

*Inhabiting the Anthropocene:*  
Designing for Accelerating  
Change in a New Epoch

Pauline Moskal

Graduate Project: Part II

*Instructors:* Susan Herrington,  
Daniel Roehr

*Advisor:* Kees Lokman

April 26, 2019

Submitted in partial fulfillment of the requirements for the  
Master of Landscape Architecture,  
School of Architecture and Landscape Architecture,  
University of British Columbia.







## *Abstract*

Landscapes are always in motion and yet, the way contemporary landscapes are designed, represented, detailed, and maintained, reflect static notions serving limited lifespans. The Anthropocene presents a new era of unpredictable and accelerating change generated by human influence. Adapting to these accelerated changes is the most significant challenge facing landscape architects today and requires engagement across multiple scales of design. This project proposes the Anthropocene as a framework for discussion and explores themes of *time* and *space* in relation to landscape architecture and their importance in the Anthropocene. The findings of this exploration will assist in the design of projected futures for landscapes experiencing accelerated change, in an effort to raise awareness about our influence on the Earth.







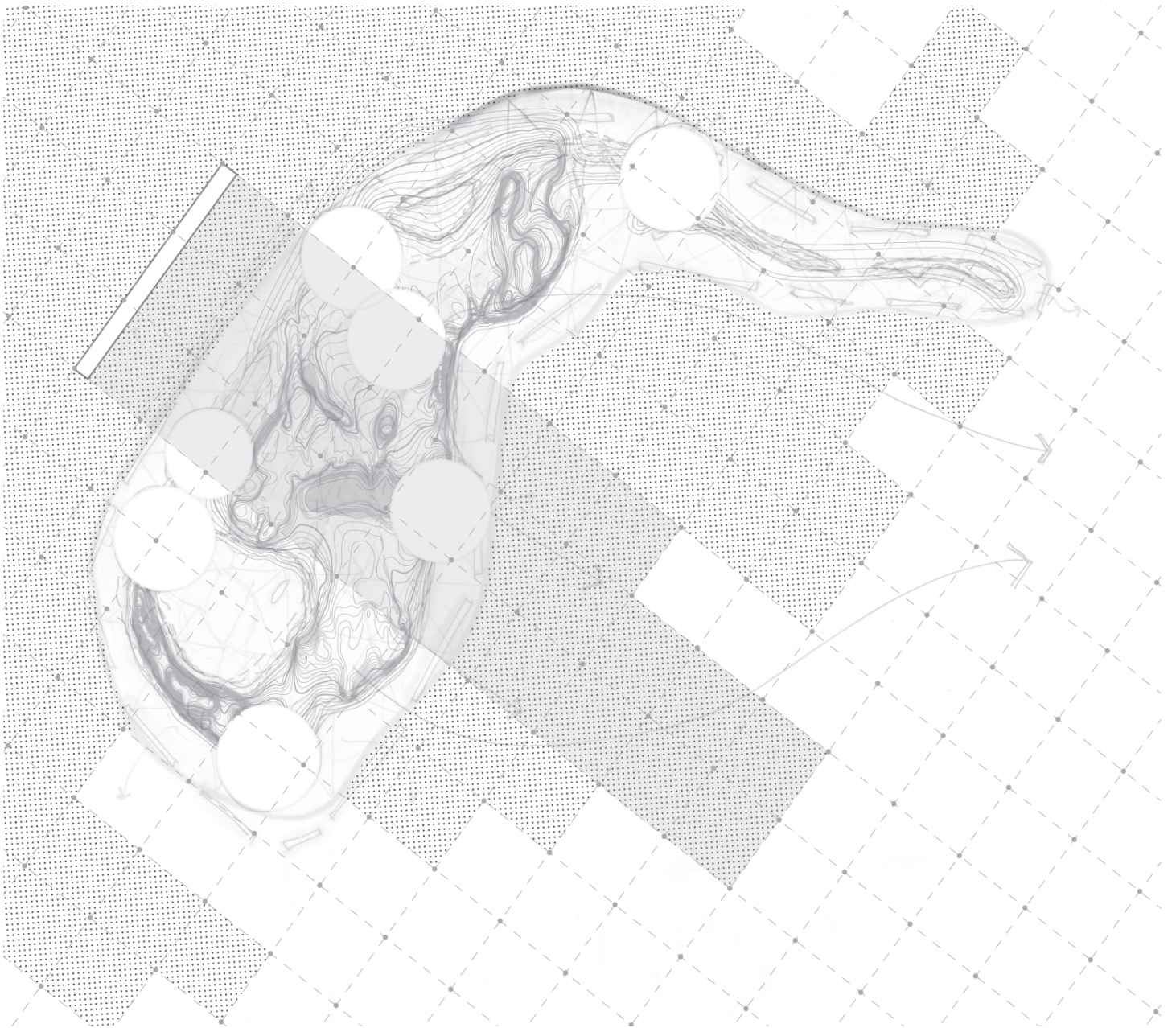
# *Table of Contents*

<i>Prelude: A Microcosm of the Anthropocene</i>	<i>1</i>
Chapter 01: An Introduction	6
Chapter 02: Time and the Anthropocene	16
<i>Interlude: A Layered Approach</i>	<i>25</i>
Chapter 03: Space and the Anthropocene	29
Chapter 04: Precedents & Case Studies	37
<i>Postlude: Not So Sci-Fi</i>	<i>52</i>
Chapter 05: Next Steps	57
<i>- Part II -</i>	
Chapter 06: EXPO 2067	63
<i>Process</i>	<i>72-79</i>
Conclusion	94
Bibliography	98
Appendix A: Catalogue References	101
Appendix B: Figure References	104



## *PART II*





## *Chapter 06*

### *EXPO 2067: [HU]MAN[S] AND [T]HIS WORLD*



## *An Introduction into World's Fairs & Expositions*

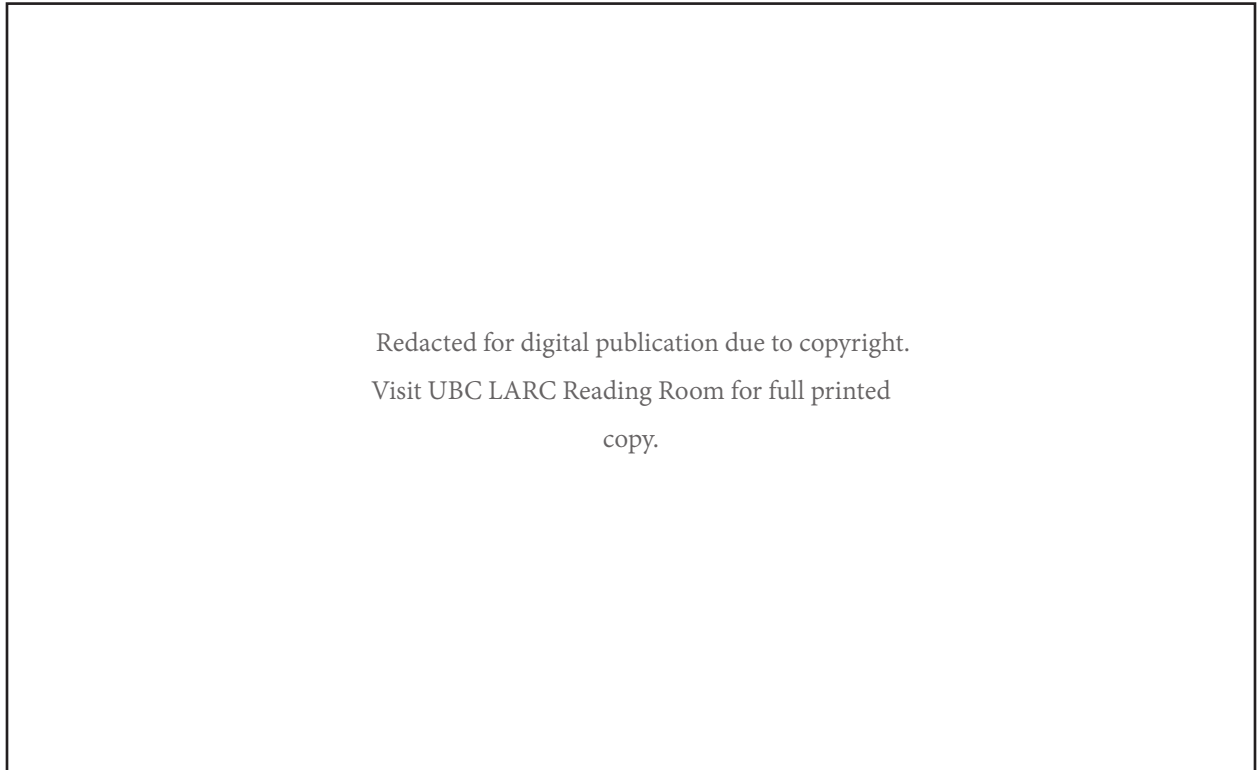


Figure 2.01 The  
Crystal Palace for  
the Great Exhibition,  
1851

World's Fairs or Exhibitions (EXPOs) have been historically used to display the international achievement of nations. These EXPOs were typically centralized events held in one city. This tradition dates back to the first World's EXPO held at the Crystal Palace in London in 1851. Over the years, themes of EXPOs have been used to reflect the most current cultural, social, and environmental issues of the times.

With this in mind, this graduate project proposes to create a speculative world's EXPO. I do not intent for any of these interventions to be built, rather, for them to host discussion on landscape architecture in the Anthropocene. For the purpose of this discussion I would like to invite you all to join me in the year 2067.



47 years ago, in 2020, the B.I.E (Bureau International des Expositions) decided centralized EXPOs no longer accurately represented the most prominent issues of the times. The planned Dubai EXPO 2020 was cancelled, making room for a new EXPO prototype. The B.I.E. decided 2020 to be the first year of a new, 47 year 'experimental and decentralized' EXPO. EXPO 2067 would focus on the collaboration between humans, the environment, and technology.

As many of you may remember the early 2000's were officially designated the beginning of a new geological era: the Anthropocene. At the time, Environmental Scientist, Erle C. Ellis best described this new era as a:

*"A new 'great force of nature' [that] is shifting earth into a new interval of geological time, an "age of humans," the Anthropocene. Global climate change, widespread pollution, mass extinction, and the loss and reshaping of natural habitats are a few of the many indicators that human societies have gained the capacity to transform the functioning of an entire planet."*<sup>1</sup>

EXPO 2067 would therefore set the stage to showcase the challenges facing humans in the Anthropocene.

Commemorating Montreal's EXPO, which took place 100 years ago (in 1967), EXPO 2067 has redefined the original theme in order to more accurately reflect the shift in our relationship to our environment. The original theme "Man and His World," set the tone for humans exerting their will on the planet. Quoting the official 1967 guidebook:

*"Man must have control of his world for the benefit of mankind...Technology is creating the means for more efficient observation, analysis, action, and information processing, thereby freeing man to concentrate on that element of control only he can handle, decision."*<sup>2</sup>

Redacted for digital  
publication due to copyright.  
Visit UBC LARC Reading Room  
for full printed copy.

Redacted for digital publication due to copyright.  
Visit UBC LARC Reading Room for full printed  
copy.

Figures 2.02 and 2.03 Images from Montreal's Expo 1967, "Man and His World."



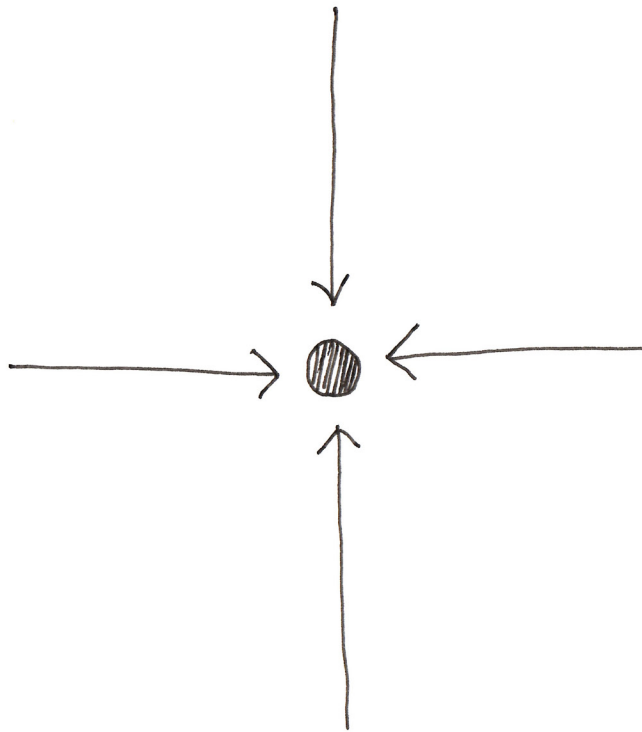


Figure 2.04 A  
“centralized” World’s  
EXPO.

It is this role of “control” and “decision” that EXPO 2067 focuses on, in order to develop a way of thinking about the future of a site that can be applied to multiple areas. This scale was redefined to instead use the terms “confidence” and “uncertainty,” which are terms used by the International Panel on Climate Change.





Rather than one host city, EXPO 2067 is a global initiative with host sites or pavilions from around the world. The priority for chosen sites were given to those which were experiencing the accelerated and unpredictable effects of the Anthropocene firsthand. As writer Darran Anderson first proclaimed:

*“Perhaps it is time to host World’s Fairs, not with noble platitudes in sparkling metropolises, but in the places facing impending catastrophes.”<sup>23</sup>*

Figure 2.05 A “de-centralized” World’s EXPO.



## *Pelly Island: Canada's Arctic Pavilion*

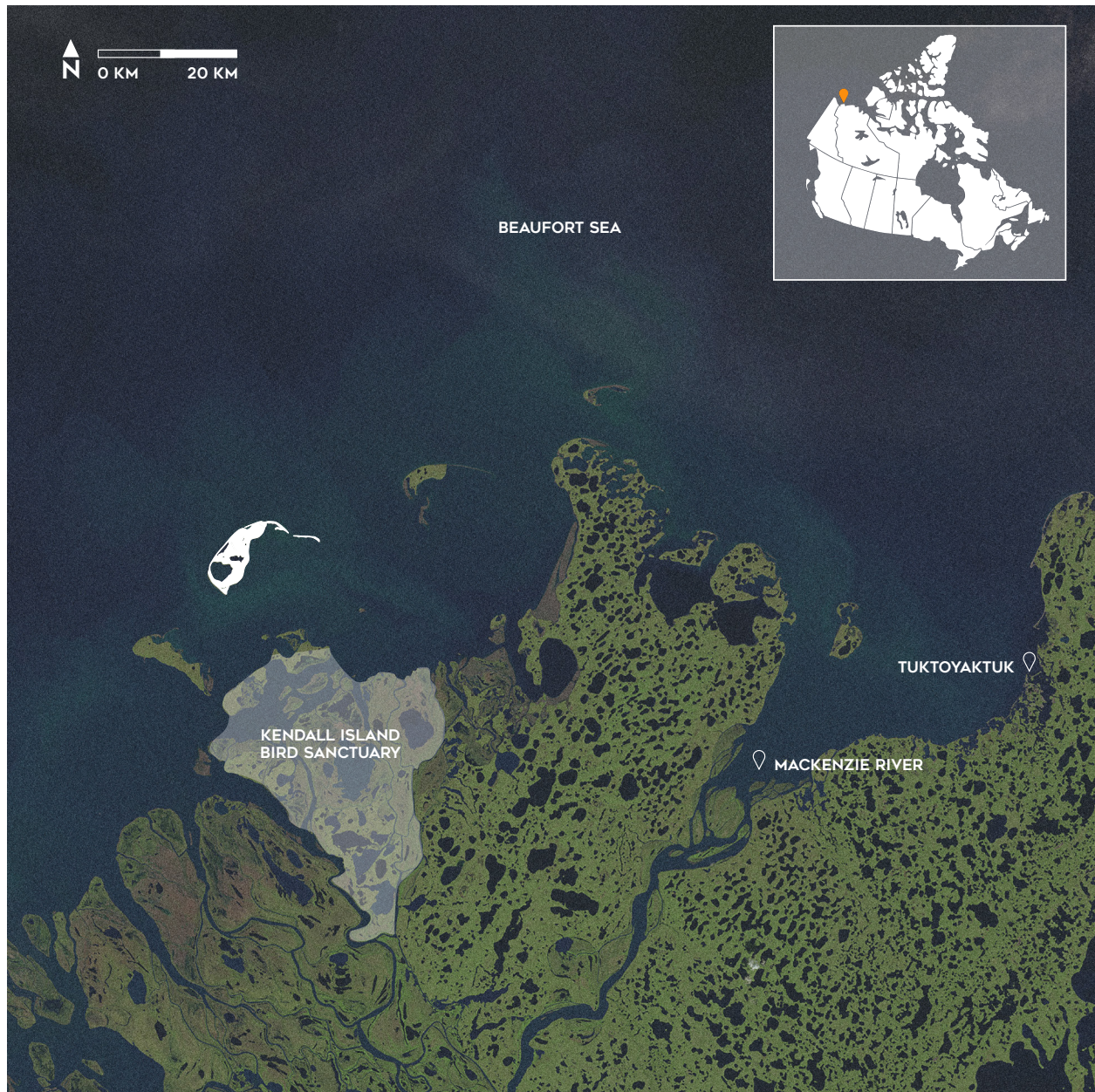


Figure 2.06 Key map of Pelly Island and nearby places of interest.

Pelly Island, located in the Beaufort Sea, was one such place. 47 years ago, this island was chosen as Canada's Arctic pavilion for EXPO 2067: Humans and This World.

At the time, Pelly Island was experiencing the devastating effects of global warming in the arctic at an accelerated rate. Compared to other coastlines in the arctic which were eroding at an average rate of 1.5 m/ year, Pelly Island's coasts were eroding at an estimated 30-40m/ year, with its predicted disappearance by this year, 2067.



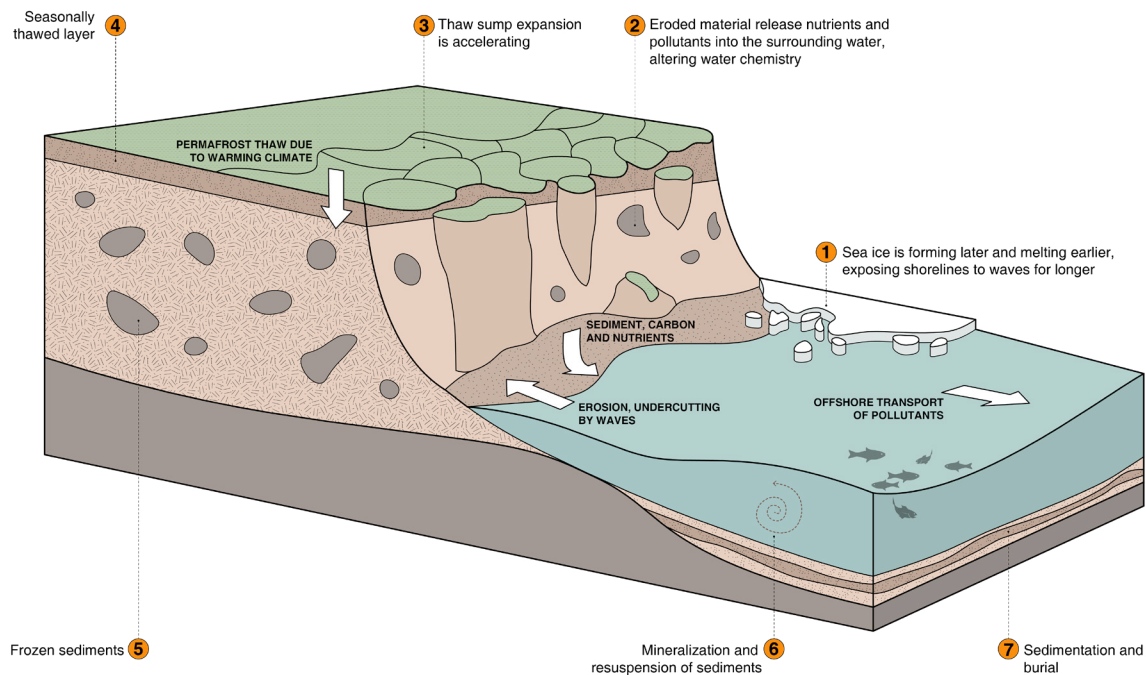
Three main factors were causing this accelerated erosion:

1. *Warming climate*
2. *Coastal waves*
3. *Sea level rise*

Increasing temperatures were thawing coastal permafrost while a decrease in sea ice left the coastline susceptible to waves and storm surges for longer periods of time. Eroding sediments would deposit pollutants into the sea, which began to change surrounding water chemistry. So much so that, scientists at the time began to notice a visible decline in the herring population which local fishers depended on. In addition, permafrost melt began releasing carbon dioxide and methane into the atmosphere, adding to the vicious cycle of global warming (Figure 2.07).

These effects were also being felt in the closest community, the Inuvialuit hamlet of Tuktoyaktuk 100 km away.

Figure 2.07 Axo showing the problems facing the Arctic. Diagram adapted by author from Alfred Wegener Institute.





Redacted for digital publication due to copyright. Visit UBC LARC Reading Room for full printed copy.

Figure 2.08 Pelly Island Coast.



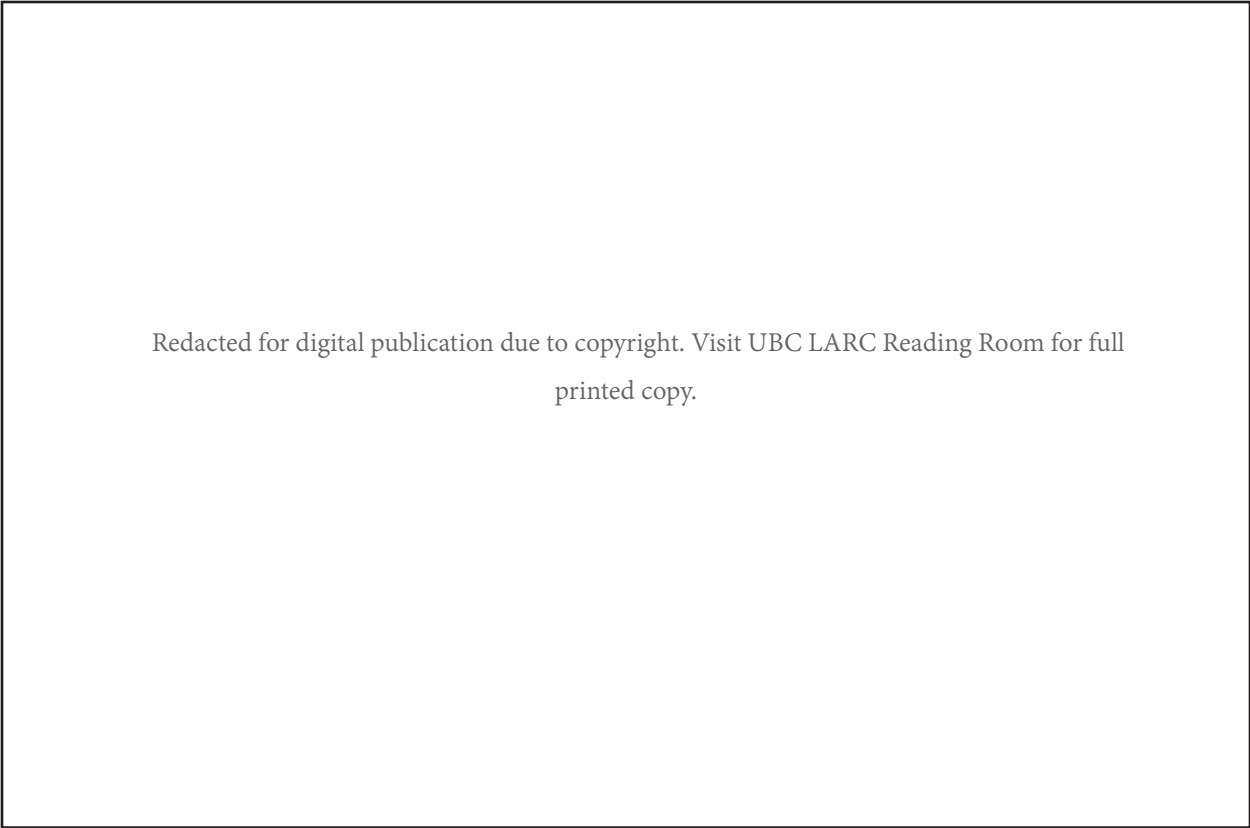


Figure 2.09 Permafrost block on the Arctic coast of Alaska (similar conditions to Pelly Island).

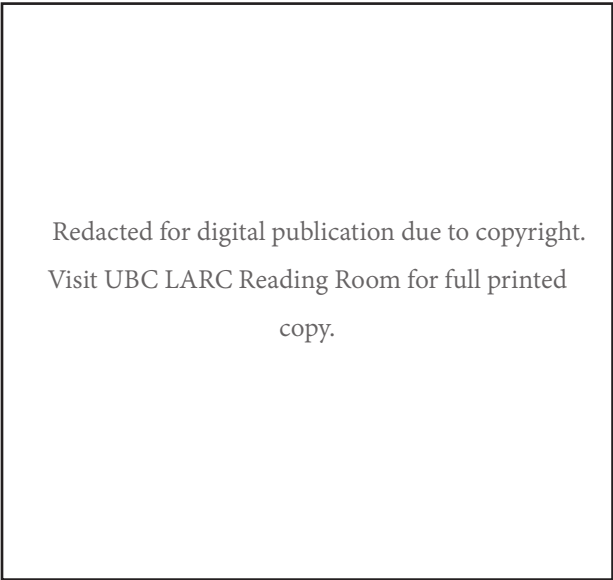


Figure 2.10 Tuktoyaktuk Point, 1982.

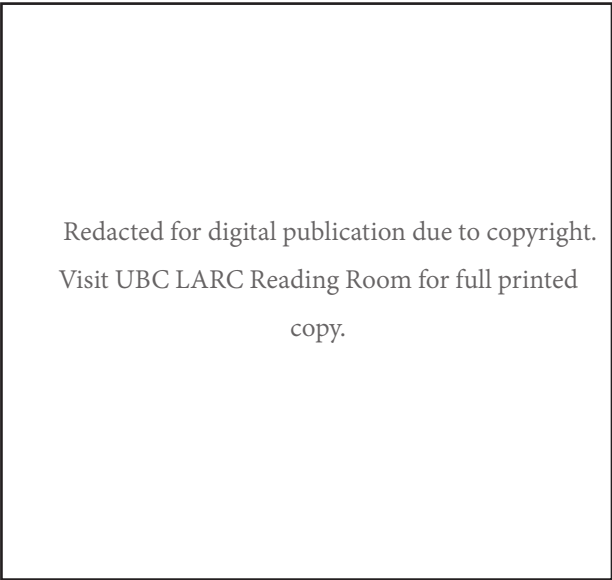


Figure 2.11 Tuktoyaktuk Point, 2019.



## *Process: Sketching*

Sketching became a very important tool during the design process. It allowed for quick iteration and easy communication of ‘big ideas.’ The following are a selection of initial sketches conducted during this phase, exploring big themes regarding the possible ‘future(s)’ of Pelly Island.



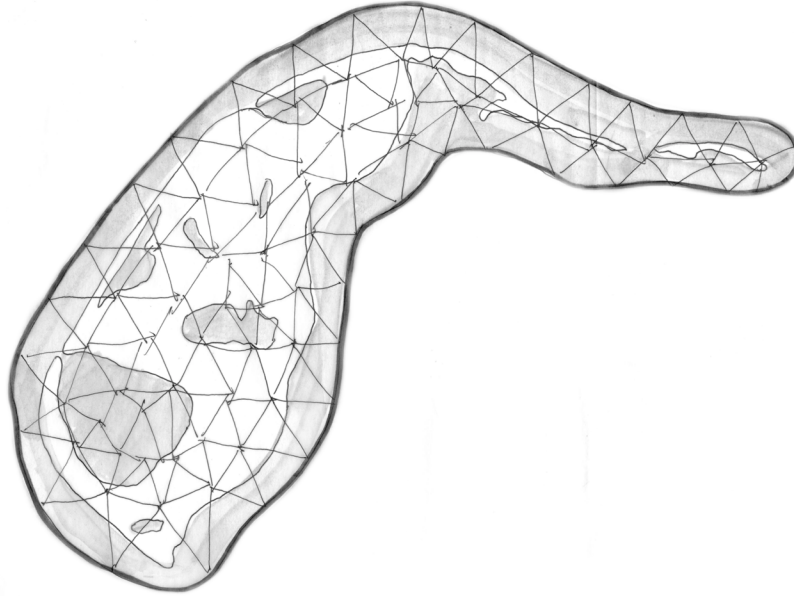


Figure 2.12 Sketch - Placing a dome over the entire island, total control.

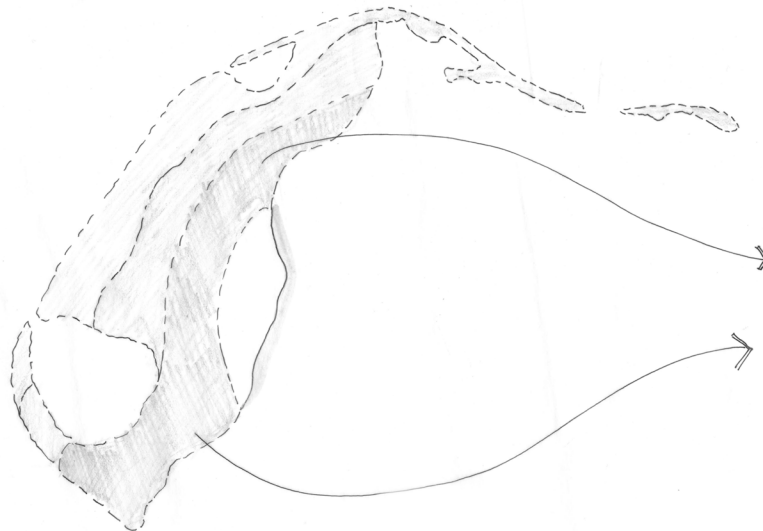


Figure 2.13 Sketch - Using eroded sediments to defend Tuktoyaktuk.



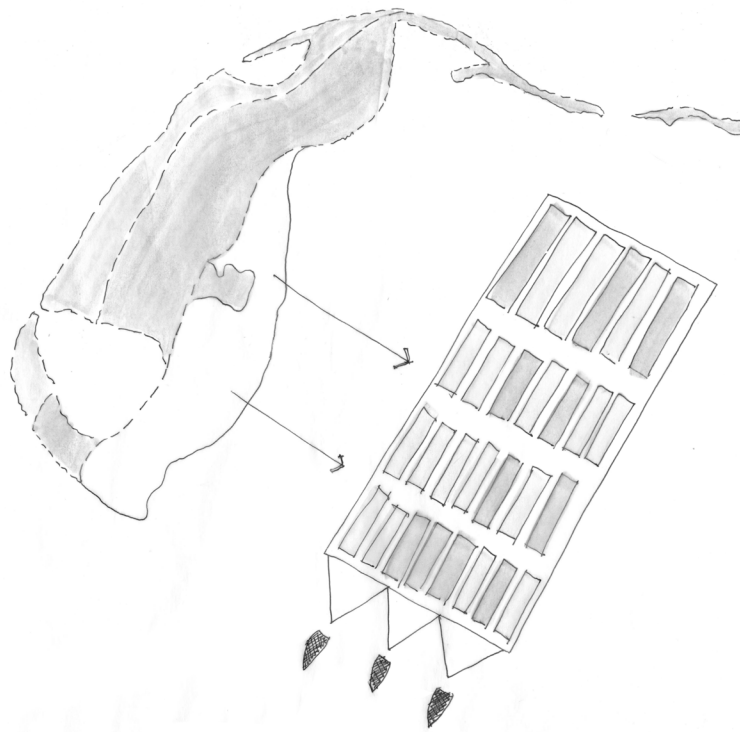


Figure 2.14 Sketch - Displacing eroded sediments onto floating barges.



Figure 2.15 Sketch - Capping certain areas of the island to control methane and carbon dioxide release.



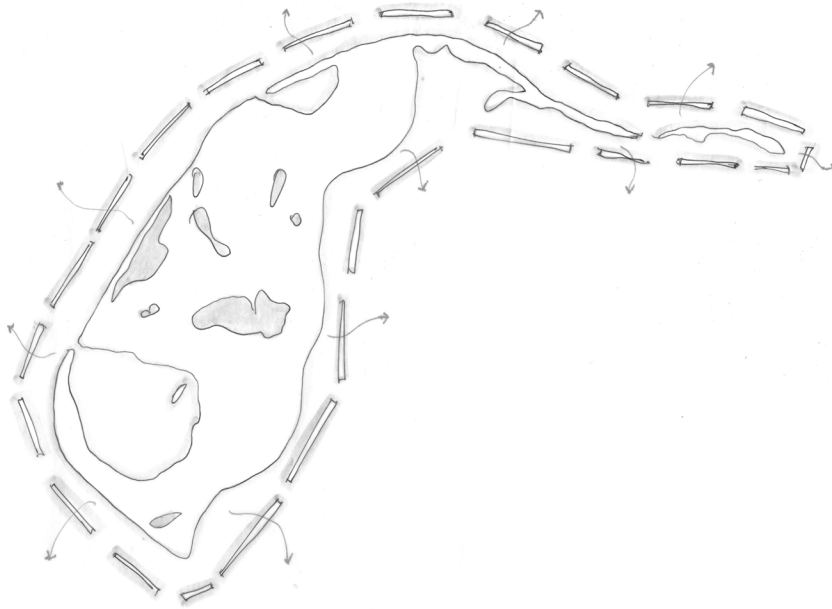


Figure 2.16 Sketch - Using structures to filter contaminated sediments that erode into the sea.



Figure 2.17 Sketch - Using barriers to protect certain areas of the island.



## *Process: Model-making*

In addition to sketching, model-making also became a critical tool. In order to gain a better grasp on the ephemerality of this disappearing landscape, a physical model was constructed out of wax to be melted. This process was quite labour intensive and required trial and error. The following images display this process and the final outcome.

### **Figure A:**

The initial topography was inverted and CNC routed out of foam. Liquid wax was poured into this form, and removed once hardened. There was major difficulty in removing the mold from the foam.

### **Figures B-D:**

It was decided that a silicone mold would be more efficient and effective. The first wax topo model was used as a base to pour liquid silicone around.

### **Figures E-F:**

Once hardened, the wax model was easy to take out, and allowed for multiple iterations. From melting the wax to full hardening took about four hours per model. In total, about 15 models were produced.

As seen in the next page of images, these models were used for melting. Using satellite photos, I was able to approximate the Northwest direction of eroding forces in order to generate a conceptual model/ timelapse of Pelly Island (see Figure 2.18 film strip).





Figure A.



Figure B.



Figure C.

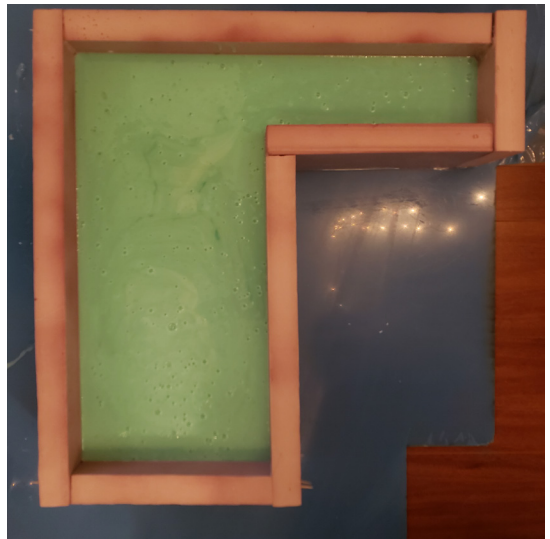


Figure D.



Figure E.

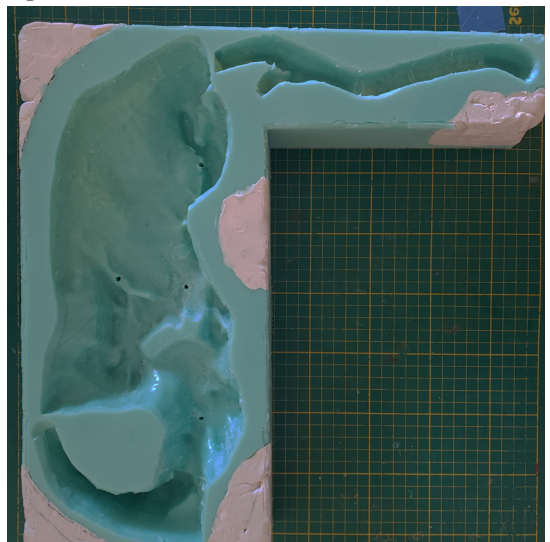
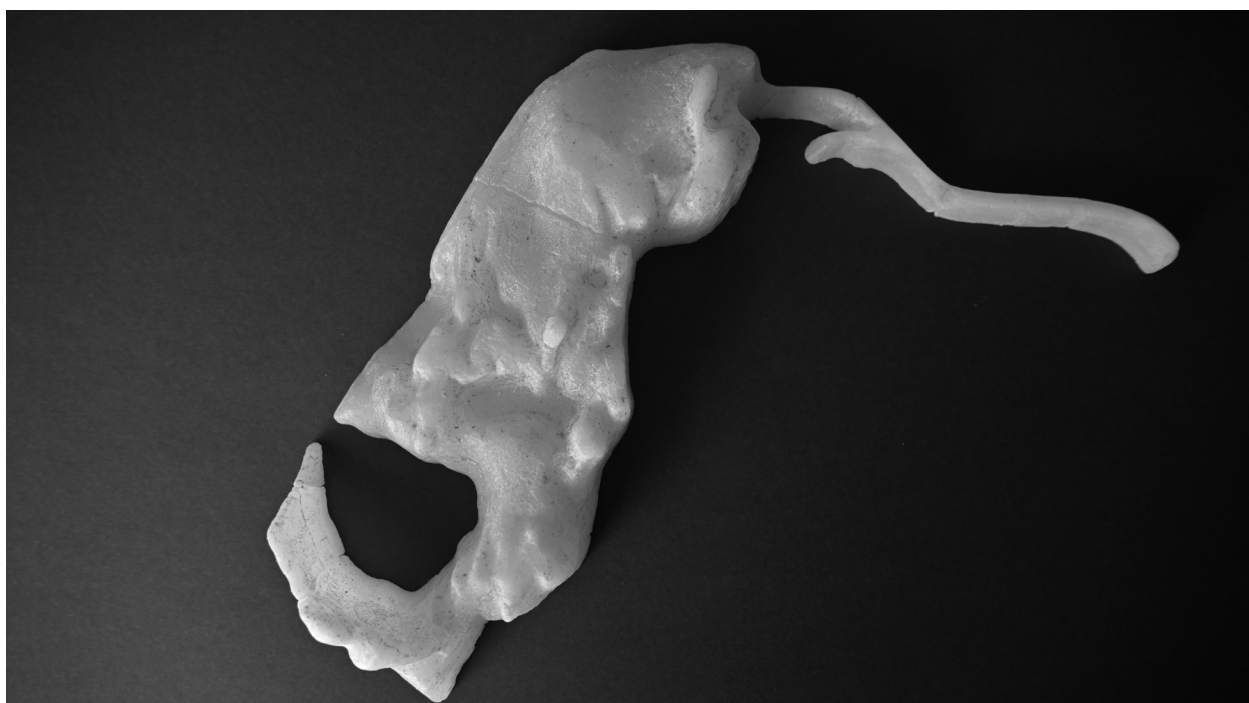
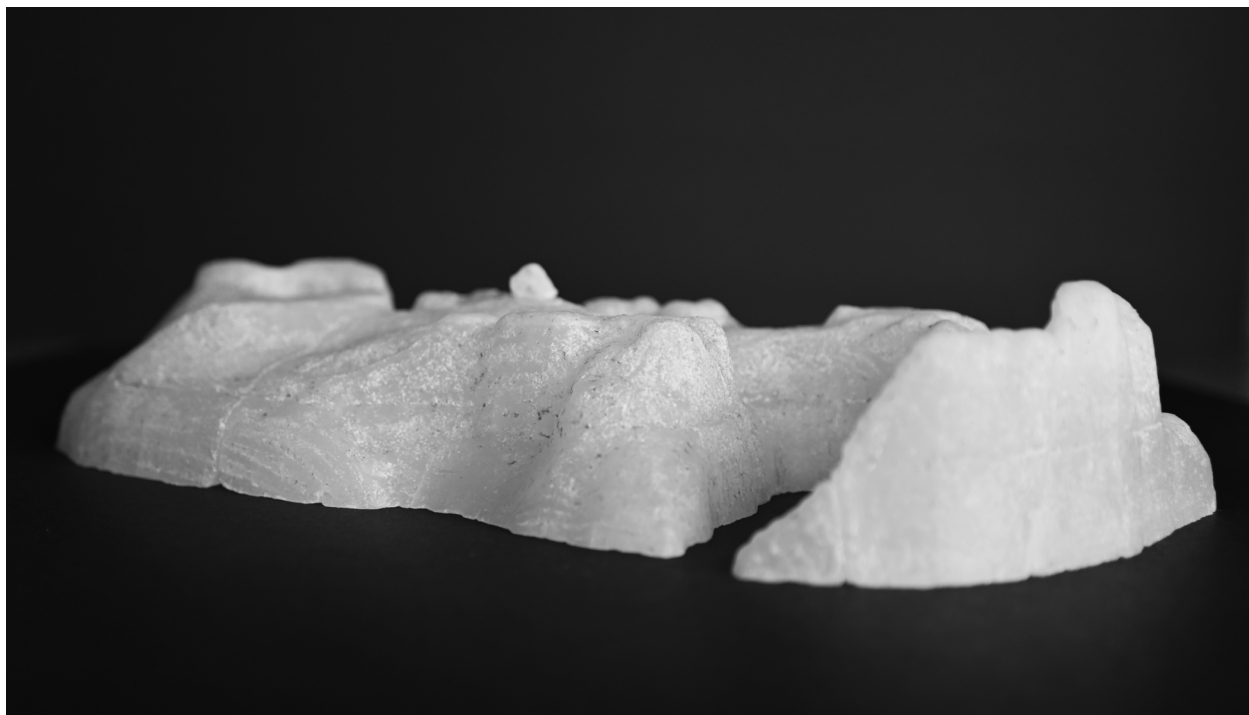
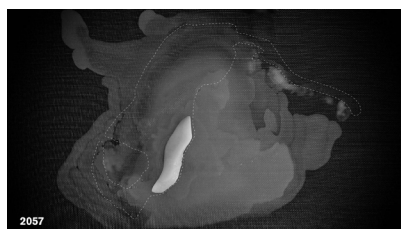
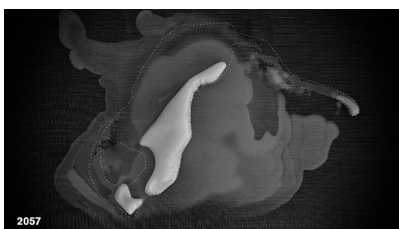
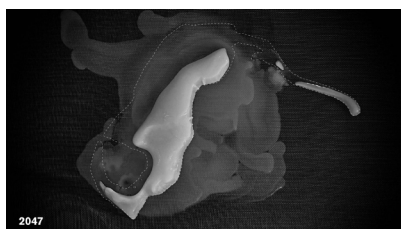


Figure F.









Figures 2.18 Model photos.



## *Design*

The goal of EXPO 2067 is to address the accelerating issues facing the island, treating Pelly as an experimental site. With interventions implemented in 2020, the EXPOs intention was to run for 47 years, Pelly's predicted life-span.



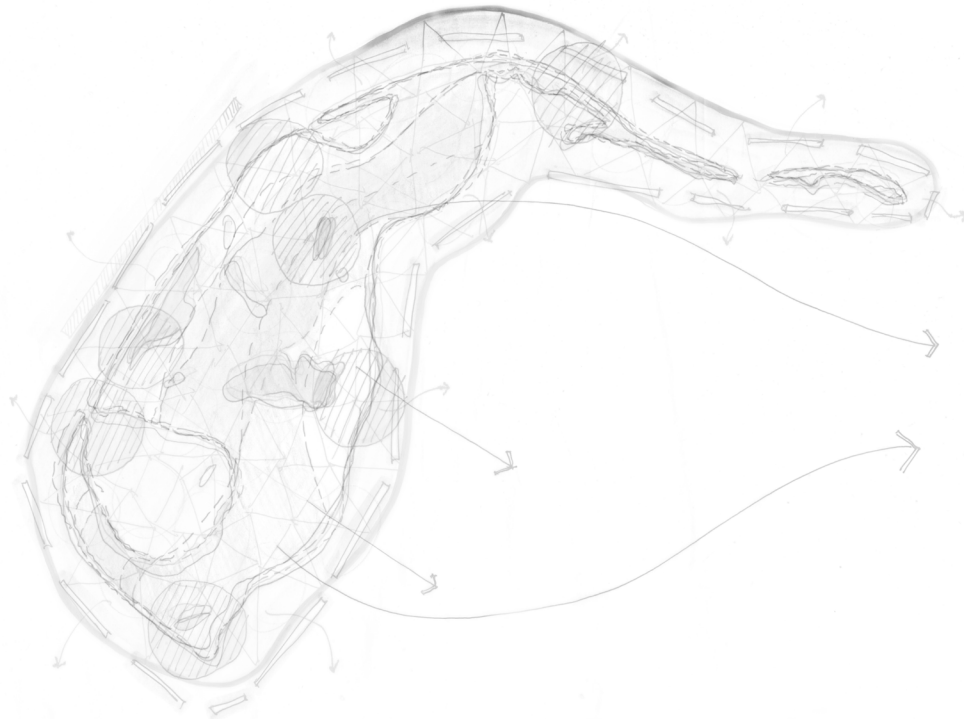


Figure 2.19 Overlay of individual sketches.

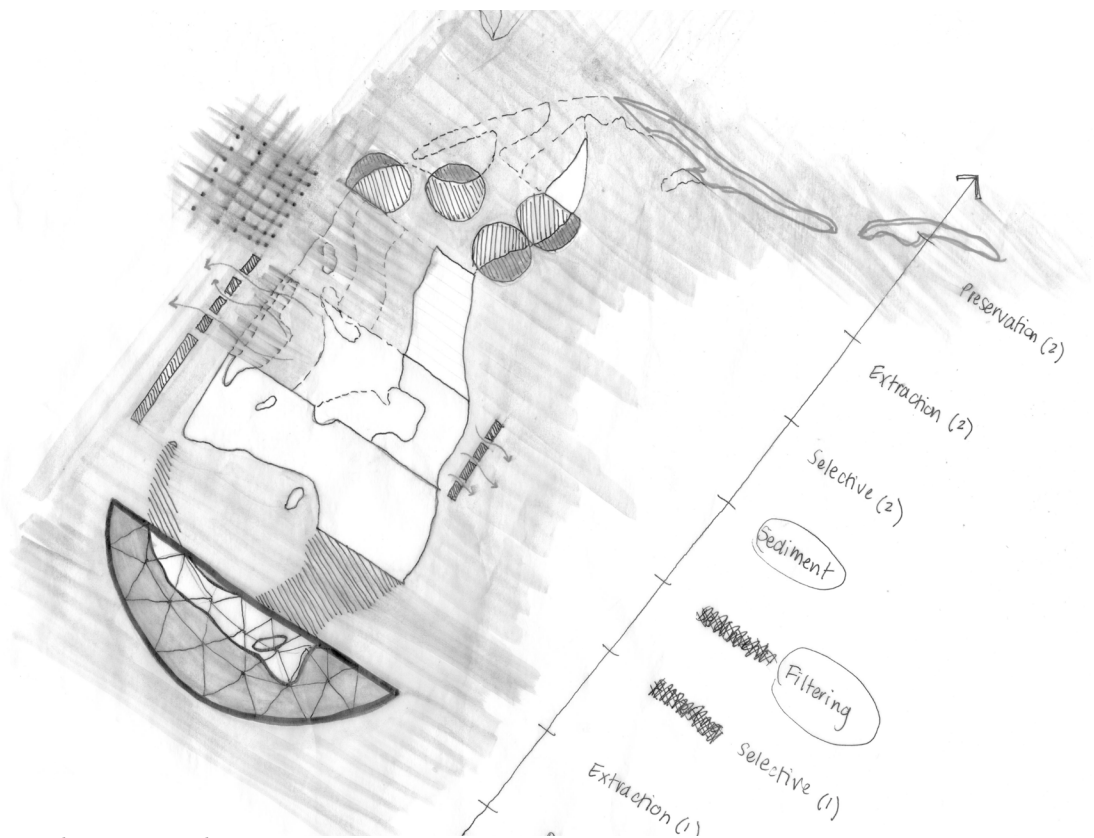


Figure 2.20 Initial programmatic layout.



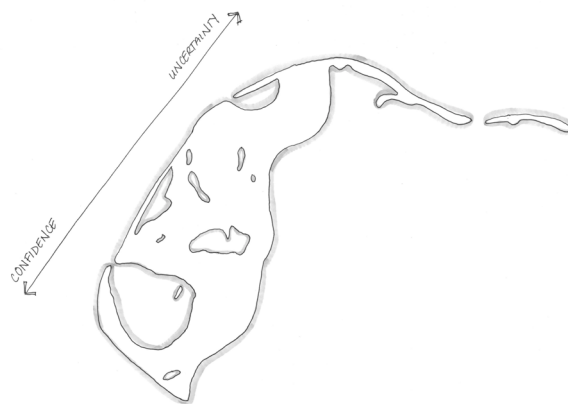


Figure 2.21 Overlay 'scale.'

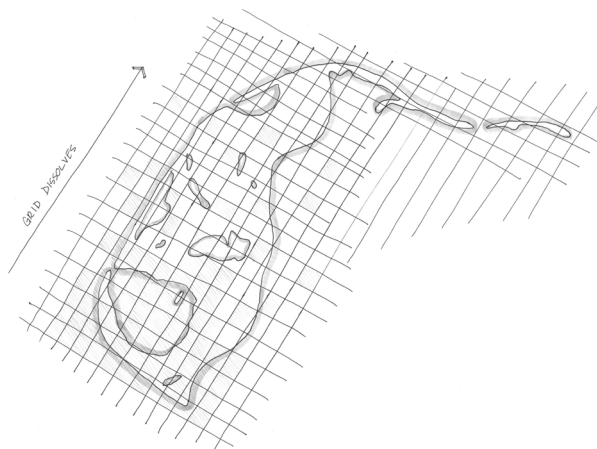


Figure 2.22 Overlay 'grid.'



Figure 2.23 Overlay ‘circulation.’



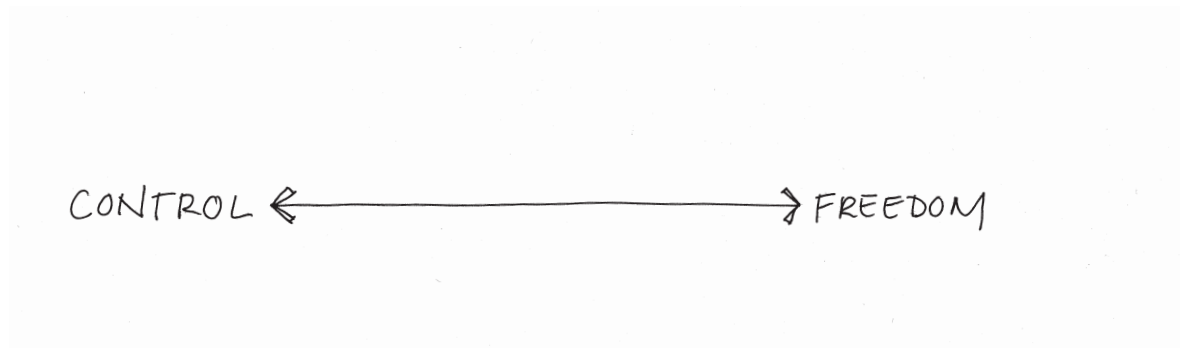


Figure 2.24 Montreal EXPO themes.

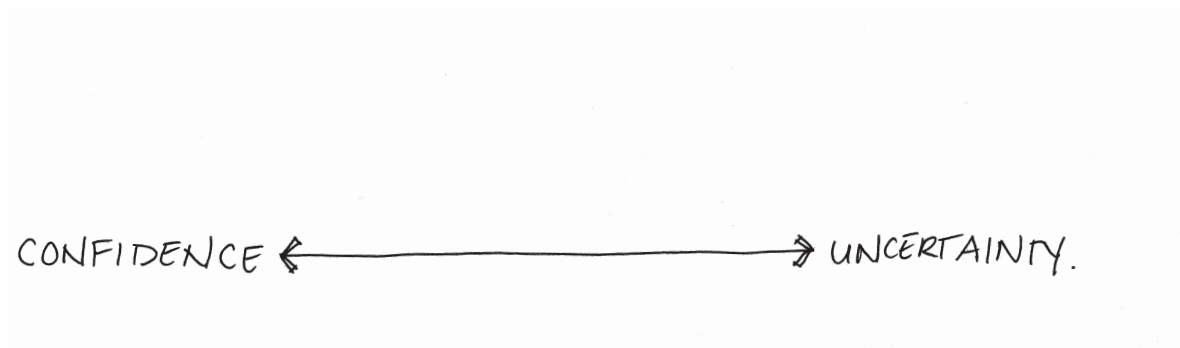


Figure 2.25 Redefined scale for EXPO 2067.

Challenging Montreal's EXPO call for control, the island was organised spatially along a "spine" of ranging from "confidence" on and "uncertainty" at the other (Figure 2.21). A grid was applied to the site for spatial organization (Figure 2.22). As you approach the uncertainty end, the grid begins to dissolve. Four 'attractions' are placed along this scale, connected by a linear circulation route (Figure 2.23).



## *Attraction #1: “Preservation Station”*

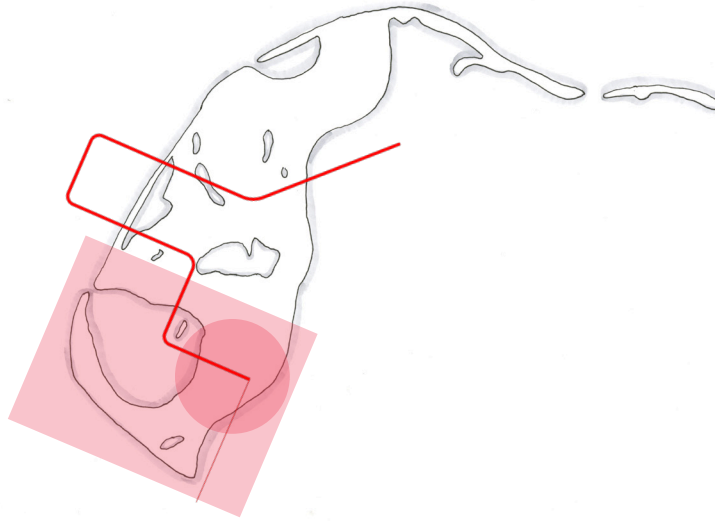


Figure 2.26 Key map showing program of “Preservation.”

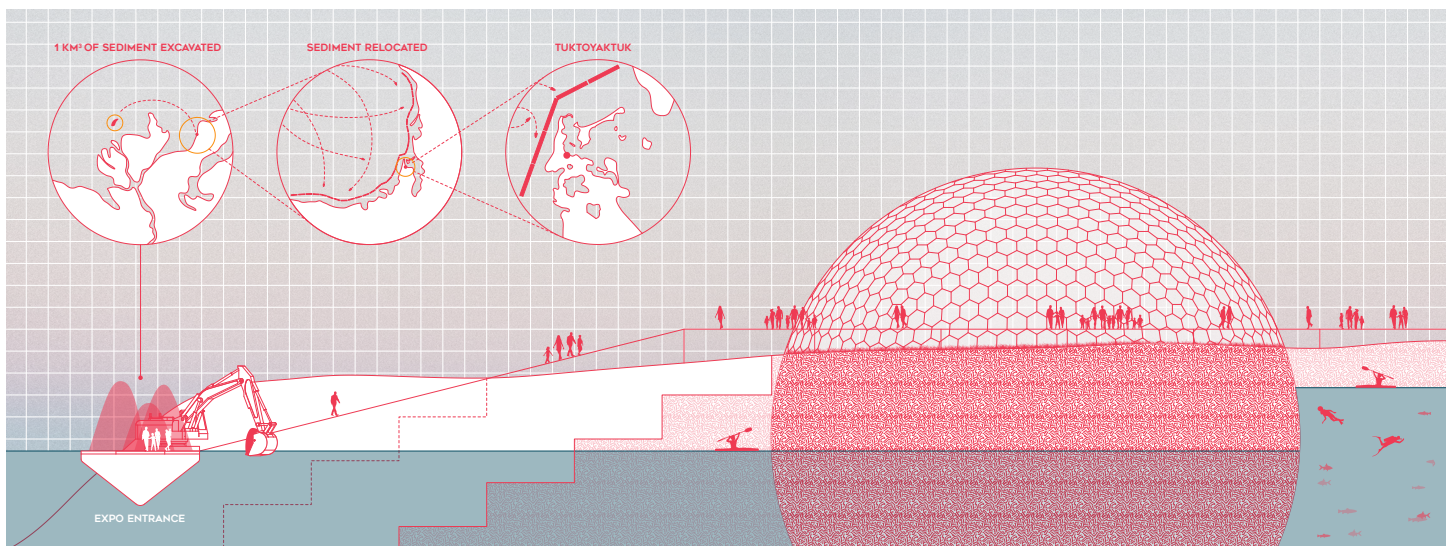
In the opening year of 2020, Pelly Island would be accessed through the small community of Tuktoyaktuk. Departing by crane barge used for dredging, you would leave Tuktoyaktuk.

Arriving at the South West point of Pelly Island, you are dropped off by barge, which is actively excavating sediments to be used for defense against wave action in Tuktoyaktuk. Just from the southern tip of the island, 1 cubic kilometre of sediment is extracted, which is redistributed along the coast of Tuktoyaktuk.

Slowly you make your way through into the Great Dome. This dome is an ‘arc’ of the last epoch and preserves a piece of what was once the arctic tundra and the Richards Island Coastal Plain Ecoregion. This Dome pays tribute to Buckminster Fuller’s speculative Dome over Manhattan, where he intended to be able to control temperature and climactic conditions within the dome. With advancements in technology, we were able to make this happen, keeping the inside of the dome at the perfect temperature to stop methane and carbon release, while simultaneously protecting from external climactic forces.

While inside you can see the tension and similarity between extreme land preservation and land exploitation on the outside. Both methods are effectively killing the landscape by removing them from their natural processes.





Figures 2.27 & 2.28 Render and section.



## Attraction #2: “Venice of the North”

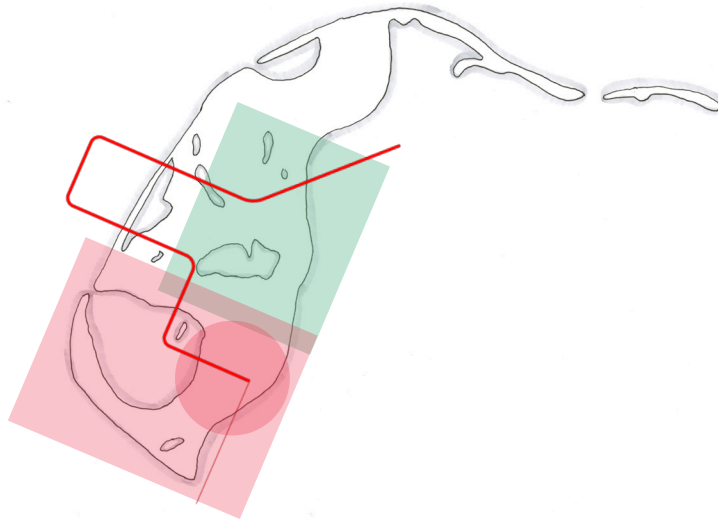
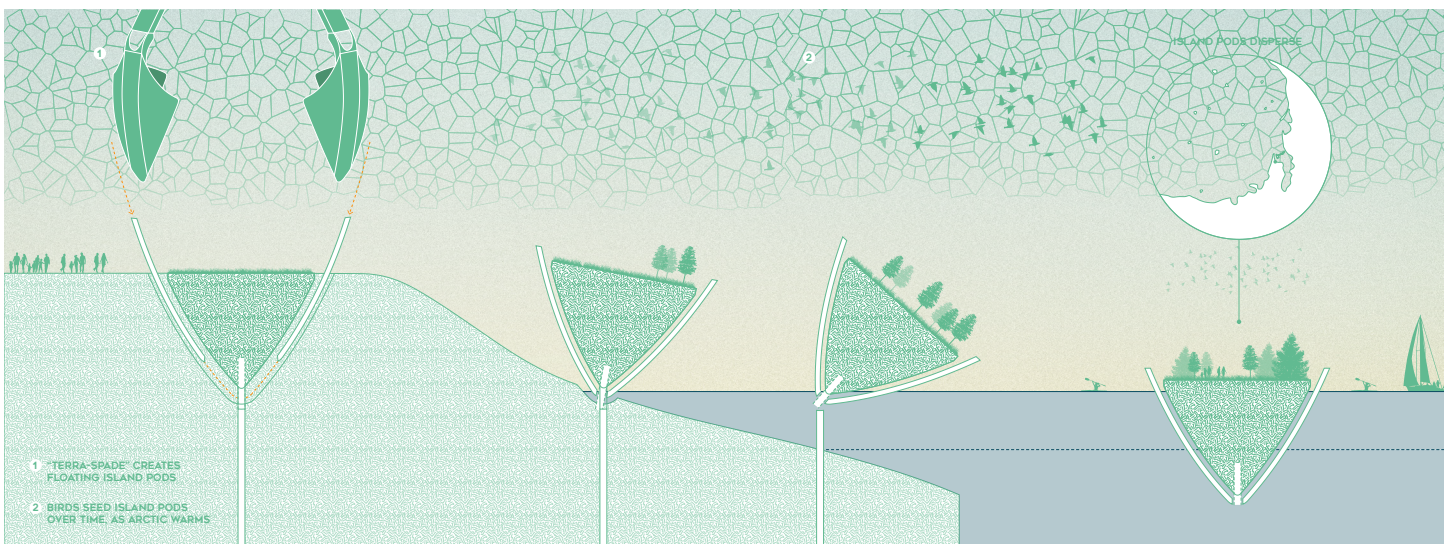
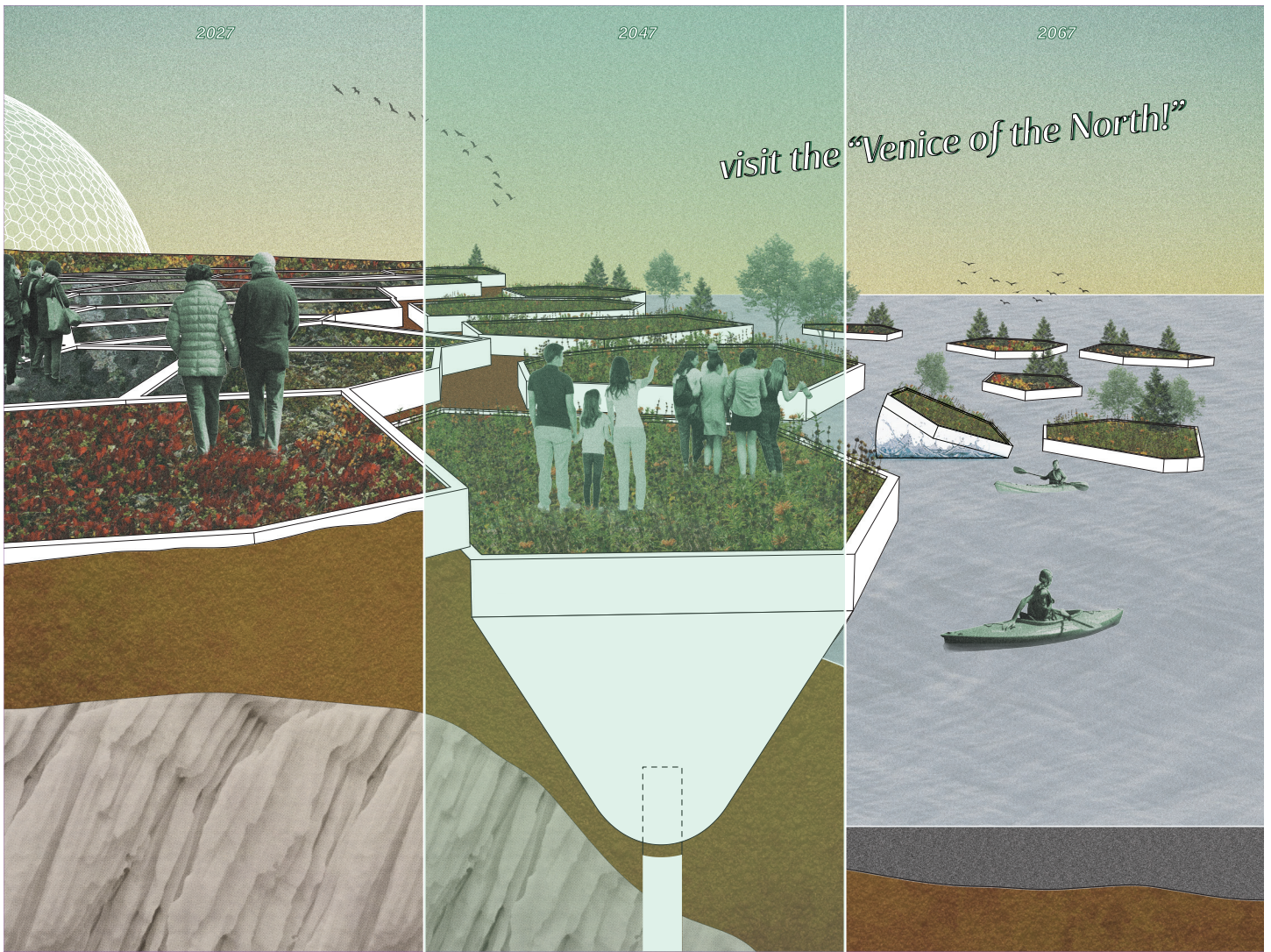


Figure 2.29 Key map showing program of “Venice of the North.”

Next we move into the “Venice of the North.” Using the patented “Terra-Spade,” pieces of the island are preserved in floating capsules. As the Arctic warms, what was once an area above the tree line may be able to host new forests. The remnants of Pelly Island are free to roam the Arctic Ocean serving as a cautionary tale to other landscapes which are currently under threat of disappearance. This intervention, like the dome, uses technology to preserve slices of land from destruction. Yet, rather than freezing the land in a single state, these “open-air time capsules” or “messages in a bottle” are allowed to evolve with warming temperatures and rising seas.





Figures 2.30 & 2.31 Render and section.



### Attraction #3: “Phyto-Plank”

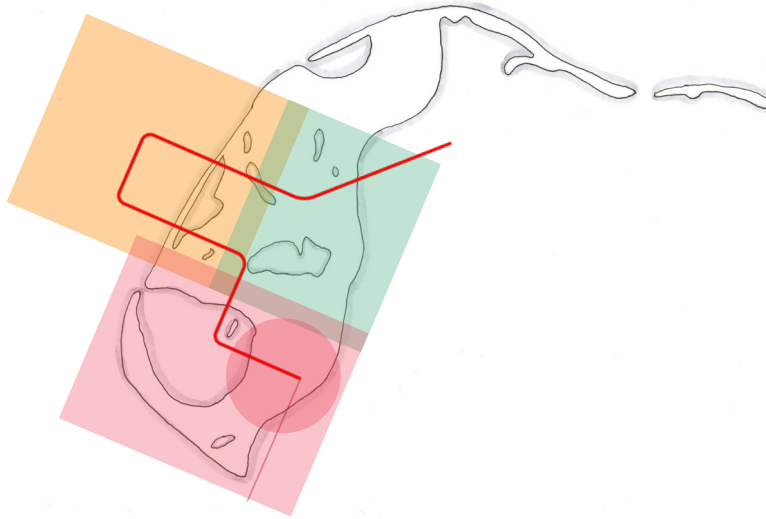


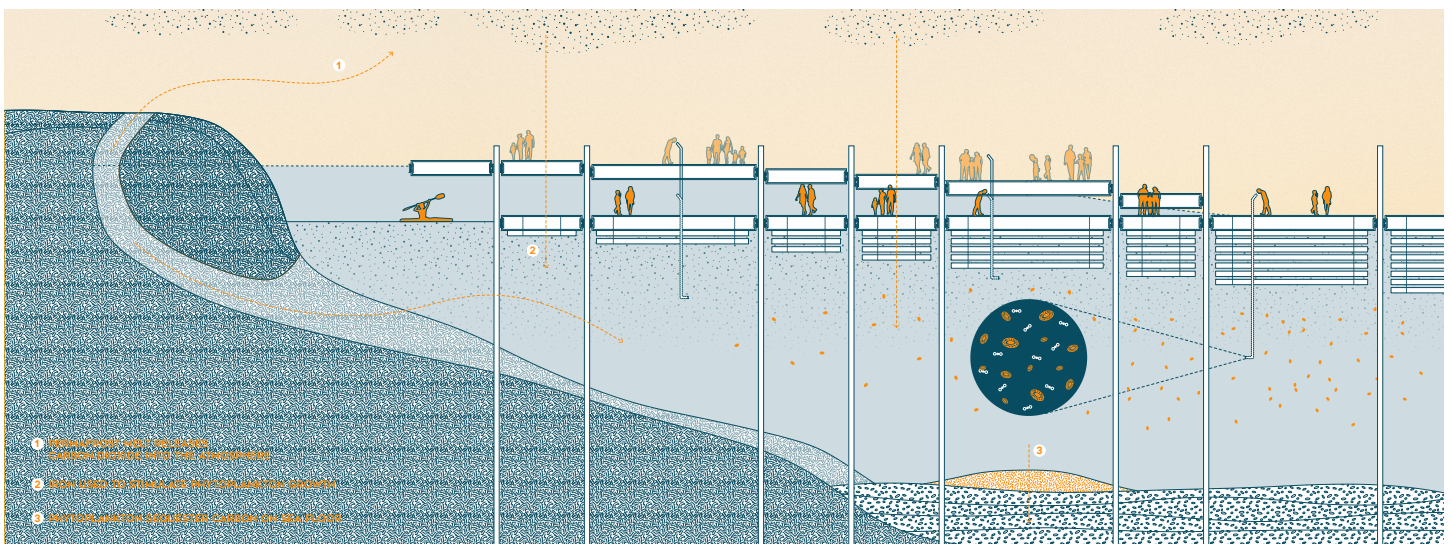
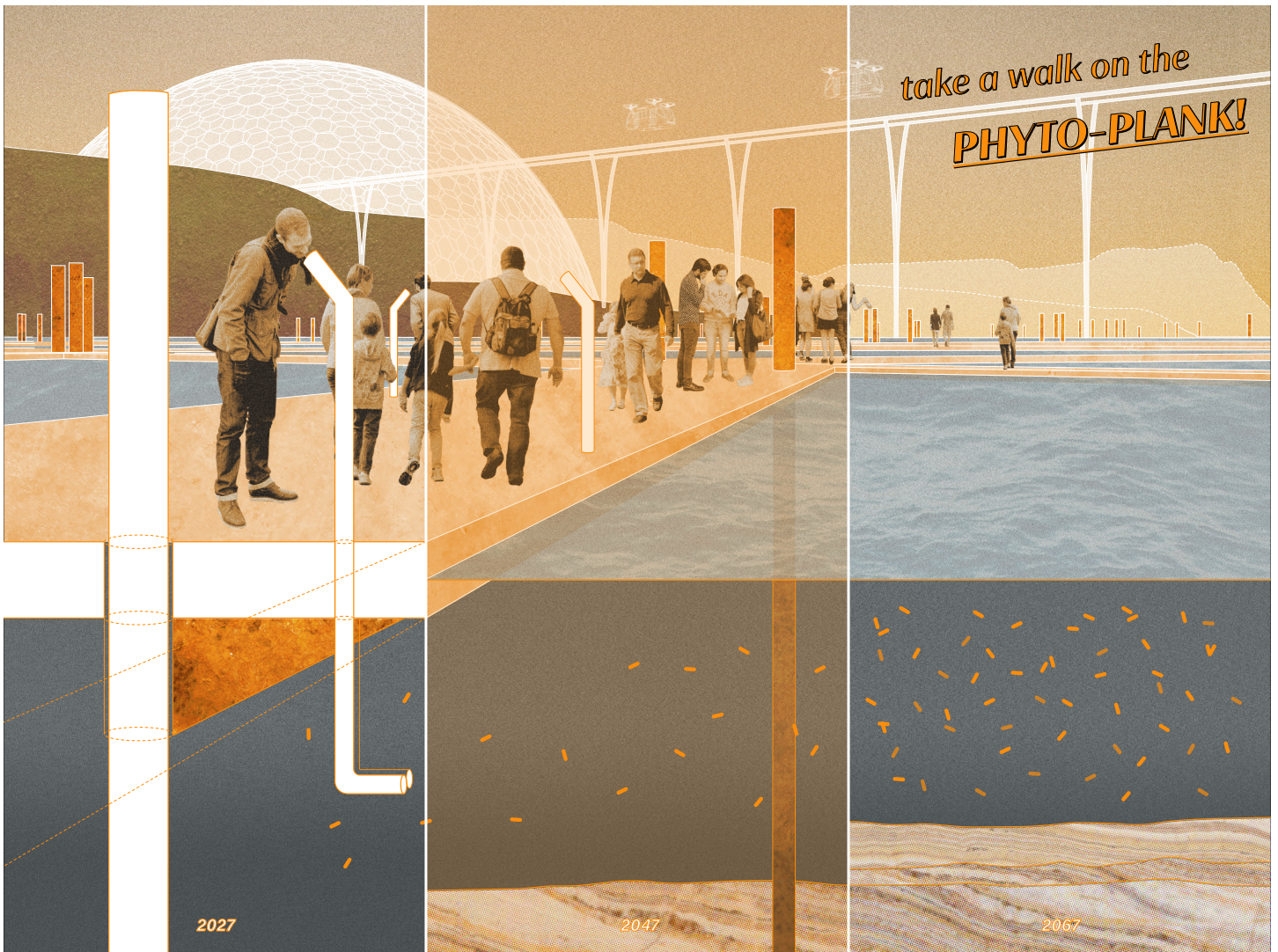
Figure 2.32 Key map showing program of “Phyto-Plank.”

Next we reach the “Phyto-Plank.” This attraction turns an ecological process into a spectacle. The iron posts and structures under the floating boardwalk stimulate phytoplankton growth. Phytoplankton absorbs carbon dioxide in the atmosphere and when they die, they sequester the carbon at the bottom of the sea. As Pelly continues to erode, and more carbon is released, this attraction will attempt to remediate and adapt.

*For the low price of an admissions ticket, you can peer into one of the periscopes and look at the phytoplankton in action, which give us life-saving oxygen free of charge!*

This intervention does not deny climate change, nor does it attempt to allow evolution to take its course, but instead accepts the current conditions and attempts to provide a local remedy.





Figures 2.33 & 2.34 Render and section.



#### *Attraction #4: “Augmented Reality Experience”*

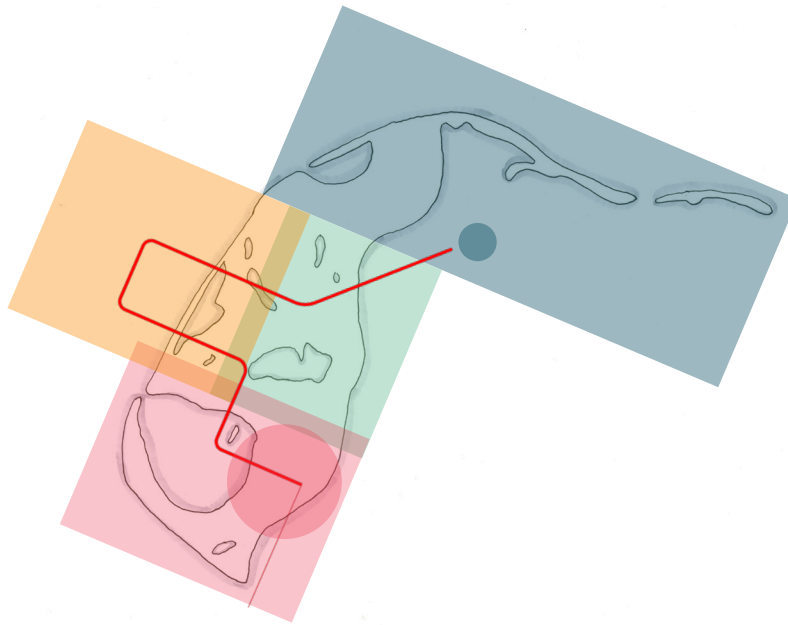
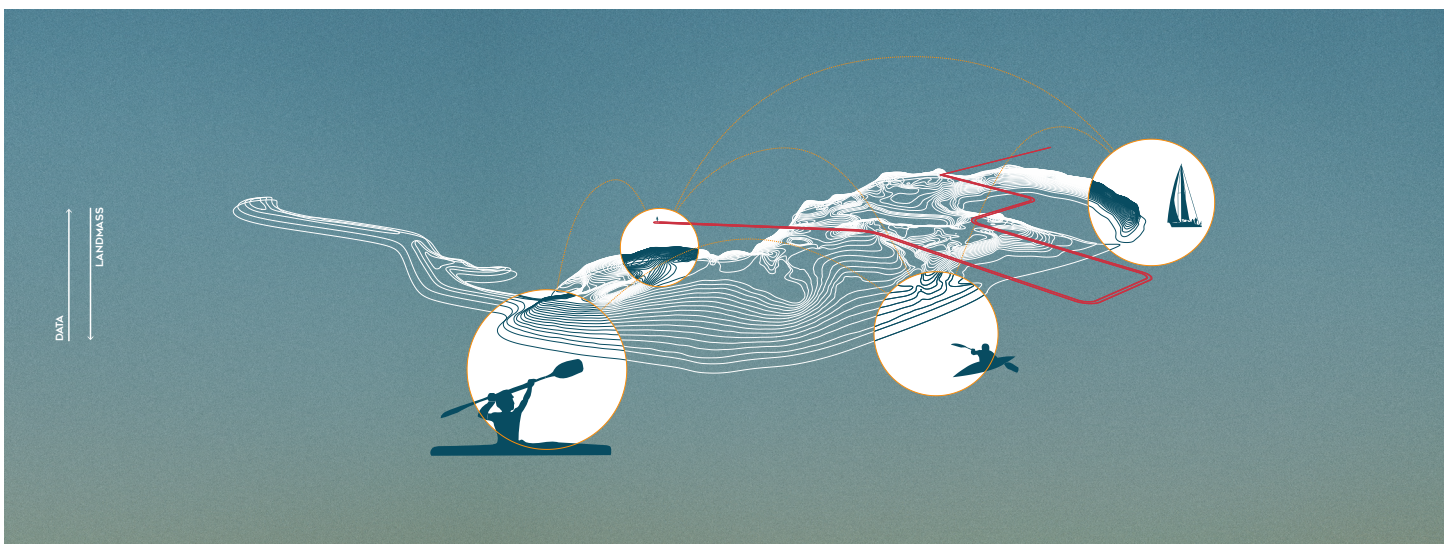
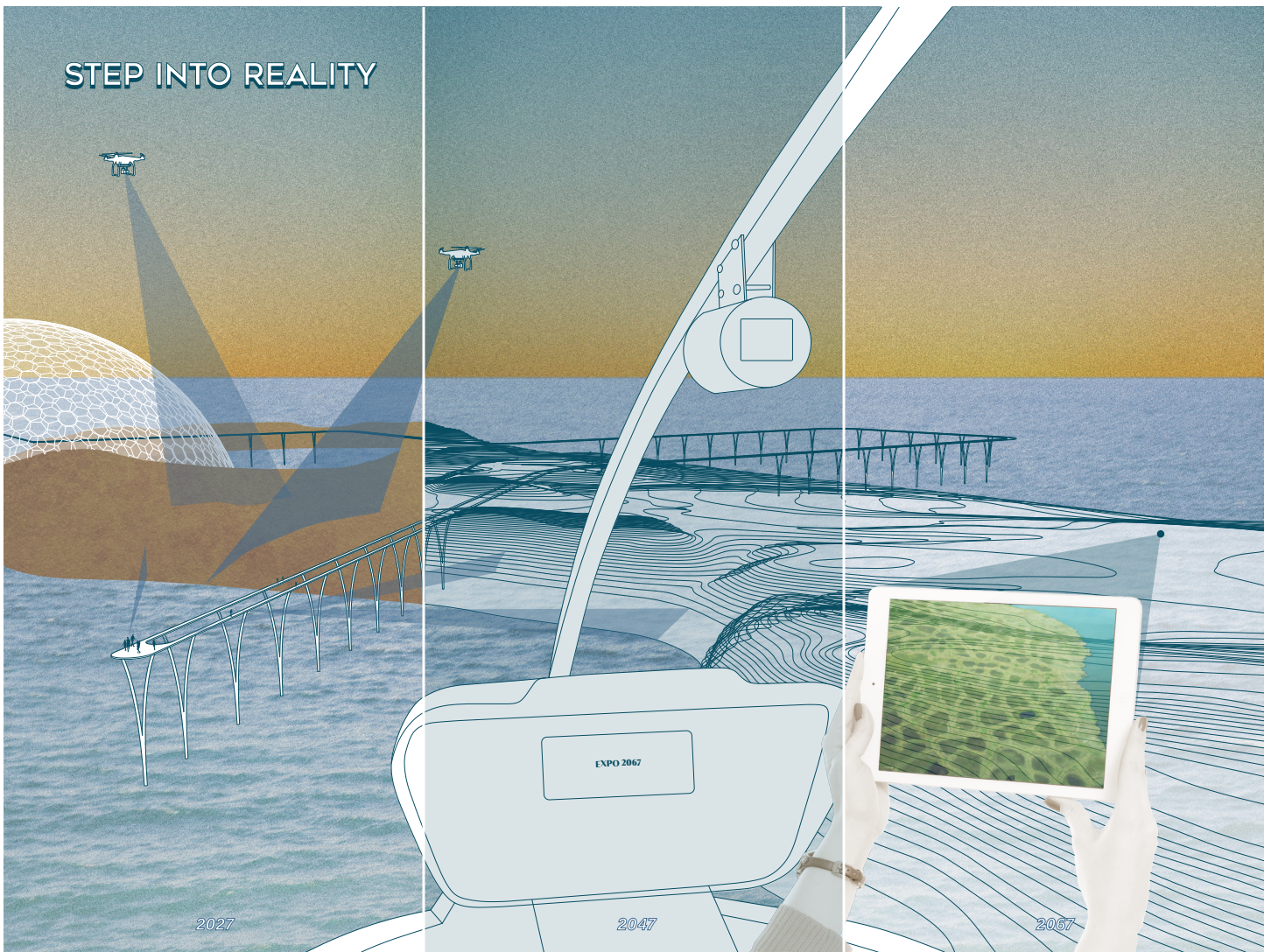


Figure 2.35 Key map showing program of “Augmented Reality Experience.”

Lastly, we reach the interactive Augmented Reality experience, where your journey on Pelly Island is measured in Kilobytes and not Kilometers. Here you can experience 50 years of change all at once. A flattening of time and space, this experience is the most hands-off or ‘business as usual.’ It allows the forces acting on the island to run their course and uses technology to give us a first row seat on the geological time scale.





Figures 2.36 & 2.37 Render and conceptual diagram.







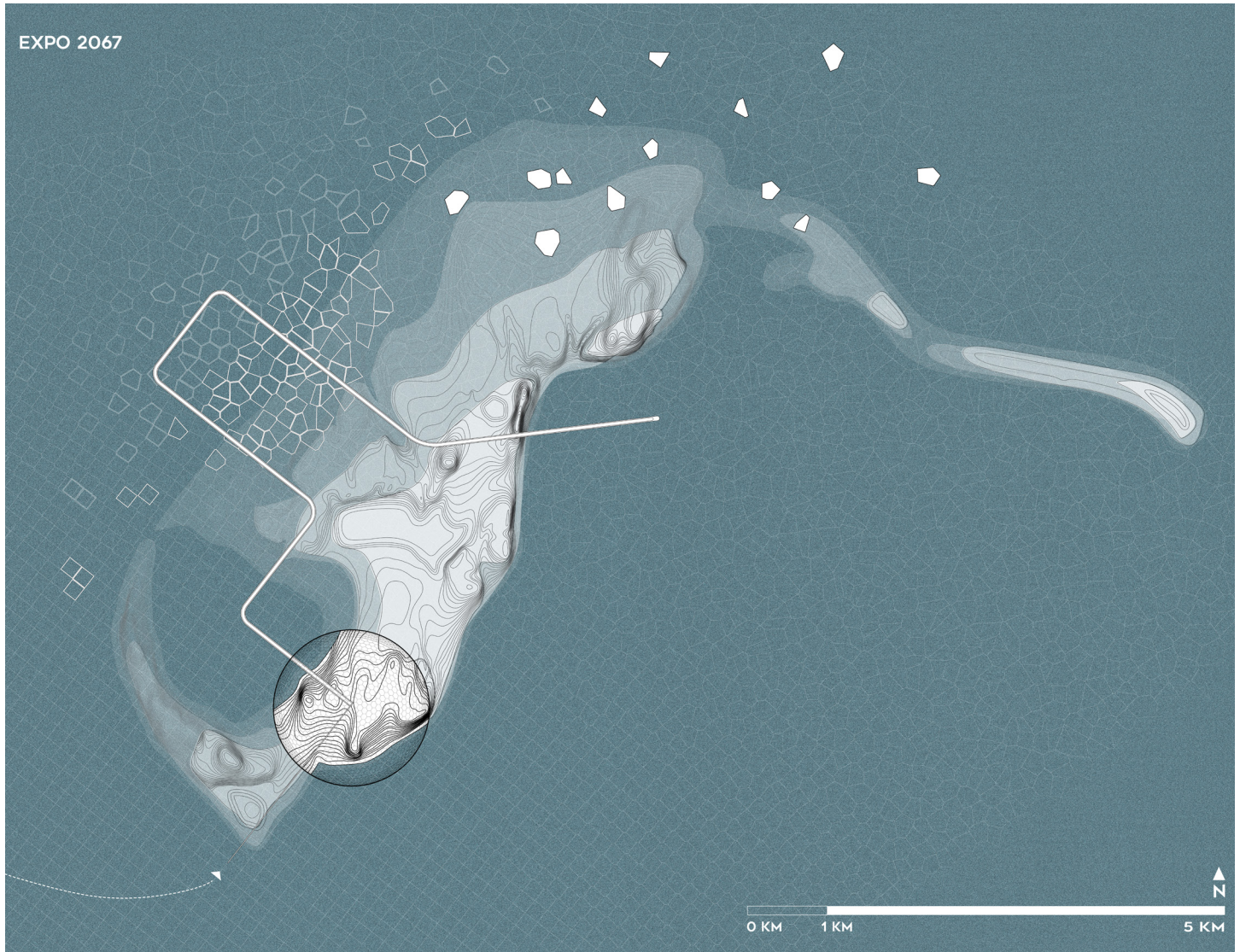


Figure 2.38 Conceptual plan of EXPO 2067.



## Conclusions

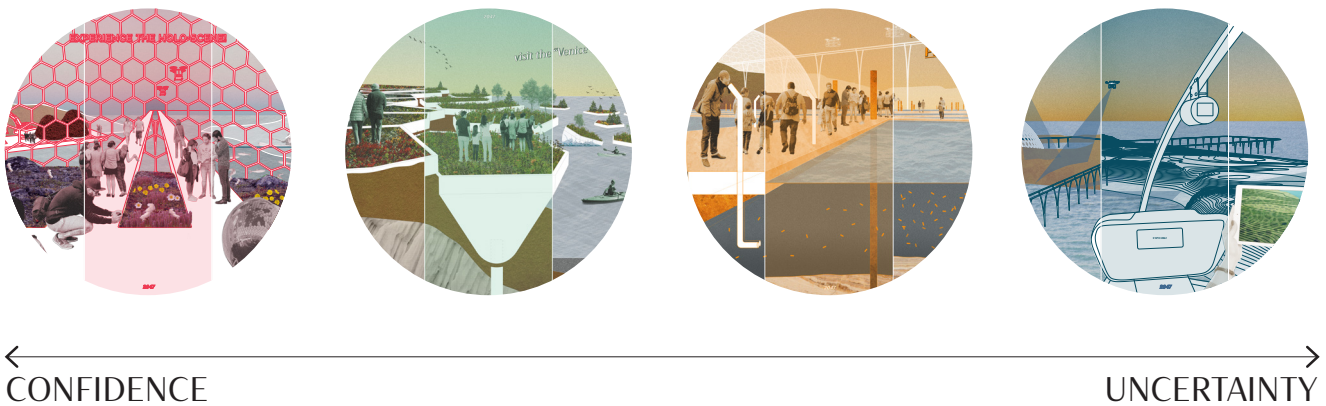


Figure 2.39 Each attraction placed along the scale of intervention.

This year, 2067 marks the 100th anniversary of Montreal's EXPO, "Man and His World," and the conclusion of this 47 year-long experiment.

I don't think that the tactics to engage with the problems we are facing today can be found on either end of the scale. I think the way to move forward can be found somewhere in the middle ground, where we collaborate with the system rather than thinking we can control it.

I believe the role of the landscape designer in the Anthropocene will be one of stewardship, education, awareness, and we should not believe that the world is as simple as any one-single solution. Perhaps through the device of a World's Expo we can shift practices' focus to global awareness, through local implementation.



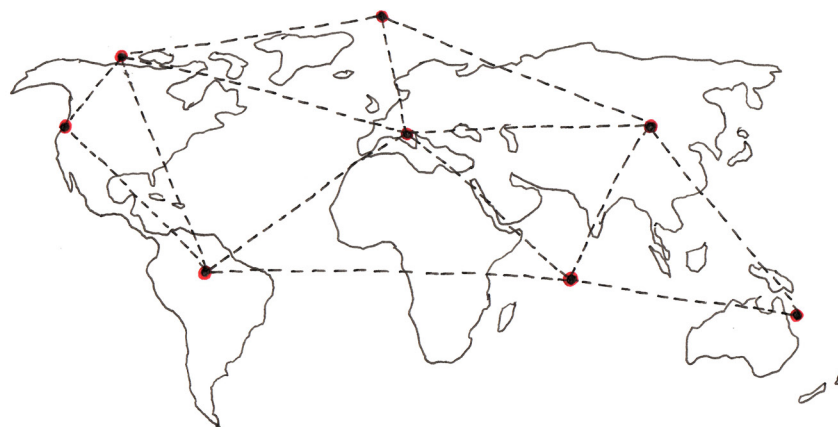


Figure 2.40 Possibility of EXPOs Pavilions around the world.







## Endnotes

- 1 Erle C. Ellis, "Time in Our Hands: Co-designing a Better Anthropocene," in *LA+ Interdisciplinary Journal of Landscape Architecture:Time*, no. 8, ed. Tatum L. Hands (Pennsylvania: ORO Editions, 2018), 107.
- 2 Official Expo 67 Guidebook, "Theme Pavilions." Maclean-Hunter Publishing Co. Ltd., 1967. Pg 62.
- 3 Darran Anderson, "World's Fairs and the Death of Optimism," CityLab Website (October 2018). Accessed February 02, 2019. <https://www.citylab.com/design/2018/10/worlds-fairs-and-the-death-of-optimism/571969/>.



## *Bibliography*

- Bowring, J., & Swaffield, S. "Shifting Landscapes In-Between Times," *Harvard Design Magazine*, no. 36. (2013). Accessed November 20, 2018. <http://www.harvarddesignmagazine.org/issues/36/shifting-landscapes-in-between-times>
- Campanella, Richard. "How Humans Sank New Orleans." *The Atlantic*. February 6, 2018, accessed November 25, 2018, <https://www.theatlantic.com/technology/archive/2018/02/how-humans-sank-new-orleans/552323/>
- Clowes, R., and Wilson, J. *Ghost Mountains and Vanished Oceans*. Toronto, Ontario: Key Porter Books Limited, 2009.
- Cook, Philip S., and Ted T. Cable. "The Scenic Beauty of Shelterbelts on the Great Plains." *Landscape and Urban Planning*, no. 32 (April 1995): 63-69. [https://doi.org/10.1016/0169-2046\(94\)00171-X](https://doi.org/10.1016/0169-2046(94)00171-X)
- Corner, J. ed. *Recovering landscape: Essays in Contemporary Landscape Architecture*. New York, NY: Princeton Architectural Press, 1999.
- Dykema JA, Keith DW, Anderson JG, Weisenstein D. "Stratospheric Controlled Perturbation Experiment: A Small-scale Experiment to Improve Understanding of the Risks of Solar Geoengineering," *Philosophical Transactions of the Royal Society: Mathematical, Physical and Engineering Sciences*, 372. (2014). <http://dx.doi.org/10.1098/rsta.2014.0059>
- Ellis, Erle C., "Time in Our Hands: Co-designing a Better Anthropocene." In *LA+ Interdisciplinary Journal of Landscape Architecture: Time*, no. 8, edited by. Tatum L. Hands, 106-109. Pennsylvania: ORO Editions, 2018.
- Farrier, David. "How the Concept of Deep Time is Changing." *The Atlantic*. October 31, 2016, accessed December 2, 2018, <https://www.theatlantic.com/science/archive/2016/10/aeon-deep-time/505922/>.
- Folkerts, Thilo. "Landscape as Memory," *Journal of Landscape Architecture* 10, no. 1 (February 2015): 68-77, <https://doi.org/10.1080/18626033.2015.1011445>.
- Hands, Tatum L., ed. *LA+ Interdisciplinary Journal of Landscape Architecture*, (No. 8: Time.). Pennsylvania: ORO Editions, 2018.
- Hamilton, Clive. *Earthmasters: The Dawn of the Age of Climate Engineering*. New Haven: Yale University Press, 2013. Retrieved from <http://ebookcentral.proquest.com>.



## Bibliography

- Hamilton, C., Bonneuil, C., & Gemenne, F., eds. *The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in a New Epoch*. London: Routledge, 2015.
- Jennings, Ken. "Maphead: Ken Jennings Finds the World's Lowest High Point." *Conde Nast Traveler*. Accessed December 5, 2018. <https://www.cntraveler.com/stories/2012-05-14/villingili-island-maldives-lowest-highest-point-maphead-ken-jennings>.
- Kim, Janette and Erik Carver. "The High-Tech Dome that Could Save Us Energy and Make a Better City: Can Buckminster Fuller's Dome over Manhattan be Reinvented for the Future?" *Forefront*, (November 2015). <http://ezproxy.library.ubc.ca/login?url=https://search-proquest.com.ezproxy.library.ubc.ca/docview/1748041732?accountid=14656>.
- Li, M., Liu, A., Zou, C. et al. "An Overview of the "Three North" Shelterbelt Project in China," *Beijing Forestry University and Springer-Verlag Berlin Heidelberg* (2012), 14: 70-79. <https://doi-org.ezproxy.library.ubc.ca/10.1007/s11632-012-0108-3>
- Milligan, B. "Migration of Landscapes," *Free Association Design* (2013). Accessed 3 Nov 2018. <https://freeassociationdesign.wordpress.com/2013/08/23/migration-of-landscapes/>
- Milligan, B. "Landscape Migration: Environmental Design in the Anthropocene," *Places Journal*, (2015). Accessed November 3, 2018. <https://doi.org/10.22269/150629>
- Morton, T. *Hyperobjects: Philosophy and Ecology after the End of the World*. Minneapolis, MN: University of Minnesota Press, 2013.
- OMA. "OMA Projects: Parc de la Vilette." Accessed December 12, 2018. <http://oma.eu/projects/parc-de-la-villette>.
- Oxford English Dictionary Online, s.v. "Geoengineering," accessed December 8, 2018, <https://en.oxford-dictionaries.com/definition/geoengineering>.
- Oxford Engineering Programme, University of Oxford. "What is Geoengineering?" Accessed December 10, 2018. <http://www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/>.
- Parker, Laura. "Parched: A New Dust Bowl Forms in the Heartland." *National Geographic*. May 17, 2014, accessed December 12, 2018. <https://news.nationalgeographic.com/news/2014/05/140516-dust-bowl-drought-oklahoma-panhandle-food/>.



## *Bibliography*

- Petri, Alexandra E. "China's 'Great Green Wall' Fights Expanding Desert." *National Geographic*. April 21, 2017, accessed December 5, 2018. <https://news.nationalgeographic.com/2017/04/chi-na-great-green-wall-gobi-tengger-desertification/>
- Rebuild by Design. "Hudson River Project: Resist Delay, Store Discharge." Accessed December 16, 2018, <http://www.rebuildbydesign.org/our-work/all-proposals/winning-projects/nj-hudson-river-project-resist-delay-store-discharge>
- Rinder, Larry. "Lawrence Rinder on Lebbeus Woods' San Francisco Project: Inhabiting the Quake, Quake City." Filmed January 18, 2010 at 75 Reasons to Live Exhibition, SFMOMA. Video, 2:00. <https://openspace.sfmoma.org/2010/07/75-reasons-larry-rinder/>
- Schneider, Ann M., "Designing Dialectical Landscape." In *LA+ Interdisciplinary Journal of Landscape Architecture: Time*, no. 8, edited by. Tatum L. Hands, 28-35. Pennsylvania: ORO Editions, 2018.
- Stewart, Brian. "Sinking into the Sea." CBC News. October 13, 2017, accessed September 2018, <https://www.cbc.ca/news2/interactives/sh/Tnq3tJHEAz/disappearing-island-arctic-beaufort-sea-tuk-toyaktuk/>.
- Torres-Campos, Tiago. "Sailing is Necessary, Living is not Necessary," CNTXT Studio. Accessed December 8, 2018. <http://www.cntxtstudio.com/Sailing-is-necessary-living-is-not-necessary>
- Turpin, E., ed. *Architecture in the Anthropocene: Encounters Among Design, Deep Time, Science and Philosophy*. Michigan: Open Humanities Press, 2013.
- Woods, Lebbeus. "The Experimental." Lebbeus Woods. Blog. August 12, 2010, accessed December 12, 2018. <https://lebbeuswoods.wordpress.com/2009/10/24/another-rem/>
- Woods, Lebbeus. "Another Rem." Lebbeus Woods. Blog. October 24, 2009, accessed December 12, 2018. <https://lebbeuswoods.wordpress.com/2009/10/24/another-rem/>
- Zolli, Andrew. "Toward a Transparent Planet." In *LA+ Interdisciplinary Journal of Landscape Architecture: Risk*, no. 6, edited by. Tatum L. Hands, 28-35. Pennsylvania: ORO Editions, 2017.



## ***Appendix A: Catalogue References***

### **California**

Image: Deadly Camp Fire Burns through Butte County, California. Eyewitness News. Accessed December 14, 2018. <http://wccg1045fm.com/2018/11/16/photos-deadly-camp-fire-burns-through-butte-county-california/>

1. Hurteau, M., Westerling, A., Wiedinmyer, C., Bryant, Benjamin. "Projected Effects of Climate and Development on California Wildfire Emissions through 2100." *Environmental Science & Technology* 48, no. 4 (2014): 2298-2304. DOI: 10.1021/es4050133
2. Government of California. "Camp Fire Incident Information." Last modified December 11, 2018. [http://www.fire.ca.gov/current\\_incidents/incidentdetails/Index/2277](http://www.fire.ca.gov/current_incidents/incidentdetails/Index/2277)

### **Venice**

Image: Rellandini, Stefano. "Tourists Walk on Platforms in Flooded Venice." Digital Image. Citylab. Accessed December 14, 2018. <https://www.citylab.com/environment/2018/04/will-a-huge-new-flood-barrier-save-venice/556226/>

3. World Population Review. "Venice Population Information 2018." Last modified December 12, 2018. <http://worldpopulationreview.com/world-cities/venice/>
4. Buckley, Jonathan. "When will Venice Sink?" The Guardian. Last modified November 2, 2016. <https://www.theguardian.com/commentisfree/2016/nov/02/when-will-venice-sink-google>

### **Detroit**

Image: Vacant Residential Lots at the Edge of Downtown. Digital Image. Skyrise Cities via The New York Times. Accessed December 14, 2018. <https://skyrisecities.com/news/2016/08/cityscape-journey-through-shrinking-city-detroit>



## ***Appendix A: Catalogue References***

5. Abbey-Lambertz, Kate. "Detroit Neighborhoods Fall into Ruin." Huffington Post. Last modified March 26, 2016. Accessed November 15, 2018. [https://www.huffingtonpost.ca/entry/google-street-view-detroit-abandoned-homes-foreclosure\\_us\\_56f41be3e4b0c3ef52183d4b](https://www.huffingtonpost.ca/entry/google-street-view-detroit-abandoned-homes-foreclosure_us_56f41be3e4b0c3ef52183d4b)
6. Gamble, Adrian. "Cityscape: A Journey Through the Shrinking City of Detroit." Skyrise Cities. Last modified August 10, 2018. <https://skyrisecities.com/news/2016/08/cityscape-journey-through-shrinking-city-detroit>

### **Great Barrier Reef**

Image: Peled, Dan. "Water Quality Degradation in the Great Barrier Reef." The Conversation. Accessed December 14, 2018. <https://theconversation.com/the-new-great-barrier-reef-pollution-plan-is-better-but-still-not-good-enough-83233>

7. Bay, Dr. Line. "Reef Recovery, Adaptations and Restoration." Australian Institute of Marine Science. Accessed November 20, 2018. <https://www.aims.gov.au/reef-recovery>
8. World Wildlife Federation. "Great Barrier Reef." Accessed December 5, 2018. <https://www.wwf.org.au/what-we-do/oceans/great-barrier-reef#gs.rYjWRsU>

### **Lake Chad**

Image: The Ups and Downs of Lake Chad. NASA Earth Observatory. Accessed December 14, 2018. <https://earthobservatory.nasa.gov/images/91291/the-ups-and-downs-of-lake-chad>

9. Stacke, Sarah. "An Uncertain Future on the Shores of Africa's Vanishing Lake." National Geographic. Last modified May 12, 2018, accessed November 28, 2018. <https://www.nationalgeographic.com/photography/proof/2017/05/lake-chad-desertification/?user.testname=none>
10. United Nations Environment Programme. "The Tale of a Disappearing Lake." Last modified February 28, 2018. <https://www.unenvironment.org/news-and-stories/story/tale-disappearing-lake>



## *Appendix A: Catalogue References*

### **Pelly Island**

Image: E-postcards from the Arctic. Government of Canada. Accessed December 14, 2018. [http://science.gc.ca/eic/site/063.nsf/eng/h\\_74C25260.html](http://science.gc.ca/eic/site/063.nsf/eng/h_74C25260.html)

11. Stewart, Brian. "Sinking into the Sea." CBC News. October 13, 2017, accessed September 2018, <https://www.cbc.ca/news2/interactives/sh/Tnq3tJHEAz/disappearing-island-arctic-beau-fort-sea-tuktoyaktuk/>.
12. McKendy, Joe. "Climate Change: Arctic Coastlines Eroding Up to 40m Yearly." Natural Resources Canada. Last modified February 28, 2018. <https://www.nrcan.gc.ca/simply-science/20661>

### **Athabasca Glacier**

Image: Glacier Movement. Digital Image. The Canadian Encyclopedia. Accessed December 14, 2018. <https://www.thecanadianencyclopedia.ca/en/article/glacier>

13. Carman, Tara. "Near Total Loss of Glacial Ice in B.C., Alberta expected by 2100, Researchers Say." Vancouver Sun. Last modified April 7, 2015. <http://www.vancouversun.com/technology/Near+total+loss+glacial+Alberta+expected+2100+researchers/10949165/story.html>
14. Baker, Nathan, and Rutter N. "Glaciers in Canada." The Canadian Encyclopedia. Last modified February 1, 2018. <https://www.thecanadianencyclopedia.ca/en/article/glacier>



## ***Appendix B: Figure References***

### **Prelude**

Figure 01 (edited by author): Google Earth aerial view of New Orleans.

Figure 02: Campanella, Richard. "New Orleans and its Vicinity in 1863." The Atlantic via Wells, Rigway, Virtue and Co./ Library of Congress. Digital Image. Accessed December 17, 2018. <https://www.theatlantic.com/technology/archive/2018/02/how-humans-sank-new-orleans/552323/>

Figure 03 (edited by author): Lynch, David. "New Orleans Elevation." Map Resources via USGS Vicinit. Accessed December 17, 2018. [http://cdly.org/map\\_resources.htm](http://cdly.org/map_resources.htm)

### **Chapter 01**

Figure 04: Dauphin, Lauren.V "Volcanic Plateaus in Argentina." NASA Earth Observatory. Digital image. September 19, 2010. Accessed November 15, 2018. <https://earthobservatory.nasa.gov/images/144304/volcanic-plateaus-in-argentina>

Figure 05: Delagrive, Jean. "Engraved Map of Versailles designed by Andre le Notre (1689-1757)." Wikimedia Commons. Accessed December 17, 2018. [https://commons.wikimedia.org/wiki/File:Plan\\_de\\_Versailles\\_-\\_Gesamtplan\\_von\\_Delagrife\\_1746.jpg](https://commons.wikimedia.org/wiki/File:Plan_de_Versailles_-_Gesamtplan_von_Delagrife_1746.jpg)

Figure 06 (adapted by author): Harvard Solar Geoengineering Research Program. "Solar Geoengineering Diagram." Digital Image. Accessed December 5, 2018. <https://geoengineering.environment.harvard.edu/geoengineering>

Figure 07 (adapted by author): Oxford Geoengineering Programme. "Proposed Carbon Geoengineering Techniques." Via New Scientist. Accessed December 5, 2018. <http://www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/>

Figure 08: OMA (edited by autor). "HUD Rebuild by Design Site Plan." Digital Image OMA Project Website. Accessed December 17, 2018. <http://oma.eu/projects/hud-rebuild-by-design>

### **Chapter 02**

Figure 10: "Australia's Ephemeral Lake Mackay." NASA Earth Observatory. Digital image. September 19, 2010. Accessed November 15, 2018. <https://earthobservatory.nasa.gov/images/84984/australias-ephemeral-lake-mackay>

Figure 11 (edited by author): Landscape Forms "Material Spec Sheet." Digital Image. Accessed December 17, 2018. [https://www.landscapeforms.com/en-us/LFI%20Material%20Tech%20Sheets/LF\\_Color-Chart.pdf](https://www.landscapeforms.com/en-us/LFI%20Material%20Tech%20Sheets/LF_Color-Chart.pdf)

Figure 12: Folkerts, Thilo & Tourelle, Rodney. "International Festival des Jardins de Metis." Digital Image. [https://www.arquitectes.cat/iframes/paisatge/cat/mostrar\\_projecte.php?id\\_projecte=8103&lan=en](https://www.arquitectes.cat/iframes/paisatge/cat/mostrar_projecte.php?id_projecte=8103&lan=en)

Figure 13: Fisk, Harold. "Geological Investigation of the Alluvial Valley of the Lower Mississippi River, 1944." Via US Army Corps of Engineers: Engineering Geology and Geophysics Branch. Accessed



## ***Appendix B: Figure References***

December 17, 2018. <http://lmvmapping.erd.c.usace.army.mil/index.htm>

Figure 14: Graham, Joseph, Newman, William, and Stacy, John, 2008, The geologic time spiral—A path to the past (ver. 1.1): U.S. Geological Survey General Information Product 58, poster, 1 sheet. (Also available online at <http://pubs.usgs.gov/gip/2008/58/>.)

### **Interlude**

Figures 15 & 16: Woods, Lebbeus. “Quake City. From San Francisco: Inhabiting the Quake 1995.” SFMOMA Collection. Accessed December 17, 2018. <https://www.sfmoma.org/artwork/96.88>

### **Chapter 03**

Figure 17: Voiland, Adam.E “Dust Streams from Southwestern Africa.” NASA Earth Observatory. Digital image. October 21, 2018. Accessed November 15, 2018. <https://earthobservatory.nasa.gov/images/84984/austrialias-ephemeral-lake-mackay>

Figure 20 (adapted by author): OMA. “Parc de la Villette plans.” OMA Project website. Accessed December 15, 2018. <http://oma.eu/projects/parc-de-la-villette>

### **Chapter 04**

Figure 21 & 22: Fuller, Buckminster & Sadao, Shoji. “Dome Over Manhattan, 1960.” Digital image via Design Science. <https://medium.com/designscience/1960-750843cd705a>

Figure 23: Steinmetz, George. “Tarim Desert Shelterbelt.” Digital image via Landscape as Infrastructure. Accessed December 10, 2018. <https://landscapeasinfrastructure.wordpress.com/projects/li-for-erosion-repair/ex2-tarim-desert-highway-shelterbelt/>

Figure 24 (edited by author): Google Earth image.

Figure 25-27: Campos, Tiago-Torres. “Sailing is Necessary, Living is Not Necessary.” Digital image via Cityvision. Accessed December 5, 2018. <http://www.cityvisionweb.com/competition/b30a1/>

Figures 28-30 (edited by author): Figure 12: Folkerts, Thilo & Tourelle, Rodney. “International Festival des Jardins de Metis.” Digital Image.[https://www.arquitectes.cat/iframes/paisatge/cat/mostrar\\_projecte.php?id\\_projecte=8103&lan=en](https://www.arquitectes.cat/iframes/paisatge/cat/mostrar_projecte.php?id_projecte=8103&lan=en)

Figures 31-32: Jensen, Erik. & Sunter, Rebecca. “Memorials for the Future Competition 2016.” Digital image via National Capital Planning Commission. Accessed December 5, 2018. <https://future.ncpc.gov/>

Figures 33-34 (edited by author): Talon, Kettj. “Burri’s Grande Cretto.” Digital image via NSS Magazine. Accessed December 5, 2018.

Figure 35 (edited by author): Google Earth image. <https://www.nssmag.com/en/pills/16428/burri-s-grande-cretto/image:156925>



## Appendix B: Figure References

### Postlude

Figures 37 & 38 (screen caps): Nolan, Christopher. *Interstellar*. Film. (2014).

Burns, Ken. *The Dust Bowl*. Film. (2012).

### Chapter 05

Figure 39: Dauphin, Lauren.V “Volcanic Plateaus in Argentina.” NASA Earth Observatory. Digital image. September 19, 2010. Accessed November 15, 2018. <https://earthobservatory.nasa.gov/images/144304/volcanic-plateaus-in-argentina>

Figure 40: MacLeod, Roger. “Erosion on the Beaufort Coast.” Natural Resources Canada via CBC News. October 13, 2017, accessed September 2018, <https://www.cbc.ca/news2/interactives/sh/Tnq3tJHEAz/disappearing-island-arctic-beaufort-sea-tuktoyaktuk/>.

### Chapter 06

Figure 2.01: London: Read & Co. Engravers & Printers, 1851, “View from the Knightsbridge Road of The Crystal Palace in Hyde Park for Grand International Exhibition of 1851. Dedicated to the Royal Commissioners.” Accessed April 2019. [https://en.wikipedia.org/wiki/The\\_Crystal\\_Palace#/media/File:The\\_Crystal\\_Palace\\_in\\_Hyde\\_Park\\_for\\_Grand\\_International\\_Exhibition\\_of\\_1851.jpg](https://en.wikipedia.org/wiki/The_Crystal_Palace#/media/File:The_Crystal_Palace_in_Hyde_Park_for_Grand_International_Exhibition_of_1851.jpg).

Figure 2.02: “Promotional Expo 67 Poster.” Accessed February 2019. <https://www.canadashistory.ca/explore/arts,-culture-society/mad-men-of-expo>.

Figure 2.03: Montreal Chronicle #41, “A Short History of the Biosphere.” Accessed April 2019. [http://archives-demontreal.com/2015/07/16/chronique-montrealite-no-41-breve-histoire-de-la-biosphere/001\\_p110-y\\_15-001/](http://archives-demontreal.com/2015/07/16/chronique-montrealite-no-41-breve-histoire-de-la-biosphere/001_p110-y_15-001/)

Figure 2.07(adapted by author): Michael Fritz, Jorien E. Vonk, Hugues Lantuit. “Collapsing Arctic coastlines.” *Nature Climate Change*. January 2017, accessed January 2019, <https://www.awi.de/en/about-us/service/press/archive/when-the-arctic-coast-retreats-life-in-the-shallow-water-areas-drastically-changes.html>. DOI: 10.1038/nclimate3188

Figure 2.08: McKendy, Joe. “Erosion on Pelly Island.” Natural Resources Canada. February 28, 2018, accessed January 2019, <https://www.nrcan.gc.ca/simply-science/20661>

Figure 2.09: US Geological Survey, “Permafrost block on the Arctic coast of Alaska” via *BioScience* (2015), 65: 722. Accessed April 2019, <https://academic.oup.com/bioscience/article-abstract/65/7/718/258480>



## *Appendix B:* Figure References

Figure 2.10: Murray, Weronika. “Last Remaining Homes on Beaufort Drive in Tuktoyaktuk, N.W.T.” Via National Post. February 28, 2019, accessed April 2019, <https://nationalpost.com/news/canada/eroding-tuktoyaktuk-every-day-homes-in-this-northern-hamlet-are-getting-closer-to-the-sea>.

Figure 2.11: Palmer, Harry. “Police Point, Tuktoyaktuk, Aerial View, 1982.” Via A Portrait of Canada, accessed April 2019, <http://www.aportraitofcanada.ca/?p=1596>.



