

A COAL MINER'S SHADOW

by

Adam Pelissero

Submitted in partial fulfilment of the requirements
for the degree of Master of Architecture

at

Dalhousie University
Halifax, Nova Scotia
July 2012

© Copyright by Adam Pelissero, 2012

DALHOUSIE UNIVERSITY
SCHOOL OF ARCHITECTURE

The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "A COAL MINER'S SHADOW" by Adam Pelissero in partial fulfilment of the requirements for the degree of Master of Architecture.

Dated: July 9, 2012

Supervisor: _____

Reader: _____

Reader: _____

Reader: _____

DALHOUSIE UNIVERSITY

Date: July 9, 2012

AUTHOR: Adam Pelissero

TITLE: A COAL MINER'S SHADOW

DEPARTMENT OR SCHOOL: School of Architecture

DEGREE: MArch

CONVOCATION: October

YEAR: 2012

Permission is herewith granted to Dalhousie University to circulate and to have copied for non-commercial purposes, at its discretion, the above title upon the request of individuals or institutions. I understand that my thesis will be electronically available to the public.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

The author attests that permission has been obtained for the use of any copyrighted material appearing in the thesis (other than brief excerpts requiring only proper acknowledgment in scholarly writing), and that all such use is clearly acknowledged.

Signature of Author

Contents

Abstract	vi
Acknowledgements	vii
Chapter 1: Introduction	1
Chapter 2: On Light	3
Perception of Light.....	3
The Articulations of Light	4
Our Demand for Light and the Receding Shadow	7
A Plea for Shade	9
Chapter 3: On Mining	12
History of Mining in Cape Breton	12
The Cape Breton Miners' Museum	18
The Theatre and The Men of the Deeps	20
Sheldon Currie's Critique of the Museum	22
George Orwell's Account of Coal Mining	23
Critique of the Current Museum	25
Chapter 4: Design Development	27
Themes in the Research	27
Designing the Terrible Darkness.....	33
Application Studies of Light in a Black Model.....	36
New Site – Former Colliery 1B + 26	40
Program Development.....	48
Chapter 5: Design.....	50
Entrance Shaft.....	54
Central Hall.....	56
The Music Hall.....	59
The Museum.....	64
Room 1A.....	66
Room 2A.....	69
Exhaust Room, 2B.....	74
Remembrance Room.....	77

Service Areas	80
Limewater Treatment Facility.....	82
Above Ground - Systems	84
Chapter 7: Conclusion	89
Appendix.....	91
References	92

Abstract

Light and shadow have the capacity to move us emotionally and create atmospheres that allow us to better understand stories. This thesis explores how light and shadow can propel the design of a music hall and museum space to commemorate the miners that lived and worked in the former industrial landscapes of Cape Breton, Nova Scotia, Canada.

Acknowledgements

I would like to recognize my supervisor Susan Molesky, and advisors Catherine Venart and Emanuel Jannasch for all of their encouragement, interest and effective criticism throughout this process.

To Ken Kam and Dale Arsenault, I will be forever grateful for your insight and advice.

To Beverly Nightingale and Steve Parcell for their patience.

Thanks to Ernie Hennick at the Ministry of Natural Resources in Nova Scotia.

It would have been impossible to complete all of this work without the help of Janelle Fillion, Justin Kennedy, Will Perkins, Daniel Toumine, Thomas Villiger and my good friend Brett MacIntyre. Your help was critical.

To my friends from near and far for providing me with laughter and encouragement, you were always there.

Finally, but most importantly, I would like to thank my family for their love and support. Words are never enough.

Chapter 1: Introduction

Throughout most of our lives we are surrounded by light. It has become so pervasive that near daylight conditions continue into the night through the use of artificial light. For twenty-four hours a day, three hundred and sixty-five days a year, we function irrespective of time because of the abundance of light. Only when we drift asleep do we find refuge in a veil of darkness.

We live in a world that is so saturated by light that it has become a resource we take for granted. This condition is the opposite for a miner working underground, because for him light is a refuge from the all-encompassing darkness. From the moment a miner descends below ground he is surrounded by total darkness mitigated by meagre artificial light sources. He understands how important light is to him - without it he would be trapped in total darkness.

For three hundred and fifty years coal mining was a way of life for the people of Industrial Cape Breton. However, since the 1960s the mines have been systematically shut down, the industrial infrastructure dismantled and the land remediated. The collieries that dotted the landscape and provided thousands of people with jobs have been effectively erased. The little that remains is a pock-marked landscape and stories from the people that remember what it was like to make a living below ground.

The delicate exchange between light and shadow can form the basis for architectural development to commemorate the forgotten landscapes of the Cape Breton collieries. Coal miners have an understanding of the dangers that reside in the shadows and the preciousness of a lit refuge. By creat-

ing a facility to recall their experiences I hope to develop a better understanding of how we understand light and shadow, and how it can be used to tell stories and evoke a sense of place and time.

Chapter 2: On Light

The topic of light is inseparable from architecture. Le Corbusier famously defined architecture as; “jeu savant, correct, et magnifique des volumes assembles sous la lumiere” (masterly, correct and magnificent play of volumes under the light).¹ More broadly he proclaimed that “nos yeux sont faits pour voir les formes sous la lumiere” (our eyes are made to see forms in light).² This interplay of light, space and form provides the benchmark through which we see and understand the built world.

Today, light in architecture has become more a function of maximizing utility, but light in the built space is more than just ensuring there is adequate light to work. This utilitarian notion minimizes the great effect that light has upon our daily lives and fails to acknowledge how light and shadow can connect people to each other and the landscape. Natural light is not only a dynamic force that changes throughout the day and into the night, but also changes depending upon geography. The light in an arid desert is different than the light in Nova Scotia, and the people in these regions see light and shadow in very different ways. This is why understanding light in a specific region becomes critical to maximizing its potential.



The light in Nova Scotia evokes a certain closeness due to the climate. Natural light is typically filtered by clouds that diffuse the light, and create a more uniform experience.

Perception of Light

William Lam outlines the technical reasons of why we should understand the importance of light in his book *Perception and Lighting as Formgivers for Architecture*. He demon-

¹ Le Corbusier, Jean-Louis Cohen, and John Goodman, *Toward an Architecture* (Los Angeles, Calif: Getty Research Institute, 2007), 31.

² Ibid.

strates the many ways that light can work within a building to ensure that a building's performance is maximized and recognizes that our own perception is key to making the building desirable. On perception he quotes William James by stating that

Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no interest for me. My experience is what I agree to attend to. Only those items which I notice shape my mind – without selective interest, experience is an utter chaos. Interest alone gives accent and emphasis, light and shade, background and foreground – intelligible perspective, in a word. It varies in every creature, but without it the consciousness of every creature would be a grey chaotic indiscriminateness, impossible for us even to conceive.³

Lam further states that “perception is not simply a passive recording process which receives and processes all incoming sensory stimuli indiscriminately [...] The unconscious biological mechanisms of perception handle most of this sorting and selecting automatically, although they require time and experience to learn how to do so.”⁴ In this case, the role of the architect is to perceive and filter relevant information to compose meaningful space.

The Articulations of Light

Henry Plummer offers an ephemeral perspective with an itemized list of the various effects that light has within the built environment. He decomposes light and its uses into a series of qualitative experiences, and describes the usages and effects that these have had throughout time and today. His observations provide a subtle, nuanced view of the effects of light and offer a better understanding of how light

3 William M. C. Lam, *Perception and Lighting as Formgivers for Architecture* (New York: McGraw-Hill, 1977), 17.

4 Ibid.

can become evocative of time, space and place. The categories include:

Evanescence: given that buildings are physically static forms, natural light displays of movement and subtle variations that enliven the space between the forms. Understanding these changes through time and how they relate to form laid the foundations for how architecture was developed in pre-historic times.

Procession: is the ability for light to “seduce and attract”⁵ the inhabitant through various spaces that are “rewarding and memorable.” This continuous flow through spaces is established either in a linear progression, or more recently in a maze-like fashion that allows the user greater autonomy. Light seduces the user through these spaces.

Veils of Glass: the use of glass over the past century has developed a certain interest in transparency. On the one hand, clear unobstructed views through a large pane of glass that seemingly disappears can be derived from Enlightenment ideas of clarity and intellect. On the other hand, the ambiguity provided by translucent glass heightens the experience of the glass itself and establishes a certain sense of mystery.

Atomization: the usage of a screen to aerate the light and selectively reduce the it provides shifting conceptions of depth and softens the harshness that can be attributed to direct sunlight.

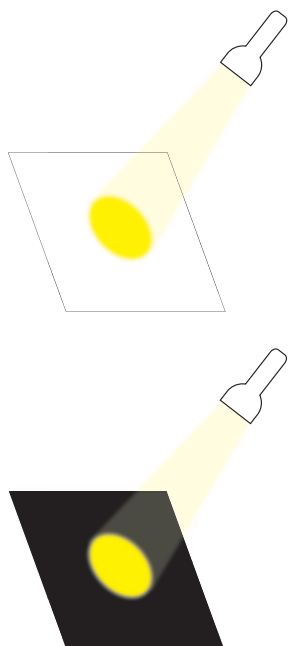
Canalization: by carving voids from the solid of a buildings mass, it is possible to channel light into even the deepest of

5 Henry Plummer, *The Architecture of Natural Light* (London: Thames & Hudson, 2009), 54.

buildings. Contemporary methods for this include offsetting voids for light to travel through the building skin and directed into very specific places. The result is a mixture of direct and indirect light that is greatly affected by the materiality of the reflecting surfaces.

Atmospheric Silence: since light cannot exist by itself, it is perceived as what it actually reflects upon. Homogenous surfaces can provide a clarity and unity of understanding, thereby amplifying the overall atmosphere of a place, instead of glorifying specific forms or items found within that space.

Luminescence: light has the capacity to inhabit material and produce an outward glow. Following this path often explores the “material imagination, as opposed to the formal imagination.”⁶



Greater contrast between lit and unlit areas increases the importance of the focal region thereby creates a more dramatic situation.

Much effort has been spent examining the importance of light in the built realm. However, the shadow has often been overlooked as an important reality in architecture. If we use William James’ concept of how intelligible perspective subconsciously defines what he attends to, the shadow becomes an integral part of the equation. For example; if we decide to shine light on an object it denotes a focal point – therefore that object must be important because we are highlighting it. However, the shaded area around the focal point becomes just as important because it frames our focus. Taken to its natural extension, the more dramatic the contrast between the frame and the subject (light and shadow) the more important the focal point appears.

6 Ibid., 218.

Our Demand for Light and the Receding Shadow

Le Corbusier's legendary use of light is accompanied only by an acknowledgement of shadow as light's counterpoint. As Ingeborg Flagge points out; "Le Corbusier did devote an unusually great deal of attention to light. After all, it was he who was responsible for the definition of architecture as the play of bodies under the light; but for him shadow is devoid of any magical reality and does not possess a significance of its own, except as a counterpoint to light."⁷ For example, Le Corbusier's use of the *bris soleil* to achieve a more evenly illuminated space is a prime example of his interest in light. His interest in maximizing the amount of natural light into a given room makes sense given that during his time this was not the norm.

If Le Corbusier only acknowledged the presence of shadow, then Louis Kahn could be considered its master. For Kahn, "all material in nature, the mountains, the great rivers and we ourselves are extinguished light, and this decayed mass that we call material casts a shadow, and the shadow belongs to the light."⁸ He further states that: "on the threshold, the point where light and shadow cross, lies the sanctum of art [...] This is a treasury of shadows. Everything that consists of light casts a shadow. Our work is shadow work, and it belongs to the light."⁹

Louis Kahn's adulation of the shadow was unfortunately brief. After the time of his work increasing amounts of light

⁷ H el ene Binet, Roberto Casati, Werner Oechslin, and Tadao And o, *Das Geheimnis Des Schattens: Licht Und Schatten in Der Architektur = The Secret of the Shadow : Light and Shadow in Architecture* (T ubingen: E. Wasmuth, 2002), 73.

⁸ Ibid., 69.

⁹ Ibid., 70.

became the norm and a sort of demonization of shadow developed. Flagge states that “since the rapid triumph of the digital pictorial media, reflecting today’s culture of ever brighter images and conception and the influence that exerts on architecture, shadow has been on the retreat and is threatening to disappear.”¹⁰

We can acknowledge the receding of the importance of the shadow in our own homes as large windows are often a key selling feature in residential developments. The book *Illuminating: Natural Light in Residential Architecture* notes that since greater attention has been given to residential architecture in the past century “the idea of bright and open living spaces in particular, more than any other, has taken root in our minds as the epitome of modernity and zeitgeist. ‘Light-flooded’ homes are being built everywhere to satisfy our seemingly insatiable hunger for natural light.”¹¹

Our demand for light is also realized through the development of new technologies that rely on light to communicate messages. “With television, the limits to visibility fall away: the final, most space-consuming opening brings a new source of light into the home, the televisions and computer screens and their anticipated successors (...) are turning into a new genre of lighting.”¹² Every time someone interacts with new technologies they are feeding a hunger for more light. This increased light in the private sphere is also recognized in the public space through colourful traffic signals and low-pressure sodium street lights, glowing fluor-

10 Ibid., 65.

11 Michelle Corrodi, Klaus Spechtenhauser, and Gerhard Auer, *Illuminating : Natural Light in Residential Architecture* (Basel; London: Birkhäuser ; Springer [distributor], 2008), 9.

12 Ibid., 21.

escent store fronts and flashing LED billboards - thereby ensuring a twenty-four hour lit city.

A Plea for Shade

The abundance of light has become so pervasive in our modern world, that the shadow and how it interacts with the light has been rendered meaningless.

[Kenneth] Frampton once remarked that modern architects often forget that man needs twilight, a reduced volume of light, needs darkness in order to find rest. In Frampton's opinion, we should eliminate half the glass we used in buildings today in order to prevent a constant increase in the floods of light that nowadays suddenly ambush us inside buildings, and to give shady rooms a chance.¹³

The beauty that dwells in the shadows was celebrated in the essay by Jun'ichiro Tanizaki entitled *In Praise of Shadows*. He states; "so benumbed are we nowadays by electric lights that we have become utterly insensitive to the evils of excessive illumination."¹⁴ The essay continues with a celebration of the richness that lies in shadows. The suggestions, the unanswered questions and the unknown that live in the shadows allow our own creative mind to fill in the gaps of what we don't see. At one point in the essay, Tanizaki comments on the beauty of the luminescence of gold in shadows.

How, in such a dark place, gold draws so much light to itself is a mystery to me. But I see why in ancient times statues of the Buddha were gilt with gold and why gold leaf covered the walls of the homes of the nobility. Modern man, in his well-lit house, knows nothing of the beauty of gold; but those who lived in the dark houses of the past were not merely captivated by its beauty, they also knew its practical value; for gold, in these dim rooms, must have served the function of a reflector. Their use of gold leaf

13 H el ene Binet et al, *Das Geheimnis Des Schattens*, 75.

14 Jun'ichir  Tanizaki, *In Praise of Shadows* (New Haven, Conn.: Leete's Island Books, 1977), 36.

and gold dust was not mere extravagance. Its reflective properties were put to use as a source of illumination.¹⁵

The beauty of how materials, like gold, behave in shadow demonstrates a depth and dynamism that, in my opinion, outperforms the most intricate construction detail or the most outrageous building form. Peter Zumthor is captivated by how light and shadow interact with materials. From Zumthor's book *Atmospheres*:

Walter De Maria, an artist in America, showed me a new work he'd done for Japan. It was to be a huge hall – two or three times the size of this barn. And it was to be open at the front and completely dark at the back. And he had put two or three gigantic stone balls in it: solid stone, quite enormous. Right at the back there were wooden bars, coated with gold leaf. And this gold leaf – we all know this but it really touched me when I saw it – the gold leaf shone right from the back of the room, out of the deep darkness. Which means gold seems to have the capacity to pick up even the smallest quantities of light and reflect them in the darkness. That was an example of light.¹⁶

In both cases, the beauty of gold could only be seen in the darkness. The shadows were used to alter and enhance perception. Light was not indiscriminately shone on gold to highlight its presence, but was allowed to dwell in the shade and seductively reveal itself with only a glimmer. The shadow acted as a frame around a carefully articulated totem. Without the shadow frame, the true worth of the totem would have been lost due to the lack of dramatic contrast.

In my opinion, being sensitive to our own needs for light and shadow and the beauty that can exist in these realms can tell stories, create moods and define an evocative sense of place.

Light is clearly a necessity for our modern world. In the

¹⁵ Ibid., 23.

¹⁶ Peter Zumthor, *Atmospheres: Architectural Environments, Surrounding Objects* (Basel; Boston: Birkhäuser, 2006), 57.

light we are better able to work, interact, learn, or accomplish any number of tasks that allow us to be productive members of society. As the pace of our world increases we demand more and more light - modern man demands prospect. However, as light becomes more abundant we are numbed to its value. With this dependence on light, the shadow remains useless.

The dynamic relationship of light and shadow is the elixir that enlivens our natural and built landscapes. We must not overexpose our world with light in an effort to maximize our productive possibilities because although we demand prospect, we still need refuge. That refuge resides in understanding that we need both shadow and light in our lives.

Chapter 3: On Mining



Davy Safety Lamp used in the mines near Glace Bay.



Miner's Helmet Lamp
Source: Coal Action Scotland.

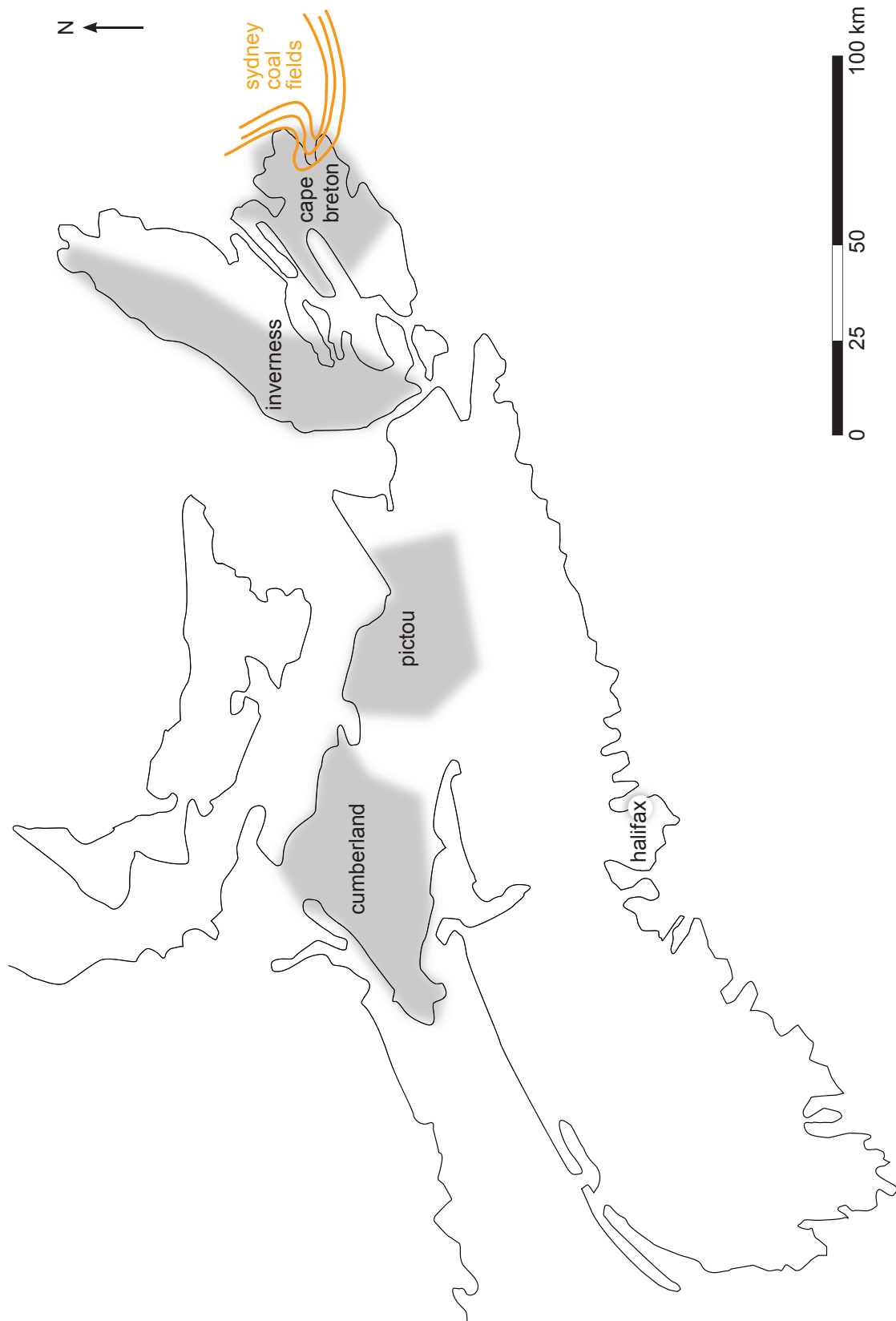
Over a hundred years ago coal mines were the backbone that supported the advancements of the Industrial Revolution. The men that toiled in the coal mines were cloaked in total darkness except for limited artificial light from Davy lamps or helmet lamps. In this world, darkness was all encompassing and light was a precious refuge for these workers. This condition is the inverse of our modern world in which we are accustomed to perpetual daylight. As demand for coal gave way to other forms of energy, mines have been shutting down but the memories and stories they leave behind are important to our modern history.

History of Mining in Cape Breton

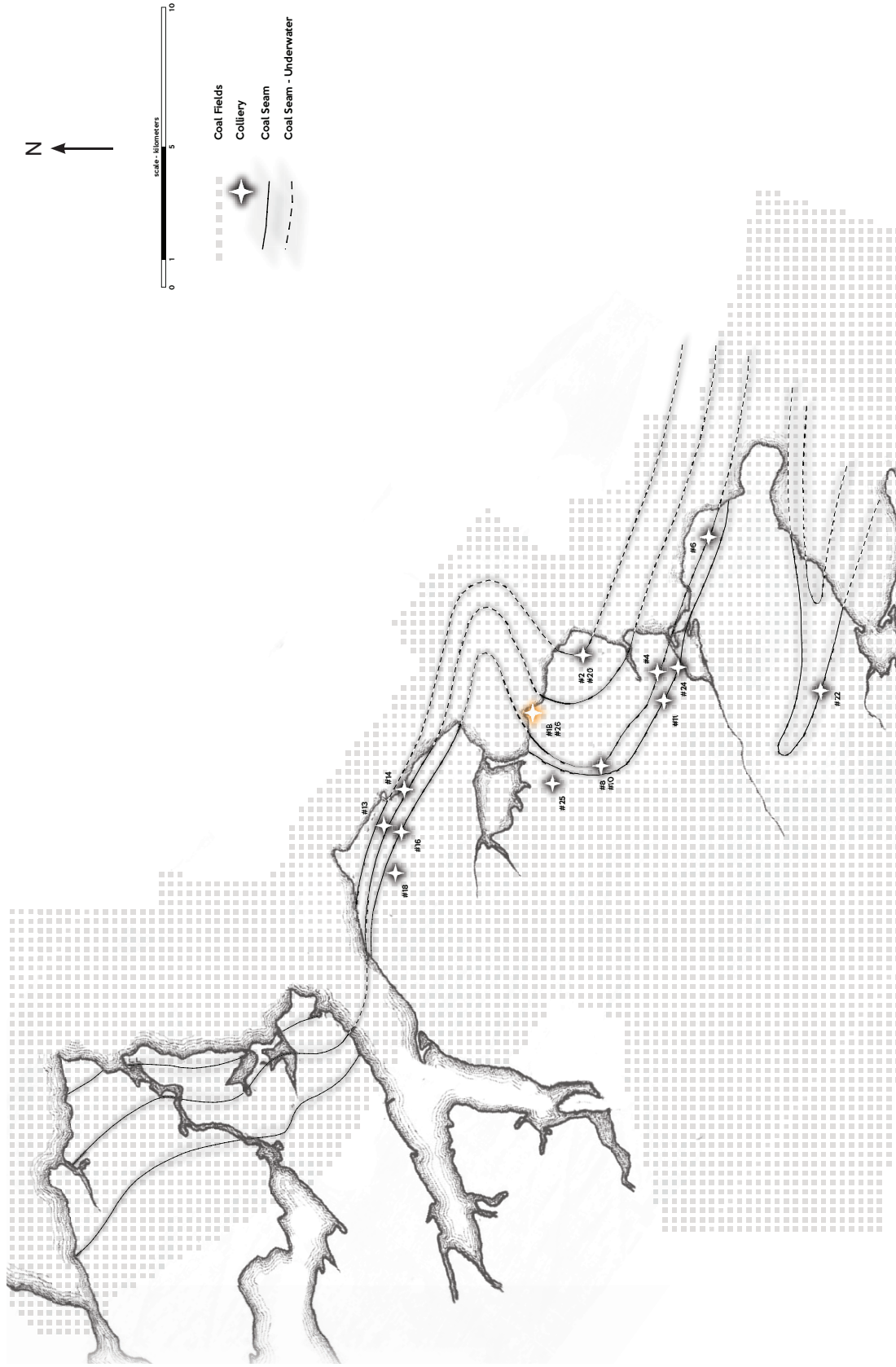
Three hundred kilometres northeast of Halifax in Cape Breton, Nova Scotia, lay the Sydney Coal Fields. Coal has been mined in that region since 1685 and it was the region's main economic driver.¹⁷ Starting in the 1960s, the policy of the Government of Canada has been to slow the coal extraction, close the mines and remediate the land.¹⁸ This has been effectively implemented and most of the jobs that accompanied the industry are gone along with the infrastructure that defined the landscape. The infrastructure gave an indication of the riches that lay beneath the soil; the history of the place; the urban planning rationale; the stories from the men that worked in the mines, and; their families. What exists now is a strange void on the land where these industrial giants once dominated.

¹⁷ Louis Frost, "History of Sydney Coal Field." *Mining History Nova Scotia*. 28 May 2000. <http://www.mininghistory.ns.ca/lfrost/lfintro.htm>.

¹⁸ Tom Ayers, "Devco ready to dissolve." *Cape Breton Post* (Sydney), 19 October 2009, Environment section.



Coal mining counties in Nova Scotia. Sydney Coal Fields in Cape Breton County labelled in orange.



Map showing the coal seams extending under the Atlantic Ocean and the collieries in Industrial Cape Breton.
 Source: Louis Frost, "History of Sydney Coal Field".

In 1964 an internal document was written to provide a better understanding of the size and the scope of the coal mining operation in Industrial Cape Breton. This document is known as the Louis Frost Notes and was prepared for the Dominion Coal Company, the largest coal company in the region. It provided an understanding of the depth of each mine, the condition of the coal, the height of the coal seam and the extent to which each coal field had been mined.

For example, Colliery 1B was located in Glace Bay and started in June 1924. The colliery was 55 yards from shore with a coal hoisting shaft measuring 31'2" by 13'4" and an air and man hoisting shaft 12' in diameter. It accessed mainly accessed the Phalen Seam which was 7' thick. At the time of Louis Frost's writing the colliery produced 17,022,961 long tons of coal. Output at the time was 5,000 tons of coal per day and it was estimated that the colliery could mine for another 80 years (until 2044) with approximately 2,882 acres already worked. A trolley locomotive haulage system was built in the mine that was 3 1/2 miles long (5.6 kilometres).¹⁹ This is but one account of the numerous mines in the region.

The Dominion Coal and Steel Company (DOSCO) ceased operation in the late 1960s because it was consistently losing money. In 1967 the Government of Canada nationalized DOSCO and the Cape Breton Development Corporation (DEVCO) was created to divest the coal mine operations and develop other industries for economic sustainability. This eventually became the Enterprise Cape Breton Corporation (ECBC) in 2009, and continued its mission of closing the collieries and remediating the former industrial land.²⁰

¹⁹ Frost, "History of Sydney Coal Field."

²⁰ Ayers, "Devco ready to dissolve."



No. 26 Colliery, Glace Bay. (Also the site of 1B)
Source: Nova Scotia Archives, 1977.



Site of Former Colliery No. 1B + 26, 2010.
From Google Maps, 2010.



Former site of Colliery 1B+26, 2012.

ECBC and its previous incarnation successfully dismantled the former collieries and has since been working to remediate the sites into a more hospitable landscape. However, the remains of the former collieries and their workings are unmistakable. The former industrial giants that dotted the landscape have been replaced by open fields and a pock-marked landscape that elude to a former livelihood.

This livelihood was born out of the sweat and toil of the miners as they attempted to make a living extracting the coal from beneath the earth's surface and below the sea floor. This was extremely dangerous work that resulted in over 2400 deaths between 1838-1992 in all of Nova Scotia.²¹ Additionally, countless injuries, physical dismemberments and breathing problems plagued the miners as they worked the coal seams.



Victoria Junction - facility dismantled, but before remediation.
Source: Public Works and Government Services Canada.



Victoria Junction - after remediation.
Source: Public Works and Government Services Canada.

21 "Nova Scotia Mine Fatalities, 1838-1992," Nova Scotia Archives, last modified May 1, 2006, <http://www.gov.ns.ca/nsarm/virtual/meninmines/fatalities.asp>.

The Cape Breton Miners' Museum

In 1966 the Cape Breton Miner's Museum was built in Glace Bay just in time for Canada's Centennial.²² It was designed to "pay tribute to the region's long and rich history of coal mining."²³ The form of the Museum was designed to resemble a colliery – with tower suggestive of the head frame and an angular roof to mimic the lines of the collieries. Concrete walls support an open-web steel joist roof structure that is clad in red brick and asphalt shingles. Some wood elements adorn the inside with black painted walls providing the backdrop for the curated museum space.

Among the exhibits is a video of a day in the life of the miners, a brief explanation of how coal is formed, some geological information, a display of some of the tools and lamps used to while below ground, a small exhibit of life above ground in the towns, a film about the demise of the coal industry and a tour of a recreated mine.²⁴ There is a small theatre for approximately 120 people - painted white and



The Cape Breton Miners' Museum

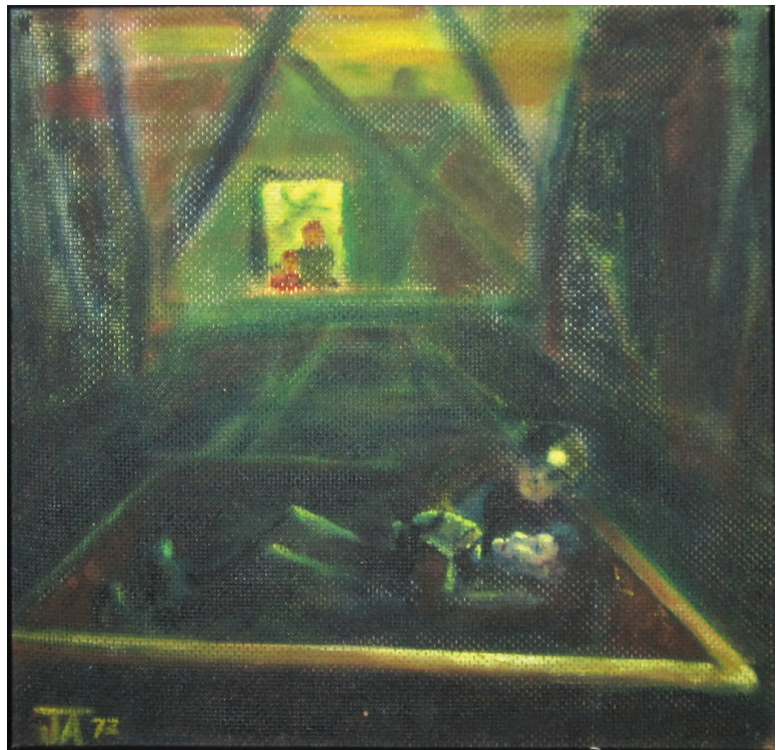
22 "Contract is Open Only to Designers in Nova Scotia," *The Chronicle-Herald* (Halifax), 13 February 1965.

23 The Cape Breton Miners' Museum, "Miners' Museum – The Museum," http://www.minersmuseum.com/the_museum.htm (accessed 29 October 2011).

24 Site visit. November 7, 2011.

without windows. Atop the exhibition space sits office space and a small archive for storage. All programmatic elements are arranged in a pin-wheel fashion around a main entrance hall. The museum communicates the factual occurrences of mining, but stops short of evoking an aura or mood.

Perhaps the most moving display in the Museum is a series of paintings by Jack Lily MacLellan. With paintings entitled *Explosion*, *A Fall of Stone*, and *Open Coffin* ideas of the hardship inherent to working in the mines becomes legible. *Explosion* depicts a miner in front of a fireball that was most likely ignited when sparks ignite the poisonous gases that are always a danger. *A Fall of Stone* shows a man pinned beneath a rock that collapsed while he was working, and *Open Coffin* shows a coal bin being used to bring the lifeless body of a miner to the surface. These images begin to show the hardships that are inherent in working hundreds of meters below the earth's surface.



Jack Lily MacLellan, *Open Coffin* (painting)



Jack Lily MacLellan, *Explosion* (painting)



Jack Lily MacLellan, *A Fall of Stone* (painting)

The Theatre and The Men of the Deeps

The Museum has a small theatre that is home to the coal miner's choir, The Men of the Deeps. The group was formed in 1966 by retired and current coal miners and has become enormously successful with numerous albums and world-wide tours. From the groups website: "a special sense of authenticity is given to the group by the presence of several retired coal miners who recall vividly the days when coal miners were looked upon as 'second class' citizens,

forced to eke out a living mining coal in hazardous conditions while their lives were almost entirely dependent upon the company.”²⁵

The group sings songs describing the toil of working in the mines, and the effect it brings. One of the chorus’ to their songs describes the persistent dust that lingers in the air:

Dust in the air,
 All through the mine.
 Its concrete on your lungs,
 And you’re old before your time.²⁶



The Men of the Deeps performing.
 Source: Innovative Business Solutions - Special Events.



The theatre at the Cape Breton Miners’ Museum in Glace Bay.

25 The Men of the Deeps, “History, News and Reviews”, 16 Feb. 2009, <http://www.menofthedeeps.com/historynewsreviews.html>.

26 Gregbord. “Savoy Theatre Men of the Deeps Rita 1.” YouTube, 01 July 2009, <http://www.youtube.com/watch?v=-qD42gnAjo4>.

Another song builds on the idea of chronic breathing problems with this verse:

The coal seams rich and gleamin'
 Ay, it's far beneath the soil.
 Black gold is what they call it
 And it's won with sweat and toil.
 But when your shift is overlook
 And you've gone to have your rest.
 You'll never get to spend black gold
 Whilst lyin' on your chest.²⁷

The Men of the Deeps offer a direct account of the effects of extracting coal on the miners and the hardships inherent in their work. The unvarnished, poetic account by these men offer a sincere account of their experiences. The directly personal nature of their song offers an appropriate emotional tenor compared to the more factual account of the Museum.

Sheldon Currie's Critique of the Museum

Sheldon Currie is a writer from Cape Breton that felt compelled to write a short story when he heard of the Cape Breton Miners' Museum.²⁸

The original short story was inspired by the highway sign announcing the Cape Breton Miners' Museum in Glace Bay – a museum built while the author Sheldon Currie was living away from the region. Sheldon told the CBC broadcaster Shelagh Rogers that when he saw the sign he asked himself what a miners' museum might look like, what kind of monument would speak to the reality of mining as he knew

²⁷ Ibid.

²⁸ Refer to Appendix.

of it growing up in Reserve Mines, down the road from Glace Bay. What he imagined was a museum that included the horrors of coal mining, with arms and legs nailed up on the walls.²⁹

Upon finally visiting the museum, “he [Sheldon] remembered in particular an inner room, glassed in like a greenhouse, with a big table displayed open account books – lists of shareholders who once owned the mines. And came away wondering whether it was more the Dominion Coal Company Stockholders’ Museum.”³⁰ Currie felt that the museum should speak of the “terrible darkness, low pay, sudden physical dismemberment and brutally hard work – that included more of a coal miners shift and his family’s life, constantly at the financial and physical edge.”³¹

George Orwell’s Account of Coal Mining

In 1937 George Orwell wrote his account of the living conditions of the working class in Northern England entitled *The Road to Wigan Pier*. For three months Orwell lived and researched in the industrial regions of England to ensure his writing authentically portrayed the dramatic conditions of the coal mines. He wrote of the cramped living, poor hygiene, malnutrition, bad food and unemployment that characterized the region.

In the second chapter of his book he described the coal mine as his impression of hell, with “heat, noise, confusion, darkness, foul air, and, above all, unbearably cramped

29 Sheldon Currie, *The Glace Bay Miners’ Museum: The Novel*, (Wreck Cove, Nova Scotia: Breton Books, 1995), 117.

30 Ibid., 119.

31 Ibid.

space.”³² He also described the Davy lamps and electric lamps as scarcely able to penetrate the clouds of coal dust, thus rendering it quite dark.

You cannot see very far, because the fog of coal dust throws back the beam of your lamp, but you can see on either side of you the line of half-naked kneeling men, one to every four or five yards, driving their shovels under the fallen coal and flinging it swiftly over their left shoulders. They are feeding it on to the conveyor belt, a moving rubber belt a couple of feet wide which runs a yard or two behind them. Down this belt a glittering river of coal races constantly.³³

Orwell wrote of the immense horizontal distance that the miners had to travel underground before they could actually mine the coal.³⁴ The spaces became more cramped as one pushed into the depths of the mine. Orwell also described “mysterious machines of which you never learn the purpose, and bundles of tools slung together on wires, and sometimes mice darting away from the beams of the lamps.”³⁵ “You creep through sacking curtains and thick wooden doors which, when they are opened, let out fierce blasts of air.”³⁶ Orwell wrote of the pain that he felt when he traveled in the mines because his muscles were not accustomed to moving throughout the depths, and stated that the miners themselves always discussed the ‘traveling’ as very hard work.

The picture that Orwell painted of work in the mines was grim. The conditions below ground were paired with paltry living conditions above ground. At the time of his writing, most people in England were not aware of the conditions

32 George Orwell, *The Road to Wigan Pier* (London: Secker & Warburg, 1959), 21.

33 *Ibid.*, 22.

34 *Ibid.*, 25.

35 *Ibid.*, 26.

36 *Ibid.*

because these towns were so far removed from the bulk of the population. Yet, these places were the backbone to the industrialized world at the time. Orwell states; “their lamp lit world down there is as necessary to the daylight world as the root is to the flower.”³⁷ Orwell’s graphic depiction of the working and living conditions was praised when it was published. It is little wonder why because the accounts of what comprised a normal day for the coal miners is as shocking now as it was when first written.

Critique of the Current Museum

The written words of Sheldon Currie and George Orwell, the paintings of Jack Lily MacLellan, as well as the songs of The Men of the Deeps offer a moving account of the experiences of coal miners. When comparing the richness of these works to the current Cape Breton Miners’ Museum, the facility does not seem to give justice to the experiences of the miners and the hardships they faced. While the building houses a factual account of the development of the mines and the rationale for their existence, it stops short of providing a moving architectural experience to convey a miner’s story. Additionally, due to its siting there is a certain placelessness to the Museum that does not effectively represent the rich built landscape that once dominated Industrial Cape Breton. Located in the middle of a suburban fabric, it seems oddly out of place. This makes sense given that the current Miner’s Museum was built on a former landfill site that, upon discovery, seems to devalue its experience.

37 Ibid., 34.



Current site of the Cape Breton Miner's Museum with overlay of a map from the 1950s. Source: Google Maps.

Chapter 4: Design Development

Themes in the Research

While researching the culture, the stories and the landscapes of Industrial Cape Breton themes started to emerge. Those themes are: *resistance*, *loss*, *repetition* and *closeness*. Abstracting these concepts into models and drawings served as the basis for architectural development.

Ideas of *resistance* come from the grueling physical labour that miners endured to extract the coal from the earth. As machines took over the physicality of mining may have subsided, but the resistance of the coal is undeniable given the size and ferocity of the machines required to tear the coal away from the seam. *Resistance* was also realized in the political struggles that the miner's waged in defiance of the coal mining companies and the government. In the early twentieth century the Communist Party was very active in Cape Breton because it was a staunch advocate for miners' rights.³⁸



Resistance+Loss.

Detail photo of the gap created where wax was melted out creating a void. Several metal wire columns provide structural support for the concrete top portion.

38 Michael J. Earle, "The Coalminers and Their Red Union: The Amalgamated Mine Workers of Nova Scotia, 1932-1936," *Labour / Le Travail* 22 (Fall, 1988): 105.

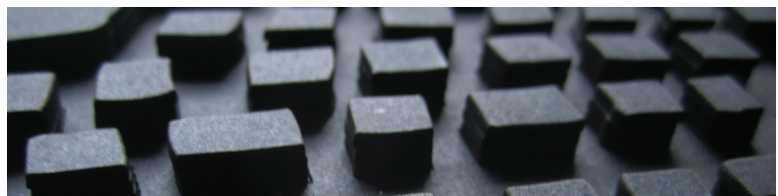


Resistance+Loss.

Concrete mass with metal wire running throughout to provide tensional support. Concrete was poured in several stages to allow the mixture to set and form striations with wax substituted for two of the stages. Wax was melted out of the lower level to expose structure and create a void.

Loss is an evident theme due to the 2426 coal miner's that lost their lives since records were kept.³⁹ Lesser told are the other physical effects of mining like the loss of limbs and the chronic breathing problems felt later in life. When a miner was not able to work because of these circumstances the family had to deal with the loss of wages and livelihood. Finally, since the Government of Canada decided to close major mining operations, the region lost the infrastructure and the economic benefits that it brought.

Repetition. The type of work a miner does on a daily basis is highly repetitive. There is consistency in their work, and consistency of their product. The extraction left a highly organized, repetitive pattern throughout the coal seam that evokes an urban streetscape. Above ground, this repetitive urbanity is evident through the company houses that miners lived in at the beginning of the 20th century. Finally, many of the miners can identify themselves as a second, third or fourth generation miners within their families.

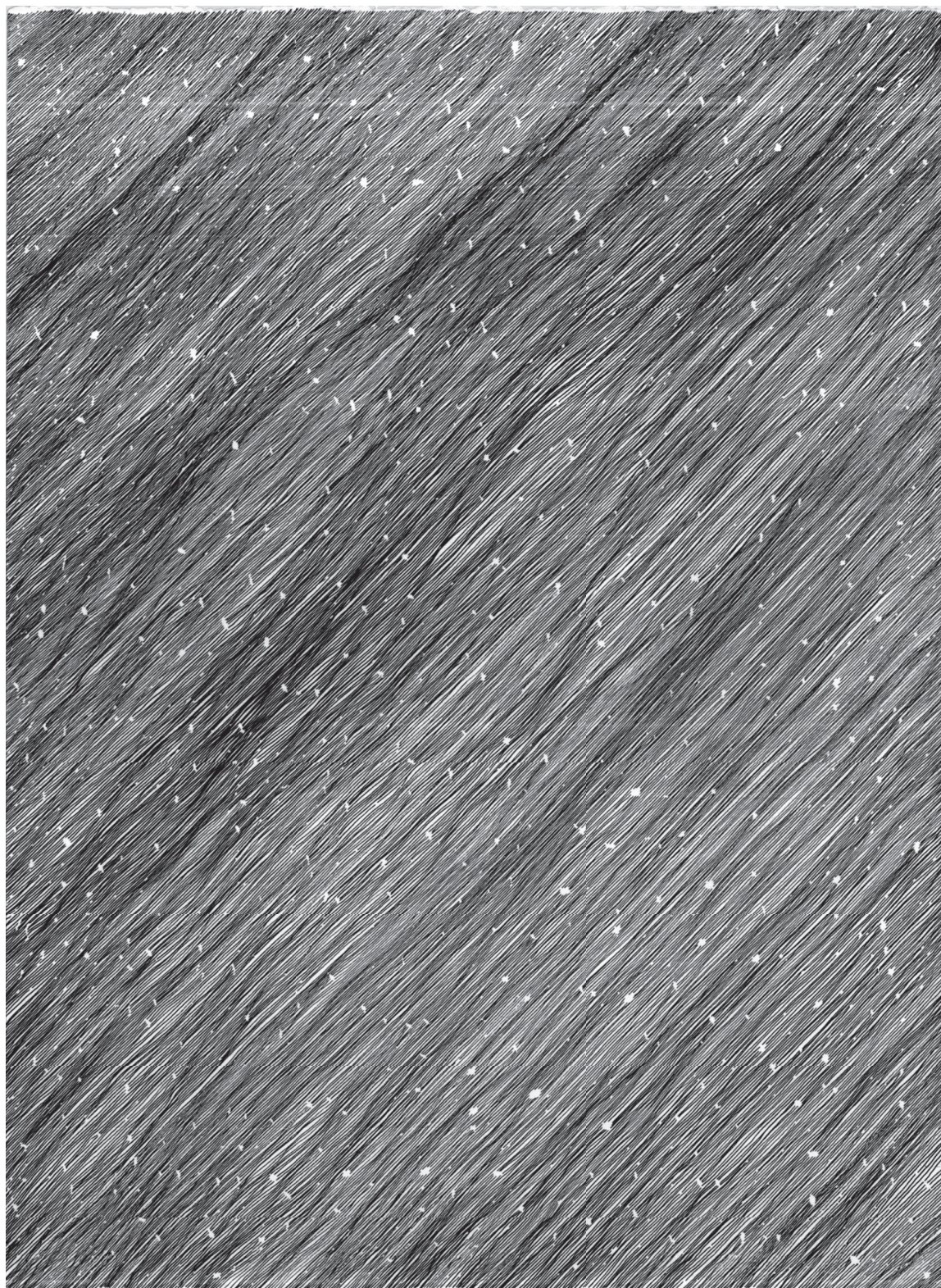


Model made from plans of a mine. Pillars of coal would be left to provide structure for the mine to ensure it did not collapse.



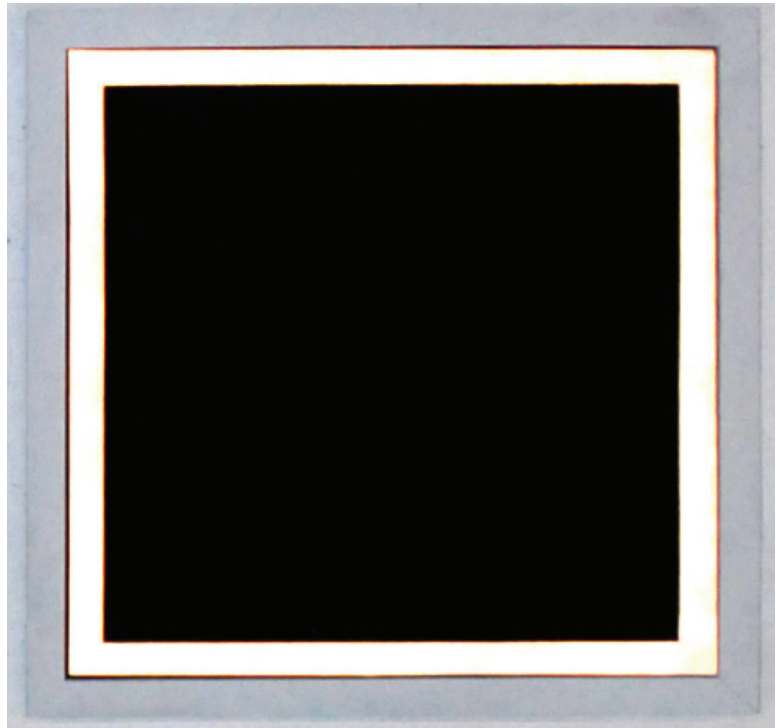
Housing provided by the mining company in Cape Breton.
Source: Nova Scotia Archives, 1909.

³⁹ Nova Scotia Archives, "Nova Scotia Mine Fatalities, 1838-1992," <http://www.gov.ns.ca/nsarm/virtual/menmines/fatalities.asp>

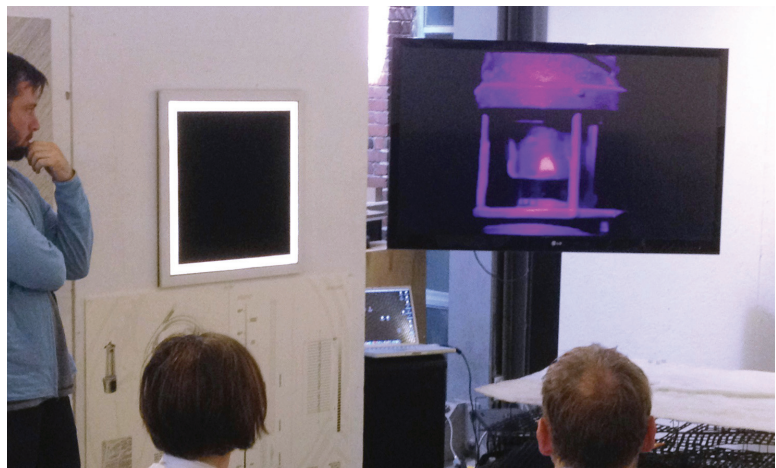


Repetition. Thematic drawing. Black pen on watercolour paper. Original size 22" x 30"

Closeness. On the landscape the region's sky has a close proximity to the land due to the low hanging clouds as a result of the climate. Additionally, the people of the region seem to share a tight bond both within the family and the community. This is especially noticeable between miners, with many of them working in the same work crew for their entire working lives. The men also worked in close, cramped working conditions underground.



Closeness. Thematic model.



Closeness. Thematic model installed in wall for thesis defense.



Closeness. Thematic model. Black painted hardboard with LED lights installed behind paper, inset into a wall. 21" x 21" x 48"

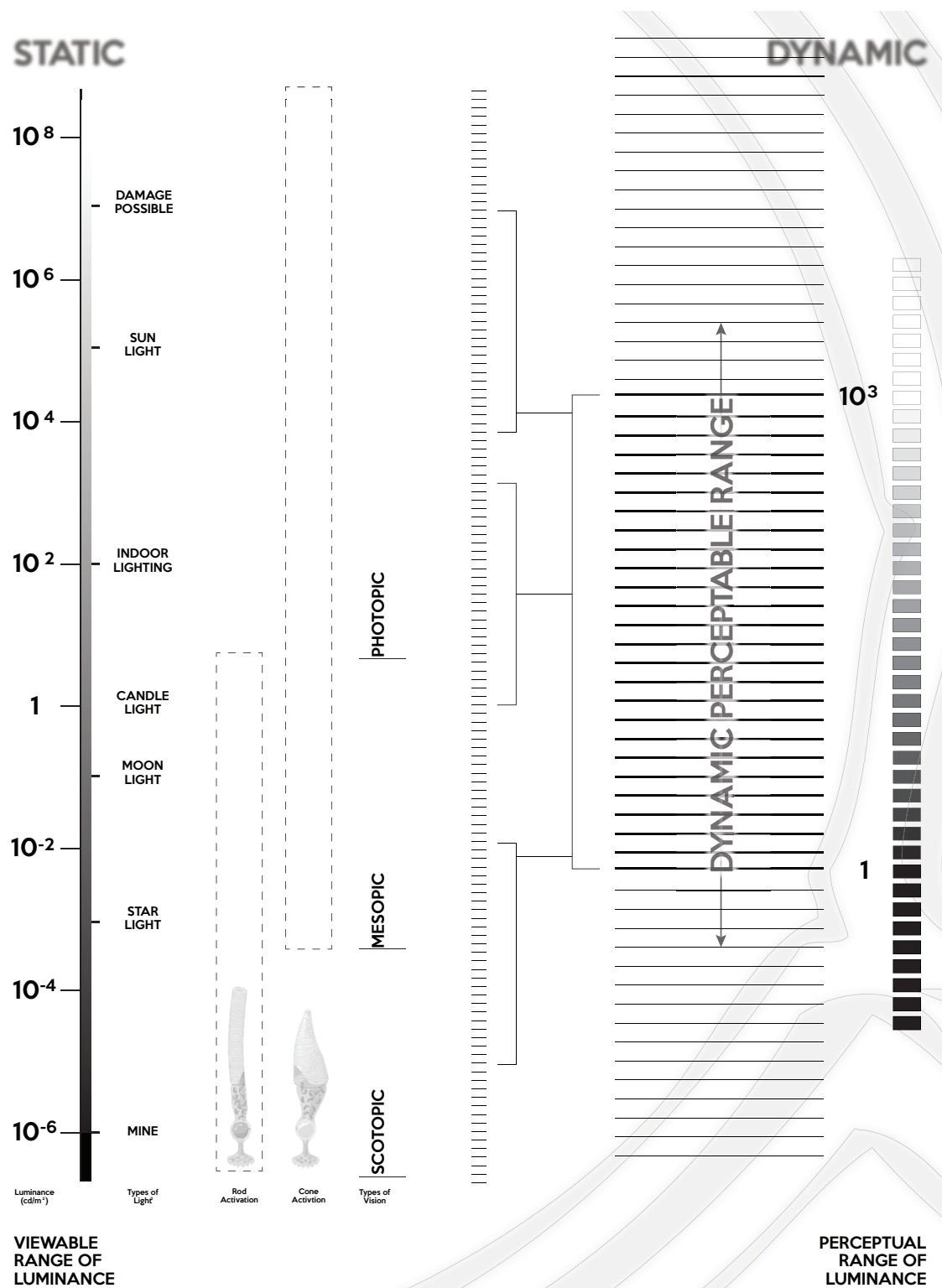
Designing the Terrible Darkness

Sheldon Currie and George Orwell spoke of the all-pervasive darkness within the coal mines. Since the darkness was unrelenting, any light available would be treated as a precious refuge. To convey this darkness it would be insufficient to merely construct a room absent of light - this would be overly literal and would not meet occupancy demands for an architectural setting that requires usability. However, it is possible to alter one's visual perception of darkness to synthesize the presence of total darkness. This can be done by understanding a biological coping mechanism called 'dark adaptation.' The eye is a dynamic organ that can see light levels across a total tonal range of approximately 1×10^{14} lumens. A range that is darker than a single candle in a black room to brighter than full sun during the summer.

In the darkness of night we can see slight movements, while during a bright summer day we can see full colour. However, we can not see both circumstances at the same time because the eye is constantly adjusting to its conditions to maximize our own cognitive ability. At any one time the eye can only perceive light across a range of approximately 1:1000, while it can take the eye up to thirty minutes to fully adapt between the highest and lowest ends of the range. This adjustment period is most noticeable when we walk into a dimly lit movie theatre from outdoors, or vice versa. While initially we feel blinded, our eye quickly adjusts and we are able to see - this is called 'adaptation.'⁴⁰

The eye more quickly adapts to higher light levels than it

40 Dale Purves and R. Beau Lotto, *Why We See What We Do: An Empirical Theory of Vision* (Sunderland, Mass.: Sinauer Associates, 2003), 23.

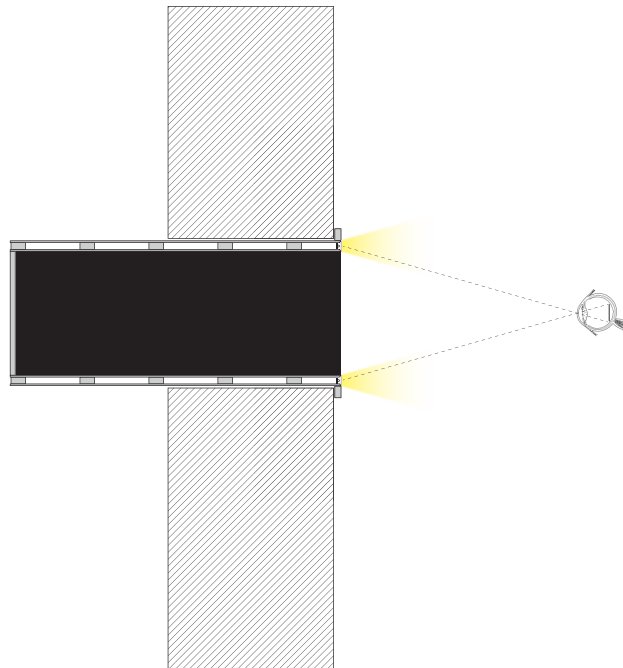


The eye is able to see luminances between 0.000,000,1 cd/m^2 and 1,000,000 cd/m^2 but only able to perceive a range of 1:1000 at any one time. As a result, the blackest perceptible object in our current view will never be noticeably darker even in the darkest conditions.

Source: Dale Purves and R. Beau Lotto, *Why We See What We Do: An Empirical Theory of Vision*, 23.

does to lower light levels. Moreover, since our eyes can only perceive light across a range of 1:1000, the darkest tone that is currently in our field of vision is the darkest tone we will ever *perceive*. While there may be a vast difference in the amount of light in any particular circumstance, our brain only ever understands a 1:1000 range. For example; if a person stands in a well lit room looking into a poorly lit room below the 1:1000 range, the only thing that person would perceive in the poorly lit room is total darkness. Therefore, the threshold and the frame around the threshold become important - similar to the idea explained on page six of this thesis.

This concept of adaptation makes the model *Closeness* work. By using a luminaire around the threshold, the detail in the black void of the model becomes imperceptible. This demonstrates that it is possible to perceive total darkness without ever being in a space absent of light.

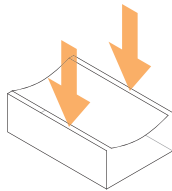


Closeness Diagram.

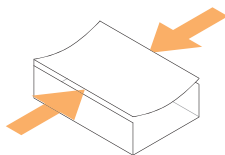
The light emitted from the edges of the model hinders the ability to perceive the depth within the model. This makes the black void seem like a planar black square - moving the depth *closer*.

Application Studies of Light in a Black Model

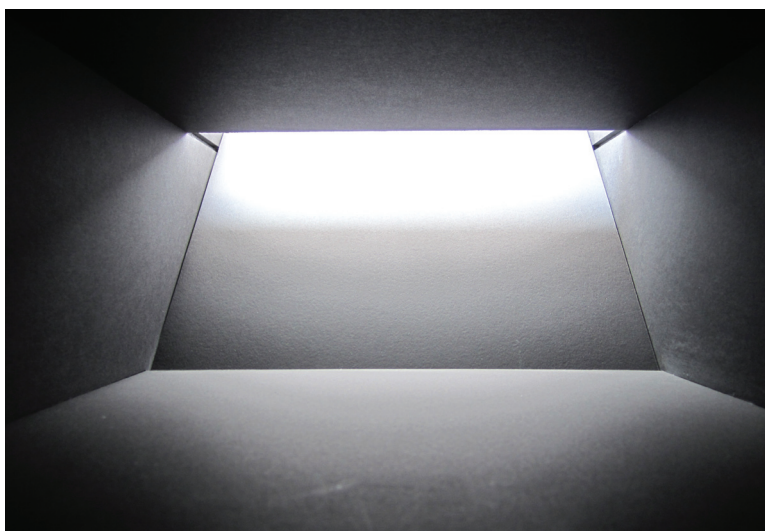
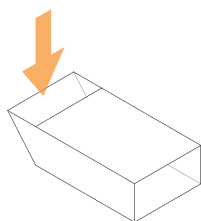
To gain a better understanding of light in the darkness, study models were built to understand various architectural conditions. Several models using the same black material were designed with the same X and Y dimensions, while altering the roof and placement of openings. Pictures were taken at the same time of day in the same lighting conditions, with the same camera settings.



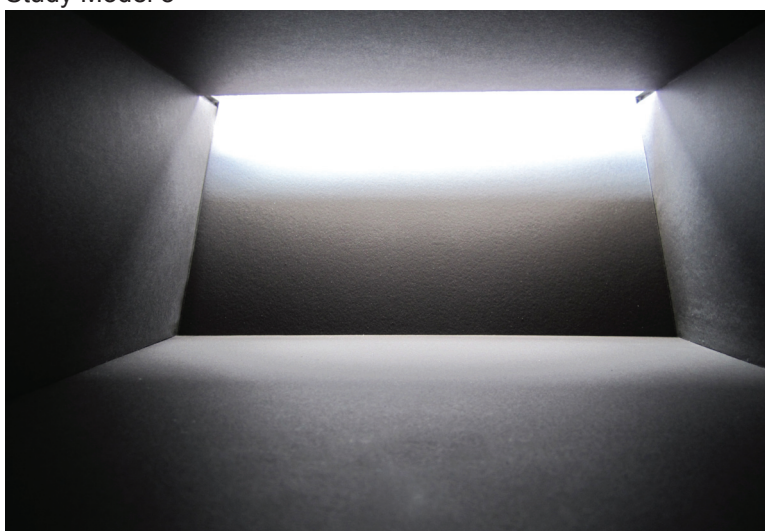
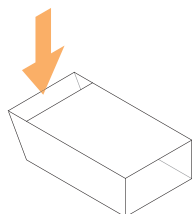
Study Model 1



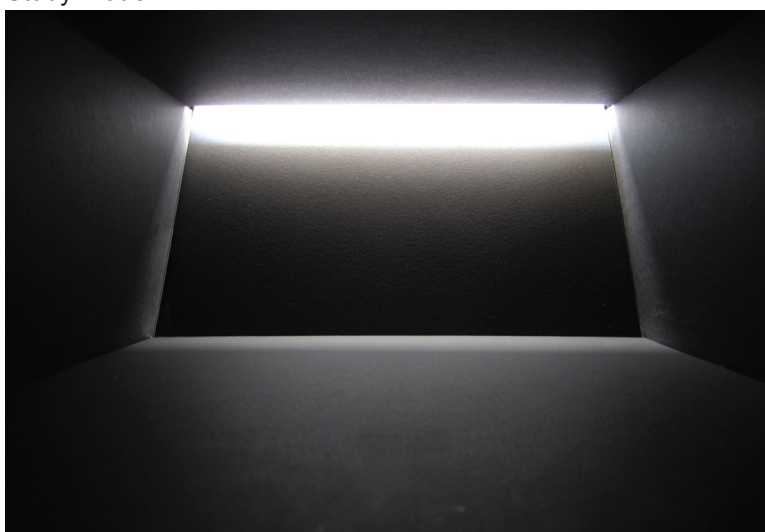
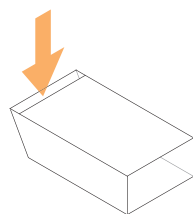
Study Model 2



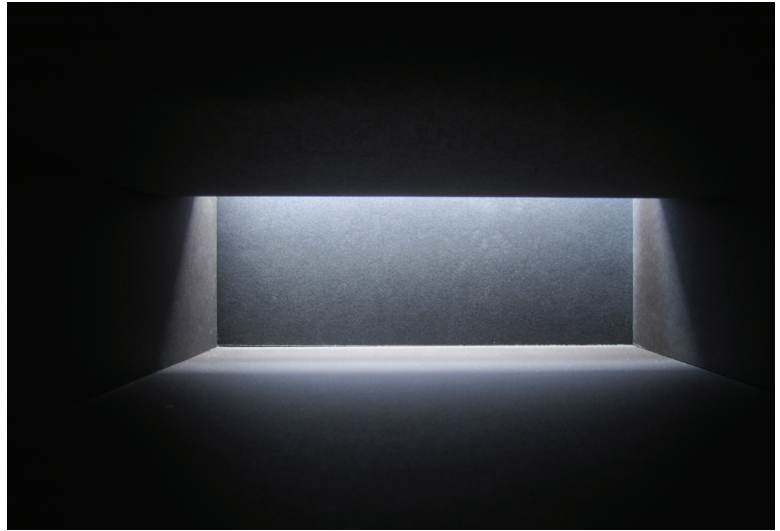
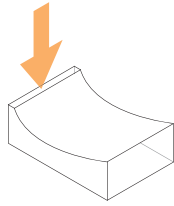
Study Model 3



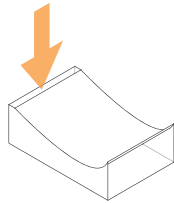
Study Model 4



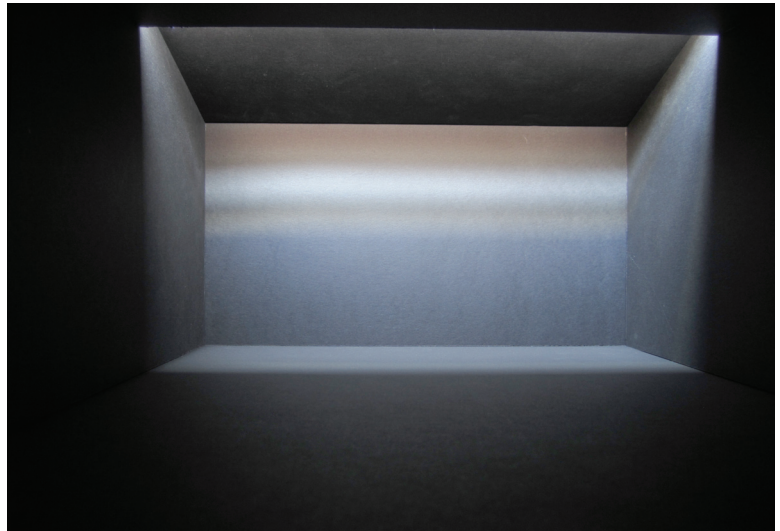
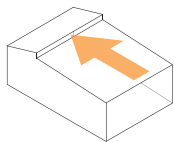
Study Model 5



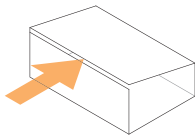
Study Model 6



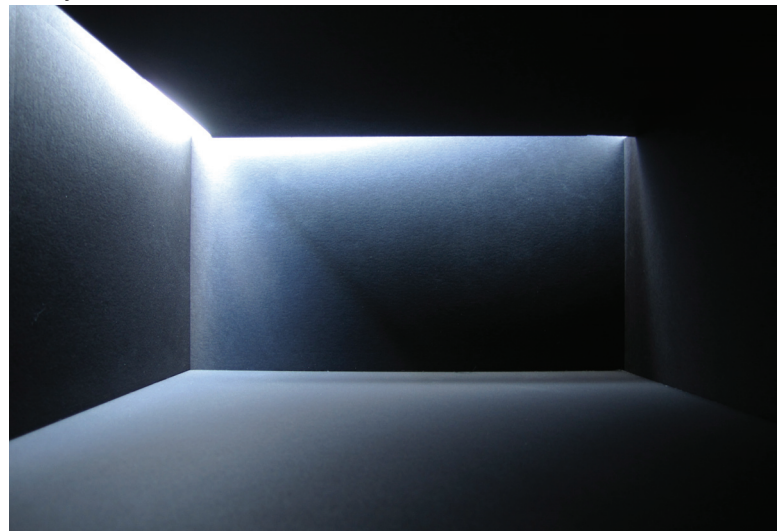
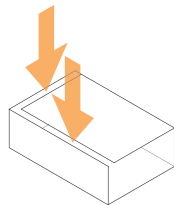
Study Model 7



Study Model 8



Study Model 9



Study Model 10

The study models demonstrated how light behaves in a dark environment. The presence of glare in the models with a direct view through openings is of particular note. As a result of that glare, the physical restraints of the walls play a less important role than the perceptual restraints imposed by the shadow. In that shadow the possibilities for form could be endless, with our imagination filling in the gaps. The light becomes the key element to understand the space of the encompassing shadow.

New Site – Former Colliery 1B + 26

There are many vacant sites throughout Industrial Cape Breton from when mining in the region was fully operational (refer to page 14). Today on many of these sites, a strange void exists where once formidable infrastructure dominated the land and informed the surrounding urban fabric. One compelling site within Glace Bay is the former site of Colliery 1B and 26. This site was forced to begin closure in 1984 when a fire raged in the mine that resulted in the death of miner Ronald Winston McDonald.



No. 26 Colliery, Glace Bay. (Also the site of 1B)
Source: Nova Scotia Archives, 1977.



Former Colliery 1B + 26, 2010.
From Google Maps, 2010.

The site of former Colliery 1B and 26 has been by razed and the shafts sealed due to the Government of Canada's policy to systematically shut down the collieries. Large expanses of concrete foundations were left on the site and derelict mining machinery was pushed over the cliffs and left to rust. This strange sight, paired with the flatness of the surrounding landscape and lack of major vegetation, imparts a ruinous quality to the landscape. Upon visiting the site, an unmistakable sense of exposure is felt due to the negligible topography, flat horizon line, and quickness of the changing sky. There is a sense that at one point in time this site was important.



Looking east along the shore of the site of former Colliery 1B + 26.



Industrial waste on the shore of the site of former Colliery 1B + 26.



Former Site of Colliery 1B+26, located along the Atlantic Shore. Remaining mineshaft in orange, cliff debris in red. Scale 1:5000.



Plan of the Phalen Seam, 201 meters below Colliery 1B+26. The mine extended north over 5.6 kilometers under the ocean. Scale 1:5000.



Concept Site Model. Wax + wire topography supported by metal struts on wood base. Mines in black card suspended. Scale 1:1000.



Concept Site Model detail. Black, laser cut, card attached to the struts represents the tunnels built within the coal seam. Scale 1:1000.

During the colliery's operation four shafts were open to the mines below. Today, all but one was sealed shut with an emergency mine water treatment facility sitting on top of the only remaining shaft.

Since the majority of the Sydney Coal Fields are located below the ocean, pumping water out of the mines was critical to their ongoing operation. But, after the closure of the mines the pumps were shut down and the mines were allowed to flood. In 2002 mine water from the field was tested and it was realized that if the mine water was allowed to



Former site Colliery 1B+26. Scale: 1:5000.

Originally, four shafts provided the contact to the world above. Now, only the 'man shaft' remains open while the others are sealed. This mine stretched over 5.6 kilometers northward, below the sea floor. Source: Google Maps.



Former Site of Colliery 1B+26. Currently on the site is a tower for lime storage and minewater pumphouses.

freely discharge into the ocean it would hurt local marine life and fisheries due to its high acidity and metal content. As a result, a pumping station was built on the site to extract the deleterious water, treat it with lime and deposit into a settling pond before it would be evacuated into the ocean.⁴¹ Mine water engineers at the Cape Breton Development Corporation believe that based on typical projections this will be required for approximately seventy years from the time of this thesis being published.⁴² The facility is rarely ever used and serves as a back-up for a larger facility nearby.



Former Colliery 1B + 26, 1992.

In 1992 water from the mines was discharged into the Atlantic Ocean. This deleterious water was high in iron, as is evident by the red plume. A small treatment facility was built to add lime to the water, thereby stabilizing the pH, before its ejection into ocean. This site does not continually discharge mine water, but is a sort of safety valve used as a last resort.

Source: Shea, "Mine Water Management of Flooded Coal Mines in the Sydney Coal Field, Nova Scotia, Canada."

41 Joe Shea, "Innovative Management Techniques to deal with Mine Water Issues in the Sydney Coal Field, Nova Scotia, Canada," *Mine Water & Innovative Thinking* (Sydney, Nova Scotia: CBU Press, 2010), 633 – 637.

42 Ibid.

Program Development

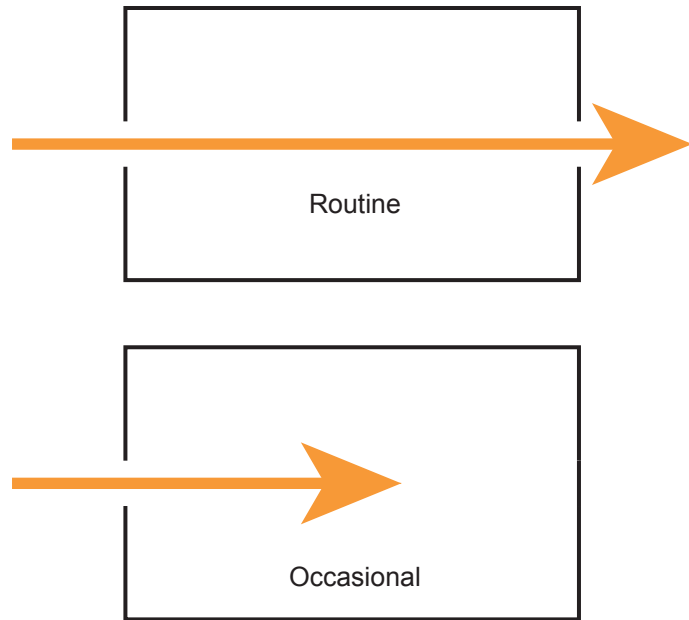
Based on the current Cape Breton Miners' Museum, the program for this project will exhibit many of the same characteristics. A music hall, exhibition space and clerical space are the core of the building, with the aforementioned water treatment facility being incorporated into the design.

The music hall will become a more celebrated space, due to the importance of The Men of the Deeps choir. The choir seems to be one of the only positive development that came out of the hardships of working in the mine. Through their song, the choir provides a direct storytelling experience of life in the mines. Accompanying the music hall will be the requisite support spaces like a rehearsal room, dressing room, and washrooms.

The museum portion of the building should focus more on the individual experience of a miner. As stated before, author Sheldon Currie refers to the "terrible darkness, low pay, sudden physical dismemberment and brutally hard work – that included more of a coal miners shift and his family's life, constantly at the financial and physical edge."⁴³

The experiences of Cape Breton miners can be abstracted into two experiential categories - the routine and the occasional. Routine experiences are those encompassed in a normal day - like going to work, the act of mining, coming home, and the daily occurrences above ground. Occasional experiences happen less frequently and entail the accidents that occur in the mine that result in bodily harm or hardships to the family, or worse yet, death. The design of the museum will reflect this abstraction.

43 Currie, *The Glace Bay Miners' Museum*, 119.



Two programmatic scenarios developed from miners' experiences. Routine experiences are passageway rooms while occasional rooms are terminal.

Finally, the facility requires service spaces to support the music hall and museum. These spaces will include office space, a ticket window for admission, storage facilities, washrooms and separate entrances for employees.

Chapter 5: Design

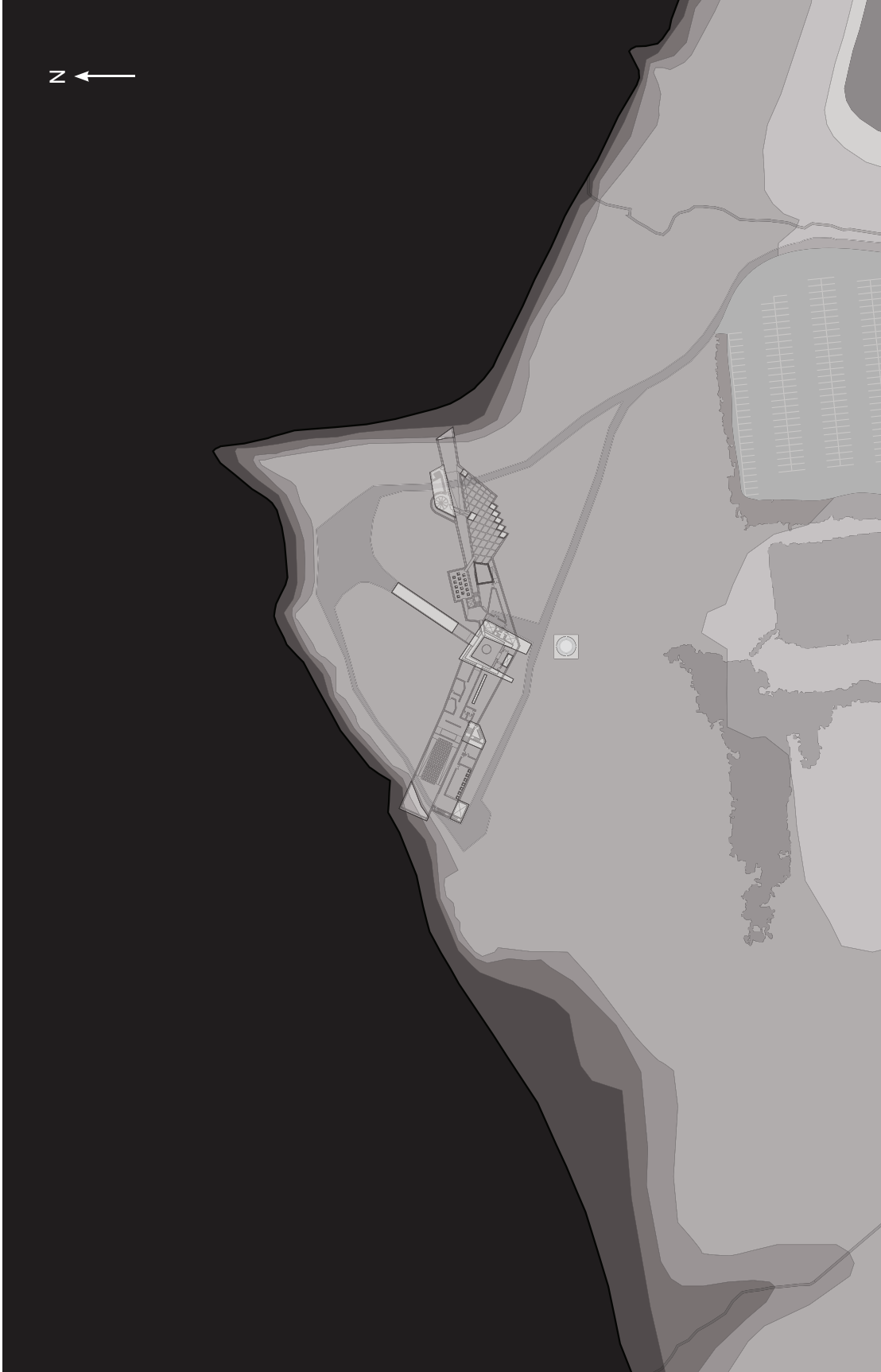
The initial design intention is to incorporate the existing lime treatment facility and acknowledge the existing open mine shaft. This is one of the only remaining open mine shafts in a region that was dependent upon these portals for prosperity.

Since the mine shaft is the central figure in the building, all other functions converge on that spot. The entrance, music hall and museum pinwheel from the shaft, with the service section nestled around these main elements.

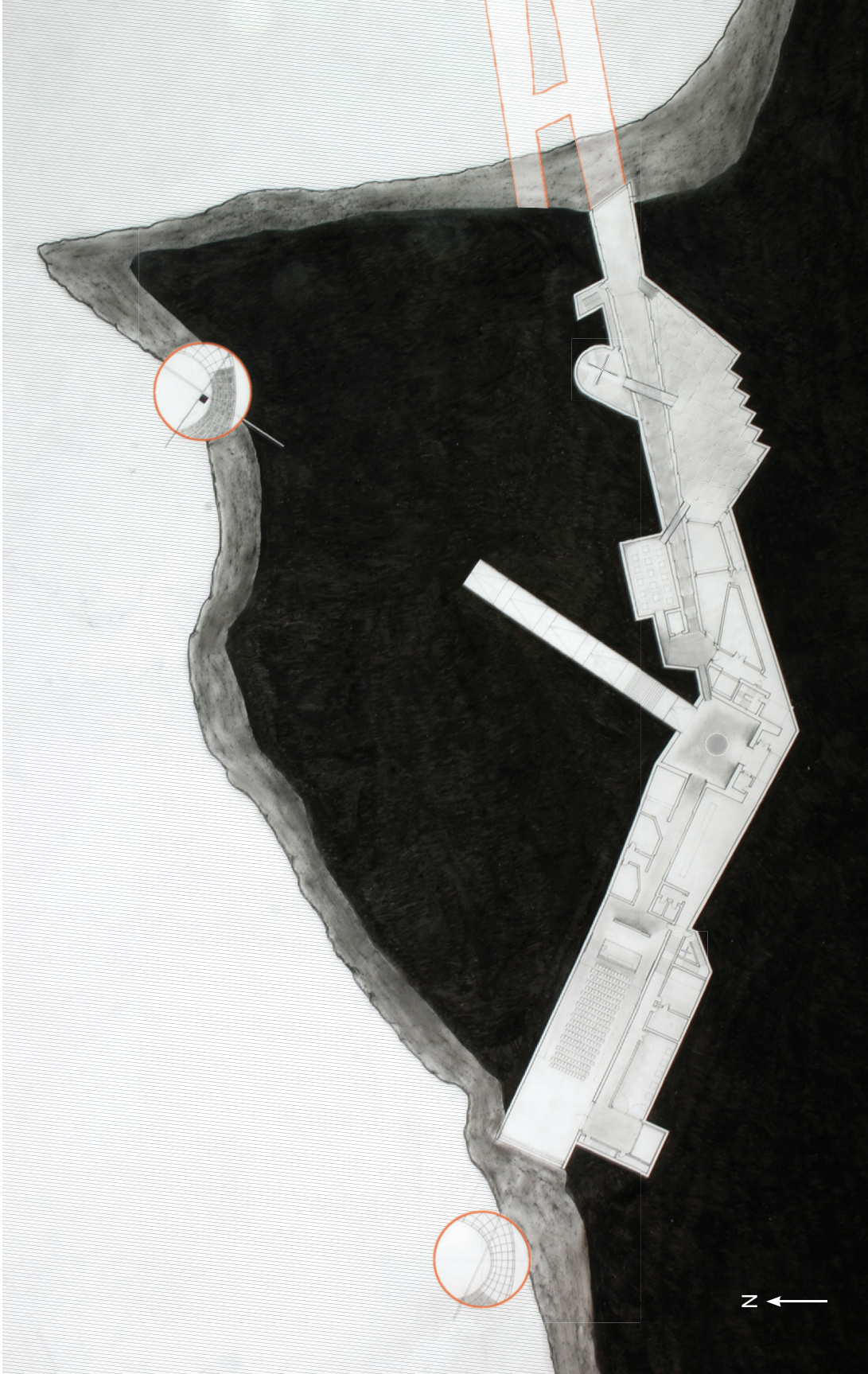
The facility is located below ground, with the systems providing the only link above ground. This is the same condition as the collieries that dotted the landscapes of Industrial Cape Breton. Although the infrastructure above ground was a grand scene with headframes rising up towards the sky, this was quite small in comparison to the massive workings underground. When the site was an operational coal mine, Colliery 1B + 26 had four shafts provided the link to the surface. Two air shafts, one shaft to extract the coal and one shaft to transport the miners provided the only link to an enterprise that extended over 5.6 kilometers below the Atlantic. In this same spirit, the building systems expressed above ground are the windows to allow light, ventilation shafts to ensure air flow, emergency exits for evacuation and access to the Atlantic Ocean for cold water air conditioning. These will be represented later in the report.



Proposed Site Plan. Scale 1:5000.

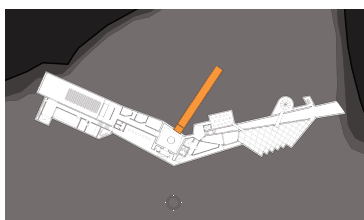


Proposed Site Plan with Floor Plan. Scale 1:2500.



Floor Plan. Scale 1:1000. The three axes are developed using sunpath diagrams and a plan from the existing mines 201 meters below ground. The Entrance Shaft is in the middle, with the Music Hall to the west and the Museum to the east.

Entrance Shaft

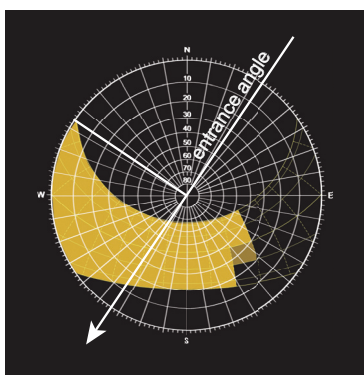


Entrance Shaft location.

The main entrance for the building is meant to emphasize the threshold of passing into the darkness and to evoke the sense of travelling that George Orwell wrote about in *The Road to Wigan Pier*.

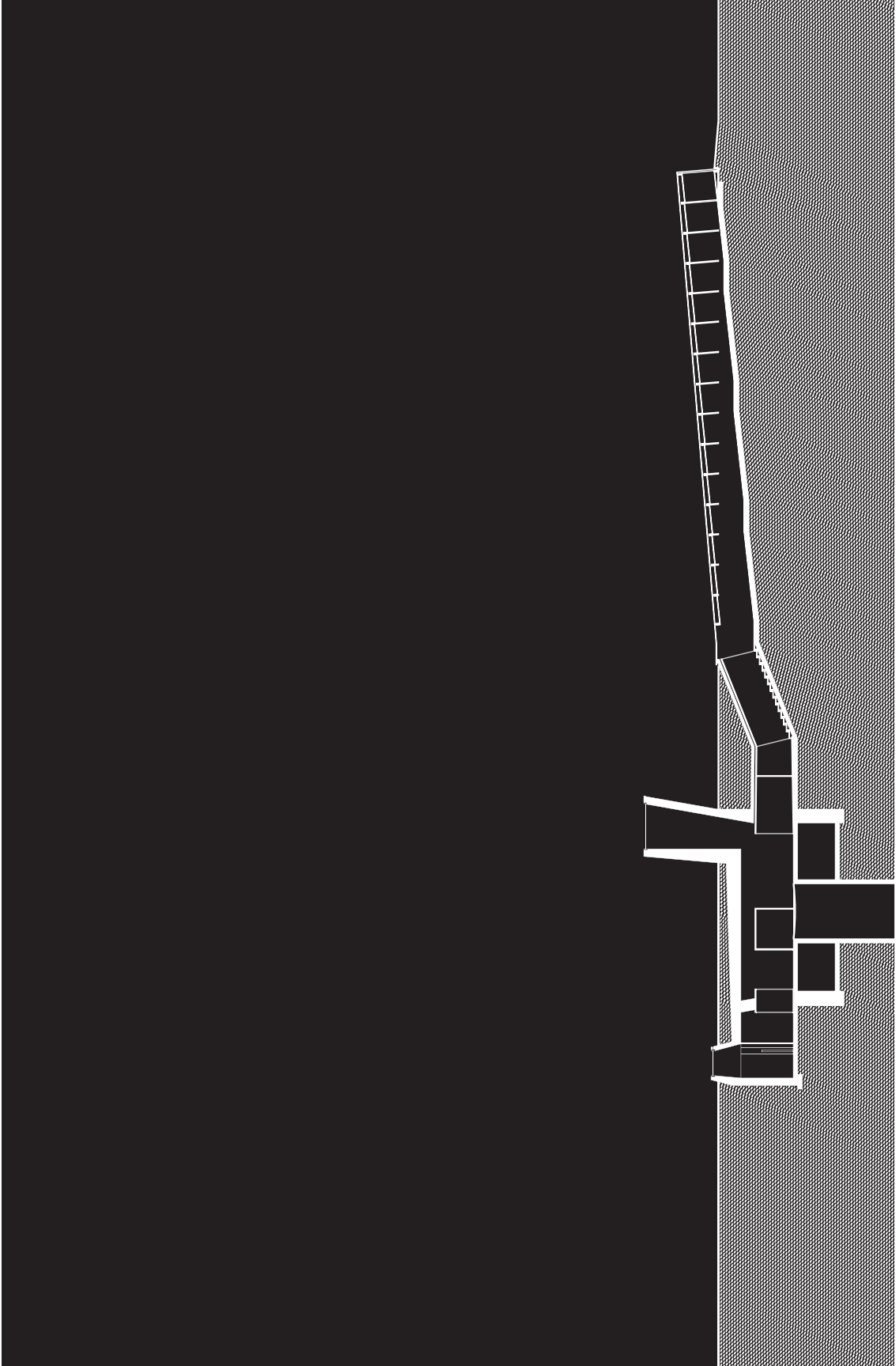
The entrance threshold is as black as possible when viewing from outside, but still usable when inside. It is aligned perpendicular to the angle of the setting sun at its extreme. This is meant to maximize the contrast when visitors arrive at the music hall for a typical 8pm performance. It also complements the typical opening time for the museum of 10am (this is a common time for cultural institutions in the region).

When plotting this data on a sunpath diagram for the region's latitude of 46 degrees a clear vector emerges that ensures the sun will always be behind the opening threshold during operation hours. This establishes a relationship whereby the light behind the entrance will be greater than the light in front of the threshold. The relatively limited amount of light inside the entrance shaft compared to the outside creates a condition similar to the lighting condition in the thematic model for *Closeness*.

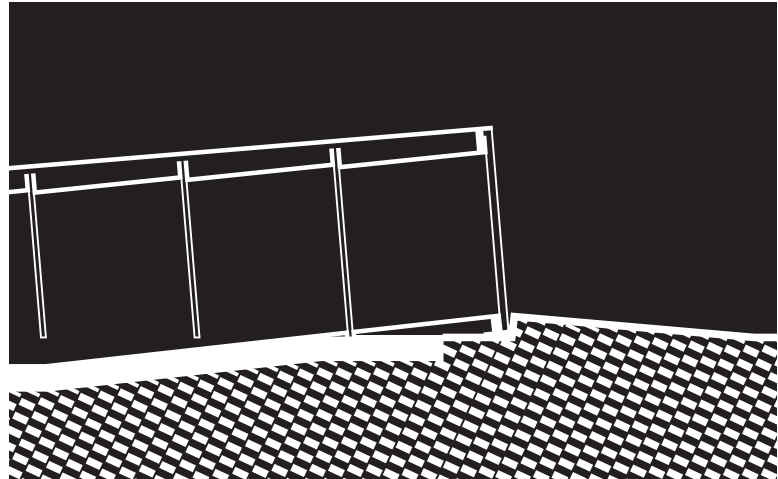


Typical visitor times of the museum are plotted onto a 46 degree latitude sunpath diagram in yellow. Entrance angle of the facility is perpendicular to the northern most setting sun for the region.

Light within the entrance tunnel will be provided by slits throughout the walls that allow the user to understand where they are in relation to the ground plane. As the user moves entirely below ground more light is provided for the user to notice the change from ramp to stairs for the final leg of the journey into the facility.

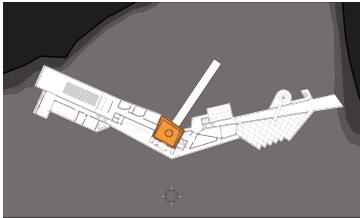


Entrance Shaft and Central Hall Section. Scale 1:400.



Section through the Entrance threshold. Gaps in between the black metal structure to provide light inside. The black metal structure is wrapped with perforated Corten steel.
Scale 1:100.

Central Hall



Central Hall location.

At the end of the entrance tunnel the user is introduced to the Central Hall. The Central Hall is the convergent point of the facility that is a series of thresholds to emphasize either shadow or light. These thresholds are arranged around the remaining mine shaft as its central focus.

The mineshaft is covered by a concaved grate providing the user with a physical sensation of depression as one walks over it. To heighten a feeling of compression a looming concrete mass is cantilevered over the space to provide its roof.

The Central Hall is the space where people come to gather before engaging the museum or theatre. Since people are typically drawn towards light, the information and ticket window is placed in the only well-lit opening in the space. The brightness of the space is emphasized by the relative darkness of its framing wall. This wall provides the structural support for the cantilevered ceiling, as well as a dark frame around the lit void.

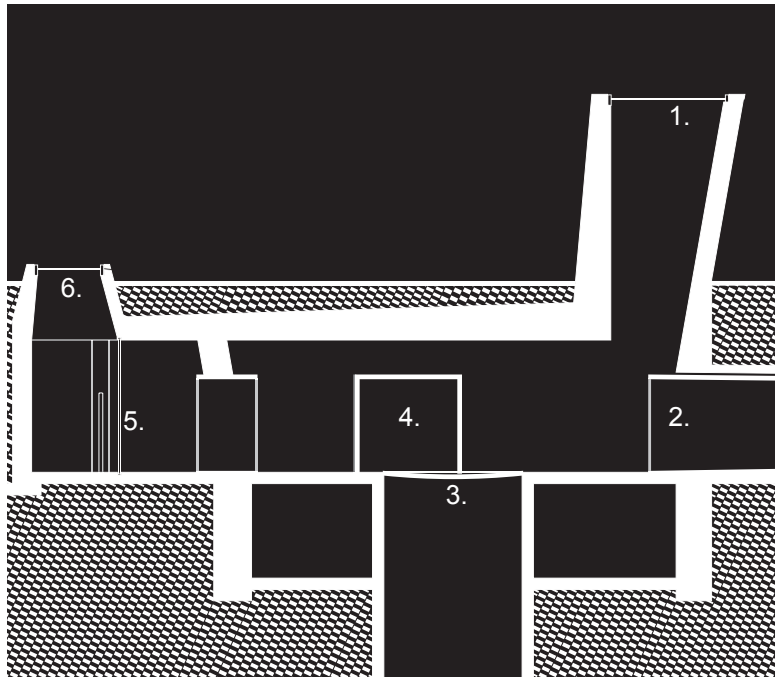


Central Hall. All passages pinwheel from the covered mineshaft. The lit opening contains the ticket window, the dark opening leads to the Music Hall.



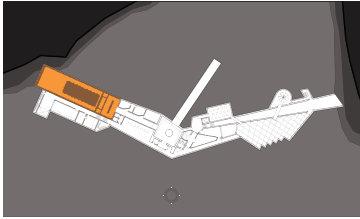
The large concrete mass that forms the ceiling was developed from the thematic model for *Loss + Repetition*.

The other three thresholds in the Central Hall (entrance shaft, museum and music hall) are dark voids encased by a light frame - the opposite of the aforementioned. The lit frame is achieved through skylights flooding the walls with daylight. Black metal extrusions surround each threshold to offer a precise cut between the light frame and the dark void while also shielding it from excessive daylight.



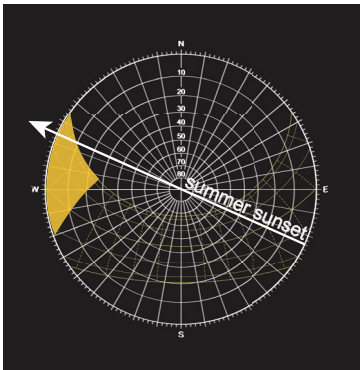
Central Hall Section. 1. skylight, 2. entrance threshold, 3. concave grate covering shaft, 4. music hall entrance, 5. glass wall, 6. skylight to illuminate glass wall. Scale 1:200.

The Music Hall



Music Hall location.

The siting of the Music Hall is another main driver behind the design of the building because it provides the second main axis originating from the mine shaft. The choir is one of the few positive developments that came out of the hardships faced by the miners. The setting sun will provide the dramatic backdrop for the performances of The Men of the Deeps which typically happen at 8pm. Situating their performances against the setting sun provides a fitting juxtaposition to the seriousness of their verse.

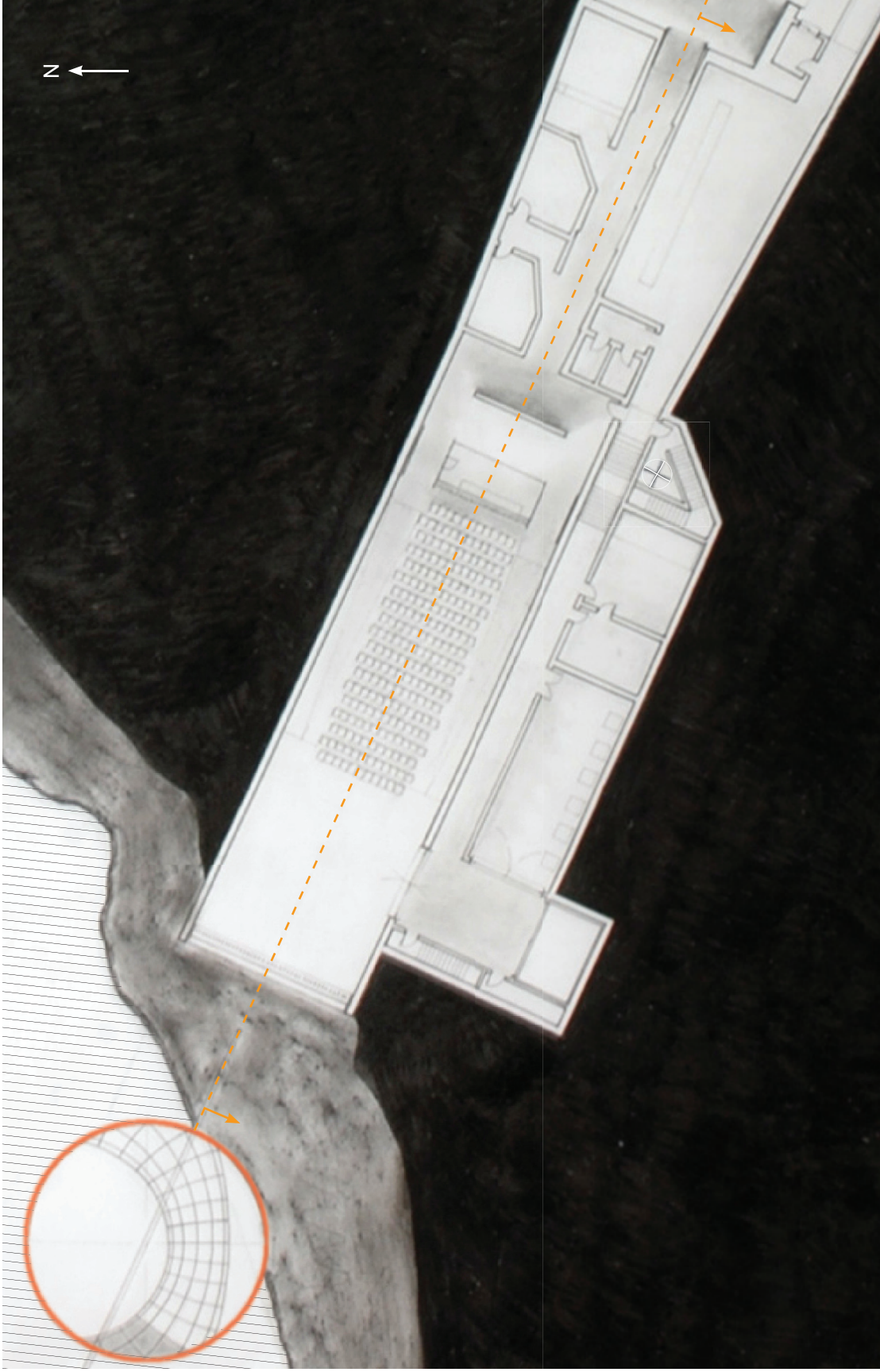


Setting sun in yellow plotted onto 46 degree sunpath diagram. Aligning the Music Hall along the resulting vector will maximize the view during concert season.

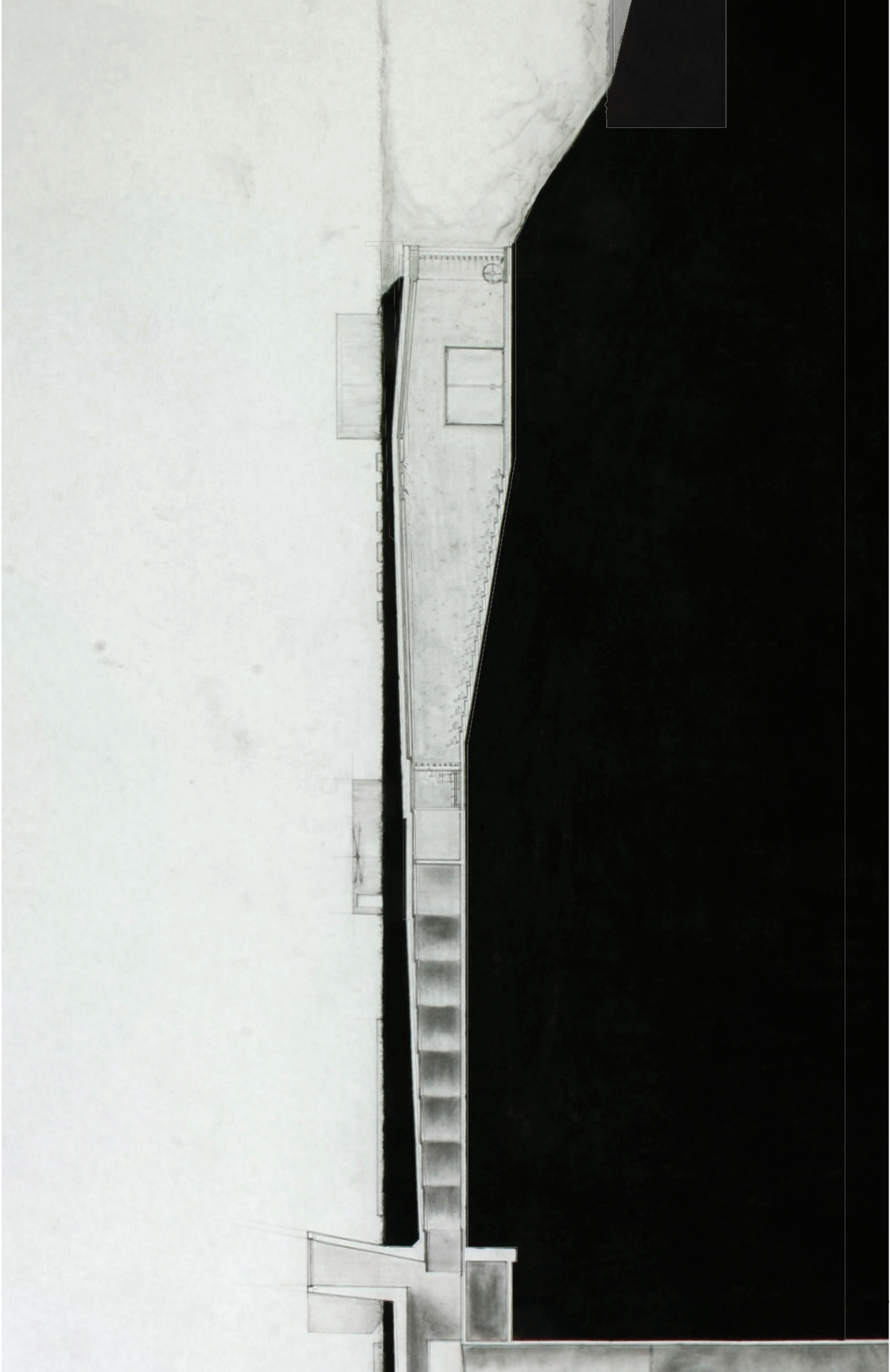
During the summer months the sun is higher on the horizon and daylight runs into the evening. At the summer solstice the sun sets at approximately 8pm with dusk extending until 10:30pm. At the end of the summer concert series, typically at the end of August, the sun sets at 6:40pm with dusk extending until 8:30pm. This range establishes a baseline for possible sun exposure and establishes a situating angle to align the Music Hall. The back of the Music Hall stage will protrude from the cliff face towards the setting sun of the summer months.

The placement of the Music Hall in this location also overlooks the industrial waste that was pushed over the cliff when Colliery 1B+26 was closed. This siting reinforces the dramatic consequences that mining can wreak on the land, as well as the people.

To get to the Music Hall users have to travel down a long hallway covered in matte black brattice cloth typically used in mines to cover openings and suppress fire. Integrated into the walls of the hallway are luminaires that only shine light away from the Central Hall. This preserves the



Plan of Music Hall and hallway. Scale 1:400. Music Hall points towards the setting summer sun. Sunpath diagram highlighted in orange circle.



Section Drawing through the Central Hall, hallway and Music Hall. Scale 1:400.

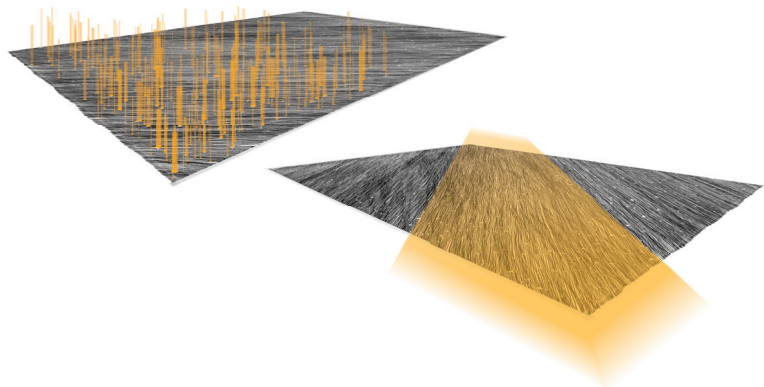
perceptable darkness as the patron enters the passage. At the end of the hallway a wall prevents any remaining light in the Music Hall from entering the hallway.

The design of the hallway is a result of the thematic drawing for the theme 'Repetition.' When viewed at different angles, the drawing emphasizes certain gaps in between lines, while concealing others. The hallway to the Music Hall will appear black when viewed from entering from the Central Hall, but will evoke the image of pit props when travelling through it from the Music Hall.



Notice the 'pit props' providing structural support for the miners to ensure the mine does not collapse.

Source: Skinningrove Mines – East Cleveland Image Archive.



By altering the viewing angle of the drawing *Repetition*, different aspects become more visible while others fade away.

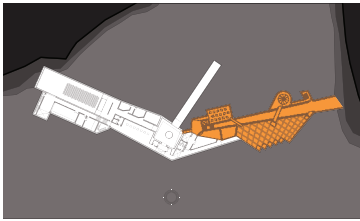


On the shore of site of former Colliery 1B+26 industrial waste was pushed over the cliffs and into the Atlantic Ocean.



Model of the rear of the Music Hall extending through the cliff face.

The Museum



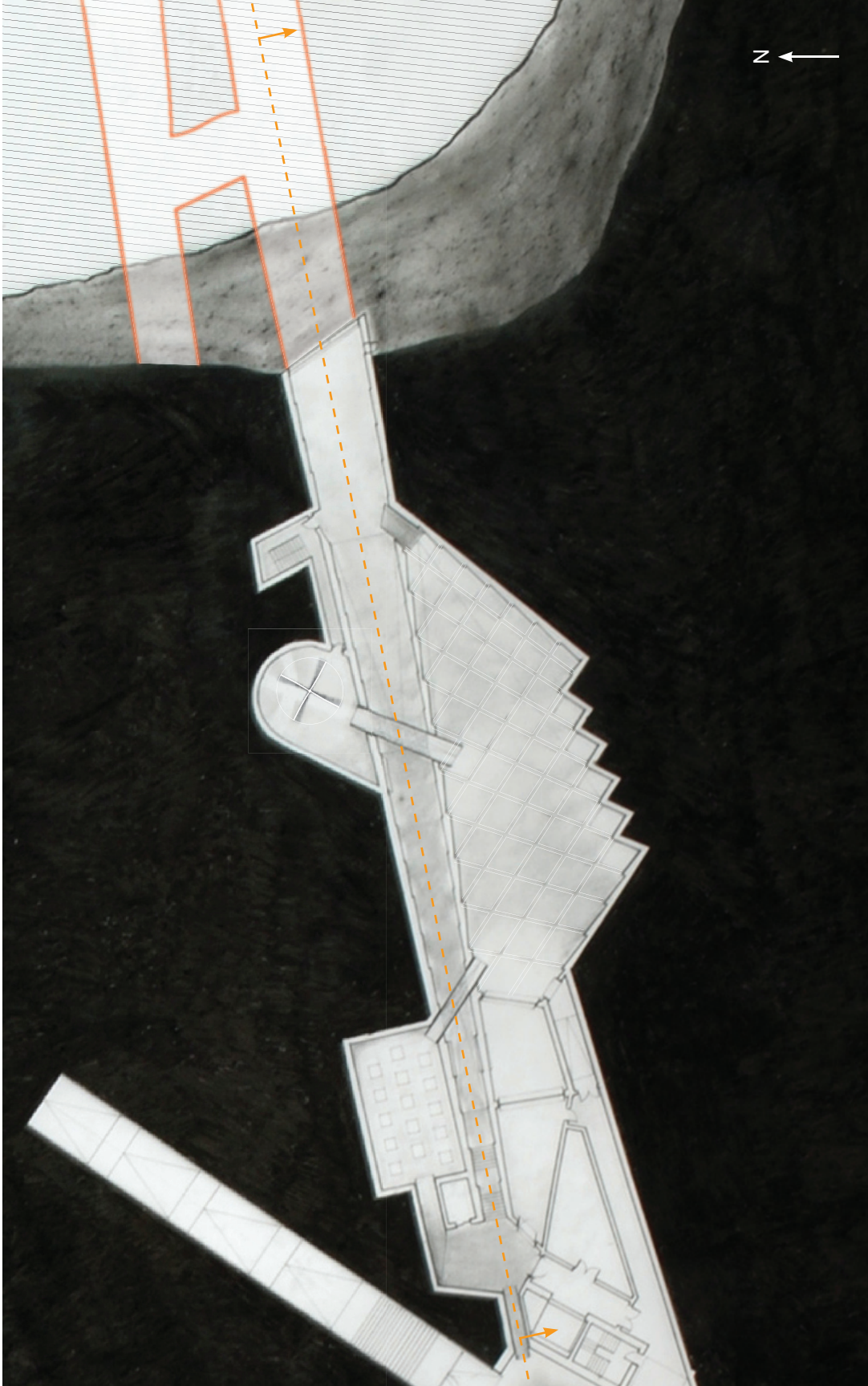
Museum location.

The final axis for the building is the museum component. The entrance for this space also originates from the Central Hall and is the final dark void within a lit frame. The hallway points in the same direction as a pathway in the Phalen Seam, some 200 meters below the museum, and terminates by protruding through the cliff face.

This hallway follows the same visual logic as the hallway leading to the Music Hall with luminaires embedded into the walls pointing away from the Central Hall. This hallway changes in elevation to accommodate the Museum's program and to ensure direct light does not reach the user upon entry from the Central Hall. The terminus of the hallway overlooks the Atlantic Ocean and is designed to be the same dimensions as the mine 200 meters below - 2.1 meters tall and 6.5 meters wide. The end of the hallway is supposed to be a quiet, contemplative space away from the normal activity of the Museum and Music Hall.

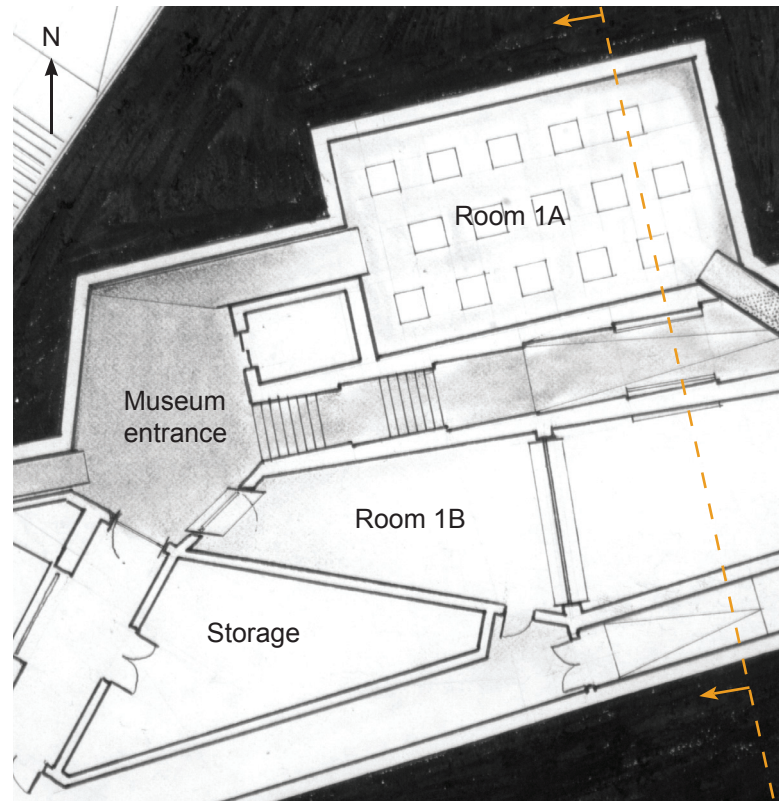


Section through the end of the Museum axis. Scale 1:200.



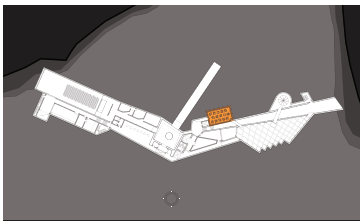
Plan of Museum axis pointing in the same direction as the mines 201 meters below ground level in the Phalen Seam. Scale 1:500.

Upon entry to the museum space the user can either continue down the stairs and through the hallway; enter the flexible exhibition space to the south, or proceed to the permanent exhibition space to the north.



Plan of beginning of the Museum axis. Scale 1:100.

Room 1A



Room 1A location.

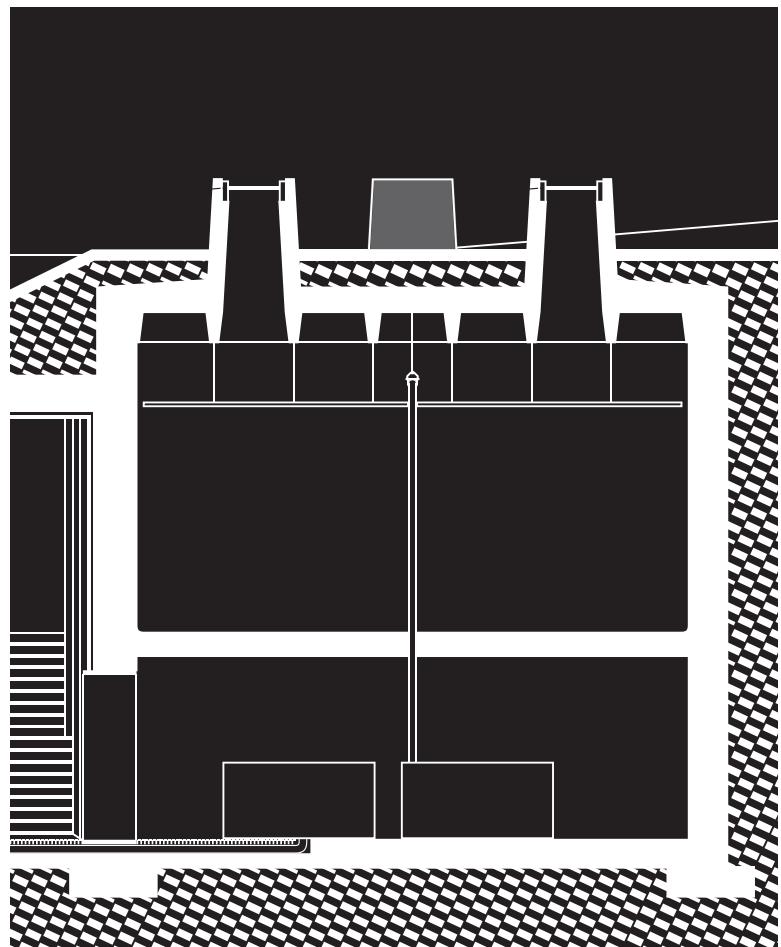
The first permanent exhibition room that the user enters is a room curated to highlight the social-political struggles faced by the miners. In this room a high amount of light is let in through skylights and diffused through translucent glass that covers the ceiling. As a result, very few shadows are cast in the room due to the even diffusion of light. This allows the user to easily view artifacts and read stories of their struggles. If light is typically used as a means of gaining prospect and engaging to discover new ideas, this room is about shining a light on their socio-political struggles.



Room 1A. Visible are the cold water pipes in the middle of the room and the etching on the floor of a typical Glace Bay company house.

The socio-political struggles of the miners' were born from their experiences in the coal mines, but mainly take place above ground. Daylight in the region feels very close to the ground due to the cloud cover that is typical in the region. This idea is reinforced through the looming translucent glass ceiling.

The simple rectilinear geometry is due to the shape of the room being less important than the artifacts within it. However, the dimensions of the room, 12.2 m x 7.3 m (40' x 24'), are the same dimensions as a typical company house in Glace Bay. The floor plan of the duplex house is etched in the concrete floor with the two holes cut out of the floor placed where the chimneys would be located.

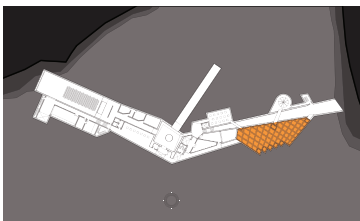


Section through Room 1A. Scale 1:100.

The cold water air conditioning system extends through the holes in the floor from the service room below. The chill from the pipes condenses the water within Room 1A, so the museum user will be able to didactically engage with water - an element that is always a concern to a miner.

Since this room highlights the typical struggles of the miner and their families everyday, this room serves as a passage-way to the next room. This responds to the routine versus occasional events outlined in the previous chapter. The passage to Room 2A is through a dark void similar to the other dark thresholds throughout the facility.

Room 2A



Room 2A location.

This room is designed to highlight the occurrences and feelings of the miners below ground - a harsh, subterranean environment filled with strange machines, as written by George Orwell. The insertion of machines into this space becomes the rationale for the size and shape of the room.

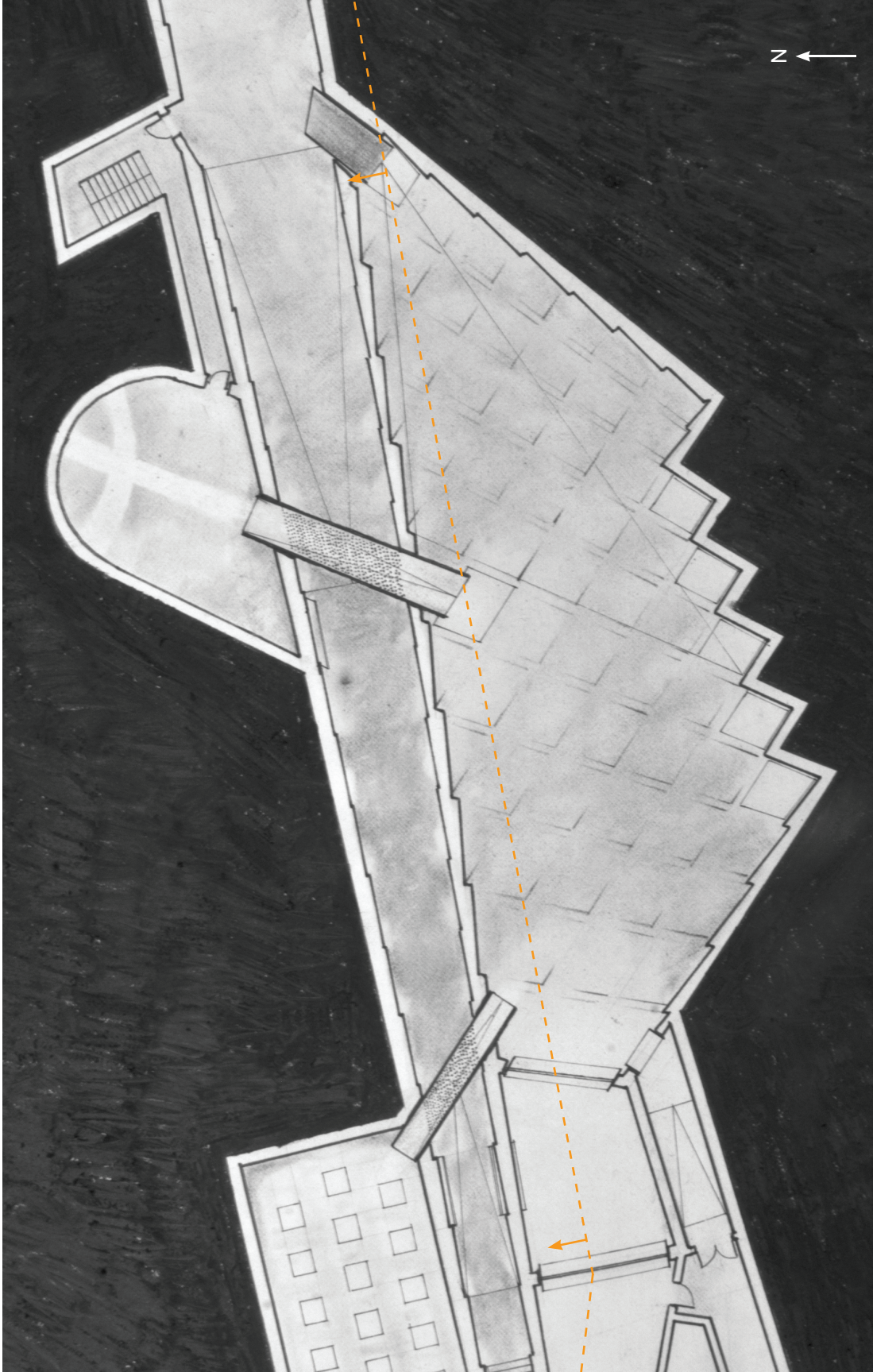
Existing machines that are outside of the current Cape Breton Miner's Museum will be brought back below ground to form the display and the display cases within the room. They can be lowered in through the concrete void adjacent to Room 2A and move in through the large window. Placement of the machines will align to sightlines to maximize their impact and create a visual consistency to the user.



Machines for Room 2A are currently located in a field adjacent to the current Glace Bay Miner's Museum.



Room 2A.

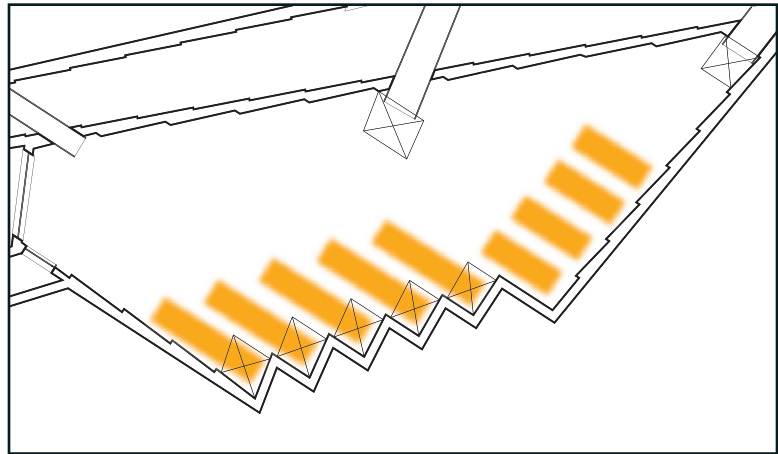


Plan of Room 2A. Waffle ceiling is also drawn. Scale 1:100.

Mining machines leave cut marks in the walls as they loosen the coal for transport. These cut marks are echoed in the structural walls by highlighting where the longspan waffle roof meets the wall.

The waffle roof is designed to accommodate the machines within the room and to create a choreography between light and shadow. The compartments that the ceiling creates with light and shadow is akin to the room and pillar mining system still employed in the region up until the middle of the last century. Skylights are inserted in the south wall to shine on the machines and are placed at the other two main thresholds in the room.

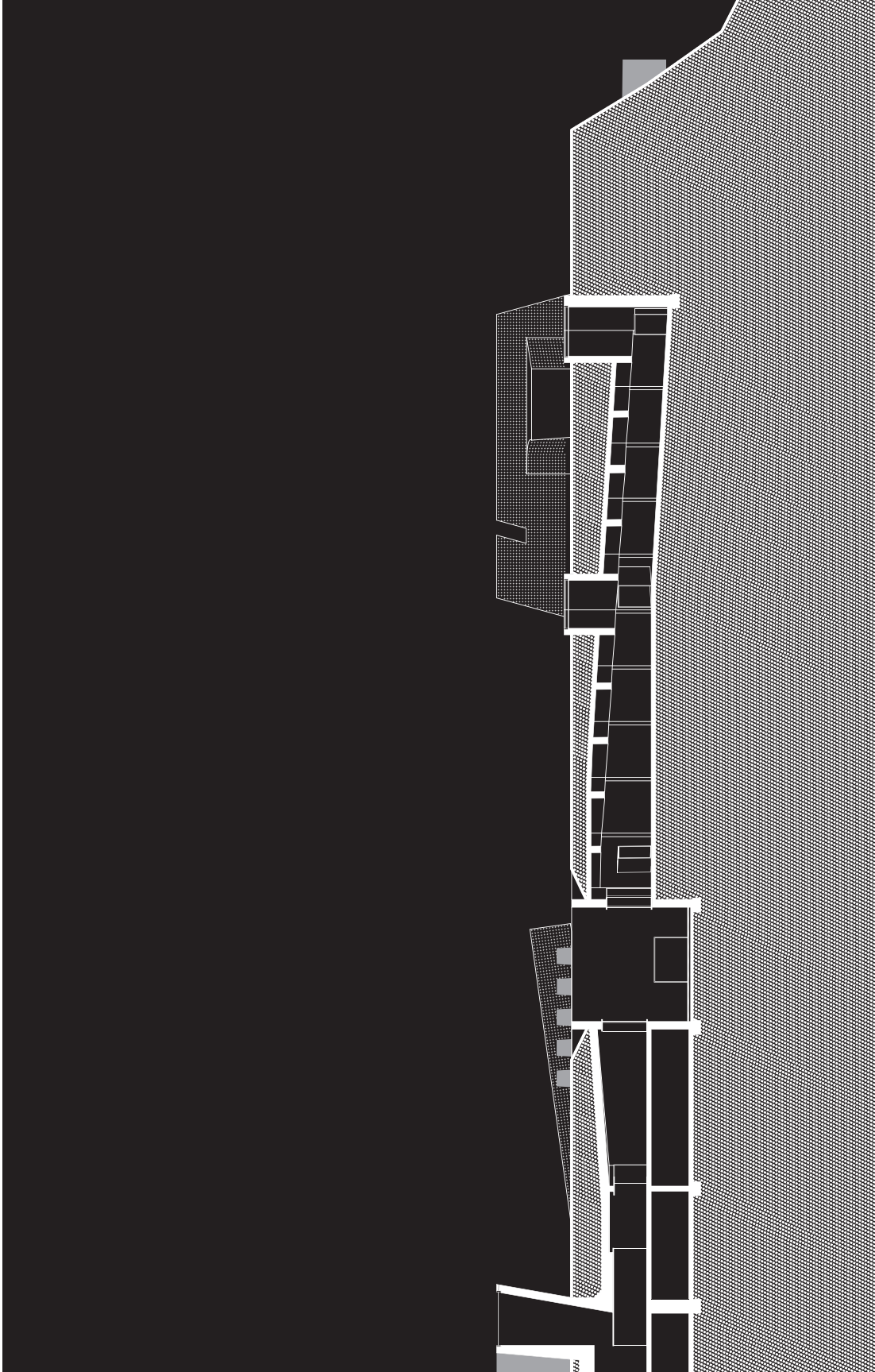
Finally, a 1:12 downward slope in the room begins halfway through the room to transition to the next space and highlight the constant downhill trajectory of the mines.



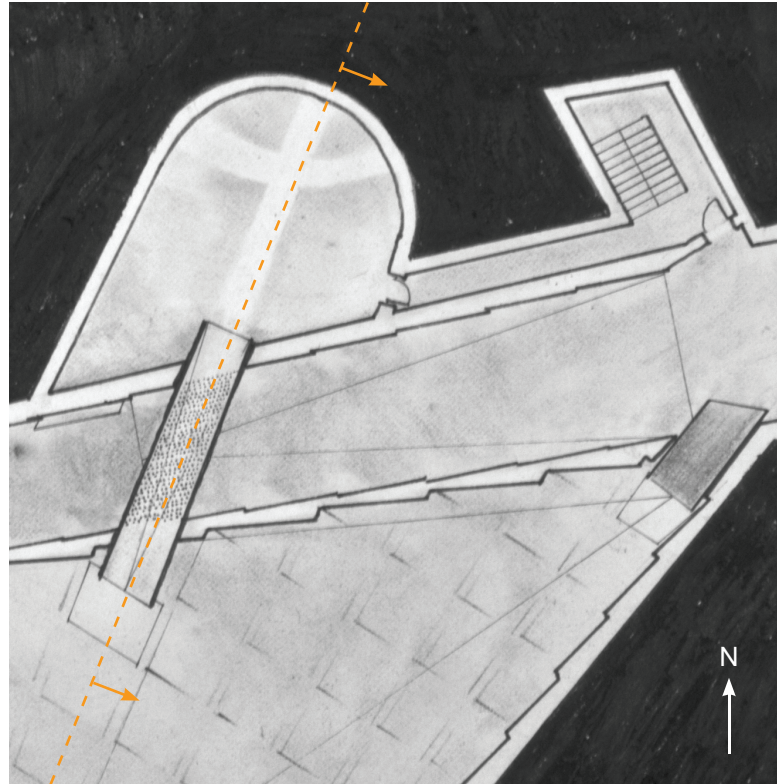
Organization of machines within Room 2A. These machines will serve as the display and display cases for the room.



Example of a coal mine that was mined using a Room and Pillar system. Coal is left as a structural support for the mines.

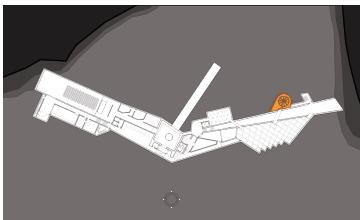


Section of Room 1B, the void to move major machinery into the facility, and Room 2A. Scale 1:400



Plan for Exhaust Room, 2B. Scale 1: 200

Exhaust Room, 2B



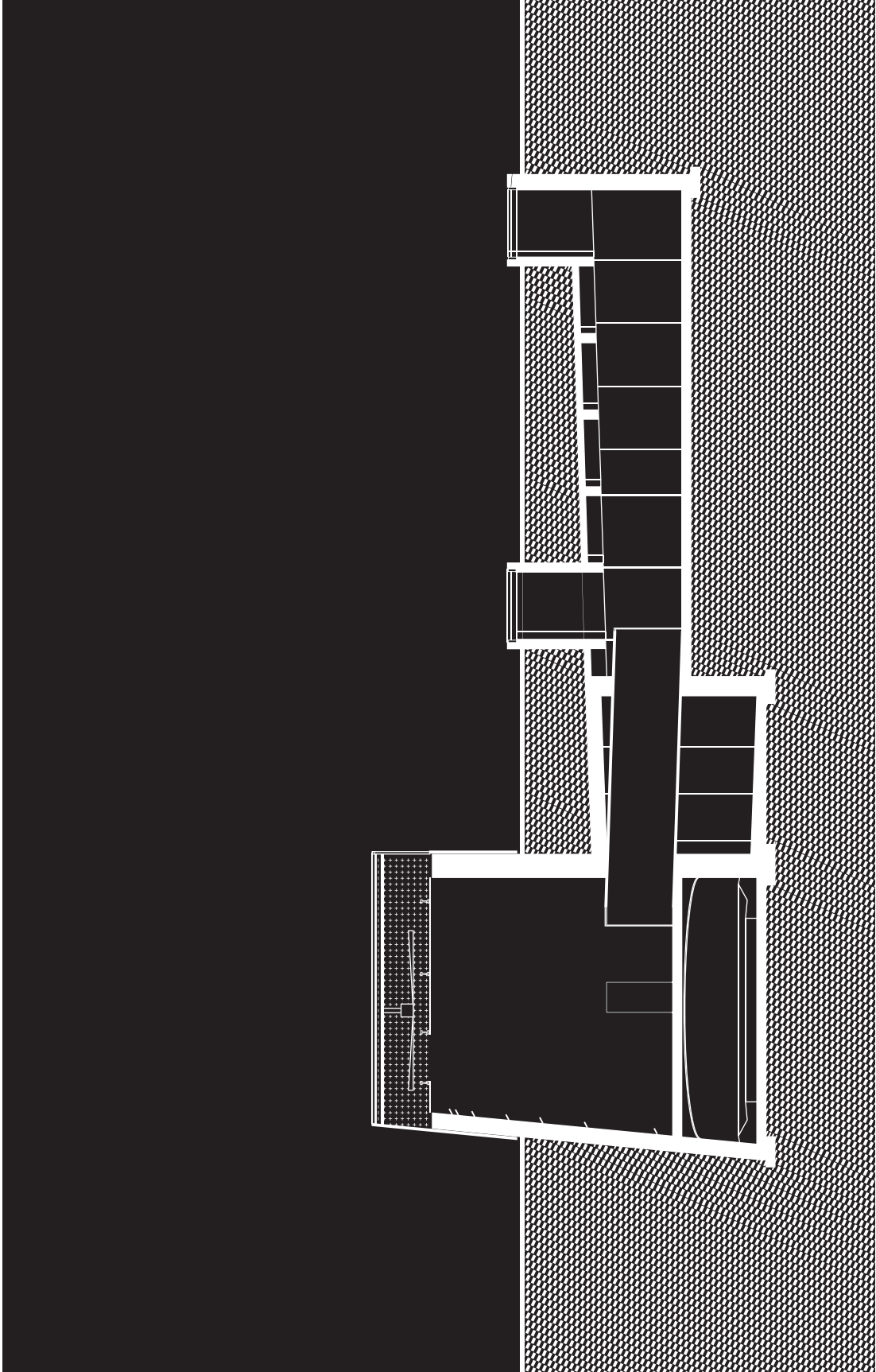
Exhaust Room, 2B location.

Midway through Room 2A is the entrance threshold to Room 2B, the Exhaust Room. This space is designed to highlight the hazards encountered when mining. The cave-ins, the explosions and the hazards of working with such violent machinery, although inherent, could be referred to as occasional, because these occurrences do not happen to the miner everyday of his working life. Therefore, this destination room has only one main threshold, aside from an emergency fire exit.

Light in the room is provided from above by a double layered, perforated, Corten steel roof. This provides even distribution of light to fully understand the stories told in this room. Two opposing slices in the roof allow a beam of rectilinear light into the space that will track along the curved

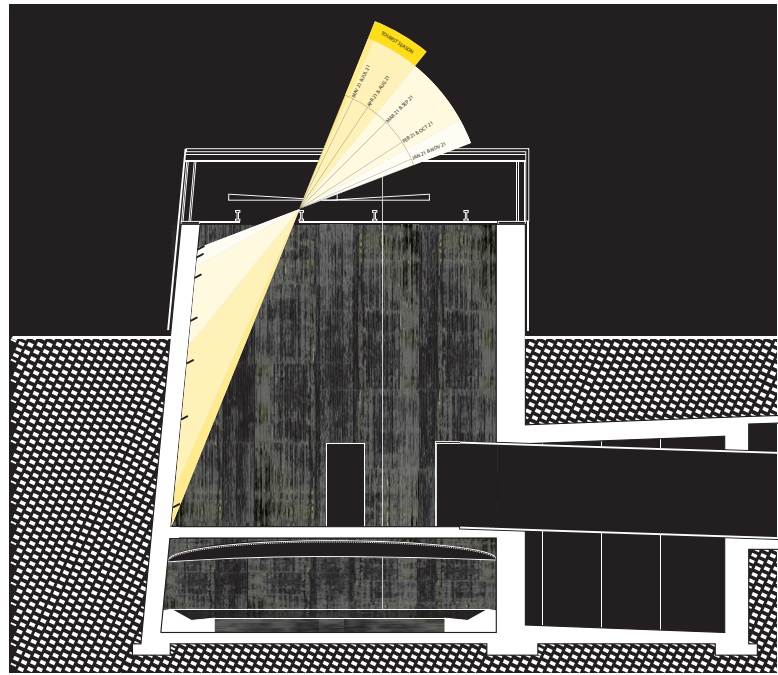


Exhaust Room, 2B



Section through Room 2A and into Exhaust Room, 2B. Fan is situated between two layers of the Corten steel roof. Scale 1:200.

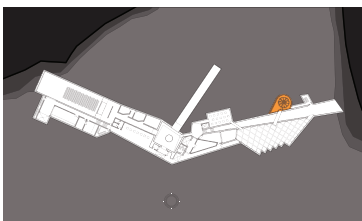
wall, never touching the floor of the room. Within the roof is an eleven meter fan that provides the ventilation for the museum. Air is gathered through the perforated floor of the ramps that criss-cross the museum hallway that act as oversized air ducts. This spinning fan creates an unsettling tension within the room as the user feels the air rush past them and sees the light constantly changing.



Section of Exhaust Room, 2B and Remembrance Room.
Scale 1:200.

Cuts in the roof allow a rectangular beam of light to track along the wall and activate light receptors.

Remembrance Room



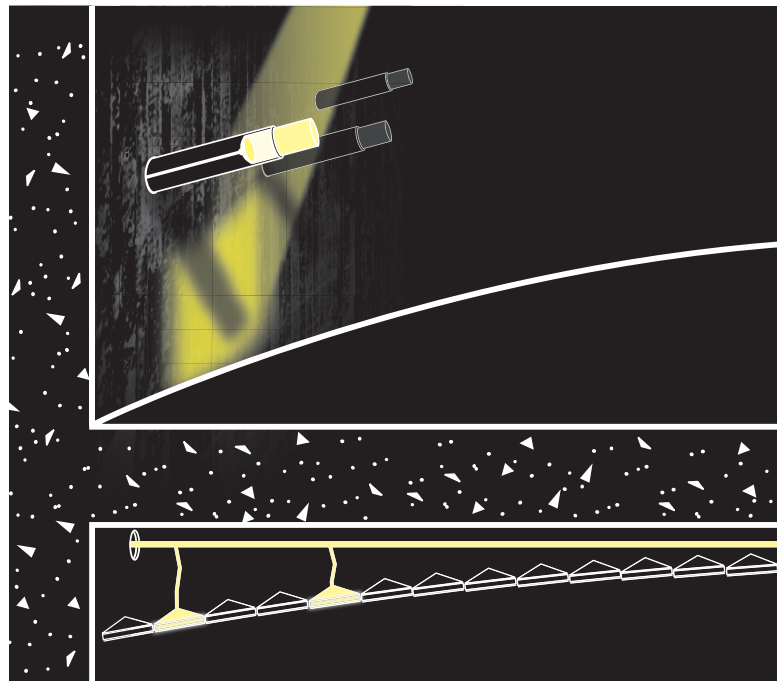
Remembrance Room location,
below Exhaust Room, 2B.

The Remembrance Room is designed to slow the user to acknowledge the death of each individual coal miner lost in Nova Scotia since the recording of miners' deaths began in 1838. In total, 2426 coal miners lost their lives and their sacrifice should be remembered.

This room is the darkest and the lowest in the entire building - very much like a crypt below a church. It is designed to slow the user by forcing them to stay in the room to allow their eyes to adapt to the lowest of lighting conditions.

Light is solely provided by light harvested through the receptors in Exhaust Room, 2B and emitted via fibre-optic cable through nameplates in the ceiling. Each nameplate is of a deceased miner organized throughout the room based on geographic constraints. As the rectilinear beam of light tracks through the Exhaust Room, 2B it activates certain names to shine corresponding to the month in which they passed away. The remaining names emit a small amount of ambient light within the Exhaust Room, 2B.

Concrete benches line the perimeter of the room allowing the user to sit and adjust their eyes to the low levels of light. For the nameplates to reach their full perceptual brilliance



Detail of the sunlight harvesters embedded in Exhaust Room, 2A. This light is transmitted through fibre-optic wire to the nameplates in the ceiling of the Remembrance Room.

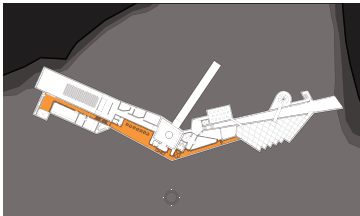
users will have to spend approximately 20 to 30 minutes to fully realize the over 2400 names on the ceiling.

The light in this room is designed to be slow and meditative, with an eventual brilliance akin to the glimmering quality of a piece of bituminous coal. Additionally, since it is the lowest part of the facility it also drains any excess water and pumps it away through the end of the museum hallway.



Bituminous Coal recovered from the shores of the site. The shine of the coal is visible at certain angles.

Service Areas



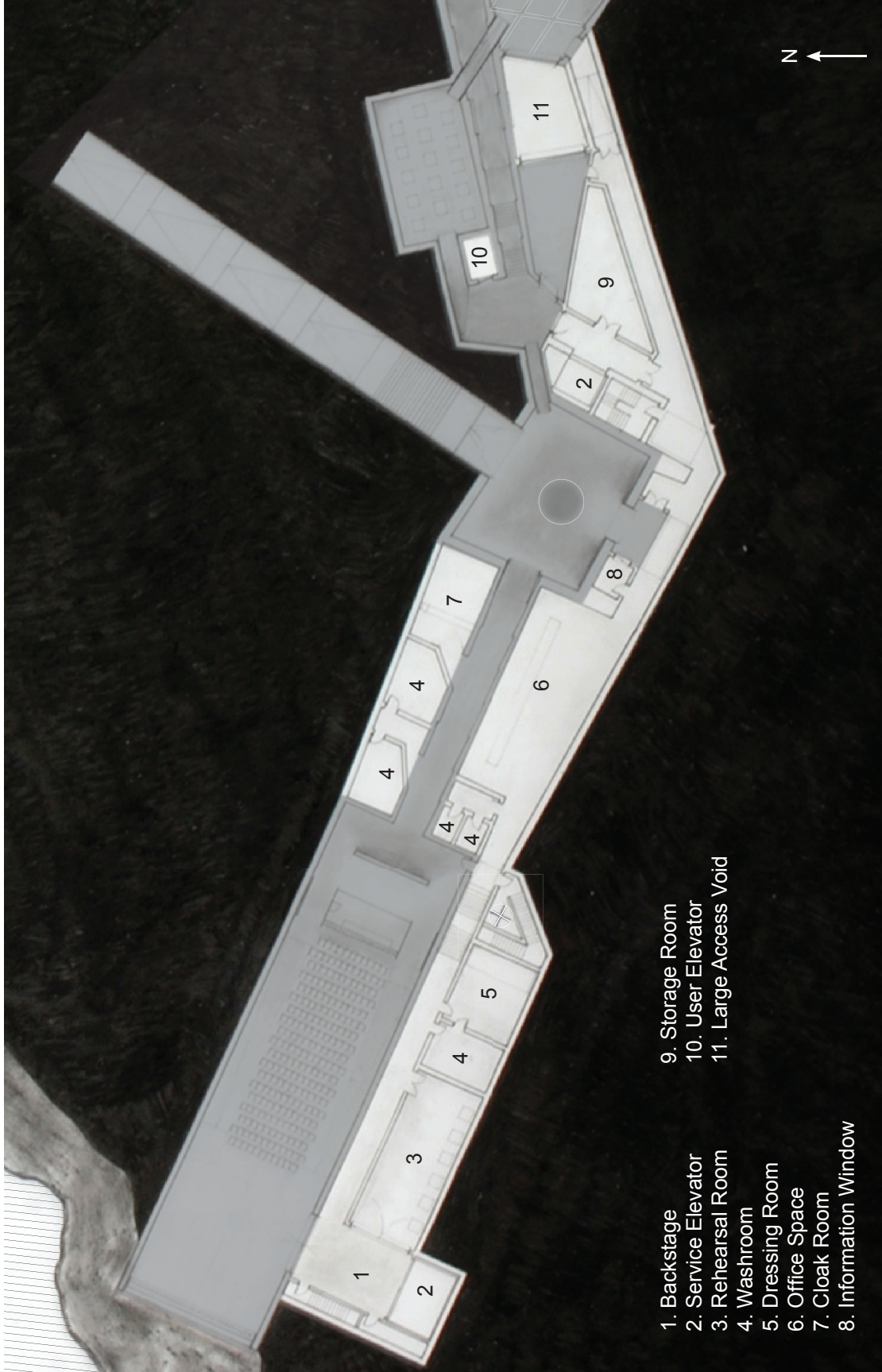
Service Areas location.

The facility requires service space to allow proper functioning of the building. These service areas are attached to the south side of the building along a hallway that winds around the various programmatic constraints of the building.

To access the Music Hall a large elevator is located adjacent to the backstage. Also next to the backstage area is the rehearsal room, and further down the hallway are the washroom and dressing room for the musicians.

Office space for clerical duties is situated close to the Central Hall, next to the information and ticket window. Further service for the Music Hall patrons is provided by the washrooms and cloak room facilities off of the Music Hall hallway.

Workers at the facility can enter directly through the concrete form extending from the Central Hallway through

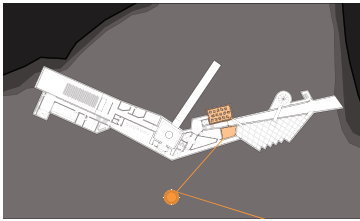


Plan of Service Area throughout facility. Scale 1:500.

either the service elevator or the stairs. This entrance also provides access to the storage room and mechanical rooms below the main floor.

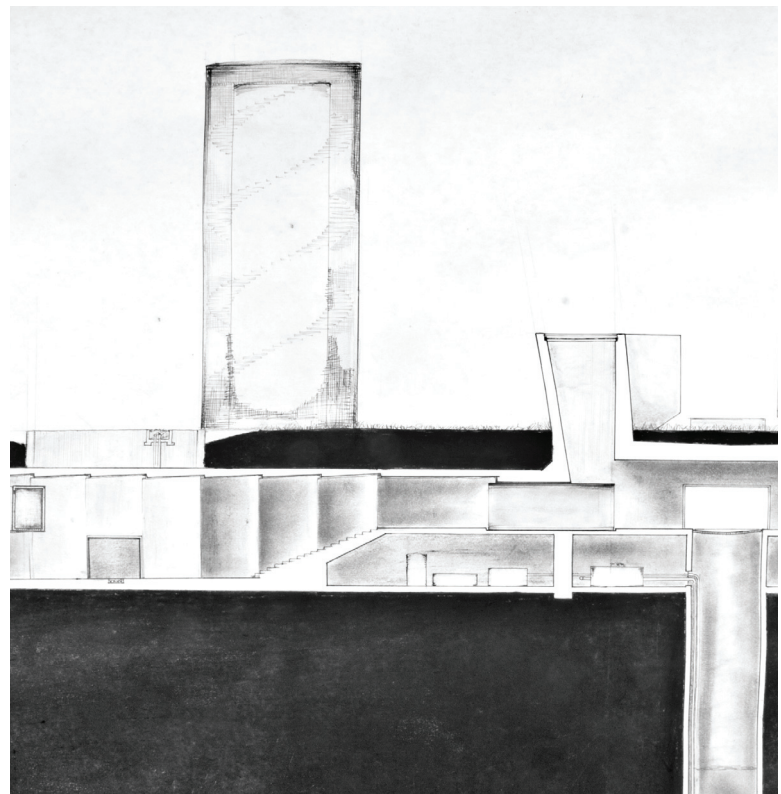
The large void cut into the landscape allows light to penetrate into Room 1B and Room 2A, but also allows machinery to be lowered into the mechanical rooms on the lowest level. This machinery would be lowered by use of a crane, since these larger machine would only rarely have to move.

Limewater Treatment Facility

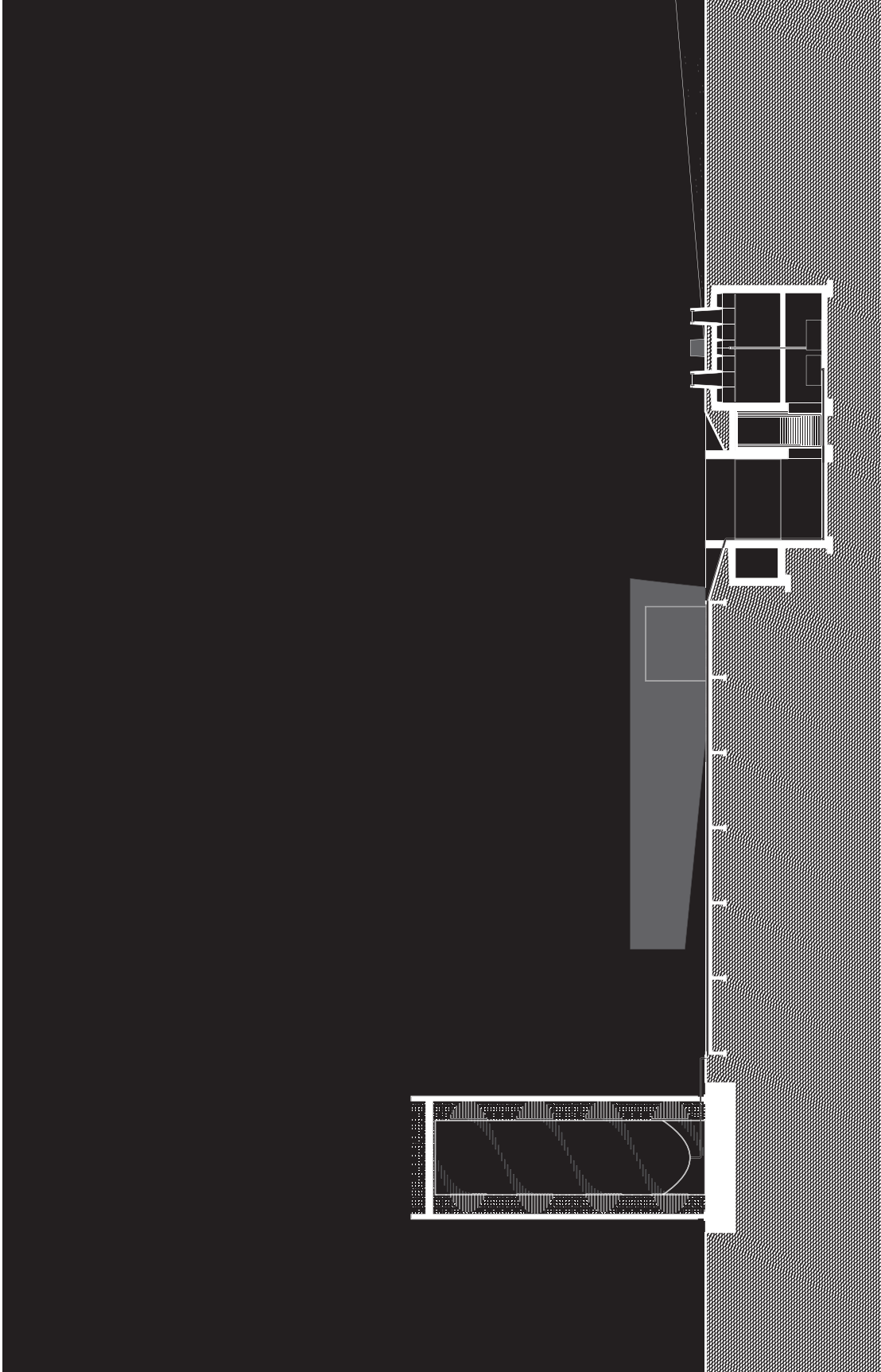


Lime Treatment location.

As stated previously, the minewater is extremely toxic and cannot be pumped directly into the ocean in case of emergency - it must be treated first. The existing small buildings on site will be incorporated into the proposed facility, occupying the level below the Central Hall and parts of the Mu-



Section Drawing showing the mineshaft, mechanical rooms and lime tower in the background. Scale 1:400.



Section Drawing through Room 1A, mechanical room, museum hallway, access void, and lime tower. Scale 1:400.

seum. The other mechanical rooms are also located on this level, with components like the cooling system incorporated into the design of Room 1A.

After the water is pumped from the connected mineshaft, the water will travel above ground through the large concrete access void, and to the lime tower for mixture before being ejected into the settling pond. Both the settling pond and the lime tower will remain on site, with the lime tower wrapped in a double helix staircase and Corten steel. Users can ascend the staircase to gain similar views that workers must have experienced when working at the top of the colliery headframe.

Above Ground - Systems

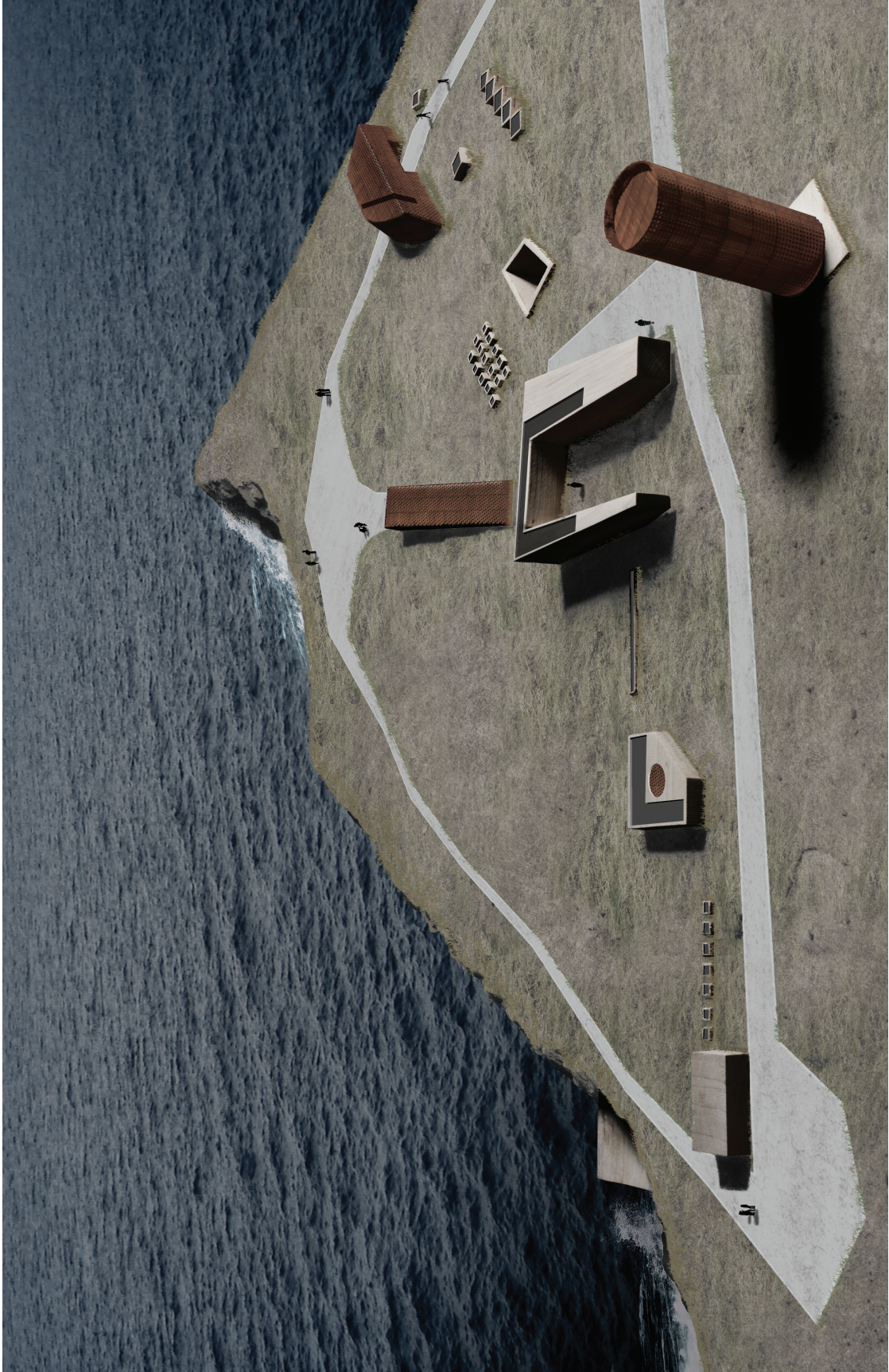
The only above ground articulations of the building are the requisite systems. These systems include the entrances, windows, fire exits and ventilation that allow the building to function. Concrete is used for those expressions that are not meant to interact with visitors to the facility. Perforated Corten steel is wrapped over the elements with which visitors should interact. These include the Lime Tower for visitors to ascend, the Entrance Shaft for visitors to enter the facility and the Exhaust Room, 2B to act as a gate along the path from the parking lot. The parking lot is in the same location as the previous parking lot for Colliery 1B+26. A path surrounds the museum to allow visitors a hard surface to engage the full site and allow delivery vehicles access to the two freight elevators.



Concept Model of the building.



Concept Model of the building.



Perspective View of the building.

Chapter 7: Conclusion

How can light and shadow commemorate the forgotten landscapes of the Cape Breton collieries?

The result of this study is a building that, I hope, serves to commemorate the life and times of the miners of Cape Breton. Their experiences served to establish that place as important in the development of Nova Scotia and Canada. Miners toiled in the mines for over three hundred years, but the industrial landscapes above ground have been erased and the underground sealed for good. By using light and shadow to propel the design of a theatre and music hall to commemorate their experiences I hope these ideas could serve as a dignified homage to their struggle.

Light and shadow have the capacity to move us when employed effectively and carefully. The effect of these potentially dramatic devices should not be applied indiscriminately, but should be considered in reference to program, usability, and effect.

Typically, light is used to 'display', while shadow is used to 'conceal.'⁴⁴ It is no wonder that we are constantly demanding more light as we seek to make new discoveries and propel our modern world. However, this thesis has demonstrated that shadow can also be used to 'display'. In this case, shadow was used as a narrative device to convey the feelings and tensions of working in some of the most dangerous working conditions. The uncertainty of living on the financial and physical edge, as stated by Currie, can be articulated architecturally through the use of the threshold and an understanding of human perception. Although employed

44 Hélène Binet et al, *Das Geheimnis Des Schattens*, 65.

at a more emotional level, rather than intellectual, shadow can indeed be used to 'display'.

This thesis also built on Plummer's idea of how light is used in 'procession'. He states that light can "seduce and attract" the user through "rewarding and memorable"⁴⁵ spaces. This idea was inverted by having the user gravitate towards the darkness. Just as Tanizaki and Zumthor wrote of the true beauty of gold found cradled in the shadows, the depth and the mystery of the darkness was examined by framing it in light. Perhaps another category can be added to Plummer's list of seven categories - Frame. The ability for light to focus and alter our perception to of what is understandable and what is mysterious.

Further study of the importance of the shadow could be explored through residential buildings. As Frampton pointed out, we need the shadow to seek refuge and provide rest from the outside world. How shadow can be used in a house could be explored programmatically, as well as emotionally, by understanding where and when we need shade. As energy usage becomes an increasingly important topic in construction, how and where we use that energy to light our homes is critical. Not every space of our home needs light, and the light that we need should be considered to not only maximize its utility, but also to maximize its importance to our daily lives.

45 Plummer, *The Architecture of Natural Light*, 54.

Appendix

Sheldon Currie's disapproval of the Museum manifested itself as a book entitled *The Glace Bay Miners' Museum*. Currie paints a clear picture of the day to day hardships of living in a mining town by telling the story of Margaret MacNeil. From the outset of the story, Margaret has already lost her father and older brother due to a mining tragedy. By the story's conclusion she loses all of the remaining men in her life due to the mines - her newlywed husband, her younger brother and her grandfather. Her sense of betrayal manifested itself when she decided to remove certain portions of anatomy from the three recently deceased men. She preserved the anatomy in pickling jars, placed them on shelves in her house, and arranged other items on chairs, tables or on the walls. Margaret saw her house as an homage to the tragedies that were endemic to Industrial Cape Breton. To Margaret this was an appropriate Miner's Museum. It articulated the tragedy that beset the miners and their families as well as shocked anyone that decided to visit her museum with such a graphic display. Sheldon Currie built his Miner's Museum through Margaret's tragedy, and in so doing penned a moving story of a woman that experienced the dangers of the mines without ever setting foot below ground.

References

- “Architects to Compete for Design of Museum: Contract is Open Only to Designers from Nova Scotia.” *The Chronicle Herald* (Halifax), February 13, 1965.
- Ayers, Tom. “Devco ready to dissolve.” *Cape Breton Post* (Sydney), 19 October 2009. Environment section.
- Binet, Hélène, Roberto Casati , Werner Oechslin, Tadao Andō , and Deutsches Architekturmuseum. *Das Geheimnis Des Schattens : Licht Und Schatten in Der Architektur = the Secret of the Shadow : Light and Shadow in Architecture*. Tübingen; New York, NY: E. Wasmuth ; Available through D.A.P., 2002.
- The Cape Breton Miners’ Museum, “Miners’ Museum – The Museum,” 8 June 2004, http://www.minersmuseum.com/the_museum.htm.
- Coal Action Scotland. Miner’s Helmet Lamp. (photograph) 2010. http://coalactionscotland.noflag.org.uk/wp-content/uploads/2010/02/091808025102_coal-mine-hat-dust1.jpg.
- “Contract is Open Only to Designers in Nova Scotia.” *The Chronicle-Herald* (Halifax), 13 February 1965.
- Corrodi, Michelle, Klaus Spechtenhauser, and Gerhard Auer. *Illuminating: Natural Light in Residential Architecture*. Basel; London: Birkhäuser ; Springer [distributor], 2008.
- Currie, Sheldon. *The Glace Bay Miners’ Museum: The Novel*. Wreck Cove, Nova Scotia: Breton Books. 1995.
- Earle, Michael J. “The Rise and Fall of a Red Union: The Amalgamated Mine Workers of Nova Scotia, 1932-1936.” *Labour / Le Travail*, 22 (Fall 1988): 99-137.
- Frost, Louis. “History of Sydney Coal Field.” *Mining History Nova Scotia*. 28 May 2000. <http://www.mininghistory.ns.ca/lfrost/lfintro.htm>.
- Gonzalez, Valérie. “The Comares Hall in the Alhambra and James Turrell’s “Space that Sees”: A Comparison of Aesthetic Phenomenology.” *Muqarnas* 20 (2003): 253-278.
- Google Maps. Cape Breton Miners’ Museum, Glace Bay. (map) 2010. <http://maps.google.ca>.
- Google Maps. Site of Former Colliery No. 1B + 26, Glace Bay. (map) 2010. <http://maps.google.ca>.
- Gregbord. “Savoy Theatre Men of the Deeps Rita 1.” YouTube, 01 July 2009. <http://www.youtube.com/watch?v=-qD42gnAjo4>.

- Innovative Business Solutions - Special Events. The Men of the Deeps performing. (photograph). <http://www.innovative4you.com/psr2011/specialevents.htm> (accessed 25 October 2011).
- Lam, William M. C. *Perception and Lighting as Formgivers for Architecture*. New York: McGraw-Hill, 1977.
- Le Corbusier, Jean-Louis Cohen, and John Goodman. *Toward an Architecture*. Los Angeles, Calif: Getty Research Institute, 2007.
- MacLellan, Jack Lily. *Explosion*. (painting) Date Unknown.
- MacLellan, Jack Lily. *A Fall of Stone*. (painting) Date Unknown.
- MacLellan, Jack Lily. *Open Coffin*. (painting) Date Unknown.
- MacLeod, Mary K., and James O. St. Clair. *Pride of Place : The Life and Times of Cape Breton Heritage Houses*. Sydney, N.S.: University College of Cape Breton Press, 1994.
- The Men of the Deeps. "History, News and Reviews." 16 Feb. 2009. <http://www.menofthedeeps.com/historynewsreviews.html>.
- Nova Scotia Archives - Men in the Mines. No. 26 Colliery, Glace Bay. (photograph) 1977. <http://www.gov.ns.ca/nsarm/virtual/meninmines/archives.asp?ID=536>.
- Nova Scotia Archives - Men in the Mines. Row of Miners' Cottages. (photograph) 1909. <http://www.gov.ns.ca/nsarm/virtual/meninmines/archives.asp?ID=557>.
- Nova Scotia Archives. "Nova Scotia Mine Fatalities, 1838-1992." last modified May 1, 2006. <http://www.gov.ns.ca/nsarm/virtual/meninmines/fatalities.asp>.
- Orwell, George. 1959. *The Road to Wigan Pier*. London: Secker & Warburg.
- Plummer, Henry. *The Architecture of Natural Light*. London: Thames & Hudson, 2009.
- Public Works and Government Services Canada. Enterprise Cape Breton Corporation Former Mine Site Closure Program [Halifax]. (photograph) June 2011. http://www.ecbc-secb.gc.ca/upload/SiteClosure2011_51331233279.pdf.
- Purves, Dale, and R. Beau Lotto. *Why We See What We Do : An Empirical Theory of Vision*. Sunderland, Mass.: Sinauer Associates, 2003.
- Shea, Joe. "Mine Water Management of Flooded Coal Mines in the Sydney Coal Field, Nova Scotia, Canada." (photograph). In *Water Institute of Southern Africa & International Mine Water Association: Proceedings, International Mine Water Conference*, 289-297. Pretoria: Document Transfer Technologies, 2009.

Shea, Joe. "Innovative Management Techniques to deal with Mine Water Issues in the Sydney Coal Field, Nova Scotia, Canada." In *Mine Water & Innovative Thinking*, 633 – 637. Sydney, Nova Scotia: CBU Press, 2010.

Skinningrove Mines – East Cleveland Image Archive. Underground at Loftus Mine. (photograph). <http://ecol.org.uk/loftus/category/industry/ironstone-mine/skinningrove-mines/page/3> (accessed 20 May 2012).

Tanizaki, Jun'ichirō. *In Praise of Shadows*. New Haven, Conn.: Leete's Island Books, 1977.

Zumthor, Peter. *Atmospheres: Architectural Environments, Surrounding Objects*. Basel; Boston: Birkhäuser, 2006.

Zumthor, Peter, Maureen Oberli-Turner, and Catherine Schelbert. *Thinking Architecture*. Basel; Boston: Birkhäuser, 2006.