

ENVIRONMENTAL ISSUES AND HAZARD MITIGATION

Introduction

There are many in Terrebonne Parish who are beginning to “connect the dots.” They are coming to realize that the problems impacting the parish—increased traffic congestion, loss of open space in some areas of the parish, infrastructure costs (including roads), and a desire of more housing options, including affordable housing, to name a few—are interconnected and that the approach to solutions must, therefore, be integrated. This is, perhaps, the reason for emphasis on comprehensive planning as a method to approach all these various problems in an integrated manner.

These problems may be more acute in Terrebonne due to the amount of land actually available for development in the parish. It is commonly accepted that more than 90% of the Terrebonne's land mass is considered “environmentally sensitive.” This term was defined in the Terrebonne's Comprehensive Plan of 2004 as “...areas within which traditional development is not possible. Most, if not all, of these...areas are wetlands, swamps, and marshes.” Once considered abundant, these areas are being lost at an alarming rate, eroding away due to natural forces, allowing the salt water of the Gulf of Mexico to move ever farther inland. To put this in perspective, while Louisiana's coastal erosion problem is well known nationally, the majority of Louisiana's land loss from erosion each year takes place in Terrebonne Parish. The amount of land loss, as well as the receding outline of the parish's coast line, has been documented since the 1800s. The projections for land loss due to coastal erosion are dire and yet completely believable. This problem is now the recipient of a great deal of effort and money designed to stop the loss and eventually restore what has been lost. Progress, however, has been very slow and may not be fast enough to gain on the

problem.

Despite this, Terrebonne Parish has continued to grow, attracting new residents and workers to the jobs produced by its economic engine. As a result, Terrebonne's unemployment rate is among the lowest in the state and much better than the nation as a whole. This situation has helped to compound the Parish's struggles with its environmental issues, including the impacts of coastal erosion, the loss of barrier islands, frequent flooding from storm surge, and wind damage associated most often with hurricanes. However, water and air quality have given the Parish cause for concern, the former due at least in part to the lack of adequate sewage treatment and disposal in many area of the Parish (made worse by frequent flooding), and the latter because of pending (and probable) non-attainment status relative to ozone from the U.S. Environmental Protection Agency (EPA). All of these concerns and issues relate to Terrebonne's ability to grow in a sustainable and resilient manner.

1. Air Quality

Although the promulgation by EPA of the final rule on the new ozone standard has been delayed by more than a year (original date for the final rule was August 2010), Terrebonne Parish and the region have only been given a reprieve of sorts. The new standard will be promulgated, by all accounts, and it could significantly impact Terrebonne when the rule is finalized at some point in the near future. The expectation is that the new ozone standard will be measurably lower than the existing one, causing those areas which exceed the standard—and Terrebonne Parish is expected to be in that number—to fall into non-attainment status. When this happens, Terrebonne Parish and the region will be required to enact measures designed to achieve attainment status in a prescribed time period. There is little doubt the proposed new standard,



when made final, will generate controversy and possibly lifestyle changes in Terrebonne, particularly as the burdens placed on the parish by the new standard become more intrusive. This will come as a shock to many, but preparation should help to lessen the blow. As an aside, there is a growing contingent in the U.S., if not a majority of people led by the U.S. Chamber of Commerce, who believe the imposition of such air quality standards ahead of schedule, and based largely on *fiat*, will cause the national economy to falter and, based on the loss of jobs, slip farther off the precipice heading toward full-scale recession. This would undoubtedly have a serious adverse impact on Terrebonne's economic engine and ability to create jobs. Nevertheless, forewarned is forearmed, as the saying goes.

In order to provide context for the proposed new standard, some background discussion is useful and educational since many do not understand the "fuss" about ozone which is considered a health hazard by EPA. Ozone is actually a compound composed of two primary ingredients, called pre-cursors, combined in a photo-chemical reaction with sunlight. These two ingredients are volatile organic compounds (VOC) and nitrogen oxide (NOx). Ozone, then, is formed, not emitted, and it is commonly referred to as "smog" which is quite visible in many large U.S. cities. Potentially harmful levels of ozone, however, can be present without being visible in the way that smog is. The harm to humans results from the length of exposure such that longer exposure to a certain level of ozone is deemed just as harmful as short duration exposure at much higher levels.

Volatile organic compounds, many of which are man-made chemicals used and sometimes produced in the manufacture of paints, refrigerants, and even pharmaceuticals, generally exhibit high vapor pressures. They are often the

components of petroleum-based fuels, such as gasoline, and diesel, as well as paint thinners, dry cleaning solvents and hydraulic fluids which are common products used in various applications. Volatility and high vapor pressure go hand-in-hand as volatility is the tendency of a substance to vaporize or transition from a liquid or solid state or phase to a gaseous state. A substance with a higher vapor pressure (at any given temperature) vaporizes or transitions to a gas phase more readily than a substance with a lower vapor pressure. This means, obviously, that VOCs have a tendency to transition quickly to a gaseous state and enter the ambient air.

Today, however, the largest amount of VOCs emitted in Louisiana comes from biogenic sources (84%), according to the Louisiana Department of Environmental Quality (LDEQ). Such emission sources are the most difficult to deal with since they are the result of biological activity or from living things. The remaining sixteen percent of VOC comes from four other sources, with on-road mobile sources accounting for only two percent of the total. Obviously, this leaves little room for improvement in terms of VOC emission reduction without the imposition of drastic measures.

- | Ozone "Ingredients" |
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| <ul style="list-style-type: none"> • Volatile Organic Compounds (VOC) • Nitrogen Oxide (NOx) • Sunlight |

The other ingredient needed to join with VOC in the sunlight-induced photo-chemical reaction to form ozone is nitrogen oxide (NOx). This substance is formed when fuel is burned at high temperature such as happens in motor vehicle engines. Also, the combustion of coal and oil at electric power plants is another ("human")



source of nitrogen oxide. A natural source of NOx is the lightning bolt, but these cannot be effectively controlled or eliminated. In Louisiana, biogenic sources account for only eight percent of total NOx emissions according to LDEQ. The largest producers of NOx in the state at this time are point sources, that is, stationary sources that can be identified by name and location. Although the two figures are not strictly comparable, in 1999, the EPA reported that mobile sources of NOx (both road and non-road) accounted for 56% of total NOx emissions nationwide. In Louisiana, using 2009 figures, the comparable NOx level is 39%. One is tempted to conclude that vehicle emissions have been greatly reduced through the utilization of more efficient automotive engines in Louisiana and the nation even as vehicle miles driven have increased.

With point sources identified as the main culprit for NOx emissions in Louisiana, remediation or actions aimed at reducing NOx emissions at these locations may be easier to achieve. However, such measures could bring about inevitable changes in lifestyle, although these measures, at least initially, will be voluntary.

Why is the EPA considering lowering the ozone standard again? The answer is found in the Clean Air Act of 1990, a revised and expanded version of the legislation first passed in 1970. This legislation mandates the EPA to set benchmarks under the National Ambient Air Quality Standards program (NAAQS) for six critical air pollutants, and to do so periodically. Typically, the standard is reviewed, and revised if warranted, every five years based on the best available scientific data. Ozone is one of these six air pollutants and the EPA describes two types of standards relative to ozone. These are primary standards, aimed at protecting public health, and secondary standards which address public "welfare" issues, such as crops and sensitive vegetation.

In June 2004, the EPA announced a new ozone standard based on analysis of the air quality data recorded by monitoring stations around the country, including twenty-six locations in Louisiana. At that time, EPA set the standard for ozone at 0.080 parts per million (ppm), and only the five-parish area around Baton Rouge failed to meet this standard and, thus, fell into non-attainment. The standard for ozone is called an "8-hour" standard because it is taken as the three-year average of the fourth highest daily maximum 8-hour ozone concentration measured at each monitor within an area each year and, for attainment, the standard cannot be exceeded.

When EPA published the new ozone 8-hour standard of 0.075 ppm in June 2008, however, six more Louisiana regions joined the Baton Rouge area in the non-attainment "club." But by mid-September 2009, armed with new methods to calculate benefits associated with ozone reduction and positive benefit-cost analyses, EPA announced that it would reconsider the 2008 standard, and was looking for a new benchmark between 0.060 and 0.070 ppm for ozone.

In abandoning the general five year schedule it had used to develop and publish new ozone standards, EPA will plunge many more areas of the state into non-attainment, and several rather seriously. With an 8-hour ozone standard of 0.070 ppm, twenty-two of the twenty-six areas (about 85%) of the state which are monitored for air quality, will fall into non-attainment. This differs sharply with incremental approach that EPA had used in the past in publishing new rules and does not give most areas of the state a reasonable amount of time to achieve a standard before a new one is announced.

Although EPA had planned to sign the final rule in August 2010, within two years of the 2008 rule,



this has not happened yet, and LDEQ has temporarily set aside the development of its recommendations for attainment/non-attainment designations—previously required by the end of January 2011—until further notice. These designations were to have been based on the new 8-hour ozone standard and data obtained from the various air quality monitoring stations around the state which establish each area's design value relative to the official standard. Although monitoring and air sampling around the state continues, LDEQ must await the new ozone standard before submitting its designations. At some point, after having reviewed recommendations from all fifty states, EPA will publish the final designations, the ones that count. This was to have been done by the end of August 2011. It is not known at this point when this will occur, but there is little doubt that it will. Under the previous schedule, by December 2013, all State Implementation Plans (SIPs) were to have been submitted to EPA from the various departments handling air quality issues in each state, LDEQ in Louisiana.

The purpose of the state SIP is to explain in detail how those areas within its jurisdiction will meet the requirements of the Clean Air Act (CAA) whether through the enactment of specific regulations or other measures. These specific regulations and other measures are the factors that may bring about lifestyle changes and inconveniences that could require adjustments to daily living and activity patterns. The degree of disruption, however, is tied to an area's designation and classification, which are descriptive categories based on an area's design value. Even if an area achieves attainment based on the expected promulgated 8-hour ozone design standard, attainment does not mean that all the parishes in that area are free of consequences. In those fortunate attainment areas, steps will need to be taken to ensure the

area remains in attainment. But, most of these steps will be voluntary and the main thrust of local efforts to remain in EPA's good graces will be largely educational.

Classification Requirements for Marginal Areas

- Attainment timeline is 3 years
- Major Source 100tpy of either VOC or NO_x
- Emissions Inventory
- New Source Review (NSR) for Air Permitting
- Offsets of 1:1 to 1
- Transportation Conformity
- General Conformity (federal, non-highway projects)
- Additional requirements if you fail to attain the standard



But what of those areas of Louisiana, as well as the rest of the country, that fall into non-attainment and are classified as "marginal" (as in marginally exceeding the standard), or "moderate," or even "severe," depending on how far design values exceed EPA's standard for ozone? The consequences are cumulative as the area's classification becomes more of a concern. For example, for a non-attainment area classified as "marginal," certain "sanctions" are imposed which are designed to "help" the area meet the standard in a specified amount of time, three years in this case. For a non-attainment area classified as moderate, EPA allows more time to reach attainment designation (6 years), but not only are additional requirements imposed, all those imposed for marginal areas are included as well. Therefore, each classification step farther from attainment carries its own particular sanctions, plus the corrective requirements of the previous classification.



What will those areas that are in marginal non-attainment (the expected situation for Terrebonne Parish) be required to do in order to achieve attainment within the allotted three-year period? The requirements will be costly and add layers to the permitting process for industry, layers which will result in delays and additional costs. Overall, these requirements will place Terrebonne at an economic disadvantage relative to other areas of the state or country not faced with such burdens.

- Expected Requirements for Marginal Ozone Non-Attainment**
1. Emissions inventory identifying sources and quantities for VOC/NOx (in tons per year-TPY)
 2. Impose methods to reduce either VOC/NOx from major sources by 100TPY
 3. Introduce New Source Review, permitting process for new industrial construction or modifications requiring EPA pre-construction review for environmental controls if significant increases in regulated pollutants expected.
 4. Conformity determination

Specifically, an area in marginal non-attainment, under the expected requirements, will have to conduct an emissions inventory to find out where VOCs and NOx are being emitted and in what quantities (usually measured in tons per year, TPY), then figure out how to reduce by 100TPY either VOCs or NOx from major sources (identified in the emissions inventory), and introduce New Source Review (NSR), a permitting process which requires new industrial construction or modifications to undergo an EPA pre-construction review for environmental controls if the proposed new facilities or modifications would create significant increases in a regulated pollutant. Unfortunately, the term "significant increase" has not yet been adequately defined and, consequently, has been the subject of much litigation. New Source Review, therefore, appears to be mechanism which introduces considerable delay and costs into the industrial development process.

By way of perspective, EPA estimates, according to the Louisiana Department of Environmental Quality, that a 0.070 ppm ozone standard would require just the Baton Rouge multi-parish area alone to reduce NOx by a total of 250,000 TPY, plus some VOC reductions in a smaller area, at a cost somewhere between **\$3.1 and \$3.6 Billion**. To achieve the required NOx reduction, Baton Rouge and the multi-parish region could be expected to impose stricter vehicle emission standards, require a different (and more costly) gasoline formulation, require point source reductions in NOx, to name a few measures.

Statewide, the aggregate costs of these reductions would be much more. They could be considerable in Terrebonne, too, although not as high as the Baton Rouge region. Should EPA decide to drop the new ozone standard down to 0.060 ppm, the amount of the required NOx

Transportation Reduction Measures

- Vehicle Emission Reduction Activities
 - Ridesharing
 - Bicycle Lanes
 - Compressed Workweek, Flex-Hours
 - Telecommuting
 - Mass Transit: Buses, Light Rail, Vanpools




reduction in the Baton Rouge area, according to LDEQ, would exceed the entire 2009 emissions inventory of the state of Louisiana (all 64 parishes, point sources, area sources, on-road and non-road mobile sources combined) by nearly three percent at a cost in excess of **\$10 Billion**. Under this scenario (0.060 ppm), the costs imposed upon Terrebonne Parish and the region would be very, very burdensome.

Reduction thru Voluntary Measures

- Open Burning Restrictions
- Engine Idling Restrictions
- Truck Stop Electrification
- Traffic Light Synchronization
- Vehicle Scrappage Program
- Use of Electric Lawn Equipment
- Ozone Action Day Restrictions
- Clean City Coalition Programs
- Port and Marine Vessel Emission Reductions



The list of requirements for marginal non-attainment does not end with these. Areas in marginal non-attainment, as Terrebonne is expected to be, must also implement so-called "offsets," at a 1.1 to 1.0 ratio, meaning that the area's industries must reduce emissions from existing facilities by ten percent more than the emissions of any new facility that is to open in the area. This has potentially serious consequences for an area's economic development efforts, placing it at a disadvantage to other regions not burdened by such offset requirements.

A final requirement for areas in marginal non-attainment, calls for the performance of both transportation and general conformity analyses to certify that all federally-funded highway and non-highway projects are in accordance with the State Implementation Plan (SIP). Projects that are

shown through modeling to not conform to the SIP face the strong probability of losing federal funding participation unless modifications can be made to bring such projects into conformity. While the burdens and requirements imposed on an area as a result of marginal non-attainment of the ozone standard are quite costly, those caused by severe or even moderate non-attainment status are nearly unimaginable since the burdens and requirements are cumulative. It should be noted that, given the delay in coming out with the final ozone rule, requirements under non-attainment status could be altered. The direction these changes could take is unknown at this time.

Ozone Action Day Reduction Measures

- Maintain your vehicle properly
- Trip chain, combine errands and limit daytime driving
- Ride public transportation or carpool to work
- Take your lunch to work
- Walk or ride a bicycle for short trips.
- Refuel when its cool - after 6 p.m. Don't top off your tank
- Avoid prolonged idling and jackrabbit starts - "Drive Emission-Wise"
- Wait until the evening (6 p.m.) to mow your lawn or use gas powered lawn equipment
- Barbecue with electric starter or use a chimney, not fluid starter.
- Conserve energy in your home
- Spread the word! Talk to your coworkers and neighbors about the Ozone Action Program.



Since Terrebonne Parish is expected to fall into the marginal non-attainment status under an ozone standard of 0.070 ppm, it would be wise for Terrebonne Parish, in cooperation with South Central Planning and Development Commission (SCPDC), the region's Metropolitan Planning Organization (MPO) for transportation, to take steps now to lessen the burden and shock of the expected changes. Some of these impacts on citizens in the Parish, but not all, will be indirect, unless a needed highway project is not built because it cannot demonstrate conformity with the SIP. On the other hand, the imposition of locally-enacted "Ozone Action Days", could directly impact most people in Terrebonne,



causing them to alter driving habits, use available transit service for some routine trips, discard yard implements powered by two-stroke gasoline engines (a major contributor of ozone precursors), or even wait until after 6:00pm to undertake domestic chores such as grass-cutting with gasoline-powered lawn mowers.

a. Recommendations

At this point, the primary focus of Terrebonne Parish and SCPDC should be on education. Citizens of the Parish should be informed about the expected ozone

Recommendations
1. Produce/distribute educational brochure
2. Encourage greater transit usage with discounted passes
3. Relocate transit stops closer to entrances of shopping centers
4. Implement “complete streets” policy
5. Ensure subdivision connectivity and bike paths
6. Ensure sidewalk construction in new subdivisions

standard through a variety of means. This should not be done to alarm citizens about possible lifestyle changes, but to educate and suggest ways to reduce ozone emissions in the Parish now so that when (not if) the new ozone standard is made final and promulgated by EPA, Terrebonne (and the region) will be better able to cope with the potential adjustments required by the broad sweep of the Clean Air Act.

Recommended steps and actions Terrebonne Parish, in conjunction with South Central Planning and Development Commission (where appropriate), should implement as soon as possible include the following:

- Produce and distribute informational brochures on ozone and the relevant aspects of attainment/non-attainment, indicating what citizens can do each day to reduce the production of ozone precursors (VOC and NOx) in their daily routines.
- Encourage greater use of transit in the Parish by enlisting the cooperation of businesses located on transit routes in the distribution of discounted transit passes.
- Evaluate all aspects of the feasibility of relocating transit stops closer to the main entrances of major shopping facilities (Wal-Mart, etc.) to encourage transit usage for these types of trips.
- Implement a “complete streets” policy in Parish subdivision regulations and other relevant policies and procedures for the construction of all roads in the Parish, making it easier and safer for pedestrian, bicycle and transit modes (where appropriate) on these streets.
- Re-evaluate local subdivision regulations to ensure requirements for connectivity, including bike lanes, between adjacent subdivisions to reduce total vehicular travel on major streets and state roads.
- Implement policies for sidewalk construction in all new subdivisions to promote pedestrian travel.

2. Water Quality

a. Section 404 of the Clean Water Act

This 1972 revision to the Clean Water Act (CWA) was intended to protect wetlands adjacent to navigable waterways. It authorized the Corps of Engineers to implement and administer a permit process “for the placement of dredge and fill material in waters of the United States” (ibid. p. 39).



Although the Corps administers this program, the EPA through Section 404(c) has the power to disapprove or veto a Corps permit if the EPA believes that the proposed action will have “unacceptable adverse impacts on municipal water supplies, shellfish beds, or fishery, wildlife or recreation areas.”

The ultimate objective of this permit process is to mitigate the impacts of natural hazards on development in



coastal Louisiana by helping to reduce the loss of wetlands that buffer coastal communities from storm surge. By reducing the loss of wetlands, the program actually directs development away from the more exposed and risky areas of the coast.

b. The National Pollutant Discharge Elimination System (NPDES)

This is actually Section 402 of the Clean Water Act. EPA is the regulatory agency charged with setting effluent limits to protect the quality of the nation’s surface waters. The NPDES concentrates on “point sources” of polluting discharges, such as pipes, into U.S. waters. It requires permits for such discharging entities as municipal wastewater treatment facilities and municipal separate storm sewer systems (MS4), as well as sediment runoff and erosion control for construction activities.

Sediment runoff can clog or restrict the flow of watercourses that carry storm water, thus increasing floods or impairing or interfering with wetlands that serve as natural buffers

for storm surge. If the capacity of such areas is decreased, flood elevations can rise and inundate areas of the floodplain or shore not normally impacted.

3. Hazard Mitigation

Terrebonne is a coastal parish and, as such, it can be significantly impacted by eight specific natural hazards common to coastal Louisiana. These include flooding, subsidence, coastal erosion, sea level rise, various wind-related events (tornadoes, windstorms, and hurricanes), and storm surge. Although Louisiana may from time to time be impacted by geologic natural hazards, most natural hazards affecting the state, particularly its coastal parishes, fall into the atmospheric and hydrologic categories. In general, natural hazards are described by the scientific community in terms of risk and vulnerability. According to the *Louisiana Coastal Hazard Mitigation Guidebook*, risk is defined as “...the probability of an event or condition occurring that will result in injury or damage” (p.7). Vulnerability is the area’s or structure’s “susceptibility...to damage” (ibid).

Given coastal Louisiana’s historical experience with reoccurring natural hazards of the atmospheric and hydrologic varieties, it can be safely concluded that the coastal zone of the state is a high-risk place to live and work. This can also be said without fear of contradiction for Terrebonne Parish as well. Most of us now living in Terrebonne Parish for any length of time have experienced these hazards on almost an annual basis. These natural hazards have been so destructive that virtually all development here “... is at risk no matter where or how it takes place.” Solutions which potentially offer a high degree of protection—levees and river diversions—may require as much as forty to fifty years to complete. Some have argued that these solutions



may come too late. Action is needed immediately to forestall damage from these hazards. If Terrebonne Parish is to continue to function over the next several decades while these long-term structural solutions are designed and implemented, the Parish must turn to comprehensive planning and give much greater attention to non-structural measures in order to reduce hazard losses.

Fortunately, Terrebonne Parish has placed emphasis on both of these methods. But now, for the first time, the Parish wants to make sure that sustainability and resiliency are introduced into the comprehensive planning process so that an integrated approach to hazard loss reduction considers all possible aspects of the issue. With an updated Hazard Mitigation Plan, a considerable number of non-structural projects completed or underway (residential elevations), proposed amendments to strengthen its Flood Damage Prevention Ordinance, along with this comprehensive planning effort which has been designed to consider sustainability and resiliency in its recommendations, Terrebonne has made and continues to make significant progress toward becoming a sustainable and resilient coastal parish.

Despite this progress, however, Terrebonne is faced with continuing challenges from sea level rise and land subsidence. Throughout coastal Louisiana, including Terrebonne Parish, the effects of sea level rise are made to appear more severe due to land subsidence. While scientists believe that subsidence results, at least partially, from on-going geological processes, they also think it has been accelerated by a variety of "human-induced activities like pumped drainage, withdrawal of subsurface fluids during oil and gas production, and depressurization of shallow gas fields" (ibid. p. 31). Although there is very little Terrebonne Parish can do to stop sea level rise at

its source, it can look longingly at the Mississippi River and the vast amounts of sediment it carries (largely wasted at this time) and work on "...re-establishing the connection" between it and the vast coastal wetlands and marshes it once built.

4. Existing Regulatory Framework

Land use and development in the coastal zone of the state, including Terrebonne Parish, are regulated by certain conservation and environmental laws which indirectly influence local planning for hazard mitigation. Some of these offer incentives to encourage such planning, but none are as effective as actual planning for hazard mitigation. What follows is a brief description of the major federal regulations which can shape land use and hazard mitigation planning.

a. The Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) authorizes (but does not mandate) coastal states (the Great Lakes states are included in this legislation) to establish their own coastal zone management programs, but retains federal oversight responsibility. Louisiana has chosen to participate in this program, recognizing the need for effective coastal zone management and induced, perhaps, by the incentives contained in the CZMA.

b. The Coastal Barrier Resources Act

The Coastal Barrier Resources Act (CBRA) was passed by Congress in 1982 to essentially reverse federal and state policies which encouraged development of barrier islands and beaches. Although CBRA does not restrict federal financial assistance to existing communities, it no longer encourages growth in areas where it does not exist. Specifically,



under CBRA, the federal government no longer provides assistance for the construction of infrastructure (water and sewer systems, roads, bridges, airports, seawalls, etc.) on certain barrier islands. This type of infrastructure would encourage or facilitate growth where it did not exist before. This act also restricts the availability of federal flood insurance, certain types of projects normally undertaken by the Corps of Engineers, and loans from the Veterans Administration or the Federal Housing Administration. Not prohibited by this law are private financial transactions or the construction of infrastructure, etc. using private, state, or local funds.

Some of Louisiana's coastal barrier islands are exempt from the provisions of CBRA because they were inhabited before the law was enacted. These include Grand Isle (Jefferson Parish) and parts of the Cameron Parish shoreline. Presumably, the barrier island formations off Terrebonne's coast would fall within the restrictions of this act.

c. The National Flood Insurance Program (NFIP)

Congress enacted NFIP in 1968 in order to address "the cycle of building, destruction, disaster relief and rebuilding that was being repeated as populations encroached into riverine and coastal floodplains." Although a voluntary program initially, participation became mandatory in 1973 if the community expected to receive "any form of federal financial assistance for acquisition or construction purposes" in flood zones. Federal financial assistance has been broadly construed to include loans "guaranteed, insured or secured" by the Veterans Administration, Federal Housing

Administration, or the Rural Housing Service. It also includes federal disaster assistance used to repair or reconstruct buildings damaged or destroyed by flooding in a flood zone. While the program is still technically voluntary, few individuals or communities can afford to forego the benefits offered through participation in NFIP. Even in private transactions, lenders such as banks require that mortgaged properties in flood zones carry flood insurance. Although the NFIP is not concerned with land use from a regulatory standpoint, it is implemented through floodplain regulations which are intended to encourage the wise use of floodplains to reduce losses.

Part of the NFIP is the Community Rating System (CRS) which rewards communities that meet specified criteria with reductions in flood insurance premiums. Much of the CRS program is designed to improve the resiliency of participant communities. Fortunately, Terrebonne Parish continues to avail itself to the benefits of the CRS program with subsequent flood insurance premium reductions enjoyed by those in the parish who participate in this program. It is interesting to note that CRS may award up to 900 CRS rating points for the creation of permanent no-build areas (see discussion below). In addition, for buildings in hazardous areas (flood-prone, etc.), that cannot be relocated or removed, retrofitting of these buildings can earn up to 2,800 CRS points.

d. Flood Disaster Mitigation Act of 2000 (DMA 2000)

The DMA 2000 amended the National Flood Insurance Program (NFIP). In response to DMA 2000, the State of Louisiana has prepared a statewide Hazard Mitigation Plan



(HMP). This plan, as well as those prepared by local governmental entities, follows the required planning process which allows those entities with approved HMPs to retain eligibility to receive federal disaster mitigation funding when such funds become available after a presidentially declared disaster. Although the state HMP provides a great deal of information and technical assistance regarding best practices for mitigation, "...it does not include land use decisions or requirements." Such decisions are left to local governments.

While all these pieces of federal legislation contribute to hazard mitigation and the lessening of storm impacts in Terrebonne Parish, none of these mandate land use changes. The use of land in high hazard areas of the state is the purview of local governments.

Yet, some form of land use regulation in high hazard, flood-prone areas is recommended as a way to reduce the damages caused by hurricanes with their high winds, storm surge, and flooding. This was suggested in the recommendation offered for Terrebonne Parish in the *Louisiana Speaks Regional Plan* produced in 2007 by the Louisiana Recovery Authority (see pages 52-53). In addition, an outright prohibition of new development in wetland areas and the requirement for buffer zones adjacent to levees were offered by way of a Smart Growth approach to protect investment in levees and wetlands inside hurricane protection systems in *Louisiana's Comprehensive Master Plan for a Sustainable Coast* produced by the Coastal Protection and Restoration Authority of Louisiana in 2007. These wetlands are seen as a vital line of defense within the levee system that helps to reduce flooding in the event of levee failure

or levee topping.

Many other communities and counties around the country, which employ some type of zoning for land use control, also use the mechanism of a floodplain/flood hazard overlay district on those areas of their jurisdictions which are susceptible to periodic flooding and the problems that such flooding causes. These overlay districts embedded in the zoning ordinance are in lieu of separate, free-standing ordinances in the city, municipal, or county codes which deal with the same topic. Such overlay districts describe additional requirements for construction in floodplains. Examples include: Marshall County, Iowa; Prince William County, Virginia; Town of Stoneham, Massachusetts; Town of Newbury, New Hampshire; City of Savage, Minnesota; City of Springfield, Ohio; and City of San Bernardino, California. These are by no means the only examples of such floodplain overlay zoning districts.

Although Terrebonne Parish has no land use regulations in place for most of the parish, outside of most of the urbanized area, it should be possible to incorporate a floodplain overlay district applicable to those unregulated areas of the parish also falling in the 100-year floodplain.

5. Other Planning Documents

a. Louisiana Speaks Regional Plan: Vision and Strategies for Recovery and Growth in South Louisiana. May 2007. Louisiana Recovery Authority.

The development of this regional plan entailed a massive grass-roots planning effort encompassing virtually all of south Louisiana impacted by the storms of 2005. The planning



effort gave all participants from St. Bernard to Calcasieu Parish the opportunity to re-shape the future of their respective parishes in light of the devastation caused by these hurricanes and subsequent flooding. In these areas, the *Louisiana Speaks Regional Plan (LSRP)* built upon allied planning efforts, including *The Unified New Orleans Plan: Citywide Baseline Recovery Assessment*, prepared by the Citywide Planning Team in October 2006, and *Louisiana's Comprehensive Master Plan for a Sustainable Coast*, prepared by the Coastal Protection and Restoration Authority of Louisiana in April 2007.

In developing LSRP, the planning team at its meetings in Terrebonne learned that the resident of the parish and surrounding areas were vocal and clear about how they wanted Terrebonne to redevelop. Regarding redevelopment patterns for the Houma metro area, 75% of the citizens who took part in the survey favored greater public and private reinvestment and focused new development—which represents a significant change in development patterns—in areas of the parish already developed. This shift appears to be away from flood-prone areas. Supporting this is the finding that 87% of respondents favored regulations and incentives that emphasize methods to reduce community risk in flood-prone, unprotected areas. According to LSRP, the Houma area "...sees a combination of reinvestment and new growth activity" and new development "within protected areas" and around existing communities (p. 56).

During the course of meetings in the parish which led to the vision for the redevelopment of Terrebonne Parish, the strong consensus was for a safer, stronger, smarter Terrebonne with a series of strategies and actions

designed to accomplish this (p. 52-53). These strategies and actions support and promote both community resiliency and sustainability. They are as follows:

- Integrate coastal restoration and protection projects, land development, and state and regional infrastructure investments. All of these must be on the "same page," in that decisions in one area must be cognizant of and supportive of decisions in another area.
- Invest and develop smarter. This can be done by committing to the following actions:
 - Redirect public investments to support smarter private development (promotes sustainability)
 - Reinvest in existing communities, to more efficiently use public monies (promotes sustainability)
 - Preserve sensitive land (promotes sustainability)
 - Effectively manage risk (promotes resiliency)
 - Create new walkable, mixed-use communities with higher densities, more efficient use of infrastructure (promotes both resiliency and sustainability)
 - Provide greater safety from storms (promotes resiliency)
 - Build Transportation Network of the Future, based on the following principles:
 - Efficient passenger transportation that supports our communities (supports sustainability)
 - Efficient goods movement that supports our economy (supports both resiliency and sustainability)
- A seamless network of regional and local transportation service corridors with public investment and land development focused along these corridors (promotes



- sustainability)
- Manage Storm and Flood Risk
- Restore wetlands (supports both resiliency and sustainability)
- Build strategic levees, such as the "Morganza" system for Terrebonne (supports resiliency)
- Enforce building codes (promotes sustainability and resiliency)
- Implement coastal zoning ordinances with such new concepts as "rolling easements" and floodplain overlay districts (supports both resiliency and sustainability)
- Focus new developments in low-risk areas (promotes sustainability)
- Educate homeowners living in high-risk areas (a part of the CRS program which also promotes resiliency).
- Manage our watersheds (in conjunction with BTNEP's Comprehensive Conservation and Management Plan. Greatly supports sustainability of our region).
- Purchase high-risk and environmentally sensitive land through such methods as conservation easements, etc. (promotes both resiliency and sustainability)

b. Terrebonne Parish Hazard Mitigation Plan Update 2009

The parish's Hazard Mitigation Plan Update (HMPU) was produced through a cooperative effort which included many stakeholders in Terrebonne Parish. The outcome of the planning process employed is the Action Plan which calls for specific steps or actions to be taken to reduce or eliminate storm damage and flooding in the parish. Actions recommended specifically include elevations and acquisitions, among other actions, designed to achieve the desired results.

The Steering Committee for this planning effort agreed upon goals that the plan would work to achieve. Among them is the goal of facilitating sound development in the parish to reduce or eliminate impacts of hazards (Goal No. 4). This goal is supported by several objectives. Among them is the objective of guiding commercial and industrial development to non-hazard areas of the parish to limit business interruption, which promotes resiliency (See p. c3-7ff of the HMPU). Several of these goals and objectives directly relate to resiliency and sustainability. One recommendation pertains to evaluation of the zoning ordinance for areas where resiliency/sustainability codes could be introduced or strengthened. Also, the Action Plan places emphasis on acquisitions/elevations of RL/SRL properties, which addresses both resiliency and sustainability.

c. Louisiana's Comprehensive Master Plan for a Sustainable Coast, Coastal Protection and Restoration Authority of Louisiana, 2007

"Humans have altered Louisiana's coastal ecosystem for centuries, and these changes have allowed our communities and the nation to prosper. However, the unintended effects of these changes have now reached a critical mass that threatens not just the health of the natural systems but life in south Louisiana as we know it. Our challenge: to promote a sustainable coast that allows both human and natural communities to thrive over the long-term." p. 12



This document, *Louisiana's Comprehensive Master Plan for a Sustainable Coast* (CMP) was in development at about the same time as the *Louisiana Speaks Regional Plan* (LSRP), although it was published and made public just prior to the release of the LSRP. It was also used as one of the allied documents which served as the basis for many of the recommendations in the LSRP. As such, the two planning documents present one harmonious picture of how our coastal areas can be sustained, and how our coastal communities can be redeveloped in a sustainable, resilient manner, thus helping to promote coastal sustainability.

In promoting sustainability and community resiliency, particularly as these relate to hurricane protection, the CMP suggests a number of strategies and actions communities can use to reduce or minimize their vulnerability to hurricanes and the flooding they cause. These include:

Implement a variety of non-structural solutions to minimize risks. Some actions suggested are:

- Smart growth: Communities can prohibit development in wetland areas and require buffer zones near levees. They can enforce appropriate land use and zoning regulations to protect the enormous public investment in levees and the all-important wetlands inside hurricane protection systems. These wetlands are needed to promote interior flood storage capacity which can reduce flooding in the event of levee failure or levee overtopping during storm events.

It is interesting to note that for communities and parishes that participate

in the CRS rating program, the creation of permanent no-build areas can earn up to 900 CRS points. In addition, for buildings in hazardous areas (flood-prone, etc.), that cannot be relocated or removed, retrofitting or elevating these buildings can earn up to 2,800 CRS points.

- Flood insurance: According to statistics, flooding is much more likely (nearly 3 times more likely) than fire during course of 30-yr. mortgage. Unfortunately, Louisiana has the dubious distinction of owning the highest rate of repetitive flood losses in nation. Flood insurance coverage through the National Flood Insurance Program (NFIP) would help greatly and it is a requirement for participation in Community Rating System (CRS) to lower flood insurance premiums. Under this program there is a substantial incentive to CRS-participating communities that zone floodplains with low density uses.
- Elevation and retrofitting of structures: With the adoption and application of improved building construction standards throughout Louisiana there is now a lower risk of wind damage. Structure elevations have done much to help avoid damage from storm surge. Hazard Mitigation Grant Program (HMGP) funds are available for these types of activities which promote resiliency.
- New building codes: In 2007 the State of Louisiana adopted a new Uniform Construction Code. This is a mandatory building code which helps new construction in the state to better withstand hurricane force winds. This new building code is most effective when used in concert with structure elevations.



- FEMA-approved hazard mitigation plans. Such plans are now required by FEMA to maintain eligibility for federal disaster funds. Hazard mitigation plans help communities identify their likely natural disasters, highlight their vulnerabilities, and adopt an Action Plan designed to address and mitigate these vulnerabilities. All 64 parishes have such plans now, and all are subject to five-year updates. If a community prepares and adopts a Post Disaster Recovery Plan, however, it can earn up to 10 CRS points.
- **Evacuation Routes:** Communities, parishes and coastal regions should identify safe evacuation routes, and armored and or raise them (as needed) to preclude flooding.
- "Compartmentalization": This is a flooding defense strategy picked up from the Dutch. This method sets up 2nd lines of defense in case of levee failure. With such compartmentalization, areas of the community are disconnected from each other hydrologically such that the entire community is not inundated if the first line of flooding defense fails at some point or in some area.
- **Focused Structural Solutions:** Communities can engineer and build a multi-layered protection system, but these are not inexpensive solutions. If part of the strategy of protection, they should be designed and constructed based on lessons learned. In addition to compliment these engineered structural solutions, communities can take steps to strongly discourage unwise development in flood-prone areas through appropriate land use regulations. These would greatly

help to protect the considerable public investment in the protection system (levees, floodgates, locks, etc.).

"...Wiser land use practices must govern the way we live in this dynamic landscape if we are to create safe communities that thrive over the long-term." (p. 15)

d. Comprehensive Conservation and Management Plan (CCMP) for the Barataria and Terrebonne basins. June 1996.

The *Comprehensive Conservation and Management Plan* (CCMP) produced under the auspices of the Barataria-Terrebonne National Estuary Program (BTNEP) was driven by requirements of Section 320 of the Clean Water Act (CWA). The National Estuary Program (NEP) under which BTNEP functions, was created by Congress through Section 320 of CWA in 1987. This program is administered by U.S. Environmental Protection Agency (EPA).

The goal of NEP is the prevention of activities that: 1) threaten the estuary's public water supply; 2) are harmful to shellfish, fish, and wildlife populations, and, 3) negatively impact recreational opportunities for estuary residents. It should be noted that in the long-term, all of these objectives address the region's sustainability.

The CCMP is meant to serve as guidance for the preservation and restoration efforts throughout the Barataria-Terrebonne estuary. In the CCMP's Action Plan, Ecological Management (EM) as it pertains to Water Quality is one of the plan's stated objectives.



At least three of the actions under this objective are directly relevant to the sustainability of Terrebonne and the region and its waterways and estuarine system. These actions are the following:

- EM-10 Reduction of sewage pollution
- EM-11 Reduction of agricultural pollution
- EM-12 Storm water management

These actions are designed to improve water quality in the region and, as such, are directly related to the region's long-term sustainability.

Terrebonne Parish, which probably submitted a resolution in support of the CCMP and its goals and objectives in the mid-1990s, should renew its commitment to support these sustainability goals of BTNEP/CCMP. However, if no such resolution was adopted previously, Parish Administration should prepare one and submit to the Parish Council for consideration and adoption.

