RELINK:
LIFELINE IN EQALUIT

By
Assal Bakhshandeh

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Postdoctoral Affairs
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in

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Azrieli School of Architecture and Urbanism
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Assal Bakhshandeh

RELINK:
LIFELINE IN EQALUIT

ABSTRACT

Re[link]- Lifeline in Iqaluit

Project Type: Conceptual Design
Team No.: Individual
Location: Iqaluit. Nunavut
Year: 2018

Architects draw. Drawing is fundamental to architectural thinking, communication and organization and this thesis explores the nature of architectural drawing by using speculative drawing methods as a form of research.

Architecture is not revolutionary itself, but has the capacity to position information in relationships that are a catalyst for creating productive dialog between inter-connected technological, environmental and societal systems. The speculative spaces produced in this work create new and multiple narratives through complexity on this site. As such, the drawings of the project are an examination of the abstract spatial possibilities, with particular attention to the quantifiable needs on such a challenging site. The speculative spaces produced through this process can be read as new narratives, new possibilities and new organizational structures for spatial thinking in the North.

The Arctic is an extreme landscape and sea ice is a significant factor in navigation and access in this area. It is unlike any other environment on earth and the approach to this work is sensitive to how one perceives this place. Architectural conventions are built on a common set of rules for perceiving and measuring space. Drawing from local cultural practices, this thesis investigates alternative drawing methods for an environment that is not easily perceived or measured by known architectural conventions.

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INTRODUCTION

This thesis is about drawing. It is not about a specific architectural proposal, but rather a drawn investigation to find spatial qualities born out of local conditions in an extreme environment. The drawing methods and techniques in this work are a response to the environment; the socio-economic conditions, cultural practices and natural landscape of the North.

This thesis began by examining the environment of Iqaluit, Nunavut. Located on Baffin Island, Iqaluit is geographically isolated from the rest of Canada. There is no road to Iqaluit, you fly in, or arrive by boat during the warmest weeks of the year when the pack ice dissipates. The average daily temperature in winter is -32 C and drops even lower with wind chill. Home to approximately 8000, Iqaluit is located at the western point of Frobisher Bay. 50% of its population are Inuit. Like many other Inuit communities, suicide rates are increasing among young adults. Increasing rates of suicide among youth in the Canadian Arctic is the biggest health problem of the North. While suicide rates are driven by a large variety of factors, it is clear there is a need for targeted intervention to improve the socio-emotional health of young people in Inuit communities.¹

The built environment is governed by codes, conventions and practices that protect public health and welfare. These codes, conventions and practices have been generated in response to environments south of the Arctic and do not address the socio-economic conditions, cultural practices and natural landscape of Iqaluit. Beginning with the assumption that known architectural conventions do not adequately address the Canadian Arctic environment, this thesis developed speculative methods of drawing that respond to the environment of this place.

These drawings are not meant to be read as plans, sections or details, but as spatial speculations and as the beginning of an approach to architectural drawing for the North. The title of this thesis, Lifeline, refers to this new method of drawing that is sensitive in its response to the socio-economic conditions, cultural practices and natural landscape of Iqaluit.

Arctic Map - Nunavut
 ◉ Iqaluit

Arctic Maximum Ice Extent

Arctic Minimum Ice Extent

Arctic Permafrost Coverage

Wind Direction - Nunavut

Arctic Shipping Route

OBJECTIVE OF THESIS

This thesis aims to use the environment of Iqaluit to generate speculative drawings as a form a research. The work addresses three areas:

1 - Socio-economic conditions: Existing architecture in Iqaluit, often typologies imported from the south, produce social isolation and this isolation spurns a variety of public health concerns. Social isolation is a contributing factor to substance abuse, sexual abuse, mental illness and suicide.

As new arctic shipping routes open through the Canadian Archipelago, it is likely that there will be an increase in Western influence and a coinciding increase in social isolation among Inuit people. This thesis seeks to develop new methods of drawing space that sensitive to the environment of Iqaluit as a prompt to find new approaches to architectural drawing that are sensitive to the socio-economic conditions of the North.

	2
City Plan, Iqaluit [2010]	
Pop: 6,699 [2011]	
Settled: 1942	
City status: 2001	
Area: 52,50km ²	
Density: 127.6/km ²	
Dwellings: 2,930

2 - Cultural Practices: Conventional strategies, such as separating residential areas from commercial areas at an urban scale or even the design of a kitchen at the scale of a home, are out of sync with traditional Inuit practices. Hunting, slaughtering, and food sharing are an essential part of Inuit social structure. These practices require temporary, seasonal structures. In other words, appropriate architectural strategies in Inuit communities are dynamic. Drawing from traditional Inuit cultural, this thesis aims to develop new methods of architectural drawing that are dynamic in nature and can both document and express the dynamism of traditional Inuit cultural practices.

3 - Natural landscape: Standard methods of mapping, documenting and measuring the natural landscape do not account for the extreme conditions of the North. Large annual deviation in solar cycles, extreme weather conditions, and large tidal flows make this landscape difficult to measure. The Inuit measure distance not in miles, but in "sleeps." One measures distance by calculating how many stops for rest are necessary to get from one destination to another. This method of measuring the landscape includes the impact that weather, topography, luck, skills, size of the group, etc. would have on the travel time. Learning from Inuit techniques for mapping and measuring the landscape, this thesis aims to develop new methods of architectural drawing that are perception-based and able to account for extremes of the natural landscape in the North.³

SITE ANALYSIS

This thesis began in a manner similar to many other architectural projects; with a site analysis addressing physical, environmental, economic considerations. Using the quantifiable information gleaned from this site analysis, I began proposing architectural programs and programmatic relationships on the site. The forms, spaces and architectures explored in response to this site analysis were drawn from pre-conceived notions and fundamentally felt out of place. I was practicing architecture from outside the perspective of the North. The analysis and proposals contained in appendix A represent the research that led to a shift in focus of the thesis toward the development of a drawing method more appropriately suited to this site.

DRAWING STRATEGY

CONCEPT:

Lifeline uses drawing as a form a research. Architectural drawing has the capacity to position ideas in productive relationships to one another and the three objectives of this thesis are intersected through a process of drawing that is sensitive to socio-economic conditions, cultural practices and the natural landscape of the North. Specific issues of suicide rates, dynamic cultural practices and perception of the natural landscape are addressed through the development of speculative, spatial drawings.

1 - Suicide: The death rate by suicide in Inuit populations under the age of 25 in Nunavut has increased more than six-fold over the previous three decades. Across all age groups, suicide rates in Labrador and Nunavut are nearly seven times the Canadian average. ⁴

Marc Stevenson, Principal of All Nations Services, outlined that Inuit suicide is directly related to regional economic transformation. The ruin of the seal skin market in the 1980s played a significant role in rising Inuit suicide rates. Such economic factors when combined with social isolation in communities like Iqaluit, have created a public health crisis. ⁵

2 - Dynamism: Dynamic cultural practices, historically connected to hunting and migration, are fundamental to Inuit social life. A successful hunt would have been celebrated with drumming and dancing. Drumming was banned for a time by the Canadian government and the traditional Inuit dance celebrations were suppressed. The loss of these traditions, among others, is directly connected to the increase in suicide rates. Traditional Inuit dance can be considered as a form of therapy for suicide prevention. Dance is a physical activity, stimulating circulation of the blood, oxygenation of the organs, and repairing the heart and the joints. Dance is also a cultural activity, connecting participants and viewers to historical traditions and ways of life.

3 - Perception: The natural landscape has historically been perceived and measured by the Inuit in relative terms. This symbiotic relationship between viewer and environment is a defining theme of traditional Inuit dances.

Iqaluit is a real place; the actions described are real actions. Drawings attempt to explore and deliver interactions between man, object, hidden forces of the environment and their engagement with space and the occurrence of events.

These set of drawings hang between reality and fantasy of deconstructivism which is a movement of postmodern architecture in 1980s."Deconstructivism gives the impression of the fragmentation of the constructed building. It is characterized by an absence of harmony, continuity, or symmetry." ⁶

Besides fragmentation, Deconstructivism creates non-rectilinear shapes and its finished visual appearance is characterized by unpredictability. ⁷

(A)

(B)

(C)

The drawings always presuppose a reality already in existence(A), a reality waiting to be deconstructed(B), and eventually transformed(C).

A series of preliminary drawings were developed by translating traditional Inuit dancing into a series of lines, shapes, color and movements. Motion is expressed through the incorporation of multiple perspectives and observed choreography in the dancing.

The work was developed iteratively, first by embedding the observed rules of the dancing into the drawings and then by building new drawings out of these systems of rules. The drawings create a system for architectural speculation that draws on the specific nature of this place. These experimental drawings allow for new interpretations of spatial possibility and reveal hidden forces through the exploration of technique.

The drawings are then translated back into rules for generating new drawings.

The work was further developed into a new series of drawings using four rules, each informed by the context of this place.

1 - Complexity, not simplicity. Seasonality shapes every aspect of Inuit life including housing. Inuit winter house and summer house are different. They live in the igloo and bone houses called Qarmaq during the winter. Igloo are made of snow blocks, and are quick to build. Seasonal change force them to make a transition from Igloo to the skin tents during the summer. Today temporary dwelling have been replaced by cabin that serve as shelters for hunting. The location of winter settlement varied annually. Based on research by anthropologist Milton Freeman, existing of the source of food was the primary reason for selecting a winter settlement.⁸

Multiple geometries, interpenetrating spaces, multi-perspectival spaces, overlapping and and the complex relationship between the context and the proposed spaces contribute to the complexity in drawings.

2 - It is full of tension. The Arctic region is basically a frozen ocean. The condition may be considered too tough for most humans. These forms consist of elements which dialogue in tension with each other: the geometrical fragment, in contrast with the linear transitional ways-red lines- reflecting the paradoxical nature of tension in the context.

3 - Spontaneity. "As Inuit say today is today and tomorrow is tomorrow and people can not predict future."⁹ This means that Inuit can not make firm plans for their travel path in order to catch food and they have to learn to accept and be adapted to the unpredictability of the future and change. Focusing on the importance of the process and moment in the COMPOSITION set of drawings is based on the inability of the human to predict the future.

4 - It is risky. Inuit believe that "Things happen when they happen as they happen"¹⁰ Such as attitude entails living in the moment and acting based on present circumstances. The COMPOSITION set of drawing shows how time-moment- and space are interlinked and if there is no experience of time, the space can not be defined.

COMPOSITION:

The freedom of form, belonging to the sphere of feeling, contains a kind of unformed orders which creates movement. And constantly changing visual scene happens while a dancer is dancing or when viewer is changing his point of view and experience specific moments. A number of deliberately awkward moments will be created which complicate the intersection of forms as a build space with its human occupation while they are not disconnected from the context. The discordant moments will be created as the viewer changes the visual scene and tries to interpret those scenes as a journey of space.

The dancer and the viewer are both in motion which creates a shifting viewpoint through the drawing. The viewer captures unexpected views of different level by changing the viewpoint and can move from one to another space. Every translation of space is a degree of freedom with multiple transformative qualities. It seems that multiple projections collapsed into one drawing.

These drawings consist of individual moments which are superimposed. The intention is to emphasize on the importance of the process.

The idea behind presenting a series of process drawing is coming from Inuit concept of time. As they believe that the people can not control over the future, "Inuit tend to emphasize the importance of process. If one is unable to predict what will get done, how things are done becomes important."¹¹ According to Inuit, time is perceived in terms of *durée*=duration or moments that flow into one other. Each moment exists individually, but they flow into something else when put together.

The main intention of using such these forms, is to reveal powerful hidden forces of the environment and adapt them to the need of the project. The hidden forces of this landscape are translated in to the language of forms which are taken from the nature.

Inuit believe human do not control the forces of the environment but, they must ally themselves to these forces to keep harmony between different forces and human being.

The important thing about the architectural approach to this work is that, architecture is about the action, event and what is happening in spaces while taking into account Northern cultural and climatological sensibilities.

The understanding of these spaces relies on the perception of the space (which allows us to take in, understand and make our conclusion) rather than sensation (information received through the senses).

RENDERING

Three lines of thinking for designing the project is specified. Each of which relates to Inuit culture (content) and the harsh environment (context) are summarized as follows:

1 - The first one is the existing limitation of the site for development: Frobisher Bay is the second place in the world which has the highest rising tide that makes the Iqaluit inaccessible most of the time.

2 - The second aspect is creating a social life and social acceleration along lifeline. Existing architectures in Iqaluit and unpredictable conditions produce social isolation and this project seeks new possibilities for social acceleration and suicide prevention.

3 - The third aspect is that of the positive economic impact to provide job opportunities and income for inhabitants.

The key concept of the project is of a line of diverse spaces: long, short, broad, or tall spaces, each with different lighting conditions focusing on the idea of emptiness and nothingness of the North. Each volume relates to the defined space of the building and the interior space is dominated by series of voids, transparent and translucent skins allow direct and indirect lighting into the interior spaces.

The building enclosure consist of solid and transparent volumes representing the connection between inside and outside space of the project. The unique geometry, scale and varying heights of each space offer organizational flexibility to accommodate different activity in each pod. The lightness of the transparent skins at different level, topped by solid part that float above, gives the building a sculptural quality. The use of different material reveals the programmatic uses inside: private spaces are exposed in solid form and public spaces are transparent, inviting viewer into the building.

The division of the interior space consists of the suspended pieces, capturing reflections of light penetrating the depths of the chambers coming into focus. To inhabit such a space is to exist between a multitude of possibilities.

By using movable boundaries to orginize public spaces such as fish market for different operation, space is gradually transforming into variant scales of subdivision, fragmented and isolated spaces, spaces that form in-between. Switching between these spaces allows for a manipulation of simultaneous chains of development. In effect, the lifeline project is an assemblage of spaces that are connected to the surrounding urban fabric, resonating with the linkage's role as a mediator between the Iqaluit community and the outside world.

Lifeline project pivots the new neighborhood to the downtown and transforming a vacant area of land into a dense, intense linear mixed-use neighborhood.

Dance for Inuit is to create a harmony between their physical world and spirituality. For Inuit their spirituality is connected to physical environment and life is seen as interconnected. Inuit use dance as a way to communicate with the spirit world.

Living in such a harsh environment is like dancing to create harmony between the environment and habitant in order to survive in complex condition and ensure that Inuit have a sound future are the goal of this project.

PROPOSED PROGRAMS:

POD1:

- Proposed Seaport
- Open and Covered Storages
- Temporary Residence for Travelers
- search Center
- Petroleum Tank

POD2:

- Fish Market
- Fish Storage
- Kitchen

POD3:

- Hotel
- Local Craft Market
- Tourist Information Center
- Educational Center

POD4:

- Residential Area

APPENDIX A - SITE ANALYSIS

Seventeen years ago, Iqaluit became the capital of Canada's farthest northeast territory, Nunavut. It was around then that it began attracting more people from the Canadian south and even around the world. It's now the smallest territorial capital in Canada, while Nunavut is the largest Canadian territory. Since 1980 the population of Iqaluit has grown from 2500 to 8000. So, the annual volume of dry good and petroleum products being shipped to Iqaluit have increased and other marine activities such as tourism have emerged as significant factor for consideration. So, that makes the development of new area of land for housing and infrastructure necessary. The Inuit leaders realized that new infrastructure would mean increased benefits to the communities in which they were located.

Iqaluit is located on the shore of Frobisher Bay, an arctic estuary. Estuaries are some of the most productive ecosystems on earth. Simultaneously, because of their geographic features, estuaries provide great opportunities for development and safe navigation. Frobisher Bay provides access to Iqaluit, and is home to Frobisher ship channel. This channel carries Iqaluit's cargo ships each year and is representative of the intertwinement of industrial infrastructure and significant habitat.

Beginning with the assumption that the marine industry will expand, this thesis asks how marine infrastructural strategies could develop to prepare for a future with low-impact development, estuarine recovery, supports the efficient shipping and trans-shipment of goods using the best environmental practices; and how the infrastructure necessary to serve and promote local industries including tourism, commercial fishing, mineral exploration and traditional pursuits could evolve.

“Much of Nunavut, Nunivak, and Nunatsiavuut, as well as many communities in Northwest Territories, rely on ports for access to shipped goods, fuel, and other basic needs.”¹²

The project provides speculative solutions for the considering future marine infrastructure such as an integrated deep-water port with a new extension to the downtown Iqaluit in one coherent system of commerce, transit and housing.

Iqaluit is strategically positioned to take advantage of new global shipping routes opening in the arctic. Iqaluit is a challenging location to build a port as it has the second highest rising tide in the world, with a 12 meter tidal flow. High tide in this area only happens 2 times during every 24 hours. So, ships have to stay far out at the sea, when they bring cargo and supplies. These supply have to be brought to the shore by barge and because they depend on tide levels, unloading can take several days. Deliveries taking place between late June and late October.

A new deep-water port is proposed and is the entry gate to the lifeline. "During the 1970s, a series of federal government studies led to preparation of a preliminary federal government engineering report in 1980 that recommended the construction of a concrete caisson wharf to handle the shipping of dry cargo and petroleum."¹³ The need for deep-water port facilities in Iqaluit has long been recognized by Iqaluit leaders and Federal government but the project did not proceed.¹⁴ The need for deep-water port facilitates serving all potential user groups of Shipping cargo, Fisheries, Tourism and Petroleum shipping.

Improvement marine industry supports:

1 - Cargo shipping

2 - Petroleum shipping

3 - Fisheries

4 - Tourist cruise ship

Shipping Cargo

The cargo can be unloaded to shore from the vessel for a few hours during each 24 hours period at high tide. So, cargo is transferred to shore by barge. Under the present system, there is a risk of damage to cargo due to the rough water.

A deep-water port would reduce time spend unloading by almost 80%, compared to current situation.¹⁵

Iqaluit Harbour Shipping Dates:		
General Cargo	JUN	NOV
Petroleum Products Tanks	JUN	NOV
Fishing Vessels	JUL	NOV
Passenger Ships	JUL	SEP
Coast Guard Icebreakers	JUN	NOV
Small Crafts	JUN	NOV

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Cargo Vessels: Days spent unloading [2003]	
Minimum Days Unloading	1
Maximum Days Unloading	14
Avg. Days Unloading	4.8
Average Number of Cargo	17

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Fisheries

Currently, fishing fleets operate out of Churchill, on Hudson Bay in Manitoba which is Canada's only Arctic seaport for ocean trade. It takes up to 12 days return trip to their home port and back to the fishing ground, a major loss in fishing time. "Construction of port facilities is considered to be a necessary condition for the development and viable operation of a summer inshore fishery within the regional economy."¹⁸ A deep water port would reduce time lost through retuning to port for resupply, refueling and product transfer reduce by 6 days and would help development of the inshore fisheries. "Shrimp fishing is a year round activity, starting in January in Newfoundland, reaching Baffin in late June and operating in the area until December."¹⁹

Currently there are 14 vessels fishing for shrimp, which hold up to 500 metric tones of products. These fishing vessels require facilities to unload product, cold storage facilities and services for food and fuel.²⁰ A port and lifeline would provide essential infrastructure to enable Nunavut to land and process its own fish resources.

Tourism

The transfer of passenger to shore and back to ship is extremely risky operations and only could happen in high tide due to the lack of facilities.²¹

Small Craft

Small craft operation depends on high tide which is almost 12 meters. Loading, unloading, transferring passengers and cargo can be done during 2 hours every 12 hours at high tide.

Petroleum Shipping

The current method of unloading petroleum tankers, creates a very high environmental risk. Time spend unloading could be reduced by 60%, from 16 to 6 days annually,- compared to current situation.²²

Petroleum Product Tankers: Days spent transferring products [2003]	
Minimum Days Unloading	2
Maximum Days Unloading	5
Avg. Days Unloading	3.3
Average Number of Petroleum Shipments	4.4

23

Existing services and accommodation in Iqaluit
(downtown):

- Banking: RBC, CIBC, First Nations Bank of Canada.
- Emergency services: RCMP
- Medical Services: The Qikiqtani General Hospital,
Dental Offices, Pharmacies,
Chiropractors, Massage Therapists, a Public Health
unit, a Family Practice Unit.
- Religious Services: Churches
- Schools: Four elementary schools, One middle school,
One secondary school.
- Daycare: Several daycares
- Recreational Services: Social Clubs
- Capital Suites
- Hotel arctic
- Frobisher Inn
- NorthMart
- Arctic Ventures Marketplace
- Baffin Island Cannery

Proposed Supplies in Lifeline's Pods:

At the first pod, creating a port, Temporary Residency for Travelers are proposed. The other suggestion is to create a basin on one side of the port and using the tidal energy system under water. So, as the water rise and fall, the movement of the water runs the turbine and it generate electricity for the whole site.

At the second pod, there is a fish farm, fish market, fish storage, kitchen. At the third pod, there is a hotel, art galley and local craft market on the midway between the entry gate and downtown Iqaluit. At the closest pod to the downtown Iqaluit, developing new area of land for affordable housing is proposed.

A linear city will be created along lifeline and an interconnected connection between each pod and landscape will be formed. It would be a city with different type of seasonal and permanent structure. The major activities take place in each pod and in between the pods, minor activities take place.

Construction of a entry gate and lifeline in Iqaluit would change the economics of the whole picture, making Iqaluit a gate to the northern part of arctic. The proposed seaport is taken as an entry gate to lifeline and the lifeline is creating a continuous connectivity between the sea port, air port and downtown Iqaluit. The viewer's uninterrupted journey through the project starts outside at the seaport, allowing visual connectivity into the other levels of the project. The sealift vessels carry containers in Arctic constitute a vital Lifeline on the water from southern to northern communities and proposed seaport in Iqaluit act as an entry gate for another Lifeline on the ground as well. "Despite the challenges, sealifting continues to expand with the opening up mining, global interest in the Northwest Passage route, and longer ice-free shipping periods."²⁴

Goods transport, airlift and sealift:

LEGEND:

- Nakasuk School
- Nunatta Sunakkutaangit Museum
- Northmart
- Iqaluit Centennial Library
- First Air Cargo
- Baffin Business Development Corporation
- Arctic Circle Dental Service Ltd
- Nunavut Auto-Heavy Equipment
- Carrefour Nunavut
- Judge's Anglican Cathedral
- CIBC
- Iqaluit Post Office
- Legislative Assembly of Nunavut
- Frobisher Inn
- Centres Service Canada
- Government of Canada Bld
- Nunatsiaq News
- Iqaluit MCTS and Storage Facility
- Airport
- Existing pipeline
- Primary snowmobile trails

PROPOSED:

- Proposed port
- Proposed Railway-LifeLine
- Proposed Pod

DEPTH CONTOURS:

- 0m - 5m
- 5m - 10m
- 10m - 15m
- 15m - 30m

GOODS TRANSPORT:

- 20' x8' container
- Goods
- Vehicles
- Construction materials

LEGEND:

- Location of Project
- Depth 10-15m
- Depth 15-30m

Bridge

Proposed Port

Urban Area Link

Landside Link to Seaside Link

Ship Turning Radius

TYPE OF VESSELS:

MV Mitiq 136m x19m

MV Avataq 113m x19m

LEGEND:

A Designated Area For Maintenance And Safe Storage Of Small Craft

Bridge

Free Stand Port Provides:
 -Docking Facilities
 -Covered Storage
 -Open Storage

Times and Heights for High and Low Tides

2017/12/04

Hour	00	01	02	03	04	05	06	07	08	09	10	11
Predicted Hourly Heights (m)	1.3	1.0	2.2	4.3	7.0	9.4	11.1	11.6	10.7	8.7	6.2	3.6

Hour	12	13	14	15	16	17	18	19	20	21	22	23
Predicted Hourly Heights (m)	1.5	0.6	1.1	2.9	5.4	8.0	10.0	11.0	10.7	9.2	7.0	4.4

Pro Forma

Item	Cost	Total	%Total
ACQUISITION			
Land Acquisition (per sq.m)	155	(5000 sq.m) 775,000	1.65%
SITE IMPROVEMENT			
On-Site Imp.	30,560,000	30,560,000	65.2%
Off-Site Imp.	2,423,000	2,423,000	5.16%
CONSTRUCTION			
New Construction(per sq.m)	173	(5000 sq.m) 865,000	1.84%
Contingency	7,517,096	7,517,096	15.99%
permits (per sq.m)	25	(5000 sq.m) 125,000	0.27%
Furnishings	75,000	75,000	0.16%
Engineering	2,127,480	2,215,480	4.7%
Site Utilities	2,444,000	2,444,000	5.2%
DEVELOPMENT COST		47,000,000	100%

REVENUES	Shipping Cargo	Shipping Petroleum	Fisheries	Tourism	Grants	Effective Gross Income
Year1	2,139,500	336,000	912,515	14,000	---	3,402,015
Year2	2,237,098	367,900	1,064,635	17,780	---	3,687,413
Year3	2,798,000	410,980	2,359,235	25,780	---	5,593,995
Year4	2,989,000	480,890	2,600,275	36,067	---	6,106,232
Year5	3,000,143	510,000	2,800,000	42,980	---	6,353,123
Year6	3,329,089	538,760	2,860,000	48,563	---	6,776,412
Year7	3,568,000	559,870	3,000,239	53,780	---	7,181,889
Year8	3,678,000	591,890	3,100,672	62,280	---	7,432,842
Year9	3,879,654	610,000	3,200,872	67,346	---	7,757,872
Year10	3,989,000	623,980	3,250,000	71,540	---	7,934,520
Operating Expenses	Management Fee	Maintenance	Insurance	Terminal Operating Cost	Total Operating Expenses	Net Operating Income
Year1	209,181	392,116	564,457	980,659	2,146,413	1,255,602
Year2	250,000	422,121	610,672	1,127,000	2,409,793	1,277,620
Year3	277,121	450,000	637,987	1,328,890	2,693,998	2,899,997
Year4	301,122	477,876	789,000	1,430,000	2,997,998	3,108,234
Year5	324,000	495,124	820,000	1,560,876	3,200,000	3,153,123
Year6	341,000	504,674	832,239	1,588,120	3,266,033	3,510,379
Year7	354,120	552,132	849,000	1,590,020	3,345,272	3,836,617
Year8	377,000	571,162	890,154	1,671,429	3,509,745	3,923,097
Year9	389,163	581,325	901,000	1,699,025	3,570,513	4,187,359
Year10	402,143	592,091	988,541	1,729,019	3,711,794	4,222,726

APPENDIX B -
SKETCHES & PROCESS

Port- Ground level floor plan
1:100

Port-Level2 floor plan
1:100

ENDNOTES

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