



St. Tammany Parish Watershed Management: Water Quality Impact Modeling Program

E. deEtte Smythe, Ph.D.
LDEQ MS4 Annual Conference
October 23, 2019

About Us

St. Tammany is a multi-faceted, culturally rich, economically diverse, exceptional place to live, work and explore. Every community within our Parish has its own distinctive identity, yet each are bound together by a deep-rooted sense of pride.

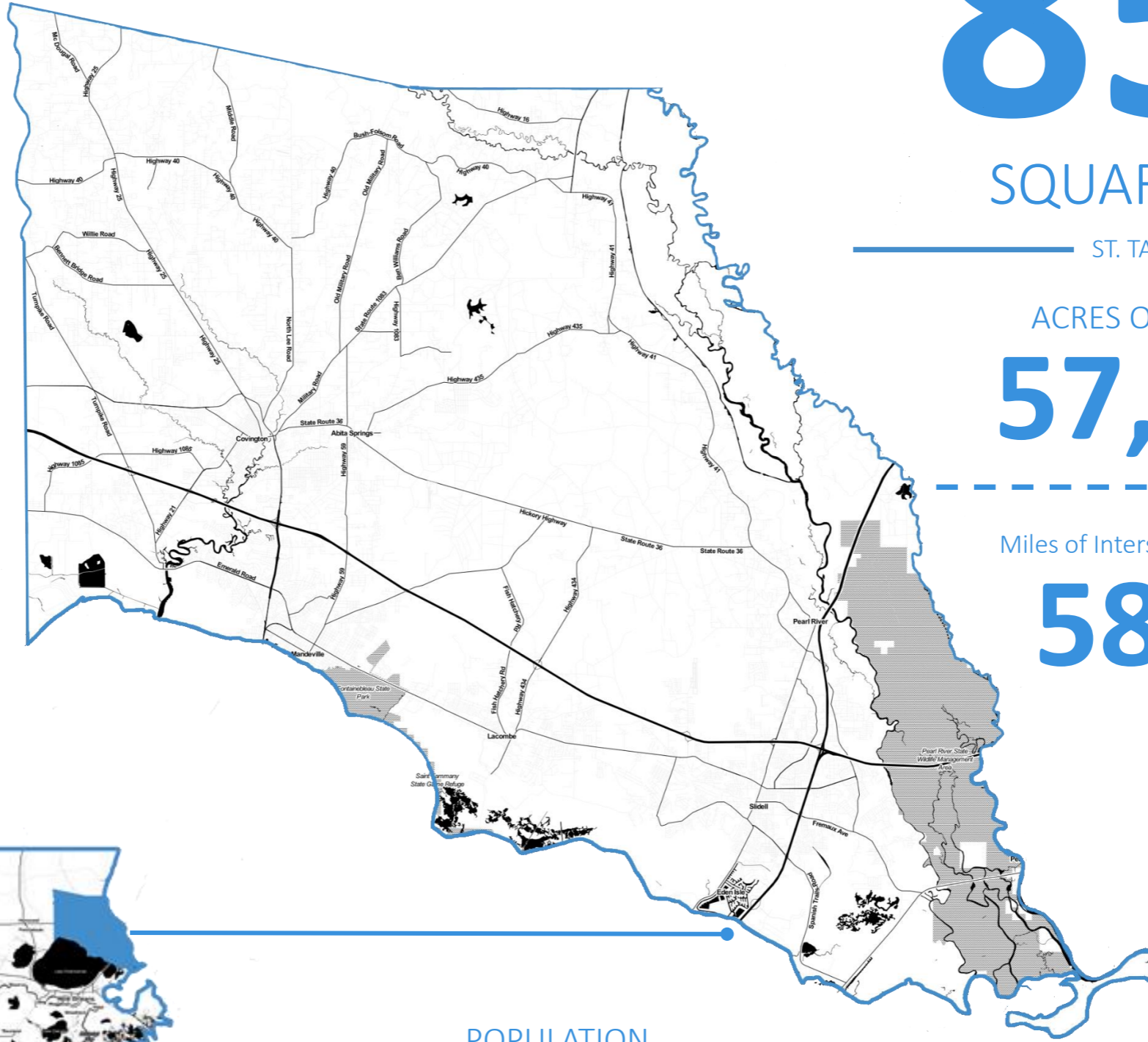
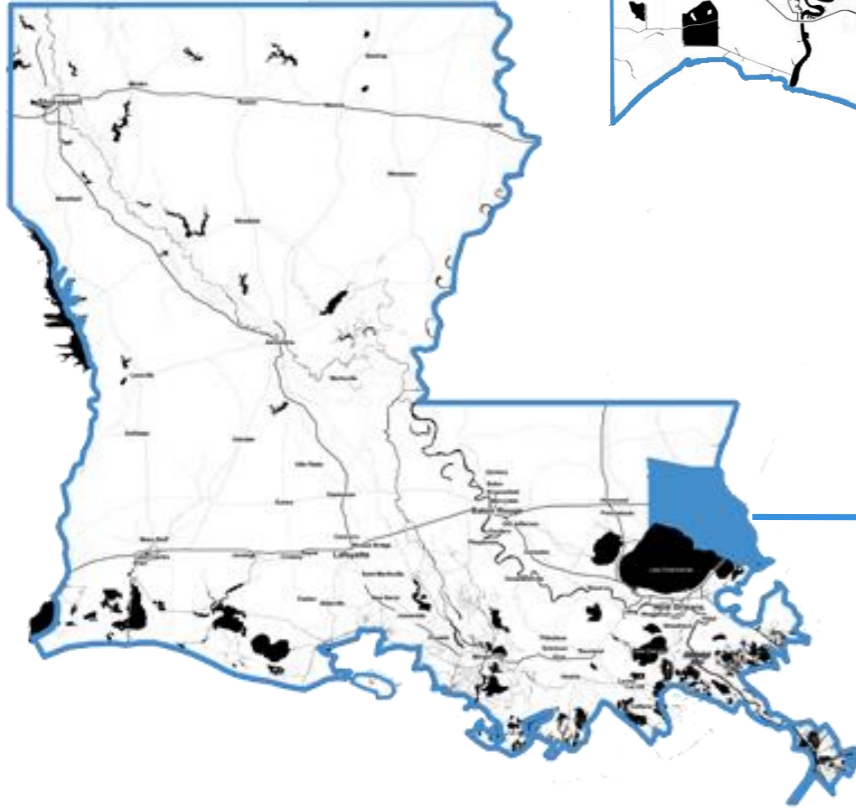
Our Parish offers fertile ground for businesses and families to thrive. Our educational system is top-ranked in the State and our residents collectively achieve some of the highest levels of education throughout the region. We are known for our highly trained, well-equipped workforce. These factors contribute to consistently low unemployment rates; often below state, regional and national averages.

St. Tammany is well-known for our thriving active lifestyle. Lake Pontchartrain skirts our shores and beckons seafarers, swimmers and sunbathers. Winding rivers offer paddlers serene navigable blueways. The 28-mile Tammany Trace, parallel equestrian trail, and wildlife conservation area, links various parks and providing beautiful vistas of rivers, bayous and streams.

We have a deep appreciation for the vibrancy we have cultivated through our entrepreneurial exceptionalism, our thriving, diverse economy, our traditions, our hospitable, balanced lifestyle and the cultural arts.



About Us



854

SQUARE MILES

ST. TAMMANY

ACRES OF WETLANDS

57,057

Miles of Interstate

58

Miles of Federal Highway

74

POPULATION

~250,000

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St. Tammany Parish Government

Our Mission

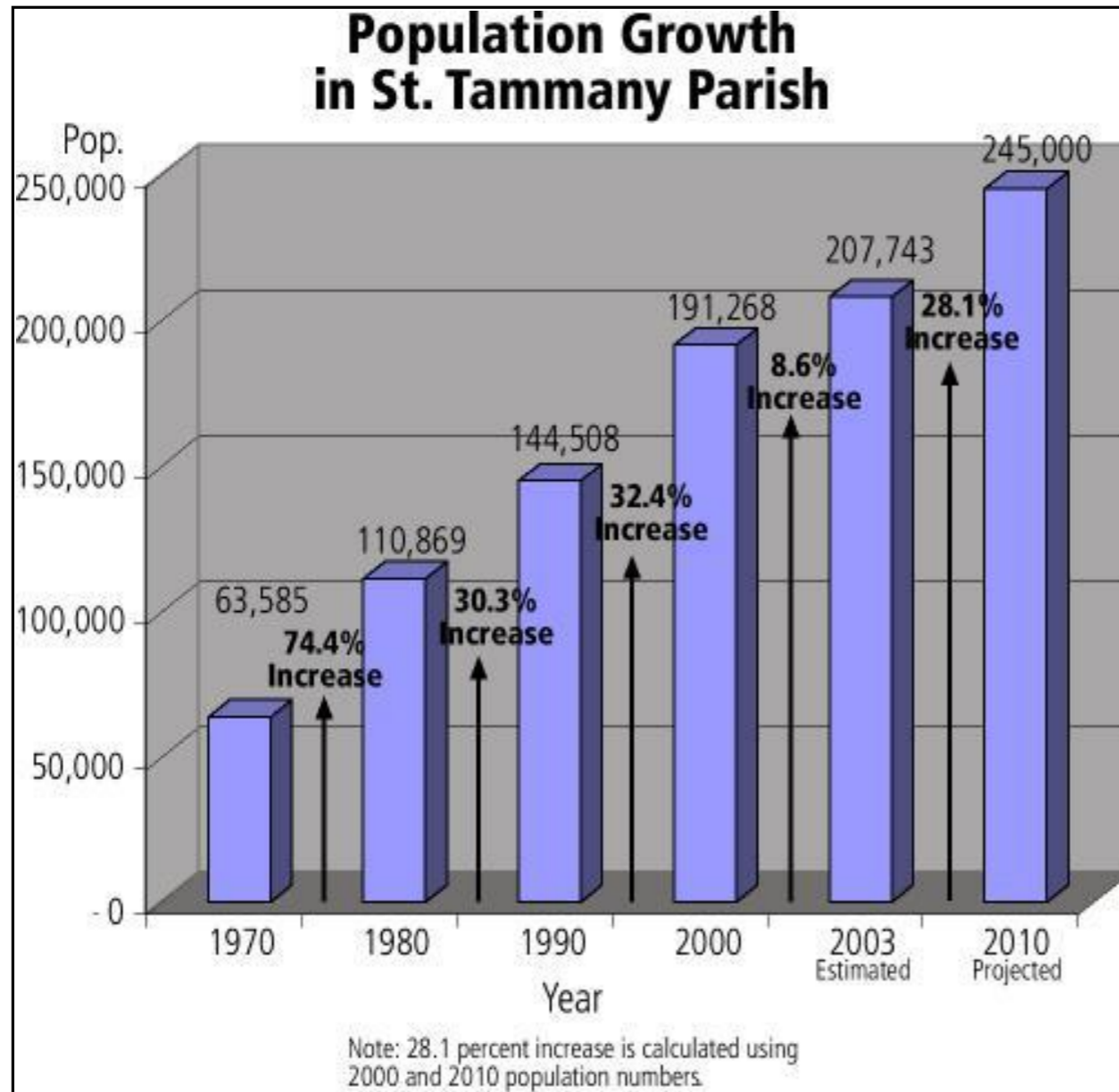
“The mission of St. Tammany Parish Government is to provide and enhance services that support the health, safety and quality of life of our residents and communities in a transparent, efficient and fiscally responsible way.”



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Population “Driver”



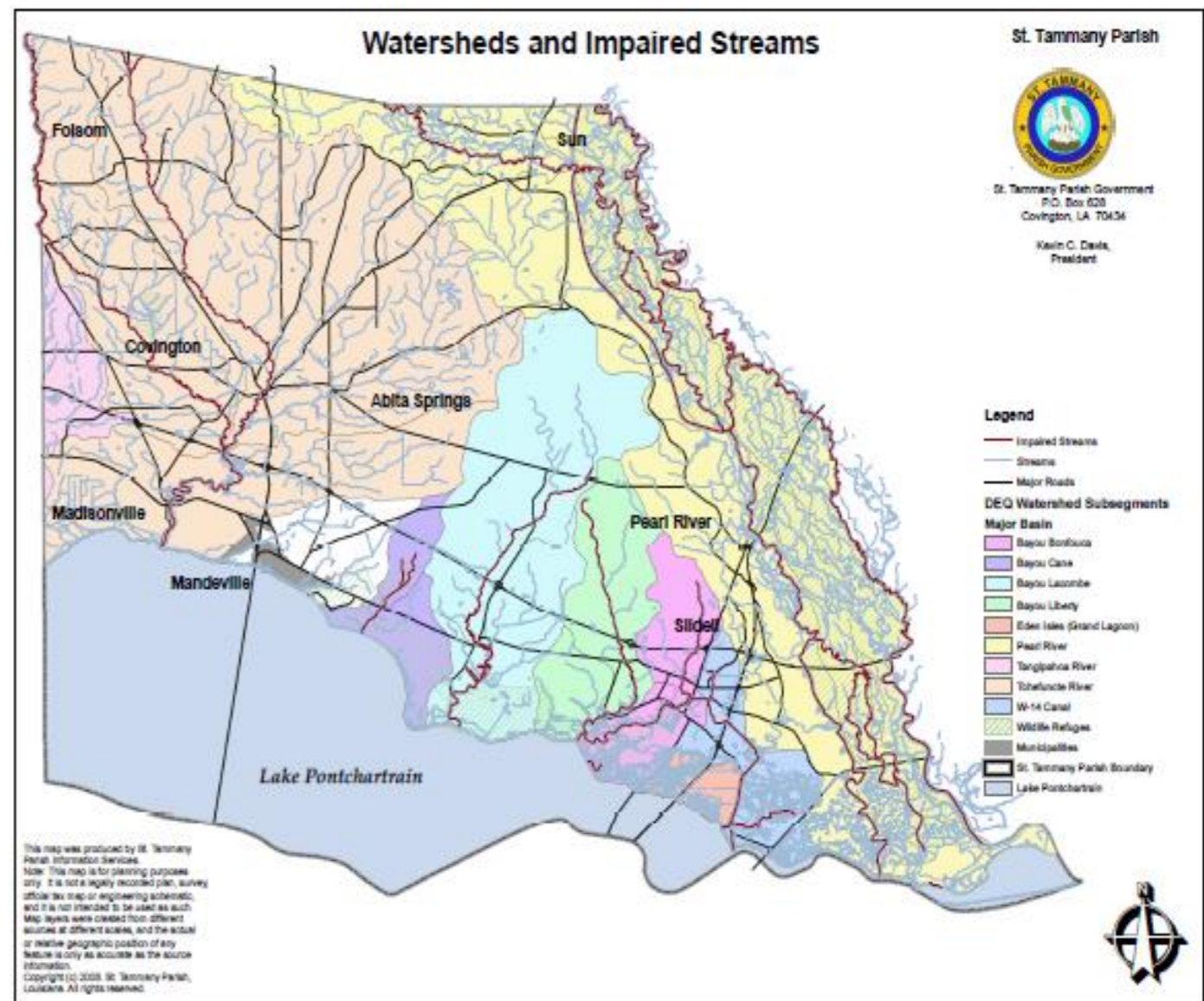
- St Tammany Parish is one of the fastest growing Parishes in LA
- Since 1990, St. Tammany Parish has increased in population from ~145,000 to ~250,000
- An increase of **> 70% in 30 years!**
- Construction to accommodate this growth has impacted many of the Parish streams and rivers



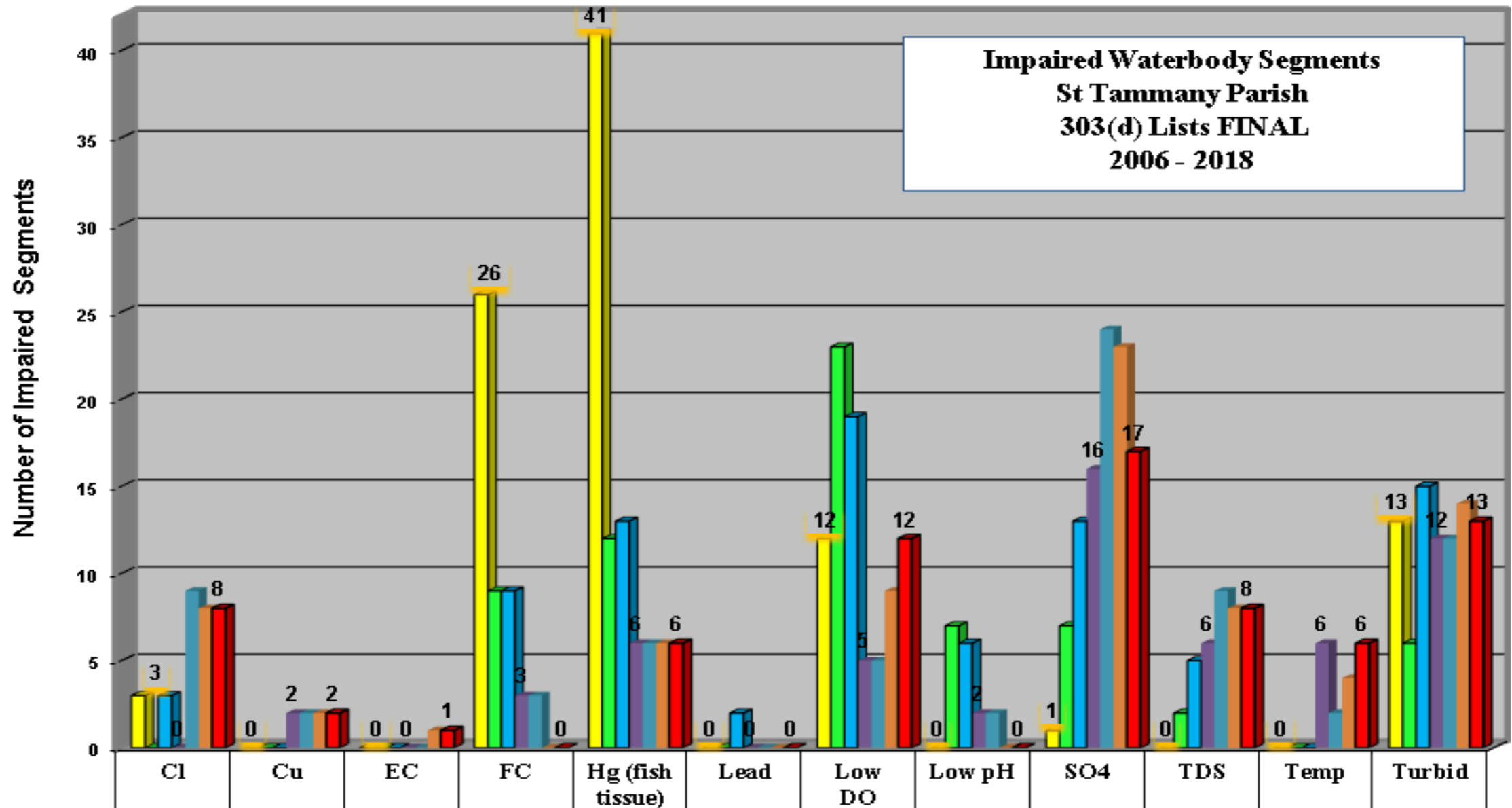
Regulatory “Driver”

As a consequence, many of the stream segments in St. Tammany Parish have been listed on EPA’s 303(d) list of Impaired Waterbodies.

- TMDLs have been completed for **BOD, Nutrients, and Fecal Coliforms** to force the Parish to improve water quality that meets CWA goals of **“fishable & swimmable”**
- The major source of these constituents in the watersheds are from Nonpoint Sources (NPS), primarily:
 - Failing individual sewer systems
 - Construction & development



Regulatory "Driver"



	Cl	Cu	EC	FC	Hg (fish tissue)	Lead	Low DO	Low pH	SO4	TDS	Temp	Turbid
2006 (96)	3	0	0	26	41	0	12	0	1	0	0	13
2008 (66)	0	0	0	9	12	0	23	7	7	2	0	6
2010 (85)	3	0	0	9	13	2	19	6	13	5	0	15
2012 (58)	0	2	0	3	6	0	5	2	16	6	6	12
2014 (74)	9	2	0	3	6	0	5	2	24	9	2	12
2016 (75)	8	2	1	0	6	0	9	0	23	8	4	14
2018 (73)	8	2	1	0	6	0	12	0	17	8	6	13



37 TMDLs for Impaired Waterbodies in St. Tammany Parish

Subsegment	Watershed	Impairment	
40802	Tchefuncte River	BOD	
40803			
40901			
40902	Bayou Lacombe		
40903			
40904	Bayou Cane		
40905	Bayou Liberty		
40906	Bayou Paquet		
40907	Bayou Vincent		
40908	Bayou Bonfouca		
90105	Pearl River Navigation Canal	Fecal Coliform	
90204			
90207	Middle & West Middle River		
40909	W-14 Diversion Canal		
40910	Salt Bayou		
90101	Pearl River		
90207	Middle & West Middle River		
40801	Tchefuncte River		Mercury
40905	Bayou Liberty		
40906	Bayou Paquet		
90101	Pearl River		
90107			
90102	East Pearl River		
90103			
90105	Pearl River Navigation Canal		
90204			
90106	Holmes Bayou		
90201	West Pearl River		
90205	Wilson Slough		
90207	Middle & West Middle River		
90105	Pearl River Navigation Canal	Nitrate	
90204			
90207	Middle & West Middle River		
40903	Bayou Cane	TSS	
90106	Holmes Bayou	Turbidity	
90201	West Pearl River		
90202	Morgan River		
Total		37	



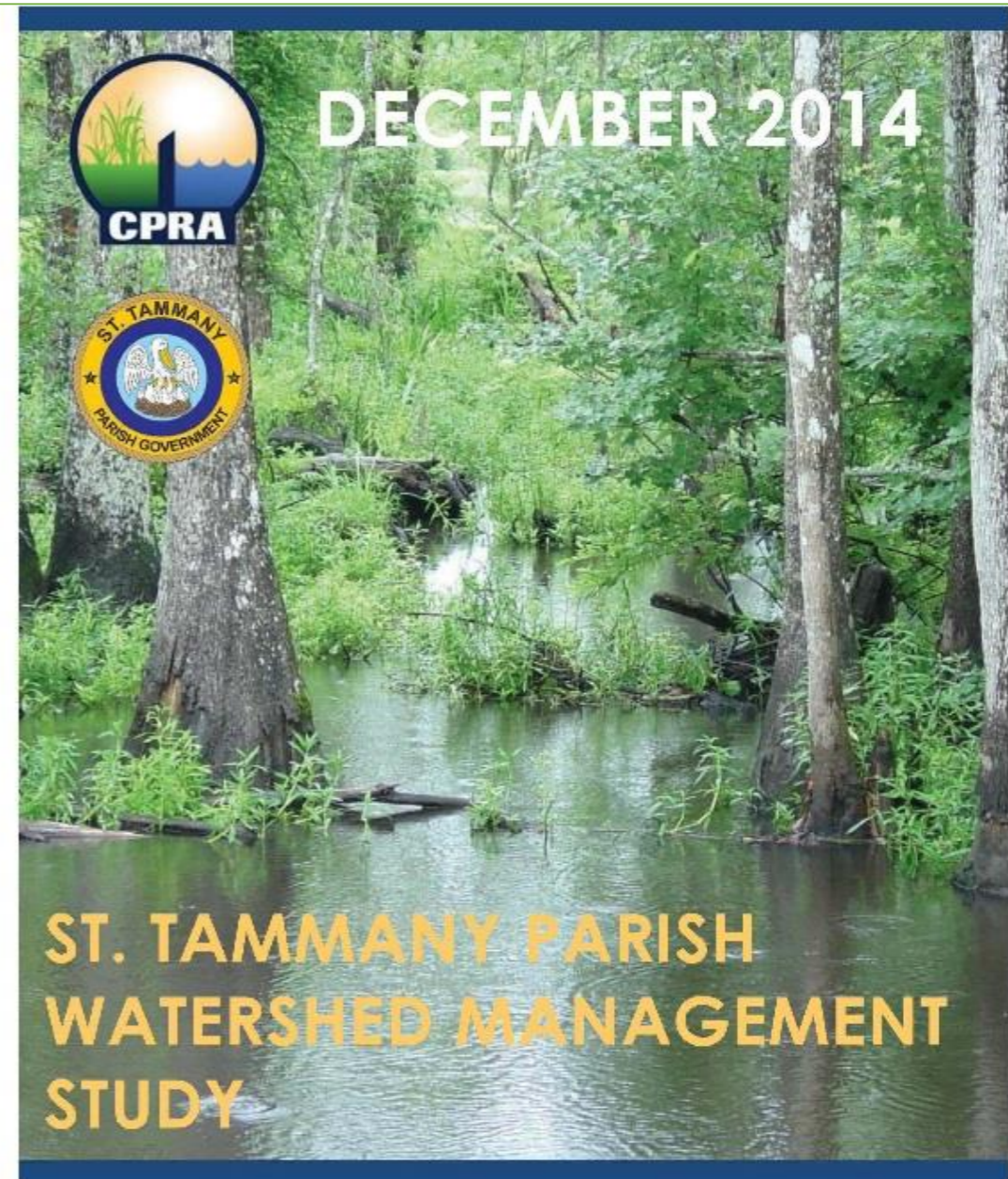
Pollutants of Concern in STP TMDLs

- Suspended solids – aesthetic impacts, reservoir siltation, harmful to aquatic life at high levels
- Metals – can be toxic to humans and wildlife at various levels (depending upon metal species)
- Nutrients – stimulate algal growth, high levels can be toxic to humans and wildlife
- Oxygen demanding substances – may reduce dissolved oxygen levels to levels harmful for aquatic life



STP WQ Impact Modeling Program: Objectives

- Plan - watershed management strategies at the planning level
- Assess & control - potential water quality impacts related to new developments
- Implement - strategies to maintain or improve watershed health as land uses change
- Predict - Best Management Practices (BMPs) that will be needed in order to meet or exceed water quality goals for a specific watershed and land use

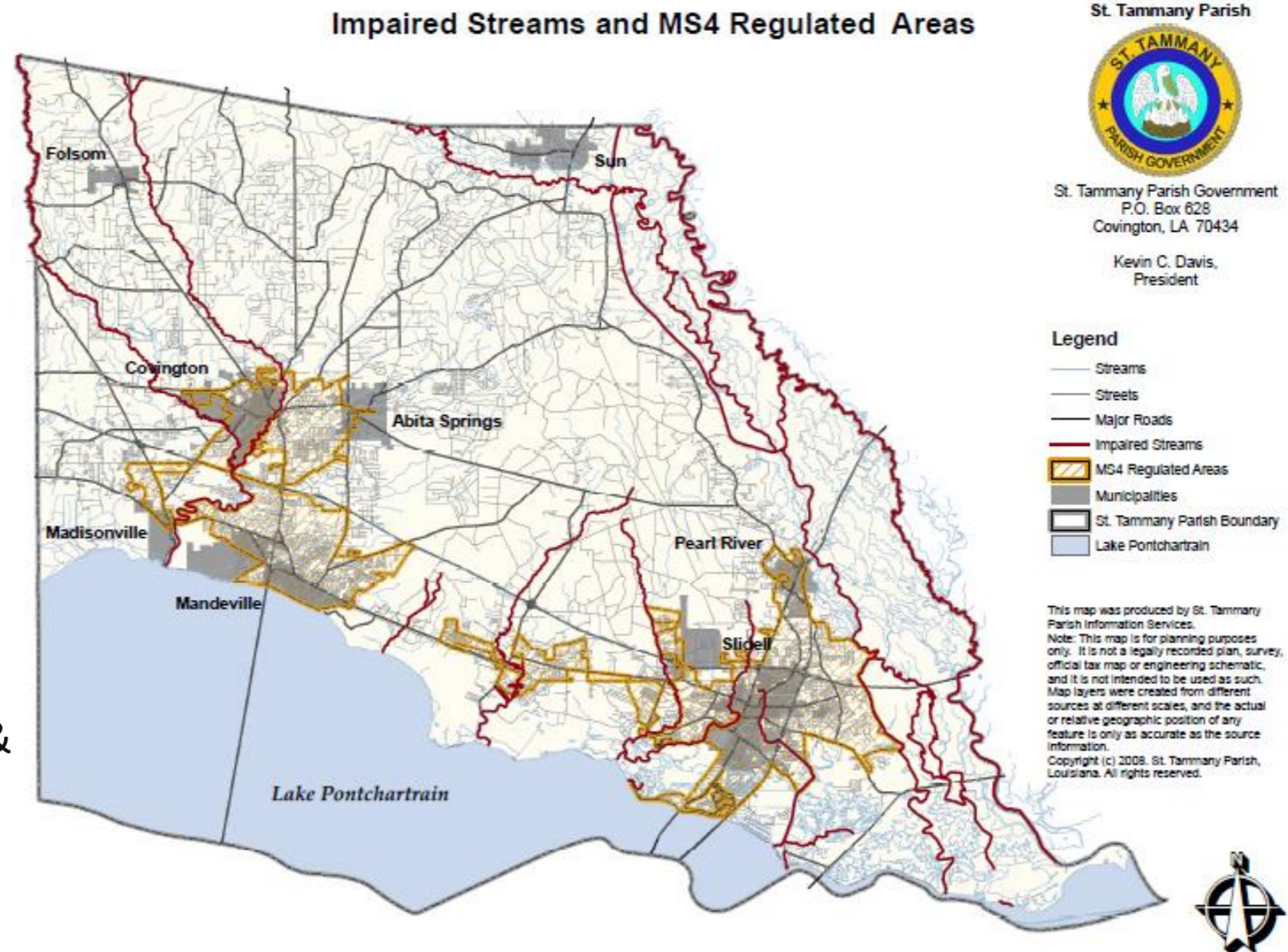


STP MS4 Permit: Vehicle for WQ Improvement

2018 MS4 Annual Report details STP WQ programs & results

Draft 2018 STP Stormwater Management Plan (SWMP) provides TMDL implementation details

- To be finalized in 2019 & submitted with MS4 Annual Report



All drainage projects proposed to be reviewed for WQ improvement potential

STP Stormwater Management Plan (SWMP)

REQUIRED by MS4 Permit - Originates from the need to protect waterbodies from WQ & quantity problems due to past practices & future development

- Enhance public safety due to land development
- Reduce flooding
- Decrease volume and intensity of runoff
- Improve water quality in streams
- Minimize loss of wetlands
- Improve stream habitat
- Enhance economic growth
- Enhance aesthetics of watersheds

Draft St. Tammany Parish Stormwater Management Plan

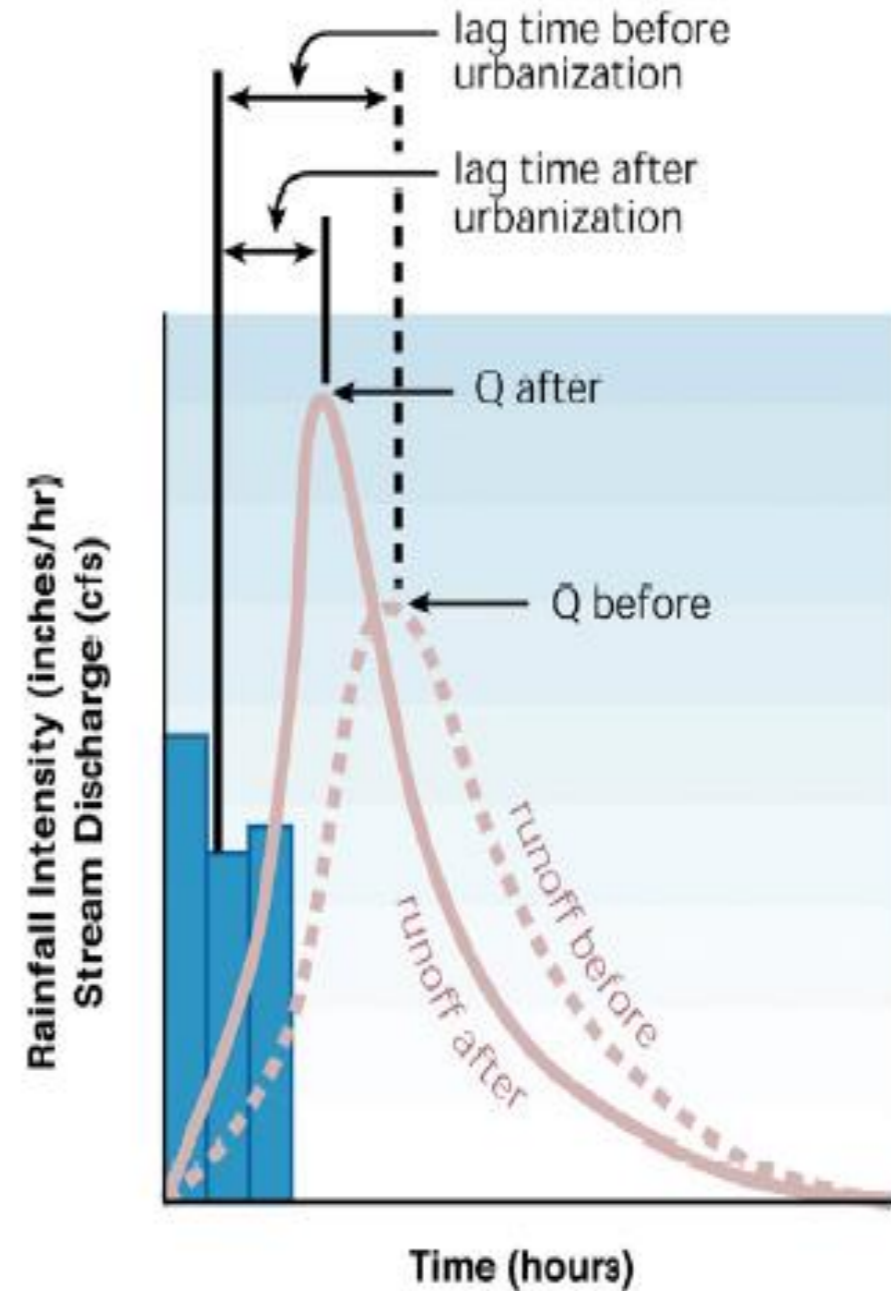


December 2018
(For MS4 Permit Cycle 2018-2023)



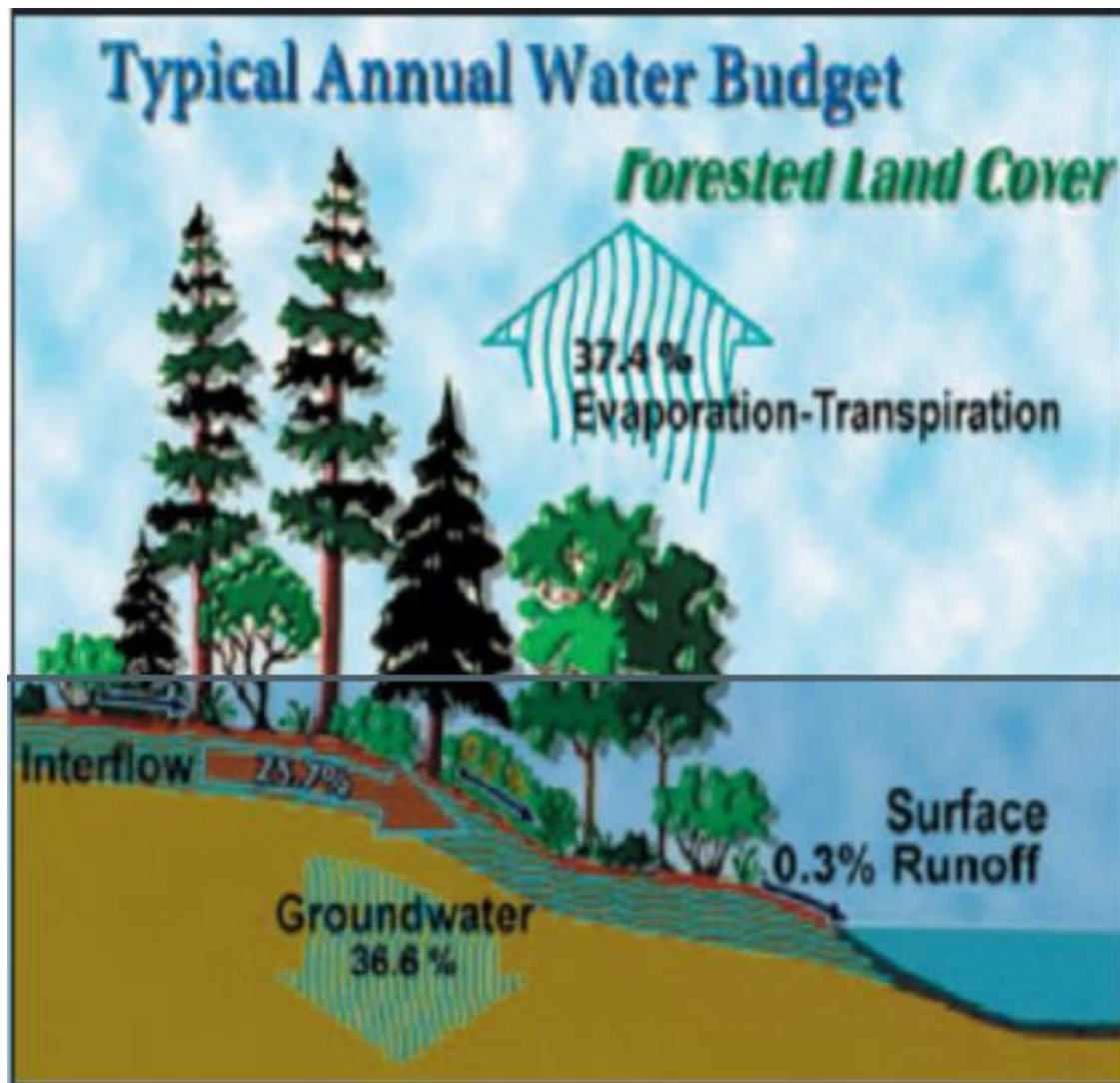
Increased Urban Development Impacts

- Higher peak discharge during floods
- Greater volume of runoff
- Degraded WQ in streams & lakes



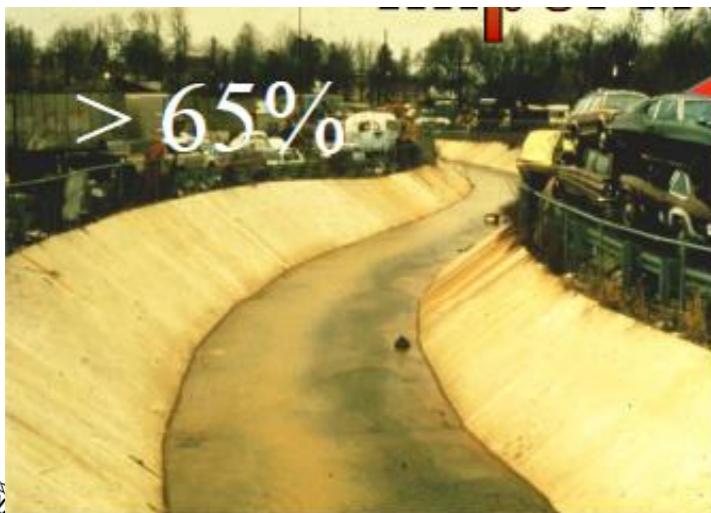
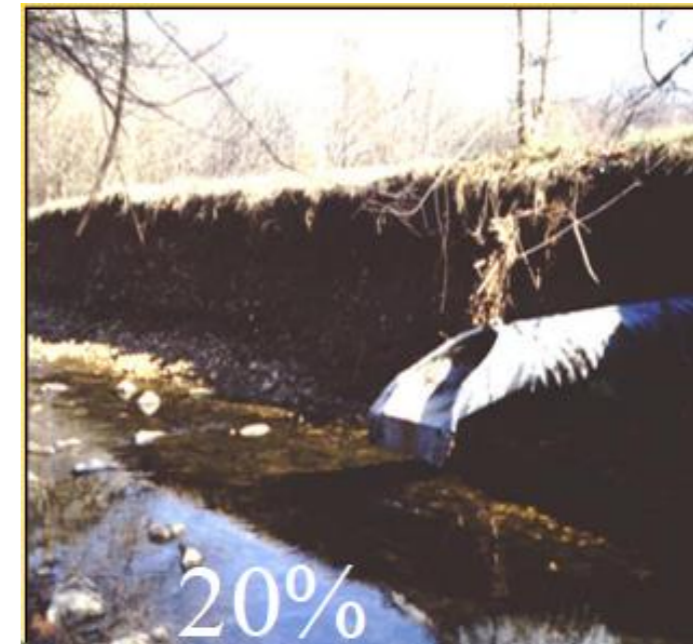
Impact of Urbanization

Differences in Annual Water Budget from Natural Land Cover to Urbanized Land Cover



Increased Urban Development: Greater Volumes of Runoff

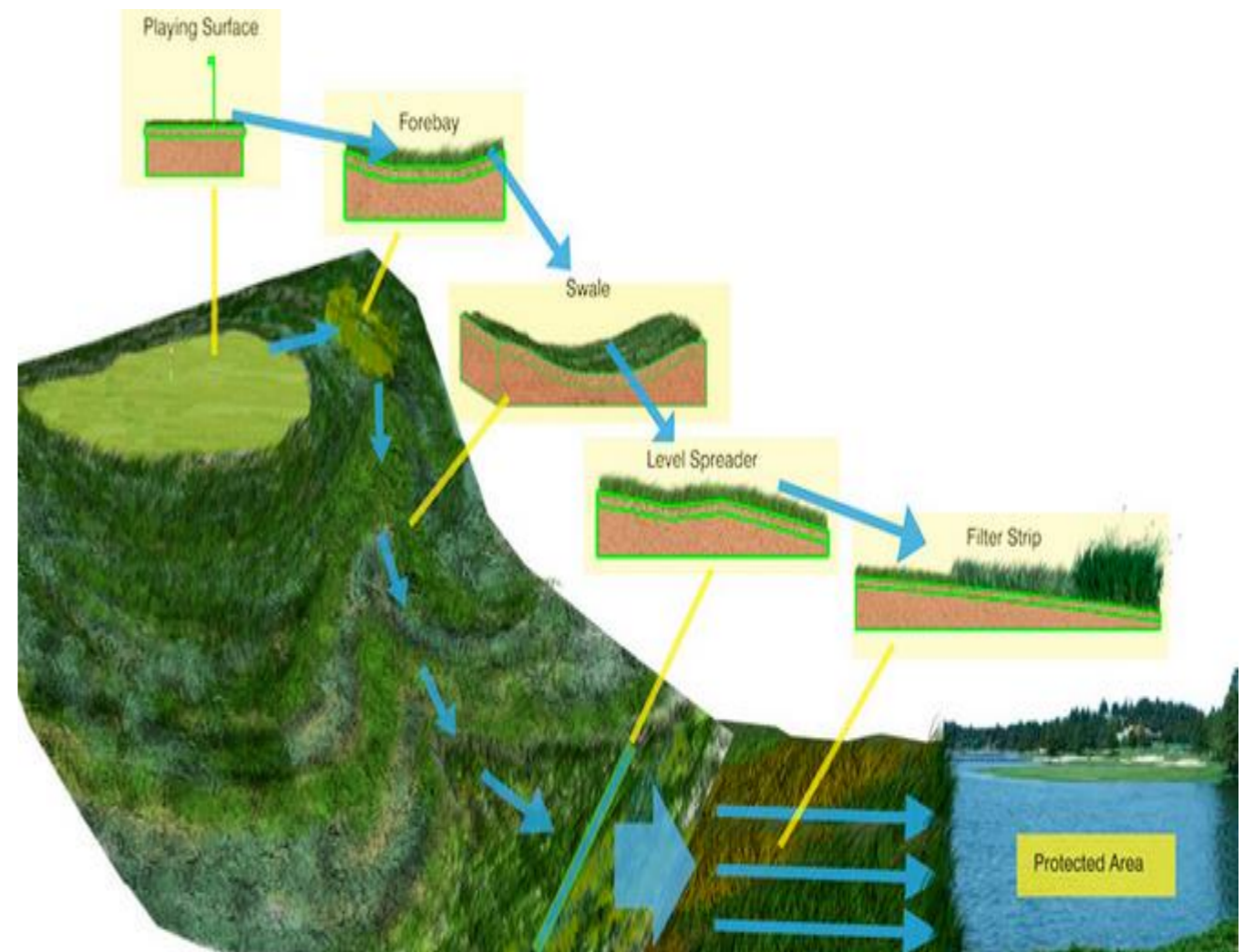
Greater % runoff increases downstream erosion, flooding & pollutant loading



Best Management Practices (BMPs) & Treatment Trains

BMPs are structural or non-structural stormwater technique that is recognized by the scientific community to be the most effective practical means of controlling stormwater runoff and nonpoint source pollution

“TREATMENT TRAIN” should be employed if BMPs are inadequate to reduce pollutant loading from a development to a receiving stream



Structural BMPs to Mitigate Stormwater Impacts

Structural

(Impervious Cover)

- Facilities designed to capture and treat stormwater runoff
- Include: stormwater ponds, constructed wetlands, rain gardens

- Wet ponds (detention and retention of stormwater)
- Dry Ponds/Bioretenion (detention, filtration, and retention of stormwater)
- Vegetated Swale (ditches)
- Aeration (oxidizes organics & nutrients not TSS)

NOTE: Permit Holder required to have a Maintenance Agreement prior to permit issuance:

- Specifies O&M activities
- Provides schedule for maintenance & inspections
- Must contain provision for access to Parish or inspectors



Non-Structural BMPs to Mitigate Stormwater Impacts

Non-Structural

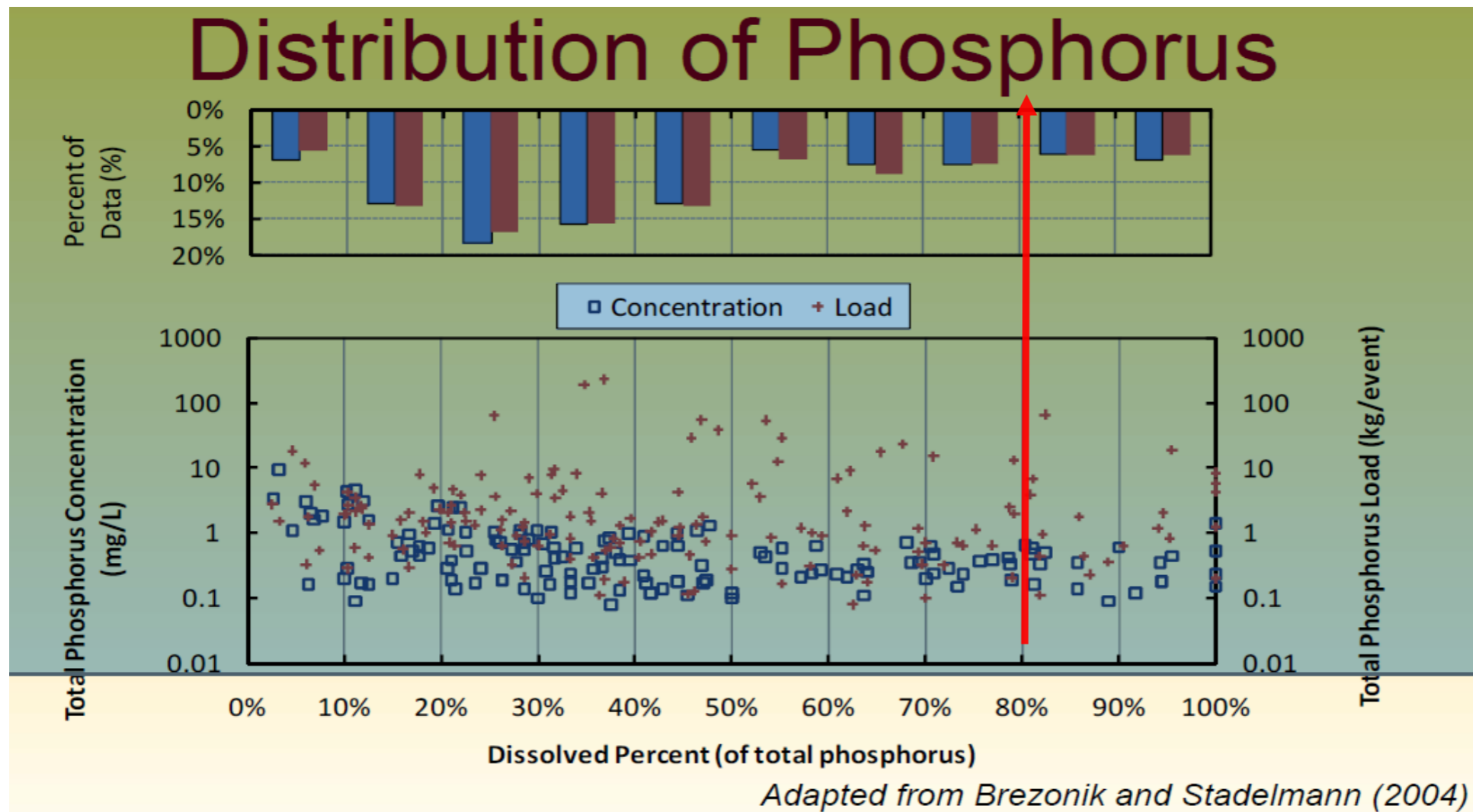
- Facilities designed to slow stormwater runoff and facilitate percolation
- Include: porous pavement, set-backs, buffers

- Reduce stormwater velocity and volume
- Reduce size of structural BMPs
- Minimize impervious cover through judicious site planning.



To improve WQ Most Urban Watersheds need:

80%+ capture of solids (TSS), which reduces adsorbed P loads



STP TMDLs for dissolved oxygen (DO) Pollutants of Concern (POCs) also include:

- TSS
- Ammonia
- BOD
- NO₂+NO₃

Treatment Methods: Wet Pond

Wet Pond: Bioremediation

Constituents	<i>RE, %</i>
TSS (CBOD)	66
TN	38
NO3-N	59
TKN	59
TP	65



Bioremediation: Littoral shelves & floating wetlands mimic natural functions, transforming nutrients & pollutants into forms that are useful for organisms



Treatment Methods: Dry Pond

Dry Pond:
Infiltration Basin
with Vegetative
Planting BMP

Constituents	RE, %
TS S (CBOD)	66
TN	84
NO ₃ -N	53
TKN	
TP	39



Labarre Street Regional Detention Pond in St Tammany Parish

Treatment Methods: Vegetated Swale (ditch)

Vegetated Swale:

Constituents	RE, %
TSS (CBOD)	66
TN	84
NO ₃ -N	53
TKN	
TP	39



Treatment Methods: Aeration

Aeration:

Constituents	RE, %
TSS (CBOD)	74
TN	64
NO3-N	25
TKN	52
TP	47



Aeration: Breaks stratification, increases oxygen and facilitates proliferation of beneficial bacteria that transform nutrients & pollutants into forms that are useful for organisms



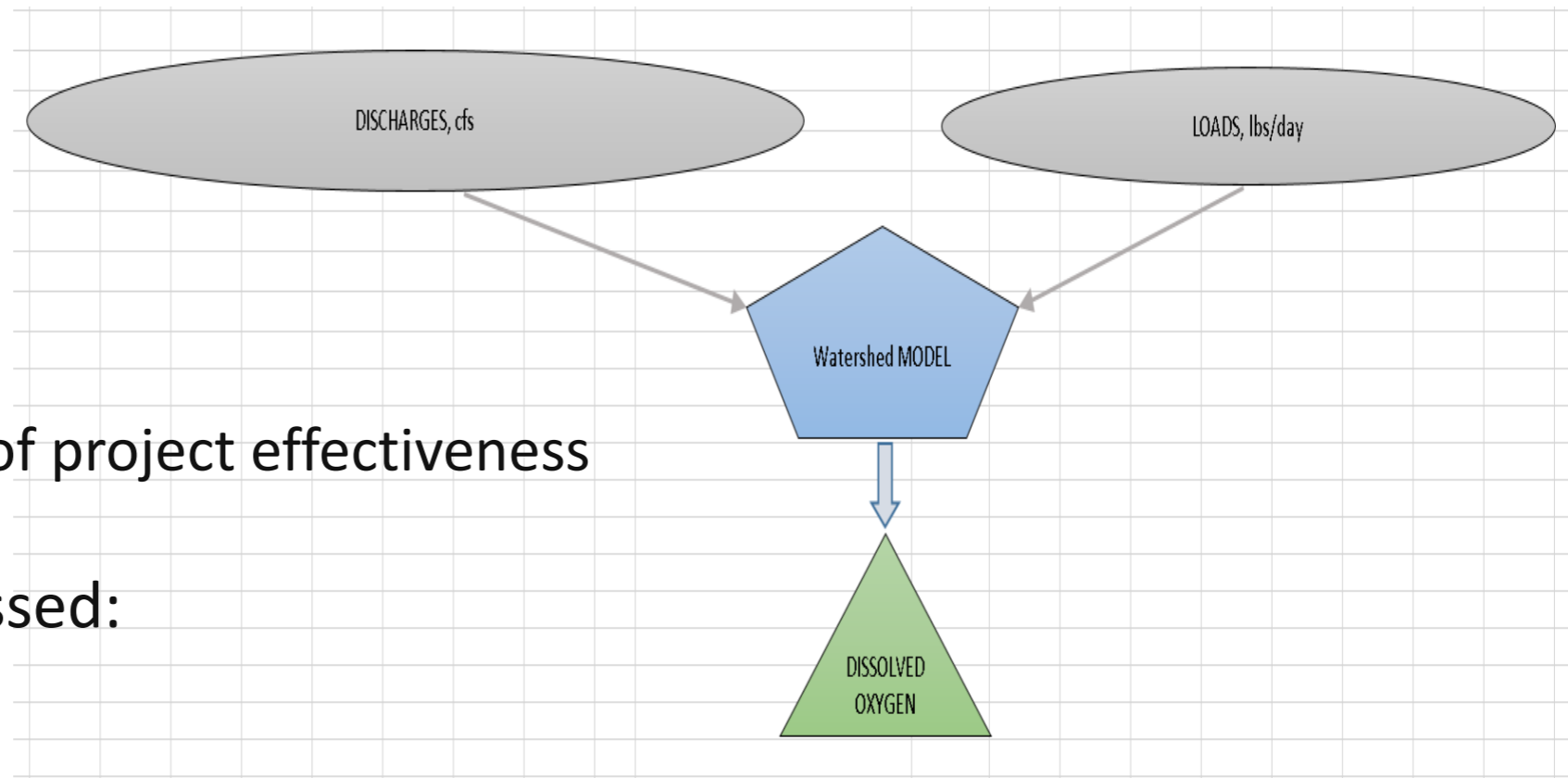
Water Quality Impact Modeling (WQIM) in St. Tammany Parish

Used for:

- Planning
- Permitting
- Grants
- Demonstration of project effectiveness

Developments Assessed:

- Subdivision
- Commercial, Industrial & Institutional
- Dischargers into TMDL OR Outstanding Natural Resource Water (ONRW)/Scenic River
- Large residential developments ≥ 5 acres



Model Components

LDEQ LA-QUAL WQ Model with *STP Watershed Management Study*
TMDL Model Revisions (CPRA 2014)

- Calibration model:

Simulates current conditions and provides a river response to stormwater or wastewater discharges

- Projection model:

Predicts WQ response to a variety of scenarios of future management changes



Phases of WQ Modeling Process

- Phase 0 - Required documentation
 - Permit application(s)
 - Letters from other agencies
 - BMP site plan
 - Types & locations of discharge outfalls
 - Discharge rates from outfalls
- Phase 1 - Characterization
- Phase 2 – Assessment & Modeling
- Phase 3 – Report & WQC Response Letter



Phase 1: Characterization

- Identify discharge locations (SW & WW, outfall locations)
- Specify receiving stream/watershed model to be utilized
 - 17 watershed models available for STP
- Identify POCs in discharges
- Quantify pollutant loading from discharges that may contribute to exceedances in TMDLs

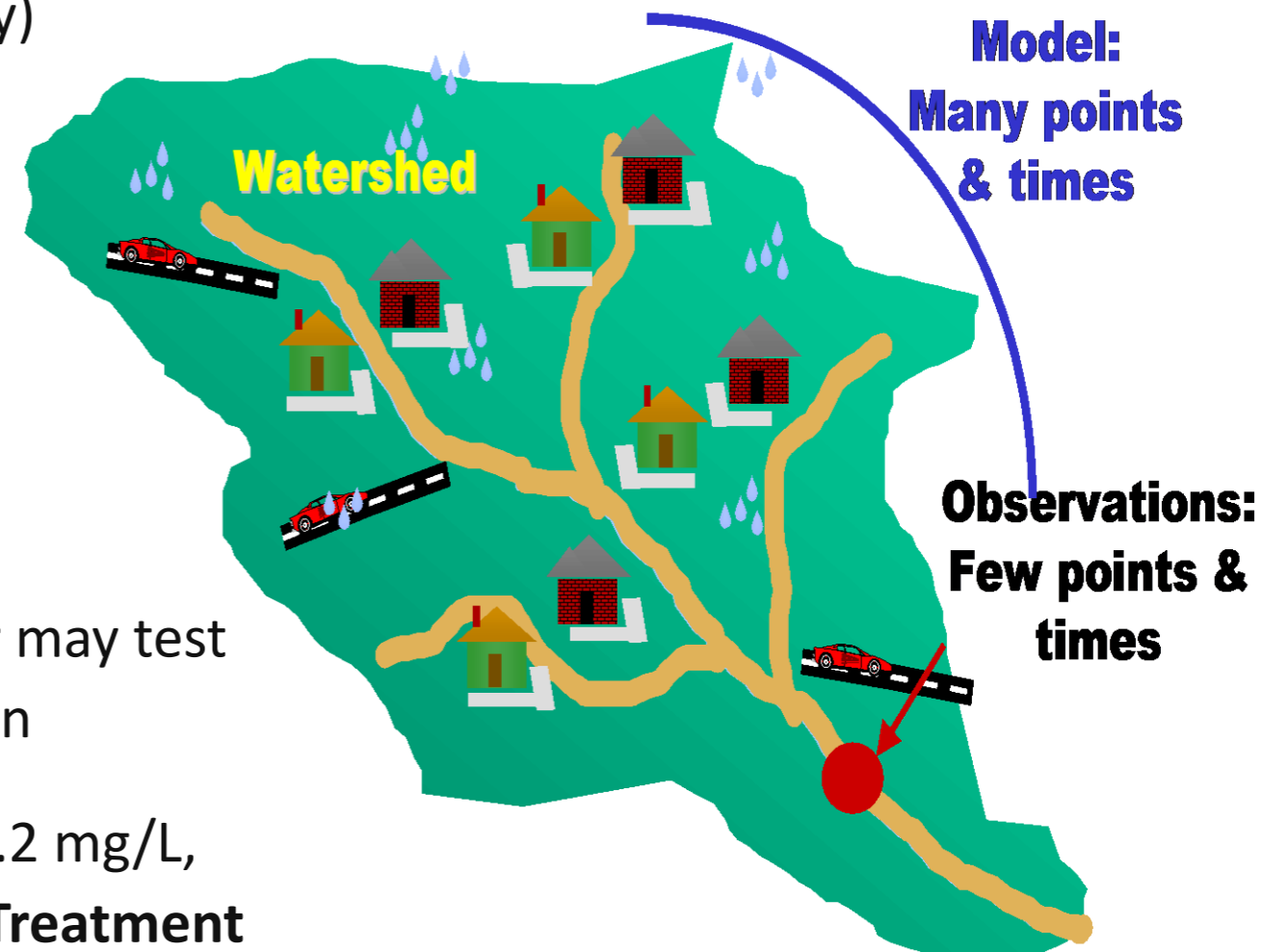
Models with checks are well-calibrated & developed by LDEQ during TMDL process

Watershed	LDEQ BOD/ Low DO TMDL
Abita River	
Bayou Bonfouca	√
Bayou Cane	√
Bayou Castine	
Bayou Chinchuba	
Bayou DeZaire	√
Bayou Lacombe	√
Bayou Liberty	√
Bayou Tete L'Ours	√
Bayou Vincent	√
Big Branch	√
Bogue Falaya River	√
Cypress Bayou	√
Lower Tchefuncte River	√
Ponchitolawa Creek	√
Upper Tchefuncte River	
W-14 Canal	



Phase 2: Assessment & Modeling

- Determine 2-Yr 2-Hr discharge
 - Engineer-supplied (from Hydro study)
 - Apply Parish Q-minimum algorithm
- Calculate CBOD & NBOD loads
- Model to evaluate DO impacts in receiving stream
 - If DO is reduced >0.2 mg/L, modeler may test discharge impacts in another location
 - If DO impact (reduction) remains >0.2 mg/L, developer will expand on-site **BMP Treatment Train**



Phase 3: WQIM Report

If Modeling results are:

Acceptable:

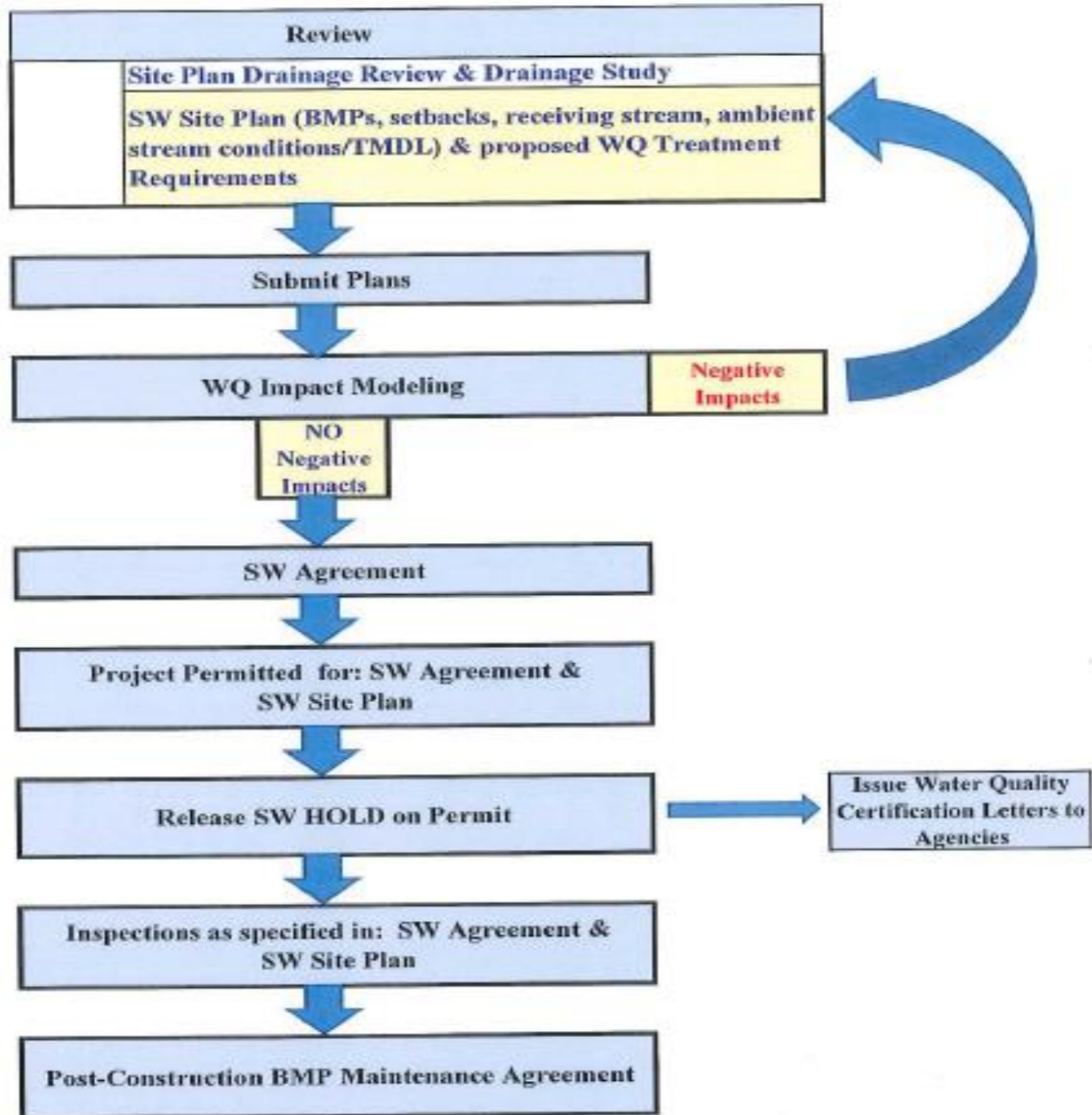
- Watershed impacts minimal/ DO < 0.2 mg/L reduction
- Developer signs SW Agreement
- SW Hold is released and permit is issued
- WQC response letter is issued to LDEQ for agency distribution
- Construction may begin and inspections verify the project follows the SW Agreement & Site Plan

Unacceptable:

- Impacts on DO > 0.2 mg/L
- SW Hold is not released on permit
- WQC response letter is not issued
- Developer will be asked to take additional action:
 - Construct additional BMPs on the site
 - Move discharge to a less burdened stream



WQIM: Modeling Process Flowchart

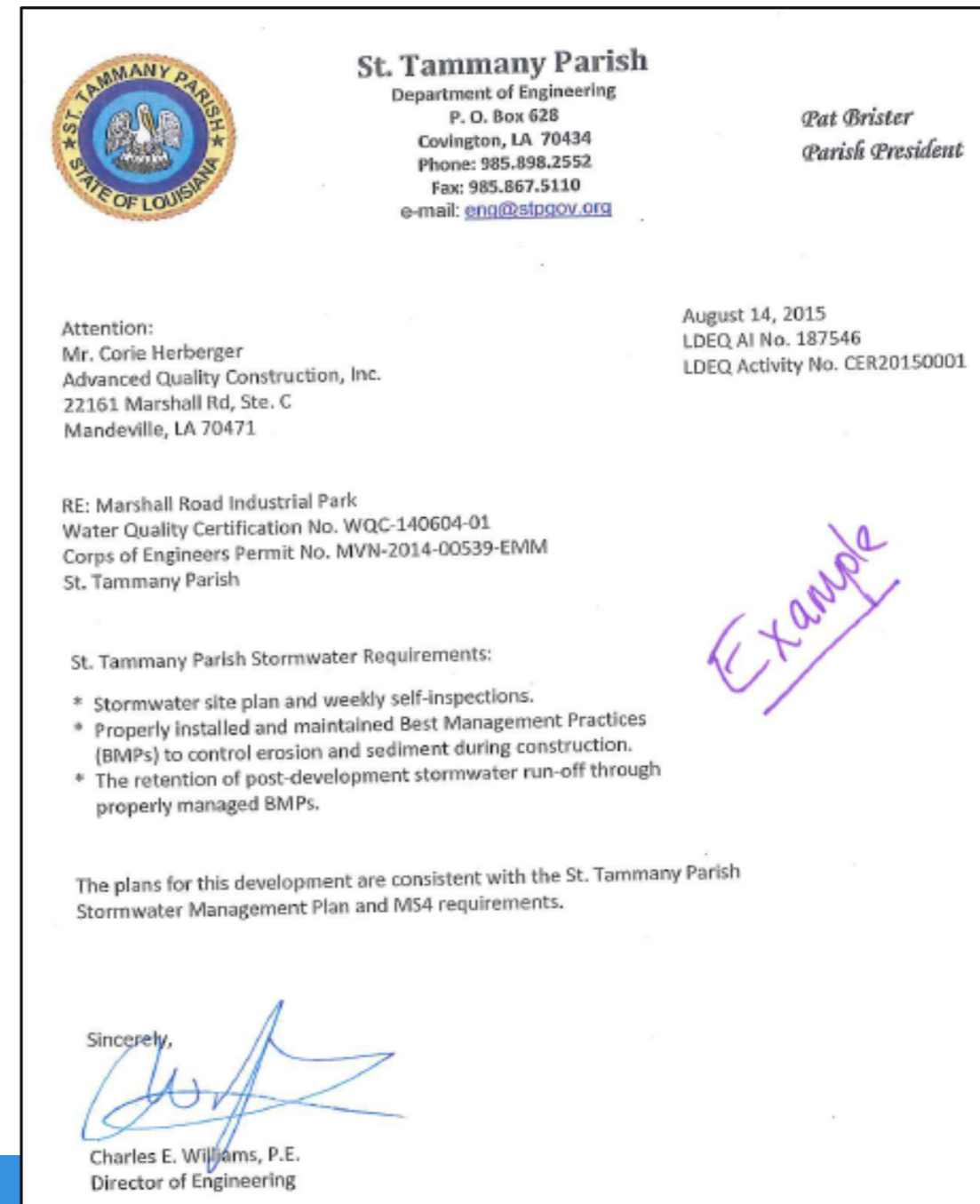


WQIM: WQC Response Letters

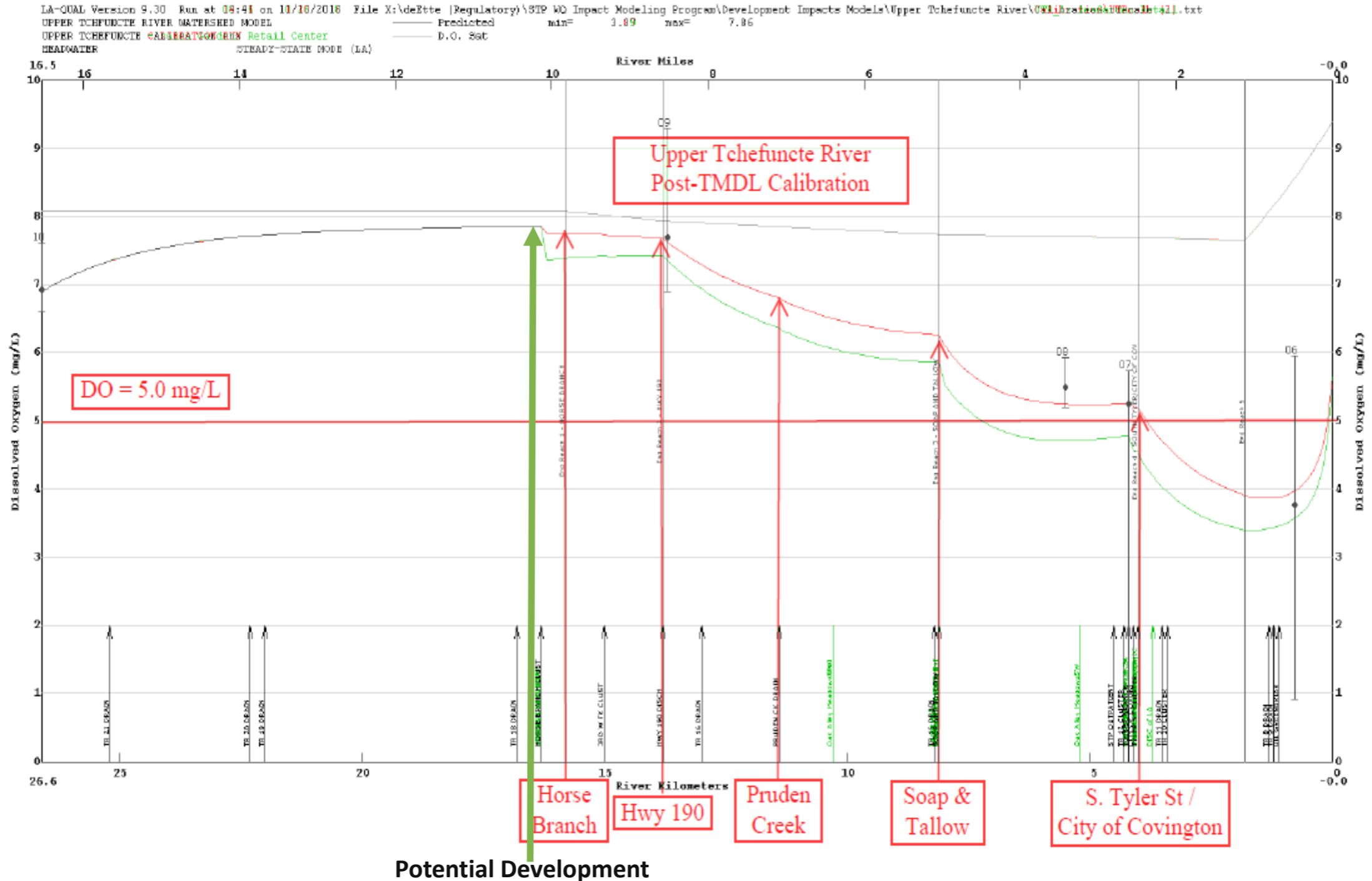
WQC response letters are being required from MS4 Administrators for:

Agency permits:

- USACE (404)
- LDEQ (LPDES in TMDL Waterbodies)
- LDWF (Scenic Rivers)



WQIM: Failed Development (Example)



WQIM: Pre-Permit Results (2016 – present)

DEVELOPMENT 12/12/2017	SCOPE	UTILITIES PROVIDER	WATERSHED MODEL	Dev. Size	BMP Treatment Train to Receiving Stream [4]	DO Standard (Pass/ Fail)		
				acres		Anti Deg	EPA Std	Watershed
Abita Lakes, Ph. 3-B-2	Residential, 17 Units	Tammany Utilities	Abita River	33.01	d-> Wp-> branch--> Abita River(LA59)	Pass	Pass	Pass
Abita Ridge <i>(formerly Abita River Park)</i>	Residential; 138 total lots	UIL	Abita River	46.32	Wp-d	Pass	Pass	Fail
Alexander Ridge <i>(Pending approval 2/14/2017) Formerly Terra Mariae Phase 3</i>	Residential; 103 Lots	Tammany Utilities	Bogue Falaya	48	d-Wp-d	Pass	Pass	Fail
Angelic Estates Phase 1-B-2 (Sherry Court and April Court)	Residential; 12 Lots; AKA "The Birg"	Tammany Utilities	Ponchitolawa	1.51+0.762=2.272)	Dp-d	Pass	Pass	Fail
Artesia Apartments @ Watercross	Residential; Multi-Family; Apartment Complex; 264 Units; 19 Total Buildings	UIL; Approved	LTR	14.33 (w/ offsite roadway)	d-> Wp --> wetland	Pass	Pass	Fail
PRUDEN CREEK SD <i>(Recorded 4/05/2016; File NO.5571)</i>	Residential; 60 Lots	H20	UTR	24.88	d-Wp-d --> Pruden Creek/ Horse Branch -> UTR	Fail/Pass	Pass	Fail
SIMPSON FARMS	Residential; 106 Lots	Individual/ H20	UTR	51.28	d-Dp-d --> Horse Branch --> UTR	Fail/Pass	Pass	Fail

Since 2016 >200 projects have been modeled for WQ impacts



WQIM: Watershed Summary for Permit Review

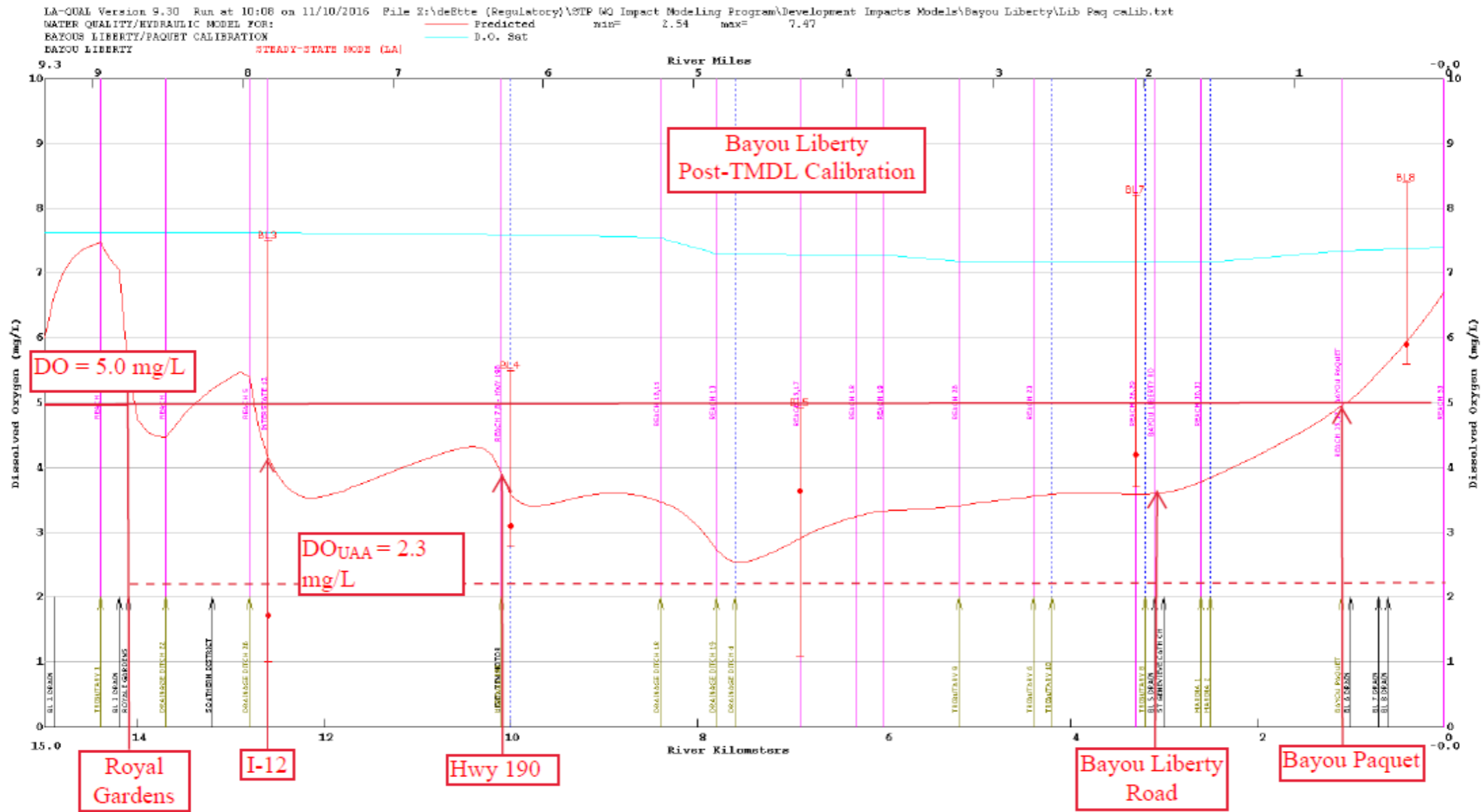
The WQ Impact Modeling Program should become an integral part of the development review process:

- Assists Local Permit Review – Permitting caution should be exercised in areas of impairment
- Assists developers - Testing developments for DO impacts on receiving streams, as early as possible in the process, may prevent Agency permitting problems (LDH, LDEQ, LDWF)

Watershed	Summer DO Standard, mg/L	Subsegment	DO Criteria		Watershed Condition at Calibration Pass [1] /Fail	Comments
			Anti-degradation Pass [1] / Fail	EPA Standard in Reach where Developments Confluence Pass [1] / Fail		
Abita River	5		Passed	Passed	Failed	Failure at RM 2.3 (south of Hwy 190), with recovery at RM 1.5. Caution should be exercised when permitting developments south of Hwy 190 until DO improves.
Bayou Chinchuba	2.3	040806	Passed	Passed	Failed	In danger of failure nr headwaters. Caution should be exercised when permitting developments near headwaters of Bayou Chinchuba to West tributary drains at the end of Reach 1 (from RM 8 - 6.7 until recovery at west tributary confluence).
Bayou Vincent	2.3	040907	Passed	Passed	Failed	Failure at RM 2.5, with recovery at RM 12.2. Failure at RM10.3 with no recovery. Caution should be exercised when permitting developments in Reaches 7-12 (below I-12 to confluence with Bayou Bonfouca) until DO improvement.
Bogue Falaya River	5.0		Passed	Passed	Failed	Failure at RM 15.3 beginning just upstream of Hwy 190, with no recovery. Caution should be exercised when permitting developments below Hwy 190 until DO improvement.
Lower Tchefuncte River	2.3 (Hwy 190 to Bogue Falaya River)	040807	Passed	Passed	Failed	Failure RM 10-9: downstream of I-12, with recovery at confluence with Ponchitolawa Creek and Tete L'Ours. Caution should be exercised when permitting dischargers near I-12 and upstream Flowers Bayou. (These include Nor du Lac, Avanti Nursing Home, Cultural Arts, Rooms to Go, River Chase, Estates of Watercross. All of these developments have excellent BMPs. Unfortunately, upstream Flowers Bayou contains a significant load from unsewered homes along this scenic stream.)
	2.3 (Bogue Falaya River to Hwy 22)	040808	Passed	Passed	Marginal	Caution should be exercised when permitting developments from I-12 to the Ponchitolawa Creek.

WQIM: Planning & Grants (Example)

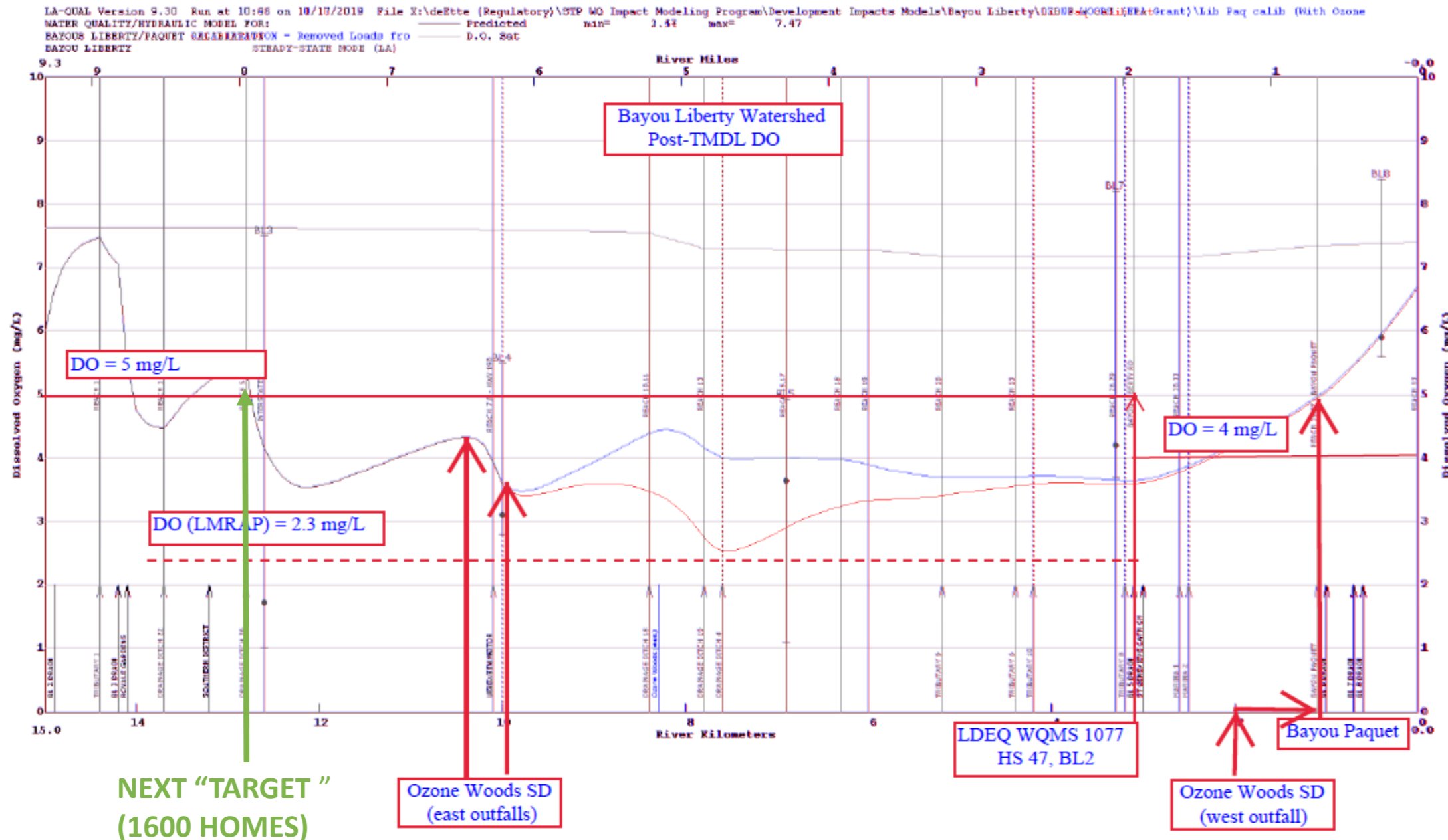
STP awarded \$400,000 from EPA for “Pollution Source Tracking” in Bayou Liberty Watershed (~4000 inspections in Phases 1&2)



WQIM: Project Results (Bayou Liberty, Phase I)

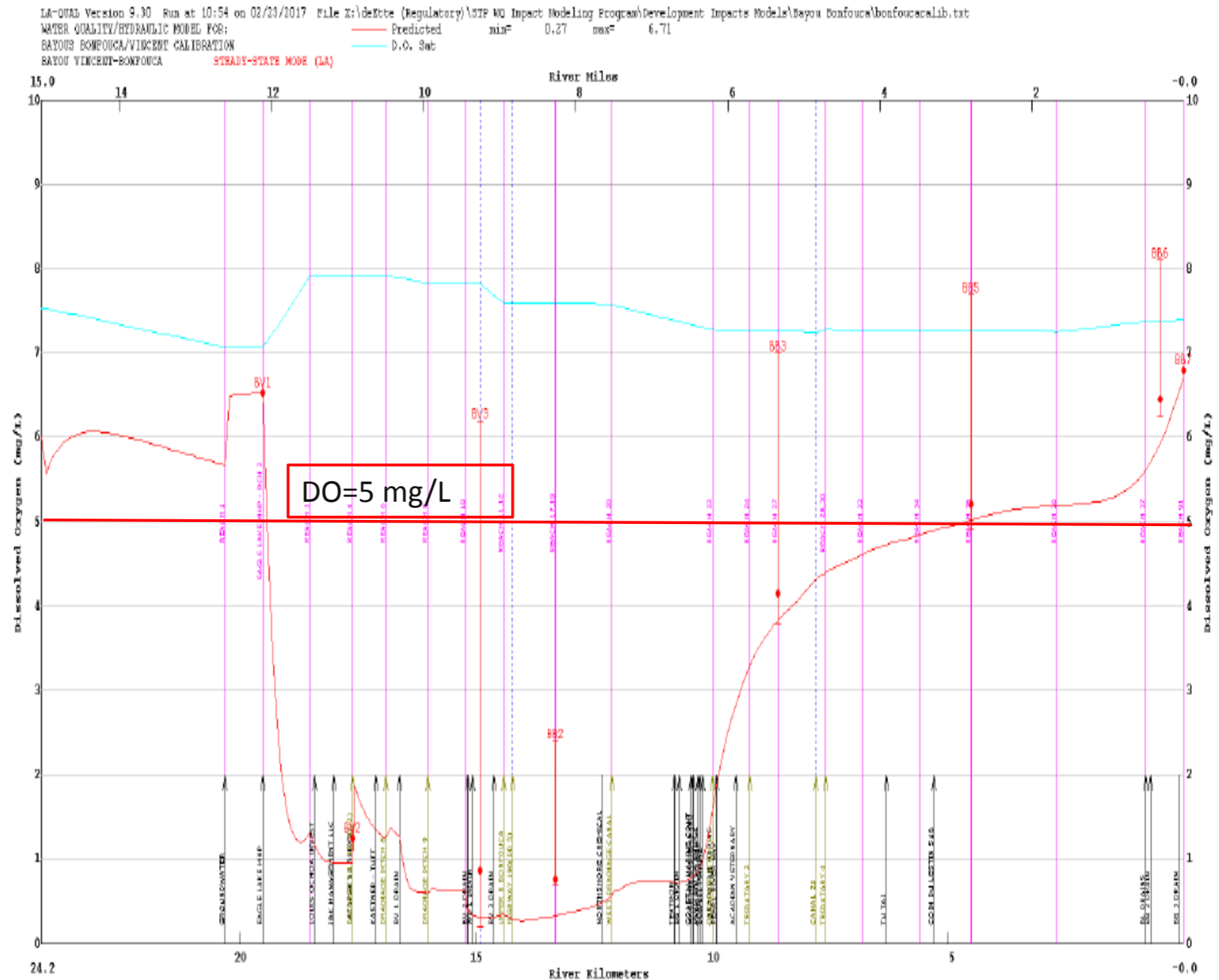
Inspections of 856 individual homeowner sewer treatment units resulted in:

- 215,000 GPD of improved wastewater
- 598 lbs BOD5/day from the subsegment



WQIM: Modeling Recommendations for SWMP & MS4

- Add study report, results & recommendations to SWMP updates and report progress in MS4 annual reports
- Continue targeting HotSpot areas with low DO (such As Bayou Bonfouca)
- Develop STP-specific Technical Manual for use by developers & engineers



Continued WQ Improvements

As more individual on-site sewer systems are repaired and BMPs are implemented in developments, we can expect to see greater WQ improvement throughout the Parish... and de-listing of impaired waterbodies



Our Vision

St. Tammany Parish will be the place to be along the I-12 Corridor. Through EFFICIENT, TRANSPARENT and ACCOUNTABLE operations, St. Tammany Parish Government will promote a STRONG ECONOMY with INNOVATIVE DEVELOPMENT, while investing in our natural environment and cultural diversity, to preserve the QUALITY OF LIFE that makes St. Tammany Parish vibrant and unique.



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Contact Us

ST. TAMMANY PARISH GOVERNMENT
21490 KOOP DRIVE
MANDEVILLE, LA 70471

E. deETTE SMYTHE, Ph.D.

Regulatory Manager
DEPARTMENT OF DEVELOPMENT-ENGINEERING

p 985.809.7448

e edsmythe@stpgov.org

w www.stpgov.org



Questions or Comments?

Thank you for your attention and interest in our GREAT Parish! If you think of other questions, please feel free to contact us.

We will be happy to assist you.