

From the Gutter to the Gulf: Legible Water Infrastructure for New Orleans

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GUTTER TO GULF AND THE DESIGN MOMENT IN NEW ORLEANS

Our teaching and research project, *Gutter to Gulf*, speaks to both the practice and the theory of managing the design moment in post-Katrina New Orleans. Our consciousness about what a design moment might mean has been shaped by extensive experience in the trenches: we have been working continuously on actual projects in the city since shortly after the storm.

The project arose from our collective teaching and practical work in New Orleans in the years since Katrina. This experience includes recovery planning through and in addition to the Unified New Orleans Plan process; design-build work; the development of design and business plans with community organizations; the development of a manual for grassroots neighbourhood landscape rehabilitation; and involvement with an international collaborative for discussion about water management issues in the city and the region.

Gutter to Gulf (www.guttertogulf.com) is a collaborative effort designed to address the need for a water plan for New Orleans. This is one of the greatest dilemmas facing the city, and, at present, there are not funds to create a conventional com-



Figure 1: Synthetic, inter-studio model of hydrology and infrastructure systems in New Orleans.

mission. We decided to mobilize a free labour pool—our students—to develop realizable scenarios that crossed boundaries among architecture, landscape architecture, and urban design. The students'

work fuels *Dutch Dialogues*, (www.dutchdialogues.com) an ongoing international advocacy effort for water management planning and is already being disseminated as an argument for policy initiatives. In addition, *Gutter to Gulf* has been recognized for “innovation in design and research for recovery act projects” by the AIA and the ACSA.

Goals, Methods, and Utility

Gutter to Gulf is a multi-disciplinary research initiative organized to address water management questions in New Orleans. Four years after Hurricane Katrina, the city still faces enormous challenges, many of them are related to the lack of a water management plan. Advocacy efforts for water planning are gaining momentum, and *Gutter to Gulf* is intended to provide support from the fields of architecture, landscape architecture, and urban design. Led by design school faculty members who have been working in New Orleans before and after Hurricane Katrina, the project is a collaboration among Derek Hoeflerlin, Senior Lecturer at Washington University in St. Louis; Jane Wolff, Associate Professor and Director of the Master of Landscape Architecture program at University of Toronto; Elise Shelley, Assistant Professor at University of Toronto; and, David Waggoner, one of the leaders of *Dutch Dialogues*, an international advocacy effort for water planning in New Orleans. *Dutch Dialogues* was spearheaded after Hurricane Katrina by local New Orleans architecture firm Waggoner & Ball Architects, the American Planning Association and the Royal Netherlands Embassy, Washington D.C.

Gutter to Gulf's and *Dutch Dialogue's* goal is to advocate for the development of an integrated water management plan for New Orleans. Currently, this advocacy has been embraced by the soon-to-be-completed New Orleans Master Plan, as a key recommendation for implementation. *Gutter to Gulf's* scope includes the rigorous documentation of existing conditions, the definition of appropriate arenas for design work, and the proposal of specific design tactics and strategies for the city, understood as a whole rather than isolated moments. *Gutter to Gulf* is intended to ground design proposals at detail, building, site, and city scales in a clear understanding of the regional dilemmas operating across southern Louisiana.

New Orleans demonstrates the impossibility of separating infrastructure from ecology: the circumstances that made Hurricane Katrina so devastating—and that continue to make the city's rehabilitation so difficult—constitute a Gordian knot of dilemmas about water and its management. These issues face every metropolitan landscape in North America, and the intensity of their expression at the bottom of the continent's largest drainage basin makes New Orleans a crucible for their examination and their resolution.

A Brief History of Water in New Orleans

New Orleans has always been a water landscape. A commercial transfer point between the North American interior and the Gulf of Mexico, it owes its existence to its location between the Mississippi River and Lake Pontchartrain. The high, dry land along the river's natural levees was stable enough to build on; the passage to the lake could be made by boat with a short portage; and the lake offered access to the gulf via Lake Borgne. The cypress swamps between the river and the lake lay just above sea level, but they were too wet to occupy permanently, and until the early twentieth century, the city's development was confined to the high ground along the Mississippi. The mechanical drainage of the city's back-of-town swamps began at the turn of the twentieth century, and it accelerated after 1913, when pump technology became more efficient. By the 1950s, the area bounded by the river, the lake, the Industrial Canal, and the Jefferson Parish boundary (now known as Drainage Basin 1) had been completely drained and developed. Almost no trace of water remained at the surface of the city: land was subdivided to create as many saleable parcels as possible, and storm water was conveyed to the lake through a series of canals, some at grade and many below ground.

Twentieth-century New Orleans was a testament to faith in modern engineering. No one believed that the system would fail, even though it faced increasingly complicated challenges. The development and drainage of New Orleans's soggy ground had an unexpected consequence: it made ground levels fall. This process, called subsidence, occurred through different mechanisms. Organic matter in the soil oxidized, so soil volume was reduced. As pumping extracted water from the ground, soil particles collapsed onto each other. The removal

of the cypress forests brought an end to soil creation through organic decomposition. Finally, the levees that had been constructed along the length of the Mississippi to stop flooding prevented the replenishment of soil by alluvial material. By the turn of the twenty-first century, the city had become a giant sink. Ground levels had fallen to as low as twelve feet below sea level; Drainage Basin 1 was completely surrounded by levees; and the only way to get water out of the city was by pumping it over the levee to Lake Pontchartrain.

The twentieth-century development of New Orleans constituted an extraordinary denial of physical geography. It assumed that mechanical systems could overcome the basic ecology of the Mississippi Delta. That position played a major role in the havoc wrought by Hurricanes Katrina and Rita, when both pumps and levees failed. It also presents real challenges for rebuilding New Orleans. The city will remain vulnerable to flooding unless it expands its ability to accommodate water safely, and its citizens will continue to court disaster unless they come to terms with the environment they inhabit. New Orleans needs a water plan, and it doesn't have one.

Synthetic Infrastructure

Gutter to Gulf aims to develop resilient water management strategies for New Orleans. Planning for water demonstrates how the consideration of one phenomenon can lead to a synthetic approach to infrastructure. It raises design issues that are rhetorical—what, for instance, should the image of water be in a soggy place, and how can that image help citizens to come to terms with where they live?—and practical—how does rainwater hit the ground, travel through the city, and make its way to the Gulf of Mexico? Questions of expression and pragmatism come together around public safety. Limiting risk depends not only on adequate water storage but also on the development of a flood culture that recognizes the landscape's basic tendencies. These issues cross disciplines and arenas: they engage planning, urban and landscape design, architecture, engineering, economics, and politics. They involve landscape types from public infrastructure to civic space to private gardens. They demand reckoning with ecological systems from regional to residential scales.

Although water planning has been conspicuously absent from the official planning process for rebuilding New Orleans, it has made its way into grassroots discussions about the city's future. Neighbourhood planning efforts that address water as a central aspect of urban landscape rehabilitation have been useful case studies, but they do not address water issues across the city. *Dutch Dialogues*, an international effort to bring together water managers from the Netherlands and Louisiana, has examined water planning across the city, but its efforts have been limited to brief workshops coupled with limited funding. Jane Wolff and Derek Hoeflerlin have been active participants in the first two *Dutch Dialogues* workshops. *Gutter to Gulf* is designed to extend and support these initiatives: its aim is to address the question of water planning comprehensively and synthetically.

Gutter to Gulf has been organized to address water management questions across the disciplines of architecture, landscape architecture, and urban design. It is intended to ground design proposals at detail, building, site, and city scales in a clear understanding of the regional challenges facing southern Louisiana. Led by design school faculty members who have been working in New Orleans since Hurricane Katrina, the project is a collaboration among students and teachers at two universities. This academic labour pool means that ideas without conventional clients can be proposed, studied, tested, and brought to public attention. In return, the city's circumstances provide vivid dilemmas worthy of careful investigation. The initiative's goal is to produce theoretical work that can influence official design policy.

The first task facing *Gutter to Gulf* is to develop documentary drawings and models that explain how water moves into, across, and out of Drainage Basin 1. At present, the status quo of water in New Orleans is not only problematic but mysterious: base information about the city's drainage system, soils, and terrain is fragmentary, unreliable and outdated. The area looks flat, but what seem like minor differences in topography have an enormous impact on drainage. Beyond that, internal divisions by ridge lines, embankments, sub-basins, and waterways affect the possibilities for new proposals. The design studios are studying water infrastructure in New Orleans at multiple scales of space and time. In the first step in an

ongoing five-year programme, they made annotated cross-sections through the drainage basin that brought together the best available information about soils, water table, vegetation, and building patterns. This initial work was generated from pre-existing work and base information supplied and generated by Wolff, Hoferlin and Waggoner & Ball Architects from their extensive efforts and networks in New Orleans, pre- and post-Katrina. *Gutter to Gulf* developed sequential images of the history and mechanics of the city's drainage system. The design studios conducted research about the regional context that is shaping New Orleans's future. These studies were synthesized in a three-dimensional representation of the city designed to relate its cross-sectional conditions to its horizontal infrastructure systems. The main armature of this model accommodated detailed inserts that described the city at a finer grain and with respect to perception and experience. The model (Figure 1), joint-crafted by the students in St. Louis and Toronto, was delivered and installed in New Orleans and is currently used for view with the *Dutch Dialogues* work.

All of this documentation has been tested against observations made on the ground in New Orleans through collaborative field studies: *Gutter to Gulf* is committed to wrestling with the city's untidy reality.

A New Vocabulary for Water Infrastructure

Gutter to Gulf uses documentary work to set an agenda for design. The studios' research terms have defined a set of questions about how water infrastructure in New Orleans might evolve. These problems emerge from critiques of the status quo: asked to identify circumstances that demand change, studio members have addressed specific dilemmas with respect to their programmatic, formal, ecological, and infrastructural implications.

The *Gutter to Gulf* projects have been developed for diagrammatic clarity and experiential richness. Each one raises questions about time, performance, and the evolution of the urban landscape. The studios work to transcend conventional boundaries among architecture, landscape architecture, urban design, and planning. Projects address both the mechanics and the rhetoric of drainage: the conveyance of water; mechanisms for its storage and absorption; its transformation of ecological systems; its

relationship to public space; its legibility in the city; its legal status; and its capacity to increase the ecological and hydrological integrity of the urban landscape. Each of the projects operates at multiple scales. Some are site-specific, and others deal with problems that occur all over New Orleans.

This paper will present twelve *Gutter to Gulf* projects. They are grouped according to the scale of the issues they raise: individual lots and blocks; neighbourhoods; sub-basins in Drainage Basin 1; and the city as a whole. Each project (and each scale) asks a unique set of questions about the definition of infrastructure in twenty-first century New Orleans. From the smallest increments of building—the individual house and garden—to the largest—cross-town streets, canals, and levees—the projects propose constructed and organic systems to manage water. Together these proposals begin to define a new vocabulary for urban water infrastructure. Each deals with a familiar landscape problem or type and transforms it according to the dilemmas of the current moment. As the *Gutter to Gulf* initiative progresses over the next five years, this vocabulary of problems and proposals will grow. The broader its range, the more possibilities for its translation to landscapes and cities far beyond New Orleans, southern Louisiana, and other delta regions: every major city in North America contends in one way or another with issues of water management, and this compendium of strategies and tactics can be transposed and adapted to fit local ecologies, cultures, and circumstances.

Brief descriptions of the twelve projects follow, grouped by scale. We have included an image from one project in each group.

Scale: Individual Lots and Blocks

Theme 1: Forest

Problem

Like many of the neighbourhoods located near Lake Pontchartrain, Lakeview suffers from low elevations (as low as eight feet below sea level), unstable organic soils, and a high water table that restricts infiltration. As a result, the area is subject to significant flooding. The area suffered substantially during Hurricanes Katrina and Rita, and conditions are not optimal for rebuilding: vacancy remains high.

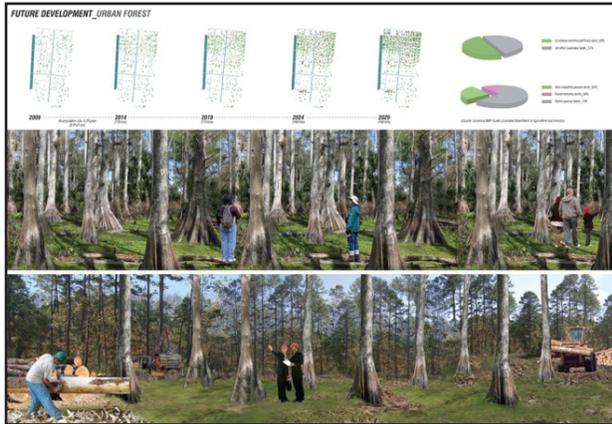


Figure 2: "Forest"

Proposal

The same conditions that make Lakeview less than ideal for rebuilding provide an excellent environment for urban forestry. The area's vacant lots could be used for cypress farming. These hydrophilic trees absorb large quantities of water, and they also tolerate flooding, so the forest lots could serve as a water storage basin for the rest of the neighbourhood. Keeping the forested lots wet would ameliorate the forces that cause ground elevations to drop, and tree harvesting would provide new economic resources for the city.

Theme 2: House and Garden

Problem

The houses and grassy yards that fill much of twentieth-century New Orleans do not offer ways to store, slow, or absorb water. Runoff overwhelms the storm sewer system, and rainfall that could be collected to irrigate gardens is lost.

Proposal

The project combines a modular house addition with an adaptable strategy about hydrophilic gardening. The house addition includes a cistern and, if needed, storage or living space. The garden uses subtle changes in topography and water-loving plants to limit runoff from the lot, increase habitat value, and provide food crops.

Theme 3: Parcel

Problem

St. Roch, a historic inner-city New Orleans neighbourhood, suffered from urban blight before Katrina, and its circumstances have grown even worse. Vacancy is a significant problem. An overburdened underground canal system has produced flooding and degraded streets and houses.

Proposal

The project consolidates blighted and adjudicated properties in order to create mid-block water channels and basins. Clear criteria are established for the evaluation, sorting, and transfer of land parcels. The protocol for sorting and consolidation reduces the number of blighted structures in the neighbourhood, protects historic architecture, increases density, and reduces flood risks. Although developed in response to particular circumstances, the strategy could be generalized across New Orleans and beyond.

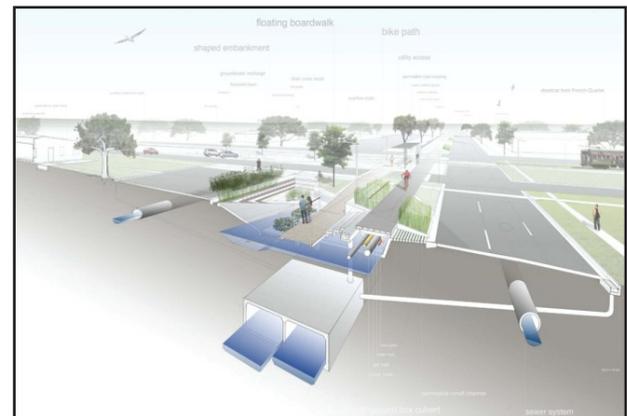


Figure 3: "Street Network"

Scale: Neighbourhood

Theme 4: Street Network

Problem

Most of the canals that convey stormwater out of New Orleans are below ground. Water is invisible and inaccessible. It functions only as a nuisance, moving at high speeds through the storm sewer system and overwhelming the city's pumps in huge pulses.

Proposal

The project expands New Orleans's water storage capacity by creating a network of canals that crisscross the northern part of the city. Streets are reconfigured as multi-use boulevards. Pressure on the London Avenue Canal is relieved by re-routing water through the city's streets and parks. As it travels, the water supports plant life and runs through purifying filters. Its slower movement means that the burden on the pumps is reduced during storms.

Theme 5: Park

Problem

At 1300 acres, City Park has the potential to store large quantities of floodwater during storms. However, because the park is drained to two pumping stations beyond its borders, it does not function as a retention basin. Ironically, as stormwater that falls in the park is being sent to Lake Pontchartrain, its lagoons are fed by Bayou Saint John, whose flows come directly from the lake.

Proposal

City Park could be disconnected from Bayou Saint John, restructured to collect and store its own stormwater, and provide an overflow for drainage infrastructure in adjacent neighbourhoods. Vegetation, floating wetlands, and reconfigured topography provide tools to increase water storage capacity, develop native habitat areas, and create public space.

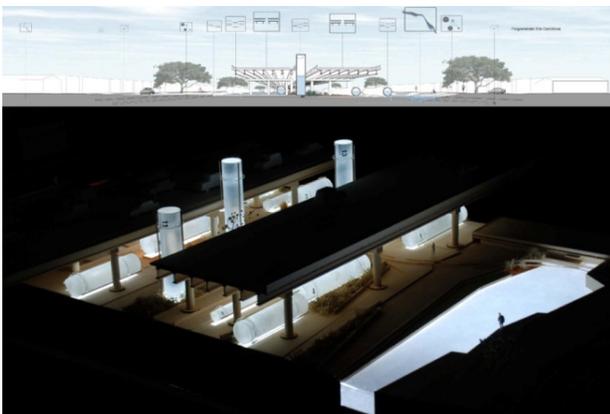


Figure 4: "Tank Farm"

Theme 6: Contamination

Problem

The Central City neighbourhood, like many others in New Orleans and across the United States, suffers from unsafe levels of lead contamination. Hurricanes Katrina and Rita exacerbated soil contamination by spreading a mix of toxic substances across the city. The soils in the neighbourhood present a health hazard, especially to small children.

Proposal

Phytoremediation has the ability to remediate lead and other soil contaminants. The project presents a phased strategy for cleanup and rebuilding. As soils are purified, they become suitable for urban agriculture, redevelopment, and public space.

Scale: Drainage Sub-basin

Theme 7: Tank Farm

Problem

New Orleans's freeways are designed to shed water as quickly as possible. The water flows at high speeds into the storm sewer system, where it swamps the city's pumps, and it cannot be used for irrigation or industrial purposes.

Proposal

Large water tanks situated along the freeway right of way collect and store water coming from the road surface. Water can be gradually released into the storm sewer system, or it can be used for irrigation and industry. The tanks, charged by photovoltaic panels, are illuminated to create a dramatic awareness of the presence of water in the city.

Theme 8: Street Detail

Problem

The current design of most New Orleans streets sends stormwater at high speeds across impermeable surfaces and into storm drains. This water, contaminated by oil and other chemicals, races through the storm sewer system at speeds and volumes beyond the capacity of the city's pumping systems.

Proposal

This project uses the planted street median, called a neutral ground in New Orleans, to slow, hold, and clean stormwater. The neutral ground is reconfigured as a planted swale, and water percolates into the street's underground canal through a sand and gravel filter. Tree planting on either side of the neutral ground increases the travel time of water to the ground and into the canal; it absorbs water; and it brings dignity and quality to the street.

Scale: The City as a Whole

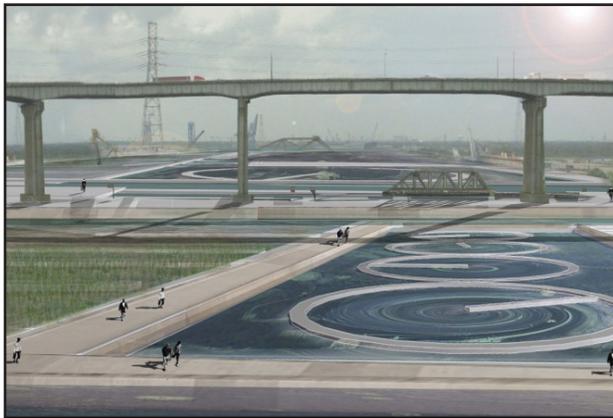


Figure 5: "Fish Farm"

Theme 9: Fish Farm

Problem

Many of New Orleans's industrial waterways have lost their economic value as the city's port moved downstream, out of the city's center. These industrial channels are polluted and hazardous, and their large scale makes them dangerous sites for destructive wave action during storm surges.

Proposal

This project fills in a defunct industrial channel and reconfigures it for aquaculture. The threat of storm surges is eliminated by closing the channel. The dimensions of the new landscape are scaled to optimize production of catfish, crawfish, and rice. A wetland at the downstream end of the system absorbs the nutrients produced by fish farming and releases clean water into the main channel of the Mississippi River.

Theme 10: Canal

Problem

Bayou Saint John, the waterway that connected historic New Orleans to Lake Pontchartrain, terminates at the underground Carondelet Canal. The canal's water is a partially hidden nuisance rather than a civic amenity, and its flows are not connected to the bayou. However, the ground above it, along Lafitte Street, is currently being studied and implemented as the site of a public greenway with the *Friends of the Lafitte Corridor*. Encouragingly, the work is cognisant of water management issues.

Proposal

The project re-exposes the Carondelet Canal, increasing its capacity and providing opportunities for slowing, retaining, and cleaning water. Charged by a connection to the old turning basin (or to the Mississippi River), the canal is brought into open connection with Bayou Saint John to increase circulation and improve water quality. Therefore, this proposal re-frames the reality of the current Lafitte Greenway project within a holistic understanding of water as both security and amenity by connecting the proposal to the citywide drainage unit.

Theme 11: Levee

Problem

The canals that drain New Orleans are bounded by high walls. These walls hide the water; they create inviolable boundaries in the city; and they are subject to failure.

Proposal

This project reconfigures the boundaries of the London Avenue Canal as a stepped earthen levee. The terraces that face the canal become building sites. The water creates a real estate amenity and becomes an urban front rather than a hidden nuisance, and the terraced inner levee becomes a public space that allows pedestrian and bicycle passage across town. Terracing the levee adds to its stability, and the houses built on its upper level are safe from flooding. This proposal hinges of the issue of relocating the pumping stations from within the city to Lake Pontchartrain's edge. If so, this will al-

low the water level of the canals to be dropped to below grade, rather than the canals' current above-grade situation.

Theme 12: Jurisdiction

Problem

The 17th Street Canal, whose breach flooded large areas of New Orleans during Hurricane Katrina, marks the dividing line between Orleans Parish and Jefferson Parish. It receives flow from both parishes, but it is drained only by Orleans Parish pumps. The system's jurisdiction is shared among the two parishes, the Army Corps of Engineers, and the Orleans Parish Sewerage and Water Board. This fragmented administration is inefficient and opaque. The canal functions only as a drainage feature, isolated from the city and from its constituents.

Proposal

The project creates an emergency spillway from the 17th Street Canal to Jefferson Parish, where sophisticated pumps have greater capacity than those in Orleans Parish. During normal conditions, the spillway functions as a public amphitheatre. The canal's capacity is increased, and its levee is modified to allow inhabitation and public uses.