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THE SYSTEM*

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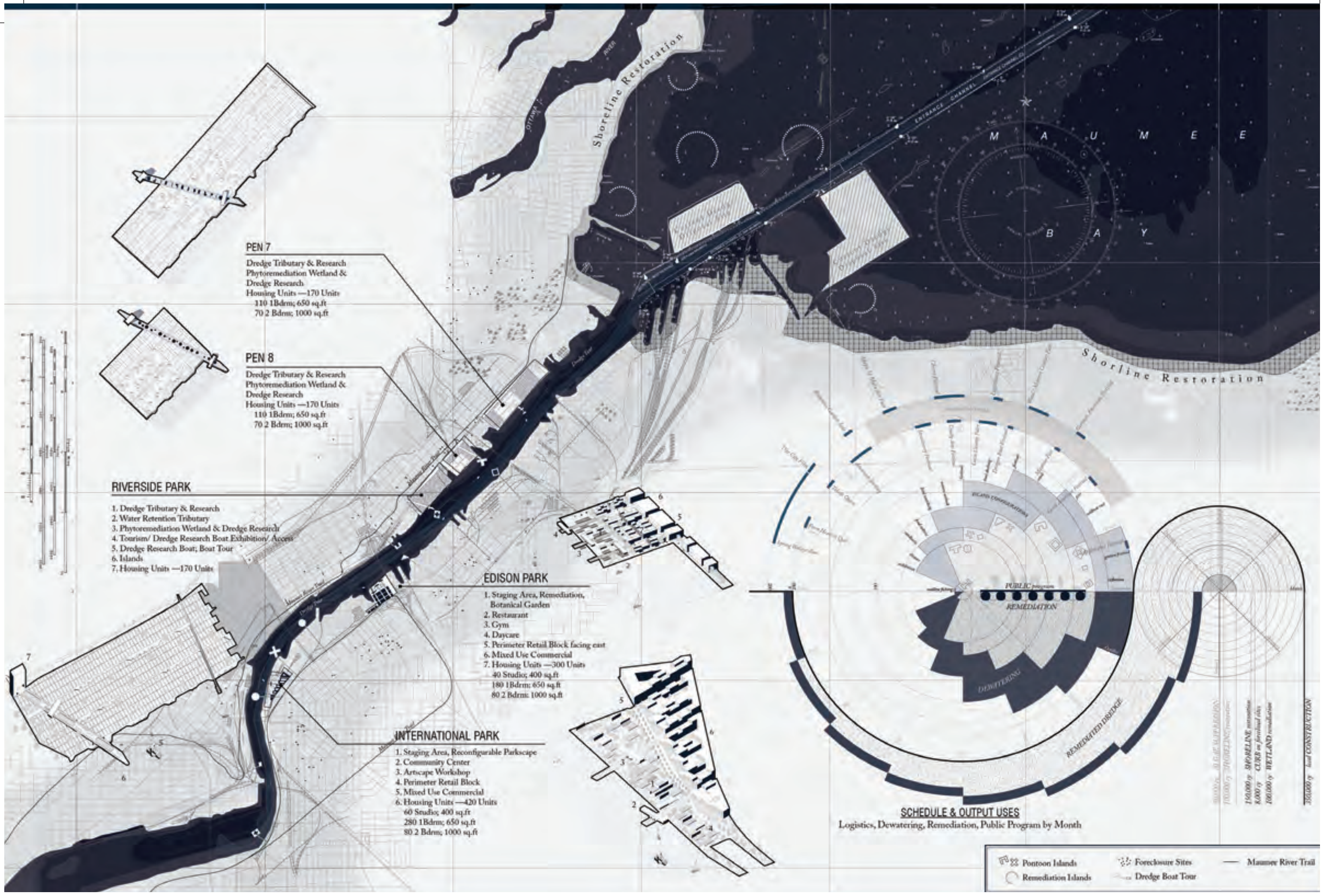
Volume 47

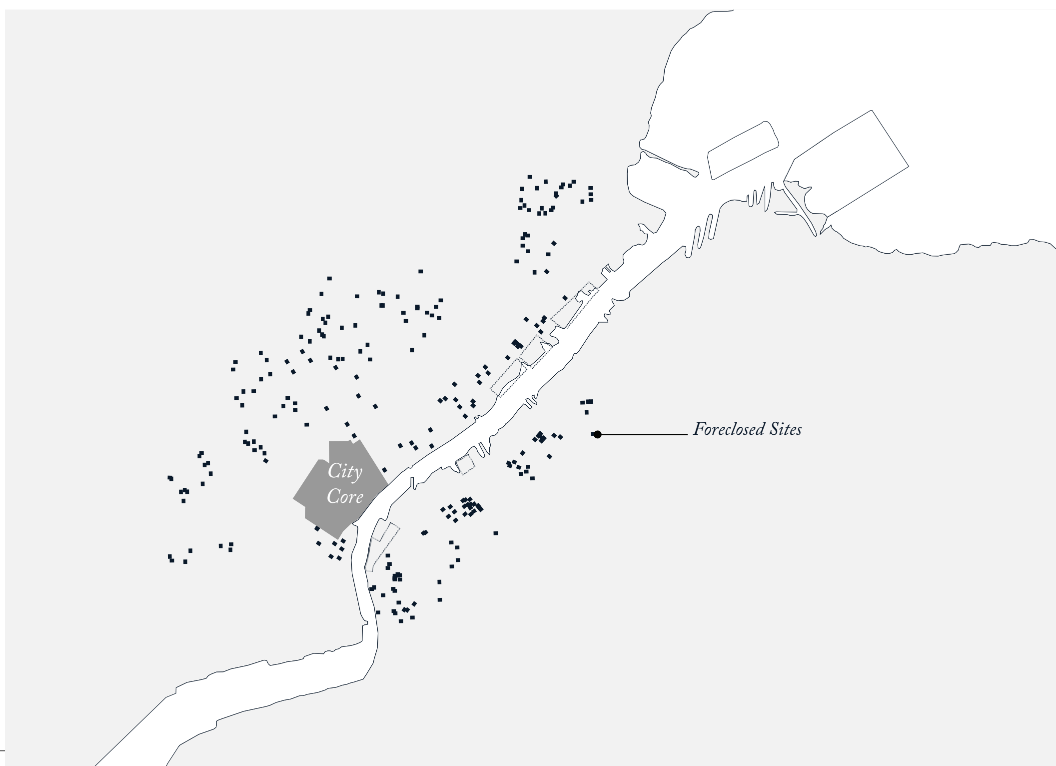
THE* SYSTEM

'The system' is oft lamented to little effect. Aside from something out of our hands, what is 'the system', anyways? And how out of our hands is it, really? In this issue of Volume, we're collecting a series of definitions, maps and strategies for intervening in it.

* **leveraging** To position ones efforts within a system so that its outcomes are multiplied by the system itself.
* **short-circuiting.** To modulate resistance so that either excessive or insufficient current flows.
* **disrupting** To develop alternative processes and replace existing technologies.
* **infecting** To introduce an alien and viral presence.



MASTERPLAN AND SCHEDULE of the expanded Geologics.
Drawing: The Open Workshop



WAITING LANDS of the 1124 foreclosed sites in Toledo in 2014 are operationalized as micro-diffused detention basins. This 'distributed lake' totals 84 acres.
The Open Workshop

EXPAN-DING DREDGE GEO-LOGICS

NEERAJ BHATIA / THE OPEN WORKSHOP

DREDGING IS THE MECHANICAL PROCESS THAT KEEPS WATER, WATER. YET DUE TO NATURAL FLUID DYNAMICS, SILTING IS AN ONGOING PROCESS. SO WE HAVE TO CONTINUOUSLY TAKE SUBAQUEOUS SEDIMENT FROM ONE PLACE AND MOVE IT TO ANOTHER, RELEASING A HOST OF DISRUPTIVE ECOLOGICAL PROCESSES ALONG THE WAY. THE OPEN WORKSHOP HAS DEVELOPED A STRATEGY FOR TOLEDO, OHIO TO USE DREDGED MATERIAL FOR BOTH EXTENDING THE CITY'S CIVIC SPACE AND CLEANING UP LAKE EERIE.

The movement and management of sediment is arguably the largest continuous project of spatial manipulation on the planet. This ongoing battle between geology and industry is most apparent through the act of dredging. Dredging is the excavation, gathering, transport, and disposal of sediment from subaquatic areas, enacted to maintain depths of shipping channels, harbors, and ports as well as to reclaim land, create sea defenses, and remove toxic chemicals.[1] The primary impetus for dredging is to sustain logistical routes for the shipping industry by countering the forces of erosion, movement, and settling of sediments. Like the logistics of the global shipping industry it serves, dredging is a continual process whose magnitude and significance have fostered their own series of 'geologics' – the engineering of material processes that operate in temporal and spatial scales that are geological in scope.[2] Currently in the United States alone, more than four hundred ports and over 25,000 miles of navigation channels are being dredged.[3]

The combination of integrated globalized shipping as well as growing ship sizes has created logistical routes that, as they approach shallower depths close to urbanized areas, require incessant dredging to counter the natural tendencies of erosion and sediment movement. Accordingly, dredging is continually reconciling the meeting of anthropogenic forces on land with shipping logistics on water. This ceaseless process of dredging – the co-making of hydrological and geologic processes – has been termed the 'dredge cycle'. It is cyclical because it is constantly driven by anthropogenic influences that produce erosion (urbanization, agriculture, deforestation, damming, etc.) and the desire to tame the effects of these forces that cause fluctuations to shorelines.[4] The dredge cycle positions the physical act of displacing sediment as just one component in a larger series of relationships between humans and their physical environment. This includes both intentional acts as well as unintentional byproducts that feedback with each other. Moreover and ironically, dredging accelerates the forces of erosion that they are established to counter – dredging, in fact, stimulates more-and-more dredging.[5]

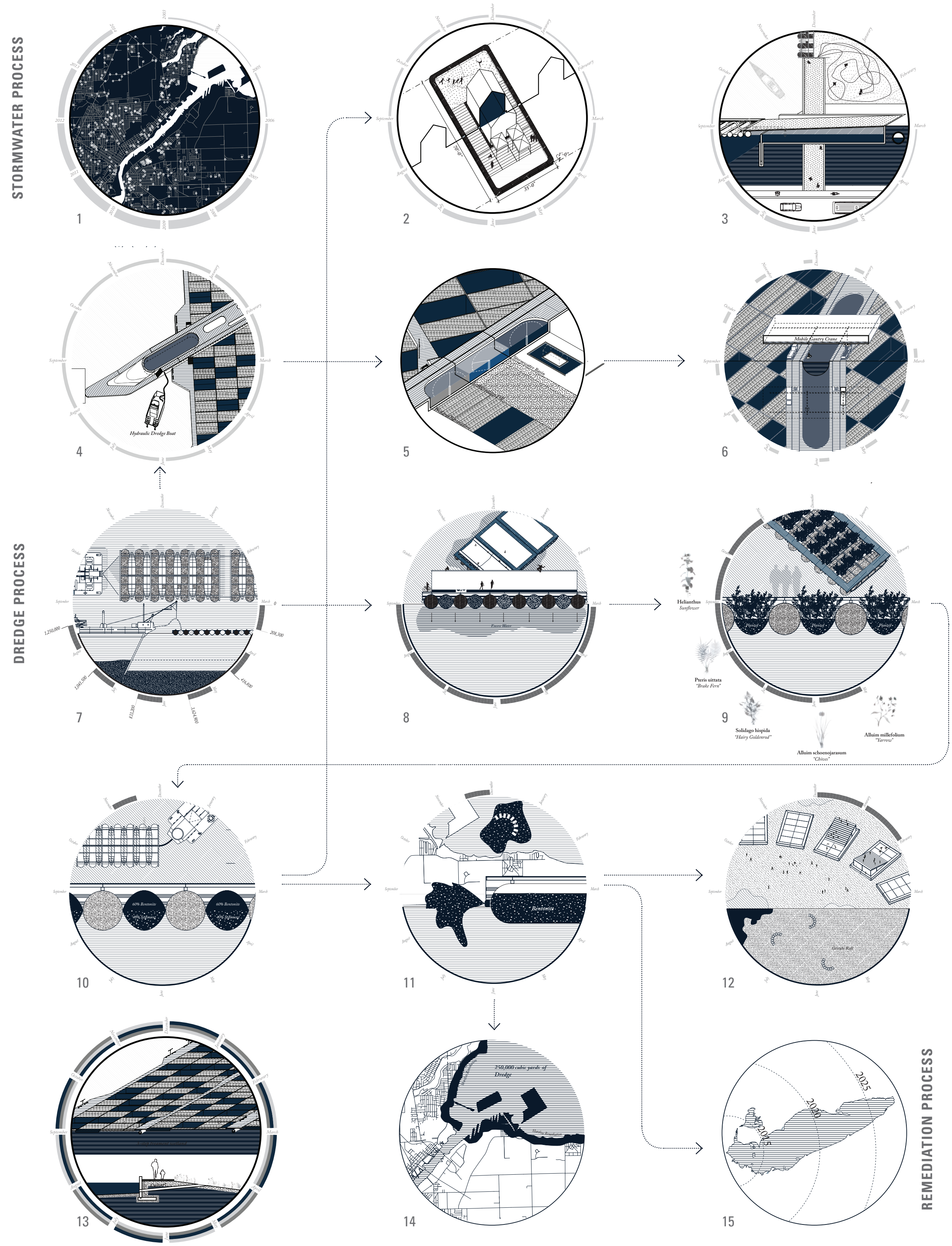
Given the complexity of engineering a logistical cycle to counter geology, dredging is currently a highly top-down process. It is no surprise that the largest dredging organization in the United States is a branch of the army, given that logistics itself was born from military operations. To execute this massive land manipulation project, The US Army Corps of Engineers uses an extensive number of (relatively) small instruments such as barges, geotubes, mechanical dredges, hydraulic dredges, cutter dredges, dragheads, suction pipes, trucks, tractors, backhoes, geotextiles, pumps, and silt fences, amongst others.[6] These almost ubiquitous instruments are the primary components of a logistical sequence that includes the removal, transport, and disposal of sediment. What varies in the dredge process is the selection of technologies – decided through a combination of natural geology, available technology, volume, and costs – and both where and how to dispose of this material. Traditionally, dredge material was highly contaminated and placed in confined disposal facilities (CDFs), which are now approaching maximum capacity and becoming a costly venture.[7] Another method of disposal has been open water dumping, but the environmental ramifications of this approach are still not fully understood. As a consequence, new 'beneficial uses' are being sought for dredged material that positions this sediment as a resource. Beneficial uses are part of a longer-term strategy of sediment management that focuses on environmental health such as top-soil creation, aquacultural facilities, beach nourishment, aggregate for construction material, brownfield improvements, and habitat restoration.[8] Yet in the American context, despite this transition from a linear process of dredging and dumping to a productive and opportunistic cycle of sediment management, little design effort has been afforded to how the engineered geologics of dredging itself – which is a continual backdrop to urban life in most cities – can be rethought more holistically to benefit currently unheard yet affected subjects.

The dredge cycle has presently been used to unpack the relationship between anthropogenic and geologic influences that are negotiated through dredging. To short-circuit this relationship would entail the introduction of currently silent subjects that are implicitly implicated in the dredge cycle and question how these subjects can leverage the actual geologics of dredging. For instance, how can local populations re-appropriate this process for socio-political engagement and empowerment? How can ecological processes be an integral component to this system to reduce the environmental footprint of dredging? How can dredging be used as a mechanism to remediate territorial ecologies that it has traditionally impacted? The potential here is to re-envision how smaller components – both physical (instruments of dredging) and systemic (within the geologics of dredge) – can be tactically expanded to both engage and integrate local populations and environments, while strategically aggregated to address urgent issues at a territorial scale. Using differential and overlapping time-scales, we ask how incrementalism, dispersion, and iteration enable new subjects – human and environmental – to co-evolve with the dredge cycle.

Dredgescaping Toledo is a design case study that attempts to advance a new discussion on the geologics of dredge by focusing on the Maumee Bay on the western edge of Lake Erie and part of the Great Lakes navigation system. Dredging in the Great Lakes began over one hundred and fifty years ago, and currently over three million cubic yards of sediment are dredged annually from its 136 harbors and 745 miles of federal navigation channels. The removal of this sediment from the Great Lakes shipping channels costs the U.S. Army Corps of Engineers between twenty and thirty million dollars annually.[9] Shipping, however, generates over thirty billion dollars in annual revenues and moves an average of three hundred million tons of cargo, making it an integral industry for the region.[10] Almost one-third of the dredge material from the entire Great Lakes system – approximately 800,000 cubic yards – originates in the Maumee Bay adjacent to the City of Toledo. *Dredgescaping Toledo* proposes a series of tactics that we have termed, *tributaries*, *islands, sponges,* and *lakes*, to expand the geologics of dredge.

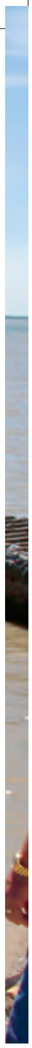
As Toledo grew beyond its urban core, its urban fabric encircled the industrial lands that colonized the riverfront. These lands are still extremely productive – the port of Toledo is ranked seventh in the Great Lakes in total tonnage, generating nearly seventy million dollars in personal income and supporting fifty thousand regional jobs.[11] While these industrial lands are vital to the city's economic health, they have forged a wall between the expanded city and water, rendering the notion of a continuous linear public waterfront implausible. Instead of negating industry, this study employs a series of connectors between land and water, or *tributaries*, which provide a public access easement through the port's terrain vague while seldom interfering with the industrial lands and processes themselves.

Presently, Toledo's dredged material is disposed of in an existing two square mile open-lake placement area, located at the mouth of the Maumee River. Not only has this disposal technique been associated with inciting algae blooms in Lake Erie that suppress aquatic ecosystems,[12] but by dumping this material far from the City of Toledo it is difficult to leverage it as a public amenity. Due to the Maumee River's narrow width, steady flow, and considerable shipping routes, it is impractical to dispose of this dredge sediment in the river itself, where it could potentially create vital and lacking public waterfront lands for the city. Working within the geologics of dredging, we ask how land can be operationalized in its different states of matter – from slurry to soils – and cleanliness – from partially contaminated to remediated – to enable the co-existence and symbiosis of industry and public life. Our proposal utilizes a series of



THE EXPANDED GEOLOGICS — integrating social, cultural, and ecological factors to the logistical system.
Drawing: The Open Workshop

GEOTUBE® container being filled with dredged material.
Photo: Tencate



geotube pontoon *islands* to process the dredged slurry in close proximity to the city.

Geotubes are massive 'sand bags' fabricated from flexible geotextiles to hold and dewater newly extracted dredge slurry. Dredge material is pumped directly into these bags, and over the course of three months purified water slowly seeps out while sediment remains within the tube's casing. What is critical about this technology is that the tubes can be fabricated in a variety of sizes and are easily filled, deployed, emptied, stored, and transported. This enables dredge slurry (both water and sediment) to be dewatered and remediated in close proximity to the city of Toledo without disrupting draft depths or navigation routes, thereby creating new public lands. During the dewatering phase, these islands host a series of programed platforms that connect to the easement tributaries, forming a poly-nuclear public waterfront – an evolving archipelago. These pontoons are grouped into larger figures to provide different programmatic opportunities for a city starved of public space and access to water. This disaggregated approach to managing dredge sediment establishes a highly flexible and resilient system, as temporal public land is incrementally deployed alongside and within the dredge cycle, and can therefore be calibrated to seasonal changes, festival and event schedules, or the general needs and desires of local citizens. This inserts a bottom-up, tactical, and iterative approach to forming public space within the geologics of dredge.

After the dewatering period, the public platforms are removed and reinserted into newly dredged pontoons, while the dewatered pontoons are 'unzipped' and hydro-seeded for a phase of phytoremediation. These floating wetlands are connected to the stormwater culverts and detention basins that are integrated within the easement tributaries. Once the sediment is remediated and safe for open-lake placement, the soil in the pontoons is mixed with a rare-earth bentonite and water solution, which acts as a sponge to suppress and absorb algae growth. The sealed geotubes are then tugged into the bay and the slurry is distributed throughout Lake Erie. Over several years, this process is anticipated to return Lake Erie to its original nutrient composition. The emptied geotube pontoons can be either reinserted into the dredge process or stored, depending on the season. By inserting incremental materials into the geologics of dredge, territorial issues – such as harmful algae blooms – are addressed in an appropriate timescale, which can also be iteratively calibrated to other specific ecologies of the lakes.

The last component of this design study examines how the dredge cycle can more robustly interface with the hydrological cycles of water management in the city. Due to a large number of combined sewer overflow events, the Environmental Protection Agency has mandated new forms of stormwater management for Toledo. While the city contemplates a series of hard infrastructures and the consolidation of stormwater onto three sites, our proposal investigates how a distributed approach to water management can reduce contaminants caused by the large distances traveled by stormwater run-off, and once again, disaggregate a sizable (and potentially expensive) problem into a series of distributed soft components. The study proposes the employment of foreclosed home sites in Toledo as a series of distributed detention basins. These 'waiting lands' are operationalized by creating a perimeter curb of dredge-filled bags around the house and property line to allow stormwater to fill these sites and reduce pressure on the sewer system. In total, this 'distributed lake' consists of an area of land equivalent to the three sites currently set aside by the city. Further, public platforms from the islands could be placed on these lots – resting on the curb foundations – to enable local neighborhood public programs when not in use on the river.

The proposed geologics of dredge enable local environments and citizens as well as territorial transformations to co-evolve with and through the dredge cycle. The expansion of 'beneficial uses' that moves beyond sediment repurposing, to engage how the system of dredging itself can be a resource to cities and their ecologies – both locally and territorially – as well as in an immediate and geological timeframe, implicates new subjects into what was once a top-down linear system. While the health and growth of industry instigates dredging operations, these operations also accelerate erosion and therefore more dredging. This means that where industry is steady or flourishing, dredging operations are continually increasing in scope. Dredged sediment acts as a material index to the prosperity of industry, yet in mid-sized towns with industrial waterfronts and low land value, how this new land is processed and disposed needs to be reconsidered. While dredge material is often used to create new lands, particularly in cities boasting high real estate values as the history of Toronto, Boston, New York, and San Francisco amongst others has shown, these cities have used these same real estate values to push industry to the periphery and return their waterfronts to the public. In the context of mid-sized cities such as Toledo where low land values, productive industry along the water, and an associated depravity of public space collide, a system of producing land in a malleable, temporal, transformable, and transportable logic enables the symbiotic co-habitation of industry, culture, and ecology. This positions land not as a commodity to capture and hold, but rather a temporal material state that is iteratively deployed and used by local constituents and then redistributed to a territorial ecology. Within this expanded geologics, culture, politics, economics, and ecology find synergetic opportunities that empower new subjects to be agents within what was once an engineered system of global capital.

Project Team: Neeraj Bhatia, Anesta Iwan, Cesar Lopez, Jeremy Jacinth

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12 Ibid., Great Lakes Commission, (2015).