



Assessing the City & SWBNO Drainage System: Recommendations for Enhancing New Orleans Stormwater Protection

**New Orleans Citizen Sewer, Water &
Drainage System Reform Task Force**

April 2012

City Drainage & Stormwater Protection



The Sewerage and Water Board of New Orleans (SWBNO) and City of New Orleans (City) have before them the most significant opportunity to transform the city’s antiquated stormwater protection since it was created more than a century ago. Collectively, SWBNO’s proposed drainage investments, the City’s new tranche of federal hazard mitigation funds, the Comprehensive Zoning Ordinance, and other active policies and programs present immediate opportunities to end the city’s overdependence on an aging network of pumps and pipes and instead create a more resilient, cost-effective, and integrated stormwater protection system.

Looking ahead, exclusive reliance on an aging “pipe-pump-canal” stormwater system will not ensure the city’s safety – all the more when control of that system is spread among multiple bureaucracies. Importantly, SWBNO’s proposed \$2.3 billion drainage investment provides needed upgrades and maintenance funds for that portion of the city’s stormwater system under SWBNO control. However, those investments do not introduce more sustainable protections that are needed to ease burden on the city’s “pipe-pump-canal” system and address New Orleans evolving stormwater threats from soil subsidence, rising seas, and increasing storm severity. Nor does SWBNO’s investments address the larger portion of the city’ drainage system controlled by the City’s Department of Public Works (DPW).

As such, the *New Orleans Citizen Sewer, Water & Drainage Management Task Force* recommends that SWBNO’s proposed drainage improvement plan be implemented in conjunction with the following additional policy and infrastructure initiatives that are immediate available to SWBNO and the City of New Orleans.

Recommended Reforms to Augment SWBNO's Proposed Drainage System Improvements

I. Implement Land Use Policies that Ease Stress on Drainage Infrastructure.....Pages 8-11

Recommended Action Items

Create a Comprehensive Water Management Regulatory and Investment Framework that utilizes the City Master Plan, zoning, permitting, blight policy, property rehabilitation assistance, and other land use controls to incentivize and mandate runoff reduction from private property

II. Consolidate & Integrate Local Stormwater Management.....Pages 12-17

Recommended Action Items

- Utilize an expanded SWBO drainage department to manage all city drainage infrastructure and related policy development*
- Institute a single, prorated drainage fee towards all city stormwater infrastructure based on property size, run-off potential, and property conservation features*
- Formalize intergovernmental coordination and inter-parish compacts to achieve regional-level stormwater management planning and infrastructure investment*
- Establish a Stormwater Advisory Committee to advise SWBNO and City on long-term stormwater management policy and investment planning*

III. Build on Existing Initiatives to Invest in Integrated Stormwater Protection Policies and Projects.....Pages 18-26

Recommended Action Items

- Establish quantifiable performance and investment goals to guide implementation of integrated stormwater management advancements by SWBNO and the City*
- Reduce stress on city drainage system by using federal hazard mitigation funds and other resources to add stormwater storage and other integrated water management safeguards to planned improvements to streets, canals, and public space projects*

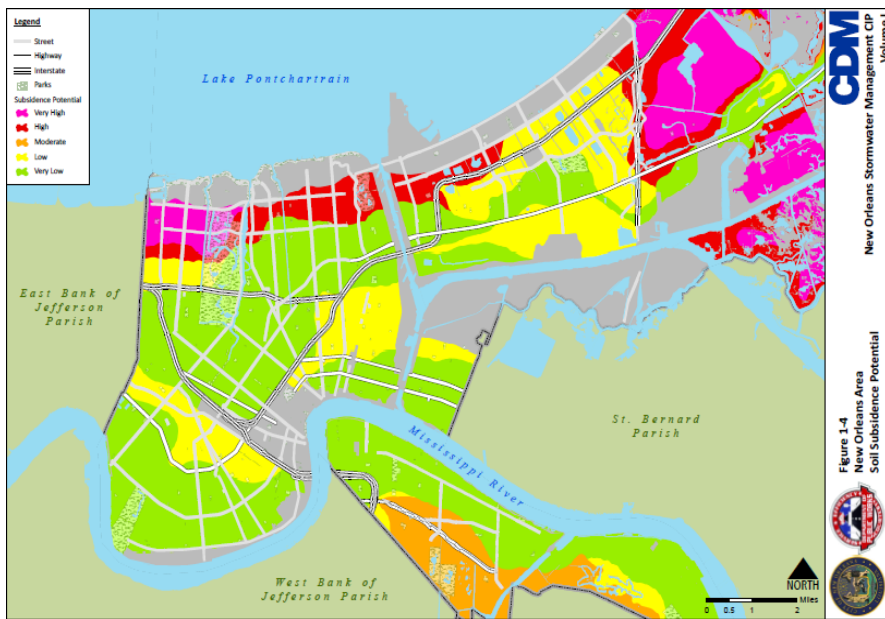
IV. Modify Planned SELA & Monticello Canal Improvements to Ensure Greater Effectiveness & Sustainability.....Page 27

Recommended Action Items

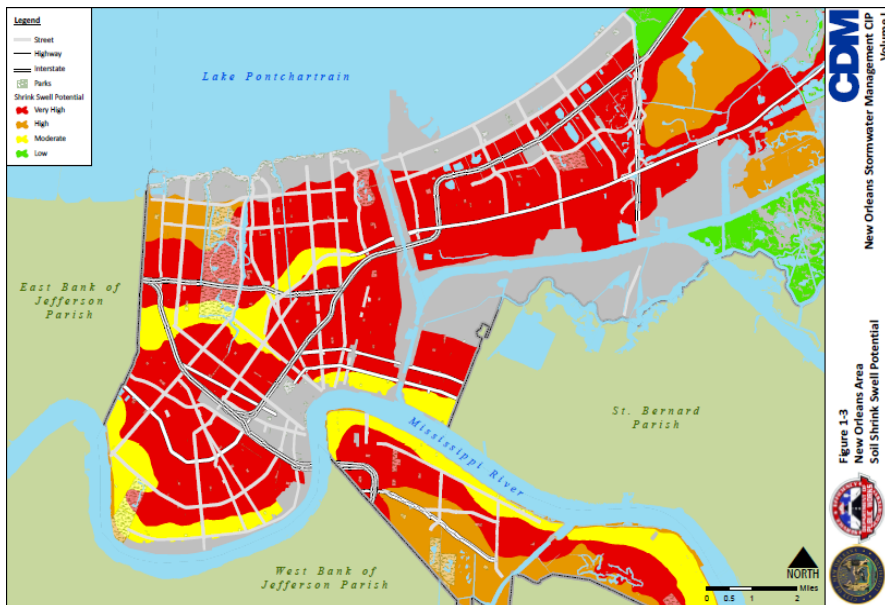
- Enhance proposed SELA underground drainage culvert projects, still in design phase, to ensure adequate connectivity to city drainage pipes and include water storage features*
- Design Monticello Canal improvements to ensure effective inter-parish drainage capacity*

Assessment of SWBNO's Drainage Improvement Plan & Other Available SWBNO-City Opportunities to Increase Stormwater Protection

The need to begin creating a more sustainable and balanced stormwater protection system is essential. The City's recently-issued Draft *Stormwater Management Capital Improvements Plan (City Stormwater Improvement Plan)* estimates that the existing City-SWBNO pipe-pump-canal drainage system can barely accommodate a 1-year rainfall event (2.0 inches per hour at peak; 4.2 inches over 24 hours) – that is a severe flood event with a near 100% chance of occurring annually.¹



The factors contributing to this problem roadmap the reform actions needed. Foremost, the city's diminished stormwater capacity is a function of mass pipe breakages along over 1,500 miles of drainage pipes. These breakages are largely caused by soil subsidence and "shrink-swell" that are worsening because rainwater does not sufficiently absorb into the ground as it is pumped to Lake Pontchartrain via barricaded culverts and canals.²



Neighborhood flooding is exacerbated when pipe breakages pair with catch basins clogged by excessive runoff from impervious properties, curbs, and streets. As the city subsides, pipes break, and runoff accelerates, pumping stormwater become more expensive, requiring ever more power and maintenance to take on gravity.

¹ See, City of New Orleans Draft Stormwater Management Capital Improvements Plan (New Orleans Department of Public Works (2011) (*Hereinafter* "City Stormwater Improvement Plan"). Performance assessments for how the city's drainage system performs in rain events of varied severity were based on models of how Drainage Pump Station No. 1 would perform, then that data was extrapolated to estimate how the city's entire drainage system would perform.

² *Id* at pgs. 5-6. Citing, Dixon, T.H., et al. "Subsidence and flooding in New Orleans." *Nature*, 2006: 587-588 and URS. *A Century of Subsidence: Change in New Orleans DEMs relative to MGL 1895 to 1999/2002*. Poster, Federal Emergency Management Agency, Baton Rouge, 2006.

Looking ahead, SWBNO and the City can greatly increase local stormwater protection and save billions in costs by jointly investing in a long-term program for methodically repairing the city's fractured drainage pipe network – approximately two-thirds of which is controlled by DPW.

Equally important, the City and SWBNO should begin supplementing existing pipe-pump-canal drainage infrastructure with projects and policies that increase water storage, absorption, and runoff reduction. Such protections, modeled after the Netherlands and other international best-practices, have been long heralded by local government as a necessity for ensuring the safety and vitality of New Orleans into the future. SWBNO's proposed improvement plan along with numerous ongoing and planned capital projects and programs administered by the City provide meaningful opportunities begin ushering in this more innovative and sustainable stormwater protection

SWBNO's Drainage Improvement Plan:

SWBNO's proposed \$2.3 billion drainage improvement plan includes important improvements and long-deferred maintenance to the assets within the city's drainage system that are under SWBNO control. However, SWBNO's investment does not reach the substantial amount of the system's pipes, catch basins, and other assets, which are under DPW control. Further, none of SWBNO's proposed projects are presently designed to increase water storage, absorption, and runoff reduction.

SWBNO will invest over \$1 billion in expansions to massive underground drainage culverts throughout the City pursuant to the *Southeast Louisiana Urban Flood Control Program* (SELA) and over \$800 billion to complete three permanent canal closure pumps stations at the lakefront. To a lesser extent, SWBNO's plan will further stormproof drainage pump stations, upgrade certain canals and drainage pipes, and finance SWBNO-generated electricity to power drainage pump stations. In all, approximately \$2.0 billion of SWBNO's plan will be financed through non-SWBNO sources, including mostly by the United States Army Corps of Engineers (USACOE).³ SWBNO will fund at least \$295.3 million of the plan, depending on its share of SELA costs.⁴

Proposed SWBNO Stormwater System Investments

Louisiana Ave Canal Expansion	\$106,038,404
SELA Program Management	\$7,500,000
Hollygrove Canal Expansion	\$50,000
So. Claiborne-Lowerline Culvert Expansion to Monticello	\$99,963,061
Napoleon Ave Canal Improvements	\$124,808,259
Donner Canal Improvements	\$118,300,000
General De Gaulle Canal Expansion	\$149,550,000
Florida Ave Canal (Drainage Pumping Station #19)(DPS)	\$241,453,167
Dwyer Intake Canal Expansion (St. Charles to Dwyer)	\$1,000,000
Jefferson Ave Canal Expansion	\$131,688,636
Construct DPS #4	\$25,908,000
Dwyer DPS Expansion	\$50,000
Improvements to DPS #13	\$34,550,000
Airline & Monticello Canal Improvements	\$8,925,000
SWBNO Drainage Asset Repairs Related to DPW Projects	\$43,000,000

³ See, "SWBNO Financial Plan & Rate Study 2011-2020," p.23 (September 28, 2011). (Hereinafter SWBNO Rate Study).

⁴ *Id* at p.40.

Improvements to Metairie Relief Canal	\$6,650,000	
Drainage Improvements on Tchoupitoulas Ave.	\$12,250,000	
Melpomene St. Canal Improvements	\$50,000	
Expansions of DPS #15	\$16,500,000	
DPS # 6 Improvements	\$26,400,000	
Flood Gate - DPS # 16 Discharge Tunnel	\$1,000,000	
Hurricane Recovery Bonds	\$660,000	
Stormproof Protections among SWBNO Assets	\$167,229,458	
Routine Replacements at Drainage Pump Stations	\$73,855,000	
Construction of Permanent Lakefront Pump Stations	\$800,000,000	
Drainage Share of Power Projects	\$62,927,000	
Drainage Share of General Budget Items	\$51,512,876	
Engineering Inspections	\$130,000	
Power and General	\$114,569,876	5%
SELA	\$1,040,859,527	45%
Replacement / Rehabilitation	\$73,855,000	3%
Lakefront Pump Stations	\$800,000,000	35%
Stormproof Projects	\$167,229,458	7%
Non-SELA Canal & Drainage Station Improvements	\$115,435,000	5%
Total SWBNO Drainage System Investment	\$2,311,948,861	

Source: SWBNO Rate Study (2011), Appendix C

Joint Funding and the Need for Consolidating SWBNO & City Drainage Assets:

Nearly two-thirds of the city's stormwater protection system does not receive funding through SWBNO's plan because it is under DPW control. This includes nearly 20,000 catch basins and 1,288 miles of the city's over 1,500 miles of drainage pipes.⁵ Nonetheless, the City's *Stormwater Improvement Plan* recommends that SWBNO and DPW drainage assets should together limit localized flooding to six-inches during the peak of a 10-year rain storm (8.5 inches of rain over 24 hours).⁶ To achieve that protection level, the City's study estimates that over \$4.7 billion in drainage pipe improvements are needed, including \$3.1 billion to improve DPW assets.⁷ At present, SWBNO's improvement plan directs less than 3% of proposed funding to improve SWBNO pipes. Still, that amount, paired with \$40 million for annual maintenance, far exceeds DPW funding that is available to replace and maintain DPW assets. The City's 2012 budget for maintaining streets and related DPW pipes and catch basin is less than 7% of SWBNO's 2012 drainage maintenance budget.⁸

In essence, with nearly 80% of SWBNO's investment aimed at massive drainage culverts, canals, and pumps and so little comparatively directed towards improving the pipes and catch basins at the front of the city's drainage system, the city's current stormwater protection funding structure is akin to financing a new highway without investing in the connecting roads and onramps to use it.

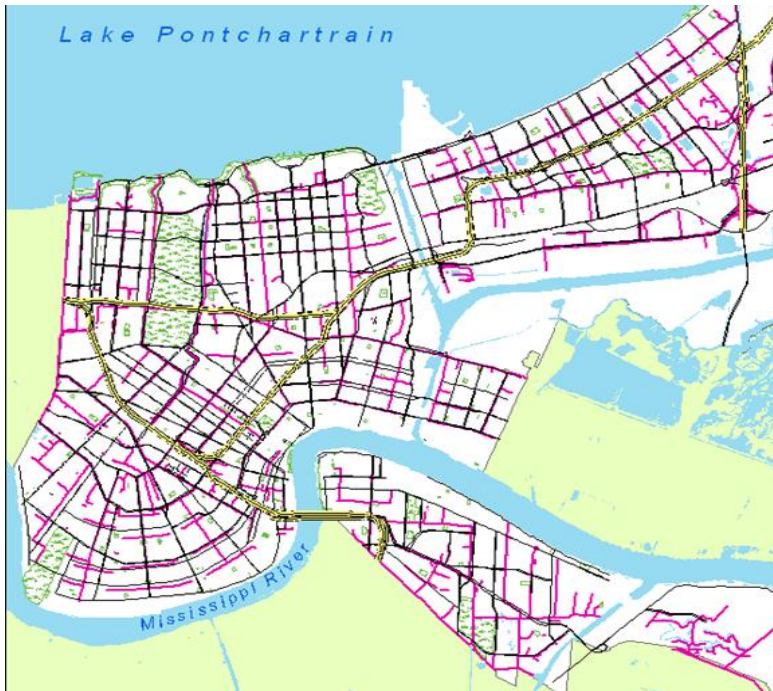
⁵ A 1992 Cooperative Endeavor Agreement between the City and SWBNO establishes that the replacement of "all drainage lines smaller than thirty-six inches (36") in diameter, or the equivalent in arched pipe; all catch basins and catch basin laterals; and manholes designed to accommodate lines less than thirty-six inches in diameter... should normally be performed as part of a Street Capital Construction Improvement Project" which is undertaken by DPW.

⁶ See, City Stormwater Improvement Plan, Section 1, pgs 2-3.

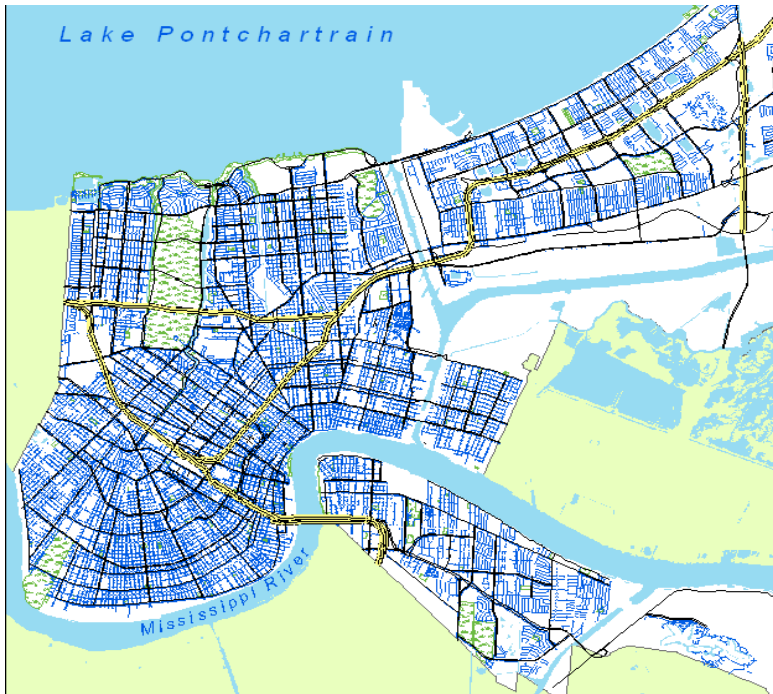
⁷ See, Jackson, Louis L., Jessica Watts. "Presentation of City of New Orleans Stormwater Capital Improvements Plan to DPW." (September 9, 2011) (*Hereinafter* CDM Presentation). \$4.7 billion in pipe repairs is equivalent to adding approximately 775 miles of new pipe throughout the City.

⁸ See, 2012 Annual Operating Budget, City of New Orleans (October 2011), p.298; SWBNO Rate Study, Appendix E-6.

A Tale of Two Drainage Systems



SWBNO Drainage System:
235 Miles of Drainage Pipe & Canals
FY 2012 Budget for O&M: \$40,065,972



City-DPW Drainage System:
1,288 Miles of Drainage Pipe
19,460 Inlets & Catch Basins
FY 2012 Budget for all Street O&M: \$3,156,273

To address existing city drainage system inefficiencies, the *Task Force* recommends that the City and SWBNO develop a joint funding plan for improving the city's entire drainage pipe network. It is unsustainable for DPW to administer two-thirds of the system with barely 7% of the budget that SWBNO uses to maintain the rest of the system. Compounding this gap, SWBNO's proposed drainage fee is presently only intended for SWBNO assets.

Set forth in more detail in the following section, the *Task Force* strongly recommends that SWBNO and the City develop a unified financing and management strategy for the city stormwater protection system. This unified strategy should include a single parcel-based drainage fee and coordinated bond financing to ensure long-term system improvements. Such joint financing should ultimately be part of a broader initiative to consolidate the management of all city drainage assets and related policy within a single local governmental unit.

Left unchecked, the city's needlessly bifurcated drainage management system will remain a leading cause of delays in repairing broken pipes and a hindrance to integration needed to improve the city's stormwater protection. As such, a single drainage management structure should be used to administer all drainage-related assets from catch to pumps and basins, and oversee stormwater management policy development and its coordination with applicable zoning, permitting, and community development initiatives. Given existing institutional expertise and resources, the *Task Force* recommends that management of city drainage assets and policy be housed within an expanded SWBNO drainage department.

SWBNO and City Should Capitalize on Existing Opportunities to Begin Making Integrated Stormwater Protection a Reality:

The *Task Force* recommends that SWBNO's drainage improvement plan be supported only in conjunction with augmenting proposed SELA and canal improvements with feasible designs to increase water storage, absorption, and runoff reduction in relation to stormwater entering the city's drainage system. More specifically, the *Task Force* strongly urges that City and SWBNO work with USACOE to enhance proposed SELA projects still in the design phase to increase water storage rather than merely increase conveyance through a fragile pipe-pump-canal system.

In addition, SWBNO's improvement plan should be paired with efforts to bolster the "front lines" of the city's stormwater protection system – the rooftops, lawns, and parking lots of over 189,396 commercial and residential properties and adjoining streets and curbs from which rainwater cascades into the city's pump-pipe-canal network. In this domain, heightened investment is needed to slow the course of runoff and ease stress on fragile infrastructure through more effective stormwater management regulations, pervious pavement, and water storage features.

Several existing or already-planned public projects, including citywide FEMA-funded street repairs, USACOE-funded outfall canal repairs, Lafitte Greenway, and other project significant and immediate opportunities to begin incorporating Netherlands-inspired stormwater protection in New Orleans. To help achieve this, the *Task Force* recommends that the City use a reasonable portion of its estimated \$247 million in additional federal hazard mitigation funds to incorporate water storage features into such planned public initiatives.

Expanded policy safeguards are also needed to improve the city's stormwater protection. The *Task Force* recommends that the City lead in creating a *Comprehensive Water Management Regulatory and Investment Framework* that guides the creation of stormwater control mandates and incentives among applicable governmental entities. For example, enactment of more aggressive stormwater management permitting is recommended, which would require stormwater control plans for specific design and construction activities. Further, stormwater control related zoning should be expanded and applied to properties that are 5,000 square feet or larger in lieu of the current 15,000 square feet threshold, which only applies to 3% of the city's properties. Paired with this, uniform runoff reduction mandates and incentives should be incorporated in blighted property acquisition transactions and housing and commercial development assistance offered by City departments.

Finally, the *Task Force* recommends creating inter-parish working groups among City, SWBNO, Jefferson Parish, and St. Bernard Parish officials to commence joint policy development and infrastructure planning based on needs within apolitical regional drainage basins.

Recommended Reforms to Augment SWBNO's Proposed Drainage System Improvements

Goal: Implement Policies that Ease Stress on Drainage Infrastructure

Recommended Action Items

Create a Comprehensive Water Management Regulatory and Investment Framework that utilizes the City Master Plan, zoning, permitting, blight policy, property rehabilitation assistance, and other land use controls to incentivize and mandate runoff reduction from private property.

"An ounce of prevention is worth a pound of cure" – or in New Orleans instance, perhaps worth several billion dollars in repairs to aging and fractured drainage pipes.

Citywide stormwater management and flood protection begins at the rooftop. During storm events, billions of gallons of rainwater careen from the roofs, soggy lawns, and dirty driveways and parking lots of the city's commercial and residential properties. Safely slowing, storing, and absorbing this deluge at the property line can greatly reduce burden on the city's pipe-pump-canal infrastructure and alleviate subsidence, debris, and other elements that further compromise that system.

To achieve this more sustainable strategy, stormwater protections must be incorporated into commercial and residential properties on a measureable, citywide scale. Comprehensive and coordinated policymaking is essential to accomplishing this. Given this, concurrent with constructing drainage-related public infrastructure, the *Task Force* strongly recommends that the City and SWBNO, collaborate with each other and with the City Planning Commission (CPC), Regional Planning Commission (RPC), and New Orleans Redevelopment Authority (NORA), to develop a comprehensive stormwater management regulatory plan that includes mandates and incentives in all governmental rules and programs that can improve stormwater management on private property.

Specifically, the *Task Force* recommends that local governmental entities implement regulatory controls and incentives to achieve the following aims:

- Reduce water volume in pump-pipe system by safely increasing onsite rainwater retention
- Increase soil water absorption using landscaping that enables water storage and seepage
- Reduce runoff volume, pollution, and erosion by limiting paved surface area and increasing use of porous pavement and runoff absorbing plantings.

The following are existing policy opportunities to achieve these aims:

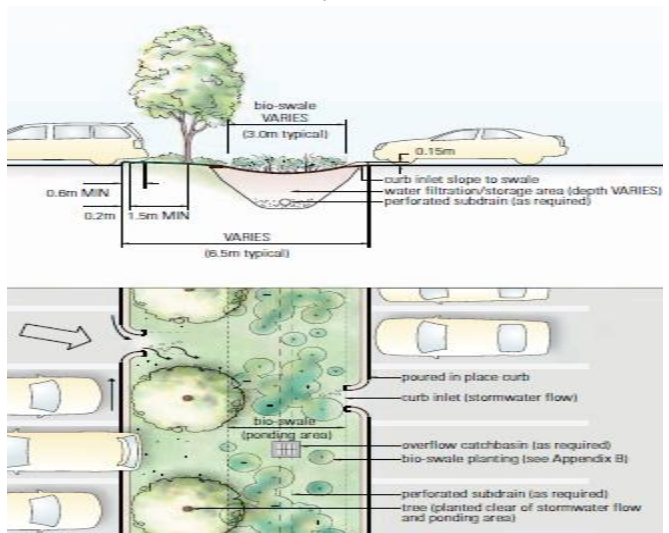
- *Stormwater Control Permitting Ordinance*: The *Task Force* recommends enacting a stormwater control ordinance that requires *stormwater permits* and *stormwater management plans* to achieve prescribe runoff rates for new residential and commercial construction or property additions greater than 500 square feet requiring clearing, excavation, dirt work, filling, or construction.

The ordinance should also provide uniform enforcement standards relative to federally required *Municipal Separate Storm Sewer System (MS4) Permitting*. Such standards are essential towards preventing discharge of contaminated stormwater runoff from industrial, commercial, residential, and construction sites into the City/SWBNO drainage system. Recommended enforcement elements include: (a) consolidating all MS4 enforcement and education efforts within a single local governmental unit; (b) inclusion of MS4 inspection fees as part of overall MS4 permits costs; and (c) enhanced enforcement authorities that daily fines, injunctive relief, and civil fines.⁹

- **Master Plan & Comprehensive Zoning Ordinance:** The Comprehensive Zoning Ordinance should include a chapter for stormwater management codes.¹⁰ These codes should apply to properties 5,000 square feet or larger. The currently proposed threshold of properties 15,000 square feet or greater with impermeable surfaces only applies to 6,313 of the city’s 189,396 private property parcels – less than 3.3% of properties within the city. Given that runoff impact increases with property size, a tiered structure with heightened requirements with increasing property size is recommended. Further, zoning incentives should be used to reward safeguards above minimum requirements.

Within the above framework, the following zoning safeguards are recommended:

- ✓ For new construction and retrofits greater than 10,000 square feet, require post-development runoff rate no more than 50% of pre-development runoff rate if previously developed and no greater than pre-development runoff rate if previously undeveloped.
- ✓ Require that parking lots of ten or more spaces, including all lots in Central Business District, are constructed and maintained using approved surfacing, drainage, and landscape plans that include perimeter vegetation to absorb runoff; 20% minimum pervious pavement requirement; grading requirements orientated to pervious pavement and landscaping. In addition, new lots with more than twenty-five spaces should require submission of a stormwater management plan and filter or store the first inch of rainwater during rain events and include catch basin restrictors and other pollutant filters as feasible. Below are illustrations of ideal city commercial lots:



⁹ See, for additional guidance, City Stormwater Improvement Plan, Volume 1, Section 8 - Regulatory Review.

¹⁰ Recommended content guidance includes the Louisiana Model Stormwater Based Landscape Code. Available at: www.abbey-associates.com/splash-splash/text/Model%20Landscape%20Code/LDEQ-EPA%20Appendix.A.pdf.

- ✓ Conserve water by mandating efficient and cost-effective irrigation. Recommendations include rules and incentives for native, drought-tolerant species; recycling water elements; landscaping maintenance; low-volume irrigation with automatic controllers; and safeguards to avoid backflow, runoff, or low-head drainage causing water to flow onto adjacent property, walks, or roadways.
- ✓ Require landscape water meters that are owner purchased, installed, and maintained.
- ✓ Expand public guidance by including best-practice designs and specific recommended techniques for selecting, installing, and maintaining stormwater management features.¹¹
- *Blighted Property Sale & Reuse*: Blight-declared properties sold via auctions and other government initiatives should include minimum requirements and incentives for water storage features. Equally important, the City and NORA should properly maintain the thousands of abandoned blight-declared properties and former *Louisiana Land Trust* (LLT) properties, awaiting resale or other final use by ensuring effective subsurface infiltration and runoff reduction.

Applicable Existing Programs: Lot Next Door; Sheriff Sale and NORA Auctions; National Stabilization Program Rehabilitation; Hazard Mitigation Pilot Reconstruction Program

Recommended Existing Funding Sources: LLT funding; hazard mitigation grants; community development block grants; neighborhood stabilization funding; and blight fines and revolving liens.

- *Economic Development Incentives*: SWBNO, NORA, CPC, City economic development and permitting departments, the New Orleans Business Alliance, and GNO, Inc. should coordinate relative to meeting commercial and large-scale residential project drainage needs. In addition, economic incentive programs related to attracting commercial relocation and property rehabilitation should include unified minimum standards and incentives aimed at maximizing runoff reduction, pervious surface use, and onsite stormwater storage and reuse.

Applicable Existing Programs: Neighborhood Commercial Investment Program; NORA Commercial Loans; Industrial Development Board Tax and Bond Approvals

Recommended Existing Funding Sources: Community development block grants; PILOTS, TIFs



Photo: Ellen Greenberg, Arup.



¹¹ See, "LA Model Stormwater Based Landscape Code" (www.abbey-associates.com/splash-splash/text/Model%20Landscape%20Code/LDEQ-EPA%20Appendix.A.pdf) and "Universal Stormwater Model Ordinance for North Carolina" (www.efc.unc.edu/publications/pdfs/Stormwater_Model_Ordinance/UniversalStormwaterModelOrdinanceNC.pdf).

- *Residential Property Rehabilitation & Construction Assistance:* Existing City and NORA residential property rehabilitation and new construction assistance programs provide excellent opportunities to incorporate stormwater reduction features into properties citywide and provide related technical assistance.

Recommended features include: “dry streams,” bioswales; street-side rain gardens; sidewalk runoff controls; porous driveway pavement; rain-barrels and cisterns; subsurface infiltration systems; and tree-plantings and other vegetative cover capable of absorbing stormwater.

Such incentives should be administered to target geographically specified hazards, such as repetitive-loss flood risk in certain city drainage basins.

Applicable Existing Programs: Lot Next Door; “Growing Home,” Sheriff Sale and NORA Auctions; National Stabilization Program Rehabilitation; Hazard Mitigation Pilot Reconstruction Program; “*Soft Second*” Homeownership Mortgage Financing

Recommended Existing Funding Sources: LLT funding; hazard mitigation grants; community development block grants; neighborhood stabilization funding, permit fees, blight fines and liens



Water for irrigation is one the largest sources that burdens a city’s stormwater protection system. Rooftop runoff only compounds this burden. For example, 1 inch of rainfall on a 1,000 square foot roof typically yields approximately 623 gallons of water. Effective solutions to controlling such runoff are rain-barrels and cisterns, such as in this illustration, which, in turn, provide water for irrigation. Financial incentives to incorporate stormwater storage into rehabbed property or new construction could achieve citywide reductions in the amount of water burdening the city’s drainage system.



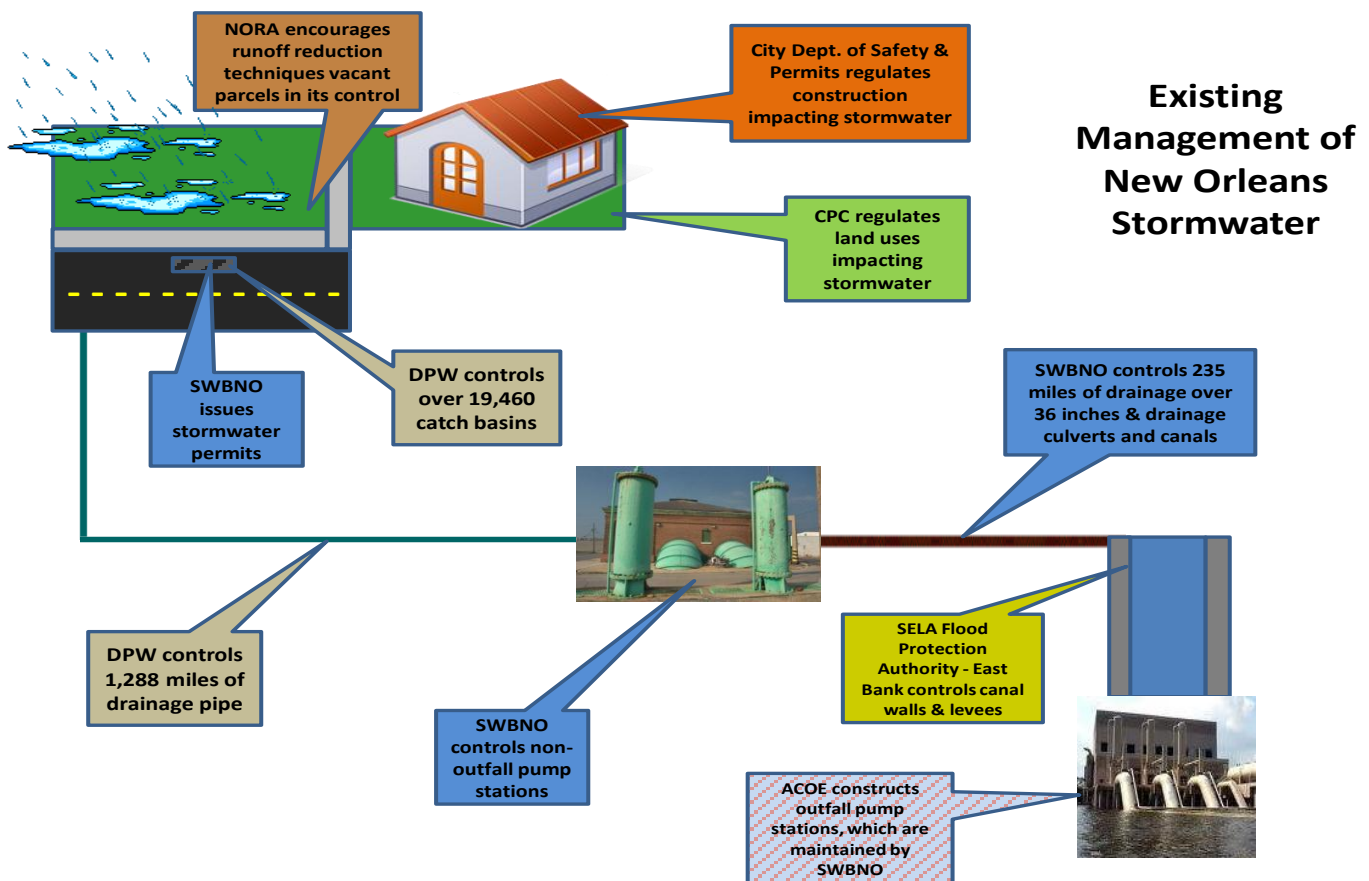
Rainwater overflowing from property drains can be sent to “bioswales,” such as in this illustration, where it slowly infiltrates into the ground in lieu of cascading into streets. Financial and technical support could establish such features as a norm among government-supported property rehab and new construction.

Goal: Consolidate & Integrate Local Stormwater Management

Recommended Action Items

- Consolidate all city stormwater management policy and infrastructure functions within an expanded SWBNO Drainage Department
- Institute a single, prorated drainage fee towards all city stormwater infrastructure based on property size, run-off potential, and property conservation features
- Formalize intergovernmental coordination and inter-parish compacts to achieve regional-level stormwater management planning and infrastructure investment
- Establish a Stormwater Advisory Committee to advise SWBNO and City on long-term stormwater management policy and investment planning

A raindrop serves many masters in New Orleans. Illustrated below, multiple governmental entities administer regulations, infrastructure, and property that shape local stormwater management.



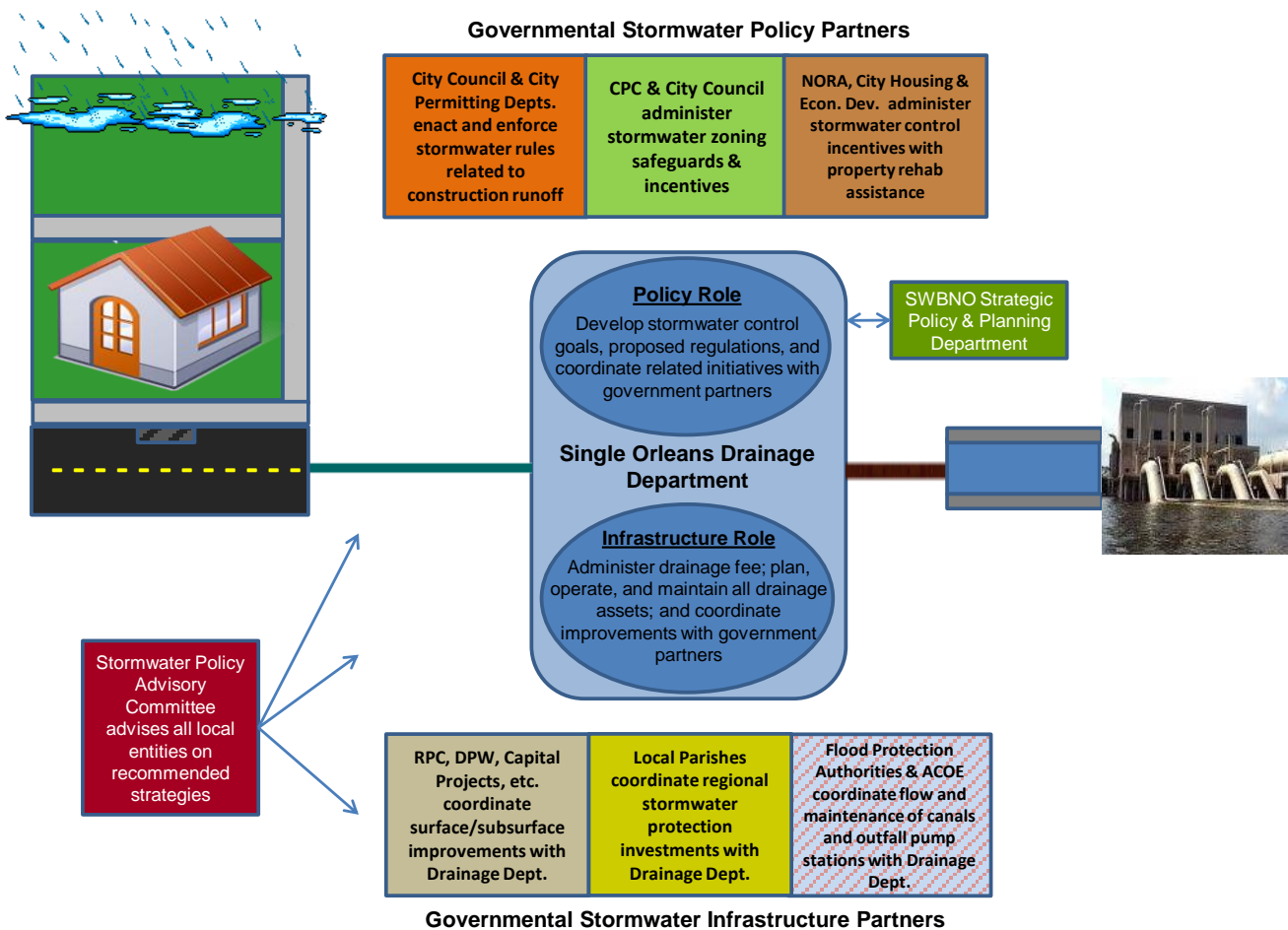
SWBNO's proposed drainage improvement plan sheds light on this unworkable dispersal of stormwater management that stymies the good faith efforts of local government. SWBNO's portion of the stormwater system is slated for billions in investment, while the majority lacks a complete improvement plan with dedicated funding. Meanwhile, policies that are critical to a cost-effective protection system are scattered throughout the local bureaucracy without formal coordination.

To increase efficient stormwater protection, the following management reforms are recommended:

Consolidate all City Stormwater Related Functions into SWBNO Drainage Department:

All stormwater policy development and infrastructure planning and operations in New Orleans should be consolidated in a single *Stormwater Management Department*. Given existing in-house expertise, experience, and available resources, SWBNO’s Drainage Department should serve this role. Such consolidation is consistent with the City’s *Stormwater Improvements Plan* which recommends a single department “to provide for effective management and financing of a stormwater management system within the city.”¹² As such, a consolidated stormwater department should achieve:

- **Policy Development & Coordination:** Develop stormwater regulations, incentives, and technical assistance that are administered in conjunction with initiatives among other governmental entities.
- **Strategic Infrastructure Planning & Investment:** Merge all drainage assets under single utility to better plan, fund, operate, and maintain pipes, culverts, canals, and pumps as an entire system.
- **Strategic Master Planning for Integrated Stormwater Protection:** Oversee the “establishment and implementation a master plan for stormwater drainage including design, coordination, construction, management, operation, maintenance, inspection and enforcement.”¹³



¹² City Stormwater Improvement Plan, Volume I, Section 8-Regulatory Review, p.93.

¹³ *Id.*

Institute a Single, Prorated Drainage Fee Towards all City Stormwater Infrastructure Based on Property Size, Run-off Potential, and Property Conservation Features:



The *Task Force* concurs with SWBNO's recommendation that a drainage fee is the most equitable and reliable means for financing SWBNO's estimated \$295.3 million share of its \$2.3 billion drainage improvement plan.¹⁴ However, the *Task Force* strongly recommends that a single drainage fee be established for both SWBNO and DPW drainage asset needs because significant deficiencies among DPW drainage infrastructure will undermine SWBNO improvements if unaddressed.

SWBNO is wise to move away from solely relying on tax levies as its local source of drainage system funding. Given the city drainage system's long-term capital, operations, and maintenance needs, a drainage fee system will more fairly and sustainably generate needed funding by recovering costs of constructing, operating, and maintaining the drainage system based on stormwater generated by a property rather than a property's assessed value. Also, a fee system can more easily be structured to reward property owners with reduced fees for using stormwater runoff controls.

Nonetheless, the fairness of a drainage fee will be negated if property owners pay fees for SWBNO improvements, while their property taxes continue to be concurrently stretched to finance repairs to DPW assets. SWBNO proposes a monthly drainage fee, from at least 2013 to 2020, that charges on average \$18.83 for residential property above 5,500 square feet; \$22.24 for commercial property above 6,300 square feet; and \$88.10 for industrial property above 25,000 square feet.¹⁵ Conversely, facing deep revenue constraints, the City allocates just \$3,156,273 in its 2012 budget for all street-related maintenance, including DPW drainage pipes for which the City estimates \$3.1 billion is needed in total repairs.¹⁶ Indeed, SWBNO estimates that it performs approximately \$300,000 annually in response work related to DPW drainage assets – including loaning “S.&W.B.” pylons to demark potholes caused by broken DPW drainage pipes.¹⁷ (See, Appendix)

Looking ahead, SWBNO estimates it would cost approximately \$8.5 million to conduct annual complaint-based “reactive drainage maintenance” to repair, clean and inspect DPW manholes, drains, and catch basins.¹⁸ This is based complaint volumes from 1997 – the last year SWBNO assumed

¹⁴ SWBNO Rate Study, p.36.

¹⁵ *Id* at 39.

¹⁶ See, Note 7 (“CDM Presentation”); see also 2012 Annual Operating Budget, City of New Orleans, p.298.

¹⁷ See, Appendix: “Estimated SWBNO Costs in Responding to DPW Drainage Repairs.” (September 2011).

¹⁸ *Id*.

responsibility for such repairs – and does not reflect likely backlog and increased repair demand.¹⁹ More proactive “schedule for maintenance where everything is addressed according to schedule and not based upon waiting for complaints” would cost several more million dollars annually.²⁰

In addition, the City lacks a dedicated, stable source of funding that could help underwrite the construction and maintenance of stormwater storage and subsidence abatement public projects that are critical to ushering in more integrated, sustainable stormwater protection. In this, a single, comprehensive drainage fee could be the foundation upon which the City and SWBNO finance the modernized stormwater protection needed in New Orleans.

More than 1,000 utilities, nationwide, use drainage fees based on impervious property surface area, providing ample best-practices to explore, including Philadelphia, which generates stormwater fees from owners of vacant lots, parking lots, and other such spaces that contribute significant stormwater runoff.²¹ As an excellent starting point, the City’s *Stormwater Improvement Plan* provides important preliminary data, billing units, and analysis upon which to structure a joint fee.²²

Given this, the *Task Force* recommends the following priority considerations and next-steps to establish a single drainage fee for the city’s entire stormwater protection system:

- Develop a fee structure based on impervious cover, gross area, and land use type to include vacant lots and other privately-held spaces that contribute stormwater volume to the city’s system.
- Establish a fee flexibility to reduce charge based on measurable mitigation controls but also increase charges for parcels with impervious areas exceeding average development.
- Finance citywide analysis of impervious area; use single needs-assessment for SWBNO and DPW drainage assets; and conduct public education related to implementing the drainage fee.
- Utilize alternative or supplemental fee structures for particular development types –
 - ✓ Fee-In-Lieu-Of Charge: Upfront charges from developers when major stormwater infrastructure improvements are needed to service their development²³
 - ✓ “Availability Charge”: Charge to developer or resident to recover their contribution to a stormwater control system already constructed with finite capacity.²⁴
 - ✓ Zoning Incentives: Link zoning incentives to fee system to allow higher than normal density if there land is also dedicated for stormwater control (i.e., detention, retention, absorption, etc.).

¹⁹ *Id.*

²⁰ *Id.* SWBNO estimates a proactive drainage maintenance program for city assets would cost \$42 million every 10 years.

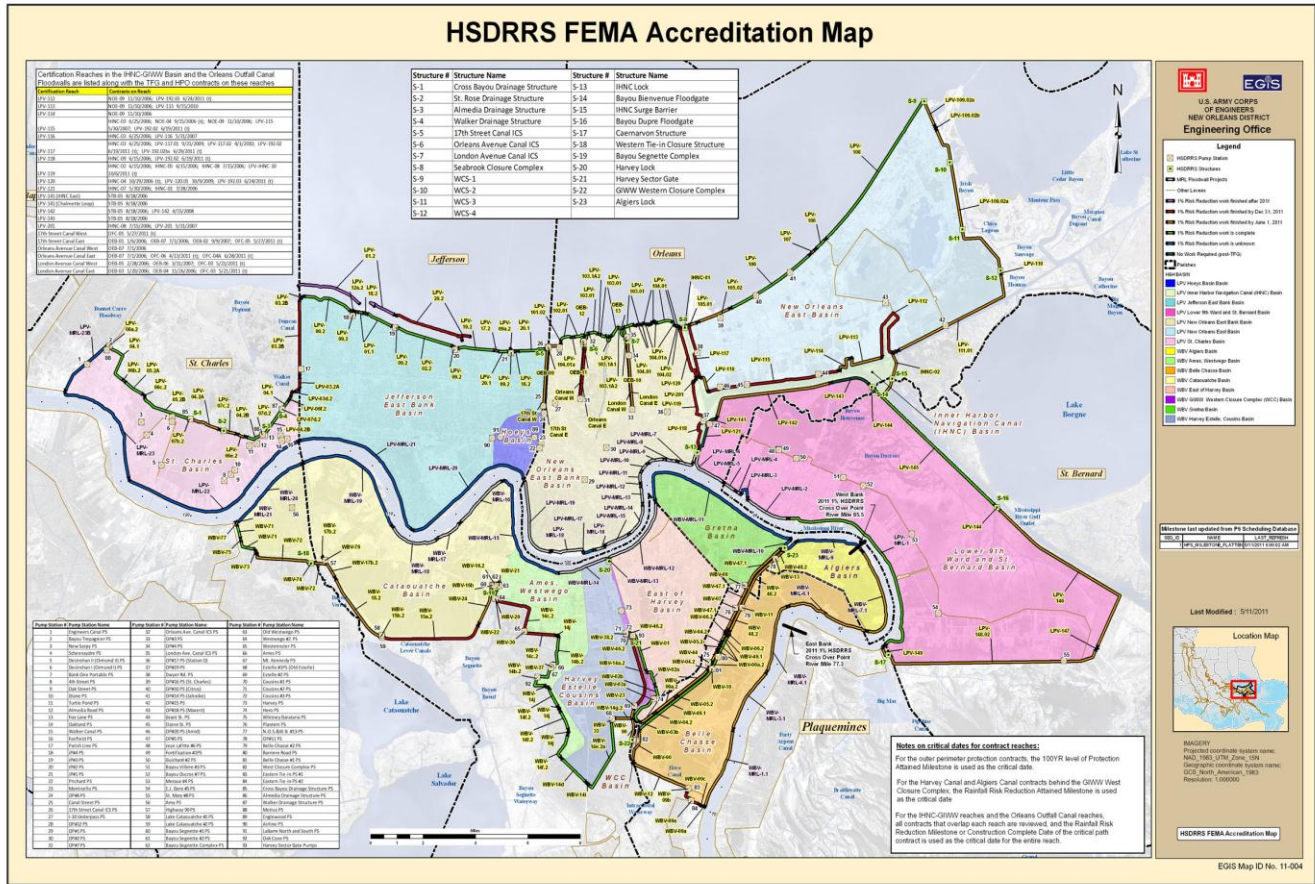
²¹ City Stormwater Improvement Plan, Volume I, Section 9-Rate Study, p.115, 121-122. (Citing survey by Western Kentucky University [<http://wku.edu/engineering/wp-content/uploads/2010/07/Western-Kentucky-University-SWU-Survey-2010.pdf>]). Based on a property’s impervious surface area, a uniform unit of measurement (“equivalent runoff unit”) is then typically derived to create separate billing rates for residential, multi-family, commercial, and industrial properties.

²² *Id.*

²³ *Id.* at 120 (Major improvements appropriate for this fee include large marginal costs for constructing additional facilities or development requiring new stormwater management controls [i.e., detention/retention facilities]).

²⁴ *Id.* (i.e., expansions of multi-family complexes, etc.).

Formalize Intergovernmental Coordination and Inter-Parish Compacts to Achieve Regional-Level Stormwater Management Planning and Infrastructure Investment:



Rainwater and topography forge their own boundaries. In the Greater New Orleans Area, there are at least ten separate drainage basins that devilishly move stormwater over political and taxing district lines without care (see above map).²⁵ SWBNO and City stormwater investments must be gauged by the extent to which they protect from floods based on these natural boundaries. The *Task Force* recommends that more effort be dedicated by SWBNO and the City to commence work with counterparts from Jefferson and St. Bernard Parishes to develop inter-governmental frameworks through which joint stormwater policies and infrastructure investments can be planned, financed, and implemented.

The *Comprehensive, Sustainable Integrated Water Management Strategy for Harvey Canal and Orleans Canal for St. Bernard Parish and the East Banks of Orleans and Jefferson Parishes (CSIWMS)* being developed for Greater New Orleans, Inc. (GNO, Inc.) through a grant from the State of Louisiana presents SWBNO and the City with a timely and important opportunity to begin this effort. At present, a multi-disciplinary private-sector team is developing proposed inter-parish stormwater control projects based on international best-practices and this area’s specific hydrological, land, and development characteristics.

²⁵ Hurricane and Storm Damage Risk Reduction System (HSDRRS) FEMA Accreditation Map available online at: <http://www.espeyconsultants.com/images/HSDRRS.jpg>.

However, for these projects to become a timely reality and potentially harness the public funding now available or being proposed, it is essential that SWBNO and the City begin to work with Jefferson and St. Bernard parishes to perform the following recommended next-steps:

- Assign representatives from relevant local governmental entities to contribute data and information pertaining to current policies, laws, and funding that impact proposed stormwater projects
- Per state law or binding agreements, establish an inter-parish governmental team to identify existing policies, laws, public financing streams, and governance structures that would need to be modified or created to enable proposed inter-parish stormwater control projects and initiatives²⁶
- Issue executive orders mandating review of planned public infrastructure investments to assess their impact or opportunity for benefitting regional-level stormwater protection
- Issue executive orders establishing a minimum percentage of pervious surface and/or other stormwater controls for incorporation into street, public space, and other applicable public projects.
- In partnership with RPC, conduct a regular review of the Regional Transportation Improvement Program and identify opportunities and funding sources for incorporating an increased amount of stormwater controls into planned transportation projects.

Establish a Stormwater Advisory Committee to Advise SWBNO and City on Long-Term Stormwater Management Policy & Investment Planning:

The *Task Force* recommends that a public-private *Stormwater Policy Advisory Committee* (SPAC) be established to advise SWBNO and the City on implementing longer-term stormwater management policies, practices, and investments based on regional goals for environmental protection, transportation, and community and economic development. At a minimum, SPAC should include representatives of SWBNO, City, City Council, other local government entities, the New Orleans Business Alliance and Business Council, GNO, Inc., academic institutions, and stakeholders representing environmental, planning and development, architecture and engineering, business, and community interests.

²⁶ A model for inter-parish coordination relative to developing stormwater management infrastructure on a regional level is the current cooperative endeavor agreement between the City of New Orleans, SWBNO, and Jefferson Parish, which governs all drainage improvements, including related funding and engineering aspects, within the 17th St. Canal Drainage Basin. The Agreement establishes an engineering committee comprised of Jefferson Parish and SWBNO personnel from engineering, administrative, and executive departments and makes recommendations to the signatories of the agreement on all technical matters. The Agreement was established in 1988.

Goal: Invest in Integrated Stormwater Protection Policy and Projects

Recommended Action Items

- *Establish quantifiable performance and investment goals to guide implementation of integrated stormwater management advancements by SWBNO and the City*
- *Reduce stress on city drainage system by using federal hazard mitigation funds and other resources to add stormwater storage and other integrated water management safeguards to planned improvements to streets, canals, and public space projects*

Establish Quantifiable Performance & Investment Goals to Guide Implementation of Integrated Stormwater Management Advancements by SWBNO and the City:

The *Task Force* recommends that SWBNO and the City commit to verifiable performance and investment stormwater management targets in implementing and operating their respective public assets. Realistically, transforming the city's stormwater protection system into a more integrated and sustainable system will be achieved one investment at a time. Annually, SWBNO and the City construct the streets and curbs, public spaces and buildings, culverts, pipes, and canals that must be the solutions to better protecting New Orleans from deepening stormwater flood risk.

Given this, the capital investment processes regularly conducted by SWBNO and the City should be guided by transparent and quantifiable benchmarks for expenditure and performance that ensures increasing water storage, soil subsidence abatement and runoff reduction within the city's stormwater management system. The following more specific aims are recommended:

- Enactment of a SWBNO Board order and ordinance and/or executive order establishing a minimum percentage of integrated stormwater control related investment among all capital project expenditures by SWBNO and the City, respectively, between 2012 and 2017.
- Enactment of a "*green street*" ordinance or executive order with specified commitments of total pervious surface area and/or a minimum financial commitment to other stormwater control features that are incorporated into street, roadway, and curb improvements.
- Enactment of an ordinance and/or executive order that establishes a maximum runoff rate from public property, including parks, parkways, and other public spaces.
- Commencement of a formal community engagement process by SWBNO and the City to discuss specific opportunities for constructing new open stormwater canals and interconnecting existing and proposed waterways.

Reduce Stress on City Drainage System by Using Federal Hazard Mitigation Funds and Other Resources to Add Stormwater Storage and Other Integrated Water Management Safeguards to Planned Improvements to Streets, Canals, and Public Space Projects:

The City has several timely and significant opportunities to begin investing in “Dutch-Model” stormwater protection that increases water storage, reduces run-off, and minimizes burden on the city’s drainage system. Specifically, the City’s 2012 Capital Budget outlines at least \$280.7 million in street and public space initiatives between 2012 and 2016, including FEMA-funded street repairs in the Lower Ninth Ward, Broadmoor, Lakeshore/Lake Vista, Lakeview, Milneburg, and St. Claude.²⁷ In addition, nearly \$247 million in recently awarded federal hazard mitigation grants (HMGP) to the City for continued Hurricane Katrina recovery provides added funding to incorporate large-scale and important integrated stormwater controls into planned public improvement projects.

The following are specific project opportunities recommended by the *Task Force*:

Stormwater Improvements to Incorporate into Planned Street Enhancements



Coordinate the acquisition and reuse of abandoned or LLT properties as well as city parks and parkways adjacent to planned street overlays and streetscape enhancements to establish neighborhood detention ponds and rain gardens fed by street runoff channeled through sidewalk and curb features.



Establish successive landscaped stormwater planters and rain gardens between the sidewalk and curb of planned street overlays and streetscape enhancements to slow, cleanse, and infiltrate runoff. A 100-foot section could absorb over 27,000 gallons of stormwater. (Source: *Futureproof, LLC.*)

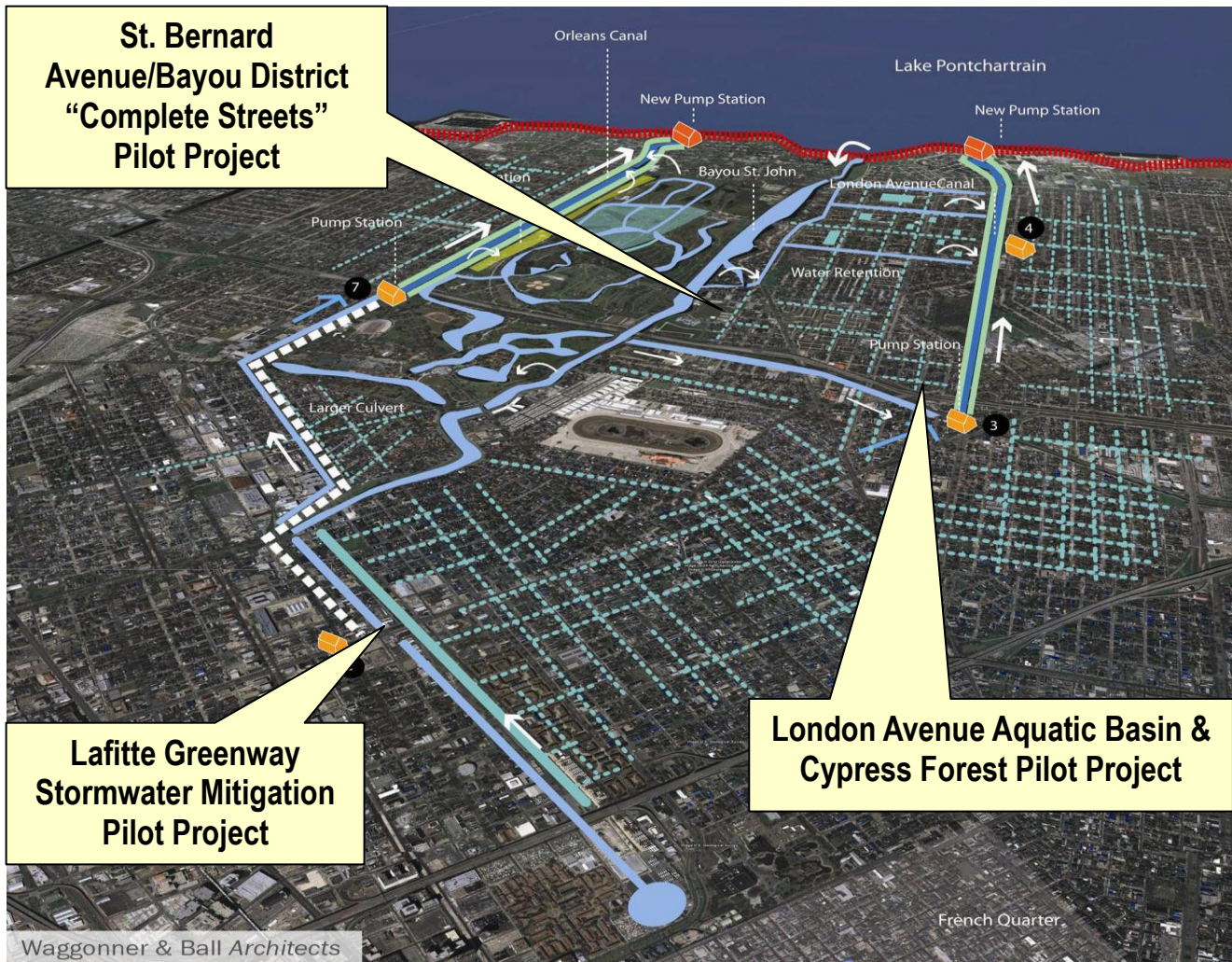


Establish stormwater curb extensions at feasible locations along planned street overlays, repairs, and streetscape enhancements to capture, slow, cleanse, and infiltrate runoff. A 100-foot section could absorb approximately 23,000 gallons of stormwater. (Source: *Futureproof, LLC.*)

Where feasible, establishing *Community Benefit Agreements* is recommended whereby the City and private entities, including local universities, non-profits, corporations, or community development organizations, formally agree to share maintenance responsibilities and costs.

²⁷ See, Executive Capital Budget, City of New Orleans (November 2011) (p.12) (Available at: <http://www.nolacitycouncil.com/docs/news/2012/2012NOLACapitalBudget.pdf>); see also, <http://www.nolacitycouncil.com/content/display.asp?id=54&nid=%7B830683CD-F708-4560-9BC4-FA6744181930%7D>. To date, specific allocations for street improvements include: including FEMA-funded street repairs in the Lower Ninth Ward (\$45MM), Broadmoor (\$4.8MM), Lakeshore/Lake Vista (\$7.5MM), Lakeview (\$16.7MM), Milneburg (\$1.3MM), and St. Claude (\$21.8MM).

Major Recommended Integrated Stormwater Retention Opportunities



The recent conferral of approximately \$247 million in additional federal HMGP to New Orleans presents incredible opportunities to create large-scale flood protection projects that help the City “develop a more sustainable water management system modeled after the Dutch.”²⁸ In addition to whatever HMGP allocation is directed to SWBNO power generation infrastructure, the *Task Force* strongly recommends the above illustrated projects, which are set forth in more detail in the proceeding section. These projects leverage already planned projects without redirecting existing funding commitments. Further, the projects are consistent with priorities within the City’s Hazard Mitigation Plan, Master Plan, and Mayoral Transition Report, as well as active HMGP Orleans Parish applications. Finally, each project measurably reduces identifiable hazards as required by applicable FEMA regulations in using HMGP funds.

²⁸ Mayor Landrieu Letter to Governor Bobby Jindal (February 17, 2011).

St. Bernard Avenue/Bayou District “Complete Streets” Pilot Project

Estimated Cost: \$15 Million

Project Description:

St. Bernard Avenue is an important boulevard linking Gentilly, Mid-City, and the new “Bayou District” neighborhoods. In so doing, the Avenue sits at a lower elevation than these dense, recovery-challenged communities that are subject to documented repetitive flood risk. As such, the Avenue provides a unique and valuable opportunity for aesthetic bio-swales and rain gardens with pipe connections to serve as stormwater storage and mitigation. By converting the Avenue to a soft-infrastructure corridor that can store and convey water, neighborhoods connected by the boulevard will be made safer, including several federally and locally funded projects, such as *Columbia Parc* redevelopment of the St. Bernard Housing Project.

In addition to location, the Avenue’s characteristics lend further advantages to using to mitigate stormwater flooding. First, it has a broad right of way that carries a low volume of traffic. Second, its median can be widened. Third, it does not have major drainage infrastructure in its wide median.

Project Breakdown:

- Project Length - Approximately 10,000 linear feet (Florida Avenue to Robert E Lee Blvd)
- Existing Median - Average 18 feet wide. With lane removal, median can expand to 32 feet
- Median will be excavated 4-6 feet, geotextile fabric laid at base, perforated drainage pipe and 2-3 feet of coarse gravel or crushed concrete will be installed
- Hard pipe will connect adjacent catch basins to the detention area and each median will be interconnected to create a linked network
- Trees and plantings with high trans-evaporation potential, such as cypress trees, will be installed to both replenish groundwater and transpire stormwater

Mitigation Area:

1,100 acres

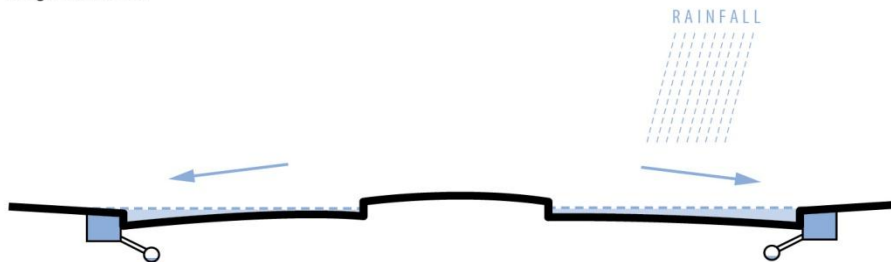
Approx. 3,200 properties mitigated

HMGP Consistency:

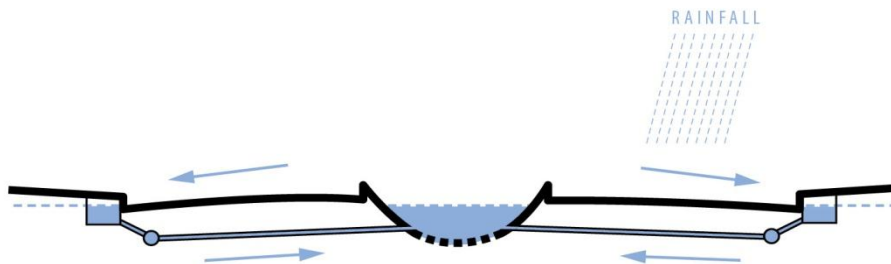
Project already stated priority in FEMA-approved City Hazard Mitigation Plan. Project is consistent with approved HMGP Pontilly Water Mitigation application.



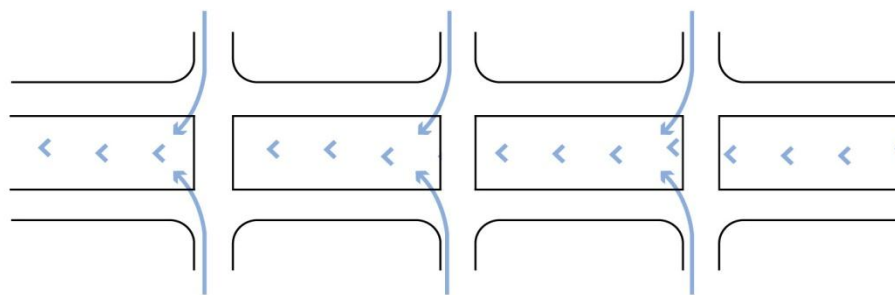
St. Bernard Avenue would be an ideal location for linked bio-swales and detention areas to connect proposed water storage area projects, such as the Oak Park Hazard Mitigation Grant Project, the St. Joseph's Convent property redevelopment and the Columbia Parc neighborhood.



Streets flood as drainage system is overwhelmed during large storm events. Neutral grounds are high and dry.



Neutral Grounds could be used to store or convey stormwater during peak of storm event



Source: Waggoner & Ball Architects, APC

Lafitte Greenway Stormwater Mitigation Pilot Project

Estimated Cost: \$25 Million

Project Description:

This project would use HMGP funds to incorporate constructed wetlands, bio-swales, rain gardens, and other aesthetic stormwater control features alongside the green and recreational space being developed to revitalize the *Lafitte Corridor* between Claiborne Avenue and Jefferson Davis Parkway. The Corridor and surrounding neighborhoods, including the new Lafitte Mixed-Income Community, are subject to repetitive stormwater flooding due to low elevation and an existing, overburdened drainage system. These stormwater controls build upon existing surface and subsurface drainage by providing additional space for stormwater. Such an investment is highly consistent with the Corridor's recent designation as an *Urban Waters Federal Partnership* pilot project and will allow the City to leverage additional federal resources to expand the Corridor and its stormwater protection.

Project Breakdown:

- Project Length - Approximately 6,350 linear feet (Claiborne Ave. to Bayou Saint John)
- Project Area Width – Will vary depending upon available right of way and specific drainage requirements of adjacent neighborhoods.
- Linked bio-swales will be installed along St. Louis and Lafitte Streets from Claiborne to Broad Street to filter, detain and convey water north to the Broad Street Pumping Station.
- Ground will be excavated 4-6 feet, geotextile fabric laid at base, perforated drainage pipe and 2-3 feet of coarse gravel or crushed concrete will be installed:
 - Hard pipe connecting adjacent catch basins to network of detention areas
 - Trees and plantings with high trans-evaporation (cypress) installed to replenish groundwater and transpire stormwater
- Constructed wetland from Broad St. to Jefferson Davis Pky. to receive continual brackish water flow from Bayou St. John (1 foot below sea level) and flow to Broad St. pumps:
 - Ground will be excavated 5-7 feet, resulting in a linear depression that is 4 to 5 feet below sea level and 2 to 3 feet below adjacent neighborhood.
 - A weir will provide a one-way connection to Bayou St. John
 - Hard pipe will connect detention area with Hagin Basin drainage system

Mitigation Area:

700 acres directly served by Lafitte Corridor; Approximately 4,700 properties mitigated

HMGP Consistency:

Project already stated priority in FEMA-approved City Hazard Mitigation Plan. Project is consistent with approved HMGP Pontilly Water Mitigation application.



The concrete-lined canal depicted to the left traverses several thousand linear feet of the Lafitte Corridor site. The proposed project, illustrated below, would enhance stormwater storage with features more consistent with the planned community green and recreational space that would be adjacent to this canal.

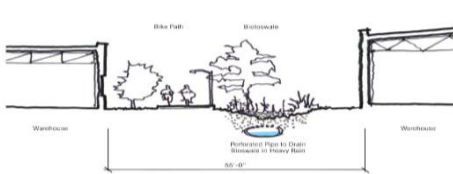
LAFITTE GREENWAY SUSTAINABLE WATER DESIGN

New Orleans, Louisiana

Water Identities:

3 FILTERED WATER

Narrow area accommodates a bike path and bioswales
On-site storage of all rain that falls within the greenway
Wildlife habitat renews former industrial sites



2 BRACKISH WATER

New public space marks the end of an expanded Bayou St. John
Reconnect historic waterway into the Lafitte Greenway
Parallel courses of fresh and brackish water with extra storage capacity to absorb localized flooding
 Bayou St. John becomes the source of a **city-wide circulating water system** to improve safety and quality of life



1 FRESH WATER

Permeable edges absorb runoff from surrounding neighborhoods
Fresh water source supplies water features for attractive public spaces and ground-water recharge
Additional capacity for stormwater built into the landscape
Wide area allows for multiple programs
Biofiltration zones cleanse water that ultimately flows to Lake Pontchartrain
Connections to the French Quarter, Armstrong Park, the Claiborne Corridor, and the Iberville & Lafitte housing developments
Historic turning basin reimagined as a significant new public space built around water



Source: Waggoner & Ball Architects, APC

London Avenue Aquatic Basin & Cypress Forest Pilot Project

Estimated Cost: \$44 Million

Project Description:

This project utilizes 40 acres of undeveloped City-owned property adjacent to the London Avenue Canal to provide 15 million cubic feet of detention, doubling the storage capacity within the outfall canal. This will reduce flood risk by providing space for water, thereby lowering pressures on the floodwalls and the city's drainage system. At least 55,000 properties and a third of New Orleans' footprint would be directly mitigated while reduced demands on the drainage system benefit the entire city. A restored cypress forest within the basin will help absorb stormwater, filter out pollutants, and provide carbon sequestration. Bio-swales and other soft-infrastructure measures will be installed along the north edge of the project to alleviate surface drainage issues in the immediate area.

Project Breakdown:

Existing London Avenue Outfall Canal Capacity:

- Approximately 1.4 – 2 million square feet surface area (33 – 47 acres)
- Approximately 3 million cubic foot maximum volume capacity at existing safe water level of 1.5' above sea level
- Possibly up to 16 million cubic foot capacity at a water level of 8' above sea level, after US Army Corps of Engineers certifies repaired floodwalls

London Avenue Canal with Additional Relief Area Capacity:

- 1.7 million square feet surface area (39 acres)
- A 6 to 9 foot high, earthen ring levee, five feet above sea level, with gradual slope on the neighborhood side will be installed around project area, providing 10 – 15 million cubic feet of capacity. Soil for the levees will be excavated from the drainage basin area, if possible.
- Weirs and pumps will provide hydraulic connection to the London Avenue Canal to provide controlled flow into and out of the basin
- Invasive species of trees and plants will be removed and the cypress and other native plantings will be installed
- Bio-swales along Pratt Street at north end of project area to receive street flooding

Mitigation Area:

12,800 acres of served by London Avenue Canal; Approx. 55,000 properties mitigated

HMGP Consistency:

Project already stated priority in FEMA-approved City Hazard Mitigation Plan. Project is consistent with approved HMGP Pontilly and Dillard-related Water Mitigation applications.



Existing USACE Pumps: 5,000 CFS
 Future Structure: 8,000 - 9,000 CFS

S&WB Pump Station #4: 3,720 CFS

London Avenue Outfall Canal:
 1.43 to 2.06 M Square Feet
 Current Safe Water El. = 1.5' Above Sea Level
 Approx. 3 M Cubic Feet Max. Capacity
 Future Safe Water El. = 8' Above Sea Level
 Approx. 16 M Cubic Feet Max. Capacity

London Avenue Canal Relief Area
 1.7 Million Square Feet
 Cypress wetland basin with the potential
 capacity to receive 10 to 15 million cubic feet
 of stormwater

S&WB Pump Station #3: 4,260 CFS

Source: Waggonner & Ball Architects, APC

Goal: Modify Planned SELA & Monticello Canal Improvements to Ensure Greater Effectiveness & Sustainability

Recommended Action Items

- Enhance proposed SELA underground drainage culvert projects, still in design phase, to ensure adequate connectivity to city drainage pipes and include water storage features
- Design Monticello Canal improvements to ensure effective inter-parish drainage capacity

SWBNO’s proposed installation of massive underground stormwater culverts through the SELA program, the Monticello Canal expansion, and other proposed canal work are SWBNO’s most significant opportunities in its improvement plan to incorporate contemporary flood control concepts into the region’s drainage system. These projects will greatly increase the volume and rate of barricaded stormwater making its way to outfall pump stations and Lake Pontchartrain, which will be a noted improvement to the “back-end” of the city’s drainage system.

Nonetheless, the *Task Force* strongly recommends that these projects be enhanced with features that naturally and safely absorb stormwater into soil surrounding these massive projects to lessen energy and mechanical burdens on the pipe-pump-canal system. Moreover, careful attention should be given to the impact that faster mechanized stormwater conveyance will have on lower lying neighborhoods adjacent to the larger culverts receiving that water. Subsurface pipe connections to the culverts, catch basins, soil subsidence abatement, and natural water absorption features will dictate whether those areas are merely a pass-through for stormwater or wading pools.

Given this, for those projects still within the design-phase, the *Task Force* recommends that the City and SWBNO request that USACOE convene a public-private working group comprised of representatives from SWBNO, City, USACOE, and appropriate private-sector experts to design enhancements that augment existing plans with surface and subsurface features that complement the culvert’s fast-track stormwater conveyance with water storage, absorption, and natural channelization.

The *Task Force* recommends design review for the following projects from SWBNO’s drainage improvement plan:

Improvements to Metairie Relief Canal
Louisiana Ave Canal (South Claiborne to Constance St.)
Tchoupitoulas Corridor
Melpomene Street Canal
Hollygrove Canal
South Claiborne Canal (Phase 2: Leonidas to Lowerline St.)
Airline & Monticello Canal Improvements
Napoleon Ave Canal (Phases 2-3: South Claiborne to Constance St.)
Florida Ave Canal (Phases 2-4: Mazant St. to Peoples St. [DPS # 19])
Jefferson Ave Canal (Phases 1-2: South Claiborne to Dryades)



Appendix: Estimated SWBNO Costs for Maintaining City DPW Assets

Scenario 1: Subsurface Street Drainage remains the responsibility of the CNO DPW.

SWB responds to customer complaints, investigates and places Board barricades to make area safe until DPW responds. Response to customer complaints may involve any or all of the following: phone operators, data entry, emergency inspectors, investigation crews, placement and maintenance of barrels, rocks or other safety equipment and referrals to DPW. SWB would make drain repairs only to drain defects that are located inside existing SWB cuts.

Annual cost \$300,000.00

Scenario 2: Reactive Drainage Maintenance Program

Despite the fact that the drainage millage was voted down in or around 1992, calendar year 1997 was the last year that we provided drainage maintenance activities to the City of New Orleans. During that year, we completed 400 drain main repairs, 120 catch basin lateral repairs, 150 drain manhole repairs, 300 drain catch basin repairs, inspection services and record keeping, flushed 200 drain mains, cleaned nearly 13,000 catch basins and split the cost with the CNO to replace 3 drain lines. A breakdown of the costs to provide these services annually again at that level is listed below. These prices include all material, equipment and labor for any excavation and surface restoration required.

Main repair: 400 mains at \$12,000 each	\$4,800,000	
Lateral Repair: 120 laterals @ \$6000 each	720,000	
Manhole Repair: 150 repairs @ \$2000 each	300,000	
Catch Basin repair 300 repairs @ \$2500 each	750,000	
Catch Basin Cleaning: 13,000 basins		
20 basins/crew yr @ \$115,000/ crew	300,000	
Main Flushing: 200 mains @ \$1500 each	300,000	
Inspection of Drainage installations	180,000	
3 full time inspectors		
Maintenance of drainage records	60,000	
1 full time employee		
Participation in Capital Replacement	375,000	
12 line replacements/month @ 50% split with CNO	\$7,785,000	
annual cost with 10% contingency		\$8,500,000.00

We expect that a significant backlog has developed in each of the areas in the 13 years. Scenario 2 does NOT include addressing this assumed backlog. Addressing this backlog can be estimated, both by schedule and financially, if the backlog was quantified to the SWB.

Scenario 3: Proactive Drainage Maintenance Program

Rather than react to complaints, establish a schedule for maintenance where everything is addressed according to schedule and not based upon waiting for complaints to drive activities.

Scenario 2 Reactive Maintenance Activities	8,500,000	
Clean all Catch Basins 2/year	\$3,200,000	
70,000 basins x 2 clean/yr –250 work days@20 basins per crew day		
\$115,000 per crew		
Drainage Inspection Program		
Smoke system every five years	800,000	
[1500 miles x 5280 x .5 \$/lf] / 5 year cycle		
Clean mains every ten years	12,000,000	
[1500 miles x 5280 x 15 \$/lf]/ 10 year cycle		
Televise mains identified from smoke and cleaning	400,000	
[[1500 miles x 5280 x 2.5 \$/lf]/10 years]/20%		
Drainage Replacement program	19,000,000	
50 year design life replaces 2% of system/yr		
1500 miles x 5280 x .02 x 120 \$/lf		
	\$43,900,000	
annual cost with 10% contingency		\$50,000,000

Savings can be obtained within the proactive contingency by lengthening the allowable time to complete repair and inspections cycles. The above cost is based upon cleaning all Orleans parish catch basins twice a year, cleaning drain mains once every ten years and replacing pipe on a 50 year life cycle. If we were to go to cleaning basins once per year, clean pipe every twenty years and use a 75 year life cycle, the cost would drop to about \$35 million annually. The SWB would recommend a more aggressive proactive preventative maintenance program.

SWBNO Water & Sewerage System Solutions
CHECKLIST FOR CHANGE

Recommended Reform	Lead Entity	Partner Entities	Applicable Policies	Applicable Funding	Recommended Next Steps	
Modify Planned SELA & Monticello Canal Improvements to Ensure Greater Effectiveness & Sustainability	<i>Enhance proposed SELA underground drainage culvert projects still in design phase to ensure adequate connectivity to city drainage pipes and include water storage features</i>	SWBNO	City, USACOE	SELA Program	SELA funding, SWBNO drainage related revenue, drainage fee	<i>Within Next Six Months:</i> (1) City/SWBNO request design review of projects in design phase; (2) convene public-private design team to propose enhancements; (3) verify sequencing and local share amount that SWBNO must certify before each SELA phase
	<i>Design Monticello Canal Improvements to ensure effective inter-parish drainage</i>	SWBNO, Jefferson Parish	City, RPC, USACOE, State	Existing Orleans-Jefferson CEA regarding drainage management	SWBNO drainage related revenue, drainage fee; Jefferson Parish revenue	(1) Permanently institute <i>City-SWBNO-JP Interparish Stormwater Management Team</i> per existing CEA; (2) establish final agreement as to whether to expand to what extent; (3) develop construction plan for Airline Highway and Monticello infrastructure alterations
Implement Land Use Policies that Ease Stress on Drainage Infrastructure	<i>Enact stormwater control ordinance with requiring runoff reduction plans for expanded types of construction and development activities and controls limiting runoff pollution</i>	SWBNO, City	City Council	City building permit, environmental, and drainage-related codes	SWBNO drainage related revenue, drainage fee, permitting fees, developer fees	<i>Within Next Year:</i> (1) Complete data gathering and analysis recommended in <i>City Stormwater Improvement Plan</i> but relative to runoff and storm impact on entire drainage system; (2) SWBNO and City development joint policy aims based on data analysis and MS\$ obligations; (3) develop draft ordinance for public comment; (4) finalize ordinance and related executive policies and programs to administer ordinance
	<i>Expand stormwater-related zoning requirements to properties that are 5000 square feet or larger and with increased safeguards against runoff volume and pollution</i>	SWBNO, CPC	City, City Council	Comprehensive Zoning Ordinance (CZO)	Developer fees	<i>Within Next Year:</i> (1) Draft tiered stormwater controls based on property size beginning at 5000 square feet; (2) develop draft CZO amendments for public comment; (3) finalize CZO changes and related enforcement policies and assistance programs
	<i>Incorporate uniform stormwater control mandates and incentives in blighted property sale transactions, interim vacant property maintenance, and housing and commercial development assistance programs</i>	City, NORA	City Council, SWBNO, RPC, CPC	Policies and programs related to blight control, housing assistance, and economic development	CDBG and other HUD funding, HMGP, blight fines, liens, and purchase funds, general revenue, etc.	<i>Within Next Year:</i> (1) Identify priority areas and runoff reduction goals for those areas; (2) identify stormwater controls eligible for federal funds; and (3) implement incentives or minimum standards.

Consolidate and Integrate Local Stormwater Management

<p><i>Utilize an expanded SWBNO drainage department to manage all city drainage infrastructure and related policy development</i></p>	<p>SWBNO, City</p>	<p>City Council, Civil Service Commission</p>	<p>SWBNO Drainage Improvement Plan, stormwater related permitting, policies, and programs</p>		<p><u>Within Next Two Years:</u> (1) Develop City-SWBNO team to identify assets and functions to consolidate and funding, staffing, and timeline needs; (2) assess laws and policies to consolidate; (3) execute necessary legal and policy changes; and (4) finalize protocols for staff transition, hiring, and continued City-SWBNO coordination.</p>
<p><i>Institute a single, prorated drainage fee towards all city stormwater infrastructure based on property size, run-off potential, and property conservation features</i></p>	<p>SWBNO, City</p>	<p>City Council</p>	<p>SWBNO Drainage Improvement Plan, City Capital Improvements Plan</p>	<p>Drainage fee</p>	<p><u>Within Next Year:</u> (1) Complete financial and parcel runoff impact analysis recommended in <i>City Stormwater Improvement Plan</i> but relative to entire drainage system; (2) assess and finalize legal changes to establish single drainage fee for SWBNO and City assets (until consolidated); (3) develop fee structure based on parcel size, imperviousness, and runoff controls; (4) identify administrative costs and processes to administer fee.</p> <p><u>Within 12-18 Months (subsequent to above):</u> (1) Conduct public hearings to present fee structure and implementation timeline; (2) present fee for approval; (3) commence implementation of fee</p>
<p><i>Formalize intergovernmental coordination and inter-parish compacts to achieve regional-level stormwater management planning and infrastructure investment</i></p>	<p>SWBNO, City, Jefferson and St. Bernard Parishes</p>	<p>GNO, Inc., NORA, RPC, CPC</p>	<p>Same as above.</p>		<p><u>Within Next 8 Months:</u> Establish interparish working groups to identify policies, codes, and funding to be consolidated or otherwise altered to better accommodate interparish stormwater projects and policies.</p> <p><u>Within 12-18 Months:</u> Establish formal agreements and formal implementation strategies relative to recommendations of CSIWMS</p>
<p><i>Establish Stormwater Advisory Committee</i></p>	<p>City, SWBNO</p>	<p>City Council</p>	<p>SWBNO Drainage Plan, City Capital Improvements Plan</p>		<p><u>Within Eight Months:</u> (1) Develop scope of committee and identify appropriate areas of expertise; (2) finalize any necessary policies to codify existence and role of committee; (3) conduct selection process; and (4) initiate committee advisory process</p>

Invest in Integrated Stormwater Protection Policies and Projects

<p><i>Establish quantifiable performance and investment goals to guide implementation of integrated stormwater management advances by SWBNO and the City</i></p>	<p>City, SWBNO</p>		<p>Same as above.</p>		<p><u>Within Next Eight Months:</u> (1) Enact SWBNO order and executive order establishing minimum percentage of integrated stormwater control related investment among all capital project expenditures between 2012 and 2017; (2) Enact “green street” ordinance or executive order with specified commitments of total pervious surface area and/or a minimum financial commitment to other stormwater control features that are incorporated into street, roadway, and curb improvements; (3) Enact ordinance and/or executive order that establishes maximum runoff rate from public property, including parks, parkways, and other public spaces.</p> <p><u>Within Next Year:</u> Commence formal community engagement process by SWBNO and the City to discuss specific opportunities for constructing new open stormwater canals and interconnecting existing and proposed waterways.</p>
<p><i>Use federal hazard mitigation funds and other resources to add stormwater storage and other integrated water management safeguards to planned improvements to streets, canals, and public space projects</i></p>	<p>City, SWBNO</p>		<p>Same as above.</p>	<p>CDBG funding, HMGP, general fund, SWBNO drainage related revenue, drainage fees</p>	<p><u>Within Next Year:</u> (1) Develop action plans consistent with HMGP regulations; (2) submit for review by GOHSEP and FEMA; (3) supplement existing or planned designs to incorporate stormwater control features; (4) finalize timeline for design completion and construction</p>

Stormwater Management Advisory Group

Members:

- Billy Marchal, Director, New Orleans Flood Protection Alliance (Chair)
- Bruce Thompson, CEO, Thompson Equipment Co. (Vice-Chair)
- Mark Davis, Director, Tulane Institute on Water Resources Law and Policy
- Abigail Feldman, Principal, Heavy Meadow, LLC
- Louis Jackson, Senior Project Manager, CDM
- Shirley Laska, PhD, University of New Orleans (Center for Hazards Assessment)
- Grasshopper Mendoza, Horizon Initiative, Water Management Subcommittee
- Steve Picou, LSU AgCenter, SE Region
- Jeffrey Thomas, Principal, Thomas Strategies, LLC
- Aaron Viles, Deputy Director, Gulf Restoration Network
- David Waggonner, Principal, Waggonner & Ball, APC
- Jessica Watts, Water Resources Engineer, CDM
- Prisca Weems, Principal, Future Proof, LLC

Organizational Advisors:

- City of New Orleans
- GNO, Inc.
- Horizon Initiative, Water Management Subcommittee
- New Orleans Redevelopment Authority
- Sewerage and Water Board of New Orleans

