



2012 Report  
Card for

LOUISIANA'S  
INFRASTRUCTURE

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## OUR FUNDAMENTAL CANON

ENGINEERS SHALL HOLD PARAMOUNT THE SAFETY, HEALTH AND WELFARE OF THE PUBLIC AND SHALL STRIVE TO COMPLY WITH THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT IN THE PERFORMANCE OF THEIR PROFESSIONAL DUTIES.

## EXECUTIVE STATEMENT

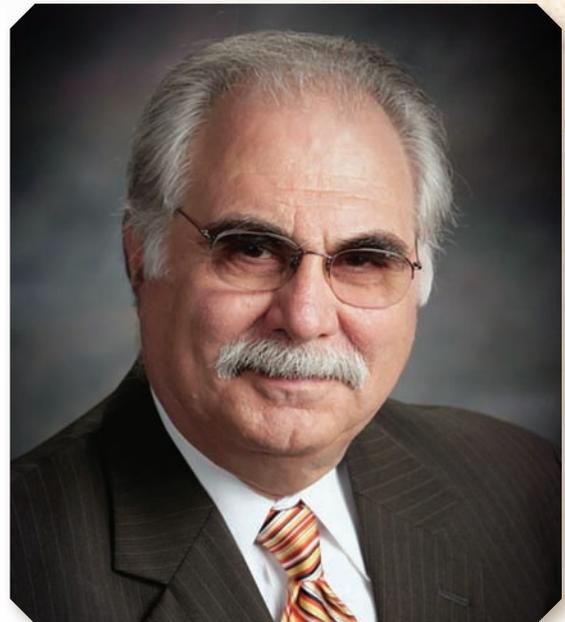
### *Louisiana's infrastructure needs immediate attention.*

This is the overarching conclusion of the *Report Card for Louisiana's Infrastructure*, the first-ever report from the Louisiana Section of the American Society of Civil Engineers (ASCE). An expert team of more than 50 civil engineers studied nine major components of Louisiana's infrastructure for more than 18 months. Their technical reports, which were peer-reviewed by independent experts and scrutinized by an ASCE executive committee, conclude that our infrastructure is poorly maintained, inadequately funded and not designed to meet tomorrow's demands.

As civil engineers, we understand the intricate details of infrastructure. We plan, design, build, maintain and operate roads and bridges, dams and levees, and we provide the public with safe and clean drinking water. The Louisiana Section of ASCE believes that responsibility also carries an obligation to tell the public what we know about the state of our infrastructure. In this sense, we present this report card as a fulfillment of our public duty as designers and builders of public facilities.

Our infrastructure is of vital importance to all; it sustains our quality of life, keeps us safe and healthy, allows us to be mobile, and provides the framework for our global economy to function. We depend daily on our infrastructure, yet we take its condition for granted until a failure produces tragic results, such as a levee failure or a bridge collapse. Our goal in producing this report card is to inform the public and our elected leaders about the state of our infrastructure in one easy-to-understand document. Our hope is that the public will demand that our political leaders, who ultimately have control over the future of our infrastructure, take action to prioritize funding to build and maintain society's vital components.

The national ASCE first reported on the state of the nation's infrastructure in 1995. The most current report card, published in 2009, gave the nation's infrastructure an average grade of "D." Since 1995, more than 23 Sections of ASCE have offered a more localized opinion on state infrastructures through statewide report cards. This first-ever *Report Card for Louisiana's Infrastructure* is an un-biased and objective document prepared by volunteers from private companies, public agencies, and public universities. A great deal of time and resources was dedicated to this effort, and we hope that our leaders turn these recommendations into actions that will improve our infrastructure and secure a better future for all of Louisiana's citizens.



Sincerely,

A handwritten signature in black ink, appearing to read 'Kam Movassaghi', written in a cursive style.

Kam Movassaghi, Ph.D., P.E., F.ASCE

Kam Movassaghi is the executive director of The 2012 *Report Card for Louisiana's Infrastructure*. His professional career spans over 40 years of industrial, academic, and public service. He is the president of C.H. Fenstermaker and Associates, Inc. and the former Secretary of Louisiana Department of Transportation and Development.

## THE REPORT CARD FOR LOUISIANA'S INFRASTRUCTURE

The American Society of Civil Engineers (ASCE) was founded in 1852, and is America's oldest national engineering society. Our mission is to provide value to our members and partners, advance civil engineering and serve the public good. To carry out that mission, ASCE advances technology, encourages lifelong learning, promotes professionalism and the profession, develops civil engineer leaders and advocates infrastructure and environmental stewardship. The Louisiana Section of ASCE was founded in 1914, and has more than 2,000 members in four branches: Acadiana, Baton Rouge, New Orleans and Shreveport. The Louisiana Section of ASCE joins 23 other states that have developed a state-specific report card to complement the well-known national Report Card for America's Infrastructure.

Roads, Bridges, Dams, Levees, Sewer Collection and Treatment, Drinking Water Distribution, Solid Waste, Aviation and Ports are all civil infrastructure. As a society, we invest in civil infrastructure to support an elevated quality of life; we expect this infrastructure to be here tomorrow and anticipate that it will be even better in the future.

A large number of public, private and nonprofit groups routinely collect data on the state's infrastructure. This data are often disparate, spread out and coded for the specific use of a particular group. Rarely are the data gathered across multiple infrastructure areas and presented to the public in an easy-to-understand format. The Louisiana Section of ASCE has developed this fact-based assessment of the state's infrastructure because its members believe the public has a right to know exactly what the condition is of our infrastructure. By assigning a letter grade to each infrastructure area, the public can gauge the relative strengths and weaknesses of each area and, we hope, call on our leaders to make the appropriate decisions.

*The Report Card for Louisiana's Infrastructure* has been developed by ASCE volunteers. More than 50 professionals, primarily civil engineers, from across the state were involved in the effort. Volunteers from public agencies, private firms and nonprofit groups worked diligently for more than a year to develop the report card. A committee comprised of an executive board and nine technical committees was established. The executive board was tasked with administrative functions, while the technical committees were tasked with data gathering, developing grading criteria, grading the infrastructure and offering targeted recommendations. The work of the technical committees was reviewed by peer reviewers; often a subject matter expert that had no prior involvement with the technical committee activities. The mixture of public, private and nonprofit volunteers, along with the peer review process, provides an unbiased and neutral opinion.

Technical committees assessed data reaching as far back as 10 years and, when possible, followed grading guidance developed by ASCE National for The Report Card for America's Infrastructure. Seven fundamental grading components that were considered are Capacity, Condition, Funding, Future Need, Operations &

Maintenance, Public Safety and Resilience. It is important that these terms are clearly defined, as they will be discussed in each of the infrastructure sections:

-  **Capacity** A measure of how much reserve remains in the system.
-  **Condition** A measure of ability of the system to perform as it was designed.
-  **Funding** A measure of the past, current and predicted future investment in the system.
-  **Future Need** A measure of the projected demand and projected importance of the system.
-  **Operations & Maintenance** A measure of the past, current and predicted future ability to preserve the system.
-  **Public Safety** A measure of the danger posed by an ineffective system.
-  **Resilience** A measure of the ability for a system to withstand occasional overloads.

The Report Card utilized a 10-point grading scale, similar to what is done in developing a traditional school report card. Each of the seven fundamental grading components was assigned a weighting factor by the committees and was graded for each infrastructure category.

-  **90-100 = A** Exceptionally Performing Infrastructure
-  **80-89 = B** Satisfactorily Performing Infrastructure
-  **70-79 = C** Marginally Performing Infrastructure
-  **60-69 = D** Crumbling Infrastructure
-  **59 or Below = F** Failing Infrastructure

The *Report Card for Louisiana's Infrastructure* is a practical, yet powerful tool. Where infrastructure is marginally performing, crumbling or failing, immediate action should be taken by the public and our elected leaders to reverse the trend and to improve the grade. Each category that was reviewed contains specific recommendations by infrastructure experts so our leaders will have a clear course of action.

The Louisiana Section of ASCE plans to update *the Report Card for Louisiana's Infrastructure* every five years to inform the public and our elected leaders on where we have improved and where we should commit more resources. Our overriding goal for this project is to share our knowledge and expertise with the public to help make Louisiana a stronger, safer, healthier and more prosperous community that serves all of its citizens' needs.

## LOUISIANA'S REPORT CARD

When possible, each category was evaluated on the basis of capacity, condition, funding, future need, operation and maintenance, public safety and resilience.

**C** Aviation

**D<sup>+</sup>** Bridges

**B** Dams

**D<sup>+</sup>** Drinking Water

**C** Levees

**C** Ports

**D** Roads

**C<sup>+</sup>** Solid Waste

**C** Wastewater



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# ROADS

**SUMMARY** Louisiana's road system is congested, in poor condition and inadequate to meet the needs of a state competing to provide economic opportunities for businesses and citizens in the 21st Century. Nearly every deficiency noted in the road system is directly attributable to an inadequate and outdated funding model that forces transportation professionals to defer capacity, safety and maintenance projects. Although recent infusions of capital, through state sales tax surpluses and federal stimulus programs, have improved the road system, Louisiana lacks a long-term funding plan that adequately addresses current and future needs. Unless Louisiana's governor and legislature provide a significant, long-term increase in funding for roads, the current model practically guarantees that congestion, safety and road conditions in Louisiana will only get worse over the next several years.

**OVERVIEW** Louisiana has more than 61,000 miles<sup>19</sup> of roadways (see Figure 1: *Mileage Classification of Louisiana Roadways*) that are critical to Louisiana's economic development. Louisiana's primary means of financing transportation is through a 20-cent tax on every gallon of gasoline and diesel. Four cents of that tax is dedicated to paying bonds for the Louisiana Transportation Infrastructure Model for Economic Development program, 16 specific projects approved by voters in the 1980s. The Louisiana Department of Transportation and Development (DOTD) also receives revenues from motor vehicle license taxes, and unclaimed property monies (approximately \$15 million per year) are dedicated to the completion of Interstate 49 from Shreveport to Arkansas. Motor vehicle sales taxes are designated to go to DOTD, but no monies are being transferred because of general fund shortfalls in the state budget.

In Fiscal Year 2010, DOTD received approximately \$674 million<sup>23</sup> in state revenues. Louisiana also receives approximately \$480 million to \$625 million<sup>11</sup> per year in federal funds for which the state must provide matching funds.

The 16 cent-per gallon gas tax established in 1984 and dedicated to DOTD is now worth only 7 cents per gallon because of inflation. As vehicles achieve better fuel efficiencies, revenues from these tax revenues continue to decline because drivers do not need to buy as much gas or diesel as they did years ago. On the federal side, the long-range federal surface transportation program, the Safe, Accountable, Flexible and Efficient Transportation Equity Act - A Legacy for Users (SAFETEA-LU), expired on September 30, 2009. The program has been extended by a series of short-term resolutions; however, no long term federal funding of the transportation bill exists, making long-term planning for projects very difficult.

An efficient roadway system in Louisiana is critical to commerce and the state's economy. Businesses and trucking rely on a well-designed network of roadways with little or no congestion to move goods. As part of this network, Louisiana has approximately 1,593 miles of constructed and planned interstate highways that connect major cities in the state. However, because of the lack of funds, not all of the planned interstate system is completed. I-49 from Shreveport to the Arkansas state line is being designed or is under construction, but funding does not exist for I-49 from New Orleans to Lafayette. This portion of future I-49 is important to Louisiana's economic viability because of the dependence the oil and gas business has on this route, which now follows U.S. 90. I-49 from New Orleans to Lafayette has earned the name of "America's Energy Corridor" because 80% of the nation's offshore oil and gas supply comes from or through Louisiana, which amounts to 30% of the entire energy consumption in the country.

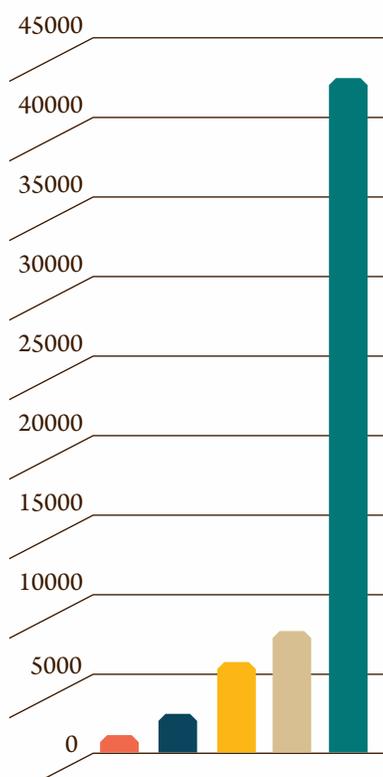
State surplus funds from 2006-09 and the recent federal stimulus funding reduced the backlog of roadway needs to \$10.3 billion<sup>9</sup>. However, many congestion, safety and pavement condition projects remain unfunded, and there is little chance that Louisiana will have any state surplus funds in the foreseeable future. According to a report from The Road Information Project<sup>1</sup> (TRIP), these issues cost the average New Orleans driver \$1,254 a year and the average Baton Rouge driver \$1,052 per year. In 2009, the national congestion cost was \$115 billion, with \$33 billion<sup>20</sup> contributed to truck congestion through wasted time, fuel and truck operating costs.

From 1999 to 2009, congestion worsened in Louisiana as annual vehicle travel increased by 8%, from 41.2 billion vehicle miles traveled (VMT) in 1999 to 44.9 billion VMT in 2009<sup>15</sup>. In Louisiana, commercial trucking is expected to increase 17% by 2020<sup>1</sup>. TRIP<sup>1</sup> estimates that in the year 2030, overall travel on Louisiana's roadways will increase to 57 billion miles. This will further increase the congestion in major urban areas will add to the deterioration of the roadway system.

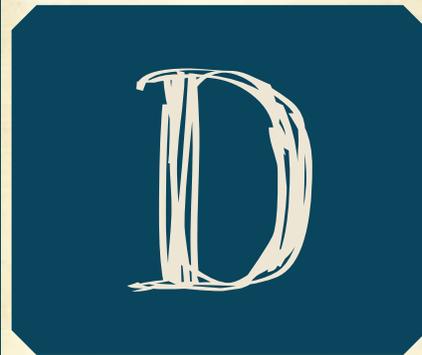
**FIGURE 1: MILEAGE CLASSIFICATION OF LOUISIANA ROADWAYS<sup>19</sup>**

**LEGEND**

- Interstate Highway System
- National Highway System
- State Highway System
- Rural Highway System
- Local Highway System



# LOUISIANA'S GRADE



## FACTS AND ISSUES

**CAPACITY** Capacity is a measure of the maximum traffic flow obtainable on a roadway using all available lanes. The capacity evaluation of the roads grade was obtained through review of volume/capacity (V/C) data available from Metropolitan Planning Organizations (MPOs) in Louisiana, DOTD's 2009 *State Highway and Bridge Needs* report<sup>9</sup> and from TRIP. Typically, any V/C of 1.0 or higher indicates the capacity is less than fair. We found that for the MPOs that provided this data, the vast majority of the mileage of roadways within their transportation networks has fair or better V/C ratios. However, the capacity of the roadways in New Orleans<sup>2</sup>, Baton Rouge<sup>3</sup> and Lafayette<sup>6</sup> was determined to be less than fair. As the TRIP report points out, nearly 43% of Louisiana's roadways currently have capacity issues, mostly concentrated in the major metropolitan areas. The DOTD report indicated that more than 51% of the state's construction budget was related to relieving congestion and increasing capacity in 2009. A grade of D+, which is weighted 15% of the total road grade, was assigned to the capacity category.

**CONDITION** Condition of a road includes its geometry, roadside features, drainage, signs and markings and, most importantly, the riding quality of the pavement. This pavement riding quality feature is generally used as the indicator of the overall condition of the road. Pavement roughness is measured and compared to accepted standards that range from very poor to excellent conditions. The pavement condition rating is sometimes simplified to three conditions: poor, fair or good.

Of Louisiana's 61,000 miles of public roads and streets, 27% are on various components of the state highway system. A small amount of public road mileage is owned by the federal government and toll authorities, and the remainder is owned by local units of government. DOTD monitors changes in the state highway system's pavement condition through an annual survey. Since the state highway system carries the highest traffic volumes and contains the most vital transportation links, information on its condition was used as the primary indicator for road and street conditions in the state.

According to the 2010 TRIP report, 44% of major state and locally maintained roads in Louisiana were in poor or mediocre condition<sup>1</sup> in 2007. Those conditions improved on state-maintained roads after 2007 because of new projects funded by from state surplus and Federal ARRA funds. According to DOTD, the percentage of state maintained roads in poor or very poor condition<sup>10</sup> was reduced from 11.1% in 2007 to 9.4% in 2009, and the percentage of state maintained roads in good to excellent condition improved from 50.4% in 2007 to 55.1% in 2009.

Some major road condition problems exist in the New Orleans and Baton Rouge metropolitan areas. The 2010 TRIP report states that, in the New Orleans metro area, 49% of major state and locally maintained roads are rated in poor condition and 19% are in mediocre condition. In the Baton Rouge metro area, 37% of major roads are rated in poor condition and 23% of major roads are rated in mediocre condition. Some road conditions in the New Orleans area

will improve because of repair and resurfacing work paid for by hurricane recovery funds and in the Baton Rouge metro area through the Green Light construction and overlay program (a city bonded construction program).

Based on the above discussion and the information submitted by DOTD and TRIP, the condition component, which was weighted 20% of the roads element of the report card, was given the grade of C-.



**FUNDING** Road construction and maintenance projects are funded through a state tax on gasoline and diesel, motor vehicle license taxes, federal highway funds and state bonds. Louisiana has reduced the backlog of road needs from \$11.9 billion in 2007 to \$10.3 billion through the use of surplus state funds, federal stimulus funds and the TIMED program funds. However, the state's budget situation precludes the availability of additional surplus funds in the foreseeable future, and the revenue from the motor fuels tax is declining, both in real dollars and in buying power. According to DOTD, the 16-cent state tax that is dedicated to running the operations of DOTD and providing matching money for federal funds is worth about 7 cents, when compared to when the tax was first implemented in 1984. State drivers will continue paying an additional 4 cents per-gallon tax for several years for the TIMED program to service bonds, but the program's construction activity is nearly complete. A grade of D was assigned to the funding category, which is weighted at 20% of the total.

**FUTURE NEED** The extra money that funded many Louisiana road projects over the past three years will no longer be available, and the state will not be able to reduce its \$10.3 billion in backlogged road projects through its basic funding. Although project costs have stabilized, DOTD faces a grim financial future. Currently, about 1 cent of Louisiana's 16-cents-per-gallon motor fuels tax is being diverted to help pay off TIMED program bonds because the 4 cents-per-gallon tax is not generating enough money to meet the bonds' repayment schedules. This siphoning of the 16-cent gasoline tax to pay for the TIMED bonds could accelerate in the future unless drivers buy more gas

and diesel, which is doubtful because of increased vehicle fuel efficiency. This will further reduce available funds for DOTD to provide basic and essential road improvements, operations and maintenance. At the federal level, the outlook for an increase in federal highway funds is in serious doubt, and a decrease is possible. Within this funding model, Louisiana will not have an expanded highway program. It is more likely that Louisiana roads will fall into further disrepair while congestion increases in the metropolitan areas. A grade of D- was assigned to the future needs category, which is weighted at 20% of the total.

**OPERATION & MAINTENANCE** The Operation and Maintenance (O&M) of the roadway infrastructure includes the condition of the roadway surface and shoulders, drainage, sweeping, mowing, litter control, signals, signs and striping. The O&M portion of the grade considered data from DOTD<sup>12,13</sup> that included maintenance funding (in-house and contract maintenance) for two years and a level of service rating from FY2007-2008. Maintenance data for parishes and municipalities were not readily available and were not considered in determining the grade. DOTD spent approximately 17% and 18% of its total budget for Engineering and Operations for FY 2008-2009 and FY 2009-2010, respectively, for O&M. According to the Federal Highway Administration, 2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance<sup>22</sup>, the average of states' O&M expenditure in 2006 was 25%. A grade of C-, which was weighted at 10% of the total roadway grade, was assigned for the operations and maintenance category.

**PUBLIC SAFETY** Public Safety is defined as traffic safety as it applies to the roads in Louisiana. Data from the Federal Highway Administration<sup>19</sup>, DOTD<sup>14,15</sup> and the TRIP Report<sup>1</sup> were analyzed.

Several contributing factors are associated with road safety on Louisiana roads. These factors include:

-  Roadway characteristics including geometry, lane widths, lighting, signage, traffic signals, the presence or absence of guardrails, rumble strips, median barriers, insufficient clear distances for speeds, no turn lanes, inadequate or non-paved shoulders and poorly laid out intersections or interchanges.
-  Driver behavior including use of seat belts, driving under the influence of alcohol or drugs, speeding and distracted driving.
-  Vehicle characteristics.

The Trip Report estimates that roadway characteristics are likely a contributing factor in about one-third of all fatal and serious traffic accidents in Louisiana. This factor is also greatly affected by funding available for the maintenance of roadways

**TABLE 1: LOUISIANA HISTORICAL FATALITY RATES<sup>14</sup>**

Year	Louisiana Number of Fatalities	Louisiana Fatality Rate	Louisiana Safety Funds Spent	National Fatality Rate
2006	890	2.20	\$19,116,570	1.42
2007	900	2.20	\$18,691,151	1.36
2008	820	2.00	\$27,600,000	1.26
2009	729	1.8	\$57,498,190	1.13
2010*	614	1.5	\$26,699,125	1.09

\*Note: 2010 LADOTD numbers are still preliminary.



and safety improvement projects. The Federal Highway Administration<sup>1</sup> has found that every \$100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.

The basis of analysis was the fatality rate, which is defined as the number of fatalities per 100 million vehicle miles traveled. The fatality rate, in addition to other information, is tracked and reported every year by each state. Table 1 shows information provided for Louisiana, including the fatality rate and amount of safety funds spent from 2006 to 2010. National fatality rates

have been added for the years they were available.

Louisiana has made great strides in reducing the fatality rate from 2006 to 2010. When compared with the national fatality rate decline of 23% between 2006 and 2010, the Louisiana fatality rate of decline of 32% between 2006 and 2010 is a significant improvement. The significant and sustained decline of Louisiana's fatality rate is the main factor considered in the scoring of this category.

A grade of C+, which was weighted at 10% of the total road grade, was assigned for the safety category.

**RESILIENCE** As Louisiana has multiple major river crossings, the resilience of the roadway system considered the redundancy of bridges<sup>17</sup> for the crossings and roadway connections throughout the state. A major transportation connectivity requirement in Louisiana is the division of the state by the Mississippi River. The multiple Mississippi River crossings were a prime consideration for this grade. There are bridge crossings and roadway connection redundancies in New Orleans (Crescent City Connection & Huey P. Long bridges); Luling (Interstate 310 Bridge); Gramercy (Veterans Memorial Bridge); Donaldsonville (Sunshine Bridge); Baton Rouge (Interstate 10 & US 190 Huey P. Long bridges); St. Francisville (James J. Audubon Bridge); Vidalia (Natchez/Vidalia Bridge);

and Delta/Vicksburg (Interstate 20 Bridge) that allow for alternate detours in the case of a catastrophic event at any one location. Also, the majority of interstate routes have parallel, primary highways that are available as alternate detours.

Because of major evacuations that may occur in hurricane season, the Southeast Louisiana Evacuation Plan<sup>18</sup> was also considered for the grade. This plan has been implemented twice, in 2005 before Hurricane Katrina and in 2008 before Hurricane Gustav. In both instances, the contraflow component of using both sides of the interstate system was successfully utilized to evacuate major sections of southeast Louisiana. A grade of B, which was weighted at 5% of the total roadway grade, was assigned for the resilience category.

TABLE 2: GRADE SUMMARY\*\*

Fundamental Components	Capacity	Condition	Funding	Future Need	Operations & Maintenance	Public Safety	Resilience	TOTAL GRADE
Weighting Factor	.15	.20	.20	.20	.10	.10	.05	
Score	D+	C-	D	D-	C-	C+	B	D

\*\*The total grade of D was arrived at by considering the weighted factors and individual scores of each component. 55% of the total grade was between a D- and D+; 40% of the total grade was between a C- and C+ and 5% of the total grade was a B.

## POLICY OPTIONS/FUNDING

Louisiana's current funding model is inadequate to meet current road needs, as evidenced by a congested system in poor condition that has a \$10.3 billion backlog of projects. Additional, sustained funding is critical for Louisiana to meet current needs and address future needs. Because of inflation, the current buying power of the 16 cents-per-gallon motor fuels tax is now worth about 7 cents per gallon. In addition, 1 cent of the 16 cents is being levied against the bond payments of the TIMED program, further reducing monies available for roadway improvements. As of this writing, there is no long-term, federally funded transportation program in effect, and the most ambitious of the proposals is to set spending levels no higher than they were under the old program. These funding issues are critical for the future of our road system and economic development in the State of Louisiana. Failure to provide DOTD with additional revenues will severely curtail Louisiana's ability to compete economically on a national and global level.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

-  Increase the current gasoline and diesel tax in order to reduce the inflationary effect on the original 16-cents-per-gallon tax.
-  Index gasoline and diesel taxes to match inflation.
-  Leverage and index natural gas as a primary fuel source.
-  Move vehicle sales tax dollars to the Transportation Trust Fund.
-  Increase commercial and private vehicle registration fees.
-  Develop a plan to implement Vehicle Miles Traveled (VMT) as a future alternative funding source.
-  Incorporate tolling and public-private partnerships, where possible, as a means of funding major projects.
-  Pass, fund and sustain a new multiyear Federal Transportation Bill.
-  Initiate an Infrastructure Bank.

## SOURCES

- <sup>1</sup> *The Road Information Project (TRIP) Report, "FUTURE MOBILITY IN LOUISIANA: Meeting the State's Need for Safe and Efficient Mobility," April 2010.*
- <sup>2</sup> *Regional Planning Commission for Jefferson, Orleans, Plaquemines, St. Bernard and St. Tammany parishes.*
- <sup>3</sup> *Capital Region Planning Commission for Ascension, East Baton Rouge, East Feliciana, Iberville, Livingston, Pointe Coupee, St. Helena, Tangipahoa, Washington, West Baton Rouge and West Feliciana parishes.*
- <sup>4</sup> *Imperial Calcasieu Regional Planning and Development Commission for Allen, Beauregard, Calcasieu, Cameron, and Jefferson Davis parishes.*
- <sup>5</sup> *Northwest Louisiana Council of Governments, Shreveport/Bossier Metropolitan Planning Organization.*
- <sup>6</sup> *Lafayette Consolidated Government Metropolitan Planning Organization.*
- <sup>7</sup> *Houma-Thibodeaux Metropolitan Planning Organization.*
- <sup>8</sup> *Rapides Area Planning Commission.*
- <sup>9</sup> *Louisiana Department of Transportation and Development, STATE HIGHWAY AND BRIDGE NEEDS, as assessed by LADOTD for the year 2009.*
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- <sup>11</sup> *Louisiana Department of Transportation and Development, Transportation Summary for Funding, 2010.*
- <sup>12</sup> *Louisiana Department of Transportation and Development, Maintenance Funding, FY08-09 through FY 09-10.*
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- <sup>14</sup> *Louisiana Department of Transportation and Development, Fatality Rates, 2006-2010.*
- <sup>15</sup> *Louisiana Department of Transportation and Development, Highway Safety Improvement Program, Annual Report State Fiscal Year 2009-2010, August 2010.*
- <sup>16</sup> *National Highway Traffic Safety Administration, NHTSA 05-11, April 1, 2011.*
- <sup>17</sup> *Louisiana Department of Transportation and Development, DOTD Vulnerability Assessment, March 2004.*
- <sup>18</sup> *State of Louisiana, Louisiana Citizen Awareness & Evacuation Guide (Southeast).*
- <sup>19</sup> *Federal Highway Administration Highway Statistics, 2008.*
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- <sup>21</sup> *National Highway Traffic Safety Administration (NHTSA) web site.*
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# BRIDGES

**SUMMARY** Louisiana's abundance of rivers, bayous, swamps, lakes and streams provides a wealth of recreation, fishing, boating and beauty. They also pose a transportation challenge to a state that must provide safe passage across the water. Louisiana has the fourth most bridge surface area in the United States with more than 15.4 million square feet of bridge deck<sup>1</sup>, yet it ranks in the bottom third of federal funding for bridge maintenance, repair and replacement. The Federal Highway Administration (FHWA) and Louisiana Department of Transportation and Development (LADOTD) have classified almost 29 percent of Louisiana's 13,361 bridges as either structurally deficient or functionally obsolete. The number of deficient bridges in Louisiana is more than the total number of bridges in 10 other states, the District of Columbia or Puerto Rico, and the situation is certain to worsen in the next several years as thousands of Louisiana bridges approach the end of their design lives. Louisiana needs substantial increases in revenue to fund improvements to its deteriorating bridge infrastructure.

**OVERVIEW** The FHWA requires inspections to be performed at least once every 24 months on all publicly owned bridges and culverts (located on public roads) longer than 20 feet<sup>2</sup>. The results of these biennial inspections, along with other non-inspection related bridge data, are recorded in the FHWA's National Bridge Inventory (NBI) database to determine a sufficiency rating.

The inspections yield condition ratings, which are scaled from 0 to 9, for three structural categories: bridge deck, superstructure and substructure<sup>3</sup>. Bridge deck includes the wearing surface, superstructure includes all primary load-carrying members and connections, and the substructure includes all piers and abutments. A rating of 0 indicates failed conditions, and a 9 indicates excellent conditions. The lowest of the three condition ratings is used in the FHWA formula. A component receiving a rating of 4, which indicates poor conditions, will classify the structure as deficient, thereby making it eligible for federal funding.

The formula calculates the sufficiency rating with up to 55 percent of the calculation coming from the structural condition, up to 30 percent from serviceability and functional obsolescence, up to 15 percent from its essentiality for public use and up to 13 percent for special reductions per FHWA's Specifications for the NBI and Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. The sufficiency rating indicates the bridge's capability to remain in service and is used as a basis for establishing eligibility and priority for replacement or rehabilitation with federal funding. It is formulated to a 0-100 scale. A bridge with a sufficiency rating greater than 80 is ineligible. A rating between 80 and 50 meets the requirements for federal rehabilitation funds, and below 50 qualifies the bridge for federal replacement funds.

All bridges with ratings of less than 80 are considered deficient and are classified as either structurally deficient (SD) or functionally obsolete (FO)<sup>9</sup>. Bridges are classified as SD when either load-carrying component(s) is in poor or worse condition, i.e. receives a condition rating of 4 or lower, or if unacceptable traffic interruptions occur during high water levels. This SD designation does not necessarily mean the structure is unsafe. SD bridges may remain in service, but



typically have weight limitations and require significant resources to maintain. Such maintenance can be substantial and is, in part, why states cannot for reapply for any repair funds for at least 10 years after receiving construction funding for rehabilitation.

A FO bridge was designed and built to satisfy the design standards and code requirements at the time of design and construction but has outdated geometrics, load-carrying capacity and/or waterway adequacy. Geometric requirements have continually become more stringent to improve safety, design loads have increased because of increasing traffic volumes and vehicle weights, and waterway requirements have become part of the design process as hydraulic analyses have progressed. A FO designation provides the owner the opportunity and time to plan an upgrade to meet current guidelines. A deficient structure must be designated as either SD or FO. A bridge meeting the requirement of both would be categorized as SD, being the more significant of the two classifications.

In addition to populating the NBI database, the Louisiana Department of Transportation and Development (LADOTD) also records the condition of every bridge element per FHWA's National Bridge Inventory Standards (NBIS) coding guidelines using the Pontis Bridge Management System<sup>6</sup>. This includes the same 0-9 condition reporting but for all bridge elements, including, but not limited to, every slab, beam, girder, bent, column, pier, footing, pile, shaft and caisson<sup>7</sup>. The Pontis software system, originally developed by the FHWA, models further bridge deterioration and recommends an optimal policy for preservation the existing bridge infrastructure on a specified budget<sup>8</sup>. Prior to the TIMED Program and federal stimulus funding, LADOTD had an annual funding level for the bridge infrastructure of \$70 million dollars<sup>13</sup>. A 20-year outlook showing the sufficiency ratings at a \$100 million budget and a \$140 million budget for on-system (state-owned) bridges is shown in Figure 1<sup>5</sup>.

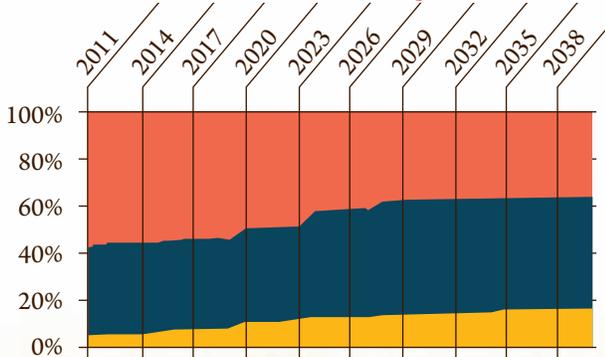


FIGURE 1: SUFFICIENCY RATINGS WITH \$100 & \$140 MILLION ANNUAL BUDGETS FOR ON-SYSTEM BRIDGES ONLY

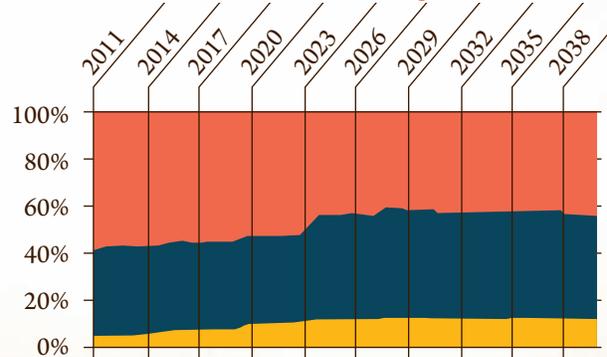
LEGEND

- Sufficiency Rating >80
- Sufficiency Rating 50-80
- Sufficiency Rating <50

% of On-System Bridges by Sufficiency Rating with \$100 Million Annual Budget



% of On-System Bridges by Sufficiency Rating with \$140 Million Annual Budget



## FACTS AND ISSUES

**CAPACITY** The cost of travel delays to the average driver was approximately \$422 in the New Orleans area and \$214 in the Baton Rouge area in 2009<sup>10</sup>. This same year, the annual estimate across the state totaled \$414 million<sup>10</sup>. The volume-to-capacity ratio for bridge structures throughout most of Louisiana does not require substantial improvement in the near term. However, there are several bridge structures in New Orleans, Baton Rouge and Lafayette that are contributing to substantial travel delays. More than half of the state's budgetary needs are related to relieving congestion. As a result of economic and population growth, traffic congestion is expected to double by 2030<sup>10</sup>. Louisiana's network of bridges helped transport \$526 billion worth of goods (384 million tons) in 2000, and the trucking industry is expected to move more than 787 million tons in and out of the state by 2030<sup>11,17</sup>. Improving the capacity of Louisiana's bridges will remain a priority throughout the foreseeable future. Resultantly, the grade for this category is a C-.

**CONDITION** More than 28 percent of Louisiana's bridge decks are classified as either structurally deficient or functionally obsolete, which is 34th among the 50 states.<sup>12,13</sup> Almost nine percent are classified as structurally deficient, and nearly 20 percent are classified as functionally obsolete<sup>1</sup>. If measured in terms of bridge count, 3,829 of Louisiana's 13,361 bridges, more than 28 percent, are classified as deficient<sup>1</sup>. This includes those bridges classified as structurally deficient (12.89%, or 1,722 bridges), and those classified as functionally obsolete<sup>1</sup> (15.77%, or 2,107 bridges).

The average bridge deficiency rate of the 50 states and the District of Columbia is 25 percent, i.e. structurally deficient

or functionally obsolete. ASCE national set this 25% deficient bridge inventory at Grade C, thereby providing a datum for each state's evaluation of its bridge infrastructure. Louisiana was 39th in the nation in 2008 with almost 30 percent of its bridges classified as either structurally deficient or functionally obsolete<sup>10</sup>. This was a considerable improvement from 2007, where it was ranked 43rd in the nation. Based on the 2010 FHWA's data from the Office of Bridge Technology, Louisiana is ranked 34th based on overall percentage of deficient bridge structures. This provided the primary basis for the grade determination of D+ for the condition category.

**FUNDING** Although our political leaders frequently proclaim the safety and condition of our bridges are of national importance, federal funding has not empowered the transportation agencies with sufficient funding to maintain, much less improve, our aging bridge infrastructure.<sup>10</sup> Virtually every state is facing an increase in deteriorating bridge infrastructure because there isn't enough money to provide adequate maintenance, repair and replacement.<sup>20</sup> The charts included in Figure 1 show that deficiencies will continue to increase, even with an annual budget of \$140 Million for only the 2,734 National Highway System (NHS) bridges. With more than \$6 billion needed to improve the current bridge inventory beyond the structurally deficient and functionally obsolete categories, a long-term solution needs to be implemented. LADOTD's backlog for bridges is about \$2.2 billion. The FHWA says it would cost \$140 billion in 2006 dollars to immediately repair every deficient bridge in the country. Funding at the national level has been tenuous since the expiration of the last transportation bill, the Safe, Accountable, Flexible, Efficient Transportation Equity Act, A Legacy for Users (SAFETEA-LU) on September 30, 2009. Subsequent to this bill, the Hiring Incentives to Restore Employment (HIRE) Act was signed into law in March of 2010, which transferred \$19.6 billion to the

Highway Trust Fund (HTF) to provide funding certainty to the end of 2011. According to the National Surface Transportation Policy and Revenue Study Commission, the U.S. is spending less than 40 percent of what it costs just to maintain the bridge infrastructure at its current condition.

Although spending \$1.2 billion of surplus state revenues from 2007 to 2009 and approximately \$430 million in stimulus funding through the American Recovery and Reinvestment Act (ARRA) reduced the state's road and bridge project backlog from \$14 billion in 2006 to \$12.5 billion in 2010, further investment in transportation will be needed to achieve the goals outlined in LADOTD's Five-Year Strategic Plan<sup>10,16</sup>.

Louisiana has four of the five longest bridges in the U.S. and, more significantly, the 4th largest inventory of deficient NHS bridges (by deck area) in the nation<sup>4</sup>. Louisiana is now the 10th worst state with more than 20 percent of its National Highway System bridges classified as functionally obsolete. Louisiana's bridge infrastructure will require substantial increases in investment to maintain its aging structures, and an approaching swell of 'expiring' bridges — those approaching the end of their design lives — will need to be replaced, starting within the next few years and lasting for the next few decades.

The grade for this category was determined to be a D+.

**FUTURE NEED** By 2015, approximately 31 percent of Louisiana’s bridges will be more than 50 years old. The number of deficient bridges will rapidly increase over the following years. By 2025, more than half of all bridges currently in Louisiana will be more than 50 years old. This acceleration of ‘expiring’ bridges will make LADOTD’s goal of having 75 percent of all bridges at a sufficient rating (as outlined in the five-year strategic plan) exceedingly difficult. By 2035, more than 70 percent of Louisiana bridges will be beyond their 50-year design lives. Although the bridges being designed and built today have a design life of 75

years or greater, almost every bridge constructed prior to 1980 was designed to last only 50 years.

In addition to the looming expense of our aging and deteriorating bridges’ exceeding their design lives, additional burdens are being placed on our transportation systems, including rising construction costs, declining revenues, increased congestion, an expanding trucking industry, diversion of available funds, the need to improve bridge safety and new bridge needs, such as the ability to thwart terrorist attacks on our high-profile ‘signature’ bridges. Resultantly, this category received a D.

**OPERATION & MAINTENANCE** LADOTD uses the Pontis software originally developed by the FHWA to most effectively maintain and operate the 13,361 bridges throughout the state. This system uses the database of all bridge structures to recommend the most optimal policy for preserving the existing bridge infrastructure for a given annual budget<sup>8</sup>. Such operations and maintenance include, but are not limited to, pavement, roadside and bridge maintenance; traffic operations and assistance to traffic; and ferry operations. The annual budget has to provide for labor, overhead, equipment, supply costs and contract maintenance. Again, as shown in Figure 1, an annual operating and maintenance budget for Louisiana’s 13,361 bridges of \$140 million will not maintain the current sufficiency ratings<sup>5</sup>. A grade of C- was given to this category.

**PUBLIC SAFETY** According to the FHWA, spending \$100 million on highway safety improvements prevents 145 fatalities over a 10-year period, and studies have shown that every dollar invested in the national highway system produces \$5.40 in economic benefits in improved safety, lower vehicle costs and reduced delays.<sup>10</sup> With an annual rate of at least two fatalities per million throughout the past two decades, Louisiana has continued to have one of the highest fatality rates in the country. As a result, our state is ranked 49th among all 50 states in fatalities for the past several years<sup>17</sup>. Improving safety features on Louisiana’s bridges will likely decrease traffic fatalities.<sup>10</sup> Subsequently, the grade for this category was marginally above failure, at D-.

**RESILIENCE** This is an appraisal of the state’s bridges against multiple extreme event loadings and the subsequent ability to quickly repair damage with minimal effects to public safety, the economy and security. The extensive presence of water crossings within Louisiana’s surface transportation system necessitates alternative routes. Fortunately, Louisiana’s transportation system has an above-average level of redundancy through multiple crossings. Unfortunately, none of the bridges, to our knowledge, has been designed taking the possibility of terrorist acts into account. However, extreme event loadings such as surge and wind forces from hurricanes have been designed into the more recent major interstate bridge structures. The resulting grade for this category is a C+.

TABLE 1: GRADE SUMMARY

	Capacity	Condition	Funding	Future Need	Operations & Maintenance	Public Safety	Resilience	TOTAL GRADE
<b>Fundamental Components</b>								
<b>Weighting Factor</b>	.15	.20	.20	.20	.10	.10	.05	
<b>Score</b>	C-	D+	D+	D	C-	D-	C+	D+

## POLICY OPTIONS/FUNDING

Louisiana is 44th in the nation in both trucking fees and gas taxes and 46th in auto registration fees<sup>14</sup>. These funding limitations helped place Louisiana at 39th in the nation in 2008, and this ranking has not improved despite LADOTD's utilizing more than \$5 billion from a 4-cent-per-gallon tax for improvements through the Louisiana TIMED program. Although Louisiana received \$430.5 million in federal stimulus funding through the American Recovery and Reinvestment Act (ARRA), this ranked 43rd overall as a percentage of 2008 state highway disbursements. These well-spent dollars have helped, but they are temporary. Again, a long-term sustained effort must begin in the near term. Motivating the 25th least-populated state<sup>15</sup> to absorb the costs of rehabilitating or replacing the fifth-largest deficient bridge deck area inventory in the nation will present myriad political and economic challenges well beyond the scope of this report.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

-  Increase gasoline and diesel tax, motor vehicle sales tax and vehicle registration fees to fund bridge maintenance, repair and replacement.
-  Utilize alternative planning, design and construction mechanisms.
-  Research and Innovation – Assist long-term national level research efforts such as the Transportation Research Board (TRB).
-  Systematic Maintenance – Publicize the efficacy of LADOTD in maintaining our state's bridges with the use of Pontis software, investing every dollar into our bridges with maximum benefit to the entire system.
-  New Financing Methods – All fund generating mechanisms should be considered, from public-private partnerships and toll-roads to statutory tools.
-  Allow parishes to increase license fees and motor fuels tax.
-  Urge policy makers to consider the high impact of the trucking industry on our roads and bridges and to use this as a potential source in allocating funding.
-  Consider utilizing Vehicle Miles Traveled (VMT) as a funding source.
-  Expand use of project delivery mechanisms such as design-build.
-  Develop and implement ways to streamline environmental processes in transportation projects.

## SOURCES

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- <sup>10</sup> TRIP, *FUTURE MOBILITY IN LOUISIANA: Meeting the State's Need for Safe and Efficient Mobility*.
- <sup>11</sup> LADOTD, *Statewide Transportation Plan*, 2008.
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- <sup>13</sup> *Transportation for America: The Fix We're In: The State of Our Nation's Bridges*.
- <sup>14</sup> *Driving Louisiana Forward*, 2011.
- <sup>15</sup> 2010 Census: Louisiana Report.
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- <sup>21</sup> U.S. Chamber of Commerce, *Transportation Performance Index*, 2011 Update.

# LEVEES

**SUMMARY** In the six years since Hurricane Katrina struck Louisiana, no component of the state's infrastructure has been more scrutinized than its levee system, which experienced a massive failure in the New Orleans area in 2005. Billions of dollars have been spent to rebuild the levee system in south Louisiana to new standards, but some issues remain. Insufficient resources have been dedicated to implementing a regular maintenance program for the new system, which will deteriorate over time if not regularly monitored and maintained. And, many vulnerable, less-populated areas in south Louisiana are not part of the new system and have poorly engineered systems that will not hold up to a tropical storm, much less a Category 3 hurricane. The successful performance of the vast riverine flood protection system in our state during the historic Mississippi River flood of 2011 helps to support the overall grade received by our levee systems.

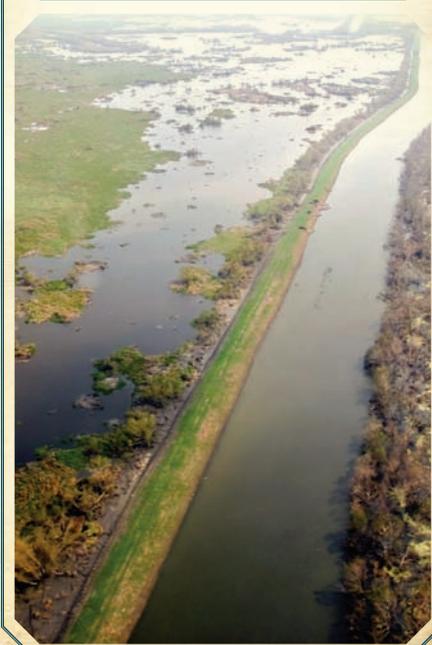
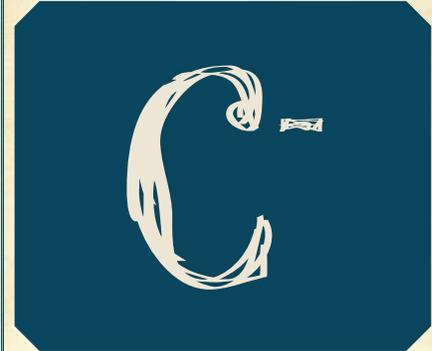
**OVERVIEW** Louisiana has more than 2,800 miles of levees that are critical to protecting the residents and economy of the state from flood events. Of these, approximately 2,500 miles are river levees, while about 365 miles are hurricane protection levees. More than 19,000 square miles of land area is protected by these structures.

The levees are managed by 27 levee districts with members appointed by the governor and Louisiana Legislature. The districts are funded by local property tax assessments for operation and maintenance (O&M) of the systems. District personnel work closely with the US Army Corps of Engineers (USACE), the Louisiana Department of Transportation and Development (LADOTD), the Coastal Protection and Restoration Authority (CPRA), and others. The state-funded flood control program and capital outlay program provide approximately \$18 million to \$30 million dollars annually. Federal funds appropriated by Congress directly to the USACE for Corps operations and construction total about \$220 million annually.

Historical flood events, including the flood of 1927, resulted in the Flood Control Act of 1928, which established federal involvement in the design and construction of flood control structures. The USACE was given control of these projects, and the federal government paid the full expense. Following this legislation, many miles of robust levee systems were constructed under the Mississippi River and Tributaries (MRT) project. Until about 1968, these MRT levees were designed and built to provide protection for the largest reasonable flood, now considered equivalent to 0.2% to 0.1% annual chance of exceedance events (500 to 1000-year flood). In 1968, Congress enacted the National Flood Insurance Program (NFIP). The NFIP designated the 1% annual chance of exceedance event (100-year flood) as the flood hazard area, requiring home owners within those areas who are financing with federally backed mortgages to purchase flood insurance. Even though this criterion was never intended to be a safety standard, the 1% annual chance event soon became the de-facto target level of protection for many communities.

Following hurricanes Katrina and Rita in 2005, Congress authorized \$14.5 billion to design and construct the Hurricane & Storm Damage Risk Reduction System (HSDRRS) for southeast Louisiana. This massive project includes hundreds of miles of levees, floodwalls, surge barriers, pump stations and floodgates. Construction of this vital flood protection infrastructure will protect the Greater New Orleans area against the effects of 100-year storms. The HSDRRS will be substantially completed by the end of 2011. However, not all of the levees in the state are built to these standards. On the other end of the spectrum, there are levees within the state that are non-engineered, crudely constructed embankments that do not conform to current design standards, often lacking adequate elevation and cross section needed to protect against even tropical storms in some cases.

## LOUISIANA'S GRADE



## 100-YEAR FLOOD PROTECTION NOT WHAT MOST PEOPLE THINK

The 1% annual chance of exceedance, or 100-year level of flood protection, does not imply that a flood would occur once in 100 years as some people believe. In actuality, a 100-year level of flood protection means there is a 26% chance of flooding during the 30 year life of a typical mortgage. By contrast, a 200-year level of protection corresponds to a 14% chance of flooding over a 30-year period. A 500-year level of protection, which many have advocated as a more appropriate standard, results in about a 6% chance of flooding over a 30-year period.

Although many believe a 100-year system does not adequately reduce potential flood damages in large urban areas, the report card grades are based on that standard. This is consistent with the current levee system evaluation for the NFIP and current design practice in the U.S. We agree that a 100-year system does not adequately reduce potential flood damage and risks to the public in large urban areas. If higher standards of protection were in place, the grades would be lower.

The flood protection systems in Louisiana, including the control structures that facilitate the management of the Mississippi River water levels near the highly populated cities in south Louisiana, are some of the best, most robust systems in the world. This was demonstrated in the spring of 2011, when for several weeks, record high water levels on the Mississippi River tested the levees. In spite of the highest historic recorded water elevations ever recorded at Vicksburg, Natchez and Red River landings, the MRT project levees performed as designed. The Morganza spillway, which is designed to relieve flows from the Mississippi River by redirecting water to the Atchafalaya River basin, was successfully operated for only the second time since its construction. This historic event exceeded the 100-year high water on the Mississippi River at most Louisiana gauge locations upstream of Baton Rouge. While the levees performed as designed, in some parts of Louisiana, there was not enough freeboard to prevent overtopping of the levees from boat wakes. As a result, flood-fighting efforts used Hesco baskets and sandbags on the levee crown to retain more water. These outstanding levee systems and flood-fighting efforts prevented an estimated \$68 billion in damages in the New Orleans district alone.

## FACTS AND ISSUES

Criteria for judging levee systems in Louisiana included assigning grades based on the following categories:

-  **Capacity** The level of protection afforded relative to a 100-year flood event.
-  **Condition** Based on regular USACE inspections, the levees are judged as Acceptable (A), Minimally Acceptable (M), or Unacceptable (U).
-  **Funding** Assessments of the necessary evaluations and urgency for upgrades within a system and the availability of the funds required.
-  **Operation & Maintenance** Availability of adequate funds, equipment and personnel needed to perform O&M requirements.
-  **Public Safety** Ability of the flood protection systems to meet or exceed the 100 year flood protection level under current design standards.
-  **Resilience** The ability of the flood protection system to withstand overtopping without excessive scour and erosion.

**CAPACITY** Based on our evaluations, the capacity of the levee systems varied significantly throughout the state. In general, the systems in the greater New Orleans area graded the highest and were the only levee systems in the state to receive an A in this category. Capacity grades for systems elsewhere in the state ranged from B to F. A grade of C and below indicates the system does not provide protection from a 100-year event. Slightly more than half of the levee systems in Louisiana do not meet the 100-year elevation. Overall the average capacity of the flood control systems in Louisiana was graded a D+.

Levee systems provide flood protection by incorporating levees and associated structures such as flood walls, flood gates, control structures, surge barriers and

pump stations. The level of flood protection can be considered the capacity of the levee system. The appropriate level of protection has been the subject of much debate for many years. Congress enacted the National Flood Insurance Program (NFIP) in 1968, and the NFIP designated the 1% annual chance of exceedance flood, also referred to as the 100 year or base flood, as the criterion for requiring flood insurance. Since the design level of protection of the levees in Louisiana is based on the 100-year flood, we have based the report card grades on that standard. This is consistent with the current levee system evaluation for the NFIP, the level that funding has been provided, and the level at which most levees are designed throughout the country.

Our capacity evaluation considered the current and authorized elevations of the flood protection system relative to the 100-year target. Since many levees and floodwalls in the New Orleans area were being designed and constructed at the time of our evaluation, we considered those projects as being in place even if construction was not yet complete. We also considered whether the levees met both the old and new design criterion. If the levee met the 100-year level of protection under all design criteria, it was given an A for capacity. If it met only the old design criteria, it was given a B. If it met the 100-year level of protection but did not meet other design criteria, it was given a C. A levee that met its authorized elevation that is below the current 100-year elevation and did not meet other design criteria was given a D. Finally, if the system has additional deficiencies, it was given an F for capacity.

**CONDITION** Based on our evaluations, the average grade for condition of the flood control systems in Louisiana is a C-. The New Orleans area levees grade ranged from A to B, while systems across the state received grades ranging from A to F.

Condition of a system assesses how the flood protection system can perform its function of protecting against flood events, which in turn depends on how it is designed, constructed and maintained. Each year, the USACE, levee districts, LADOTD and CPRA conduct routine inspections of flood damage reduction systems to verify proper maintenance, owner preparedness and component operation. A rating is assigned for each of 15 items, including unwanted vegetation growth, sod cover, encroachments, closure structures, slope stability, erosion/bank caving, settlement, depressions/rutting, cracking, animal control, culverts/discharge pipes, riprap revetments and bank protection, revetments other than riprap, under-seepage relief wells/toe drain systems and seepage. The ratings include Acceptable (A), Minimally Acceptable (M), and Unacceptable (U). An overall rating is then given based on the ratings assigned to each criterion. Overall ratings of Acceptable are given for systems receiving A ratings for all components.

## MISSISSIPPI RIVER FACTS

- 3rd largest drainage basin in the world
- Drains portions of 31 U.S. states and 2 Canadian provinces
- Highest recorded water levels ever recorded at Vicksburg, Natchez & Red River landing in May & June 2011
- MRT project levees performed as designed
- Damage prevented during 2011 historic high-water event exceeded \$68 billion in the New Orleans district alone

### Mississippi River Drainage Basin



In cases where one or more items are rated M or one or more items are rated U and an engineering determination concludes that the U items would not prevent the system from performing as intended during the next flood event, the overall rating is Minimally Acceptable. An overall rating of Unacceptable is given when one or more items is rated U and would prevent the system from performing as intended or if a serious deficiency was noted.

Where available, the USACE inspection report ratings were used to arrive at the condition grade in this report card. Our grading methodology is shown in Figure 1 to the right. Where inspection reports were not performed, the systems were generally given a D for condition.

FIGURE 1: CONDITION GRADING METHODOLOGY

USACE Inspection Report Rating	# Items Rated MA		# Items Rated U Grade Assigned
	Minimal	Significant	
<b>A Acceptable</b>			<b>A</b>
<b>MA Minimally Acceptable</b>	Minimal		<b>B</b>
	Significant	None	<b>C</b>
	Significant	1 or more	<b>D</b>
<b>U Unacceptable</b>			<b>F</b>

**FUNDING** Funding grades were assigned based on the type of upgrades needed for the system, whether large fund sources are required, and whether such funds are available. Funding grades for the levee systems were generally very low across the entire state, with many systems receiving an F and only three receiving an A. Based on our evaluations the average funding grade for the state's levee systems is a D+.

Funding for the levees and flood protection systems within Louisiana comes from federal and state appropriations as well as from local Ad Valorem taxes assessed by the local levee districts of the residents within the districts' boundaries. The recent major hurricane damage risk reduction projects in southeast Louisiana were funded with a one-time \$14.5 billion dollar Congressional appropriation. Previously, local taxes were generally sufficient to fund O&M and minor repairs. However, these funds will not be adequate to maintain and operate the new large hurricane damage risk reduction systems in southeast

Louisiana. For example, the O&M costs for the \$1 billion West Closure Pumping Station and Gate Complex is estimated to require \$5 million per year of the South Louisiana Flood Protection Authority-West's \$5.3 million annual budget. In all, the O&M costs for the new infrastructure in the New Orleans area is estimated to be more than \$38 million per year, which is more than half of the combined budget of the eight local levee districts. O&M of the interior levees, canals and pump stations also require funding. To date, Congress has not authorized federal participation in funding the future levee repairs or new lifts necessary to maintain the 100-year level of protection as the levees subside. Funding sources for maintenance, repairs, and additional future lifts to maintain the level of protection have not been identified. Further, many levee systems outside of the New Orleans area did not receive federal funds to re-design and construct flood protection systems that meet the 100-year elevation under current design standards.

Critical future needs include raising of levees that currently do not meet the 100-year elevation, construction of existing levees to current design standards, inclusion of additional pump stations to prevent flooding within the levee systems during tropical storm and hurricane events, funding for additional lifts of fill to maintain the levee elevations due to the levee settlement, and repairs, redesign and construction to bring levees up to accreditation requirements. To be recognized as providing a 100-year level of protection (1% annual chance of flooding) on the NFIP maps, levee systems must meet and continue to meet NFIP minimum design, operation and maintenance standards. Costly evaluations and documentation is needed to demonstrate that a levee system meets NFIP requirements. Costs for any upgrades needed to bring the system into compliance will be significantly greater too.



FIGURE 2: A MISSISSIPPI RIVER LEVEE PROTECTS CRITICAL INFRASTRUCTURE DURING HIGH WATER IN 2011

TABLE 1: GRADE SUMMARY

Fundamental Components	Capacity	Condition	Funding	Operations & Maintenance	Public Safety	Resilience	TOTAL GRADE
Average*	1.7	1.9	1.7	2.2	1.6	2.5	1.9
Grade	D+	C-	D+	C	D+	C	C-

\*Grade based on our grading scale.

All categories were weighted equally on a 0 to 4-point scale. The summary grades for Louisiana’s flood protection are shown in the table above. A more detailed breakdown of grades by levee district is presented in Figure 4.

**OPERATION AND MAINTENANCE** Grading for Operation and Maintenance (O&M) was based on whether or not funds, equipment, and personnel are adequate to meet or exceed O&M requirements. Based on our evaluation the average grade for O&M of the levee systems within Louisiana is a C.

As discussed previously, O&M of the levees within Louisiana are largely accomplished by the local levee districts with money acquired from Ad Valorem taxes as well as state appropriations. The USACE funds and provides most of the O&M criteria for the Mississippi River levees. For most of the levees in the state, O&M costs include mowing and minor repairs. Funding sources for O&M are generally adequate; however local tax millages and state appropriations are insufficient to pay for O&M of project features within the new hurricane damage risk reduction system in southeast Louisiana.



**PUBLIC SAFETY** The average grade of the levees in Louisiana for Public Safety is a D+. The Mississippi River levees are the notable exception as evidenced by the high level of public safety they provided during Louisiana’s 2011 historic high water levels in May and June 2011. A separate grade was developed for the Atchafalaya and Mississippi riverine systems. Based on this evaluation, these systems received a grade of B.

Levees protect more than 3 million people and hundreds of billions of dollars in property and infrastructure in Louisiana. The consequences of levee failures and overtopping are devastating. In 2005, Hurricanes Katrina and Rita took the lives of more than 1,300 people and caused more than \$200 billion in losses. Since Louisiana is exposed to flood risks from tropical storms and hurricanes, most of Louisiana can be considered to be a “high hazard” area. Levees must have the capacity and condition to withstand high-water levels for extended periods.

For our evaluation, levee systems meeting the 100-year elevation level and the current design standards were given an A for public safety. Levee systems not meeting both of these criteria were graded from B to F depending on risk. Although levee systems within the state that did meet these criteria were given an A or B, most graded poorly. The main reasons include a high hazard level, the levee elevations are below the 100-year level, they are poorly constructed with little engineering or their designs are based on older design standards.

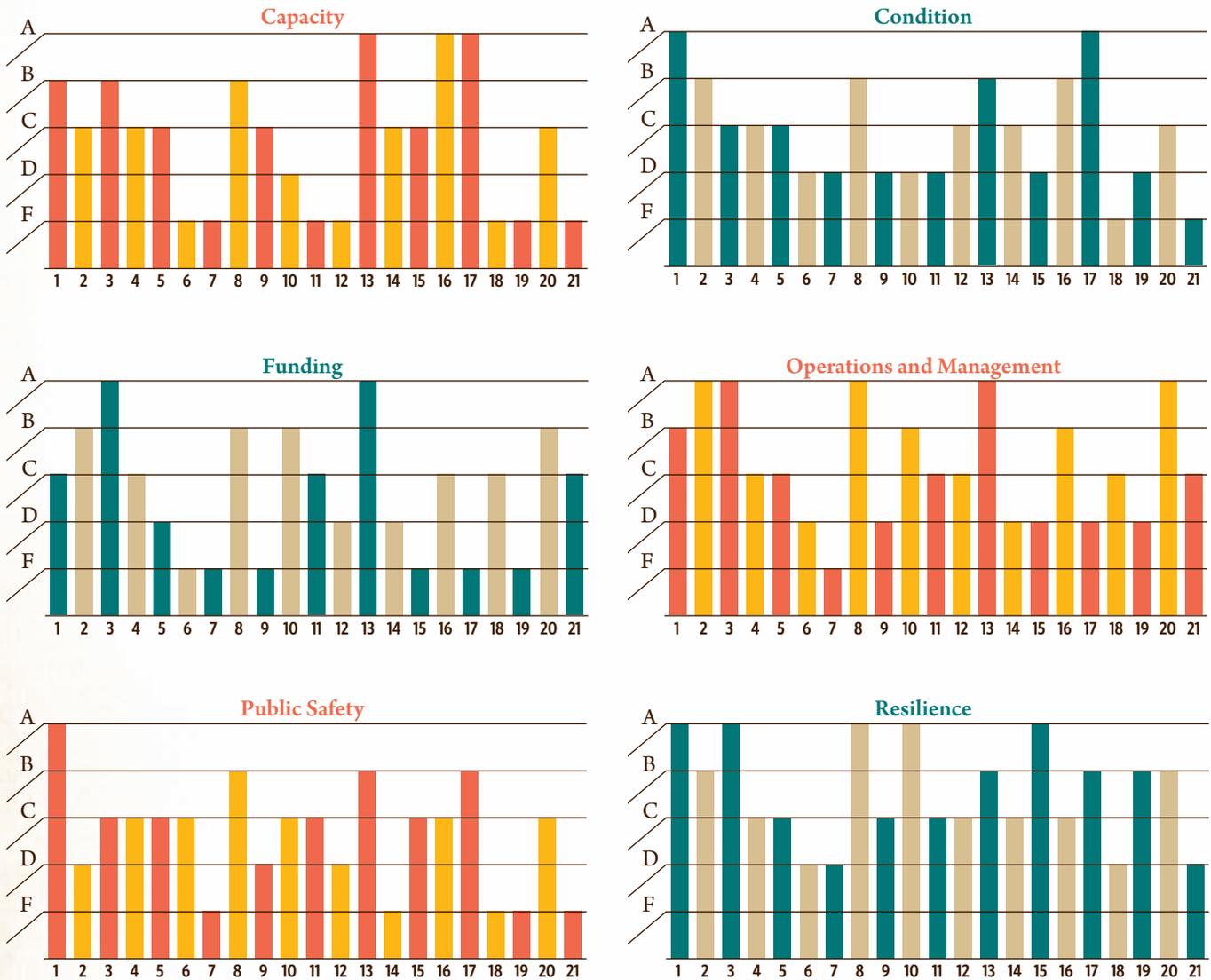
FIGURE 3: A MISSISSIPPI RIVER LEVEE WITH SLOPE PAVING PERFORMING DURING HIGH WATER IN 2011

**RESILIENCE** Overall, the levees in Louisiana received an average grade of C for Resilience.

Not only do levee systems need to have the capacity and condition to protect against high-water levels, they also must have the resilience to resist scour and erosion for extended periods from currents or overtopping from flood waters and waves if conditions exceed the 100-year elevation. This can

be assured by providing armoring on the levee slopes with revetments, slope paving or rip rap. In addition, proper vegetation is required, and in some cases vegetation alone could be adequate where the risk of failure is low. Where the levees are armored, properly vegetated and do not have seepage related issues, they were graded high. Conversely, those without armoring or with minimal armoring and poor vegetation graded poorly.

**FIGURE 4: GRADE BREAKDOWN BY LEVEE DISTRICT**



### LEGEND

- |                          |                                  |  |                 |
|--------------------------|----------------------------------|--|-----------------|
| 1 Atchafalaya Basin      | 7 Lafitte Area Independent       | 13 Pontchartrain                       | 19 St. Mary     |
| 2 Bossier                | 8 Lafourche Basin                | 14 Red River, Atchafalaya, Bayou Boeuf | 20 Tensas Basin |
| 3 Caddo                  | 9 Natchitoches                   | 15 Red River                           | 21 Terrebonne   |
| 4 City of Baton Rouge    | 10 Nineteenth Louisiana          | 16 SLFPA-East                          |                 |
| 5 Fifth Louisiana        | 11 North Lafourche               | 17 SFLPA-West                          |                 |
| 6 Grand Isle Independent | 12 Plaquemines Parish Government | 18 South Lafourche                     |                 |

\*Note: Levee districts managed by the same authority were graded collectively.

## POLICY OPTIONS/FUNDING

Louisiana owes the federal government \$1.3 billion for its share of the construction costs of the massive new Hurricane and Storm Damage Risk Reduction System around New Orleans. The state has already paid \$300 million of this and has an agreement to pay the rest over the next 30 years. As the USACE begins to turn over the major infrastructure components of this new system to the local levee districts, significant additional unidentified funding will be required to provide adequate O&M. The federal government contends that Congressional legislation requires the non-federal sponsors to pay for these O&M costs. Current local millages and state appropriations will not cover these costs, leaving the levee districts and state government with few options to fund these O&M Costs. Since three of the largest of these projects include gate structures on navigable waterways, many contend that they should be maintained and operated by federal authorities. In addition, many levees outside of the New Orleans area that were not part of the recent HSDRRS upgrades are still below the 100-year level of protection and do not meet current design standards. Bringing these systems up to current design standards and the 100-year event level cannot be done without federal assistance.

A re-evaluation of the MRT system's performance and capabilities to handle the project design flood is being undertaken. The 2011 event emphasizes the need to complete the MRT before we have the project design flood event. The MRT is 89% complete today with 70 miles of levees in Louisiana still below grade for design water elevation grade for freeboard.

Sea level rise will place additional burdens on the system. Further, there is a growing consensus that the 100-year level of protection does not adequately protect the public, vital communities and infrastructure.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

-  Federal funding is essential for adequate O&M for the new Hurricane and Storm Damage Risk Reduction Systems for the gates and pump stations on navigable waterways, as well as future levee lifts to maintain the 100-year elevation as levees subside and sea level rises.
-  The MRT system is only 89% complete with more than 70 miles of levees in Louisiana still below grade for design water elevation freeboard. This system should be completed, and the low portions of levee should be elevated to provide adequate freeboard.
-  The federal government should provide funding to ensure that hurricane protection levees in Louisiana that do not meet the 100-year level or do not meet current design standards are updated.

**FIGURE 5: A MISSISSIPPI RIVER LEVEE PERFORMING DURING HIGH WATER IN 2011**

## SOURCES

- <sup>1</sup> Atchafalaya Basin Levee District.
- <sup>2</sup> Bossier Levee District.
- <sup>3</sup> Caddo Levee District.
- <sup>4</sup> City of Baton Rouge Department of Public Works.
- <sup>5</sup> Lafitte Area Independent Levee District.
- <sup>6</sup> Lafourche Basin Levee District.
- <sup>7</sup> North Lafourche Conservation, Levee & Drainage District.
- <sup>8</sup> Pontchartrain Levee District.
- <sup>9</sup> Red River, Atchafalaya & Bayou Beouf Levee District.
- <sup>10</sup> Red River Levee & Drainage District.
- <sup>11</sup> Southeast Louisiana Flood Protection Authority – East.
- <sup>12</sup> Southeast Louisiana Flood Protection Authority – West.
- <sup>13</sup> South Lafourche Levee District.
- <sup>14</sup> St. Mary Levee District.
- <sup>15</sup> Tensas Basin Levee District.
- <sup>16</sup> Terrebonne Levee & Conservation District.
- <sup>17</sup> U.S. Army Corps of Engineers Annual Inspection Reports for Fifth Louisiana LD (September 2009), Lafourche Basin LD (April 2010), Orleans LD (December 2009, February 2010), Plaquemines Parish (April 2010), Natchitoches LD (August 2009), Nineteenth Louisiana LD (September 2009), Red River Levee & Drainage (September 2010), South Lafourche LD (2006).
- <sup>18</sup> Informational Briefing: Flood Control in the State of Louisiana, Prepared by Department of Transportation and Development and Intermodal Transportation Section Federal Programs Unit.
- <sup>19</sup> U.S. Army Corps of Engineers, New Orleans District public references (website).



# DAMS

**SUMMARY** It may come as a surprise to people that Louisiana has 555 dams, most of which are privately owned. The Louisiana Department of Transportation and Development (LADOTD) inspects each dam through its Louisiana Dam Safety Program. Of the 33 dams that are considered to have a high hazard potential, meaning a failure could cause a loss of life, 29 are in satisfactory or fair condition, according to the most recent inspection reports. Many owners of privately owned dams do not have resources to adequately maintain and repair those dams. Fortunately, most of the privately owned dams are categorized as having a low hazard potential.

**OVERVIEW** The Louisiana Dam Safety Program (R.S. 38:21-28) was created under Act 733 of the 1981 Regular Legislative Session. This Act authorized the LADOTD Public Works & Water Resources Division to supervise and provide overview of the design, construction, modification, operation and maintenance, to the extent that is required to protect life and property for any of the Louisiana regulated dams. The Louisiana Dam Safety Program's rules and regulations (<http://www.dotd.la.gov/intermodal/dams/>) define the minimum standards, and the LADOTD has the statutory authority and responsibility to enforce the standards.

The regulated dams that have been identified within Louisiana are listed in the Louisiana Dam Inventory Data file and is shared with and included in the National Inventory of Dams (NID), which is maintained by the U.S. Army Corps of Engineers.

The Federal Emergency Management Agency (FEMA) has federal guidelines for dam safety (<http://www.fema.gov/plan/prevent/damfailure/fema333.shtm>) and has identified Hazard Potential Classification System for Dams, which is in use nationally.

That document identifies the following hazard potentials:

-  **High Hazard Potential** Loss of one human life is likely if the dam fails.
-  **Significant Hazard Potential** No probable loss of human life, but likely significant property or environmental destruction.
-  **Low Hazard Potential** No loss of life and low economic impact, primarily limited to the owner's property.

According to LA Dam Inventory Data file for 2009, there are 555 regulated dams in Louisiana, of which 33 are defined as High Hazard Potential, 70 as Significant Hazard Potential and 452 as Low Hazard Potential Dams.

It should be noted that at least 290 of the 555 dams are over 50 years of age.

While the LADOTD administers the Dam Safety Program, not all of the 555 identified dams are owned by the state. The state owns 36 dams, local governmental entities own 44, and 31 are owned by different federal agencies, i.e., USACE, US Forest Service, USDA, etc. The other 444 dams are privately owned. Table 1 is a summary of the dams by classification and by owner.

As part of the LADOTD Dam Safety program, annual field inspections are performed by an independent consultant for each High Hazard and Significant Hazard Potential Dams. About 90 of the low Hazard Potential dams are inspected each year, making each dam in this category inspected once every five (5) years. Each dam is assigned a condition assessment based upon the field findings during the inspections. The findings are based upon an evaluation of capacity, erosion, infrastructure condition and operations and maintenance issues. The findings are documented and reported to the LADOTD, with copies of inspection reports mailed to the dam owners for their information and remedial actions, as necessary. A database of the inspections, findings and remediation is kept internally in the LADOTD. In addition to administering the inspections, the LADOTD oversees the design, construction, modification and operation of most of the dams, and maintains and operates the 20 state-owned dams, 14 of which were built more than 50 years ago.

TABLE 1 DAM OWNER SUMMARY

Dam Owner	Federal	State	Local	Private	Utility	Total
High Hazard	2	17	9	3	2	33
Significant Hazard	15	4	18	32	1	70
Low Hazard	14	15	17	405	1	452
<b>Total</b>	<b>31</b>	<b>36</b>	<b>44</b>	<b>440</b>	<b>4</b>	<b>555</b>

## FACTS AND ISSUES

As a whole, the dams are providing water resources management solutions in certain areas, as well as providing drinking water supply, recreation and other uses throughout Louisiana. There are isolated areas where new infrastructure is needed to replace old structures. Additionally, there are a number of older dams, especially privately owned low-impact dams that require repairs and rehabilitations. Therefore the focus of this report as it relates to dams is based upon the condition assessment of the existing infrastructure. The condition assessment accounts for capacity, operations and maintenance and infrastructure deficiencies. The classification of the dams relates to the dams' potential hazards to public safety.

**CAPACITY** The dams in Louisiana provide solutions to water resources management. While the dams are retaining water for a specific purpose, only a small portion of those dams are functioning to retain a defined capacity of water. Many of the dams are for recreation or water quality, and the capacity needed which they were designed for remains constant. There are a few for which the capacity may change over time if the function is for the management of water quantity. Therefore, in the grading of this category, consideration was given to the overall impact of capacity of the types of dams. Since the majority of the dams are privately owned and not used to manage water quality or flooding, the overall weighting of this category was given 0.05. A grade of B+ was given since there are a few capital improvements needed to increase capacity on the non-privately owned dams.

# LOUISIANA'S GRADE

B

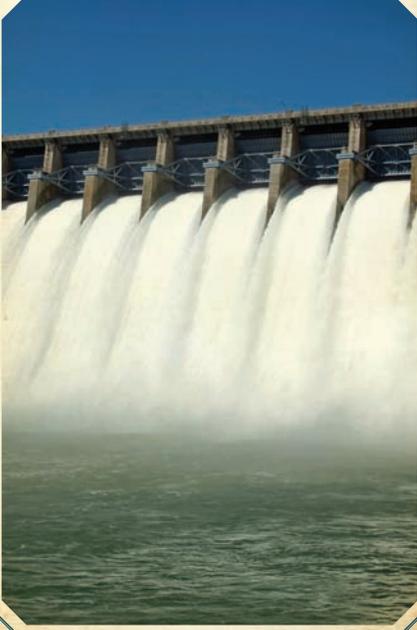


TABLE 2: CONDITION SCORING SUMMARY

Condition Assessment Rating	Score (points per each)	
	Score	Grade Equivalent
Satisfactory	4	A
Fair	3	B
Poor	2	C
Unsatisfactory	1	D
Not rated	0	E

**CONDITION** As described in the dam hazard classifications, public safety is of most importance as it relates to dam condition assessments. The damage to and loss of personal property is secondary to that of human life. Because of the potential threat to human life as it relates to dam conditions, this metric alone is the basis for the infrastructure grading. Annual inspections, along with routine maintenance and timely rehabilitation, are the keys to a satisfactory condition assessment rating. It is important that all High Hazard Potential Dams have a satisfactory or a fair rating. To minimize impacts or failure of other infrastructure, it is also important that all Significant Hazard Potential dams have a satisfactory or fair rating as well. The frequency of inspections and the level of service with respect to maintenance and repair are directly related to the funding availability. Therefore the condition assessment grading illustrates how the available funding plays a role in the grading of the infrastructure.

The basis of analysis for dams was the condition assessment of each as it follows the National Dam Safety Review Board rating scale within each individual hazard potential group. The condition assessments were collected for all of the dams that have been inspected and evaluated by the LADOTD since December 2008. There are a total of 325 dams that were included in the scoring, which is more than half of the total number of regulated dams in Louisiana. The 325 included all of the High Hazard Potential Dams, all of the Significant Hazard Potential dams and 232 of the Low Hazard Potential Dams. Note that at the time of the scoring there were several dam inspections reports for the year 2010 that were unavailable;

TABLE 3: GRADING ANALYSIS FOR HIGH HAZARD POTENTIAL DAMS

High Hazard Potential Dam Condition Assessment	Score (points per each)		
	Score	Number of Dams Inspected and Evaluated	Total Points
Satisfactory	4	8	32
Fair	3	21	63
Poor	2	3	6
Unsatisfactory	1	0	0
Not rated	0	1	0
<b>Total</b>		32	101
<b>Average Rating</b>	101/32=3.2	Fair	B+

therefore, one high hazard and nine significant hazard dams were omitted from the calculation.

The rating scale definitions are as follows:

-  **Satisfactory** No existing or potential dam safety deficiencies were recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.
-  **Fair** No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.
-  **Poor** A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. Poor may also be used when uncertainties exist as to critical analysis parameters that identify a potential dam safety deficiency. Further investigations and studies are necessary.
-  **Unsatisfactory** A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

Average rating for all dams combined =  $899/325 = 2.8$  which is equivalent to a B-. The weighting factor for the condition of the dams is 0.30 as this criteria takes into account many of the other criteria in the inspections as well as being the criteria that has the most impact on the performance of the dams.

**TABLE 4: GRADING ANALYSIS FOR SIGNIFICANT HAZARD POTENTIAL DAMS**

Significant Hazard Potential Dam Condition Assessment	Score (points per each)	Number of Dams Inspected and Evaluated	Total Points
Satisfactory	4	4	16
Fair	3	53	159
Poor	2	2	4
Unsatisfactory	1	2	2
Not rated	0	5	0
<b>Total</b>		61	181
<b>Average Rating</b>	181/61=3.0	Fair	B

**TABLE 5: GRADING ANALYSIS FOR LOW HAZARD POTENTIAL DAMS**

Low Hazard Potential Dam Condition Assessment	Score (points per each)	Number of Dams Inspected and Evaluated	Total Points
Satisfactory	4	8	32
Fair	3	140	420
Poor	2	81	162
Unsatisfactory	1	3	3
Not rated	0	0	0
<b>Total</b>		232	617
<b>Average Rating</b>	617/232=2.7	Fair	B-

Note: 1) Five USACE locks/dams that are not in the Louisiana safety program were not rated 2) Breached dams are not included because they are no longer in service 3) Included only regulated low impact potential dams inspected and evaluated since Dec. 2008.

**FUNDING** The state of Louisiana receives approximately \$85,000 per year in FEMA Dam Safety grants. The cost for the annual inspections of the dams is approximately \$574,000, which is funded by the State of Louisiana. Repairs and rehabilitation of the state-maintained dams are funded by state capital outlay funds, when they are available. The routine maintenance and operation costs come from state operating funds. The capital outlay funding is also used for construction of new dams and new gated spillways. From 2005-2009, the state of Louisiana spent \$6,364,228 on major repairs and rehabilitations of the state-maintained dams, for an average of approximately \$1.27 million per year. This equates roughly to \$36,000 per year per state owned dam in repairs and rehabilitation if needs were considered to be uniformly allocated across these dams.

While the state has allocated funds for the inspections and for an above-average operation and maintenance program, the funding is not consistent. The state has provided funding for the operation and maintenance and for repairs of those dams that would have the most impact if they failed (high hazard and significant hazard). Because of the funding that has been provided for those dams, a grade of B+, with a weighting factor of 0.15, is given for this criteria.

**FUTURE NEED** Two important statistics in Louisiana's dam program are that over 80% of the dams are classified as low hazard potential, and 79% of the dams are privately owned. This means that the operations and maintenance and repairs needed on the majority of the dams in Louisiana have to be completed with private owner funds. These dams are inspected by the state, but they are not operated and maintained or repaired with dedicated funding from the state or federal government. Because of a lack of funding, many of these dams are not properly maintained by the owners. Some of these dams were designed and/or funded by other agencies or the property owners for agricultural or other purposes many years ago with the understanding that they would be maintained and repaired by the owner. However, once these dams are constructed, many of the owners do not have the resources or opportunities for funding the operation and maintenance of these structures. This criteria has a weighting factor of 0.15. A grade of B- was given due to the lack of funding for 79% of the dams. The dams have a condition of B- which relates to minor repair and operation and maintenance needs on the dams.

TABLE 5: GRADE SUMMARY

Fundamental Components	Capacity	Condition	Funding	Future Need	Operations & Maintenance	Public Safety	Resilience	TOTAL GRADE
Weighting Factor	.05	.30	.15	.15	.20	.10	.05	
Score	B+	B-	B-	C+	C+	B+	B+	B-

**OPERATION AND MAINTENANCE** The operation and maintenance of the high hazard and significant hazard potential dams is significant because 65 percent of those dams are agency owned, and there are funding sources available to pay for it. The remaining 35 percent of the dams in these two categories, as well as 89% of the low-hazard potential dams, are privately owned. The operation and maintenance of any dam is the responsibility of the owner. Many private owners may not have the necessary funding needed for the repairs identified in the inspections. Also, many of the owners may not be aware of the O&M needs of their dams until they receive a letter from the State ASDSO officer due to the lack of routine monitoring or inspections by the owners. The low hazard potential dams are only inspected once every 4-5 years, and in that time erosion and infrastructure damage may occur. Since the privately owned dams account for 79 percent of the dams in Louisiana, and the repairs needed to them are minor, this category was given a C+ grade. A weighting factor of 0.20 was given due to the importance of the operations and maintenance on the condition of the dams.

*While the overall grade of the dams in Louisiana is a B-, maintenance of the many low hazard potential dams that are privately owned is needed. The state's funding is not used to maintain or repair these dams, it is only used to inspect and report on the condition. Proper funding for dam maintenance and proper education regarding dam maintenance for the owners of the privately owned low hazard potential dams would improve the conditions and ratings of those dams. Since the low hazard potential dams are the majority of the dams located in Louisiana, higher ratings for these dams will raise the overall grade for dams in Louisiana. In addition, continued funding for the inspections of all of the dams and for the repairs to the significant and high hazard potential dams will contribute to the improvement of the dam infrastructure in Louisiana.*

**PUBLIC SAFETY** When it comes to dams, public safety is very important and is recognized in the classifications of dams. The classifications of high hazard, significant hazard and low hazard potential are directly related to the potential impacts to life and property. The high hazard dams have the potential for loss of life in the event of failure. With this designation comes the annual inspection in Louisiana and the focus on Emergency Action Plans to be completed for the dams. In addition, these dams receive proper operation and maintenance. Due to the low number of high hazard and significant hazard potential dams, the overall impact to public safety of dams is relatively low. The weighting factor for public safety on dams is 0.10. The overall grade for public safety is a B+ because there are still minor repairs and continual operation and maintenance required of the high hazard dams, and some are part of the aging infrastructure.

**SOURCES**

- <sup>1</sup> Louisiana Dam Safety Program Presentation to the Infrastructure and Resources Sub-Committee of the House Appropriations Committee by Zahir "Bo" Bolourchi, PE., Director, Dam Safety & Reservoir Development Programs, Louisiana Department of Transportation and Development, February 11, 2010.
- <sup>2</sup> Louisiana Department of Transportation and Development, Zahir "Bo" Bolourchi, PE, Director, Dam Safety & Reservoir Development Programs <http://www.dotd.la.gov/intermodal/dams/>
- <sup>3</sup> FEMA Federal Guidelines for Dam Safety <http://www.fema.gov/plan/prevent/damfailure/fema333.shtm>

**RESILIENCE** The resilience by nature is low in dams. When it comes to dams typically there is no redundancy in the infrastructure, so if the dam fails, there will be impacts, even if minor. Overall, based upon the purpose of the majority of the dams, the duplication of the infrastructure is not a typical design approach. The weighting factor of resilience is 0.05 due to the majority of the dams being privately owned and many used for recreational or water quality purposes and not flood management. A grade of B+ was given to this criteria since the use of the majority of the dams does not have a high need for high resilience.

# AVIATION

**SUMMARY** Louisiana has 56 significant public airports that contribute 56,581 jobs, \$1.47 billion in household earnings and \$5.86 billion in business revenues to the economy. The airports' best grades were in capacity (A), pavement condition (B), resilience (B) and navigational/all-weather access (B). Areas that could use improvement include funding (D) and terminals and facilities (D+). ASCE recommends that Louisiana investigate additional funding sources to repair and maintain facilities and that DOTD update its eight-year-old Louisiana Aviation System Plan.

**OVERVIEW** Louisiana has 82 public use airports that transport passengers and cargo for business and recreational purposes. This report card limits its study to the 69 airports that are in the jurisdiction and the administration of the Louisiana Department of Transportation and Development's Aviation section (DOTD Aviation). Within these 69 state-managed airports, 56 are considered significant to national air transportation, and therefore, are identified within the National Plan of Integrated Airport Systems (NPIAS). These 56 NPIAS airports are eligible to receive grants under the Federal Aviation Administration (FAA) Airport Improvement Program (AIP).

Airports serve a critical role in contributing to Louisiana's economic development. In 2008, an impact study was commissioned by Louisiana's public use airports to assess their economic contributions to the state. The 56 NPIAS airports in Louisiana are estimated to contribute 56,581 jobs, \$1.47 billion in household earnings and \$5.86 billion in total business revenues to the Louisiana economy. The estimated state tax revenue impact from personal taxes and other major state taxes amounted to an additional estimated \$75 million.<sup>1</sup>

One of the main issues facing the aviation industry in Louisiana and throughout the nation is the lack of a multi-year FAA authorization funding bill. As of the production of this document, the FAA is relying on the 22nd short-term bill extension to extend current funding levels through January 2012. This action prevented another FAA shutdown similar to the shutdown experienced in which workers were temporarily furloughed and construction projects were halted in late July and early August of 2011. However, the absence of a multi-year funding source is prohibiting airports from implementing phased development plans because of the short-term nature of each funding bill extension and the long-term nature of most project planning and construction efforts.

Louisiana ranks 27th in the nation in the number of passenger enplanements, with approximately 5 million passengers' boarding flights statewide in 2010. Following a national trend of decreasing passenger enplanements, this represents an approximate 15% drop from 2000, which ended the last major profitable growth period for the aviation industry. The aviation industry has been deeply affected by the 9/11 terrorist attacks, drastic increases in fuel prices, and large fluctuations in the nation's economy. However, despite this recent decrease it is widely expected that passenger enplanements will begin to increase over the long term as passengers regain confidence in the nation's economy and the aviation industry itself.

Many data sources were used for information in the development of this report card. DOTD Aviation provided the majority of the data in the form of a spreadsheet detailing the status for upgrading the state's general aviation and air carrier airports to RNAV/VNAV/LPV (Area Navigation/Vertical Navigation/Localizer Performance with Vertical Guidance) approach procedures and other facility improvements<sup>2</sup>. These approach procedures allow the use of advanced air navigation methods based on an augmented Global Positioning System called WAAS (Wide Area Augmentation System). DOTD Aviation also provided a copy of the 2003 Louisiana Aviation System Plan<sup>3</sup> (LASP) for use in this report card. The LASP provides a wealth of background information on aviation infrastructure and identified areas of improvement. Other sources included FAA documentation, personal conversations with DOTD Aviation employees, and presentations.

## LOUISIANA'S GRADE

C



TABLE 1: MINIMUM STANDARDS FOR RUNWAYS/TAXIWAYS<sup>3</sup>

Airport Classification	Runway Length	Runway Width	Taxiway
Commercial Service General Aviation - Reliever General Aviation - National	75% Large Aircraft at 60% Useful Load	Must Meet Runway Width Required by Airport Reference Code (ARC)	Full Parallel
General Aviation - Regional	100% of Small Aircraft w/ less than 10 passenger seats	Must Meet Runway Width Required by Airport Reference Code (ARC)	Partial Parallel
General Aviation - Local	95% of Small Aircraft (NPIAS) or 75% of Small Aircraft (Non-NPIAS)	60' (NPIAS) or 50' (Non-NPIAS)	Turnarounds & Connectors
General Aviation - Limited	Maintain Existing	50' Paved or 100' Turf	Connector and/or Turnarounds

## FACTS AND ISSUES

**CAPACITY** Capacity refers to an airport’s ability to accommodate aircraft operations without congestion and/or delays. The 2003 LASP provides an analysis of the Louisiana Airport System’s capacity levels using the relationship between each airport’s annual service volume (ASV), which measures an airport’s ability to process activity on an annual level, and each airport’s current (2003) and projected annual operational levels. FAA planning guidelines recommend that an airport should begin the planning stages of capacity enhancement projects when it reaches the 60% demand/capacity ratio. A demand/capacity ratio of 80% generally indicates the construction of capacity enhancement projects should be initiated based on the levels of delay being experienced at the airport. According to the 2003 LASP, 99% of Louisiana’s airports are below the benchmark 60% demand/capacity ratio. This indicates that Louisiana airports are generally meeting the capacity demands required by passengers. The only airport within the State currently operating at a demand/capacity ratio > 60% is the Louis Armstrong International Airport (New Orleans - MSY). It is currently pursuing increasing its runway capacity<sup>3</sup>.

The projected demand/capacity ratios show that 91% of Louisiana’s airports will continue to be operating below the 60% demand/capacity ratio 30 years from the date of the study (2003). Using 30-year projections, the LASP estimates the following three airports will be operating between 60% - 80% of their demand capacity ratio:

- New Orleans Lakefront Airport (NEW)
- Shreveport Regional Airport (SHV)
- Slidell Airport (ASD)

Also using the 30-year projection, the following three airports are estimated to be operating at a demand/capacity ratio greater than 80%.

- Baton Rouge Metropolitan Airport (BTR)
- Houma-Terrebonne Airport (HUM)
- Louis Armstrong New Orleans International (MSY)

The Louisiana airport system’s effectiveness can also be measured by the physical characteristics of its facilities. The physical characteristics that were analyzed and used to evaluate the adequacy of the state’s runway system were as follows:

- Runway Length
- Runway Width
- Taxiway Layout

These three characteristics were compared to the following set of minimum standards set by the LASP to evaluate each component. A large aircraft as used in Table 1 is defined as an aircraft with a certificated maximum takeoff weight of more than 12,500 pounds.

The analysis showed that 91% of the primary runways at each airport meet or exceed the LASP minimum standards for runway length, and 94% of the primary runways at each airport meet or exceed the LASP minimum standards for runway width. The taxiway layout component meets or exceeds the minimum standards at 78% of the State’s airports.

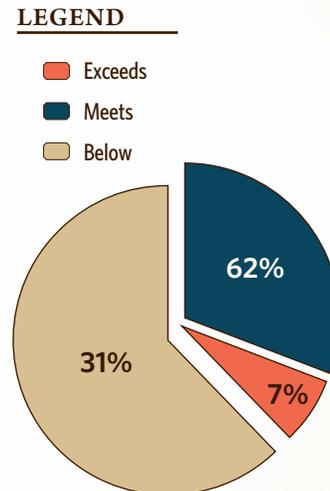
**TABLE 2: CAPACITY/ADEQUACY OF THE RUNWAY SYSTEM GRADING SUMMARY**

Sub-Category	Grade	Percent	Points
Demand/Capacity	A	99%	4
Projected Demand/Capacity	A	91%	4
Runway Length	A	91%	4
Runway Width	A	94%	4
Taxiway	C	78%	2
<b>Composite Score = A</b>	<b>GPA =3.6</b>		

**TABLE 3: PAVEMENT CONDITION RATING**

PCI	Rating
100-86	Excellent
85-71	Very Good
70-55	Good
54-41	Fair
40-26	Poor
25-11	Very Poor
10-0	Failed

**FIGURE 1: MINIMUM STANDARDS FOR FACILITIES**



**PAVEMENT CONDITION** A pavement condition study was performed in 2010 on all state general aviation airports. In particular, a pavement condition index (PCI) assessment was performed using ASTM D5340<sup>5</sup> standard testing methods. The airport’s composite PCI was then evaluated for grading purposes. DOTD Aviation uses this information as a budgetary tool when allocating state funds in accordance with priorities such as safety, preservation, improvements, and capacity.

The ASTM D5340 standard testing procedure sets forth the rating system provided in Table 3 to correlate the PCI to a qualitative rating.

The average composite PCI value of the state’s general aviation airports is 76.75. This value falls within the “Very Good” range. This “Very Good” rating gives the general aviation airports within Louisiana a grade of B.

Data for pavement conditions at commercial airports were not available for inclusion in this report. For the purposes of this report, the applied grade only applies to Louisiana’s general aviation airports.

**TERMINALS AND FACILITIES**

The LASP classifies each airport into a functional classification, each with its own set of minimum standards. The terminals and general facilities at each airport were compared to the minimum standards designated for that airport’s functional classification. See Table 4 for the minimum standards for airport facilities. Figure 1 shows that only 69% of the state’s airports meet or exceed these minimum standards. Based on a ten-point grading scale, Terminals and Facilities received a grade of D+.

**TABLE 4: MINIMUM STANDARDS FOR AIRPORT FACILITIES**

Airport Classification	# Items Minimum Required Facilities
Commercial Service General Aviation - Reliever General Aviation - National General Aviation - Regional	Terminal, Aircraft Apron, Hangars, Auto Parking
General Aviation - Local	Pilot’s Lounge, Aircraft Apron, Hangars, Auto Parking
General Aviation - Limited	Aircraft Apron, Hangars, Auto Parking

FIGURE 2: NAVIGATIONAL AIDS

LEGEND

- Exceeds
- Meets
- Below

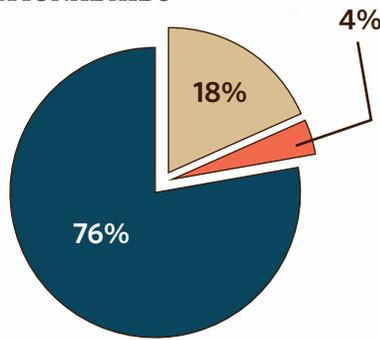


FIGURE 3: AIRPORT LIGHTING

LEGEND

- Exceeds
- Meets
- Below

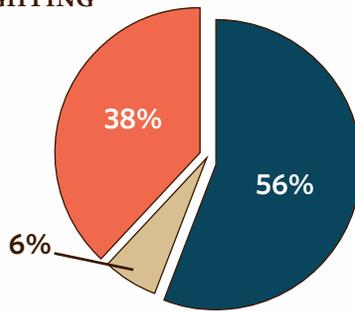
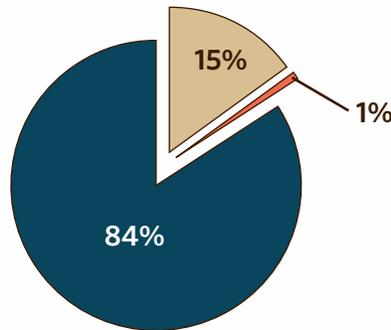


FIGURE 4: WEATHER REPORTING

LEGEND

- Exceeds
- Meets
- Below



**NAVIGATION AIDS/  
ALL-WEATHER ACCESS**

The ability of an airport to operate to its maximum capacity partially depends on its available navigation aids including approach landing systems, runway lighting and weather reporting systems. The LASP provides minimum standards for navigational aids, lighting, and weather reporting for each functional classification. See Table 5 for the minimum standards for navigational aids, lighting and weather reporting. Figure 2 shows that 80% of the state's airports meet or exceed the established minimum standards for navigational aids.

Runway lighting is also an essential part of an airport's functionality. The minimum lighting standards established by the LASP for commercial service and most general aviation airports require a Medium Intensity Runway Lighting system and a beacon. The minimum lighting standards established for "general aviation – limited" airports require runway reflectors or a Low Intensity Lighting System and a beacon. Each airport was compared to the minimum standards for lighting for its classification. Figure 3 shows that 94% of the State's airports meet or exceed the established minimum standards for airport lighting. Louisiana has an additional goal to ensure that every NPIAS airport meets minimum lighting standards using can and conduit construction methods.

In order to keep pilots, traffic control operators and ground crew members informed of current weather conditions, it is preferable that airports have weather-reporting facilities. Weather-reporting facilities were recommended by the LASP for all functional classifications with the exception of "general aviation – local" and "general aviation –limited" airport

TABLE 5: NAVAIDS/ALL-WEATHER ACCESS  
Minimum Facility Standards

Airport Classification	Navigation Aids		Lighting	Weather Reporting
<b>Commercial Service</b>	Precision Approach	MIRL , Beacon	Automated Weather Reporting	
<b>General Aviation - Reliever</b>	Precision Approach	MIRL , Beacon	Automated Weather Reporting	
<b>General Aviation - National</b>	TPrecision Approach	MIRL , Beacon	Automated Weather Reporting	
<b>General Aviation - Regional</b>	Non-Precision Approach	MIRL , Beacon	Automated Weather Reporting	
<b>General Aviation - Local</b>	Non-Precision Approach	MIRL , Beacon	None	
<b>General Aviation - Limited</b>	None	Reflectors or LIRL & Beacon	None	

TABLE 6: NAVAIDS/ALL-WEATHER ACCESS GRADING SUMMARY

Sub-Category	Grade	Percent	Points
Navigation Aids	B-	80%	3
Lighting	A	94%	4
Weather Reporting	B	85%	3

classifications. Figure 4 shows that 85% of airports in Louisiana meet or exceed these recommendations.

After considering the components of Navigational Aids and All-Weather Access, this category receives a grade of B based on the summary in Table 6.

**FUNDING** Funding for aviation projects in Louisiana originates from federal, state, local and private sources. The Federal Aviation Administration distributes funding to Louisiana’s 56 NPIAS airports through the Airport Improvement Program (AIP), which is administered by the DOTD Aviation section through use of the Louisiana Aviation Priority Program. The FAA AIP grant covers 95% of eligible project costs for small primary, reliever and general aviation airports, and 75% of eligible costs (or 80% for noise-program implementation) for large- and medium-hub airports. All of Louisiana’s NPIAS airports fall into the small primary, reliever and general aviation airport categories except for New Orleans (MSY), which is considered to be a medium primary hub. The State of Louisiana typically covers the remaining 5% of a project’s costs for small primary, reliever and general aviation airports. However, because New Orleans (MSY) is a medium hub airport, the state matches federal funds with 8.33% and the remaining 16.67% is required from local/other sources. The local/other sources typically include revenues raised through passenger facility charges.

The Louisiana Aviation Priority Program for Fiscal Year 2012<sup>6</sup> committed \$99.2 million in federal, state and local funds on

aviation projects at Louisiana’s NPIAS airports. This amount is down approximately 22% from \$127.3 million in Fiscal Year 2011<sup>7</sup>. Louisiana has approximately \$1.08 billion in unfunded projects for the 2012-2016 Louisiana Supplemental Aviation Priority Program.

State aviation funds are dedicated through the Aviation Trust Fund (ATF). The aviation industry contributes to the trust fund through a 4% tax on aviation fuel. Because the aviation fuel tax is collected based on a percentage of the cost of fuel rather than the volume of fuel sold, it is better protected from the effects of inflation when compared to a fixed cost. However, the unpredictable fuel costs result in difficulty in projecting future available funds. In 2009, the state realized an increase in ATF monies from approximately \$10 million to \$28.5 million<sup>8</sup>. This increased funding level is directly attributed to the sharp increase in fuel costs.

Local monies are also used in funding aviation projects. Commercial service airports are permitted to assess a passenger facility charge (PFC) that can be used to finance all or portions of capital improvement projects. These projects must be proposed by the airport and approved by FAA.

**AIRPORT SAFETY** Airport Safety was evaluated based on airport obstruction data and commercial service incursion rates. An obstruction can be defined as any stationary object penetrating an airport’s obstruction identification surfaces. A runway incursion is any unauthorized intrusion of a vehicle/person/aircraft onto a runway, regardless of whether an incident occurred as a result.

Obstruction data was compiled from the 2011 “5010” Airport Master Records and Reports<sup>9</sup>. The “5010” Airport Master Records and Reports is a document that compiles the physical and operational characteristics of each airport. This information is maintained by FAA for record keeping purposes and is used in airspace studies.

A decision flow chart was created by the Louisiana Infrastructure Report Card Committee for Aviation in order to place an appropriate magnitude of emphasis on the type

of obstructions that are the most hazardous to aircraft. The flowchart is based on the following questions:

- Does the airport’s primary runway have an obstruction?
- Is the obstruction considered to be a close-in obstruction?
- Is the obstruction marked and/or lighted?
- Is the obstruction clearance slope steeper than the approach surface slope?

Eighty-one percent of Louisiana’s runways are affected by obstructions. Six percent of the obstructions found at Louisiana’s airports are marked and/or lighted. Also, 11% of runways are affected by a “close-in” obstruction<sup>9</sup>.

The most recent incursion data available from FAA is from Fiscal Year (FY) 2009. According to the 2010 Annual Runway



Safety Report<sup>10</sup>, Louisiana commercial service airports reported 15 incursions in 2009. However, none of these incursions was considered to be a serious incident in which a collision was narrowly avoided or significant potential for collision existed. Instead, these incursions were considered to be either an incident characterized by ample time and/or distance to avoid a collision or an incident with no immediate safety consequences. The FAA had targeted a 1% decrease in runway incursions nationwide from FY 2008 to FY 2009. Louisiana experienced a decrease from 19 reported incursions in 2008 to 15 reported incursions in 2009. This represents a 21% decrease. Mainly because of the large number of the state's runways that are affected by obstructions, the Airport Safety category receives a grade of C+.

**RESILIENCE** The Sept. 11, 2001 terrorist attacks exemplified the struggle of the nation's aviation system to become more resilient in the wake of crisis situations. The ability of Louisiana's airports to operate efficiently during substandard conditions or during a period of crisis can greatly impact the government's ability to react and recover from the crisis.

The most common manifestation of resiliency in Louisiana's airports can be seen in the recovery from major hurricanes such as after Hurricane Katrina. For three days during the aftermath of Hurricane Katrina, New Orleans Louis Armstrong International Airport was the busiest airport in the world<sup>11</sup>.

In addition to continuing to serve as a commercial and general aviation airport, New Orleans Louis Armstrong International Airport served many essential functions during the immediate recovery operations after Hurricane Katrina, including storm shelter, relief supply depot, triage center, hospital, hospice and

morgue, American Red Cross site, relief barracks and mess, animal rescue center, military base and command center, police station, ambulance dispatch, debris dump site and FEMA trailer park site. Another positive example of resiliency is the state's goal of having generators available at each airport in order to provide emergency airport operation with a priority to airport runway lighting.

Despite these proactive measures, Louisiana's airports are not returning to pre-Katrina conditions. This is shown by the dramatic 13% and 14% respective reductions in passenger enplanements from 2004 to 2005 and from 2005 to 2006<sup>12</sup>. Passenger enplanements have yet to recover to 2004 levels. However, this can be attributed to national trends in aviation enplanements rather than a lack of resiliency by Louisiana's airports.

TABLE 7: GRADE SUMMARY

Fundamental Components	Capacity	Pavement Condition	Terminals and Facilities	Navigation Aids/ All-Weather Access	Funding	Airport Safety	Resilience	TOTAL GRADE
Weighting Factor	.10	.20	.15	.15	.20	.15	.05	
Score	A	B	D+	B	D	C+	B	C

## POLICY OPTIONS/FUNDING

The three primary items affecting the grading of aviation funding in this report card are the lack of a long-term FAA authorization bill, the \$1.08 billion dollars in unfunded projects for the 2012-2016 Louisiana Supplemental Aviation Priority Program and the fact that the ATF is funded based on a percentage of aviation fuel costs. While the lack of a long term FAA authorization bill contributes to the unpredictability of available funding for aviation projects, recent allocations by Congress have provided sufficient funds to continue developing projects that maintain and improve the aviation infrastructure throughout Louisiana, with the lone exception being the two-week shutdown experienced in late July and early August, 2011.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

 With \$1.08 billion in unfunded projects on backlog, current funding levels are not sufficient to maintain existing facilities throughout the state while continuing to address capital improvement projects. Other potential funding sources should be investigated, including Passenger Facility Charges that should be maximized where applicable. Also, the revenues received by the aviation industry from the Louisiana Transportation Trust Fund should be more reflective of the actual tax revenues received from the fund as fuel costs, and the tax revenues associated with those costs, increase.

 The 2003 Louisiana Aviation System Plan should be updated to reflect terminal and facilities upgrades that have been performed at each of Louisiana's airports.

 The LA DOTD Aviation section should continue implementing its current initiatives, including the lighting can and conduit initiative and the supplemental generator initiative. The implementation of other similar proactive measures will only serve to improve the aviation industry in Louisiana.

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- <sup>7</sup> Louisiana Department of Transportation and Development – Aviation Section, *Louisiana Aviation Priority Program, Fiscal Year 2010-2011*, 2010.
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- <sup>9</sup> GCR & Associates, Inc, *S010 Airport Master Records and Reports*, 2011.
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- <sup>12</sup> Federal Aviation Administration, *Passenger Boarding (Enplanement) and All-Cargo Data for US Airports* [http://www.faa.gov/airports/planning\\_capacity/passenger\\_allcargo\\_stats/passenger/index.cfm?year=all](http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/index.cfm?year=all)

# PORTS

**SUMMARY** Louisiana ports are mostly stable in their ability to handle their business needs of today. Most ports have significant major maintenance needs but are confident to be able to handle those needs in the short term without disruption to their existing business levels. Where Louisiana ports suffer is in their ability to create any funding levels, on their own or via governmental assistance, to significantly cover their future capital needs. The critical need for this future funding places Louisiana ports in a vulnerable position to compete for any future business growth or to handle business expansion of current customers. This is particularly important with regard to the future expansion of the Panama Canal and Louisiana ports ability to compete nationally or regionally for business growth resulting from the widening. In summary, Louisiana ports appear to be treading water and competing well for their existing business, but they are not in a position to grow and create facilities for future business.

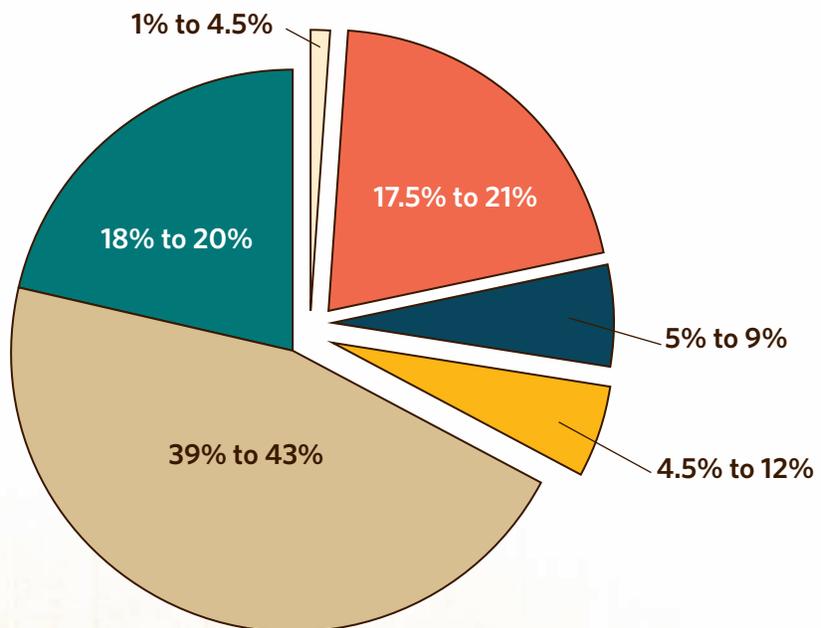
**OVERVIEW** The Louisiana public ports system is comprised of 36 public authorities with wide-ranging charters. These charters regulate the planning, design, development, operation and management of port facilities, related infrastructure and services across the state as more than half of the state's parishes have navigable waterways within their borders. Generally, the ports of Louisiana are categorized into the following interest groups: deep-draft, coastal, inland and emerging. The six deep-draft ports focus on freight movements with national and international connotations. The nine coastal ports concentrate on the oil and gas service industries, shipbuilding and fabrication. The 13 inland ports service local markets for cargo movement, manufacturing and related service industries. There are eight emerging ports, enabled by legislation, that are not developed or operational. All of these port groups create jobs and promote economic development for the state. Studies indicate that one in seven jobs in the state is waterways dependent.<sup>1</sup>

The majority of capital funds for port infrastructure in Louisiana come from the ports themselves in the form of bonds and capital reserves from self-generated revenue. These revenue sources are under considerable stress as many ports have reached their bonding capacity, and self-generated revenue is becoming harder to sustain in the current economic environment. Important additional capital funding for port infrastructure comes from other government sources such as the Louisiana Department of Transportation and Development's (LADOTD) Port Construction and Development Priority Program, LADOTD Capital Outlay Plan, occasional grants from the Louisiana Department of Economic Development and some federal funding sources like Homeland Security. Without these supplemental funds, most Louisiana ports are unable to undertake critical port development projects. Historically, these funding sources have ranged as shown in Figure 1.

FIGURE 1: PORT FUNDING<sup>2,3</sup>

**LEGEND**

- LADOTD Port Construction and Development Priority Program
- LADOTD Capital Outlay
- Federal Government
- Port Generated Revenue
- Port Generated Bonds
- Other



Capital improvement funding for the ports, averaged over a five-year period, has increased about 25 percent over the last 10 years<sup>3</sup>. During this period the LADOTD Port Construction and Development Priority Program has remained at a fairly constant rate of \$20 million per year<sup>4</sup> while the Capital Outlay contribution has steadily decreased. Federal spending usually stays at a consistent 4.5 to 5 percent investment, except when Louisiana's congressional delegation is able to earmark a project. A single large project slightly skewed the federal spending data in Figure 1. The bonding ability for the ports has generally been maximized, and there is little room for bonding growth. A majority of the increased capital improvement funding over the past 10 years has come from the ports' self-generating revenue stream, but this stream is near capacity.

The five-year Capital Improvement Plan identified 104 projects that need funding at an approximate cost of \$820 million<sup>2</sup>. Available annual capital improvement funding as of 2009 was about \$113 million<sup>3</sup> or \$565 million over a five-year period. In the short term, the ports are adequately maintaining their existing business, but they need additional funding from the private and public sectors to grow and maintain their facilities.

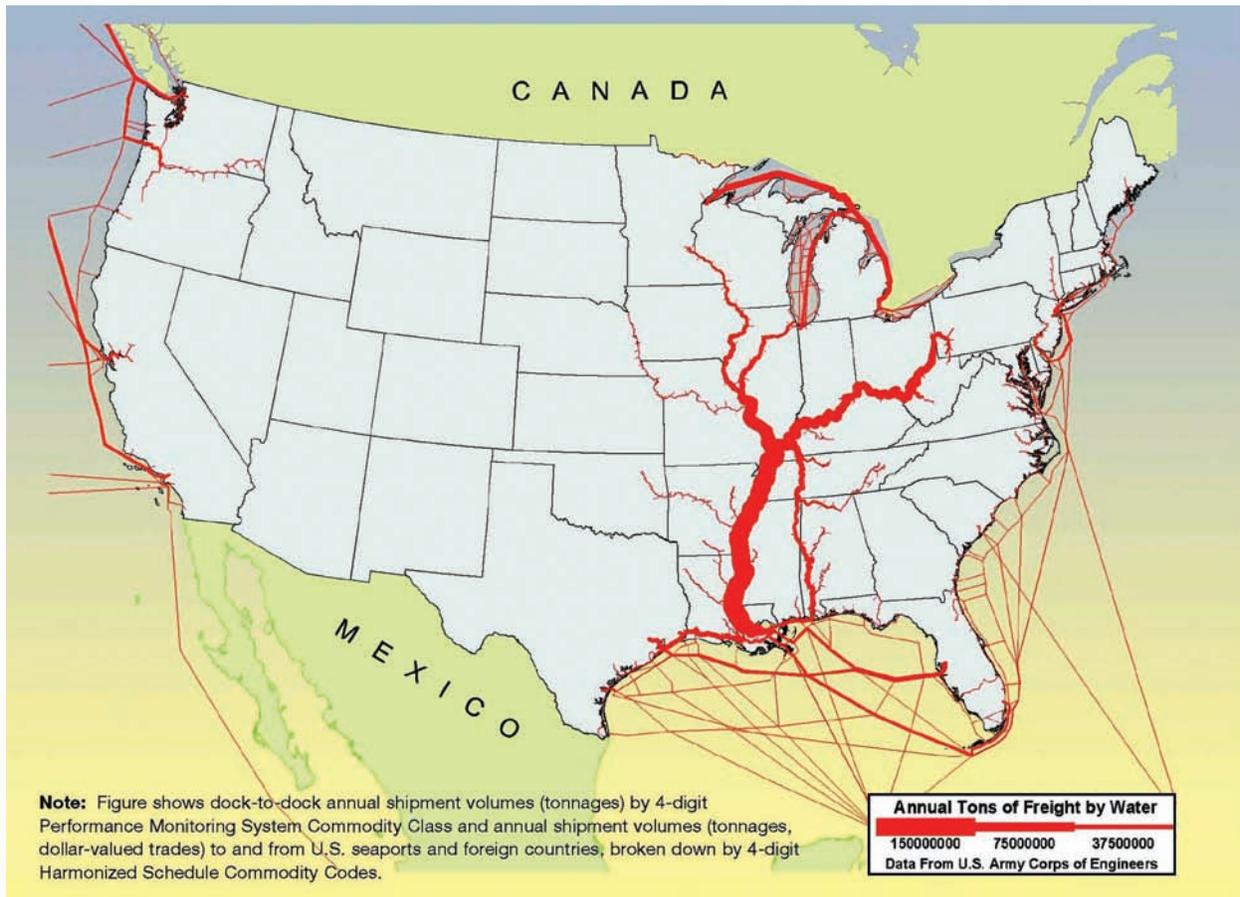
## BACKGROUND

Louisiana's ports are vital to the local, state and national economies. Louisiana has consistently ranked in the top two states nationally in tonnage of waterborne imports and exports<sup>2</sup>. Louisiana is home to the intersection of the Mississippi River and the Intracoastal Waterway, where some 97 percent of all US tonnage flows<sup>5</sup>. Exports from Canada and 28 states move down the Mississippi River, and 56 percent of U.S. grain exports travel through Louisiana ports<sup>5</sup>. Figure 2 presents a graphical representation of the amount of the 2005 dock-to-dock tonnage on the domestic waterway network. The coastal shallow-draft ports provide a vital role in the nation's oil and gas industry as Louisiana is the nation's second-largest producer of natural gas and the third-largest producer of crude oil. Also, the Gulf of Mexico accounts for more than 90% of U.S. offshore oil and gas production<sup>2</sup>.

The ports' direct economic impact characterized by two categories, port industry and port users, was estimated in 2001 at \$11.4 billion<sup>6</sup>. Port industry produces about a third of the direct economic impact and includes port operations, port construction, steamship companies, vessel services and inland transportation. Port users produce the remaining two-thirds of the direct economic impact and include manufacturing and warehouse/distribution. The 2001 estimated secondary impact was \$21.5 billion for a total economic impact of \$32.9 billion<sup>6</sup>. In 2001, the ports and related activities generated approximately \$5.7 billion in income for Louisiana residents; support, in part or in whole, 270,000 jobs in the state; produce \$467 million in recurring tax revenue; and, constitute 22.5 percent of total gross state product<sup>6</sup>.

## LOUISIANA'S GRADE



FIGURE 2: TONNAGE ON THE DOMESTIC WATERWAY NETWORK: 2005<sup>7</sup>

## FACTS AND ISSUES

To better evaluate the ports, a two-page questionnaire was sent to the 28 operating deep-draft, inland and coastal ports. The responding ports included the deep-draft ports of New Orleans, South Louisiana, Baton Rouge and Lake Charles; the inland ports of Krotz Springs, Alexandria, Great Ouachita, Columbia, Lake Providence, Natchitoches, Manchac and Caddo-Bossier; and the coastal ports of Greater Lafourche, Morgan City, Iberia, West St. Mary, Mermentau and West Cameron. Ports were asked to assess their ability to handle existing business or future business within their present port facilities. They were asked to assess the extent of their present major maintenance needs that may affect their ability to handle business. Finally they were asked to assess their ability to fund future development to meet their capital needs for a 5-year and a 20-year timeframe. Grading of capacity, condition, funding and future need was assessed based on the questionnaire as shown in Table 1.

**CAPACITY** Capacity is a measure of the available space and resources necessary to handle projected business needs. With some exceptions, operators of the vast majority of deep-draft, inland and coastal ports believed they had enough capacity to handle today's existing business level. Operators at one coastal port, West St. Mary, and one inland port, Caddo-Bossier, believe they have enough capacity to handle business well into the future. Operators at two inland ports, Columbia and Greater Ouachita, stated they did not have enough facility capacity to handle today's business. A grade of C-, which is weighted 25 percent of the total port grade, was assigned to the capacity category.

**CONDITION** Condition is a measure of the amount of maintenance and how it affects the performance of the ports. Most port operators believed they had major maintenance needs for up to 25 percent of their facilities but this maintenance would not impact their ability to handle business. Operators at one coastal port, Iberia, and one inland port, Lake Providence, believed they had maintenance needs up to 50 percent of their facilities. A grade of B-, which is weighted 25 percent of the total port grade, was assigned to the capacity category.

TABLE 1: GRADING CRITERIA

Grade Definition Criteria

Fundamental Components	A		B		C		D		E	
	<b>Capacity</b>	Port presently has the capacity to handle its projected business needs for the next 20 years	Port presently has the capacity to handle its projected business needs for the next 10 years	Port presently has the capacity to handle its projected business needs for the next 5 years	Port presently has the capacity to handle its existing business needs for today	Port presently does not have the capacity to handle its existing business needs for today				
<b>Condition</b>	Port facilities have routine maintenance needs but have no major maintenance required at this time	Port facilities need some major maintenance on less than 25% of its facilities and maintenance will not substantially impact Ports handling of business	Port has major maintenance needs on less than 50% of its facilities and maintenance will not substantially impact Ports handling of its business	Port has major maintenance on more than 50% of its facilities and some business will be disrupted during repairs	Port has major maintenance or rehabilitation of most of its facilities and there will be business disruptions during repairs					
<b>Funding</b>	Port has funding available or committed from various sources for at least the next 10 years of capital improvement needs	Port has funding available or committed from various sources for at least the next 5 years of capital improvement needs	Port has funding available or committed for most but not all capital improvements over the next 5 years	Port has very limited funding available or committed for capital improvements over the next 5 years	Port has little or no funding available or committed for capital improvements over the next 5 years					
<b>Future Need</b>	Port has funding programmed and committed for most projects over the next 20 years	Port has funding programmed and committed for at least 50% of its projects programmed over the next 20 years	Port has funding programmed and committed for at least 25% of its projects programmed over the next 20 years	Port has funding programmed and committed for at least 10% of its projects programmed over the next 20 years	Port has little or no funding programmed or committed for its projects programmed over the next 20 years					

**FUNDING** Funding for capital improvement comes from a variety of state, federal and self-generating sources. The current level of available funding for future capital improvements is a critical issue for almost all of the ports surveyed. Only one port surveyed, Alexandria, had sufficient funding available to meet all of the needs in its 5-year capital improvement program. Five ports have enough funds to do some of their 5-year capital program but not all of it. The remaining 12 ports have very limited funds to do projects under their 5-year capital program. A grade of C, which is weighted 25 percent of the total port grade, was assigned to the capacity category.

**FUTURE NEED** Future need is measured by available funding allocated and committed for programmed projects. Even more critical than short-term funding is the availability for longer-term funding needs to meet 20-year growth at Louisiana ports. Sixteen of the 18 ports surveyed either have no funding available for their 20-year needs or have funding available for only 10 percent of their needs. A grade of D was assigned to the future needs category, which is weighted at 25 percent of the total.

TABLE 2: GRADE SUMMARY

Fundamental Components	Capacity		Condition		Funding		Future Need		TOTAL GRADE
	<b>Weighting Factor</b>	.25	.25	.25	.25	.25	.25	.25	
<b>Score</b>	C-	B-	C	D	C-				

## POLICY OPTIONS/FUNDING

The Port Construction and Development Priority Program has been a major success in providing funding for port capital projects in Louisiana. Based on a review of similar programs across the country, the Port Construction and Development Priority Program is one of the best in the country in providing funding for small- and medium-sized port projects. It has a selection process based on economic benefit factors, and the program has been administered without serious problems for many years. However, there are several things that the present program lacks. It is not an adequate funding source for larger ports' seeking support for capital projects of more than \$10 to 20 million. The level of funding being provided is not statutorily dedicated, so ports have no guarantee of funding level from year to year. The amount of annual funding through state appropriations is not sufficient to fund all of the projects that meet the economic qualifications. Consideration should be given to proposing a funding level of at least \$40 to 50 million annually with several concurrent changes to the funding distribution methods. One option for making the program more beneficial to large ports would be to eliminate the present cap on project size while guaranteeing a certain portion of the funds would go to shallow draft ports. Consideration should be given to creating a higher required match rate for the large grants, up to 50 percent. In this way, deep-draft ports could access funds for large projects and shallow draft ports could still be guaranteed that each year's annual allocation would not be used up by the deep-draft ports.

Similar to the idea of the National Infrastructure Bank that has recently been introduced in federal legislation, Senate bill 652, a Port Construction Bank could be financed. This bank could be financed federally or even on the state level. Other states effectively use a revolving loan program to fund public and private port construction projects. The programs usually offer very favorable loan terms, and most programs are self supporting after an initial funding seed from the state.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

-  Increase the Port Construction and Development Priorities program from \$20 million a year to \$50 million a year.
-  If the funding level is increased as presented in the previous recommendation, revise or eliminate the cap on the Port Construction and Development Priorities program.
-  Stair-step the matching funds percentages on the Port Construction and Development Priorities program. For example, projects under \$5 million would have to be funded 10 percent by the port. Projects between \$5 million and \$7 million would have to be funded 20 percent by the port, etc.
-  Create and fund a Port Construction Bank. The low interest loans could attract private sector partners to infuse capital into the ports.

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- <sup>3</sup> *Report on State Financial Assistance for Capital Improvements at Public Ports in the United States, for the Ports Association of Louisiana* by the Port Professionals Group, November 2009.
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- <sup>5</sup> *Louisiana Ports Deliver Powerpoint Presentation* by the Port Association of Louisiana, 2002.
- <sup>6</sup> *Ports of Louisiana and the Maritime Industry* prepared by Timothy P. Ryan, University of New Orleans, August 2002.
- <sup>7</sup> *U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, 2007; based on U.S. Army Corps of Engineers (USACE), Annual Vessel Operating Activity and Lock Performance Monitoring System data, as processed for USACE by the Tennessee Valley Authority; and USACE, Institute for Water Resources, Waterborne Foreign Trade Data.*

# DRINKING WATER

**SUMMARY** Louisiana is very fortunate to have an abundance of water for its domestic, industrial and agricultural needs. Approximately 9.5% of the state is covered by water. Below the surface are 11 aquifers/aquifer systems that are used for source water. In several areas of the state, ground water supplies are being depleted by overpumping and are being threatened by salt water intrusion. The aging and deteriorating water supply and treatment and distribution systems are not capable of providing potable water for future, and in some cases, current demands. Better planning and more funding are key elements to providing Louisiana with a safe supply of drinking water in the future.

**OVERVIEW** Only about 7.4% of the water withdrawn from Louisiana's surface water and ground water sources is used for potable water demands. Approximately 88% of Louisiana's 4.5 million residents are provided potable water from a public system. The remaining 12% use domestic wells for their potable water needs. Of the 88%, 49% is taken from aquifers and 51% is taken from surface water sources.

The 2007 Needs Survey prepared by engineers at the Louisiana Department of Health and Hospitals (DHH) provided the information necessary to grade the water systems. Documents from the survey were provided for 89 water systems, which represent approximately 64% of the state's population.

After reviewing the survey, the following categories were developed. Each of the 89 water systems was graded based on these categories.

-  **Condition** This included the existing physical conditions of the raw water pumps or wells, treatment plant and distribution system.
-  **Resilience** The ability of the water system to meet the requirements of the LA Sanitary Code and Ten State Standards in the event of a loss of a system component or loss of primary power.
-  **Capacity** The ability of the water source and the water system to provide potable water for current and future conditions.
-  **Funding** The financial ability of the water system to maintain the system properly, cost effectively and in accordance with State and Federal regulations.

## LOUISIANA'S GRADE

D+



## FACTS AND ISSUES

**CAPACITY** Engineers from the Louisiana Department of Transportation and Development and the United States Geological Survey prepared a report titled Water Use in Louisiana, 2005. According to the report, approximately 10,300 million gallons of water per day (MGD) were withdrawn from ground water and surface water sources in Louisiana in 2005. Public water supply accounts for approximately 720 MGD of the total 10,300 MGD. Ground water from rural domestic water wells accounts for 44 MGD. Of the 720 MGD withdrawn for public water supply, approximately 350 MGD was from ground water sources and 370 MGD was from surface water sources. The Mississippi River is the largest surface water source providing 240 MGD.

Water withdrawn for public supply and rural residential use combined only accounts for approximately 7.4% of the total quantity. The pie chart shown below (Figure 1) illustrates the quantity of water withdrawn for each category of use.

Louisiana is known for its bayous, wetlands and the Mississippi River, but its water sources are fragile just like many other areas of the country. Low water levels in rivers and reservoirs can severely impact the ability of intake structures to feed water to treatment plants for processing. The large quantities of water withdrawn on a daily basis can stress the state's source water, particularly ground water. The northern and western portions of the state are feeling the effects of a severe drought. The Louisiana Department of Natural Resources' Office of Conservation recently developed a Ground Water Management Plan to monitor water levels and pumping rates in aquifers. This office issued an Emergency Order on August 19, 2011 for the ground water supply in southern Caddo Parish. The Carrizo-Wilcox and Upland Terrace aquifers were unable to recharge properly because of a 15-month drought that affected this area. The drought is also affecting surface water sources. Low water levels in rivers and reservoirs can reduce the flowrate for the raw water pumps to the treatment plant. One public

water system in particular issued a boil water advisory for the town because the treatment plant could not provide enough potable water, resulting in low system pressures. Fortunately, these are isolated instances within the state and are not reoccurring problems.

Aquifers in southern Louisiana experience a different but equally critical problem called saltwater intrusion. This problem occurs when declining levels in the freshwater aquifer allow saltwater to flow into the aquifers. Increased pumping rates within these areas have reduced water levels in the aquifers by as much as 160 feet. Water wells that supply industry are the main cause of the reduction in water levels. Numerous water wells have been abandoned because of saltwater intrusion. If pumping rates continue at the current pace, several public water systems will be required to find an alternate source of water.

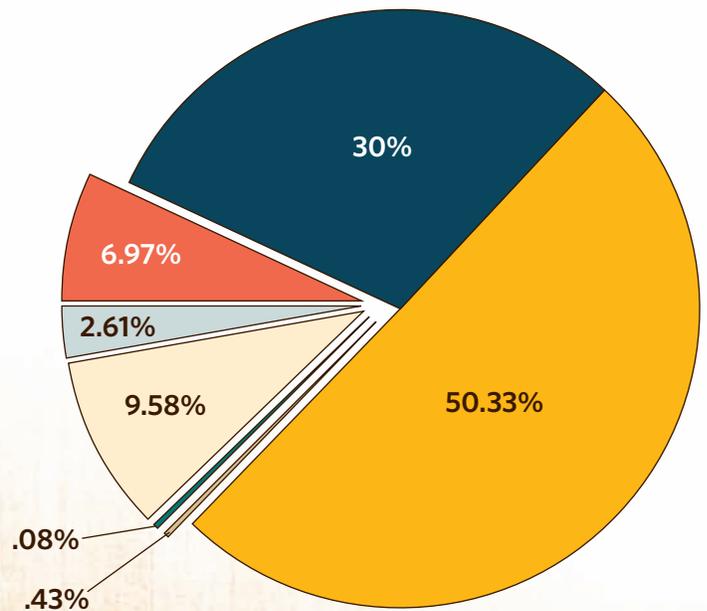
The capacity of the treatment and distribution system is also an important aspect of the water system. The 2007 Needs Survey found 11 of the 89 public water systems were unable to meet the demands of its customers on a regular basis. Upgrades will be necessary immediately for these systems to provide an adequate supply of potable water to the public. The majority of the other water systems in the survey will need upgrades within the next few years to meet the demands for future growth.

Most public water systems in Louisiana have the source, treatment and distribution system capacity necessary to meet the demand of its customers. Some need immediate upgrades while others should be looking for alternate water sources. Based on this information, the grade for Capacity is a C-.

FIGURE 1: WATER QUANTITY BY USE CATEGORIES

LEGEND

- Public Supply
- Industry
- Power Generation
- Rural Domestic
- Livestock
- Rice Irrigation
- Aquaculture



**CONDITION** Louisiana's potable water infrastructure is deteriorating at an alarming rate. Approximately half of the 89 water systems studied were constructed before 1960. Many of these systems have had little if any rehabilitation conducted since the system was built.

The 2007 Needs Survey indicated more than 10,000 miles of transmission and distribution lines would require replacement within the next 20 years because of the lines' age. These older lines result in leaks that ultimately cost the water system valuable revenue. Painted steel ground storage and elevated storage tanks need to be sand blasted and painted before they rust beyond

repair. Water wells are no longer pumping at their design capacity and need rehabilitation.

The operators of public water systems in small, rural areas are typically overwhelmed with responsibilities. Many do not have the manpower required to fix leaks, read water meters and operate the system at the same time. Other systems do not have adequately trained certified operators. Having trained operators is paramount to having a good, reliable system. Routine maintenance and rehabilitation projects must begin before it is too late. Louisiana's water systems receive a D+ for Condition.

**FUNDING** The U. S. Environmental Protection Agency's 2007 Drinking Water Infrastructure Needs Survey and Assessment reported \$334.8 billion is needed to meet the nation's current and future needs over the next 20 years. This survey and assessment was a compilation of the needs surveys developed by each state. Louisiana's 2007 Needs Survey prepared by DHH reported a need of \$6.7 billion for public water systems in Louisiana over the next 20 years.

In most cases local government can't afford to fund the projects necessary for their water systems and must rely on outside funding sources. Funding sources typically used for drinking water projects in Louisiana are the Louisiana Department of Health and Hospitals' Drinking Water Revolving Loan Fund Program (LDHH-DWRLF), USDA Rural Development and the Louisiana Community Development Block Grant Program.

The LDHH-DWRLF was established in 1997 pursuant to the 1996 Amendments to the Safe Drinking Water Act. The DHH program is capitalized by Environmental Protection Agency capitalization grants, state funds, and by any other funds generated by the program. The DHH program provides assistance through low-interest loans for infrastructure projects and other assistance in the form of set-aside activities for program administration, technical assistance, state program management, local assistance, and other state programs. Loan terms are typically 20 years from the date of project completion with a current effective interest rate of 3.45%. Congress appropriates funding for the EPA Drinking Water State Revolving Fund program each year. Louisiana was awarded \$25,649,000 and \$17,798,000 for the 2010 and 2011 fiscal years, respectively; this is approximately 1.89% of the total federal allotment. In its 2011 Intended Use Plan, the DHH

program had \$62,266,955 available for funding which includes the Capitalization grants, repaid principal on outstanding loans, interest earned on loans, and investment interest earned. However, this available funding falls far short of the DHH received loan requests totaling \$86,219,940 for public water system projects.

USDA Rural Development provides loans and grants for Business and Cooperative Programs, Housing Programs and Community Programs. Water and wastewater systems along with communication centers, police and fire stations, health care facilities, libraries, schools and street improvements are considered Community Programs. In 2010, water and sewer systems in Louisiana received \$47,977,518 from the Water and Waste Disposal Loan and Grant Program.

The Louisiana Community Development Block Grant Program is administered by the Office of Community Development and was established by Title I of the Housing and Community Development Act of 1974. The program provides funding for Public Facilities, Housing and Economic Development. Potable and fire protection systems, sewer systems, residential streets and community centers are considered Public Facilities. Grants are typically provided for use in low and moderate income areas. In fiscal year 2011, approximately \$14,000,000 was available for Public Facilities in Louisiana.

Even though there are several funding sources available, the funding needs are substantially more than the funding available. Louisiana's public water systems will need additional funding to adequately upgrade and rehabilitate their infrastructure. The significant shortfall in monies available results in a grade of a D- for Funding.

TABLE 1: GRADE SUMMARY

Fundamental Components	Capacity	Condition	Funding	Resilience	TOTAL GRADE
Weighting Factor	.25	.25	.25	.25	
Score	C-	D+	D-	D+	D+

The lack of funds available for infrastructure improvements is evident. The Condition, Resilience and Capacity of Louisiana's public water systems are suffering as a result. The grades received in each category are summarized below.

**RESILIENCE** The resiliency of a water system was based on whether it could continue to provide water to its customers after a catastrophic event. Potable water is a vital part of our society. Even after a major hurricane with widespread power outages, the public expects and relies upon the local water system to continue to provide potable water. The 2007 Needs Survey indicated 33% of the public water systems do not have an adequate back-up power source for emergency situations. However, it doesn't take a natural disaster to cause problems for operators of water systems. Mechanical and electrical components in water systems can fail especially if they are not maintained properly. Ten state standards require water systems to be designed so that the maximum day demand can be met with the largest well out of

service. Additionally, it requires water systems to have redundant sources for potable water. Many water systems in Louisiana have failed in meeting these requirements. Hurricanes Gustav and Ike in 2008 revealed this fact as many water systems struggled to obtain generators and get the water system back in operation. DHH report-wide has since revised their sanitary survey procedures making backup power and secondary sources a top priority when citing deficiencies found during a sanitary survey.

An adequate back-up power supply and redundancy of key components of the water system are critical. Water systems deficient in this category must make these items a top priority to comply with state and federal regulations. Public water systems are given a D+ for Resilience.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

- Operators and managers of public water systems in Louisiana should develop master plans for their systems. These master plans should address existing and future needs. A substantial increase in funding will be required to fully implement the recommendations that will be outlined in these master plans. Local leaders should lobby for additional state and federal funding. Infrastructure will continue to deteriorate without proper action.
- Withdrawal of large quantities of ground water for industrial use will continue to decrease the water levels in aquifers containing quality water for public consumption. In many cases, an abundance of surface water is also available for these industries. The Louisiana Department of Natural Resources, Louisiana Ground Water Resources Commission and the United States Geological Survey should continue to monitor the water levels in these aquifers. Daily limits for withdrawal quantities should be established to preserve this valuable resource.

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# WASTE WATER

**SUMMARY** Louisiana is rich in natural resources. Our wildlife and fisheries, bayous, rivers, streams and abundant coastal zone make Louisiana the Sportsman's Paradise. But Louisiana has aging wastewater treatment and collection systems that pose danger to our environment. Wastewater effluent that does not meet state and federal requirements can destroy the delicate ecosystem that helps makes Louisiana a unique place. The 2008 Clean Watersheds Needs Survey shows a \$4.9 billion total for wastewater related infrastructure improvement needs. That number has grown from the 2004 total of \$4.2 billion, a 16.6% increase in needs.

Unless significant funding resources are dedicated to the treatment of wastewater in Louisiana, the need will surely grow, as will the likelihood that our environment will suffer irreparable harm.



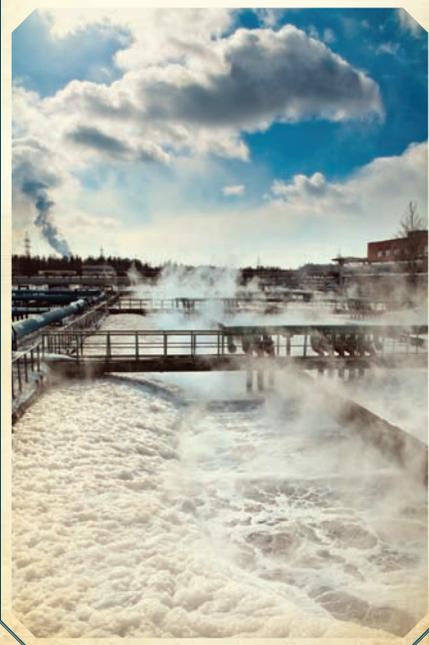
## OVERVIEW

The need to upgrade and rebuild wastewater infrastructure is growing with the years of lack of maintenance and growing population within some areas of the state. Some communities have become proactive by implementing additional fees to pay for the millions of dollars in required improvements. Many communities simply do not have the resources. The state set a goal in 2004 to reduce the number of water body subsegments impaired for boating, swimming and fishing by 25% by the year 2012. The state and other stakeholders partnered and met the goal with the exception of fish and wildlife propagation.

In 2000 approximately 63% of Louisiana's water body subsegments supported swimming. In 2010, 84% of the water body subsegments supported that activity. Also in 2000, approximately 81% of the water body subsegments supported boating activities. In 2010, 97% of those water body subsegments supported boating activities. Therefore, by 2010, the 25% goal had been met for the water body subsegments supporting swimming and boating.

In 2000 approximately 18% of Louisiana's water body subsegments supported fishing activities, while in 2010 approximately 33% supported that activity. While the 25% goal was not met for fishing activities, certainly improvements have been made.

## LOUISIANA'S GRADE



## FACTS AND ISSUES

**FACTS** According to the 2010 Census, Louisiana's population is about 4.54 million people with concentrations of people in eight (8) metropolitan areas (Houma/Thibodaux, Baton Rouge, New Orleans/Metairie/Kenner, Lake Charles, Lafayette, Alexandria, Shreveport/Bossier and Monroe).

"Louisiana contains over 66,294 miles of rivers and streams, 1,078,031 acres (1,684 square miles) of lakes and reservoirs, 5,550,951 acres (8,673 square miles) of fresh and tidal wetlands, and 4,899,840 acres (7,656 square miles) of estuaries." These figures are believed to be low in comparison to the actual total area of these bodies. (2010 Louisiana Water quality Inventory-Integrated Report Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d))

"For the fifth consecutive IR reporting cycle, Louisiana's water quality has shown incremental improvements starting with a baseline of the 2000 IR."

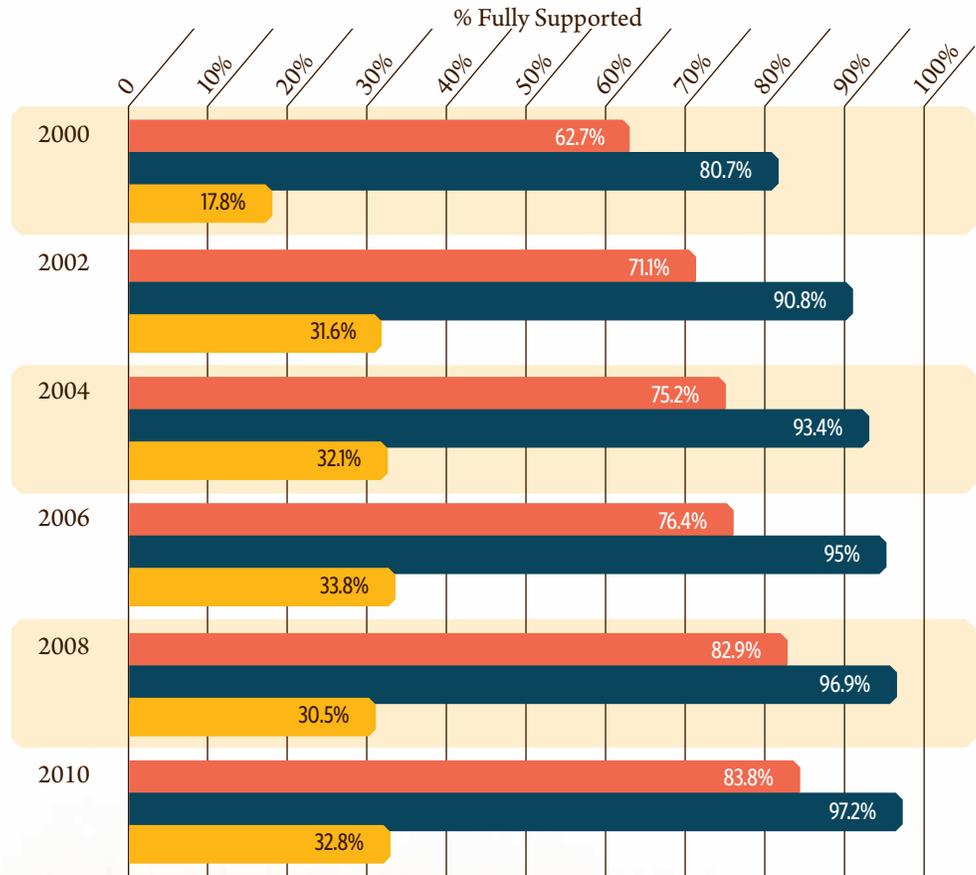
As you can see from the chart, water body subsegments fully supporting swimming and boating have improved significantly, while fish and wildlife propagation (FWP) continues to be a difficult designated use. The improvements for swimming and boating can be directly attributed to "new and improved sewage treatment plants, which leads to both a reduction in sewage loading and improvements in dissolved oxygen concentrations." Also, state and local agencies continue to work toward better enforcement of home sewage system ordinances and regulations.

\*FIGURE I.1.1 TAKEN FROM PAGE 8 OF THE DEQ 2010 LOUISIANA WATER QUALITY INVENTORY: INTEGRATED REPORT FULFILLING REQUIREMENTS OF THE FEDERAL CLEAN WATER ACT, SECTION 305(B) AND 303 (D)

**LEGEND**

- Swimming
- Boating
- Fishing

Comparison of the percentage of water body subsegments in Louisiana fully supporting the three primary designated uses. 2010 Louisiana Integrated Report assessment.



**NEEDS** According to the Environmental Protection Agency (EPA) Clean Watersheds Needs Survey, “The total reported water quality needs for the nation as of January 1, 2008 are \$298.1 billion. More than 60 percent of the nation’s needs are for wastewater treatment, pipe repairs and new pipes.” (Categories I-IV in the survey) (page 2-1) Louisiana’s data was included in that study and appears to fall near the national average per capita needs of \$971 per capita. Between January 1, 2004 and January 1, 2008, reported water quality needs increased by approximately 17% in Louisiana as compared to 28% for the national average.

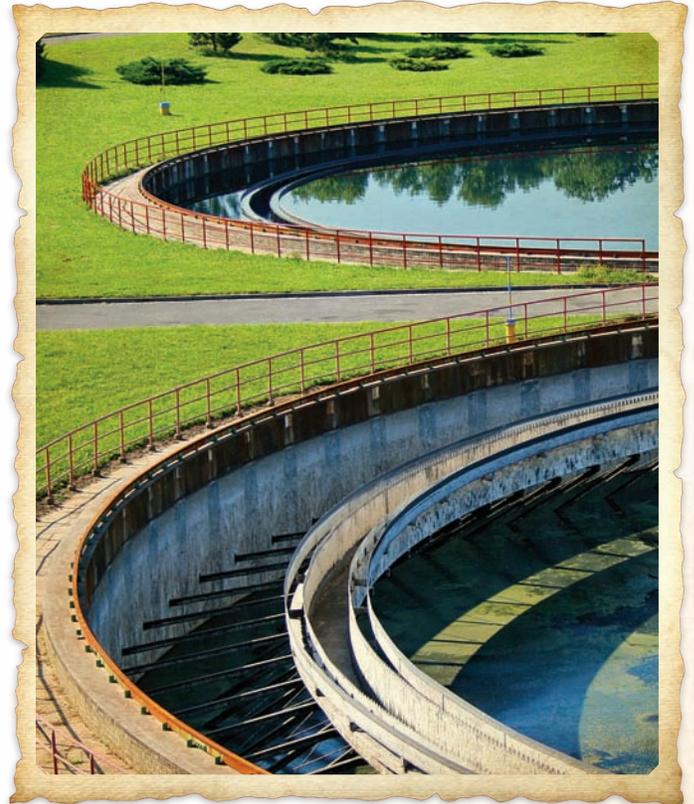
Within Categories III and IV (Pipe Repairs and New Pipes) Louisiana was 5th among states with the highest per capita cost of \$571 to rehabilitate and replace pipes and to install new sewer pipes, interceptor sewers and pumping stations. This high per capita cost can be attributed to the age of the systems as well as the environmental conditions of soil conditions and high water table. Low population density could also be an additional factor. The study states that this “shows that communities are continuing to plan for the correction of problems related to Sanitary Sewer Overflows (SSOs) and ensuring the reliability of the nation’s existing collection system infrastructure.”

In Louisiana, communities of fewer than 10,000 people account for \$173 million of the state’s \$4.9 billion in wastewater infrastructure needs. The 2010 Louisiana Department of Environmental Quality (LDEQ) Water Quality Inventory Integrated Report stated that 244 facilities were notified that the potential for a total maximum daily load (TMDL) could affect their wastewater discharge permit limits. Lowering of

**CAPACITY** The metropolitan areas of the state collect and treat the majority of their residents’ wastewater. Outlying/rural areas are making progress in providing wastewater treatment. According to the Clean Watersheds Needs Survey 2008 Report to Congress, nationally “the number of people provided with advanced wastewater treatment increased dramatically (from 7.8 million people in 1972 to 113.0 million people in 2008). Moreover, the population served by less-than-secondary treatment decreased from more than 50 million in 1972 to 3.8 million in 2008.”

The effluent receiving stream is a factor in determining effluent limits. LDEQ reviews discharge monitoring reports (DMRs) sent in on each treatment facility.

The Infiltration and inflow (I/I) problems, or the amount of ground water entering wastewater pipes, can affect the



the existing wastewater discharge permit limits on treatment facilities will certainly require upgrades to these facilities requiring additional funding. Because of these issues, we have assigned a D grade to the future needs category.

capacity of a pipe system. Particularly in Louisiana, where the groundwater table in many cases will be above the elevation of the collection system piping, the issue of I/I is of great concern. As a system ages, the pipes can either crack or settle or have other issues that can cause ground water to enter the pipe. This ground water ultimately will require treatment once it reaches the wastewater treatment facility, thus increasing the required size of the treatment facility itself.

Throughout the state, facilities are being built or upgraded to provide secondary treatment of wastewater. Approximately 10% of Louisiana population is served by individual home sewerage systems. Centralization of home sewerage systems along with the potential TMDLs affecting the need for lower effluent limits, may affect the future required capacity. Therefore we have graded the capacity as C.

**CONDITION** Also according to the study, a large portion of the nation's wastewater pipe network was installed in the 1950s through the 1970s. Many of these systems have suffered from lack of maintenance and/or upgrade funding, leaving the communities they serve with crumbling infrastructure. We sampled a few communities with treatment plant capacity of 0.6 mgd, 0.33 mgd, 2.5 mgd, 0.5 mgd, 0.15 mgd, 3.5 mgd, 3.0 mgd, 6.2 mgd, and 5.0 mgd. In the information provided, it appeared that money had been recently allocated for many of the treatment facilities to receive funding in order to upgrade their facilities. In these same questionnaire responses, it appeared there was concern over the I/I issues with the collection systems. Because of these conditional issues, we assigned a grade of C for the state's condition rating.

**FUNDING** The majority of the funding for wastewater infrastructure needs comes from local governments. The most popular funding mechanisms through grants and loans are either through the Louisiana Community Development Block Grant (LCDBG) program, the Louisiana Clean Water State Revolving Fund (CWSRF) or the USDA Rural Development funding. The LCDBG program funds between \$11 and \$12 million a year for wastewater related projects.

The CWSRF was established in 1987 pursuant to the Clean Water Act Amendments of 1987 (U.S. Statute 40 CFR, Part 35) and Louisiana Revised Statutes of 1989 (La. R.S. 30:2078). The program is funded by capitalization grants from the federal government, with 20% state matching funds required. Since 1998, state match has been provided by bond sales. All such bonds have been paid off as of May, 2011.

Presently, the program is financially self-sufficient and does not depend on state appropriations. Loans can be made to municipalities for the construction of waste water treatment facilities. As of May, 2011, a total of 120 base program loans, with an outstanding balance of \$227,195,377, have been made to 62 systems with an additional 53 American Recovery and Reinvestment Act of 2009 (ARRA) loan projects totaling \$43,081,400. The 53 ARRA projects were all awarded in the form of 100% principal forgiveness with 0% interest to communities that could not otherwise afford loans. The current loan rate has been lowered to 0.45% plus an annual administrative fee of 0.50%, making an effective interest rate to borrowers of 0.95%. Loans terms generally are for 20 years from project completion, with 22 years as the maximum loan term. The lower interest rate has made these loans attractive to municipalities. As a result of lowering the interest rate and ARRA funding, since December 2008, 103 loans totaling \$321,257,089 have been committed.

TABLE 1: SEWER

	Fiscal Year Obligated	Sewer Loan # of LN	Grant # of GR
2005	\$7,418,000	9	\$6,202,031
2006	\$1,827,000	3	\$752,200
2007	\$10,199,000	10	\$2,510,389
2008	\$5,406,000	5	\$4,323,014
2009	\$10,015,000	5	\$8,951,000
2010	\$8,316,000	4	\$11,981,893
<b>TOTAL FOR 5 FY'S</b>	<b>\$43,181,000</b>	<b>36</b>	<b>\$34,720,527</b>

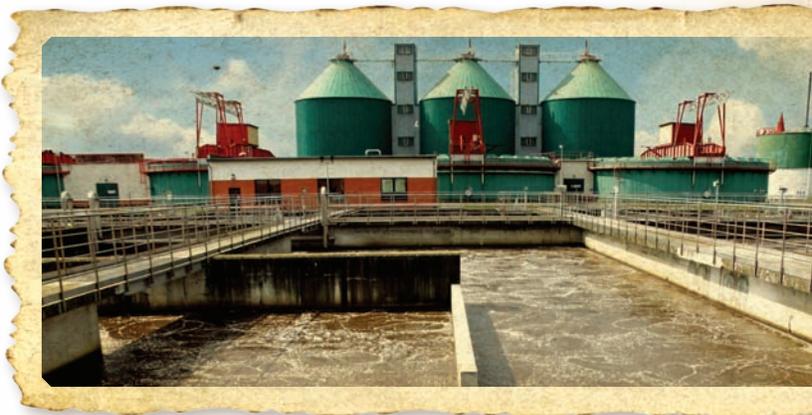
USDA – Rural Development Funding for wastewater projects have provided dollars for loans and grants with the following amounts being loaned or granted over the past 6 years.

Even with these funding options available for municipalities, with a 2010 estimate of \$6.0 billion in needs, there is definitely a Funding Gap which must be bridged if the state is to continue to improve its water quality. The funding sources are not keeping up with the ever growing needs within our state and nation causing the Wastewater Infrastructure Funding Gap. Because of this funding gap, the grade for the funding is a D.

**OPERATION & MAINTENANCE** The operation and maintenance (O&M) of many wastewater collection and treatment systems tends to be a lower priority than for other types of infrastructure because it is “out of sight, out of mind” of citizens. Most communities provide little or no maintenance on sewer lift stations or collection systems until they begin witnessing sanitary sewer overflows (SSOs) or develop system failures of pump stations or treatment plant equipment. Many communities do not employ staff with the necessary expertise to maintain their systems. Many of the smaller communities we contacted with a questionnaire did not know exactly what their O&M budgets were. This lack of awareness leads to a very reactive situation when it comes to wastewater maintenance. Because of these issues, the grade for O&M is a D.

**RESILIENCE** The capability for a wastewater collection and treatment system to prevent/protect against significant multi-hazard threats is a difficult factor to consider. Although Hurricane Katrina struck more than six years ago, the New Orleans area is still recovering from the damage. Most systems have some pump station generators and capability to run treatment plants under extreme weather conditions, but the type of conditions Hurricane Katrina created could never have been planned for. Agencies such as EPA, DEQ and DHH are monitoring SSOs and effluent limit violations. The actual threat could be significant should certain types of pollutants be released to the environment without proper treatment. Individual package plants could also pose a threat because of improper monitoring. In some cases, depending on the parish, if a home is sold, the subsequent owner must have the

**PUBLIC SAFETY** The state has instituted goals for its water quality. In 2004, the governor instituted a policy that forced improvement of water quality. Because of these measures and the desire on the part of municipalities to improve their effluents, the water quality of our waterways has greatly improved. There has been no link to any known water pollutant that has made anyone ill. Because of these measures we are giving the public safety item of this report card a B.



system reinspected to ensure the system is functioning properly. Because, at this time it appears that the threat of a significant health issue resulting from poor performing systems and/or lack of a system to have the ability to recover from a critical interruption in operation seems to be of an average nature, the system resilience receives a grade of C.

TABLE 2: GRADE SUMMARY

Fundamental Components	Capacity	Condition	Funding	Future Need	Operations & Maintenance	Public Safety	Resilience	TOTAL GRADE
Weighting Factor	.15	.20	.20	.20	.10	.10	.05	
Score	C	C	D	D	D	B	C	C-



## POLICY OPTIONS/FUNDING

Public outreach and education are keys to the collective effort necessary to improve the nation's infrastructure and its impact on the environment and quality of life. This effort can also serve to promote and generate public support for sustainable funding sources dedicated toward wastewater improvement. ASCE should actively seek commitments from candidates running for political offices of their support for investments into local or national infrastructure. These candidates, if elected, can be evaluated annually to determine if their commitments have been met. Without this type of effort, current trends will continue, resulting in nationwide deterioration of wastewater infrastructure and associated negative impacts on the environment and quality of life.

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

-  Sustainable funding sources in the form of grants or loans for wastewater infrastructure need to be identified from the state, local and federal agencies.
-  The water quality issues and their effects on the environment and quality of life should continue to be presented to local and state entities.
-  Local governments should continue to develop wastewater treatment facilities to accommodate areas not served by municipal sewer. This can help reduce small home treatment plants that are not maintained once the warranty period is completed.
-  The state should continue to evaluate wastewater effluent limits to help ensure the quality of water bodies.
-  Opportunities for recycled water use should be explored.

## SOURCES

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"2010 Louisiana Water Quality Inventory: Integrated Report Fulfilling Requirements of the Federal Clean Water Act, Sections 305(b) and 303(d)" by Louisiana Department of Environmental Quality, Office of Environmental Services, Water Permits Division.

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# SOLID WASTE

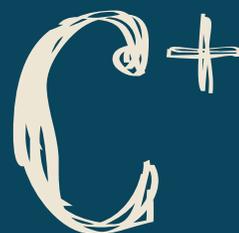
**SUMMARY** Modern solid waste landfills (SWLFs) are well-engineered facilities that are located, designed, operated and monitored to ensure compliance with federal permitting requirements and to protect the environment from contaminants in the solid waste stream. The success of Louisiana's solid waste efforts could be enhanced by a number of initiatives, including more public outreach and education on reducing the amount and toxicity of generated waste, wider utilization of sustainable practices in solid waste management, more community-based household hazardous waste collection programs and greater participation in residential and commercial recycling programs.

**OVERVIEW** Environmental safeguards include a landfill siting plan, which prevents the siting of landfills in environmentally-sensitive areas, and on-site environmental monitoring systems, which monitor for any sign of groundwater contamination and landfill gas. In addition, many landfills collect potentially harmful landfill gas emissions and convert the gas into energy.

All SWLFs must comply with the federal regulations in 40 CFR Part 258 (Subtitle D of RCRA), or equivalent state regulations. Federal SWLF standards include:

- Location Restrictions** Ensure that landfills are built in suitable geological areas away from faults, wetlands, flood plains or other restricted areas.
- Composite Liners Requirements** Include a flexible membrane (geomembrane) overlaying two feet of compacted clay soil lining the bottom and sides of the landfill to protect groundwater and the underlying soil from leachate releases.
- Leachate Collection & Removal Systems** Sit on top of the composite liner and remove leachate from the landfill for treatment and disposal.
- Operating Practices** Include compacting and covering waste frequently with several inches of soil to help reduce odor; control litter, insects and rodents and to protect public health.
- Groundwater Monitoring Requirements** Requires testing groundwater wells to determine if waste materials have escaped from the landfill.
- Closure & Post-closure Care Requirements** Include covering landfills and providing long-term care of closed landfills.
- Corrective Action Provisions** Control and clean up landfill releases and meet groundwater protection standards.
- Financial Assurance** Provides funding for environmental protection during and after landfill closure (i.e., closure and post-closure care).

## LOUISIANA'S GRADE





SWLFs typically receive municipal household wastes, but in accordance with Subtitle D of RCRA, they can also receive the following wastes:

- Municipal Solid Waste (MSW)
- Household hazardous wastes
- Municipal sludge – accumulated solids, residues and precipitates generated as a result of waste treatment or processing
- Waste water treatment, potable water treatment, air pollution control, mixed liquor from septic tanks, grease traps, privies, etc.
- Non-hazardous industrial wastes – solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C
- Municipal combustion ash
- Small quantity of generator's hazardous waste
- Construction and demolition debris (C&D) – building materials, packaging and rubble from construction, remodeling, repair and demolition operations on pavements, houses, commercial buildings, bricks, concrete, soil, rock, lumber, road spoils, rebar, etc.
- Agricultural wastes – wastes resulting from activities such as planting and harvesting crops, production of milk, slaughter of animals and feedlot operations
- Oil and gas wastes
- Mining wastes

Household hazardous waste include common household items such as paints, cleaners/chemicals, motor oil, batteries and pesticides. Although household hazardous waste are exempt and can be disposed in SWLFs, these products, if mishandled, can be dangerous to your health and the environment. As such, many SWLFs have a household hazardous waste drop-off station for these materials so that they are diverted from the landfill and reused/recycled instead.

SWLFs can also receive household appliances (also known as white goods) that are no longer needed, but may not dispose of these appliances directly within the landfill. Many of these appliances, such as refrigerators or window air conditioners, rely on ozone-depleting refrigerants and their substitutes. SWLFs have to follow federal disposal procedures for household appliances that use refrigerants. EPA has general information on how refrigerants can damage the ozone layer and consumer information on the specifics of disposing of these appliances.

## BACKGROUND

In Louisiana, solid waste is managed and segregated by type. The types of waste recognized in the solid waste regulations are:

**Industrial Solid Waste** Solid waste generated by a manufacturing, industrial or mining process, or that is contaminated by solid waste generated by such a process. This includes, but is not limited to, waste resulting from electric power generation; fertilizer/agricultural chemicals; food and related products; byproducts; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metal manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay and concrete products; textile manufacturing, and transportation equipment. Industrial solid waste does not include hazardous waste regulated under the Louisiana hazardous waste regulations or under federal law, or waste that is subject to regulation under the Office of Conservation's Statewide Order No. 29-B or by other agencies.<sup>5</sup>

**Commercial Solid Waste** All types of solid waste generated by stores, offices, restaurants, warehouses and other nonmanufacturing activities, excluding residential and industrial solid wastes.<sup>5</sup>

**Residential Solid Waste** Any solid waste (including garbage, trash, yard trash and sludges from residential septic tanks and wastewater treatment facilities) from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).<sup>5</sup>

**Construction/Demolition (C&D) Debris** Nonhazardous waste generally considered not water-soluble that is produced in the process of construction, remodeling, repair, renovation, or demolition of structures, including buildings of all types (both residential and nonresidential). Solid waste that is not C&D debris (even if resulting from the construction, remodeling, repair, renovation, or demolition of structures) includes, but is not limited to, regulated asbestos-containing material (RACM) as defined in LAC 33:III.5151.B, white goods, creosote-treated lumber, and any other item not an integral part of the structure.<sup>5</sup>

Processing and disposal of solid waste in Louisiana can only be done at facilities permitted to accept the specific type of wastes to be processed or disposed.<sup>5</sup> LAC 33:VII.405 lists five specific categories of facilities (each facility can be one type or more than one type):

**Type I** Industrial disposal facilities (e.g., landfills, surface impoundments, or landfarms).

**Type I-A** Industrial processing facilities (e.g., balers, shredders, transfer stations (processing), etc.).

**Type II** Non-industrial disposal facilities (e.g., landfills, surface impoundments, or landfarms).

**Type II-A** Non-industrial processing facilities (e.g., composting municipal solid waste facilities, balers, shredders, transfer stations (processing), refuse-derived fuel facilities, autoclaves, etc.).

**Type III** Construction/demolition-debris and woodwaste landfills, separation facilities, composting facilities, or other.

For purposes of this report, only Type I and Type II SWLFs were evaluated. Louisiana has 25 landfills permitted to accept solid waste. Figure 1 illustrates the locations of each of these facilities in Louisiana, including their respective permitted service areas.



FIGURE 1: PERMITTED SOLID WASTE LANDFILLS WITHIN LOUISIANA

### LEGEND

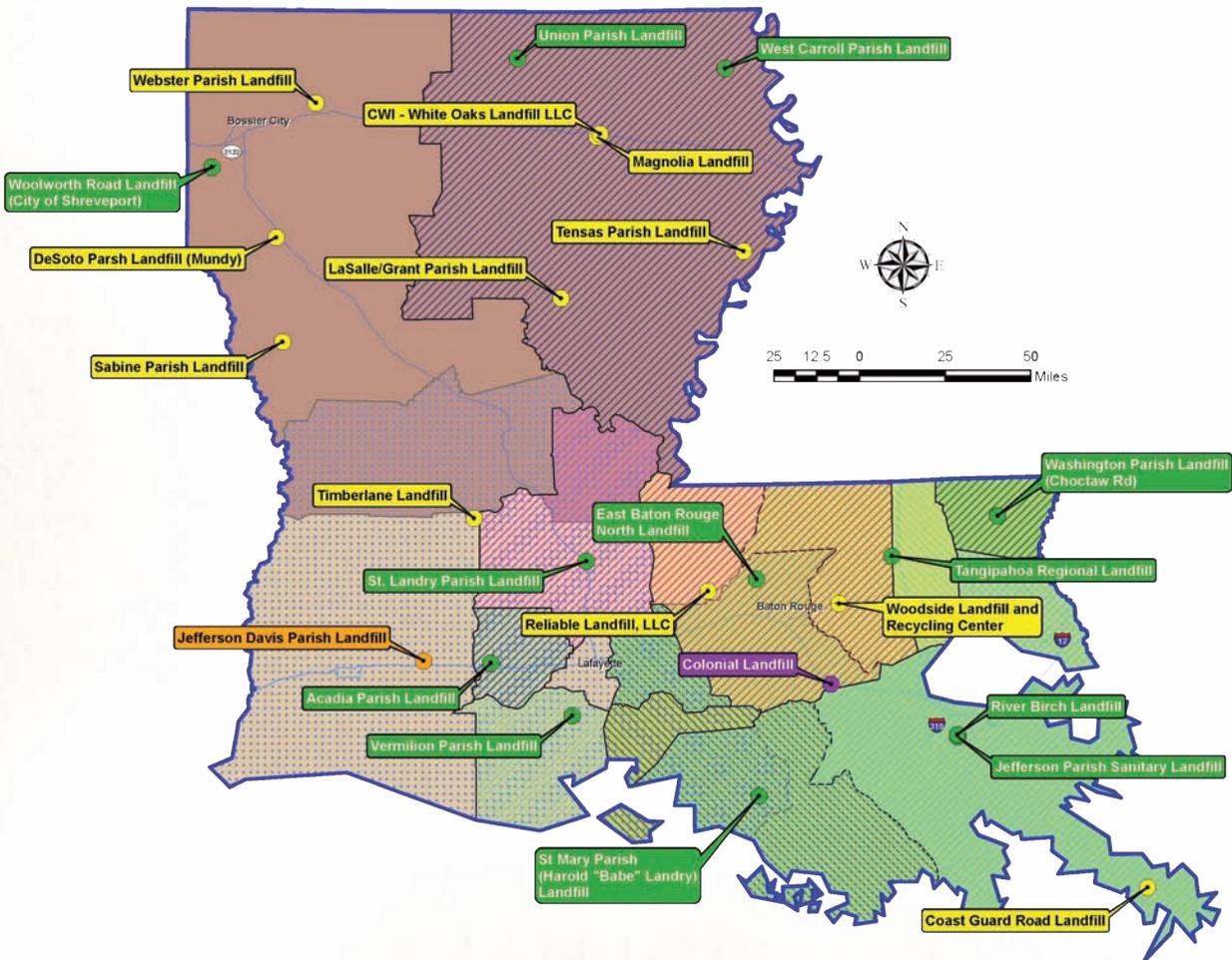
#### Landfill Service Area Type

- Parishes/Counties Specific
- Statewide
- Statewide, Unlimited
- Unlimited

#### Service Area Boundaries

- ▨ Acadia Parish Landfill
- ▨ East Baton Rouge North Landfill
- ▨ Jefferson Davis Parish Landfill
- ▨ Jefferson Parish Sanitary Landfill
- ▨ River Birch Landfill
- ▨ St. Landry Parish Landfill
- ▨ St. Mary Parish (Harold "Babe" Landry) Landfill

- ▨ Statewide Sites (Colonial Landfill and Jefferson Davis Parish Landfill)
- ▨ Tangipahoa Regional Landfill
- ▨ Union Parish Landfill
- ▨ Vermillion Parish Landfill
- ▨ Washington Parish Landfill (Choctaw Rd.)
- ▨ West Carroll Parish Landfill



## FACTS AND ISSUES

This fact sheet is based on the relationship between transportation and disposal capacity of solid waste in Louisiana. The evaluation of Louisiana's solid waste disposal facilities is based on the following criteria: remaining permitted life, capacity consumption, haul distance within service area and haul distance to next available permitted facility.

**CAPACITY CONSUMPTION** State and local planners and regulators need to utilize accurate information concerning remaining capacity in planning for future development and in managing emergencies to ensure that adequate landfill space is available. Subtitle II of Title 30 of the Louisiana Revised Statute, Section § 2162, requires that the Louisiana Department of Environmental Quality determine the permitted capacity that is available to safely manage solid waste and shall ensure that sufficient available permitted capacity exists to safely and efficiently manage solid waste resulting from an emergency. Permitted capacity must be considered along with other factors in the permitting of solid waste facilities.

In accordance with the Louisiana Department of Environmental Quality Guidance Document for Determining Solid Waste Landfill Capacity, the following definitions describe the different types of capacities that are used to determine the current and remaining volumes of a SWLF.

**Permitted Capacity** The initial total volume of waste expressed in cubic yards that a specific bounded facility (total landfill disposal area) is capable of accepting for disposal under an issued permit, i.e. for the permit's duration.

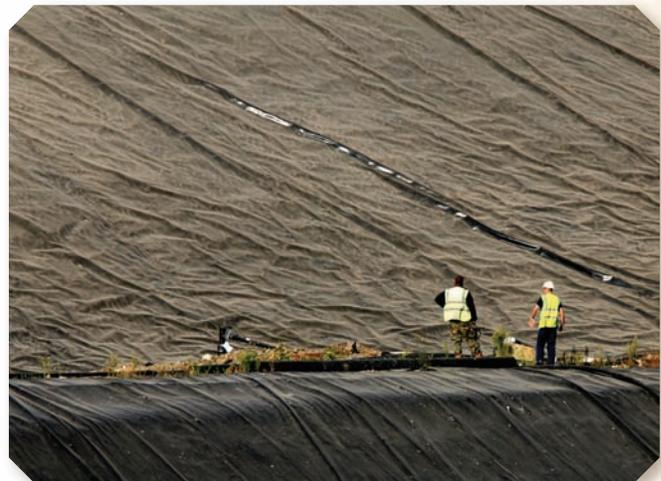
**Used Capacity** The volume of waste expressed in cubic yards that have been disposed into a landfill at a specific bounded facility operating under an issued permit.

**Remaining Capacity** The volume of waste expressed in cubic yards that may be disposed into the unused permitted disposal area at a specific bounded facility under an existing permit (for the permit's duration). Remaining Capacity is determined by subtracting the amount of capacity that has been used from the total permitted capacity.

*Remaining Capacity = Permitted Capacity – Used Capacity*

**Potential Capacity** The volume of waste expressed in cubic yards that may be disposed into an area that is not yet permitted. This disposal area must be contiguous to the permitted area, must be part of the permittee's master plan and must be available for consideration as a modification to the permit or in a renewal application. Potential Capacity represents an increase in permitted disposal area.

The grading factor for this variable was calculated by taking the remaining capacity for the landfill and dividing that number by the remaining permitted life. Based upon the average cubic yards per year anticipated to be deposited, a grade was assigned depending upon where the volume fell within the Rating Scale. A Weighting Factor of 35% was used in the overall calculation. Our calculations of Capacity Consumed resulted in this area receiving a grade of D+.



**REMAINING PERMITTED LIFE** It is important to determine the remaining permitted life at landfills. This is a vital component of landfill operations for not only the landfill owners but also for the local and state governing authorities. The remaining capacity of the landfill helps determine filling sequences, landfill operations, and staffing and equipment needs. Additionally, information regarding capacity is used by planners for long-term regional development. The remaining life component was weighted at 40 percent of the grade. Our calculations for the average remaining life of landfills resulted in a grade of D+.



**HAUL DISTANCE WITHIN PERMITTED SERVICE AREA** All permitted SWLFs have a designated area in which the facility is approved to accept solid waste. The areas vary between facilities and range from a single parish to the entire state and, in some instances, outside the state's borders. The grading factor for this variable utilized the maximum distance within the service area from the landfill site to the farthest reach within the service area. For simplicity, a straight line dimension was used in order to determine this factor rather than calculating the true travel distance.

Based upon the distance established, a grade was assigned depending upon where the distance fell within the Rating Scale. A Weighting Factor of 10% was used in the overall calculation. Our calculations of this factor resulted in a grade of B.

**HAUL DISTANCE TO NEXT AVAILABLE PERMITTED FACILITY**

In the event of emergency, natural disaster, unforeseen shutdown, or other directive, it may be necessary to reroute disposal vehicles to another permitted facility. As is the case with the majority of the landfills in Louisiana, the landfills are permitted to receive waste streams from adjacent facilities. The grading factor for this variable utilized the straight line distance from the SWLF in question to the next closest permitted facility. Again for simplicity, a straight line dimension was used to determine this factor rather than calculating the true travel distance.

Based upon the distance established, a grade was assigned depending upon where the distance fell within the Rating Scale. A Weighting Factor of 15% was used in the overall calculation. Our calculations resulted in a grade of A- for this factor.

**ALTERNATIVE HANDLING PROCEDURES**

Although for the most part the SWLFs within Louisiana appear to have sufficient remaining capacities, the utilization of alternative handling procedures could extend the lives of many of these facilities. Based on the summary of the 2009 Annual Recycling Reports<sup>6</sup>, municipalities generally handle solid waste generated by households, businesses, government facilities and schools. This waste includes non-bulky waste, such as, but not limited to corrugated cardboard, newsprint, office and mixed papers, food waste, plastics, glass, metals and textiles as well as bulky waste, such as, but not limited to tires, appliances, furniture, construction/demolition debris, wood waste and yard waste. Table 2 of the 2010 Summary indicated that there was a total of nearly 263,000 tons of materials recycled in 2009; however, this is still a very small value when compared to the amount of recyclable materials that are disposed of in Louisiana SWLFs on an annual basis.

TABLE 1: GRADE SUMMARY

Fundamental Components	Capacity Consumed	Remaining Life	Distance within Service Area	Distance to Closest Permitted Landfill	TOTAL GRADE
Weighting Factor	.35	.40	.10	.15	
Score	D+	D+	B	A-	C+

TABLE 2: GRADE SUMMARY

Evaluation Criteria		Unit	Rating Scale	Grade	Weighting Factor
Capacity Consumed	Cubic Yards per Year	0-25000	2	35	
		25001-50000	4		
		50001-100000	6		
		100001-250000	8		
		>250000	10		
Remaining Life	Years	0-5	2	40	
		6-10	4		
		11-20	6		
		21-30	8		
		>30	10		
Distance within Service Area*	Miles	0-100	10	10	
		101-200	8		
		201-500	6		
		501-1000	4		
		>1000	2		
Distance to closest permitted Landfill**	Miles	0-20	10	15	
		21-40	8		
		41-60	6		
		61-70	4		
		>70	2		

## SPECIFIC LOUISIANA SECTION ASCE RECOMMENDATIONS

-  Continue to reduce the amount and toxicity of waste generated and disposed through public outreach and source reduction education.
-  Continue to develop new initiatives to enhance sustainable practices in solid waste management systems.
-  Continue to work with communities and businesses to improve environmental protection.
-  Continue to promote household hazardous waste collection programs within communities.
-  Continue to encourage participation in recycling programs through residential and commercial customers.
-  Continue to provide regulatory compliance assistance/support and evaluate emerging management technologies.

## SOURCES

- <sup>1</sup> *Environmental Regulatory Code, Title 33 Environmental Quality, Part V Hazardous Waste and Hazardous Materials, July 2010.*
- <sup>2</sup> *Environmental Regulatory Code, Title 33 Environmental Quality, Part VI Inactive and Abandoned Hazardous Waste and Hazardous Substance Site Remediation, December 2009.*
- <sup>3</sup> *Environmental Regulatory Code, Title 33 Environmental Quality, Part VII Solid Waste, Subpart 1 Solid Waste Regulations, June 2010.*
- <sup>4</sup> *Guidance Document for Determining Solid Waste Landfill Capacity, Louisiana Department of Environmental Quality.*
- <sup>5</sup> *2009 Solid Waste Capacity Report, Louisiana Department of Environmental Quality.*
- <sup>6</sup> *December 2010 Summary of 2009 Annual Recycling Reports, Louisiana Department of Environmental Quality.*

## RAISING THE GRADE *5* key solutions

Our infrastructure is of vital importance to all; it sustains our quality of life, keeps us safe and healthy, allows us to be mobile, and provides the framework for our global economy to function. The Louisiana Section of the American Society of Civil Engineers offers the following 5 key solutions for raising Louisiana's grades:

- ❖ State and local governments should develop an educational campaign to inform citizens on how public infrastructure is developed, maintained, and funded. The citizens of Louisiana demand a clean environment, good roads, safe drinking water, and functional infrastructure, but are often unable to assess how public infrastructure is paid for and maintained.
- ❖ The Governor, State Legislature, and local government officials throughout the State of Louisiana should strive for transparency and earn public trust for infrastructure spending so that citizens are convinced their tax dollars are not being wasted in a bureaucratic system.
- ❖ The citizens of Louisiana need to be reminded by our elected officials about the benefits received from infrastructure investments. Infrastructure benefits should never be taken for granted.
- ❖ Elected officials should address the findings of the Report Card for Louisiana's Infrastructure and put forth a plan that deals specifically with the recommendations listed in each category of infrastructure to improve our grades.
- ❖ Elected officials need to take advantage of the expertise of civil engineers through professional and technical organizations, such as ASCE, when making decisions concerning public infrastructure projects and programs.

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### LOUISIANA SECTION LOUISIANA ENGINEERING CENTER

9643 Brookline Avenue  
Baton Rouge, LA 70809  
225/923-1662

[www.lasce.org](http://www.lasce.org)  
[www.lasce.org/reportcard.aspx](http://www.lasce.org/reportcard.aspx)  
[reportcard@lasce.org](mailto:reportcard@lasce.org)

### WORLD HEADQUARTERS

1801 Alexander Bell Drive  
Reston, VA 20191  
800/548-2723 703/295-6491 fax

### WASHINGTON OFFICE

101 Constitution Avenue, NW  
Suite 375 East  
Washington, DC 20001  
202/789-7850 202/789-7859 fax

