nor seen as industrial buildings. They were never intended to be occupied like a typical building. Therefore they will need to be adapted to function like a building.

Look into ways of stabilising the tanks when they are empty and the different techniques of doing this.

Don’t transition the new walls into the existing walls of the tanks as they start to get lost in the intervention.

Honour the geometry of the circles.

Design ways of providing ventilation and lighting to the tanks.

Fig. 43: Concept for new group of tanks.
Fig. 45: Initial concept drawing for new group of tanks

Fig. 46: Initial concept drawing for new group of tanks
Fig. 47: Initial concept drawing for new group of tanks
Fig. 48: Reducing the mass of the intervention.
Fig. 49: Looking at layout of building.
5.5 Design Strategy

5.5.1 Intervention

The architectural intervention for this project does more than contaminate the tanks with a new use. The intervention occupies the spaces between the tanks by linking this space together with the tanks to create a building that makes use of, not only the spaces within the tanks but also the spaces around the tanks. The proposed design takes great consideration for the existing structures and interacts in a way that the tanks existing forms are not lost, therefore retaining their form and identity. The intervention doesn’t imitate the existing structure, however it does seek to complement it.

The intervention respects the existing qualities of the tanks and chooses to express these qualities rather than hide them. The intervention places the existing structural shell on display and allows people to experience the inside of a tank, as it would be. Elements of the existing and the additions are exposed to maintain a raw industrial feel throughout the building.

The intervention for the tanks mainly avoids removal of large parts of the existing tanks walls. This is to reduce the harmful effect the changes would have on the integrity of the structures and the understanding of these structures history.

The existing structures have a significant impact on the guide of the design. The intervention is guided through the language of geometry, using the radius of the circles to project lines out from these centre points to create right angles with the tank. These projections create new spaces between the tanks. The use of right angles is to avoid creating any uncomfortable, awkward spaces that can occur with a circular object. The projections tie the building together and create new spaces in between the tanks that people will feel comfortable

Fig. 50: Exploring ways of interacting with the tanks through straight lines.

Fig. 51: Exploring ways of interacting with the tanks through the radii.
to use. Circles are enclosed forms, with the focus being inside the circle. Due to their shape the tanks create a repelling effect to everything around them, as the attention is directed on their centre rather than the spaces around them. The use of the radii and straight lines to interact with the tanks acts to reduce this repulsion and create spaces that people are likely to gather in and enjoy.

The building is designed so that visitors enter the building through the two largest tanks. The person is immediately confronted with these great looming structures on either side of them. The circulation through the building allows people to walk around part of the tanks and experience their vast size. The exposed structure expresses the way in which the tanks need to be supported and the structural relationship between the tanks and the additional structure that supports the building.

The majority of the building is maintained as it is, expressing this raw industrial feel the tanks create. One is able to look up and see the expressed conical roof truss inside the structures. The atmosphere and mood in the building varies from area to area. The building offers a variety of

Fig. 52: Looking at possible ways of placing floors in the tanks.

Fig. 53: Light translucent architectural intervention between the tanks.
atmospheres depending on the use of the space; from dark tanks illuminated by artificial light to naturally lit spaces in the workshops, café and area between the tanks.

The building aims to provide interaction with not only the artwork but also with the building and its inhabitants. The opportunity is provided to get up close to the tanks shells as well as being set back from them. Not only can one experience these majestic structures from the ground level, the opportunity is provided to experience them from a range of levels throughout the building.

The intervention includes multiple levels with overlapping floors and sky bridges that connect these spaces. The floors are recessed in places from the walls of the tanks to create atrium’s and openings that allow a sense of interaction and visual communication with the other floors. These openings also allow for a sense of verticality with in the building and space for interactive pieces of artwork.

The set back of floors allows light to penetrate down through the gap to the floors below, this aids in the natural lighting of the building. The intervention plays with light through openings in the floor, atrium spaces and roof materials. Light streams down through the roof illuminating the spaces between the tanks and enlightening the their exterior shells.

The buildings variety of spaces derives from the naturally dark spaces of the existing tanks, combined with the naturally light structure of the glass intervention.
Fig. 55: Tanks with architectural intervention
5.5.2 Distinguishing Old from New

The design shows a distinction between the old and the new. The tanks are enclosed steel forms with very little in the way of penetrations. The proposed intervention is a contrast to this as it uses glass to enable a transparency to the intervention, making it appear light in comparison to the tanks. The glass facade consists of a glazed double skin to control sunlight, wind, solar gain and temperature of the building. The glass is to distinctly show the transparency of the new in comparison with the ambiguous old whilst showing that these two elements are a single component. The glass acts as a buffer between the old and new showing the transition between these two elements whilst helping to maintain the pure forms of the tanks, preventing them from being overpowered and lost within the new structure. This along with the reduced mass of the building interior enables the tanks to stand strong within their new surroundings as the glass’s transparency enables the ability to see through the intervention to the tanks behind.

The existing shells of the tanks remain in their current state with the new complimenting the present structure. New components maintain this existing industrial atmosphere and additional structure and services are exposed within the building.

The additions complement and distinguish the new from the old, rather than blending the tanks into the new, which would result in the loss of their character and form. The intervention acts to show that they two are separate elements in the building however still linked as one.
5.5.3 Occupancies

The layout of the proposed building is essentially open plan with little in the way of separate rooms. It is designed to be adaptable and flexible with change of use when needed. This would result in the spaces being used more often as their flexibility allows for a variety of uses compared with fixed use spaces. The tanks remain largely unchanged and provide spaces for activities and display. All amenities are placed to the side of the main circulation route leaving a large adaptable space in the middle of the building. The tanks themselves have the ability to be adapted, however the largest tank has little in the way of structure and intervention, leaving the majority of the internal tank space open and free. This has been done as the space has a variety of uses, from a performance space, functions area, display space, and place to host live shows.

The large tanks at the southern end of the building have been contaminated with art displays, workshops and artist studios. A café is situated in one of the tanks to the north of the building, which opens out into a communal courtyard. A water feature as well as seats and planting is offered on the eastern side of the building to provide an outdoor space for people to enjoy the harbour views. This space has the ability to be transformed into an extension of the function area inside the building if need be.

5.5.4 Circulation

The main circulation route for the building runs around the perimeter of the largest tank, between this tank and the surrounding tanks. The building acts as a diversion from the outside pathways whilst still delivering people to the park at the end of the wharf. Off the central circulation route are the entrances to the tanks, lobby for the toilets, lifts and stairwells to access the vertical circulation in the building. This route provides access to all other areas in the building. The smallest tank in the group is being utilised for vertical circulation, fitted with a circular glass lift and spiral staircase, which wraps around the inside of the cylinder, it leads one up to all floors in the building.
5.5.5 Structure

In a project like this, and with any adaptive reuse project, it is essential to establish the existing structure and future requirements for the structure of the building. In this case it was necessary to reinforce the structural steel shell of the tanks and provide additional structure for flooring and walls.

As discussed in section 2.6, the tanks were designed to hold liquid. This liquid worked with the structural shell to provide support for the tank. As the reuse of these structures means the removal of liquid from these tanks, the tanks need a structure to replace the support of the liquid. Through analysis of existing reuse projects of this nature it was established that there are two ways of reinforcing this shell. One is to reinforce the cylinder by the placement of structure inside the tank; this would replicate the actions of the liquid by pushing the shell outwards to avoid possible collapse of the tank wall. The other option was to place the structure around the outside of the tank, rather than pushing the walls out like the interior structure, the exterior structure is attached to the shell and secures the shell in place to avoid internal collapse.

The chosen method depends on the desired atmosphere inside the tanks. Having the structure on the inside maintains the original facade of the exterior wall of the tank however placing the structure inside the tank could take away from the unique existing space inside. Therefore the technique used depends on the occupancy of the tank and atmosphere desired. The mixing of techniques provides an example of different ways to stabilise these structures and the different environments these techniques create, whilst providing variety in the design.

The Tate Modern offers an example regarding how one could approach reinforcing the tanks.

Fig. 57: Diagram showing possible types of structure.
structure. As mentioned in section 2.3.3, the tanks have a concrete insert placed within or around the walls of the tanks. This project however uses steel to reinforce the shell of the tanks as it complements the existing material of these tanks. Two techniques have been chosen to reinforce these shells. The first is an exterior structural system which wraps around the outside of two of the tanks. This system consists of a steel lattice work skin which is attached to the tanks wall and gives additional strength to the existing structure.

The second way of achieving the stability required is to retrofit the interior wall of the tank with steel framework which is attached to the tanks shell. The tanks also require insulating to reduce the heat gain from the sun and reduce heat loss through the shell in winter. Therefore the space in between the structure is insulated and has steel sheeting placed overtop to maintain the industrial nature of the tank.

The proposed design uses a variety of these techniques to stabilise and insulate the tanks. The display and performance tanks opt for external structure to maintain their existing interior features whilst the tanks accommodating the cafe and workshops opt for internal structure.

The load bearing structure of the architectural intervention along with the additions to the insides of the tanks is constructed with steel that is covered with a fire resistant coating. The steel columns are attached to the reinforced concrete flooring. Ring beams run around the outside of the tanks and are tied into the concrete flooring of the architectural intervention. This reinforces the tanks and reduces any lateral movement.

The floors do not rely on the tanks for support. Support is given to the floors primarily through steel frames and bracing. This allows the floors of the building to be recessed from the sides of the façade and tanks in selected areas where large atrium spaces are required for hanging art installations. It is important to note that the tank structure must remain separate from the structure of the intervention to allow for any lateral movement as this could result in the tanks shell being penetrate and damaged in the event of an earthquake.

Fig. 58: Diagram showing possible type of structure.
5.5.6 Envelope

A building’s envelope is essential in maintaining comfortable conditions inside the building. There are many functions required of the envelope; from moderating temperature variations, to controlling solar gain, as well as allowing light and ventilation into the building. The nature of this reuse project means that not only does the proposed building envelope need to work for the internal environment, but also the tanks envelope needs to be adapted to function as a building would. Tanks were never intended to be inhabited, they are designed to store materials, therefore the tanks have none of the characteristics of a building.

Insulation is to be installed in the tanks walls to control the internal environment and reduce heat gain during the day. Penetrations are made in the walls of the tanks that are used for workshops, artist’s areas and cafe to allow natural light into the structure. The shell of the tanks requires painting to protect the steel as well as on going maintenance of these structures to ensure fire protection and reduce any deterioration.

The envelope of the new structure consists of an innovative double skin glass facade. The double skin helps to control the internal environment of the building reducing the need for artificial heating and cooling. The facade acts to allow airflow through the air space between the two glass panels in summer, cooling the skin of the building. In winter the top of the facade can be closed off, trapping warm air in the gap between the glass, keeping the building warm and reducing any heat loss.

Glass was chosen for the double skin facade, as the building envelope needs to be transparent to allow the tanks to be visible through the added structure. Double-glazing is used to reduce solar gain and maintain indoor temperature. The facade has a double layer to stop the sun penetrating directly into the building.

Where the functions in the building need privacy, translucent polycarbonate panels are installed on the outer layer of the facade to allow privacy without losing the translucent feel of the building. These translucent walls will be on the north and south of the building, where toilets, lifts and staff areas are located.
5.5.7 Services

The required mechanical services are expressed throughout the building. These services are an additional component to the industrial feel and look of the building. Mechanical ventilation and sprinkler pipes remain exposed along the ceilings of each floor level. The intention is to leave components and services required in a building as they are and express these elements along with the structure.

The proposed building uses a combination of energy efficient active systems and passive to control the temperature and environment within the building. Passive systems include; the envelope design, to passively control the temperature as well as heat gain and heat loss from the building. The building’s envelope promotes natural light to the building within the new intervention. Natural ventilation is used where appropriate, generally in the cafe and entrance ways.

Stack effect ventilation is utilised inside the tanks to help cool these spaces during summer and recover this heat during winter. This is achieved by the placement of vents in the concrete slab ground, which release air into the room. This air then rises to the top of the conical roof where it is released through a vent in the roof or collected and recycled to provide warmth to the building.

The tanks allow for ventilation and natural light into these spaces by placement of glazed panels and controllable vents. As certain activities in the building require controlled environments the building uses active systems to control these spaces.

![Fig. 59: Air vents in the roof to allow heat to escape tank.](image-url)
5.6 Urban Design Solution

- Working with the existing master plan for the site
- Integrating the architectural intervention and the tanks into the existing master plan for the site whilst making minor changes to the immediate surroundings of the building such as the proposed building mass adjacent to the tanks, which currently overlap.
- Altering the adjacent building mass and the side of the proposed building to make them relate to one another and create a friendly courtyard space.
- Altering the directions of the paths as they hit the side of the proposed building and skew them at an angle to direct users to the entrance of the arts centre. The building is in a way acting as a dent in the otherwise very uniform and formal urban plan.
Adaptive reuse is becoming more common and accepted all over the world as people are becoming more aware of the value of our heritage. I wanted this project to explore the possibilities of adaptive reuse in structures other than a standard building or factory. The reuse of industrial structures has become a trend in recent years. Structures other than buildings are now being reused and converted into inhabitable places. New Zealand has not been at the forefront of adaptive reuse however over the last few years this trend has become more common. Not only can adaptive reuse conserve energy but it also preserves the memory of that structure.

The idea of the reuse of a storage tank was to try and change people’s views about these existing structures, even if they are considered “ugly” structures that “toxicate” our city, and to make people realise that although they are a representation of that toxicity they are also an important part of our history and culture. If we are to destroy these structures, that history is lost forever.

This project explores the reuse of these tanks and provides an example that these structures can become a viable part of our landscape whilst showing the possibilities of tanks in an adaptive reuse project. The research project shows that there are many possibilities with adaptive reuse and that it should not just stop at buildings. The precedents research demonstrates that industrial structures are now being recognised and have great value as reuse projects. They have been successful in their
conversions becoming economically viable as they attract many people.

A major drive in this design project was to interact with the tanks without destroying their existing character. Any alterations to the design needed to respect the structures that were already present on site and provide a sympathetic approach to the existing. The challenge of this project was how you go about doing this. How do you interact with a group of cylindrical structures that naturally focus on the inside, repelling what is external to them?

Research into industrial reuse further revealed the difficulty of this. These projects did not deal with the connection of more than one structure. From the beginning of the project I opted to retain a cluster of tanks, rather than just the one, to maintain the character and memory of that site. I did not believe that retaining only one structure had as great an effect as retaining a group of them; therefore I was left with the challenge of connecting these tanks together through architectural intervention to create a building that services these structures.

As well as deciding to retain a group of tanks and the need for a way to connect this group together, I needed to retain their iconic structures, whilst bringing these structures up to an inhabitable standard. The proposed design needed to connect the spaces between the tanks without taking away from them.

Overall, the design sits well into the proposed
scheme for the site. Small changes were made to the immediate surroundings of the tanks to accommodate them within the scheme. The height of the building did not exceed the height of the tallest tanks. The design decisions were made to ensure that the tanks were not lost within the architecture intervention and that this intervention would act as a support for the use of these structures.

The way in which the intervention would interact with the existing tanks was important to the scheme. After different concepts were explored about how to do this, it was decided that the architectural intervention would be inserted into the space between the tanks, rising up to their existing heights rather than just occupying the space on the ground between them, and creating a transparent structure in between to allow glimpses through the building to the surrounding tanks. I believe that the language used to create this space has been successful. By using the radius of the circle with straight lines, a usable space was created that brought the tanks together.

I believe that this project achieved the goals set in Section One. It is able to raise awareness of adaptive reuse and a viable development strategy to demolition. The project has also revitalised and integrated the tanks into their new surroundings whilst retaining their structures and shape and provides a cultural facility for all of Auckland to use.
7.0 BIBLIOGRAPHY

Interviews:

Sue Evens, Manager Urban Design and Architecture, Waterfront Auckland, March 19th 2012.

Douglas Eng, General Manager Bulk Storage Terminals Ltd, April 4th 2012 and September 17th 2012.


Auckland City Centre Waterfront Masterplan, Linking people, city and sea Waterfront Auckland,August 2009


Auckland city heritage walks, Auckland’s original shoreline, http://www.


Environmental Services Unit, “Parks and Heritage Forum Briefing”,


Gregory, Angela, “Alarm over city’s lost heritage sites grows,” The New Zealand Herald, August 13, 2008

Hermannsdörfer, Ingrid and Christine Rüb, *Solar design: photovoltaics for old...*


Lee, Uje, Dlle one thousand and one = Waterfront; resewing the city plaza and


New Zealand Historic Places Trust. “Heritage Management Guidelines for


Raymond, Crispin, “Cultural renewal + tourism, Case Study – Creative Tourism New Zealand,” CreativeNZ, September 2003


Silo Park, http://silopark.co.nz/about/ (accessed April 2nd 2012)


Auckland City, VISION 2040, Auckland Regional Council and Auckland City, December 2005


8.1 Vienna Gasometers, Vienna, Austria

Designer: Jean Nouvel, Coop Himmelb., Manfred Wehdo., and Wilhelm Holzbauer

Constructed: 1896 - 1899

Former Use: Coal-gas storage

Current Use: Multi purpose

Rehabilitated: 1999-2001
8.2 Taller de Arquitectura, Barcelona, Spain

Designer: Ricardo Bofill

Former Use: Cement factory

Current Use: Home and office

Rehabilitated: 1975
8.3 Annie MG Schmidt House, Amsterdam, Netherlands
Designers: Arons en Gelauff architects
Former Use: Sewage Silos
Current Use: Multi use entertainment complex
Rehabilitated: 2012
### Complete Design Process:

<table>
<thead>
<tr>
<th>Questions and issues raised at the beginning of the project and the first stages of design:</th>
<th>Architectural intervention with the exterior spaces around the circles, which are naturally hard to contain?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is planned for the immediate area as well as the surrounding area of Wynyard Quarter?</td>
<td>How do you join the tanks without losing the tanks in the intervention?</td>
</tr>
<tr>
<td>Has this reuse been done before? Are there existing precedents to back this idea?</td>
<td>Comments from First Critique - April 2012:</td>
</tr>
<tr>
<td>What part of the site and tanks will be focused on for the re-use?</td>
<td>There is a need to keep the essence of the tanks, can't completely destroy their existing structure.</td>
</tr>
<tr>
<td>What size are the tanks and how are they constructed?</td>
<td>Can these tanks be used by something that needs those shapes?</td>
</tr>
<tr>
<td>What would be a suitable function for that area and what function would work with the spaces the tanks provide?</td>
<td></td>
</tr>
<tr>
<td>What is the urban design solution for the site?</td>
<td></td>
</tr>
</tbody>
</table>
How is the land being decontaminated?

Series lines should be used to form outdoor spaces people will stay in.

How can the tanks be adapted to provide natural light and ventilation to the interior spaces?

Work with the interior spaces.

Intervene with architecture – push pull and puncture the skin of the tanks.

Need to find an architectural language and use it to create design.

Alterations to Design for Second Critique:

- I focused on one part of the site to develop – tanks at the very northern end of the site.
- Looked at the existing language of the tanks – stairwells running around the building – exterior stairwell. Pipes connecting at ground level – all circulation and features are on ground level and utilised these features in the design.
- Placed lifts in the centre of the cylinders
- Explored ways of dealing with the floors in an exciting and interactive way – cutting parts of the floors away, having them rotate around the lift.
- Perforating the skin of the tanks – light up at night.
- Systematic organisation – giving walls/lines a reason – use the radius of the tanks.
- Elevating the park by placing grass over the top of the building. This makes a bowl like feel to the park and elevates people at the end of the wharf.

Comments from Second Design Critique

- June 2012

Base design on the words that come from the site – contamination/artificial
Explore contamination and work into design
Prominent site – make it something exciting
Failed to capture the audience’s interest

Alterations after Second Critique:

- Rethought the idea of arts centre and went through and listed many possible functions for the tanks and decided which ideas I preferred for the site.
- Needed a strong justification for why an arts centre should be there.
- Played around with the idea of a learning centre incorporating a mix between Kelly Tarlton’s and Goat Island. A centre where people
could come and swim with fish, providing an experience that not everyone is able to experience, but without the dangers of swells, currents, and other dangers the ocean presents to inexperienced swimmers.

- Research everything needed for this centre but still wanted to connect it to the art idea. Creating a cultural learning centre for the public with fun activities.
- After weeks of playing around with this idea and visiting some examples of tank re-use and galleries I decided that I wanted to do an arts centre after all. After finding enough justification for putting one on that site my idea was justifiable and I went ahead with the idea.
- I wanted to create more than just an arts centre, I wanted the centre to be a learning and interactive environment for people of all ages. Where the public could come and get involved in the creative process and experience the artwork in a different way.
- I wanted the site to be a mix of uses, that was open extended hours helping to activate the site through the day and night. To give it functions such as an eatery and bar, performance and show space with functions area that would help activate the space at night.

Changes to Design after Second Critique:

- After great consideration, I chose to develop the larger group of tanks as they were more appropriate for what I was trying to achieve
- New development and technique for architectural intervention – I found a language to use and began to understand how to use it.
- The proposed new development sits into existing master plan better that the previous site.
- The tanks are larger, making the spaces more
suitable.

- I chose to enlarge the building – add more floors and height – built up around the tanks without losing their existence in the new design.
- No longer placed under elevated ground. The building has been opened up creating a visual difference between the old and the new.
- New facades for the design intervention that allow transparency.
- Changed the way of treating circulation, the circulation is now inside the building rather than around the tanks.
- Better use of the space available.
- Can relate to initial Auckland scheme.

Comments from Final Critique – September 2012:

Need to overcome the prejudices of the tanks. They are not seen as buildings nor seen as industrial buildings. They were never intended to be occupied like a typical building. Therefore they will need to be adapted to function like a building.

Look into ways of stabilising the tanks when they are empty and the different techniques of doing this.

Don’t transition the new walls into the existing walls of the tanks as they start to get lost in the intervention.

Honour the geometry of the circles.

Design ways of providing ventilation and lighting to the tanks.
Final Year Masters Project 2012

"Keep it Pumping"
Breathing new life into redundant storage tanks
1. Exterior perspective
2. Ground level floor plan
3. Level one floor plan
4. Level two floor plan
5. Exterior Perspective looking North-West
7. Interior perspective inside artists work area
8. Exterior perspective of main entrance way
9. Overall view of building
10. Section through largest tank.
11. West - East section through tanks.
12. Long section through building.
13. Perspective from lookout.
15. Upper level walkway perspective.