GRAPHIC NARRATIVE AND DESIGN IN MINING AND APOCALYPSE

By
Miranda DiGiacomantonio

A thesis submitted in partial fulfillment
of the requirements for the degree of M.ARCH

The Faculty of Graduate Stduies
Laurentian University
Sudbury, Ontario, Canada

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APPROVED/APPROUVÉ

Thesis Examiners/Examinateurs de thèse:

Patrick Harrop
(Thesis Advisor / Directeur(trice) de thèse)

Ted Wilson
(Thesis Second Reader / Directeur(trice) de thèse deuxième)

Professor Brian Lilley
(External Examiner/Examinateur(trice) externe)

Approved for the Faculty of Graduate Studies
Approuvé pour la Faculté des études supérieures
Dr. David Lesbarrères
Monsieur David Lesbarrères
Dean, Faculty of Graduate Studies
Doyen, Faculté des études supérieures

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ABSTRACT

“Is there valid application in processing architectural design in the method of graphic narrative? This thesis explores utilizing the language of graphic narrative to blur boundaries between apocalypse, mining, and architecture. Set in the abandoned Stobie-Frood mine of Sudbury, Ontario, the narrative in tandem analyzes the past, present, and apocalyptic driven future of the design. By including the three-time sequences in time, the structure transcends all and becomes a character itself in this narrative. The purpose of creating this connection between the method, topics, and design is to create a boundless universal language that can explore larger scale issues such as adaptive reuse, natural energy systems, and subterranean architecture. The graphic narrative in this thesis offers a portal into the architecture world, one that can be understood by architects and non-architects alike.”

KEYWORDS

Graphic Narrative, Mining, Apocalypse, Subterranean, Natural Energy Systems, Hydroelectric Pump System, Stobie-Frood, Sudbury, Adaptive Reuse, Abandoned Mine

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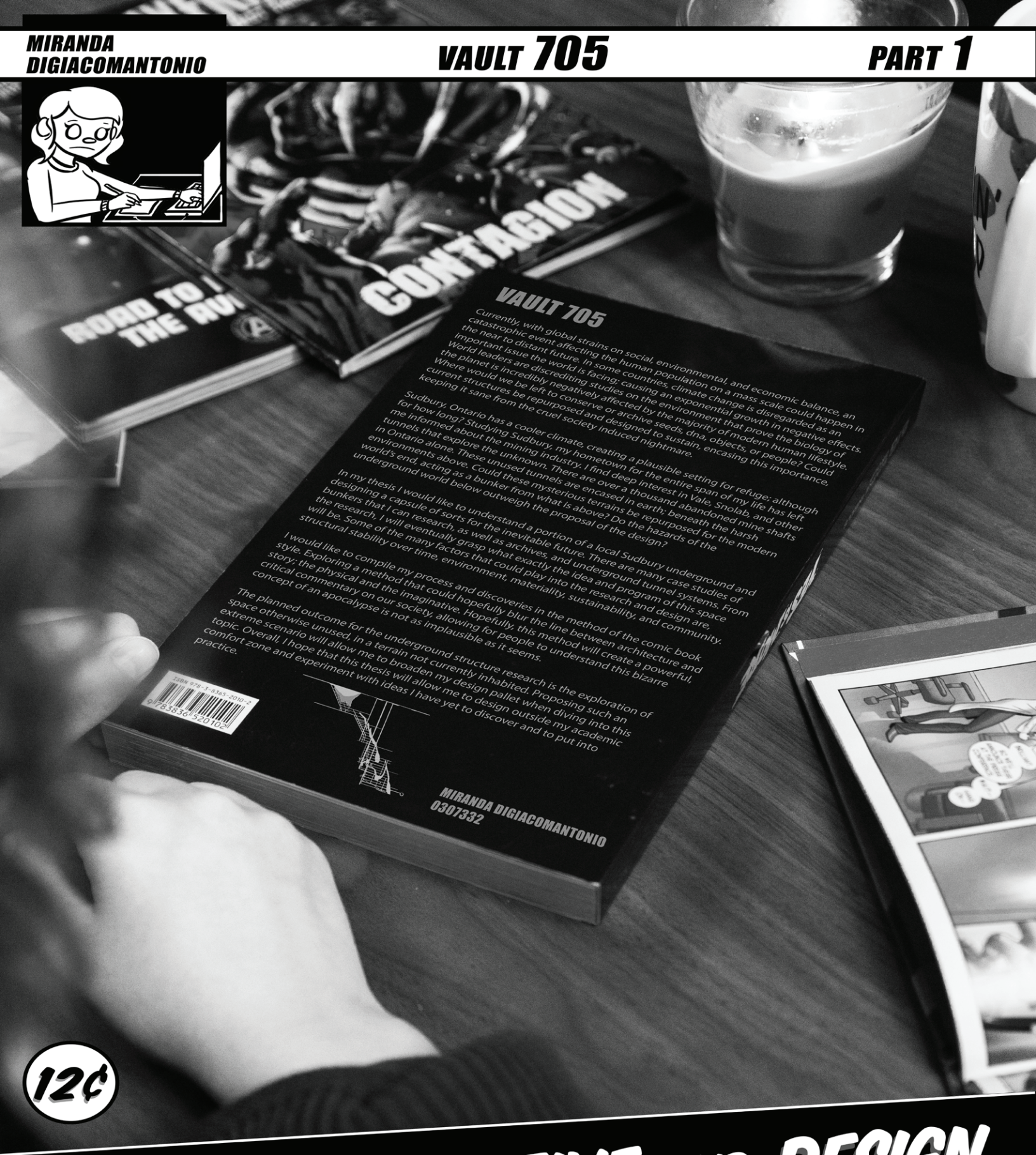

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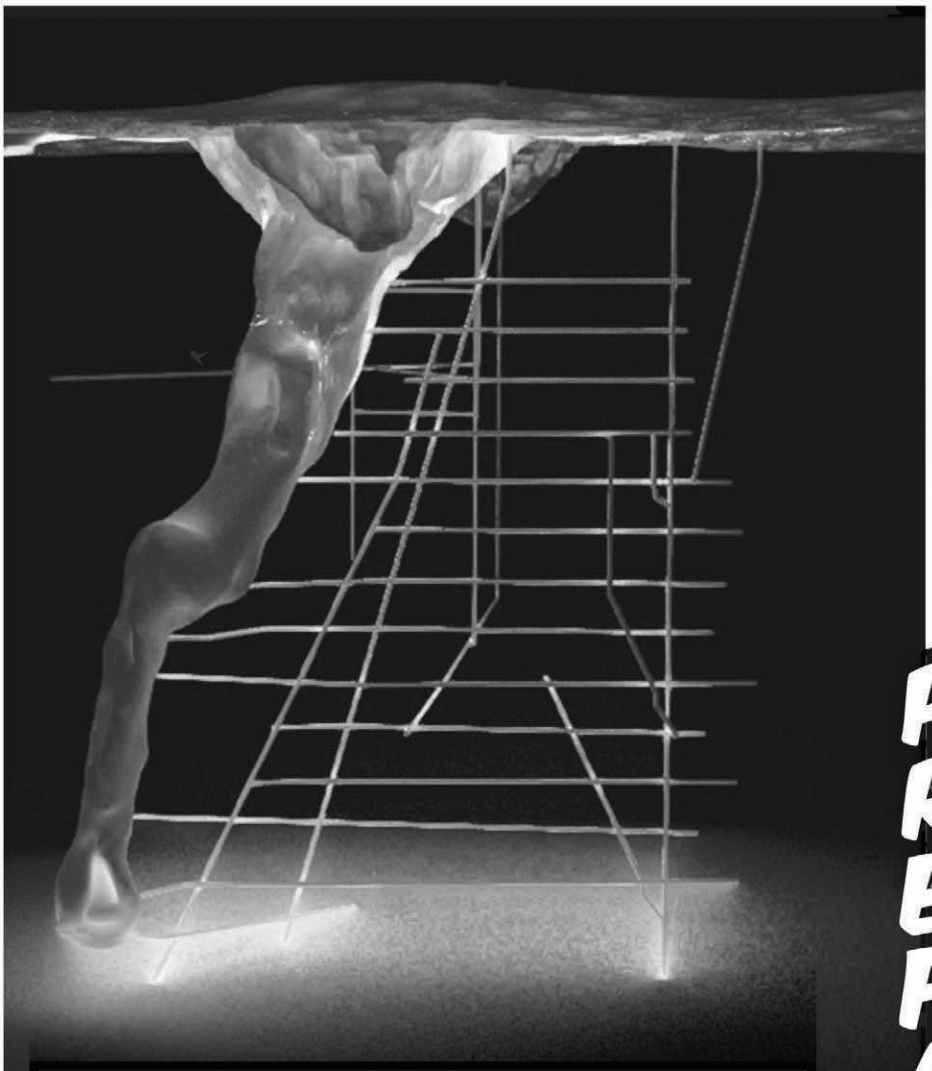
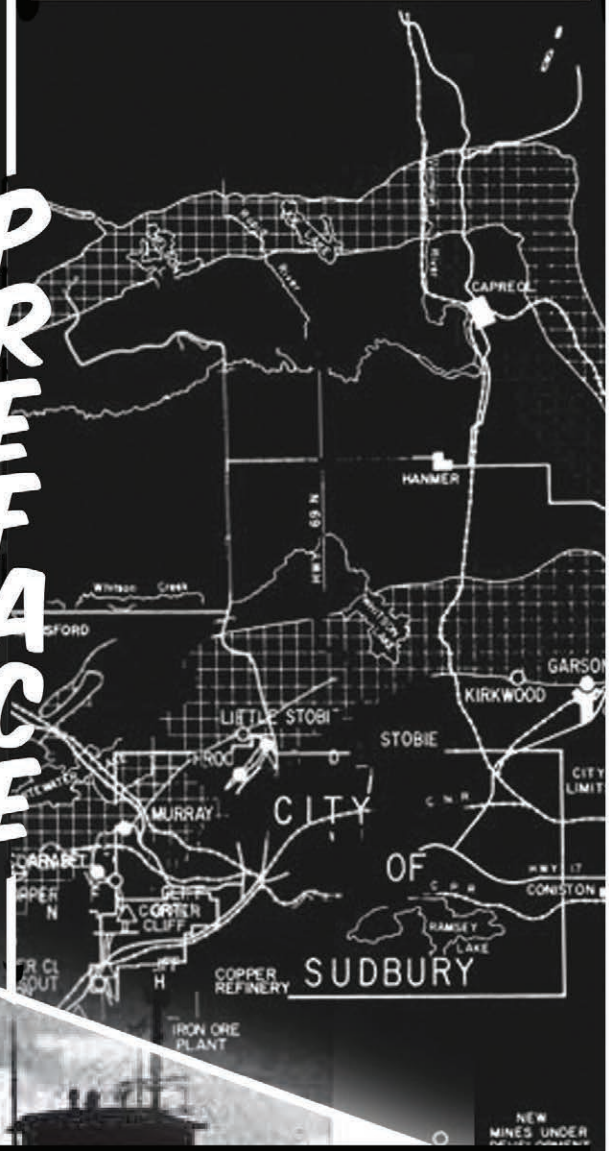
GRAPHIC NARRATIVE AND DESIGN IN MINING AND APOCALYPSE

PREFACE



MY THESIS AIMS TO DESIGN THROUGH THE MEDIUM OF GRAPHIC NARRATIVE, TO CREATE A PROTECTIVE STRUCTURE FOR ARCHIVING IMPORTANT INFORMATION IN THE CASE OF A SOCIETY ALTERING APOCALYPSE. THE SITE IS THE ABANDONED SUDBURY MINES. THE GRAPHIC NARRATIVE I AM WRITING WILL INCLUDE 3 SECTIONS: SUDBURY'S INDUSTRIAL PAST, EXPLORATION OF MINING IN THE PRESENT, AND A POST APOCALYPTIC FUTURE; REVOLVING AROUND FROOD MINE AS IT'S MAIN CHARACTER.



THE PURPOSE OF MY RESEARCH IS TO CREATE A COMMENTARY ON THE SOCIAL, ENVIRONMENTAL, AND ECONOMIC IMBALANCES RECURRING THROUGHOUT THE EXPLORED TIMELINES. WITH THIS TOPIC I AM ABLE TO EXPLORE SUBJECTS SUCH AS: ADAPTIVE REUSE, TECHNICAL STRUCTURES, AND ARCHIVAL STRUCTURE PROGRAM. THE USE OF THE GRAPHIC NOVEL AS A MEDIUM WILL BECOME THE VESSEL WHICH CARRIES THESE TOPICS TO A BETTER UNDERSTANDING. SINCE ISSUES FACING SOCIETY TODAY INVOLVE EVERYONE, THIS MEDIUM WILL BRIDGE THE GAP BETWEEN ARCHITECTS AND NON-ARCHITECTS UNDERSTANDING THESE CONCEPTS.

THE OUTCOME FOR THE UNDERGROUND STRUCTURE RESEARCH IS THE EXPLORATION OF SPACE OTHERWISE UNUSED, IN A TERRAIN NOT CURRENTLY INHABITED. THE CHOSEN SITE IS THE STOBIE-FROOD MINE SHAFTS NO.3 AND 9. PROPOSING SUCH AN EXTREME SCENARIO WILL ALLOW ME TO BROADEN MY DESIGN PALLET WHEN DIVING INTO THIS TOPIC. OVERALL THIS THESIS BROUGHT ME OUT OF MY ACADEMIC COMFORT ZONE AND ALLOWED FOR EXPERIMENTATION WITH IDEAS I'VE YET TO PUT INTO PRACTICE.

PART

I

THE FABRICATION OF THESIS

INTRODUCTION

My thesis in itself is directly correspondent to a process: crafting a method, understanding interests, and researching case studies.

Directed through a drawing course taught by Patrick Harrop, I was assisted to craft this method by studying relevant source material and painstaking practice. I had to find a way to use this method in a new way; my own way. Just as artists and designers have their unique creative niche, I found a way to discover my own niche in this method.

Following the method of my thesis, I narrowed my interest to find architectural topics that I could become absorbed in. The ambition of these topics was to not only have ample architectural design conflicts open for exploration but to also appealing to my own interests.

Apocalypse was the first topic to develop, beginning with prominent interests in media such as comics, movies, and video games. It is a increasingly understood topic as current global strains on the social, economic, and environmental balance of the planet. Architectural design as a whole needs to take a step in classifying a catastrophic apocalyptic event as a possibility for our future.

Mining is linked to my heritage in Sudbury, Ontario. I have lived here my whole life and have always been interested in the unknown world of what is below. Stories of 1 km deep tunnels have always been vocally passed around, but the understanding of the scale has never actually been clear. Throughout this process, I also learned that my grandfather was a miner. By probing this topic, I was able to fulfill my hope in understanding my unfamiliar perception of mining. The research led me to choose the site that lies underground, protected from a speculative, but perhaps inevitable apocalypse above.

Part of this initial investigation included the research of case studies of subterranean architecture. I was directed to study the troglodytes of Matmata, the Catacombs, and inherently found the Wieliczka Salt Mines. Not only did I find methods of designing subterranean structures, but also was able to understand how their past, present, and future narratives connected to the design. These case studies played a crucial role in my thesis.

Throughout the course of this process in the first phase of the thesis, I was able to connect every concept together through the architecture itself. The conclusions drawn from the process of understanding the crafting of the method, potential topic interests, and researching case studies created a framework for designing the structure involved with my thesis.

CHAPTER

1.1

MEDIA AS THE MESSAGE

FOLLOWING INTERESTS

GRAPHIC NARRATIVE AS AN ARCHITECTURAL METHOD

Graphic narrative is the style used in comic books and graphic novels; telling a story through pictures. They perform as a middle ground between text sources and film. Why is this middle ground important? How can it be used to benefit research and architecture? By studying various forms of graphic narratives I have been able to understand the importance of this medium, and am able to transform its use as a vessel of architectural communication to carry my design forward.

Graphic narratives are composed of key elements. Each page is complete with panels of various shapes and sizes, containing scenes in sequence or abstracted. Another element of the narrative is the text; usually, the text can be in different fonts to evoke emotion from the audience. Onomatopoeia is a technique used within this medium to describe a formation of words providing the sensation of a sound; for example: thwack, boom, and sniff. The words are then transformed into this technique to include the sense of sound. Other techniques in comics can draw the audience to imagine other senses such as touch, smell, and taste; using only the sense of sight.

This medium only involves the reader and the book itself. There is an art to making the experience artful, emotion evoking, and personal. The only sense used is sight, relying on drawings and layouts carefully executed a palatable understanding. Since graphic narratives are mostly composed of images, it reaches a wide variety of audiences. Someone who only understands a different language than the narrative is written in can still understand the images and get a similar message. If the topic of the graphic narrative is architecture, someone who is not immersed in the subject can understand the images. This creates a bridge between the architect and the non-architect.

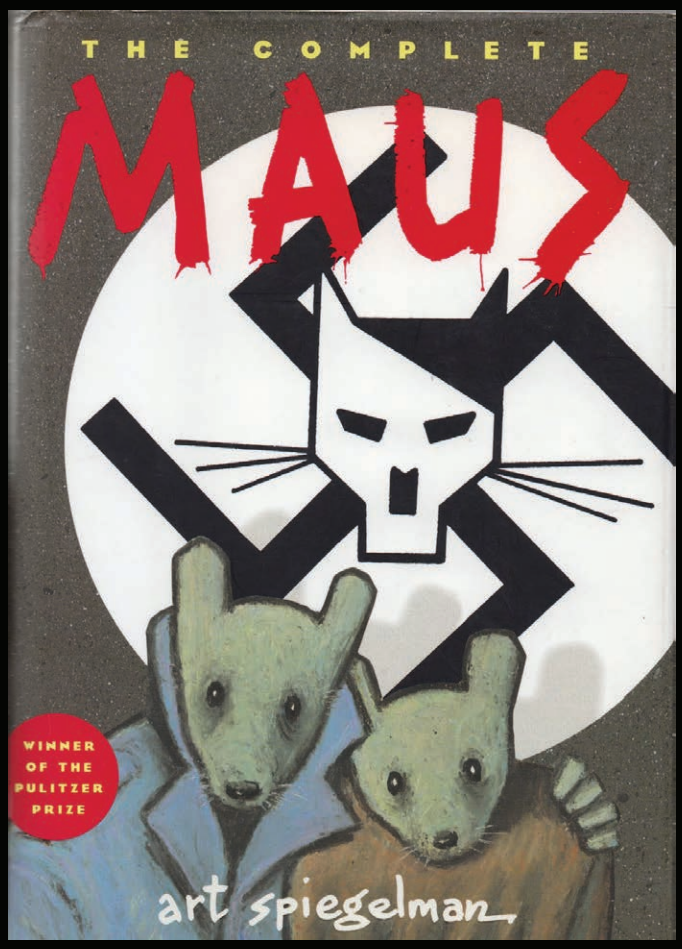
There are four graphic narratives I focused on as case studies to form a base to explore this method. MAUS by Art Spiegelman has a simple drawing style, where the author represents the Holocaust in a whimsical, easily palatable narrative. Akira by Katsuhiro Otomo displayed tremendous examples of architectural landscapes making the reader feel immersed in the space. Archigram uses the graphic narrative style to promote their new, unfamiliar architectural designs. And finally, Yes is More by BIG Architects is an example of the present firm using this form of media to expand their mission statements.

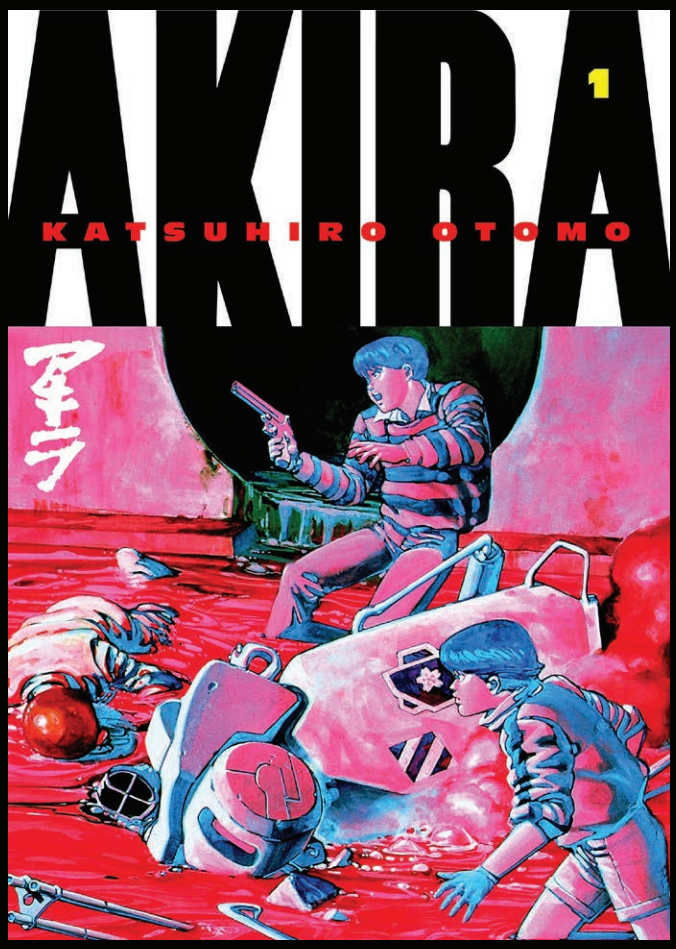
1. Art Spiegelman. *"Maus: A Survivor's Tale." Pantheon Books*, 1986-1991.

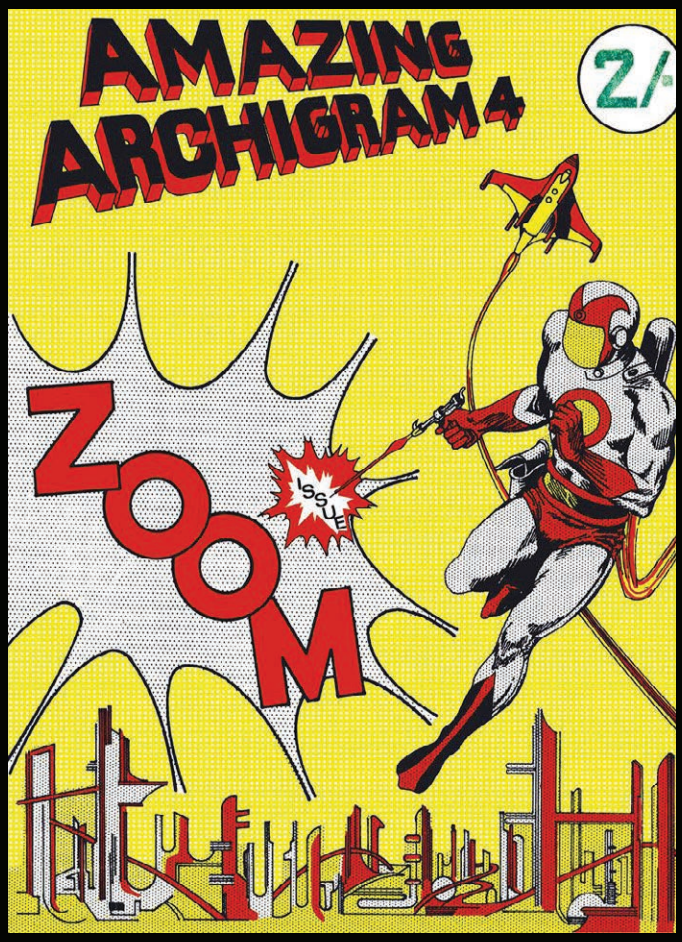
2. Katsuhiro Ōtomo, "*Akira."* New York: Kodansha Comics.

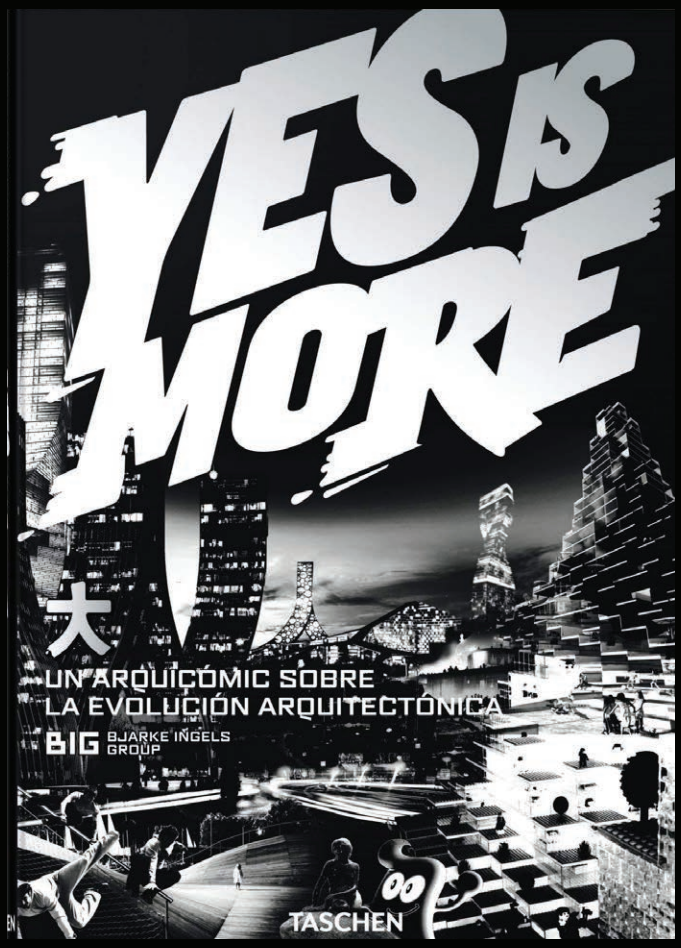
3. Archigram, *"Archigram 4"*

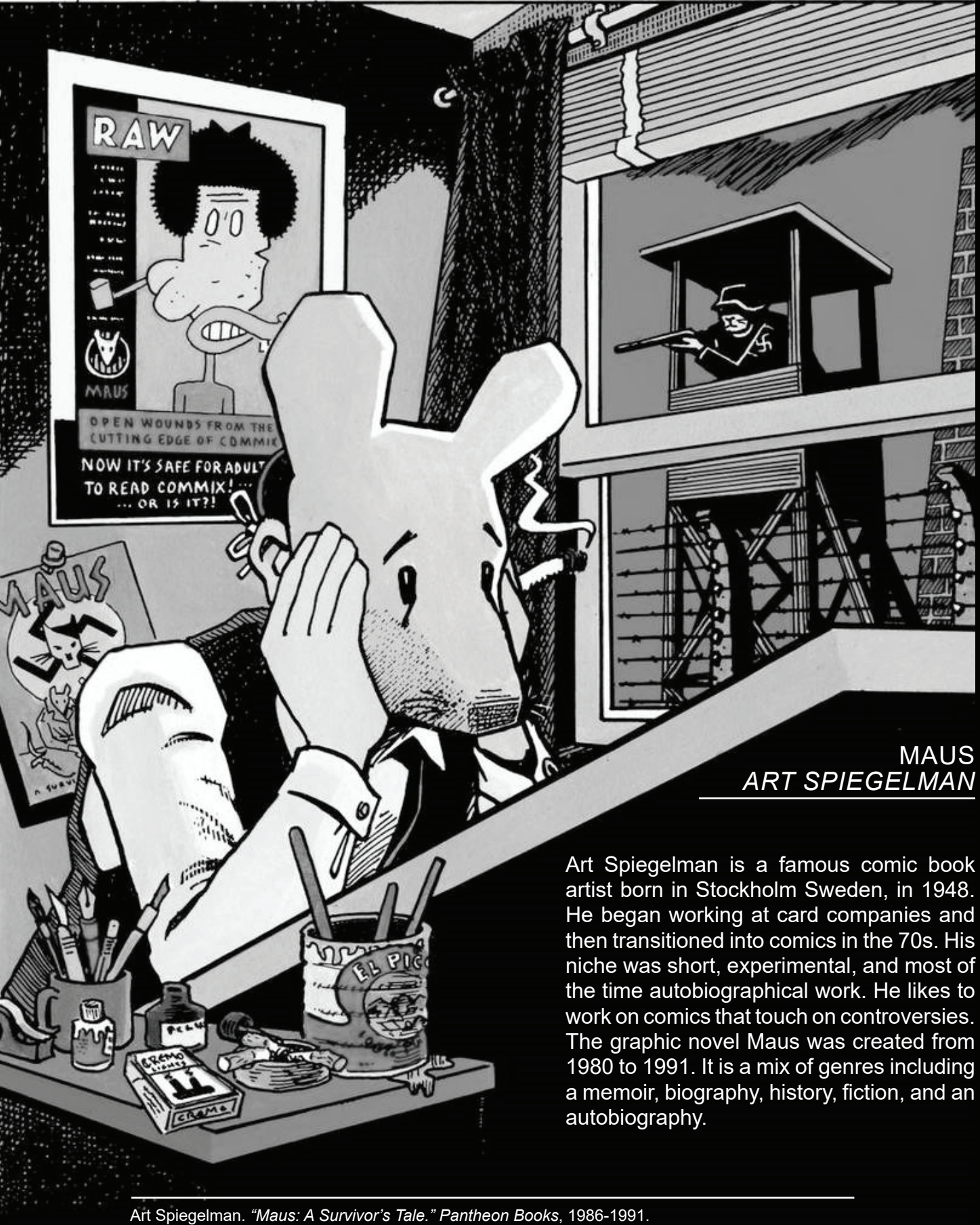
4. Bjarke Ingels, *"Yes Is More: An Archicomic on Architectural Evolution." Kbh.* Bjarke Ingels Group, 2009.


THE COMPLETE
MAUS
WINNER OF THE PULITZER PRIZE
art spiegelman


AKIRA
1
KATSUHIRO OTOMO


AMAZING ARCHIGRAM 4
2/-
ZOOM
ISSUE


YES IS MORE
UN ARQUICÓMIC SOBRE
LA EVOLUCIÓN ARQUITECTÓNICA
BIG BJARKE INGELS GROUP
TASCHEN



MAUS
ART SPIEGELMAN

Art Spiegelman is a famous comic book artist born in Stockholm Sweden, in 1948. He began working at card companies and then transitioned into comics in the 70s. His niche was short, experimental, and most of the time autobiographical work. He likes to work on comics that touch on controversies. The graphic novel Maus was created from 1980 to 1991. It is a mix of genres including a memoir, biography, history, fiction, and an autobiography.

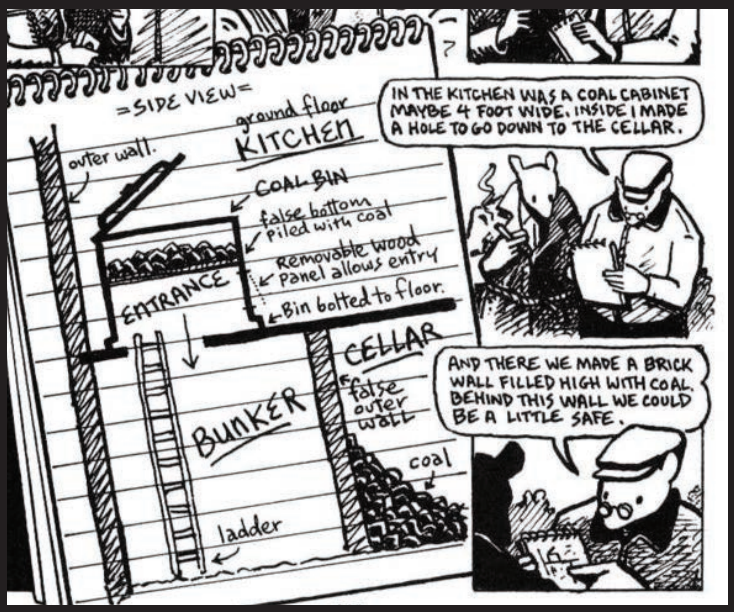
Art Spiegelman. *"Maus: A Survivor's Tale." Pantheon Books*, 1986-1991.
Images included are from comic.

This comic is an emotional piece with comical reflections. Revolving around Vladek telling his story to his son Art, for Art to eventually draw out a comic telling his father's first-hand accounts in Nazi Germany. There are many layers in this narrative, from very dark drawings of Auschwitz to Spiegelman depicting his senile father in the present, to narrating his current conversations and trials in life. I really felt a connection with these parts of the comic as my family is Italian, and they really appreciate what they have in Canada.

One of the methods Siegelman uses to make his comic so incredible is how he has chosen to metaphorically represent the characters and different ethnicities. All Jewish people are drawn as mice, German's are drawn as cats, and Americans are dogs. This method of dialogue is ironic because it takes something as horrible as the Holocaust and makes it lighter and palatable. It teaches history in a very surreal way; it looks like a children's book but retelling something very adult.

Spiegelman draws himself often within the comic, reflecting on himself as an author. This pulls him into the pages of the comic, into the narrative. I believe this is in the comic to bring a human presence in the history. When reading textbooks it's really easy to get detached from the text. It brings you through emotions from start to end of the series, and it's eye-opening to realize that this is true about real people.

There are some architectural undertones within this comic. It really assisted understanding the space in which the characters were in; very different than what is represented in a normal novel. They show sketches of what the bunkers look like in section, and a map to refer to locations that the narrative is taking place in.



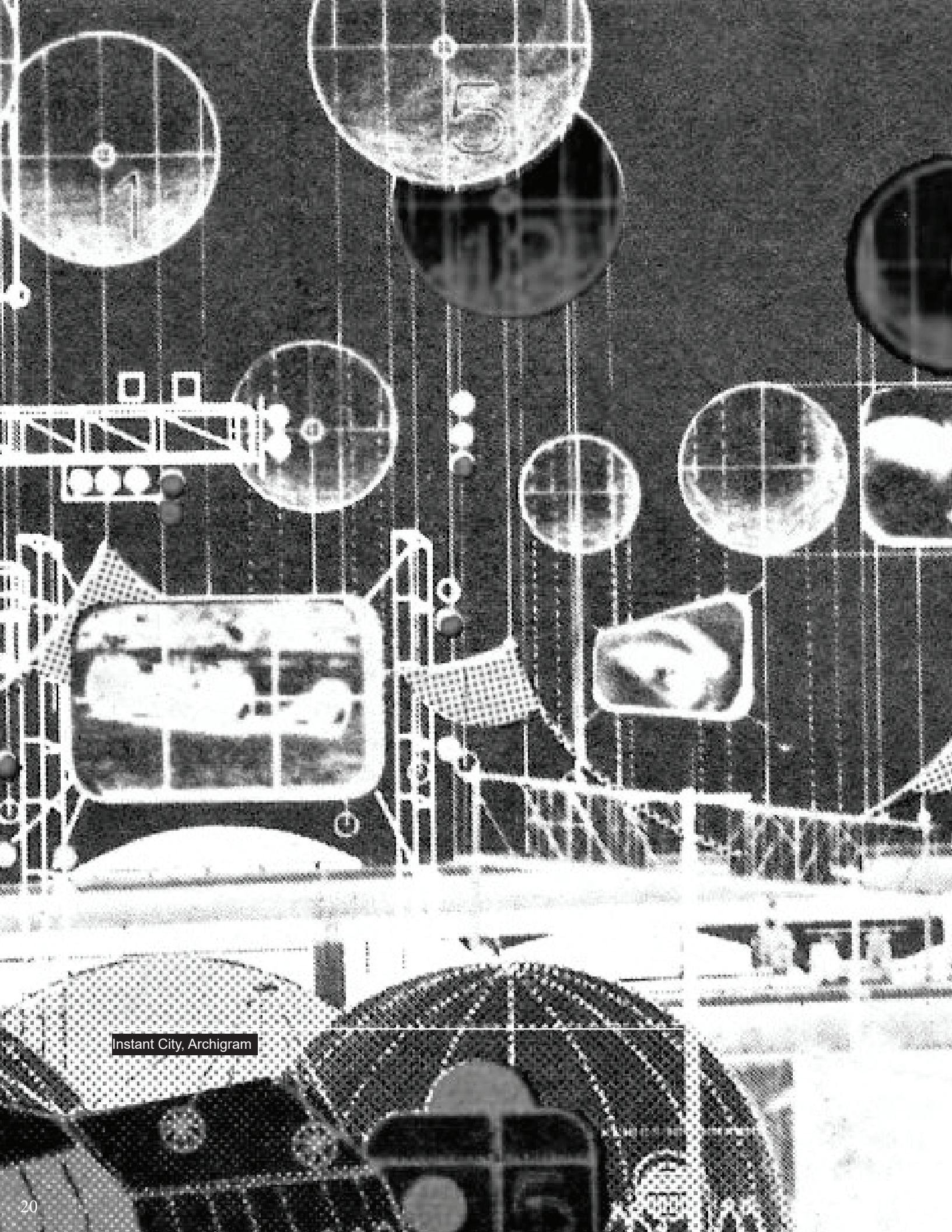
AKIRA
KATSUHIRO ŌTOMO

Katsuhiro Otomo is a manga artist born in Japan in 1954. He began with short comic strips in magazines, continuing on to bigger comics, and even directing anime films and show adaptations of his mangas. Akira was written in 1982-1990, making it the first manga to entirely be translated into English.

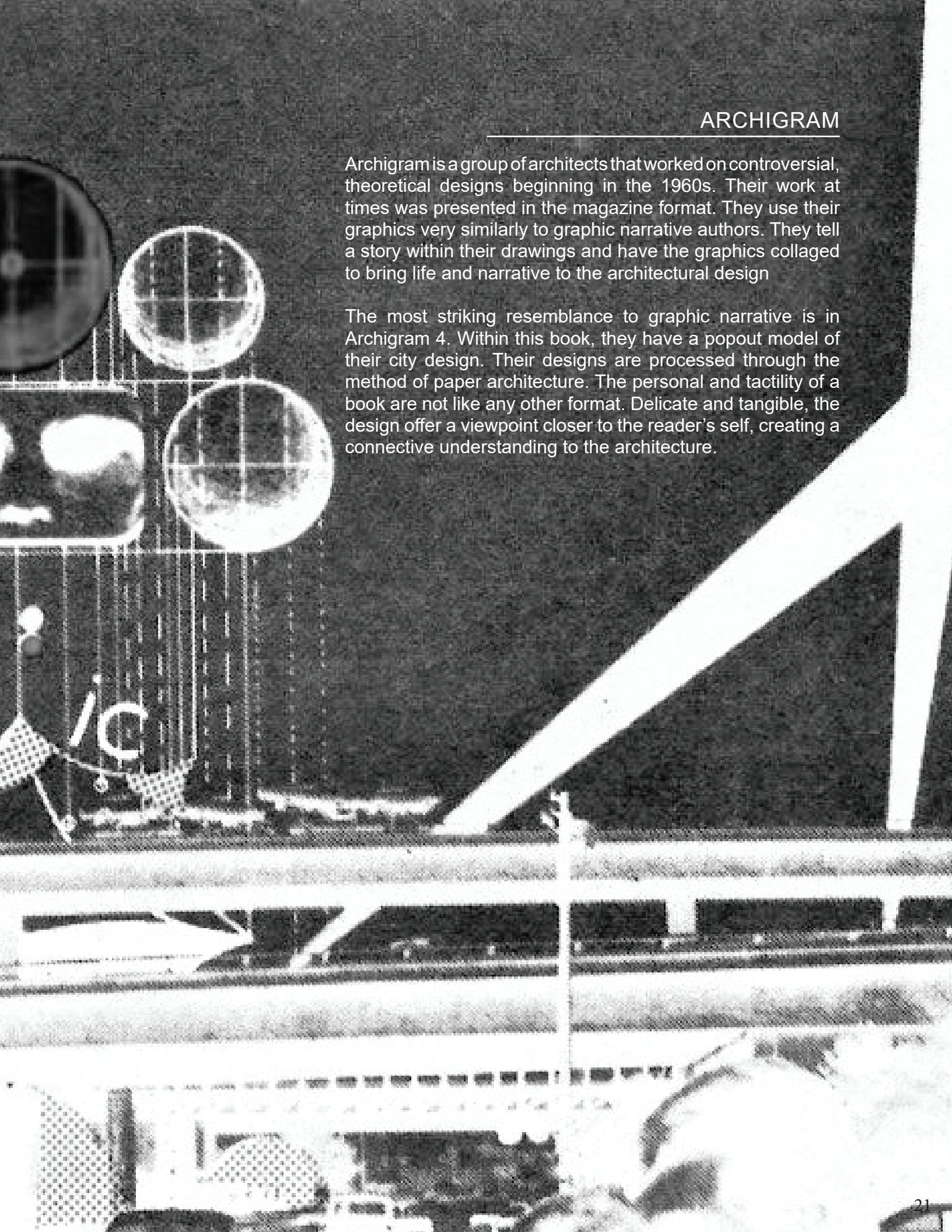
Akira is a comic about a young group of misbehaving teenagers who ride motorcycles in gangs. One night they stumble upon something odd; a translucent boy looking for pills. The story begins to change from there. His style throws the reader into the middle of nowhere, leaving the reader with the challenge of trying to determine what is really going on.

Katsuhiro Ōtomo, "*Akira.*" New York: Kodansha Comics
Image from Akira manga.

When he draws spaces within the comic, they are incredible. His style is loose, while still showing intriguing building details like wires, connections, and building systems. The amount of detail he puts in may be considered as unecessary but it, immerses the reader in the environment, and helps with understanding where the characters are situated. He creates a world in itself, a portal into the dimension of the narrative. It allows you to get completely immersed in the architectural landscapes, to assist the reader to identify the characters view, emotions, and environment.



Instant City, Archigram



ARCHIGRAM

Archigram is a group of architects that worked on controversial, theoretical designs beginning in the 1960s. Their work at times was presented in the magazine format. They use their graphics very similarly to graphic narrative authors. They tell a story within their drawings and have the graphics collaged to bring life and narrative to the architectural design

The most striking resemblance to graphic narrative is in Archigram 4. Within this book, they have a popout model of their city design. Their designs are processed through the method of paper architecture. The personal and tactility of a book are not like any other format. Delicate and tangible, the design offer a viewpoint closer to the reader's self, creating a connective understanding to the architecture.

Bjarke Ingels, *"Yes Is More: An Archicomic on Architectural Evolution." Kbh.* Bjarke Ingels Group, 2009. *Images above are sourced from archicomic.*

YES IS MORE!
BIG ARCHITECTS

BIG Architects is responsible for this archicomic. Bjarke Ingels is a Danish architect and partner of Bjarke Ingels Group. They design buildings that are sustainable in development principles and use bold sociological concepts. He was born in 1974 and went to the Polytechnic University of Catalonia, and the Royal Danish Academy of Fine Arts.

The way this book came to be, narrated at the beginning of the book, is how the intention of the book was to make a more interactive presentation to explain their firm. Very successfuly, this archicomic utilizes ideas used in other graphic narratives, such as Bjarke putting himself in the pages, and diagramming the firm's designs to clearly inform the reader.

Throughout one can see the relation to Archigram magazines, collaging habitation, design and movement alongside architecture. Relating back to Maus, BIG also uses the technique of self-narratives; showing them in the office or Ingels reflecting on what pictures are included. This adds the human aspect in this comic as well. You get to read and follow how they solved design issues, it is like watching a television program at some points. Without this comic book explaining their philosophies; you would have had to read a very long wordy manifesto. More preferably is seeing something and experience it in my own eyes which is why graphic narratives are an effective form of media.

CHAPTER 1.2

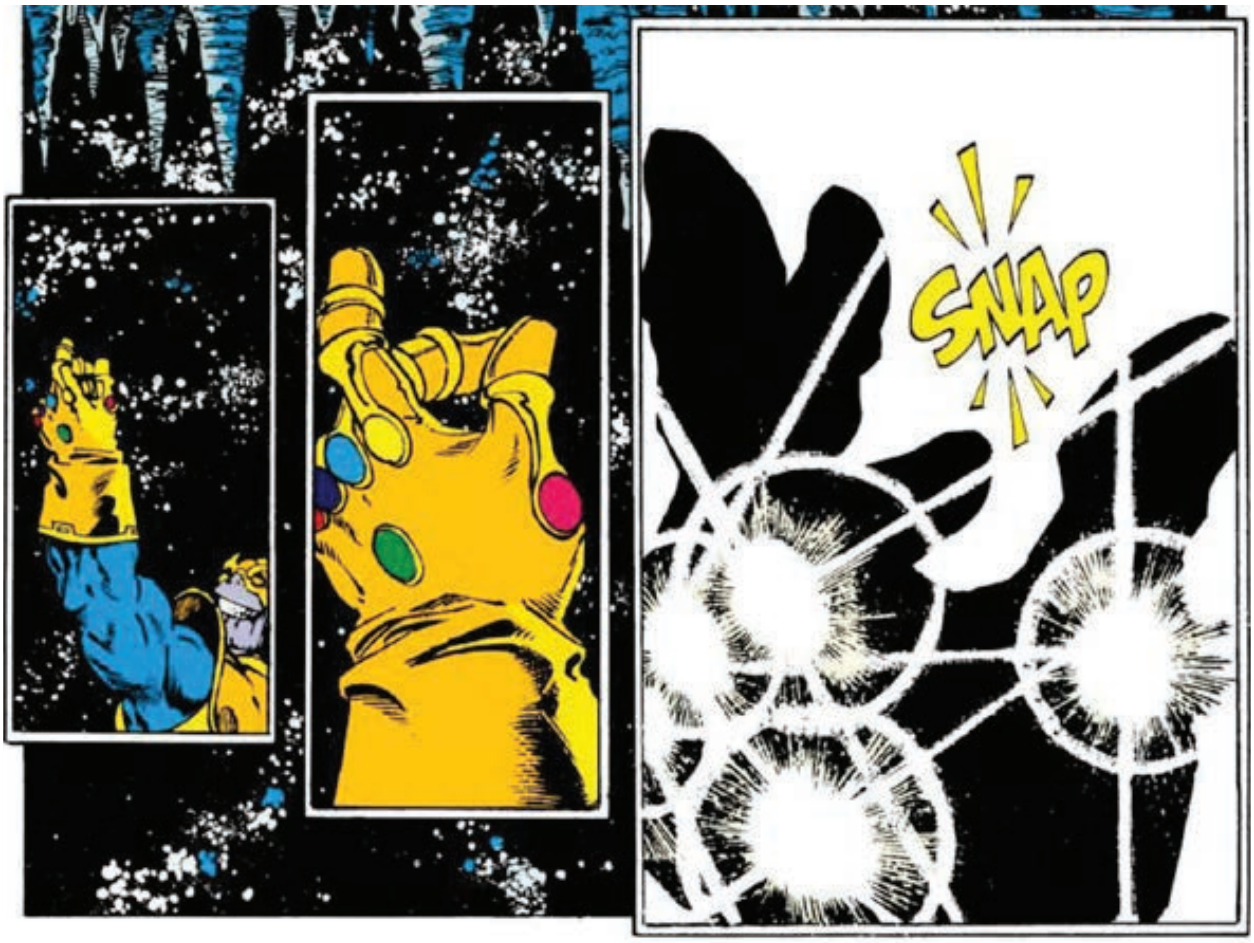
APOCALYPSE


Fallout 4
MATURE 17+
M
ESRB
MASS EFFECT 3
N7
I AM LEGEND
LEFT 4 DEAD 2
PS4
Only On PlayStation.
HORIZON
ZERO DAWN
STELLAR
TIM BURTON
WANTED
SHANE ACKER
READY PLAYER ONE
BRING
HIM
FROM THE HUMANS WHO BROUGHT YOU "FINDING NEMO"
Disney · PIXAR
WALL·E
JUNE 27
4K ULTRA HD
4K ULTRA HD + BLU-RAY + DIGITAL HD
10
CLOVERFIELD
LANE
FEATURES
FOR
FREEDOM
FOR
FAMILY
FOR
THE PLANET
WAR FOR THE PLANET OF THE APES
TOM CRUISE
WAR
OF THE
WORLDS
THE WALKING
DEAD

GRAPHIC NARRATIVE AS AN ARCHITECTURAL METHOD

The relevancy of the word apocalypse right now is incredibly high, mostly represented in film, news, novels, and other forms of media. Unfortunately, the idea of a contemporary world-ending event is plausible. World impacting factors such as plague, extreme weather events, fire, and warfare are all possible. Presently, many of the factors mentioned can be related to climate change, and the human race's impact on the natural world. Shelters are constructed in fear of an apocalyptic event. The shelters could be used for humans to inhabit or to store important information that could prove useful in the future.

What would be constituted as an apocalypse? For this thesis, the focus is on an event that could wipe out a mass amount of the world's population. Also, it has to be something that would make the earth above inhabitable. There is a theoretical and physical barrier displayed from the surface to the below, resonating in creating a subterrainian structure below the earth's surface.



George Perez, *Thanos Gauntlet Snap* - Marvel Comics

http://whatculture.com/comics/9-awesome-thanos-moments-that-need-to-be-in-avengers-infinity-war?page=6

APOCALYPSE IN HISTORY

Apocalypse can be traced back to 2800 BC, where religion depicted events that could end human civilization.[1] There was the idea that because of all the wrong doings the human race had done, the punishment would be the end of known civilization. Religion mostly ruled the idea of apocalypse until the 1940's when the idea of a nuclear apocalypse struck media. This is when the word apocalypse began to become known in media. Furthermore, because of this fear, bunkers became popular in architectural media, and began to be even personally owned. A bunker is an underground safe haven from nuclear warfare, said to be complete protection from what happens above. If it is not the initial blow that would kill you, it would be the nuclear fallout; you would need clean air to breathe for some time after the explosion.

To further this idea, the media in the 40s began to influence its audience with depictions of the apocalypse. Some examples are Dr. Strangelove (1964), Planet of the Apes (1968), and A Boy and His Dog (1975). Initially, I was exploring why these movies would keep coming out; wouldn't they only scare the public further? Movies and other recreational media are to bridge real life and fiction. They are there to help individuals understand scenarios, whether they are blown out of proportion, or realistic in small aspects. In a way, these movies help educate the public in an enjoyable way and may even counteract the fear with enjoyment. It is easier for anyone to understand a picture, without having to go through source material and drawing one's own conclusions.

1. Chris Nelson, "2800 BC - 1700" A Brief History of the Apocalypse. May 18, 2011. http://www.abhota.info/end1.htm
2. Image: Stanley Troutman, *Hiroshima Aftermath*
http://darkroom.baltimoresun.com/2015/08/now-and-then-hiroshima-after-the-atomic-bomb-and-today/#8

APOCALYPSE TODAY

Unfortunately, the word apocalypse contemporarily is commonly related to climate change. A few factors which climate change can affect are flooding from rising sea levels, extreme weather events, affected crop yields, pandemic spread rate, extreme temperatures, and fire spreading rate. Popular recreational media such as television and movies depict this idea of a new planet, Earth 2, a new home to escape to when this one ends. Zombies in popular media presently can relate to the fear of wide spreading pandemic from higher global temperatures. Our Canadian forests are dying from invasive species such as the pine beetle, creating dry, perfect to burn trees. We are losing important creatures that support the world's ecosystems. If we lose the dropping bee population crops will die off; what will we eat? In reality, there is a hope that the human race can rebuild, or save the world that we currently struggle in. Today we portray humans as the pillagers of the natural world, destroying every last of nature's innocence to better one's economic, social, or lazy form of living. These media depictions are a wake up call for humans to start changing their ways, to better the environment.

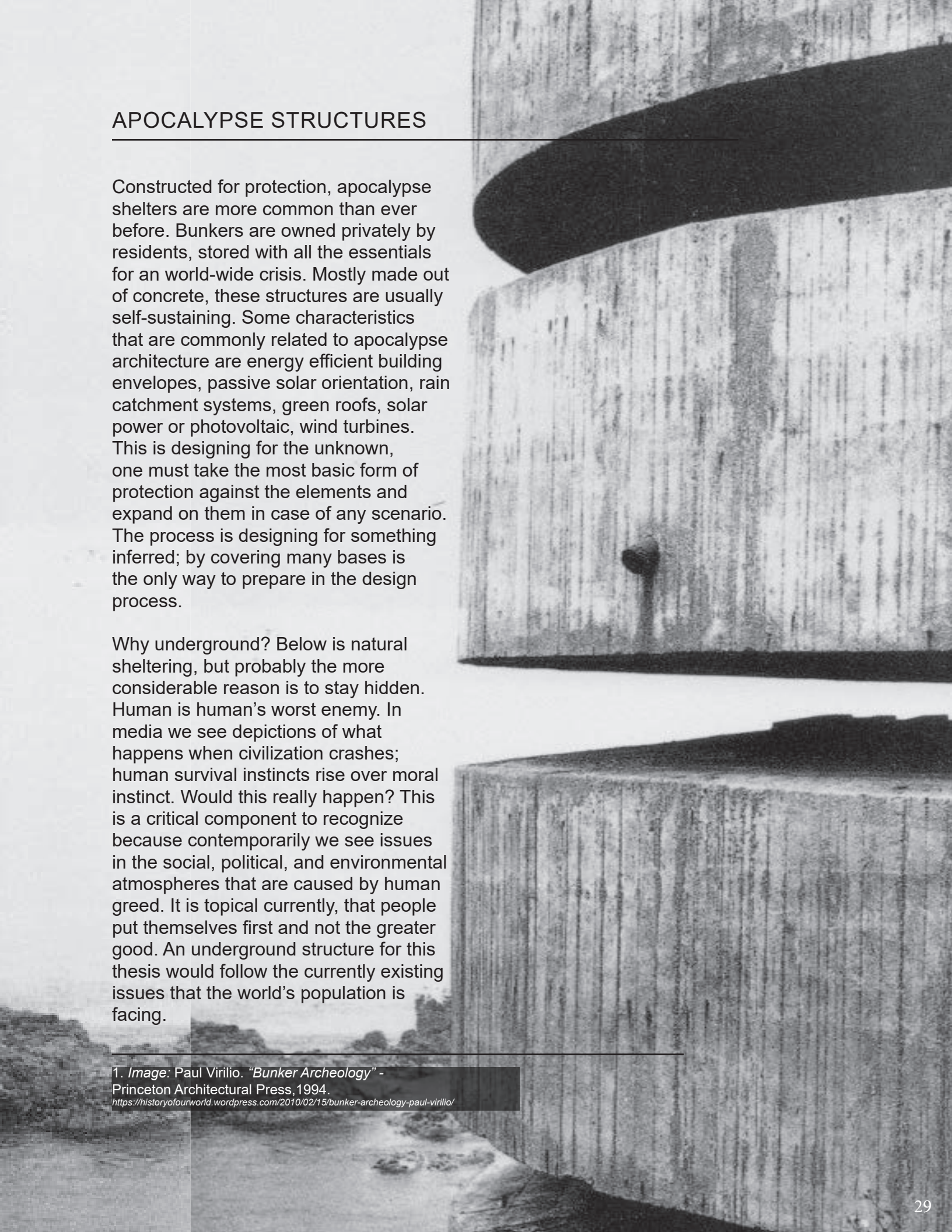
Since the setting for this thesis will be in Sudbury, the event chosen has to be plausible to further ground the design. Sudbury is far from large enough bodies of water, so the apocalypse would have to be from either: extreme temperatures, affected species of vegetation, or pandemic. Staying true to the idea of climate change causing the extreme event kickstarting the narrative of my thesis is important because it could guide the thesis into staying relevant over time, and to successfully educate in the process.

Robert Kirkman. *"The Walking Dead" - Issue #163* 2017.

APOCALYPSE STRUCTURES

Constructed for protection, apocalypse shelters are more common than ever before. Bunkers are owned privately by residents, stored with all the essentials for an world-wide crisis. Mostly made out of concrete, these structures are usually self-sustaining. Some characteristics that are commonly related to apocalypse architecture are energy efficient building envelopes, passive solar orientation, rain catchment systems, green roofs, solar power or photovoltaic, wind turbines. This is designing for the unknown, one must take the most basic form of protection against the elements and expand on them in case of any scenario. The process is designing for something inferred; by covering many bases is the only way to prepare in the design process.

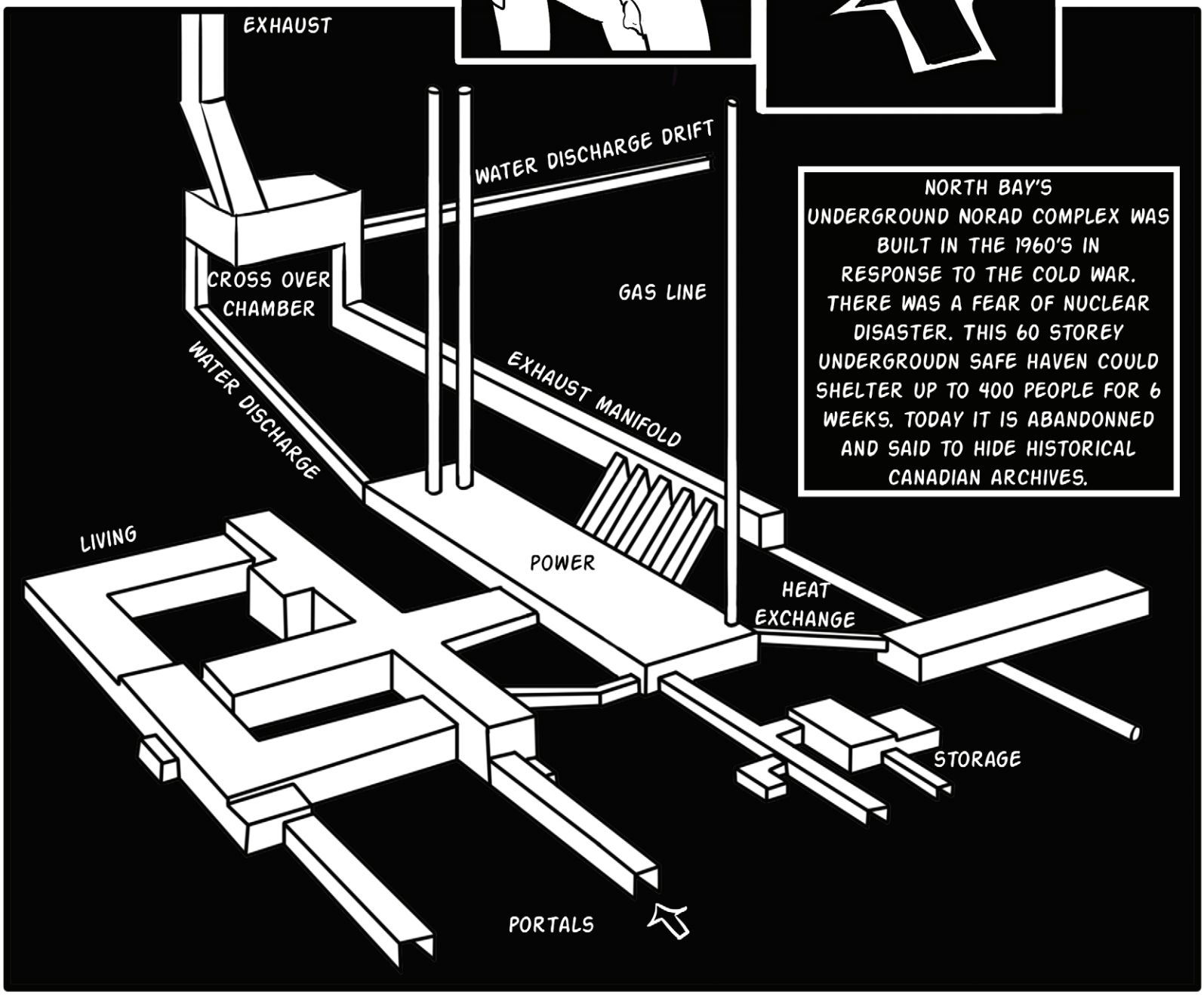
Why underground? Below is natural sheltering, but probably the more considerable reason is to stay hidden. Human is human's worst enemy. In media we see depictions of what happens when civilization crashes; human survival instincts rise over moral instinct. Would this really happen? This is a critical component to recognize because contemporarily we see issues in the social, political, and environmental atmospheres that are caused by human greed. It is topical currently, that people put themselves first and not the greater good. An underground structure for this thesis would follow the currently existing issues that the world's population is facing.



1. *Image:* Paul Virilio. *"Bunker Archeology"* - Princeton Architectural Press,1994.
https://historyofourworld.wordpress.com/2010/02/15/bunker-archeology-paul-virilio/

NORAD UNDERGROUND COMPLEX

NORTH BAY, ONTARIO



NORTH BAY'S UNDERGROUND NORAD COMPLEX WAS BUILT IN THE 1960'S IN RESPONSE TO THE COLD WAR. THERE WAS A FEAR OF NUCLEAR DISASTER. THIS 60 STOREY UNDERGROUDN SAFE HAVEN COULD SHELTER UP TO 400 PEOPLE FOR 6 WEEKS. TODAY IT IS ABANDONNED AND SAID TO HIDE HISTORICAL CANADIAN ARCHIVES.

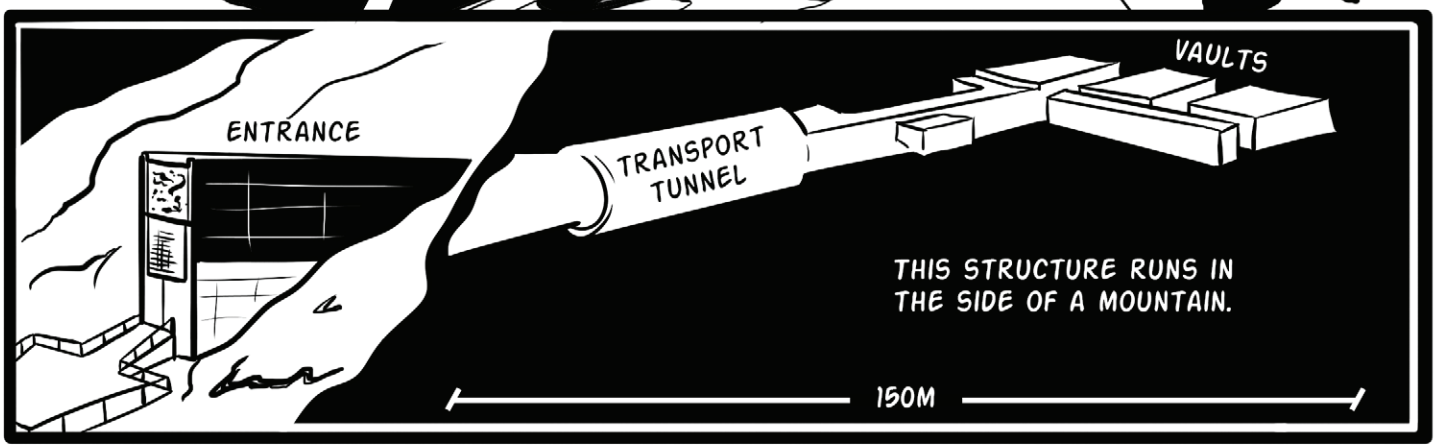
Constructed in response to the influences of the Cold War, there is a NORAD underground complex located in North Bay. Built in the 1960s, the NORAD Underground Complex is the size of a shopping centre, 60 stories below, which could house more than 400 people.[1] North Bay had already had an air base and was a hub for telecommunication; making it a perfect location for the complex.[2] Naturally, there was granite rock surrounding the shelter posing as armour resitant to a nuclear blast, and Trout Lake was close enough to provide water to the complex.[3] The complex was built strong enough to withstand a 4-megaton explosion; which is 267 times more powerful than the nuclear bomb that hit Hiroshima.[4] Costing $51,000,000 33% was paid by canada, and 66% was paid by the United States.[5] This was a lot of money at the time, and still is; an interesting endeavour for something that was not guaranteed to ever be used.

Today the complex is not open to the public. It stores archives of Canadian history dating back to the 1930s.[6] Storing information is a less common depiction in media when representing a structure built to withstand an apocalypse. If all was lost, where would that information go? It would be safe to keep storage of objects and important history in case civilization would have to be rebuilt. This case study is very relevant to this thesis because of its existence so close to Sudbury. The elements are very similar between Sudbury and North Bay, construction and design of the thesis project could take note of design decisions chosen for the NORAD Complex.

1. “The Hole Truth: Five Facts about North Bay’s Cold War-Era Bunker”ShortDOCS.
   https://www.cbc.ca/shortdocs/blog/the-hole-truth-five-fast-facts-about-north-bays-cold-war-era-bunker
2. “The Hole Truth: Five Facts about North Bay’s Cold War-Era Bunker”
3. Ibid.
4. Jim Bronskill, “North Bay’s Norad Bunker may house country’s endangered archives”CBC News. July 13, 2017.
   https://www.cbc.ca/news/canada/sudbury/norad-bunker-film-storage-1.4202668
5. Bruce Ricketts, “NORAD North Bay- The Story of Living Underground.” Canada History and Mysteries. January 25, 2016.
   https://www.mysteriesofcanada.com/military/norad-north-bay/
6. Bronskill, “North Bay’s Norad Bunker may house country’s endangered archives”
   https://www.cbc.ca/news/canada/sudbury/norad-bunker-film-storage-1.4202668
7. Image: Michael Behar. *“Air and Space Magazine” Construction of the NORAD Bunker* - 2018.
   https://www.airspacemag.com/military-aviation/06_sep2018-norad-at-1-180969908/

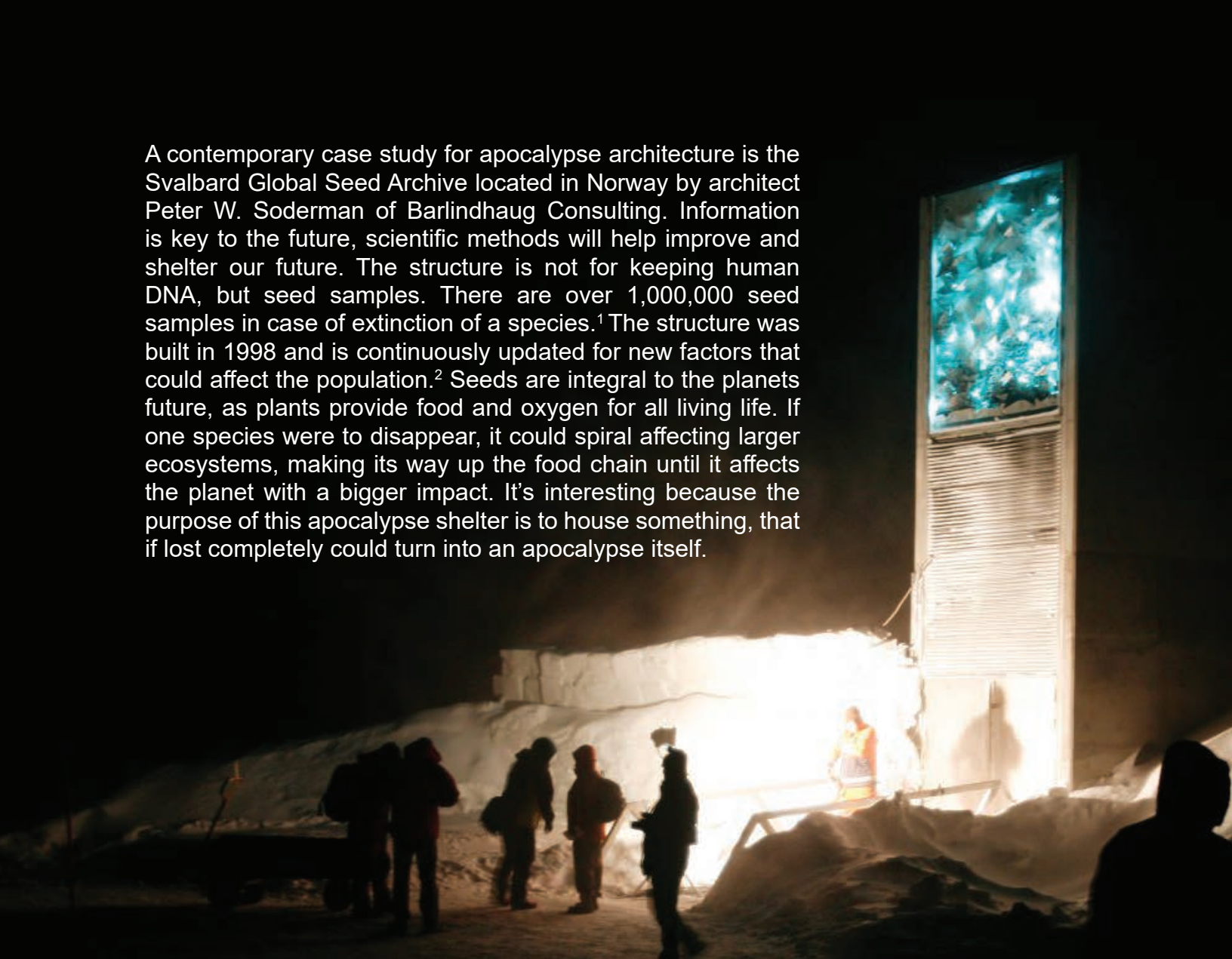
SVALBARD GLOBAL SEED VAULT
SPITSBERGEN, NORWAY

THIS VAULT OPENED IN 2008 AND IS HOME TO OVER 90,000 SEED SAMPLES. [WALSH] THE STRUCTURE WAS CREATED TO PROTECT SPECIES OF PLANTS FROM EXTINCTION.



DESIGNED STRUCTURES FOR THE INEVITABLE APOCALYPSE ARE NOT ONLY CREATED FOR THE PROTECTION OF HUMANS ALONE. THERE ARE IMPORTANT ITEMS AND INFORMATION WHICH COULD BE ARCHIVED FOR SUCH AN EVENT. SAVING HISTORICAL, OR INTEGRAL PIECES OF INFORMATION COULD NOT ONLY BE USED TO MAINTAIN OUR RACES HISTORY. SAVED INFORMATION COULD BE THE KEY IN RESOLUTION OF SOCIETY IN A CATASTROPHIC APOCALYPSE.

A contemporary case study for apocalypse architecture is the Svalbard Global Seed Archive located in Norway by architect Peter W. Soderman of Barlindhaug Consulting. Information is key to the future, scientific methods will help improve and shelter our future. The structure is not for keeping human DNA, but seed samples. There are over 1,000,000 seed samples in case of extinction of a species.[1] The structure was built in 1998 and is continuously updated for new factors that could affect the population.[2] Seeds are integral to the planets future, as plants provide food and oxygen for all living life. If one species were to disappear, it could spiral affecting larger ecosystems, making its way up the food chain until it affects the planet with a bigger impact. It's interesting because the purpose of this apocalypse shelter is to house something, that if lost completely could turn into an apocalypse itself.



The building costed $9,000,000 to build and even had to rebuild partially because of flooding from record-breaking temperatures.[3] For a structure whose sole purpose is to defend against the apocalypse, the record-breaking temperature is a comical conflict to have so early in its lifespan. Design is never perfect; therefore when designing these structures, there has to be accountability for human error. The structure itself is 130 m inside of a mountain, the water breached the main tunnel system connecting the seed vaults to the entrance space.[4] Recognizing flaws of other designs will promote a better understanding of what could go wrong in the thesis design for an apocalyptic event.

---

1. Julissa Trevino, "Global Seed Vault Gets Its Millionth Donation and a $13 Million Update." Smithsonian.com. February 28, 2018.
https://www.smithsonianmag.com/smart-news/global-seed-vault-hit-one-million-mark-donation-gets-13-million-upgrade-180968267/
2. Trevino, "Global Seed Vault Gets Its Millionth Donation and a $13 Million Update."
3. Patrick Lynch, "Svalbard 'Doomsday' Seed Vault to Receive Multi-Million Dollar Upgrade After Flooding".ArchDaily. June 13, 2017.
https://www.archdaily.com/873597/svalbard-doomsday-seed-vault-to-receive-multi-million-dollar-upgrade-after-flooding
4. Lynch, "Svalbard 'Doomsday' Seed Vault to Receive Multi-Million Dollar Upgrade After Flooding"
5. Image: John McConnico. *"Here's What It Looks Like Inside The Frozen Svalbard 'Doomsday Vault'"*2016.
https://www.sciencealert.com/here-s-what-it-s-like-inside-the-doomsday-vault-that-stores-every-known-crop-on-the-planet

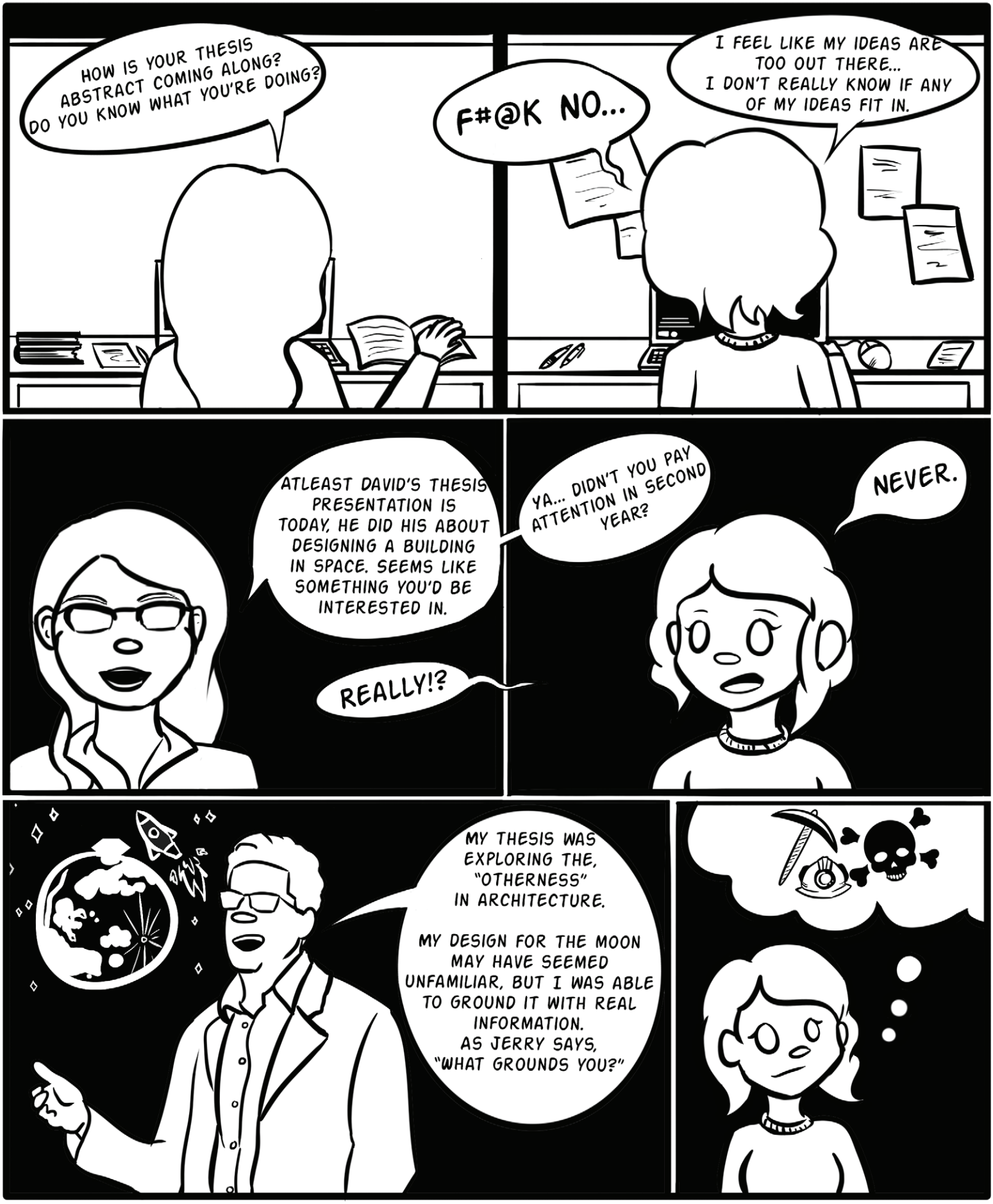
5. Ibid.

CHAPTER 1.3

NORTHERN ONTARIO MINING

GROUNDING IDEAS

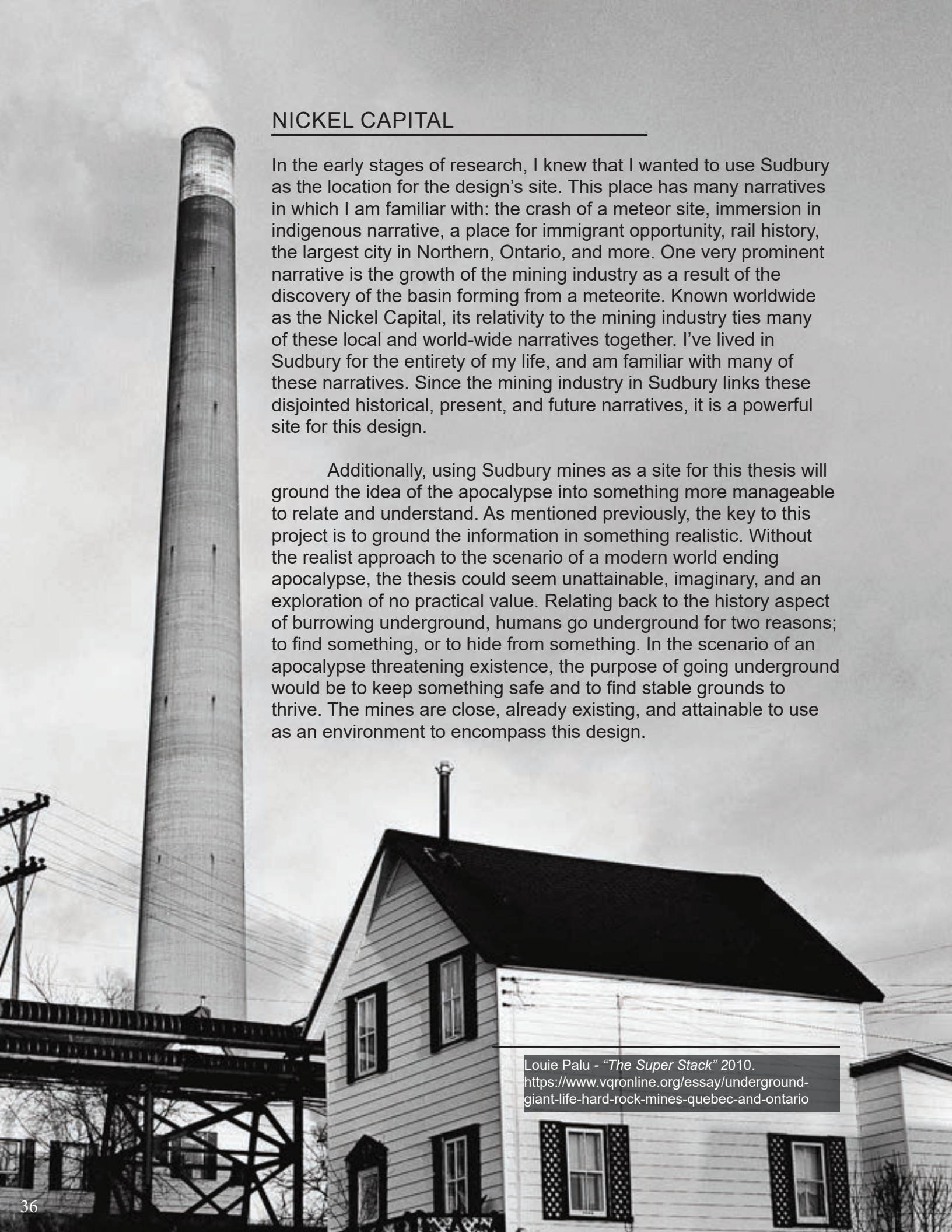
IMAGINARY THESIS



NICKEL CAPITAL

In the early stages of research, I knew that I wanted to use Sudbury as the location for the design's site. This place has many narratives in which I am familiar with: the crash of a meteor site, immersion in indigenous narrative, a place for immigrant opportunity, rail history, the largest city in Northern, Ontario, and more. One very prominent narrative is the growth of the mining industry as a result of the discovery of the basin forming from a meteorite. Known worldwide as the Nickel Capital, its relativity to the mining industry ties many of these local and world-wide narratives together. I've lived in Sudbury for the entirety of my life, and am familiar with many of these narratives. Since the mining industry in Sudbury links these disjointed historical, present, and future narratives, it is a powerful site for this design.

Additionally, using Sudbury mines as a site for this thesis will ground the idea of the apocalypse into something more manageable to relate and understand. As mentioned previously, the key to this project is to ground the information in something realistic. Without the realist approach to the scenario of a modern world ending apocalypse, the thesis could seem unattainable, imaginary, and an exploration of no practical value. Relating back to the history aspect of burrowing underground, humans go underground for two reasons; to find something, or to hide from something. In the scenario of an apocalypse threatening existence, the purpose of going underground would be to keep something safe and to find stable grounds to thrive. The mines are close, already existing, and attainable to use as an environment to encompass this design.



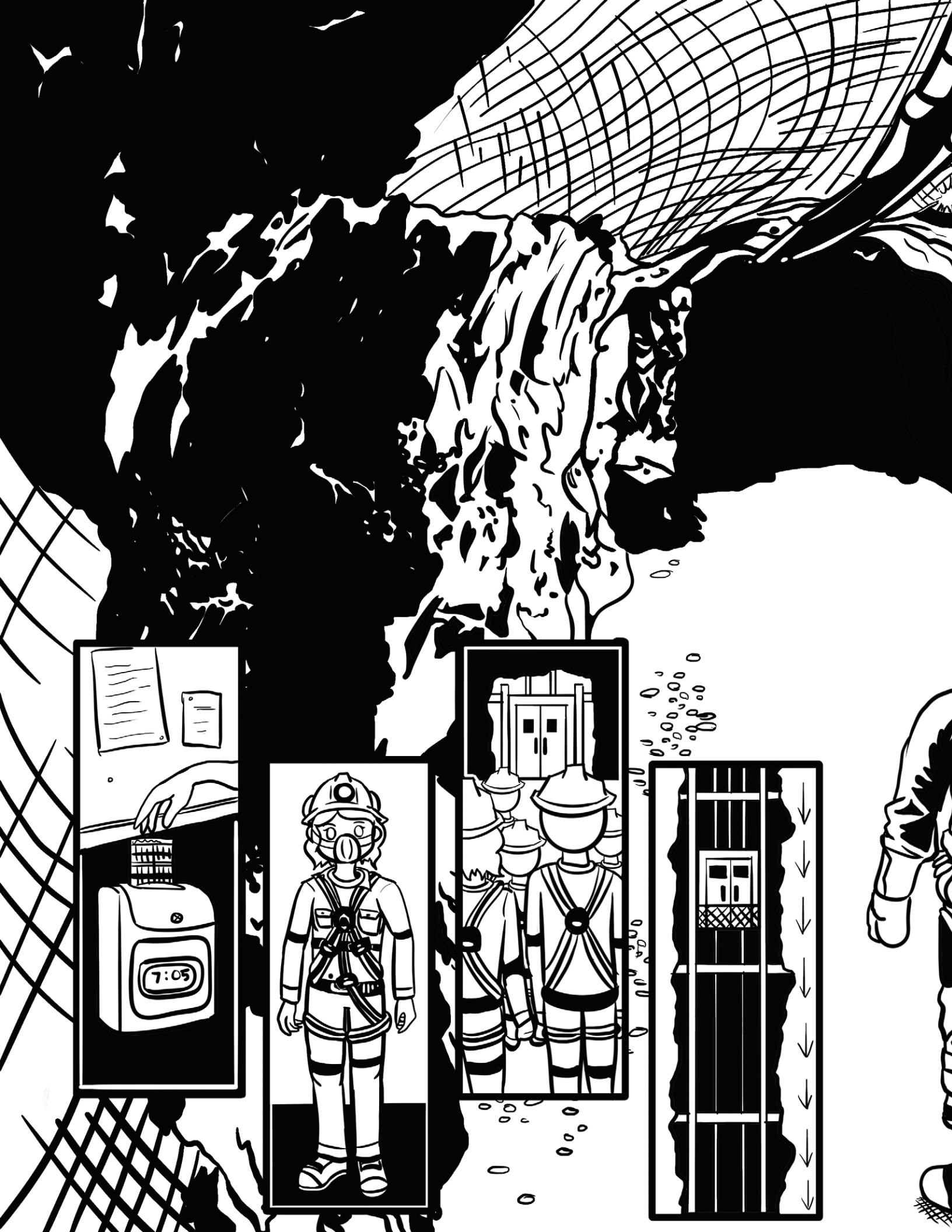
Louie Palu - *"The Super Stack"* 2010.
https://www.vqronline.org/essay/underground-giant-life-hard-rock-mines-quebec-and-ontario

LOCAL MINING HISTORY

In the 1880s migrating Europeans had taken the land from the Ojibwe Indigenous peoples in Sudbury, they began construction of the timber transporting rails.[2] Sudbury was a larger stop on this rail line, which, in turn, encouraged settlement. Many academic sources related the first sightings of natural metals to the Europeans blasting rock away with explosives to make way for rail construction.[3] Other sources state that the Ojibwe peoples first encountered copper and nickel deposits, which the Europeans fixated on, concentrating the population of settlement in Sudbury.[4]

From the meteor, Sudbury has an unusually high concentration of nickel, copper, and platinum compared to the rest of the world. Originally, there was only one mining company named *Canadian Copper* founded in 1886, but then it merged with *Orford Refining Company* in the early 1900s creating the *International Nickel Company of Canada* (INCO Ltd.).[5] World wide in the 1930-50s was a boom in the mining industry due to growing war tensions. The ores mined of Sudbury were integral in creating ammunition for WWII. Sudbury encompasses 80% of the world's supply in nickel.[6] During the Great Depression, Sudbury was a favoured place in due to of the growing mining industry, and an escape from the war related conflict, which attracted immigrants from Italy, Poland, Ukraine, Finland, and more. Many cultures came together to eventually create Sudbury's multi-ethnic origin community.

1. *"Railroad History." The City of Sudbury.* (n.d.) http://normhc.ca/history/.
3. *"Railroad History"*
4. O.W. Saarinen. *"Sudbury" The Canadian Encyclopedia.* Canada Historica, June 4, 2018, https://www.thecanadianencyclopedia.ca/en/article/sudbury-greater.
5. Saarinen. "Sudbury"The Canadian Encyclopedia.
6. Stan Sudol, "Inco's Sudbury Nickel Mines Were Critical During World War Two" Republic of Mining., February 8,2016, https://republicofmining.com/2008/09/25/inco%E2%80%99s-sudburynickel-mines-were-critical-during-world-war-two-part-1-of-7-by-stan-sudol/
7. Image: Creighton No. 3 Shaft(Royal Ontario Nickel Commission Report and Appendix, 1917) https://canadianminingreview.typepad.com/canadian-mining-review/page/3/


7:05


5:07

INDIGENOUS CULTURE AND MINING

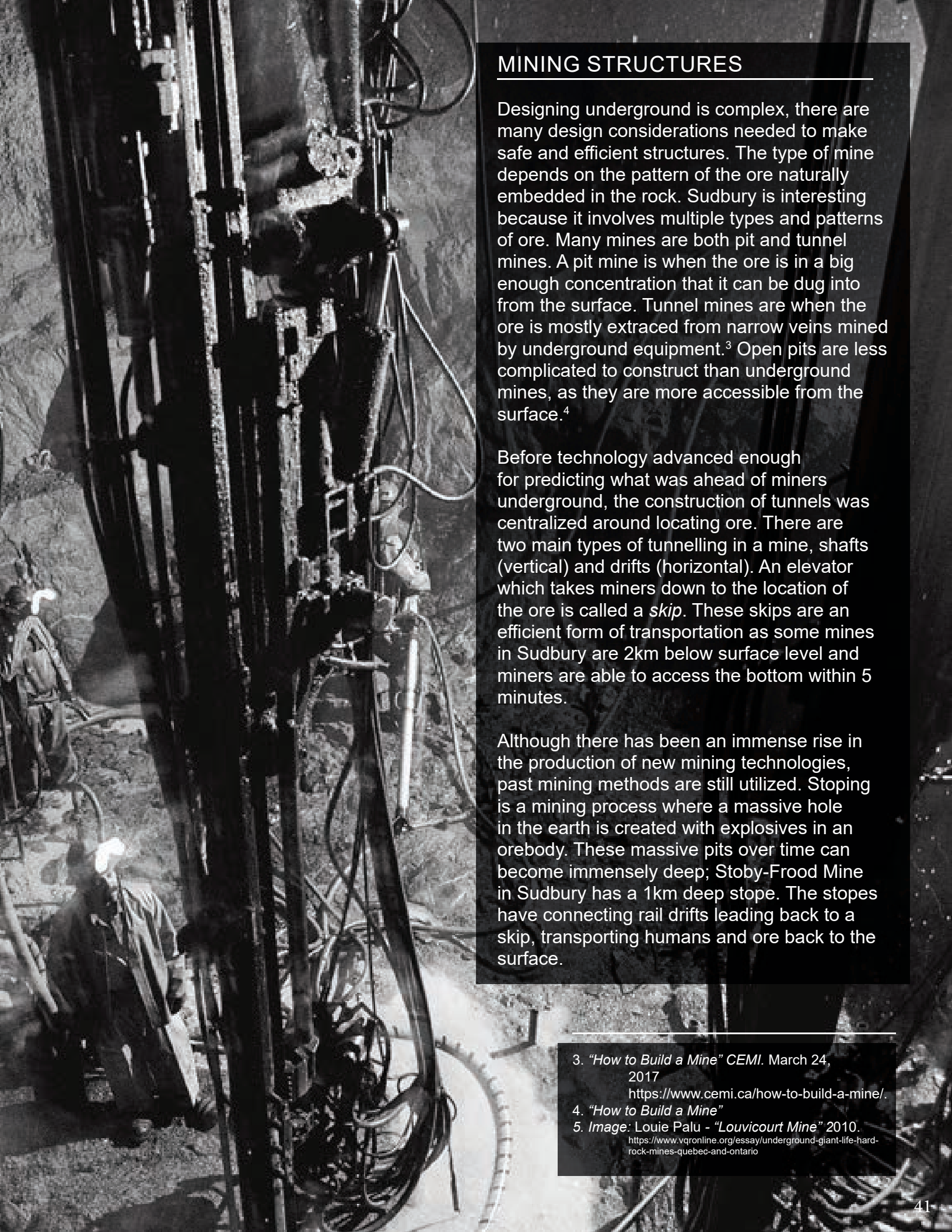
Canada, was originally populated with Indigenous peoples. Originating from Europeans, the mass mining industry greatly impacted indigenous culture. Indigenous land divisions are different from the way that the European influenced government had divided the land. Therefore, many mines intersect in Indigenous territories. A source of conflict between first nations and the government.

Another conflicting factor is the environmental impact of mining. Although there has been recent improvement to the process, ore was previously extracted by burning wood in massive roast yards. The ore sat on top of large burning timbers to extract the purer ore from the rock fragments in the early 1880s until the 1930s.[1] These roast yards destroyed the environmental ecosystem, creating toxic soils and air pollution threatening the stainability of natural life. This affected the Indigenous people of the land by affecting their source of food and landscape.

Currently, Sudbury has come a long way in attempting to bring back its natural environment. Many efforts have been put forward to support indigenous culture. Instead of segregating the culture altogether. This narrative of Sudbury is important; for this aspect in history to be omitted would be a disservice to the location itself.

1. Peter Nosko, "Sudbury's Abandoned Roast Yards: Toxicity Hotspots - Valuable Living Laboratories for the Study of Study of Ecosystem Recovery" Nipissing University. 2007.
http://sudbury-mining-environment.ca/2007Presentations/Session%204%20-%20A/5%20/Peter%20Nosko.pdf

2. Image: "Sudbury's First Major Mining Camp"
http://www.ic.gc.ca/eic/site/063.nsf/eng/97203.html



MINING STRUCTURES

Designing underground is complex, there are many design considerations needed to make safe and efficient structures. The type of mine depends on the pattern of the ore naturally embedded in the rock. Sudbury is interesting because it involves multiple types and patterns of ore. Many mines are both pit and tunnel mines. A pit mine is when the ore is in a big enough concentration that it can be dug into from the surface. Tunnel mines are when the ore is mostly extraced from narrow veins mined by underground equipment.[3] Open pits are less complicated to construct than underground mines, as they are more accessible from the surface.[4]

Before technology advanced enough for predicting what was ahead of miners underground, the construction of tunnels was centralized around locating ore. There are two main types of tunnelling in a mine, shafts (vertical) and drifts (horizontal). An elevator which takes miners down to the location of the ore is called a *skip*. These skips are an efficient form of transportation as some mines in Sudbury are 2km below surface level and miners are able to access the bottom within 5 minutes.

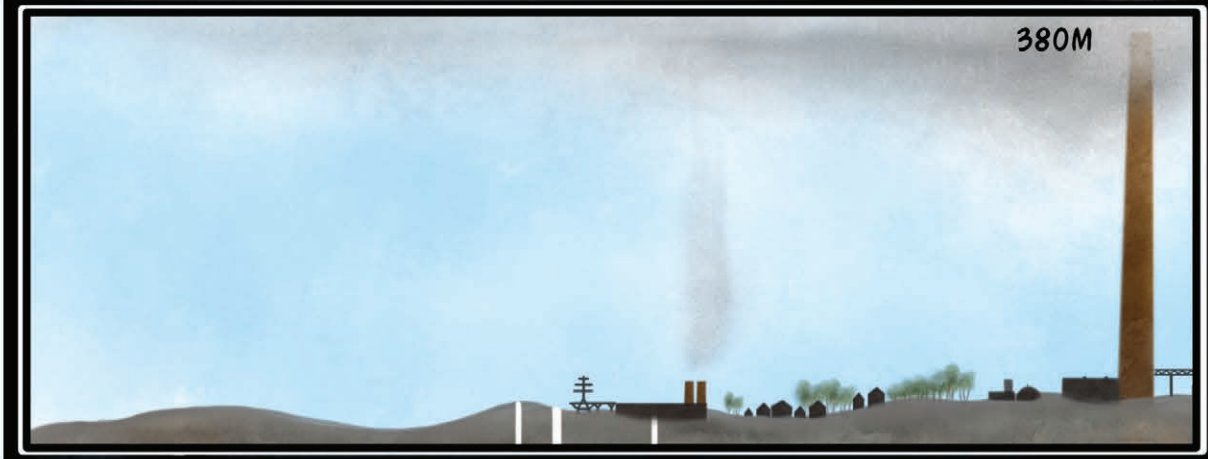
Although there has been an immense rise in the production of new mining technologies, past mining methods are still utilized. Stoping is a mining process where a massive hole in the earth is created with explosives in an orebody. These massive pits over time can become immensely deep; Stoby-Frood Mine in Sudbury has a 1km deep stope. The stopes have connecting rail drifts leading back to a skip, transporting humans and ore back to the surface.

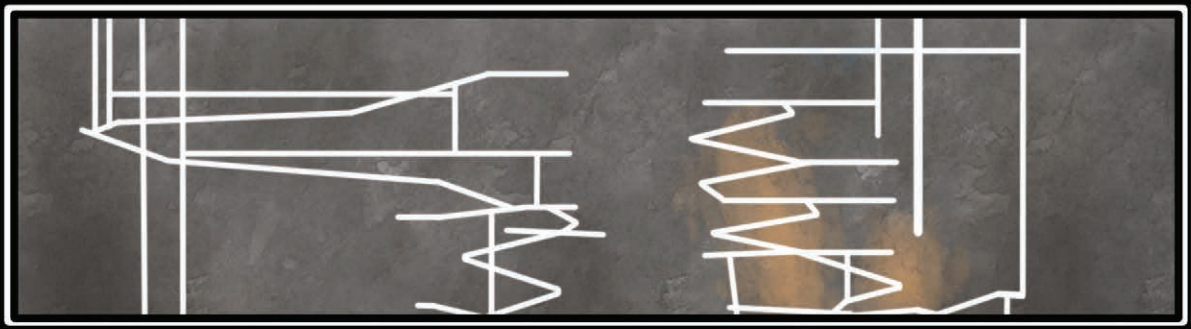
3. *"How to Build a Mine" CEMI*. March 24, 2017 https://www.cemi.ca/how-to-build-a-mine/.
4. *"How to Build a Mine"*
5. *Image:* Louie Palu - *"Louvicourt Mine"* 2010. https://www.vqronline.org/essay/underground-giant-life-hard-rock-mines-quebec-and-ontario

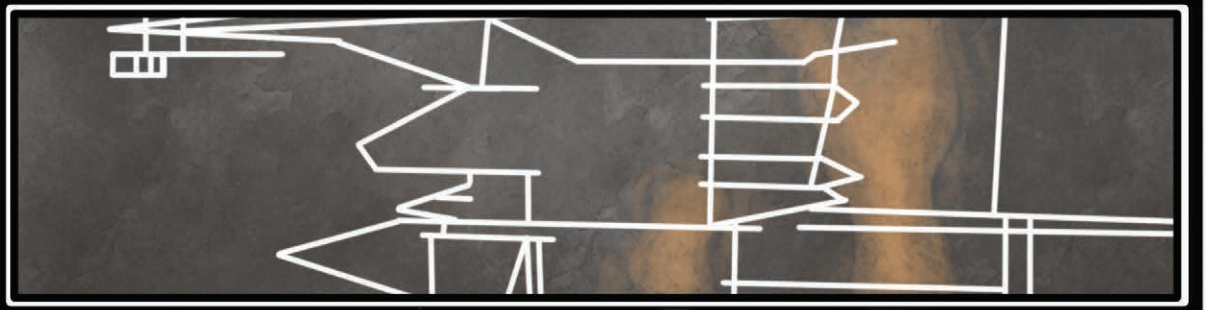
COPPER CLIFF MINE

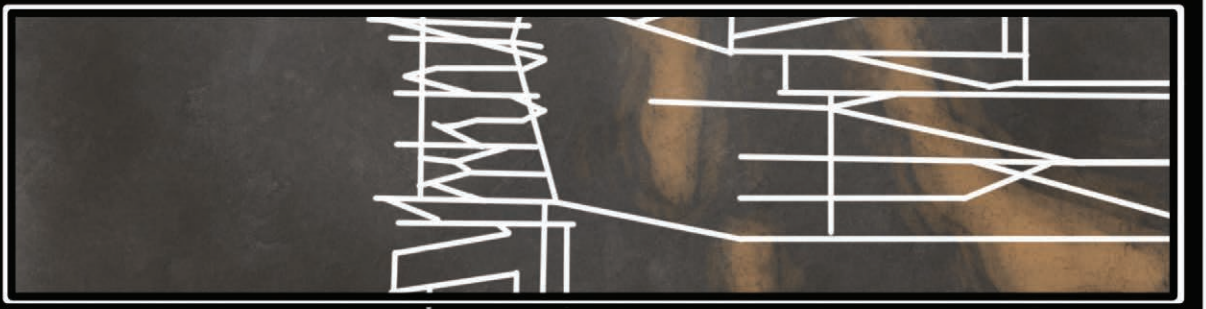
SUDBURY, ONTARIO

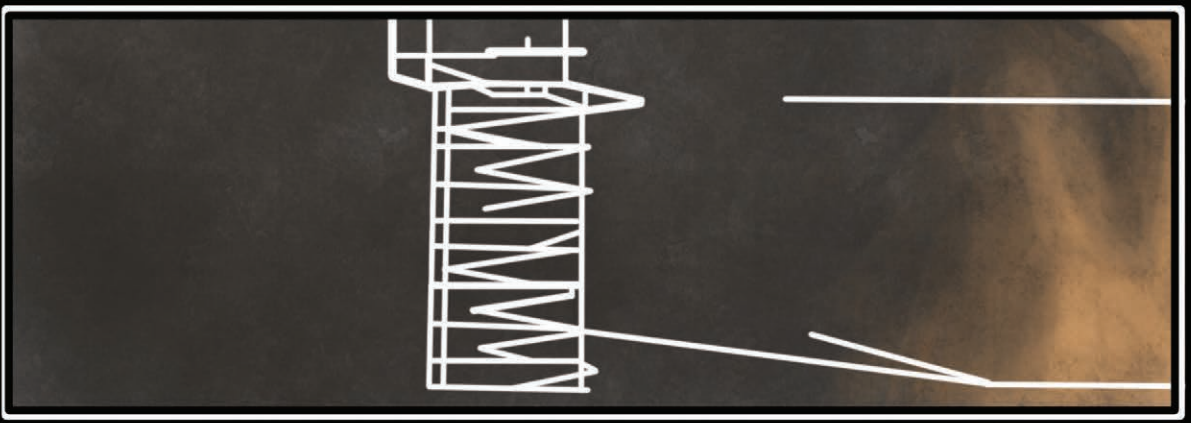
LOCATED IN THE PREVIOUSLY KNOWN NICKEL CAPITAL, VALE'S COPPER CLIFF MINE IS WORLD REKNOWN FOR ITS STRUCTURE AND NEW DISCOVERIES IN MININ. EXPLORATION OF THIS UNKNOWN TERRAIN BEGAN IN THE 1890S.

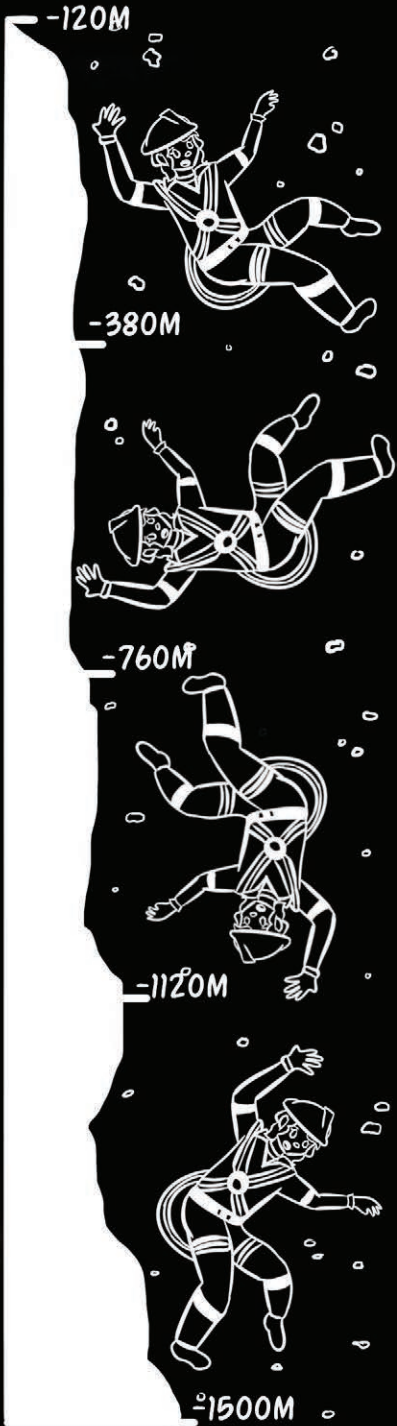












ABANDONNED MINES

Sudbury's mining company presently is Vale, which bought out INCO in 2006. Well-known over the last 100 years are 6 mines, a smelter, and a refinery.[1] Sudbury's popular mining operations throughout the present and past include: Coleman Mine, Copper Cliff North & South Mine, Creighton Mine, Ellen Mine, Garson Mine, Frood-Stobie Mine, and Totten Mine.[2] These mine locations were critical for bringing populations into Sudbury and expanding it's layout after the lumber industry left its mark on the land. Today, Sudbury's layout is spread out across the entire basin, which is the footprint of the mining narrative of the past and present.

The mining industry has evolved in many ways from the past. There are new ways of mining that involve automation. What happens when the ore runs out? Many barren mine shafts exist below today. Abandoned mine shafts are on the rise, especially in Sudbury where Stobie Mine was shut down in 2017 after 130 years of operation.[3] Without its most prominent industry what will Sudbury's future hold? Will it become a barren city itself, much like Elliot Lake; known as a retirement city after its natural resources were depleted? Could something be built in these structures to create a long-lasting relevancy of this city into the future?

Further, the idea of repurposing old mines is not a new concept. Some designs integrated within abandoned mine shafts are regulated farm systems, underground labs, energy transportation, and digital storage.[4] There are many advantages of constructing underground for new purposes, but there can also be obstacles such as pollutant remains from mining use, risk of explosion, water pockets, and air quality.[5] Before building underground there must be an intense site assessment ensure the area is stable to suite the intended reuse. Earth's land surface area is ravaged by construction, mass construction in the abandoned underground could add another dimension to building, one otherwise left to remain deserted.

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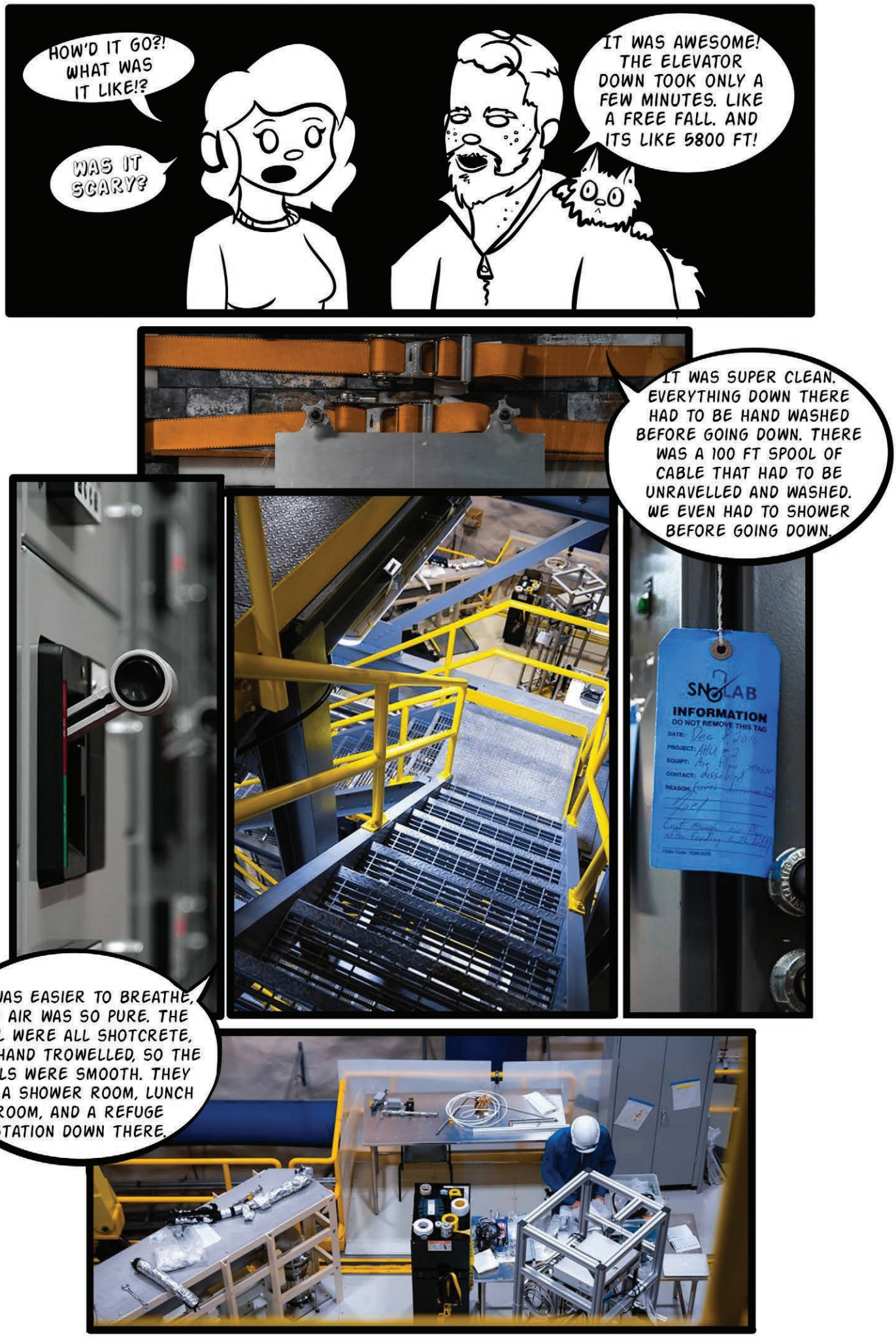
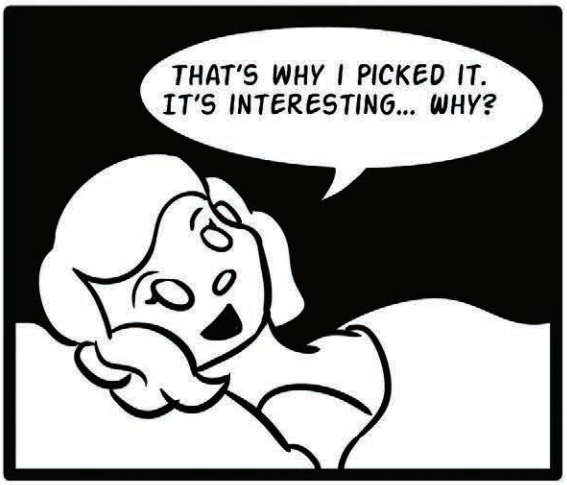
1. *"Sudbury"Vale Global Site.* 2017,
   http://www.vale.com/canada/EN/aboutvale/communities/sudbury/Pages/default.aspx.
2. *"Major Mines & Projects | Sudbury Mine." Mining Data Solutions.* MDS, 2019,
   https://miningdataonline.com/property/1485/ Sudbury-Operation.aspx.
3. *"End of the Line for Stobie Mine | CBC News." CBC News.* May 31, 2017.
   https://www.cbc.ca/news/canada/sudbury/stobie-mine-final-skip-1.4138165.
4. Martha White, "Striking Paydirt: Entrepreneurs Find Innovative New Uses for Old Mines." Materials. CNBC. October 22, 2015.
   https://www.cnbc.com/2015/10/22/striking-paydirt-innovative-new-uses-for-old-mines.html
5. White, "Striking Paydirt: Entrepreneurs Find Innovative New Uses for Old Mines."

Image: Louie Palu - *"Furnace Tapper-Falconbridge Smelter"* 2010.
https://www.vqronline.org/essay/underground-giant-life-hard-rock-mines-quebec-and-ontario


HOW'D IT GO?! WHAT WAS IT LIKE!?
WAS IT SCARY?
IT WAS AWESOME! THE ELEVATOR DOWN TOOK ONLY A FEW MINUTES. LIKE A FREE FALL. AND ITS LIKE 5800 FT!
IT WAS SUPER CLEAN. EVERYTHING DOWN THERE HAD TO BE HAND WASHED BEFORE GOING DOWN. THERE WAS A 100 FT SPOOL OF CABLE THAT HAD TO BE UNRAVELLED AND WASHED. WE EVEN HAD TO SHOWER BEFORE GOING DOWN.
SNOLAB
INFORMATION
DO NOT REMOVE THIS TAG
IT WAS EASIER TO BREATHE, THE AIR WAS SO PURE. THE WALL WERE ALL SHOTCRETE, BUT HAND TROWELLED, SO THE WALLS WERE SMOOTH. THEY HAD A SHOWER ROOM, LUNCH ROOM, AND A REFUGE STATION DOWN THERE.



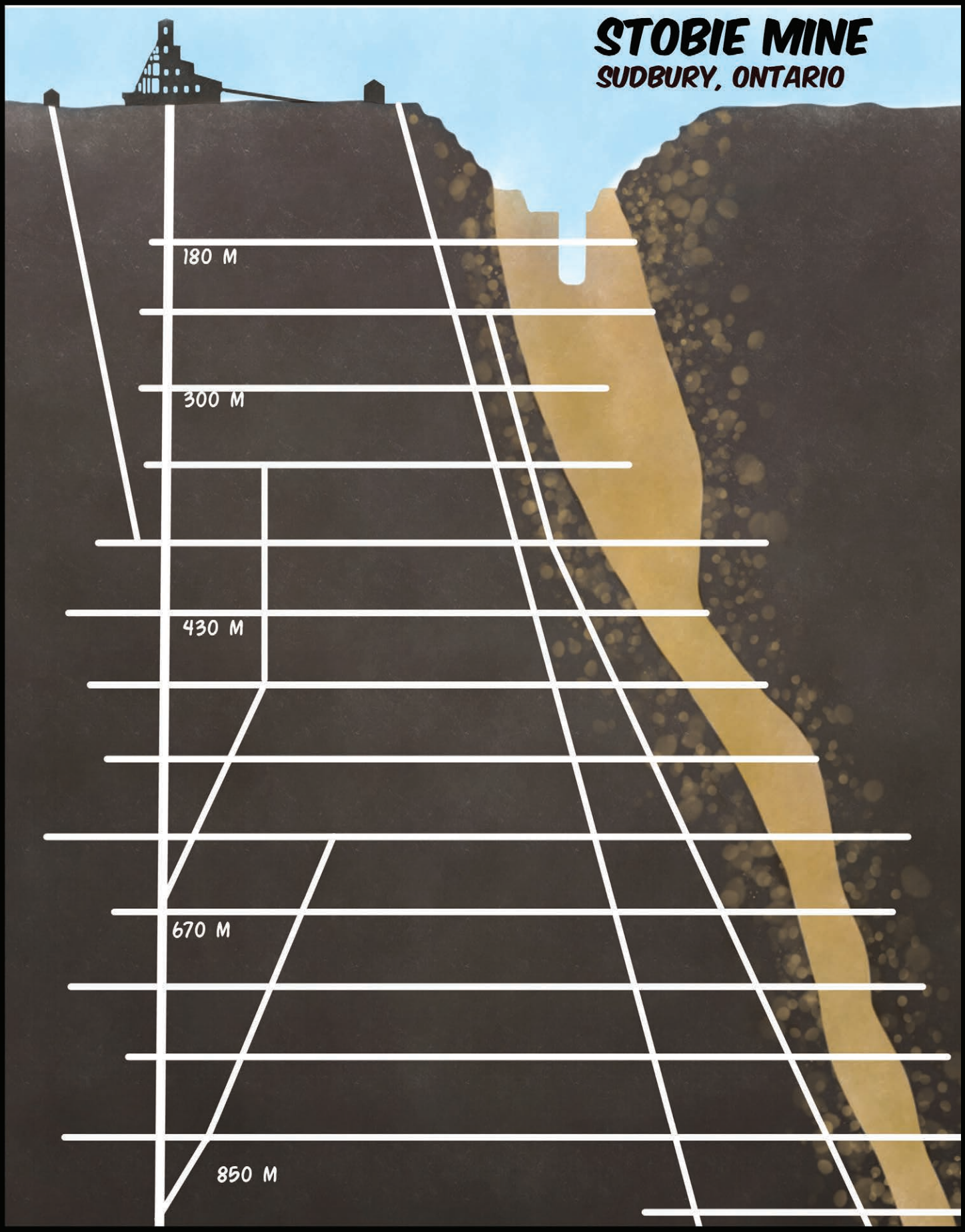
ATLEAST I CAN HELP THIS IDEA. IT'S NOT ABOUT FINISHING, IT'S ABOUT CONTRIBUTING TO A BODY OF RESEARCH.

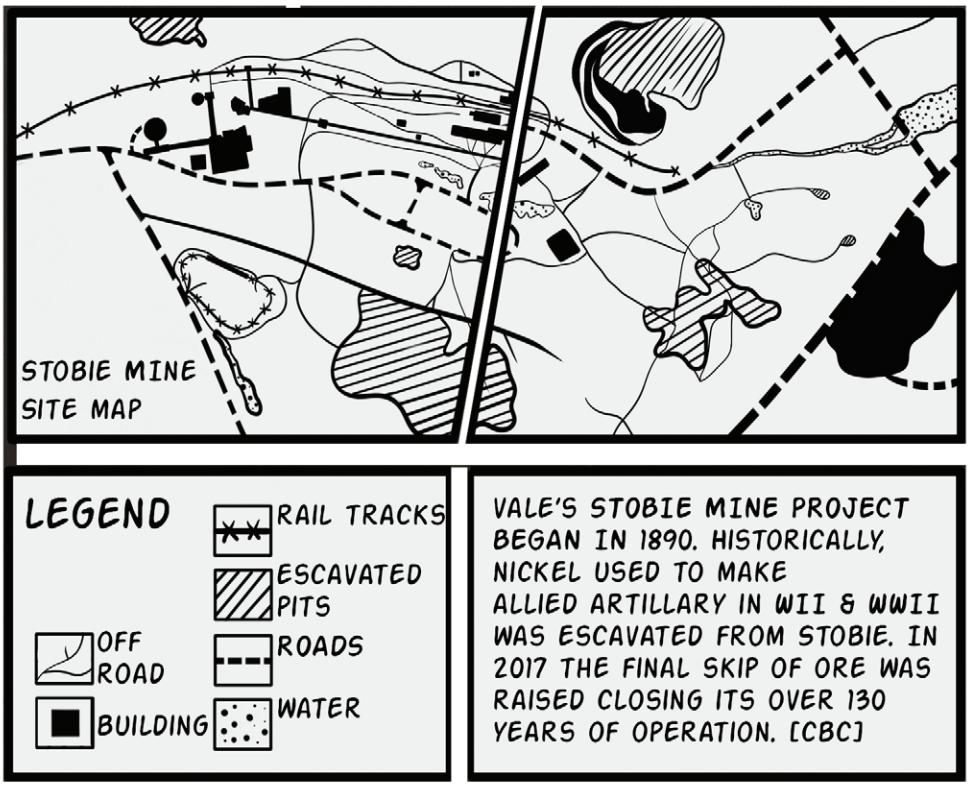
2KM

WHAT ABOUT THE PSYCHOLOGY OF LIVING DOWN THERE? HOW WOULD YOU PLAN FOR ENOUGH FOOD TO LAST FOREVER? HOW WOULD MAINTAIN HEAT AND THE ENVIRONMENT IF ALL SYSTEMS WERE DESTROYED ABOVE?

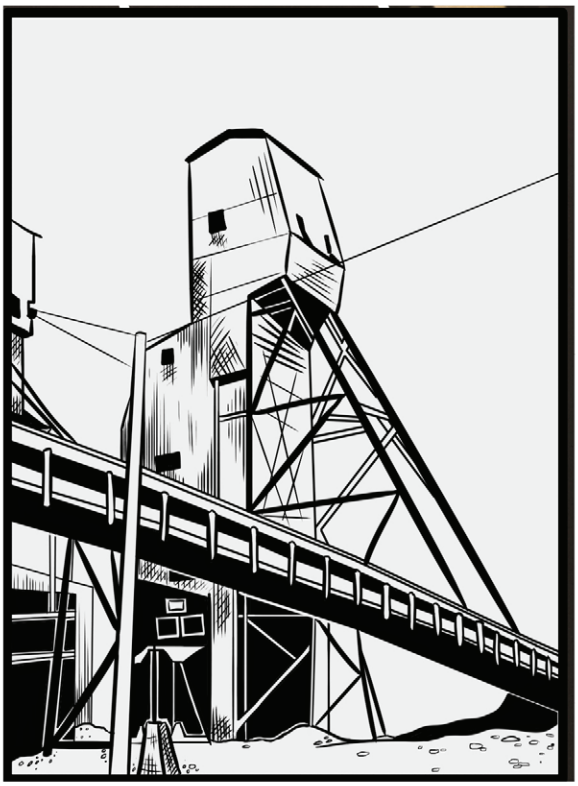
ISN'T THIS A LITTLE HARD TO IMAGINE? JUST DON'T WANT YOU TO GET STUCK IN YOUR IDEA. IT'S REALLY COOL THOUGH.

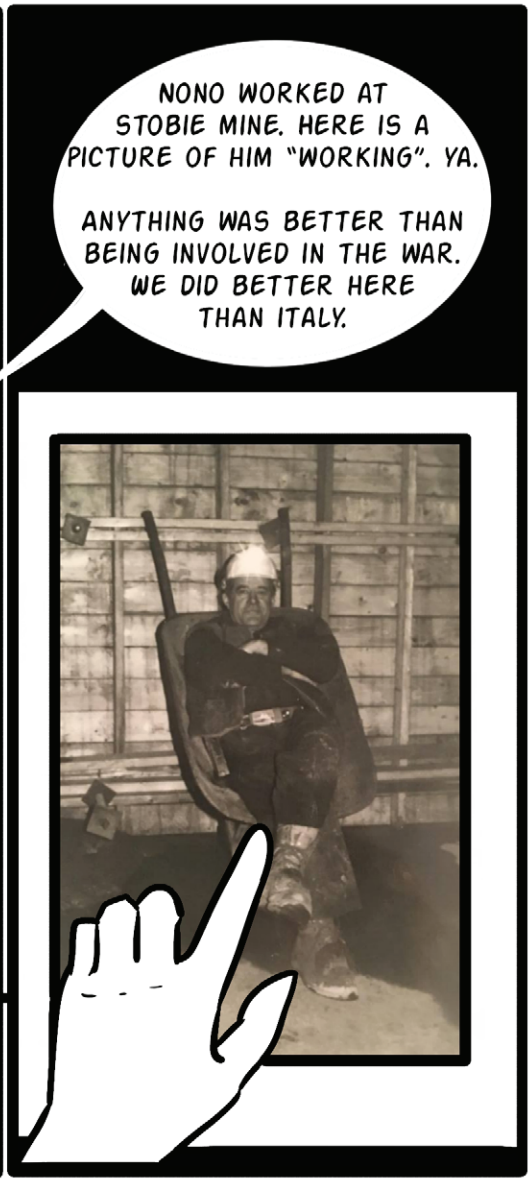
SNOLAB


STOBIE MINE
SUDBURY, ONTARIO
180 M
300 M
430 M
670 M
850 M



VALE'S STOBIE MINE PROJECT BEGAN IN 1890. HISTORICALLY, NICKEL USED TO MAKE ALLIED ARTILLARY IN WII & WWII WAS ESCAVATED FROM STOBIE. IN 2017 THE FINAL SKIP OF ORE WAS RAISED CLOSING ITS OVER 130 YEARS OF OPERATION. [CBC]





CHAPTER

1.4

SUBTERRANEAN ARCHITECTURAL CASE STUDIES

PENULTIMATE REVIEW

HISTORY REVIEW

GATHERING

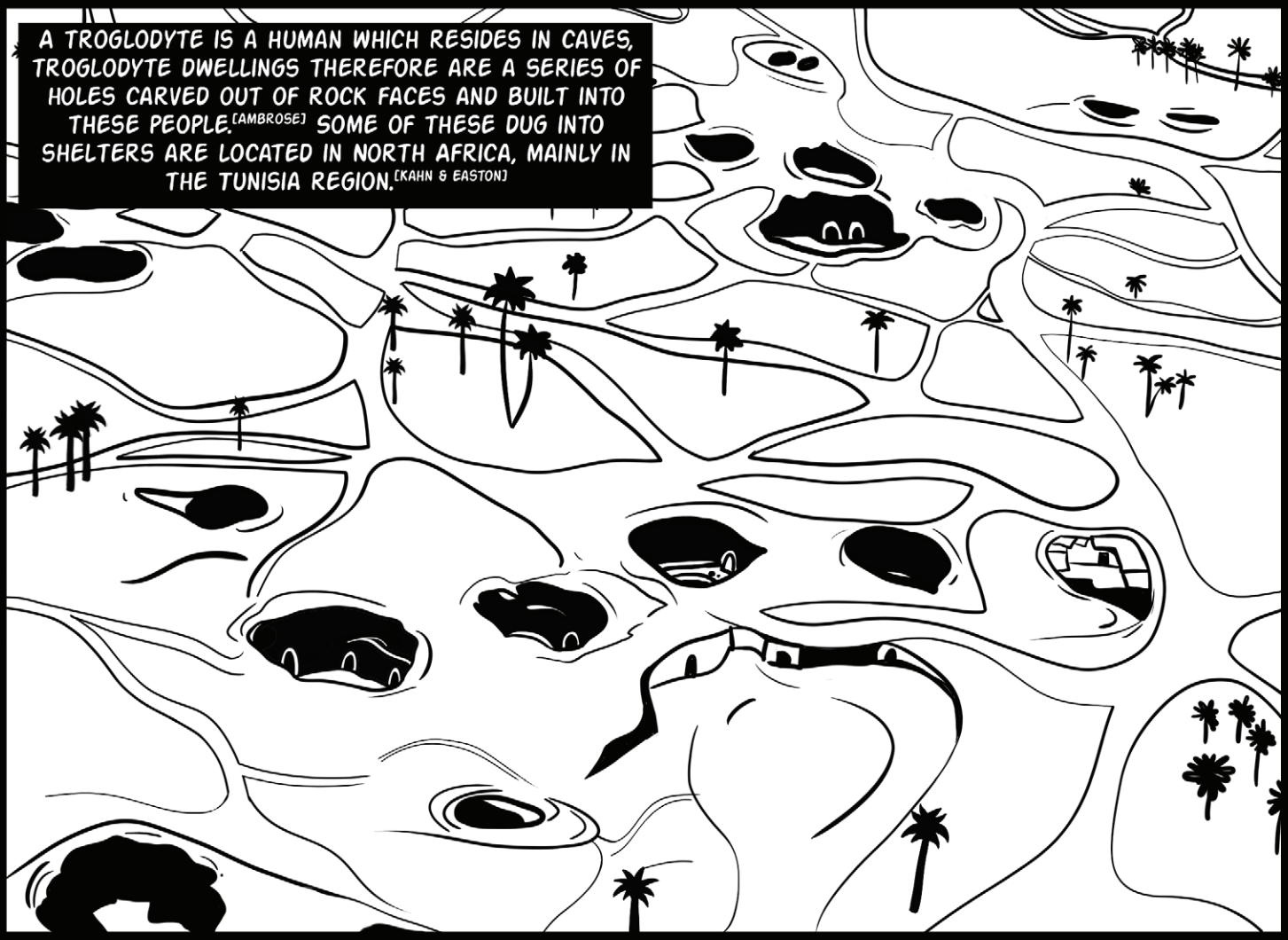
The process of gathering and collaging informative material relating to the method, topics, and interests involved on a large scale developed a stronger network in relation to the theoretical framework. Mimicing detectives in narratives with string, I was able to draw similiarities between text, images, and objects that would have gone unnoticed otherwise. Having the ability to see all the content at once is striking until dissected into smaller parts of the whole. Material that seemed to have no relation was now in one gathered piece. This step was crucial in making conclusive discoveries on how the research was directly related to the design process, and architecture.

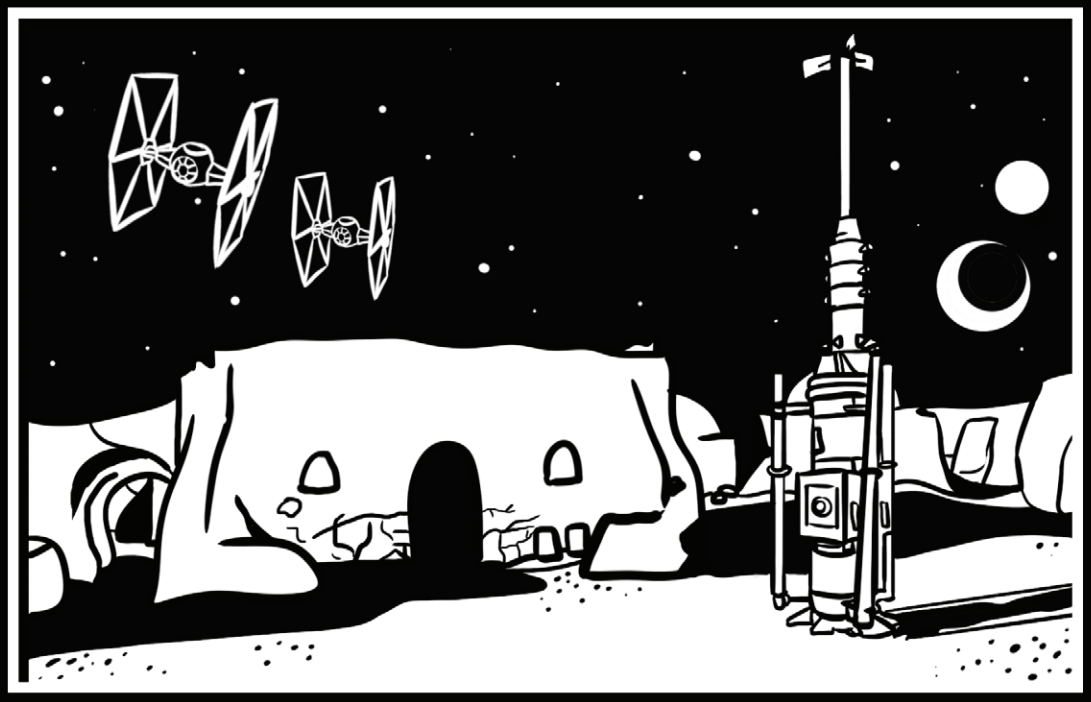
Apocalypse architecture, natural energy systems combatting climate change, and abandonned mine shafts have a strong connection. The fixation on an apocalypse caused by climate change is globally recognized, which can be combatted by minimizing non-reusable energy systems. There are many articles available on repurposing abandoned mine shafts. Their massive voids can be used to house a natural energy system? A design integrating this concept provides connection to all the topics of my thesis.

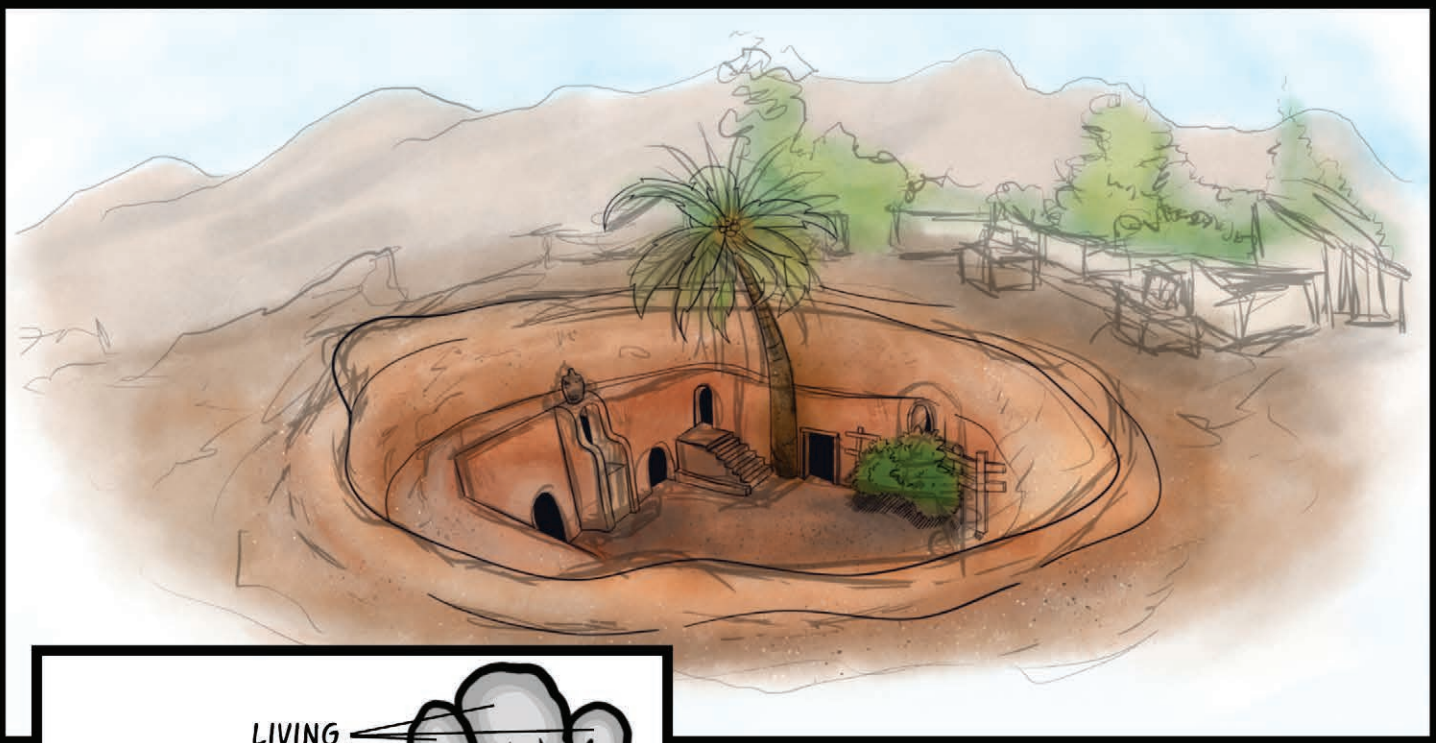
From presenting this documentation, there seemed to be shortcomings in the understanding of subterrainian architecture. Case studies followed which pointed to richer source material to draw from.

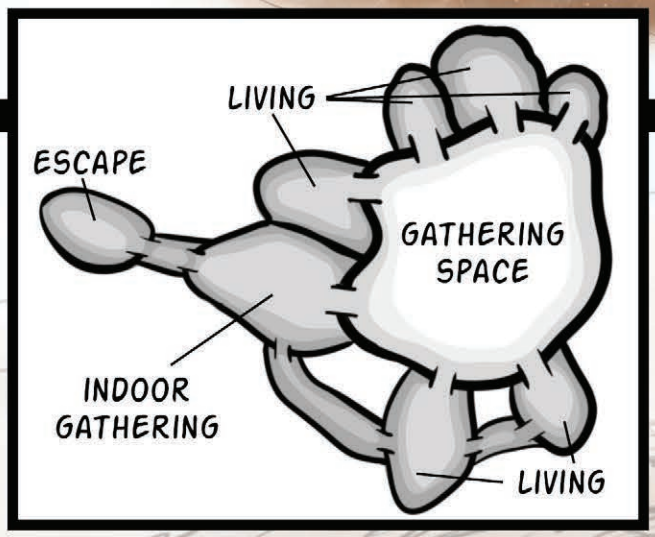
TROGLODYTE DWELLINGS

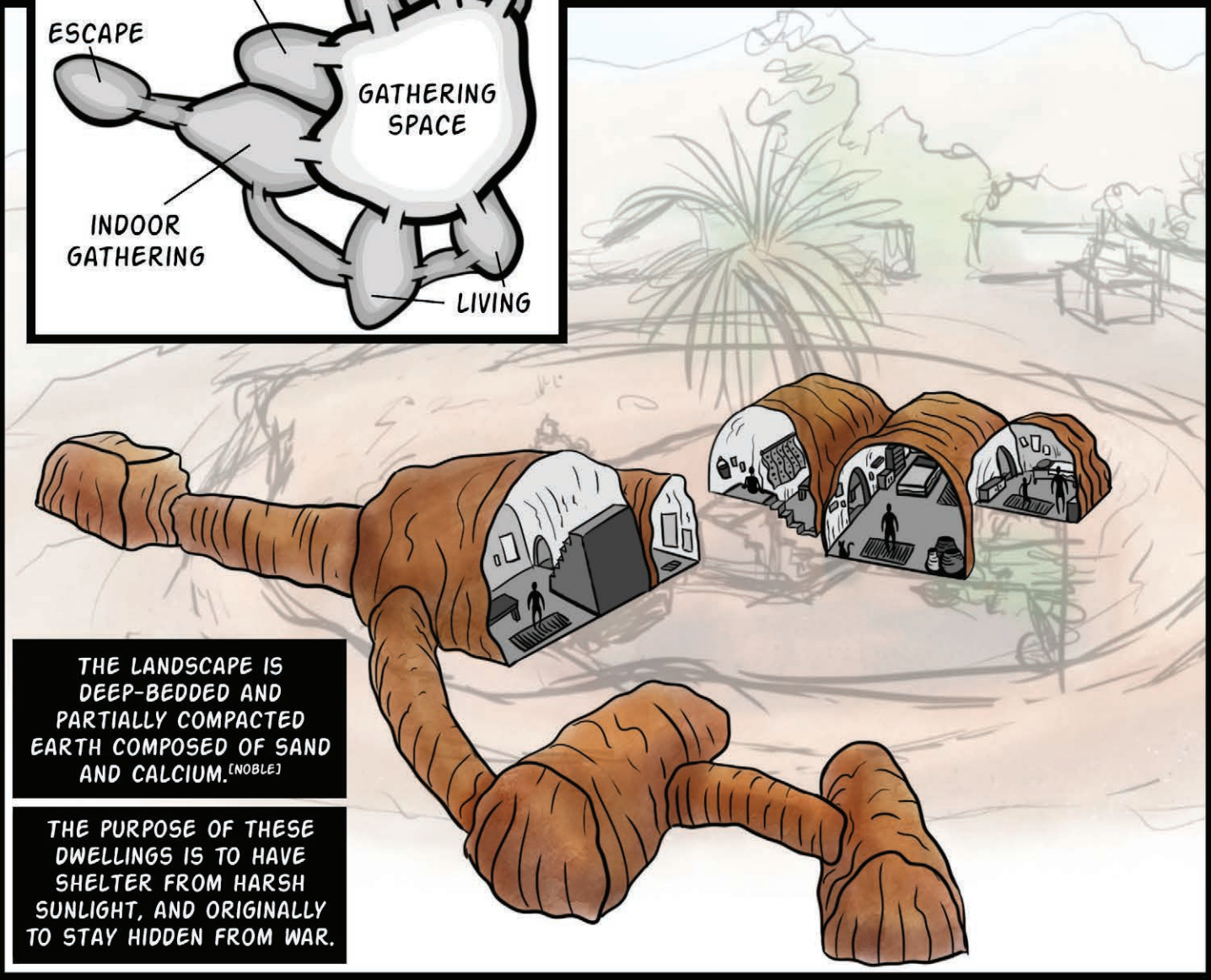
MATMATA, TUNISIA











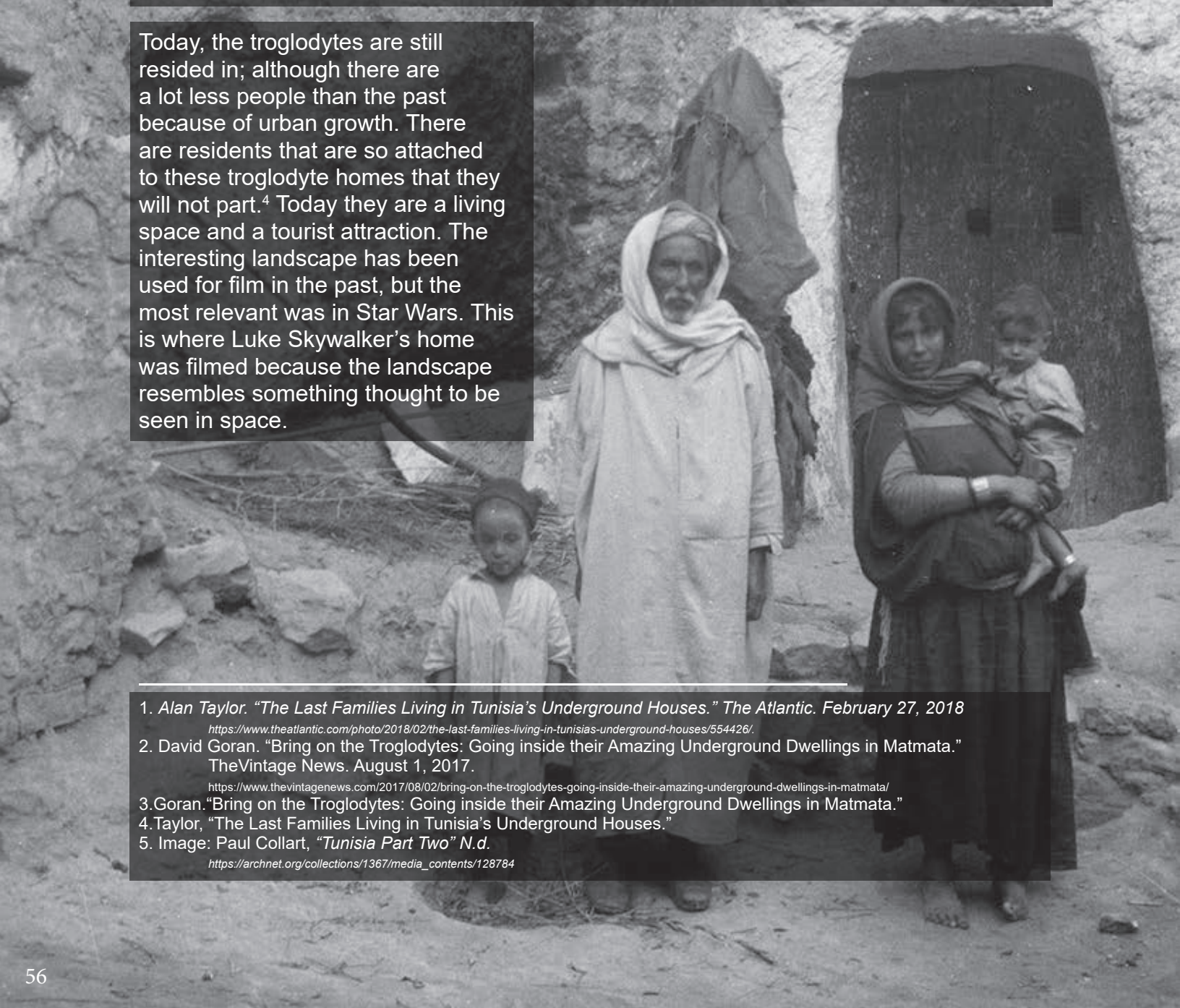
THE LANDSCAPE IS DEEP-BEDDED AND PARTIALLY COMPACTED EARTH COMPOSED OF SAND AND CALCIUM.[NOBLE]

THE PURPOSE OF THESE DWELLINGS IS TO HAVE SHELTER FROM HARSH SUNLIGHT, AND ORIGINALLY TO STAY HIDDEN FROM WAR.

TROGLODYTE DWELLINGS
MATMATA, TUNISIA

Located in Matmata, Tunisia (North Africa) are troglodyte dwellings. Troglodyte is another word for cave dweller, the phrase troglodyte dwellings partains to someone who lives encased in earth or rock. These underground homes have inhabited for centuries to escape the extremes from the seasonal elements in the desert landscape.[1] Another factor which caused the troglodytes to dwell underground was to hide from conflict and war. These dwellings were created by excavation into the sides of natural craters in the landscape creating a 15-30 ft deep pit.[2] Around the perimeter of these pits are dug into to create cave rooms and passageways connecting these rooms, and also to distant dwellings.[3] In a way these structures can be related to rabbit dens, they are constructed similarly; even with an escape tunnel in case one of their others collapses, or a if fox ends up at one exit.

Today, the troglodytes are still resided in; although there are a lot less people than the past because of urban growth. There are residents that are so attached to these troglodyte homes that they will not part.[4] Today they are a living space and a tourist attraction. The interesting landscape has been used for film in the past, but the most relevant was in Star Wars. This is where Luke Skywalker's home was filmed because the landscape resembles something thought to be seen in space.



1. *Alan Taylor. "The Last Families Living in Tunisia's Underground Houses." The Atlantic. February 27, 2018*
   https://www.theatlantic.com/photo/2018/02/the-last-families-living-in-tunisias-underground-houses/554426/.
2. David Goran. "Bring on the Troglodytes: Going inside their Amazing Underground Dwellings in Matmata." TheVintage News. August 1, 2017.
   https://www.thevintagenews.com/2017/08/02/bring-on-the-troglodytes-going-inside-their-amazing-underground-dwellings-in-matmata/
3. Goran."Bring on the Troglodytes: Going inside their Amazing Underground Dwellings in Matmata."
4. Taylor, "The Last Families Living in Tunisia's Underground Houses."
5. Image: Paul Collart, *"Tunisia Part Two" N.d.*
   https://archnet.org/collections/1367/media_contents/128784

CATACOMBS
ROME ITALY

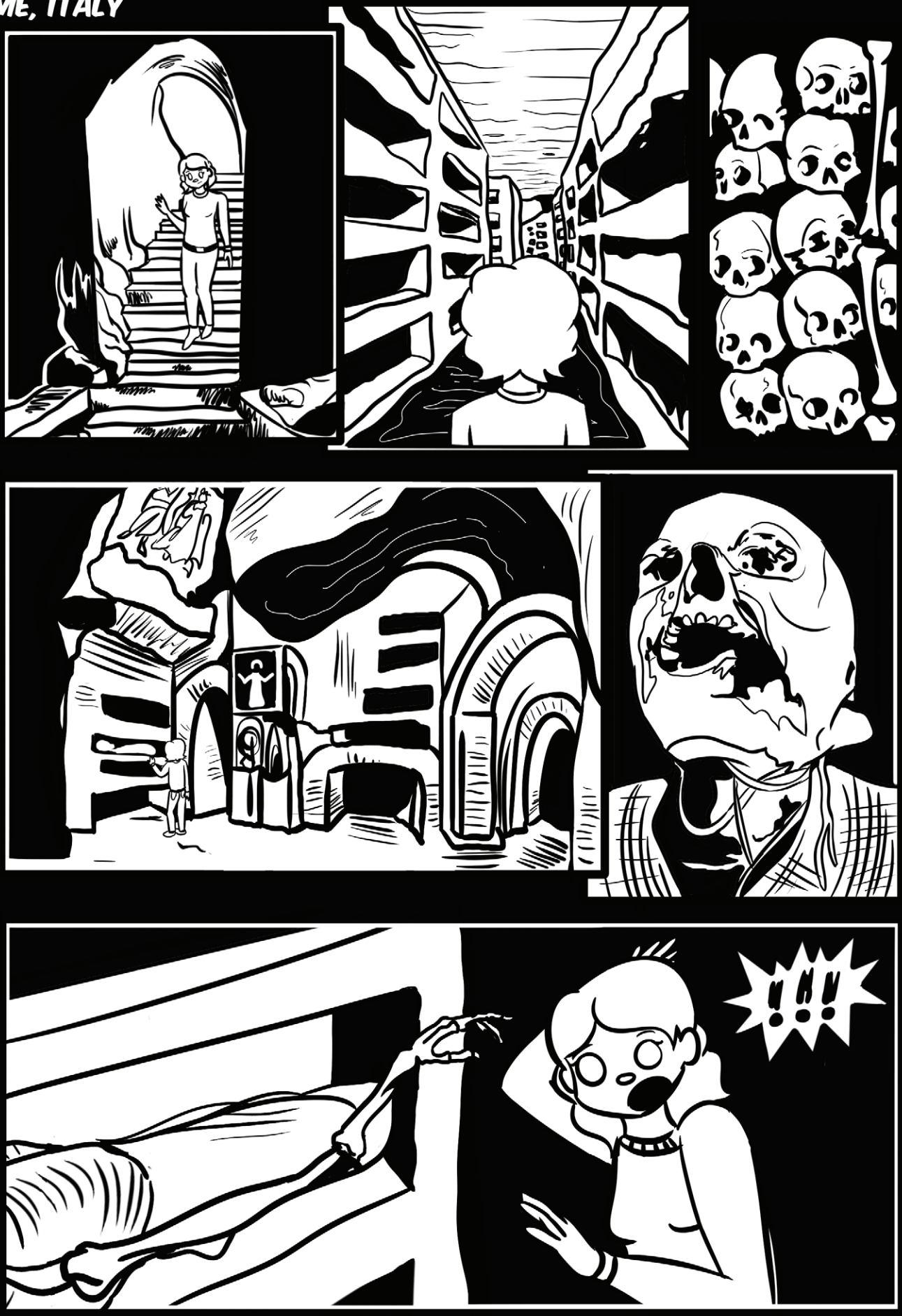
Catacombs are underground passageways used as a burial ground for Jewish, Pagan and early Romans beginning in the second century ending in the fifth.[5] Created because Christianity (an illegal religion at the time) didn't agree with burning bodies like the Pagans, and were dissalowed from burying bodies within the city.[6] Catacombs are a network of tunnels totalling 600 km in length holding millions of bodies at one time.[7] Eventually the popularization of Christianity legalized burials within the city grounds.[8] Today the catacombs are also a tourist attraction, much like the troglodytes.

As for the structure of the Catacombs, the earth in Rome mostly consists of tufa (a soft stone), making it easy to create the tunnels.[9] The entrance of the catacombs was accessed through a stairway from an atrium; continuing into a grid pattern to use the space efficiently for bodies. There are 1-4 levels of the catacombs 30-50 ft underground.[10] The walls are lined with 1-4 small compartments vertically for the bodies. Later on in the 4th century shafts were dug to the surface to provide better air flow for the living.[11] These labyrinths were used to not only to efficiently use space but to confuse grave robbers from stealing precious objects.

6. "Catacombs of Rome."Rome. Civitatis
https://www.rome.net/catacombs-rome
7. "Catacombs of Rome."
8. Suemedha Sood. "Travel- Exploring the History of Catacombs." BBC News. October 26, 2012.
http://www.citationmachine.net/bibliographies/396474384?new=true
9. Sood, "Travel- Exploring the History of the Catacombs."
10. Estelle Brettman, "Structure of the Catcombs in Rome" Society ICS. International Catacomb. 1991-2017,
http://www.catacombsociety.org/the-structures-of-the-catacombs/
11 Brettman, "Structure of the Catacombs in Rome"
12. "Catacombs" Macmillan Encyclopedia of Death and Dying. 2002
http://www.citationmachine.net/bibliographies/396474384?new=true
13. Image: NewspaperPort, *"3D Image Processing Brings Roman Catacombs To Life", 2010.*
https://fli.institute/2016/09/06/3d-image-processing-brings-roman-catacombs-to-life/

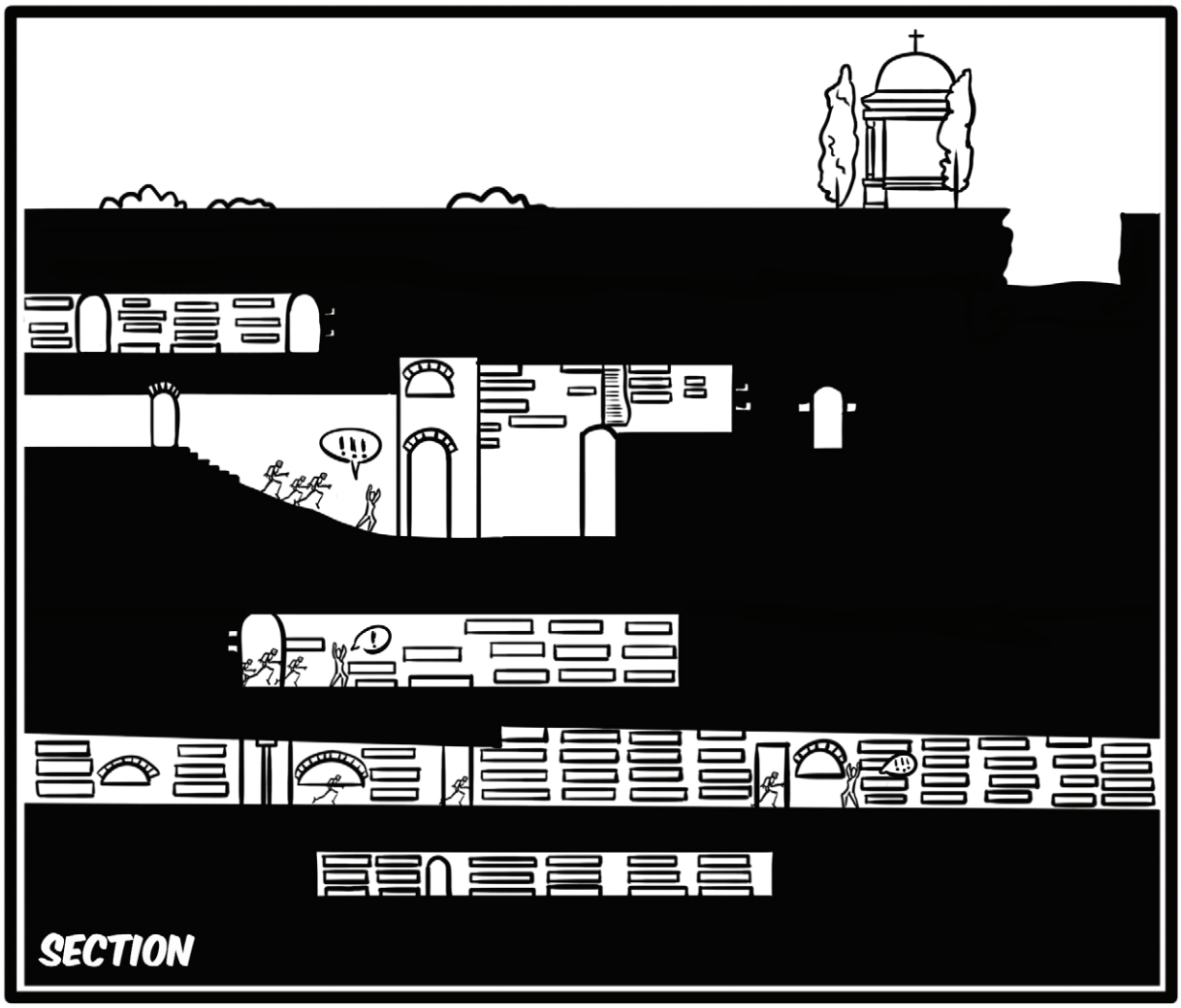
CATACOMBS

ROME, ITALY




PLAN


!!!


SECTION

WIELICZKA SALT MINE
WIELICZKA, POLAND

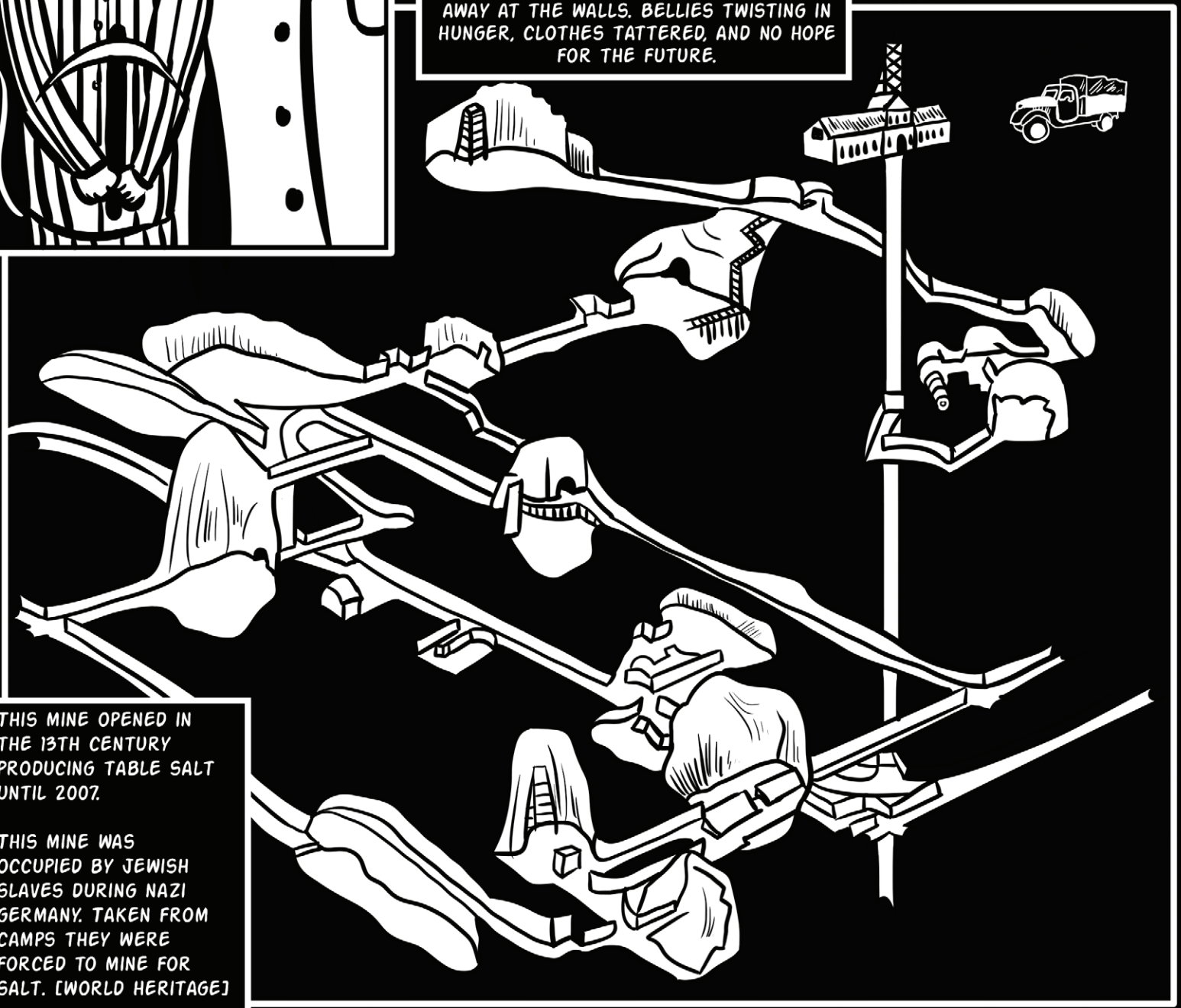
The excavation of the Wieliczka Salt Mine began in the 13th century. Through medieval times this space transformed into what it is presently; a historic museum of mining history, holocaust history, art, and religion. In the 1940s roughly 1000 Jewish slaves were transported from Auschwitz to the Salt Mines.[1] Most of the world's table salt came from here; it was a huge source for the mining industry at the time.[2] The mine is complete with 124 miles of tunnels across 7 levels, as deep as 1073 ft.[3] There are many carved artworks inside from the salt walls, making for interesting sculptures and salt carvings representing famous artworks.

This case study became integral to the overall thesis. The importance of this source lies within the structures ability to hold narrative through many timeframes. Over time it was once a place for opportunity, a place for slavery, worship, and then a place for tourism. In its own way, the structure itself is a character in its own narrative. Over time, there is character development with the program and individuals within the mine. In the following graphic narrative pages, there is a parallel between the past and present residents of the structure. In the past certain ethnicities would have conflict, but presently they can both inhabit the structure peacfully. Architecture represents and dictates what happens throughout time, and I hope to represent this in the media of my thesis.

1. *"History".Wieliczka Salt Mine.*
   https://www.wieliczka-saltmine.com/visiting/tourist-route/history
2. Amy Schellenbaum, "A Look at Poland's Awesome Underground Salt Architecture" Curbed. May 13, 2013.
   https://www.curbed.com/2013/5/13/10244246/a-look-at-polands-awesome-underground-salt-architecture
3. Image: Ryszard Tatomir, *"A Record-Breaking Polish Mine" N.d.*
   http://www.multivu.com/players/uk/8002151-wieliczka-salt-mine-record-breaking-tourists/

WIELICZKA SALT MINE
WIELICZKA, POLAND

IN THE 1940S IT WAS A GLOOMY, DAMP, COLD PLACE WHERE 1000 JEWISH SLAVES HACKED AWAY AT THE WALLS. BELLIES TWISTING IN HUNGER, CLOTHES TATTERED, AND NO HOPE FOR THE FUTURE.



THIS MINE OPENED IN THE 13TH CENTURY PRODUCING TABLE SALT UNTIL 2007.

THIS MINE WAS OCCUPIED BY JEWISH SLAVES DURING NAZI GERMANY. TAKEN FROM CAMPS THEY WERE FORCED TO MINE FOR SALT. [WORLD HERITAGE]

IN RELATION TO THE SITE AS A CHARACTER ITSELF IN A NARRATIVE, THE SALT MINE IS A STRONG CHARACTER. THROUGHOUT, IT HAS LASTED MANY VOLUMES OF STORIES THROUGHOUT THE YEARS: A SOURCE OF A MYSTERIOUS MINERAL, A MYTHICAL MEDIEVAL CHAMBER, THE MOUSE BURROW FOR JEWISH SLAVES, A MINE SHAFT INFECTED BY RUNNING WATER, A BREATH TAKING TOURIST SPOT, AND THE STORY CONTINUES...

THESE STORIES ADD VALUE TO THE MANY TWIST AND TURNS OF THIS UNDERGROUND STRUCTURE. THERE IS A NARRATIVE WITHIN EVERY CHANGE OF PROGRAM.

THE IMPRINTS OF MINING, ARTISTIC ADDITIONS, AND WATER BRING ECONOMIC, SOCIAL, AND NATURAL FAINT ERASER MARKS ON THE INTERIOR OF THIS STRUCTURE.

INSTEAD OF COMPLETELY CLOSING THE ENTRANCE TO THESE HISTORICAL TUNNELS, THE STORY GOES ON...

TODAY, IT IS LIT BY SALT CARVED CHANDELIERS IN DIFFERENT COLOURS TO ACCENT HISTORICALLY PROMINANT ARTWORK. BEAUTIFUL CHAPELS ARE SCATTERED THROUGHOUT, WELCOMING CROWDS IN.

CHAPTER 1.5

ARCHITECTURAL CONCLUSIONS

"The truth is stranger than the fiction, but it is because fiction is obliged to stick to possibilities; the truth isn't," *Mark Twain*

Architecture is the connection binding the research to design. The reality we live in is bizarre but clearly backed up with fact and reason. Architecture identifies with this truth, yet it also classifies itself as the imaginary. Architecture falls in this middle ground, the portal existing between the truth and the fiction. Further, this suspension between the authentic and the theoretical defines the researched method, topics, and case studies involved in this thesis.

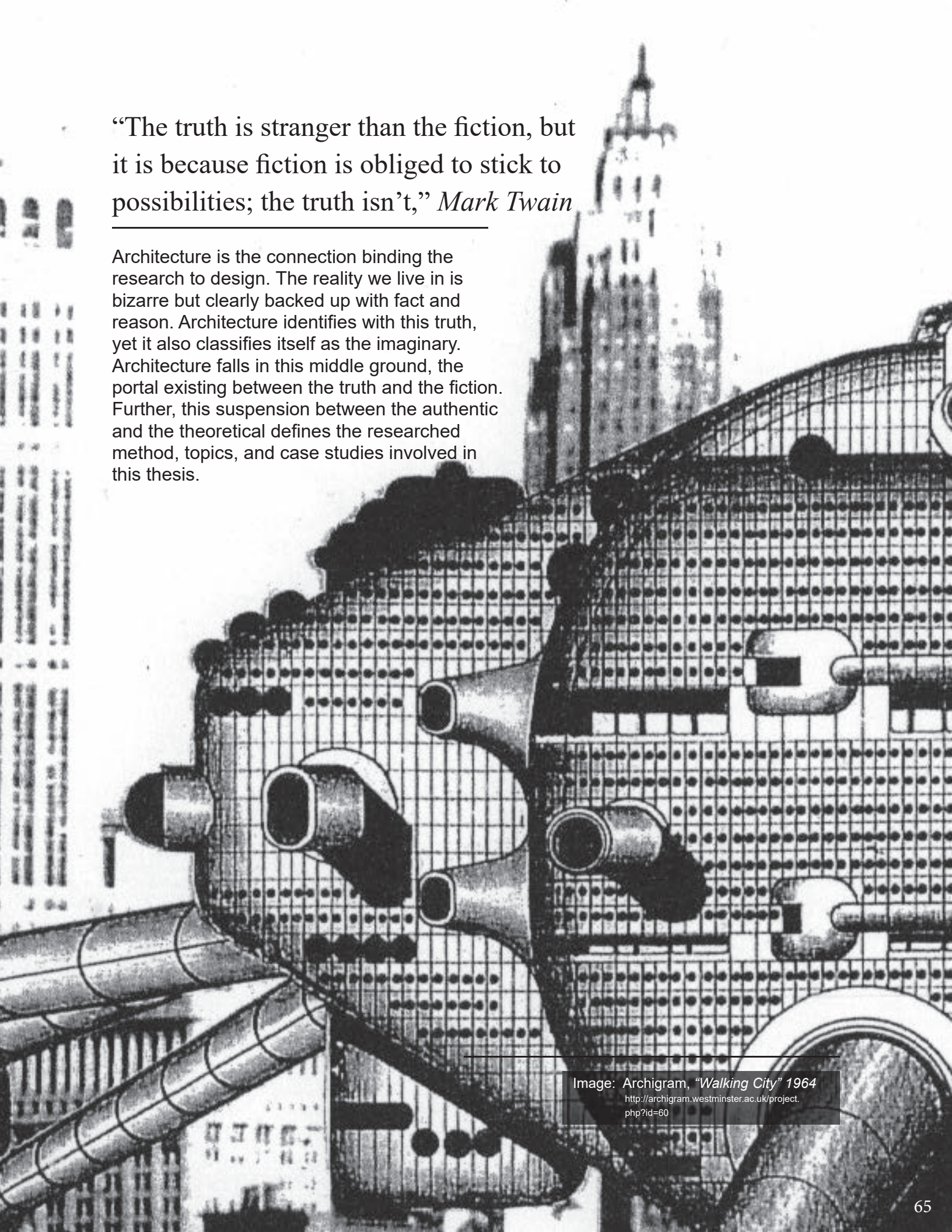


Image: Archigram, *"Walking City" 1964*
http://archigram.westminster.ac.uk/project.php?id=60

ECCENTRIC SPACES

The shapes and natures of the dwellings the human imagination creates for itself, real and fictitious: gardens, rooms, buildings, streets, museums, maps. . . with excursions to many famous eccentric spaces, from Bomarzo to Sherlock Holmes's Baker Street apartments, from Marie Antoinette's Hameau to the House of Usher.
By Robert Harbison

ECCENTRIC SPACES
ROBERT HARBISON

Eccentric Spaces, by Robert Harbison explains his theories revolving around architecture intertwining with imagination. He archives different architectural spaces in the chapters of *Eccentric Spaces* which are: gardens, rooms, buildings, streets, museums, maps, and fictional topographies to explain his concept.

One garden Harbison mentions is Boboli in Florence, Italy. The garden tempts us with dreams of release but puts obstacles in our way; maintaining the tension between feeling free and wandering. He further explains the experience: You are in the controlled experience of a maze, lost and trapped, surrounded by statues depicting fairy tales and fountains. You create a mental story as you go through; further into the surreal. This is intended to be a place in which you can go many times and still not grasp everything.

Harbison is tempting the reader to bring fiction and imagination into their real lives on the same plane; tindering new design points in the contemporary architectural world. There is value in blurring the barrier between the physical and the mind's created fiction. If humankind simply followed what is attainable logically; new theories, designs, and inventions would never continue to improve and change society. This theory of blurring assists with breaking boundaries for thesis work; expanding the guidelines and opening new paths for ideas.

1. Robert Harbison, *"Eccentric Spaces"*, 1977

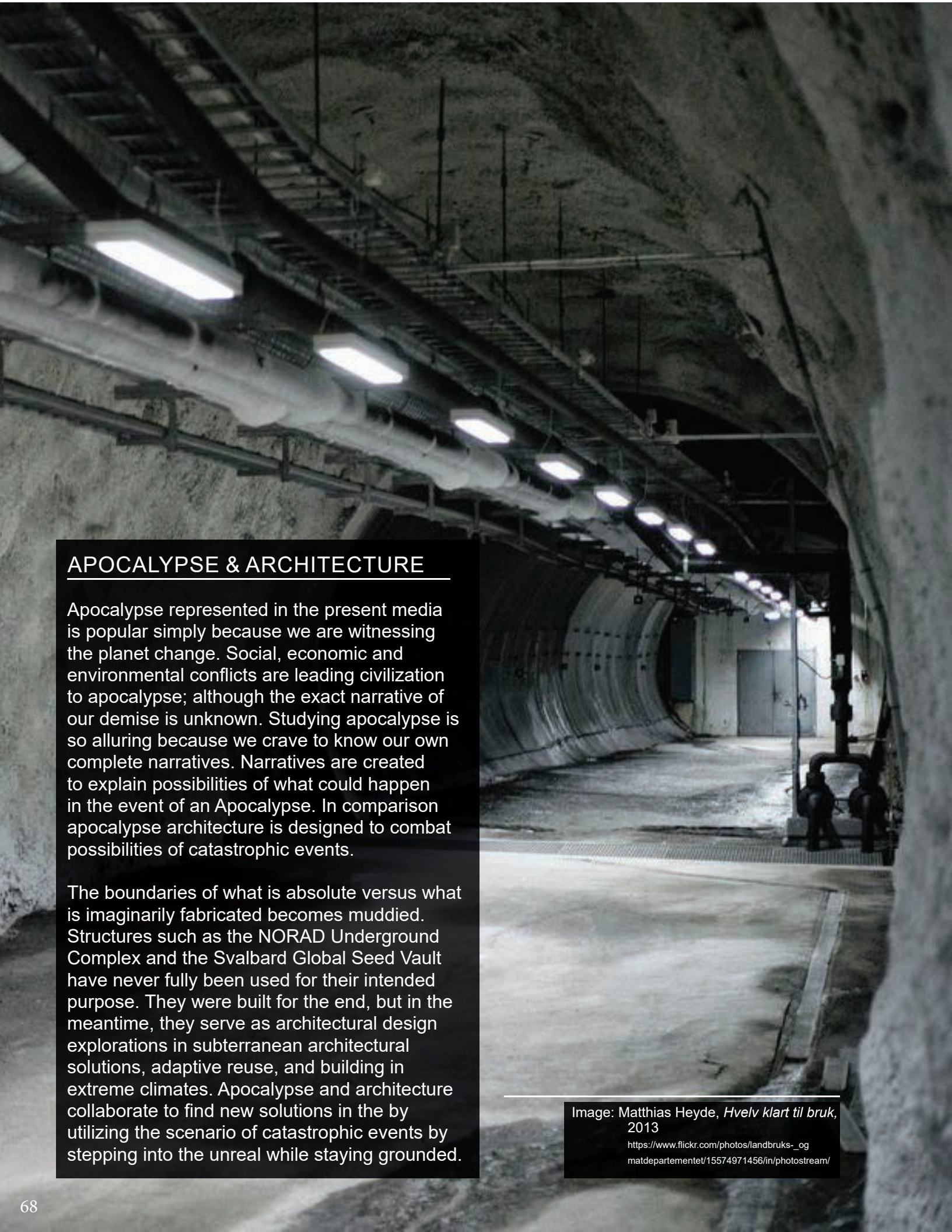
GRAPHIC NARRATIVE & ARCHITECTURE

The graphic narrative additionally acts as a gateway between truth and fiction. Real events such as the Holocaust in Maus are represented with the fictional twist of cartoon animals taking on humanism in history. Situations are contrastingly exaggerated and underplayed to alter the reality of emotion an audience feels. Spiegelman's father is hyperbolically narrated to have heart problems throughout the comic, intending to provoke pity and connection from the reader. As the audience, we connect with him through real past and present experiences. The fascinating comparison is how the reduction in the weight of the Holocaust, Spiegelman portrays with the simplicity of cartoon animals so we understand the unfathomable actually happened in history.

Artists also use the technique of creating a version of themselves, or a Virgil in their graphic narratives to ground the reality in the imaginary. Not only does it leave room for the intended audience to reflect, but it also gives the artist the creativity to represent themselves without realistic boundaries. Applying this application in architecture the presentation material by embedding design in reality.

In architectural design, exaggerating and downplaying various scales to evoke a specific response is comparable to the effects of the graphic narrative. For example, a golf course map doesn't represent the perfect proportions of a course. Instead, it exaggerates the changes in elevation to allow the user to predict a play, or understand the difficulty. Alternatively, when producing subterranean architectural representing drawings in large scale could project the solitary feeling of the thriving underground.

2. Art Spiegelman. *"Maus: A Survivor's Tale." Pantheon Books*, 1986-1991.



APOCALYPSE & ARCHITECTURE

Apocalypse represented in the present media is popular simply because we are witnessing the planet change. Social, economic and environmental conflicts are leading civilization to apocalypse; although the exact narrative of our demise is unknown. Studying apocalypse is so alluring because we crave to know our own complete narratives. Narratives are created to explain possibilities of what could happen in the event of an Apocalypse. In comparison apocalypse architecture is designed to combat possibilities of catastrophic events.

The boundaries of what is absolute versus what is imaginarily fabricated becomes muddied. Structures such as the NORAD Underground Complex and the Svalbard Global Seed Vault have never fully been used for their intended purpose. They were built for the end, but in the meantime, they serve as architectural design explorations in subterranean architectural solutions, adaptive reuse, and building in extreme climates. Apocalypse and architecture collaborate to find new solutions in the by utilizing the scenario of catastrophic events by stepping into the unreal while staying grounded.

Image: Matthias Heyde, *Hvelv klart til bruk,* 2013
https://www.flickr.com/photos/landbruks-_ogmatdepartementet/15574971456/in/photostream/

Image: Louie Palu - *"Furnace Tapper-Falconbridge Smelter"* 2010.
https://www.vqronline.org/essay/underground giant-life-hard-rock-mines-quebec-and-ontario

MINING & ARCHITECTURE

Lying below the earth's surface is a massive system of tunnels to collect deposits of industrial material. Living in a mining town for the entirety of my life I have never thought about the mysteries of this hidden realm. Yet it defines the city of Sudbury, only showing its aftermath. Residents know it exists, but similarly to an apocalypse, it isn't fully tangible even if experienced first hand. Mine shafts plunge 2km towards the core, equivalent to the height of 4 CN Towers.

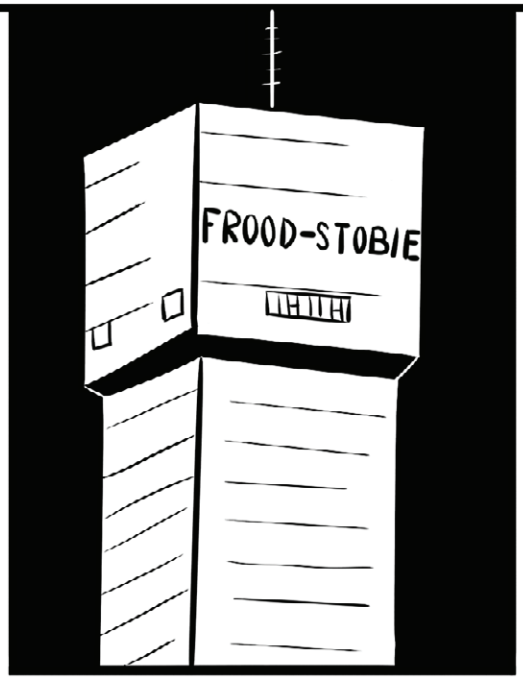
The architecture of mines is a testament to fusing the differences separating truth and fiction because the deepest insides of the earth have never been fully explored. Below the surface is open to new architectural solutions, that are unconventional in comparison to above surface design. Blurring the boundary between the truth and fiction is an analogy for designing above and below. The surface is the boundary. Above, the material is added to have a physicality, to become positive space in reality. Below, the environment is subtracted to create voids, creating negative space in the unknown.

PART 2

SITE EXPLORATION

WHERE TO GO FROM HERE?

THE PROGRAM RELIES ON WHAT THE PLOT OF THE NARRATIVE IS. THERE ARE THREE KEY FACTORS THAT THE DESIGN RELIES ON: THE SITE, THE APOCALYPSE, AND THE MATERIAL ARCHIVED. FOR THE SITE, I AM PLANNING USING THE FROOD-STOBIE MINE BECAUSE IT IS ABANDONNED AND HAS FAMILY RELATION TO MY GRANDFATHER. I CAN PLAY WITH 3 DIFFERENT TIME ZONES HERE PRESENT, PAST, AND FUTURE. FOR THE APOCALYPTIC SCENARIO, THE MOST PLAUSIBLE FOR SUDBURY AS A LOCATION IS MASS FIRE. AND FOR NOW, THE MATERIAL ARCHIVED WILL BE ONTARIO INFORMATION. I AM HOPING THAT THE DATA COULD INFORM A PROGRESSOON TOWARDS REVERSING THE APOCALYPSE, MUCH LIKE THE SEED ARCHIVE HAS INFORMATON WHICH COULD REVERSE WORLD ENDING SCENARIOS.



CHAPTER 2.1

EMBEDDING THE PAST

CONVERGING NARRATIVES

The network of the design narrative expanded unintentionally as my thesis progressed. While visiting my grandmother, I discovered old pictures of my grandfather as a miner. By integrating my grandfather's origin into the narrative, I embed my heritage into the design, along with the past of the Stobie-Frood Mine.

The past, present, and future could all coexist in this narrative, in turn describing the architecture. Just as a character in a story layers throughout time, the architecture takes on this role as well. Telling my grandfather's story working in Stobie-Frood Mine adds depth to the narrative, and provides a stronger connection to the audience.

INCO TRIANGLE ARCHIVES

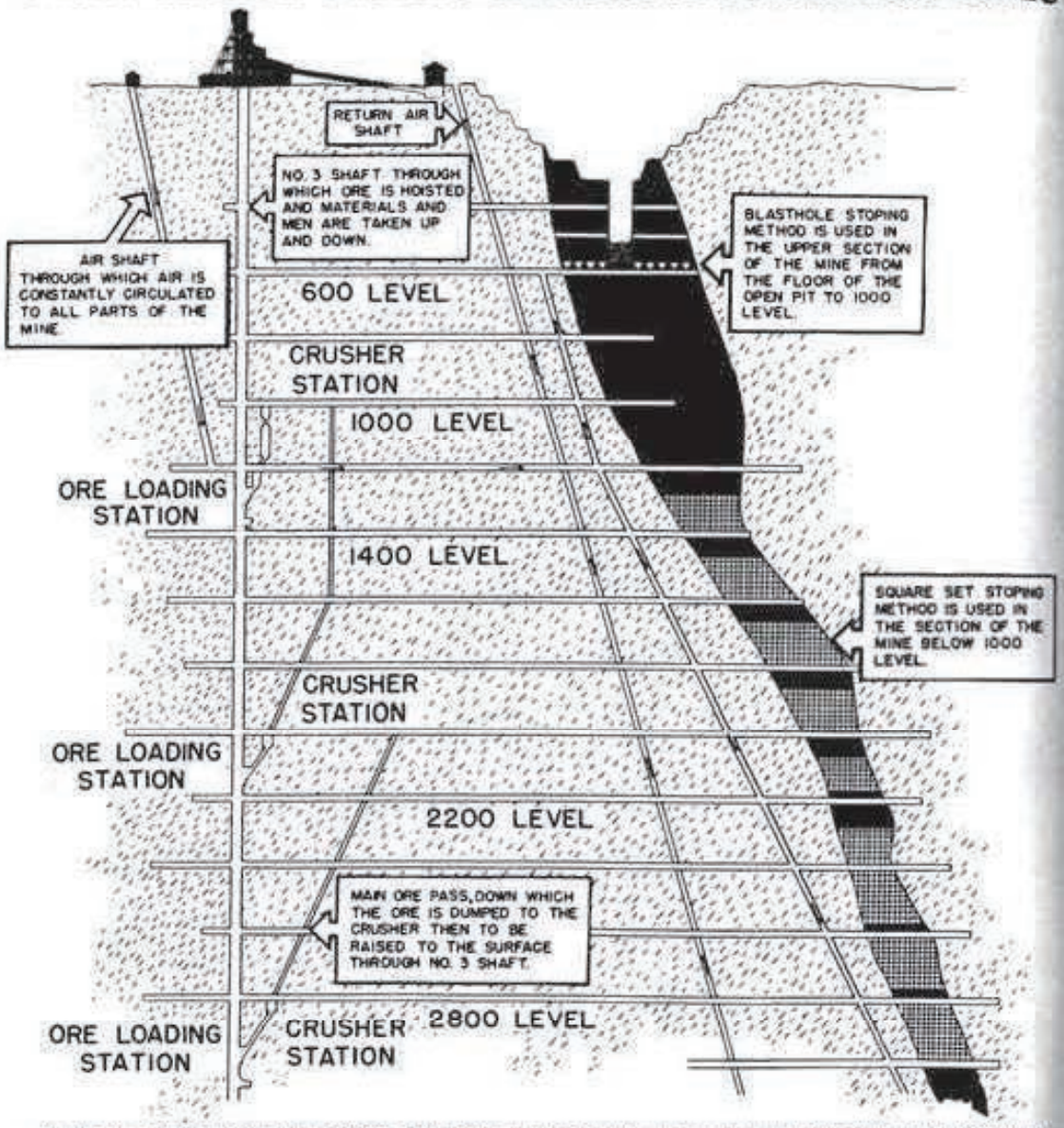
The Stobie-Frood Mine architectural drawings and schematics are restricted for public use. There is confidential information, which made it difficult to execute a site study. Encountering this dilemma granted finding the INCO Triangle. Stobie-Frood mine was previously owned by INCO before Vale. There was a newspaper called the INCO Triangle which narrated miners, their families, and the unthinkable underground. I created the full drawings from sifting through over 50 newspapers from 1949 to 1999, gathering all the drawings and stories relating to Stobie-Frood Mine. 3D modelling the site was done by using only the INCO Triangle archives.

In the graphic narrative, I also used these drawings to contrast the past and the future. Sudbury's truth was as bizarre as fiction is described. Real narratives having the Queen of England visit the depths of the mine, finding a duck in water well underground, and the illusive images of the "Furnace Man". The story unfolds without ever being written, it just happened, crafting the character of the Stobie-Frood Mine itself. Using these images in conjunction with what could exist in the future grounds this concept in reality.

Image: https://fivedials.com/art/there-arent-any-rules-any-more/

The Company's Huge Expansion
(STORY ON PAGES 10-11-12)

Cross Section of No. 3 Shaft at Frood-Stobie Mine



In this cross section is shown the relationship of the shafts, crusher stations, and ore passes to the ore body at No. 3 Shaft of Frood-Stobie Mine. The drawing illustrates how the blasthole program in the upper section of the mine carries on where surface mining leaves off.

FRUSTRATION DEPARTMENT

PROBLEM

Four members of the Rainbow Club sat down one afternoon to play bridge.

In accordance with the rules of the game, they drew cards from a deck spread face down. The man who drew the highest card chose his seat and the deck to be dealt by his side; second highest took the opposite seat, as his partner; third highest took his choice of the remaining two seats, lowest card becoming his partner.

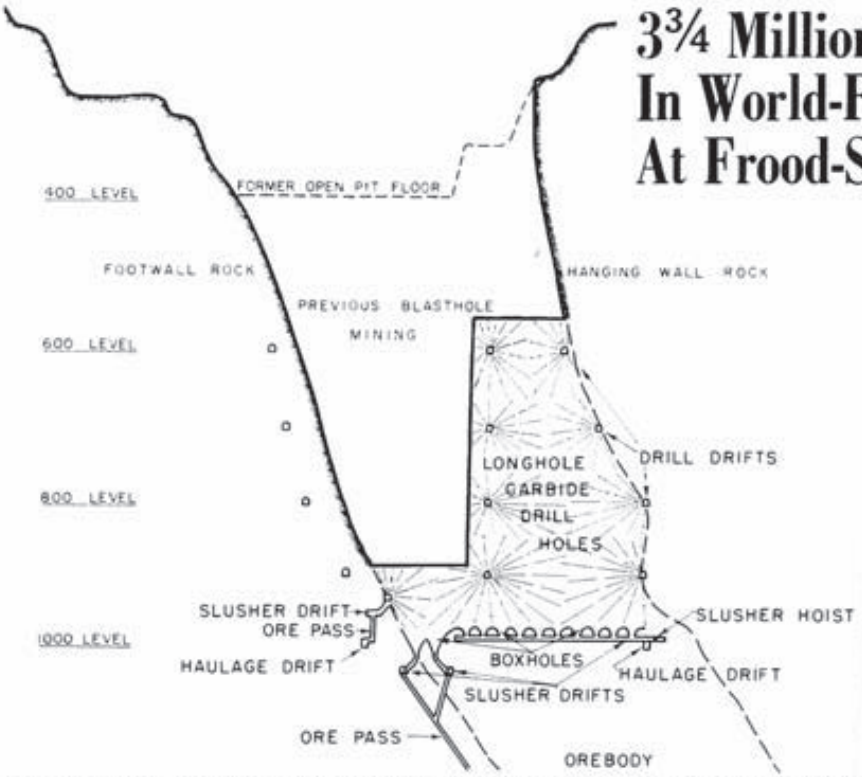
Without troubling to put the facts in chronological order, we may note that White's card was lower than Brown's. Green asked for a match, which was supplied by White's partner. Black said "What is your choice, partner?" Brown sat on White's left. The left-handed man chose the blue cards, and since Brown is right-handed you can now make a diagram of how the four players sat.

SOLUTION

White was not highest, as his card was lower than another. Black was not highest, as his partner had a choice. Brown was not highest since he was right-handed, and the choice of cards fell to a left-handed man. Green, Green drew the highest card. Green was not White's partner, and Brown was not White's partner. Therefore Green and Brown were partners against White and Black, with Brown at White's left. Black drew the lowest card, since White had the choice for his side.

Character is like the foundation to a house—it is below the surface.—The Window Seat.

3¾ Million Tons of Ore In World-Record Blast At Frood-Stobie Mine



THIS SIMPLIFIED CROSS-SECTION DRAWING shows preparations at Stobie mine for the record blast. The hanging wall portion of 600 level floor and 1000 level pillars, as well as a small portion in the footwall area, have been honeycombed with rings of drill holes driven from drill drifts in the ore body. Boxholes and slusher drifts have been established beneath the drilled ore body, ready to remove the broken ore and load it directly into cars in the haulage drift on 1000 level or send it down the ore passes for haulage on 1400 level. The drawing shows the incline of the ore body and the overhanging portion of hangingwall rock which was removed by the blast and came down on top of the broken ore; after all the broken ore has been drawn down this rock will serve as a protective cover as mining proceeds below 1000 level.

A world's record underground blast in the Stobie section of Frood-Stobie mine on November 28 broke 3¾ million tons of ore and 1½ million tons of rock.

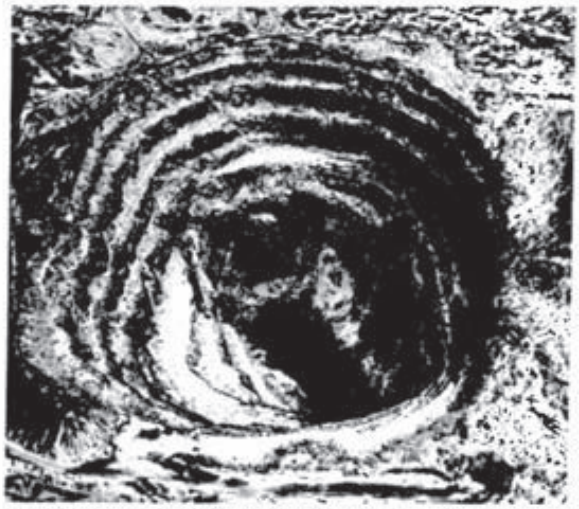
A solid block of ore the size of a football field and 750 feet high would represent the amount shattered in this gigantic mining achievement which used 464 tons of powder.

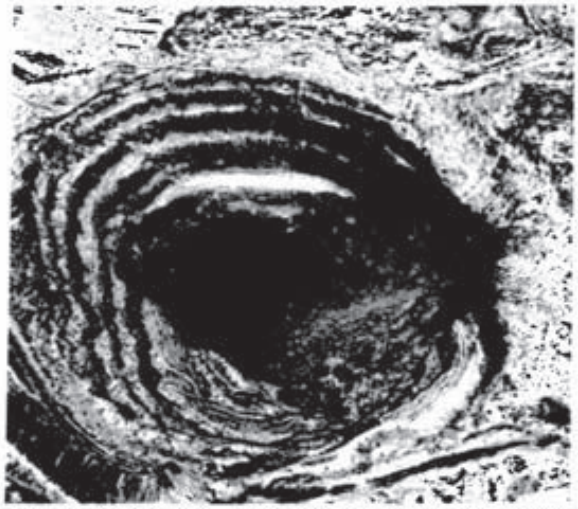
The blast was so well organized and contained that its impact was less noticeable than an ordinary open pit bench blast.

Inco manager of mines John McCreedy expressed himself as "very gratified with the safe completion of this highly complex mining operation". He said, "The work of the planning engineers, underground supervision, various service departments, and men engaged in making this record underground blast is to be greatly commended. Special mention must be made of the work of the electrical department in designing and wiring the intricate circuit for the blast."

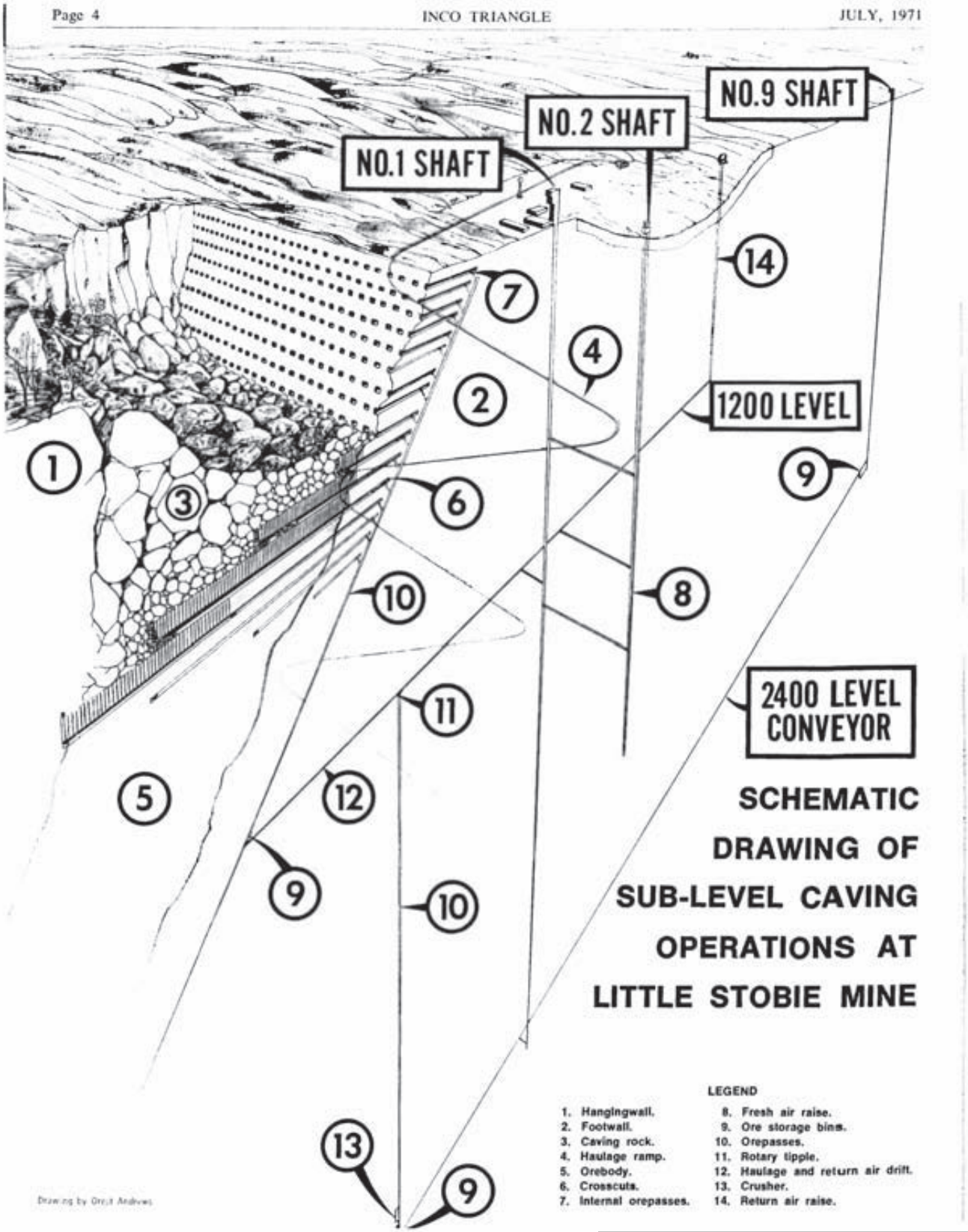
Easily the Largest

Information compiled by a leading explosives manufacturer establishes the Stobie blast as the biggest in the history of world underground mining. Next on the honor roll of large underground blasts took place at Inco's Murray mine on April 17, 1961, breaking 2,120,000 tons of ore and using 255 tons of explosives. Another Murray blast ranks third; it was fired on March 26, 1962, broke 1,580,000 tons, used 194 tons of explosives. Next in order of size come Climax

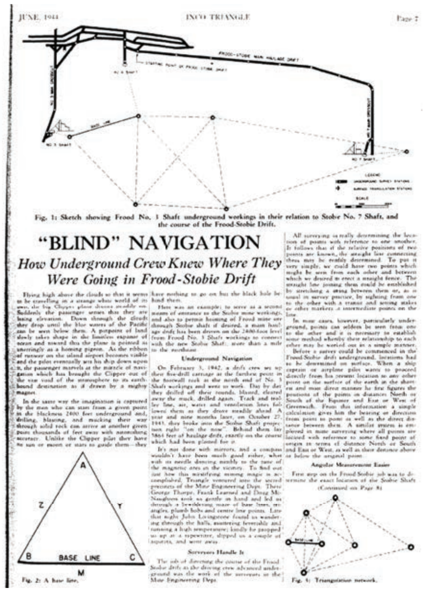




BEFORE-AND-AFTER PHOTOGRAPHS show the effect of the blast as seen from the air. The rectangular opening in the bottom of the Stobie pit, 500 feet long by 200 feet wide and extending from the 600 to the 1000-foot level of the underground workings, was enlarged by the blast to 800 feet long by 400 feet wide and completely filled to the 1000-foot level with broken ore topped by hangingwall rock. A large section of the abandoned pit haulage road on the hangingwall side disappeared. The pictures fail to convey the size of the Stobie pit but some comparison is given by the 30-foot fan installation on the mine return air raise, barely discernible in the lower right corner of each picture.



Images: Greater Sudbury Public Library, "*INCO TRIANGLE Digital Archives*"
http://www.sudburymuseums.ca/triangle/

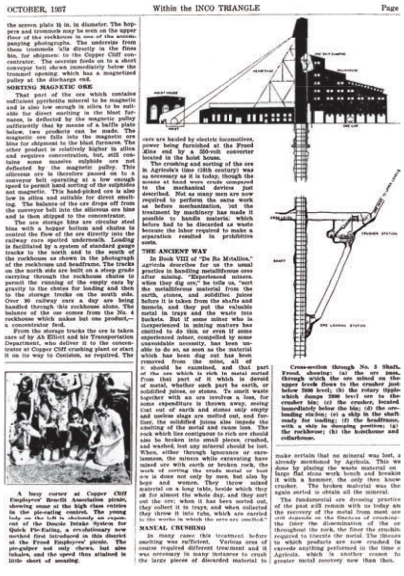


JUNE, 1944 INCO TRIANGLE Page 7

Fig. 1: Sketch showing Frood No. 3 Shaft underground workings in their relation to Stobie No. 7 Shaft, and the course of the Frood-Stobie Drift.

"BLIND" NAVIGATION

How Underground Crew Knew Where They Were Going in Frood-Stobie Drift



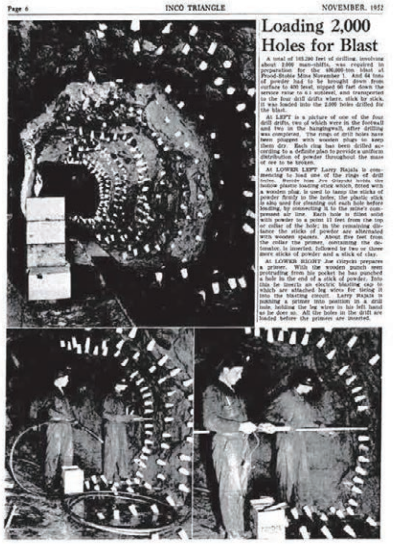
OCTOBER, 1937 Within the INCO TRIANGLE Page

Page 6 Within the INCO TRIANGLE OCTOBER, 1937

MINING

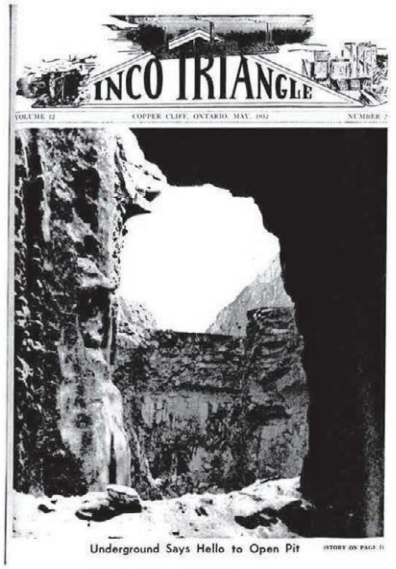
Past and Present

Fifth of a Series of Articles by K. V. Lindell, Copper Cliff



Page 6 INCO TRIANGLE NOVEMBER, 1952

Loading 2,000 Holes for Blast



INCO TRIANGLE

VOLUME 12 COPPER CLIFF, ONTARIO, MAY, 1952 NUMBER 2

Underground Says Hello to Open Pit (STORY ON PAGE 3)

Page 10 INCO TRIANGLE FEBRUARY,

Pictures Show Procedure in Handling Versatile Airleg Dri

Page 16 INCO TRIANGLE OCTOBER, 1951

Surface Mining Completed at the Stobie Section

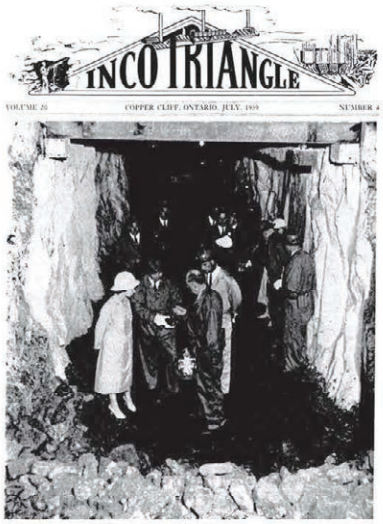
Page 12 INCO TRIANGLE JULY, 1955

Driving Tunnels To Release More Ore For Surface Mining

Page 2 INCO TRIANGLE AUGUST,

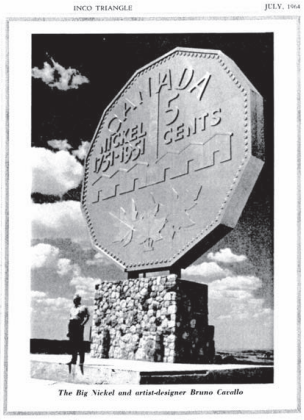
Portrait Presented to Frood Mine Following Royal Visit

Nickel Industry Faces Big Job in Next Two Years

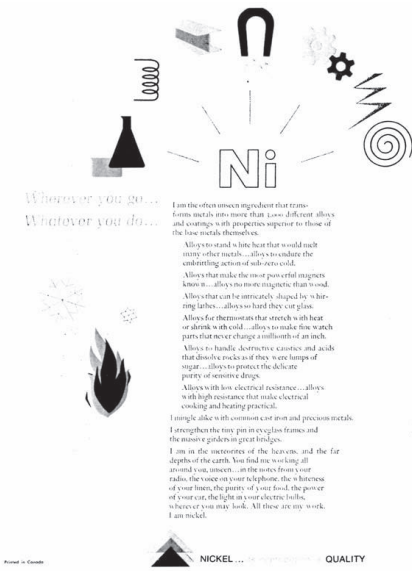


Royal Guests Underground

(Story on Page 1)



The Big Nickel and artist-designer Bruno Cavallo



The Furnaceman

(Story on Page 11)

Very Unexpected Visitor

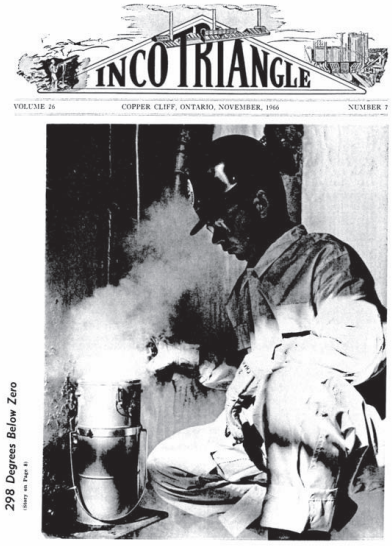
(Story on Page 13)

Glamour in the Stope

(Story on Page 9)

In the School Stope

Story on Pages 8-9

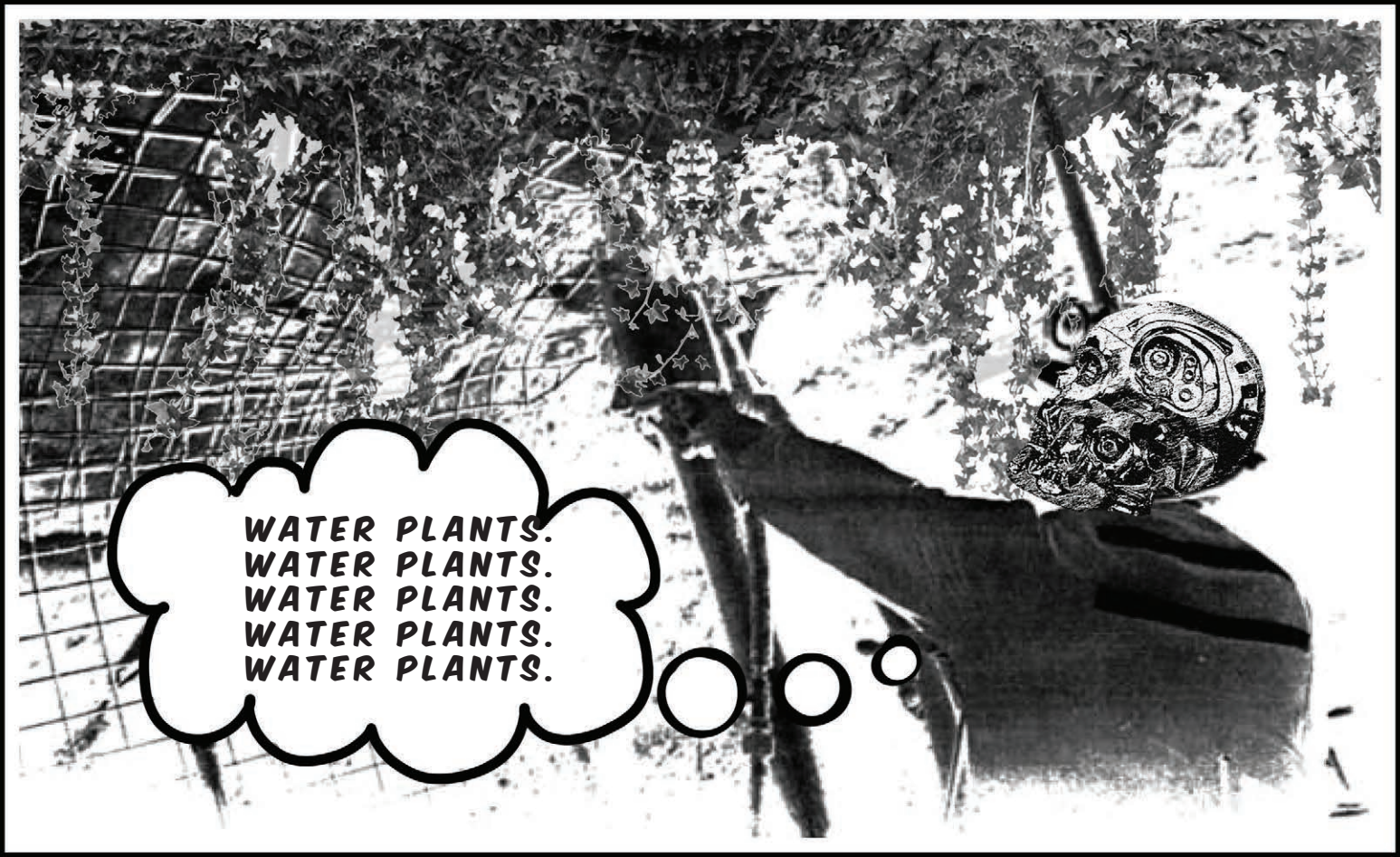


298 Degrees Below Zero

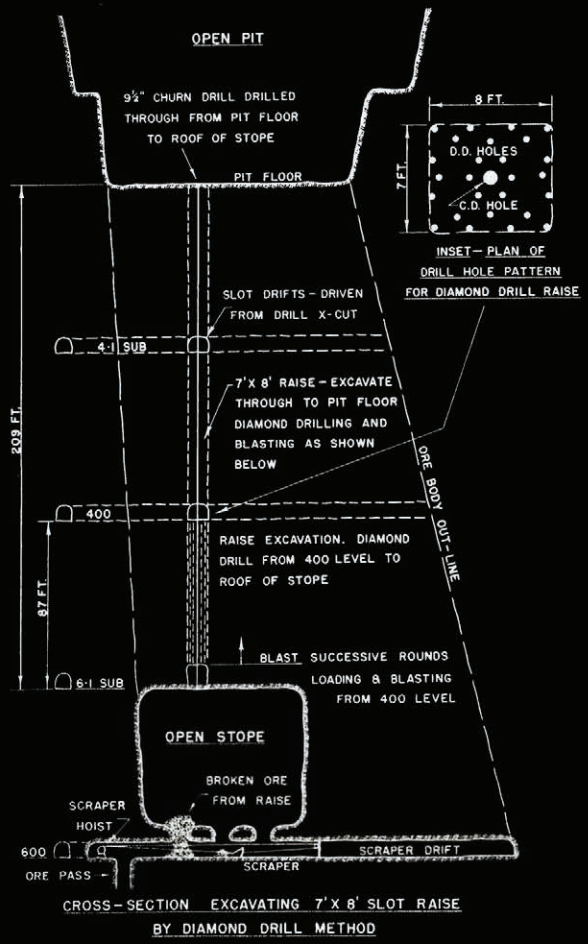
(Story on Page 8)

Images: Greater Sudbury Public Library, "*INCO TRIANGLE Digital Archives*"
http://www.sudburymuseums.ca/triangle/

This format resembles Archigrams style of scanned and collaged imagery. Images from the INCO Triangle are layered and processed to resemble the apocalyptic future.


WATER PLANTS.
WATER PLANTS.
WATER PLANTS.
WATER PLANTS.
WATER PLANTS.


LATE AGAIN!??


OPEN PIT
9½" CHURN DRILL DRILLED THROUGH FROM PIT FLOOR TO ROOF OF STOPE
PIT FLOOR
8 FT.
7 FT.
D.D. HOLES
C.D. HOLE
INSET— PLAN OF DRILL HOLE PATTERN FOR DIAMOND DRILL RAISE
SLOT DRIFTS – DRIVEN FROM DRILL X-CUT
4-1 SUB
7'X 8' RAISE – EXCAVATE THROUGH TO PIT FLOOR DIAMOND DRILLING AND BLASTING AS SHOWN BELOW
209 FT.
ORE BODY OUT-LINE
400
RAISE EXCAVATION. DIAMOND DRILL FROM 400 LEVEL TO ROOF OF STOPE
87 FT.
BLAST SUCCESSIVE ROUNDS
LOADING & BLASTING FROM 400 LEVEL
6-1 SUB
OPEN STOPE
BROKEN ORE FROM RAISE
SCRAPER HOIST
600
ORE PASS
SCRAPER DRIFT
SCRAPER
CROSS-SECTION EXCAVATING 7'X 8' SLOT RAISE BY DIAMOND DRILL METHOD

CHAPTER 2.2

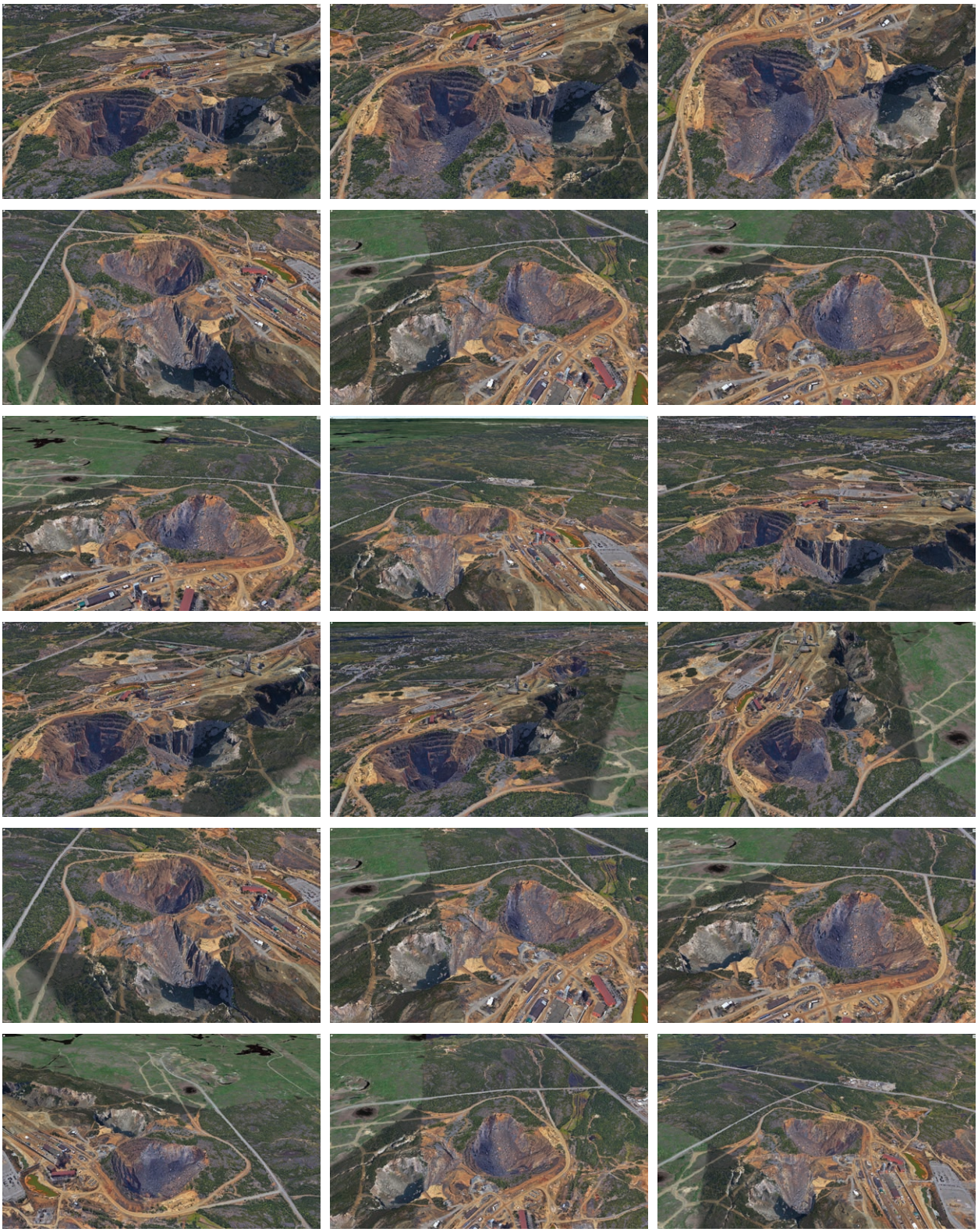
DIGITAL MODELING

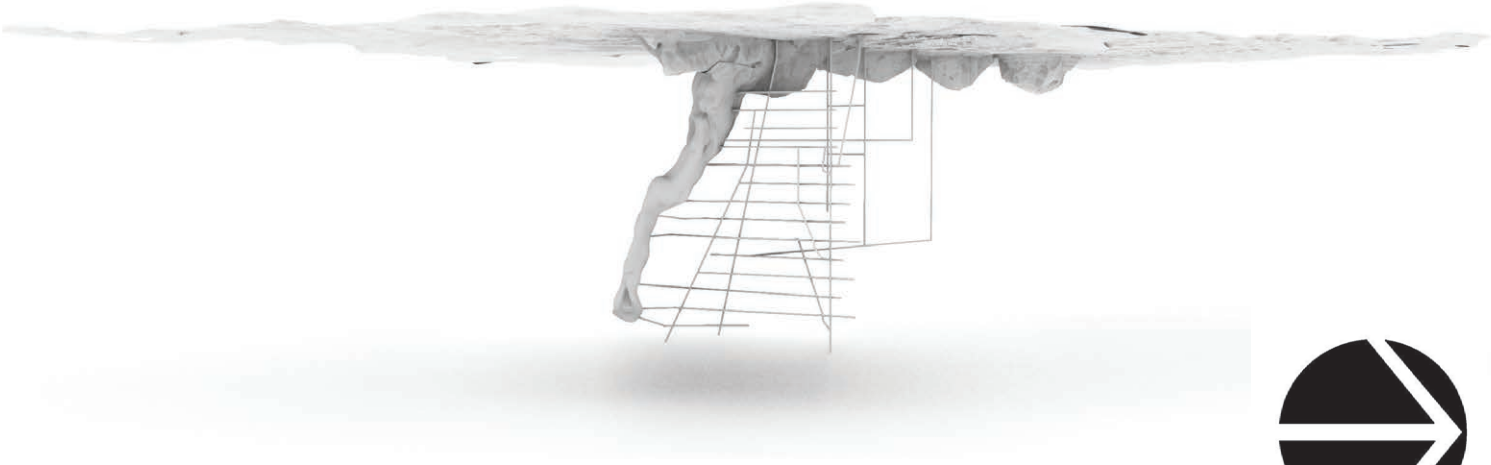
TOPOGRAPHIC STUDY

The site has 3 key components: the effects of mining ore on the surface of the landscape is responsible for the massive holes in the surface, the horizontal *drifts* used to transport ore, and the vertical shafts used to transport ore and miners to the surface.

From my previous research I was able to infer the missing parts of the drawings. The topography was created using Meshroom, an open sourced topography generating software. This program takes a mass amount of images at different rotated angles and renders a mesh from the images. Through trial and error with the program, I created the surface topography. Rhino was used to model the drifts and shafts, which was integrated to the created mesh.

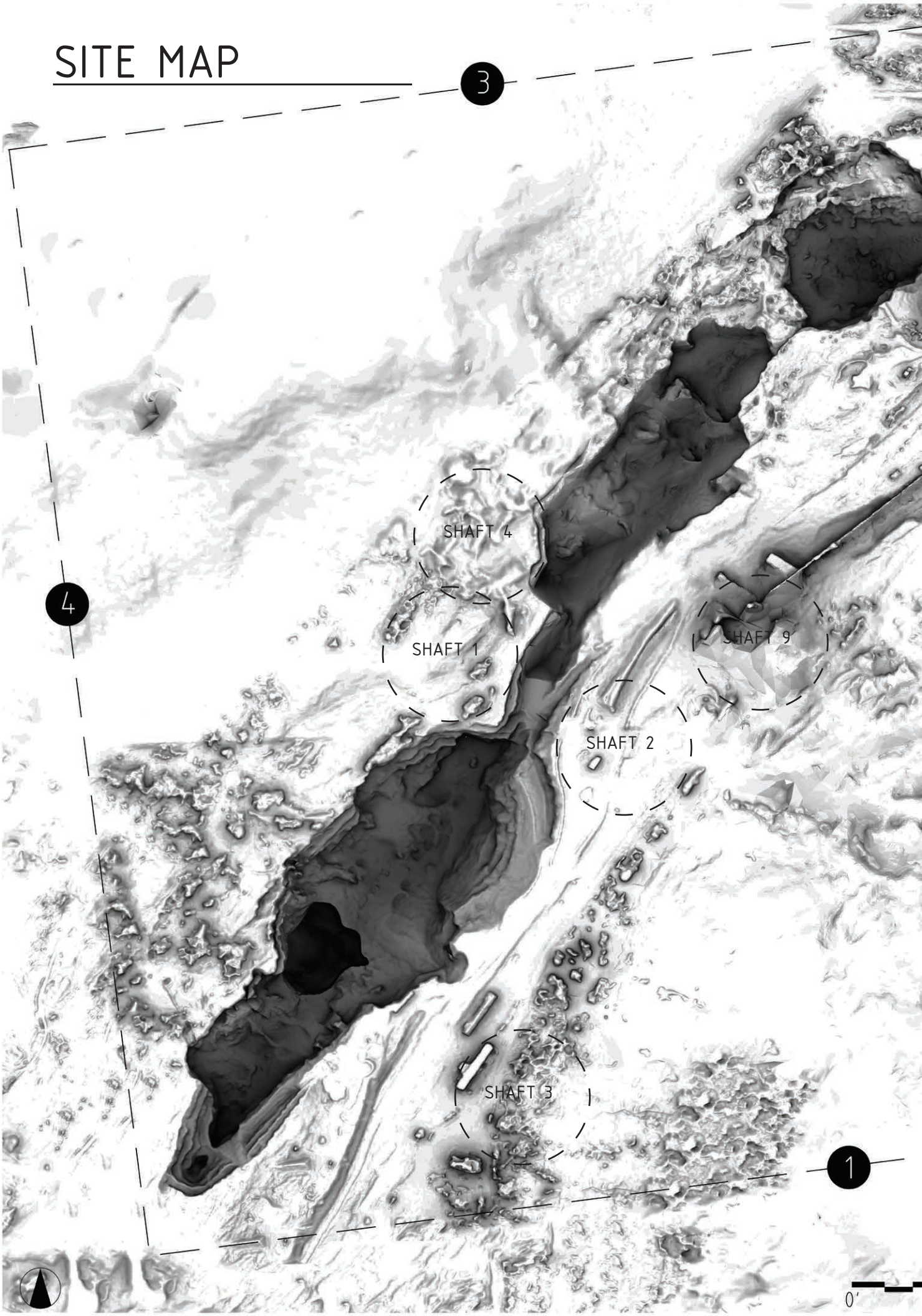
Map data ©2018 Google

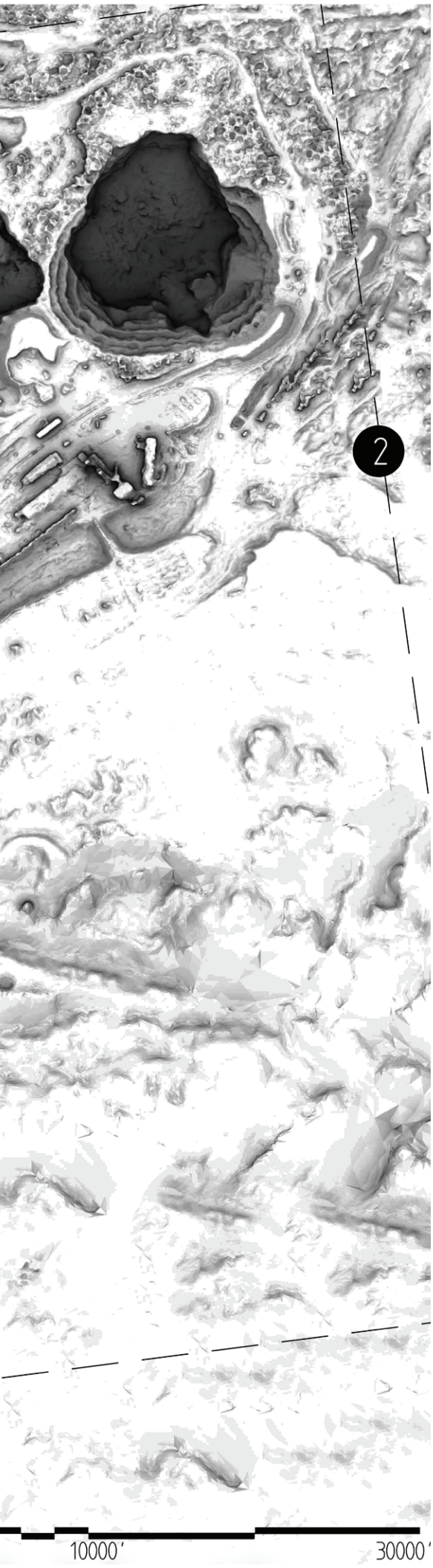




Map data ©2018 Google

SITE MAP

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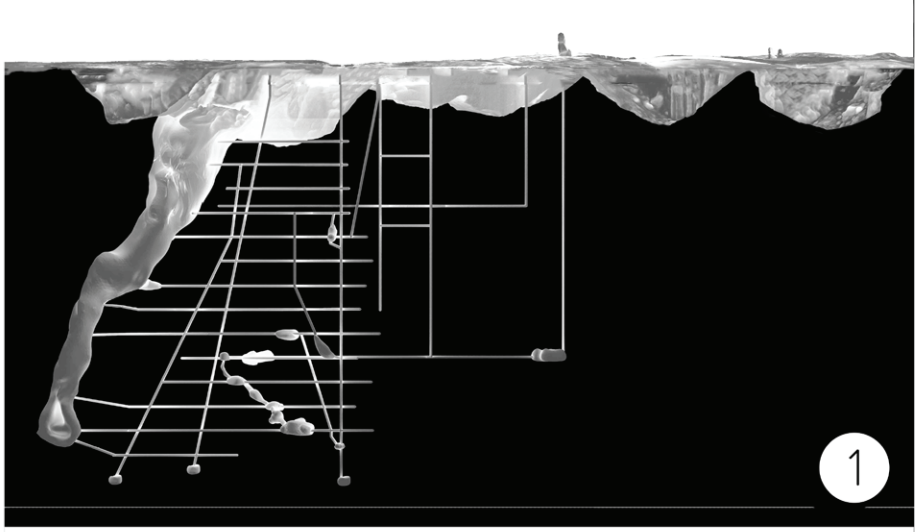
10000'
30000'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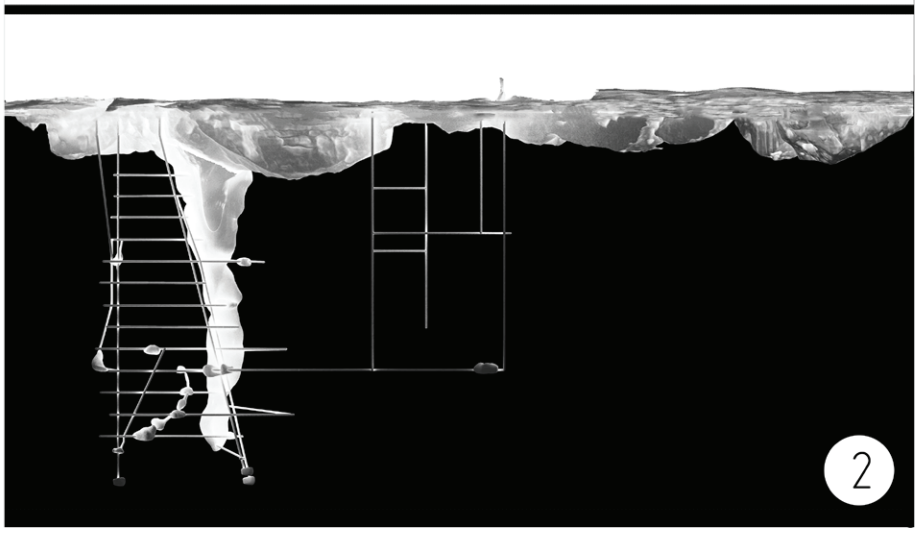
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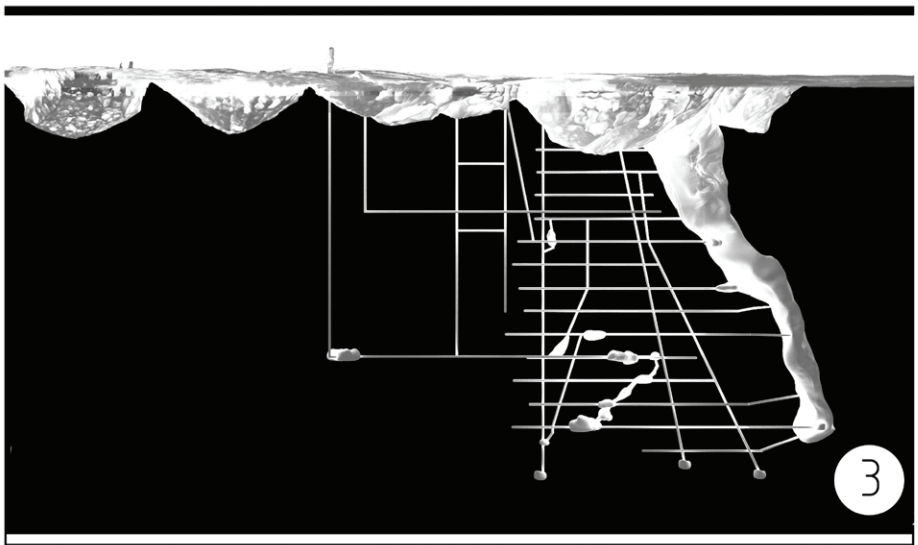
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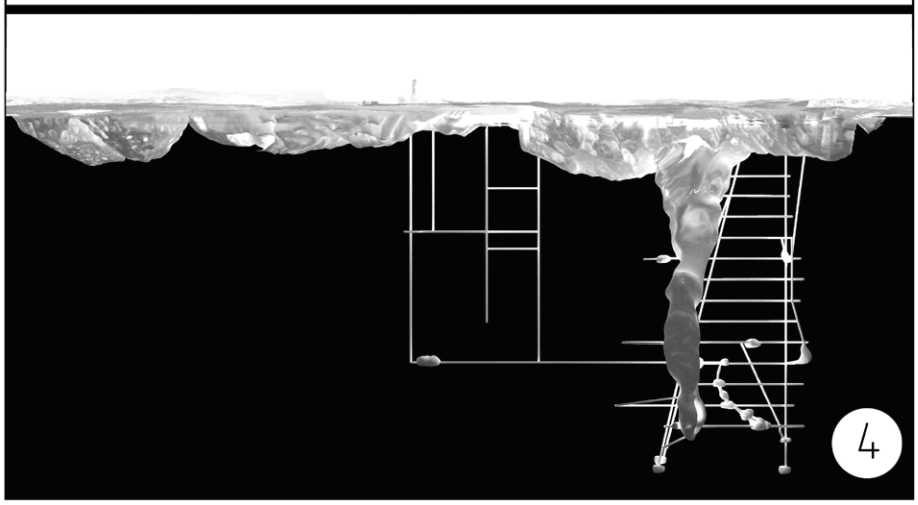
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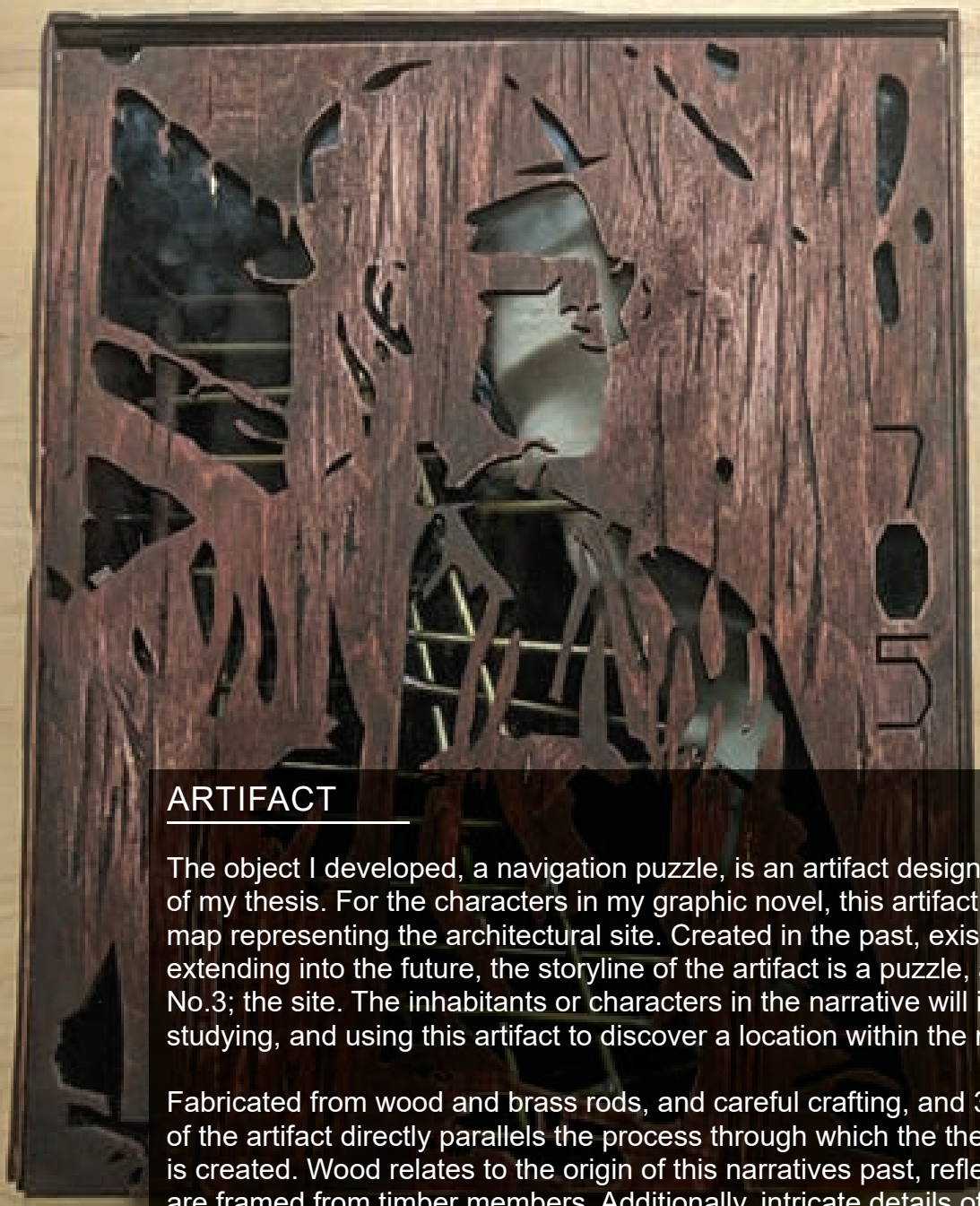
CHAPTER 2.3

PHYSICAL MODEL



ARTIFACT

The object I developed, a navigation puzzle, is an artifact designed to fall within the plot of my thesis. For the characters in my graphic novel, this artifact once solved, will be a map representing the architectural site. Created in the past, existing in the present, and extending into the future, the storyline of the artifact is a puzzle, and maps Frood Shaft No.3; the site. The inhabitants or characters in the narrative will interact with creating, studying, and using this artifact to discover a location within the mine.

Fabricated from wood and brass rods, and careful crafting, and 3D printing, the creation of the artifact directly parallels the process through which the thesis' theoretical structure is created. Wood relates to the origin of this narratives past, reflecting on how the mines are framed from timber members. Additionally, intricate details of wood craft relate to the side hobbies of the inhabitants in the structure's past. Foreign workers for example, would whittle small bird cages for exotic birds in their spare time. Birdcages were once used to test oxygen levels thousands of feet underground. This crafting also intersects with the present; as I am researching and crafting this artifact. The final element, the 3D printed stope. Frood mine becomes a housing for robots, people, and to archive information; sheltered from the exterior apocalypse. 3D printing is presently in its early stages of development. It can be assumed that in the future this type of manufacturing will be common knowledge and practice in society.

Overall, the artifact will act as a simple, tactile relic alongside my thesis. It will aid the design by assisting in understanding the scale, circulation, and landscape of my thesis. Representing kilometer long mine shafts has proved difficult at a normal scale, by having this object held in my hand it is easy to reference. I will be able to point out locations representing the circulation and landscape of the design to further an audience's understanding. The artifact's use completely unifies the three timelines in which this thesis takes place: past, present, and future.


7
5

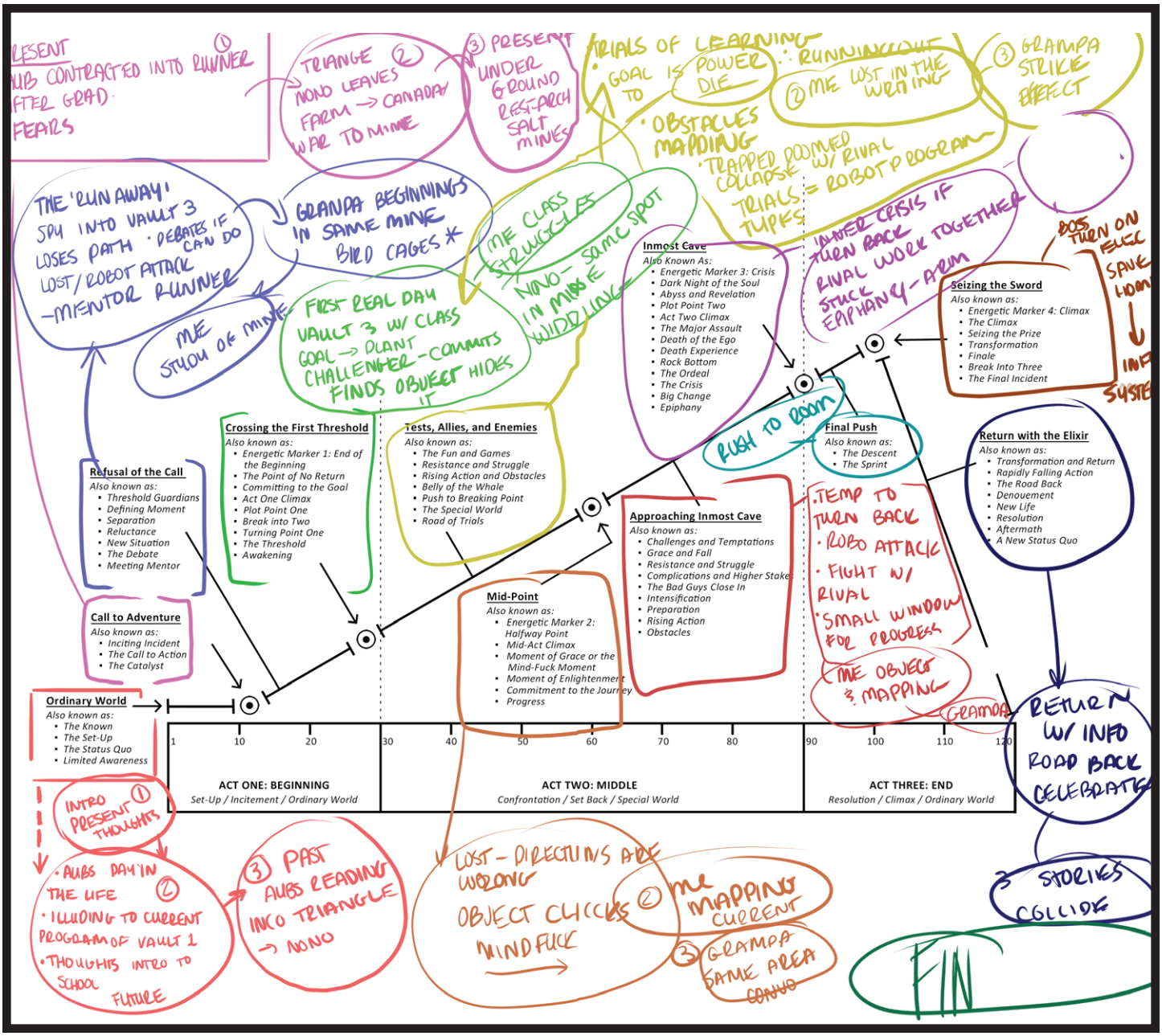
PART

3

NARRATIVE DEVELOPMENT

STORY CREATION

Creating the rough framework of the narrative in text format provided a loose guidline to follow in this thesis. Researching various narrative plot formats, a film storyline outline resonated best to base my text off of. Presenting a properly formed narrative is integral for this thesis because the story needs to connect, and interest to the reader on a personal level. Supporting this bond between the reader and the narrative allows them to not only connect with the characters and events, but also the architecture on a deeper level.



SYNOPSIS

- Apocalypse of fire & Disease slowly/ but fast enough devoured the planet through about 50 years in 2050

- People in Shaft 1 started slowly moving in over the first 30 years due to the of lack of government and lack of communication cross world. They had time to move as much as they could underground for the unknown future. (*Vault 705*)

- Residents discovered that the government/a secret agency has a massive hydroponic plant in the next shaft that was not public knowledge. (*Error*) The system was activated when the world started losing connection globally.

- Current year 2200-ish a small population of people that didn't try to run from the apocalypse are stuck underground for eternity with what they created over the 50-100 years if preparing. Human society resides in the previously abandonned Stobie-Frood Mine conflicting with robots in the opposing shaft. (There is a threshold that allows people to pass through from Vault 705 to Error not vice versa.)

Civilization has been organized into classes. Within the small human community there are 3 types of people: scientists, runners, sustainers:

Scientists:
Research to find look for solutions/ ways out of the apocalypse, how to use materials they have access to, research Error, look for solutions for their community.

Sustainers:
Farm, cook, care, medical, diplomat, take care of community as a whole and their physical and mental needs. Also own shops, and run the community on a social level.

Runners:
Since supplies cannot be gathered from above anymore, runners venture into shaft 3 to bring back information, material, plants, etc. They also help scientists gather material and help sustainers find new seeds or retreive robotic parts

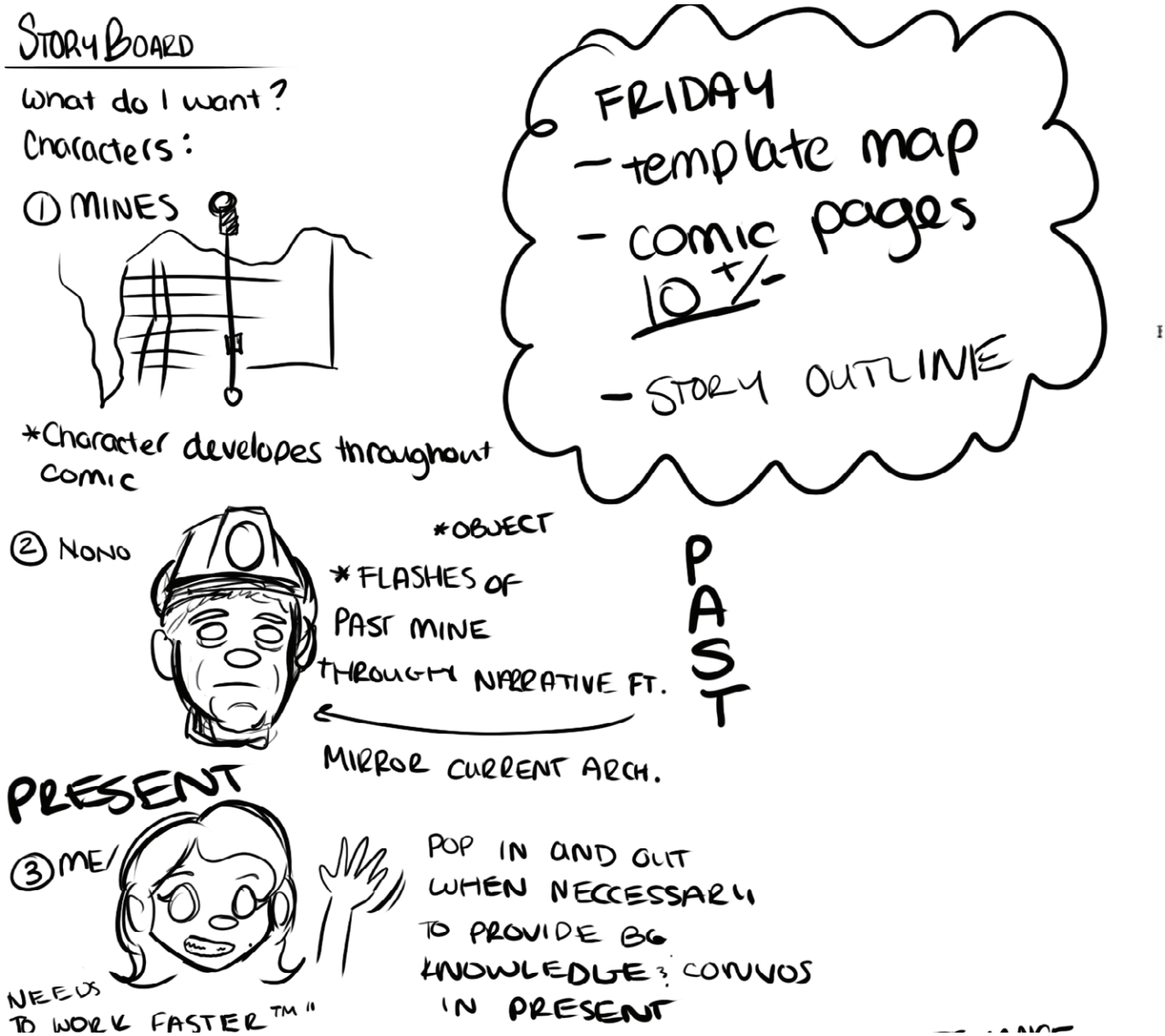
Story revolves around Aubrey born in this created world training as a beginner runner at 15. She has never existed above the surface.

*Present and past will appear and disappear melded within comic where feels right.

Past: mirrored images of same locations just different timelines 1960s vs 2100s (Images grabbed from the INCO triangle) Will also narrate my grandfather's past in the Stobie-Frood Mine.

Present: My trials in trying to figure this disaster out and the process I am going through in thesis, mirrored with the 2200s and the past.

Architecture:
Will be focused on throughout with explanations by characters, representation of programs, and full spreads of scenery surrounding characters. Program will work with and against characters, constantly existing throughout the story.



CHAPTER 1 - ORDINARY WORLD

The Known
The Set- Up
The Status Quo
Limited Awareness

FUTURE:

Aubrey is in scene preparing for school in this apocalypse driven tunnel world. Quickly chatting with her father about how she finds out which class of lifestyle (*sustainer, scientist, or runner*) she will be in today for her future graduation from "*highschool*" [need to find a new name for this] is coming in a few days. *(School that teaches you life basic skills of living underground/ passed down math-sciences from above).* Her father is one of the lead in the scientist of Vault 705. She wants to follow her father and be a scientist; *usually what class you are sorted in follows with what your family has been known to be*. Father expresses distaste for runners *[foreshadowing]*; there is tension between the classes. Runners are generalized as reckless, scientists think very highly of themselves, sustainers are neutral; but live an non-risky life.

Panels will highlight surroundings on her walk to school, showing what the underground community looks like. Showing what community does in the background of her daily life; mostly sustainers working. Section drawing of Vault 705 shaft with shops, crops, water source, lab etc; Aubrey cycling through section drawing. Converses with weird old man *(Sustainer) [Mr.Maroo]* who runs the metal working shop where he uses robot parts from Error; from the runners to build tools, weapons, etc. Also converses with his robot buddy he created mashing together robot parts from Error [Robot's name: [*Roomba (Roo for short)]*. Seems like him and Aubrey have some sort of connection but it is not given away.

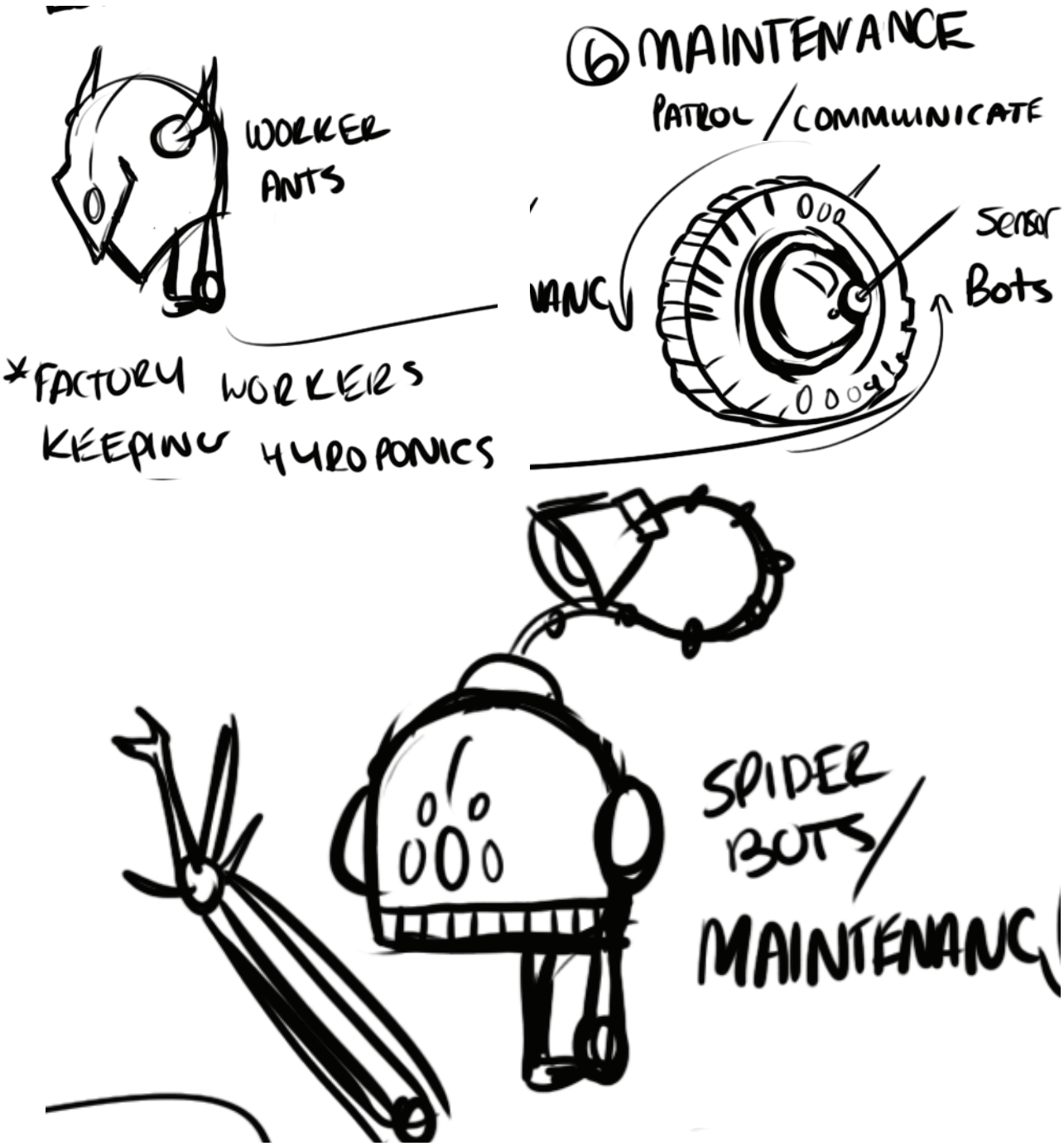
Asks how Aubrey is doing, how she feels, goes to grab her arm to check something but Aubrey realizes the time, she is late for class. Aubrey rushes for her final day of classes. Ends up late and runs in *[small section drawing of classroom]* Gets called out by the teacher; rival student who related to a long list of runners, *[Atlas]* Atlas is loud and bugs Aubrey calling her a *Spiderbot*; *(will be explained shortly)*. Teacher gets angry and regains attention of class; is going over Vault 3. This gives the reader the premise to Error. An underground factory to maintain plant life during the apocalypse; was not for human habitation and is being studied by the scientists. Here can go through more section drawings of what the vault 705 knows currently about the mapping of vault 1.Teacher goes on to explain the robot types of Error for review (4).

Worker Ants:
Maintain the plant life, diagram of their appearance and parts, strictly take care of maintaining the hydroponics. (Section drawing showing their circulation)

Wheelies:
Patrol and communicate with the other bots, organize them and help with over all structure and program maintenance. (Section drawing showing their circulation)

Spider Bots:
8 arms with tool attachments. Used to fix parts of structure and bots. (Section drawing showing their circulation)
**Aubrey nervously rubbing arm in class; side glances from other students* while this is explained.

Crushers:
No parts have been excavated or brought into Vault 705 because no one has survived long enough other than sightings. Defense robots. *(Unknown circulation with sighting spots)*



Time passes.

Teacher ends class with describing the classes they will be sorted into tomorrow: sustainers, scientists, and runners. Class dismissal.

Aubrey heads home from class showing the afternoon of Vault 705's community; class ends in the late afternoon so people are conversing and grabbing food. Aubrey gets home; no one is home montage of eating dinner/ showing what people in the vault live in. Gets into bed and goes to turn off lamp. She knocks over picture frame of deceased mother on counter. Grabs picture with the other arm and holds it up. Her long hand me down sleeves fall onto arms revealing one arm is spider bot biomechanical hand created by Mr. Maroo. *[Story will be alluded to later on in the text]*

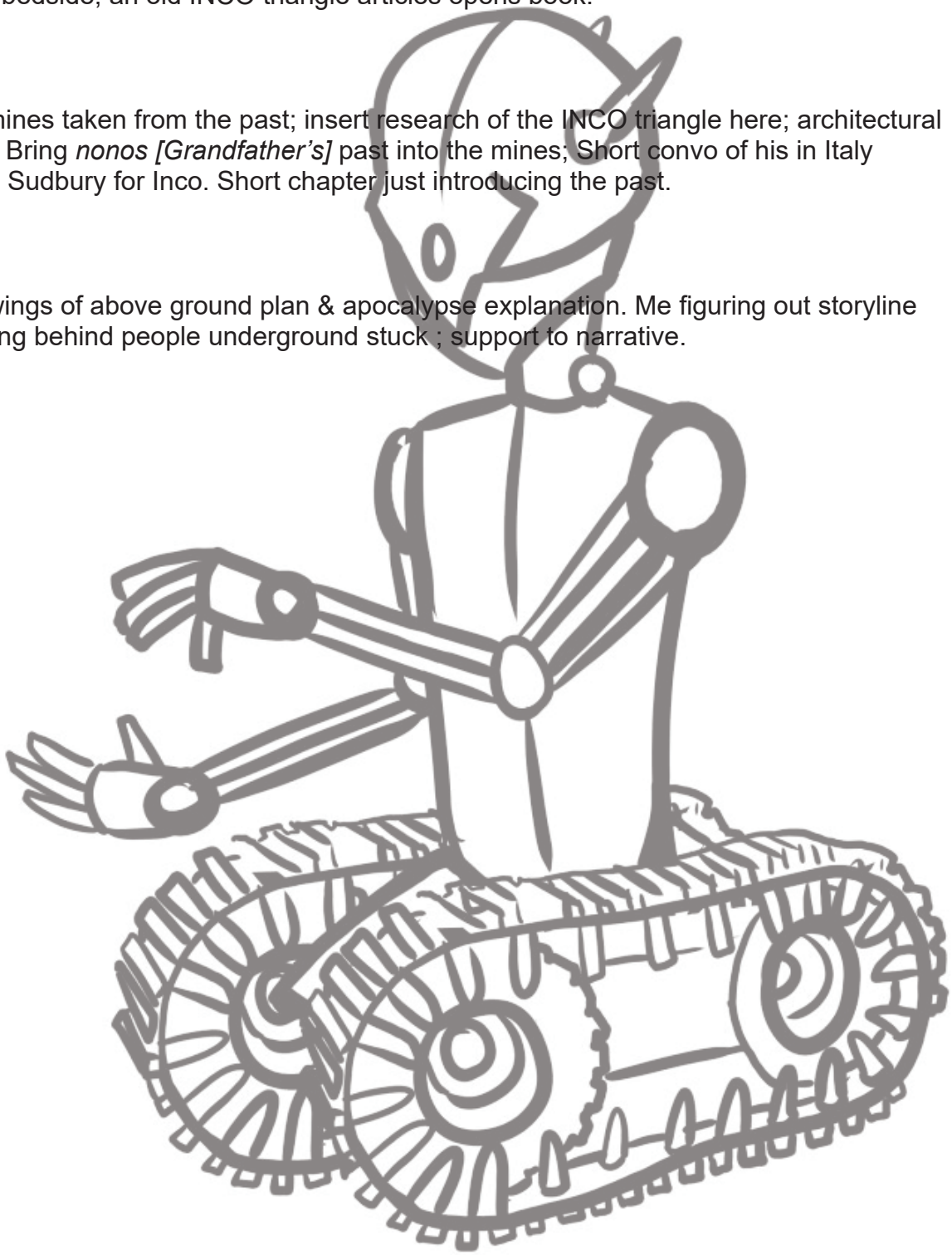
She grabs book from bedside; an old INCO triangle articles opens book.

PAST:

Old drawings of the mines taken from the past; insert research of the INCO triangle here; architectural drawings, miners etc. Bring *nonos [Grandfather's]* past into the mines; Short convo of his in Italy mentioning moving to Sudbury for Inco. Short chapter just introducing the past.

PRESENT:

Description and drawings of above ground plan & apocalypse explanation. Me figuring out storyline and setting & reasoning behind people underground stuck ; support to narrative.



CHAPTER 2 - CALL TO ADVENTURE

Inciting Incident
The Call to Action
The Catalyst

FUTURE:

Aub wakes up to breakfast, and early celebrating father wishing her good luck before school. While walking to school, Mr. Maroo wishes her luck on the class selection for *"post secondary/ hands on experience"* to start in her new class.

Gets to school and ⅔ post secondary teachers are with her current teacher getting ready to hand title badges welcoming students into their new classes. The third teacher never shows up so their current teacher starts calling out the verdict. Graduation begins and badges begin to be handed out. Aub daydreams about the role of a scientist and how excited she is; looks at Atlas and thinks about how glad she is that she will never have to deal with him again.

Time passes, and names keep being called, students react excited, and upset depending on their calling. The main teacher reading out the runners pauses and looks at the other teachers saying that there must be a mistake and points to a name. The Scientist teacher shakes their head stating that it is intentional. The teacher calling off the runners looks up and calls out Aub's name; panic ensues. She cautiously grabs badge. The teachers nod; say that the runners will meet their teacher and give the students the rest of the day off. Aub runs out of class and runs home making none of her usual stops; runs into her house. Her father asks what's wrong and asks to see her badge. Similiarly confused as she was he grabs it and storms out "I'll talk to them! I won't have it". Aub begs him not to and panics more; goes and lies in bed. Time passes and she sleeps throughout the day.

Later wakes up to a conversation of Mr.Maroo and her Father at the table in earshot. She finds out that the reason why she is a runner is because of her arm, she has the tools of a spider bot has that she lost in her mother's death from a crusher. Her mother used to be a runner. Clutching picture frame of her mother and goes back to sleep. Zooms in on INCO triangle book on floor that is open to a page.

PAST:

Mirrored images of vault 705's town with INCO triangle images. Clips taken from the foreign groups that make up INCO; italians, polish, ukrainian, finnish, etc. Short panels about Nono moving to Canada from Italy leaving his farm behind because of war and going into a new place; the unknown.

CHAPTER 3 - REFUSAL OF THE CALL

Threshold Guardians
Defining Moment
Separation
Reluctance
New Situation
The Debate
Meeting Mentor

FUTURE:

Aub wakes up late at night from sad napping, looks over at picture frame of deceased mother, looks at hand and gets mad. She looks around and sees her father sleeping on his couch bed. Sneaks by and runs out of the house trying to hide from all the bullshit that's going on. Ends up at the Error gate and stops. Looks at a crack in the wall just enough for her to get through to the next vault. Gets close; hates life, decides to peer in. Falls in. Stumbles into a purple lit darkness; with various plant life and higher humidity. Gets scared by hearing sensor bot rolling in direction. She looks back at crack in wall and its too high to get back up. Starts running in one direction hearing robot sounds seeing parts of Error; terrified. She starts being chased by something, thinks its a crusher; Section drawing of her running through hydroponic shaft being chased. Aub reaches end of tunnel and gets pinned to wall hand grabs shoulder. A woman starts giving yelling at her for entering Error alone, she sees her arm and backs up a bit recognizing Aubrey. Introduces self as *Piper,* the teacher for post secondary runners. Has conversation with her about helping her mother on missions; basically convinces her runner is not as bad as it seems; but in a hard way; Piper comes off as mean. Aub looks at hydroponic systems on the way back and mentions to Piper how interesting it is to see in person. *Time passes*. Piper makes sure to ask Roomba to ensure Aub goes straight home. Aub tells Roomba about her doubts and debates whether she can be a Runner or not. Roomba doesnt respond because Roomba cant talk. Aub says thanks to Roomba and sneaks inside.

PRESENT:

Details/ Information about the hydroponic systems ; Plan - section - elevation - objects - systems related (Humidity, water, air) with own commentary end of commentary zooms in on INCO triangle page on desk

PAST:

Images from the triangle. Nono heading off for first days of work in Frood mine. Maintaining and working on bird cages before he leaves with short conversation on his fears about being underground. Brass tubing in the background foreshadowing.

CHAPTER 4 - CROSSING THE FIRST THRESHOLD

Energetic Marker 1: End of the Beginning
The Point of No Return
Committing to the Goal
Act One Climax
Plot Point One
Break into Two
Turning Point One
The Threshold
Awakening

FUTURE:

The class gets sorted into groups of two per Runner. Atlas and Aub get Piper. *[Everyone is mad here; no one wins]* Introduction to a Runner's job and what it entails; collecting info and assistance to the other classes.

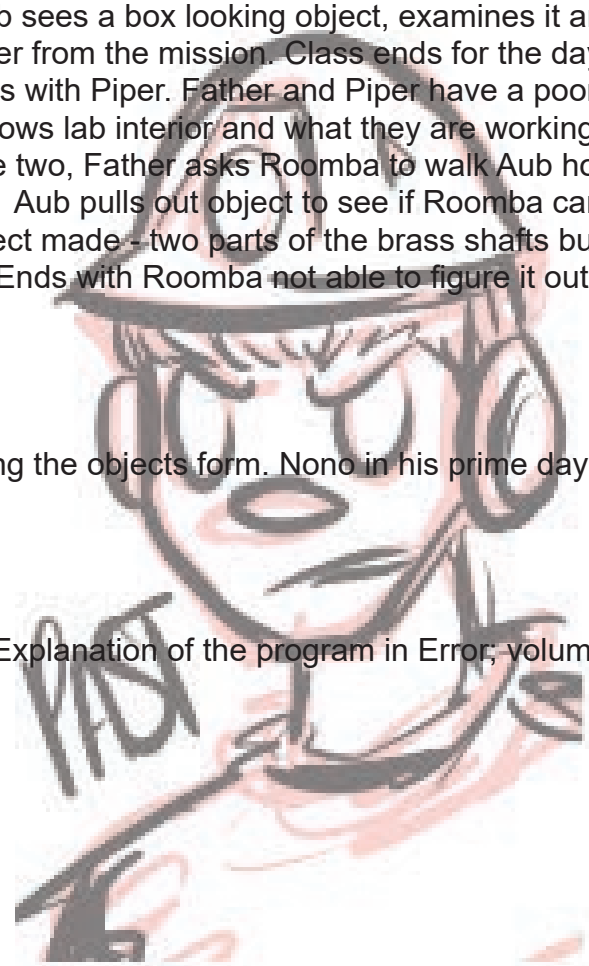
They discuss their biggest mission is to find a new energy source as their generation for the town is running very low. First day supervised in the vault with short explanation of each squads goal for the day. Piper, Aub, Atlas *[Team 5]* get the job of hooking up a new hot water line from the larger tanks in the upper tunnels to get another source of fresher water to Vault 705. Mission starts; all three reluctantly work together going through trials to complete short mission; using the shaft elevator (zoom out section of the elevator system), discovering the hot water tank shaft and using Aub's Spider arm to fix it. Small celebratory moment for the 3 while they rush back; while Piper is having a teaching moment with Atlas about using a weapon, Aub sees a box looking object, examines it and tucks it in her pack. Intrigued, she brings it back with her from the mission. Class ends for the day and the mission was a success, reports to the scientists with Piper. Father and Piper have a poor relationship because of Aub's situation as a runner. Shows lab interior and what they are working with. Class is dismissed, Piper sarcastically praises the two, Father asks Roomba to walk Aub home as he heard about Aub's solo mission the night before. Aub pulls out object to see if Roomba can understand what it is so they stop and examine it; [object made - two parts of the brass shafts but missing ⅓ shaft parts and other box containing stope] Ends with Roomba not able to figure it out. Aub goes inside and examines object.

PAST:

Old drawings of the mines taken from the past; mirroring the objects form. Nono in his prime days of mining. Learning about what it entails and his job.

PRESENT:

Their missions path for the day highlighted in section. Explanation of the program in Error; volume types.



CHAPTER 5 - TESTS, ALLIES, AND ENEMIES

The Fun and Games
Resistance and Struggle
Rising Action and Obstacles
Belly of the Whale
Push to Breaking Point
The Special World
Road of Trials

FUTURE:

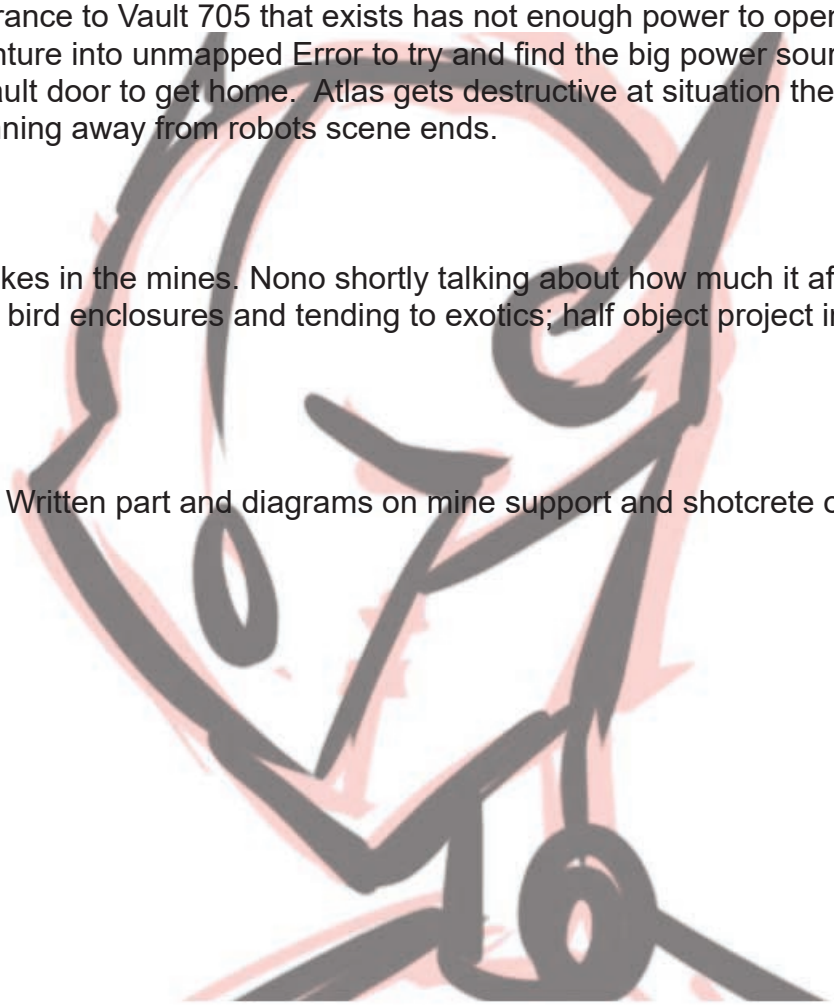
A week later; Aub packs Runner pack, weapon, object and runner garb for her first day tagging along with Piper and Atlas of actual missions. Walks to school and talks to Mr.Maroo; he had been approached by Piper to allow her to bring Roomba on the mission to act as a decoy robot, to camouflage in with the rest of them for assistance. States his worries and tightens up Aubs arm; conversing. Atlas on his way to school pokes a jab at her Spider arm peering in the door saying she'll be late. Aub, Atlast, Roomba go and meet Piper. Briefed on their specific mission by the scientists to find a rare plant deep in the hydroponics shafts. They are the first to arrive, so they are the first to leave on their mission, exit main gate into Error. Once the door closes loud noise is heard and gate lights turn off. Confused they turn back and try to re enter to make sure Vault 705 is okay. Can't get back in, but Piper calms nerves and explains to continue on the mission. The three are forced to work together to find the rare plant they are looking for, montage of fighting enemies, Roomba decoying, finding the plant. Suddenly Roomba yells Aub's name. Mr.Maroo and father are getting through to the group explaining that the only entrance to Vault 705 that exists has not enough power to open. They are stuck in Error. Will have to venture into unmapped Error to try and find the big power source for Error; to assist in connecting to vault door to get home. Atlas gets destructive at situation they are in and gets loud alerting robots. Running away from robots scene ends.

PAST:

Inco triangle articles about the strikes in the mines. Nono shortly talking about how much it affects him, and he is working on crafting bird enclosures and tending to exotics; half object project in background zoom in.

PRESENT:

Struggles went throughout thesis. Written part and diagrams on mine support and shotcrete on walls. Section drawings of the tunnels.



CHAPTER 6 - MID-POINT

Energetic Marker 2: Halfway Point
Mid-Act Climax
Moment of Grace
Moment of Enlightenment
Commitment to the Journey
Progress

FUTURE:

The three of them to escape robots chasing them fall into a garbage chute into a pile of disposed plant matter. Scene of all three of them getting mad at eachother. Roomba cannot connect to Vault 705 from here. All three end up at opposite ends of the garbage chute pissed off. Aub sees an object shining in her headlamps direction and picks up the third brass piece to the puzzle she has. Pulls out the found box and starts playing with the pieces, snaps two of them together. Rumbling noise comes from wall interrupting Aub, the four cram close together; elevator shaft opens and more plant garbage is thrown in by Worker Ants. Piper explains that's their only way out to switch spots with the robots on their next garbage run. Scene where they do the switch using Roomba's help. The three are in relief in the elevator and get dropped off in a hydroponic tunnel and hide in a safe spot. Roomba frantically points at Aubs bag wanting the object. Piper gets mad at Aub for hiding an object from the scientists she got from the lab Keeps tracking the path they just took on the object, clicks in to the 4 of them the object is a map. Put the three brass pieces together and realize something is missing. Think that the energy must be stored/ made in the unexplored section which mirrors where the object piece is missing. Set out to explore that direction. Take rest.

PRESENT:

Garbage chute function and design for waste; beginnings of object design. Reviewing inco triangle for gathered information

PAST:

Inco triangle crusher station images ; garbage chute now. Nono reading inco triangle in kitchen working on the object. I enter scene around then.

CHAPTER 7 - APPROACHING THE INMOST CAVE

Challenges and Temptations
Grace and Fall
Resistance and Struggle
Complications and Higher Stakes
The bad guys close in
Intensification
Preparation
Rising Action
Obstacles

FUTURE:

Chapter for character relationship building between the main 4 characters. Relate back to the plan of action they had made. Piper explains to Aub stories about her mother. Atlas learns why Aub has a spider bot arm. Spot a Crusher and rush to hide. Run to escape sighting hide in crack by robot charging station. Realize that energy source must be close. Use Roomba's camouflage to get a closer look on carried tablet *(will add this to previous in story at some point, can use a camera on Roomba to use it as a walking video camera)* Sees wires and vent shaft leading below. Aub checks object and the spot checks out to the connection. The three plan to sneak into outtake vent to escape into where the wires lead below. Begin the plan and something goes wrong the crusher bot approaches.

PAST:

Nono passes ending the past narrative section on his life. Recieving the hand me down puzzle object.

PRESENT:

Robot charging station vignette
Ventilation system expansion and text

CHAPTER 8 - INMOST CAVE

Energetic Marker 3: Crisis
Dark Night of the Soul
Abyss and Revelation
Plot Point Two
Act Two Climax
The Major Assault
Death of the Ego
Death Experience
Rock Bottom
The Oreal
The Crisis
Big Change
Epiphany

FUTURE:

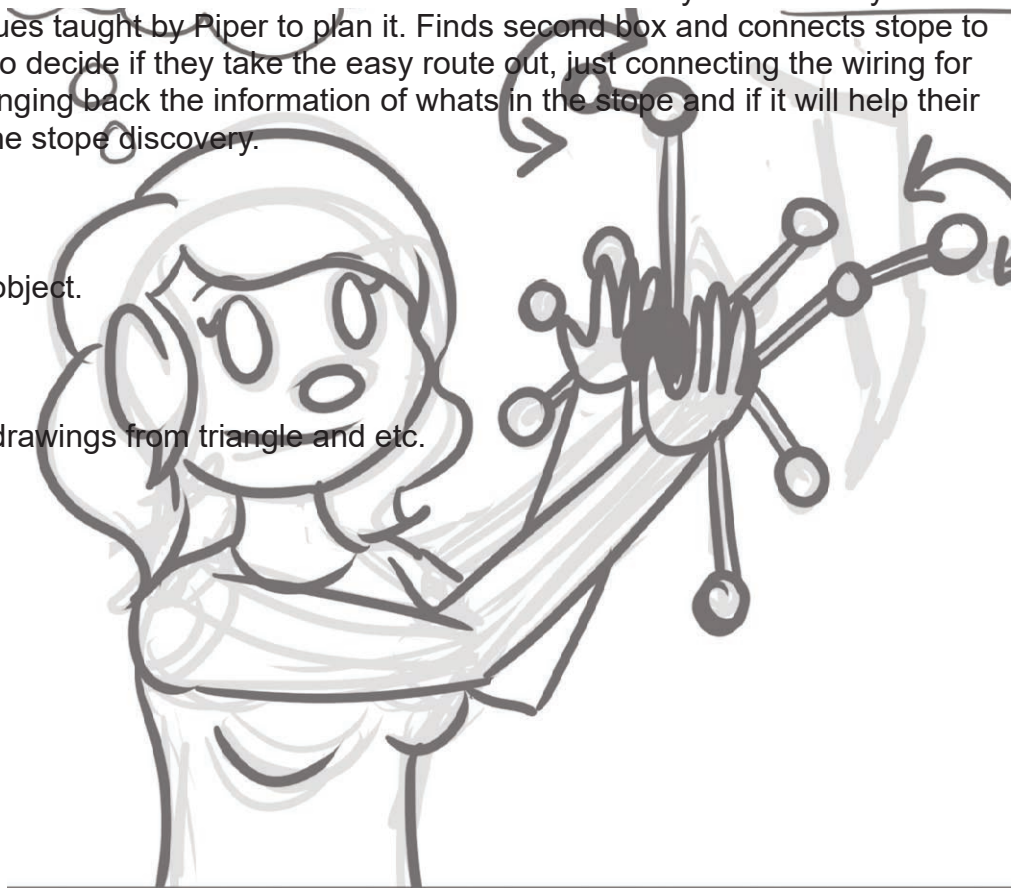
The three are about to get ended; Piper pulls the hero sacrifice card out and dies for the squad.*(May be Roomba instead; playing with idea)* Tragic outcome the two have no time to think and follow her request to keep going. Slide down vent shaft. Aug and Atlas are lost without Piper/Roomba. (I think I will take both out at this point from the story, that way Aug and Atlas are left helpless.) Scene where they get mad at eachother, talking about turning back. After fighting look around and realize they are in the substation floor, which they thought they would never reach. Many crusher bots guarding the substations from the hydro stope system. Draw a plan, decide they have to finish their mission or die trying. Have to work together and not hate eachother, breaking their characters/ego. Has to run line in pack from one substation to connect vault 705 door to substations all the way back so they can get back home. Using techniques taught by Piper to plan it. Finds second box and connects stope to object. The two of them have to decide if they take the easy route out, just connecting the wiring for their vault door to open; or, bringing back the information of whats in the stope and if it will help their community more. Decide on the stope discovery.

PRESENT:

Model making process of the object.

PAST:

Stope previous research and drawings from triangle and etc.



CHAPTER 9 - SEIZING THE SWORD

Energetic Marker 4: Climax
The Climax
Seizing the Prize
Transformation
Finale
Break into Three
The Final Incident

FUTURE:

Aub uses arm to assist in this mission/ Atlas uses runner techniques that come natural. Dodge robots, Section drawing of these substations and wiring path. Fighting robots and making it to the stope entrance surrounding turbine. Journey to get to the door. Seeing glass with water on the outside being pumped up the penstocks. Discovering the whole hydro electrical plant powering Error. Vast drawings of the hydro electricity plant from their view. Seeing mass water system. Means even more for community; a new huge water supply. Understand the architecture better as a whole.

PRESENT:

Explain with drawings full design of hydro electricity system. Drawings, process, program.

PAST:

Plan view of stobie / frood mine to explain where the stope is located and where the water is coming from.

CHAPTER 10 - RETURN WITH THE ELIXIR

Transformation and Return
Rapidly Falling Action
The Road Back
Denouement
New Life
Resolution
Aftermath
A New Status Quo

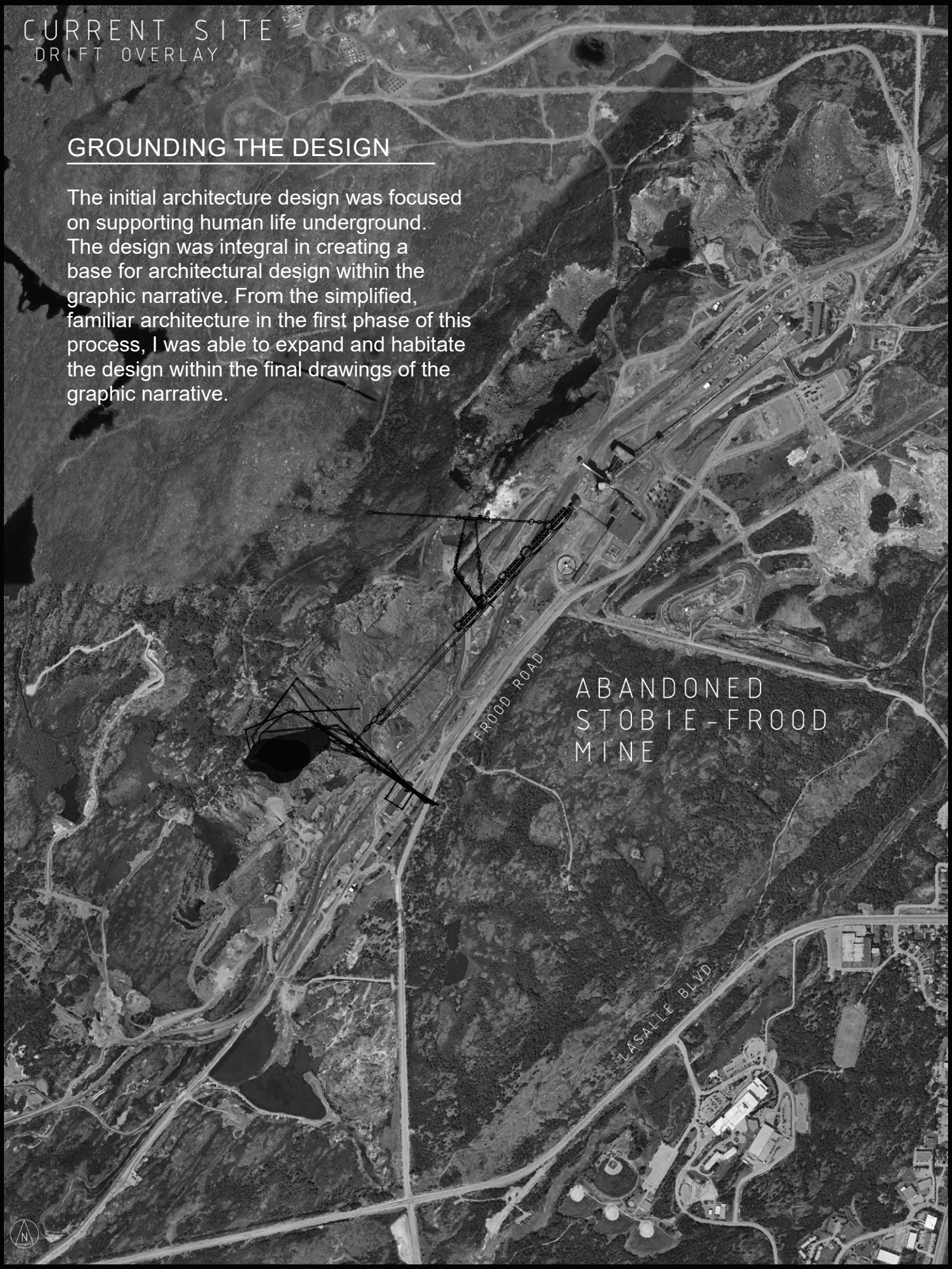
FUTURE:

Montage of road to return with wiring connecting to the furthest vault 705 wiring for electricity. Aub sketching out map of the way back describing things that they saw. End back at 705, and celebrated for their new system. Roomba reappears from the gate with Piper's things, leaving room for continuation of the narrative.

END

PART 4

ARCHITECTURAL DESIGN



GROUNDING THE DESIGN

The initial architecture design was focused on supporting human life underground. The design was integral in creating a base for architectural design within the graphic narrative. From the simplified, familiar architecture in the first phase of this process, I was able to expand and habitate the design within the final drawings of the graphic narrative.

0' 450' 900' 1350' 1/3000

GROUNDING THE DESIGN

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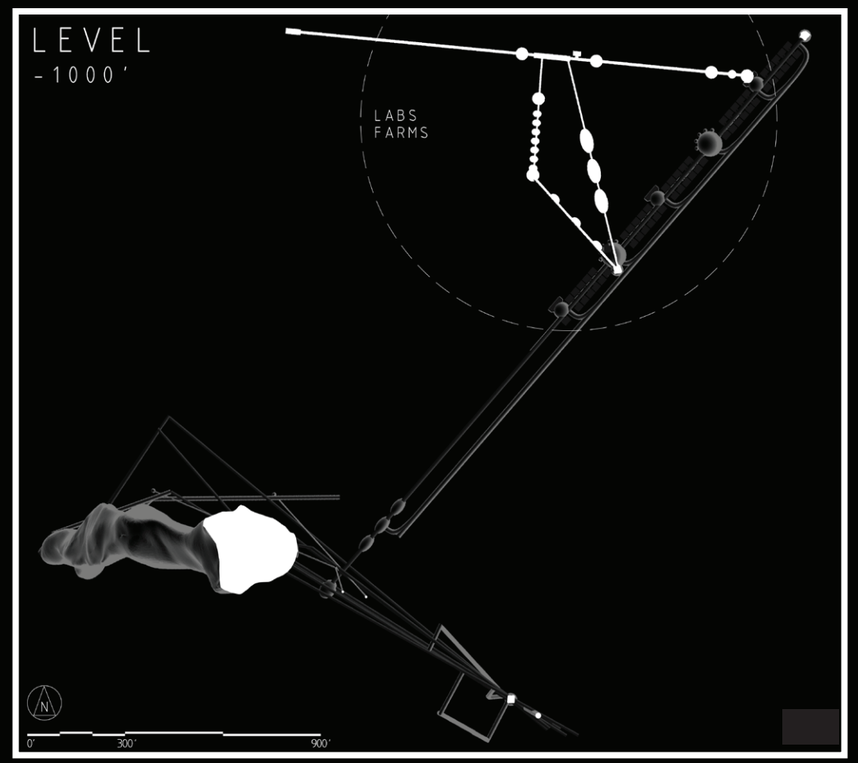
The Shaft 9 drift's deepest point opens up to Vault 705's residential sector. This location houses around 200 people and has room for expansion towards Error. A rail line runs across the entire drift for transportation to the community centers, schools, human containment units, and human service areas.

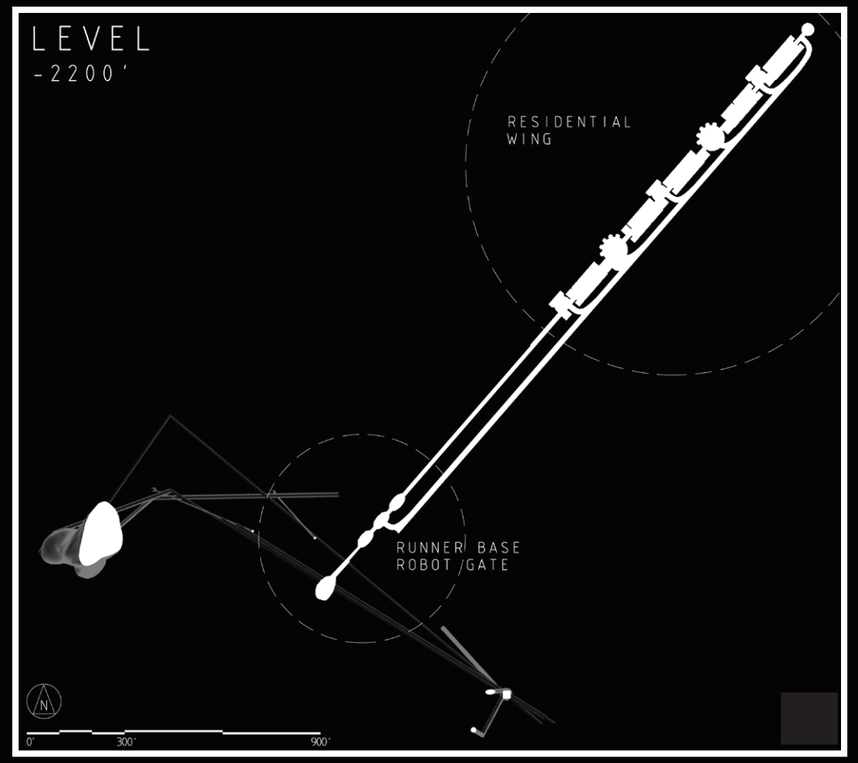
Alongside the same drift as the residential area is the Runner's base. Purposely the base is against the threshold separating Error and Vault 705. Runner's can defend and access Error from this location. The base is also distance enough from the residential location of the vault, in case of an breach from Error.

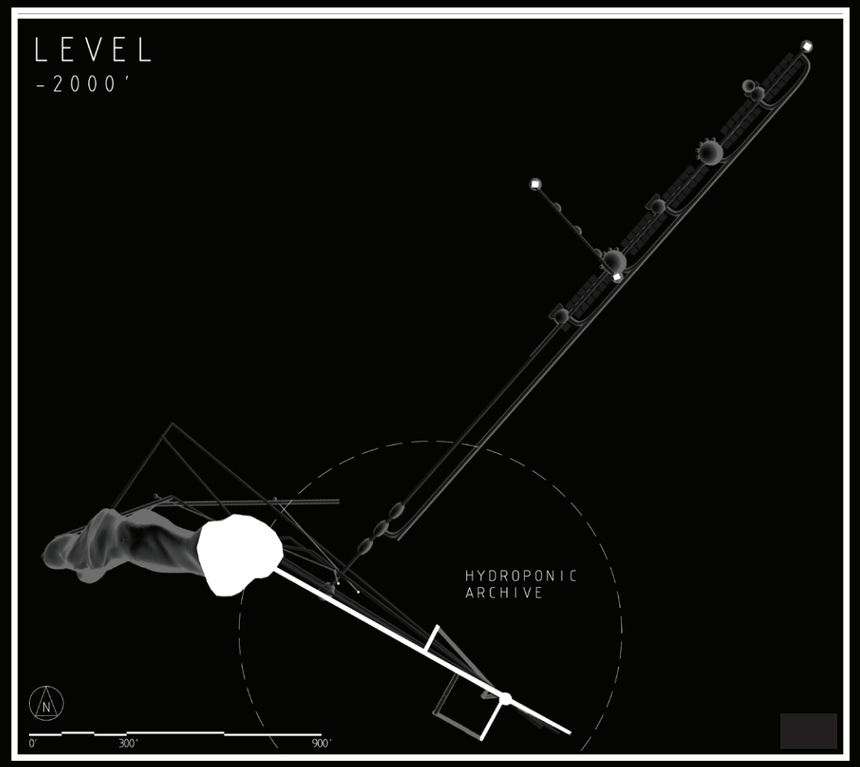
Accessible from Shaft 1 is energy storage, the sustainer bases and labs. Energy storage is central to Vault 705.

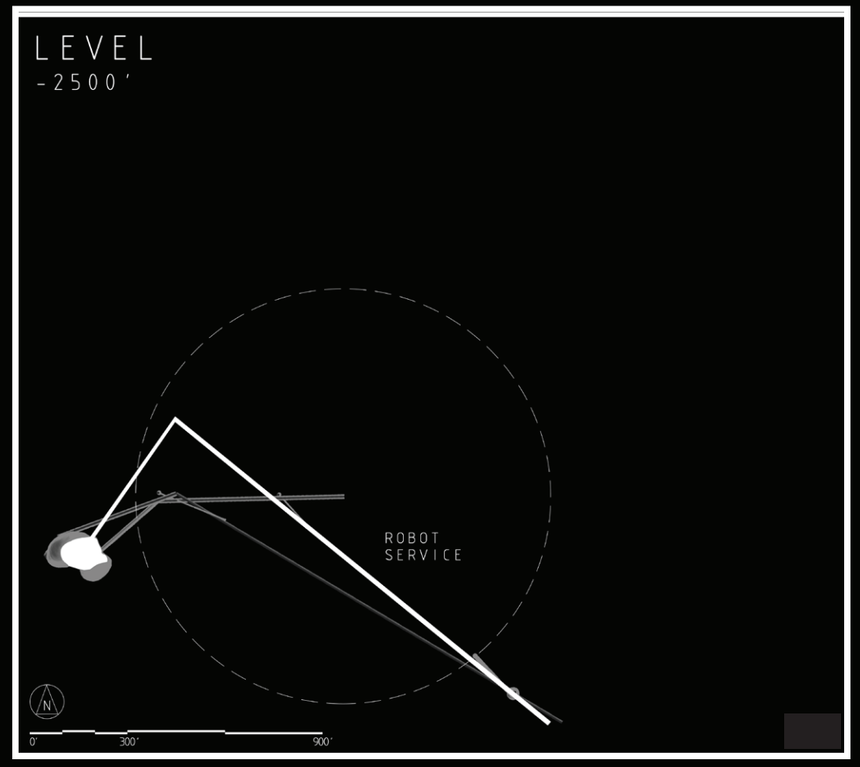
The sustainer's have two bases: One base is for farm animals, and the other is a hydroponic farm. Both locations are connected to the shaft 1 skip, for efficient transportation of goods to the residential sector. Directly attached to this shaft allows for transporting construction material and animals from the surface during the build.

The lab also has a connection to the surface so that scientists can study the events of the apocalypse above with ease. Plants and animals can also be studied from the short distance to the farms.





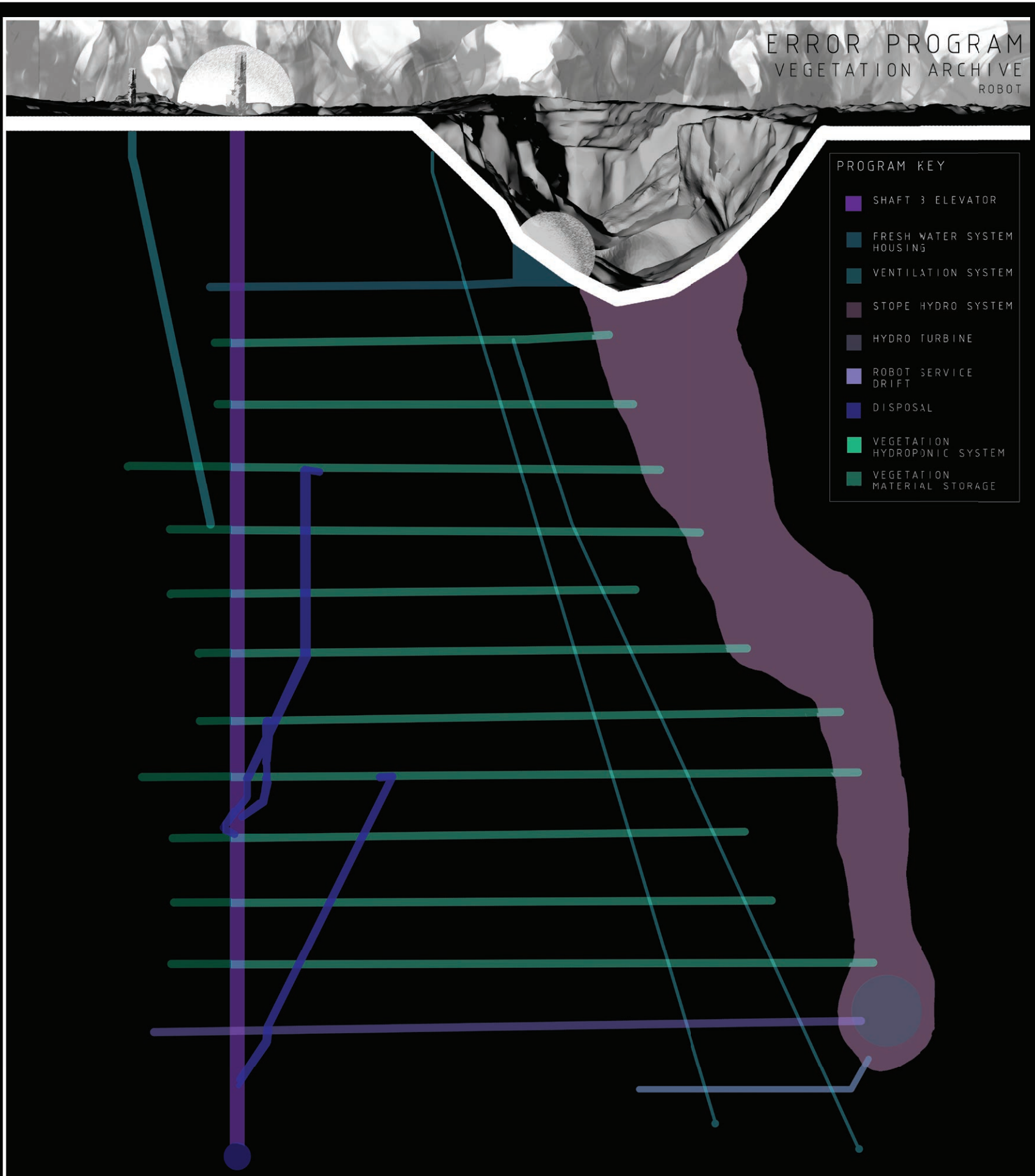




CHAPTER

4.1

ERROR
ROBOTIC HYDROPONIC ARCHIVE



Error is designed to sustain the longevity of plants and robots. Drifts are lined with hydroponic systems housing plants protected and maintained by the Worker Ants. The purpose of maintaining plant life is to sustain DNA for the potential start of new life above. On the end of each drift by the skip is vegetation material storage such as new seeds, soils, and maintenance material.

The robot service station sustains the life of the robots. Robots are repaired here and created by Spider Bots. This area is also the charging station for the majority of the robots, as it is directly attached to the energy source. Substations are located on this drift to store energy from the nearby stope turbine.

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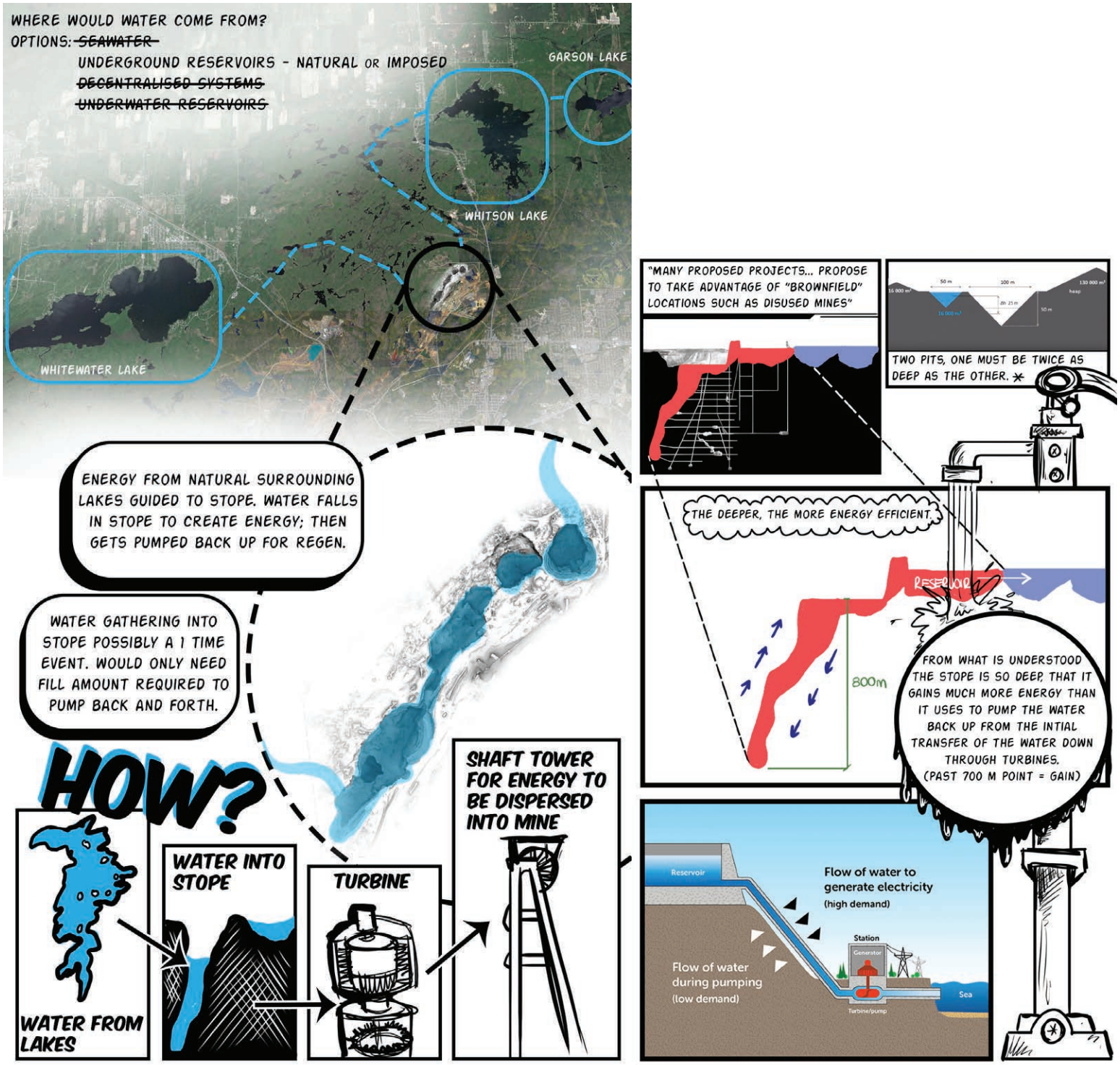
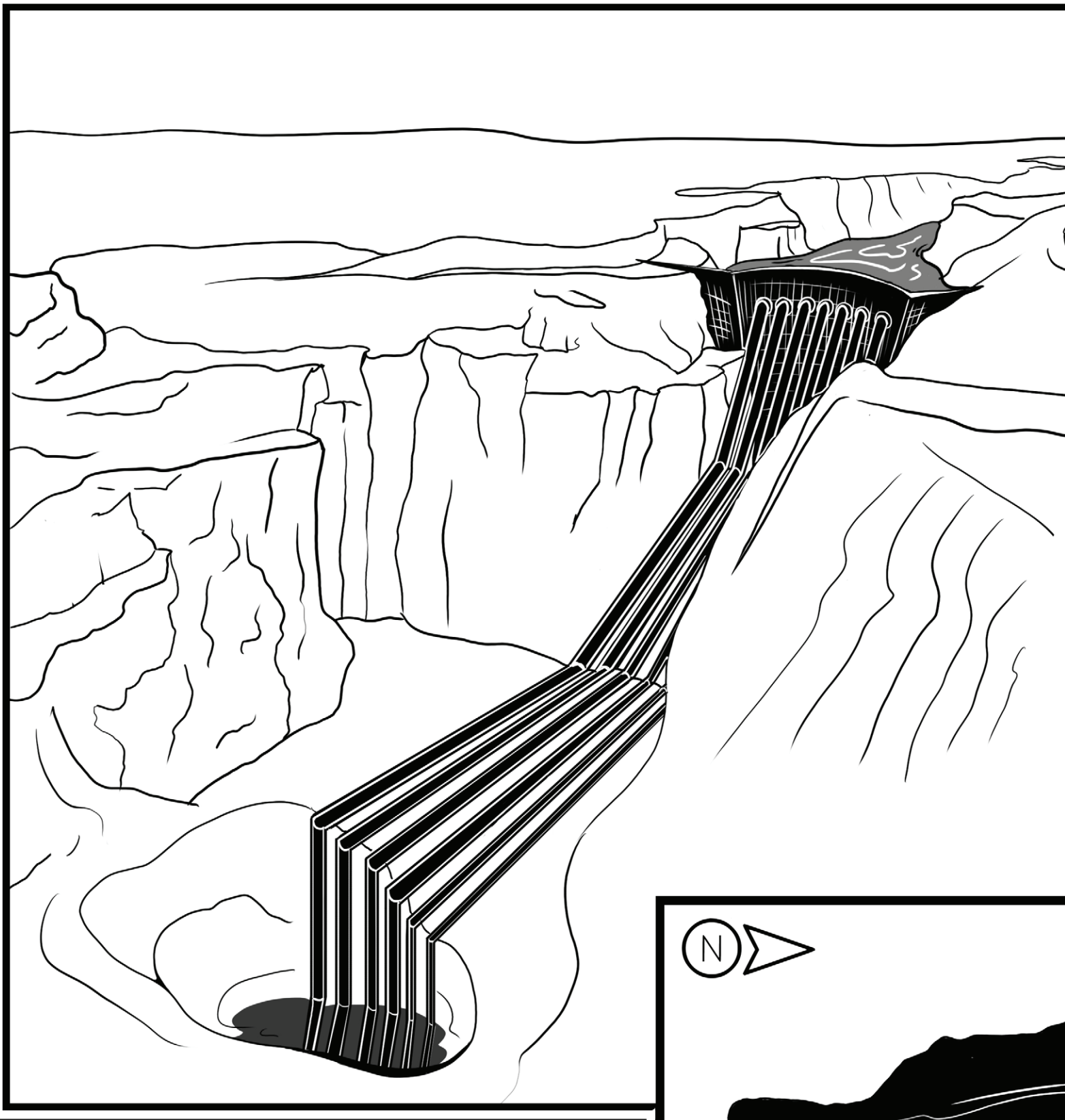
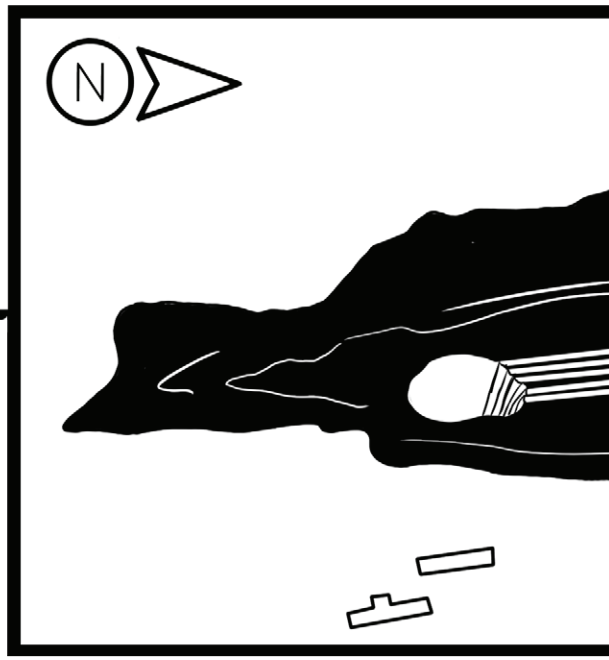
PUMP- STORAGE HYDROELECTRICTY

The stope in Error holds a massive oppurtunity. I have designed a massive hydroelectric pump-storage system to be fitted into the space. A typical turnover rate for the depth and efficiency of this system is over 800 ft; the stope is around 5 times that. The deeper the drop, the better for the system. Error will be using this electricity to run, and Vault 705 will have wired from substations in Error to thrive on it. For the water supply, there are extensive lakes surrounding the site; The water will be drawn from Garson Lake, Whitson Lake, and White water lake, into the existing landscape, hitting a dam, into penstock pipes, down into the base of the stope, housing pump-storage turbines.

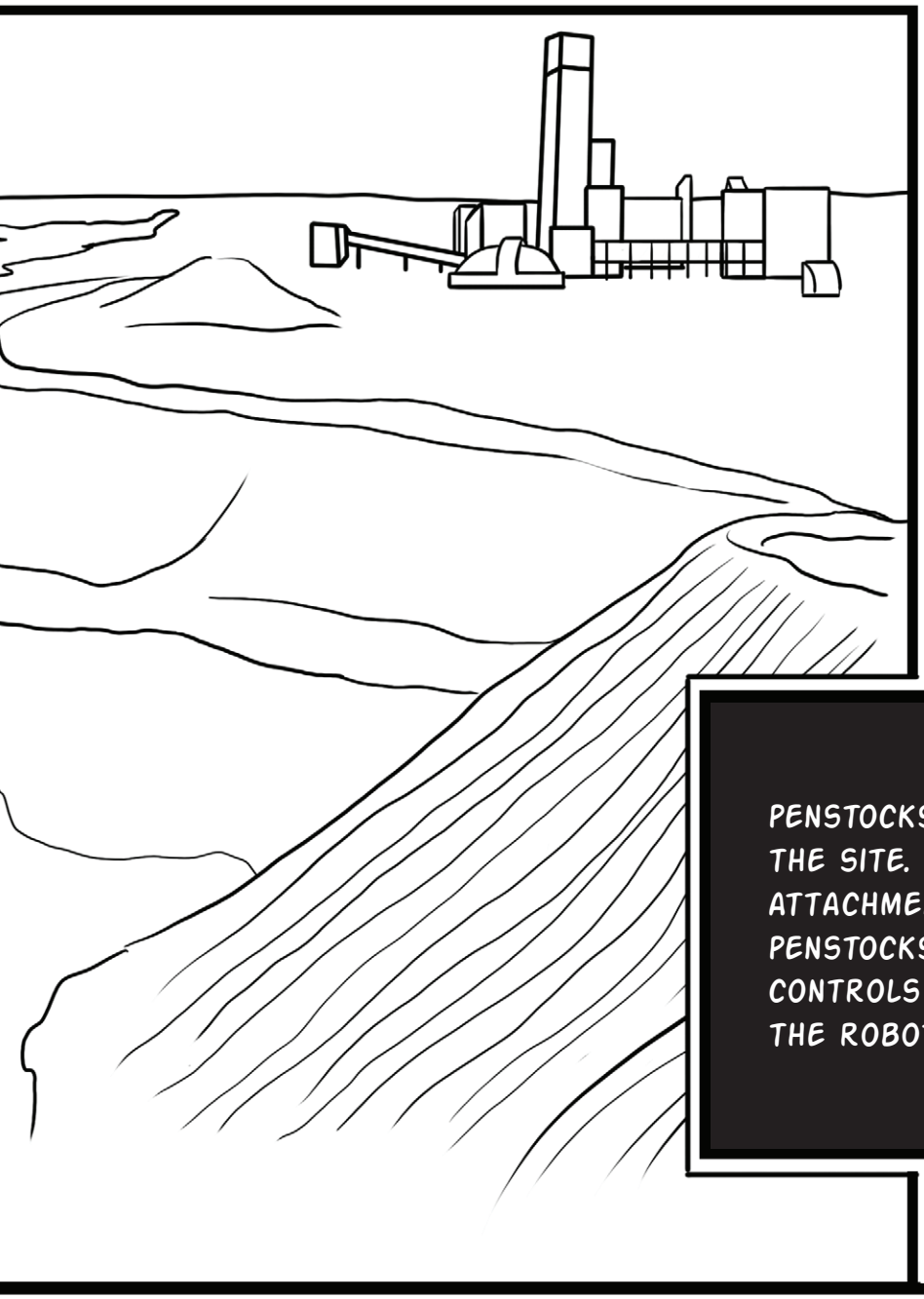


STOPE
HYDROELECTRIC SYSTEM
ROBOT

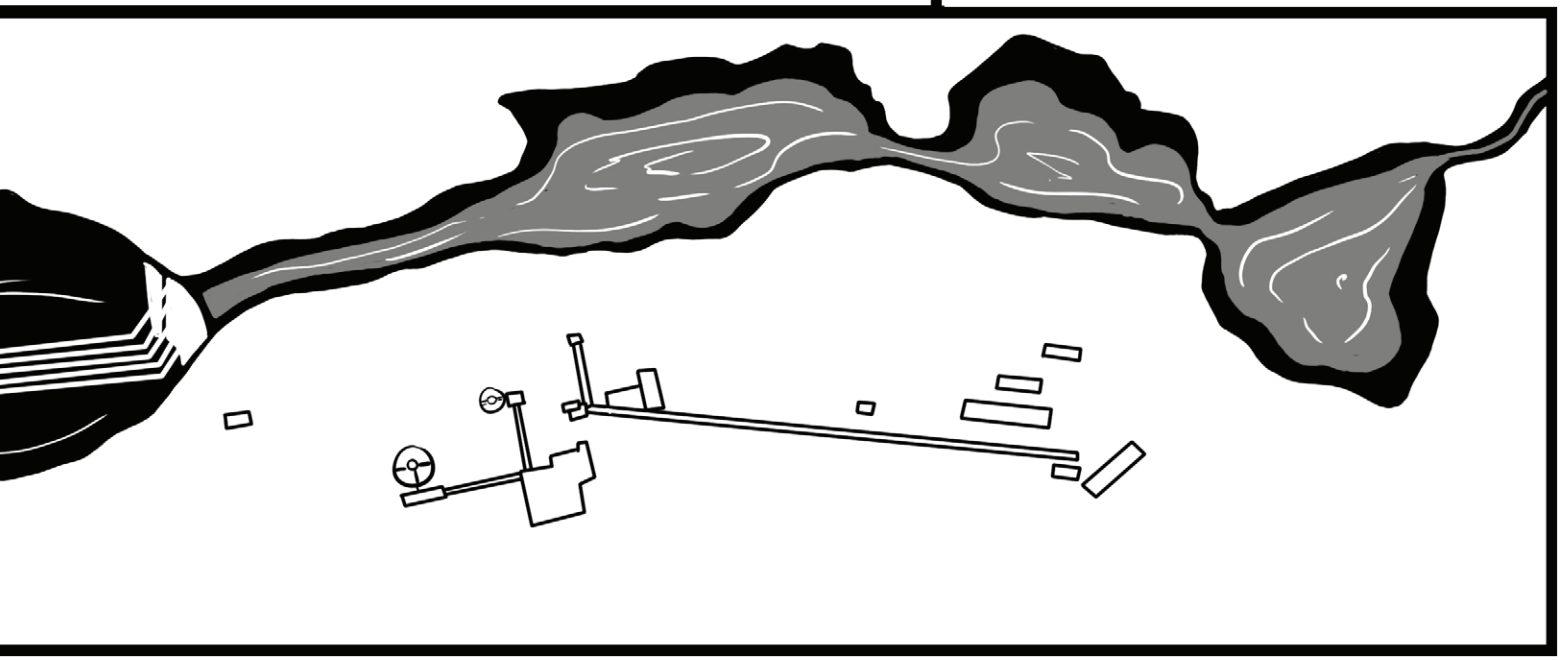




PUMP STORAGE HYDROELECTRIC DAM



PENSTOCKS LINE THE TOPOGRAPHY OF THE SITE. EACH DRIFT IN ERROR HAS AN ATTACHMENT TO DIFFERENT LEVELS OF THE PENSTOCKS FOR SERVICE PURPOSES. THE CONTROLS FOR THE DAM ARE LOCATED IN THE ROBOT SERVICE DRIFT.

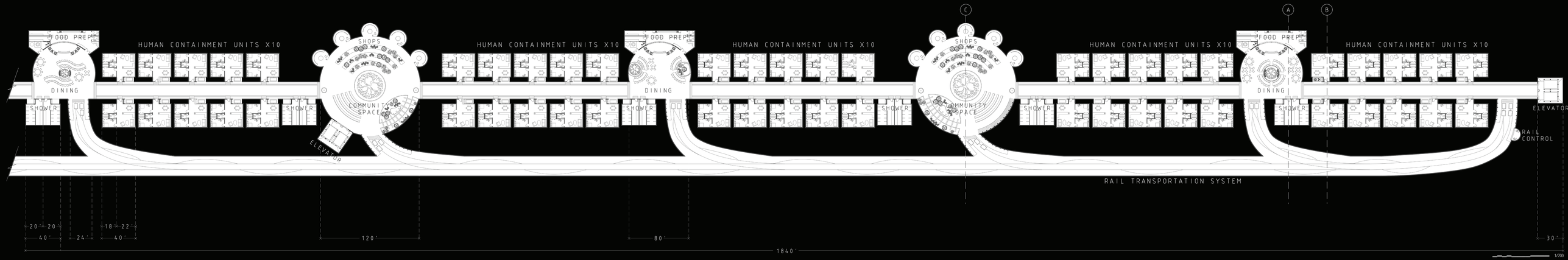


CHAPTER

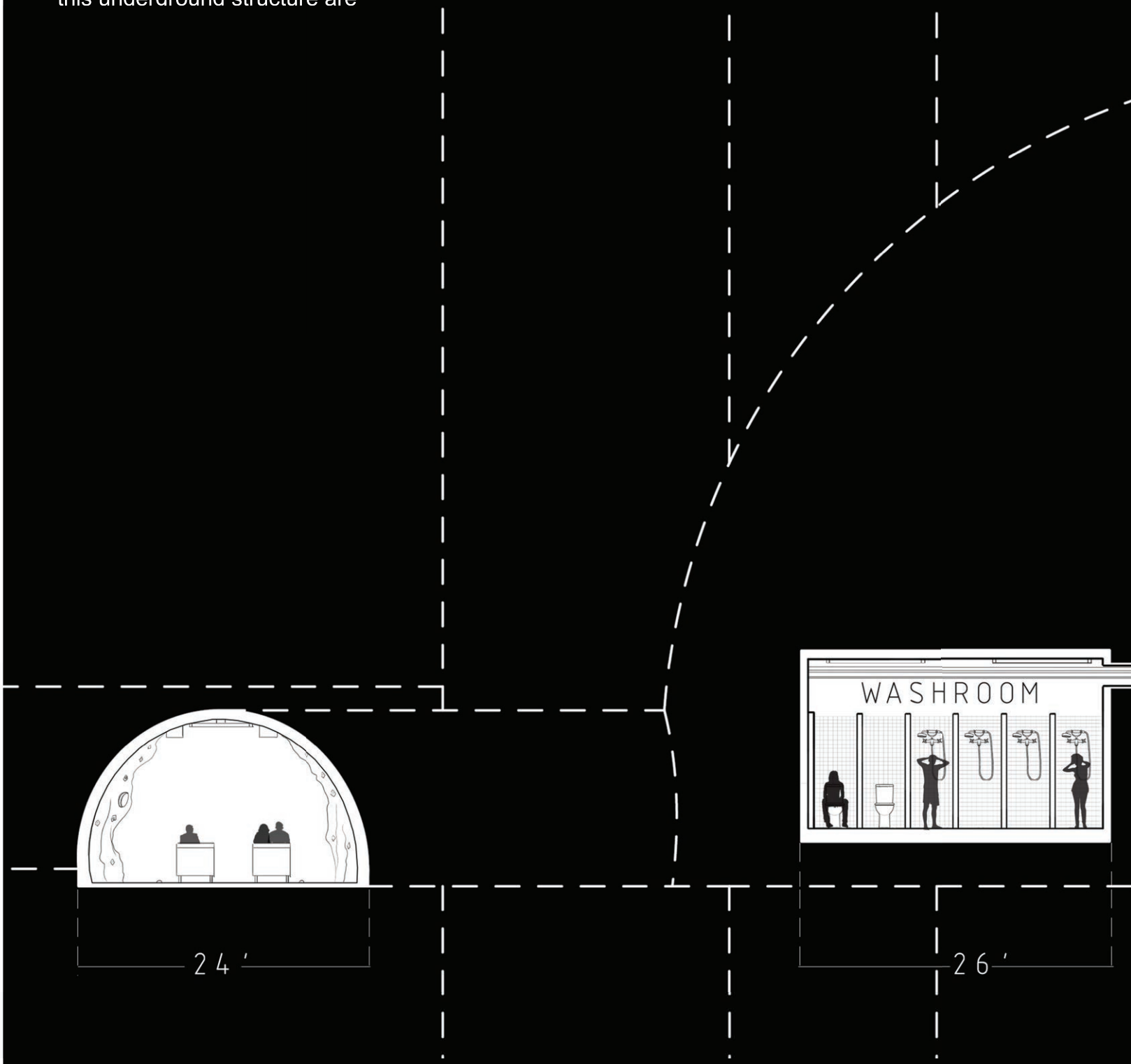
4.2

VAULT 705
RESIDENTIAL DESIGN

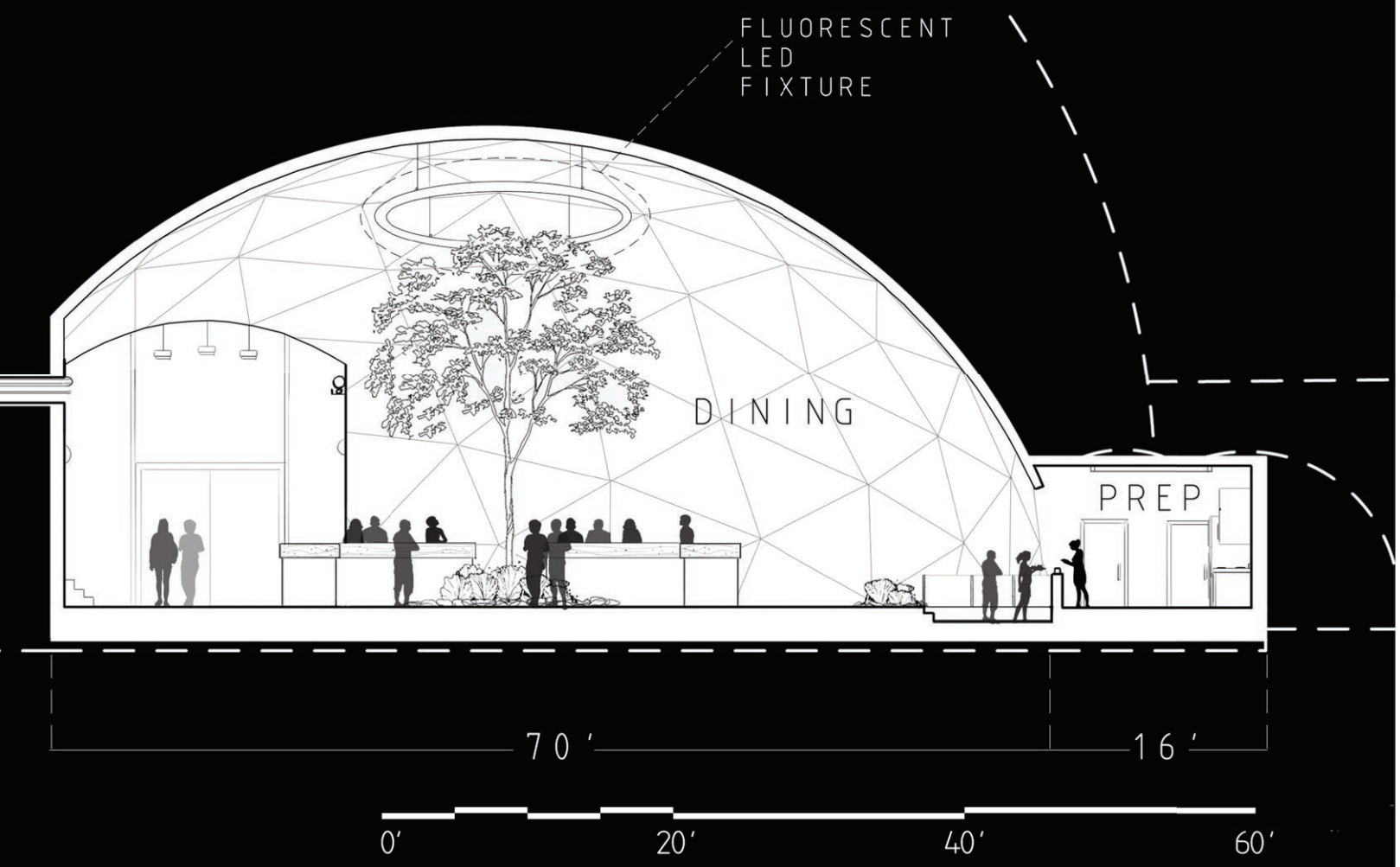
RESIDENT WING PLAN



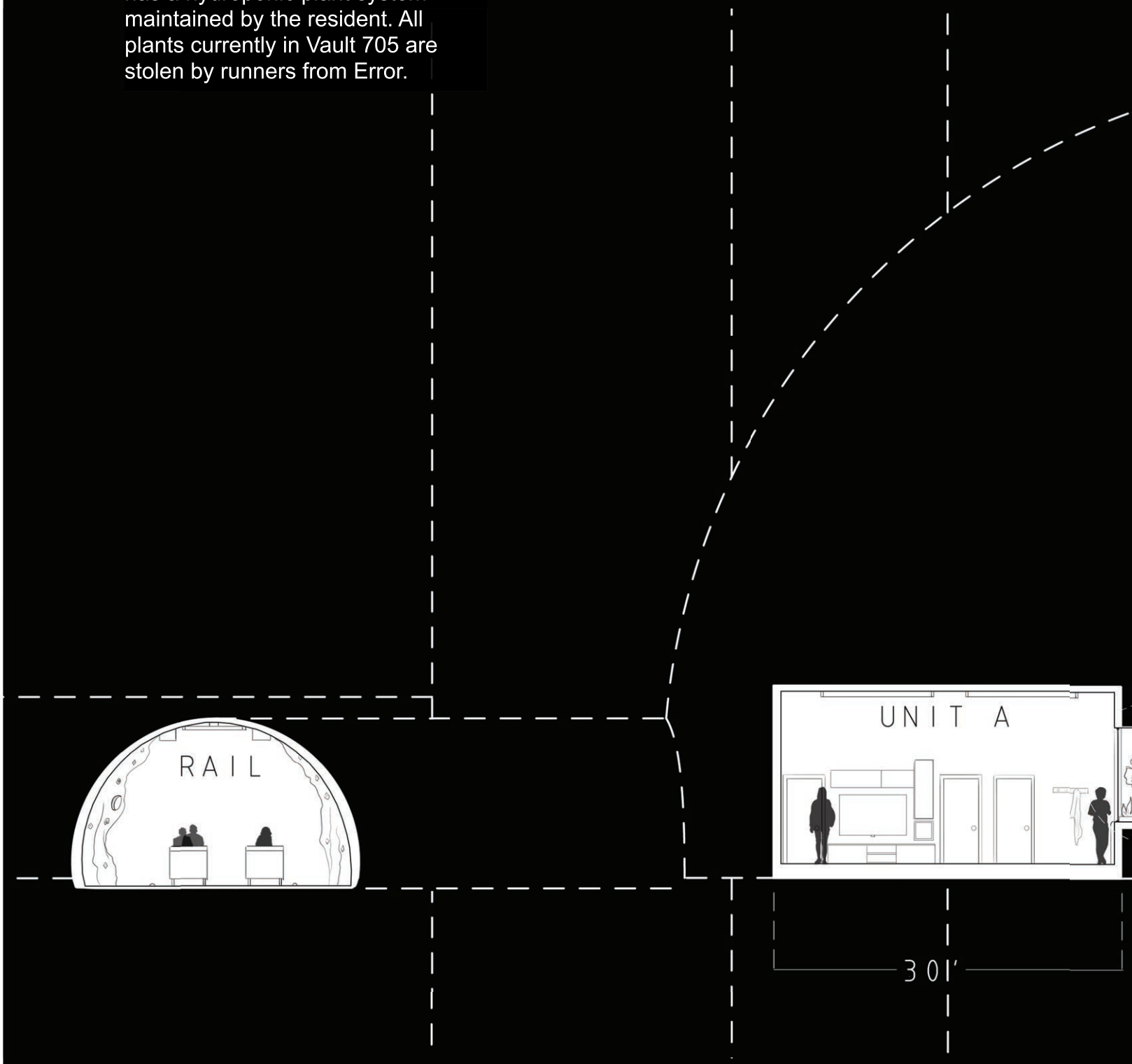
The human service spaces have communal dining, food prep (by sustainers), and a communal washroom which includes showers. Most of the domes in this underground structure are



SECTION A
HUMAN SERVICE

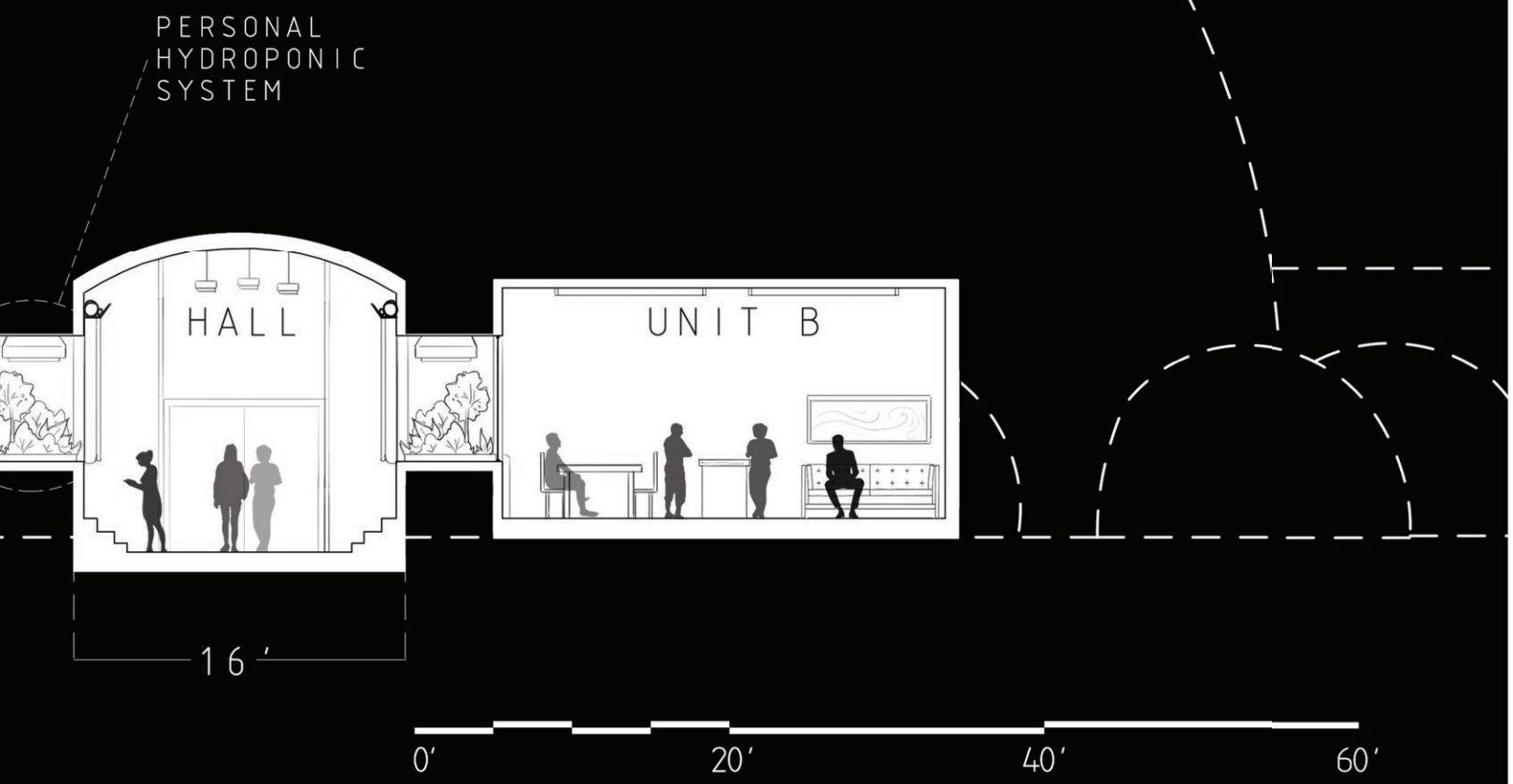


Human containment units are fitted with all the living esscentials to mimic life as it once was above. The windows open to the drift, to resemble a communal street of human traffic. Each window sill has a hydroponic plant system maintained by the resident. All plants currently in Vault 705 are stolen by runners from Error.



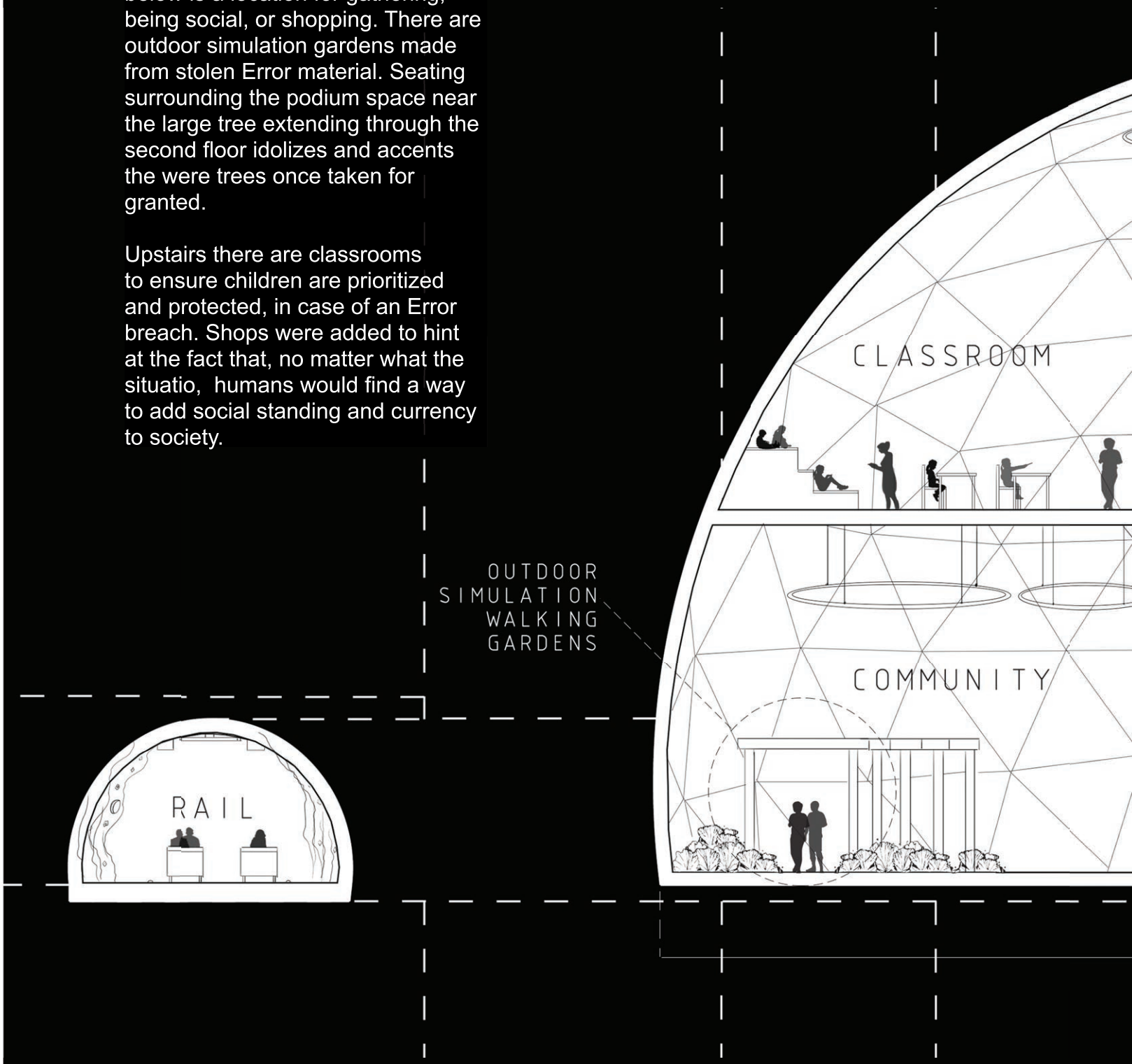
SECTION B

HUMAN CONTAINMENT UNITS

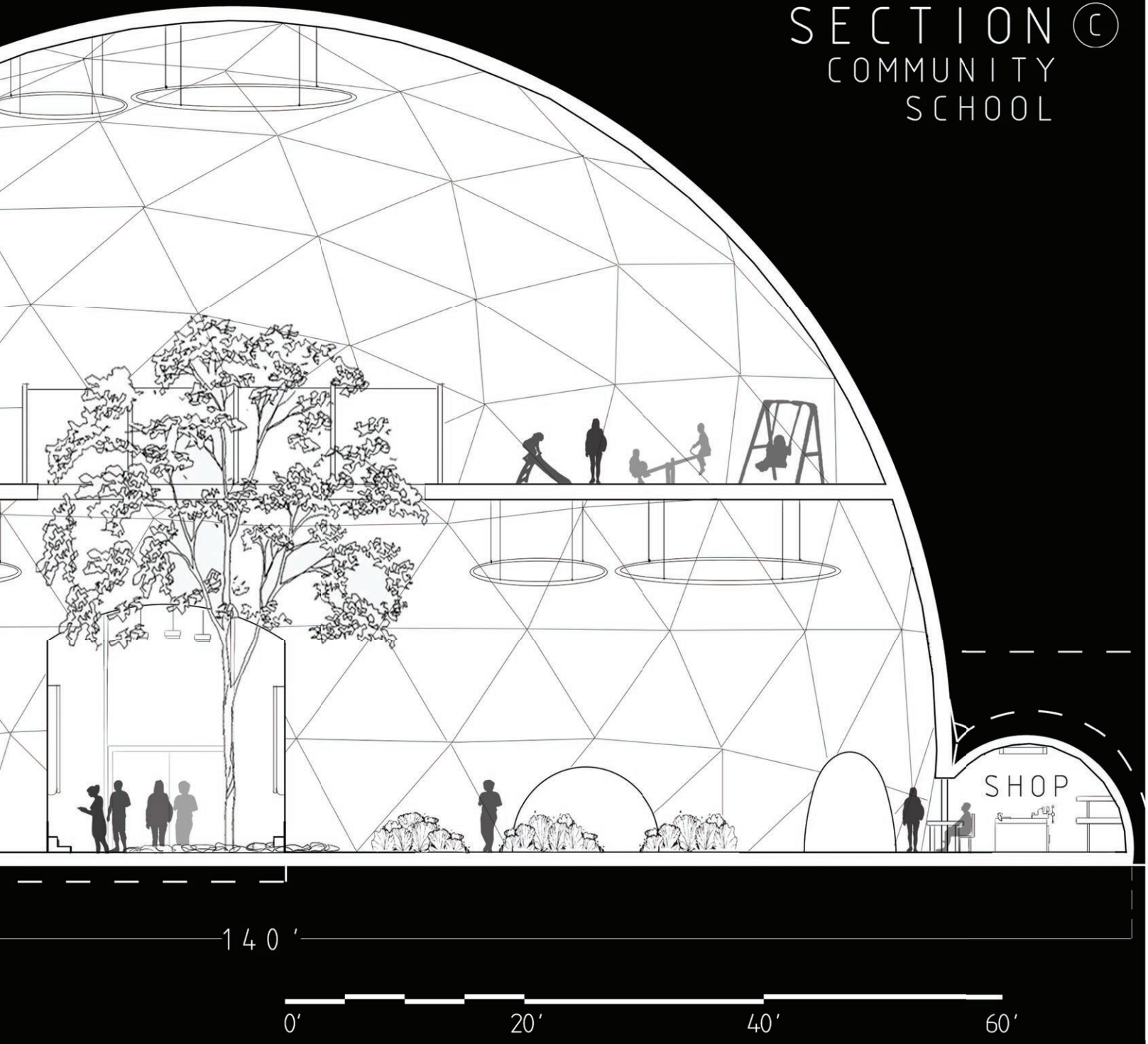


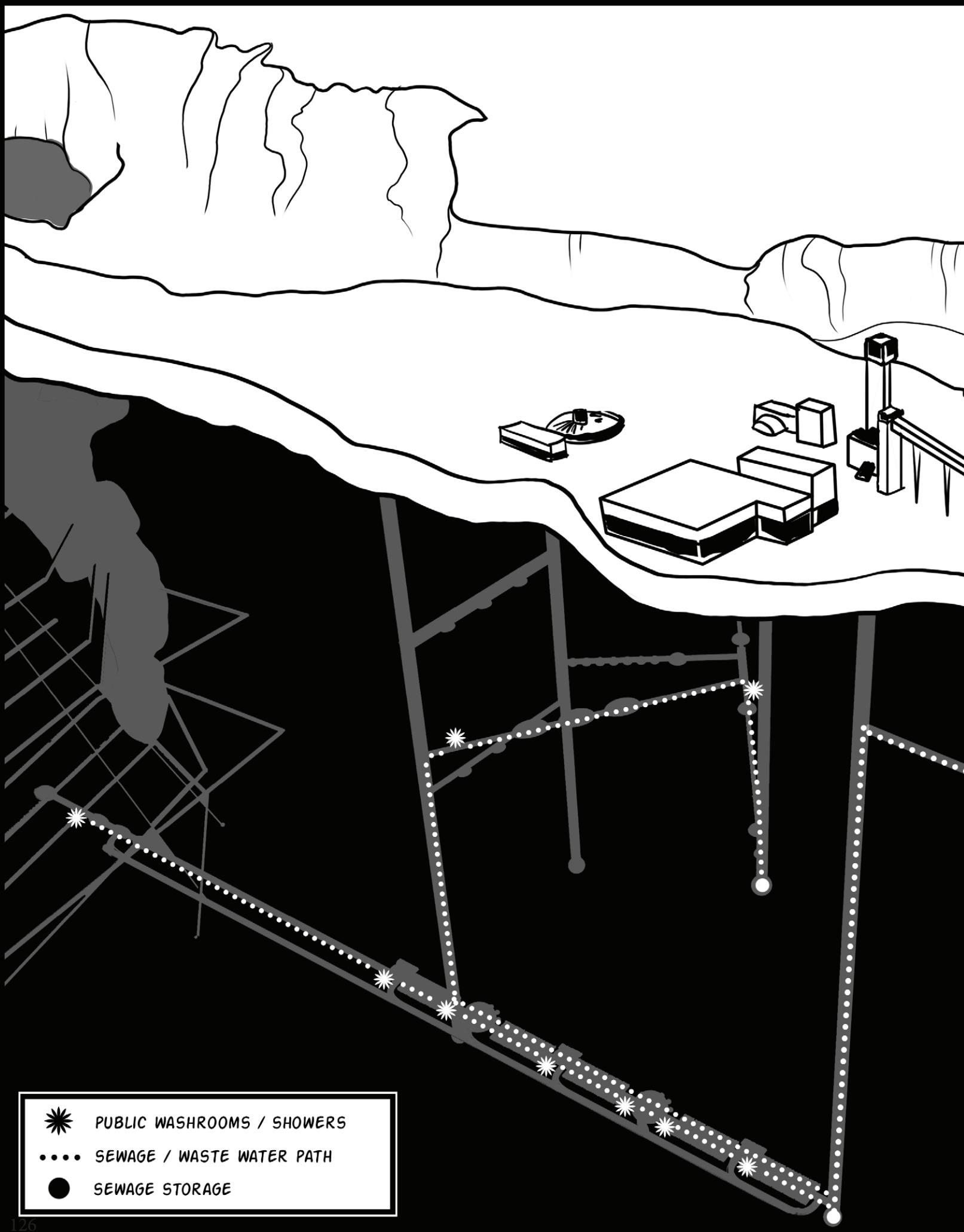
The community space has two levels, a above is a classroom and below is a location for gathering, being social, or shopping. There are outdoor simulation gardens made from stolen Error material. Seating surrounding the podium space near the large tree extending through the second floor idolizes and accents the were trees once taken for granted.

Upstairs there are classrooms to ensure children are prioritized and protected, in case of an Error breach. Shops were added to hint at the fact that, no matter what the situatio, humans would find a way to add social standing and currency to society.

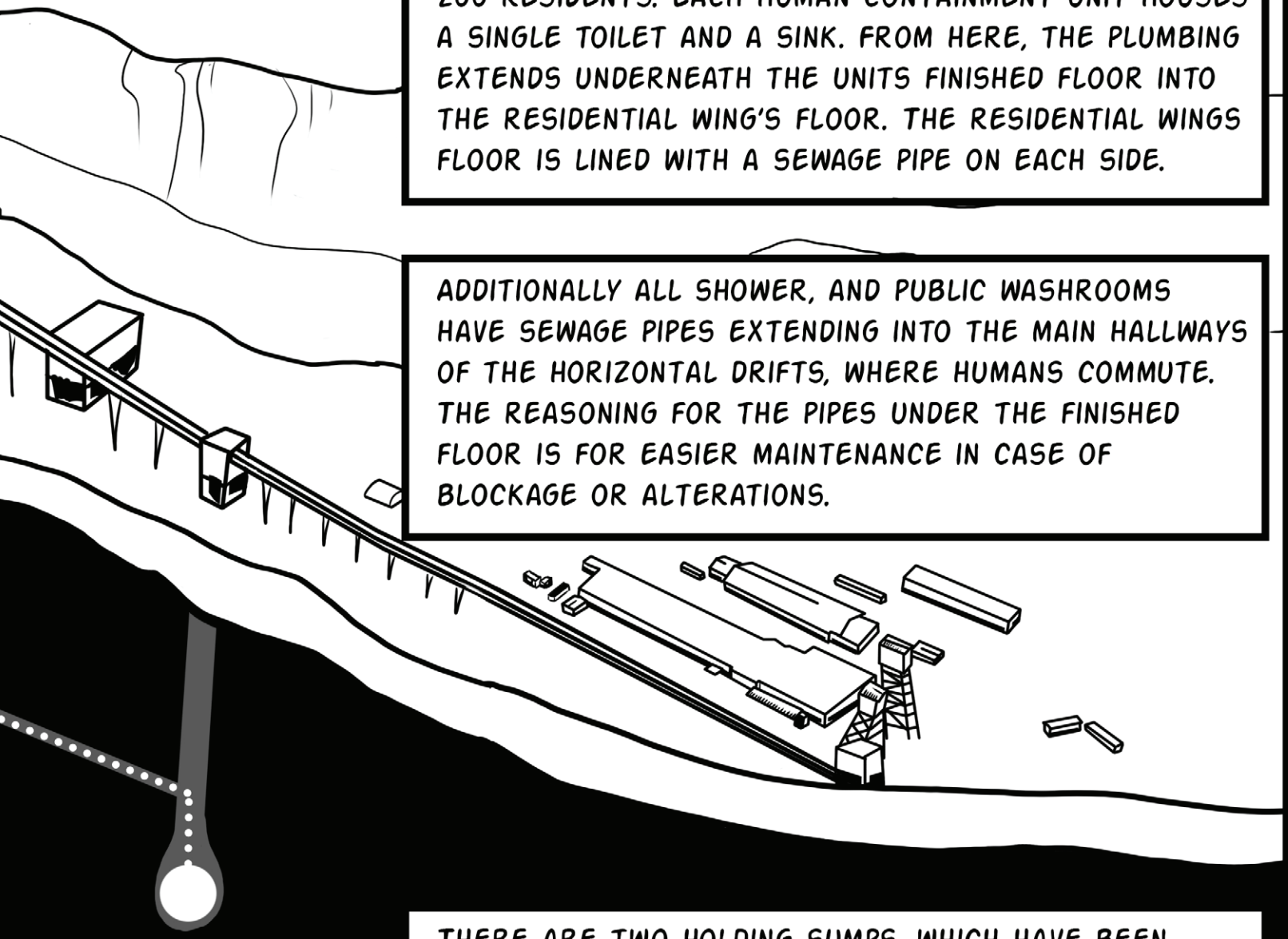


SECTION C
COMMUNITY SCHOOL




PUBLIC WASHROOMS / SHOWERS
SEWAGE / WASTE WATER PATH
SEWAGE STORAGE

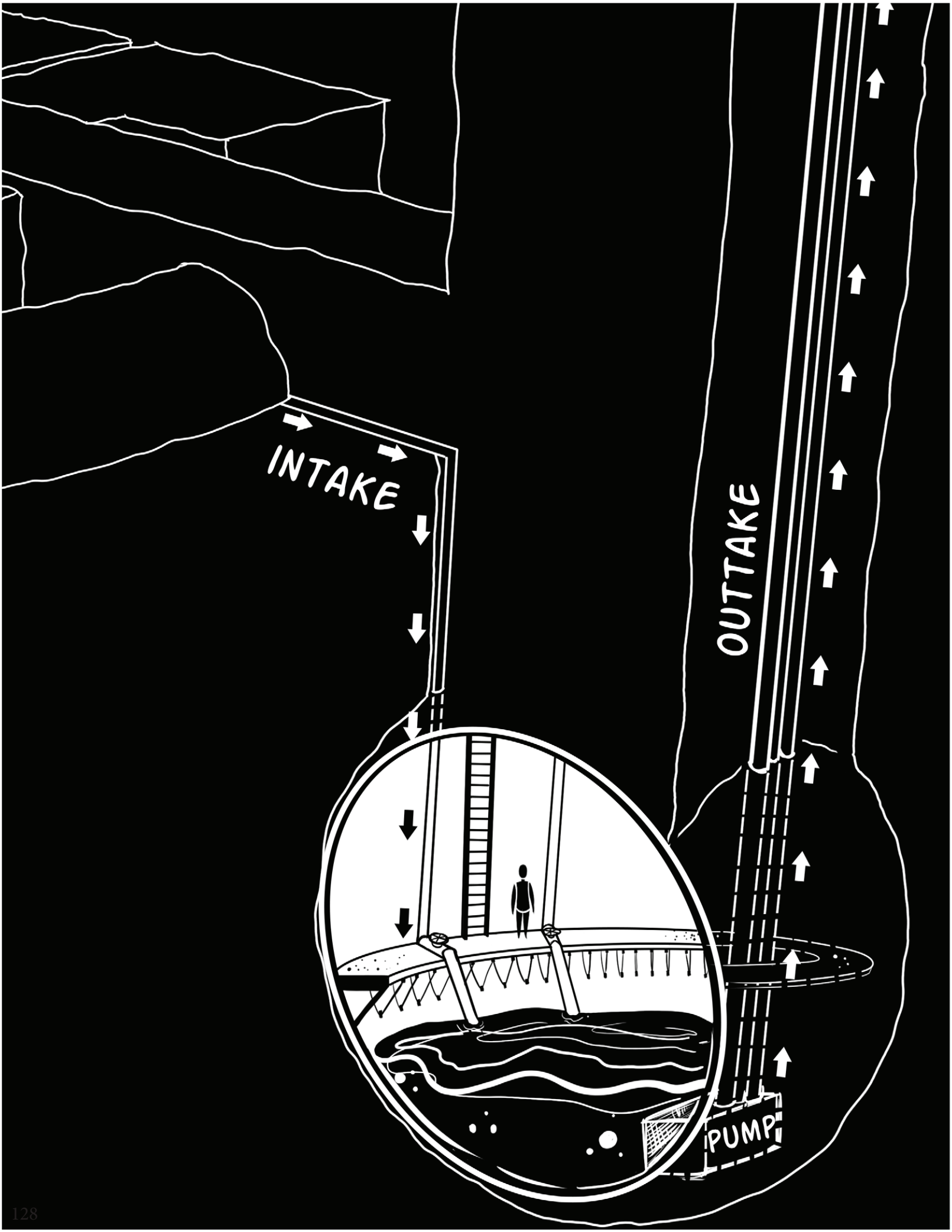
PATH OF SEWAGE



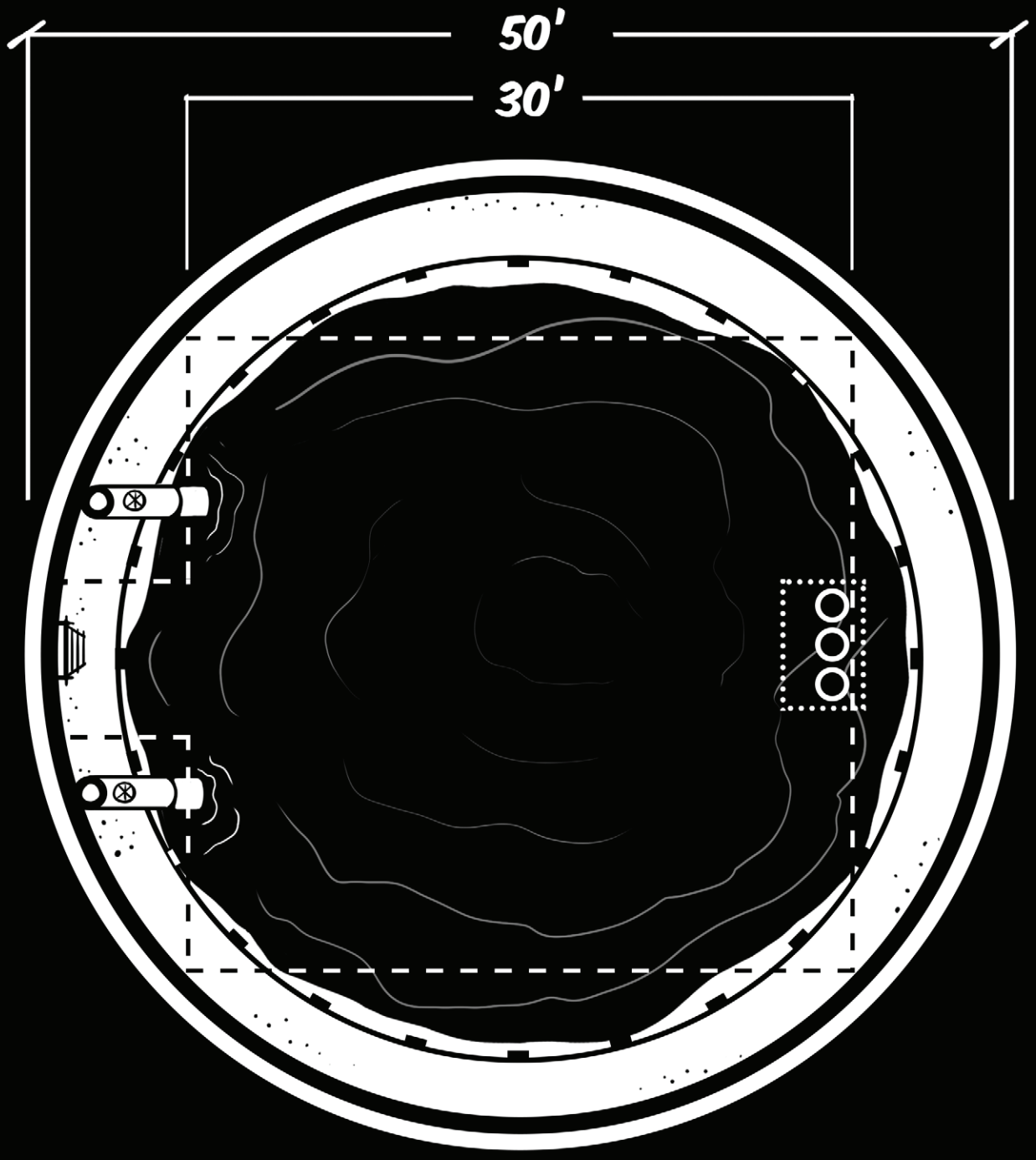
THE INTERNAL SEWAGE SYSTEM CURRENTLY SUPPORTS 200 RESIDENTS. EACH HUMAN CONTAINMENT UNIT HOUSES A SINGLE TOILET AND A SINK. FROM HERE, THE PLUMBING EXTENDS UNDERNEATH THE UNITS FINISHED FLOOR INTO THE RESIDENTIAL WING'S FLOOR. THE RESIDENTIAL WINGS FLOOR IS LINED WITH A SEWAGE PIPE ON EACH SIDE.

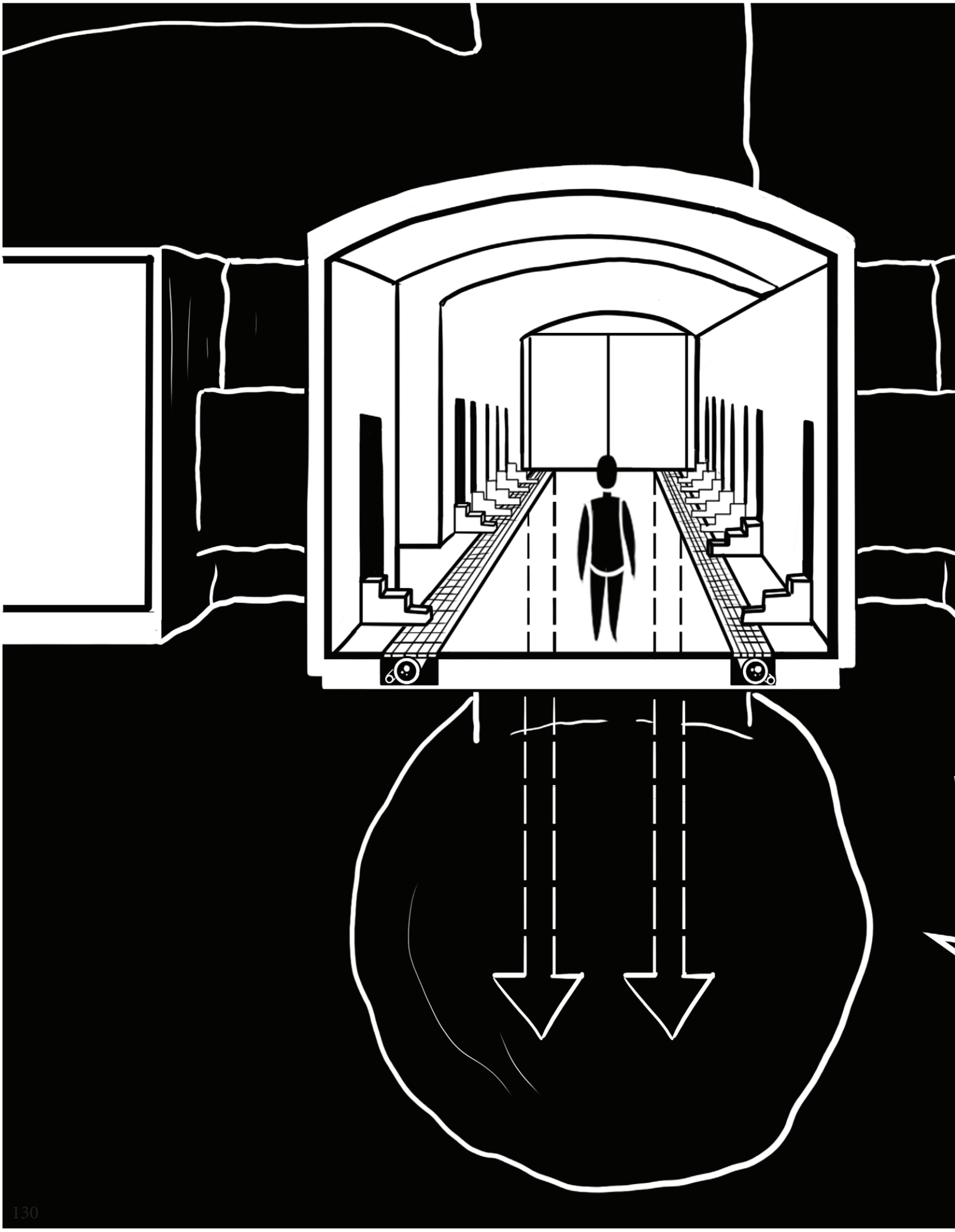
ADDITIONALLY ALL SHOWER, AND PUBLIC WASHROOMS HAVE SEWAGE PIPES EXTENDING INTO THE MAIN HALLWAYS OF THE HORIZONTAL DRIFTS, WHERE HUMANS COMMUTE. THE REASONING FOR THE PIPES UNDER THE FINISHED FLOOR IS FOR EASIER MAINTENANCE IN CASE OF BLOCKAGE OR ALTERATIONS.

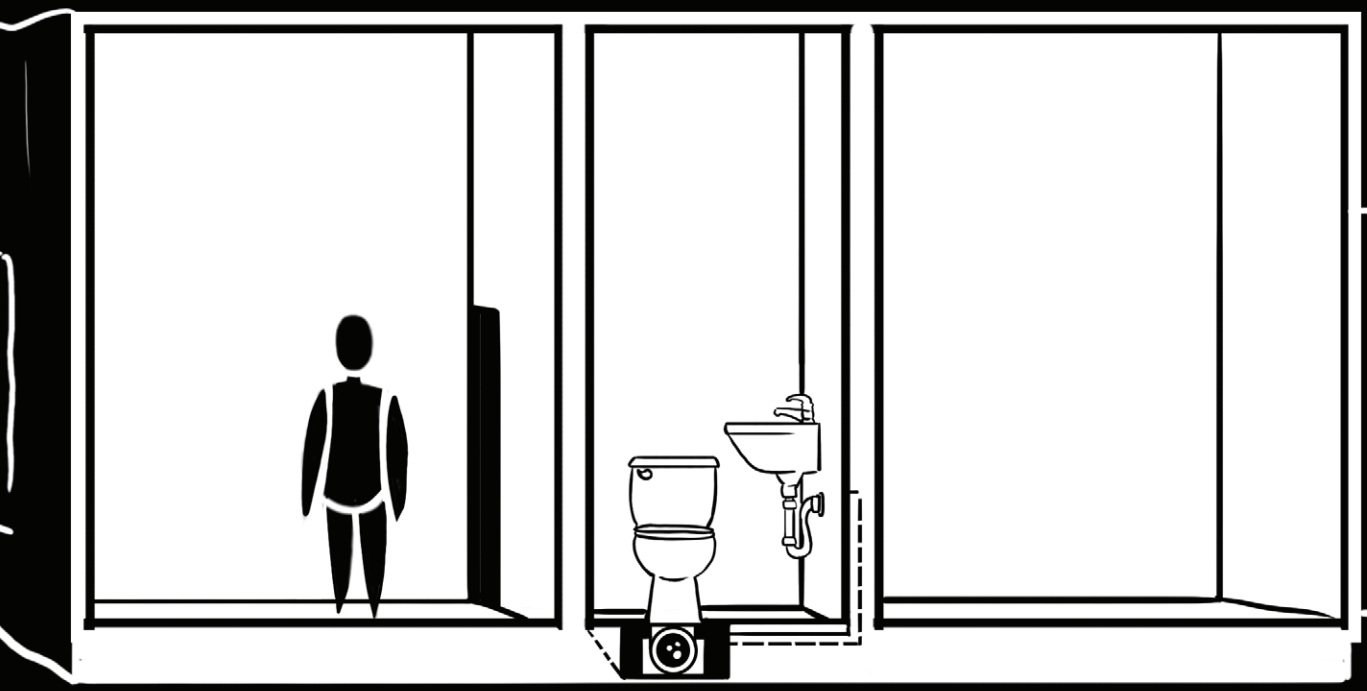
THERE ARE TWO HOLDING SUMPS, WHICH HAVE BEEN REPURPOSED INTO SEPTIC TANKS. EACH HOLDING SUMP INCLUDES A SUPPORTED CONCRETE LEVEL FOR MAINTENANCE OF THE PUMPS, AND PIPES. AT INTERVAL TIMES OF A FEW MONTHS DEPENDING ON THE SLUDGE LEVELS, THE SEWAGE IS PUMPED INTO THE EXTERNALLY LARGE SUMP FROM THE LIVING SPACES. THIS GIANT SUMP WAS BLASTED FOR LONG TIME SEWAGE STORAGE, HOPEFULLY INDEFINITELY.

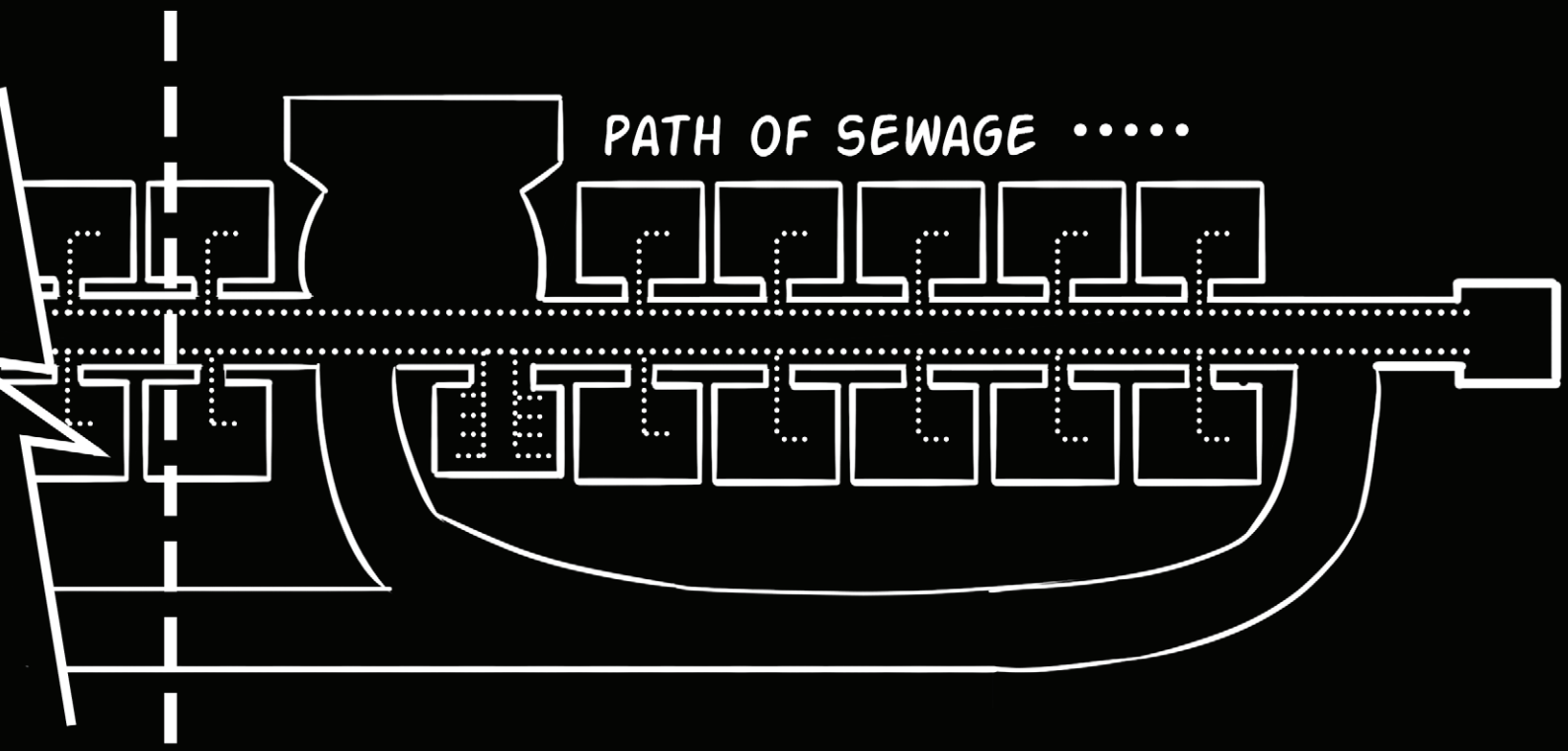

INTAKE
OUTTAKE
PUMP

SEWAGE HOLDING SUMPS








PATH OF SEWAGE •••••

PART 5

MOTIONS OF THE GRAPHIC NARRATIVE

CONCLUSIONS

I consider my thesis is to be an initial investigation of the potential of graphic narrative as a legitimate form of architectural expression. By deploying the technique of graphic narrative, I have been able to craft a new world, a new architectural vision of a world, and a character while respecting the context of past and present.

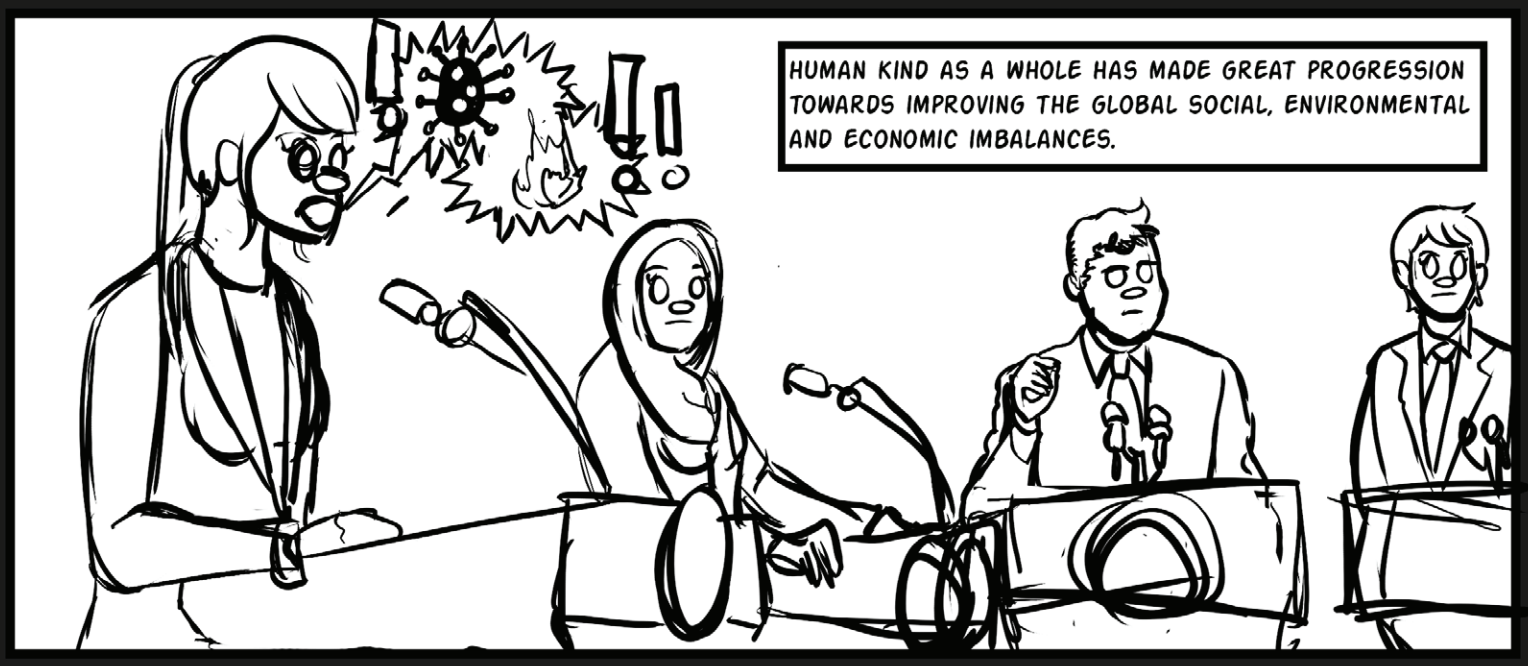
The strategy of using graphic narrative for architectural design enables an endless open network of oppurtunities for exploring larger issues. The narrative acted as a vessel to carry design topics such as adaptive reuse, natural energy systems, and subterranean architecture. It was recognized through this process that there was endless possibilities as to what design topics could fall into the plot. All architectural design involves surpassing the architect's involvement. An architectural exploration opens a new audience in this universal language, for the non-architects.

It took until the final hours of this process to realize that the narrative created serves as a metaphor for my thesis. Imagination is central to the process of architectural creation. Without it, automation or the robotic future would take over, and we would lose the humanity in design.

The following is my theories put to the test. This thesis was never intended to have a complete finality. Yet it will live on through its inevitable continuation of this graphic narrative.

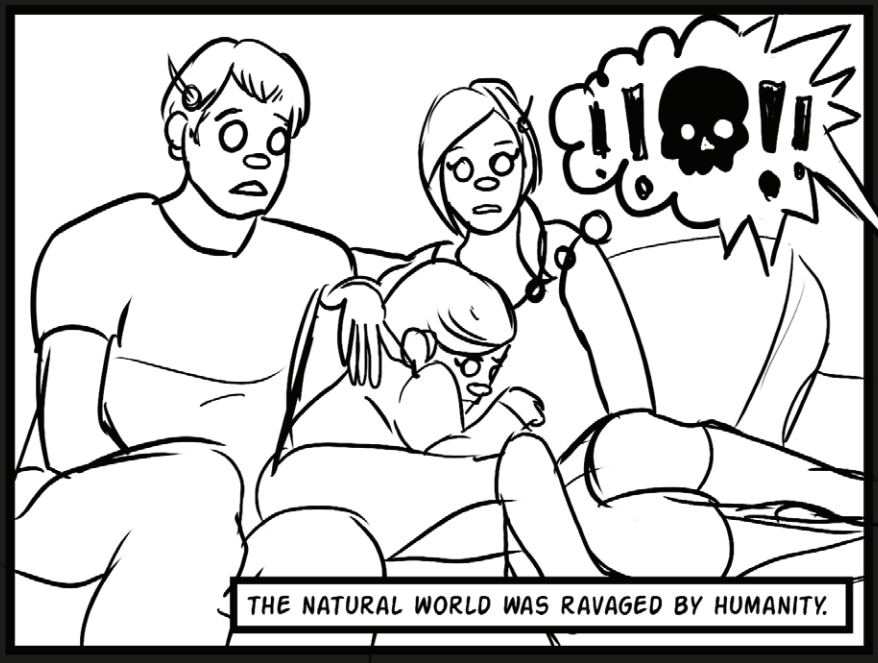
Here lies the end to a new beginning.

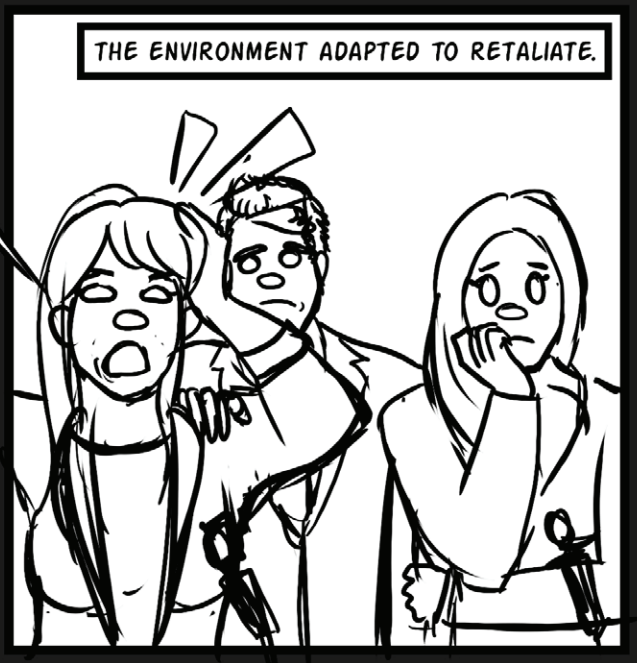

YEAR: 2040
EMERGENCY ALERTS
NOW
EMERGENCY ALERT
WORLD-WIDE PUBLIC BROADCAST WILL BEGIN AT 7:05 PM EST.
BROADCAST WILL AUTOMATICALLY OVERIDE ANY DEVICE.
SLIDE FOR MORE

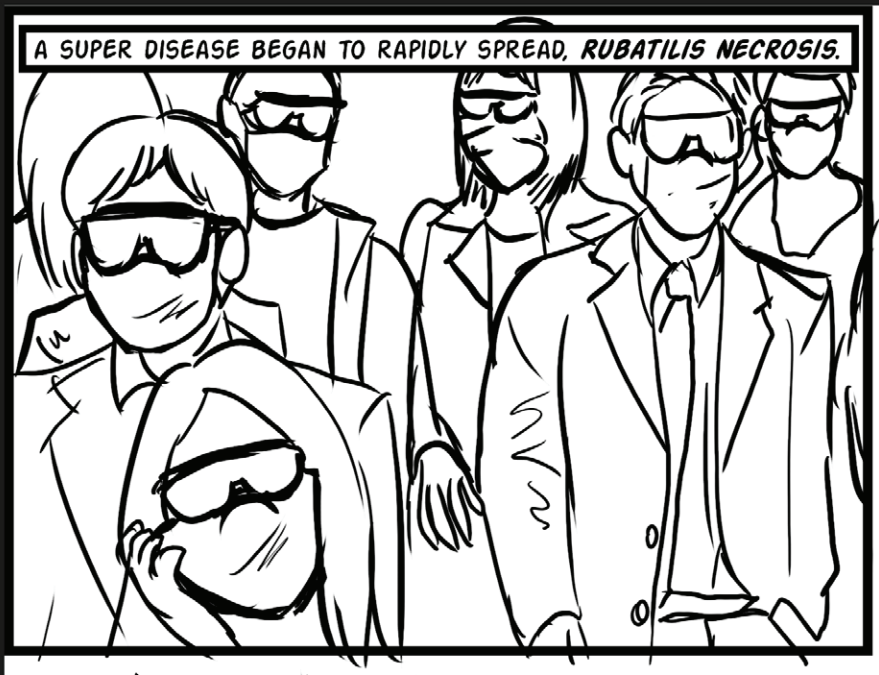

HUMAN KIND AS A WHOLE HAS MADE GREAT PROGRESSION TOWARDS IMPROVING THE GLOBAL SOCIAL, ENVIRONMENTAL AND ECONOMIC IMBALANCES.


UNFORTUNATELY, EFFORTS WERE TOO LATE.

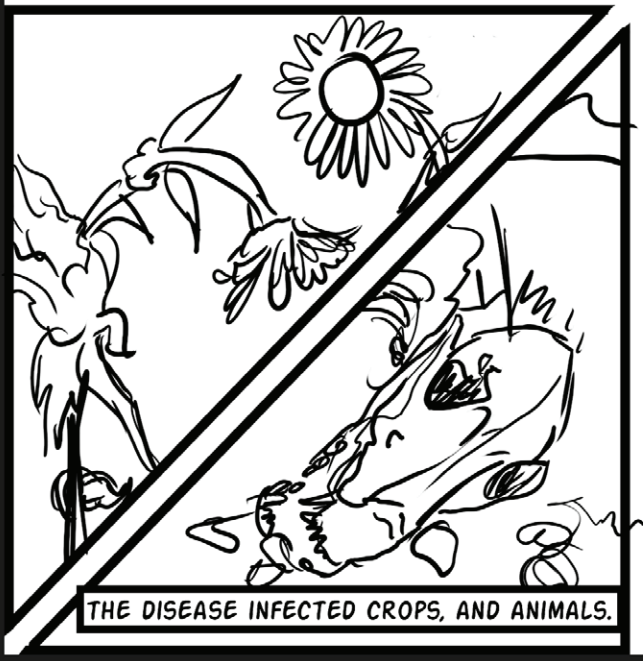

THIS WAS THE BEGINNING OF THE *RESET*.
EMERGENCY ! EMERGENCY

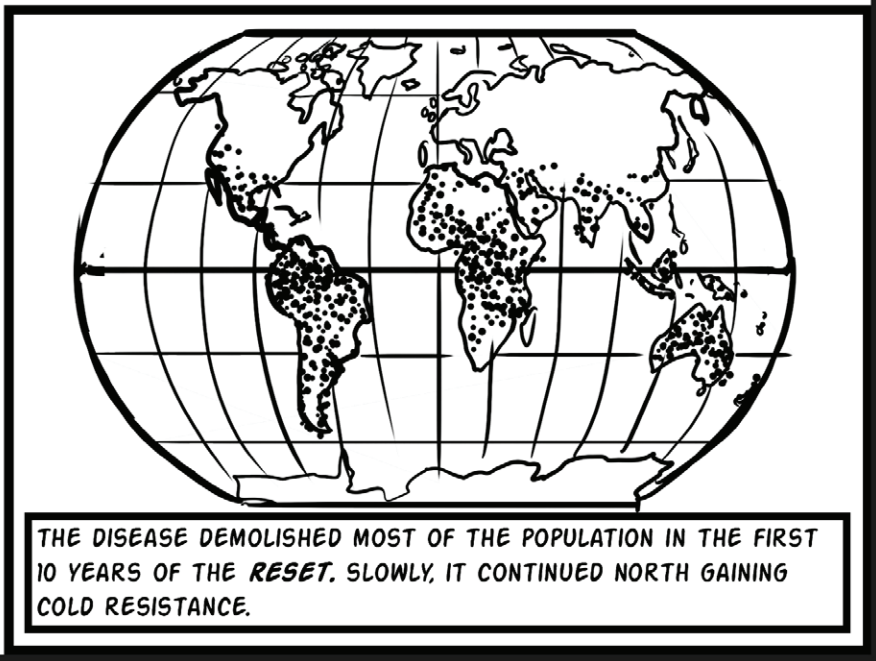

THE NATURAL WORLD WAS RAVAGED BY HUMANITY.

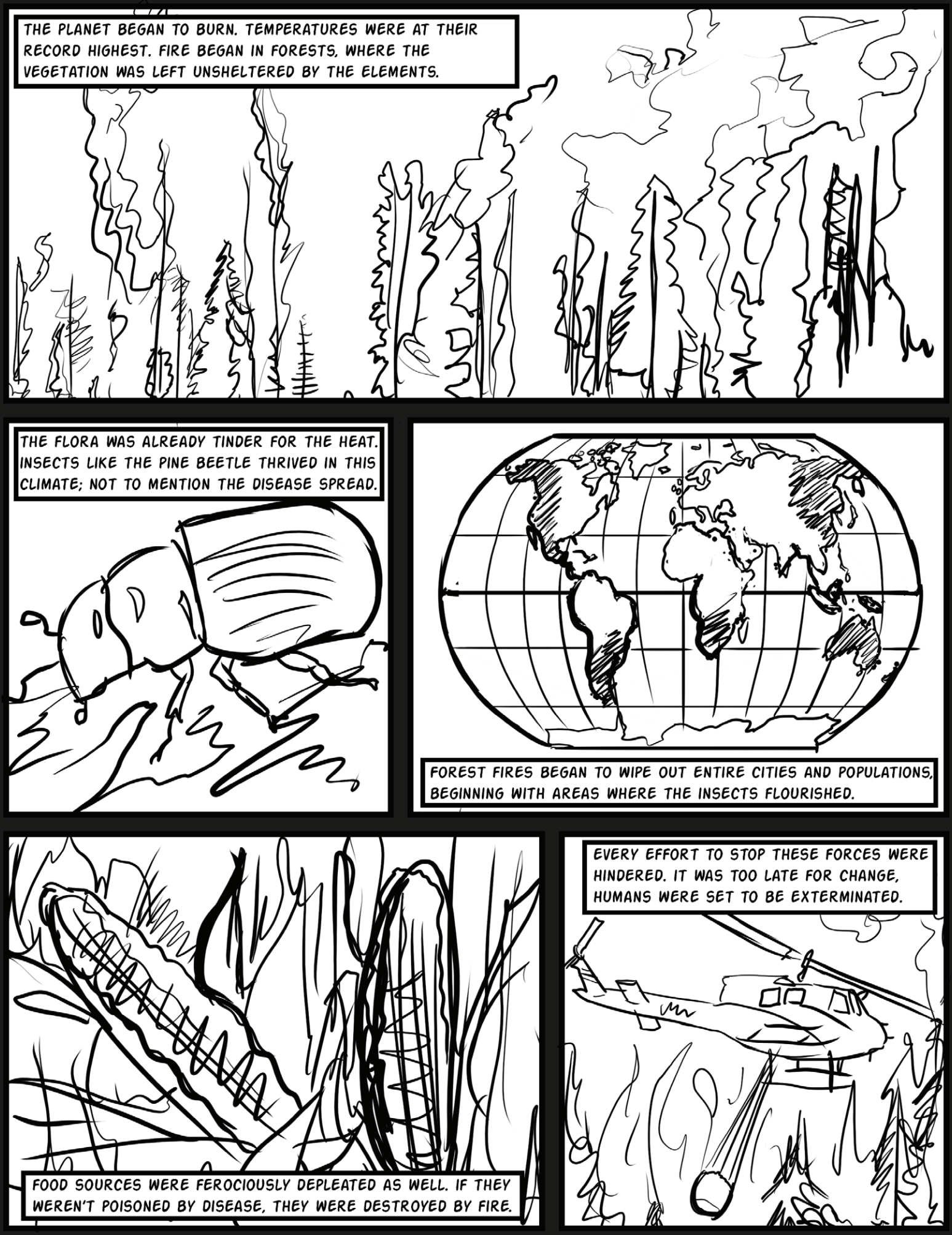

THE ENVIRONMENT ADAPTED TO RETALIATE.


A SUPER DISEASE BEGAN TO RAPIDLY SPREAD, ***RUBATILIS NECROSIS.***

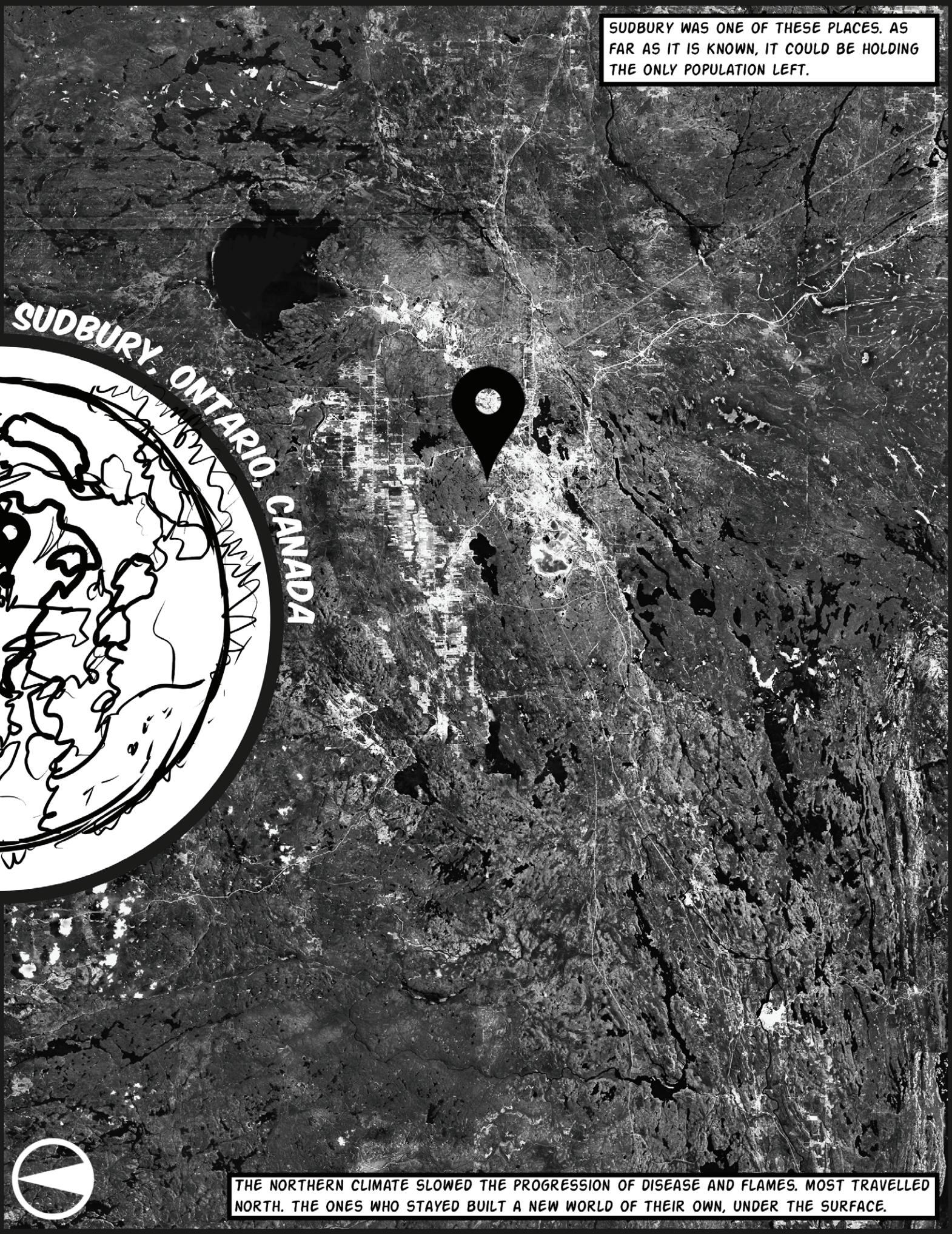

SPREADING IN EVERY METHOD POSSIBLE, IT QUICKLY ENGULFED LOCATIONS NEAR THE EQUATOR. THE EFFECTS OF CLIMATE CHANGE CREATED A PERFECT ENVIRONMENT FOR DISEASE TO THRIVE.

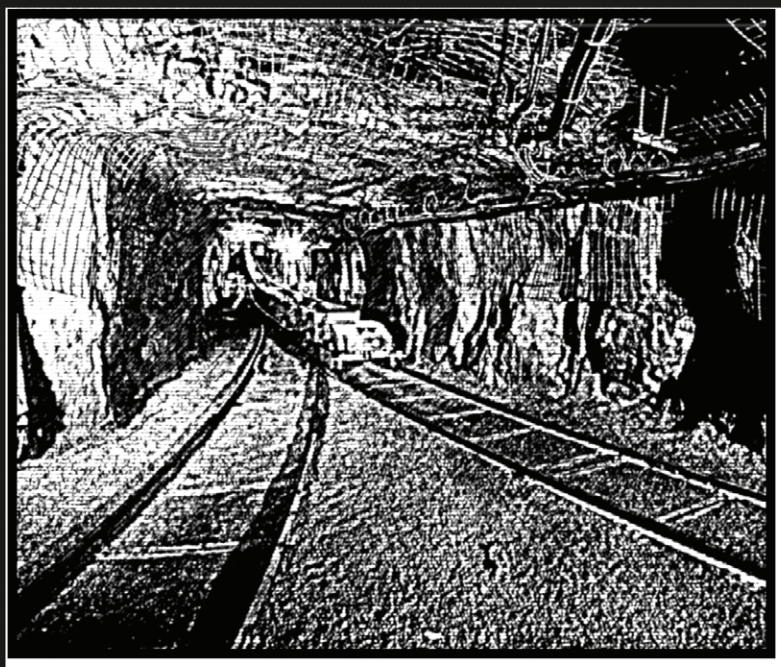

THE DISEASE INFECTED CROPS, AND ANIMALS.


THE DISEASE DEMOLISHED MOST OF THE POPULATION IN THE FIRST 10 YEARS OF THE ***RESET.*** SLOWLY, IT CONTINUED NORTH GAINING COLD RESISTANCE.

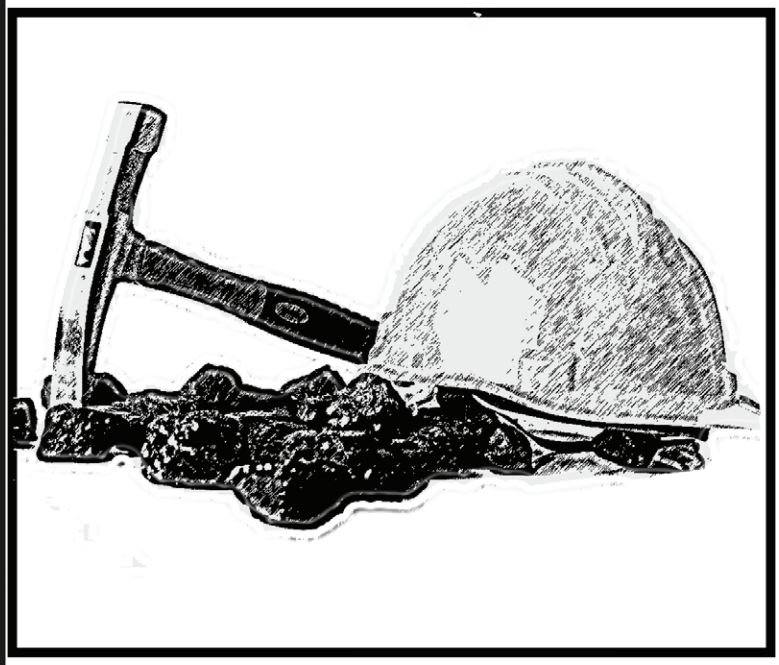

THE PLANET BEGAN TO BURN. TEMPERATURES WERE AT THEIR RECORD HIGHEST. FIRE BEGAN IN FORESTS, WHERE THE VEGETATION WAS LEFT UNSHELTERED BY THE ELEMENTS.
THE FLORA WAS ALREADY TINDER FOR THE HEAT. INSECTS LIKE THE PINE BEETLE THRIVED IN THIS CLIMATE; NOT TO MENTION THE DISEASE SPREAD.
FOREST FIRES BEGAN TO WIPE OUT ENTIRE CITIES AND POPULATIONS, BEGINNING WITH AREAS WHERE THE INSECTS FLOURISHED.
FOOD SOURCES WERE FEROCIOUSLY DEPLEATED AS WELL. IF THEY WEREN'T POISONED BY DISEASE, THEY WERE DESTROYED BY FIRE.
EVERY EFFORT TO STOP THESE FORCES WERE HINDERED. IT WAS TOO LATE FOR CHANGE, HUMANS WERE SET TO BE EXTERMINATED.

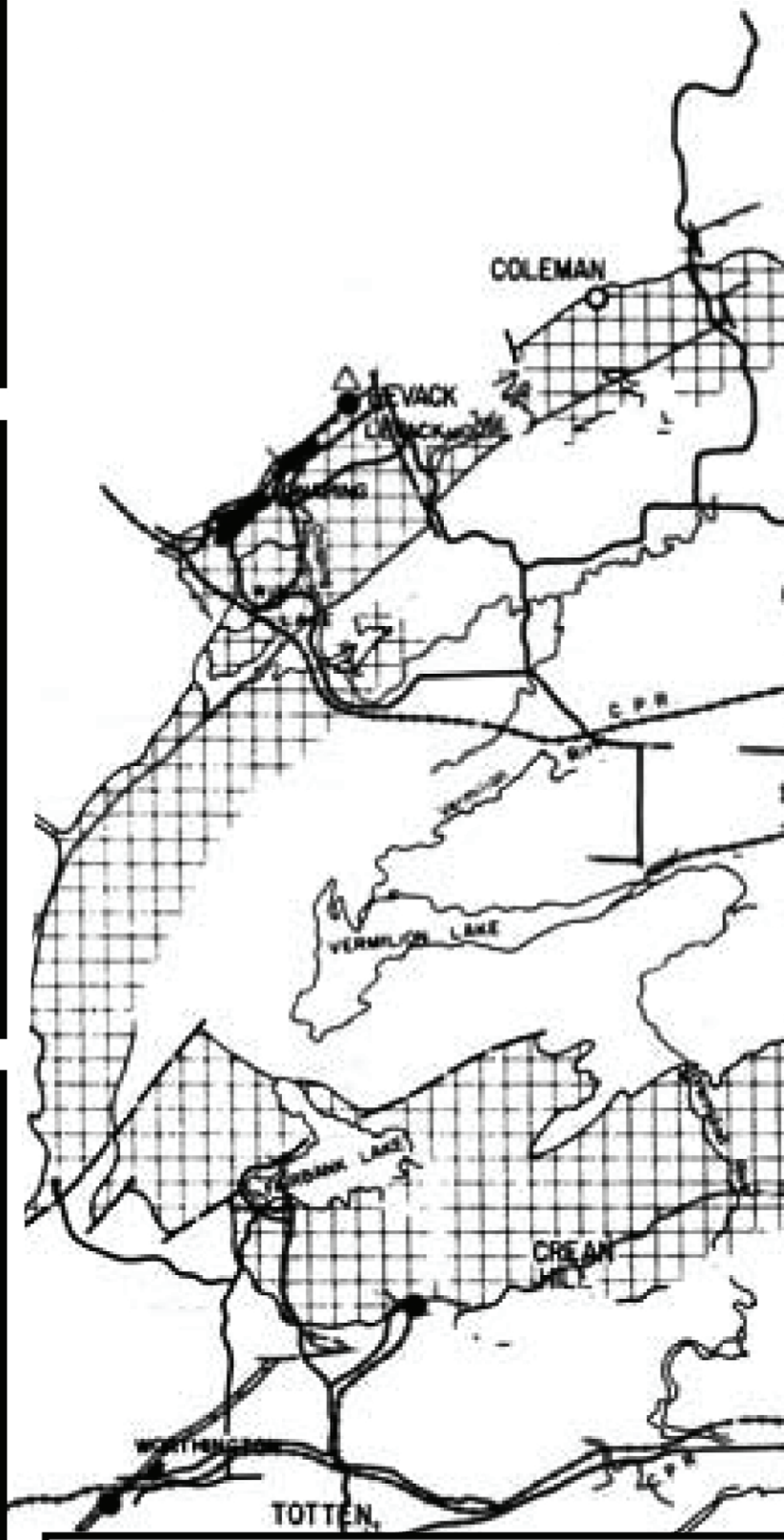

YEAR: 2050
CIVILIZATION WAS LOST. NO LONGER COULD CROSS GLOBAL COMMUNCATION BE HELD. ENTIRE COUNTRIES WOULD DROP OFF THE MAP. IT WAS TRULY AN APOCALYPSE, THE RESET.
COMMUNITIES WERE LEFT TO FIGHT FOR THEMSELVES. FEW PREVAILED, THERE NEEDED TO BE AN UNIQUE SET OF CIRCUMSTANCES FOR SURVIVAL.
THERE WAS 50 YEARS YEARS LEFT UNTIL THE PLANET'S SURFACE BECAME UNINHABITABLE. WHERE SOME PLACES PLANICKED; OTHERS WORKED TOWARDS A LONG-TERM SOLUTION.


SUDBURY WAS ONE OF THESE PLACES. AS FAR AS IT IS KNOWN, IT COULD BE HOLDING THE ONLY POPULATION LEFT.
SUDBURY, ONTARIO, CANADA
THE NORTHERN CLIMATE SLOWED THE PROGRESSION OF DISEASE AND FLAMES. MOST TRAVELLED NORTH. THE ONES WHO STAYED BUILT A NEW WORLD OF THEIR OWN, UNDER THE SURFACE.



SUDBURY WAS KNOWN AS A MINING CITY. BEFORE THE ***RESET***, SUDBURY'S ECONOMIC DEVELOPEMENT WAS INCREDIBLE. AUTOMAT WAS TAKING OVER; ORE WAS NEEDED TO CONSTRUCT THESE INCREDIBLE MACHINES. WORLDWIDE, THIS WAS THE LARGEST SUP FOR NICKEL.

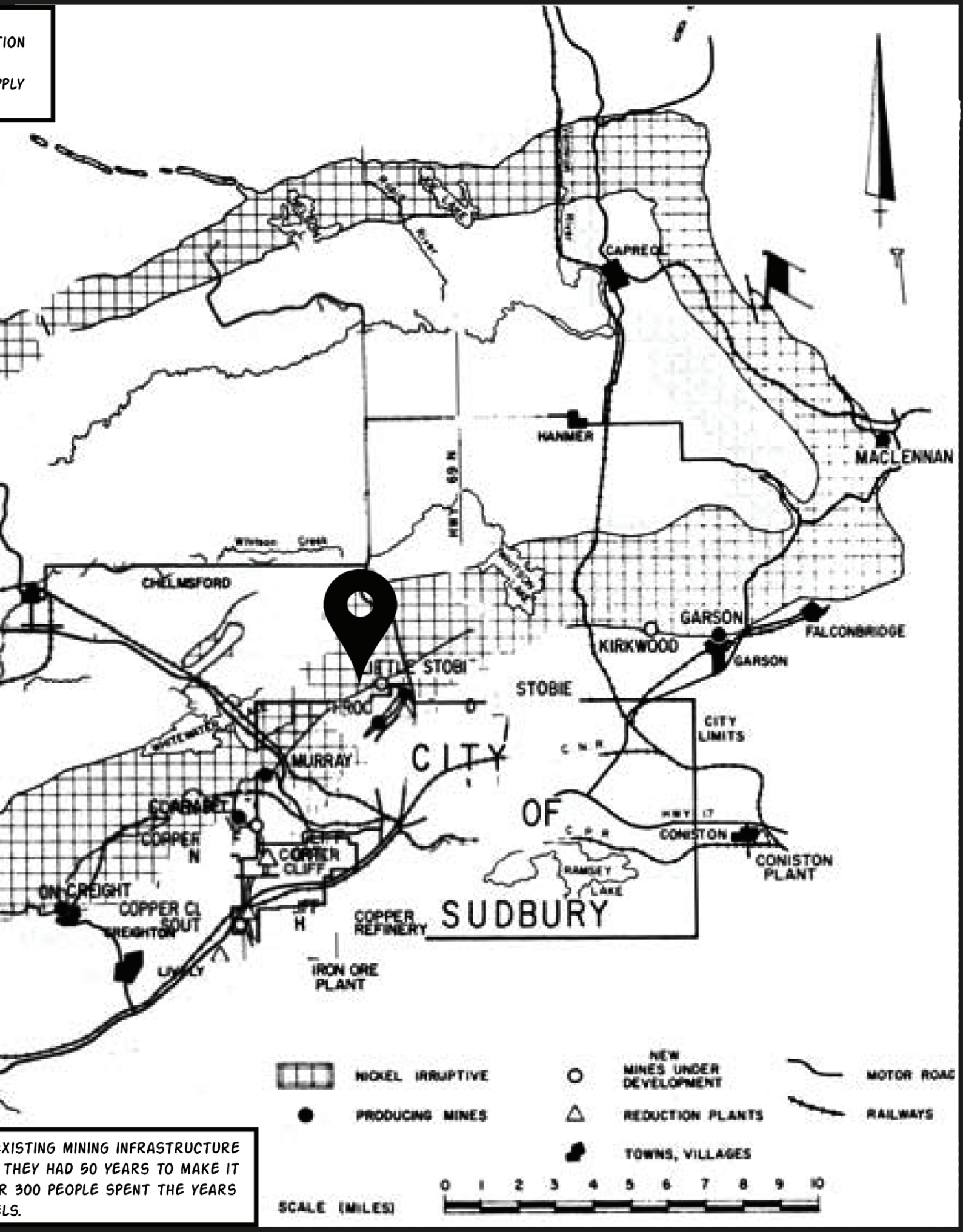




THE REMAINING COMMUNITY OF SUDBURY DECIDED TO USE THE E OF ABANDONNED FROOD MINE AS A SHELTER FROM THE ***RESET***. SURVIVABLE, AND SUSTAINABLE FOR THE UNKNOWN FUTURE. OVE GATHERING, DESIGNING, AND BUILDING ONTO THE EXISTING TUNNE

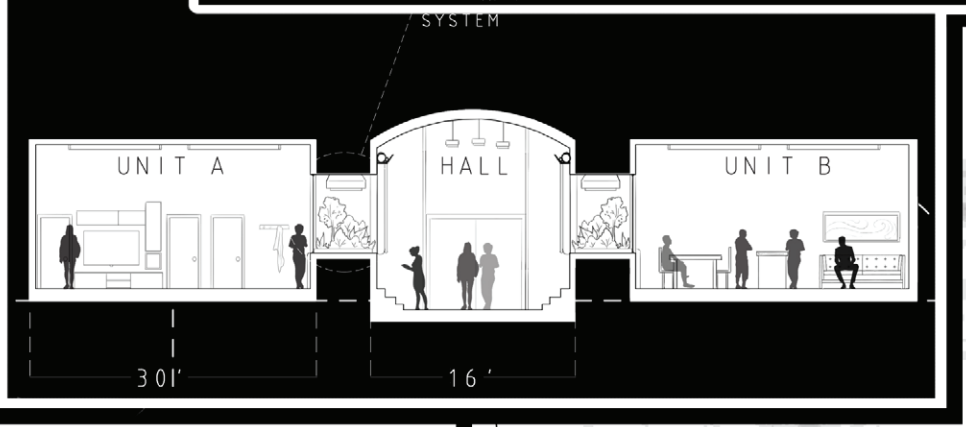
TION

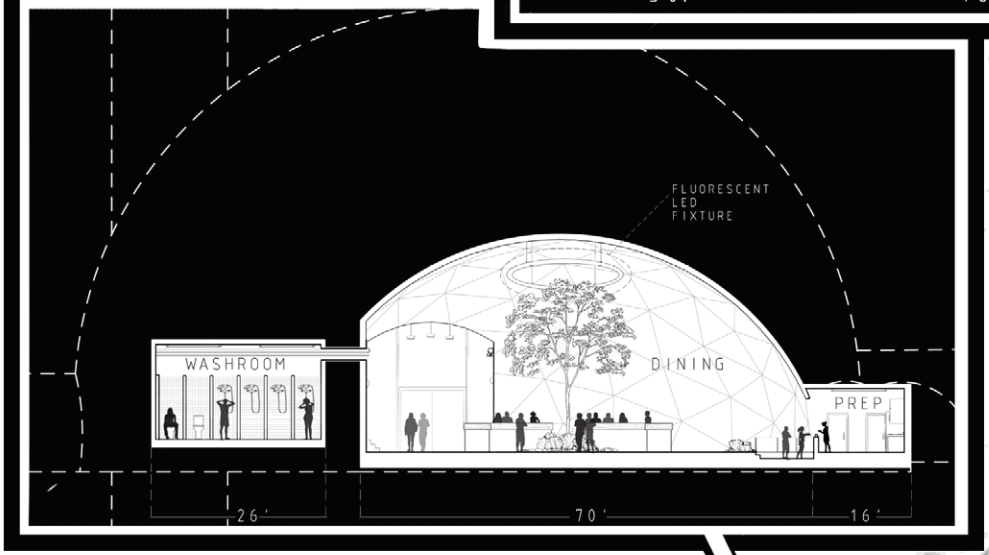
PPLY

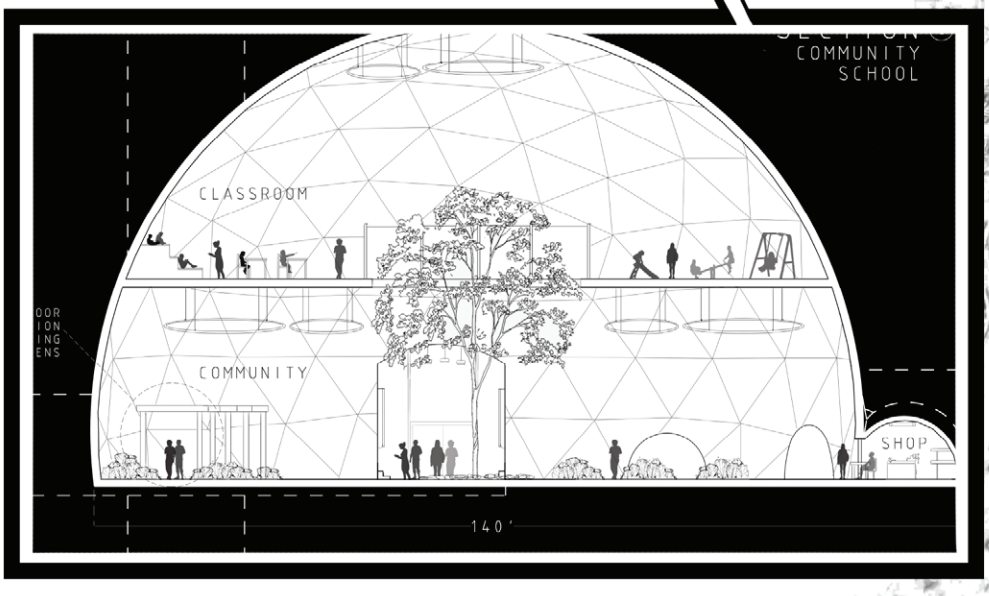


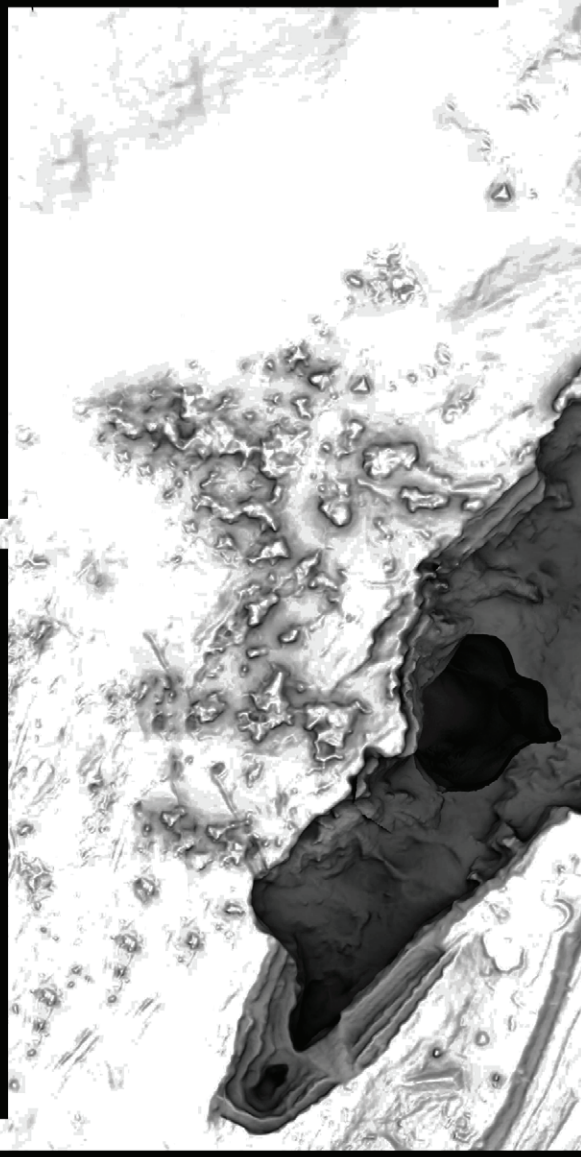
XISTING MINING INFRASTRUCTURE
THEY HAD 50 YEARS TO MAKE IT
R 300 PEOPLE SPENT THE YEARS
ELS.

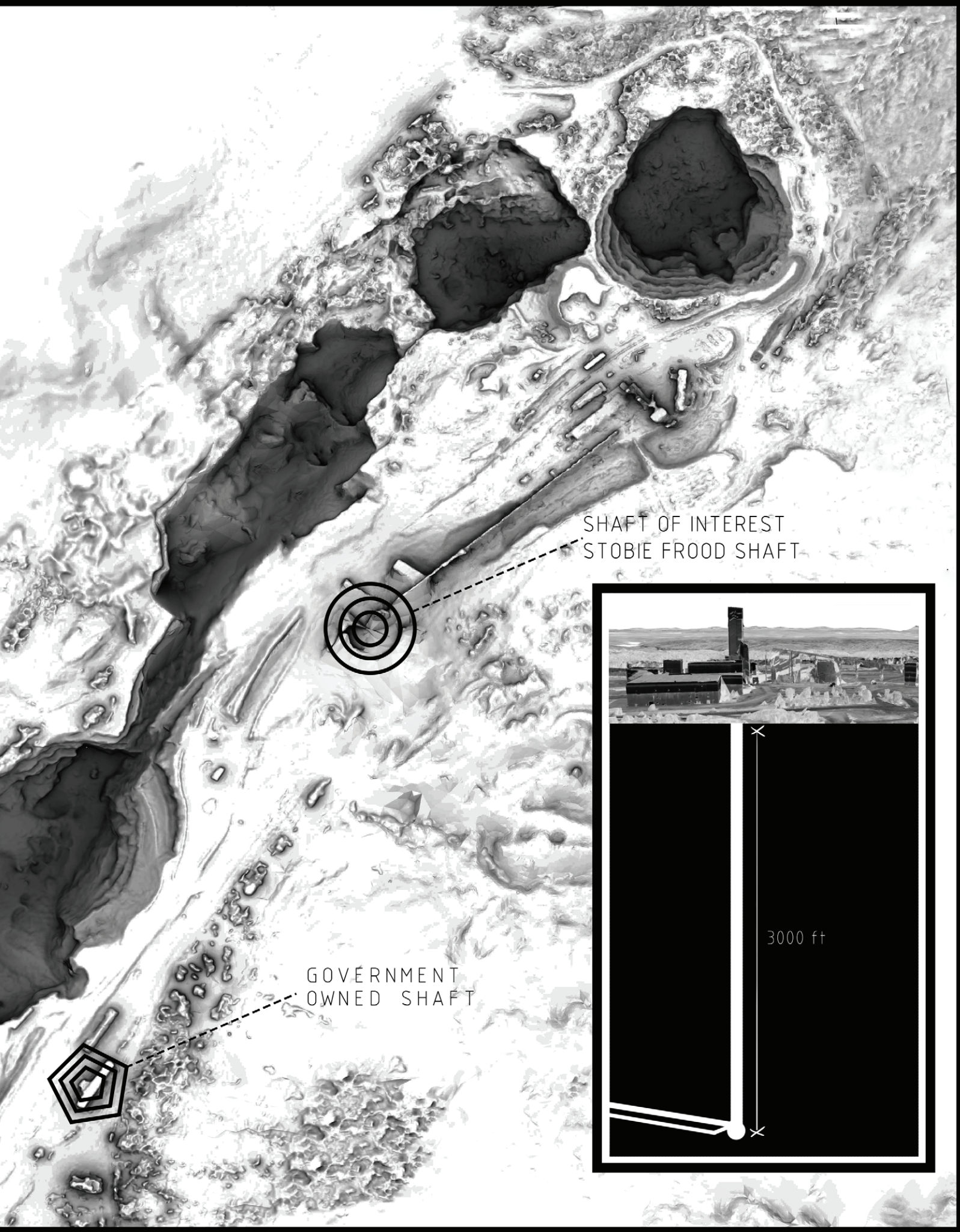
IF YOU ARE HERE, I AM GUESSING YOU'RE READY FOR THE BIG MOVE UNDERGROUND WITH US. NOT TO FEAR! WE AT S.O.L. ARCHITECTS HAVE DESIGNED YOUR NEW HOME AT THE LEVEL OF YOUR UPMOST COMFORT. VAULT 705 IS COMPLETER WITH YOUR VERY OWN 2 BEDROOM APARTMENT, COMMUNITY SPACES, SCHOOLS, AND DINING SERVICES.



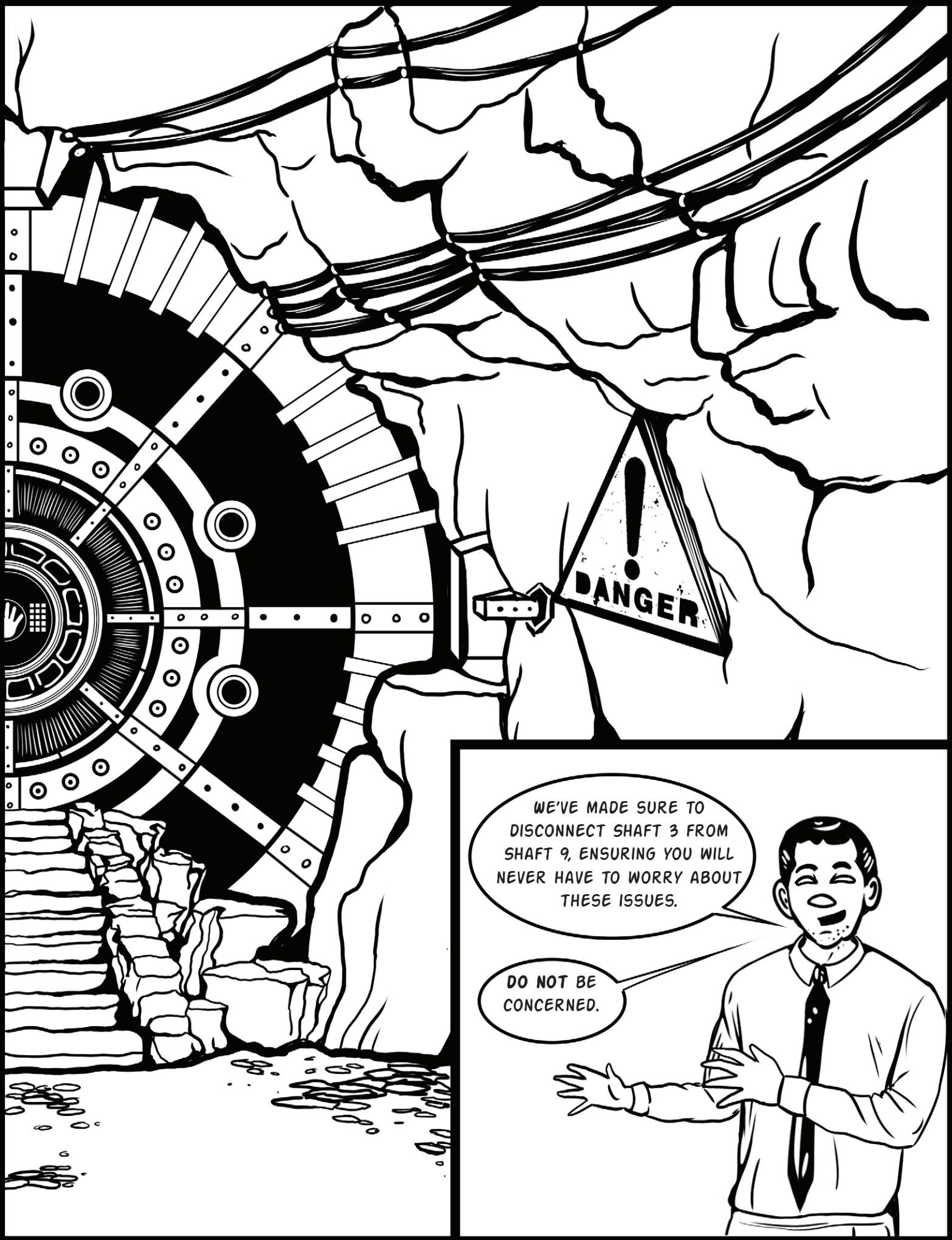


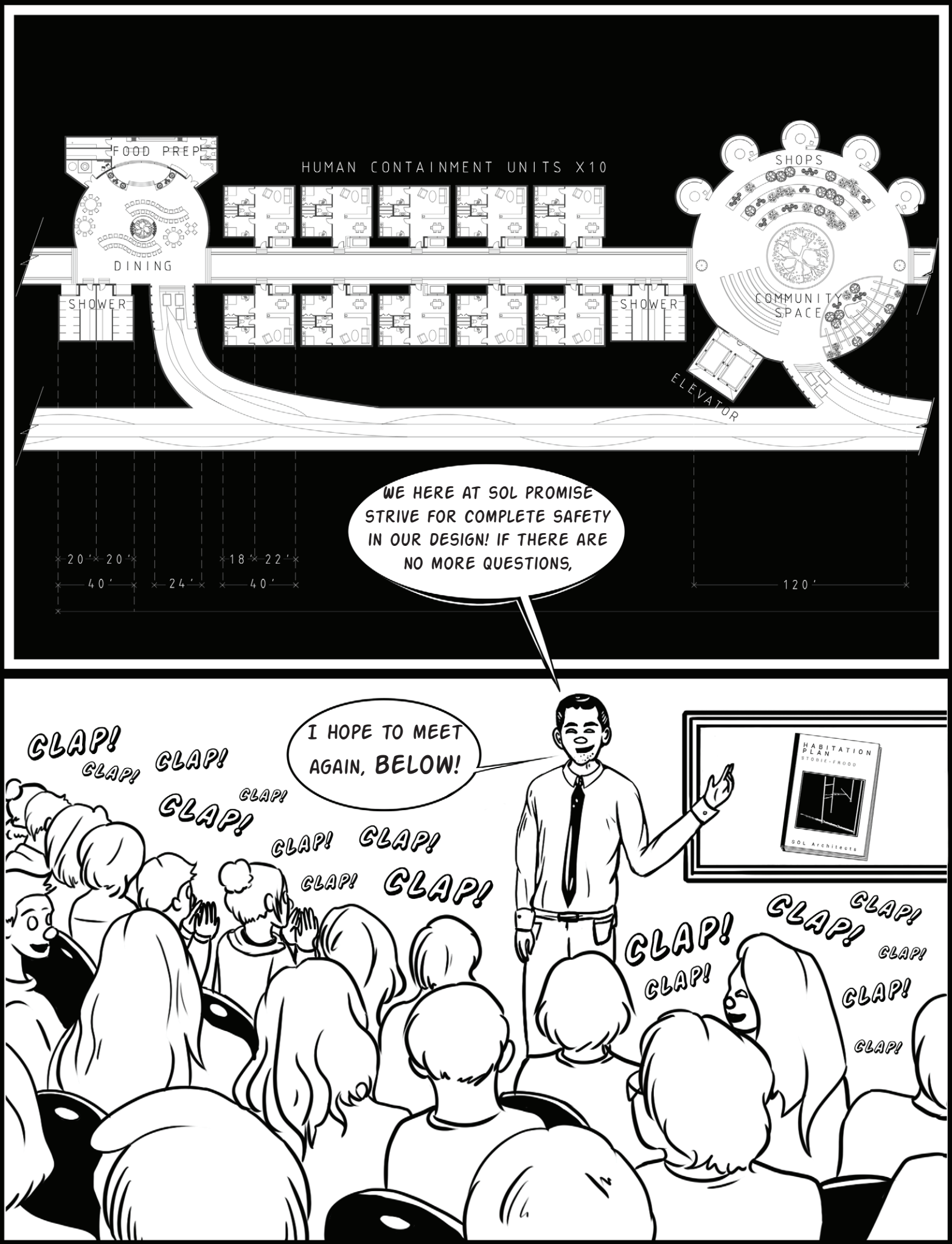





SHAFT OF INTEREST
STOBIE FROOD SHAFT
3000 ft
GOVERNMENT
OWNED SHAFT


WHO'S READY TO MAKE THE PLUNGE?! ANY QUESTIONS?
WHAT IS IN THE GOVERMENT OWNED SPACE?
OH! UH,
NOTHING TO BE CONCERNED ABOUT! THE TUNNELS ARE TOO DANGEROUS.

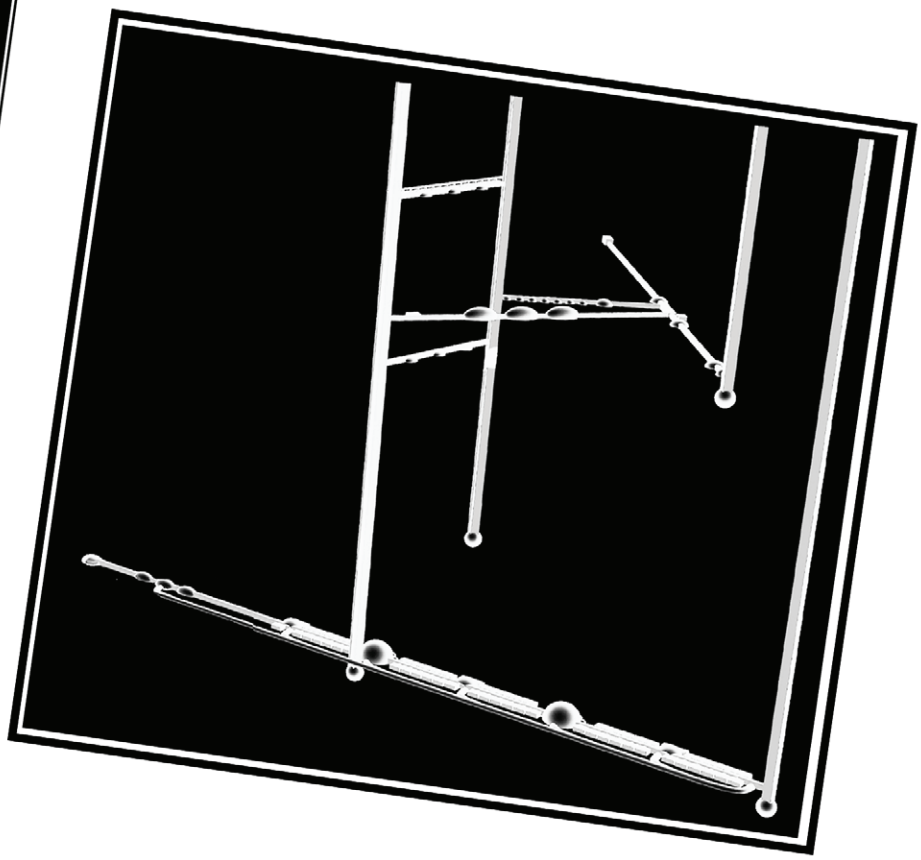

DANGER
WE'VE MADE SURE TO DISCONNECT SHAFT 3 FROM SHAFT 9, ENSURING YOU WILL NEVER HAVE TO WORRY ABOUT THESE ISSUES.
DO NOT BE CONCERNED.


FOOD PREP
HUMAN CONTAINMENT UNITS X10
SHOPS
DINING
SHOWER
SHOWER
COMMUNITY SPACE
ELEVATOR
20' 20'
18' 22'
40'
24'
40'
120'
WE HERE AT SOL PROMISE STRIVE FOR COMPLETE SAFETY IN OUR DESIGN! IF THERE ARE NO MORE QUESTIONS,
I HOPE TO MEET AGAIN, BELOW!
HABITATION PLAN
STOBIE-FRODO
SOL Architects
CLAP!

YEAR: 2125

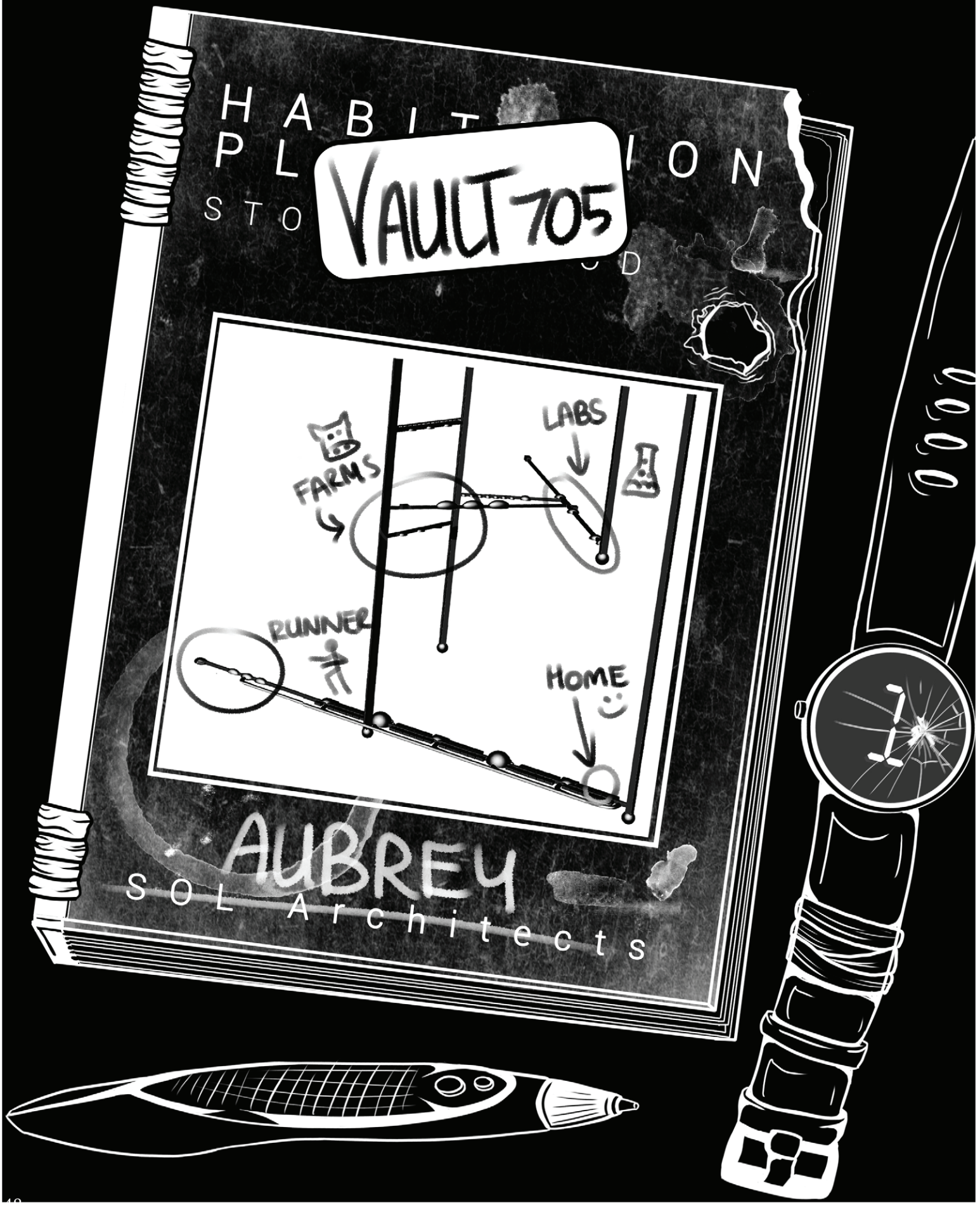
HABITATION PLAN

STOBIE-FROOD



SOL Architects

YEAR: 2200

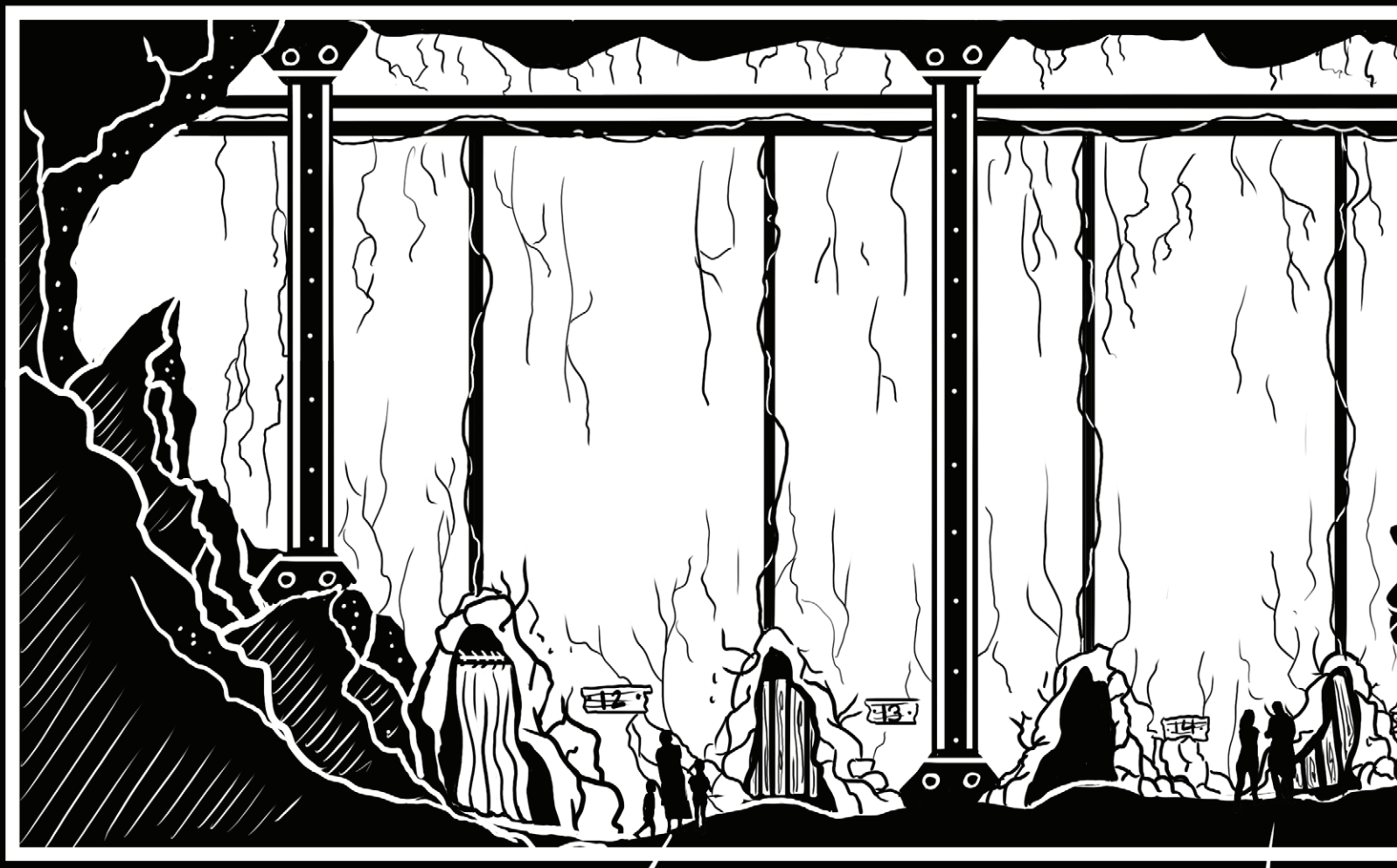

HABIT
PL ION
STO D
VAULT 705
FARMS
LABS
RUNNER
HOME
AUBREY
SOL Architects


VAULT
705


AUG!
BREAKFAST!
AUG's ROOM
301'


I'M COMING JUST GIVE ME A FEW!
HURRY UP YOU'RE GOING TO BE LATE AGAIN!
DON'T FORGET YOUR MASK AGAIN EITHER.
AUG?
VAULT 705
SORRY, I JUST WANT YOU TO BE PREPARED FOR TOMORROW. IT'S TOMORROW RIGHT?
YES DAD, I FIND OUT WHAT CLASS I'M IN.

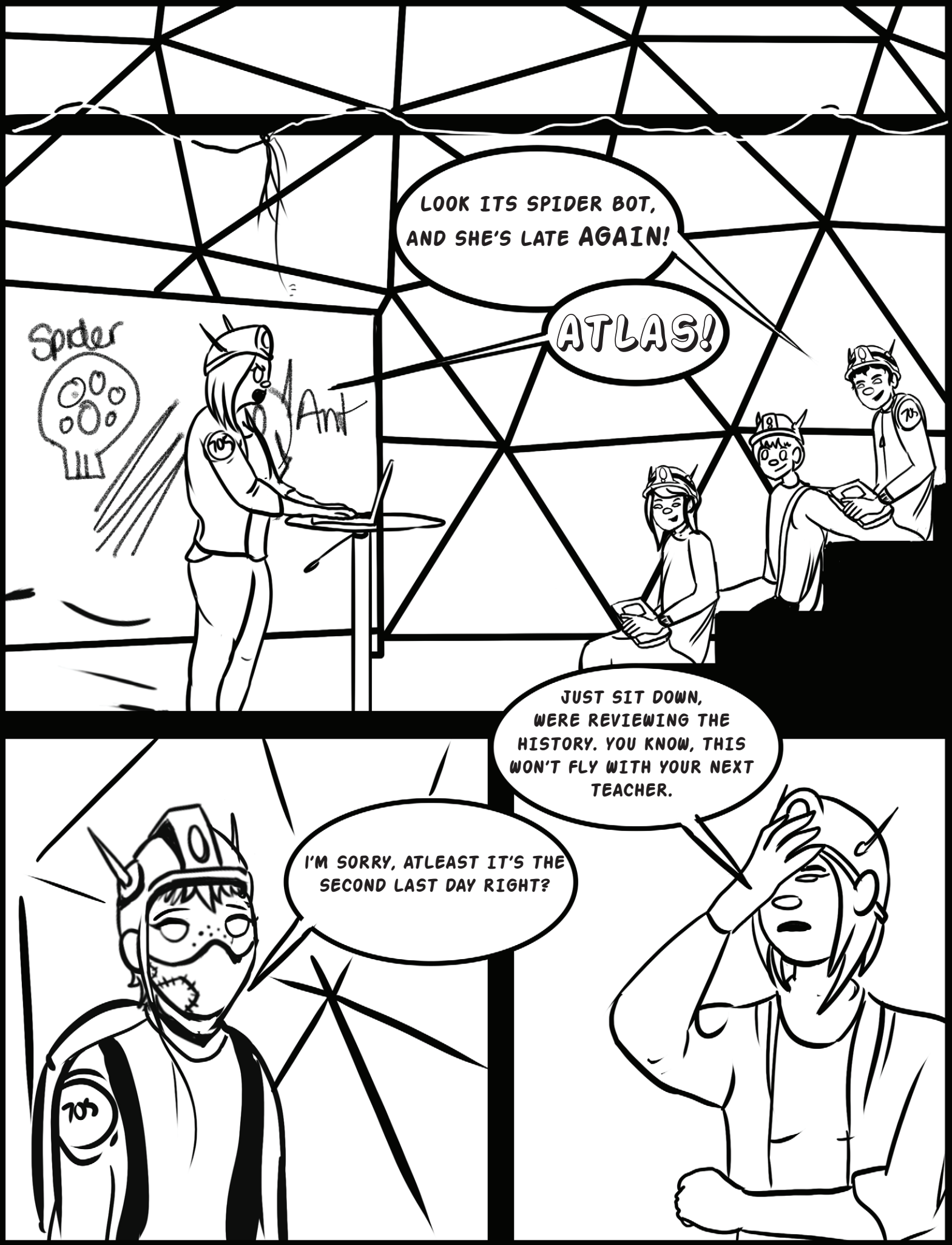

I AM NOT TOO WORRIED THOUGH, OF COURSE I'LL BECOME A SCIENTIST! BUT I MEAN, I WON'T BE TOO MAD IF I BECOME A SUSTAINER EITHER.
BEING A SCIENTIST HAS ITS UPS AND DOWNS, BUT I KNOW YOU'LL DO GREAT! IN THE LABS, WE NEVER REALLY HAVE TO DEAL WITH RUNNERS. *THEIR KIND* ALWAYS HAS SOMETHING SNARKY TO SAY WHEN THEY DROP OFF MATERIAL. IT'S NICE TO BE SECLUDED FROM THE *OTHERS.*
705
S
I GOT TO RUN DAD, I'LL SEE YOU TOMORROW MORNING!
705



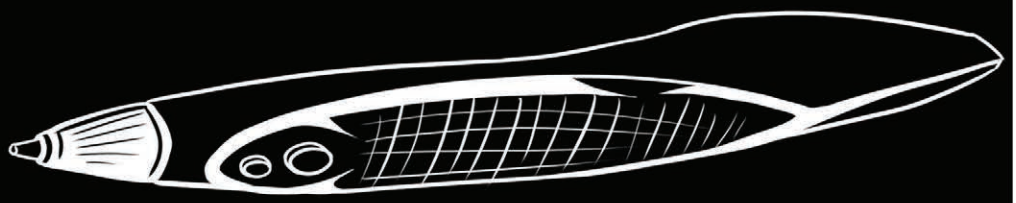

AUB!
COME HERE.

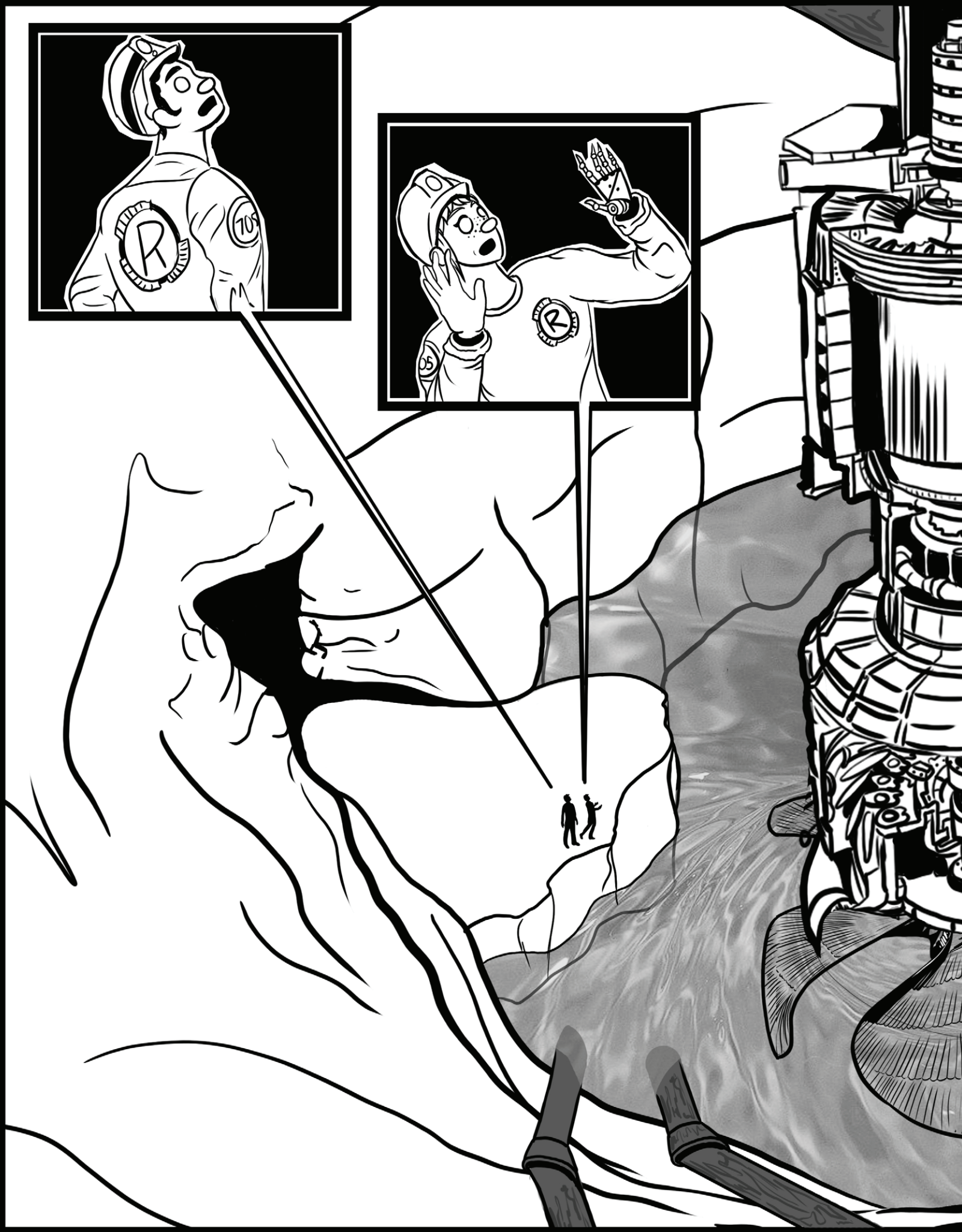

IT'S BEEN A WHILE, I'VE BEEN WORKING ON SOMETHING NEW FOR YOU. ROOMBA HERE HAS GATHERED SOME MORE MATERIAL FOR IT! YOU KNOW, HE'S JUST AS EXCITED TO WORK ON IT AS I AM. RIGHT ROO?
ROO!?
...
705
705


AUB... AGAIN? YOUR FATHER TOLD ME ABOUT TOMORROW, YOU MUST BE EXCITED! YOU KNOW, YOU'D MAKE A GREAT SUSTAINER!
TELL MY DAD THAT! ANYWAY, I BETTER GET UP THERE. I WILL COME BY AFTER CLASS TO VISIT YOU AND ROO.
GREAT, ITS BEEN BUGGING ME LATELY... MAYBE AFTER SCHOOL I'LL COME BY AND SEE WHAT YOU GOT. I WOULD RIGHT NOW, BUT I AM LATE FOR CLASS AGAIN.


LOOK ITS SPIDER BOT, AND SHE'S LATE AGAIN!
ATLAS!
Spider
Ant
JUST SIT DOWN, WERE REVIEWING THE HISTORY. YOU KNOW, THIS WON'T FLY WITH YOUR NEXT TEACHER.
I'M SORRY, ATLEAST IT'S THE SECOND LAST DAY RIGHT?

TO BE CONTINUED ...

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705
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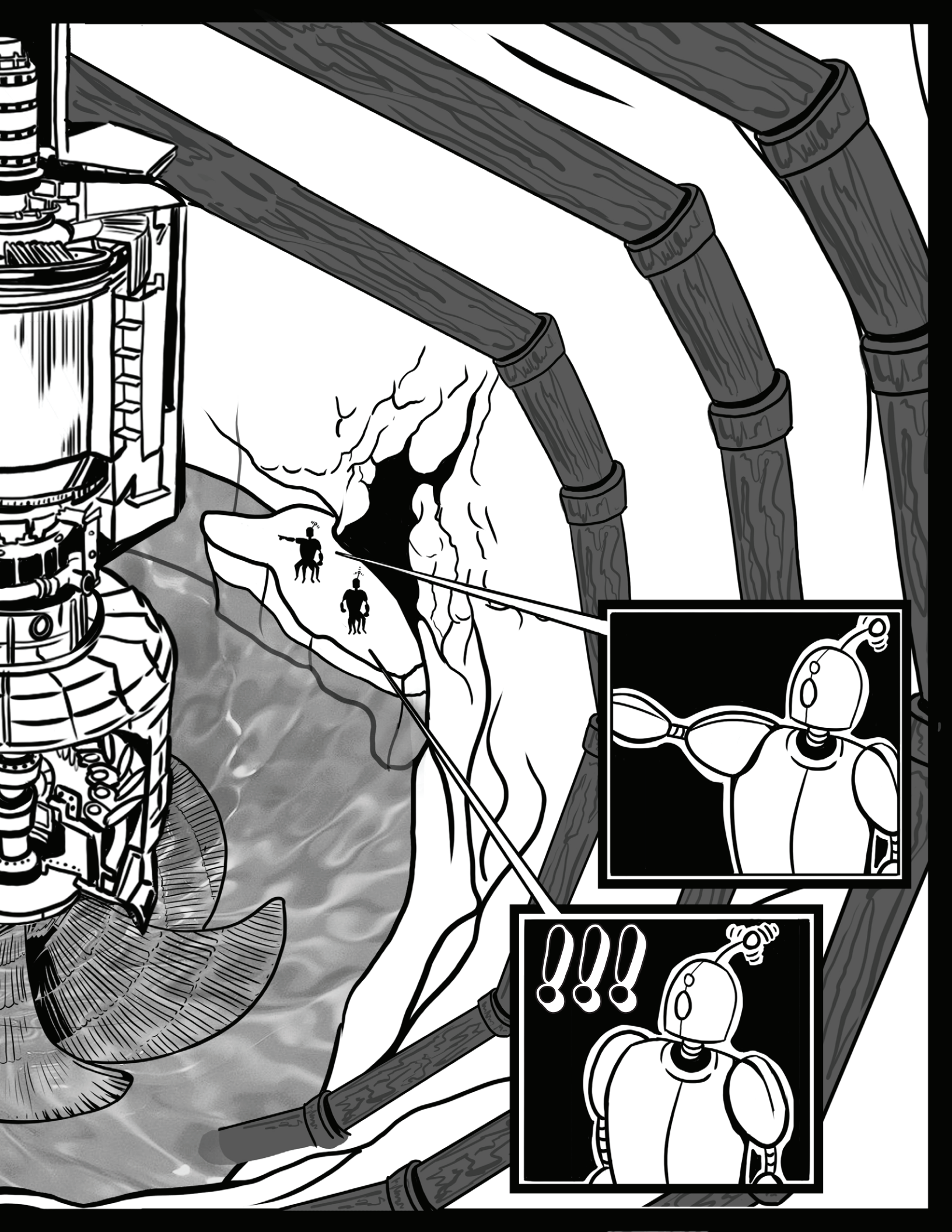

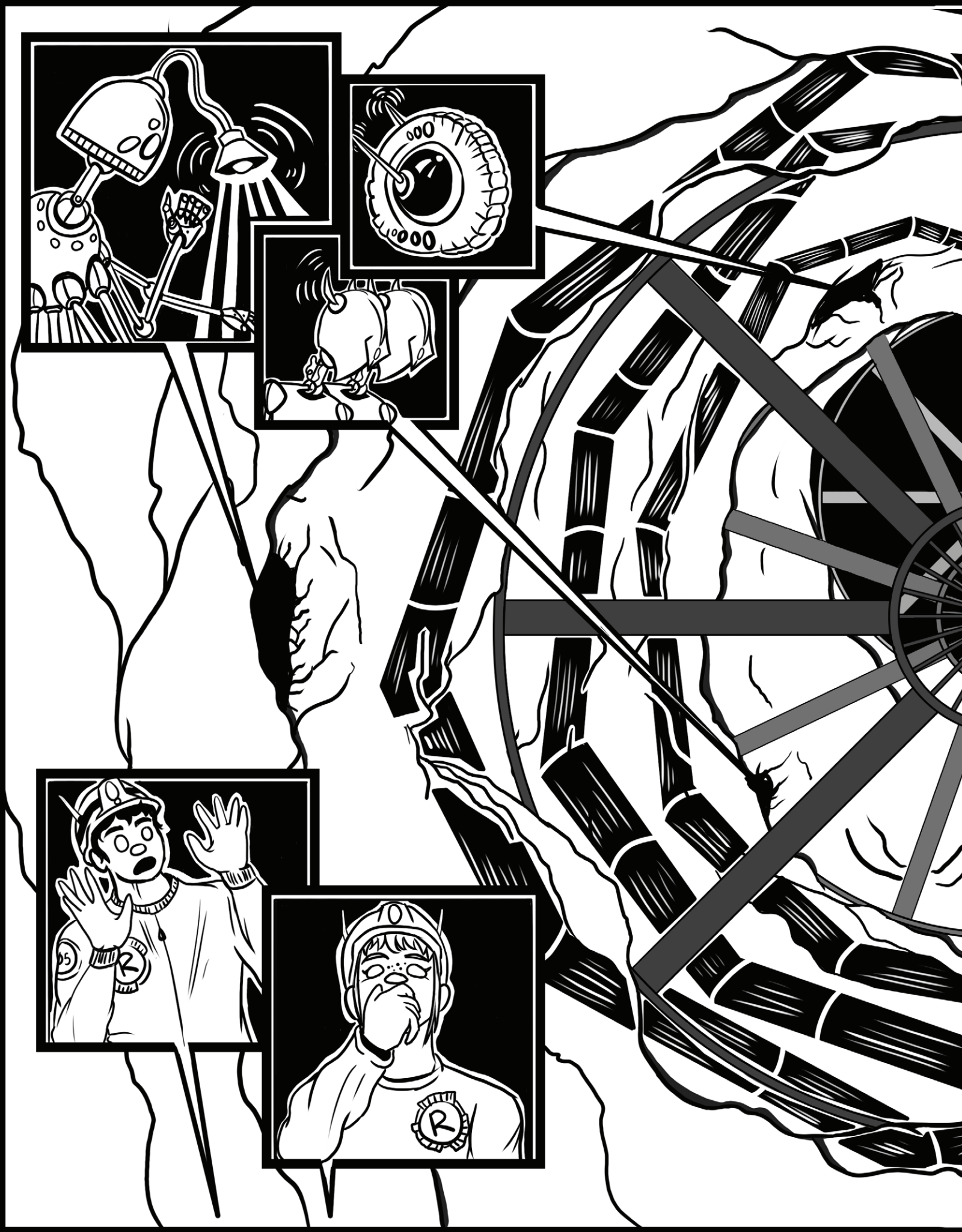

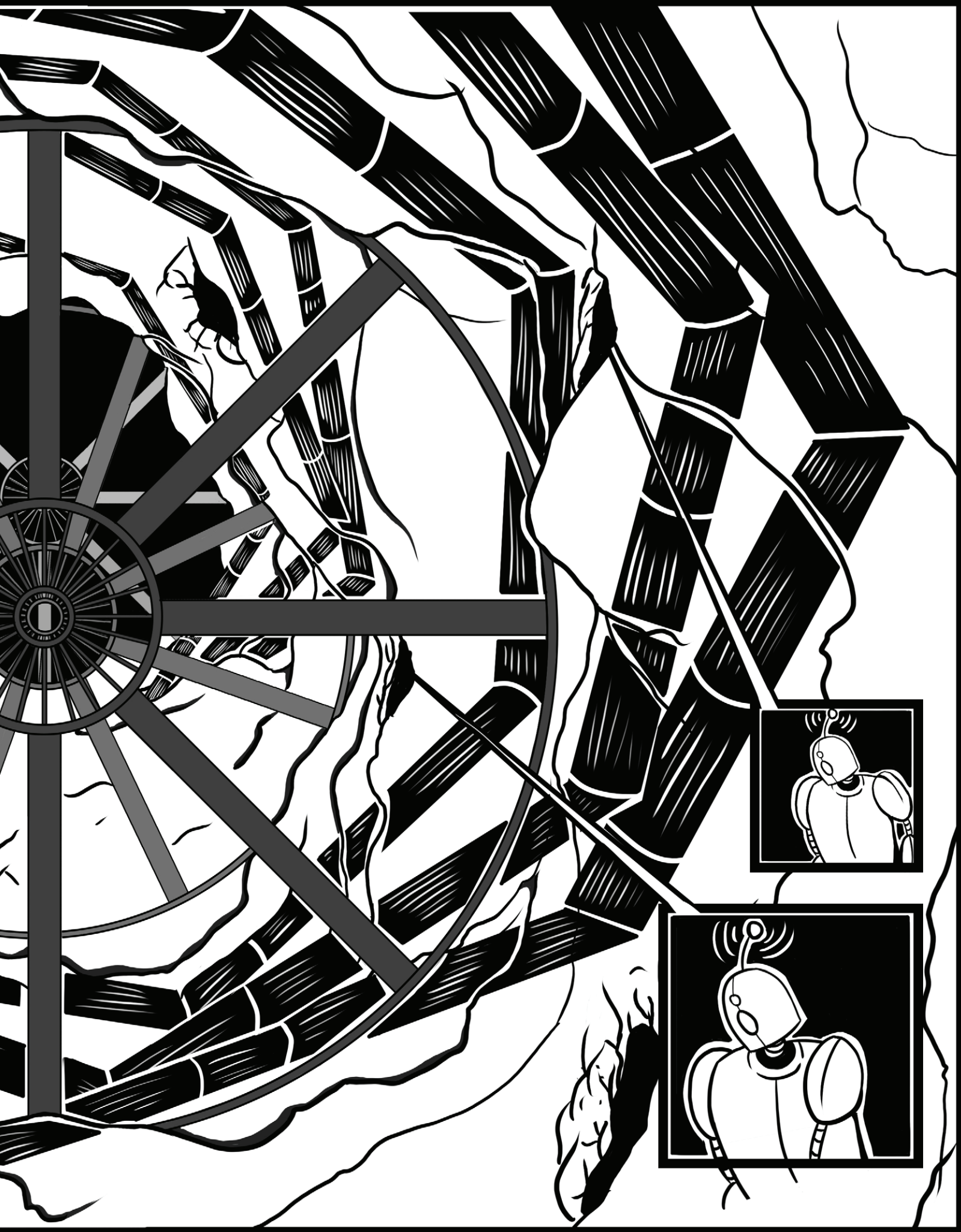

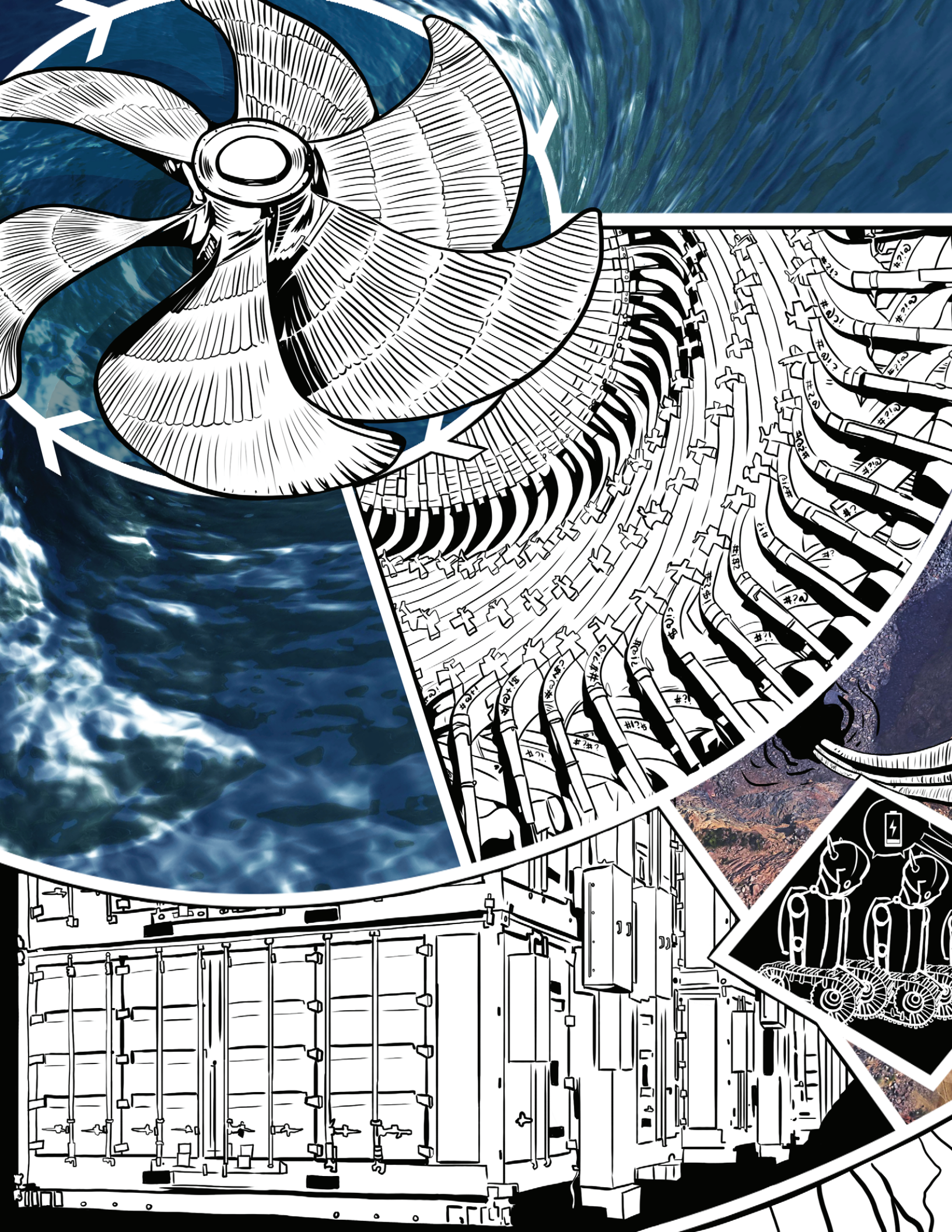

BIBLIOGRAPHY

ANNOTATED BIBLIOGRAPHY OF RELATING RESOURCES

PRIMARY SOURCES:

1. Harbison, Robert. Eccentric Spaces. Cambridge (Mass.): MIT, 2000.

Harbison's theory revolves around provoking theory intertwining with the imaginative mind. He goes through different architectural spaces in his chapters which are: gardens, rooms, buildings, streets, museums, maps, and fictional topographies to explain his concept. Harbison believes that we take art as its subject, because it's easier to understand. This makes us believe we can explain art ourselves; which we cannot because it will never truly fully explain an object or idea. It over simplifies concepts. He is tempting the reader to bring fiction and imagination into their real lives on the same plane; tindering new and improved ideas in the contemporary architectural world. There is much value in blurring the barrier between the physical and the mind's created fiction. If humankind just stuck with what is attainable logically; new theories, designs, and inventions would never continue to improve and change. This theory of blurring assist with breaking boundaries for thesis work; expanding the guidelines and opening new paths for ideas.

2. Ingels, Bjarke. *Yes Is More: An Archicomic on Architectural Evolution*. Kbh.: Bjarke Ingels Group, 2009.

Yes Is More is an archicomic by BIG architects. The purpose of this comic book was to explain the firms theories, concepts, and design process through a meaningful method; allowing for the reader to experience through the pages. A deeper connection is created by using strictly images and text in a graphic way. The concepts the firm tries to push is the evolving and adapting using conflicts in society contemporarily. Instead of falling through these issues affecting architecture, the design can instead thrive using the conditions to its advantage. Throughout the book, there are boundaries broken and explored for architectural design. Some of the designs do not initially work, but turn to be very useful as an exploration tool in the long run. Importantly, a huge part of this book is the idea of the comic book. Not only does it make it easier for a reader to understand, but it creates another language that anyone can understand. It takes complicated architecture and explains the concepts through pictures. A non architectural mind can be caught drawing out the key ideas from the texts, even without prior knowledge in the field.

3. Rossi, Aldo, *The Architecture of the City*. New York: MIT Press, 1982.

Architecture in history has repetitively standardized types of ideas and forms. He believes that these aren't just fads that change over time. The modern city is an object or an artifact consisting of these criterion. Architects are to understand and follow these criterion rather than destroy this layer of the artifact. There is a proposal here to refer back to some of the valued classics of architecture theory; that the city must be valued as a process over time. Another concept brought forth in this book is the fact that the city and its architecture are directly linked together, and cannot be separated. There is a permanence of architecture that cannot be erased; therefore not separating the two. Time is a construct in which holds these two aspects together. There will always be memory of architecture in a city, whether it is physically there or it has left its mark on future architecture of the city. All of these concepts are important to add permanency to thesis projects; even if they may not directly affect the whole world of architecture, they will still play a small part in time.

4. Rowe, Colin, and Fred Koetter. *Collage City.* Basel: Birkhauser, 2009.

Collage city overlooks the ideas of modern city planning through modernists case studies. From here they argue that the advancement and focus on science overtook the poetics of architectural designs ruining city designs. City design must be deciphered through a collage of ideas and theories instead of just following a singular path. By adapting using fragments throughout time, the city design is more transcending. The city itself would be able to create self sufficiently with these fragments. The importance of this text in architecture is the idea of taking juxtaposed elements and forcing them together into one object. This one object becomes deeper as more elements are added; there is a tremendous amount of strength in one rather than opposing clashing pieces. This method will assist in gathering and layering information for thesis. It will bring together elements otherwise unrelated into the bigger picture.

5. Scheppard, Lola, White, Mason. *Many Norths: Spatial Practice in a Polar Territory.* New York: Actar Publishers, 2017.

Written as an exploration of conflicts, influences, and opportunities indigenous communities in the far north of Canada are facing relating to the spatial practice in architecture. The ensemblement of this book is complete with many images, diagrams, and case studies to strongly create a vivid view for the reader to understand the important concepts. The argument of the book is that these indigenous designs can be contemporary viewed and valued in modern day architecture. Techniques used in planning, graphics, building techniques, and integration can be informed by this text assisting in integrating and discovering new methods into architectural academics and the practice. Another aspect that this text is trying to tackle is the idea of place. In relation to the McEwen school of architecture; Sudbury, local design issues are tackled to understand the site, people, environment, and culture which greatly influences architectural design. The indigenous north architecture of Canada directly is influenced by the environment and culture; which this book brings the reader through. It informs academically the north of Canada has tackled designs, which techniques can be extracted from.

6. Semper, Gottfried. *The Four Elements of Architecture*. Cambridge University Press, 2011

Semper's main argument in this book is that explanations architectural design can always lead back to the study of human behavior, cultures, and civilizations. To support this claim architecture is related to Semper's 4 elements: Hearth, Roof, Enclosure, and Mound. These elements may seem so simple to human survival and tradition, but that is why Semper's theory is so strong. Architecture in the modern realm tends to become overly complicated at times. Reflecting back on this text allows for a better understanding of why architectural design could be the way it is modernly. The humans mind creates the architecture; therefore basic human biology and interaction greatly influences architecture historically, and modernly. Additionally, he was able to select many architectural typologies instead of focusing on a singular for his theories. This strengthened his theory because the strength in an universal theory versus one; more coverage with his texts. His theories are more applicable to architecture generally, and this is probably why the text has remained timeless.

7. Shields, Jennifer A.E. *Collage and Architecture*. New York: Routledge, 2013

Shields argues in her text that college is an important stitching in architecture that can be used to bring together disconnecting elements in design. She mentions the different layers of architecture such as: human activities, materials, furnishings, objects, environments, etc. that are all differently related but collaged through the media of architecture. The collage however, is never constant as these elements are continuously changing over time; a forever evolving piece of art. New concepts are collaged over the old, leaving marks from the past on the new elements, just as a collage is pasted together. This theory of collage is important to architecture because it always allows for room to improve, to paste and provide new parts to an ensemble of the design. In collage, there is no logic to follow, mess is valued because it is not organized in the manor of collage. These new configurations can be embraced rather than feared for the progression of the design world. The concept stimulates imagination. More importantly, inspiring new additions to contemporary design.

ESSAYS:

8. Beck, Peggy V. Ways of Knowledge, Sources of Life, DINE College, Arizona, 2001 Pg. 47 - 63

Beck believes through her text that western education is very separate from the sacred. There is importance of learning through feeling and experiencing. The main argument is that learning this way allows for better personal awareness in this world. By being vulnerable in this society through teaching, it opens the gates for an improved learning experience by allowing more information into the mind. Sacred Indigenous teachings are taught through story and have been taught through generations by word of mouth. This clashes with European Academics because it is taught in writing. Overall, this informs the reader that the way that they are taught in academics may not be the full story. It is important to experience and add new teaching methods to their learning pallet as some are more informed in different scenarios. Another point is that there is no singular path to a definitive answer; many routes must be explored.

9. Guy, Simon, Graham, Farmer. *"Contested Constructions: The competinglogicsof green building andethics" In Current Theories of Sustainability*, Carmella Cucuzzella 73-87.

The argument of this text is that there is such a broad focus on green architectural design, we are not improving efficiently. There are so many contradicting methods which affect each other that it's slowing progression in design. The text outlines the challenges in in analyzing methods of green design. The conclusion to this text states that social constructivist approaches to understanding green buildings helps in defining interpretations of these design problems. It is important to relate the elements of the social, cultural, and environmental together when exploring these design conclusions in "green" architectural design. All of these processes rely on the individual committing to the design and allowing for the full understanding with environmental methods.

10. McMorrough, John. *Ru(m)inations: The Haunts of Contemporary Architecture" In Theorizing a New Agenda for Architecture*, 462-470. New York: Princeton Architectural Press, 1996

In this essay McMorrough is writing about how he believes that in architectural design today there are zombies. Architects are in a cyclical pattern, consuming the past knowledge and regurgitation patterns and behaviors. This is haunting contemporary architecture, it is counter productive and obsessive in itself. Academics and architects can't only rely on past methods; they must progress and discover new methods. The main question McMorrough has is if we are creating new theories and architecture, or are we always just modifying and shifting past methods. This is inspiring for thesis because the idea of creating new methods could assist in progressing the practice in smaller steps. Hopefully changing the cyclical, zombie progression of architectural design.

11. Nesbitt, Kate. *"Part 1: The Necessity of Theory" In Theorizing a New Agenda for Architecture*, 16-72. New York: Princeton Architectural Press, 1996

Nesbitt introduces the beginning of this collection of essays by arguing the necessity of theory. She fights that theory is very important to influence solutions based on explorations. Continuing she goes on to categorize theory into types promoting order in the study of theory. Theory overall comes in many abstractions and can be used in a variety of ways to assist our thesis work. Contemporarily thesis is combatting many issues our society is facing, addressing the crisis in the architectural discipline. By valuing the past methods of creating and following theory, thesis work will become more informed and stronger at assisting current architectural crisis.

12. Ngo, Jonathan. *"An Imagination for Future Histories" In Thesis* 2016, edited by Sam Choi, Alice Colverd, Cassandra Engstrom, Diego Gonzalez, Thomas Heyer, Jonathan Ngo, Vanessa Tai, Janine Wang, 64-65. New York: The Irwin S. Chanin School of Architecture of the Cooper Union for Advancement of Science and Art, 2016

Ngo's argument is that architecture has the ability to influence experiences of currently detached spaces. Architecture can be the vessel between human existence and our earth for example. For the exploration of this concept the author designs a space for the Atacama Desert; a landscape destroyed by mining. The focus of this text is the creation of a garden to create a bridge in an industrialized landscape. This is to slowly unwind the effects of industrialization and undo the damage done in time. It creates a experiential space within the landscape; for the rediscovery of the landscape. Following experiences is a valuable method in exploring space and creating designs as it fully relates to the human program.

13. Stern, Robert A.M. *"New Directions in Modern American Architecture"* In Theorizing *a New Agenda for Architecture*, 98-105. New York: Princeton Architectural Press, 1996.

Stern examines how society can be classified by exclusivists or inclusivists. He brings examining movement in architecture in the elements of social, cultural, and political design issues. His main argument is that postmodernism can be categorized into 3 main principles. To support his claim how buildings roles are communicative through history. The argument is explained through the principles of ornamentalism, contextualism, and allusionism. Although theories can seem different, this essay brings different concepts together through these principles, stating how they can interact with each other to improve designs contemporarily. Buildings can become more meaningful using past methods, enriching the references in current design.

ADDITIONAL SOURCE MATERIAL:

14. Spiegelman, Art. *Maus: A Survivor's Tale*. New York: Pantheon Books, 1986-1991.

This comic book is a memoir/ autobiography/ biography about Art Spiegelman describing his father retelling him his experience in the holocaust as a Jewish man in Nazi, Germany. Spiegelman uses animals as his characters throughout the whimsical comics to bring forward tough topics easier to understand in the comic form. He is making history more digestible for the reader. This form of method is what will be used through my thesis. The use of a social commentary through emotions replicated through comic book will be helpful throughout the process. Spiegelman's book was successful because of the fact he tackled such a rough topic; in a simpler way.

15. *A Boy and His Dog*. Directed by L.Q. Jones. Performed by Don Johnson and Susanne Benton. USA: LQ/JAF Productions, 1975.

The film is about a nuclear apocalypse wiping out the planet's population destroying civilization as it is known modernly. It follows a boy and his speaking dog through the deserted, uncivilized landscape where they eventually find a woman and a cult society underground. The psychology represented even in an old movie is really interesting to decipher. In a mass destruction scenario, people are minimized to their most basic biological elements. Structures in the movie responded to the idea of building underground in response to the apocalypse. My thesis project will also respond from apocalypse by designing an underground structure.

16. *"Architecture for the Apocalypse (Now)."* ArchDaily. December 21, 2012. Accessed November 9, 2018. https://www.archdaily.com/310542architecture-for-the-apocalypse-now.

This article goes through different architectural case studies that are in response to anxieties of a nearing apocalypse. Whether it be human protection space or archival space these designs hold importance to the rearing future. Also explored in this text is buildings that could possibly survive through a potential apocalypse. These case studies are very integral to evaluate in the continuation of my design process.

17. Architecture in Comic-Strip Form. *Norges Største Museum for Kunst, Arkitektur Og Design - Nasjonalmuseet*. Accessed November 10, 2018. http://www.nasjonalmuseet.no/en/exhibitions_and_events/exhibitions/national_museum__architecture/Architecture in Comic-Strip Form.b7C_wlfQ3c.ips.

The article outlines how effective to use comic book methods in architecture to collaborate, communicate ideas, and convey criticism. The comic book is a method for non-architectural people to engage with the design. Just as it is easier to teach a child with books with little text and large images, the comic becomes a vessel for this information. A much wider audience can be reached with this method.

18. *Fallout 4*. Bethesda Game Studios. USA: Bethesda Game Studios, 2015.

Fallout 4 is a video game that takes place in 2287, after an nuclear apocalypse that in in 2077. The game starts the player in an underground vault used to cryofreeze and shelter people from 2077 - 2287. These vaults are important to my studies as I will be creating a shelter in conversation with an contemporary apocalypse. This game will assist in looking at possible structure types and connection types that could be replicated in the design. Also, it allows for the introduction of psychological events that may take place in the underground.

19. *Interstellar.* Directed by Christopher Nolan. Performed by Matthew McConaughey and Anne Hathaway. USA, UK: Paramount Pictures (North America), Warner Bros. Pictures (International), 2014.

The movie Interstellar is about an apocalypse regarding the damage of crops destroying human civilization. There is also disease through dust spreading and all of these factors relate back to the destroying aspects of civilization on our planet. The main character heads into space to navigate a ship to try and find a new location for civilization to commute to while his daughter later on discovers the answers on how to save the planet. The purpose of researching this movie is the factors in which caused the apocalypse and the process in which this was solved. This is of value to my thesis because it relates back to the idea of the apocalypse and what could actually happen in the near to late future.

20. Ōtomo, Katsuhiro, Yoko Umezawa, Linda M. York, and Jo Duffy. *Akira.* NY, NY: Kodansha Comics, 2009.

Otomo writes a comic taking place in Japan, where a group of misbehaving teens discover a whole new world in their own space. The importance to thesis in this text lies in the images and representation of architecture. Otomo creates meaningful, experiential spaces in his work. There is a focus on this over the characters at times; the reader can explore these spaces and memorize maps within.

21. Snyder, Scott, and Greg Capullo. The Court of Owls. New York: DC Comics, 2013.

This is a comic about Batman conflicting with a secret society called the, “Court of Owls”. The content within this book story wise is not as relevant as the representations of comic and architecture throughout the book. Many inspiring methods of how the comic is presented is most important. The reader is engaged through rotation of the physical book, detailed architectural drawings, and the integration of environment through panel types in the comic. This will help my thesis as comic is the method in which it is presented in; engaging the reader immensely into the text.

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This video is a documentary of Spiegelman’s experiences and work in interview form with him. He explains why he got into comic books originally because of the fascination with the reaction of people to the comics. He was also able to present in a new way with his art. He draws his own experiences in multiple books like, MAUS and In the Shadow of No Towers. I want to replicate this method in my eventual drawing project that goes along with my thesis.

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