Post Apocalypse of the Future:
Architectural Potentiality in a changing world.

by

David Gagnon

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APPROVED/APPROUVÉ

Thesis Examiners/Examinateurs de thèse:

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

Dr. David Fortin
(Thesis Second Reader/Deuxième lecteur(trice) de thèse)

Dr. Ted Krueger
(External Examiner/Examinateur(trice) externe)

Approved for the Faculty of Graduate Studies
Tammy Eger, PhD
Vice-President Research
Vice-rectrice à la recherche
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Contents

Abstract

Post Apocalypse of the Future:
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Due to the looming Climate Change threat of anthropogenic[1] origins, the prospects of humanity's place in the world are uncertain. Conceiving an architectural response that would serve as the basis for humanity's survival under these new climatic conditions becomes a question of adaptability and potentiality. As wrought out by Climate Change's effect on an environment and its people over time, the immense gamut of possibilities implies that the potential conditions a society might find itself in are undoubtedly vast. Therefore, it is insufficient to conceive an architectural response that satisfies only one of those conditions. This thesis creates a framework that may generate potential architectural responses in dialogue with Climate Change. It maps out potentiality onto a site and discovers the architectural responses embedded within without being prophetic. To do so, criteria are first established.

1 - Developing an understanding of the temporal aspect of Climate Change and how something might need to respond.

2 - Involve a certain degree of speculation, so as to allow room for change and response.

3 - Outline an understanding of the milieu[2] as an extension of the idea of site.

4 - As an extension of speculation, the inclusion of filmic apocalyptic science fiction films provide a sense of the current thought regarding Climate Change and its impacts on society and the world.

Combining the aforementioned criteria, this thesis explores the potential of Climate Change to drastically change the world, and subsequently, a milieu, over time. This project seeks to examine the many modes of transition that occur during an apocalyptic process and how a subject might respond. It is more or less impossible to quantify a "good" or "bad" response. One would be remiss to imply that a set solution can be generated. Even simply using the word 'solution' would suggest an idea of finality, binarity, right or wrong, or up or down. Instead, it is essential that a flexible range of architectural responses, in response to a flexible gamut of points of perturbations, times, responses, lines, fields, etc., is developed during the mapping of potentiality that this project entails. Whatever this means is indeed left to interpretation.

1 Of human origin.
2 More than a site, it condenses additional information onto an area. Definition by author.

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Merci Ra'anaa pour ton amour, ta patience, ton aide à nettoyer mon bordel de texte, et pour me laisser me ventiler sans cesse, malgré avoir autre chose à faire.

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Thank you Mom & Dad, for your love and support, all the while not overly questioning what the hell your son was doing.

Thank you friends, for the warm and kind words of support which brought me all the way to the end.

We are in Robinson-Huron Treaty territory and the land on which we gather is the traditional territory of the Atikameksheng Anishnaabeg. Which also includes the traditional lands of the Wahnapitae First Nation.

List of Figures

I met a traveller from an antique land,
Who said—"Two vast and trunkless legs of stone
Stand in the desert. . . . Near them, on the sand,
Half sunk a shattered visage lies, whose frown,
And wrinkled lip, and sneer of cold command,
Tell that its sculptor well those passions read
Which yet survive, stamped on these lifeless things,
The hand that mocked them, and the heart that fed;
And on the pedestal, these words appear:
My name is Ozymandias, King of Kings;
Look on my Works, ye Mighty, and despair!
Nothing beside remains. Round the decay
Of that colossal Wreck, boundless and bare
The lone and level sands stretch far away.

Ozymandias

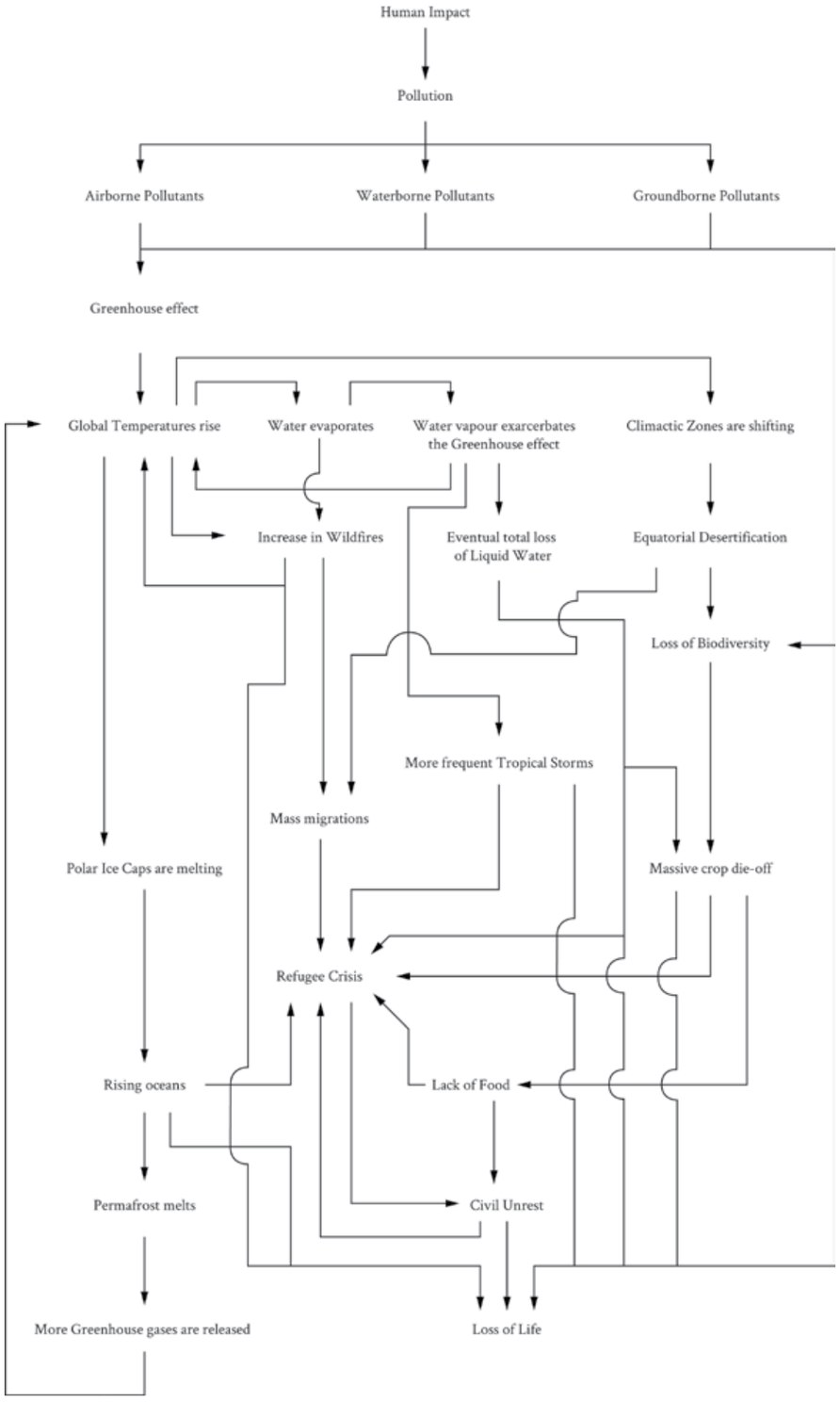
By Percy Bysshe Shelley

Act 1

Climate Change: Immanent Apocalypse

How do things change? How do we observe those changes? How do we speculate on what those changes might be? These questions were at the forefront during the development of this thesis and the adjoining research. As part of the root question in a world filled with uncertainty, this conceptualization of the intersection of architecture and Climate Change permits the observation of how society may react to forthcoming environmental changes and context. To sufficiently analyze the potentiality of said changes, they will be inscribed on a milieu, a location within which is imbedded layer upon layer of information. Through this analysis, a theoretical question may be uncovered: How might one conceive of ways to speculate about potential future events and their consequences, all the while avoiding the traps of unhinged fantasy? This question straddles the line between the present and future. It is a kind of research specifically rooted in the known and now, while simultaneously acknowledging future potentialities. This is inherently a speculative exercise, which seeks to superimpose present knowledge with future potentiality and events. This thesis intends to project the known into the future to observe any reactions. Invention is kept to a minimum, so as to avoid falling for the aforementioned stereotypes and stigmas of future potentialities. Indeed, the ingredients used for speculation are ones familiar and grounded in the real, so as to garner results which resemble reality as closely as possible. Each step of the process must build upon what is already known, yet not so much that what becomes known is suddenly unrecognizable. To do so would entail losing the intent in this case, and the observation loses meaning. This thesis seeks to answer these questions through an architectural lens which lends itself to the progressive changes in a system, as dictated by fact. The adjoining diagram (Figure 1) is a representation of the author's compartmentalization of Climate Change. An interpretation of how distinct steps might be separated from other steps in the overall Climate Change process which indicates how these steps might relate and lead to one another.

Figure 1: Opposite. Image by Author. The Cause and Effect of Climate Change.



Theoretical Background

Definition of the Apocalypse

Apocalypse[1]

apoc·a·lypse | \ ə-ˈpä-kə-ˌlips \

plural: apocalypses

Definition of apocalypse

1a: one of the Jewish and Christian writings of 200 b.c. to a.d. 150 marked by pseudonymity, symbolic imagery, and the expectation of an imminent cosmic cataclysm in which God destroys the ruling powers of evil and raises the righteous to life in a messianic kingdom

B capitalized : REVELATION sense 3

2a: something viewed as a prophetic revelation

b: ARMAGEDDON

3a: a large, disastrous fire : INFERNO

Most foresters agree that small, "prescribed" burns, carefully controlled, are essential to prevent the larger apocalypse.

— Lance Morrow

b: a great disaster

an environmental apocalypse

The term apocalypse, in popular culture, generally denotes an end of what humankind knows to be reality, potentially a sudden and cataclysmic destructive event that eradicates civilization. The apocalypse describes entropy, going from a state of "order" to a state of "disorder." The idea that the past was a perfect state and everything that has happened after this ideal state has been apocalyptic. This description discards the religious and symbolic revelatory imagery contained within the term, as this is not the focus of this thesis. The apocalypse is both a beginning and an end, an imperfect transition towards a new reality. The old establishment is, for the most part, destroyed or heavily ruined; this describes the apocalyptic transition. Like a fire that burns down a forest, only to engender more substantial growth afterwards.

1 Merriam-Webster.com Dictionary, s.v. "apocalypse," accessed November 12, 2020, https://www.merriam-webster.com/dictionary/apocalypse.

Apocalyptic Transition and Temporal Structure

"Who therefore denieth, that things to come are not as yet? and yet, there is in the mind an expectation of things to come. And who denies past things to be now no longer? and yet is there still in the mind a memory of things past. And who denieth the present time hath no space, because it passeth away in a moment? and yet our consideration continueth, through which that which shall be present proceedeth to become absent. It is not then future time, that is long, for as yet it is not: but a long future, is "a long expectation of the future," nor is it time past, which now is not, that is long; but a long past, is "a long memory of the past."

Excerpt from The Confessions of Saint Augustine

Saint Augustine

Through the examination of the mechanisms involved, the outlined criteria, and through the observation of climatic changes, this thesis discusses the notion of ending, and moving towards an end. Rather than attempting to redefine and extrapolate the beginnings and potential, if any, of an architectural ending, this investigative speculation aims to analyze the outlined mechanisms and their effects on reality. This research situates itself in the middle, or milieu, as a way to observe the change that an object undergoes as it travels from one extremity to another, those being the beginning and the end.

While discussing the complexities of extremities it is imperative to determine the conditions upon which this entire thesis is contingent. What is the beginning and the end in this context? Scientific constraints prove themselves immensely too specific, yet the notion of a theorized beginning and end remains too vague. As previously outlined we cannot rely on religious time stamps, and thus a period that describes no set limits must be selected. Doing so would dictate that the project shall be of a set period, however vague, of intervals wherein the work shall take place and then subsequently abandoned. This observation period needs to be when the future becomes the past, that is, the present. The future only becomes real once it has passed through the present, after which it becomes the past. The present, on the other hand remains transient. It is in a constant state of flux that responds to what has occurred before and to what will happen later.

"Thus, as we shall see, we think in terms of crisis rather than temporal ends; and make much of subtle disconfirmation and elaborate peripeteia. And we concern ourselves with the conflict between the deterministic pattern any plot suggests, and the freedom of persons within that plot to choose and so to alter the structure, the relations of beginning, middle, and end."[1]

In his book *The Sense of an Ending*, Frank Kermode discusses how we characterize and differentiate between the sounds a clock makes: the tick and the tock, as a means to give meaning to the space between the two sounds.

"Let us take a very simple example, the ticking of a clock. We ask what it says: and we agree that it says tick-tock. By this fiction we humanize it, make it talk our language. Of course, it is we who provide the fictional difference between the two sounds; tick is our word for a physical beginning, tock our word for an end. We say they differ. What enables them to be different is a special kind of middle. We can perceive a duration only when it is organized. It can be shown by experiment that subjects who listen to rhythmic structures such as tick-tock, repeated identically, 'can reproduce the intervals within the structure accurately, but they cannot grasp spontaneously the interval between the rhythmic groups,' that is, between tock and tick, even when this remains constant. The first interval is organized and limited, the second not."[2]

The moment between these two sounds marks a moment of transition that defines them both. "Tick is a humble genesis, tock a feeble apocalypse; and tick-tock is in any case not much of a plot."[3] It is this same transitory statement that this thesis seeks to examine. How do we observe this change, which is much more complex than simple tick and tocks, and begin to give the constant moment, the succession of moments meaning? The task is to transform Chronos or sequential time, one damn thing after another, into Kairos, the Greek word for the right time or opportunity. To give meaning to the transition, by observing what has come before and what might come after.

1 Frank Kermode, *The Sense of an Ending: Studies in the Theory of Fiction* (Oxford, NY: Oxford University Press, 2000). 30.

2 Frank Kermode, *The Sense of an Ending: Studies in the Theory of Fiction* (Oxford, NY: Oxford University Press, 2000). 44-46.

3 Ibid.

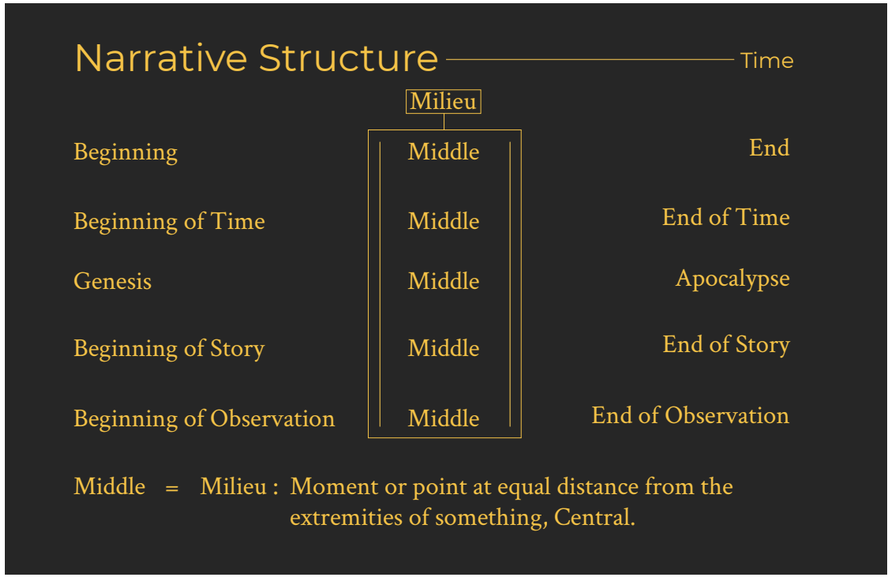


Figure 2: Image by Author. An exploration of the meaning of the concept of Milieu, as seen as a the process by which an initial set of conditions might change as a result of a series of perturbations that affect it. This transitory process morphs the initial conditions into a new set of conditions at the "end" of the process.

Milieu

As discussed in the previous sections, the physical and metaphysical aspects of Climate Change must aptly be considered in order to successfully extend the idea of a temporal middle. A physical site describes the distribution of land, providing information regarding what is inside the portion and what is outside of it. This forgoes and eliminates every other aspect that the 'site' might have and those that the site does not. The physical realities of the binary reality between these two parts fail to portray the extents to which they affect one another. A more apt name for such a setting would be milieu. The milieu is an extension of "site," which, as James corner states in his Agency of Mapping, "(…) are shifting from that of simply a geometrically defined parcel of land to that of a much larger and more active *milieu*."[1]

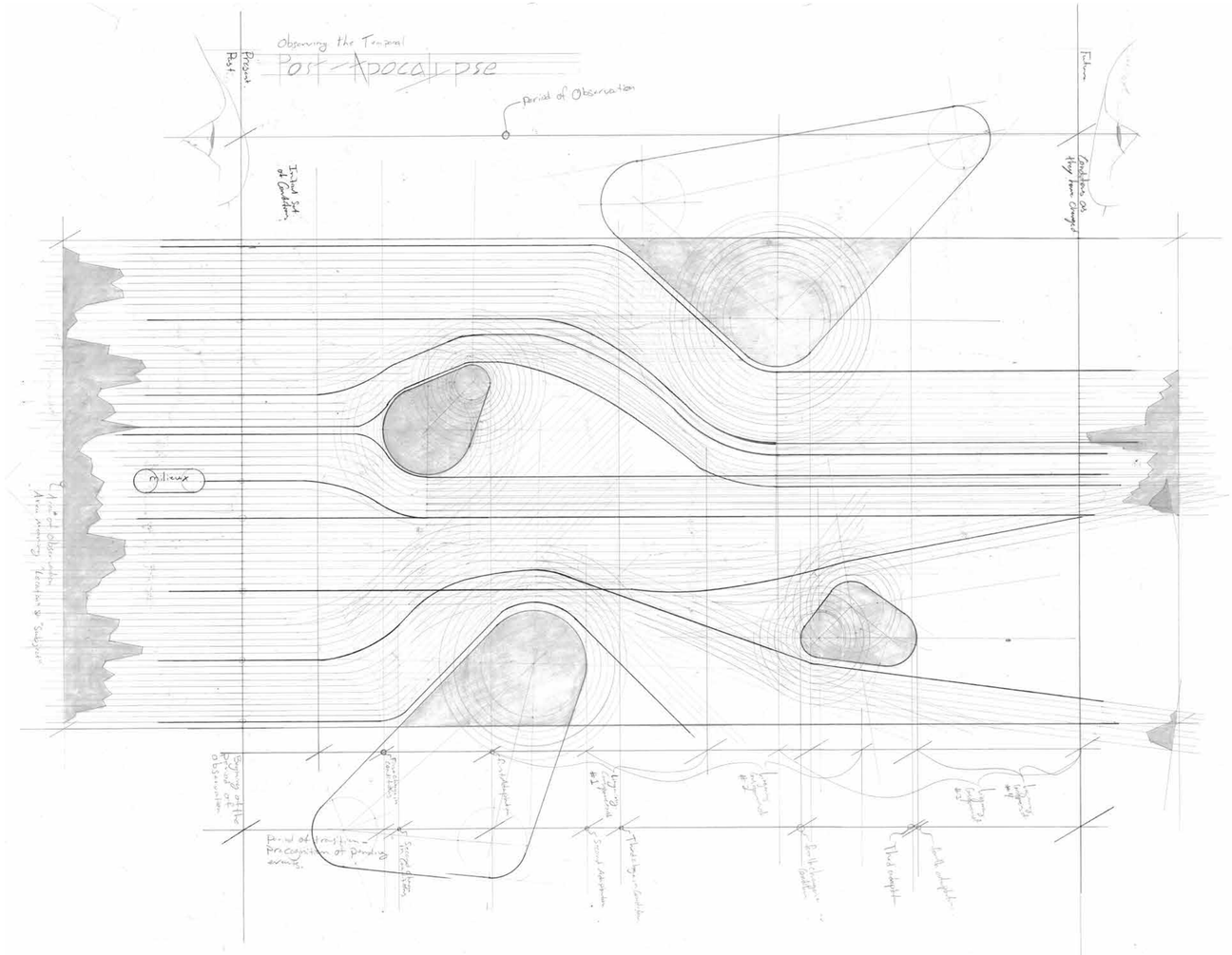
"Milieu is a French term that means 'surroundings', 'medium' and 'middle'. Milieu has neither beginning nor end, but is surrounded by other middles, in a field of connections, relationships, extensions and potentials. In this sense, then, a grounded site, locally situated, invokes a host of 'other' places, including all the maps, drawings, ideas, references, other worlds and places that are invoked during the making of a project. 'Site' today is a multiplicitous and complex affair, comprising a potentially boundless field of phenomena, some palpable and some imaginary. In making visible what is otherwise hidden and inaccessible, maps provide a working table for identifying and reworking polyvalent conditions; their analogous-abstract surfaces enable the accumulation, organization and restructuring of the various strata that comprise an ever-emerging milieu."[2]

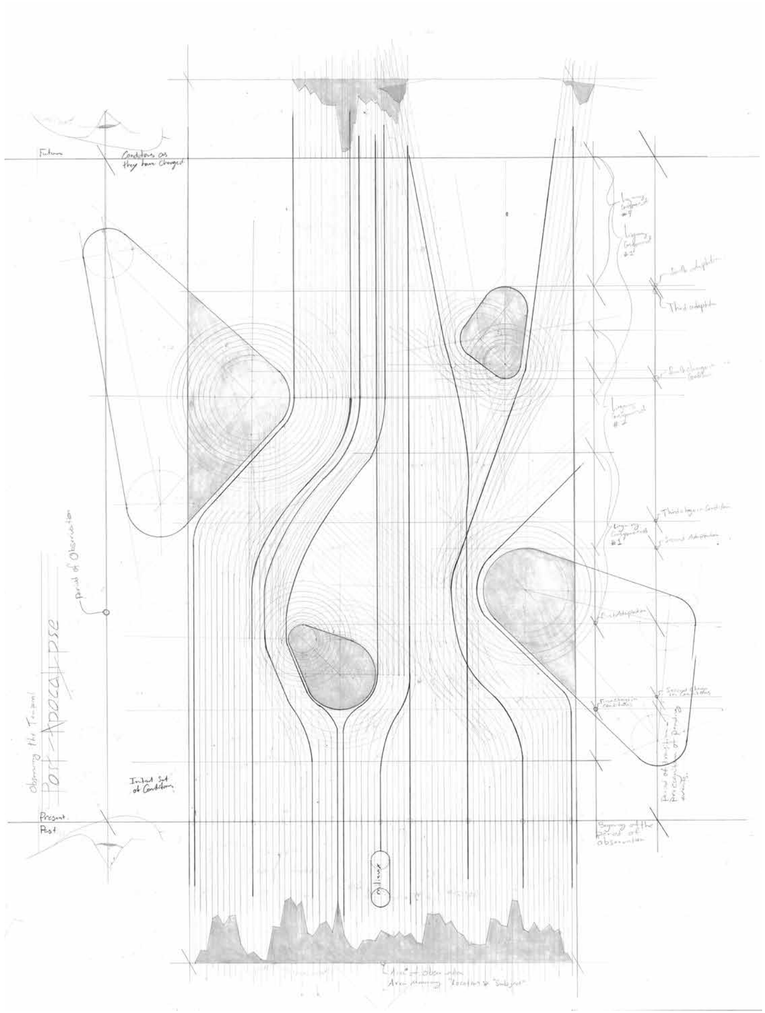
In this section both the temporal and spatial milieu are combined. This results in the overlapping effect of multiple layered fields of interest and influence, lines of flight, tangents, points and nodes, connections, etc., within an ever-present temporal forward march. This is aptly described as both a machine and a map (Figure 3). To read the drawing, it is necessary to present it in two ways; one perpendicular to the other. The first, presented horizontally, describes the process by which an initial set of conditions, on the left, portrayed by an elongated jagged shape, might be changed over time as it passes through the machine and emerges to the right as a different, altered set of conditions. These sets of conditions, both the initial and the modified sets, should, in this case, be

1 James Corner, "The Agency of Mapping: Speculation, Critique and Invention," The Map Reader, 2011, pp. 89-101, https://doi.org/10.1002/9780470979587.ch12.

2 Ibid.

Figure 3: Image by Author. An exploration of the meaning of the concept of Milieu, as seen as a the process by which an initial set of conditions might change as a result of a series of perturbations that affect it. This transitory process morphs the initial conditions into a new set of conditions at the "end" of the process.





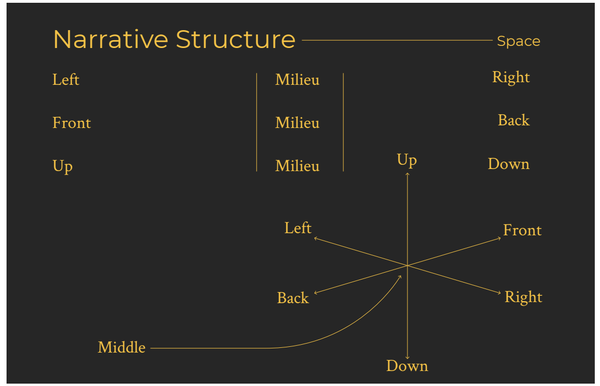
understood as one half of a given *milieu*, the temporal half, which dictates that time affects everything. Throughout this transformative process, there emerge a series of darkly rendered shapes. These shapes can be thought of as *perturbations*[3], the changes that time injects into a milieu, which beget reactions. Looking at this same drawing (Figure 4) now turned perpendicularly, it should be read as a map that describes a concentric overlapping of milieus within milieus, scales within scales, concentric circles. The perturbations, which initially were to be seen as a drawn manifestation of the effect some phenomena may have on a given milieu, can now be understood as being representations of the extents of these same phenomena. The perturbations can now be seen extend beyond the bounds of what is construed as 'our' milieu, reaching further into the concentricity of our multiple milieus, which represents the spatial dimension of this multiplicity.

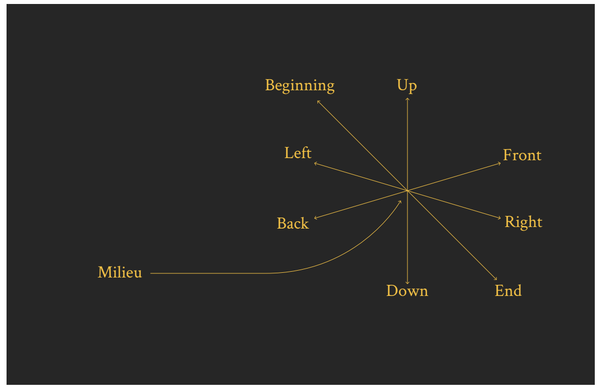
3 Being an event or series of events which causes changes and ripples in the status quo. Definition by author.

Figure 4: Image by Author. An exploration of the meaning of the concept of Milieu, as seen as a location found among other locations. Both as the center of a series of concentric circles, and also as the surroundings of another series of concentric circles. Both as center (Milieu) and as surrounding.

Figure 5: Opposite. Image by Author. The middle of a physical location, as described by our friends X, Y, and Z.

Figure 6: Opposite. Image by Author. The Milieu, as understood as being the intersection of a physical location, overlapped with phenomena and interest, as it changes and reacts throughout time.





Rhizome

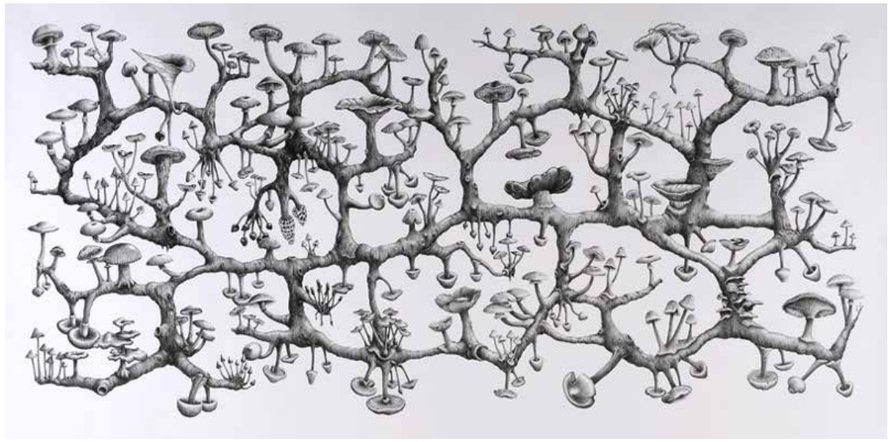


Figure 7: Richard Giblett, Mycelium Rhizome, 2009. https://literariness.org/2017/04/26/the-philosophical-concept-of-rhizome/#jp-carousel-9445.

As opposed to its botanical definition, that of a fungal root structure, a rhizome, can likewise represent, in this case. a system that describes a network of lines and intersections. First posited as an ontological framework by Deleuze and Guattari in their book *A Thousand Plateaus*, a rhizome illustrates the idea of potentiality in a system through simple principles that describe its structure. An *Assemblage:* a layering and collection of

"(…) lines of articulation or segmentarity, strata and territories; but also lines of flight, movements of deterritorialization and destratification. Comparative rates of flow on these lines produce phenomena of relative slowness and viscosity, or, on the contrary, of acceleration and rupture."[1]

The first two mentioned rules are the principles of connection and heterogeneity, which are the most necessary for a rhizome to function, that is, that every point can potentially be connected to any other.[2] These are connections that are inherently against binary states and present themselves as networks within networks, which vary in shape and size depending on how you look at them. In this way, a rhizome is necessarily a non-hierarchical network, which can be entered and exited at any point and whose connections offer both potentiality and certainty. The third is the principle of multiplicity, which dictates that the rhizome must be multiplicitous and that this multiplicity must be substantive.[3] For a thing

1 Gilles Deleuze, Félix Guattari, and Brian Massumi. A Thousand Plateaus. (London: Bloomsbury, 2013). 3-4.

2 Ibid., 7-8.

3 Ibid., 8-9.

to be multiplicitous, it must become heterogeneous; it rejects any form of simplicity and unit-y. "A multiplicity has neither subject nor object, only determinations, magnitudes, and dimensions that cannot increase in number without the multiplicity changing in nature (the laws of combination therefore increase in number as the multiplicity grows)."[4] The fourth of these principles describes how the rhizome asignifies rupture. That is, to make its significance unimportant. When interrupted or broken, the rhizome continues its movement elsewhere, starting once again from another point, as if nothing had ever happened.[5] Simple dichotomies or dualities become impossible, as there are countless other ways that these things might go, connect, be interwoven, and play. "Always follow the rhizome by rupture; lengthen, prolong, and relay the line of flight; make it vary, until you have produced the most abstract and torturous of lines of n dimensions and broken directions."[6] The final two principles are those of cartography and decalcomania, which describe how the rhizome rejects the idea of a primary structural model, like that of a tree or a genetic model; which would create a tracing of a 'real.' Deleuze and Guattari suggest that the rhizome is a map;

"The orchid does not reproduce the tracing of the wasp; it forms a map with the wasp, in a rhizome. What distinguishes the map from the tracing is that it is entirely oriented towards an experimentation in contact with the real. The map does not reproduce an unconscious closed in upon itself; it constructs the unconscious."[7]

The map develops itself through contact with the real, infinitely multiplying and dividing itself so as to best become the thing it is mapping. The same can be said for a rhizome.

4 Ibid., 8.

5 Ibid., 9-12.

6 Ibid., 11.

7 Ibid., 12.

Where Milieu and Rhizome meet

Both the milieu and the rhizome meet and congregate in the middle. To start with a quote from author *A Thousand Plateaus*;

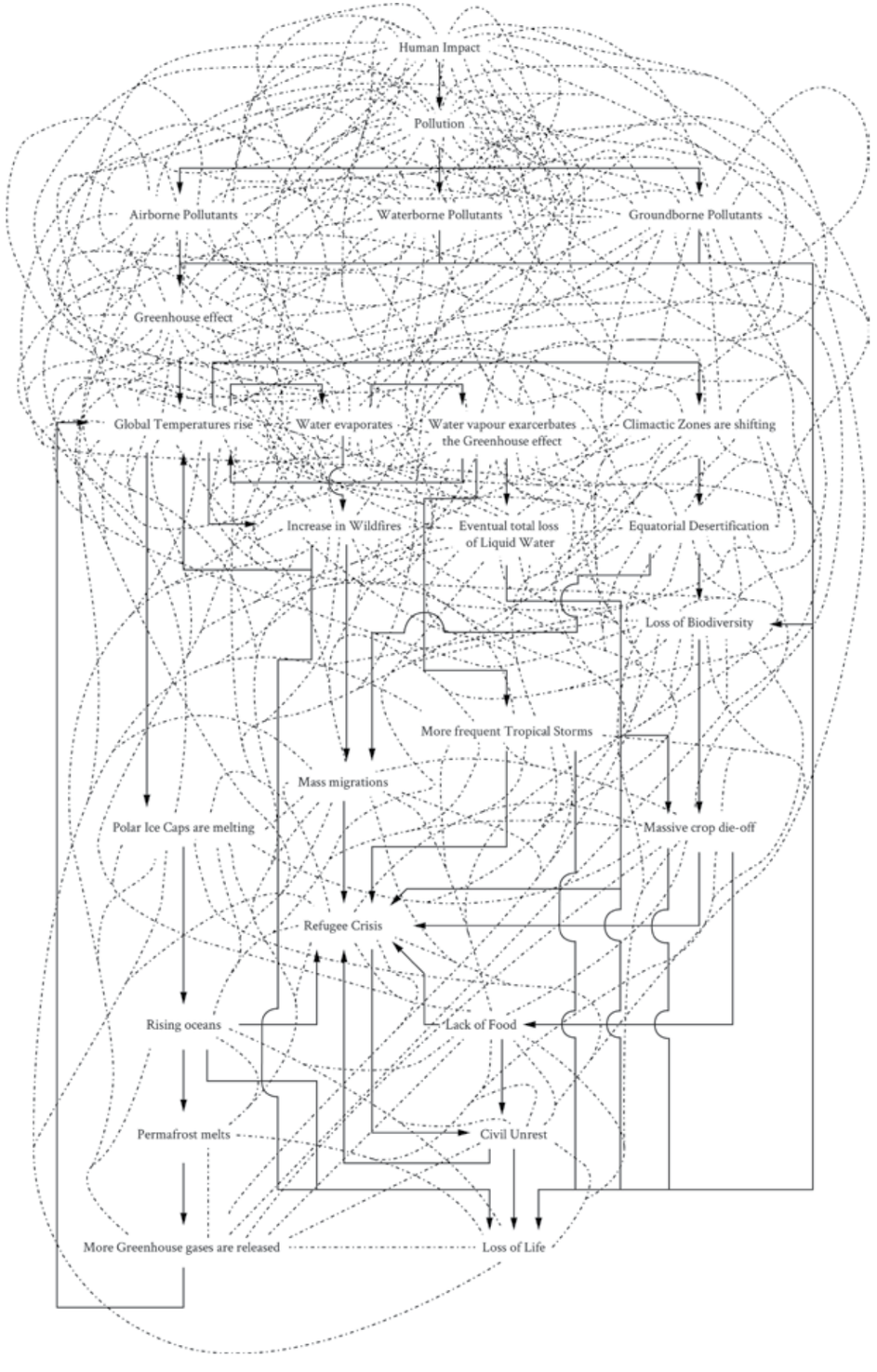
"A Rhizome has no beginning or end; it is always in the middle, between things, interbeing, intermezzo. The tree is filiation, but the Rhizome is alliance, uniquely alliance. The tree imposes the verb "to be," but the fabric of the Rhizome is the conjunction, "and…and…and…" This conjunction carries enough force to shake and uproot the verb "to be." Where are you going? Where are you coming from? What are you heading for? These are totally useless questions. Making a clean slate, starting or beginning again from ground zero, seeking a beginning or a foundation – all implies a false conception of voyage and movement (a conception that is methodical, pedagogical, initiatory, symbolic…). But Kleist, Lenz, and Büchner have another way of traveling and moving: proceeding from the middle, through the middle, coming and going rather than starting and finishing. American literature, and already English literature, manifest this rhizomatic direction to an even greater extent; they know how to move between things, establish a logic of the AND, overthrow ontology, do away with foundations, nullify endings and beginnings. They know how to practice pragmatics. The middle is by no means an average; on the contrary, it is where things pick up speed. Between things does not designate a localizable relation going from one thing to the other and back again, but a perpendicular direction, a transversal movement that sweeps one and the other away, a stream without beginnings or end that undermines its banks and picks speed in the middle."[1]

Through this methodology we add another layer to the initial idea of milieu, which has thus far been understood to be an intersection of place, time, and phenomena. At this point potentiality is added as the latest axis. The milieu is at once the point in which spatio-temporal phenomena occur and rhizomic potentiality begins; if a rhizome expands instead of lengthening, it must start from a central, intersecting point. This central point is at once a spatial one and a temporal one, forming the milieu. From this point potentiality moves forth.

Once this is comprehended it is time to insert the initial set of predetermined conditions. At this point in time the potentiality of the future is in the stages of collapse towards a linear history. It is at this stage where potentiality meets the real, the known, the observable. Through a series of predictions and educated projections a structure may be constructed to reveal both a map of potentiality and a map of what the future might hold in light of this Climatic apocalypse. In the case of this thesis, the rhizome only ever truly becomes rhizomic once we understand the compression that happens in the 'present' moment, the rhizome-from-now-on.

1 Gilles Deleuze, Félix Guattari, and Brian Massumi. A Thousand Plateaus. (London: Bloomsbury, 2013). 25.

Figure 8: Opposite. Image by Author. Cause and effect of Climate Change superimposed with the rhizome. Any and all potential connexions in this self-contained rhizome. All things can lead to another.



Mapping

So, the image...
Historians don't
search, they find.
To shield all these
images from language
means to actually
make use of them,
because they are
in the desert,
and that's where one
has to look for them.

And the day will come
when language
will turn itself against
those who speak it.

Nos humanités

Unknown Author

"As a creative practice, mapping precipitates its most productive effects through a finding that is also a founding; its agency lies in neither reproduction nor imposition but rather in uncovering realities previously unseen or unimagined, even across seemingly exhausted grounds. Thus, mapping unfolds potential; re-makes territory over and over again, each time with new and diverse consequences. Not all maps accomplish this, however; some simply reproduce what is already known."[1]

As opposed to mapping as a statistical survey of the present conditions on a site, a map should investigate, discover, and re-contextualize the milieu so as to uncover present realities.[2] The maps produced in an uninquisitive manner are often overlooked once the exercise

1 James Corner, "The Agency of Mapping: Speculation, Critique and Invention," The Map Reader, 2011, pp. 89-101, https://doi.org/10.1002/9780470979587.ch12.

2 Gilles Deleuze, Félix Guattari, and Brian Massumi. *A Thousand Plateaus*. (London: Bloomsbury, 2013). 13.

is completed. The information gleaned from this exercise not providing anything new, only repeating what is already known. "This is why mapping is never neutral, passive or without consequence; on the contrary, mapping is perhaps the most formative and creative act of any design process, first disclosing and then staging the conditions for the emergence of new realities."[3] This thesis seeks to explore the question of changing realities, therefore, to adequately experience these effects through mapping, the conditions must change, both as a result of Climate Change, and as a result of the reactions to Climate Change. In this context it is necessary to confound the typical methodology of this operation. A mapping operation should provide hidden insights, namely considering the abstraction and interpretation introduced within the operation through the author. Projected Climate Change impacts would affect all aspects of life in any number of ways, and as such, it would be a Sisyphean task to enumerate them all and understand the context in which they would generate change. As such, through the use of mapping as a warped reflection of reality, a more general approach has been developed to serve as a basis upon which a predictive effort may take place. This project then represents a framework from which any number of potentialities may arise. Through the introduction of predictive climate modeling into the aforementioned process, there begins to be an influence on the future prospects of a potential design response.[4]

Using this methodology one can no longer design only for past and present conditions; one must instead design for potentiality. This no longer is a question of sustainability, but rather of survival in the ever changing. If the conditions upon which a "sustainable" architecture is founded change, then the architecture may no longer be considered sustainable, after all. Therefore, a map

"(...) is first employed as a means of 'finding' and then 'founding' new projects, effectively re-working what already exists. Thus, the processes of mapping, together with their varied informational and semantic scope, are valued for both their revelatory and productive potential. (...)."[5]

To use the map as an instrument of discovery and change, the challenge then becomes to inject chronology as an agent of change over time, focusing on a process rather than a result.The main thesis intention is to then investigate a way through mapping in which a milieu changes in response to Climate Change as we perceive and project it.

3 James Corner, "The Agency of Mapping: Speculation, Critique and Invention," The Map Reader, 2011, pp. 89-101, https://doi.org/10.1002/9780470979587.ch12.

4 The word response is used in this context as it provides a platform upon which more change may happen; it is dialectic. On the other hand, the word solution is terminal; it offers no chance to rebuke, admonish, or agree. Rather, it is final, only either correct or incorrect, nothing more.

5 James Corner, "The Agency of Mapping: Speculation, Critique and Invention," The Map Reader, 2011, pp. 89-101, https://doi.org/10.1002/9780470979587.ch12.

Method

"In containing multiple modes of spatio-temporal description, mapping precipitates fresh insights and enables effective actions to be taken. Thus mapping differs from 'planning' in that it entails searching, finding and unfolding complex and latent forces in the existing milieu rather than imposing a more-or-less idealized project from on high. Moreover, the synoptic imposition of the 'plan' implies a consumption (or extinguishing) of contextual potential, wherein all that is available is subsumed into the making of the project. Mapping, by contrast, discloses, stages and even adds potential for later acts and events to unfold. Whereas the plan leads to an end, the map provides a generative means, a suggestive vehicle that 'points' but does not overly determine."[1]

Rather than dictating architectural formalities onto a milieu, mapping as a method proposes that the levels and layers of information need to first be peeled back and dissected. In doing so, new things may be discovered in the process, and thus new connections between points may reveal even more potential in a given milieu. To do so, various mapping operations need to first be understood and then utilized in the process of discovery that this thesis entails.

Fields: "The Field is the continuous surface, the flat-bed, the paper or the table itself, schematically the analogical equivalent to the actual ground, albeit flat and scaled. The Field is also the graphic system within which the extracts will later be organized. The system includes the frame, orientation, coordinates, scale, units of measure and the graphic projection (oblique, zenithal, isometric, anamorphic, folded, etc.)."[2]

As opposed to the ideas of 'layers,' which are elements encoded within a map, a 'field' is used to describe the metaphysical aspects of the process, the means of creation and systematic organization both out of and within the map itself. Fields affect the creation of a map through the metaphysical; with all of the nomenclatures that that entails, scale, projection, orientation, medium, the Graphic field. Layers, on the other hand, create 'areas' of data, which seek to map out intersections and points of interest, layers of influence, human movement and operation, agents and actors which serve to further impact, through their internal gravitational forces, the ways in which data might come to be uncovered.

Extracts: "Extracts are the things that are then observed within a given milieu and drawn onto the graphic field. We call them extracts because they are always selected, isolated and pulled-out from their original seamlessness with other things; they are effectively 'de-territorialized'. They include objects but also other informational data: quantities, velocities,

1 James Corner, "The Agency of Mapping: Speculation, Critique and Invention," The Map Reader, 2011, pp. 89-101, https://doi.org/10.1002/9780470979587.ch12.

2 Ibid.

forces, trajectories. Once detached they may be studied, manipulated and networked with other figures in the field. As described above, different field systems will lead to different arrangements of the extracts, revealing alternative patterns and possibilities."[3]

Through this analysis extracts may be seen as the further refinement of 'layers'. The distinction to be made is simply that a layer might come to offer information pertaining to an area, an indefinite or definite tract of information pertinent to the project, or the maker's agenda. The term 'extract' is an umbrella term that encompasses the term 'layer'. To extract information from a milieu, one must draw it into the field, giving it particular importance, whatever that might mean in a given context, and places it among other such fields. In this way, the extracted pieces are at once isolated and re-contextualized. These 'forces' or 'processes' of selection and extraction need to be understood to contextualize the reasoning behind the choice of extracts and give credence to their isolation. One might understand that Climate Change plays a prominent role in the extracts selection process. Suppose one intends to observe the effects that airborne pollutants might have on a given milieu. In that case, it might be worthwhile to begin extracting and mapping out the vehicular traffic in a milieu or certain industrial complexes that would expel polluting effluents. What is isolated needs to inherently be related to the intent behind the project. Of course, one must always keep an open mind for such things. As many elements might surprise an author during the extract process, yet is it difficult to imagine the many connections that reside in a milieu.

Plottings: "Plotting entails the 'drawing out of new and latent relationships that can be seen amongst the various extracts within the field. There are, of course, an infinite number of relationships that can be drawn depending upon one's criteria or agenda."[4] "Plotting is not simply the indiscriminate listing and inventorying of conditions, as in a tracing, a table or a chart, but rather a strategic and imaginative drawing-out of relational structures. To plot is to track, to trace, to set-in-relation, to find and to found. In this sense, plotting produces a 're-territorialisation' of sites"[5]

This step in the process involves the uncovering of relationships between fields, layers, and extracts. Fields are included in this list as well, because the simple decision between projection or orientation may come to influence the perception of information in a given map, like in Joaquin Torres-Garcia's Inverted Map of South America, 1943, (Figure 18),

3 Ibid.

4 Ibid.

5 Ibid.

wherein the south American continent is inverted;

"(…) the Uruguayan artist Joaquin Torres-Garda drew the Inverted Map of South America with a very distinct 'S' at the top of the drawing. This remarkable image reminds us of the ways in which habitual conventions (in this case the unquestioned domination of north on top) condition spatial hierarchies and power relations. The convention of orienting the map to the north first arose early in the global and economic expansion of Northern Europe and in response to practices of navigation. But there are many instances of other societies at different times orienting their maps towards one of the other cardinal points, or making them circular without top and bottom (the Dymaxion map is perhaps one of the few modern instances where singular orientation is not a prerequisite). Maps of this sort are still legible and 'correct' in their depiction of spatial relationship, but the reader must first learn the relevant mapping codes and conventions."[6]

The number of relationships to be uncovered is infinite; it is therefore up to the creator of the map or drawing to determine the depth and pertinence of extracts. By overlapping these elements, fields, extracts, and layers and recombining them through the use of a plotting methodology, new and re-contextualized information emerges. It is helpful to imagine this process as being akin to inscribing information on layers of paper or another such material, which are suspended parallel to one another. The plottings, in this case, can be thought of as relationships which pierce these sheets of paper, as if connected by a metaphorical string, passing through irrelevant extracts and relating, in new and interesting ways, extracts which would otherwise be difficult to compare.

6 Ibid.

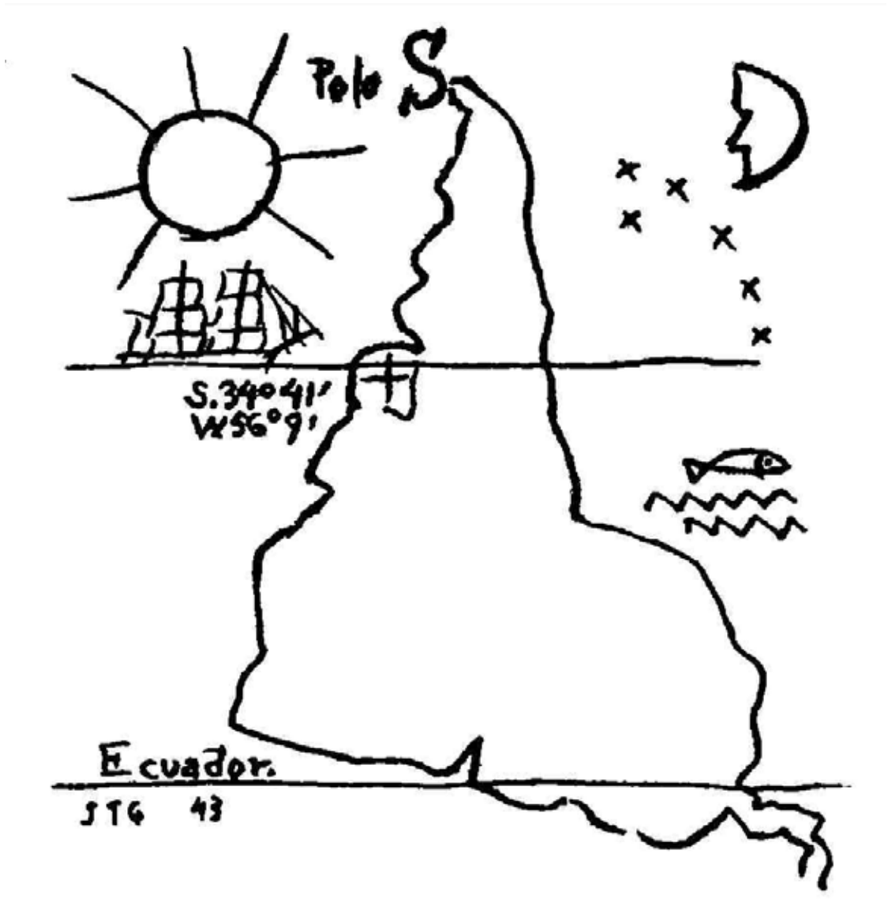


Figure 9: Above. Joaquin Torres-García, *América Invertida (Inverted America)*, 1943, ink on paper, 22 x 16 cm (Fundación Torres García, Montevideo)

Science Fiction Films

His sovereignty, and rule, and majesty;
Blazing Hyperion on his orbèd fire
Still sits, still snuffs the insense teeming up
From Man to the Sun's God: yet unsecure.
For as upon the earth dire prodegies
Fright and perplex, so also shudders he:
Nor at dog's howl or gloom-bird's Even screech,
Or the familiar visitings of one
Upon the first toll of his passing bell:
But horrors, portioned to a giant nerve,
Make great Hyperion ache. His palace bright,
Bastioned with pyramids of glowing gold,
And touched with shades of bronzèd obelisks,
Glares a blood-red through all the thousand courts,
Arches, and domes, and fiery galleries:
And all its curtains of Aurorian clouds
Flush angerly; when he would taste the wreaths
Of insense breathed aloft from sacred hills,
Instead of sweets, his ample palate takes
Savour of poisonous brass and metals sick.

Excerpt from The Fall of Hyperion

John Keats

Kermode describes here the ways in which myth and fiction differ and operate;

"Myth operates within the diagrams of ritual, which presupposes total and adequate explanations of things as they are and were; it is a sequence of radically unchangeable gestures. Fictions are for finding things out, and they change as the needs of sense-making change. Myths are the agents of stability, m sense in terms of a lost order of time, illud tempus as Eliade calls it; fictions, if successful, make sense of the here and now, hoc tempus."[1] [2]

Science fiction encourages us to speculate and dream, all the while commenting on the realities of the present. It examines the present conditions and comments on the trajectories while also proposing potentiality in the world-building of the reality and time present in the film itself as part of its setting. This is not to say that this project proposes to build the architecture present in science fiction as a means to "solve" Climate Change. Instead, it proposes to use science fiction films which reference Climate Change as a way to explore 'what might happen' and the ways in which particular perturbations may affect society and how it may react in turn—acting more as guide fields rather than goals. Science fiction films have the ability to broaden the scope of exploration and observation by introducing parallel concepts and derivatives of potentiality and suppose that 'what-if' scenarios might happen in light of the effects of Climate Change. They then build a narrative structure around this changed set of conditions. As such, these films provide an ample resource to widen the scope of this thesis by including elements of the imaginative and absurd, all the while staying within the realm of the plausible and real. Science Fiction films provide much-needed tangential ideations that can be used much in the same way a case study might be used to help understand the consequences of potentiality and any perturbation insertions.

1 Frank Kermode, *The Sense of an Ending: Studies in the Theory of Fiction* (Oxford, NY: Oxford University Press, 2000). 39.
2 *Illud Tempus*, meaning that time, and *Hoc Tempus*, meaning this time.

Selection and Analysis

The selection of the following science fiction films was based on simple criteria; their setting needed to have been directly affected by the climatic apocalyptic process. To that effect, three seminal filmic works have been selected, *Soylent Green*[1], *Waterworld*[2], and *Nausicaä of the Valley of the Wind*[3], each of which broaches the subject in a poignant and significant manner and aptly describes the methods their characters and settings, their milieus, have adapted and changed in response to Climate Change. To begin, a period of analysis was undertaken to understand the extents of Climate Change present in each film. The adjoining diagram attempt to better understand these films and quantify Climate Change in their respective contexts. Doing so helps to contextualize a rough range between the perceivable effects of the perturbations of Climate Change, and as such, keep the project open to potentiality.

The first film is *Soylent Green*, which explores the impact of long-running effects of Climate Change in New York City and attempts to observe the moment between complete and total apocalypse and what came before. This film explores this transition through themes of human impact and desperation. The people living in this setting mostly live through the consumption of soylent products. Having come to replace most foods, as the upkeep costs for everything else have become too expensive economically and ecologically, soylents provide sustenance to the majority of the now overcrowded and squalid residents of New York. Most people, those who would otherwise be considered middle class, now live in over-packed apartments, with some people sleeping in the stairwells. The poorest live in cars, among others in a similar situation in a closely packed group.[4] The film commences with the introduction of soylent green, a food product advertised as being made from seaweed matter.[5] It is later discovered, however, that soylent green is composed of the corpses of people, as no other viable food source is plentiful enough to feed these people. The planet has been used up and polluted to the point of impotence. This film paints quite a dire picture for the apparent fall of humanity due to Climate Change, wherein survival becomes paramount at the cost of social benefit. The architecture present in this film is ill-adapted to the shown scenarios and, as a result, fails to accommodate. This is a capture of the Climate Change crisis in motion, *hoc tempus*.[6]

1 Fleischer, Richard, Soylent Green, April 19, 1973; USA: Metro-Goldwyn-Mayer, April 19, 1973. Film.

2 Reynolds, Kevin, Waterworld, July 28, 1995; United States: Universal Pictures, July 28, 1995. Film.

3 Miyazaki, Hayao, Nausicaä of the Valley of the Wind, March 11, 1984; Japan: Toei Company, March 11, 1984. Animated Film.

4 Ibid.

5 Fleischer, Richard. Soylent Green. April 19, 1973; USA: Metro-Goldwyn-Mayer, April 19, 1973. Film.

6 Ibid.

Temperature

+ Hot

- Cold

Humidity

+ Arid

- Wet

Ecology

+ Collapsed

- Replenished

Pollution

+ Choked

- Fresh

Human Impact

+ Disregard

- Care

Nuclear

+ Irradiated

- None

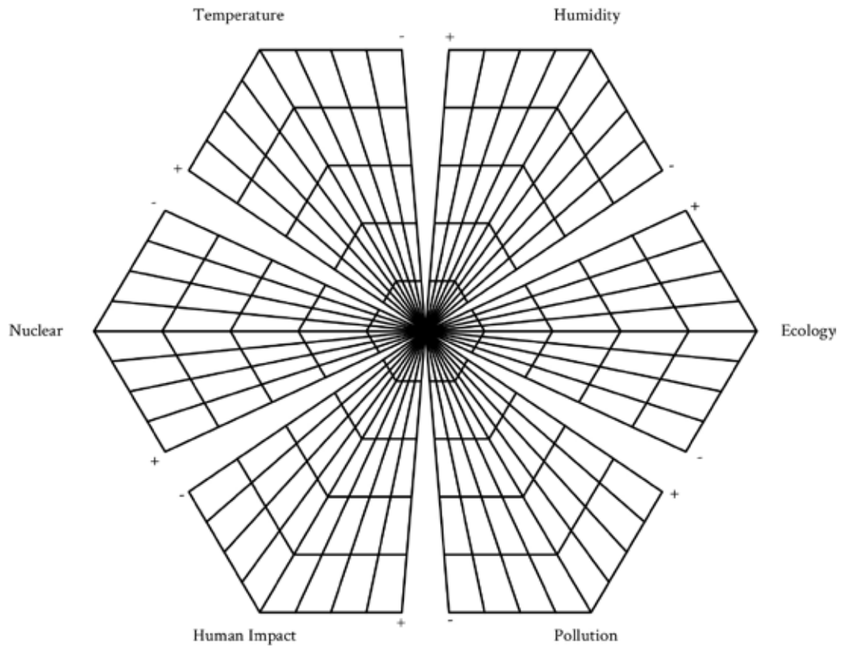


Figure 10: Above. Empty Movie analysis diagram, which describes, through the inscription of points, both the importance and degree of an aspect. The importance being determined by how far it is from the center, and the degree being determined by its polarity.

The next film that has been chosen is *Waterworld*, wherein the polar ice caps have melted as a result of rising global temperatures, and the world's oceans have risen to the point of allegedly completely encapsulating the globe.[7] The people in this world have adapted to living on ocean-faring boats and floating communities which typically serve as the only point of contact between people. Most of anything consumed is salvaged from wreaks or otherwise a holdover from before the ice melting.[8] Most things need to be recycled, including potable water, which indicates that the industrial manufacturing capabilities of the societies and people in this scenario are limited to the point of being nearly non-existent. Much knowledge of the 'before times' has been lost, only somewhat preserved on scraps of paper saved and hoarded as a precious treasure. The majority of structures, namely these boats and boat communities, named atolls, appear to be quite ramshackled. As a result of the inability to extract new material or resources, the people in this scenario have had to adopt severe restrictions in the usage of anything that has become salvaged. Ignoring the evolutionary aspects of the main character, the film explores the consequences of a population learning to live with this new change in context. This film explores the post-apocalypse not too long after the event, if it can be called that, itself.[9]

Nausicaä of the Valley of the Wind, a Japanese anime, is the final film to be studied. This film explores themes of ecological devastation and adaptation after "The 7 days of Fire", presumably a nuclear holocaust that then triggered an environmental upheaval in the world. The planet, presumably Earth, has become desolate and toxic. A poisonous fungal forest grows and overtakes the land, and immense insects emerge from it to protect it from harm. The air itself has taken up much of the forest's toxins and becomes impossible to breathe once a certain threshold is reached.[10] The citizens of Nausicaä's small country, The Valley of the Wind, have taken up a pastoral lifestyle and live near the Toxic Jungle without the crippling fear of its poisons. This is because they have adapted themselves and their architecture to the use of the wind that passes through their Valley from the lake that borders their territory.[11] They make use of windmills to crush grains and to draw

7 Reynolds, Kevin. Waterworld. July 28, 1995; United States: Universal Pictures, July 28, 1995. Film.

8 Ibid.

9 Ibid.

10 Miyazaki, Hayao. Nausicaä of the Valley of the Wind. March 11, 1984; Japan: Toei Company, March 11, 1984. Animated Film.

11 Ibid.

Figure 11: Opposite. Fleischer, Richard. Soylent Green. April 19, 1973; Metro-Goldwyn-Mayer, April 19, 1973. Film. Soylent Green movie poster.

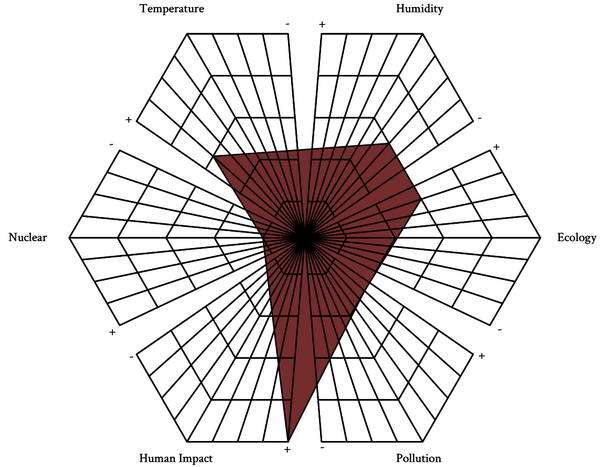


Figure 12: Above. Movie analysis diagram for Soylent Green, we see that Human Impact has had the most significant effect on the events and setting of the film.

fresh water from underground. Their most important building is the castle nestled in the middle of the Valley and uses two massive windmills of intricate construction. A hangar is also present and serves to launch their gunship, a military adaptation to the importance of wind and flight.[12] The most crucial architectural adaptation is in response to their need to breathe. The wind itself is a cleansing entity, which drives away the toxins present in the air and renders it breathable. As such, they make use of multiple chimes around their small village and in the Valley proper to indicate the invisible presence of wind.[13] In this way, they render the invisible visible and ensure their continued existence. Without the wind, all life stops, the windmills cease turning, and the air becomes noxious. This film explores the adaptations present both physically and socially in the architecture after a very long time, long enough that the memory of the apocalypse can only now be called myth, something which talks of *Illud Tempus*, that time.

In their own way, these three films have explored the potential consequences of Climate Change and have developed worlds and scenarios that each navigate different facets of adaptation. The different temporal dimensions and physical factors that play into the broadening of thought surrounding Climate Change have proven essential. Of course, some aspects of these films are less relevant to the study. Still, in essence, they each provided another voice with which to consider the potential reactions and changes that might appear as a result of the insertion of these perturbations.

12 Ibid.

13 Ibid

Figure 13: Opposite Above. Soylent Green film still, overpopulation statistics presented by the film.

Figure 14: Opposite Middle. Soylent Green film still, people sleeping in stairwells.

Figure 15: Opposite Below. Soylent Green film still, the last Tree Sanctuary in New York.

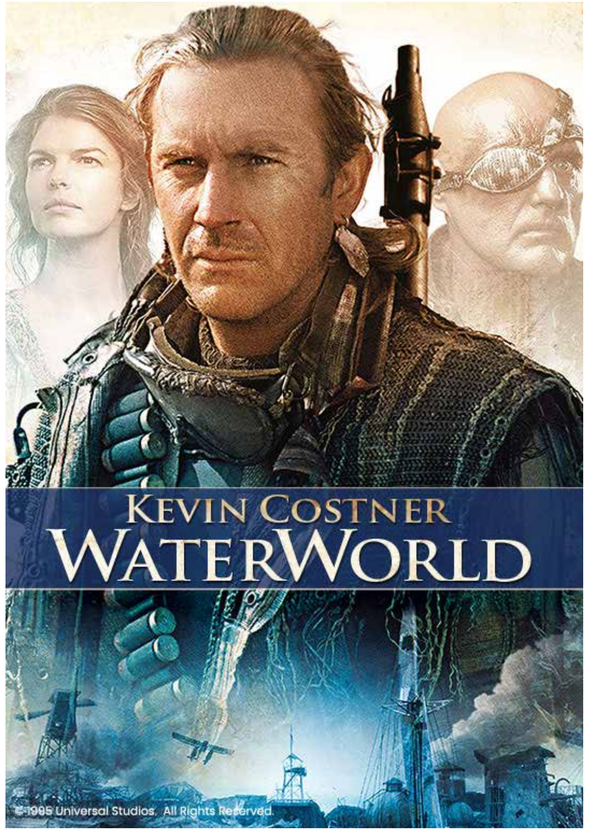


Figure 16: Above. Reynolds, Kevin. Waterworld. July 28, 1995; United States: Universal Pictures, July 28, 1995. Film. Waterworld movie poster.

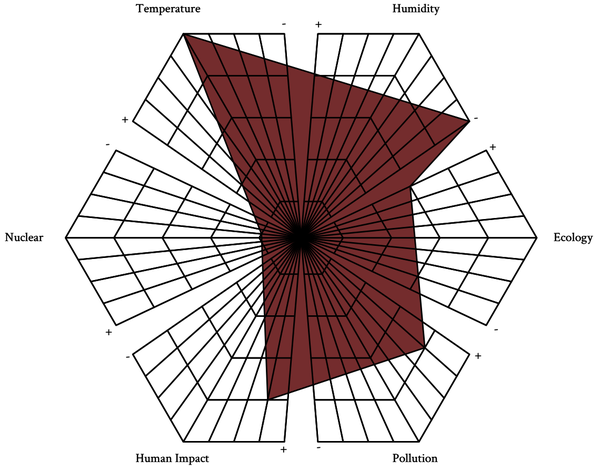


Figure 17: Above. Movie analysis diagram for Waterworld, the warming planet and the rising oceans are the main perturbations in this film.

Figure 18: Opposite Above. Waterworld film still, showing the main character's boat, where he spends most of his time.

Figure 19: Opposite Middle. Waterworld film still, an atoll community, formed by lashing floating structures together and hoping for the best.

Figure 20: Opposite Below. Waterworld film still, a repurposed tanker ship.

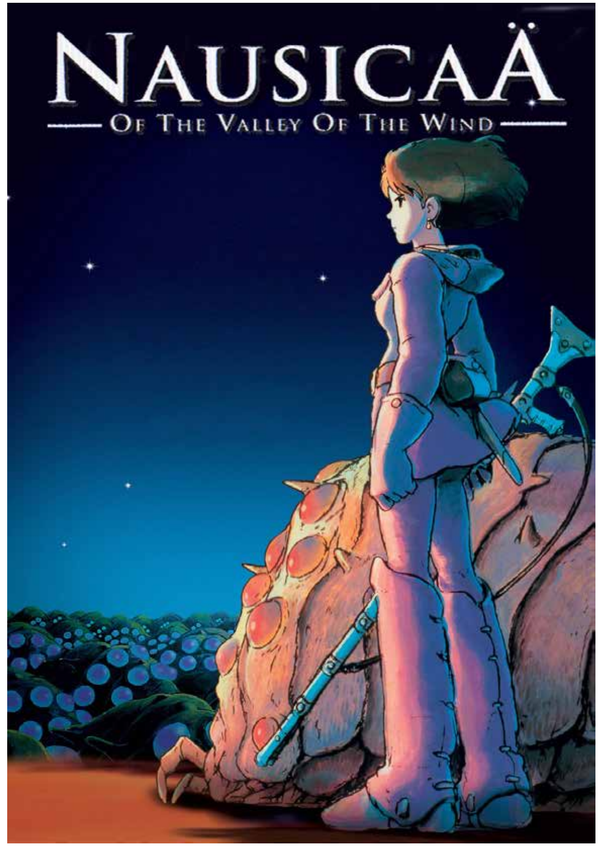


Figure 21: Above. Miyazaki, Hayao. Nausicaä of the Valley of the Wind. March 11, 1984; Japan: Toei Company, March 11, 1984. Animated Film. Nausicaä of the Valley of the Wind movie poster.

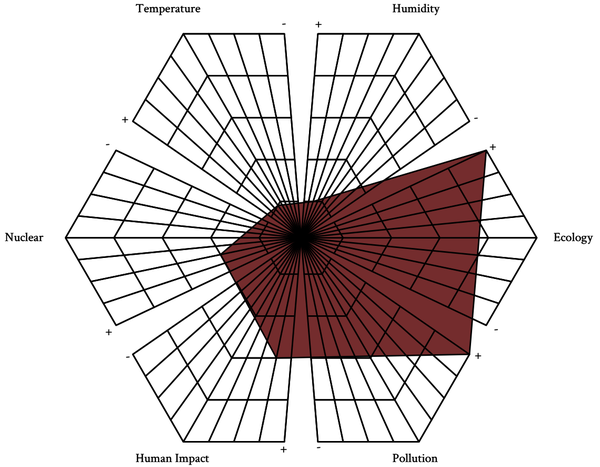
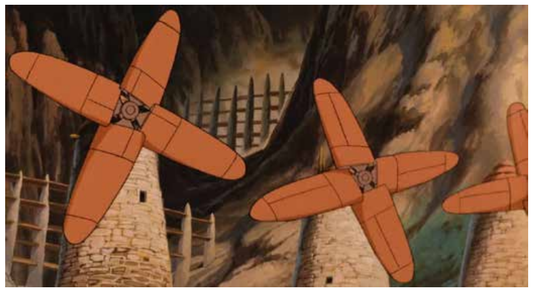


Figure 22: Above. Movie analysis diagram for Nausicaä of the Valley of the Wind, pollution and nuclear toxicity are what drive this film and the reactions therein.

Figure 23: Opposite Above. Nausicaä of the Valley of the Wind film still, zoomed out view of wind detection spires.

Figure 24: Opposite Middle. Nausicaä of the Valley of the Wind film still, zoomed in view of wind chimes, intended to warn the peope of the valley to any lack of wind.

Figure 25: Opposite Below. Nausicaä of the Valley of the Wind film still, windmills, to which the people of the valley owe their water and milled grain.



Atop the compartmentalized Climate Change diagram, are superimposed both a linear relational structure and a rhizomic one. This is done to map out the potential connections in relation and opposition to those chosen linearly. Coloured fields are then overlaid to represent the extents of the potentiality of each chosen film as they pertain to Climate Change. This diagram (Figure 26) is simply a representation of the underlying process which supports the research done through fiction, which in turn lays itself back onto the apocalyptic method. For example, after watching the film, we can understand that *Waterworld* includes various themes in its narrative, that talk of water, global warming, and resource rarefication, among others. Understanding these points, and in turn, drawing this field, allows us a glimpse into the topics which are not explicitly mentioned in the film's narrative, all the while expanding the potentiality of thought held within each compartmentalized segment of the Climate Change phenomenon.

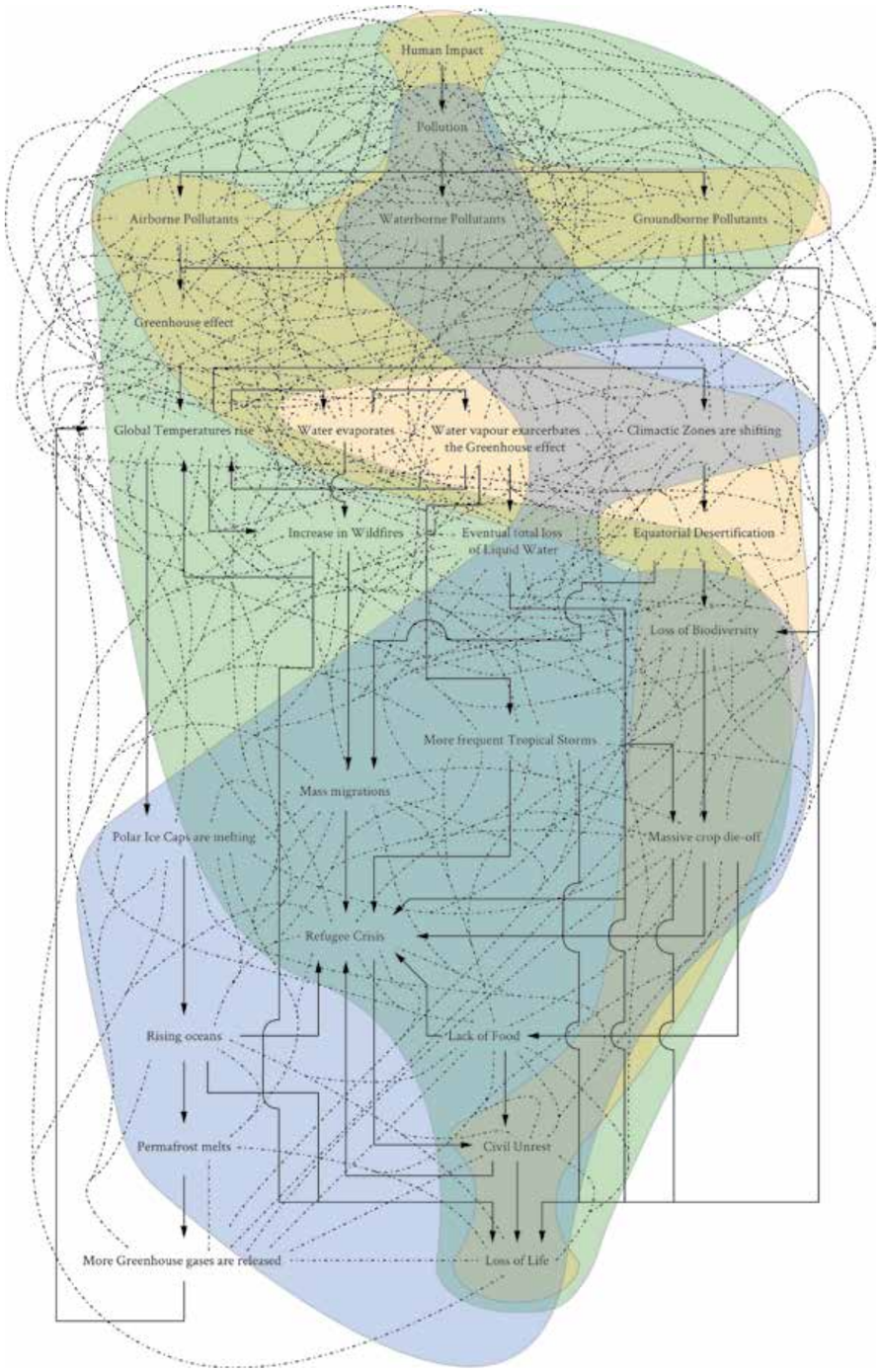


Figure 26: Opposite. Image by Author. Phenomenological Map of the Climatic Apocalypse, superimposed with the domains and extents of each chosen Science Fiction film. Green for Soylent Green, Blue for Waterworld, and finally Yellow for Nausicaä of the Valley of the Wind.

Methodology

Process

O Rose thou art sick.
The invisible worm,
That flies in the night
In the howling Storm:

Has found out thy bed
Of crimson joy:
And his dark secret love
does thy life destroy.

The Sick Rose

William Blake

Mapping is the primary tool through which this process functions. At each stage of the method, map variants are used to explore, extract, consolidate, integrate, and display various layers of information. Initial maps were created to understand the past and present conditions of the factors which are affected by a given perturbation. This step acts as a survey of the extant context and serves to ground the project in the here and now. After this, the first perturbation is inserted. This insertion is done by mapping out the physical consequences of this given perturbation onto a map. The map itself might be created at a different scale than the initial map, but this only serves as a means to understand the general scope of a given consequence. This map is among many others that might be used to understand the repercussions of a given perturbation at various scales. These may be called exploratory maps, as they seek to expand the scope of the perturbation and are used to find and extract information. Along with these exploratory drawings, one may use any number of secondary tools to explore aspects of the project that might otherwise be left out. For example, in this thesis, text, collages, and extraction drawings have been used to tease out further detail. Each of these has expanded a narrative, architectural, thematic, schematic idea. Once this phase of the process is complete, the details can then be reintegrated into a map. This re-contextualizes the milieu by bringing together this expanded line of thought into contact with the real and the posited. Once this is done, a new perturbation can be inserted and explored, and the process can then be repeated.

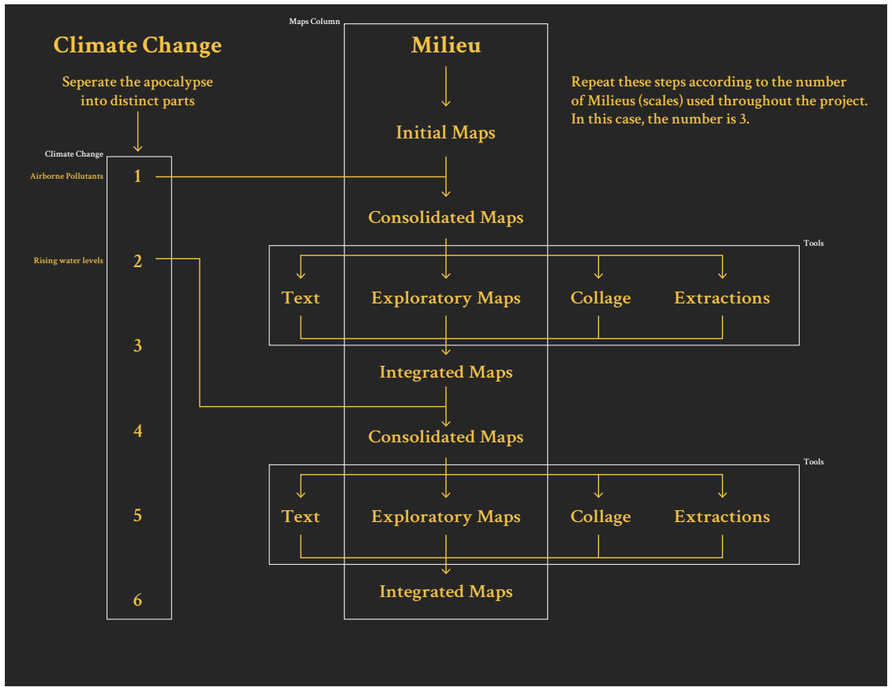


Figure 27: Image by Author. Process flow-chart.

Guidelines / Rules

1. This project proposes that we may project any current situation into the future so as to navigate potential future scenarios through the use of devices which measure change through reaction.
2. This is not an exhaustive process, but rather one in which some potentialities are drawn out.
3. These potentialities are explored through the use of objects, architecture, people, scenarios, policies, etc. which will be used as devices through which change may be perceived.
4. These devices will be subject to changes in their context, and react accordingly. These reactions are how one may perceive change.
5. The changes in a given context are perceived to be perturbations, akin to boulders in a river. The water must flow around the boulder to accommodate its existence. If the boulder were not there, the river would flow without impediment.
6. These perturbations, at least in the context of this project, follow the apocalyptic theme of Climate Change. As such, the perturbations can be thought of as symptoms of a greater issue.
7. These perturbations have no set order, and as such can be entered from any direction. This is a rhizomic understanding of cause-and-effect.
8. Rhizomic being understood as a non-hierarchical method for organizing data which can be entered from any point.
9. An order is necessary, however, for the smooth proceedings and completion of such a process. It is an aspect of the project left to the author and their respective biases and understandings.
10. The perturbations are also not limited to a specific "site." Instead, they dwell within a milieu.
11. A milieu is composed of multiple layers of information beyond topographical ones, such as cultural, political, societal, etc.
12. A milieu resembles a series of concentric shapes, which affect one another, and may also become resultant of changes within another level of the milieu.
13. A milieu resides adjacent to, and overlapping other milieus. This allows us to understand that other situations, similar or not, may also be occurring elsewhere. And also allows the user of this process to acknowledge and subsequently ignore those other situations.

14. The changes undergone by the aforementioned devices will be incremental, but cemented in the real. A change must be recognizable from what existed previously, to do otherwise would propel any change into the realm of the incomprehensible, and in so doing, lose all value in this project.
15. Any proposed change will at first emerge from an initial condition or situation. This will typically mean that any given exploration into potentiality will first emerge from something which already exists.
16. This process explores potentialities, what may happen. It is not intended to be a prediction of the future, one with a predicted finality.
17. The potentiality of the future collapses at the present moment, which is always moving forward, as per the arrow of time.
18. Any and all attempts at exploration within the scope of this process is meant to be speculative, and as such, is open to interpretation, remix, and iteration.
19. Any and all attempts at exploration within the scope of this project shall be understood to be akin to paths, scouting ahead and revealing potential futures. This is not definitive.
20. Science fiction will play a key role in this process, as it will expand the scope of any exploration done into the future and lend credence to the thoughts expressed throughout.
21. It is necessary that this process be done through a drawn medium. This is, without question, an exercise done through mapping and collage.
22. The author's biases and preferences are essential. This process is a tool, which the author wields at their own discretion, to produce different results. No two authors will arrive at the same responses.
23. The end result is not intended to be understood as being final. Rather, this process is given the opportunity to end at any time, as long as the scope of the project is made clear from the beginning. This is a "period of observation" with a clear beginning and end. The scenarios may play out before and after these two extremes however.
24. The use of the word "solution" is avoided. Instead, one should use "response." A "solution" is a final, binary end to a line of questioning. A "response," however, is dialectic, and can be subject to further change, engendering iteration and flux.

Role of the author

Given an identical set of tools, parameters, context, and methodology, another author would engender a different result. This is mostly due to the personal bias of the author, and must be taken into consideration. The assumptions that the author makes along the way are also critical, as they are what inform the core tenets of the decisions made along the way.

Assumptions:

1. Things will generally tend towards the worst, before, if ever, tending towards being better. This is an apocalyptic scenario after all.
2. Corporate mega-capitalism will continue, anything that can be commodified will be, probably to the detriment of those that cannot buy in.
3. Play to human resilience and ingenuity, the people in these scenarios will survive, no matter the cost.
4. People, and governmental entities will act in their own best interests.
5. Adhering to Maslow's hierarchy of needs is recommended.
6. The order in which the perturbations were selected was based on the author's understanding of Climate Change and its components and how they may, or may not, influence one-another.

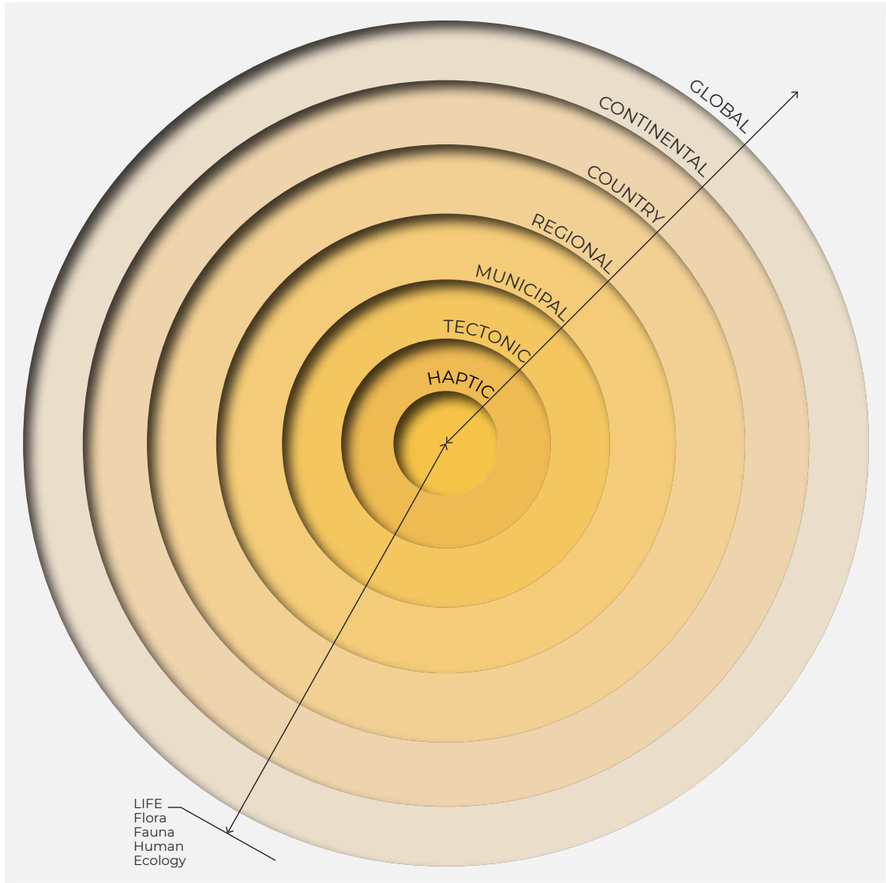


Figure 28: Above. Image by Author. Multiscalar observations are at the core of this project. How one scale might affect another, and vice versa is paramount.

Site / Milieu

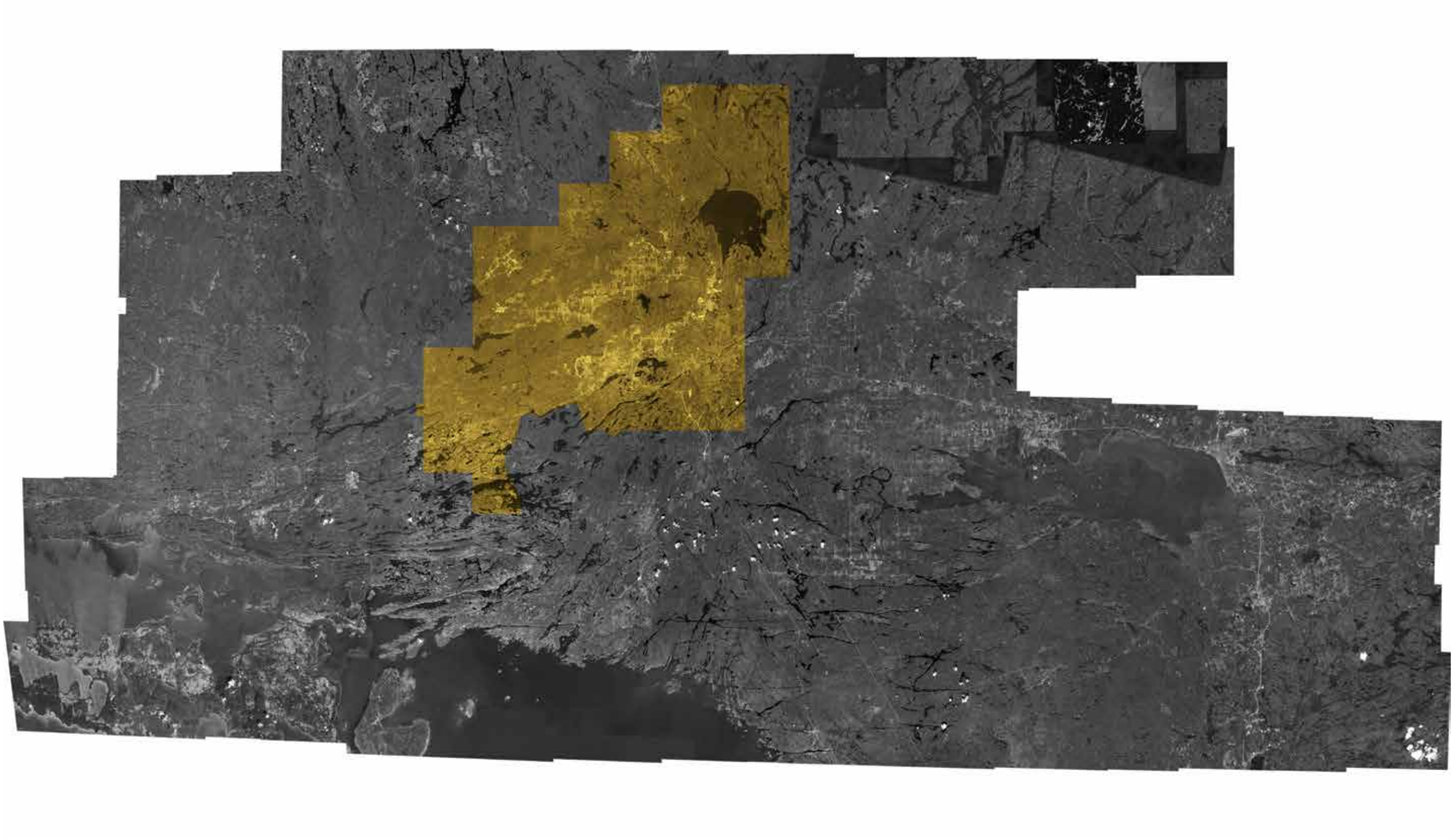


Figure 29: Above. Image by Author. Greater Sudbury composite map.

Selection

Sudbury was chosen as the milieu for this thesis because of the familiarity it held with the author and the intense and tumultuous series of changes that have historically affected its landscapes. Sudbury is wonderful as a milieu because of the multitude of events that have shaped it into what it is now and what it will be in the future. These layers range from industrial, economic, wartime, cultural, geopolitical, environmental, global, etc., each of which has had many different impacts over long distances and periods. This thesis is to serve as a demonstration of the process; thus, the selection of the milieu required some additional considerations. This selection, in particular, was merely intended to serve as an example of the methodology.

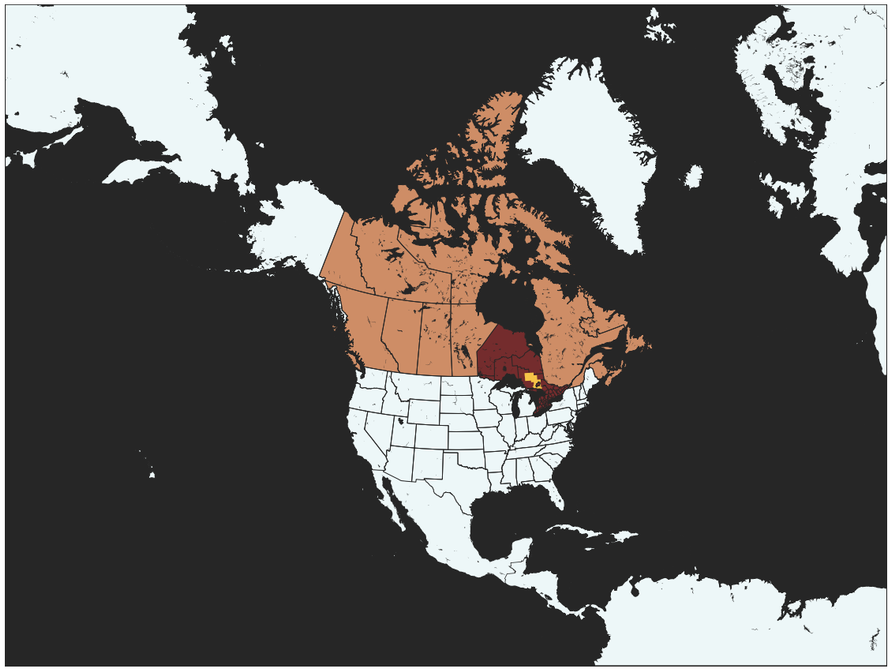


Figure 30: Image By Author. Sudbury, Ontario, Canada, North America, America, Earth.

History/Regreening

Sudbury, Ontario was initially a small colonial town formed within a dense pine forest. After the discovery of nickel-copper ore in 1883, a slow but determined trend towards prospective extraction and refining began.[1] This all started with a massive meteorite impact 1850 million years ago,[2] which formed what is now known as the Sudbury Basin. The site of this impact, the rim of the Basin, is where most of the ore is situated, and as such, most of the mining activity can be found there.[3] This impetus spurred the massive extraction complex which formed in the region, eventually leading to the Sudbury area gaining a reputation as a barren landscape, devoid of living forests and crisscrossed with acidified streams terminating in equally acidified lakes.[4] As a result of rampant capitalist industrialization, the area had lost all of its natural beauty. Much of the beautiful pine forests, for which the area was first known, was used in early smelting operations. The wood's use in the roast yards led to the loss of an essential natural resource, and the sulphur fumes released during the smelting process led to the release of acid rain onto the landscape, further destroying any plant life that might grow there.[5] The processes used to smelt the ore became much more efficient and less environmentally destructive, culminating in the construction of the Super Stack in 1972, nearly 100 years after the first discovery of ore.[6] From then on, the story shifted, gaining a much needed ecological lens which has led to the massive improvement of the Sudbury area's environment.[7] From 1973 onwards, a regreening program intended to revitalize the denuded forests began. Spearheaded by Laurentian University's Biology Department, the program devised a way to reintroduce indigenous flora to the area while engaging in ecological rehabilitation.[8] In the next drawing (Figure 31), the extents of the regreening efforts have been outlined and explored, coupled with the extents of the massively damaged areas in the Sudbury region. This drawing was created to help illustrate another aspect that played into the selection of Sudbury as a milieu. Its near-impact with an apocalyptic situation, especially one so tied to the environment and human activity, seemed to be the perfect backdrop for further explorations into this topic.

1 Saarinen, Oiva W. *From Meteorite Impact to Constellation City: a Historical Geography of Greater Sudbury*. Waterloo, ON: Wilfrid Laurier University Press, 2013. 50.
2 Ibid., 5.
3 Ibid., 50-57.
4 Ibid., 261.
5 Ibid., 261-265.
6 Ibid., 261.
7 Ibid.
8 Ibid., 271-274.

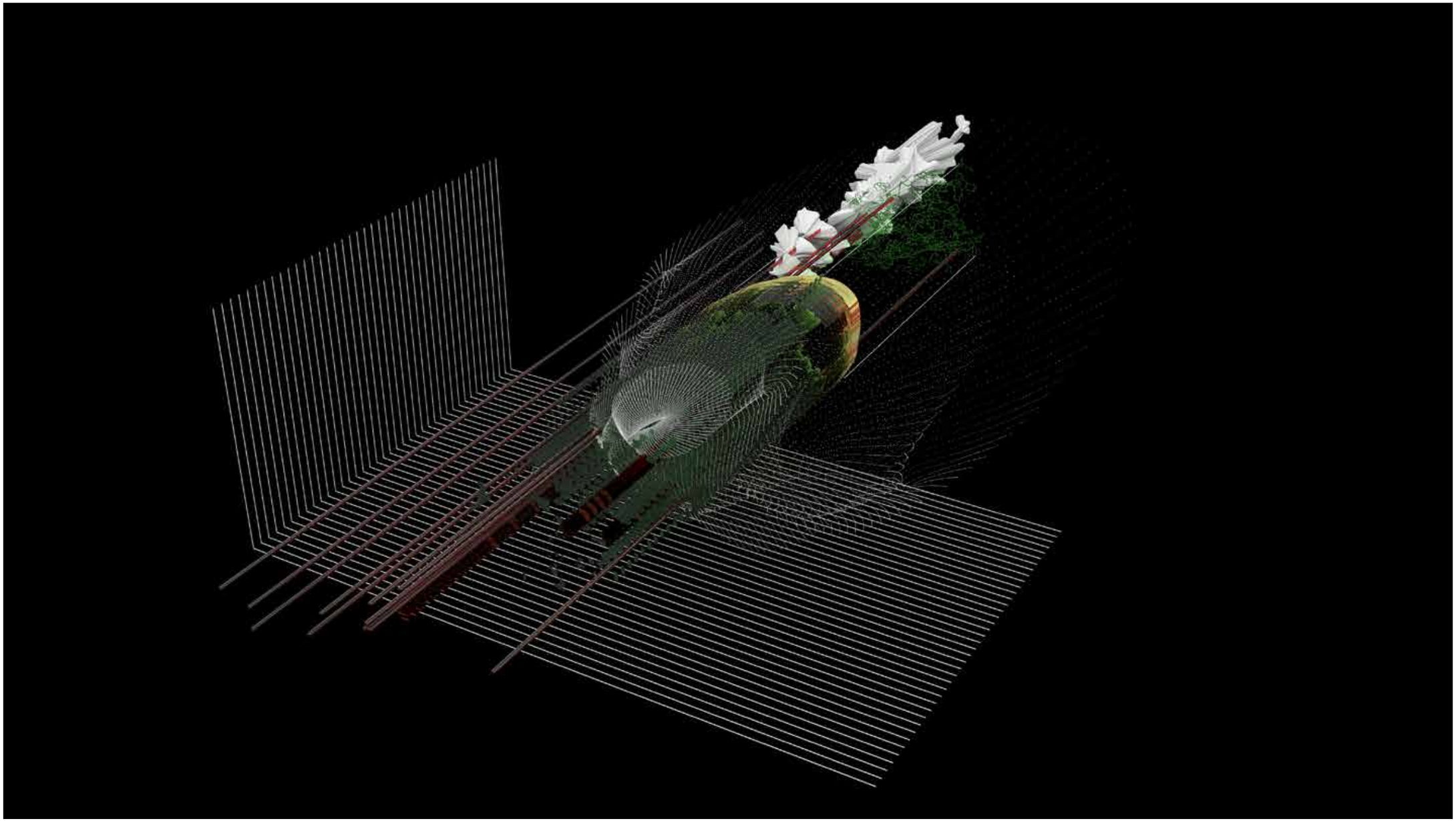


Figure 31: Image By Author. Temporal mapping of the scope of the mining and smelting processes on the landscape, and subsequent scopes, over the years, of the Regreening Program.

Act 2

Poison in the Air

Airborne Pollutants[1], which is a term that serves as a vague interpretation of a broader concept, carries certain implications concerning health, both human and ecological, as a set of consequences resulting from industry. Acting as the first injected perturbation, airborne pollutants constitutes the presence of gases and particulates in the air and atmosphere can entail a variety of adverse ecological and agricultural consequences and be quite detrimental to the health of a person, which can lead to complications in their lungs and general well-being. Historically, Sudbury has been referred to as "a bleak landscape of black, scarred and barren rock, denuded forests, and acidified lakes and streams"[2] (Figure 32) aptly depicting the extent of the damages done by the mining and lumber industries on the landscape, without even mentioning the acid rain and subsequent airborne pollution. One can only imagine the ramifications of such damages today and in the future. As has been indicated in this initial survey map drawing (Figure 33), the potency of potential air pollution following the prevailing winds, as has been the case historically in Sudbury, puts a non-negligible number of health-related centers and services at risk. This serves as an indication of potential effluent from industrial processes, as engendered by capitalism. It attempts to indicate the degree of potential damages in the region, were we to return to historical pollution levels.

This alone does not constitute an apocalypse; indeed, it might not be too noticeable to most people and only affect the most vulnerable. VALE's current air pollution and particulate matter output are vastly improved compared to that of its early industry.[3] As much as this is the trend in Canada,[4] however, it is not the case worldwide.[5] [6] Current Air Pollution trajectories indicate that outdoor air pollution relating to particulate matter and ground-level ozone will be the leading cause of environmentally related deaths worldwide by the year 2050.[7] It can be assumed that these current predictions will hold, and that air pollution becomes the leading cause of environment-related deaths. Already, air pollution is estimated to be the cause of "(…) significant excess mortality and LLE (Loss of Life Expectancy), especially through cardiovascular diseases."[8] The World Health Organization

1 Nano-particulate suspended in the air, which pose a risk to human and ecological health.

2 Nicola Ross, Healing the landscape: Celebrating Sudbury's Reclamation story (Sudbury, ON: Vegetation Enhancement Technical Advisory Committee, 2001), 8.

3 Ibid.

4 "National Air Pollution Surveillance Program," Government of Canada, accessed December 1, 2020, https://www.canada.ca/en/environment-climate-change/services/air-pollution/monitoring-networks-data/national-air-pollution-program.html.

5 Organisation for Economic Co-operation and Development, "Environmental Outlook to 2050: The consequences of inaction," (Online PDF, OECD, 2012), 4, https://www.oecd.org/environment/indicators-modelling-outlooks/49928853.pdf.

6 "Air Pollution," World Health Organization, World Health Organization, accessed December 1, 2020, https://www.who.int/health-topics/air-pollution#tab=tab_1.

7 Organisation for Economic Co-operation and Development, "Environmental Outlook to 2050: The consequences of inaction," (Online PDF, OECD, 2012), 1, https://www.oecd.org/environment/indicators-modelling-outlooks/49928853.pdf.

8 Lelieveld et al., "Loss of Life Expectancy from Air Pollution Compared to Other Risk Factors: A Worldwide Perspective."

Figure 32: VALE, Roastyards in Copper Cliff. Greater Sudbury, ON.

(WHO) listed the burden of disease attributable to ambient air pollution at 3 million deaths in 2012.[9] While this might not be directly related to industry found in the Sudbury region, it is possible that effluents from other parts of the world would travel along global air currents and negatively affect the region.

In 2020, the fires that raged in the western United States released smoke and carbon particulates recorded in the Great Lakes region.[10] [11] Despite the effect being limited to a haze in the skies, which did not significantly impact health, it is still an indicator of the worsening of both concentrations of air pollution levels and Climate Change induced ecological events. Either of which could potentially significantly affect, if not Sudbury itself, then the neighbouring regions. Assuming that these wildfires persist and worsen, consuming more land during peak season, burning more forests, and expelling more smoke and particulates into 2050. With this assumption, we also assume that the incidences of smoke and associated particulate matter of at least PM2.5 (particulate matter with a diameter

9 World Health Organization, "Ambient air pollution: A global assessment of exposure and burden of disease" (Online PDF, 2016), 40.

10 Scottie Andrew, "Smoke from the U.S. wildfires has reached six Canadian provinces," CTV News, CTV News, September 14, 2020, accessed December 1, 2020, https://www.ctvnews.ca/world/smoke-from-the-u-s-wildfires-has-reached-six-canadian-provinces-1.5104388.

11 Digital Writers, "California wildfire smoke blanketing southern Ontario skies this week," The Weather Network, The Weather Network, August 26, 2020, accessed December 1, 2020, https://www.theweathernetwork.com/ca/news/article/california-wildfire-smoke-to-blanket-southern-ontario-skies-this-week.

of 2.5 microns or less)[12] in Ontario will worsen during peak wildfire season, which occurs during the summer months, significantly impacting southern Ontario communities. These communities, namely their more vulnerable members, would be seeking solace from such fine particulate in the air, as long-term exposure would cause an "(…) increase in the long-term risk of cardiopulmonary mortality (…)."[13] Such a group would seek a location away from a major urban center and nexus of pollution, which is in the path of the smoke being emitted from the wildfires. It would cause the migration of another portion of the people towards areas with a better Air Quality Index.[14] The proximity to a network of health-related resources and clinics and a major hospital would be necessary for their primary health concerns. They would most likely also seek an area that provides a vast abundance of natural resources and beauty while also providing all of the amenities to which they are accustomed. Sudbury, among others, fulfills these criteria.

This would cause a series of preliminary effects. Namely, there would be an increase in residential accommodations to fulfill this migrating population's need for housing; the city would therefore be required to grow, be it through densification or a further expansion of the city's land area. The incidences of health-related issues will also rise in response to pollution. So a larger number of clinics and other health-related centers will need to be either expanded or constructed. Additionally, graveyards will need to be prepared to accept a larger population. Significant air pollution levels are "(…) imposing a substantial health and economic burden on billions of people." As such, individuals with the means to do so find themselves in need of purchasing air purifiers to reduce indoor air pollution levels to safe levels. Those without the financial means to buy a way to purify the air they breathe are left to choke. We can only expect this to become more common as the pollution problem persists.

We might draw some interesting parallels from two science fiction films, *Nausicaä of the Valley of the Wind* and *Soylent Green*. In the first of these, the air itself is poisonous to the point of being fatal due to the spread of a toxic jungle. The population of this world live and breathe through masks that act as respirators would, purifying the air and cleansing it for

12 British Columbia Center for Disease Control, "Wildfire smoke and your health" (Online PDF), 1.
13 World Health Organization, "Health effects of particulate matter" (Online PDF, 2013), 6.
14 Shuai Chen, Paulina Oliva, Peter Zhang, "A toxic environment: Rapid growth, pollution and migration," VoxDev (2018), accessed December 1, 2020, https://voxdev.org/topic/labour-markets-migration/toxic-environment-rapid-growth-pollution-and-migration.

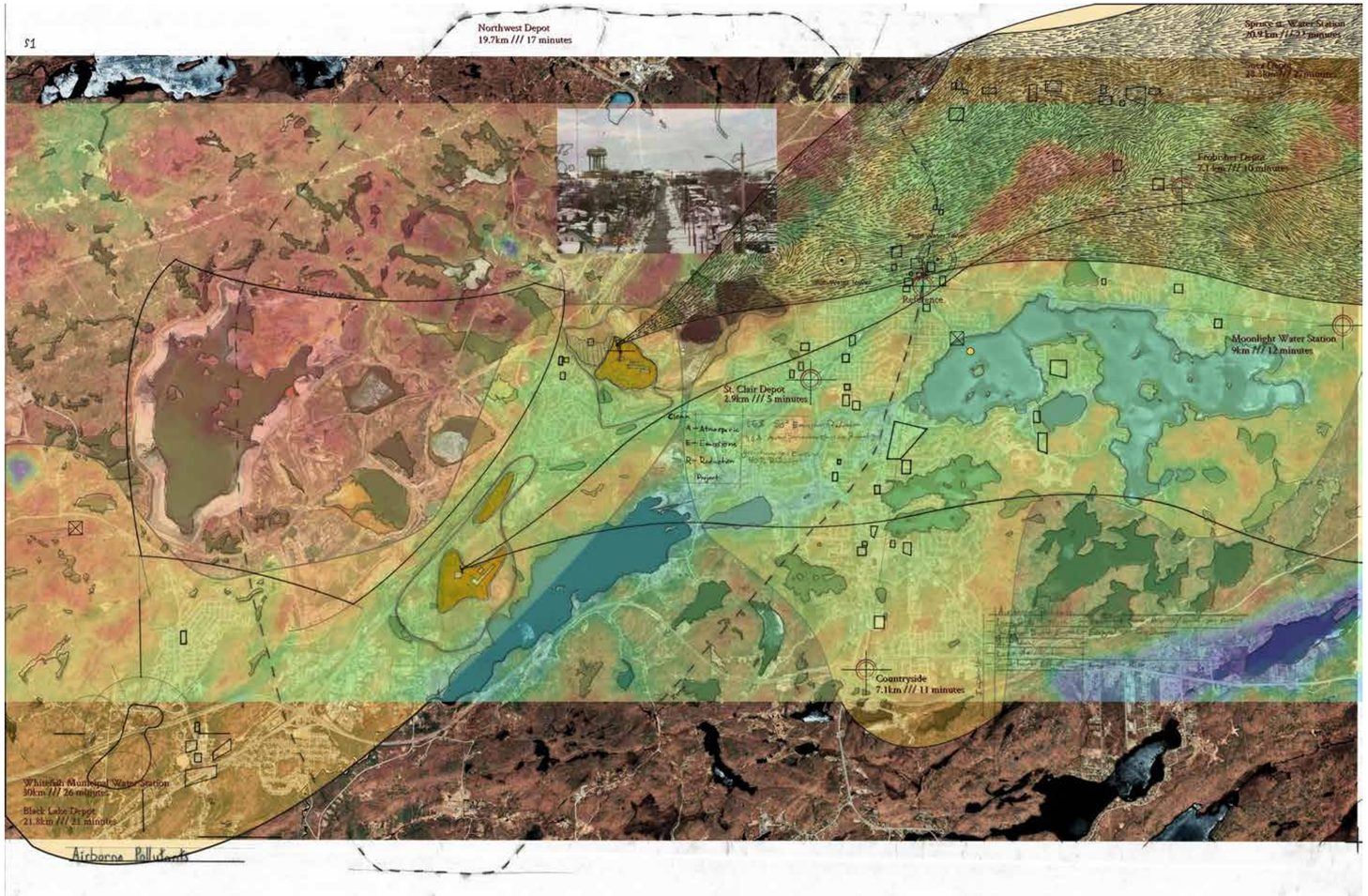
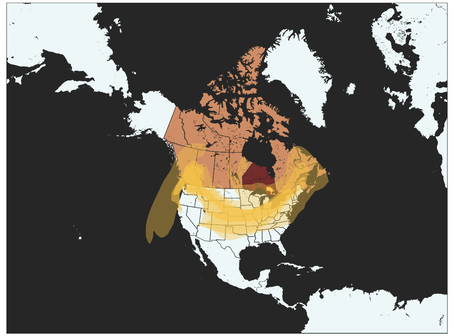
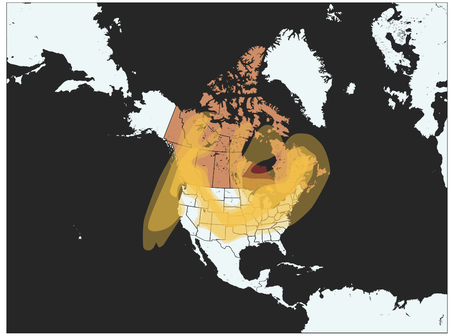


Figure 33: Image by Author. Initial survey into the scope of environmental damages engenderded by the mining and smelting complexes in the region, which combines historical and current information to explore potentiality. The location of health-related centers is outlined, as is the location of water treatment centers and water stations.





use in the body. (Figure 37) They also find themselves able to breathe in their buildings and vehicles, leading us to assume that some kind of purification process is occurring between exterior and interior spaces. The people of the titular Valley of the Wind find themselves in a particular valley, living a pastoral lifestyle, subject to frequent and sufficiently powerful gusts of wind. These breezes clear away the jungle's poisonous miasma and render the air breathable. This makes their Valley a particularly attractive area to their neighbouring countries, which are at war with one another. The context in this story is not of particular importance to this specific scenario; rather, the parallels between the realities in the film and our own speculated scenario are of interest.

Soylent Green also presents some interesting ideas concerning this topic which can be used when discussing these effects. Issues such as an over densification without proper amenities to fulfill the requirements of this population. And disenfranchisement of those without the means to sustain a lifestyle after such a trek as that which brought them to Sudbury. This population, especially those that can be classified as vulnerable, would require that the health-related services be bolstered to accommodate their needs, be it through expansion or the construction of new health centers. We can begin to assume that, on a municipal scale, in light of an increase in pollution-related illnesses, the regional hospital, Health Sciences North, would seek to expand. While it may not be feasible to expand directly adjacent to the current site, there is ample land across the Greater Area of Sudbury to accommodate such growth. These new areas of expansion would then require new graveyards, which would serve to house, the increasing number of deaths due to ambient air pollution, among other causes. In a bid to curb such an increase in pollution and to sequester carbon, the local regreening program, would continue.

Additionally to these municipal effects, it becomes possible to start observing impacts at a much more constrained scale, namely, the area concerning the VALE Smelter complex. (Figure 39) It is possible to assume that an air collection and purification plant in the vicinity of the Oxygen Plants #3 and #4 would be constructed. This would commodify purified air, which would be delivered via an elevated pipeline to a compression plant,

Figure 34: Fold-out Above. Image by Author, based on (FreeVectorFlags, Map of North America with US states and Canadian Provinces, free vector maps, Accessed December 1, 2020 https://freevectormaps.com/world-maps/north-america/WRLD-NA-02-0005?ref=atr.) Displays the scope of wildfire smoke emanating from the North American West Coast in 2020.

Figure 35: Fold-out Above. Image by Author, based on (FreeVectorFlags, Map of North America with US states and Canadian Provinces, free vector maps, Accessed December 1, 2020 https://freevectormaps.com/world-maps/north-america/WRLD-NA-02-0005?ref=atr.) Displays the scope of wildfire smoke emanating from the North American West Coast in 2050, extrapolated from existing trends.

Figure 36: Opposite. Image by Author. Effects on the Greater Sudbury municipality engendered by a continuous trend in air pollution and particulate matter, and of a subsequent migration event.

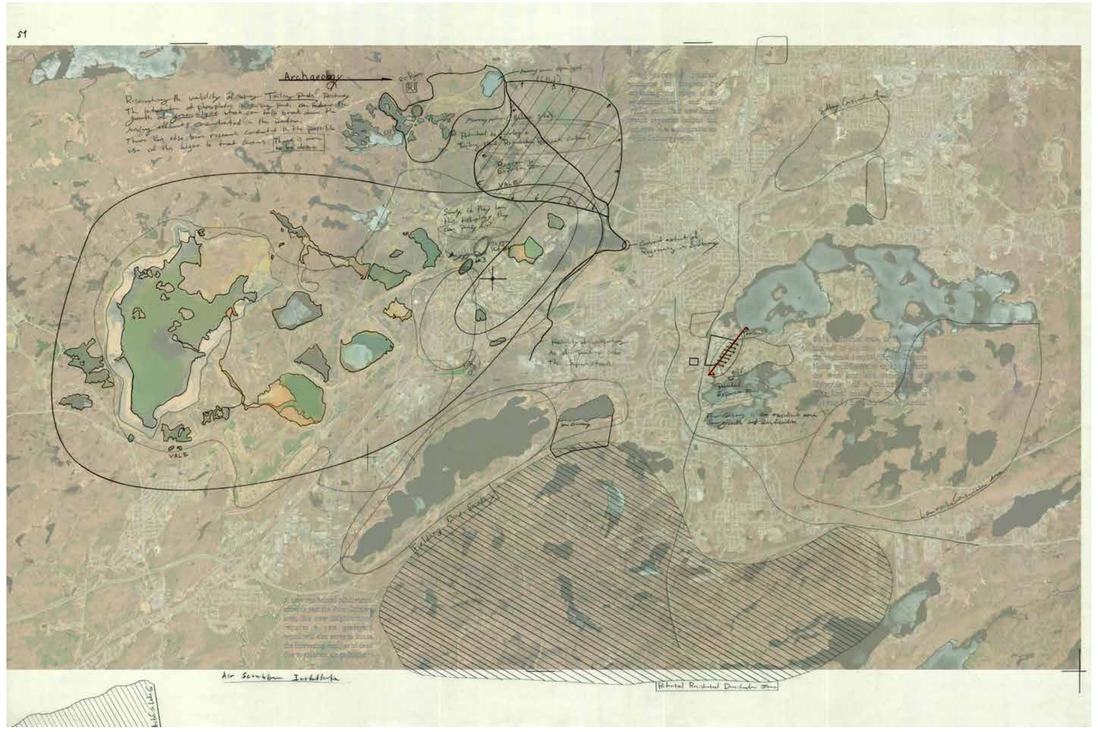


Figure 37: Miyazaki, Hayao. Nausicaä of the Valley of the Wind. March 11, 1984; Japan: Toei Company, March 11, 1984. Animated Film. Mask use in Nausicaä.

Figure 38: Fleischer, Richard. Soylent Green. April 19, 1973; Metro-Goldwyn-Mayer, April 19, 1973. FilmOvercrowded buildings in Soylent Green. Slum of people dwelling in cars.

where it would be compressed and shipped to be sold at market, netting VALE a profit from a process which they already require to some extent for their smelting process.[15] It is also possible that some of this clean air might be released via the Superstack as an act of performative goodwill, while the real goal is the monetization of clean, compressed air to hospitals and the wealthy. The Superstack while a Sudbury landmark would be inefficient for ample air distribution within the city limits, because the height of the structure would send the air elsewhere.

It is also feasible that a new wall may be erected around the northern area of Little Italy in Copper Cliff, which finds itself squarely in the middle of the smelter complex, to protect this transfer of air. The implications are clear, as the wall traverses the denuded area north of the neighbourhood, cutting it in half with a tall concrete wall. On either end, there is a barred gate, restricted to outsiders. Guards are stationed at these gates to permit entry to maintenance and other workers. The Little Italy side of the wall is regreened per the regreening program's protocol, which serves to hide the wall, and the operations behind it, from the residents and further sequester carbon.

As a joint venture between VALE and Laurentian University, a tailing pond research center intended to delve deep into tailing pond remediation and possible avenues for cancer treatments might be built. Laurentian University researchers have already begun investigating the possibility that green algae extracted from tailing ponds may combat cancerous cells.[16] This research center would provide the necessary amenities for further investigations. Located Northward from the Complex's primary tailing ponds, the center is equipped with ecological and medical equipment in its laboratories. Monitoring towers rising from the waters of the ponds provide an ideal way to monitor the state of the water and its contents during the dumping process. An additional location, South of these tailing ponds, is intended to serve as a secondary monitoring station. These two locations are linked by an elevated walkway constructed over a current earthwork separation between two ponds.

15 Koichiro Ito, Shuang Zhang, "Willingness to Pay for Clean Air: Evidence from Air Purifier Markets in China," (research paper, University of Chicago and NBER, University of Colorado Boulder, 2018), 2. http://home.uchicago.edu/ito/pdf/Ito_Zhang.pdf.

16 CBC News, "Laurentian researchers work to see if mine tailings ponds can help treat cancer," *CBC News* (Sudbury, ON), Aug. 11, 2020.

Figure 39: Opposite. Image by Author. Effects on the Copper Cliff Smelter Complex in Copper Cliff engendered by a continuous trend in air pollution and particulate matter, and of a subsequent migration event.

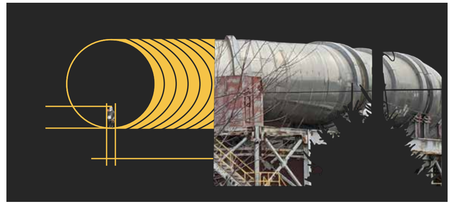


Figure 40: Image by Author. Investigation into the size of the pipes found in the Smelter Complex Milieu.

The adjacent collage (Figure 41), is an exploration into a primary aspect of the first perturbation; how does one power and supply an air purification plant of the magnitude needed to provide breathable air to a northern population? What kind of associated infrastructure would this require? Firstly this would require a critical mass of wind, parallels may then be draw to *Nausicaä of the Valley of the Wind*, which explored a similar question and built a world around this concept. Through this, the validity of windmills as a viable energy source, or at least as a method to supplement the energy costs associated with running a purification plant can be contemplated. Finally there is the exhaust that this process might produce, which might be expelled through the Superstack to send it to 'faraway lands,' which would only serve to amplify a 'not-my-problem' outlook.

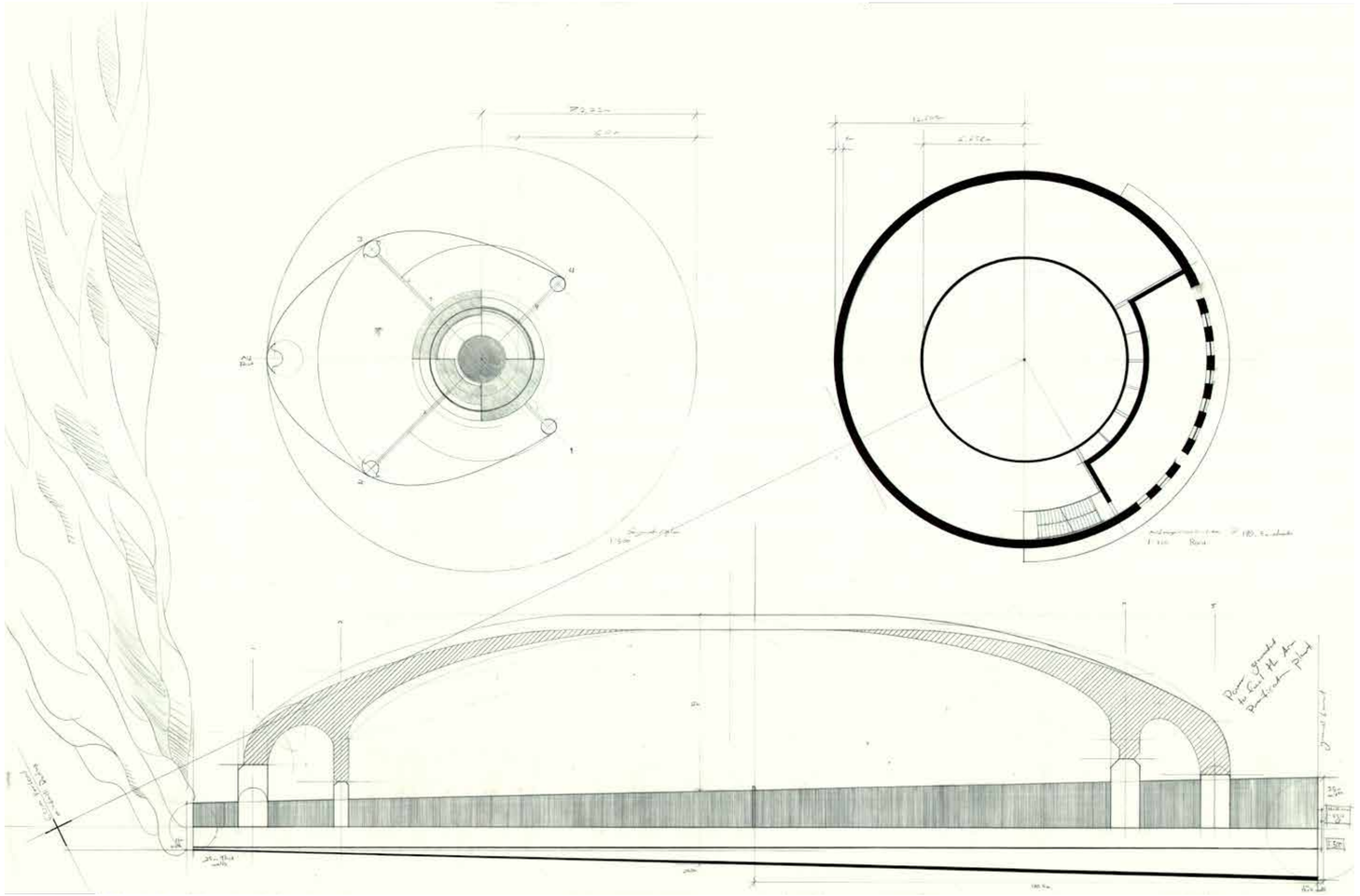
The numerous applications of wind are now at the forefront of the discussion. Perhaps other windmills would begin to populate VALE land, adjoining crop fields to support an insular population tasked with protecting the vital operation. Perhaps a roost is constructed within the shell of the Superstack, which would serve both as an outpost to observe the surrounding area, serving a similar purpose as the one that a guard tower may serve. All the while offering a means of communication, if not literally through the use of birds, then at least through the amplified signal reception that being this high up in the chimney would provide. Additionally to all of this, low-tech detection methods akin to chimes or pieces of cloth might be strung between the other existing chimneys. There is also the possibility that small wind-detecting structures, like those found in *Nausicaä of the Valley of the Wind*, would be constructed across VALE property. Doing so would provide a simple way, beyond the turning of the windmills, to indicate the presence of wind. This echoes their use in Nausicaä and certainly makes the terrain more interesting.

Architectural drawings of the Superstack are challenging to grasp, especially when considering its vast size. (Figure 42) At 381m tall, the chimney makes an imposing figure in the Sudbury skyline, and one can only imagine what a vertical windmill would look like. As is conceptualized in this drawing, placing one here to use the Superstack as a central support shaft would make it the tallest vertical windmill.[1] This drawing is, speculative, and was developed as a barometer of possibilities rather than with feasibility in mind. The segmented plan, situated in the upper-left portion of the page, helps to understand the scale of the radius of the rotors. Each quadrant associated with the drawing, segmented along cardinal lines, can be related to each of the supports for the rotors, as indicated by the numbering, which associates this plan to the elevation/section laid along the bottom of the page. The quadrants should indicate the distance from the center point of the Superstack. The plan of the roost, situated in the upper-right portion of the page indicates the scale and dimensionality of such a space, all the while underscoring the massiveness of the chimney. The inner steel liner can be seen floating in the center of this arrangement. It is what serves as a support for the room. A walkway, affixed to the exterior of the Superstack, is reached through doorways in the roost. The room itself is reached via a staircase that climbs 190.5 meters from the ground.

1 Beating out Éole, the previously tallest vertical windmill in the world. "Accueil," Éole Cap-Chat, Éole Cap-Chat, accessed Jan 4, 2021, http://eolecapchat.ca/.

Figure 41: Opposite. Image by Author. Collage describing the construction of a vertical windmill on the Superstack, which would generate electricity for an air purification plant, as well as a roost located inside the stack.

Figure 42: Image by Author. Extraction drawing which explores the realities of the attachement of a vertical windmill assembly to the Super Stack, and what a roost, situated in the middle of the stack, might begin to look like, architecturally.



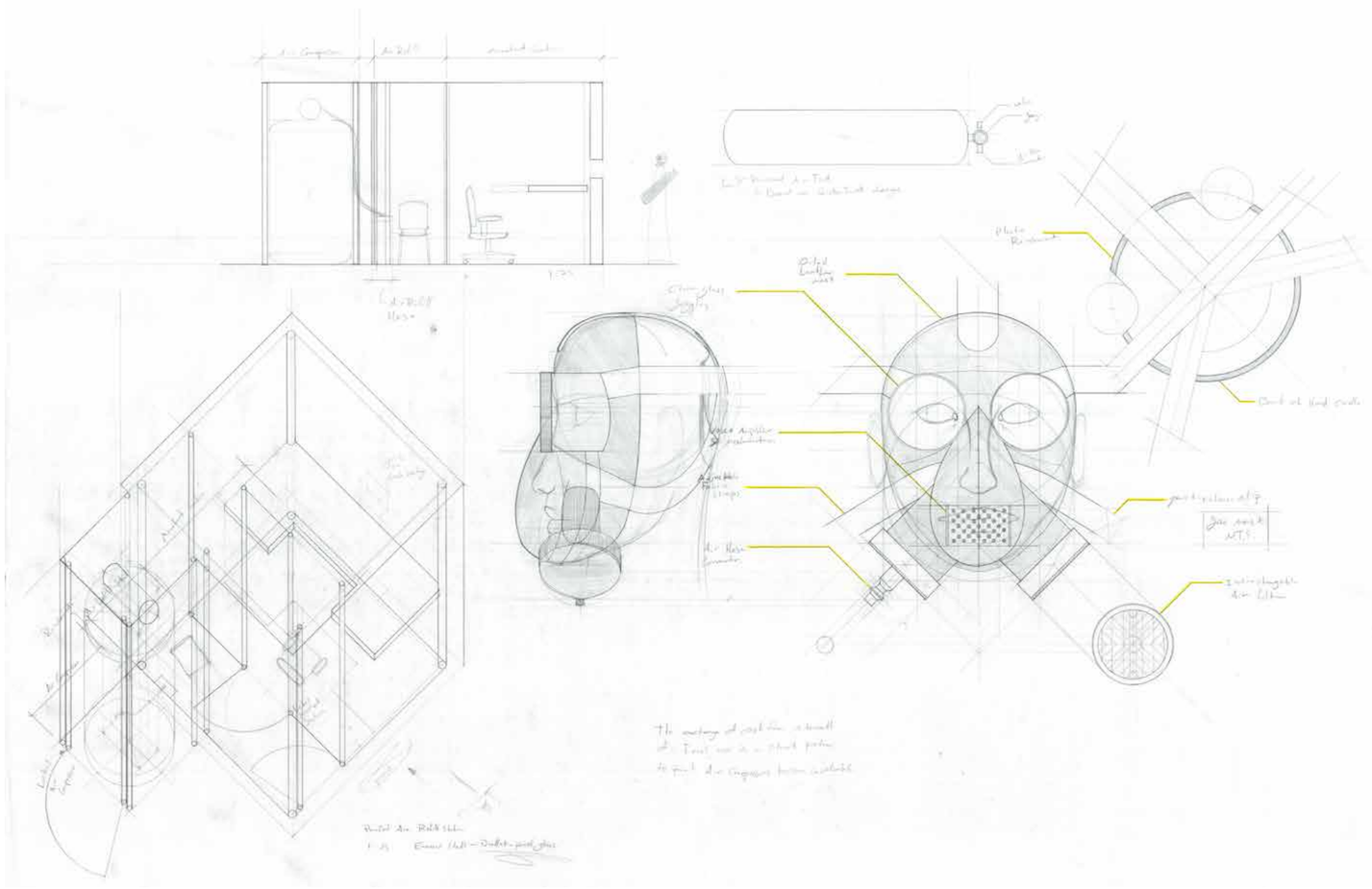
How can we conceptualize the monetization of air? How might this new commodity interact with the plight of capitalism? While difficult to wholly personify, this collage, (Figure 43) attempts to render visible certain aspects of such a thing, like the medical checks needed to certify the health of an individual with an underlying condition, which would serve to qualify a person to receive preferential treatment. If one were to assume that OHIP, Ontario's health care plan,[1] is still intact at this point, then it is also safe to assume that it would extend its medical coverage to protect those made more vulnerable due to an increase in airborne pollutants and any related illnesses. One would imagine that to live in a situation wherein the purchasing of air is made commonplace, one would have to undergo quite a severe shift in mentality and enter what might be understood as a mode centered on survival. . In the collage, the beginnings of a budding market are forming. Air tanks sold at a farmer's market, much like one would sell produce or homemade goods.

Those with the particular know-how might conceive a structure made of reinforced glass, which would serve both as a stall for the exchange of currency to use the merchant's compressor equipment and as the room wherein one might refill a portable air tank for later use. (Figure 44) Premium filtered air, scented with rose petals, would be particularly popular with those who have the means to purchase it. Gas masks, intent on filtering pollutants from the air before being breathed in, would become ubiquitous. People may then live a large majority of their life in a mask to limit the chance of becoming sick. Said masks would then become commonalities designed to be customized through speciality shops or DIY initiatives. [2] While the average person may have basic materiality that prevents prevent the permeation of nano-particulate, perhaps leather, or a thick cloth, upper-class citizens may have integrated technologies which allow for voice amplification, night vision goggles or even wear brand name masks.[3]

1 "Health care in Ontario," Ontario, No date available. Accessed January 15, 2021. https://www.ontario.ca/page/health-care-ontario.
2 "DIY Cotton Face Mask," àplat, No date available. Accessed January 15, 2021. https://aplat.com/blogs/shus-notebook/diy-cloth-face-mask.
3 "Face Masks," Neiman Marcus, No date available. Accessed January 15, 2021. https://www.neimanmarcus.com/en-ca/c/jewelry-accessories-accessories-face-masks-cat79030750.

Figure 43: Opposite. Image by Author. Collage describing the construction of air refill stations which would operate for profit in response to the desire to purchase purified air.

Figure 44: Image by Author. Extraction drawing which examines the realities of using masks to breathe, and what this might begin to look like.

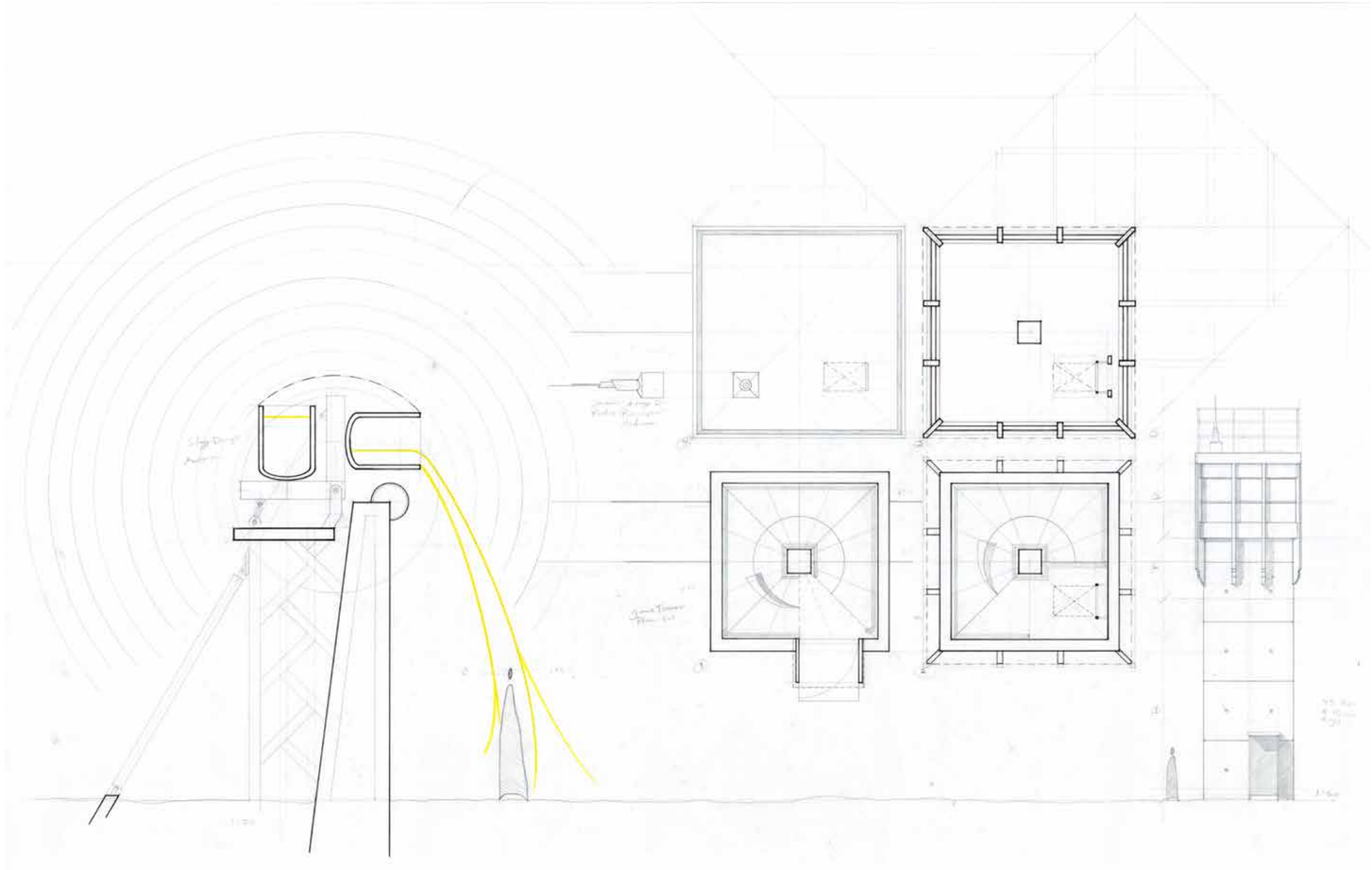


The adjacent collage explores the realities of placing an air purification plant within an already insular industrialized complex. (Figure 45) As such, is it not appropriate to question such realities to better understand how such a setting might play out? Perhaps these selling sites would be heavily guarded to prevent impending raids, perhaps a series of black market trades may ensue. The desperate and the greedy might realize that those things that they may want are within grasp if only they had the wherewithal to seize them. Such is the reason that one may find the need to protect and guard what is theirs, or create an underground market. This is also why VALE might find it necessary to fortify their territory to defend it from those who wish to control such an essential supply of such an important commodity. What already resembles a castle of an industrial nature might begin to look like a veritable fortress. A chain-link fence already demarcates VALE's property. This is sufficient to deter the curious but would be quite inadequate regarding anyone determined enough. What might begin as patrols would evolve into a more purposeful defence mechanism, involving increasingly robust physical fortifications and management of personnel dedicated to the tasks involved in defending a perimeter. The Complex would begin to stray further and further from the realities of those living outside its walls, perhaps beginning to resemble an insular township or principality, something like a fief from feudal Medieval Europe.[1] The land, and those goods that might be abstracted from it, were the source of power, and as such, the one who owned the most land had the most potential for power. For the sake of this argument, substitute 'land' for 'purified air,' and the results are similar; the *control of air becomes a* source of power, and as such, the one who owned the most *air* had the most potential for power, economic and political. People need to breathe after all. In response to this shift, one might see a similar change in the mindset of the population. To live, one might argue, it is necessary to seize the means by which air is purified.[2] In this way, the tension between those inside and outside the walls of the Complex is exacerbated. A solid wall of poured and reinforced concrete delineates the periphery of VALE's property, affixed along its top; a steel tube makes surmounting the wall a challenge. (Figure 46) At intervals along its length, tall guard towers, filled with armed guards, extend their watchful eyes across the Sudbury landscape. These guards echo the "(…) class of specialized warriors (…)" of a fiefdom.[3] How else would the lord protect his land?

1 Marc Bloch, Feudal Society: The Growth of Ties of Dependence, trans. L.A. Manyon, vol. 1 (London: Routledge & Kegan Paul., 2004).
2 Karl Marx and Friedrich Engels, The Communist Manifesto (Singapore: Origami Books, 2020).
3 Marc Bloch, Feudal Society: The Growth of Ties of Dependence, trans. L.A. Manyon, vol. 1 (London: Routledge & Kegan Paul., 2004), xiii.

Figure 45: Opposite. Image by Author. Collage describing the construction of fortifications around the Smelter complex and a possible air purification plant.

Figure 46: Image by Author. Extraction drawing which explores potential architectural form for the fortifications that would soon be littered around the Copper Cliff Smelter Complex. How to best keep the raiders and the desperate out?

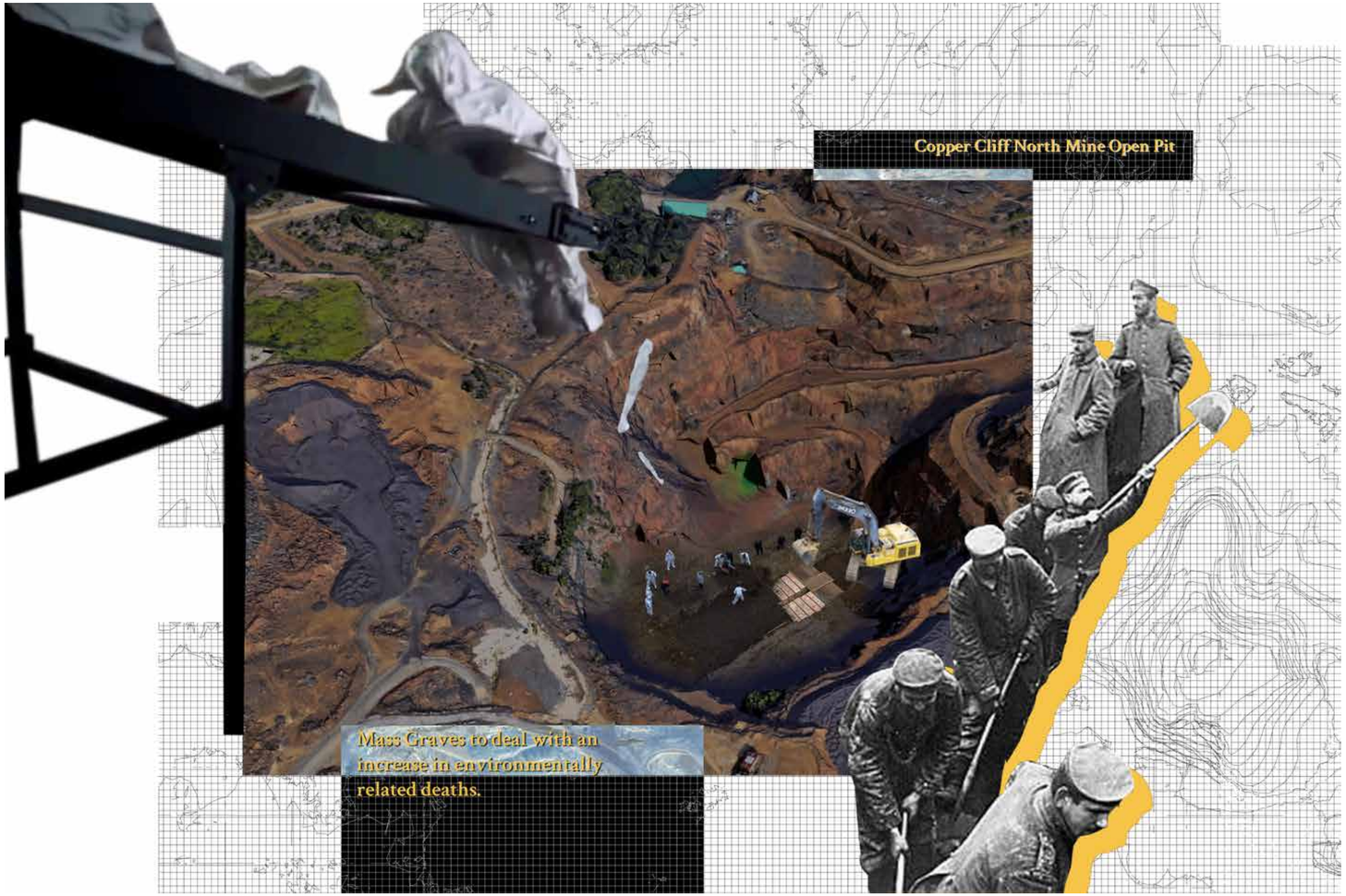


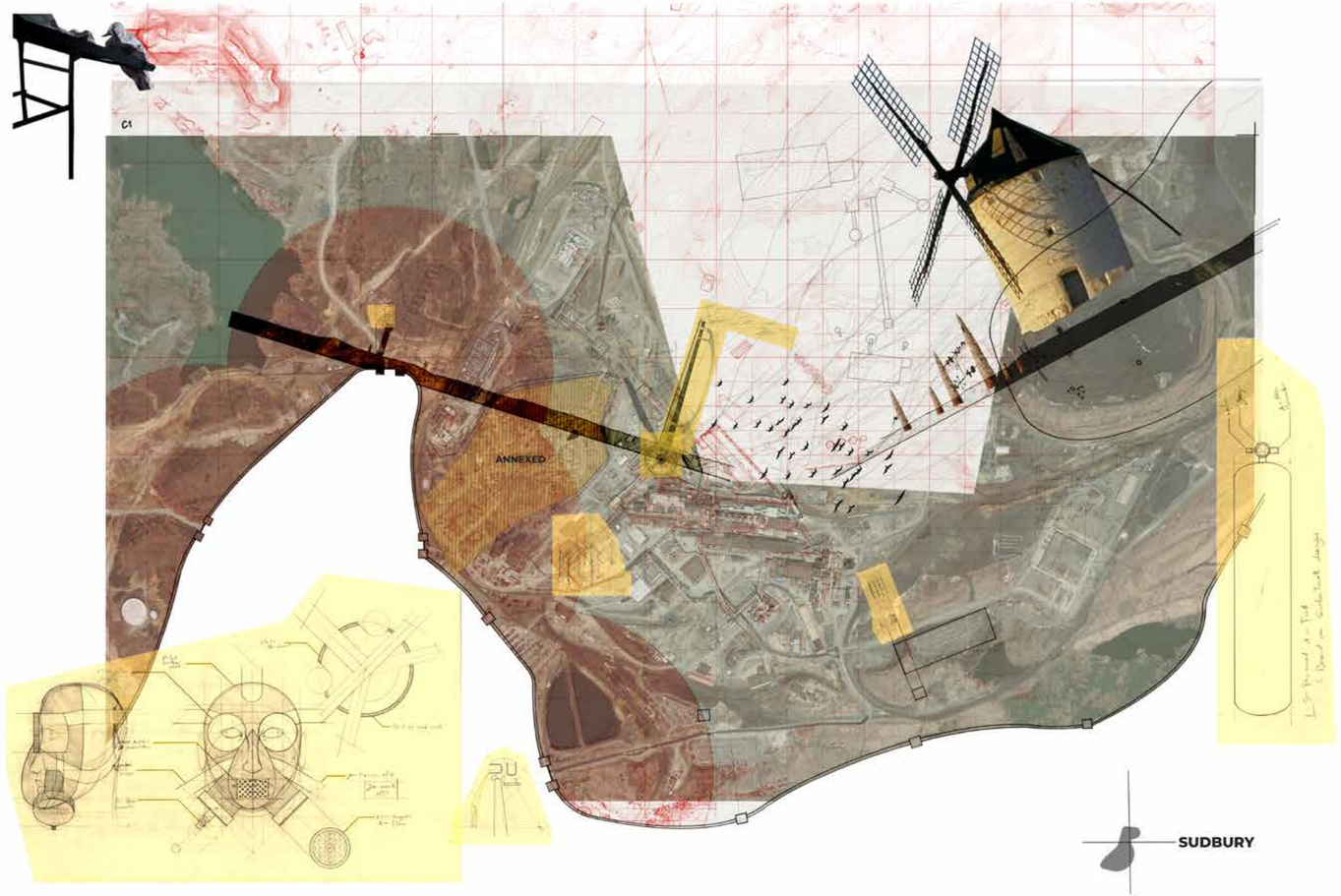
In such a situation, wherein VALE's property becomes isolated, the questions abound. How would the bodies of the dead be disposed? (Figure 47) It may be assumed that some form of protocol would need to be established to bury the deceased within the Complex. Similar, in a way, to the treatment of unclaimed or otherwise unidentified corpses as a result of the Covid-19 pandemic in New York?[1] In this case, one would only need large plots of land within which to bury the bodies. In this case, the open pits, as part of the northern VALE mine, should serve adequately.

In terms of isolation it is important to recognize the nearby neighbourhood of Little Italy. Previously a community of Italian migrant workers who worked for nearby VALE, it has become a much less significant part of Copper Cliff and the Greater Sudbury Area. In a power play, one has reason to believe that this neighbourhood would become annexed into VALE property and be transformed into an area dedicated to housing those working in management positions. In a socio-economic situation such as this, wherein the lives of those less affluent or less white are put at risk, those in power would seek to solidify their position as best as possible. This would entail hiring an armed guard and the barricading of oneself within the safety of high walls. Of course those truly in power, would not be staying here, instead choosing to oversee the operations from a "safe" distance. Indeed, this unfortunate neighbourhood revampment project would be dedicated to the middle-managers of the plant. To keep them compliant, they would be rewarded for their work by those in upper management through generous stipends and other medical and life benefits. Having established those that would work and those that would fight in this pseudo-feudal society, these people in management positions aptly fulfill the final piece of the tripartite puzzle, that of the ruling class and the religious caste. The establishment of this 'ruling,' or management class, would be what would make the already present hierarchy inherent in the Complex's daily operations that much more apparent. All those that would take part in such a system would inherently need to perpetuate the system, as failing to do so would lead to its collapse. As such, means to enhance the living standards within the walls (both the physical and the mental kinds) would be necessary. Perhaps a religious movement, sponsored by those in power, would be established, similarly to what Robespierre

1 Jada, Yuan, "Burials on Hart Island, where New York's unclaimed lie in mass graves, have risen fivefold," The Washington Post, The Washington Post, April 16, 2020, accessed January 18, 2021, https://www.washingtonpost.com/national/hart-island-mass-graves-coronavirus-new-york/2020/04/16/a0c413ee-7f5f-11ea-a3ee-13e1ae0a3571_story.html.

Figure 47: Opposite. Image by Author. Collage which posits the usage of old open pit mines as mass graves for those that died and could not be identified.





attempted with his Cult of the Supreme Being.[2] Without delving into the fetishization of living within the Complex (the Superstack as a symbol of God, a physical manifestation of deistic intentions, perhaps?), surely some kind of religious fervor would creep into the minds and souls of those that feel themselves to be superior to those outside. God's chosen people, saved from death.

2 Jeremy D. Popkin, A Short History of the French Revolution (Upper Saddle River, N.J.: Prentice Hall, 1998), 86, 91.

Figure 48: Opposite. Image by Author. Map of a new setting, which considers the insertion of Airborne Pollutants into this milieu.

Rain, midnight rain, nothing but the wild rain
On this bleak hut, and solitude, and me
Remembering again that I shall die
And neither hear the rain nor give it thanks
For washing me cleaner than I have been
Since I was born into this solitude.
Blessed are the dead that the rain rains upon:
But here I pray that none whom once I loved
Is dying tonight or lying still awake
Solitary, listening to the rain,
Either in pain or thus in sympathy
Helpless among the living and the dead,
Like a cold water among broken reeds,
Myriads of broken reeds all still and stiff,
Like me who have no love which this wild rain
Has not dissolved except the love of death,
If love it be towards what is perfect and
Cannot, the tempest tells me, disappoint.

Rain

Edward Thomas

Act 3

Rising Waters

The second perturbation of the Climate Change apocalypse is associated with water levels rising due to increasing average global temperatures. Let us assume in this scenario that RCP 6.0 (Representative Concentration Pathway) is the projection of emissions and effects of Climate Change that is used throughout this section of the scenario. This would entail that emission levels stabilize and that the global temperature increase would be limited to ~2.8 degrees Celsius.[1] RCP 6.0 is well above desired emission levels established in the Paris agreement, which states that signatory countries should aim for RCP 1.9, which entails a maximum temperature increase of ~1.5 degrees Celsius.[2] These RCPs estimate potential scenarios with the end goal of predicting what the world might be like by the year 2100. Yet, it is increasingly likely that warming will continue beyond 2100, with current estimates establishing projections leading into the year 2300.[3] [4] As part of this increase in global mean surface temperature would bring about many consequences and is, of all perturbations, arguably the most impactful. Consequences linked to water are among these, water access, the oceans, and water pollution, each of which could lead to a bevy of potentialities and responses. In keeping with the spirit of the project, these consequences shall, in turn, be evaluated, to summarize, however; an increase in length of the dry seasons in already arid regions as part of the migration of clement climate zones and increased rate of water evaporation leading to the rarefication of potable and renewable water sources, making water a valuable and highly sought-after resource. The mistreatment of water and water wastage become punishable offences. Water collection becomes essential to conserve what little water is available at both commercial and private levels.

The global rising sea levels would engulf coastal land and the built infrastructure along the shores of coastal nations, given enough time, much of which would be built to prevent or mitigate the damages that rising tides might wreak on populous areas. Most of the world's coastal ports and trading centers will be massively impacted to the point of potential inoperability. These combined assaults on the coasts would lead to a migration of people, mostly from areas in the path of those tides, towards inland regions due to physical displacement or panic. Some may recognize the severity of a given situation and adapt to allow for future potentialities; however, it is much likelier that a given population's reaction will be slow.

It is estimated that by 2100, in an RCP 6.0 scenario, global mean sea levels will rise by 0.63m with a likely range of 0.33m to 0.63m.[5] In another study that focused on sea-level rise projections, namely those in the RCP 2.6 and RCP 8.5 scenarios, similar projections were posited for the years 2100 and 2300.[6] While a similar hypothesis is lacking for the RCP 6.0 scenario in the latter year, we can extrapolate with the given data in both of these documents and arrive at our own speculative conclusions. In this case, global mean sea levels are expected to rise by 0.48m in 2100, with a range of 0.33-1m, and by 2.25m in 2300, with a range of 0.63-3.5m. It is estimated that areas which are "now home to 200 million people could fall permanently below the high tide line (…)."[7]It is also estimated that roughly 1 billion people around the world who "occupy land less than 10m above current high tide lines would be under risk of an increase in coastal water levels (…)."[8] This proximity to the high tide water line places these populations at risk of being engulfed by water-related disasters, tsunamis and the like. This tidal force, combined with changing climate zones and reduced access to freshwater, will incur massive global migrations, stressing economic and social boundaries and safeguards.

Several regions along the coasts of the United States would be confronted with rising tides. This combined attack would severely stress both the economic and political situation in the U.S. and might lead to challenges along the Canada-U.S. border. Along such a long international border, one which has, for the most part, been relatively lightly guarded. Which might lead to skirmishes among groups of desperate people. Canada is a land dense in natural resources, including 20% of the world's freshwater (of which, notably, less than half is renewable, at 7% of the global supply),[9] and which would also benefit significantly from the north-ward migration of a clement climate zone. The country might become the target of an increasingly desperate United States. An initial spirit of cooperation might devolve into competition between the two nations and then into outright hostility as desperation sets in. This is not a scenario that would play out in the short term; instead, it would take many years before the most severe challenges are felt. In the near future, however, we might begin to see situations similar to Cape Town in 2018, wherein the city was using its potable water resources more rapidly than it could replenish.[10] This lead to a "Day Zero," which saw the city shutting off its water supply to residents. Before this day,

1 "Mitigation," Climate Scenarios, https://climatescenarios.org/primer/mitigation/.

2 United Nations, "Paris Agreement," United Nations, December 12, 2015. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

3 Intergovernmental Panel on Climate Change. "Climate Change 2014 Synthesis Report." Online PDF, IPCC. https://ar5-syr.ipcc.ch/ipcc/ipcc/resources/pdf/IPCC_SynthesisReport.pdf.a

4 Horton, Benjamin P., Nicole S. Khan, Niamh Cahill, Janice S. H. Lee, Timothy A. Shaw, Andra J. Garner, Andrew C. Kemp, Simon E. Engelhart, and Stefan Rahmstorf. "Estimating Global Mean Sea-Level Rise and Its Uncertainties by 2100 and 2300 from an Expert Survey." Npj Climate and Atmospheric Science 3, no. 1 (May 8, 2020): 18. https://doi.org/10.1038/s41612-020-0121-5.

5 Intergovernmental Panel on Climate Change. "Climate Change 2014 Synthesis Report." Online PDF, IPCC. https://ar5-syr.ipcc.ch/ipcc/ipcc/resources/pdf/IPCC_SynthesisReport.pdf.

6 Horton, Benjamin P., Nicole S. Khan, Niamh Cahill, Janice S. H. Lee, Timothy A. Shaw, Andra J. Garner, Andrew C. Kemp, Simon E. Engelhart, and Stefan Rahmstorf. "Estimating Global Mean Sea-Level Rise and Its Uncertainties by 2100 and 2300 from an Expert Survey." Npj Climate and Atmospheric Science 3, no. 1 (May 8, 2020): 18. https://doi.org/10.1038/s41612-020-0121-5.

7 "Flooded Future: Global vulnerability to sea level rise worse than previously understood," Climate Central, 2019, https://www.climatecentral.org/news/report-flooded-future-global-vulnerability-to-sea-level-rise-worse-than-previously-understood#:~:text=PERMANENT%20LOSSES,below%20the%20high%20tide%20line.

8 Kulp, Scott A., and Benjamin H. Strauss, "New Elevation Data Triple Estimates of Global Vulnerability to Sea-Level Rise and Coastal Flooding," Nature Communications 10, no. 1 (October 29, 2019): 4844. https://doi.org/10.1038/s41467-019-12808-z.

9 "Water quantity," Canadian Federal Government, 2018, https://www.canada.ca/en/environment-climate-change/services/water-overview/frequently-asked-questions.html

10 "We have seen the future of water, and it is Cape Town," Huffington Post, 2018, https://www.huffpost.com/entry/opinion-gleick-cape-town_n_5a7cac75e4b08dfc93019ac2

the city enacted many water-saving measures and restrictions, which saw that people were limited in their water use.[11] Water plays an important role in the chosen films as well. In *Nausicaä of the Valley of the Wind*, purified water found deep underground allowed non-toxic plants to grow. In both *Soylent Green* and *Waterworld*, water is a precious natural resource that demands rationing. This may beget similarities to the latter such as utilizing water as a currency, or purifying urine and other liquids out of desperation. . Indeed, it is not too strange to think of these scenarios as being plausible. Indeed, assuming such scenarios become "reality," as it were, we can begin to speculate on the realities of the people living in these conditions.

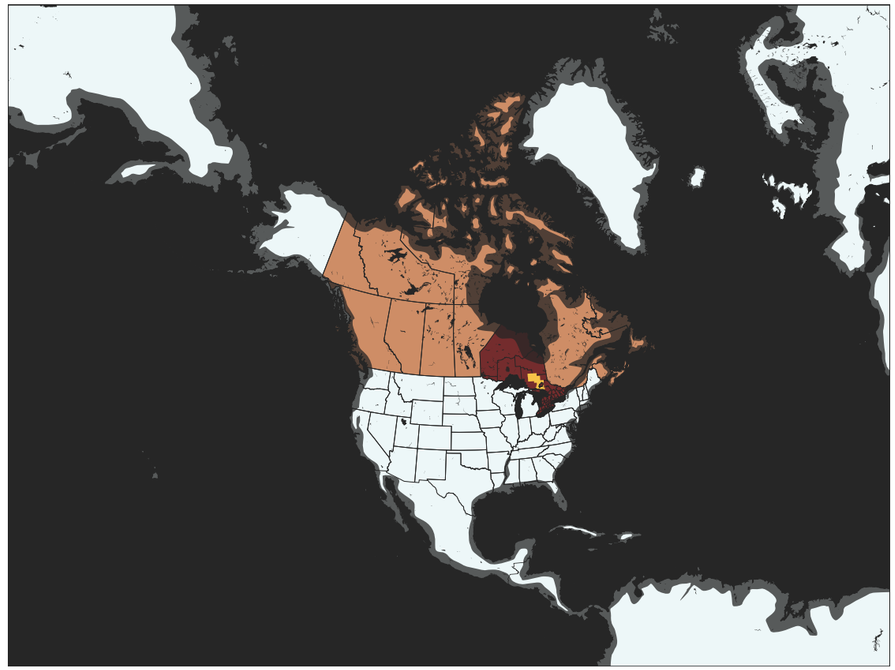
As part of an invasion plan to control more agrarian or otherwise economically valuable land, there might be multiple potential attacks on Sudbury as a means to solidify a position around the Great Lakes Region and as a valuable source of nickel as a war-making material. This plan, as outlined below, is based on War-plan Red, which is a document initially approved in 1930 and brought up-to-date in 1935, which detailed an invasion of Canada by U.S. troops in an effort to gain control of the territory and as a means of resistance against Britain.[12]

"The U.S. control of Inco was paralleled by the country's concern about controlling nickel as a strategic wartime mineral. For example, during the 1920s and early 1930s, paranoia existed in certain U.S. circles concerning the possibility of a theoretical war between the United States and the British Empire that would use Canada as a theatre of warfare. Added to this paranoia was the belief held by many Americans in the expansionist ideology of "Manifest Destiny:" that the United States had the inherent and inevitable right to control all of North America. To prepare for this unlikely scenario, the United States government even prepared a Joint Army and Navy Basic War Plan in 1924 that included the option of invading Canada and preparing the provinces and territories for statehood. (…) One of the critical aspects of this plan was its repeated emphasis on the need to control Sudbury's vital nickel deposits via an invasion route through Sault Ste. Marie."[13]

Using this plan as a basis for a potential scenario, wherein the relationship between Canada and the United States has deteriorated to the point of enmity, will allow us to further develop a possible invasion scenario. Roughly outlined, the plan is as stated:

11 "Ibid.
12 Lippert, Kevin C., War Plan Red: America's Secret Plan to Invade Canada and Canada's Secret Plan to Invade the U.S. New York, NY: Princeton Architectural Press, 2015.
13 Saarinen, Oiva W. *From Meteorite Impact to Constellation City: a Historical Geography of Greater Sudbury*. Waterloo, ON: Wilfrid Laurier University Press, 2013, 119.

Figure 49: Opposite Top. Image by Author. Map of the potential increase in Global mean sea-level rise, and the communities which are possibly at risk.



"The first step was a naval takeover of Halifax, to deny the port area for the British. Moving north from Albany and Vermont, an armored column would take Montréal and Québec. From Detroit, another column would take Toronto, and from Buffalo, Niagara Falls, crippling the Canadian power grid. Grand Forks, North Dakota, would be the launch point for an invasion of Winnipeg, and, finally, from Bellingham, Washington, American troops would overpower Vancouver."[14]

In addition to these phases, much supplementary material was outlined concerning the Great Lakes area and the importance of the bodies of water in the region and the industrial centers that border those shores. It also makes sense to assume at this point that control of the Great Lakes region would be needed to access some of the largest freshwater bodies in the world, which might alleviate some of the internal pressures coming from the populace. It is worthy to note at this point that both countries have had, since the inception and adaptation of the Rush-Bagot naval agreement, the industrial capabilities to construct warships on the great lakes, despite the letter of the agreement stating otherwise.[15] [16] All of this points towards the Great Lakes region's control as paramount to any successful invasion of Canada. As part of this region, Sudbury becomes a primary target, as stated in War Plan Red's Supplement No.3; "Nickel is necessary to industry and indispensable in war. Control

14 Lippert, Kevin C., War Plan Red: America's Secret Plan to Invade Canada and Canada's Secret Plan to Invade the U.S. New York, NY: Princeton Architectural Press, 2015.
15 Stacey, C. P. *The Undefended Border*. Ottawa, Ontario: Canadian Historical Association, 1962.
16 Lippert, Kevin C., *War Plan Red: America's Secret Plan to Invade Canada and Canada's Secret Plan to Invade the U.S.* New York, NY: Princeton Architectural Press, 2015.

of the Sudbury mines, in case of war, is therefor of vital importance."[17] It is possible to speculate on the creation of a militarized base of operation being created, in conjunction with the extant Sudbury armoury, to protect the city against attacks. This, among others, would be a potential avenue for the city to defend itself. More privately, the Complex would also defend itself, most likely utilizing a multi-ringed layered defence network that prioritizes the central operations and smelting buildings. There is also the possibility of U.S.-backed insurgents targeting critical material storage centers. Namely, those which contain hazardous chemicals, which, when bombed, would lead to the various hazardous materials leaking into the city.[18] Which may lead to severe adverse health effects,[19] such as acute nickel carbonyl poisoning,[20] pulmonary inflammation due to exposure to nickel oxide nanoparticles,[21] or the various effects brought about due to exposure to liquid or gaseous sulfur dioxide.[22] Among these fears, other factors loom which might affect the potential responses. Such as the increasing hesitation by parents to not have children due to fearing the child's safety amidst Climate Change and their prospects for the future.[23] Indeed, these prospects weigh heavily in the minds of the present and potential future individuals, and their prospects seem grim.

17 Wikisource contributors, "War Plan Red/Supplement No. 3," Wikisource , https://en.wikisource.org/w/index.php?title=War_Plan_Red/Supplement_No._3&oldid=3785902 (accessed November 28, 2020).

18 VALE. "Copper Cliff Nickel Refinery." Online PDF, VALE.

19 New Jersey Department of Health and Senior Services. "Hazardous Substance Fact Sheet." Online PDF, New Jersey Department of Health and Senior Services

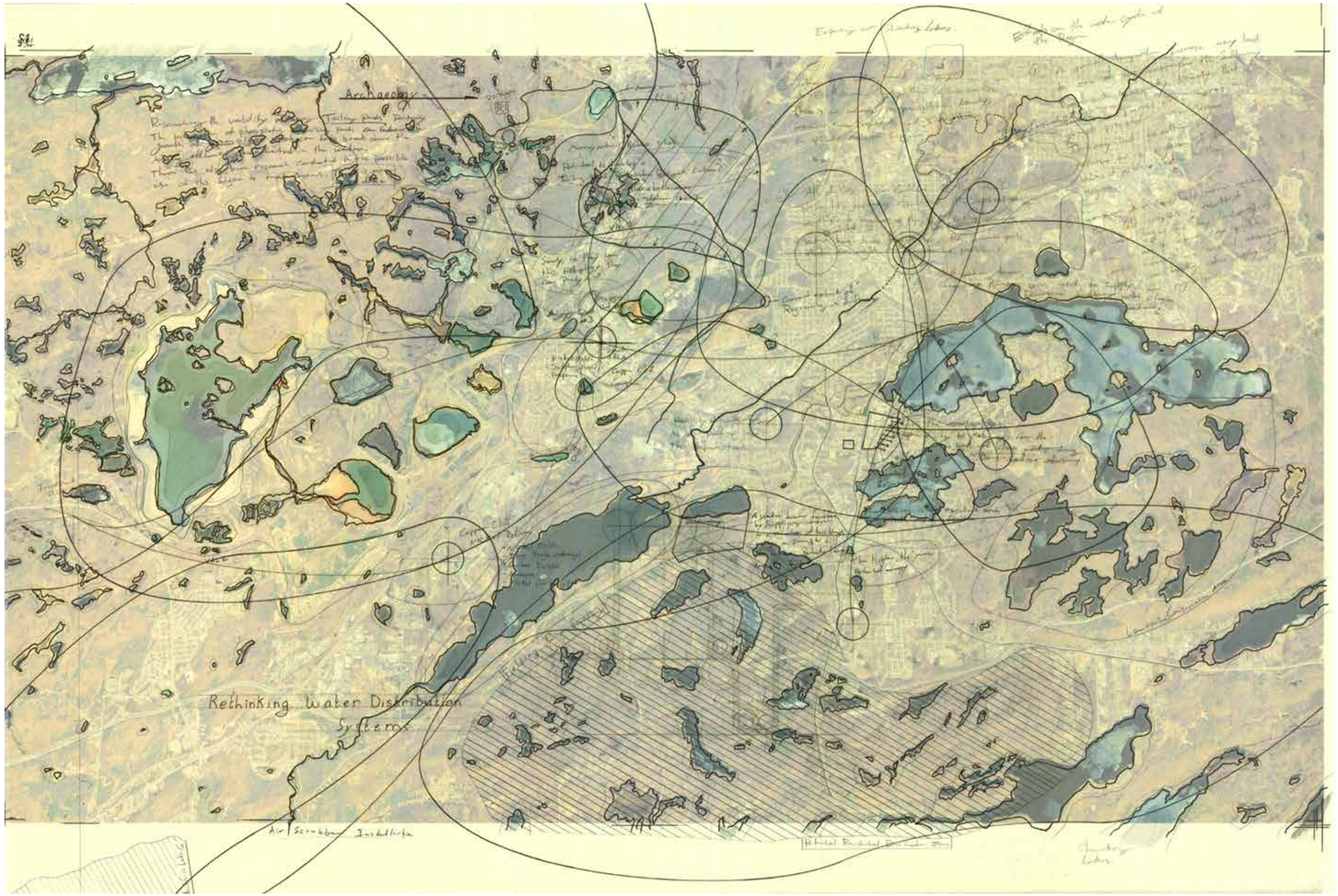
20 Kurta, Dean, and Krenzelok, "Acute Nickel Carbonyl Poisoning."

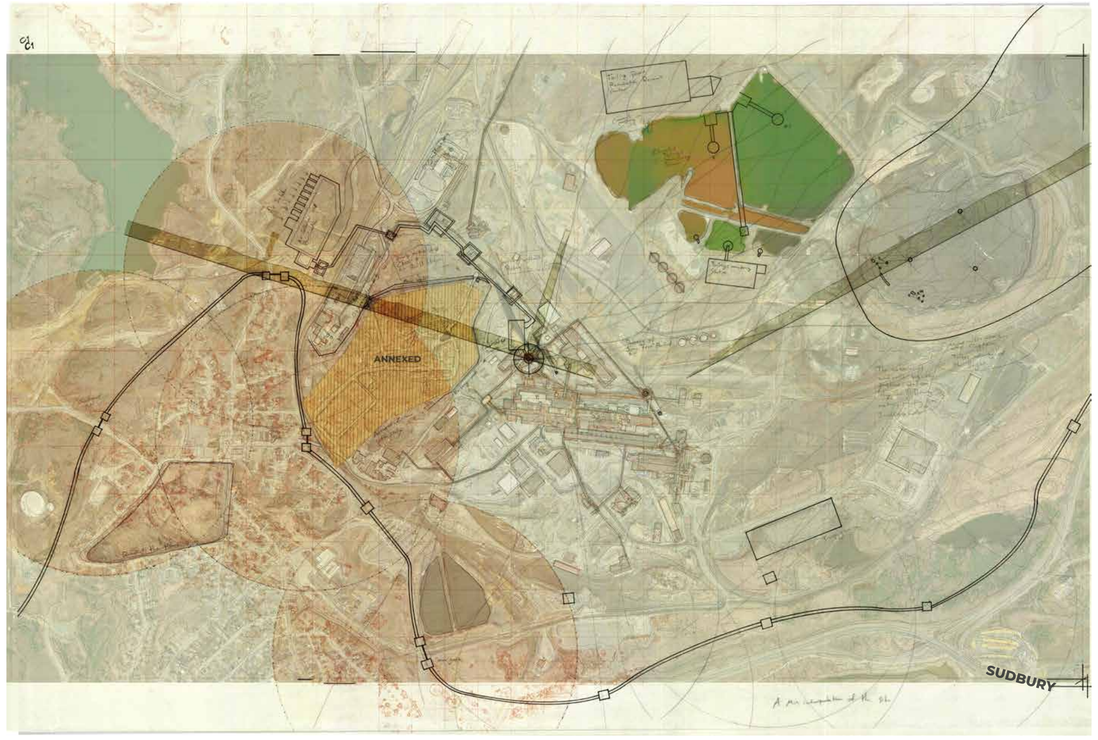
21 Cao et al., "Exposure to Nickel Oxide Nanoparticles Induces Pulmonary Inflammation through NLRP3 Inflammasome Activation in Rats."

22 Toxicology, SULFUR DIOXIDE.

23 Schneider-Mayerson, M., Leong, K.L., "Eco-reproductive concerns in the age of climate change," *Climatic Change* 163.

Figure 50: Opposite. Image by Author. Effects on the Greater Sudbury municipality engendered by this new perturbation. How might access to water be threatened under these new circumstances?





As part of the process, and in preparation for the second perturbation, an initial set of maps is established. These maps consolidate the work done so far, namely, the explorations and the changes made to the context. It is within these maps that most of the information that has been gathered and expounded is collected and simplified. They serve as map, evidently enough, of what has been done throughout the project so far. On top of these maps, an additional layer of information, pertaining to the potentiality linked to this second perturbation is added. This additional layer serves as a means to insert the perturbation into the milieu. This phase of the process is another essential step, as it reframes the information that is currently available, all the while adding new information. This step of the process becomes the starting point for any other changes that will occur in the later phases of this project which are all associated with the second perturbation. To continue the film analogy used throughout; we have changed the set to reflect the new contextual realities in this reality.

Additionally to this previous measure, a series of collages and extractive drawings has been done. The collages are intended to explore and navigate potential situations, or scenarios, which would involve people, and their role in this new context. It enables a further speculation on what might occur given the new parameters of the timeline. These collages are in no way prescriptive, rather, they evoke an idea or a feeling. The collage medium simply acts as a way of preventing too much finality too early.

The extractive drawings play a similar role, yet are distinctly different, as they may take place during or after the inception of the collages. As such, they are able to integrate these potential scenarios and develop architectural responses which may emerge from these explorations. The process is cyclical, as such, many of the previous steps used with the previous perturbation are once again put to use so as to further the narrative present in this scenario.

Figure 51: Opposite. Image by Author. Effects on the Copper Cliff Smelter Complex as a result of an increase in global average temperatures and water rarification.

Figure 52: Image by Author. Effects of water rarification and increased global average temperatures on a smaller scale. How might this affect people at the level of their homes and neighborhoods?

Figure 53: Image by Author. Collage investigating the realities of access to potable water and the potential behaviors that people might have in these circumstances.

Figure 54: Image by Author. Impromptu raiding parties seeking resources, water being the chief target of their greed and survival. Border Skirmishes leading to outright hostilities.

Figure 55: Image by Author. Formal war between nations in search of control and resources. Sudbury and the Great lakes Region being a chief target.

Figure 56: Image by Author. An initial, catch-all page Extraction drawing, intended to begin developing ideas surrounding water rarification.

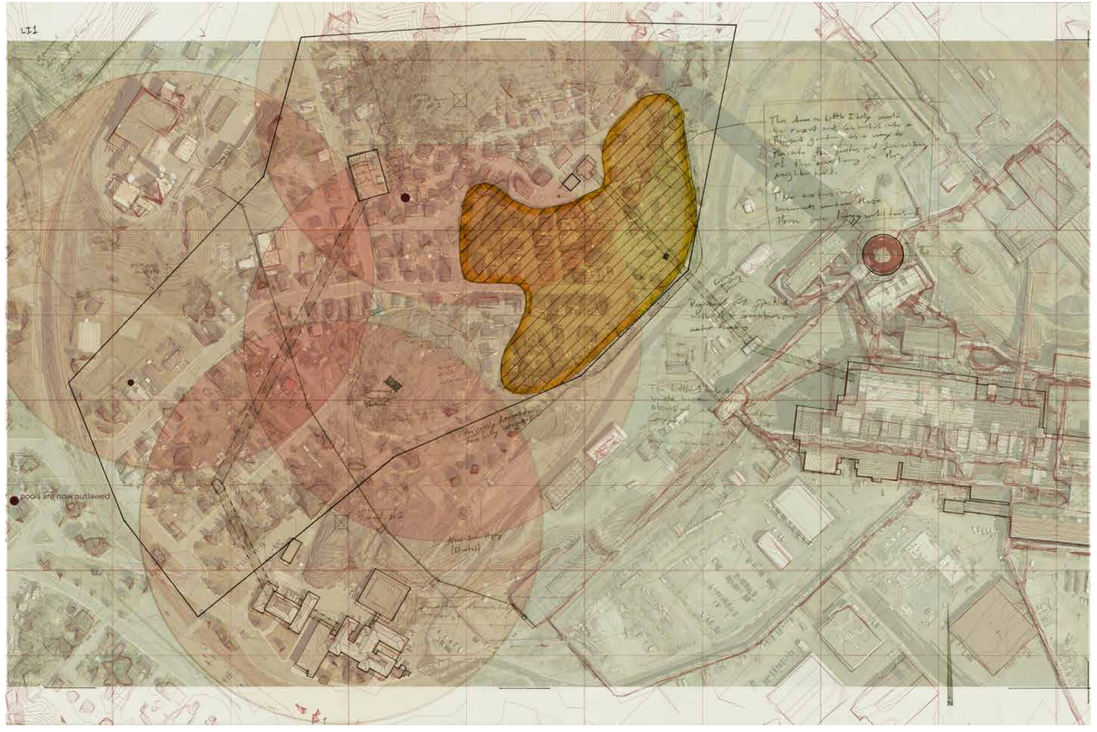
Figure 57: Image by Author. This drawing develops a conceptual design for a lake-scaled water trap, which would involve trapping water as it evaporates and then directing it towards a cistern to be redistributed in the lake. In principle, this is much like the distillation process.

Figure 58: Image by Author. This Extraction drawing is intended to explore the idea of using building-scaled camouflage to disguise its inner infrastructural workings. In this case, a pump and monitoring station are disguised in a small, unassuming brick building.

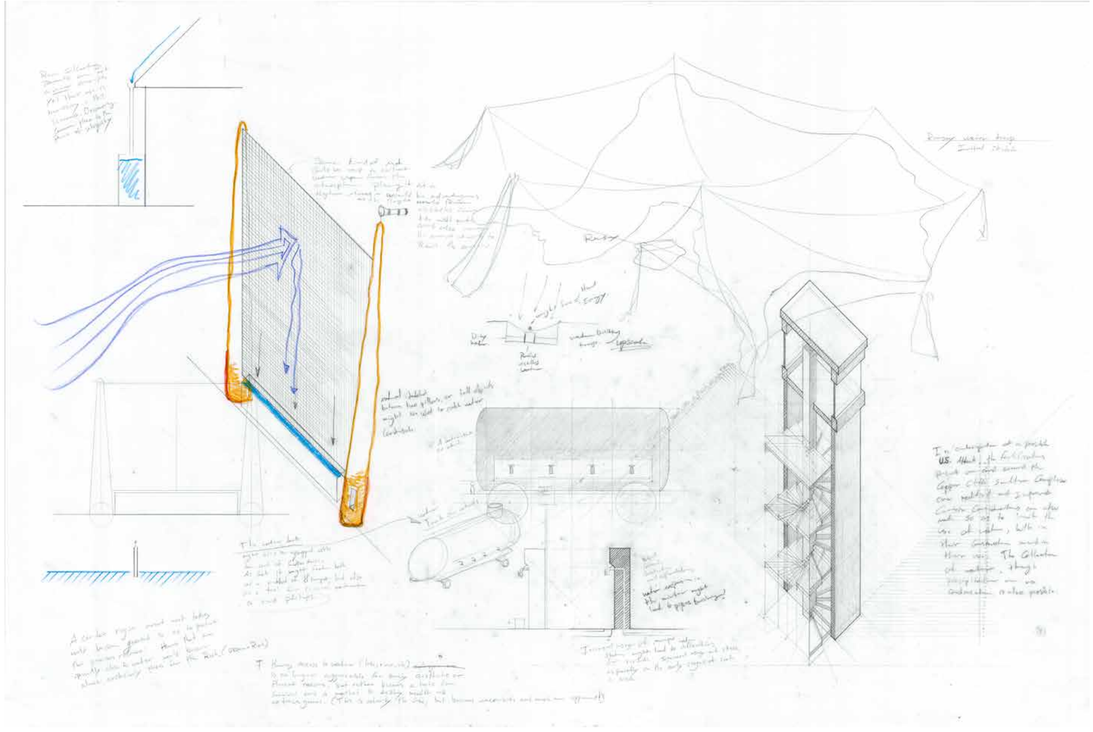
Figure 59: Image by Author. Sudbury Integrated Map, wherein the information garnered from the extracts and the collages has been reintegrated into the Sudbury Milieu. Robinson Lake could be used as a natural water filtration system.

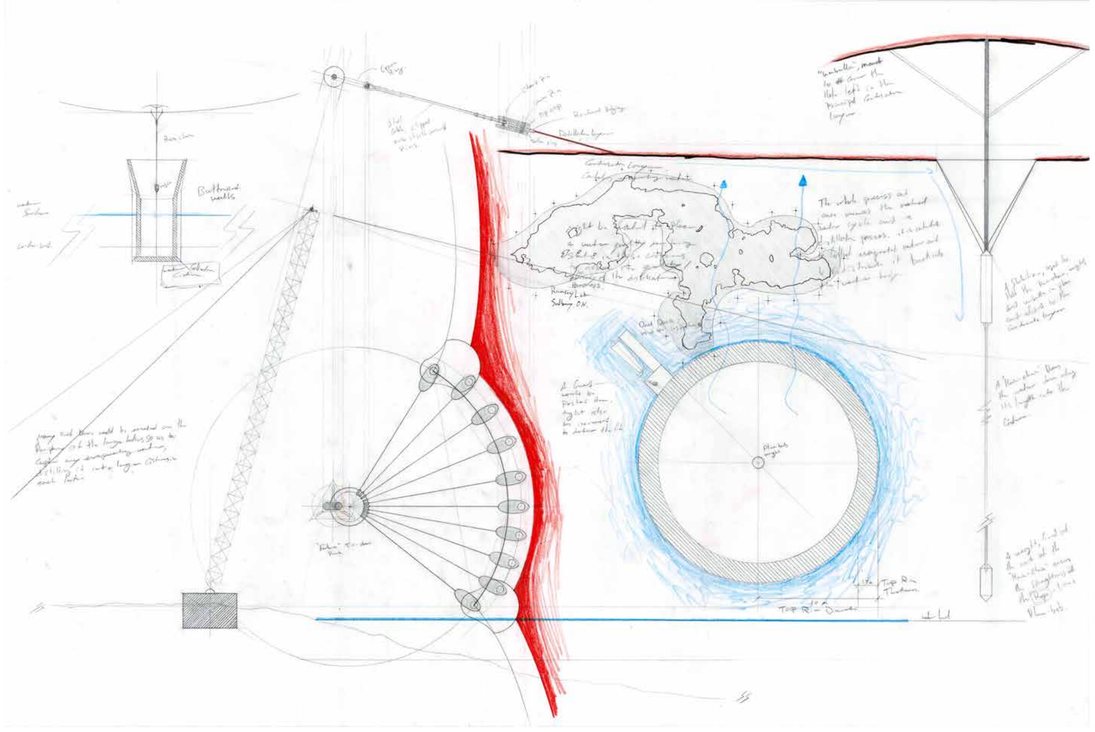
Figure 60: Image by Author. Copper Cliff Integrated Map, wherein the information garnered from the extracts and the collages has been reintegrated into the Copper Cliff Milieu. Concentric defences would protect the inner workings of the Complex. The potential integration of religious symbols and buildings to satisfy the zealotry of the people within the walls.

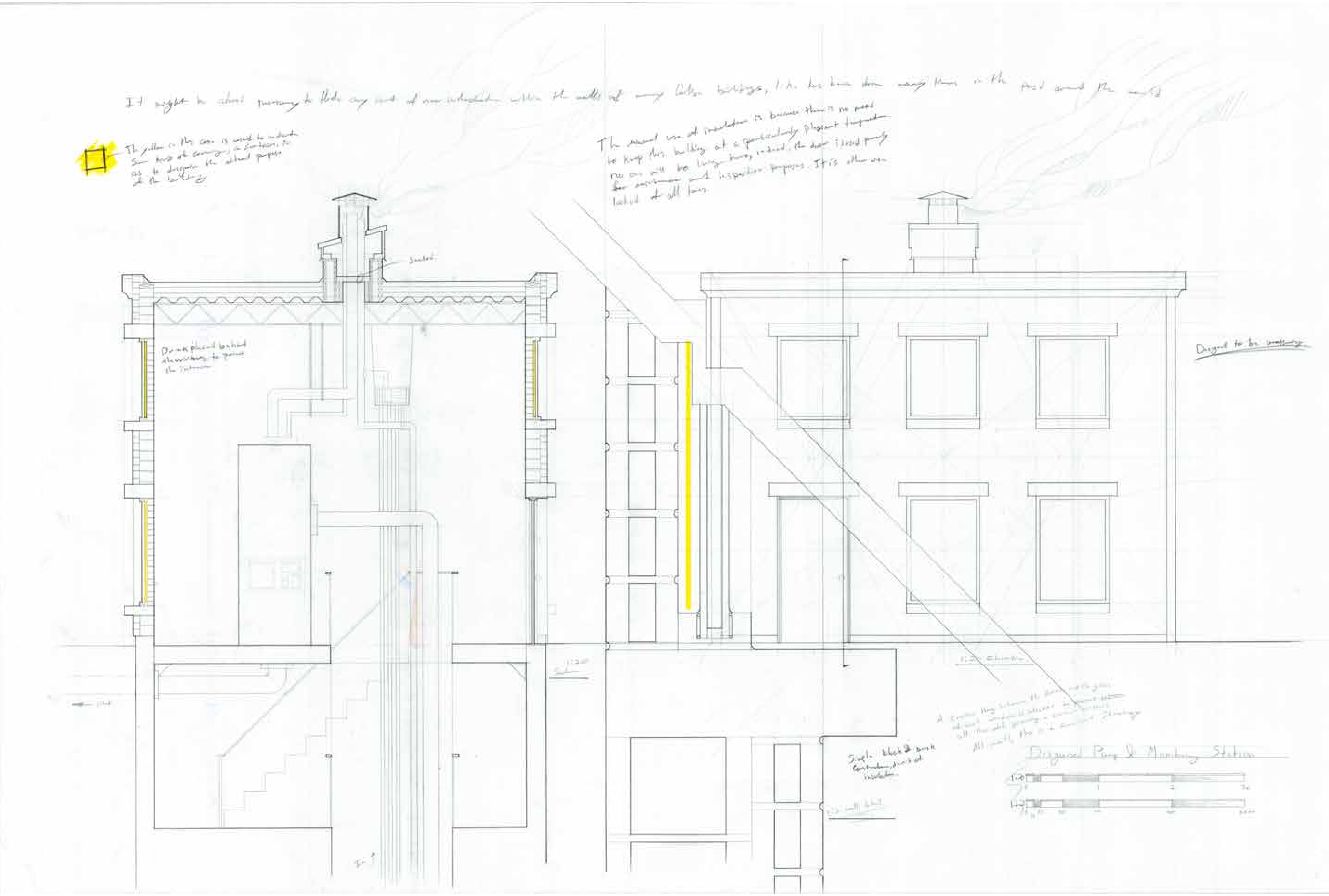
Figure 61: Image by Author. Little Italy Integrated Map, wherein the information garnered from the extracts and the collages has been reintegrated into the Little Italy Milieu. A large part of the neighborhood is converted to a park. Underground tunnels pass beneath the houses, and pipes cross the sky.

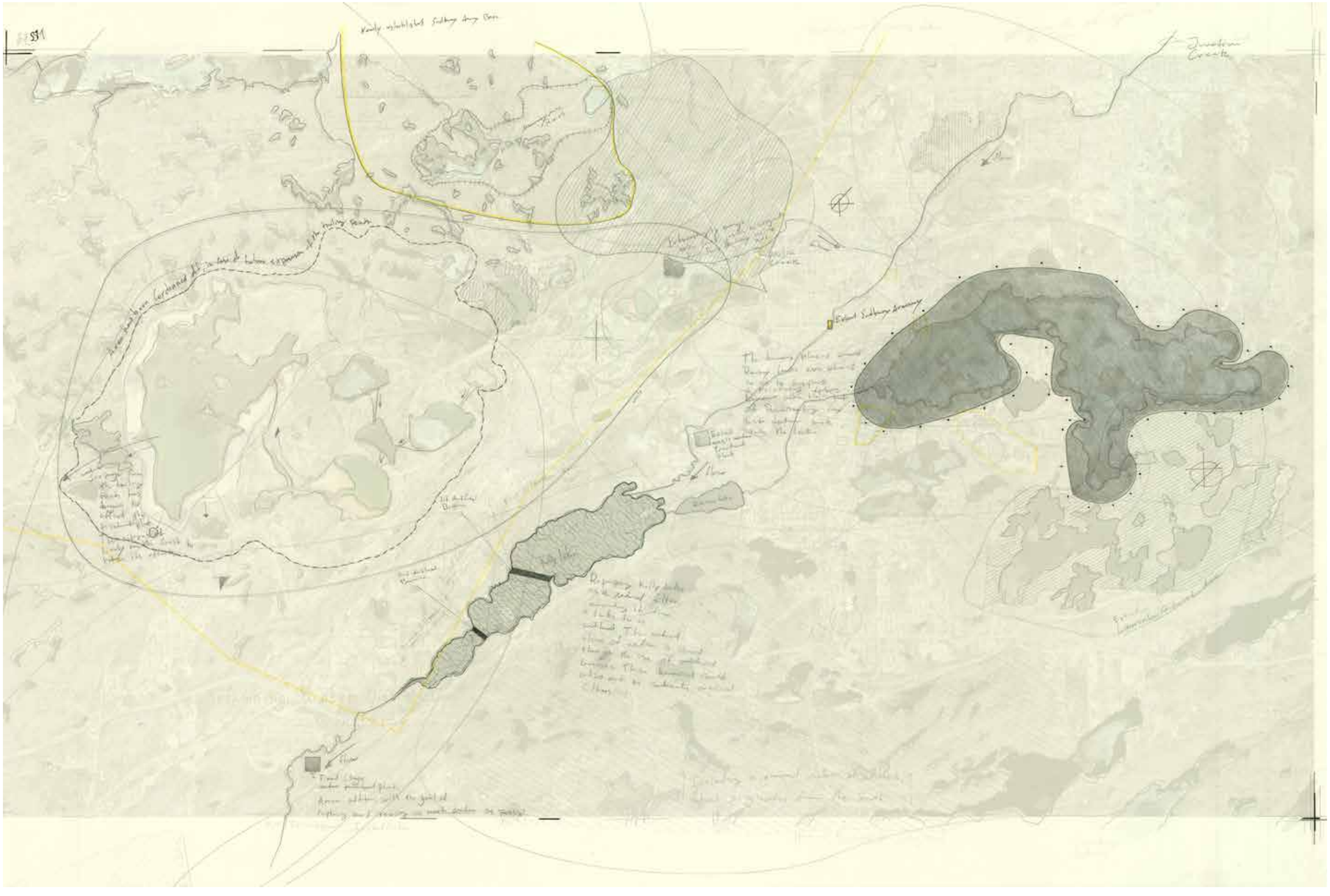

pools are now outlawed

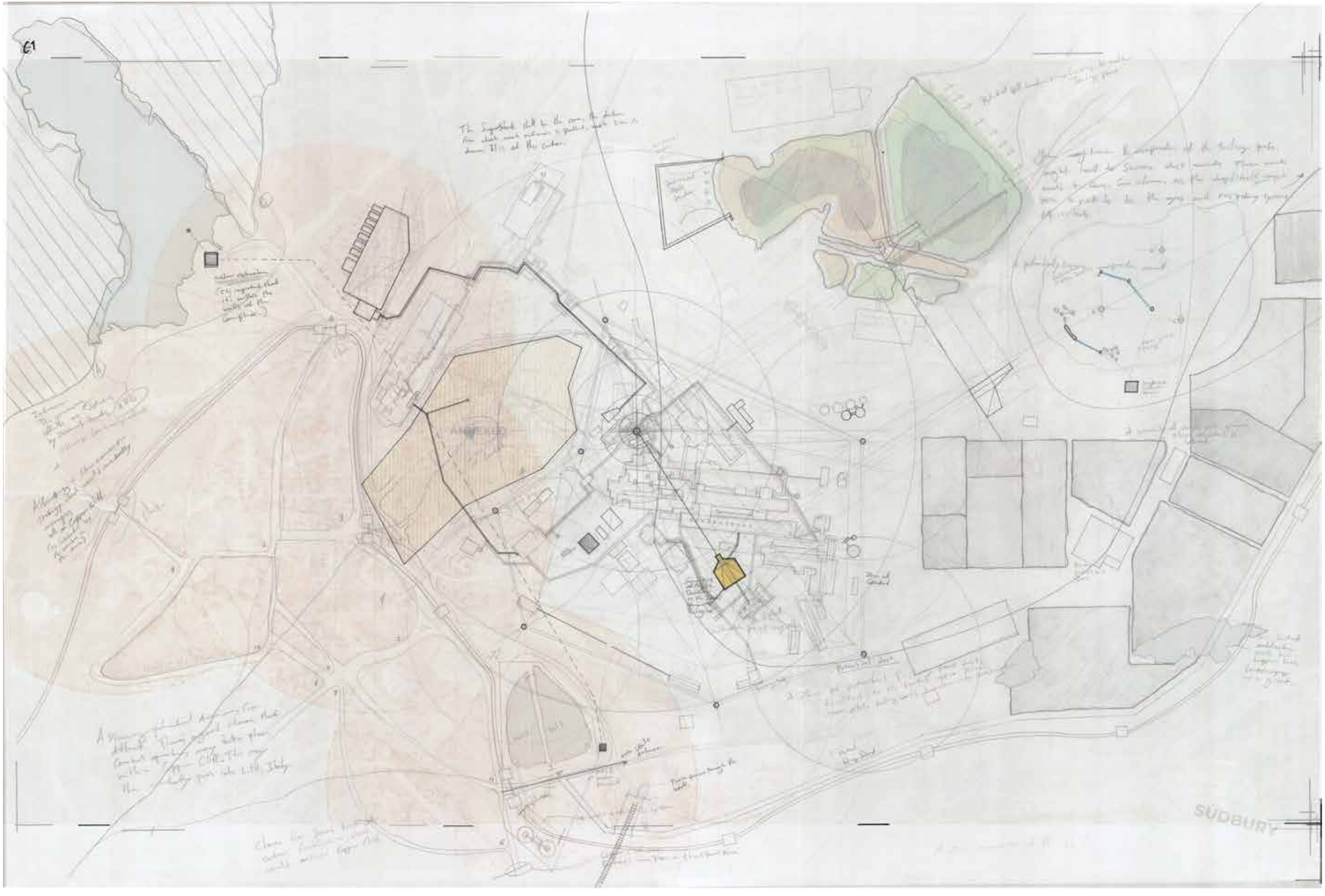

WATER STATION

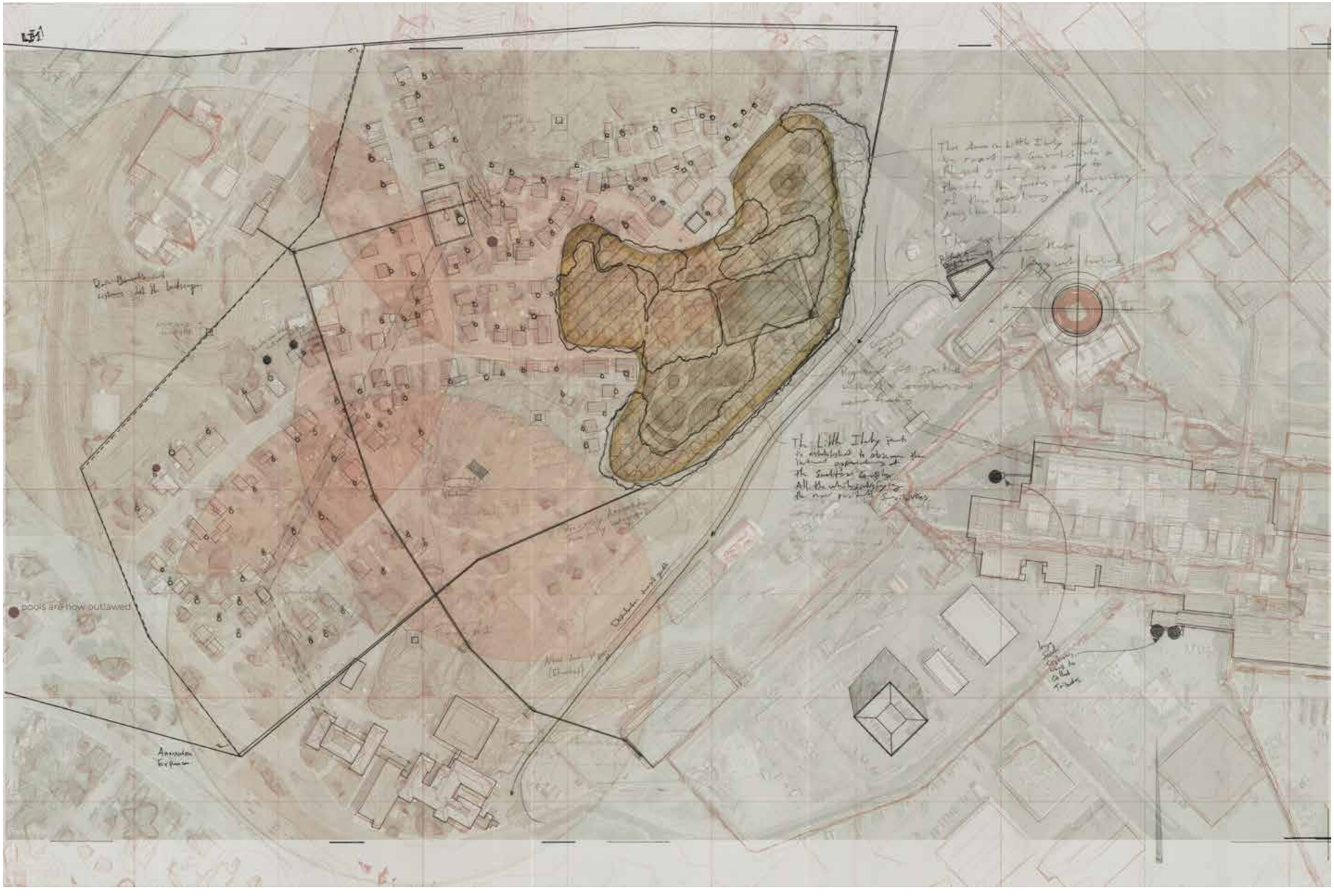





Disguised Pump & Monitoring Station




SUDBURY


pools are now outlawed

Conclusion

Does this sound dismal? It isn't.
It's the most wonderful life on earth.
Or so I feel.

A Poet's Advice

E.E. Cummings

Despite stating that the area of interest is the transition between beginning and end, it is difficult to completely excise either notion when dealing with the modes by which we might go from one state to another. Indeed, the definitions of what is a beginning or an end must become fluid and changing. The definition of beginning and of end provides no insights or hints as to how this system might feedback into itself, which the methodology must necessarily do; otherwise, there would be no point. The whole is cyclical, as it is intended to inform the present of potentiality in the future and reflect present realities of the milieu back into the milieu. During this process, it is essential that, especially when deciding on a beginning and an end, these two states resemble one another to a degree. In Planet of the Apes, the whole movie is re-contextualized at the end, once the Statue of Liberty is revealed.[1] The 'end' must necessarily feed back into the milieu, thus informing present and ongoing decision making.

This thesis is not intended to predict coming events, instead it attempts to answer the 'what if?' questions which permeate our lives in the face of the apocalypse. Doing so from the onset ensures a certain degree of flexibility, not only in the design of architecture and of other fields, but in their inception, permutation, and adaptation. This methodology attempts to widen the gamut of potential responses by intentionally retaining a certain degree of vagueness. It seeks to avoid over-committing the resources available into one or two contingency plans and instead aims to offer a more generous and flexible approach, which responds to the needs of each milieu. It is irresponsible to claim that anyone solution would benefit everyone, as each person necessarily has different needs and desires. Of course, generalizations can be made, but these must only be used as a basis for argument and not as the whole argument in and of itself. These arguments must be informed by genuine study and thought in context with the milieu and be shaped by a person with close ties to this milieu. It must be understood that this system would necessarily have certain limitations regarding the extents to which an individual would shape and influence an outcome using

1 Schaffner, Franklin. Planet of the Apes. April 3, 1968; USA: 20th Century Fox, April 3, 1968. Film.

this methodology. There are people all over the world who are already facing their own crisis. For better or for worse, these people have all adapted to the changing conditions in their particular milieus. It is not so farfetched to assume that similar situations might arrive to those not yet facing these hardships. This is a story of tragic resourcefulness and the intense survival that ensues.

Reflecting on the process, one realizes that the reality, as it were, that is present at this point in the project is one that closely resembles our own. This apparently fictitious scenario is rooted in the real after all. By utilizing extant factors and projecting them into the future, all the while understanding how these factors might change, one might begin to produce an understanding of how architecture would necessarily have to change. If a road were to be built on a flood plain, it might be of value to consider how rising water levels on said flood plain might engender the need for change; otherwise, the road would become flooded. Perhaps a wall might be constructed to physically bar the water from impeding traffic. Or perhaps a canal would be dug to redirect flow. Or perhaps a bridge would be built to take its place. Or perhaps the road would be abandoned entirely. These considerations are essential because they help us understand that the architecture built at this present moment is in no way of any significant permanence. This type of process is also not to be limited to apocalyptic scenarios. Indeed, it is a methodology that could just as well be adapted to a mundane event, be it, for example, the addition of a school to a neighbourhood. What is important to maintain, however, are the key elements of this methodology. Namely, the context, the vector, and the source, or in other words, the milieu, the apocalypse, and the research resources. . Attempting to gather and manage 'everything,' is a fool's errand. Finally, the sources, as digested by the author, are the multiple resources that influence how the vector, in turn, affects the context. Namely, the source is the driver of a car (vector), which dictates how the vehicle is driven on the road (context).

Stable and static architecture, intended to endure come what may, will inevitably fail. This is because the architecture built with this ethos in mind is built on the presupposition that the factors that informed its design will either not change or change slowly. Adaptable architecture, which reacts to changes before and while they occur, would surely be encoded with the very notion and capability to engender change. This thesis does not propose to design such an architecture per se as if there were an answer to be discovered. Rather, it suggests its existence and the methods by which typical architectural practice might come to adopt it. This methodology is intended to be used as a means to understand the impact of both an intentional change or insertion of a perturbation in a milieu or the unintended consequences of a massive societal change. In a world full of uncertainty, this work attempts to clarify things a little.

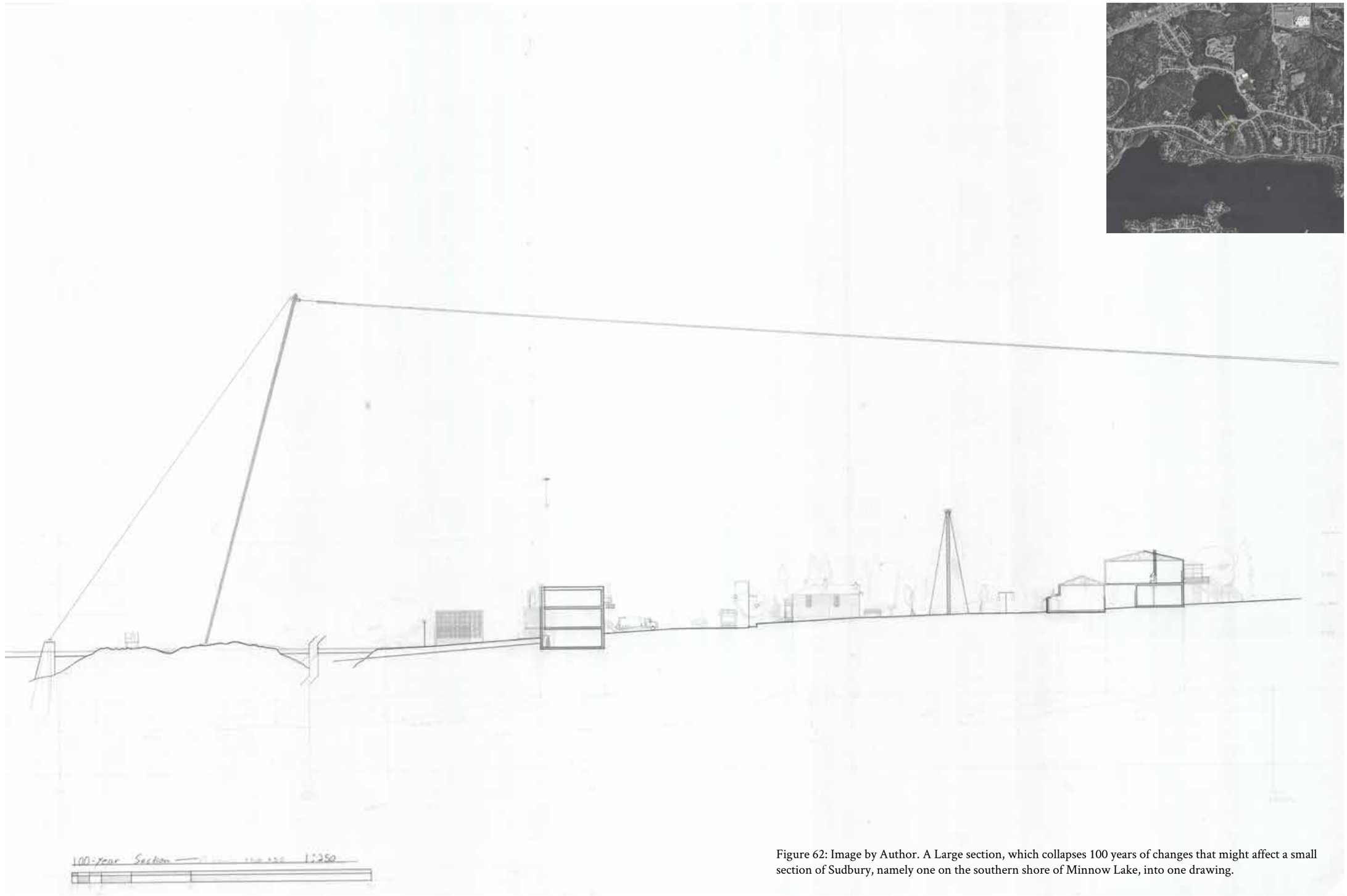


Figure 62: Image by Author. A Large section, which collapses 100 years of changes that might affect a small section of Sudbury, namely one on the southern shore of Minnow Lake, into one drawing.

Appendix

Appendix 1: Glossary

Perturbation: A change in a given context which affects it. The stone thrown into the water causes ripples, a perturbation is both the stone and the effects.

Rhizome: A non-hierarchical network method of organizing points with connections. This network can be entered at any point and resists being broken. Originally posited by Deleuze and Guattari in their book *A Thousand Plateaus.*

Milieu: The point of convergence wherein physical, and temporal dimensions overlap. Adding to this; the thickening of information pertaining to both real and fictitious worlds

Apocalypse: The mechanism by which a "better" state becomes a "worse" state.

Climate Change: The "flavour" of Apocalypse chosen for this thesis. Refers to anthropogenically induced climatic effects.

Collage: Refers to the superimposition of thoughts, words, images, drawings, maps, etc. which might compose a drawing, idea, or otherwise.

Multiscalar: Occurring at or otherwise affecting multiple physical dimensions of scale.

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