IDENTITY AND ECONOMY

MINING THE RING OF FIRE

by

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AUTHOR'S DECLARATION

I herby declare that I am the Sole author of this thesis. This is a true copy of the thesis including any required final Revisions, as accepted by my examiners.

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ABSTRACT

When the price of oil fell in 2014, Canada's economy suffered. Even now, two years later, companies continue to drop their prices to stay competitive, as the global supply of oil remains great without any corresponding demand. No end has been predicted for the declining price of oil, which means the country must consider investing in new opportunities to generate revenue. Canada has been dependent on the exportation of its natural resources since its founding, from fur to lumber to minerals; the mining sites in Ontario's Far North, dubbed the Ring of Fire and hailed as the province's own oil sands, represent the next logical investment. However, the current model of temporary settlements used at resource extraction sites requires rethinking, as these settlements promote extraction based on a shadow population of transient and predominantly male workers, and permit mining companies to exploit both the land and local populations. While boomtowns may present a more permanent alternative, the First Nations communities are not suited for the explosive growth mining will bring to the region.

This thesis proposes a new settlement typology for resource extraction, in which workers embrace a mobile lifestyle of mining operations, moving from one mining site to another with their families according to the lifespan of the extraction in a given region of the Ring of Fire. Parts of the settlement are designed for constant population fluctuation, while others are designed for permanence, forming a resilient economic core to stabilize the resulting community. Local ways of life, such as hunting and fishing, are merged with the resource extraction requirements of the settlement and supplemented with social gathering spaces, operation monitoring and education programs, all in order to create a community conscious and considerate of the land it occupies, benefiting the region socially and economically. A new hybrid landscape is created using the byproducts of extraction to create productive networks throughout the region: these byproducts will increase connectivity and the circulation of various resources, such as electricity and drinking water, both of which are currently lacking in the underserviced communities of Ontario's Far North. Ultimately, this thesis explores what a settlement providing maximum benefits to both an existing and newly-embedded population—as well as benefits to the country as a whole, through the resulting economic activity—might look like.

This thesis also explores the reincorporation of a community into its surrounding landscape once extraction is complete. What architectural elements (pieces or entire buildings) should remain for the benefit of the communities? What elements can be entirely removed and relocated to other resource extraction sites? And can pieces of architecture be left behind to enhance landscape for those who will remain to inhabit the land? The Ring of Fire has the potential to be so much more than a mining operation, but this requires an accompanying vision of settlement to successfully integrate it within its larger context.

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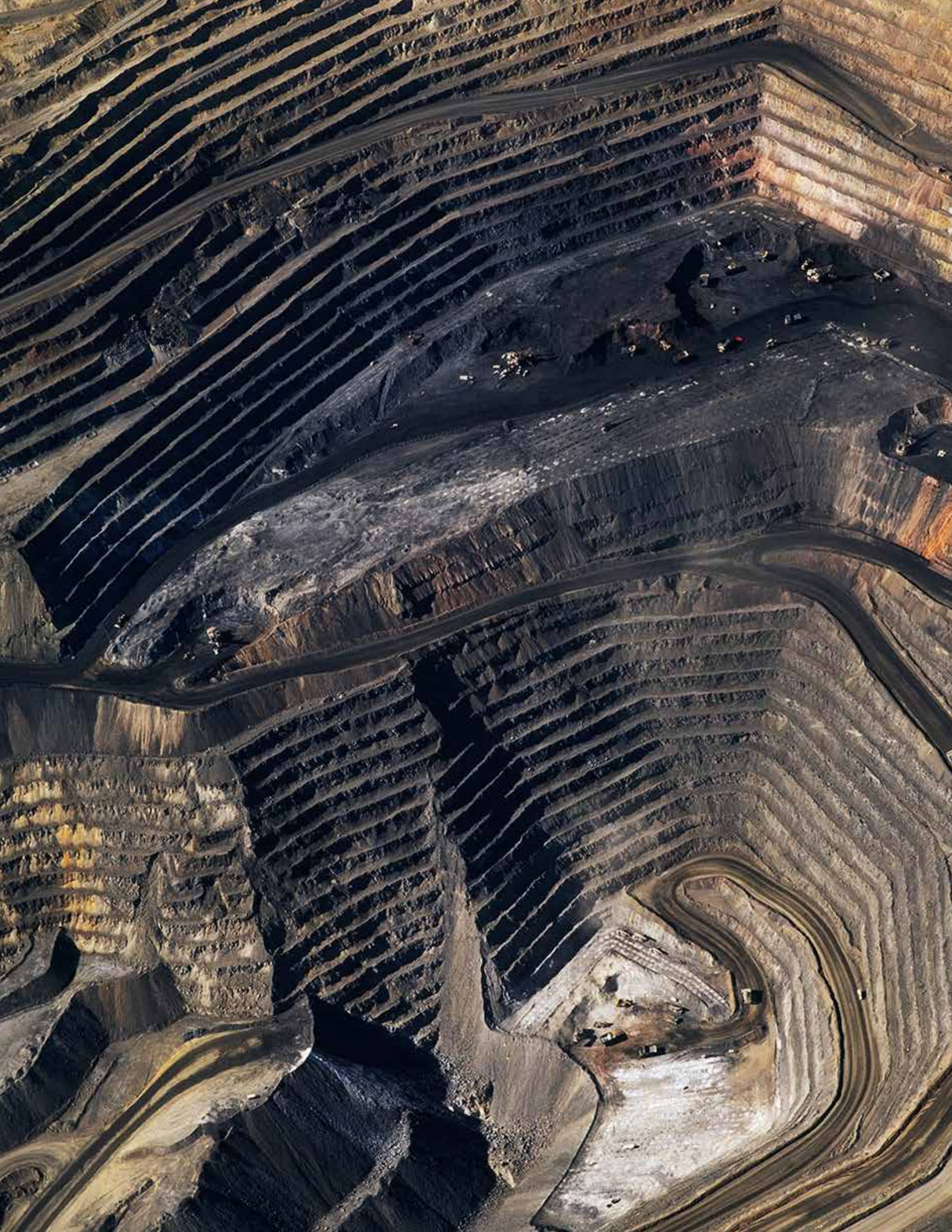

INTRODUCTION

Identity and Economy is an experiment in regional, settlement and architectural planning. It examines the strained relationship between resource extraction and landscape in Canada, establishing a design problem that frames how extraction settlements can use both identity and economy as tools for development. The actual processes and methods of resource extraction are beyond the scope of this project, as they are technological problems. Instead, the project explores how better settlements for resource extraction might be created to benefit the region environmentally, socially and economically, even after extraction. This thesis asks: what does a resource extraction settlement providing maximum benefits to its population, region and country as a whole, look like? Currently a potential mining site in Ontario's Far North, the Ring of Fire is the chosen test site for this new extraction settlement typology, as it is positioned in an environmentally and culturally vulnerable ecosystem. Its currently-undeveloped state presents the greatest potential for holistic design.

Setting up the design proposal, *Part One: Positioning* provides a contextual framework through two essays, both of which investigate the existing relationship between Canada's identity and its economy; this framework will position research for the design of future extraction settlements in both a national and a global context. The first essay, "Nature and Extraction", traces the relationship between two different ideas of Canadian landscapes as they have intertwined throughout history: the picturesque wilderness revered as part of the country's identity, and the often-overlooked man-made landscapes of extraction that generate the economy. The essay concludes with observations on the current state of the nature-economy relationship, in which the desire for revenue has only increased the scale of extraction in apparent opposition to the population's desire to be more conscious of humanity's effect on the environment. Can the settlements for these remote extraction sites successfully recombine nature and economy back into one image as it was during the country's founding? The second essay, "Extraction Urbanism", continues by examining the current global context of resource extraction and how the next generation of extraction settlements might adopt strategies from existing *successful* models, while at

Fig. 0.1 David Maisel, *American Mine (Carlin, Nevada 2)*, 2007

the same time learning lessons from those that were less so. These strategies will be applied to the design proposal elaborated in subsequent parts of the thesis.

Part Two: The Ring of Fire examines the current cultural and environmental context of the Ring of Fire. This section identifies major players in the development of mineral deposits and what potential exists in the region for future development: economically, socially and environmentally. This section establishes conditions to which the design proposal will respond in the following section.

Finally, *Part 3: A New Settlement* envisions new models for extraction settlements in a post-extraction context which privilege long-term sustainability. Instead of proposing an all-encompassing master plan for the Ring of Fire, this thesis outlines a series of tactics that might be used towards an overall vision of development. This allows for variations of settlements depending on environmental factors and business objectives, but will ultimately connect mining operations to the communities located in Ontario's Far North. The first scale of the design, *New Networks*, proposes the overall vision at a regional scale, using the Ring of Fire as a catalyst to create a more economically-sustainable region. The second scale, *Tactics*, zooms into the networks created within the Ring of Fire itself, and presents the design tactics in greater detail. The chapter concludes with tactics assembled into six envisioned scenarios, outlining their evolution from pre- to post-extraction communities, no longer solely dependent on finite resources.

part one

POSITIONING

Fig. 1.2 Molson Canadian, *Mountains* (Advertisement), 2007

Fig. 1.3 Destination Canada, *Australian Advertisement, 2014*

NATURE & EXTRACTION

essay one

"When people weigh the nature and basis of their nationalism they usually dwell on aspects of their culture, history or race; but English-speaking Canadians tend to explain themselves in terms of land and location."

-Cole Harris, "The Myth of the Land in Canadian Nationalism"[1]

CONQUERING LAND

Canadian identity is not static: it is evolving, shifting and realigning itself with the developing values of its population. Canadians are part of a mobile culture, spread across thousands of kilometers of land, travelling to work, to escape, to connect, enfolding distinct cultures and landscapes into a single nation. The term "landscape", in this sense, is not limited to the beautiful vistas often evoked by the term, but includes various ecological, political and urban landscapes. Still, it is this picturesque idea that often forms the foundation to our national identity. Representation in the media only reinforces this limited idea of what constitutes Canadian landscape, and exports it internationally; they continue to define what is Canadian as "nature" (*fig* 1.2 & *fig* 1.3). But this image of Canada as picturesque would not enjoy such prominence without the country's history of resource extraction, as it is the accumulation of natural resources that first generated and circulated the image of Canada as a vast wilderness of sublime landscapes and wealth around the world. Yet while landscape and resource extraction were once equal in public prominence and though resource extraction remains a necessity to our economy, today these man-made landscapes are removed and hidden from the public eye until disaster strikes or environmental protests bring it back to the country's attention.

Fig. 1.1 [Previous Page] *Garth Lenz, Greenhills coal Mine, Elk Valley, South Eastern British Columbia, Canada*

Landscape as the inseparable foundation to Canadian identity is a product of the age of discovery (15th -18th century), when Europeans searching for the Northwest Passage landed on North American shores.

The first visualizations of Canada were created by cartographers who used information gathered by the explorers of this "new land" to produce maps and accompanying descriptive images of the territory and its vast natural resources. Art history scholar Marylin McKay calls this hybrid an art-map, and argues that like any other piece of art they were subjective to their creators. The "early maps of Canada employed language that was mediated through the social, economic, and political discourses of which the patron, explorer, and artist/map maker were a part", meaning Canada was portrayed how elite society wished to see it and wanted it to be seen by others.[2] As these new maps continued to circulate among upper society and eventually the larger public, Europe began seeing itself as smaller and less central than it once believed. This was especially true in the 16th century following the invention of world maps called "planispheres", which mapped the known coastlines but projected imagined land covers across the continents.[3]

def'n land cover
expression used by ecologist Frederick Edward Clements referencing any physical material covering the earth's surface

Cartography allowed Europeans to divide and assert their ownership over these new lands, claiming vast territories and resources for their monarchs without actually exploring or knowing all that was included in their maps. Territories across North America already existed between First Nations tribes before European exploration, but these were not respected by European explorers as they believed the land to be unused, since it had not been improved by agriculture or infrastructure; it was thus regarded as

Fig. 1.4 Harleian World Map Fragment, c. 1542-44

terra nullis, available to its finder. The explorers did not understand that, for First Nations tribes, "[*h*]*armony with* rather than *exploitation of* the natural world was a guiding principle," as ecological philosopher Max Oelschlaeger has observed.[4] This "remains a cardinal commitment among modern aborigines".[5] The Western method of delineating territory, on the other hand, ignored subtle shifts in the land known by its First Nation inhabitants, and was in favour of homogenizing territory to represent it by the subjective characteristics deemed most important for the map, a practice that continues to dominate today. Though some later art-maps would use newer scientific devices such as longitude and latitude—adding a semblance of truthfulness and accuracy—the content was still subject to generalization, and remained a practice of solidifying land claims.

Besides the visual practice of cartography, Europeans used language to add an additional layer of ownership creating names for new lands, resources, and geographical features. Scott Watson remarks how "namelessness is a preface to, if not quite permission for, conquest. The assertion of wilderness is also an assertion of namelessness and ownerlessness".[6] An unknown landscape, unmapped and thus believed to be uninhabited, can be named, and thus possessed (*fig.* 1.4). New territory mapped and named by explorers in honour of their Empire meant European powers were once again represented at the known world's scale. They saw themselves as the rightful possessors of these new territories, which could be exploited for their gain.

Canada continued to be portrayed by these subjective art-maps into the 19th century. These maps represented what those in power wanted to show and hid what they did not, producing a fictional geography that art historian Svetlana Alpers calls a "geography of the mind".[7] Canadian landscape was a resource to be exploited and was represented as such: land to be inhabited, forests to be logged, fertile soil to be tamed, minerals to be extracted. The identity of Canadian settlers were therefore constrained by nature as they were not only surrounded by it but also defined by it to the world, tethering the Canadian identity to an ever-present backdrop of wilderness.

FIGHTING WILDERNESS

Though the process of mapping aimed to clarify the land it portrayed—its location, area, resources, etc.—occupying Canada in the 18th century was a much different story than the "race for land" mentality that had driven this initial mapping. Back in Europe, centuries of occupying land had subdivided it to create neat linear borders between human-occupied

"improved landscapes" and wilderness. Nature was seen as something that could be controlled. Even the hinterlands surrounding major cities such as London were seen "as a place for outdoor sporting activities, military exercises and repose and relaxation", not an obstacle impeding movements or an ever-present source of potential threats from the unknown as it was in North America. Furthermore, unlike the United States' relatively continuous seaboard, traveling to Canada "[was] a matter of being silently swallowed by an alien continent",[8] as one navigated down the St. Lawrence to reach the English colonies. While Americans could retreat from the frontier to the seaboard, Canadians were engulfed by it.[9]

The feeling of isolation was (and to an extent still is) especially true for resource extraction communities, which were required to venture further into the wilderness in search of new caches of resources to be exploited. While the promise of natural resources remained a crucial impetus for this outward expansion, nature began to take on a different, more perceptive, role. The resulting Canadian settlements have been described by Northrop Frye as:

> *small and isolated communities surrounded with a physical or psychological "frontier", separated from one another and from their American and British cultural sources: communities that provide all their members have in the way of distinctively human values, and that are compelled to feel a great respect for the law and order that holds them together, yet confronted with a huge, unthinking, menacing and formidable physical*

Fig. 1.5 Logging Camp, 1868-1923, Library and Archives Canada

setting – such communities are bound to develop what we may provisionally call a garrison mentality.[10]

The continual fight against nature and the feeling of isolation generated this "garrison mentality": a fear of the empty wilderness, but also a necessary fight for resources and survival as expansion continued westwards towards more profitable farmlands. Nature became a felt experience, something humans had to fight against to claim the prizes mapped out by their predecessors. Those living on this treacherous frontier could no longer associate nature with the defined frontiers of their homeland, and instead continued to distance themselves, developing their own identity as a people braving the harshness of the new world's wilderness.

In general, critical thinking at the end of the 18th and beginning of the 19th century had two opposing dimensions: *scientific*, emerging from the Enlightenment's methodological way of thinking, summarized by French philosopher René Descartes as a world composed only of "mind and mechanism"[11]; and *experiential*, a direct response to scientific rationality by the counter-Enlightenment and later Romanticism, which triumphed the unpredictability of the world. While the Enlightenment's liberation of the mind allowed for huge scientific advancements, anthropologist Wade Davis remarks on the ideology captured in Descarte's phrase that "all sentient creatures aside from human beings were devitalized, as was the earth itself… But more significantly, the reduction of the world to a mechanism, with nature but an obstacle to overcome, a resource to be exploited, has in good measure determined the manner in which our cultural tradition has blindly interacted with the living planet".[12]

Fig. 1.6 Caspar David Friedrich, *The Sea of Ice,* 1824, oil on canvas

On the other hand, there were natural phenomena such as the violence and sublime qualities of nature that science failed to provide reason for. While the ancient Greeks and Romans worshiped deities they believed controlled these irrational forces, the counter-Enlightenment and Romanticist thinkers glorified the actual phenomena through art. Pure nature was the setting in which humanity existed, not a force that could be tamed. Oelschlaeger observes that "[t]he idea of nature as the source of human existence, rather than a mere re-source to fuel the economy, is the outcome of the second scientific revolution initiated in the nineteenth century by Charles Darwin and Rudolf Clausius"[13]. This highlights the divide between rational and irrational, resource and nature. The Romantic period "judged works of art literature and music not by predetermined rules, but according to the sensibility of the individual".[14] In Europe, painters such as Casper David Friedrich captured the awesomeness of nature in paintings such as *The Sea of Ice* (1824)(*fig.* 1.5). In his Massey Lecture *Romantic Winter*, essayist Adam

Gopnik claims the imagery of winter in such paintings "works both as a thing to give identity to the newly unifying (or just beginning to be unified) German nation and also as a symbol of the things that the French Enlightenment and French reason will never understand".[15] Though the Canadian frontier continued to pose threats to the settlements, it also became a place of awe and wonder of which there was not only a sense of fighting back, but also belonging. The American frontier was "not a line to stop at, but an area inviting entrance", observes Walter Prescott Webb. "Instead of having one dimension, length, as in Europe, the American frontier has two dimensions, length and breadth…", or gradients of threat and inspiration along its length.[16]

Natural resources and landscape were represented together for many years in art-maps, however the two started to split around 1840,[17] as the former became the subject of scientific studies documented through maps and journals—only circulated amongst the scientific and industrial communities—while the latter was glorified and circulated amongst the public. Images exported from the colonies were predominantly watercolours and sketches (*fig.* 1.7) by amateur artists; these conformed to a western visual language and were sent across the Atlantic to European family and friends or else accompanied military reports.[18] Resource studies, such as the French Canadian's study of the beaver for its pelt (a dominant export at the time, *fig.* 1.8), were exported through more scientific drawings on a backdrop of wilderness, to satisfy the western craving for understanding, collecting and categorizing nature.[19] Though people were starting to recognize the "differences between the classical idea of nature as a organism and the modern idea of natures as a mechanism",[20] these studies were limited to resources that reproduced at a human time scale; materials extracted through mining were simply there for the taking with little repercussion. Landscape became a phenomenon to be shared and circulated, while resources were studied, categorized and then stored away.

DESIRING LANDSCAPE

Canada was no longer a British colony following the Confederation of Canada in 1867, and though it maintained some of its royalist ties, Canada had much in common with the nation to its south. Although Canada is North American, it saw itself as a small neighbour to the United States and avoided association with the "mass movements" upon which the larger country was founded.[21] This meant Canadian identity was neither easily defined by cultural values from a French or English heritage, nor by the United States. Geographer Cole Harris argues that what is considered "Canadian" could easily

Fig 1.7 Henry Hugh Manvers Percy, *Les Chutes Montmorency,* Quebec, 1838-1840, watercolour, Library and Archives Canada

Fig 1.8 John James Audubon, *I-46 American Beaver*, 1844, publsihed in W.H. Coverdale collection of Canadiana, Library and Archives Canada

Fig 1.9 Tom Thomson, *The Jack Pine, 1916-17*, oil on canvas, National Gallery of Canada

Fig 1.10 A.Y. Jackson, *Terre Sauvage, 1913*, oil on canvas, National Gallery of Canada

be described by the Precambrian Shield, as this environment's proximity to the country's populated southern border means it is a uniquely accessible landscape for Canadians, not quite American. "The resources of the Shield, furs, timber and minerals, the centers which provided the capital and some of the skills for the development of the Shield as well as the enterprises which emerged in the Shield have been considered the mainspring of Canada".[22] Similarly, Frye argues that "[t]o feel 'Canadian' was to feel part of a no-man's-land with huge rivers, lakes, and islands that very few Canadians had ever seen".[23]

While extraction operations generally seek large-scale deposits distributed across great distances, the manufacturing process done by production economies tend to agglomerate to reduce production costs[24]. But technological advances, such as trains, reduced capitalism's all-important factors of space and time, which allowed Canada's population to grow in central locations, like Montreal and Toronto, transitioning from fighting back the wilderness to the occupation of great centers of commerce. Though the majority of Canadians occupied (and still occupy) the land between the non-agricultural North and the United States[25] the development of land

> *advanced geometrically across the country, throwing down the long parallel lines of the railways, dividing up the farm lands into chessboards of square-mile sections and concession-line roads. There is little adaptation to nature: in both architecture and arrangement, Canadian cities and villages express rather an arrogant abstraction, the conquest of nature by an intelligence that does not love it.*[26]

This all lead to a new relationship between the individual and nature, in which nature was preferred for the nostalgia of simplistic and peaceful living.[27] Cottages and parks suddenly became popular escapes from the busy cities. This was followed by a renewed interest in exploration by the federal government in the early 20th century, with commissioned films and studies researching the potential of the Canadian North and settling the Arctic that furthered the country's interest in its own landscapes.[28] Art, however, materialized this new desire for wilderness. Artists such as the Group of Seven, Tom Thomson and Emily Carr not only filled the population's desire for nature, but also solidified the dominance of Canadian landscape in the country's identity by initiating the first major national art movement. While abstract art was prominent in both Europe and the United States in the early 20th century, aided by their patrons and the National Gallery of Canada, the Group of Seven promoted a Canadian wilderness painting aesthetic, allowing the genre to persist in Canada long after it had faded out of favour in other

countries.[29] Art critic John O'Brian has coined the term "wildercentric" to describe this inseparability of national identity from the nation's geography and landscape in the Group of Seven's work.[30]

Though the Group of Seven appeared to favour a landscape devoid of humans, many critics have noted this is misleading as "[t]he Group's paintings were as closely tied to the industrial growth produced by mining and lumber interests as they were to the perception of the north as uninhabited pristine territory".[31] Many of the Group's sketching explorations were defined by the routes that first made these Northern regions accessible for resource extraction, like the railways (*fig.* 1.11) or the presence of old mining cabins. Further, though many logging and mining operations were scattered around the Algoma and Lake Superior regions where the Group of Seven painted, any objects representing human presence were omitted from these wildercentric paintings, or were framed in such a way as to remove human evidence. However, due to its historical and continuing role in the country's economy, resource extraction (mining and logging) remains a part of the country's identity that cannot be erased, even though most of the people in the Windsor-Quebec corridor often forget that the prosperity of the majority of cities in Canada is still based on the production of a single primary commodity.[32]

Fig 1.11 A.Y. Jackson, Frank Johnston and Lawren Harris on the Algoma boxcar

It wasn't until the 1960s and 1970s, when both Canada's population and economy began diversifying, that landscape began losing its dominance over Canadian identity, supplanted most notably by an idea of multiculturalism. However, it was only somewhat diminished and continues to play a defining role.[33] Then-retired major general Richard Rohmer's 1968 proposal for the Mid Canada Development Corridor positioned resource extraction to once again be at the forefront of defining the Canadian identity. Rohmer's report showed that Canada was advantageously positioned to develop into a production leader of natural resources and argued for investment in properly-planned infrastructure across the country that would create national unity by connecting the densely populated South with the developing North.[34] Though Rohmer's proposal failed to acquire the support needed to implement the envisioned infrastructural network, Canada continued to develop an economy dependent on resource extraction. But a lack of long-term planning and the desire for quick profit has meant extraction companies rely on a shadow population of transient workers for the necessary labour, and have produced a culture that "accept[s] it as normal that people who have never been on the land, who have no history or connection to the country may legally secure the right to come in and by the very nature of their enterprises leave in their wake a cultural and physical landscape utterly transformed and desecrated".[35]

Fig. 1.12 Mid-Canada Corridor Map by Chris Brackley based on original design by Pamela Richot/Planning Alliance

In 2014, architect John Van Nostrand published his essay "If We Build It, They Will Stay" in which he argues for revisiting Rohmer's Mid-Canada Corridor Proposal with an expanded scope to create a bold national vision uniting the country not only geographically from coast-to-coast, but also culturally, with the respectful inclusion of the First Nations people into this unifying vision.[36]

Unlike the myth of pristine landscape idealized at the beginning of the previous century, the twenty-first century regularly documents the horrors of extraction, alongside its other-worldly beauty, portrayed by photographers such as Edward Burtynsky (*fig.* 1.12) and Garth Lenz (*fig.* 1.13). These photographs seem to pit the Romantic ideals of the Canadian landscape against the man-made extraction landscapes, capturing the current state of their relationship where society's admiration of nature is trumped by its desire for wealth, allowing extraction companies to destroy the common lands without compensating for their destruction.[37]

Fig. 1.13 Edward Burtynsky, *Nickel Tailings No. 30*, Sudbury Ontario, 1996

Fig. 1.14 Garth Lenz, *The MacKay River, the Boreal Forest and a tar mine in Northern Alberta,* 2010

Canadian author and social activist Naomi Klein has described Canada's largest mining operation, the Alberta Tar Sands, as "[t]he Earth, skinned alive".[38] Playing off the science fiction concept of terra-forming to transform outer space's frontiers for human occupation, Klein criticizes the Tar Sands by calling it an act of terra-*de*forming: producing a monoscape the size of whole countries that is uninhabitable by any life form.[39]

Is there an alternative method of resource extraction that would allow humans to continue to extract while also channeling resources back into the region? The next generation of extraction settlements holds the potential for a mutually-beneficial relationship with the extraction operations that created them. As a mine expands, settlements could use leftover materials to shape their communities. This would not only allow for an increase in population, but would also provide a framework for other economic activities that might gradually replace extraction as both the labour force and operations decline. But could the energies driving current mining practices be harnessed to also transform the landscape positively, creating a hybrid man made natural system?[40] This new form of extraction could put the myth of "pristine" nature to rest, allowing the hybrid landscape to perform as a healthy, ongoing contributor to the smaller economies of sparse populations along the remote frontiers.

EXTRACTION SETTLEMENTS

essay two

"The rapid urbanization of regions outside of consolidated metropolitan areas is a ubiquitous global condition… Although the scale and speed of this transformation is unprecedented, the relationship between urbanization and extraction has a long history that has positioned the city as a critical staging ground for a productive hinterland."

- Felipe Correa and Tomás Folch, "Resource Extraction Urbanism and the Post Oil Landscape of Venezuela" [41]

EXTRACTION URBANISM

Resource extraction is hardly a new phenomenon. However, as architect and urbanist Felipe Correa argues, it is the scale and speed of modern extraction that is unprecedented. The very success of the human species is attributed to its ability to manipulate the land, to "utilize a broad spectrum of species…, to extract more nutrients from them by cooking and grinding, to burn woodlands to enhance hunting and foraging success, and to propagate and later to domesticate the most useful species".[42] Humans create niches by altering their environments to support growing populations. Advancements in architecture have allowed humanity to continue expansion into ever more extreme climates.

Around the world, the variant conditions of land and climate have generated place-specific qualities and quantities of raw materials. This has, in turn, led to the structuring of the world's economy around the exploitation and exchanges of these materials.[43] In their book *Globalization and the Race for Resources*, sociologists Stephen Bunker and Paul Ciccantell observe this historical evolution of resource extraction, and note that "[a]s capitalist economies of scale expand, development and implementation of the technologies that make them work become increasingly costly. As the scale of these technologies increases, the circuits of capital that initiate them expand and accelerate. Generations of and control over finance expands the relative power of societies that generate new technology".[44] Thus as the speed of new technology increases, so too does the rate of extraction. Due to the distribution of resources, extraction economies must shift further and further from the populated settlements it first created in order to access new

Fig 1.15 Garth Lenz, *A tar sands upgrader in Northern Alberta, Canada*, 2010

deposits. Resource extraction is not limited to a single area of production as it was historically, but is now located across a series of often-isolated sites in extreme conditions across a given territory.

The shift in scale of extraction has also lead to what economist David Leadbeater calls the "new hinterland crisis", where both the power and wealth of mining has shifted from the labourers and resource towns in favour of the international mining companies who operate with a great mobility of capital, and do not need to establish roots in any single area.[45] Therefore, as extraction has become more complex, so too has resource extraction settlements. Boomtowns and company work camps have replaced the lone prospector's cabin. But both also face inherent issues in the nature of their construction and intended lifespan. For example, while boomtowns often suffer from a lack of planning during their rapid increase in population, they may also later face ghostification when the resource runs out and the extraction company leaves, along with the majority of the workers. Work camps face similar temporal challenges. Since they are designed to be temporary and located in remote areas, they often don't even qualify as a traditional settlement type, and their small size means they are not an urban center within themselves.[46] Further, these camps are manufactured with maximized economy for instantaneous deployment, applying the same design to any location a resource might be found; this often fosters a sense of placelessness to workers living in these camps.

In the 1980s, critical regionalism began addressing the value of place-specific identity and the adaptation of architecture to regional conditions. This movement emerged from such architectural theorists as Alexander Tzonis and Liane Lefaivre rebelling against the lack of identity fostered in the International Style. So why do resource extraction settlements, work camps and boomtowns, continue to be developed today in such a manner, while haphazardly disregarding their context? More care needs to be placed into the planning of these settlement types, investing them within the remote areas they occupy. New settlements should be seen as an opportunity to enrich the area—as architectural projects often do for dense urban areas, known as cities. Due to the sheer size of the extractive operations they are affiliated with, rethinking these settlement models represents an opportunity on a territorial scale. Resource extraction operations must be included in the cognitive realm of human occupation.

In defining the concept of the urban, Henri Lefebvre argued that the term "does not define the built world of cities but all manifestations of the dominance of the city over the country".[47] Thus built objects and networks, including supermarkets and highways, must also be included in an idea of the larger urban fabric. Roberto Luís Monte-Mór has since expanded this definition, redefining it as extended urbanism: "the dominant sociospatial form of contemporary capitalism; it spreads beyond cities through networks that penetrate every regional space, integrating them into a worldwide

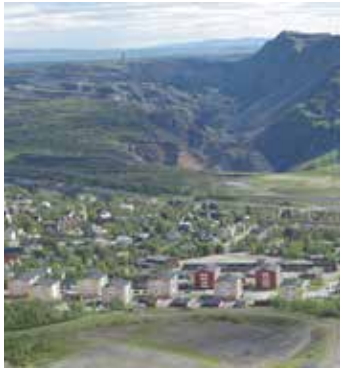

Fig 1.16 The company town Kiruna in northern Sweden, founded by state-owned mining company LKAB

Fig 1.17 The placelessness of a work camp in the Athabasca Oil Sands

fabric".[48] During the current geological era of the Anthropocene, in which human beings move the equivalent amount of earth as natural forces, humans have touched either directly or indirectly (by protecting specific natural areas, or through the act of cartography, etc.) every part of the globe. This has lead other recent urban theorists, like Neil Brenner and Christian Schmid, to question the very definition of urban, and ask: if every space in the world has been touched directly or indirectly by humans, does this not mean that the whole world is urban?[49]

Brenner and Schmid also argue that, while recent urban theories (such as those working within post-colonial urbanism) are more understanding of the constant changes of the urban, they still do not sufficiently address new urban trends, as they continue to use the universal concept of the city and treat it "as privileged terrain of urban research".[50] This privileging of the city sees centers of human occupation as separate entities in a field, ignoring the smaller in-between pockets of settlement or infrastructural connections—the space of most resource extraction settlements. But these new extraction settlements that spread across vast territories are still occupied by humans, so should they not be subject to the same exploration conducted in denser or more populous settlements? Many architects, including Hashim Sarkis in *The World According to Architecture*, have similarly asked: "why should the city be considered the ultimate spatial manifestation of globalization?"[51] If we are to consider the whole world as urbanized, we must also expand the realm of design to include the far-flung settlements and these in-between urban spaces.

As Canada occupies a particularly vast territory, it has access to a range of spatial conditions and raw material to conduct these experiments in new models of settlement. Since the nation has matured by exploiting many of its materials, it has already become a powerful player in the global mining industry. Thus Canadian businesses are not only implicated in their country's own extraction, but a large portion of global extraction. With the country's relatively stable economic and political condition compared to many other global centers of mining, Canada is an ideal candidate for re-examining how the industry should occupy these spaces; mining business can transition the installation of their operations from being solely concerned with the extraction of raw material, to a concomitant concern of adapting to a surrounding environment. As a major player in global extraction, Canada could then bring these lessons to more vulnerable nations currently being exploited by the resource extraction industry, as well as to the underserviced population at home.

PROJECTIONS

Conceptualizing resource extraction settlements as urban spaces requires they receive a comparable level of design and consideration to other

urban spaces, namely dense urban centers (or "cities"). Unlike these urban centers, however, designers of extraction settlements know that eventually the resource around which the settlement is located will run out, and thus have the advantage of being able to design for population and economic declines. Therefore, in order to ensure the next generation of resource extraction settlements is viable and sustainable, extraction settlements must be given clear design principles based on lessons learned from existing ones. More specifically: each needs to be developed with an overall vision, must adopt a sense of place and embrace the characteristics of extraction.

OVERALL VISION

The majority of extraction settlements—especially those in the Americas—are located along a country's frontier, a space "defined by overlapping and ambiguous administrative jurisdictions… difficult terrain, massive capital investment, a tantalizing mix of potential commercial success and imminent disaster".[52] In Canada, this frontier is often associated with a cardinal direction, north, where the expanses of sprawling cities and rolling farmlands of the south disappear, giving way to the wilderness. The technological lifestyle of major cities like Montreal and Toronto, articulated by the forces of globalization, has removed resource extraction from public consciousness, yet ironically the country depends on it more than ever. Between the populated South—the couple of hundred kilometers in which eighty percent of Canada's population calls home—and the treeless North—the key asset to the country's northern sovereignty—are millions of square kilometers quickly becoming the most productive part of Canada's economy because of resource extraction. However, this mid-Canada appears to be a forgotten zone, absent from the national conversation.[53] Similar conditions of forgotten terrain are found across the world in spaces where resource extraction seeks to set up operation. Extraction Urbanism should therefore look to use the production of extraction settlements as agents to create a connective vision for remote, unconnected territories. Otherwise, the cost of connecting established settlements after extraction, or even decades into operation, will be astronomical: it will only result in a design feat likely to fail.

As evidenced by Felipe Correa and Tomas Folch's essay "Resource Extraction Urbanism and the Post-Oil Landscape of Venezuela", the cost and impracticality of retroactive design of extraction sites and settlements is prominent in Venezuela, where the extraction industry has drastically altered the country's landscape for oil. When extraction companies set up North American–style work camps that projected a sense of progress to the nation in the 1920s, people flocked to these new centers. However, movement of

the population resulted in unintentional and informal secondary economies surrounding the extraction sites.[54] Despite investment in operations by both private and public sectors, only the international companies and government profited, not the workers. At the turn of the 20th century, Venezuela's population was about 2.7 million. But the country's population exploded from 1920-1940, and was 8 million by 1960. The simultaneous, large-scale migration from poorer rural areas to new centers created a socioeconomic divide between the populated north and industrialized south of the country.[55]

Following initial development around existing extraction sites, two growth projects, *Ciudad Guayana* in southern Venezuela (*fig.* 1.18) and *El Tablazo* in the west (*fig*. 1.19), were commissioned in the 1960s by the national government to counter this growing socioeconomic imbalance and return profits to the country by connecting the existing settlements.[56] The government hoped these projects would improve living standards around these now-urban areas, and diversify the economy. Both, however, were never completed: *Ciudad Guyana* due to the lack of a shared vision between the extraction company and the designers during construction, and *El Tablazo* from funding problems and lack of institutional mechanisms to implement the project. While extraction continued in these locations, the surrounding settlements were never properly developed. If a development plan for the territory had been established before the extraction companies started operations, on the other hand, these disorganized settlements might have been avoided, and in the case of *Ciudad Guyana* the desired network to jumpstart the south's economy might have been achieved.

Fig 1.18 Linear plan of Ciudad Guyana connecting existing and proposed nodes of Settlements and indutry.

Higher Local Density
Primary School
Local Centers
Bus Stop
Open Spaces
Local Industry
Secondary School

Fig 1.19 Prototypical 1-square-kilometer agro-urban block for El Tablazo intended to house 10,000 people.

ENVIRONMENT ADAPTATIONS

Seeing as there are various spatial and climactic conditions around the world yielding differing qualities and quantities of raw materials, the planning and architecture of resource extraction settlements should aim to correspond to these unique conditions in which the resource is found. Incorporating raw materials discarded by the extraction industry—such as cut down trees or overburden rock—as well as lessons from vernacular architecture in the existing built environment will help generate an identity congruent with the geographical context, providing inhabitants with a sense of belonging rather than a sense of placelessness. Landscape can thus also be considered a tool for extraction urbanism: not only a pastoral image, place of protection or decorative treatment, landscape has the ability to provide a place with a sense of time, heightened experience and context.[57] Extraction Urbanism "calls for another kind of thinking and planning, an originative thinking whereby buildings become other than discrete monuments to human ingenuity".[58] Ecologist Timothy Morton notes in his book *The Ecological Thought* that "[m]odern economic structures have drastically affected the environment. Yet they have had an equally damaging effect on thinking itself".[59] Today, the health of the environment is often perceived as someone else's problem. Furthermore, "[t]he cost destroying a natural asset, or its inherent worth if left intact has no metric in the economic calculations that support the industrialization of the wild".[60] By generating a geographical identity integrated with nature in Extraction Urbanism, however, humanity can be reinserted within the context of nature, holding the extraction companies responsible for the health of the environment, both during and post-extraction.

As seen in the case of the Athabasca oil sands, an extraction model of fly-in workers who inhabit generic company camps, or who are alternatively relocated to the operation's boomtown Fort McMurray, prevents this type of human insertion within a natural context. The Athabasca Oil Sands are located in northeastern Alberta and represent a vital extraction operation

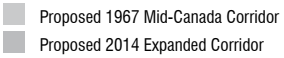

Fig 1.20 Location of the Athabasca Oil Sands in Alberta within the mid-Canada corridor

Fig 1.21 [RIGHT] Athabasca Oil Sands, Fort McMurray and Company Work Camps


FORT
MCKAY
FORT
MCMURRAY
Airport
Work Camps
0
5
10km

of mid-Canada that contributes significantly to the national economy. As the third largest crude oil deposit in the world, the sands cover 142,000 square kilometers, of which only 895 square kilometers have been disturbed for extraction so far. It is expected to be operational for another 400 years. However, instead of settling the region for long-term operations, companies are still opting to create camps "which operat[e] primarily through dispersion (the geographic diffusion of working population), exclusion (the removal of the family unit from worksite accommodations), and atomization (the isolation of the working individual both within and outside of the camp)".[61] This has led to a predominately-male workforce flown in from all over the country, even internationally, to work for a couple of weeks after which they are flown home for a week off. These company camps create a malleable work force, prioritizing economic gain over the health of their easily replaced workers. This means company camps do not represent positive communities, either socially or mentally. Furthermore, the economic potential of these well-paid workers is removed from the region, ie. not reinvested in a local economy to generate later growth. Nor does this type of inhabitation promote environmental stewardship. Feelings of alienation, boredom and loneliness means many workers will try to dull these feelings with alcohol, drugs and sex, generating less savoury, secondary economies around settlements.

Fort McMurray presents an alternative to the dorm-room housing of company work camps: the settlements provides workers with an inclusive "town" feeling that accommodates the family unit, encourages permanence and provides institutional functions to its residents.[62] However, due to the rapid growth of the area, planning here has been less than successful. Though Fort McMurray has a Lower Town Site Master Plan and a series of neighbourhood plans intended to guide the growth of the community and its infrastructure over the course of extraction, "development timeframes in resource extraction, which function at the rate of market fluctuations, never match the slow rationale pace of municipal planning time lines", so only parts were completed in accordance to these plans.[63] The solution has been to continually release land for development, with minimal planning in place for the production of secondary economies. As such, the town and its inhabitants are held hostage to the price of oil. This caused grief in 2014, when more than 40,000 jobs were lost as oil prices crashed. Partially anticipating the instability of a town built around a single economy, the Regional Municipality of Wood Buffalo published the *Municipal Development Plan* in 2011, which outlined its growth plan for the oil sands and Fort McMurray. It focuses on responsible development, environmental stewardship, developing a resilient economy, consolidating work camps and improving on their communities to "foster a sense of home and belonging".[64]

Fig. 1.22 Synacrude Canada Ltd. Company Work Camp near Fort McMurray

Fig 1.23 Sprawling Suburbs of Fort McMurrayFort McMurray

ACCEPTING EXTRACTION

Though Extraction Urbanism calls for settlements to adapt to their environments, this does not mean they should be developed in disregard of the extraction industry. The planning of the next generation of extraction settlements must acknowledge that extraction is the reason these settlements exist, and understand that resources dominate the industry's value hierarchy. There will also always be major population fluctuations accompanying the industry and Extraction Urbanism needs therefore to take into account the temporal aspect of extraction.

In Northern Sweden, the town of Kiruna, founded in 1900 by the state-owned mining company, LKAB, has "become a testament to the power wielded by mining companies and the difficulty a town faces in branching out beyond it".[65] The Kirunavaara mine is the largest iron producer in Europe. But the area of extraction has historically expanded ever-closer to the town itself, causing ground deformations that will eventually reach the inhabited area and affect schools, healthcare spaces, as well as thousands of apartments and square meters of retail space over the next 20 years. The town of Kiruna now has to move in order for extraction to continue, and LKAB will pay for it. Instead of fighting these extreme circumstances, however, the community has presented little opposition, recognizing the temporality of their settlement as part of extraction and the move as necessary for production to continue.[66] Unfortunately for residents, there were no consultations about what benefits they would acquire from the relocation, and the focus has been on design rather than community consultation.

Fig 1.24 Kiruna, Sweden

In 2013, an international competition called for a 20-year masterplan for Kiruna's relocation, however the winners, White Arkitekter with Ghilardi + Hellsten Arkitekter, instead presented a 100-year plan that aimed "to create a sustainable model city, a city with a diverse economy that is less dependent

Fig 1.25 [Left]
Kiruna with Kirunavaara Mine in the distance

Fig 1.26 [Right]
kiruna in 2016 in relationship to mine


To Abisko National Park
HIGHWAY E10
KIRUNA
HIGHWAY E10
EXTRACTION OPERATIONS
Airport
0 1 2 3 4 5km

on the world market for iron ore".[67] The masterplan is to be enacted in phases allowing Kiruna to "crawl" eastwards, keeping its character in tact by reclaiming demolished building materials and even relocating 21 significant historic and cultural buildings such as the city hall, the town church and some original houses. Additionally, the new Kiruna will be able to adapt more to the arctic environment through its urban planning strategies and by creating a symbiotic relationship between extraction and settlement, harnessing the heat generated by mining activities[68]. White Arkitekter says the town's relocation presents huge opportunity to transform the city, describing similar goals to those that this thesis outlines for Extraction Urbanism:

> *The relocation presents an unparalleled opportunity for Kiruna to transform itself into a more environmentally, socially and economically sustainable city. The new development will be designed to a carbon neutral agenda. A denser more intelligent plan, equipped with meeting places and cultural amenities, will promote public life, broadening the male dominated demographic of Kiruna's past, allowing a more diverse community to settle and thrive.*[69]

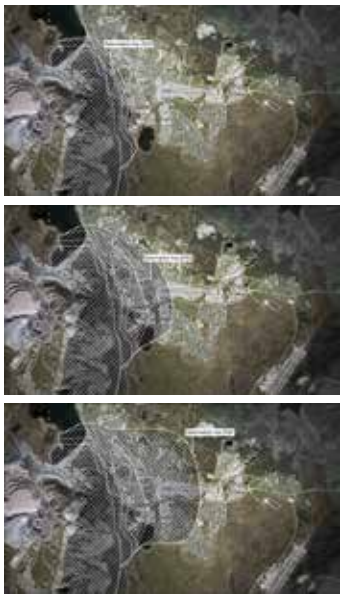

Fig 1.27 Projected ground deformation effecting Kiruna

Though Kiruna's identity is beginning to diversify, mostly due to its proximity

Fig 1.28 New Kiruna in 2100

Fig.29 Render of Kiruna‘s new city Center showing relocated historic clock tower

Fig. 30 Render of Kiruna‘s new city center

to the Esrange Space centre and Abkisko national park as well as the presence of research stations and a growing tourism industry, the town will continue to be tied to resource extraction for many years to come, especially as new mines have been proposed for the area.

Partly because the town grew alongside the mine from its founding, the people of Kiruna readily embraced its ties to resource extraction. But the town has also been in the fortunate position of experiencing other ideal circumstances: not only is the mine still operational and generating revenue for the area with plans to expand operations, but it now has a new master plan for relocation that can accommodate an increased demand for housing. Not all extraction settlements are as fortunate to have this type of expansion and plan for it, as many towns see a large population decline once the natural resource runs out and the company leaves. Extraction Urbanism should therefore accommodate design strategies allowing for both the expansion and contraction of a settlement's population.

The town of Fermont, by comparison, is an example of an extraction

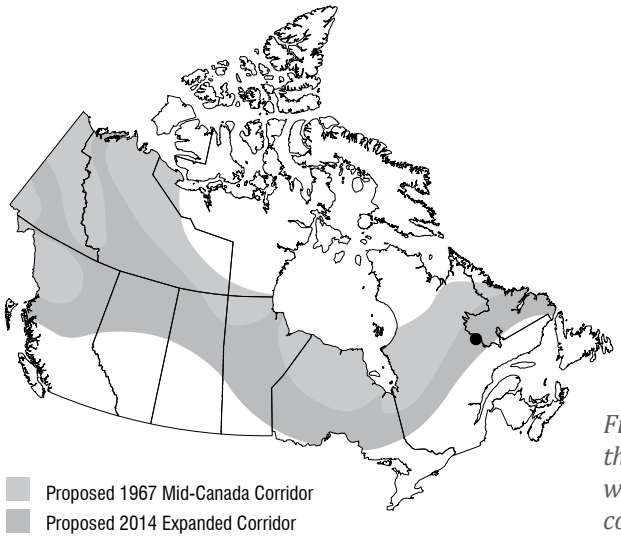

Fig 1.31 Location of the Fermont, Quebec within the Mid-Canada corridor

town that has not experienced the same fortunate circumstances. This northern Quebec town was conceived around an adjacent mine site run by the Quebec Cartier Mining Company, who hired the firm Desnoyers and Schoenauer in the 1960s. The overall design used principles suitable for a northern climate, as the town confronts both the cold and isolation experienced by subarctic settlements.[70] Fermont was designed to be compact, protected from the harsh winds by "the wall" or *Mur-Écran* ("windscreen"), a concept inspired by Swedish architect Ralph Erskine's design for similar remote communities.[71] Along with apartments, the institutional and social programs are housed within the wall, providing a continuous internal

Fig 1.32 [Right] Map of Fermont and its Mining Operations


NEWFOUNDLAND
& LABRADOR
QUEBEC
FERMONT MUNICIPALITY
To Labrador City
HIGHWAY 389
FERMONT
EXTRACTION
OPERATIONS
0 1 2 3 4 5km

circulation, safe from the elements. While this type of settlement is keyed to the conditions of Fermont, the architects acknowledge this housing typology was not for everyone, so townhouses and single-family homes were built within the wall's shelter. The density of these external housing units "make human interaction more comfortable, especially in the winter", reducing the need for infrastructure.[72] This means each resident can access the land quickly. However, the eventual population increase of Fermont was not predicted, and has led to a compromise of the original design intent. Forty years later, the citizens of Fermont still see the wall as their town's symbol, but with continued extraction and two other mines opening in the area, it has also taken on a new role: as a dividing line between the citizens of Fermont within the wall, and the fly-in fly-out workers drawn to the area by high-paying extraction jobs outside of its protection.[73] Though the physical space of Fermont has successfully fostered a thriving community, it is also not easy for residents who have created a life there to stay: company houses are for company employees, and thus retired workers are forced to leave the company town, alongside the sick, elderly and unemployed. This

Fig 1.33 The Mur Écran

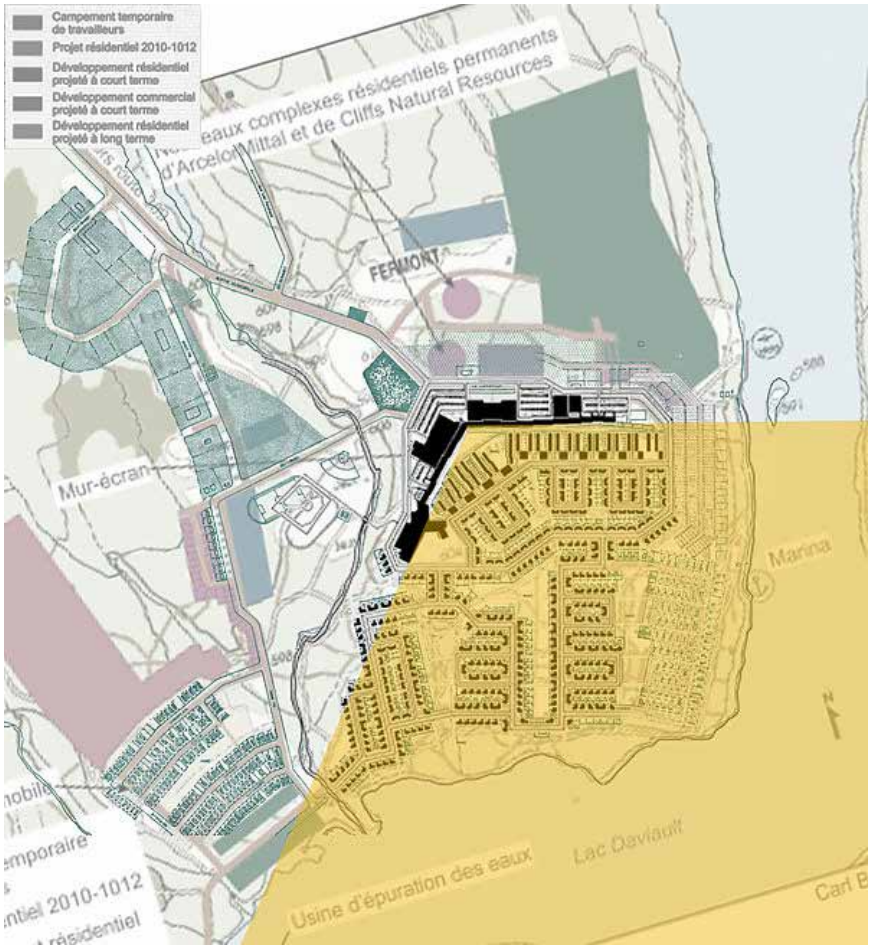

Fig 1.34 [Left]
New developments outside of the Wall

creates a selective population that will be unsustainable if the mines ever run dry. Though Fermont has experienced an increase in population, it has not seen a corresponding economic improvement, since the fly-in fly-out workers remove their earnings from the town. Had the temporary housing been located within the wall, their earnings might have been invested in the community and allowed residents and temporary workers to mix.

If resource extraction settlements can develop with an overall vision, adopt a sense of place derived from its location and embrace the fluctuations of extraction, they have the potential to be viable and sustainable centers of human occupation. Under Extraction Urbanism, the next generation of extraction settlements will not simply extract then leave but generate meaningful social and economic networks while maintaining a healthy environment.

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part two

THE RING OF FIRE

CONTEXT

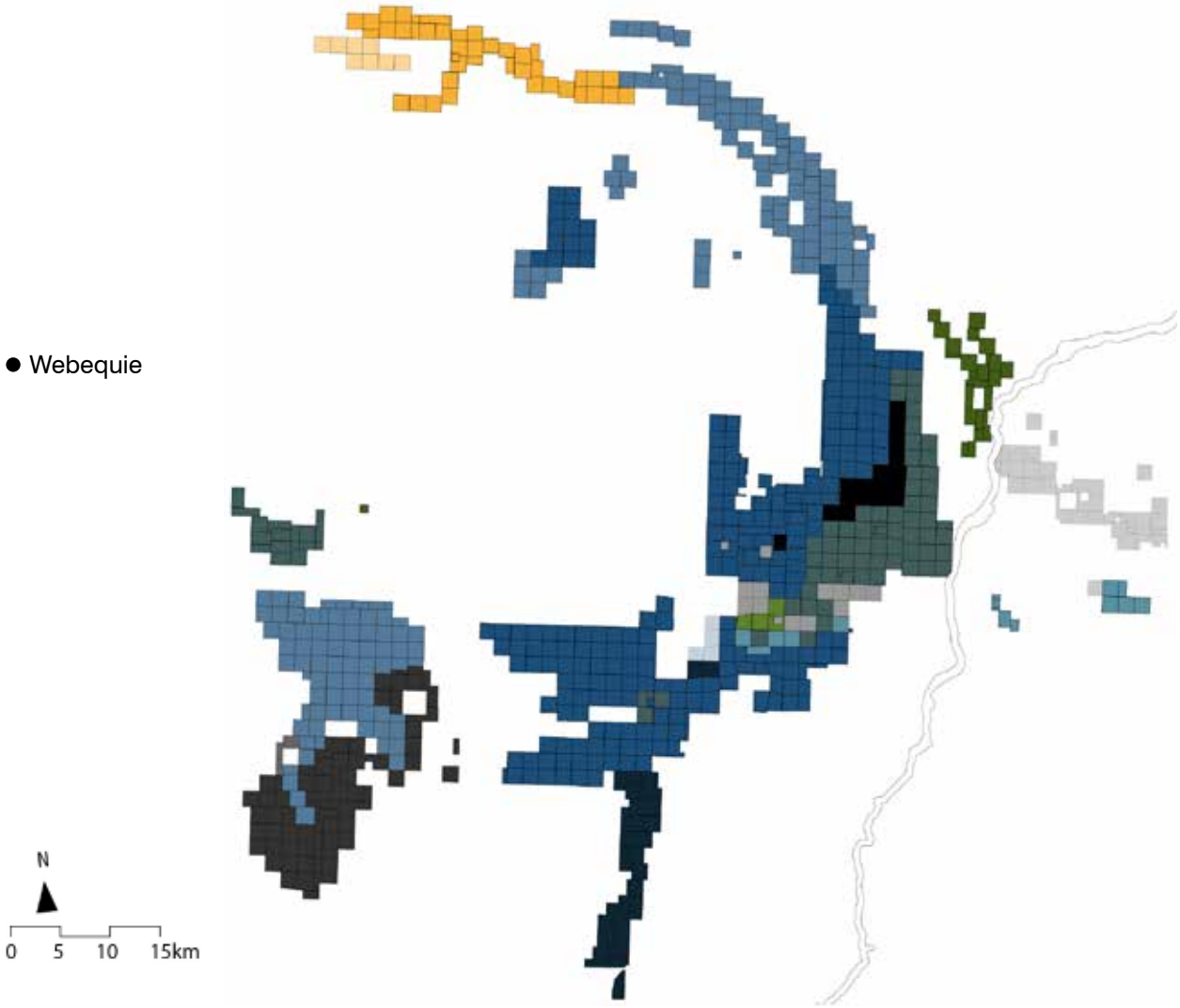
In 2007, the Ring of Fire was found to possess the first commercial quantities of chromite in North America, as well as other major deposits of copper, zinc, nickel, platinum, vanadium and gold. Mining companies flocked to claim a piece of the find. The chromite deposit is so significant that, along with the other 5120 square kilometer of mining claims, it is believed the Ring of Fire could potentially sustain activity for a century, while generating an estimated $120 billion in revenue.[1] Furthermore, experts have noted "the quality of the Ring of Fire's chromite deposits is high relative to other commercial deposits, which could lower the cost of processing", thus increasing the potential profits from the Ring of Fire.[2] This is of particular importance, considering the millions of dollars that will have to be invested before extraction can even begin. Historically, similar large-scale discoveries have also led to other discoveries, such as Sudbury's nickel and copper deposits, which continue to be extracted hundreds of years later as new deposit finds keep emerging.[3]

Despite the initial race to these claims in the Ring of Fire, the quantity of claims, as well as number of companies holding them, has fluctuated over the last decade. In 2013, for example, one of the major claim holders, U.S. extraction company Cliffs Natural Resources, suspended investment planning for their claims. Then in 2015, Cliffs withdrew from the Ring of Fire completely, selling their chromite assets to Toronto-based Noront Resources for $20 million—significantly less than the $550 million initial purchase price.[4] However, projects in Ontario's Far North usually take considerable time to develop, so even though the Ring of Fire's development pace may appear slow, it can be considered typical.[5]

As an example, the DeBeers Victor diamond mine in the James Bay Lowlands, first discovered in 1987, did not reach commercial production until 2008. This was due to limited access by winter roads and air, as well as the requirement to erect infrastructure, accommodations, operation

Fig 2.1 [Previous Page]
Edward Burtynsky, Kennecott Copper Mine #22, Bingham Valley, Utah

Fig 2.2 Existing landscape of the Ring of Fire



LEGEND

- Norton Resources Ltd.
- MacDonald Mines Expliration Ltd.
- Melkior Resources Exploration Ltd.
- Fancamp Exploration Ltd.
- Canada Chrome Corporation
- Resources KWG Inc.
- Norton Muketei (85%) & KWG Resources (15%)
- Probe Metals Inc.
- James Bay Resources Ltd
- Platinex Inc.
- Norton Muketei Ltd.
- Aucrest Gold
- Norton Muketei (72%) & Canada Chrome Corporation (28%)
- Metalex Ventures Inc.
- Aritibi Royalties Inc
- 52/86 Northwest Company Ltd

MINING CLAIMS IN THE RING OF FIRE

Fig. 2.3

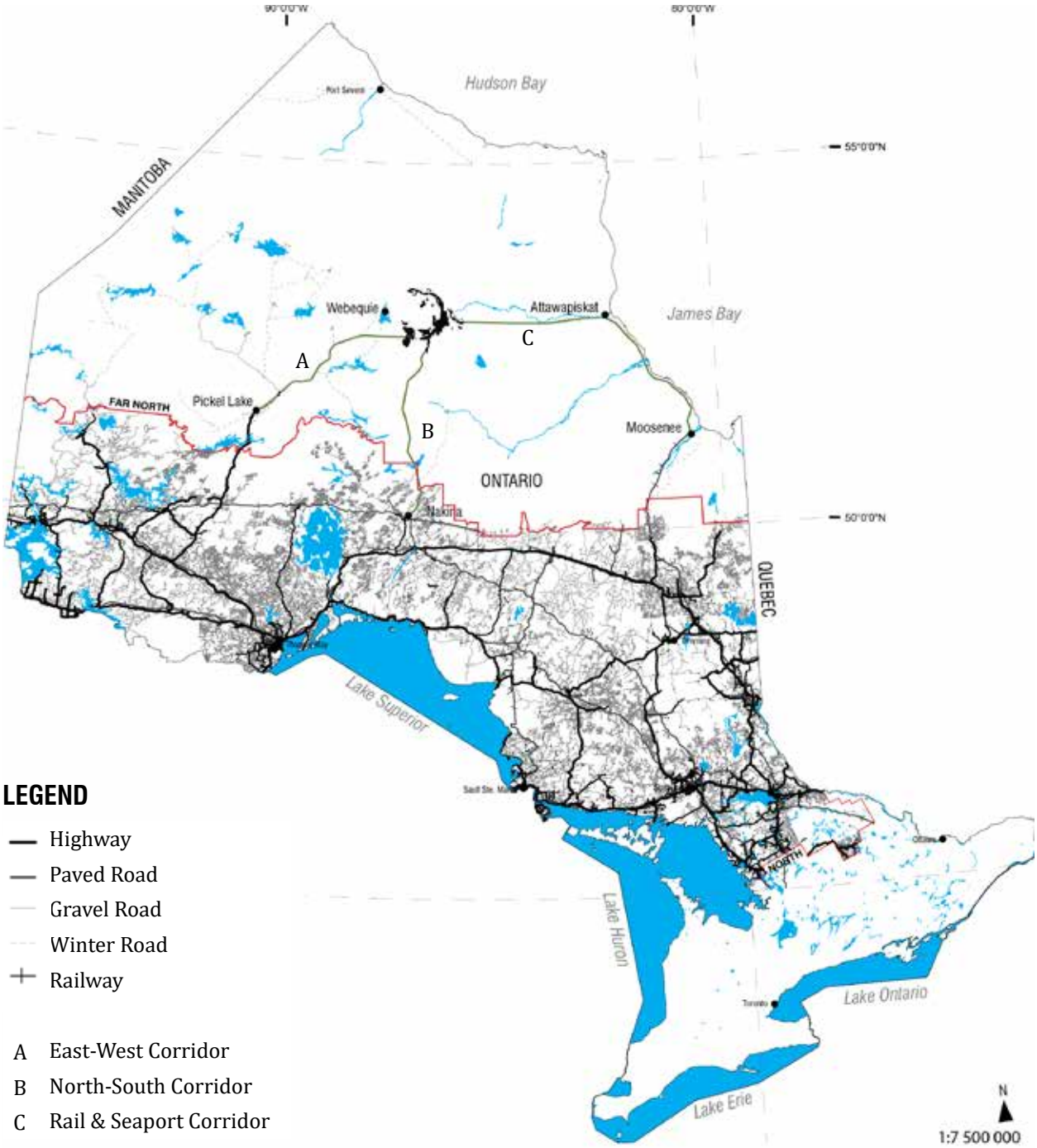
Fig 2.4 Chromite is used in the production of stainless steel. Most of the world's reserves are in South Africa, Zimbabwe, Kzakhstan and Turkey,

buildings, and an airstrip before starting extraction, all after completing environmental assessments and establishing an impact benefit agreement with the First Nation community of Attawapiskat to the east. Development in the Ring of Fire will likely need to address similar issues as well. Ontario Chamber of Commerce's 2014 report on the potential of the Ring of Fire, *Beneath the Surface*, noted four major obstacles the region currently faces: "there is a significant infrastructure gap in the region, skilled labour is in short supply, partnerships with Aboriginal communities need to be finalized and implemented, and cutting-edge technologies will need to be deployed to minimize environmental impacts."[6]

The Ring of Fire is approximately 330 kilometers away from the nearest rail line or all-season road in Nakina, and any infrastructure planning to bridge the gap between the all-season roads in the south and the Ring of Fire will have to deal with the natural obstacles of the Canadian Shield, notably large waterways and muskegs. Though the provincial government has pledged $1 billion towards such a transportation corridor, no consensus has been reached on its location. Three distinct options by various major extraction companies in the Ring of Fire have so far been proposed (*fig.* 2.5).[7]

The Mushkegowuk council leading a First Nation alliance proposed the Mushkegowuk Rail, Seaport and Energy Transportation Corridor in 2014. This proposal extends the Ontario Northland Railway from Moosonee northwards along James Bay and then westwards to the Ring of Fire, connecting the First Nation communities along the coast. The second proposal is the north-south corridor, which follows a sand ridge formation from Nakina up to the Ring of Fire. The Canada Chrome Corporation proposed the options of a rail line or an all-season road. Feasibility studies revealed, however, that while a rail line would be the more economical option for transporting resources, it also carried a huge initial fee. As a result, it was abandoned in favour of the more affordable, all-season road option. Noront has now proposed a third, and currently most likely, option: an east-west road connecting Pickle Lake to the Ring of Fire, as well as four First Nation fly-in communities, by transforming the current winter roads to all-season. Indecision about which infrastructure corridor should be used and how to share its costs means construction has not yet started, however many now agree that the infrastructure should address something greater than merely facilitating industry.[8] What has been made clear, though, is that the regional, provincial and federal government all believe this project should be an opportunity to "provide the necessary transportation and social infrastructure as well as address potable water and other housing, health and education issues, allowing Ontario to finally meet [their] treaty obligations".[9]

This refers specifically to Treaty No. 9 (1905-06), or the James Bay



ONTARIO'S TRANSPORTATION NETWORK

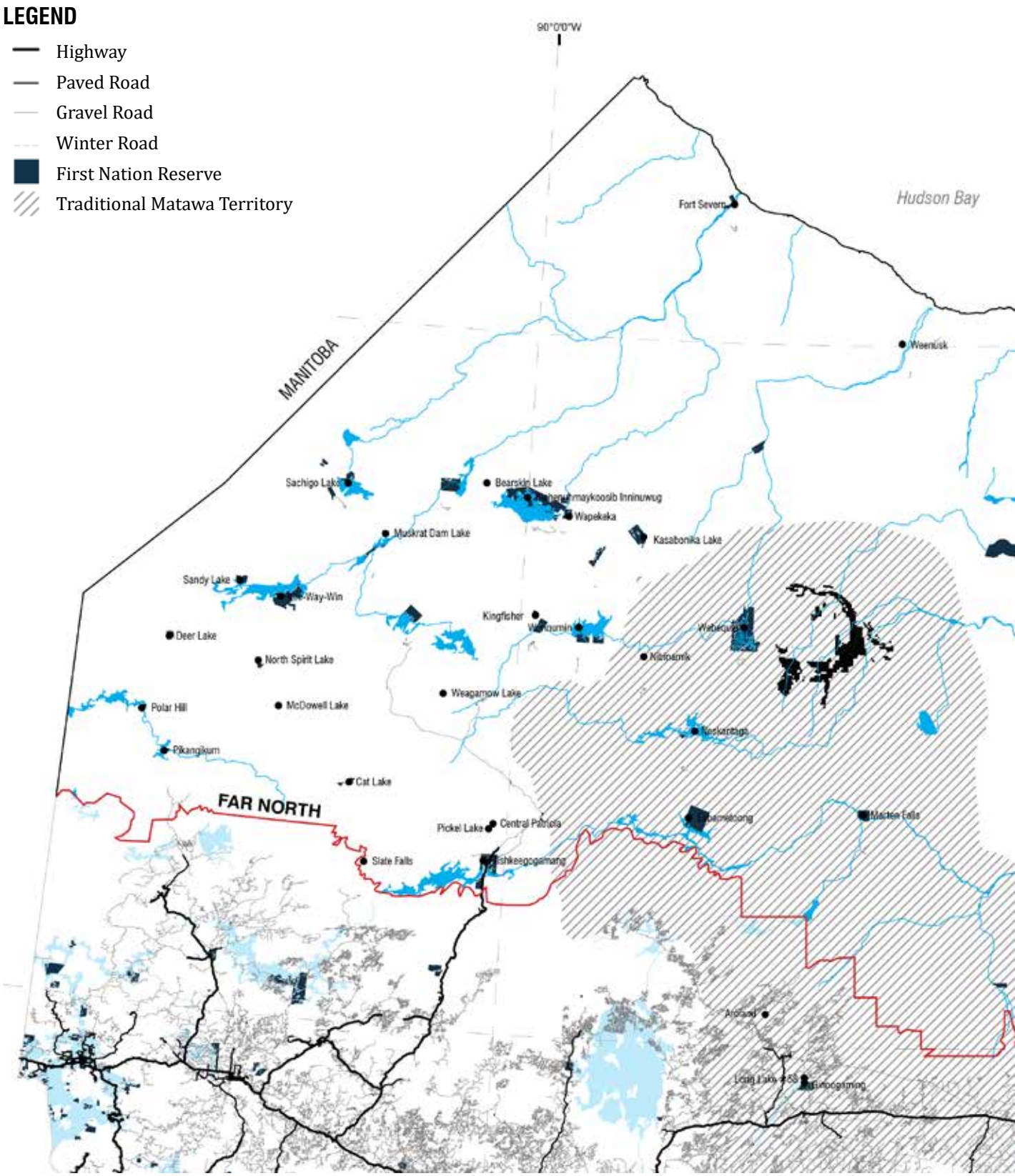
Fig. 2.5

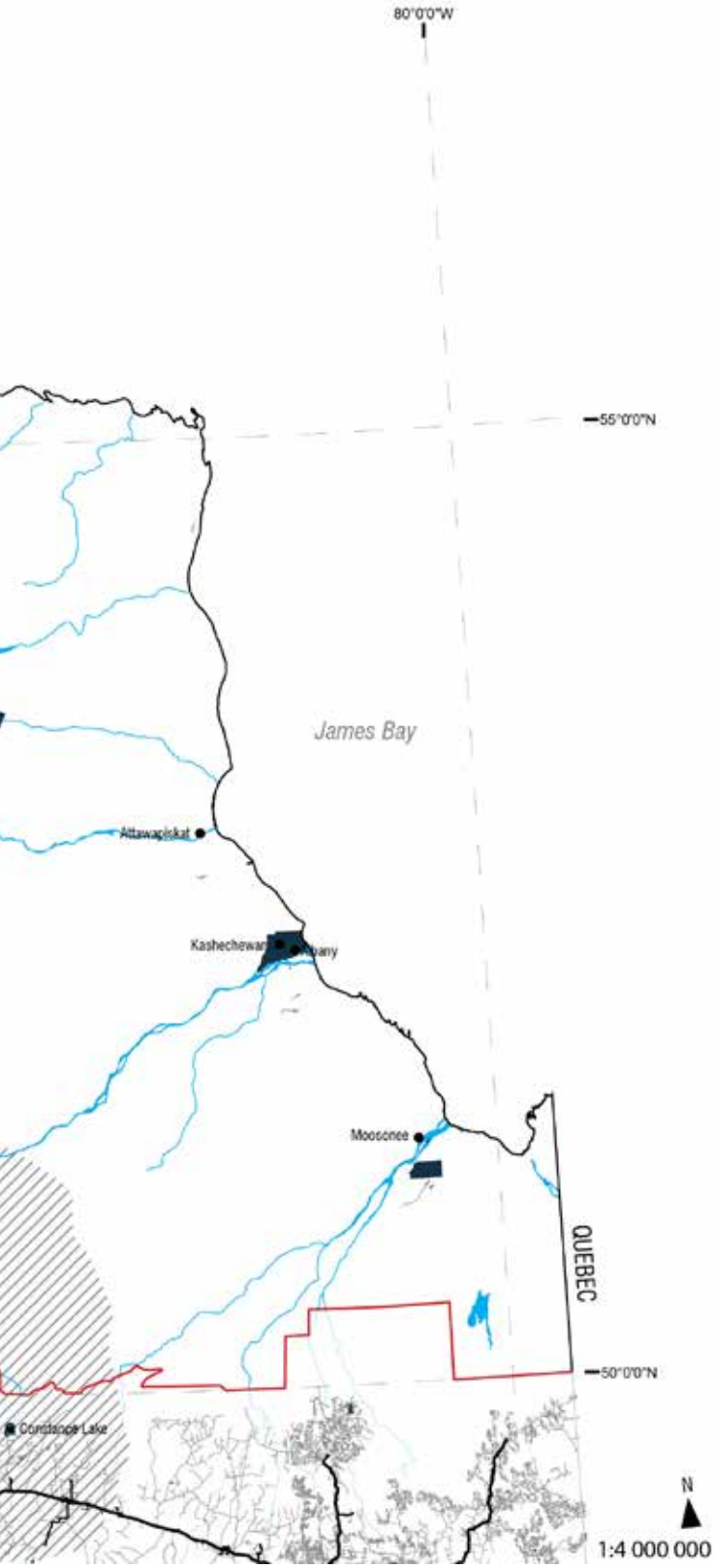
Map of Ontario's Transportation Network highlighting the lack of infrastructure in Ontario's Far North and outlining the three proposed transportation corridors to Connect the Ring of Fire

Treaty, which was signed between the Canadian government and various First Nations governments in northern Ontario. The treaty meant that the land would be shared by both First Nation and Euro-Canadian inhabitants, protecting the First Nation's rights to collect from the land as country's industrial network advanced into their territory.[10] Today, the treaty is a contested subject. It has resulted in conflicting views of landownership in the area. With the exception of Long Lake #58, the nine communities of the Matawa First Nations are all beneficiaries of Treaty No. 9. But over a century after its signing, neither the Canadian Government, Ontario Government nor First Nations can agree what specifically the treaty means, as "the Crown believes that it has jurisdiction on the land, whereas First Nations believe that the creator made them stewards of the land, water animals and resources on their homelands and traditional territories and that they have shared jurisdiction with Ontario".[11]

While 40 percent of Ontario's First Nation population live in Ontario's Far North, the Matawa First Nations will be the most directly affected by extraction in the Ring of Fire. Though the projected revenue figures allude to an economic boom within the region, these existing communities are, as Eabametoong Chief Elizabeth Atlookan says, "not in such a rush".[12] Proceeding slowly with the Ring of Fire will ensure things are done right and in pursuit of a goal to benefit the area as a whole—not just to line the pocket of extraction companies. These companies are not allowed to overlook First Nation communities, as the country's Supreme Court has declared it "the Crown's legal duty to consult [First Nation] communities when decisions may infringe upon their rights".[13] However, the confusion around the roles and responsibilities of the government and the extraction companies are contributing to the Ring of Fire's slow development.[14] The Chiefs of the Matawa Tribal Council have appointed former Premier of Ontario, Bob Rae, as lead negotiator for the interests of the Matawa First Nations; the Ontario Chamber of Commerce report is optimistic that an agreement between all parties will be reached in the near to medium term.[15]

If executed properly, there is enormous potential to improve the quality of life in the Matawa communities through the development of the Ring of Fire as well as other First Nation communities in Ontario's Far North. Regular supply runs on their way to the Ring of Fire will greatly reduce the astronomical price of food and goods in the communities, which are currently dependent on fly-in goods marked up to cover fuel charges. Increased services along the transportation corridor means that Neskantaga, which has been on water boil advisory for twenty years, could finally receive clean drinking water.[16] In addition to the poor conditions and overcrowding of houses in First Nations communities such as Neskantaga and Attawapiskat, a lack of


LEGEND
Highway
Paved Road
Gravel Road
Winter Road
First Nation Reserve
Traditional Matawa Territory
90°0'0"W
Hudson Bay
MANITOBA
FAR NORTH
Fort Severn
Weenusk
Sachigo Lake
Bearskin Lake
Wapekeka
Muskrat Dam Lake
Kasabonika Lake
Sandy Lake
Way-Win
Kingfisher
Deer Lake
North Spirit Lake
Nibinamik
Weagamow Lake
Polar Hill
McDowell Lake
Pikangikum
Cat Lake
Pickel Lake
Central Patricia
Slate Falls
Machin Falls
Arolund



MATAWA COMMUNITIES

- Webequie
- Nikinamik
- Neskantaga
- Marten Falls
- Eabametoong
- Aroland
- Long Lake #58
- Ginoogaming
- Constance Lake

LEGEND

- Road Access
- Fly-in Community
- On Reserve Population
- Off Reserve Population

Fig 2.6 Communities in Ontario's Far North and the Matawa First Nation traditional territory

housing currently contributes to suicides amongst the community's youth, placing these communities in a state of emergency. Repurposing houses from decommissioned extraction settlements and employing new skills obtained by those First Nation workers who helped build them could alleviate of these housing issues.[17] Furthermore, as mining activity produces jobs in the area, both directly and indirectly, more community members will be compelled to stay instead of relocating to find better work, thereby improving the local economy.

There already exists a population that has adapted to the harsh climate of Ontario's Far North, and through training programs—such as Noront Resources' Kiikenomaga Kikenjigewen Employment and Training Services (KKETS), in partnership with Confederation College and the Ring of Fire Aboriginal Training Alliance—the extraction industry can access this potential. Other factors that deter prospective employees are the remoteness of these operations, the high cost of living and limited housing options.[18] While questioning what it means to be "northern", aside from a latitude reference, Canadian geographer Louis Hamelin observes that not only are there degrees of "nordicity", but these are also subject to change.[19] In addition to global warming effecting an increase in temperature of Ontario's Far North, extraction in the Ring of Fire will could lower the region's nordicity by connecting the region, growing its population and boosting its economy. The Ring of Fire's extraction settlements therefore have the potential to become desirable economic centers for Ontario, providing an outdoor-oriented lifestyle to its inhabitants while connecting to the rest of the province.

Fig. 2.7 Image of existing condition of the Ring of Fire (Canadian Shield Condition)

def'n nordicity
The adjective of being Northern. Coined by Louis Hamelin

Fig. 2.8 Big Trout Lake Ecoregion Axonometric

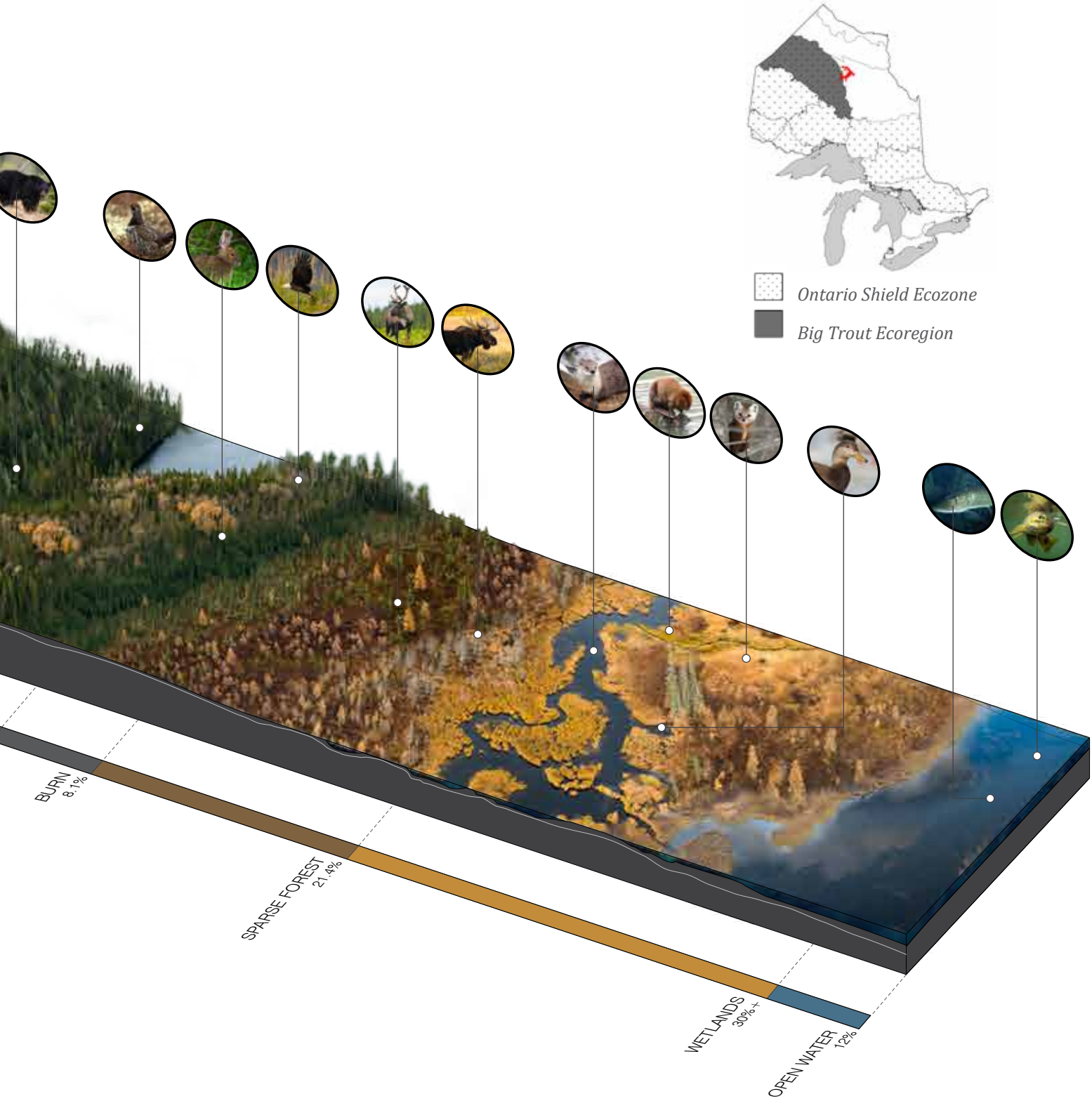

Ontario Shield Ecozone
Big Trout Ecoregion
BURN
8.1%
SPARSE FOREST
21.4%
WETLANDS
30%+
OPEN WATER
12%

Fig 2.9 Tailing Pond in the Athabasca Oil Sands

The environment of the Ring of Fire presents an obstacle, not only to actual mining operations but also to the creation of extraction settlements. The Ring of Fire straddles two ecoregions of Canada: the Big Trout Lake Ecoregion (*fig.* 2.8) and the James Bay Ecoregion (*fig.* 2.11). Similar to the rest of the Ontario Shield Ecozone, forests predominantly cover the Big Trout Lake Ecoregion, as the raised topography of the Canadian Shield allows water to drain. However, only a small western portion of the Ring of Fire is located within the Ontario Shield Ecozone. The James Bay Ecoregion, by contrast, consists of saturated ground that stunts tree growth. The majority of the Ring of Fire is actually located here, in the world's largest wetland, and its saturated ground will prove particularly challenging in terms of managing environmental impacts of the mines—especially tailings and waste rock.[20] As for extraction settlements, simply clearing a large area to erect a company work camp is not an option due to the extensive wetlands and thus unstable

Fig. 2.10 Image of existing condition of the Ring of Fire (wetland condition)

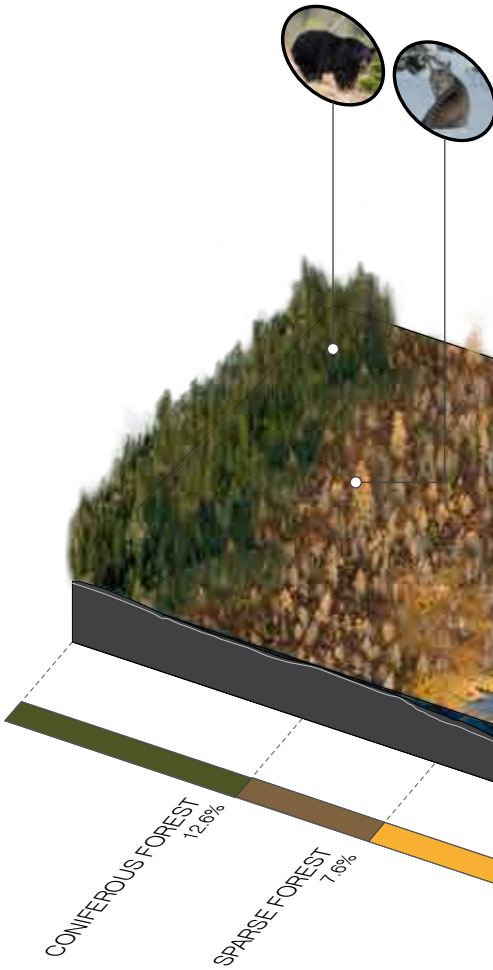
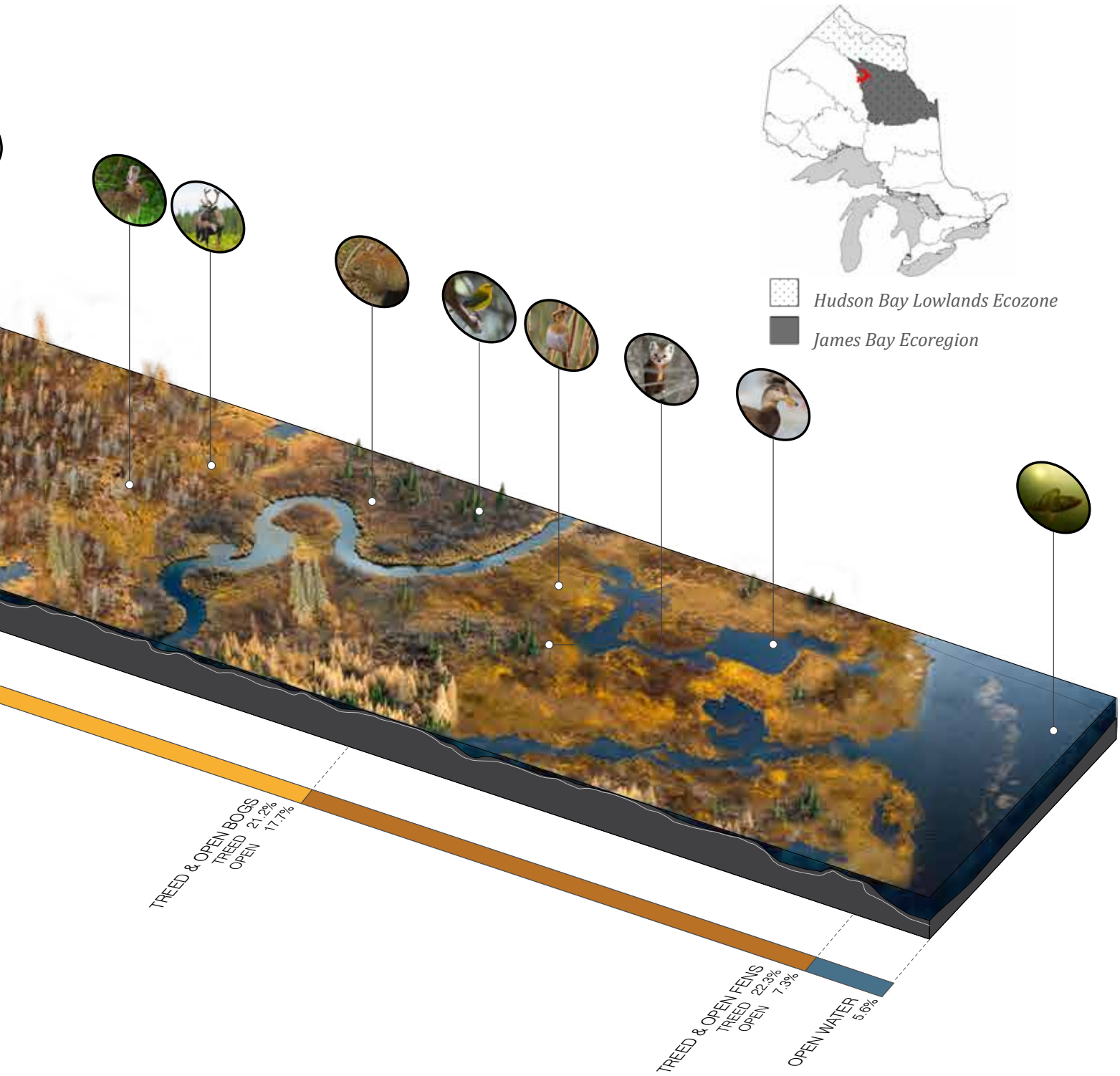
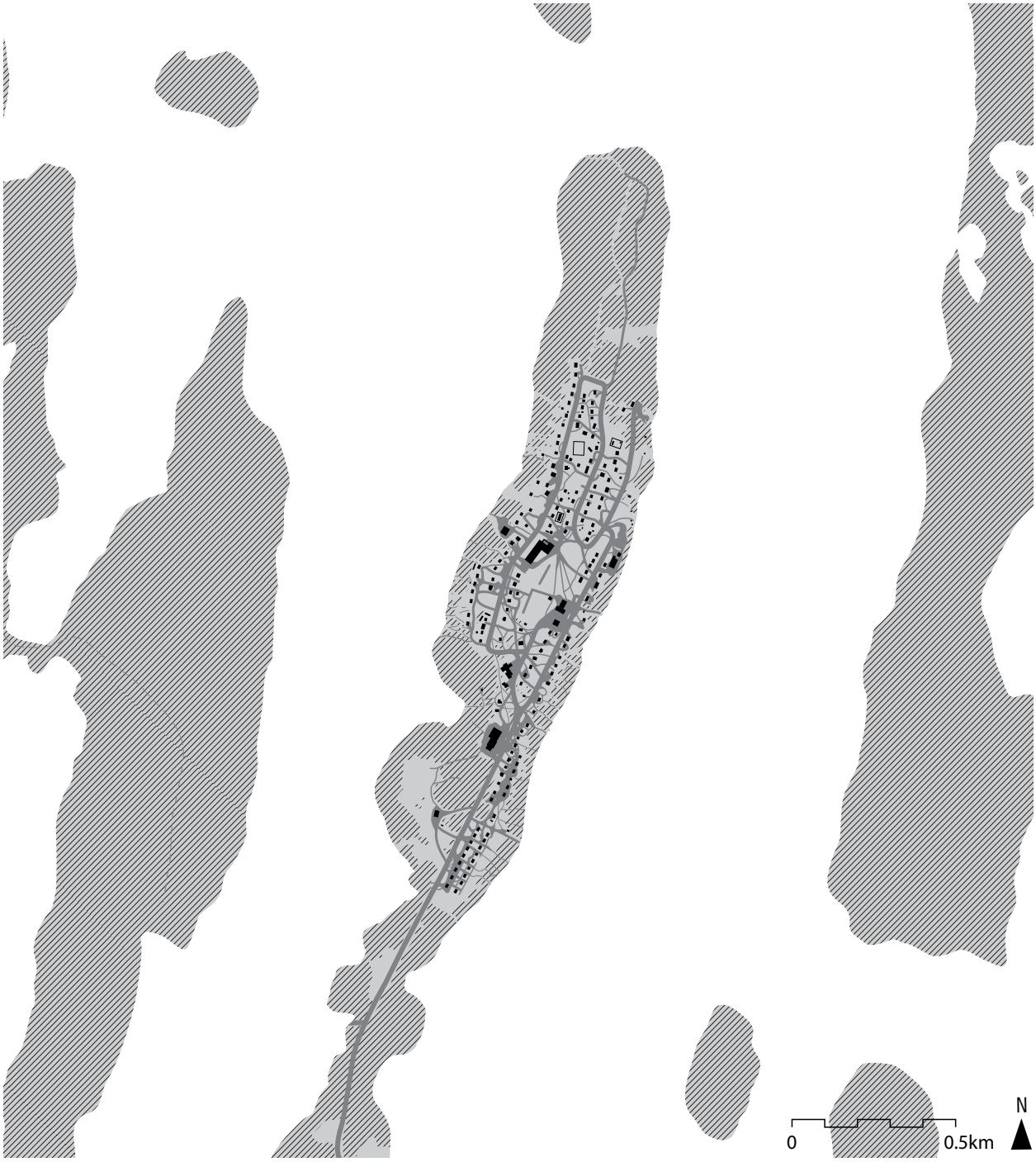
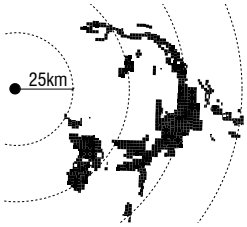


Fig. 2.11 James Bay Ecoregion Axonometric


Hudson Bay Lowlands Ecozone
James Bay Ecoregion
TREED & OPEN BOGS
TREED 21.2%
OPEN 17.7%
TREED & OPEN FENS
TREED 22.3%
OPEN 7.3%
OPEN WATER
5.6%





WEBEQUIE

Fig. 2.12

The fly-in community of Webequie located on Winnisk Lake is the closest existing settlement to the Ring of Fire

grounds in the area. Any settlement in the Ring of Fire will have to adapt to its surroundings and will require creative solutions in order to inhabit the James Bay Lowlands while limiting its effects on this vulnerable environment.

The closest existing settlement to the Ring of Fire is the First Nation community of Webequie. Its population of approximately 700 occupies a small island on Winnisk Lake, already stretching from shore to shore (*fig.* 2.12). Its size, in addition to the cultural need to access the land and integrity of the Reserve boundary, makes Webequie a poor candidate for a boomtown to support the entire extraction workforce of the Ring of Fire. However, during the start of extraction in the Ring of Fire, Webequie could offer itself as an initial base of operations, since it already has a runway and various other amenities established, like stores and motels. When companies begin building their extraction settlements, however, Webequie should not simply be forgotten: rather, the community should be incorporated into the new infrastructural systems that emerge from development. The Northern Policy Institute's report on the Ring of Fire suggests building on the momentum of infrastructural development once the Ring of Fire is connected with the rest of the province in order to connect remote communities of Ontario's Far North.[21] As we will see, the same momentum can also be harnessed to develop a system for inhabiting and extracting resources in the Ring of Fire.

Fig. 2.13 Ariel view of Webequie

ENDNOTES

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2 Ibid.
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18 Ontario's Chamber of Commerce, *Beneath the Surface,* 21
19 Hamelin, Louis Edmond, *Canadian Nordicity: It's your North Too,* trans. William Barr (Montreal: Harvest House, 1979), 33.
20 Ontario's Chamber of Commerce, *Beneath the Surface*, 26
21 Northern Policy Institute, *Roads, Rail and the Ring of Fire*, 14.

part three

A NEW SETTLEMENT

PROPOSAL

This proposal is for a new method of designing extraction settlements by combining the relationships explored in Essay 1, "Nature and Extraction", with lessons outlined in Essay 2, "Extraction Settlements". Instead of designing a single extraction town that might be outgrown (as witnessed in the cases of Kiruna and Fermont) this proposal outlines a series of strategies that can be applied in various combinations with one another, allowing for a range of smaller communities to develop alongside extraction operations. Though these strategies provide the Ring of Fire with a flexibility of development currently nonexistent in other resource extraction settlements, they do conform to an overall vision. Settlements are connected to the extraction sites and each other by infrastructure developed from waste rock produced during extraction, allowing for a network that can share resources and services. The key priorities of this proposal seek to address the creation of a sustainable economic network, during and post-extraction, for the Ring of Fire and Ontario's Far North. The connective infrastructure that facilitates the economic activities will also allow for new service networks in the region and permanent settlements, imbuing a sense of belonging and stewardship to the area thereby making communities a productive component of the greater system. To a lesser extent the proposal will investigate the preservation of the environment during extraction and the nature's reclamation of extraction sites and settlements post-extraction. Though this proposal would ideally address the merging of cultures within the new extraction settlement, as the local first nations and new work force integrate, this thesis will only touch on social activities, not social interaction within the communities.

The design proposal is neither solely a master plan nor a series of tactics. Instead this "tactical plan" consists of a broad overall vision to achieve socially, economically and environmentally-sustainable extraction settlements in the Ring of Fire. Settlements will be constructed using a lexicon of tactics, deployed in combinations suitable to each unique context. Due to the sheer size of the Ring of Fire, the plethora of physical conditions and the many uncertainties as to how extraction development will unfold, a singular proposal would be destined to address only some of the possible futures, while falling short on others. By comparison, this proposal presents a sample of ecological, infrastructural, urban and extractive conditions with

Fig. 3.1 [Previous Page]
Garth Lenz, The MacKay River, the Boreal Forest and a tar Mine in Northern Alberta, Canada

Fig. 3.2 J Henry Fair, Kayford Mountain Mining Site

the possibility for a variable application of design tactics that address both immediate development during the period of extraction and the evolution of the region post-extraction. The tactics presented here deal with abstracted, prototypical fragments of development; but in reality, the application of both the overall design strategy and proposed local tactics will need to respond to existing environmental and social conditions. This will require substantial co-ordination with multiple stakeholders, including resource companies; First Nations and others that constitute local populations; environmental groups; and various levels of government.

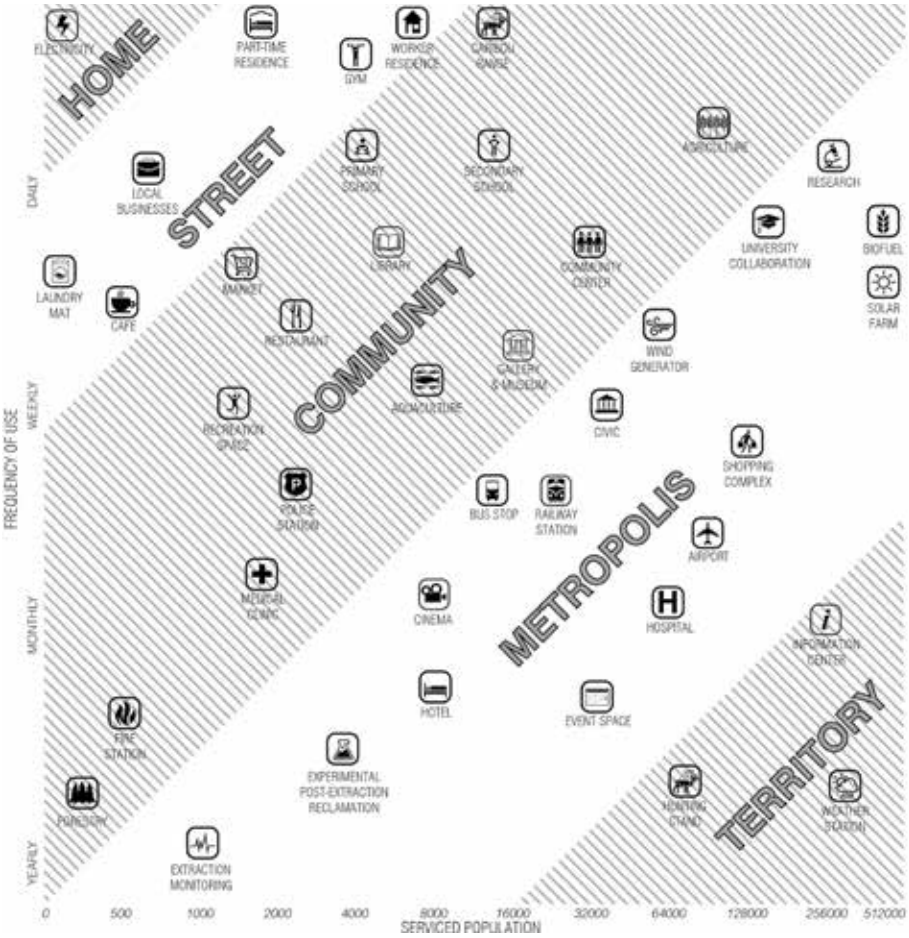
The development of the Ring of Fire should not be conceived of only during its extraction phase nor should it be developed on the "extract and leave" model currently employed for quick profit both in Canada and around the globe. The Ring of Fire should be seen, rather, as an opportunity to connect and benefit the underserved population of Ontario's Far North, by establishing new networks during extraction that will continue to improve the quality of life in these remote communities post-extraction. Extraction operations will inevitably draw a large population to the Ring of Fire. The area will thus require new education, healthcare and judicial services. At the regional scale, these and other advancements will position the Ring of Fire to become a service hub for the communities of Ontario's Far North, improving the current networks while providing more accessible service options.

Using the water-management tactics outlined in this proposal, extraction companies will construct all-season roads from the by-products of their operations, which will aid in protecting the fragile ecosystem from human contamination (*fig.* 3.3). The new infrastructure not only creates a circulatory spine for extraction but also generates land for occupation within the Ring of Fire. Due to the vast area of potential extraction operations projected, a singular boomtown would be insufficient to house all the workers within reasonable commuting distance. Thus, a series of "networked-cities" is outlined in the masterplan portion of the proposal. The locations along the new infrastructure slated for networked-cities are located in proximity to a minimum of two different companies' mining claims. This will generate socially-diverse communities, each composed of a population with varying employers, together with their families. Since each networked-city will be funded by multiple extraction companies, its urban fabric will develop inherent variations fueled by competition between its patrons. Thus networked-cities will ultimately feel more like a town and less like a placeless work camp. Additionally, each networked-city will assume its own specific identity, influenced by a unique topography, environment, and infrastructure. As part of the master plan for the Ring of Fire, resources from non-extraction operations in the networked-city or local decommissioned mining sites are shared with other networked-cities. Applying a modified version of Team 10's Scales of Association (*fig. 3.4*), which "provides a model for separating and connecting a city based on scale", the proposal identifies

Fig. 3.3
Main infrastructure network created around the Ring of Fire's mining claims

Fig. 3.4 Modified Scales of Association identifying the location of programatic elements the Ring of Fire.

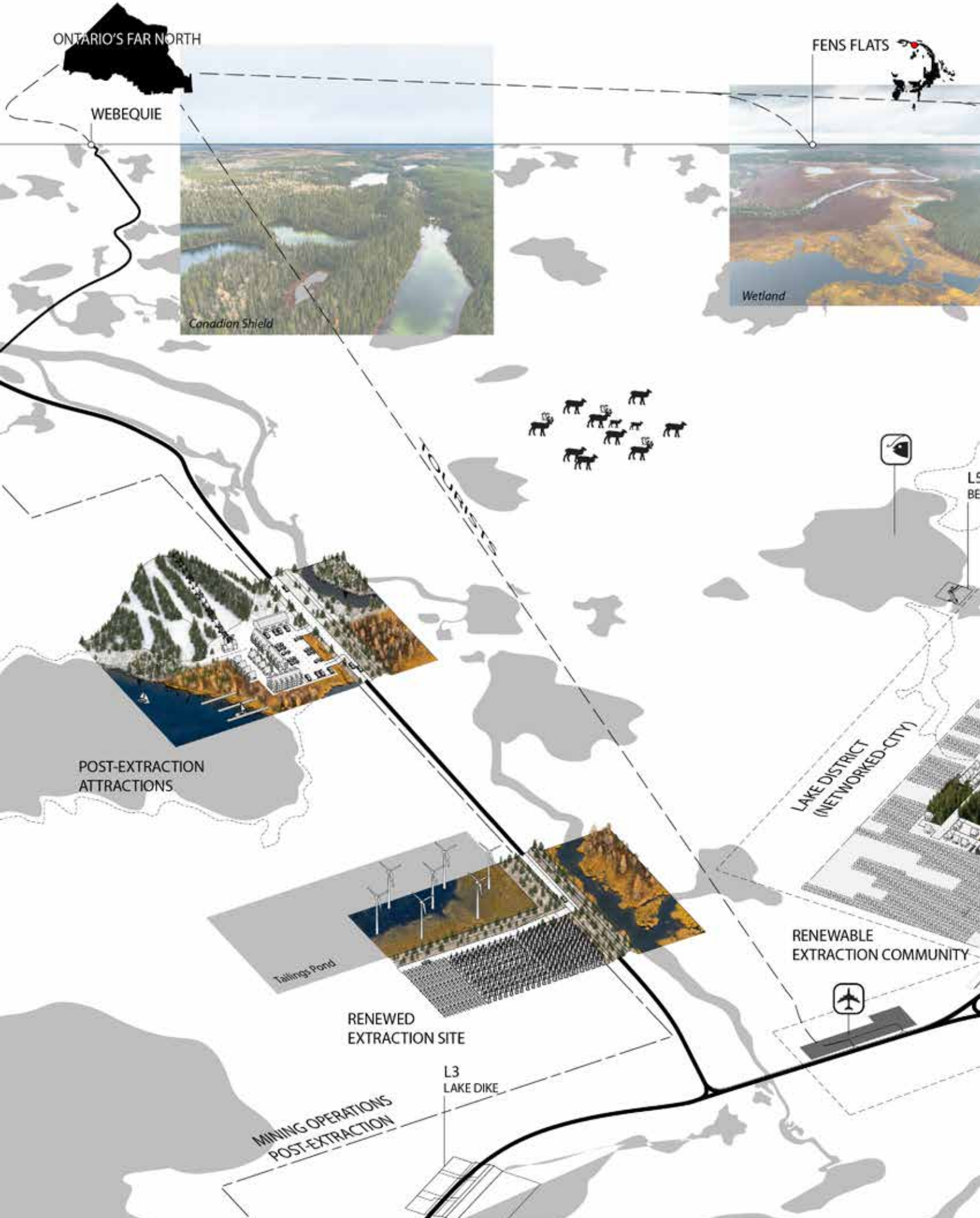
Home & Street: *Static programs making up the majority of the Networked-City's built fabric.*
Community: *New businesses and rotational programs that develop with permanenet settlements.*
Metropolis: *Programs that defines the identity of a Networked-City*
Territory: *Programs dispersed around the infrastructure to support the extraction Settlements.*

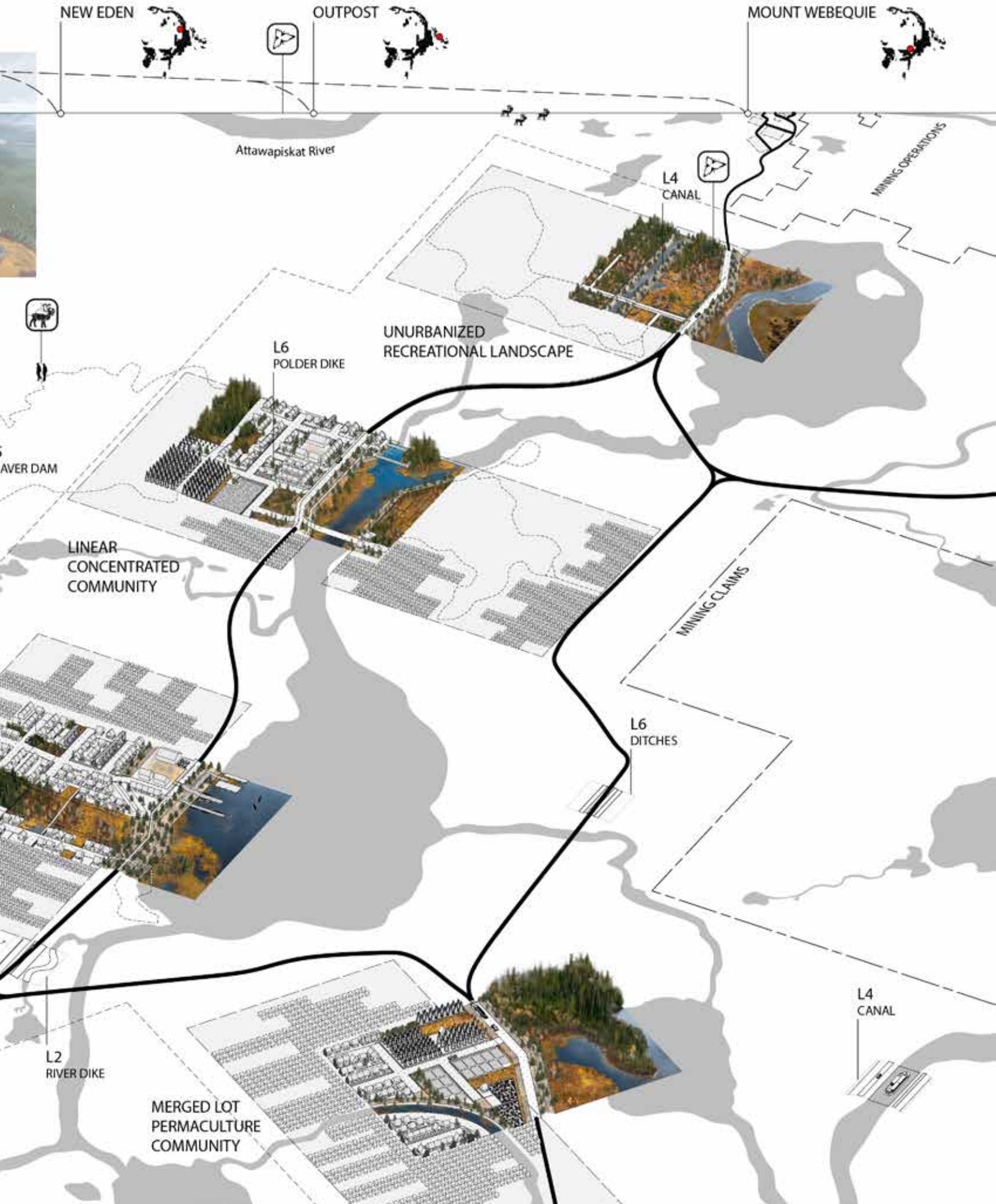


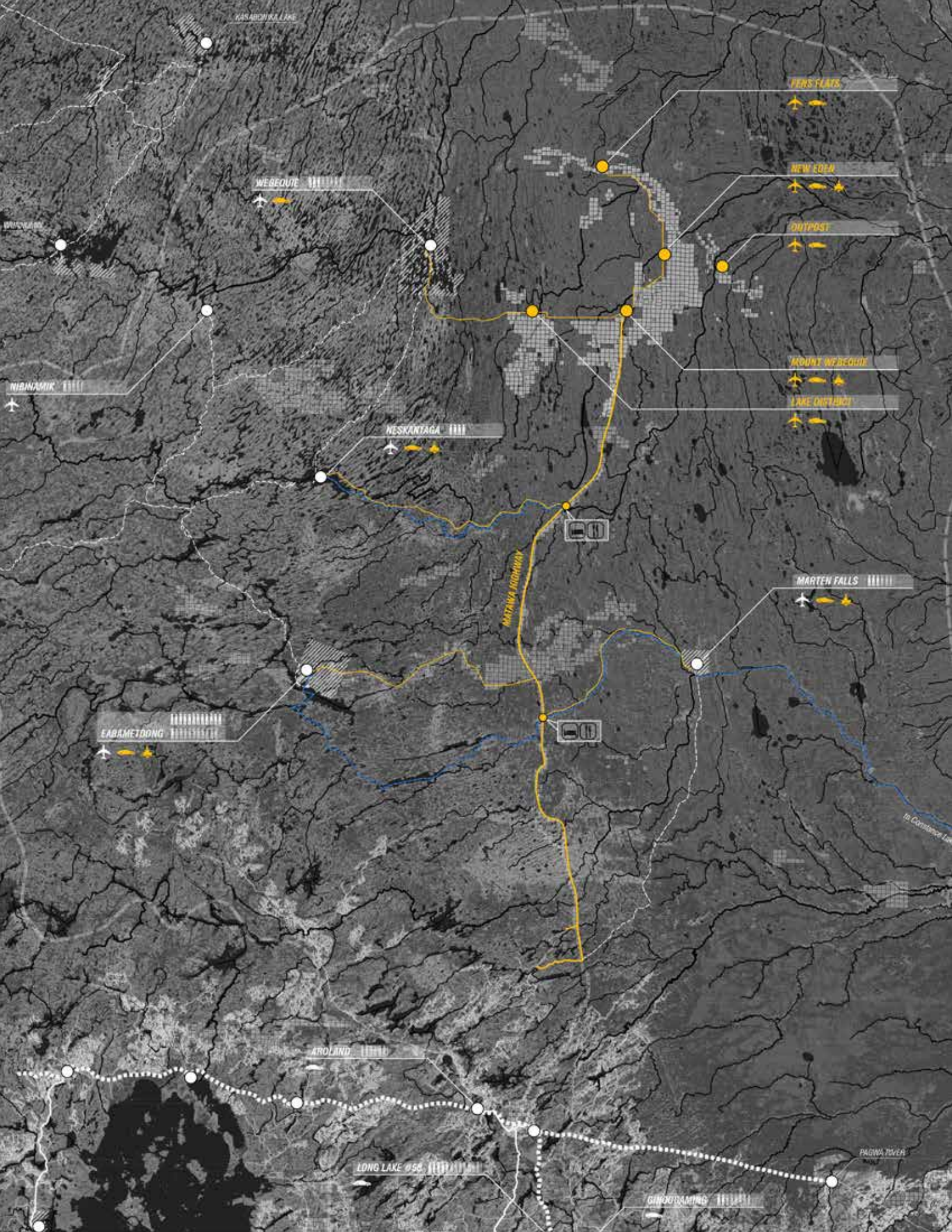
medium scale programs such as legal clinics, cinemas, amongst others, that can rotate between transitional buildings in one networked-city to another, eliminating structures that become obsolete post-extraction.[1]

The networked-cities themselves are made up of multiple smaller communities, developed or repurposed in response to their fluctuating populations over the various stages of mining. This fragment of the proposal takes "core samples" in which to test design strategies as idealized conditions. In reality, development would need to negotiate spatial, infrastructural, environmental frontiers that would create complex boundary conditions. As the population from peripheral communities leave, the remaining population would relocate to centralized communities that can be sustained through non-extraction economic activity, such as industrial tourism, agro-forestry, renewable energy generation and different forms of agriculture. These new economic activities, separate from mining, would be implemented in the early phases of extraction to start generating new businesses, networks and economies within the Ring of Fire and surrounding communities. Extraction settlements will thus remain viable communities in which a population stays invested in the land post-extraction.

Fig. 3.5 [NEXT PAGE] Aerial view of the the proposed tactics assembled and applied to the Ring of Fire


ONTARIO'S FAR NORTH
WEBEQUIE
FENS FLATS
Canadian Shield
Wetland
TOURISTS
POST-EXTRACTION
ATTRACTIONS
LAKE DISTRICT
(NETWORKED-CITY)
Tailings Pond
RENEWABLE
EXTRACTION COMMUNITY
RENEWED
EXTRACTION SITE
L3
LAKE DIKE
MINING OPERATIONS
POST-EXTRACTION


NEW EDEN
OUTPOST
MOUNT WEBEQUIE
Attawapiskat River
MINING OPERATIONS
L4
CANAL
UNURBANIZED
RECREATIONAL LANDSCAPE
L6
POLDER DIKE
AVER DAM
LINEAR
CONCENTRATED
COMMUNITY
MINING CLAIMS
L6
DITCHES
L4
CANAL
L2
RIVER DIKE
MERGED LOT
PERMACULTURE
COMMUNITY


NASABONKA LAKE
FENS FLATS
NEW EDEN
WEBEQUIE
OUTPOST
MOUNT WEBEQUIE
LAKE DISTRICT
NIBINAMIK
NESKANTAGA
MATAWA HIGHWAY
MARTEN FALLS
EABAMETOONG
AROLAND
LONG LAKE #58
PAGWA TOWER
GINOOGAMING

NEW NETWORKS

Though often envisioned as such, Ontario's Far North is far from a vast, uninhabited landscape. Many communities and cultures exist within the region, though they are less connected than those in southern Ontario. As a result, communities usually suffer from a lack of services. This proposal calls for an establishment of permanent settlements in the Ring of Fire whose populations will require new medical, educational and judicial service networks, and which carry the potential to bolster and, in cases, replace the existing sub-par systems in the area. Though this section focuses on the benefits to the Matawa First Nations Communities specifically—as they are the closest existing communities to the Ring of Fire and will experience the most impact from development—these new services are not meant exclusively for them: services will be available to all inhabitants of Ontario's Far North. The Ring of Fire development can be seen as a reorientation of Ontario's Far North, shifting away from its southern pull towards an internal and accessible service hub in the region.

Before this can happen, however, a decision will need to be made on how to access the Ring of Fire in order for goods and labour to be exported to or imported from global economic networks. Whichever plan is chosen, it should connect as many communities as possible, allowing new economies to appear along its route, increasing not only the availability of services and goods in the area but also employment opportunities (*fig. 3.6*).

Fig. 3.6 [LEFT]
An example of how a transportation corridor to the Ring of Fire, in this case the North-South road and rail option can connect communities in the area. Developing new economic activities along the infrastructure such as rest stops, tourist activities and commerce, can spread the benefits of the Ring of Fire.

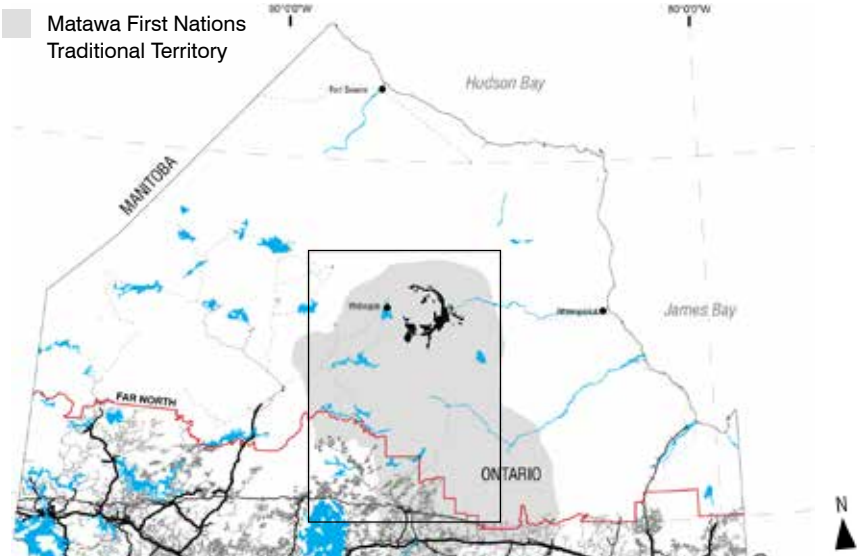
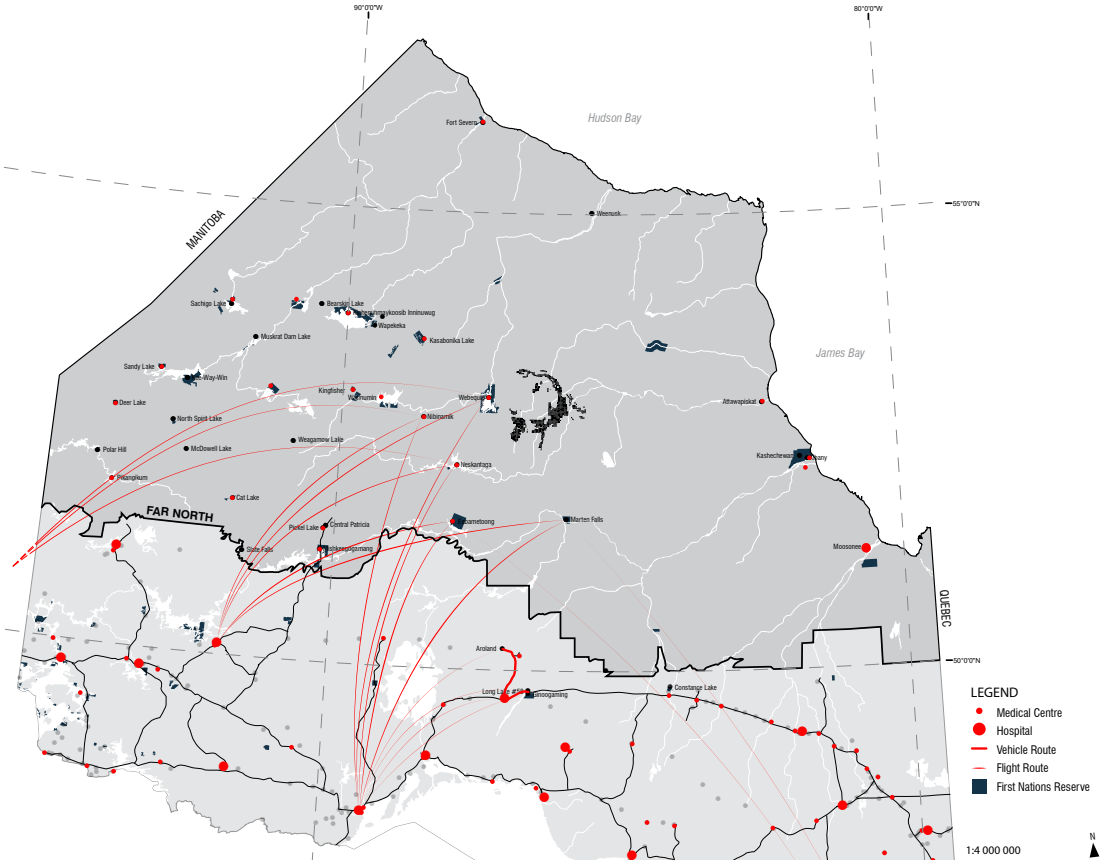


Fig. 3.7 Ontario's Far North infrastructural network

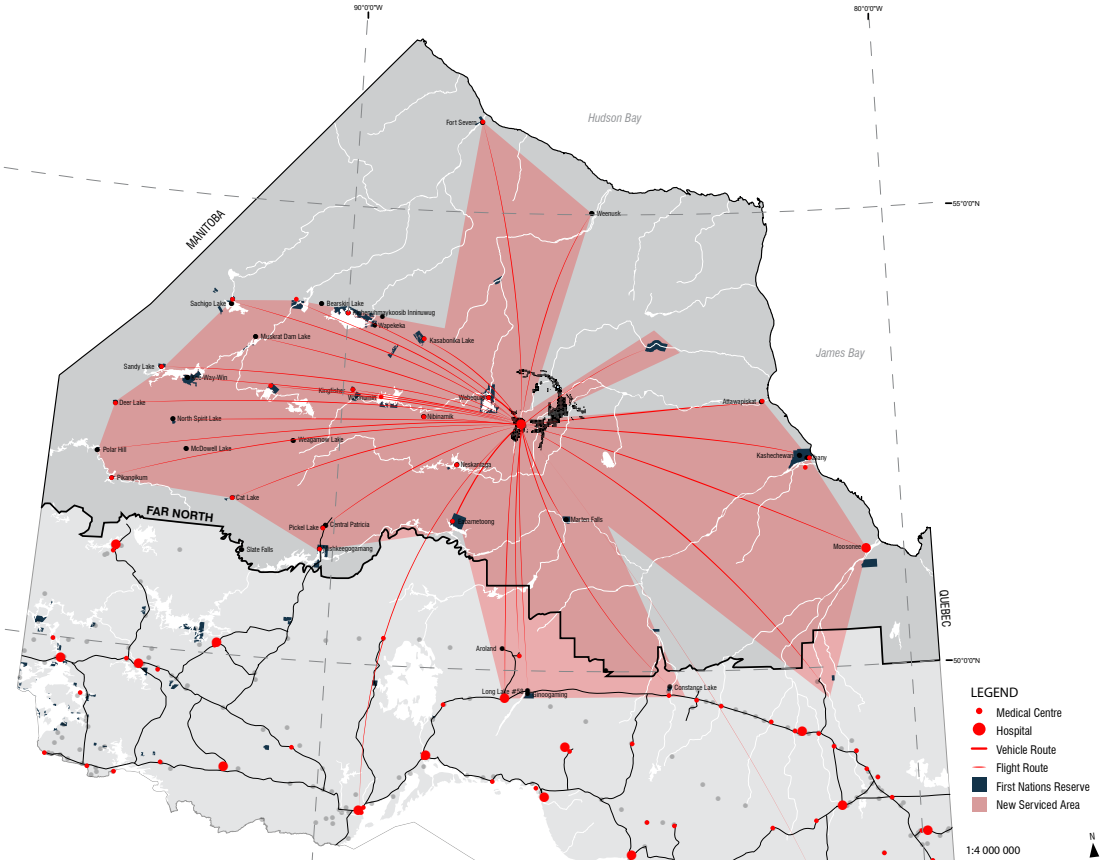
MEDICAL NETWORK



EXISTING MEDICAL NETWORK

Fig. 3.8

While many of the Matawa First Nation communities have a nursing station or health care center within the community, the available services are limited, and some have none at all.[2] In addition, stations are not always adequately staffed, meaning illnesses or leaves of absences can often lead to temporary closures. Currently, telemedicine is a temporary solution for communities without a nursing station, but it is an inadequate solution as it does not provide immediate access to health care.[3] Other communities that do have health care centers experience issues hiring staff due to a lack of housing or finding professionals willing to relocate to the remote region.[4]

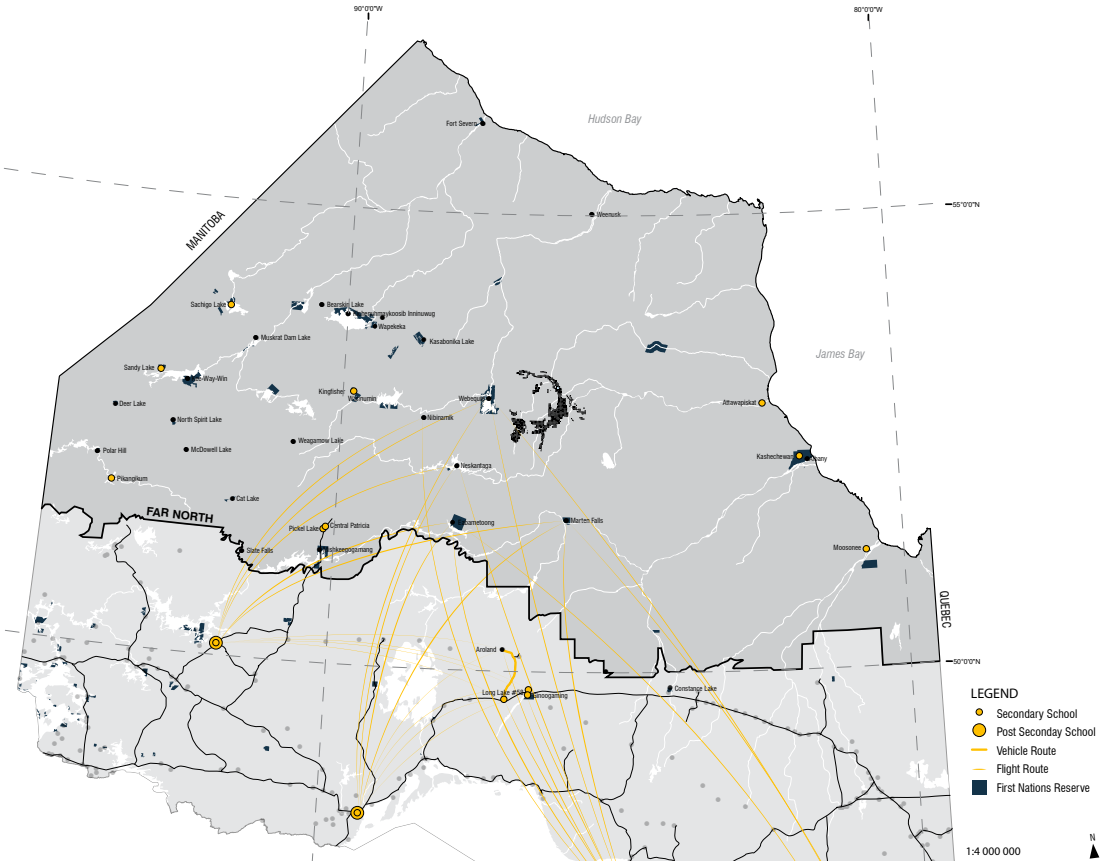


NEW MEDICAL NETWORK

Fig. 3.9

The Ring of Fire would become a connected central hub for the communities of Ontario's Far North. A hospital in the Ring of Fire could provide a more local and immediate healthcare system in a familiar environment. This means residents would not have to leave the community to seek medical care in the south, which is often put off until it is too late.

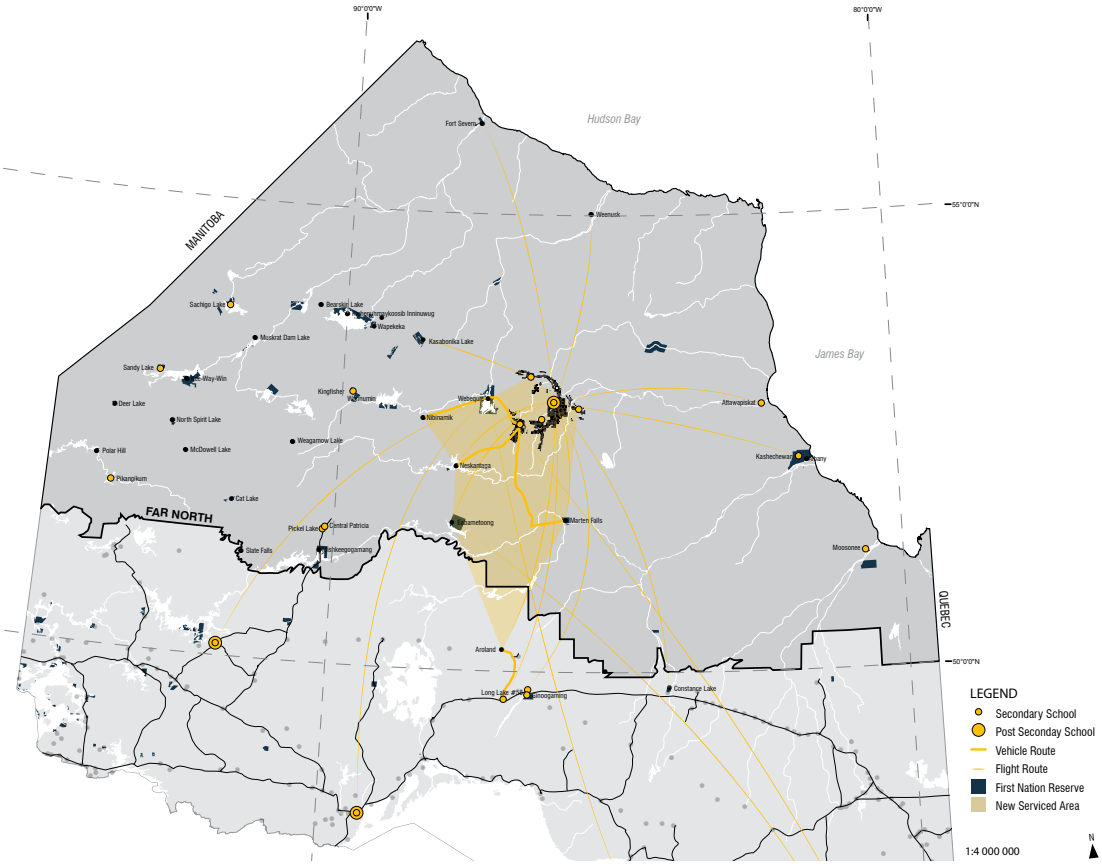
EDUCATION NETWORK



EXISTING EDUCATION NETWORK

Fig. 3.10

Though many of the Matawa communities can provide primary education to residents, students in these fly-in communities wishing to pursue a secondary school–level education or beyond must leave the community for Thunder Bay or other southern cities.[5] This often generates feelings of alienation and isolation for students. By establishing permanent settlements that will encourage family-oriented living within the Ring of Fire, younger generations will soon be present in the area; this means more advanced levels of schooling will be needed. New secondary schools in greater proximity could be established to service this larger, connected population. These would not replace the existing schools within the communities

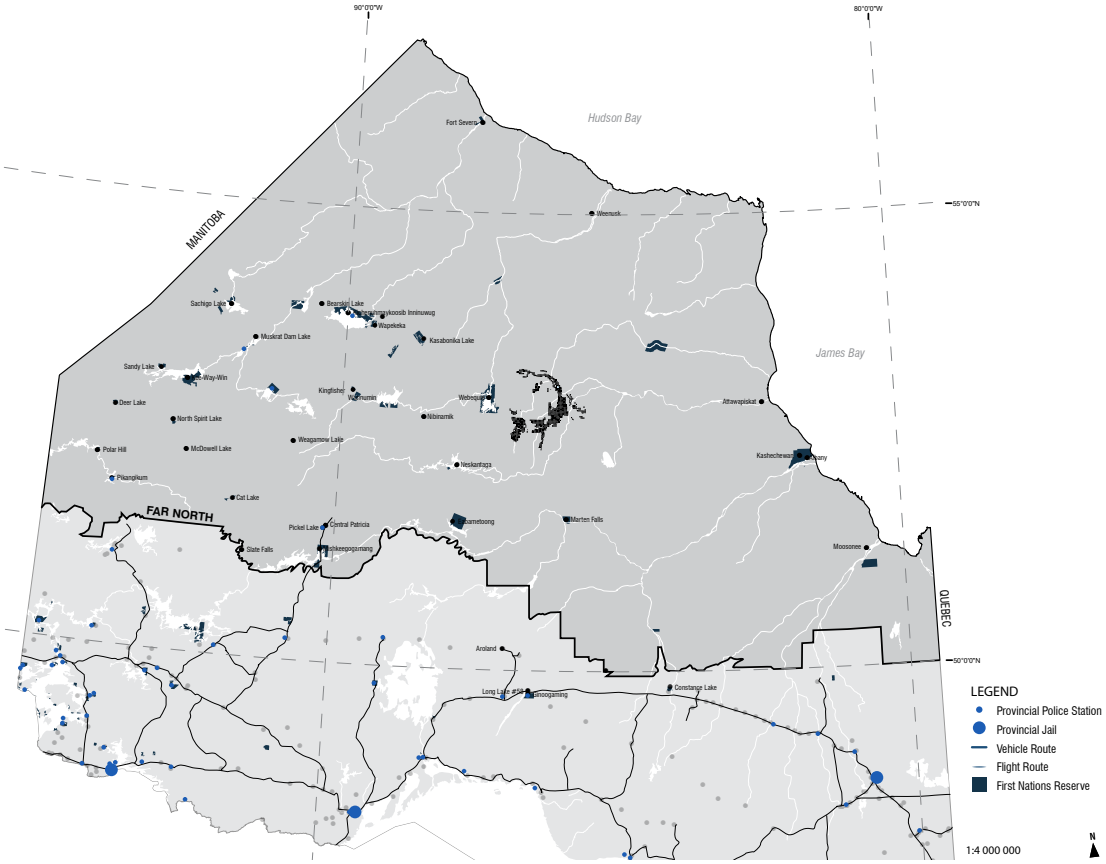


NEW EDUCATION NETWORK

Fig. 3.11

but would mainly provide a closer option to students wishing to pursue education. Since the Ring of Fire will be under scrupulous observation by environmental and government authorities, it also has the potential to attract post-secondary institution collaboration programs that focus on innovative mining procedures, operations and reclamations. This could improve the knowledge base within the local extraction industry, while also positioning workers to become experts in their field.

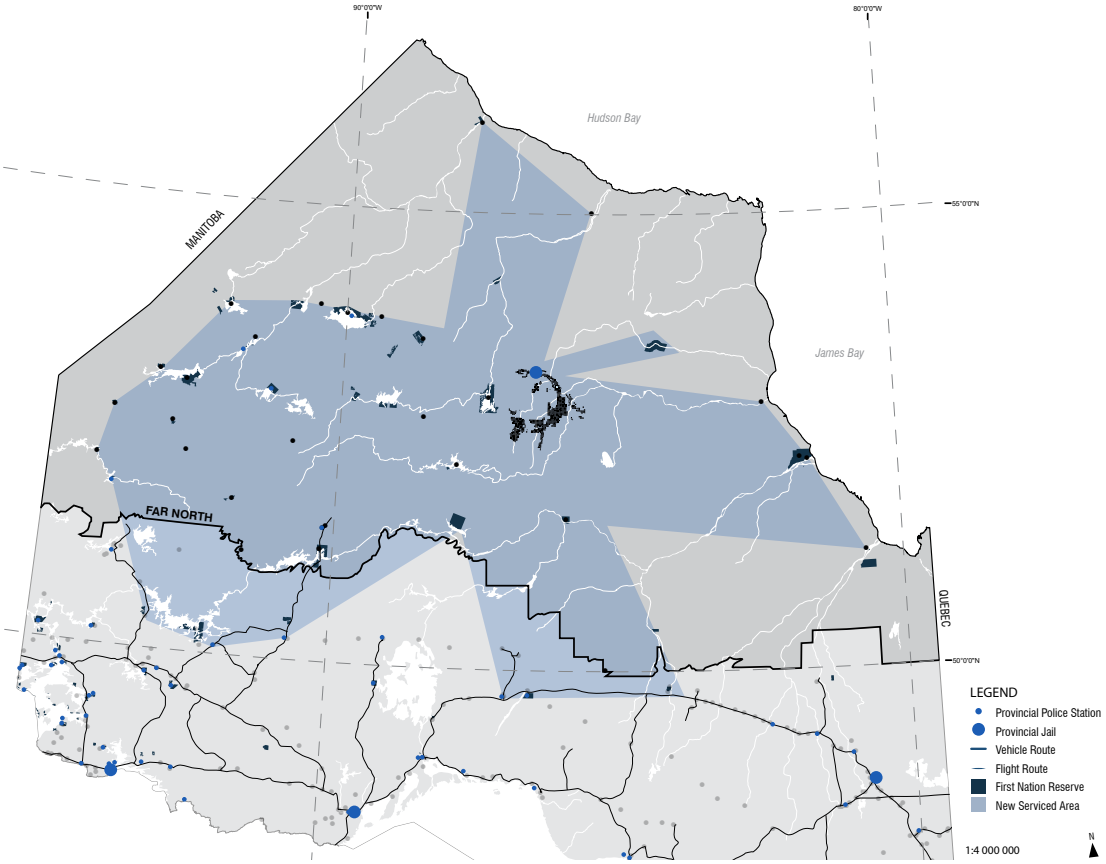
JUSTICE NETWORK



EXISTING JUSTICE NETWORK

Fig. 3.12

Instead of irregularly-held law clinics in these fly-in communities or consultations with legal offices in Thunder Bay, a new justice network centered on the Ring of Fire would allow for more immediate legal aid. Increasing the number of lawyers in the area means not having to wait weeks for an appointment or depend on a phone conversation to accurately convey details of a case. If a crime were committed, a new jail in the Ring of Fire would mean the perpetrator would not be moved to the south, but could stay relatively close. Upon release, they would not be stranded away from their community.



NEW JUSTICE NETWORK

Fig. 3.13

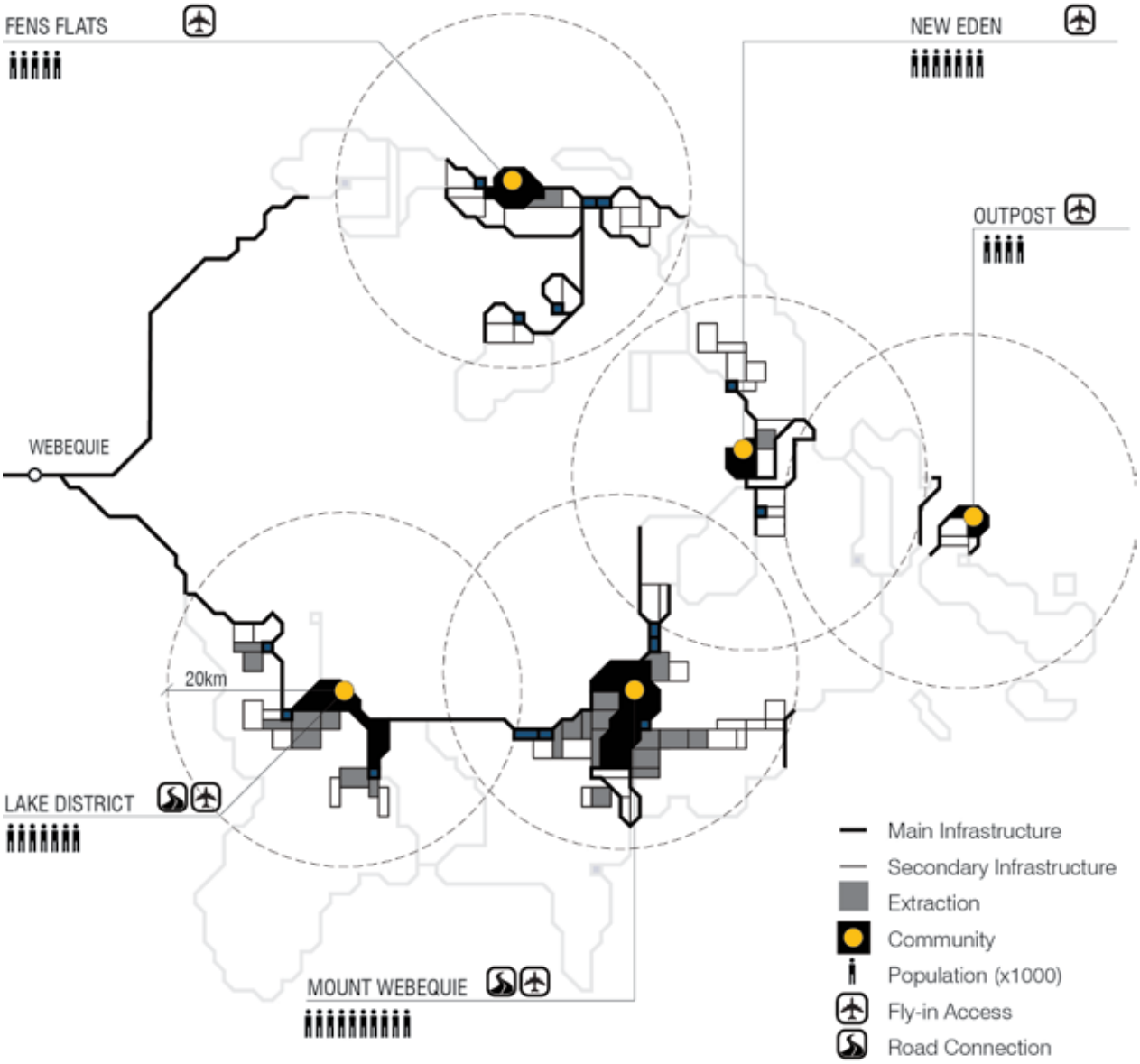
TACTICS

Maps from the previous section reveal how southern-dependent and isolated the infrastructure of Ontario's Far North is. This mirrors what politician David Kilgour argues in his book *Inside Outer Canada*: that life in the Canadian Shield is a "grossly unequal struggle between the heartland of southern Ontario… and the northern hinterlands".[6] Though this is where cheap natural resources have been sourced for centuries, these northern materials continue to be transported southwards. As manufacturers do not want to relocate to areas less connected to the global economy, the north rarely sees their profits reinvested in the area.

The tactics presented in the following section, in conjunction with larger-scale plans, seek to rethink how infrastructural networks might be created. The vulnerable ecosystems of the Ring of Fire require infrastructure to address the question of how it can facilitate environmental stewardship while at the same time facilitating one of the most destructive human activities currently practiced. New water controlling infrastructure will allow for the separation of extraction from the existing landscape, protecting it from contamination. As extraction develops the vast amount of materials removed during extraction can be repurposed and the resulting infrastructure can be shaped over time; it can respond to the variable conditions it encounters. Mining is usually conducted systematically in cells: as one mine reaches the end of its productive life, another adjacent area opens for extraction. Using the materials generated in the operational mines, infrastructure can be created to simultaneously prepare the next site by protecting the existing water systems from potentially harmful waste generated in the mining process. In addition to the water-management and land creation tactics presented for the Ring of Fire's infrastructural development, this section explores the new network's relationships with extraction operations, settlements, non-extractive economic activities and the land.

Fig. 3.14 [LEFT] J Henry Fair, Mountain Top Removal Coal Mine at Night

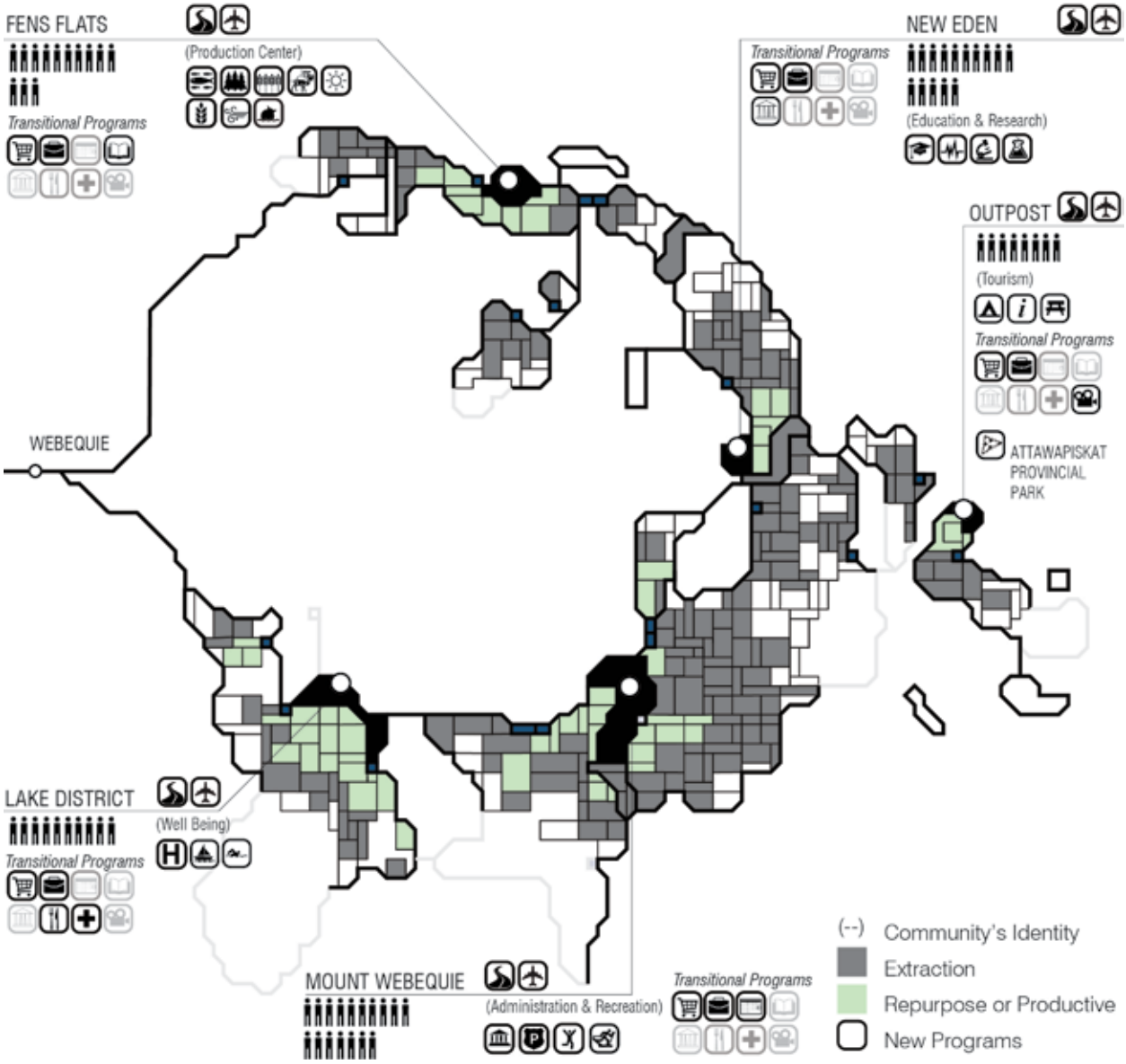
COMMUNITY DEVELOPMENT



START OF EXTRACTION (2020)

Fig. 3.15

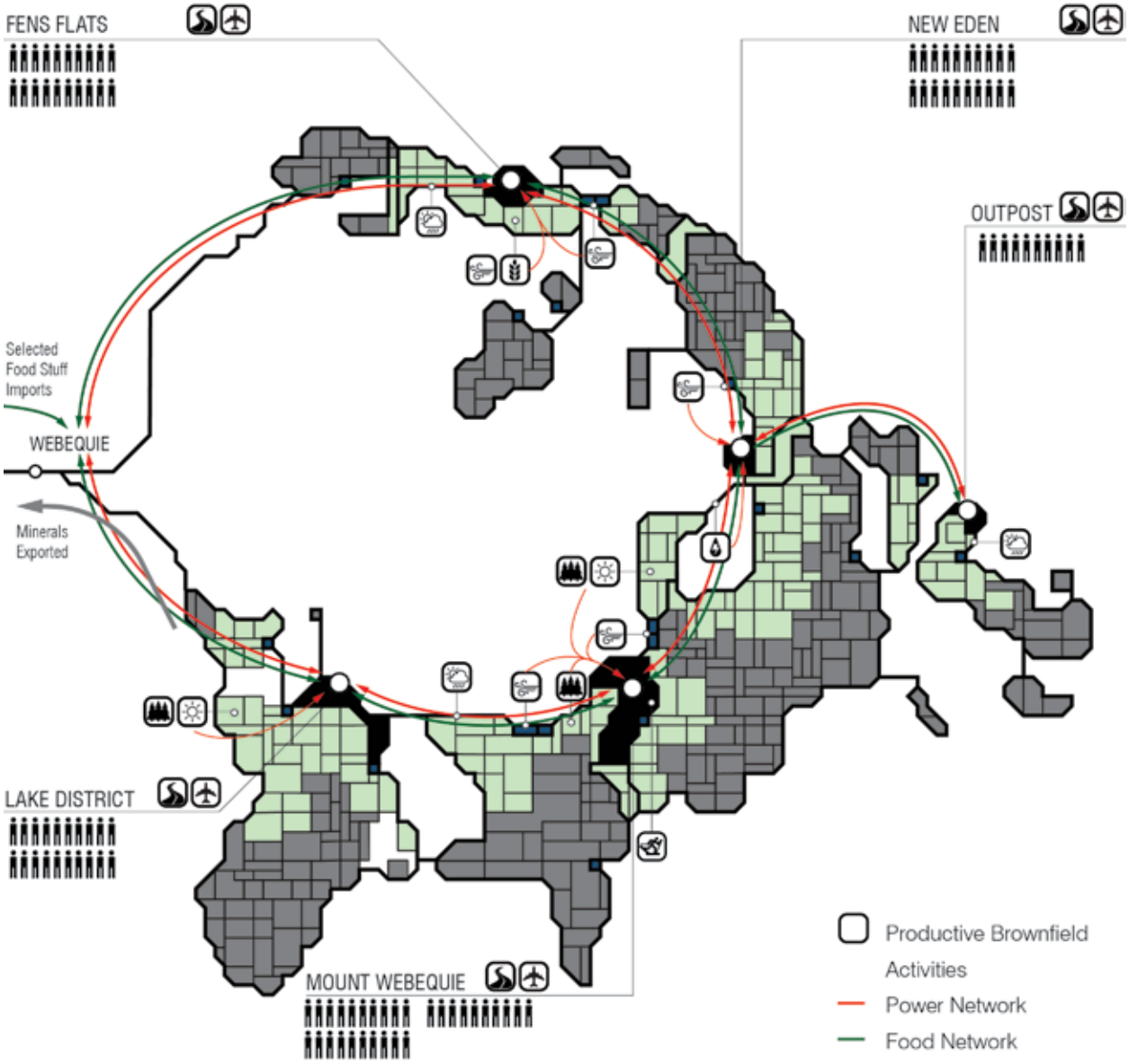
At the start of extraction the infrastructure to the Ring of Fire has already been established and the five network-cities have small populations initiating work on the extraction sites closest to their networked-city. Lake District and Mount Webequie, the first communities established are already connected to the region's infrastructure and are starting commercial production. The other three networked-cities are only starting operations, using the overburden to construct their infrastructure.



EXPANSION (2060)

Fig. 3.16

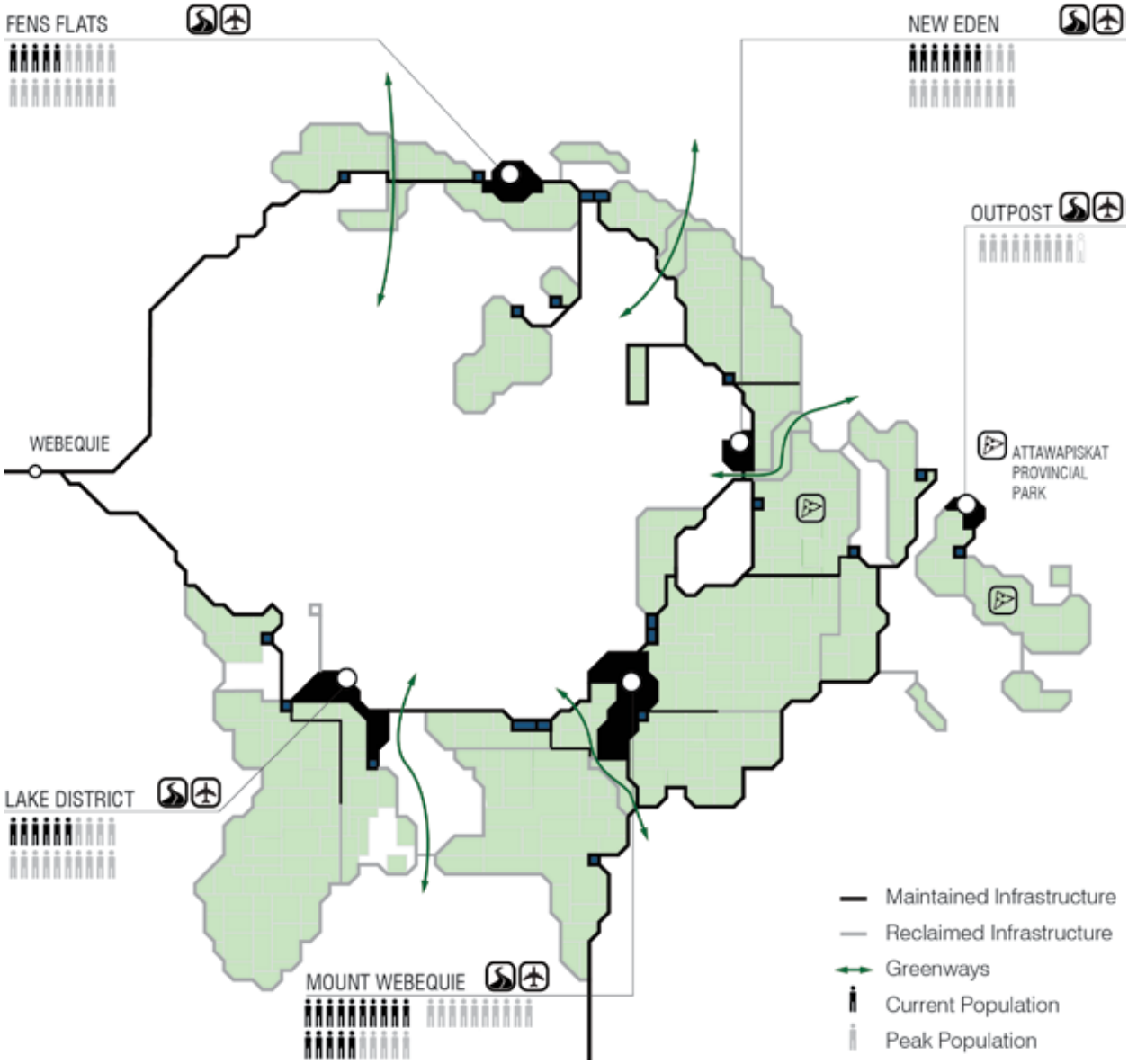
The main infrastructure now connects every networked city and each have developed an identity that serves the whole Ring of Fire. Products can be transported out of the Ring of Fire, and goods and services can be circulated within. As extraction moves outwards from the networked-cities, closed mining cells become reclaimed and transformed into productive landscapes that slowly reduce the Ring of Fire's dependency on finite resources.



EXHAUSTION (2100)

Fig. 3.17

The Ring of Fire is now at peak population. While extraction has drawn more workers to the area the original population brought up a new generation who call the Ring of Fire home. New service networks have been created along the infrastructure and a variety of social activities are available in the networked-cities.



POST-EXTRACTION (2140)

Fig. 3.18

The inevitable population decline hits the Ring of Fire, as a large portion of workers leave in search of other extraction jobs. Select secondary roads are maintained while others become part of the new hybrid landscape. Workers who do not wish to leave, and those who call the Ring of Fire home, stay in the area continuing to operate the established secondary economies of the area and bolster the Ring of Fire's tourism industry.

WATER MANAGEMENT + LAND FORMING

Both the exploration and development of mineral deposits need to be carefully planned for, as they each cause stress to the environment. These activities both "impac[t] air, land and water, as well as plant and animal life. Mineral extraction can result in tailings, which may pose a risk to wildlife, vegetation and water supplies if not properly contained".[7] Since the Ring of Fire is located in one of the largest wetlands, whose extensive and flat topography causes poor drainage, water control is of the utmost importance.[8] Any substance leaked into the environment will spread rapidly, becoming hard to contain and absorbing into natural systems. The expansive wetlands thus pose a problem to creating settlements, as it is not a matter of simply clearing a patch of land and erecting buildings: these operations must also consider the presence of water in their established locations, as well as any seasonal water level changes that could threaten settlements.

Various water-management and land-forming tactics have been gathered from precedents around the world, and assembled here. A predominant influence is the great water-engineering infrastructure in the Netherlands, where local designers and engineers have been manipulating water to expose inhabitable land for centuries. Though proven to have worked in their original context, these tactics will need to be adapted to better fit the unique conditions found in the Ring of Fire and coordinate with natural systems of the area.

Allowing water courses the freedom to follow their own path has been the defining characteristic Rotterdam-based landscape architecture firm LOLA identified in the contemporary Dike Period (1985-present) of the Netherlands.[9] The Ring of Fire's infrastructure should follow this same strategy, working with the landscape to inhabit it instead of forcing it into a rigid system.

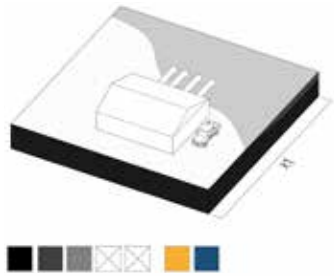
Fig. 3.19 "Room for the River" strategy lowers the flood plane Level along the Meuse River in the Netherlands

LEGEND

- Mechanincal
- Constructed
- Water Control
- Land Creation
- Inhabitable

- Wetland
- River
- Lake
- Ridge

P Point
L Line
S Surface



P1
PUMP STATION

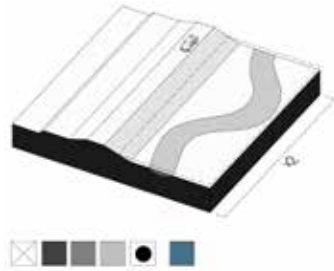
Fig. 3.20

...removes water or adds water to a system by moving it from one area to another through the use of mechanical pumps. Used in various infrastructural projects, like canal water supply, draining water boged lands as well as processing sewage.

L1
DEWATERING WELLS

Fig. 3.21

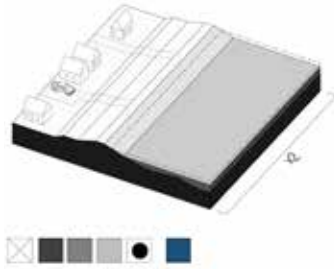
...removal of surface water and lowering of water line around extraction site. Large pumps placed within wells are called deep wells and smaller (50mm diameter) well points draw water down.



L2
RIVER DIKES

Fig. 3.22

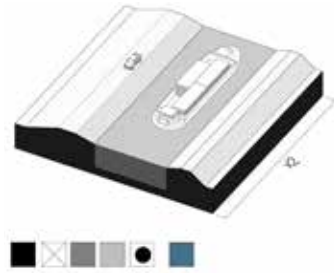
...removal of surface water and lowering of water line around extraction site. Large pumps placed within wells are called deep wells and smaller (50mm diameter) well points draw water down.



L3
LAKE DIKES

Fig. 3.23

...are constructed to protect lower lying lands against the water in a lake. A flood prfile is required on the side holding back water, which is constructed high enough to ensure any changes in water height won't breach the dike.



L4
CANAL

Fig. 3.24

...engineered water ways that provide accessible waterways for transportation. Constructed with vertical walls, water levels in the canal is controlled and are thus connected to other water control methods.

L5
BEAVER DAM

Fig. 3.25

..non-man made barrier between two bodies of water constructed and inhabited by beavers. Constructed in slow moving bodies of water to create separate ponds and provide protection against predators.

L6
DITCHES

Fig. 3.26

...located on the side of roads to catch run off from paved surfaces and prevent soil erosion. Though man made, often inhabited by various plant species as they are only dug out, not lined with impervious materials.

L7
DAM

Fig. 3.27

...are a special category of dikes, as they lie between two bodies of water and therefore have two flood defense profiles. Dams do not create land, but instead can be used for separating two bodies of water, especially of various quartiles.

S1
LAKE DIKE (CONSEQUENTIAL)

Fig. 3.28

...found in the Netherlands as a consequence of diverting water through other methods of water control that then Affects existing built areas.

S2
POLDER DIKES

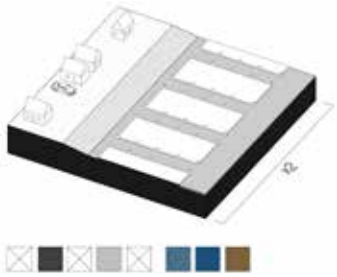
Fig. 3.29

...artificial management of water in the netherlands originating from reclaiming of peatland, parceling of land, or management of lake water. Man made channels in which water is directed to make land more inhabitable.

S3
ISLAND CREATION

Fig. 3.30

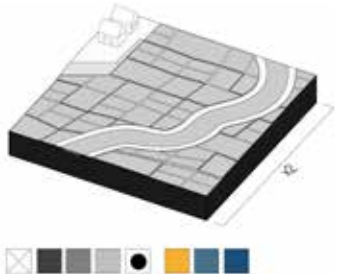
...used in various locations around the world, usually in shallow bodies of water, soil, sand, rocks, etc. are piled up to create inhabitable land. Land should be built high enough to main the surface any change in water level, unless flooding is desired.



S4
CHINAMPAS

Fig. 3.31

...artificial land creation for agriculture originating from the Aztecs and still in used in Mesoamerica today. Land is created in shallow bodies of water by creating a bed of sticks and reeds that are then covered in mud from the lake bed.



S5
TERRACES

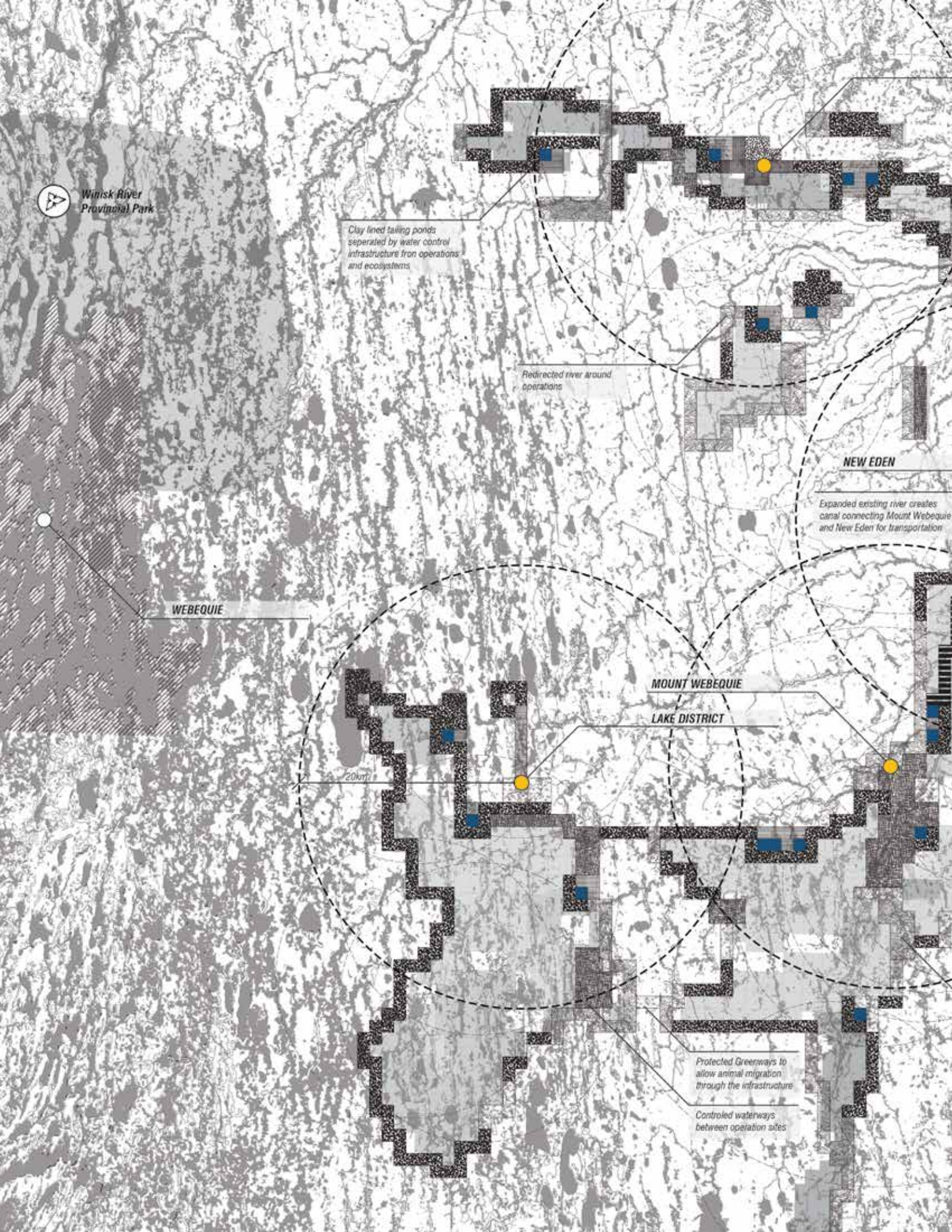
Fig. 3.32

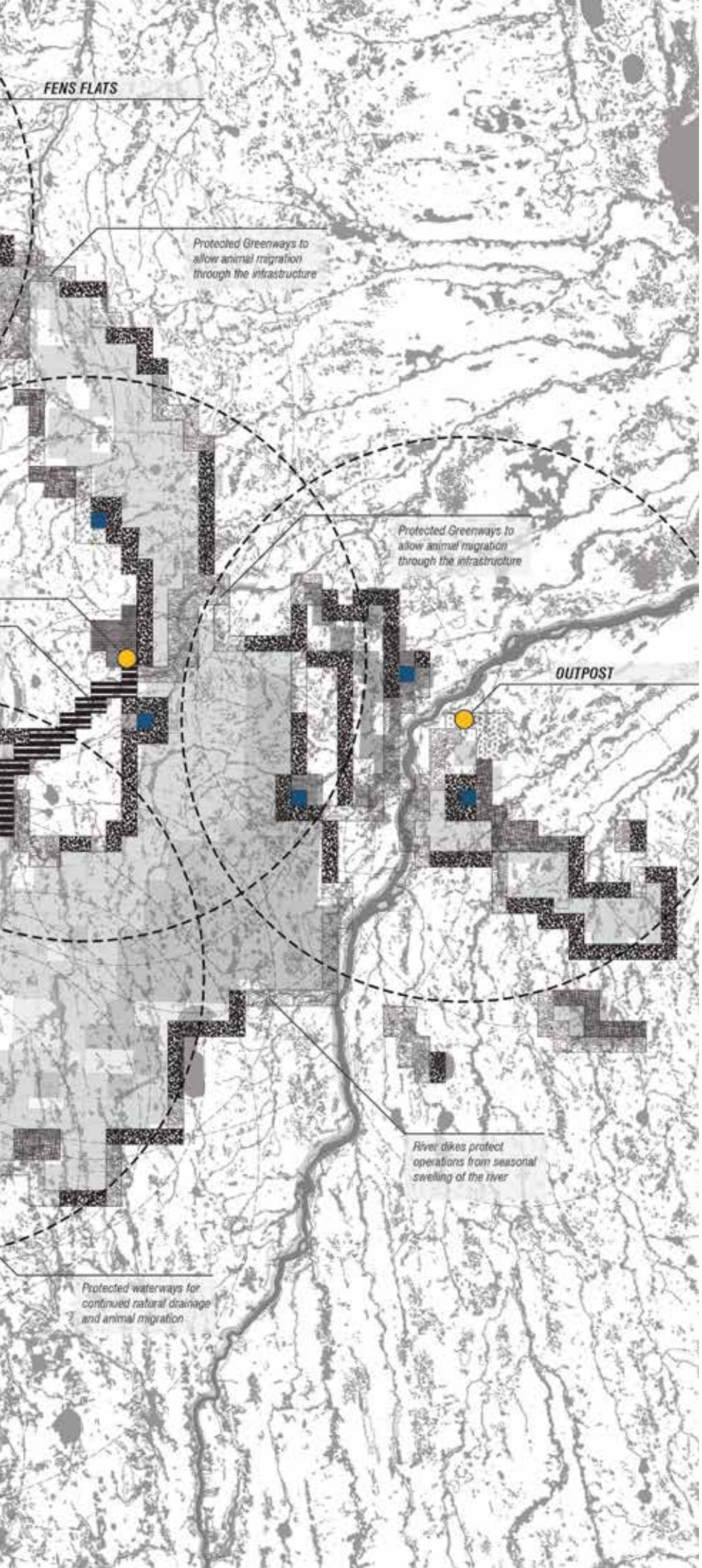
...often associated with rice paddies, water is directed to irrigate various parcels of land used for agriculture. Usually carved into steep hill sides, these take lots of material and labour to create.

S6
ELEVATED ISLANDS

Fig. 3.33

...building method often used in tidal areas where the water level greatly fluctuates or areas where solid land is not readily accessible. Floating "constructed" land is created for inhabiting the area.


Winisk River
Provincial Park
Clay lined tailing ponds
seperated by water control
infrastructure fron operations
and ecosystems
Redirected river around
operations
NEW EDEN
Expanded existing river creates
canal connecting Mount Webequie
and New Eden for transportation
WEBEQUIE
MOUNT WEBEQUIE
LAKE DISTRICT
20km
Protected Greenways to
allow animal migration
through the infrastructure
Controled waterways
between operation sites



MINING CLAIMS & COMMUNITIES

Fig. 3.34

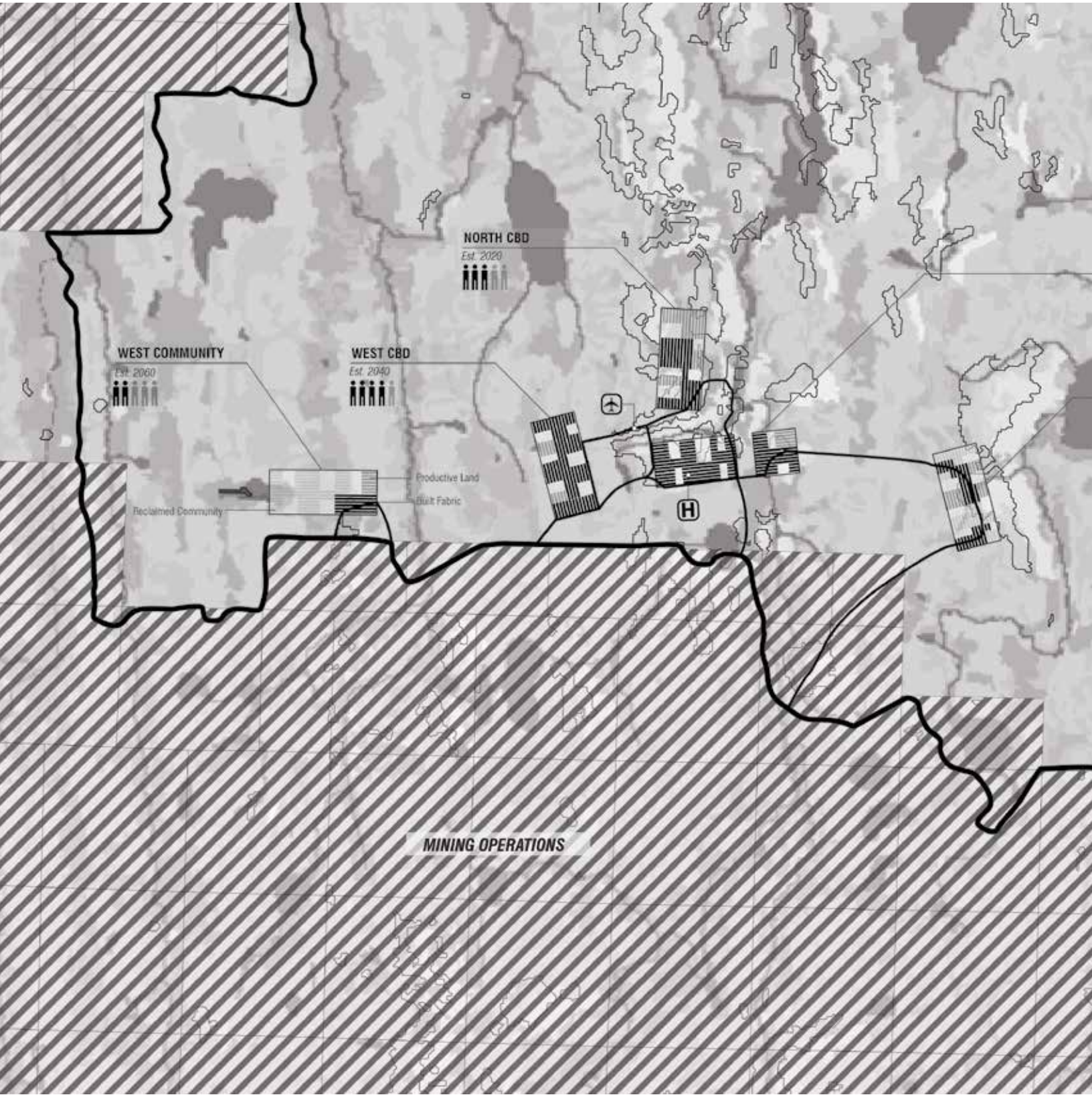
The pixels outlined on the previous pages are applied to the major infrastructure proposed around the current mining Claims to connect the Ring of Fire's extraction operations and settlements. The infrastructure tactics are abstracted to pixel form to show which is best applied to the topographical condition represented in this map. In reality this would be a flexible system, and many of these tactics will be applied to spaces represented by one pixel.

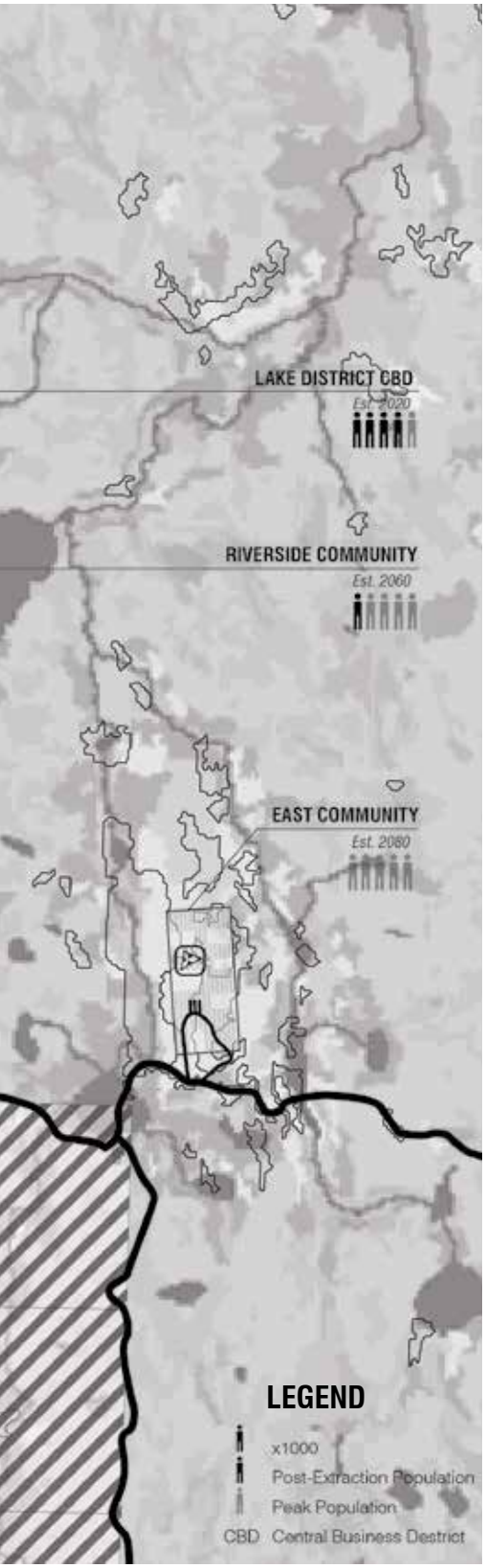
LEGEND

- P1 PUMP STATION
- L1 DEWATERING WELLS
- L2 RIVER DIKES
- L3 LAKE DIKE
- L4 CANAL
- L5 BEAVER DAM
- L6 DITCHES
- L7 DAM
- S1 LAKE DIKE (CONSEQUENTIAL)
- S2 POLDER DIKES
- S3 ISLAND CREATION
- S4 CHINAMPAS
- S5 TERRACES
- S6 ELEVATED ISLANDS

N

0 5 10 15km


NORTH CBD
Est. 2020
WEST COMMUNITY
Est. 2060
WEST CBD
Est. 2040
Productive Land
Built Fabric
Reclaimed Community
MINING OPERATIONS



COMMUNITY EXPANSION AND CONTRACTION

Fig. 3.35

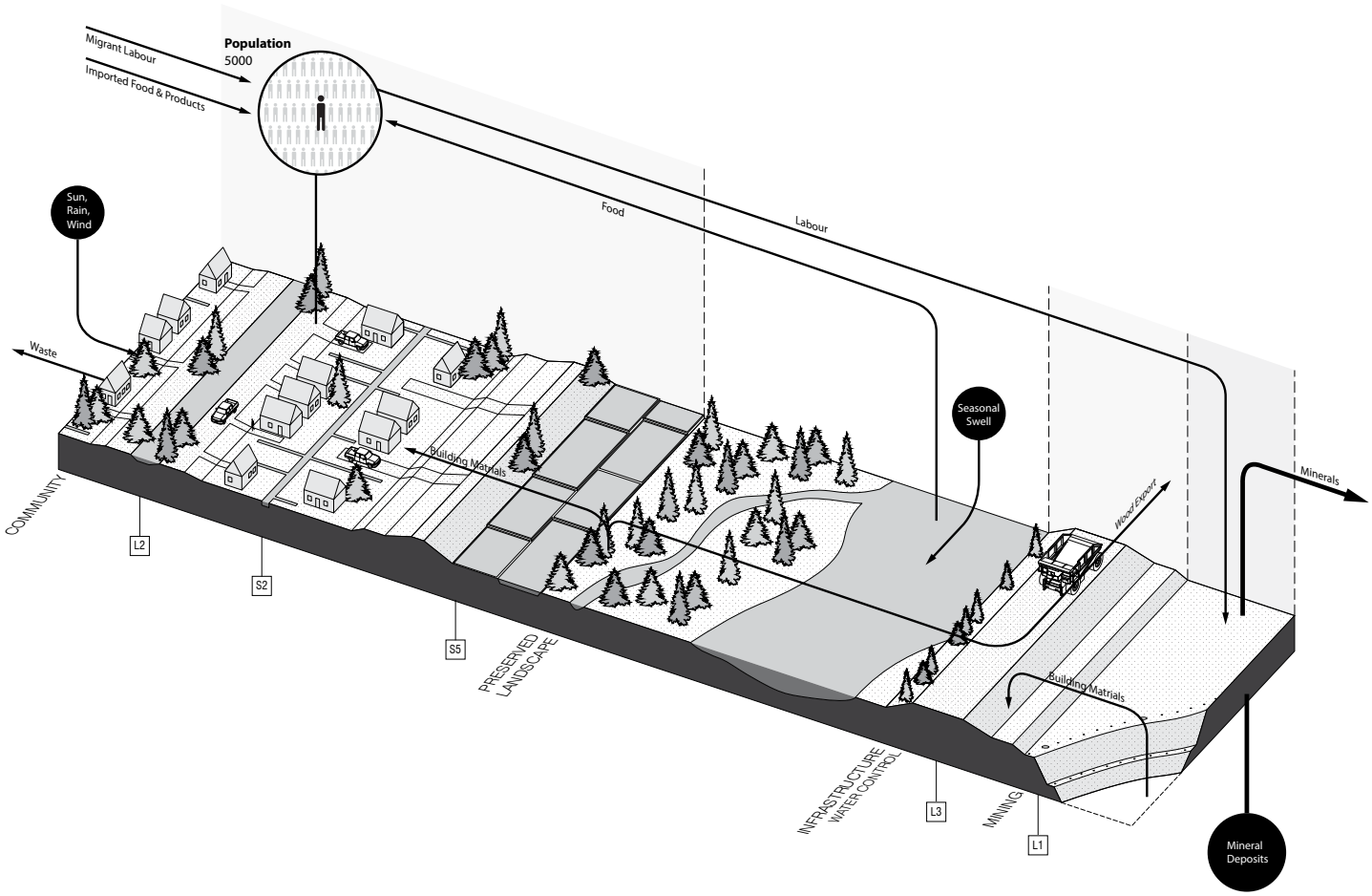
Each networked-city is composed of multiple communities organized along the primary infrastructure. All communities are set back from the main infrastructure in consideration of noise disturbance but also in anticipation of additional deposits that may be discovered at the edge of the mining claim, which would require the community relocate. Located beyond the mining claims, communities are placed in areas with the least disturbance on the landscape and will use the water-management and land-formation tactics to adapt to the existing topography. Each community is represented by a rectangular shape, suggesting they be designed in as compact a form as possible in order to reduce their footprint on the land—though, as we know, community planning in reality rarely materializes with such strict regulation.

The relationship between communities informs the expansion and contraction of the networked-city. As more housing is required, a new community is created according to the expansion plan of that networked-city. Communities on the periphery provide residents with a quieter lifestyle and greater access to the land, but post-extraction they will be the first communities to depopulate: at this stage, the networked-city shrinks inwards, toward the clustered central communities. These busier central communities create the core of the networked-city and are the location of its identifying programs, such as the Ring of Fire's hospital in the case of the Lake District networked-city.

The details of the infrastructure also become visible at this scale. New water-controlling infrastructure will not follow the mining claim boundaries, but rather respect and adapt to natural features of the land, tailoring itself to the extraction operations, independent of arbitrary orthogonal boundaries. The variety of water-controlling strategies, the manipulation of the landscape and the expansion and contraction of the built environment generates a variety of new and diversified landscapes.

Fig. 3.21
Networked-City Location in the Ring of Fire

COMMUNITY ENERGY FLOWS

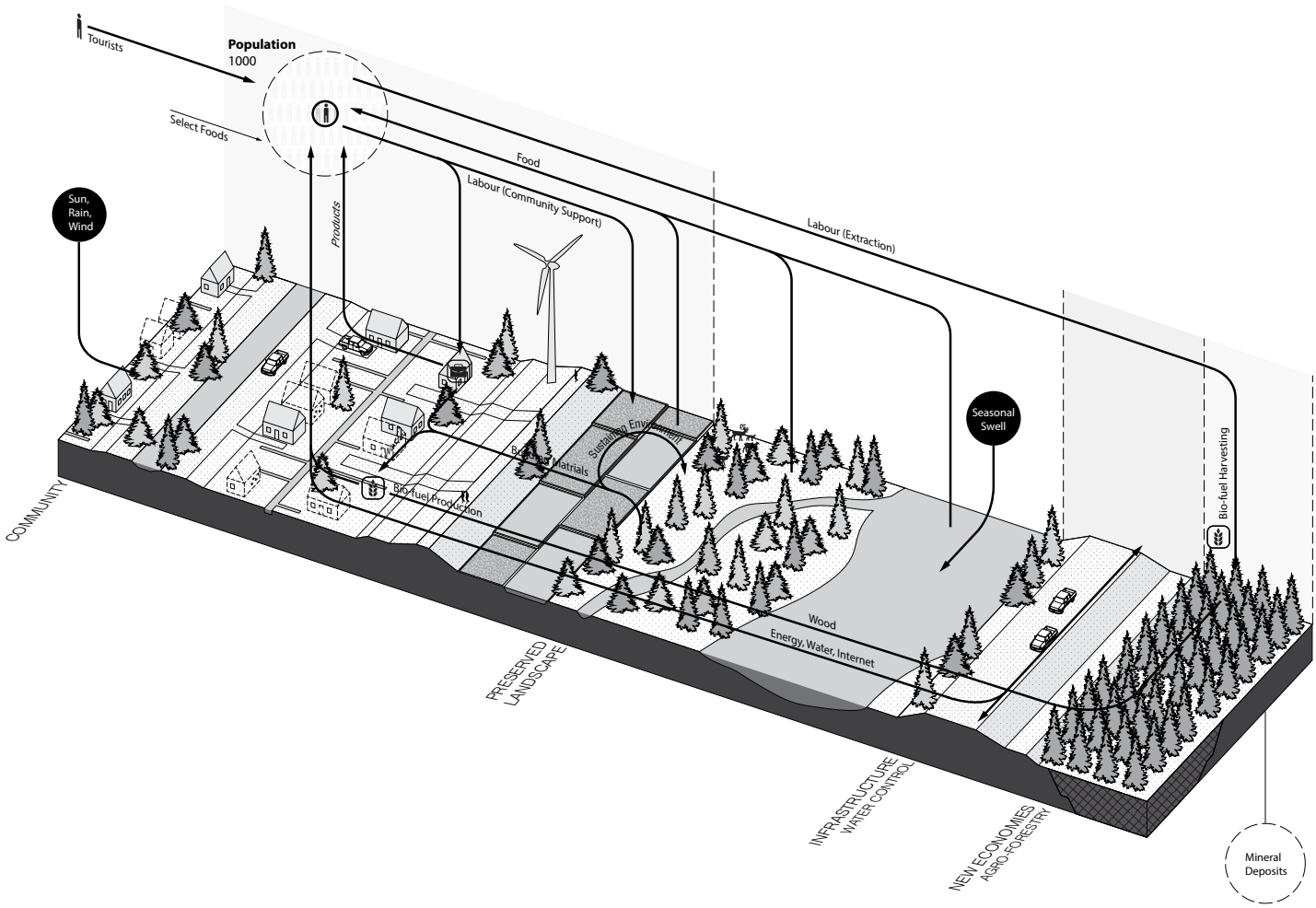


EXTRACTION ENERGY FLOW

Fig. 3.36

These two axonometric drawings portray a possible combination of the Ring of Fire's new infrastructure, extraction operation and community, representing the objectives of any similar combination and indeed all community energy flows in the Ring of Fire.

During the initial phase of extraction, the community's energy system requires imports of goods and labour, and exports the mined raw material for further processing in southern facilities. This is not the energy flow of a sustainable community and runs counter to the objective of settling the Ring of Fire. Over time the exchanges between the built fabric and the landscape (natural and the man made) evolve with the extraction process



POST-EXTRACTION ENERGY FLOW

Fig. 3.37

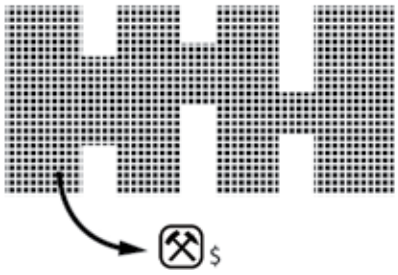
and a more internalized energy flow emerges as extraction progresses. The Ring of Fire can produce its own energy and foodstuff, supplemented only by select imported goods. Natural building materials such as earth, stone and wood are sourced form the by-product of extraction. Then, when the population begins to shrink, excess energy and goods can be exported as a cheaper alternative for the other communities of Ontario's Far North. More specific combinations of infrastructure, extraction and communities will be explored in the following pages.

RENEWABLE EXTRACTION COMMUNTIY

The first community sample is taken from the edge of a proposed interior community. The objective is to condense the community's footprint as the population fluctuates and to reconnect natural systems. This community is an example of one forming the central core of a networked-city, eventually absorbing the population of shrinking outer communities after peak extraction, and thus renewing the community's own population of workers who have left to follow the movement of extraction sites. Instead of tacking new housing areas onto the existing community, the new population densifies designated areas of the community's fabric, which will increase businesses in the area while still providing residents with quick access to the land. The greenways created during the community's establishment are expanded to become water-filtration systems for the communities, thereby reconnecting the human and natural water systems. Over time, the infrastructure becomes seeded by both human and natural activities; this will increase the preserved nesting ground's connectivity to the ecosystem. Nature will reclaim areas disturbed by construction, creating a new hybrid landscape. Throughout the community, the homogenous urban fabric transforms as various abandoned lots are returned to nature, creating new recreational areas and outdoor programs for the residents.

COMMUNITY FABRIC

Fig. 3.38

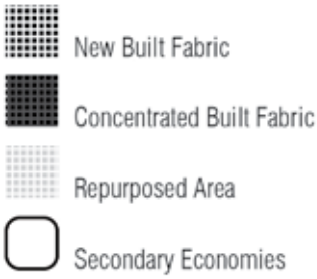


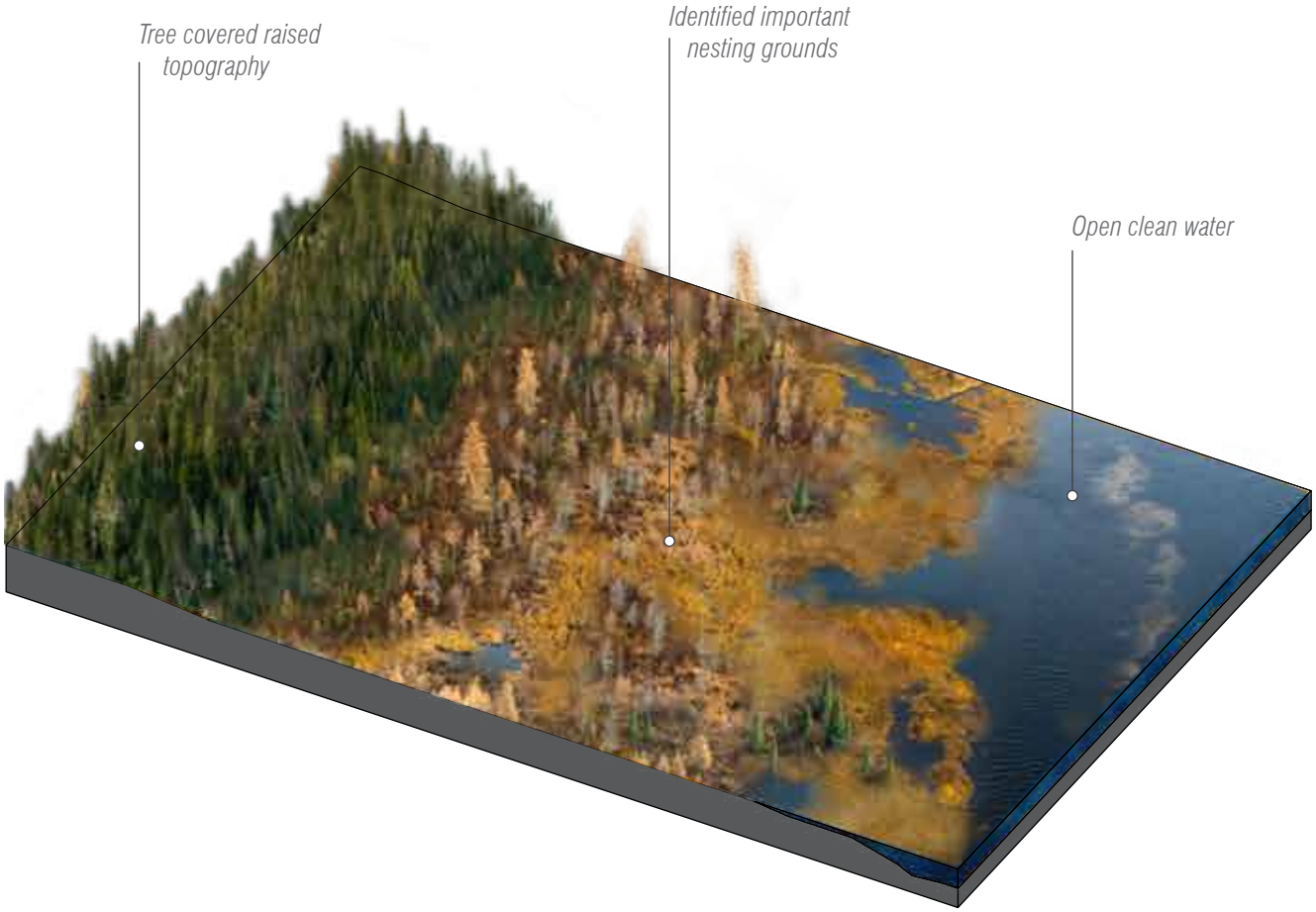
Phase 2

Primary economic activity of community is mining.

Phase 3

Workers in new concentrated population centers continue to operate mining sites that have been transformed into rewnewable energy production sites.

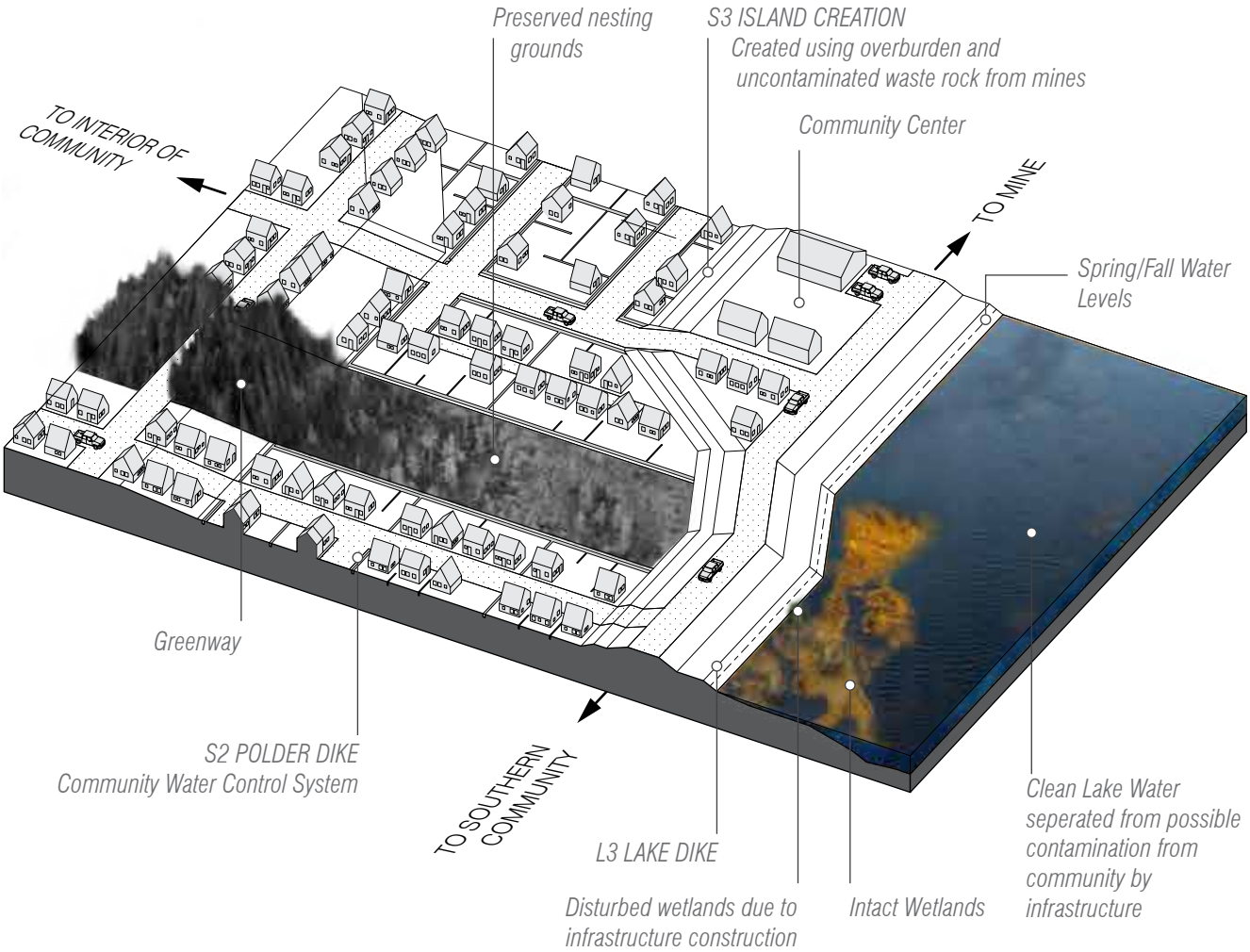




PHASE 1 | EXISTING

Fig. 3.39

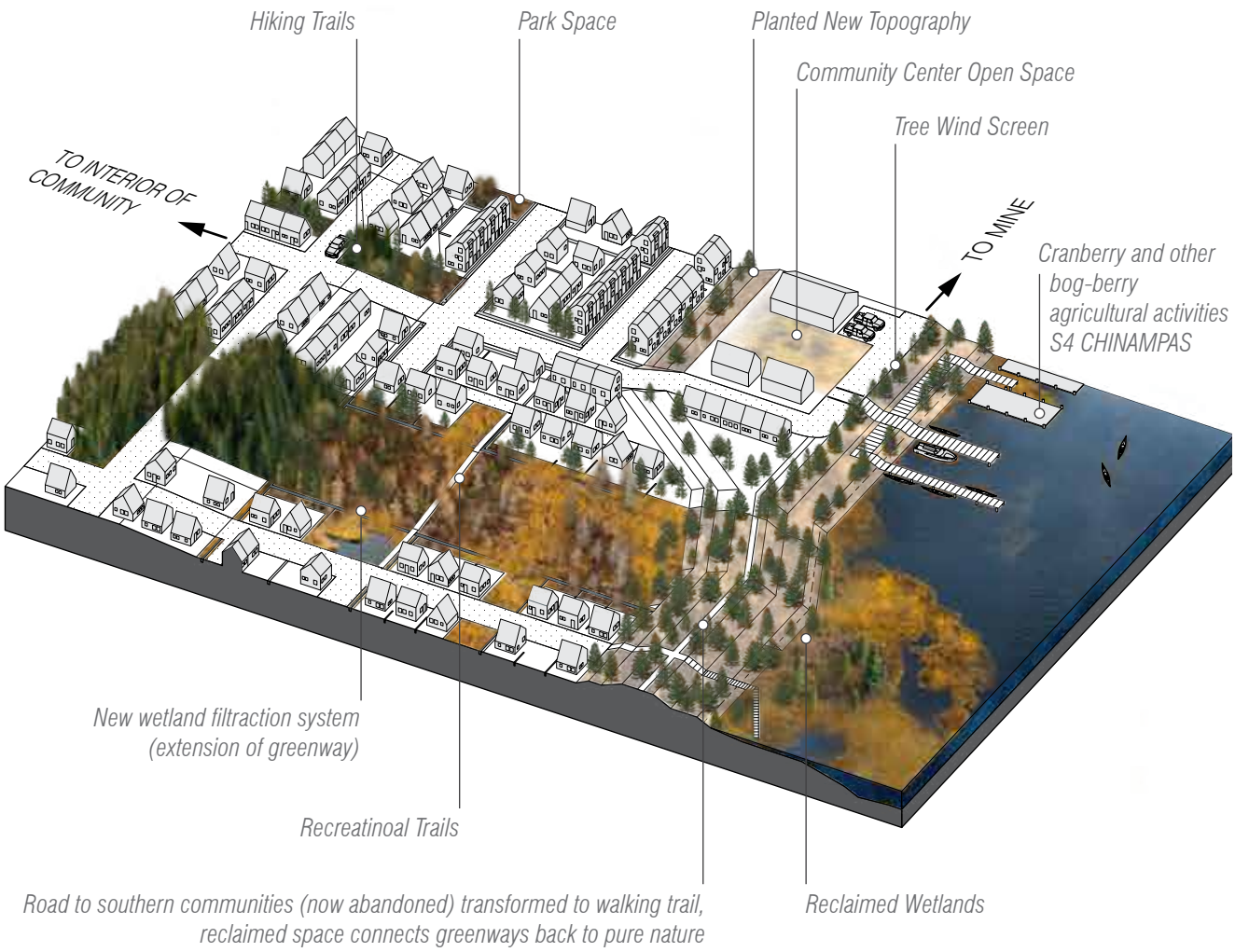
Existing condition of an area projected for community development. The area transitions from forest cover on well-drained slightly sloped topography to stunted forest growth and marshlands around the edge of an existing lake. An important nesting ground for bird migration is identified as an area to be protected during the community's construction.



PHASE 2 | EXTRACTION

Fig. 3.40

Using the uncontaminated overburden of the nearby extraction site a lake dike is created along the existing shore creating the infrastructure that provides access to the extraction operation and protects the existing clean water from the community's water system. Within the community polder dikes channel water in lower lying areas, exposing land for housing plots. The community facilities are built on the lake dike connected to the main road and well above the spring and fall's high water levels. Though slightly disturbed due to the surrounding construction, the important nesting ground remains intact.



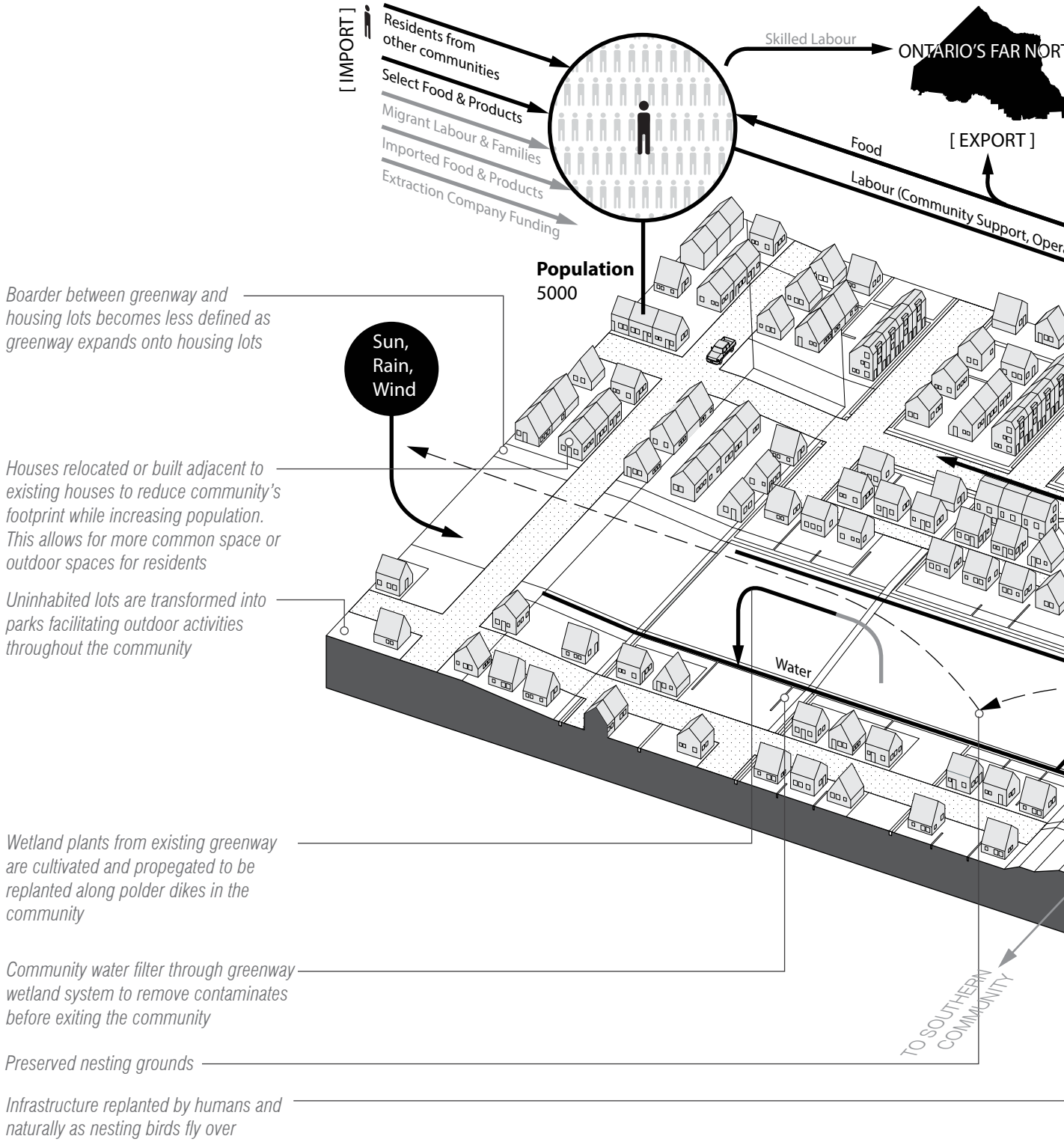
PHASE 3 | POST EXTRACTION

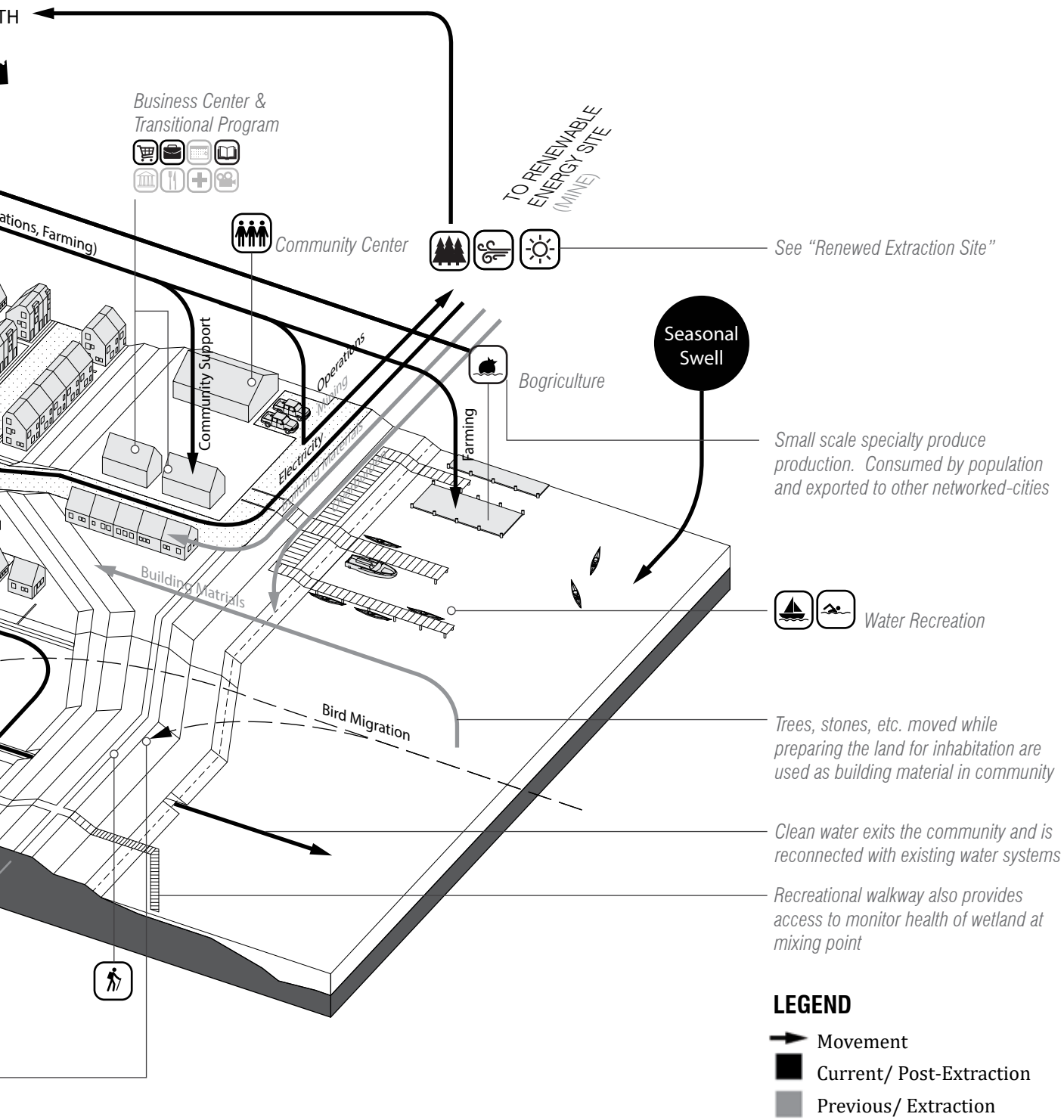
Fig. 3.41

As extraction slows, humans and nature seed the infrastructure, transforming the southern road into a walking trail and creating a wind screen that shields the community from the harsh lake winds. Residents from the now closed southern community relocate to the renewable extraction community, renewing its post-extraction population. Residents work at renewable energy operations on the brownfield site at the closed mine. The greenway expands to incorporate selected polder dikes, naturally filtering water in the now hybrid landscape before exiting the community. Nature reintegrates itself into the community through parks, trails and new greenways.

RENEWABLE EXTRACTION COMMUNTIY

Fig. 3.42




TH
Business Center &
Transitional Program
TO RENEWABLE
ENERGY SITE
(MINE)
ations, Farming)
Community Center
See "Renewed Extraction Site"
Seasonal
Swell
Community Support
Operations
Mining
Electricity
Farming
Bogriculture
Small scale specialty produce
production. Consumed by population
and exported to other networked-cities
Building Matrials
Water Recreation
Bird Migration
Trees, stones, etc. moved while
preparing the land for inhabitation are
used as building material in community
Clean water exits the community and is
reconnected with existing water systems
Recreational walkway also provides
access to monitor health of wetland at
mixing point
LEGEND
Movement
Current/ Post-Extraction
Previous/ Extraction

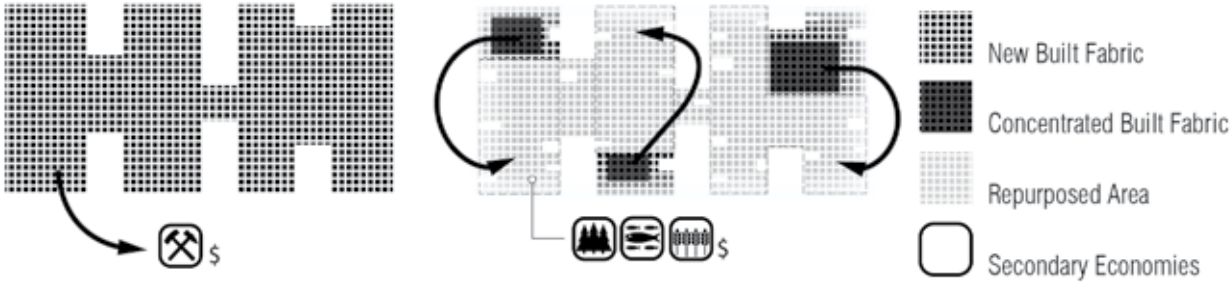
MERGED LOT PERMACULTURE COMMUNITY

The second community sample is taken from the edge of a proposed outer community. The objective is to use the disinhabited land to generate food and energy for the community and networked cities. This community is close enough to the central ones that it remains viable for some residents to stay in the area once extraction moves elsewhere in the Ring of Fire or the country, but it is assumed a large portion of residents will relocate either to the central communities to work at the renewable extraction sites or else out of the Ring of Fire completely. Prefabricated houses are disassembled and transported to either of these new locations. Lots that were once inhabited are now agglomerated with their neighbouring ones, whose inhabitants remain in the community. This will allow for larger lots to be used for new productive, non-finite activities such as agroforestry, aquaculture and bogriculture. Community members who want to stay in this particular community but do not wish deal with the costs of the larger production areas densify small areas of the community, revealing yet more land for production. Workers in these small communities are employed by the productive lots or operate small local businesses. Besides infrastructure, only activities with no impact on the ecosystem will be established.

def'n bogriculture
farming of edible plant organism that grow specifically in bogs or marshlands, such as cranberries, wild rice and various other herbs and berries.

COMMUNITY FABRIC

Fig. 3.43



Phase 2

Primary economic activity of community is mining.

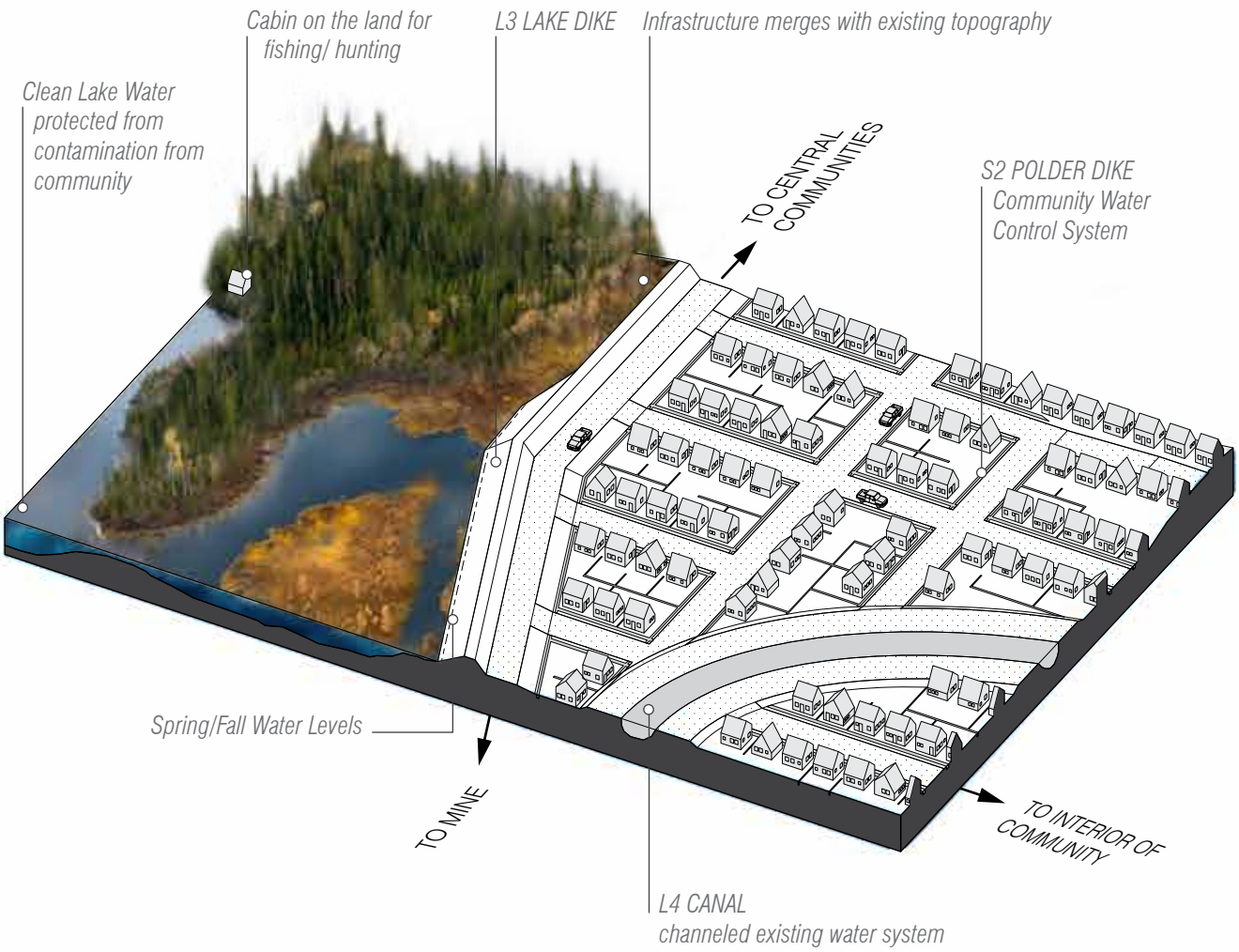
Phase 3

Workers in new concentrated population centers operate production lots, formed by merging numberous uninhabited lots. The activities include agroforestry, acquaculture and bogriculture.

PHASE 1 | EXISTING

Fig. 3.44

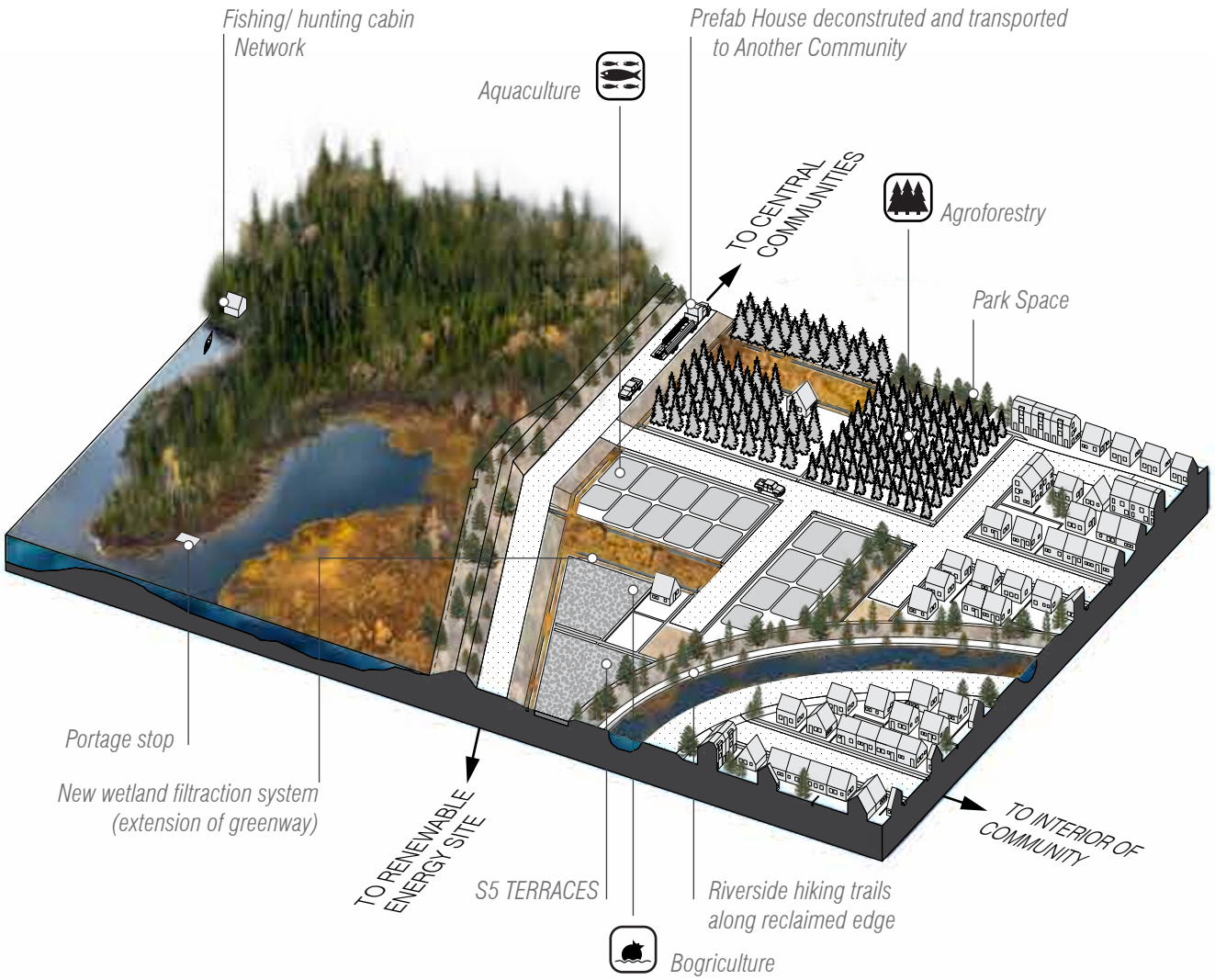
Existing condition of an area projected for community development. The area is covered in wetlands with small patches of boreal forest on higher grounds. A river traversing the wetlands connects two lakes and has been deemed an important feature to maintain for water transportation.



PHASE 2 | EXTRACTION

Fig. 3.45

A lake dike is created across the wetlands using uncontaminated overburden and waste rock, dividing the area into nature and community. The infrastructure is no longer required when it encounters raised topography but the road continues on the existing level as well as other services such as water, electricity and Internet that are run parallel. The waterway connecting the two lakes remains for transportation, however it is walled and managed to regulate water quality exiting the community. A cabin for outdoor activities is located close to the canal allowing overnight stopovers to tourists traveling the area or for community residents.



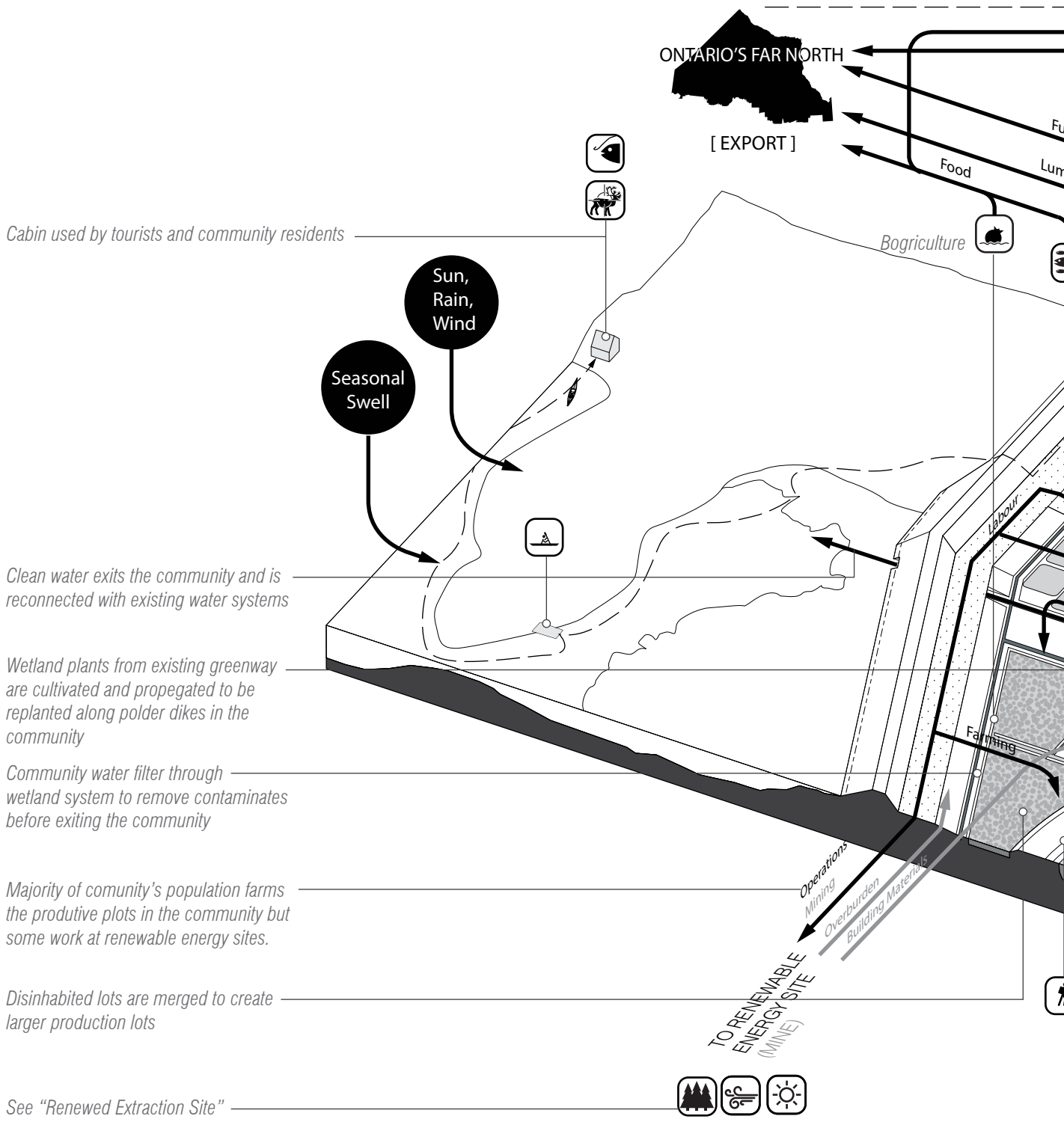
PHASE 3 | POST EXTRACTION

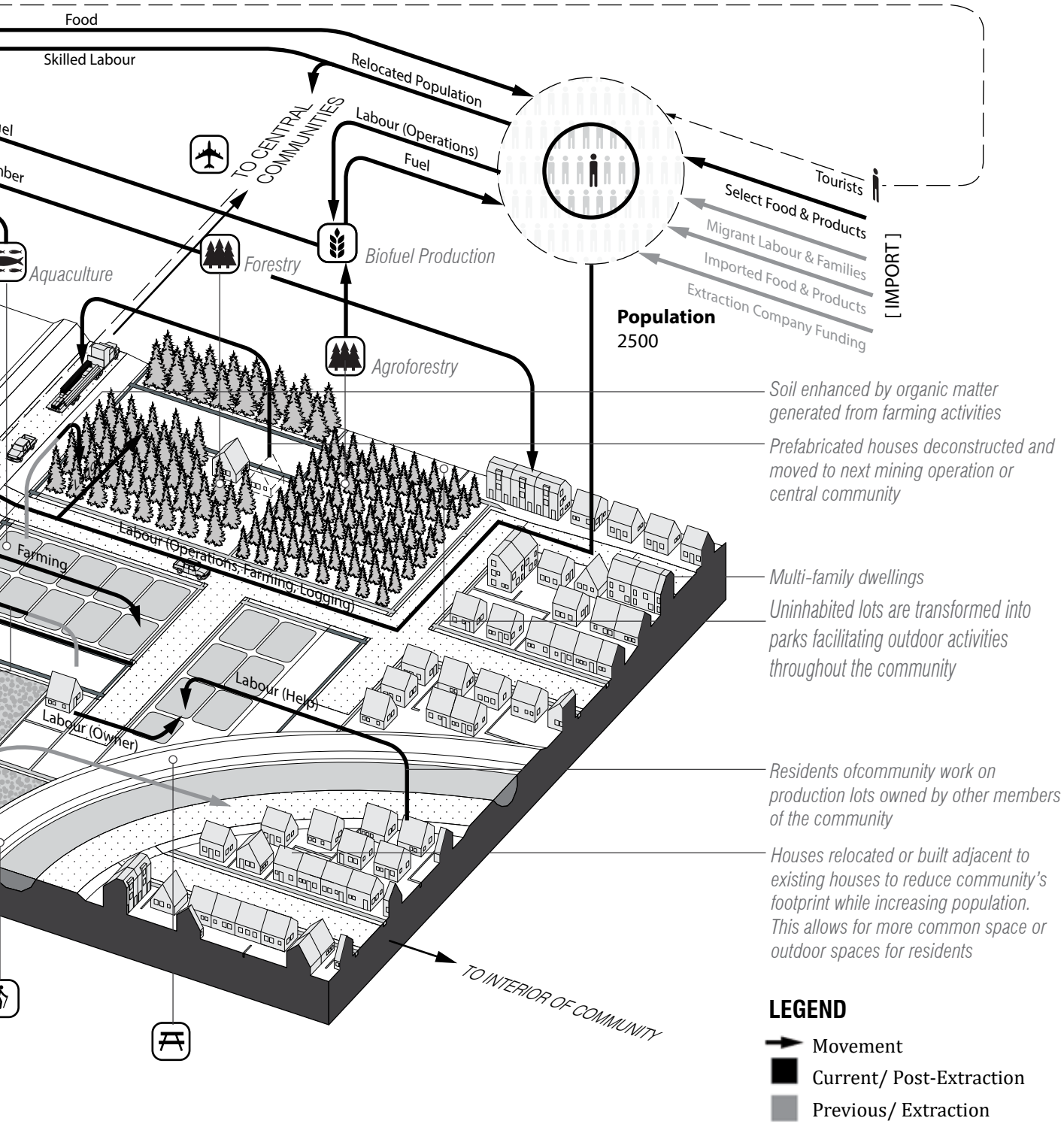
Fig. 3.46

As extraction slows the population of the community is greatly reduced. Prefabricated houses are disassembled and transported to new communities. Vacated land is merged into larger productive lots to create new ways of generating revenue within the community such as aquaculture, agroforestry and bogriculture. Residents who do not own the land but continue to work at these secondary economies also agglomerate in small dense pockets. Portage stops and designated campsites further enhance the excursion network. The infrastructure and canal edge are reclaimed by nature.

MERGED LOT PERMACULTURE COMMUNITY

Fig. 3.47





Soil enhanced by organic matter generated from farming activities

Prefabricated houses deconstructed and moved to next mining operation or central community

Multi-family dwellings

Uninhabited lots are transformed into parks facilitating outdoor activities throughout the community

Residents ofcommunity work on production lots owned by other members of the community

Houses relocated or built adjacent to existing houses to reduce community's footprint while increasing population. This allows for more common space or outdoor spaces for residents

LEGEND

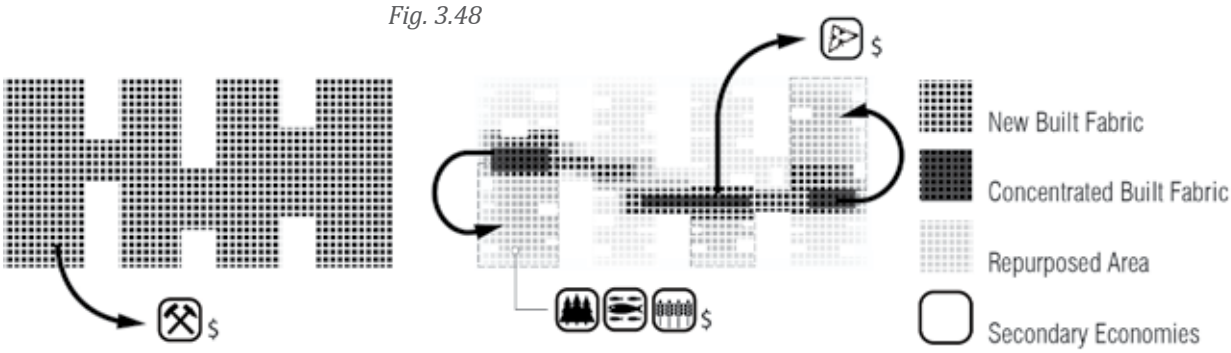
- Movement
- Current/ Post-Extraction
- Previous/ Extraction

LINEAR CONCENTRATED COMMUNITY

In the third sample, also taken from a proposed outer community, a significant river runs through the center whose course must be preserved. The objective is to agglomerate the population along the existing infrastructure, reducing the community's footprint and maximizing the space for new productive and reclaimed areas. River dikes are created to both protect the river's water quality and guide its course; but between dikes, the river is given the freedom to move naturally. Like all other communities, the population will decrease following the end of extraction in the area. However, this specific community's population is planned to reduce significantly—down to only a couple hundred—and all remaining inhabitants will relocate along the infrastructure running through the center of the community, thus allowing the perimeter infrastructure to be reclaimed by nature and reduce the road maintenance to a single road. The built fabric thus contracts, and buildings now protect each other from the harsh climates. Travel distances are now also reduced for residents. Select abandoned plots will be transformed into productive lots, however most of the dis-inhabited land will be taken over by nature, which will enlarge the community's green ways almost to the point of dividing its original footprint in half. Those remaining in the community will be mainly employed by tourism activities. They will maintain and operate either the reclaimed parklands of the community, the new provincial park of completely reclaimed nearby communities or the existing Attawapiskat Provincial Park. The community center provides facilities for these new industries, but also allows space for transitional programs such as cinemas or art galleries.

COMMUNITY FABRIC

Fig. 3.48

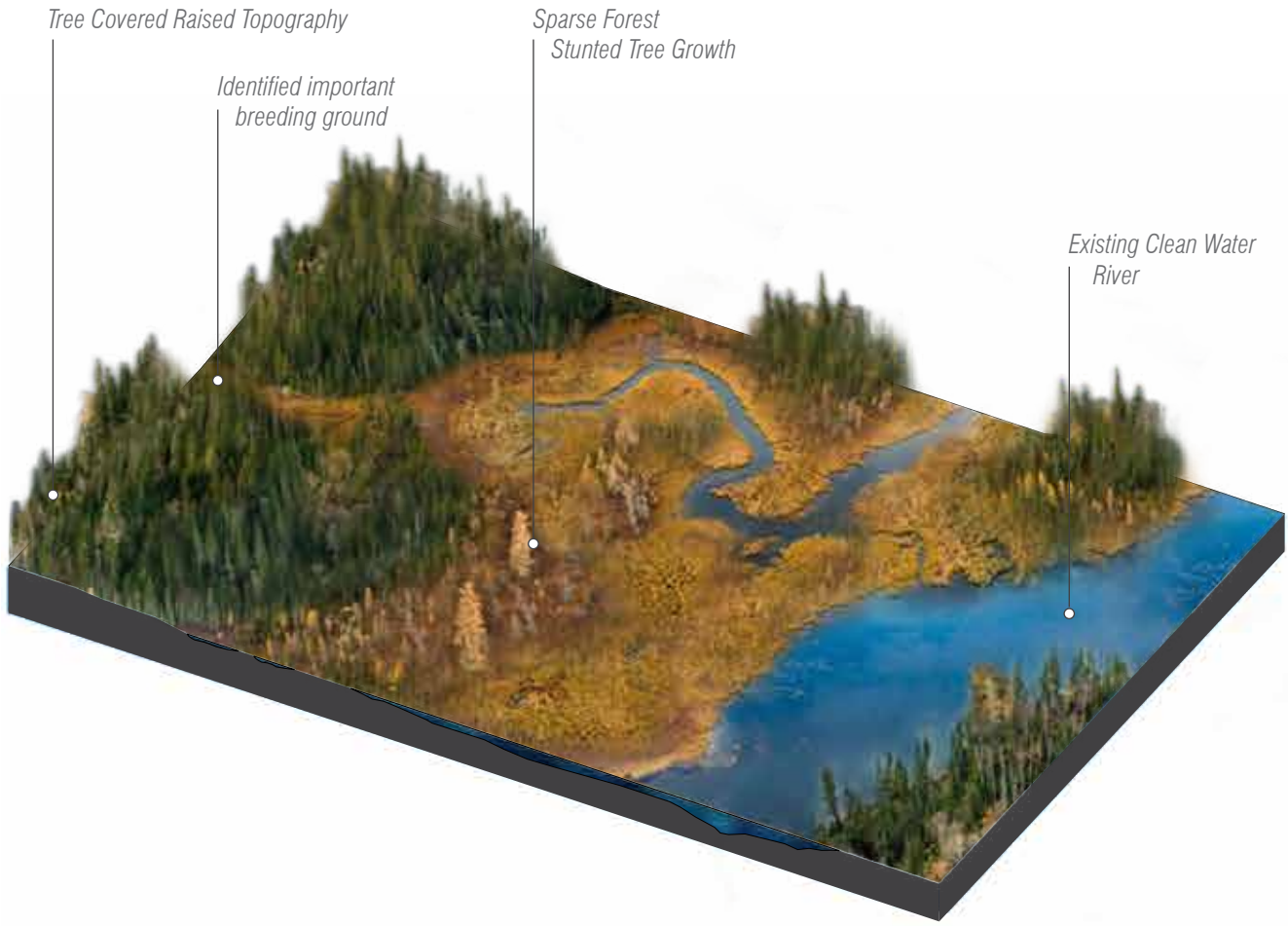


Phase 2

Primary economic activity of community is mining.

Phase 3

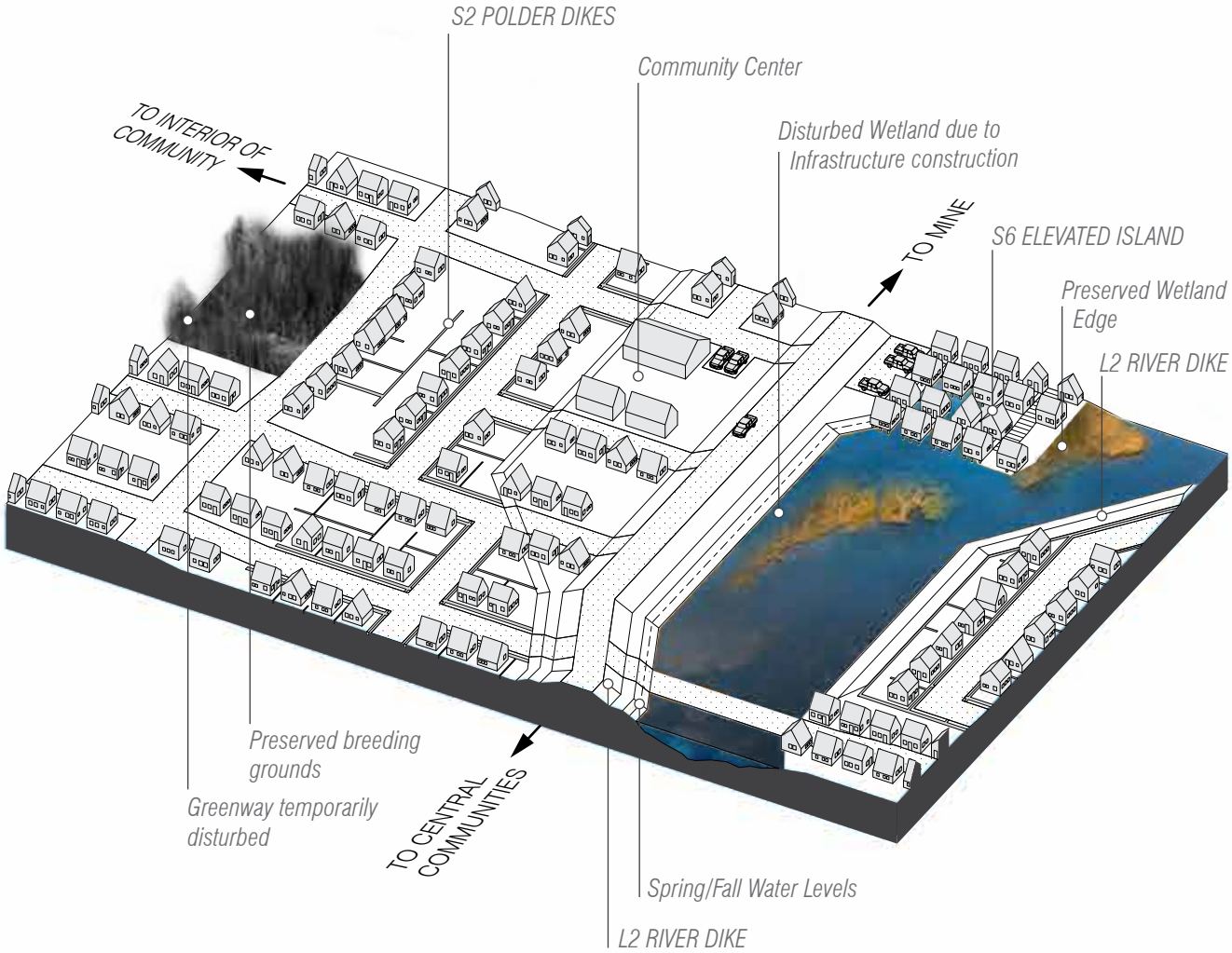
Workers in new concentrated population centers along the primary infrastructure operate and maintain nearby Provincial Parks.



PHASE 1 | EXISTING

Fig. 3.49

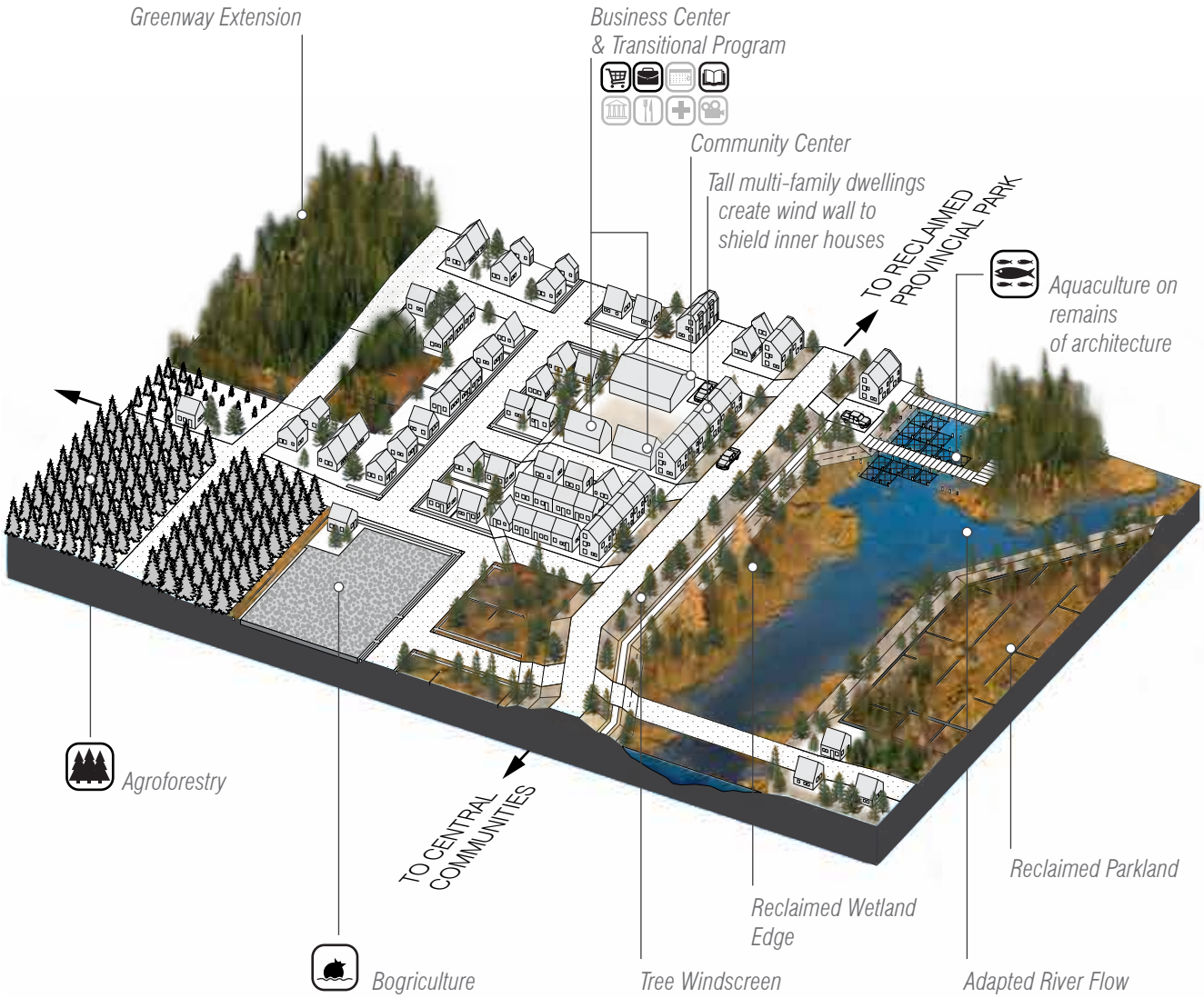
Existing condition of an area projected for community development. The large river running through the area has been identified as an important drainage waterway and habitat that should be maintained. An important marten breeding ground has also been identified for protection.



PHASE 2 | EXTRACTION

Fig. 3.50

A river dike is constructed on each side of the major river. The dikes are created with uncontaminated overburden and waste rock and generate a transportation spine through the interior of the community to which community programs are attached. The infrastructure's construction has disturbed the wetlands edging the river. Polder dikes control the water within the community. Some houses are created on elevated islands above the spring and fall high water level extending above the disturbed wetlands on the other side of the infrastructure to also occupy an existing island. The identified important breeding grounds are preserved with a greenway.



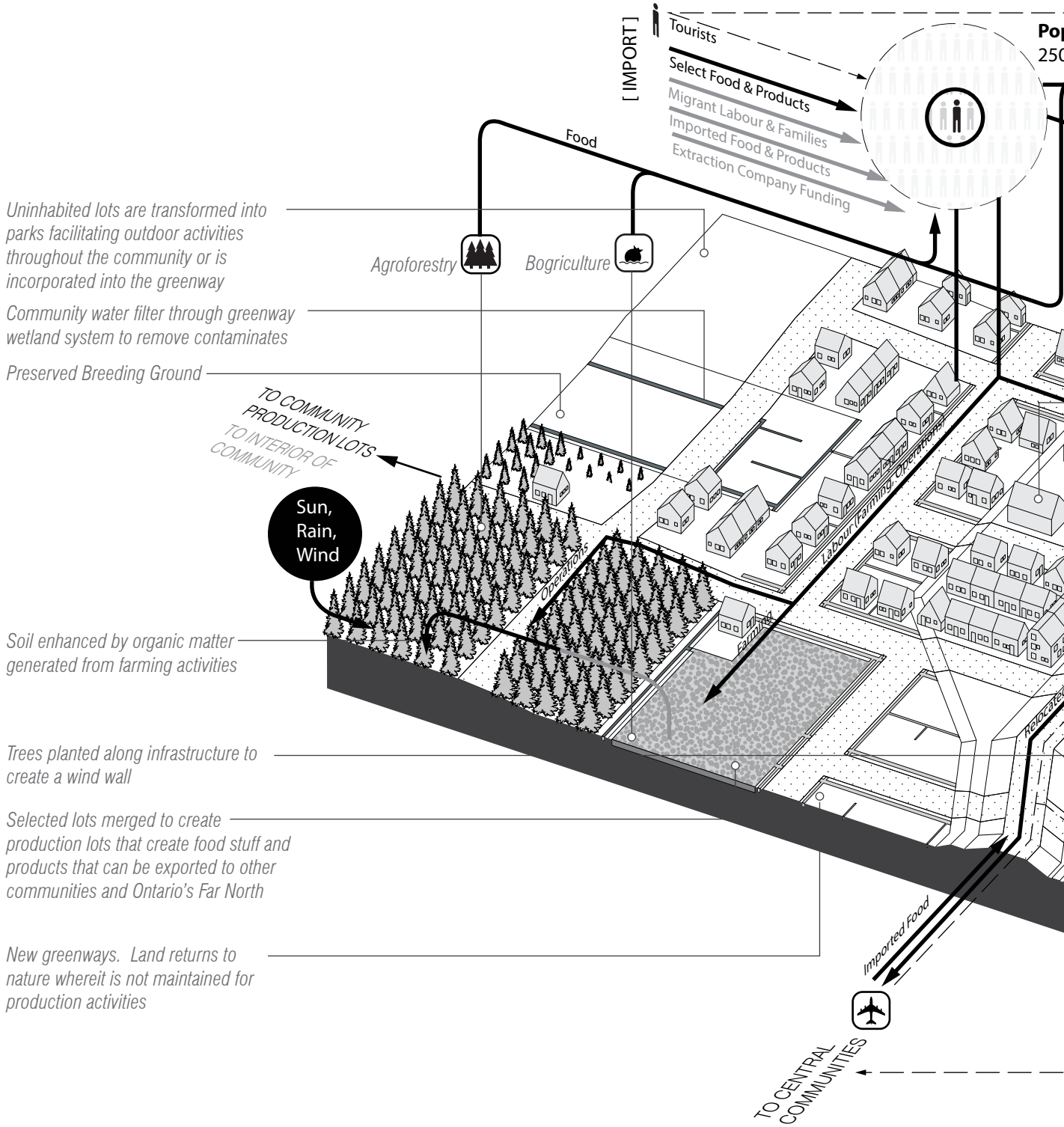
PHASE 3 | POST EXTRACTION

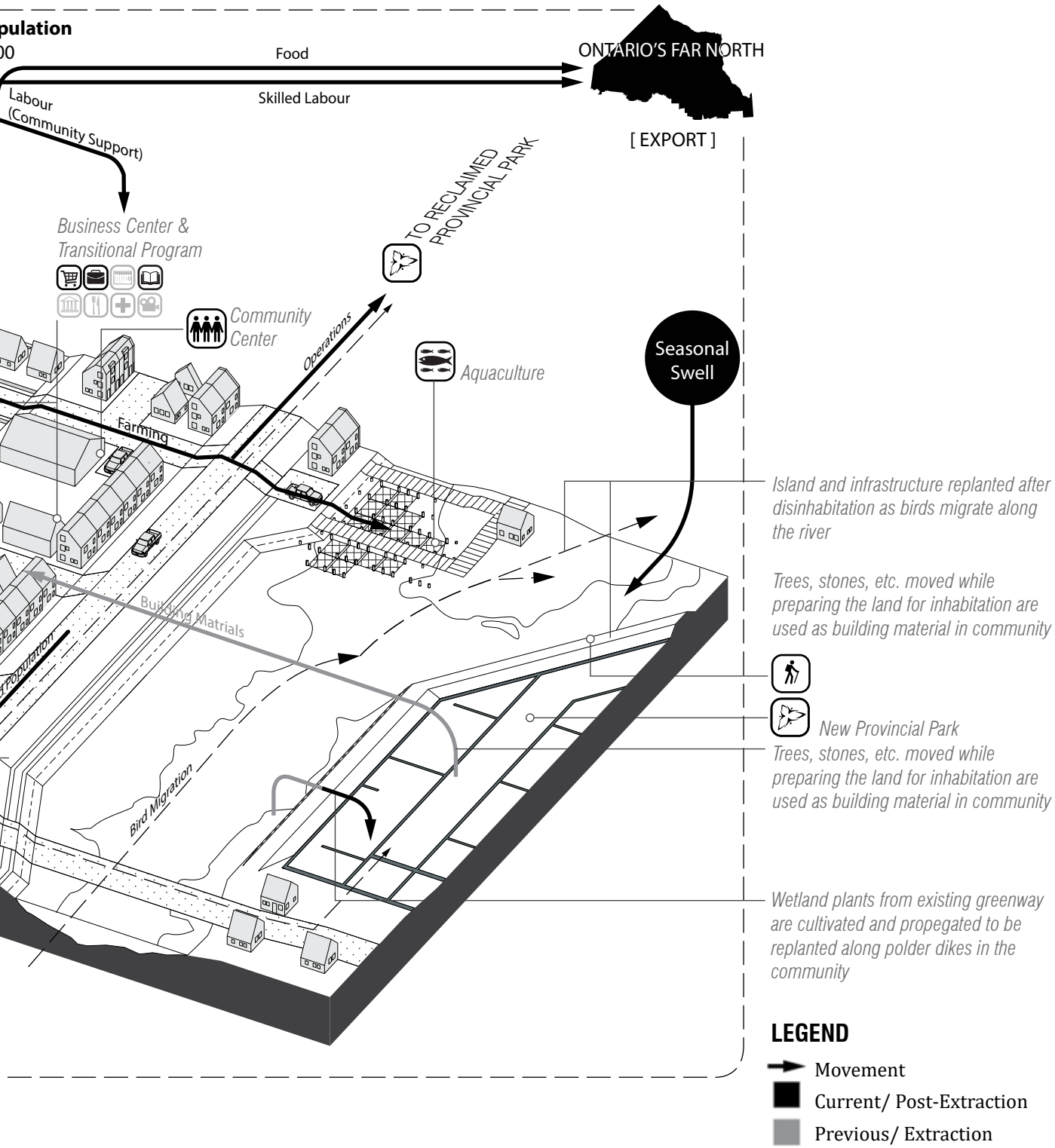
Fig. 3.51

v

LINEAR CONCENTRATED COMMUNITY

Fig. 3.52




pulation
00
Food
ONTARIO'S FAR NORTH
Skilled Labour
Labour
(Community Support)
[EXPORT]
TO RECLAIMED
PROVINCIAL PARK
Business Center &
Transitional Program
Community
Center
Operations
Aquaculture
Seasonal
Swell
Farming
Building Matrials
Bird Migration
Island and infrastructure replanted after disinhabitation as birds migrate along the river
Trees, stones, etc. moved while preparing the land for inhabitation are used as building material in community
New Provincial Park
Trees, stones, etc. moved while preparing the land for inhabitation are used as building material in community
Wetland plants from existing greenway are cultivated and propegated to be replanted along polder dikes in the community
LEGEND
Movement
Current/ Post-Extraction
Previous/ Extraction

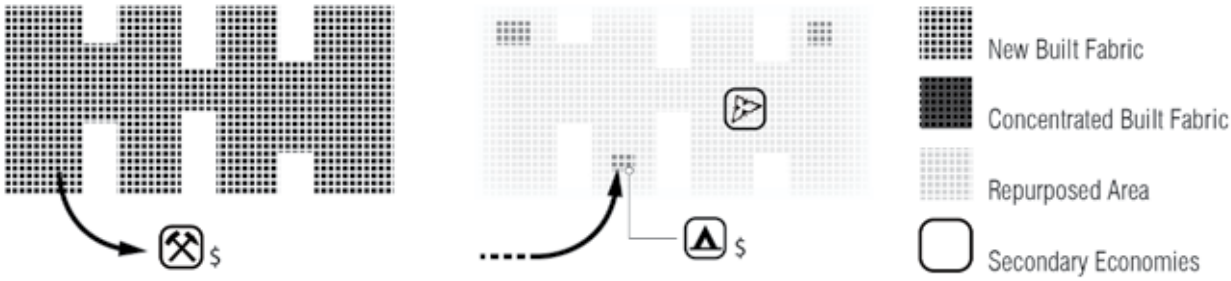
UNURBANIZED RECREATIONAL LANDSCAPE

The fourth and final community sample is taken at the edge of an outer community, at the farthest periphery of the network-city. The objective is to allow the disinhabited land to return to nature but continue to be economically productive. A very quiet community during extraction, it is completely dis-inhabited post-extraction. Residents relocate either to the central communities to work at the renewable extraction sites or out of the Ring of Fire completely. Their houses have been either disassembled for parts or relocated. Though this community might be perceived as suffering from ghostification, it is a planned deterioration: the land becomes operational afterwards and continues to act as a productive part of the Ring of Fire's post-extraction economy. Selected road sections remain operational on the site, transforming the area into an accessible Provincial Park with campgrounds on old housing lots and hiking trails along reclaimed road networks. Tourists can now visit the Ring of Fire to experience this hybrid landscape first-hand. Camp sites in the further periphery are more private, as only every other plot is maintained as a campsite. Now an "unurbanized recreational landscape", the community is maintained and operated by the residents of nearby communities.

def'n ghostification
the process of physical decline associated with resource dependant towns, or the process of becoming a ghost town

COMMUNITY FABRIC

Fig. 3.53

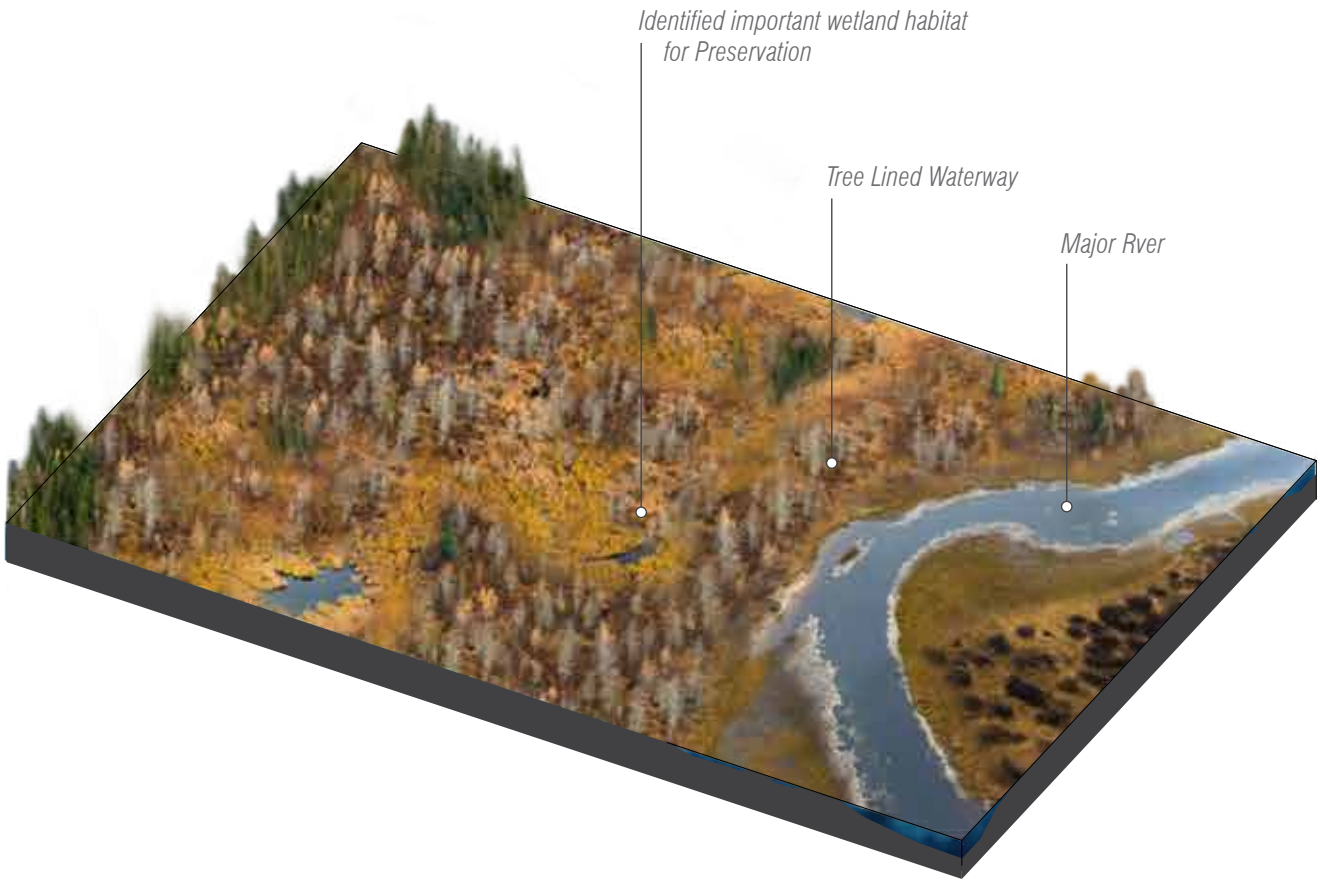


Phase 2

Primary economic activity of community is mining.

Phase 3

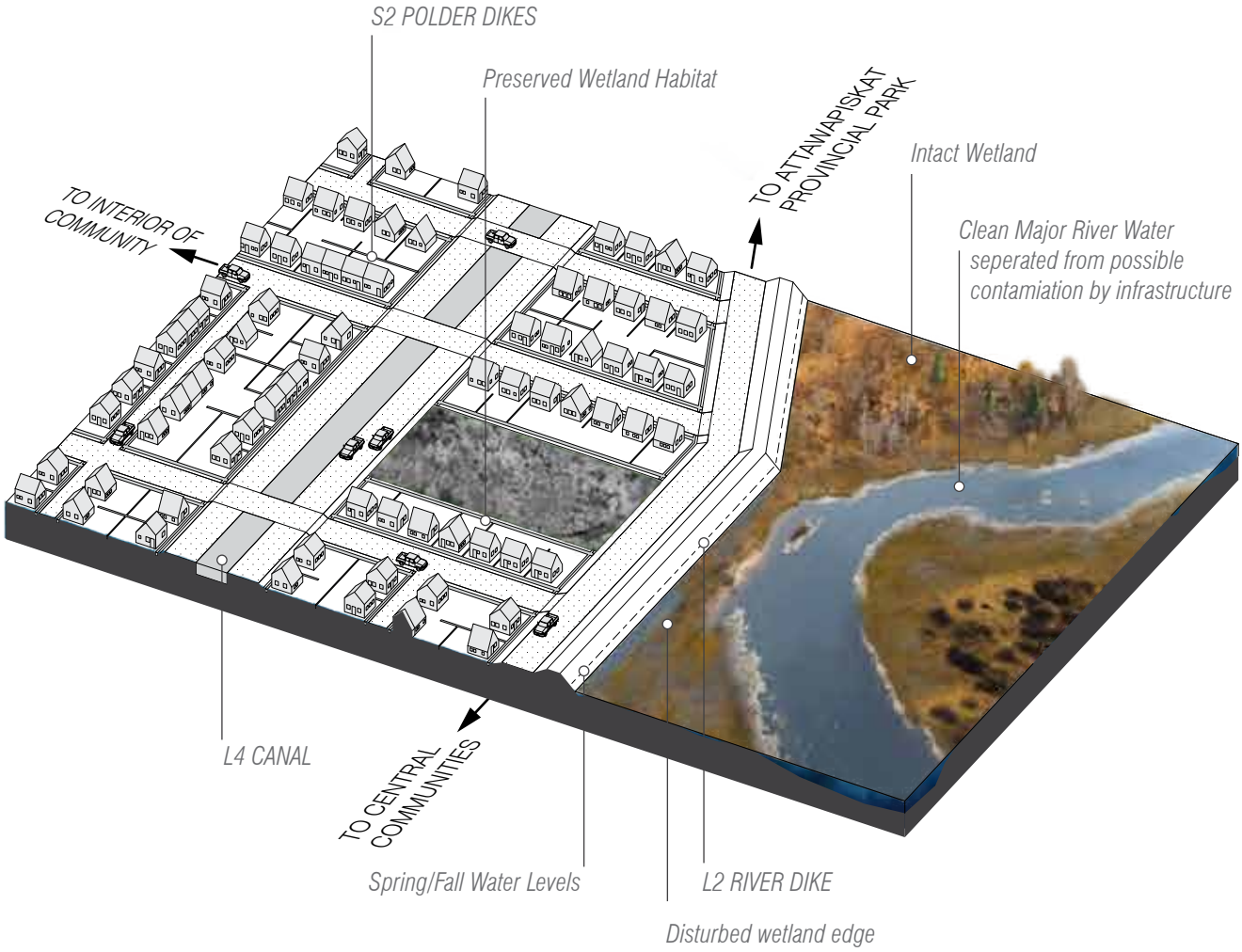
There is no population in the community anymore, as it has been transformed into a Provincial Park. Nearby communitites operate and maintain the transformed community.



PHASE 1 | EXISTING

Fig. 3.54

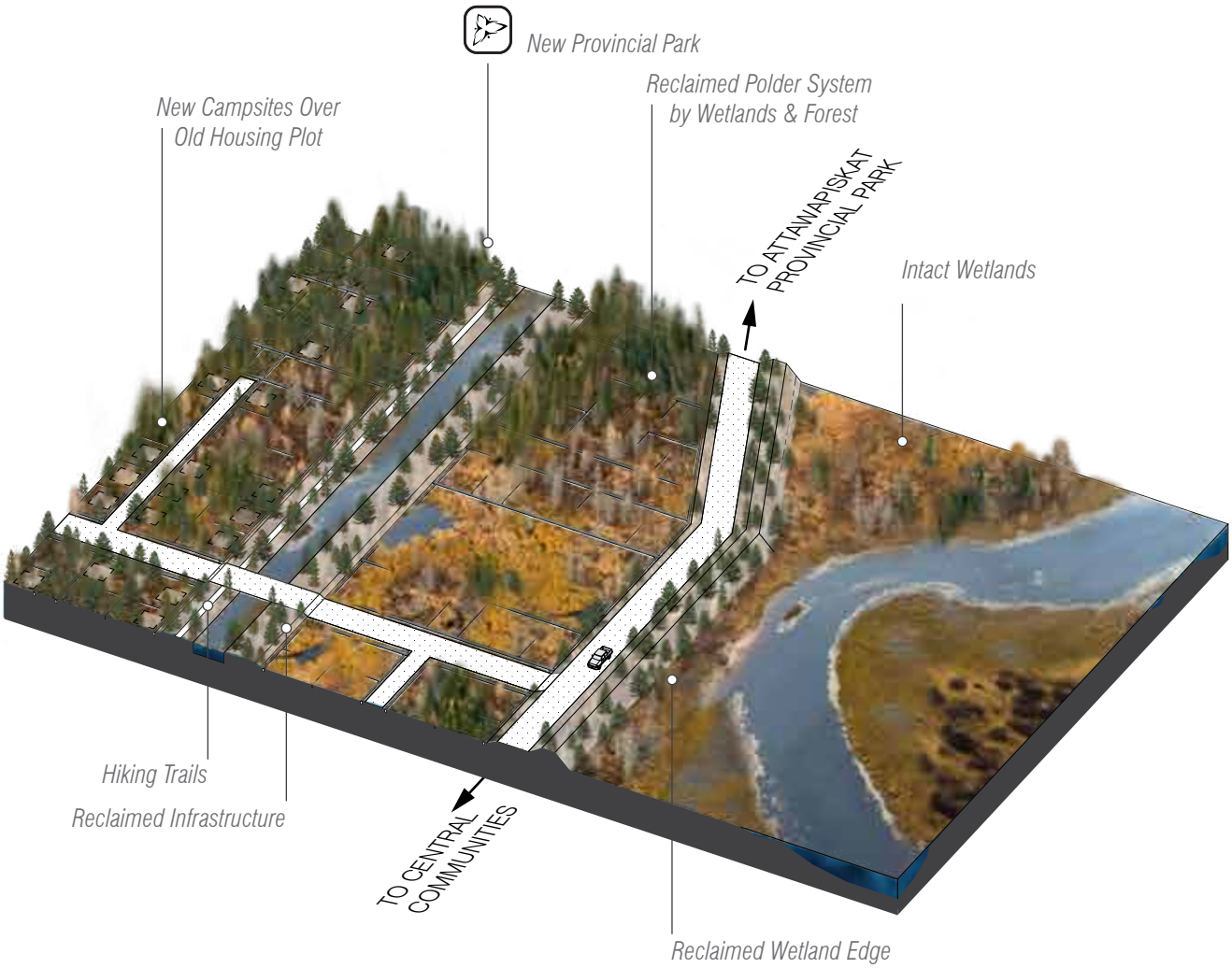
Existing condition of an area projected for community development. The area is predominantly covered in wetlands with no significant forests or topography changes. A major river runs next to the proposed community and because of the flatness of the area, its width expands significantly during the spring and fall seasons. An important wetland habitat is identified as an area to be protected during the community's construction.



PHASE 2 | EXTRACTION

Fig. 3.55

Using the uncontaminated overburden and waste rock of the nearby extraction site a river dike is created enough distance away from the river to prevent eroding of the infrastructure. The infrastructure provides residents with access to extraction operations, other communities and Attawapiskat Provincial Park. Due to the large amount of water in the area a canal is created within the community, in addition to the polder dikes, to channel larger amounts of water. Though slightly disturbed due to the surrounding construction, the important wetland habitat remains intact.



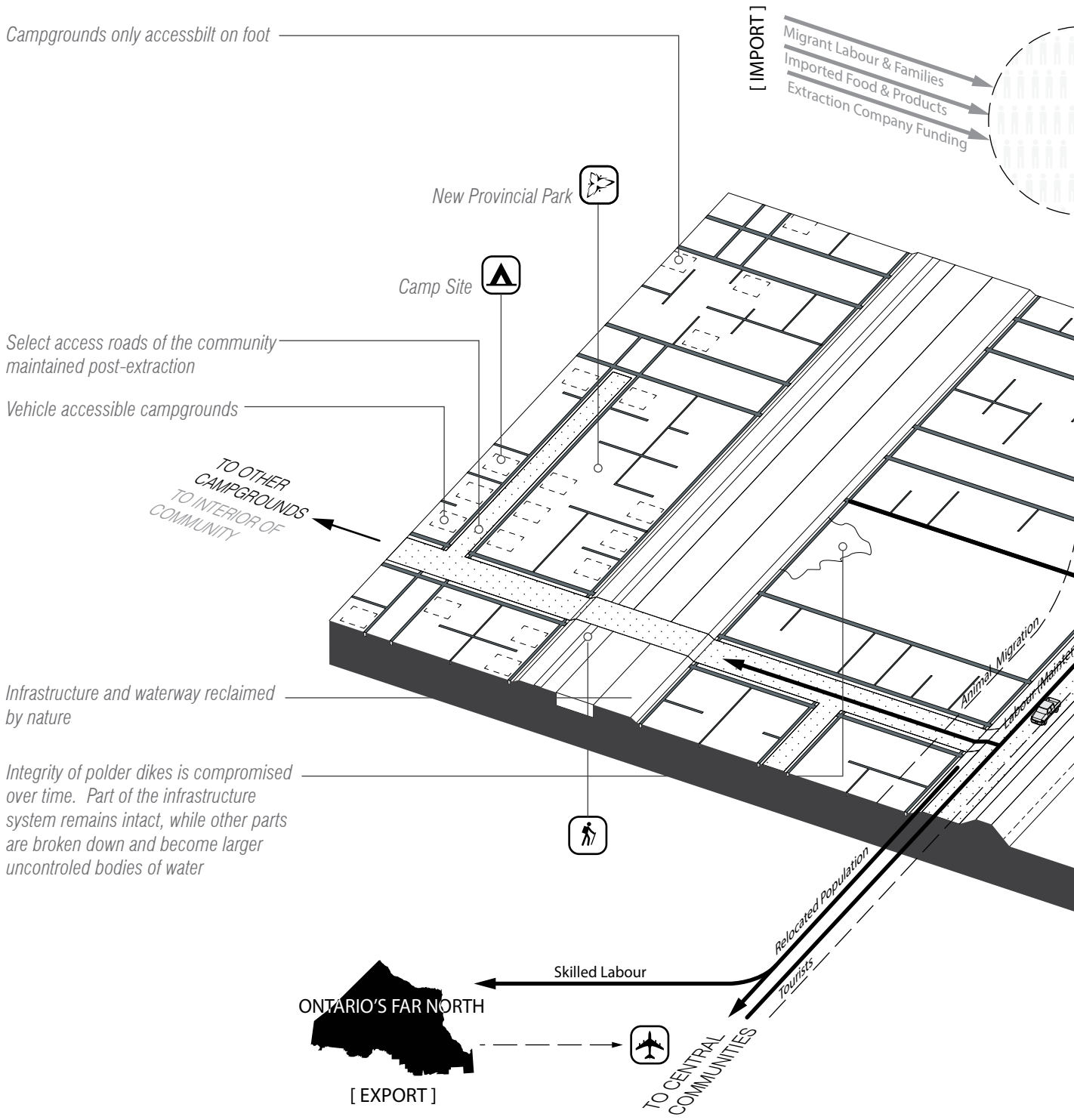
PHASE 3 | POST EXTRACTION

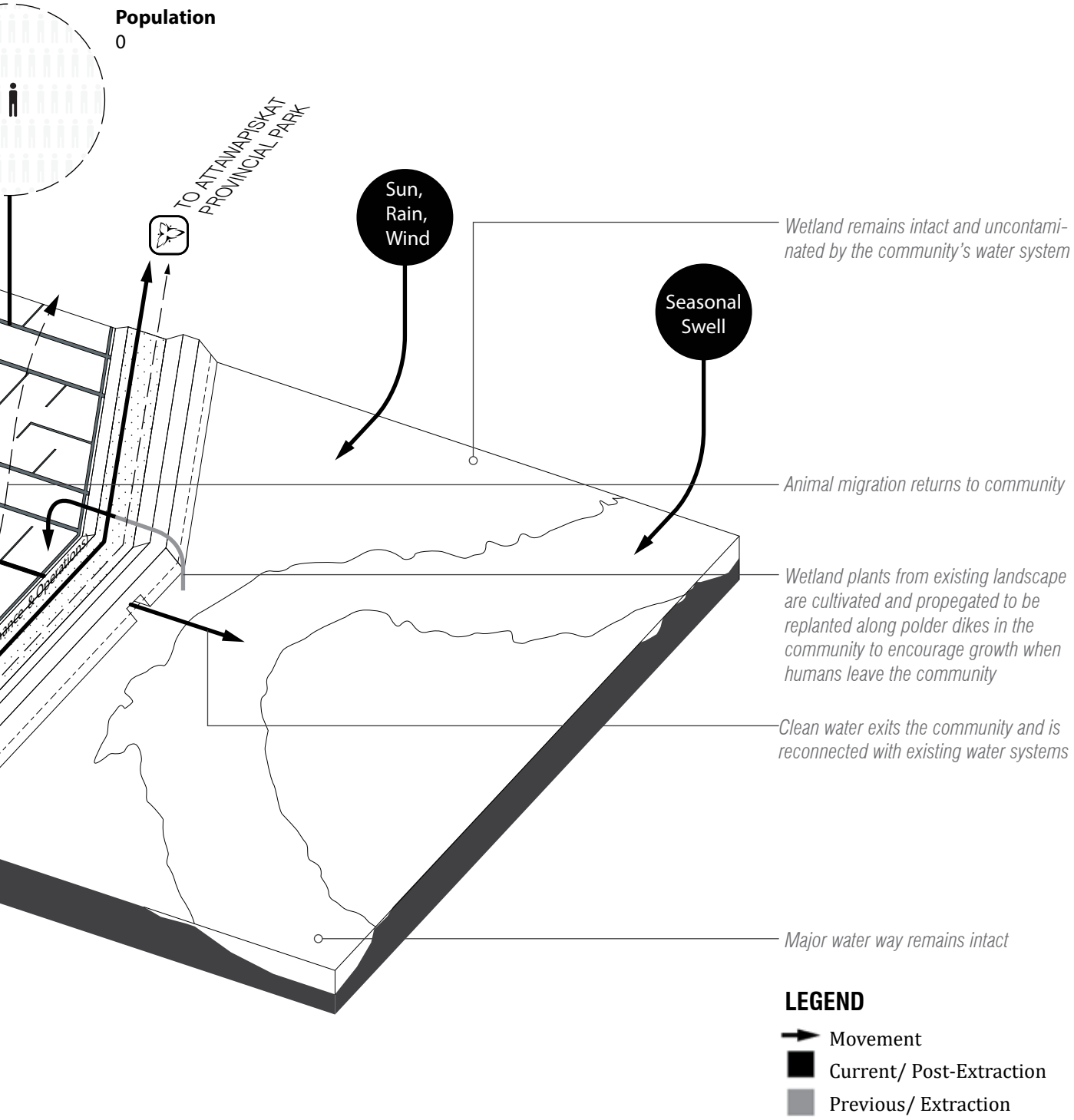
Fig. 3.56

Residents move along with the extraction operations as it leaves the area or relocate into a more centralized community, dis-inhabiting the community all together. Houses are relocated or reused, only their plots remaining. The landscape cultivated between houses becomes the dividers between campsites, whose clearing over old housing plots are maintained by park workers. Select roads are maintained to access these sites, however the majority of the site, infrastructure and all, are returned to nature, with the help of the park's rangers as necessary. The community turns into a hybrid landscape Provincial Park.

UNURBANIZED RECREATIONAL LANDSCAPE

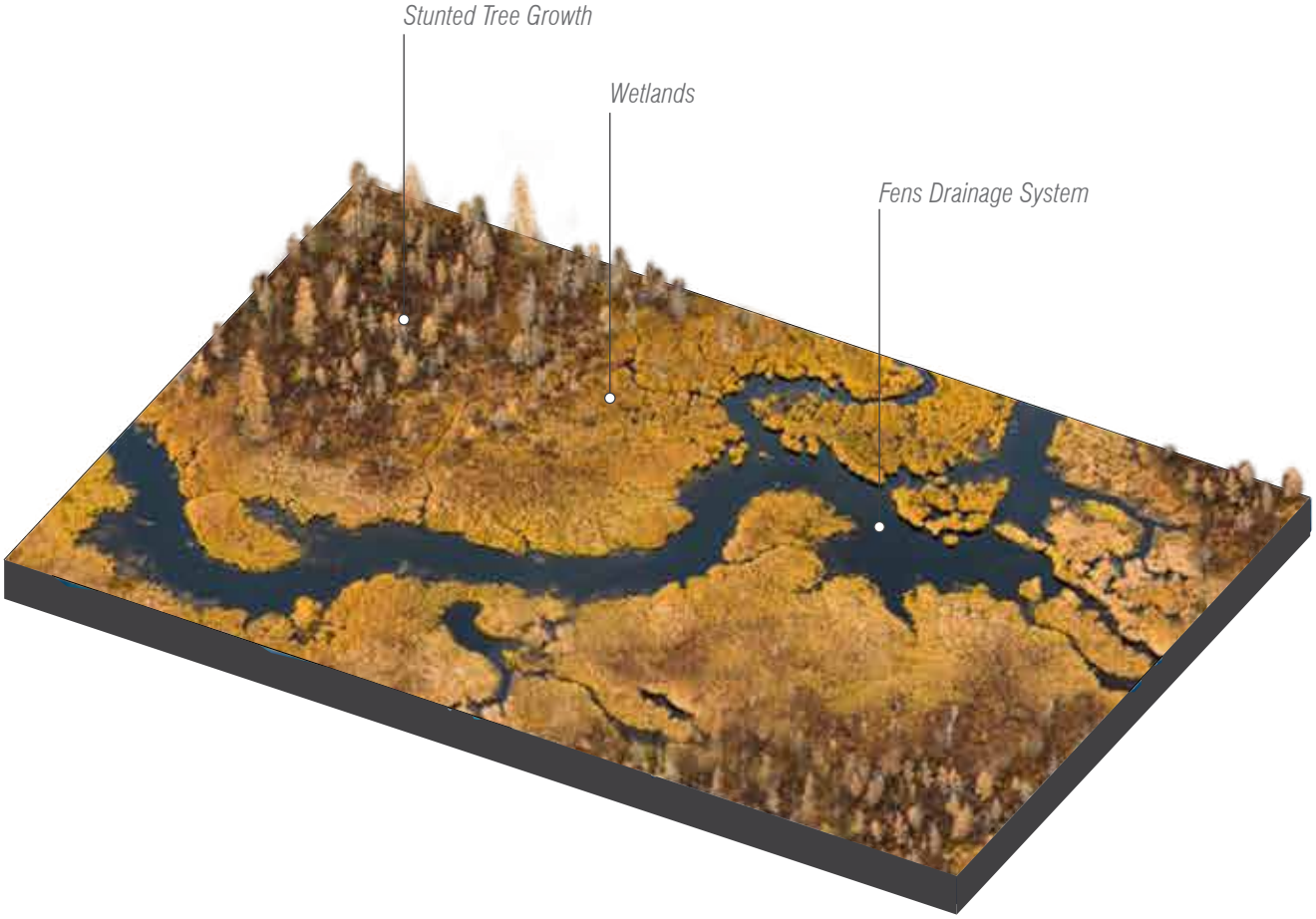
Fig. 3.57




Population
0
TO ATTAWAPISKAT PROVINCIAL PARK
Sun, Rain, Wind
Seasonal Swell
Wetland remains intact and uncontaminated by the community's water system
Animal migration returns to community
Wetland plants from existing landscape are cultivated and propegated to be replanted along polder dikes in the community to encourage growth when humans leave the community
Clean water exits the community and is reconnected with existing water systems
Major water way remains intact
LEGEND
Movement
Current/ Post-Extraction
Previous/ Extraction

RENEWED EXTRACTION SITE

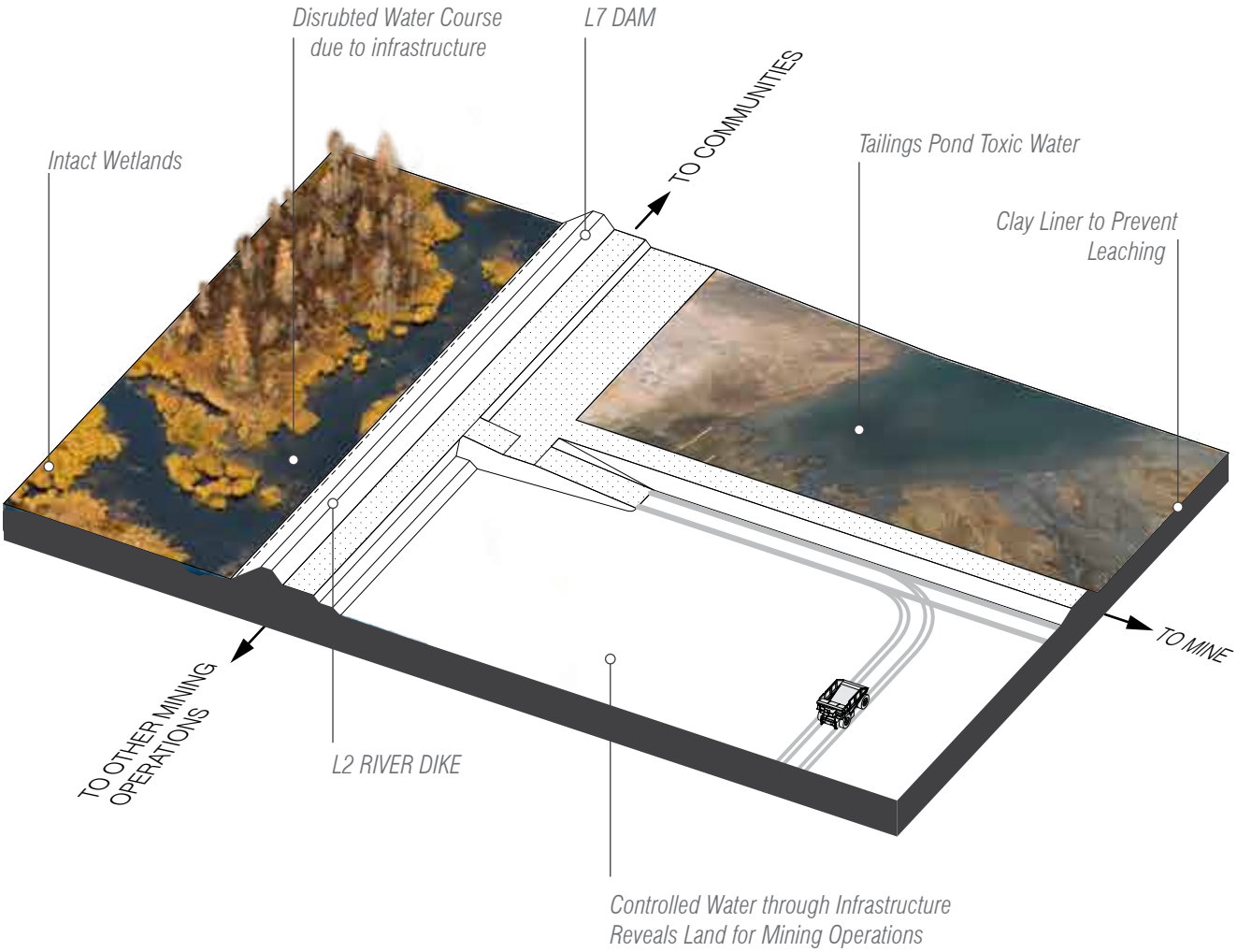
The first operation sample is taken at the edge of a projected mining operation's tailings pond. The objective is to continue to use the mine's territory for non-finite economic activities, providing work for the networked-city's inhabitants. In order to protect the ecosystems in the Ring of Fire, new infrastructure is created to separate the existing natural water systems from the contamination of the extraction industry. The clean layer of topsoil is removed from the mining site and stored for later use. Post-extraction, new companies specializing in renewable energy production, or other branches of the extraction companies, will come to the area to renew extraction on the site, this time to acquire renewable products. These large operations will employ residents of the local communities. The stored topsoil will be spread across uncontaminated parts of the site and used for agroforestry, while remediated parts also employ technological means of producing renewable energy. For instance, solar panels will be erected over part of the brownfield site to harvest energy from the sun. Tailing ponds also provide large flat areas in which the wind can gain speed and so these areas may also be used as wind farms. The quality of infrastructure surrounding the tailing ponds is crucial, however, as methods of remediating toxic waters, while improving, still take decades. The infrastructure separating the clean existing water system from the man-made toxic one can be reclaimed by nature, but they must be kept separate post-extraction until remediation is complete.



PHASE 1 | EXISTING

Fig. 3.58

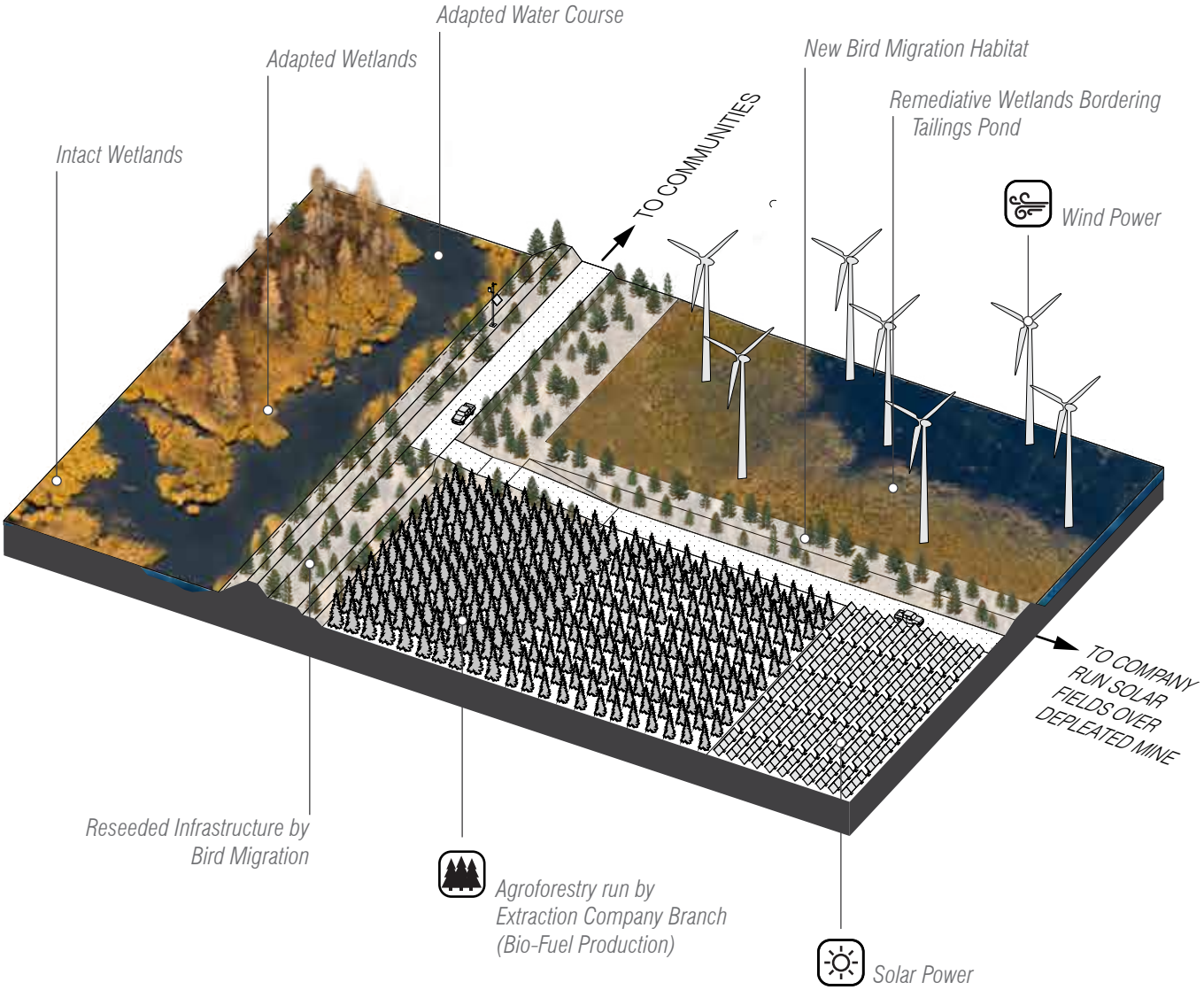
Existing condition of an area projected for extraction. The area is completely flat with no forest cover and any tree growth is stunted due to the saturated soil and bogs. The area's fens drain into the river running through them. No part of this landscape has been identified for preservation.



PHASE 2 | EXTRACTION

Fig. 3.59

To control the presence of water at the extraction site a river dike is created using the uncontaminated overburden and waste rock from a previously developed mine. The top layer of soil of the mining site is removed and stored for later redistribution on the site post-extraction. The infrastructure blocks the river flow increasing the volume of water at the infrastructure's edge as the river finds an alternative route. A clay lined tailings pond is created surrounded by a smaller dike to prevent any toxic materials in the tailings water from seeping into the ecosystem.



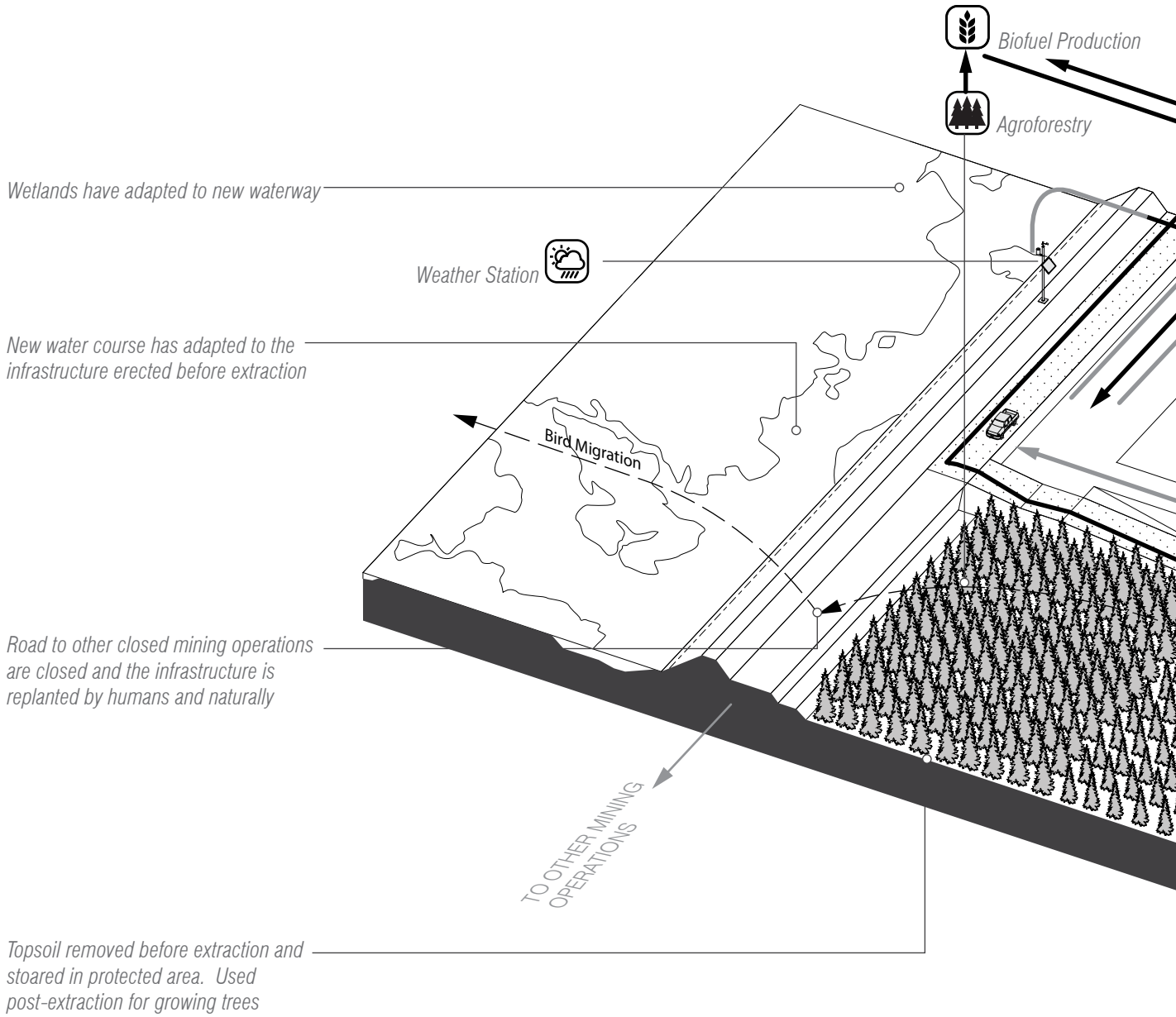
PHASE 3 | POST EXTRACTION

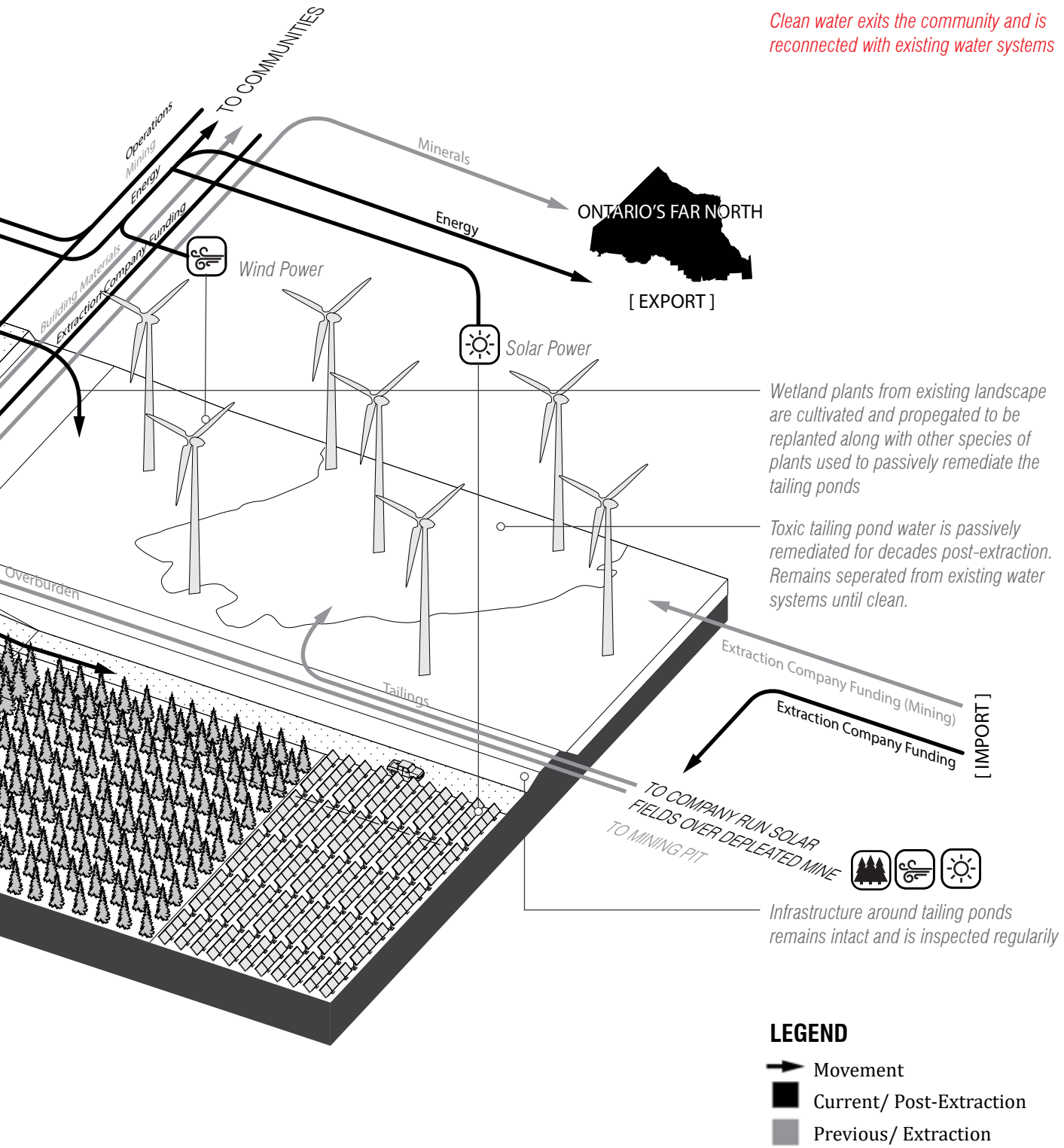
Fig. 3.60

Mineral extraction has halted on the site. Productive landscapes are constructed to harness renewable forms of energy and increase the site's productivity. Residents of the nearby communities operate the new energy economy. The stored layer of soil is returned to the site to allow the trees used in agroforestry to grow, while other areas are covered in solar panels. Water in the tailing ponds are cleaned by the constructedwetlands bordering the pond, while wind turbines take advantage of the high speeds that winds can reach on such a flat landscape. The infrastructure is seeded naturally and becomes incorporated in the hybrid landscape of the Ring of Fire.

RENEWED EXTRACTION SITE

Fig. 3.61

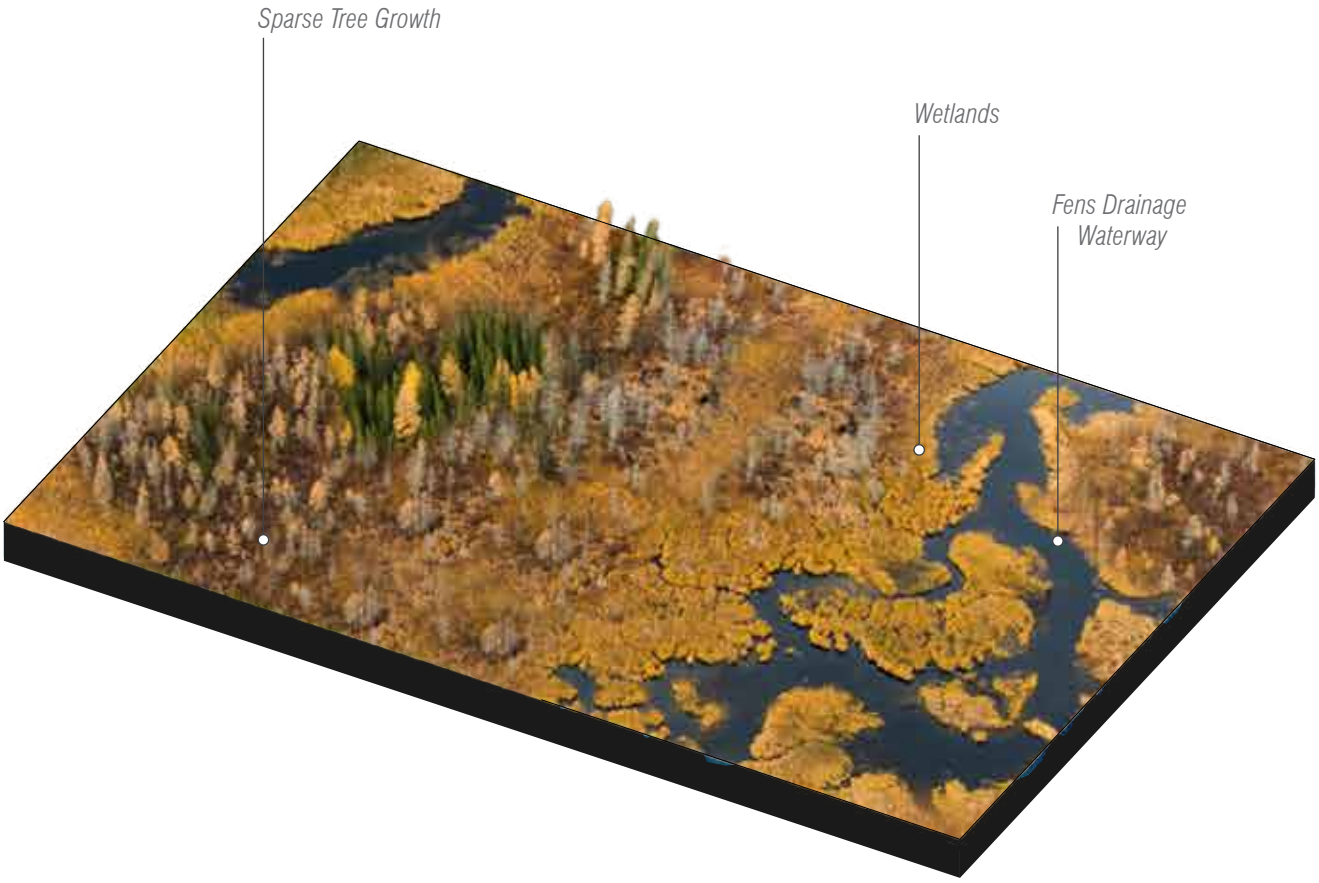



Clean water exits the community and is reconnected with existing water systems
TO COMMUNITIES
Operations
Mining
Energy
Building Materials
Extraction Company Funding
Minerals
Energy
ONTARIO'S FAR NORTH
[EXPORT]
Wind Power
Solar Power
Wetland plants from existing landscape are cultivated and propegated to be replanted along with other species of plants used to passively remediate the tailing ponds
Toxic tailing pond water is passively remediated for decades post-extraction. Remains seperated from existing water systems until clean.
Overburden
Tailings
Extraction Company Funding (Mining)
Extraction Company Funding
[IMPORT]
TO COMPANY RUN SOLAR FIELDS OVER DEPLEATED MINE
TO MINING PIT
Infrastructure around tailing ponds remains intact and is inspected regularily
LEGEND
Movement
Current/ Post-Extraction
Previous/ Extraction

POST-EXTRACTION ATTRACTIONS

The second operation sample is taken at the edge of a new mining pit. The objective is to use the new landscape created through mining activities to generate revenue and draw people from outside the region to the area. While the "renewed extraction site" sample focused on energy production, this sample focuses on tourism for its non-extractive economy. However even during extraction, the mine can draw tourists by integrating extraction tourism within their overall model. Visitors can be provided viewing platforms to observe the operations; they can take tours of the site and learn about the mining processes themselves.

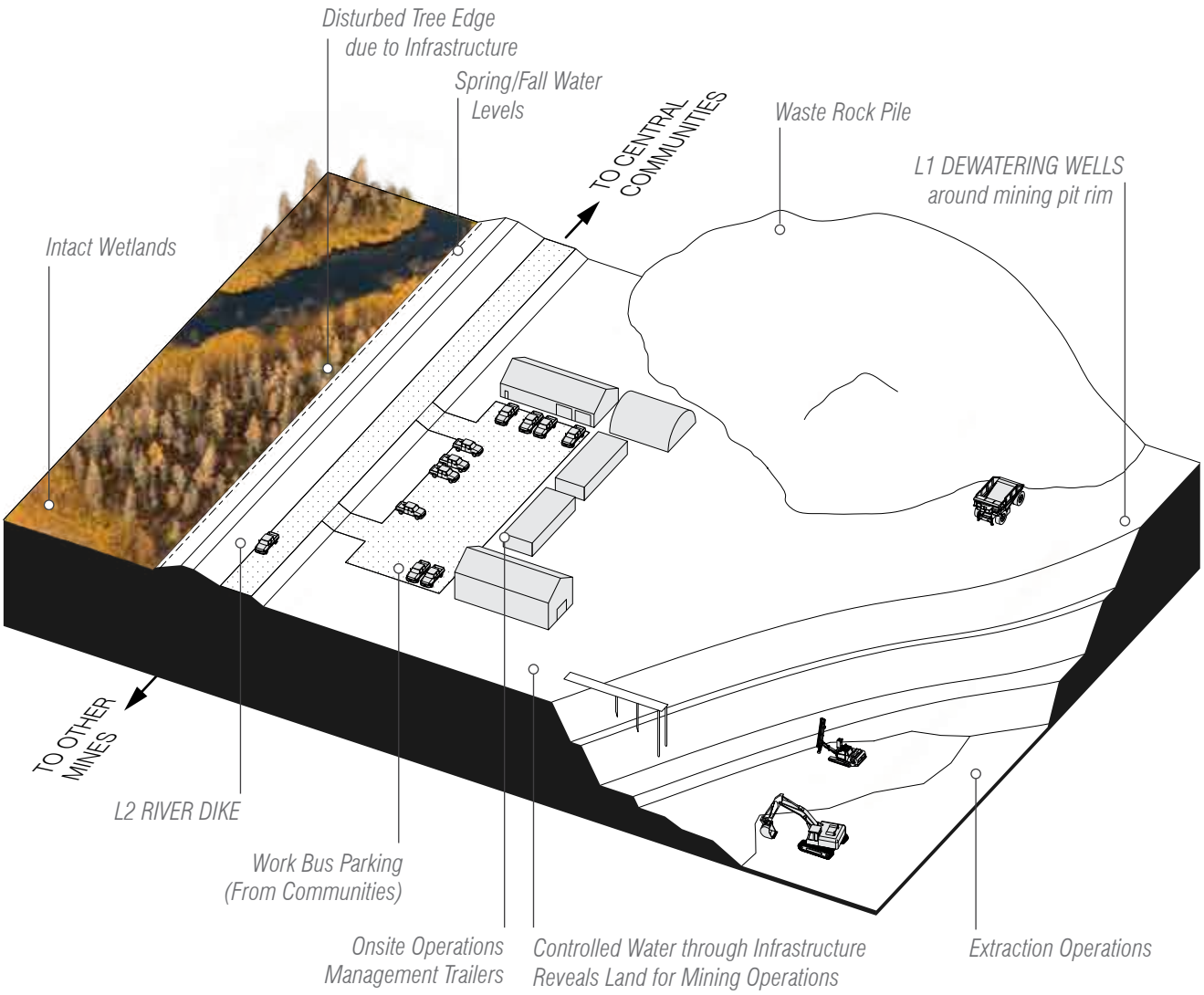
Post-extraction, the site will remain a tourist attraction, only now with a focus on outdoor activities. The main feature shown in this sample is the waste rock pile that will be transformed into a ski hill—the largest in Ontario's Far North. Tourists coming to ski can stay in converted mining buildings or new chalets. Like many other ski hills, the pile can also be used for mountain biking in the summer, ensuring the site is operational year-round. In addition, the mining pit converts to a lake, providing additional activities for the resort during the summer such as water-skiing, windsurfing, or kite-surfing, and provides a portaging launch point. While the resort area is maintained, the rest of the site and the infrastructure is reclaimed by nature, allowing a modified ecosystem to occupy the former extraction site.



PHASE 1 | EXISTING

Fig. 3.62

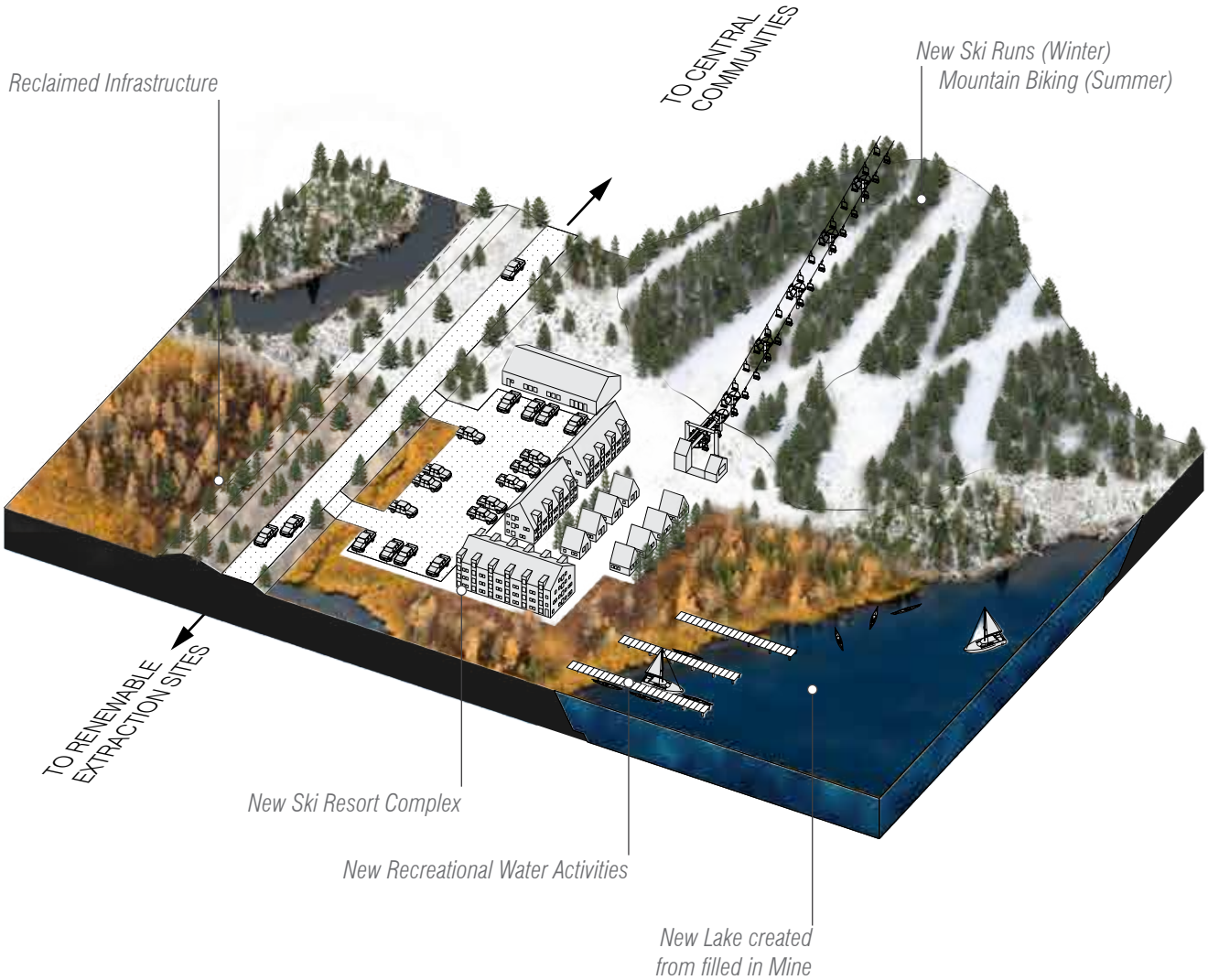
Existing condition of an area projected for extraction. The area is completely flat with minimal forest cover except along a small ridge. Any tree growth is stunted due to the saturated soil and bogs of the area. The area fens drain into the river running through them. No part of this landscape has been identified for preservation.



PHASE 2 | EXTRACTION

Fig. 3.63

Using the uncontaminated overburden and waste rock of a previous extraction site a river dike is created along the slightly raised topography ridge, which provides access to the extraction site for workers in the community and protects the existing clean water from contamination. The infrastructure runs parallel to the river to disrupt its flow as little as possible. Waste rock extracted from the mining pit is piled on the site. As extraction slows, companies could introduce industrial tourism on the site even while extraction continues.



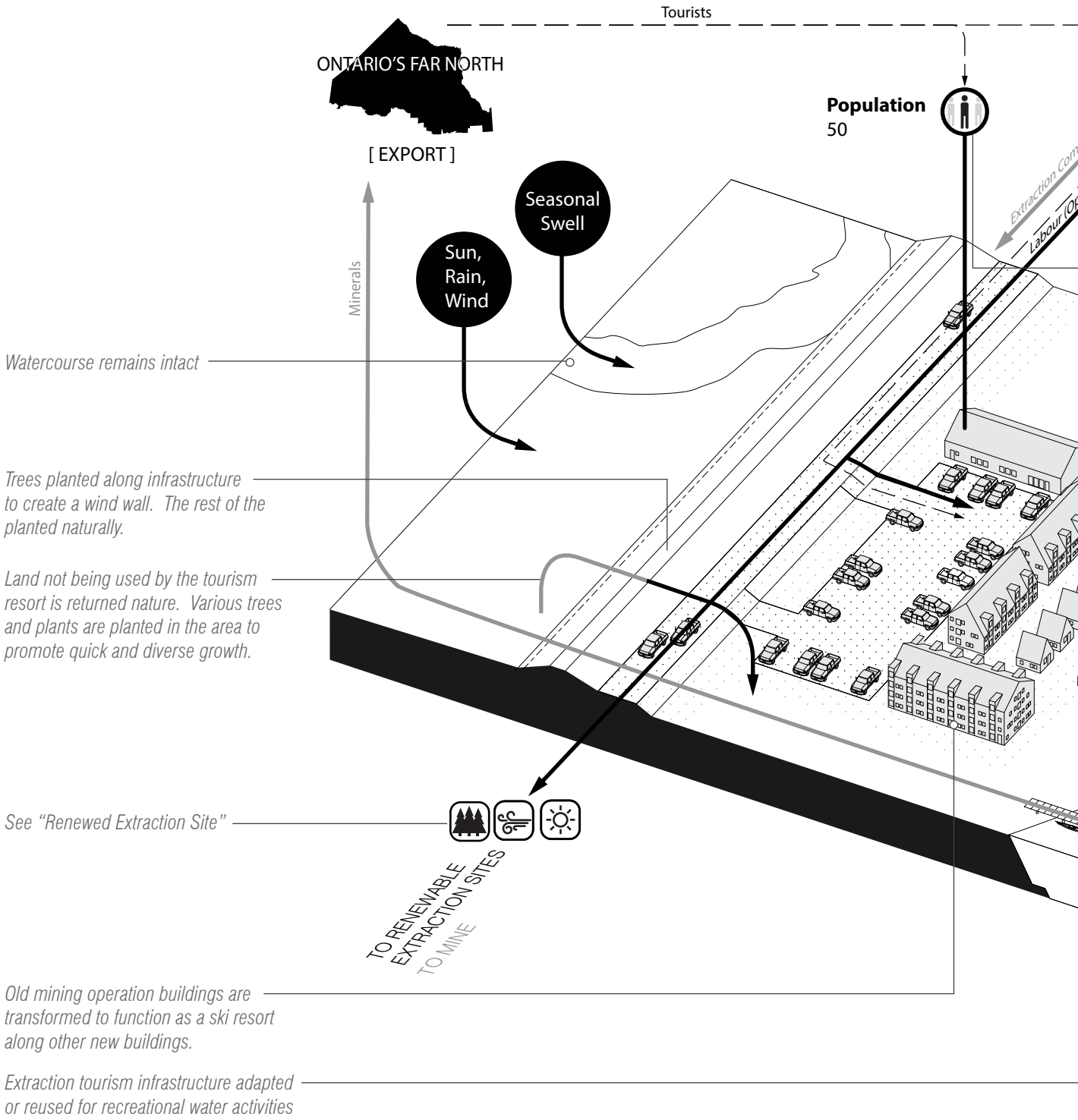
PHASE 3 | POST EXTRACTION

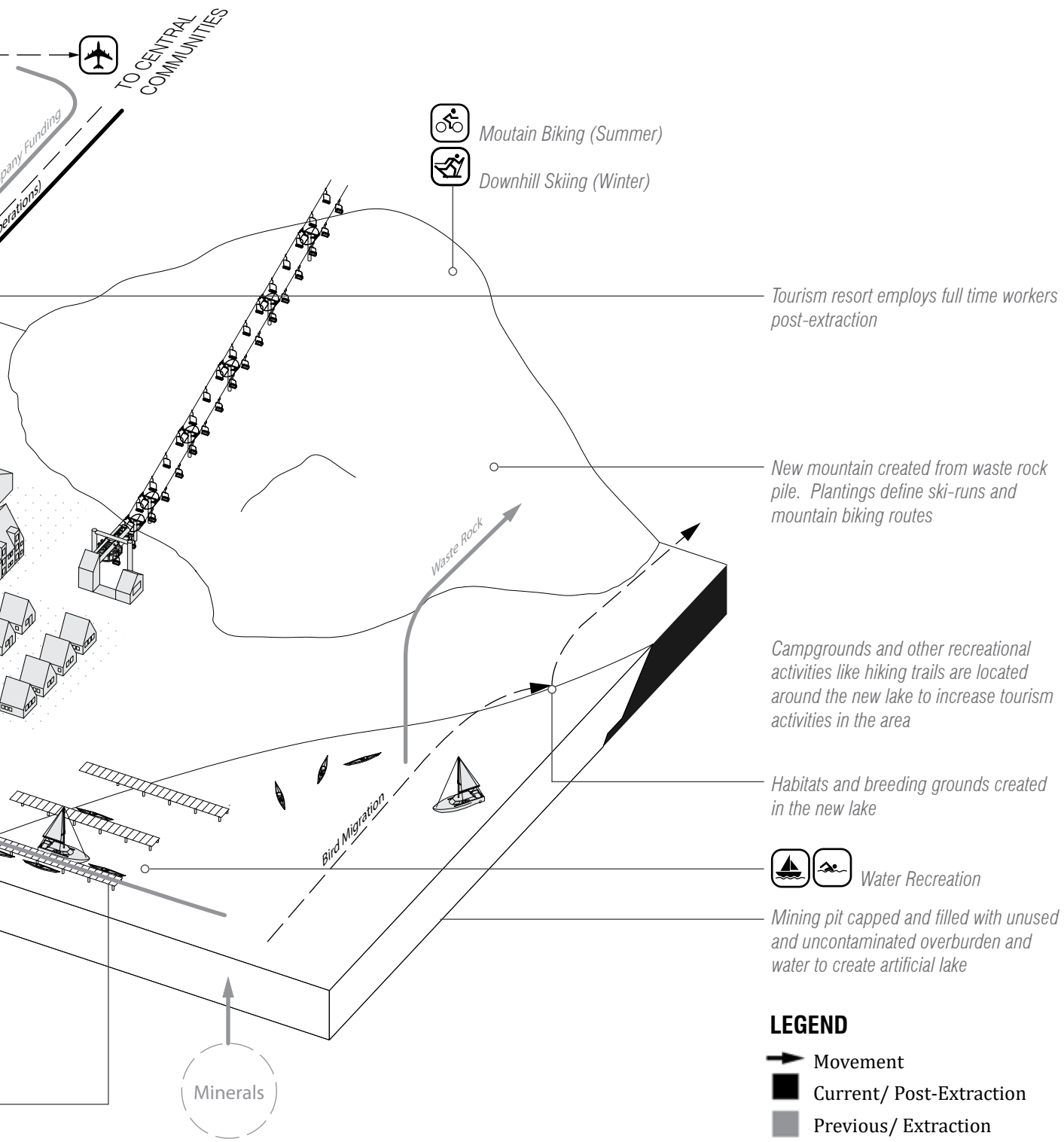
Fig. 3.64

The site is no longer an operational mine, but has transitioned to its second life. The waste rock pile created during extraction is seeded and becomes the largest ski hill in Northern Ontario. Tourists visiting the ski hill can stay in the ski lodge, a combination of new buildings and repurposed mining buildings. The mining pit also turns into an attraction as the rest of the pits volume is filled in with water, creating a new expansive lake that provides tourists and community residents with recreational water activities. The infrastructure, though partially replanted, remains opens to allow the residents from nearby communities to area for either work or pleasure.

POST-EXTRACTION ATTRACTIONS

Fig. 3.65




TO CENTRAL COMMUNITIES
pany Funding
erations)
Moutain Biking (Summer)
Downhill Skiing (Winter)
Tourism resort employs full time workers post-extraction
New mountain created from waste rock pile. Plantings define ski-runs and mountain biking routes
Waste Rock
Campgrounds and other recreational activities like hiking trails are located around the new lake to increase tourism activities in the area
Habitats and breeding grounds created in the new lake
Bird Migration
Water Recreation
Mining pit capped and filled with unused and uncontaminated overburden and water to create artificial lake
Minerals
LEGEND
Movement
Current/ Post-Extraction
Previous/ Extraction

ENDNOTES

1 Neeraj Bhatia and Mary Casper, *The Petropolis of Tomorrow* (Houston: Actar Publishing & Publishing at Rice, 2013), 458.
2 Information gathered from Matawa First Nation's community profiles, available at http://community.matawa.on.ca
3 Kristy Kirkup, "First Nations Communities Upset with Health Canada Over Memo," *The Globe and Mail*, August 25, 2016, accessed August 31, 2016, http://www.theglobeandmail.com/news/national/first-nations-communities-upset-with-health-canada-over-memo/article31569937/.
4 Ben Spurr, "How Attawapiskat suicide Crisis Unfolded," *The Star*, April 18, 2016, accessed August 31, 2016, https://www.thestar.com/news/canada/2016/04/18/how-the-attawapiskat-suicide-crisis-unfolded.html.
5 David Kilgour, *Inside outer Canada (Edmonton: Lone Pine, 1990)*, 59.
6 Ibid., 56.
7 Ontario's Chamber of Commerce, *Beneath the Surface: Uncovering the Economic Potential of Ontario's Ring of Fire* (2014), 26.
8 Ministry of Natural Resources, *The Ecosystems of Ontario, Part1: Ecozones and Exoregions* (2009), 16.
9 "Dike History," Dutch Dikes, accessed August 30, 2016, http://dutchdikes.net/history/
Selected information from the book is available online. Book citation: Eric-Jan Pleijster, Cees van der Veeken and Steffen Nijhuis, *Dutch Dikes* (Rotterdam: nai010 publishers, 2015).

CONCLUSION

In today's condition of rapid technological advancement, the speed and scale of resource extraction continues to increase exponentially. Society's desire for commodities and raw materials also encourages extraction to more and more remote geographies, further afield from population centers. There has been a recent shift in the power and wealth of mining industry, away from the labourers and towns that once fueled it to favour large-scale, international companies that prioritize ever-cheaper and more rapid extraction. Canada as a nation was founded on resource extraction, but mid-Canada in particular has closely felt this growth and power shift. Whereas, prospectors founded towns to extract minerals for decades, today extractions are mostly operated by a workforce flown to the site for week-long shifts, occupying temporary, company-built work camps. The value of the resource has been placed above that of the workers, environment and local population.

This thesis argued that resource extraction settlements must be reexamined and that the next generation of settlements must be designed on a specific set of principles to ensure settlements remain viable and sustainable. Extraction settlements should be developed from an overall plan to enrich the region, instead of attempting to connect a series scattered points post-extraction. They should adopt a sense of place derived from the local environment and respond to its various conditions. At the same time, these settlements must acknowledge the reason they exist is because of extraction—which brings with it certain unique characteristics, such as major population fluctuations, that settlements must be able to adapt to.

The design proposal illustrated how these objectives might be applied to the Ring of Fire, a currently-undeveloped but highly-anticipated extraction site. However, the proposal is not a fully-designed masterplan for the Ring of Fire; instead, it suggests an overall vision of development that will benefit the region and Ontario's Far North by combining a series of outlined tactics. This will enable flexible development, though it will still guided by a larger vision. The design proposal successfully outlined various economic

and service strategies for the region but was not able to fully explore the social impacts that such a development would have on the region, aside from the benefits of a community designed for a range of demographics. The infrastructure was successful in creating a connected Ring of Fire that facilitated both extraction and secondary economies, however the proposal did not fully examine the environmental impacts it would have on the area. Though the water management strategies presented are known to work, the full effect of diverting a river or how water would continue to circulate around the remaining post-extraction infrastructure was not fully explored. Furthermore, a major flaw remains unaddressed in this thesis: the diversity and complexity of the First Nations in the area. Additional research and consultation with the First Nations communities in the Ring of Fire must be conducted before the larger region can even begin development and environmental impacts of the proposal would require much more study.

Though the government now requires First Nations to be consulted before proceeding with the Ring of Fire, there are no regulations currently in place for inhabiting the area. Though this thesis aimed to be broad enough to account for many different situations, it is the nature of construction to reveal the unexpected. The Ring of Fire is simply too large to anticipate a solution for every problem that might arise. Despite mining claims existing for almost a decade, there are still many questions surrounding its development. When will construction start? Who will be the major players? What mines will be constructed first? What will the benefit agreement with First Nations entail? How will companies access the Ring of Fire? Who will pay for its infrastructure? What new regulations will be put in place? There are many key decisions yet to be made, all of which could make this proposal no longer valid.

The parties involved are constantly changing. As negotiations stretch on, many stake-holders relinquish their mining claims or sell them off to other companies. Even while writing this thesis, claims have changed. Though this requires updating various drawings and applications of tactics, the principles they outline will still remain the same. Although the Ring of Fire may be the focus, the core principles and design ideas of this thesis could be repurposed for many future extraction sites across Canada. Many Canadian cities, such as Yellowknife, Sudbury, Labrador City, amongst others, were founded on extraction. It is possible the principles stated here might become a new method of founding the next generation of Canadian extraction towns. Richard Rohmer's mid-Canada corridor proposal should be revisited to ensure the new extraction towns efficiently connect the north and south of the country, thus achieving a unified national vision.

This thesis argues for permanent settlements due to the benefits to

both companies and its workers, however in the fast-paced global economy, quick and cheap will likely continue to win—unless stipulations are placed on extraction companies to develop more sustainable extraction settlements. Although technological or scientific advances may mitigate the risks to the environment making the "extract and leave" method more appealing, this will do nothing to remediate the imbalance between Ontario's Far North and the South. The large scale of the Ring of Fire presents the region with an opportunity to reorient itself by creating new economic and service networks. Eventually resources in Ontario's Far North will run out, therefore these new networks also must promote renewable production that will continue to operate when extraction companies inevitably move on.

Landscape should be seen as a design tool for extraction settlements, aiding to wean the Ring of Fire off its economic dependency on finite resources and transitioning it to a dependence on renewable ones. By harnessing the energy driving current mining practices to positively transform the landscape into a hybrid of man-made and natural systems, we might begin to develop self-reliant and sustainable extraction settlements that do not require the country to choose between its landscape and its economy.

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GLOSSARY

BOG
…one of the main types of wetlands, characterized by poorly drained peaty soil, usually composed of decaying vegetable matter. The dominant vegetation growths in this ecosystem are mosses and heath. Water in bogs is usually acidic, and not well oxygenated, limiting the variety of aquatic life that can survive. Bogs accumulate water only form surface runoffs but drain solely into the ground water table.

BOGRICULTURE
…the farming of edible plant organism that grow specifically in bogs or marshlands, such as cranberries, wild rice and various other herbs and berries.

BOOMTOWN
…a community, previously existing or none existing, that experiences a large population growth very quickly usually in relationship to a nearby resource to be exploited.

CANADIAN SHIELD
…a geological region covering an extensive region of central and northern Canada. Its predominant characteristic is eroded Precambrian rocks, with a low profile, often exposed or under thin layers of soil.

CHROMITE
..the principal ore of chromium, Fe3 Cr2 O3.

DAM
…a sloped, engineered or natural, wall that has water on both sides usually used to retain water.

DIKE
…a sloped, engineered or natural, wall that holds back a body of water on one side. Man-made dikes are usually used to prevent flooding of inhabited land.

FEN
…one of the main types of wetlands, characterized by wet spongy ground (peaty soil) usually composed of decaying vegetable matter. The dominant vegetation growths in this ecosystem are grass like plants, sedges and reeds. Water in fens is alkaline and fed from surface and ground water, draining into streams or ground water.

OVERBURDEN
... The layer of abiotic or biotic material that covers an area that is to be exploited for resources. Also called, waste or spoil. Unlike tailing, overburden is usually not contaminated by the extraction process.

PLACELESSNESS
... being without context or not having a feeling of belonging to an identifiable place in space or time.

PRIMITIVE ACCUMULATION
…the issue of the origin of capital, originally explored in Marxist economics for its role in creating class distinctions. Later redefined by Jason Moore as an accumulation of capital that does not involve human labour, but where labour is done through the Earth abiotic or biotic systems to produce raw material that is brought into economies.

RESERVE
…an area reserved for First Nation occupation after contact with the Canadian government.

TAILINGS
...the by-products left over from mining after the valued resource has been extracted, which can include chemicals, rock particles, etc.

WILDERNESS
…an area that has experienced little to no modifications by humans or an area that is not controlled by human activity.