

Recommended Best Management Practices

## **Nonpoint Source Pollution Sand & Gravel Mining Industry**

Cover Photo: Color Infrared Orthophoto, Southeast quadrant of Pride and Southwest quadrant of Pine Grove quadrangles, LA, 50:1 MrSID compressed, UTM 15 NAD83, Louisiana Oil Spill Coordinator's Office (2000).

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## Foreword

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**Sand, gravel, and crushed stone – the main types of natural aggregate – are essential resources for use in construction today.**

However, the manner in which these resources are mined are under more scrutiny today, because of the habitat and water quality impacts that mining operations have caused within the past. Therefore, the Louisiana Department of Environmental Quality (LDEQ) has worked with the Concrete & Aggregate Association of Louisiana, Inc. to develop a set of best management practices (BMPs) that should be utilized for all wet mining processes of sand and gravel mining operations within Louisiana. The goal is to reduce the amount of sediment and turbidity in streams and rivers in Louisiana that result from sand and gravel mining and improve water quality in watersheds where these mining operations exist.



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*Sand and gravel is Louisiana's second most valuable nonfuel resource*

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Aggregate production accounts for about half of the non-fuel-mining volume in the United States. In the future, the rebuilding of deteriorated roads, highways, bridges, airports, seaports, waste disposal and treatment facilities, water and sewer treatment systems, and private and public buildings will require enormous quantities of aggregate to be mined.

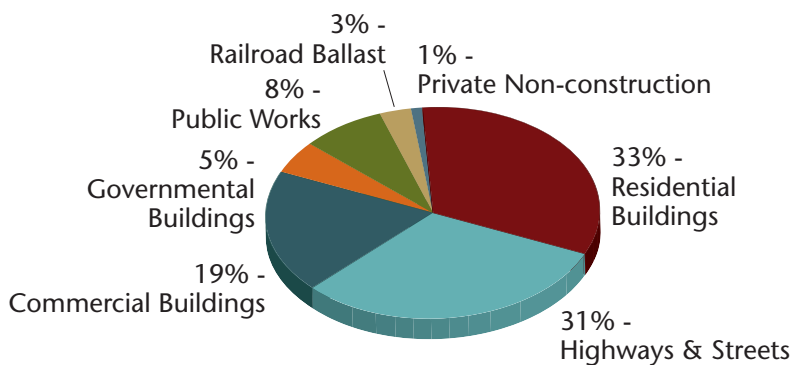
An area's geology, land ownership, land use, and transportation infrastructure are factors that affect aggregate supply. Although potential sources of sand, gravel, and crushed stone are widespread and large, land-use choices, economic considerations, and environmental concerns may limit their availability.

Providing aggregate resources for our country’s increasing needs will be an ongoing challenge. Understanding how sand, gravel and crushed stone are produced and how the related environmental impacts are prevented or mitigated can help citizens, communities, and our nation meet this challenge. Aggregate resources are vital to our way of life because they are the major raw materials used in construction of roads, bridges, rail lines, hospitals, schools, homes and factories. The mining and processing of natural resources such as aggregate, commonly raises concerns about potential environmental impacts. Nevertheless, we must have access to a readily available supply of high quality aggregate if we wish to maintain our current lifestyle. Aggregate producers can meet the nation’s demand for aggregate without causing undue harm to the environment. The question is how to achieve a balance among the economic, social, and environmental aspects of aggregate resource development.

## Introduction

**Deposits of sand and gravel, the unconsolidated granular materials resulting from the natural disintegration of rock or stone, are generally found in near-surface alluvial deposits and in subterranean and subaqueous beds.** Sand and gravel are products of the weathering of rocks and unconsolidated or poorly consolidated materials and consist of siliceous and calcareous components. Such deposits are common throughout the United States. Construction sand and gravel is made up of varying amounts of different rock types and is, therefore, of varying chemical composition. Silica, or silicon dioxide (SiO<sub>2</sub>), is the major constituent of commercial sands. Lesser amounts of feldspar, mica, iron oxides, and heavy minerals are common. Industrial sand, often called silica sand, and industrial gravel differ from construction sand and gravel in that they contain high percentages of quartz, or silica, typically 95 to 99 percent.

The largest use of construction sand and gravel (about 48 percent) is as aggregate for the production of concrete. The second largest use (about 22 percent) is as base material for highways, railways, runways, etc. Other major uses include aggregate for hot mix asphalt (about 12 percent), and



2004 statistics for all types of aggregate use.

fill for highway, dam, and other recontouring types of projects (about 14 percent). The other 4 percent makes up railroad ballast, roofing granules, filtration media and other miscellaneous uses. Sand and gravel typically are mined in an open pit excavation (i.e., dry mining) or by the use of a dredge (i.e., wet mining). Open pit excavation can be carried out with power shovels, draglines, front-end loaders and bucket wheel excavators.

Mining by dredging involves mounting the equipment on boats or barges and removing the sand and gravel from the bottom of a body of water by suction or bucket-type dredges. After mining, the materials are transported to the processing plant by suction pump, earth mover, barge, truck, belt conveyors, or other means.

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*Note: This manual is intended only to address wet mining processes*

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*Open pit dredging operation – MMM closeup of a dredge*

### **Common Uses of Sand & Gravel include:**

1. Concrete and Asphalt Construction for Public Works Infrastructure
  - Road construction (road base, concrete ready mix, asphalt)
  - Sewage Treatment Plants
  - Water Purification Plants
  - Incinerators/Recycling Facilities
  - Dams, Reservoirs and Water Supply
  - Utility Lines (water, sewage, electrical)
2. Erosion Control and Slope Protection
  - Dams
  - Roadways/Bridges
  - Shorelines/Navigation Channels
  - Rivers/Stream Banks
  - Construction Site (exits and runoff control)
  - Wetland and Stream Restoration
3. Filtration
  - Sewage Treatment
  - Wastewater Control

- Septic Tank Leaching Fields
  - Infiltration for Aquifer Replenishment
4. Reclamation
    - Backfill
    - Land Cover
  5. Landfills and Waste Disposal
    - Leachate and Gas Collection Layers
    - Cover and Protection
    - Leachate pH Adjustment

## **Nonpoint Source Storm Water Management** \_\_\_\_\_

**Nonpoint source pollution is one of the most significant water quality problems affecting Louisiana's rivers, bayous, lakes and estuaries.** Emphasis has been, and continues to be placed, on reducing these impacts. Through implementation of Best Management Practices (BMPs) for all types of nonpoint activities (i.e. farming, forestry, urban development and construction) nonpoint source pollutants can be reduced.

Sand and gravel mining operations can potentially cause off-site impacts to water quality if site planning and BMPs are not factored into every aspect of the mining operation. Nonpoint source runoff can occur from the time the site is initially cleared to the time when the berm or levee is constructed to retain and divert the water back into the pit. Since nonpoint source runoff occurs during rainfall events, sediment, nutrients and organic material can leave the site during these events and migrate to the receiving stream (i.e., ephemeral or intermittent) through small natural channels or depressions at the site.

Sand and gravel mining operations disturb land and soil in order to build entrance roads to the site, to level the area where the equipment will be installed, and to levee the entire site and the pit where storm water will be retained once the operation is fully functional. Good site planning and operation can reduce the likelihood of sediments moving off of the operation from the time the site is cleared of the trees or other vegetation, to the time the site is closed and restored, to the uses that the landowner and the company have agreed to in their contractual agreement.

Several aspects of storm water management are mandatory and require a storm water permit from the Louisiana Department of Environmental Quality (LDEQ). The purpose of this BMP Manual is to provide information on the types of BMPs that should be utilized during every phase of the mining operation in order to prevent pollutants from leaving the mining operation.

References to LDEQ's authority to require permits and to implement programs to protect the state's water quality have been included in the Appendix of this manual.



The State of Louisiana has an active sand and gravel mining industry and these operations, if not properly managed, may be a source of increased sediment loads to rivers and streams within Louisiana. Whereas in forestry, agriculture, and construction activities, nonpoint source pollutants consist primarily of sediments, nutrients, and pesticides; in resource extraction, many minerals are mined, each with their own specific set of chemical and physical properties. Some of the activities associated with mining include discharges from inactive operations, surface runoff from inactive road networks, old tailings and spoil piles. Although active mine sites also pose water quality problems, they are typically considered to be point source discharges, which are regulated under state and/or federal permits. Nonpoint source pollutants associated with metal and non-metal mining activities include (1984, Report to Congress):

- Runoff of sediment from haul roads at both active and inactive mine sites;
- Drainage of pollutants, including acid, sediment, salts, and metals from inactive mines; and
- Drainage and leachate containing acid, metals and sediment from the spoil and tailings piles generated both by active and inactive mines.

Siltation is considered the highest nonpoint source priority of concern in wetland areas and the second highest priority affecting lakes (1992 Report to Congress). Mining related activities have been estimated to cause 7 percent of the nation's nonpoint source impacts to lakes and 17 percent to coastal waters. Sediments from mining operations could consist primarily of biologically inert materials which could potentially adversely affect the water body's designated uses. Inert suspended sediments have the following detrimental impacts to the aquatic habitat:

- Sediments smother lower forms of aquatic life in the bottom of a stream. This can destroy the aquatic life in a stream because it kills the food supply. If sedimentation continues with a high concentration of suspended solids, the stream will fail to recover. Sediment deposition may also cover fish eggs and break the life cycle; thereby, destroying the fishery uses of the stream;
- A continued cloudy condition of a stream will deter its use for almost all recreational purposes;
- Directly or indirectly, it can change the characteristics of a stream channel and in many instances can limit boat usage and cause additional flooding hazards;
- In rivers that are utilized for drinking waters, silt creates an additional expense upon the water treatment and purification process for both domestic and industrial users; and
- It decreases photosynthetic action and thereby reduces the capacity of a stream to assimilate organic matter.

Whereas LDEQ establishes effluent limitations on discharges from sand and gravel operations as point source discharges, best management practices need to be utilized in all phases of excavation and reclamation of these mining sites.

## Regulatory Permitting

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### A. LDEQ

The Louisiana Department of Environmental Quality (LDEQ) regulates process wastewater, process area storm water, storm water runoff from auxiliary process areas, construction storm water, and treated sanitary wastewater discharges related to extraction, mining or dredging of dirt, sand, gravel, shell and similar materials.

A self-implementing general permit (LAG490000) is available for Louisiana Pollutant Discharge Elimination System (LPDES) permit coverage for discharges of process wastewater, process area storm water, storm water runoff from auxiliary process areas, and treated sanitary wastewater from sand and gravel mining sites.

General Permit LAG490000 does not cover commercial dredging of shell or other natural resources in natural water bodies which are regulated under Section 404 of the Clean Water Act (CWA). Operators who wish to apply for a permit to commercially dredge shell or other natural resources that are regulated under the CWA Section 404 permit process must submit an individual permit application.

Site activities that include clearing, grubbing, grading, constructing roads, and/or excavation that are being conducted as part of the exploration and construction phase of a mining operation are activities that require coverage under a separate LPDES permit for storm water discharges from construction activities. Exploration and construction activities that disturb equal to or greater than one acre but less than five acres of land are regulated under LAC 33:IX.2511.B.15 and are covered under the LPDES Storm Water General Permit for Small Construction Activities (LAR200000). Exploration and construction activities that disturb five acres of land or more are regulated under LAC 33:IX.2511.B.14.j and are required to obtain permit coverage under the LPDES Storm Water General Permit for Construction Activities (LAR100000).

Although the NOI requirements for the two permits are different, they both require that a notice be posted at the construction site, that a storm water pollution prevention plan (SWPPP) be developed and implemented for the exploration and construction-related phases, and that LDEQ be notified when the construction activities cease and the site has been finally stabilized as defined in the construction permits.

Certain land clearing and/or excavation activities require approval from the State Historic Preservation Officer prior to applying for general permit coverage. Under certain circumstances, authorization under the general permit requires coordination with the U.S. Fish and Wildlife Service (USFWS) prior to applying for permit coverage.

## B. Standards

The Louisiana Department of Environmental Quality is required to protect and maintain all of the water bodies of the state used for fishing and swimming. In order to ensure that these uses are protected, LDEQ has established water quality standards for parameters such as bacteria, dissolved oxygen and turbidity. These water quality standards have been adopted as state law and are reviewed by the U.S. Environmental Protection Agency (USEPA) to ensure that the State of Louisiana is in compliance with the Federal Clean Water Act and that the fishable and swimmable goals of the Act are met.

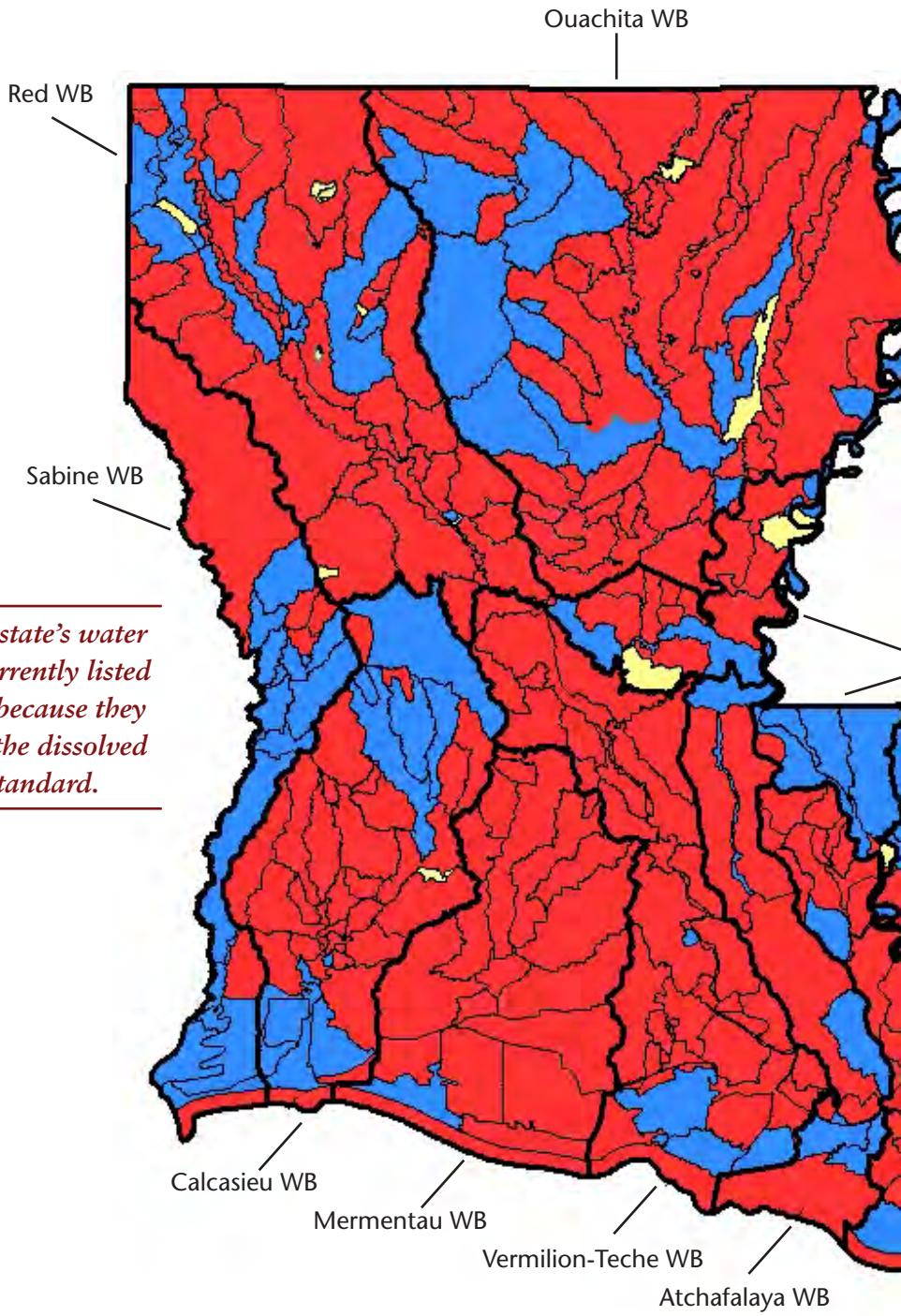
The types of water quality problems that can be associated with sand and gravel mining operations could include sediment leaving the site, causing an exceedance of the turbidity standard. Appendix III includes the turbidity standards for the different types of water bodies within Louisiana (i.e. scenic, primary contact recreation, etc.) There are also water quality standards for oil and grease and pH, which need to be considered at sand and gravel operations.

Many of the state's water bodies are currently listed as impaired because they do not meet the dissolved oxygen standard. For most water bodies, the water quality standard for dissolved oxygen is 5 ppm or mg/L. High levels of sediment, nutrients or organic material entering the water body can result in low dissolved oxygen levels, which can affect the viability of fisheries in the stream. LDEQ monitors the water bodies of the state on a 4-year cycle to determine whether water quality standards are met or whether limits (i.e., Total Maximum Daily Loads) will need to be established for the water body in order to restrict the amount of pollutants that can be discharged into the water.

Another factor that can affect the concentration of dissolved oxygen is the temperature of the water. During hot summer months when the air temperature rises, the temperature of the water does also. One way to protect the stream from direct sun is with natural shading of the water body by trees along the river bank. The canopy cover of the trees protects the water and buffers it from higher summer temperatures. Therefore, it is important to retain a forested buffer (riparian buffer) along natural drainages that run across or adjacent to the mine site.

## C. USACE

The U.S. Army Corps of Engineers (Corps) regulates sand and gravel operations when they occur in navigable waters and/or other waters of the U.S., including wetlands. The Corps regulates all work and or structures in or affecting the course, condition, location, or capacity of navigable waters of the U.S. under Section 10 of the Rivers and Harbors Act of 1899 and by the issuance of activity-specific permits for discharge of dredged or fill material into waters of the U.S. under Section 404 of the Clean Water Act. Navigable Waters are defined as areas subject to the ebb and flow of the tide, and all waters that are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.

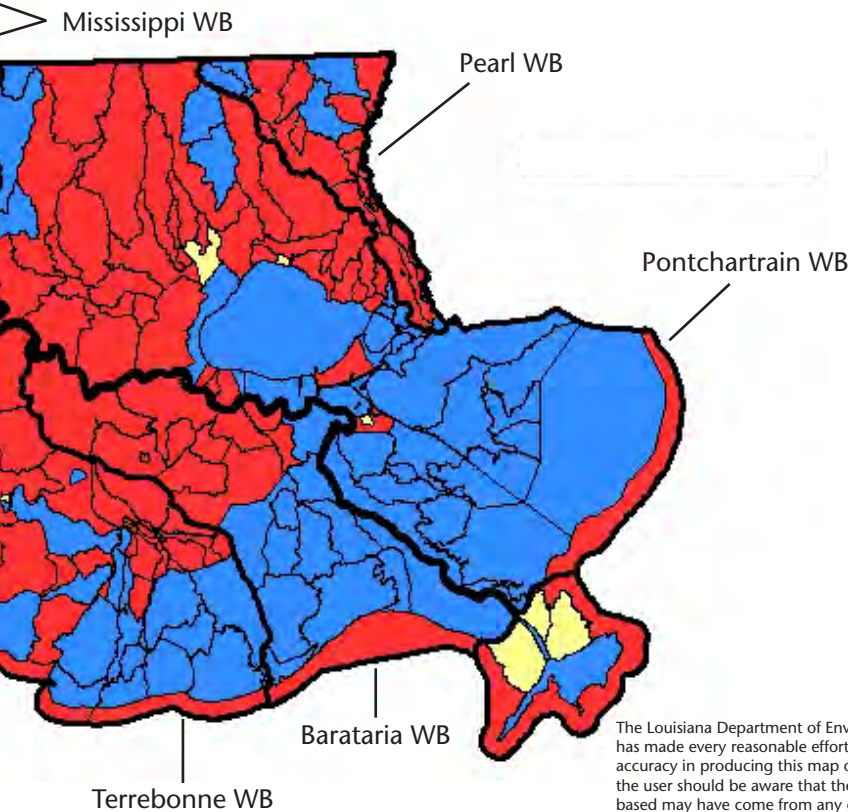
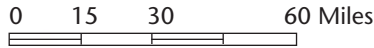
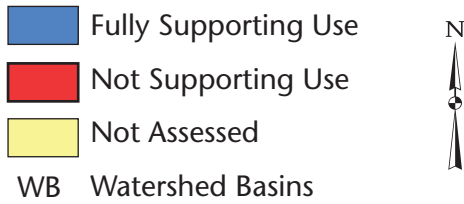


*Many of the state's water bodies are currently listed as impaired because they do not meet the dissolved oxygen standard.*



Louisiana Department of Environmental Quality  
 Water Quality Assessment Division  
 Standards, Assessment and Nonpoint  
 Map No. 200602083, September 7, 2006  
 Base Map: 1:100k DLG  
 Projection: UTM Zone 15, NAD 83

# 2006 305(b) Fish and Wildlife Propagation



The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore, LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.

The lateral limit of jurisdiction under the Rivers and Harbors Act in non-tidal waters is the ordinary high water mark. This is defined as a clear natural line along the shore caused by the death of terrestrial vegetation, erosion, shelving, changes in soil character, presence of litter or debris, or other appropriate means considering the characteristics of the surrounding area. In tidal waters, the lateral limit of jurisdiction under the Rivers and Harbors Act extends from the mean high water line to a point 3 nautical miles seaward of the baseline (which is usually considered the ordinary low tide line).

In addition, the discharge of dredged or fill material into waters of the U.S., including wetlands as delineated using the Corps' 1987 Wetlands Delineation Manual, are regulated under Section 404 of the Clean Water Act. Such discharges may vary from the obvious site development fills to discharges associated with mechanized land clearing.

Public supply wells should be researched through the Louisiana Department of Transportation and Development Water Well Database located at <http://www.dotd.state.la.us/intermodal/wells> to ascertain specific information such as location coordinates, depth, date drilled, and other pertinent data. The direct relationship between the sand and gravel industry and its potential impact to various waters of the U.S. necessitates close coordination between operators and the appropriate District Office of the Corps prior to performing any activity that will fill-in waters of the U.S. at a potential site. The Corps decision on your application will be based upon the least damaging practicable alternative available to the applicant. Operators should be aware that the Corps' evaluation and decision making process typically takes between 90 and 120 days and will often result in a modified project, from that proposed, to lessen environmental impacts associated with the mining operation. In some situations this process could lead to denial of the permit request. Therefore, when evaluating a potential mining site an operator should consider ways to avoid impacts to jurisdictional waters, including wetlands that have been determined to exist on-site, prior to submitting a Department of the Army permit request.

#### *401 Water Quality Certification*

*A Water Quality Certification, issued by the LDEQ, is a statement that a proposed activity will not have an unacceptable impact on water quality, and is issued in accordance with Section 401 of the federal Clean Water Act. A Water Quality Certification is not a permit to perform the proposed activity, but is often required in order to obtain a permit from another agency. Most Water Quality Certifications are required to obtain permits from the U.S. Army Corps of Engineers, for a permit to discharge dredged or fill material under Section 404 of the Clean Water Act; and from the Louisiana Department of Natural Resources, for a Coastal Use Permit under Louisiana's State and Local Coastal Resources Management Act.*

*Applications for Water Quality Certifications generally do not need to be sent directly to the LDEQ. If a Water Quality Certification is required, the permitting agency will send a copy of the permit application to us. Regulations for issuing Water Quality Certifications can be found at LAC 33:IX.Chapter 15.*

## Typical Best Management Practices (BMPs) For Non-Point Sources

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**Soil conservation should be addressed during the initial phase of any surface disturbing activity.** This is typically done through the use of BMPs. These are physical, structural, or managerial practices designed to prevent or reduce pollutants in the discharge of water offsite. Typical BMPs include redirecting storm water to prevent mixing with process water, coverage of chemicals, and containment of spills. These are particularly important in areas where water flow is concentrated. Sediment loads discharged to streams must be minimized, if not eliminated altogether, by implementing successful and proven BMPs.

Select appropriate vegetative and structural controls, housekeeping practices, and post construction/storm water management measures and controls prior to, during and after land disturbing activities. Also, language in deeds, covenants, leases etc., may require sediment and erosion controls be installed and left in-place after mining is complete. There are basically two types of controls: 1) vegetative and 2) structural. Some of the more common controls are described.



*Streambank Best Management Practice (BMP). When “Native Vegetation” is used to maintain streambanks, there are many benefits provided to the public and environment. Near the waters’ edge, herbaceous and wetland plants help filter pollutants from the water and prevent bank erosion during high flow periods. These plants also provide habitat for fish and natural predators of mosquitoes as well as increasing aesthetical appeal. Spatial balance between native trees and shrubs on the streambank provides stability and shading. Shading from trees lowers water temperature and improves water quality by conserving the oxygen in the water. When a path is located on the top of the bank, it can give the public access for outdoor activities such as walking, biking, viewing nature, and fishing. A path can also provide access for potential maintenance activities.*

## A. Vegetative Controls

Vegetation is an inexpensive and effective way to protect soil from erosion. It also decreases erosion from flowing water by reducing its velocity. Roots hold soil and increase infiltration. Topsoil should be added where existing soils are not suitable for adequate vegetative growth. Amendments may include composted manures, sawdust or even treated sludge. However, you must check with the LDEQ Solid Waste Department before using sludge applications.

*Vegetative buffer zones* are undisturbed or planted vegetated areas that surround a development, land disturbance activity or that border an intermittent stream or permanent water body. Buffer zones aid in sediment filtration and removal by slowing surface water flow through these areas. Construction site runoff should be dispersed over the entire buffer zone if possible. A minimum 100-foot buffer zone is recommended adjacent to perennial streams > 20' in width, 50 feet for perennial streams <20' in width and 35' for intermittent streams.

*Sod stabilization*, the most effective vegetative practice available, involves establishing long-term stands of grass with sod on exposed surfaces. When installed and maintained properly, sodding can be more than 99 percent effective in reducing erosion.

Protection of trees involves preserving and protecting selected trees that exist on the site prior to development. Mature trees provide extensive canopy and root systems that hold soil in place. Shade trees also keep soils from drying rapidly and becoming susceptible to erosion, as well as increasing property value. Consideration should be given to the tree root structure. Some trees root structure equal the size of the tree crown canopy.

*Tillage, with lime and fertilizer*, to maintain adequate soil pH and nutrient content, may be important before seeding. The local county agent and/or the Natural Resources Conservation Service (NRCS) can analyze soil for lime and fertilizer needs.

*Temporary seeding* is the planting of fast-growing annual grasses to hold the soil in areas that will not be disturbed again for 30 or more days. For long-term protection (greater than one year), permanent seeding should be initiated. Mulching helps insure seed growth and maintains soil moisture, and helps prevent erosion. It is essential when slopes are steep, the weather is hot or dry, and soil conditions are poor. The local county agent and/or the NRCS can analyze soil for lime and fertilizer needs.

*Permanent seeding* is the use of perennial grass (with trees & shrubs) to stabilize the soil. A seeding chart lists recommended perennials, depending on your geographic area. Vegetation is often not fully established until one year from planting. Inspect, repair and re-seed as needed, evaluating choice of seed and quantities of lime and fertilizer. Use temporary seeding if the time of year is not appropriate for permanent seeding. The local county agent and/or the NRCS can analyze soil for lime and fertilizer needs.





*Mulching, seeding, grassing*



*Erosion control blanket use – TXI vegetative control*

**Mulching** is the placement of hay, grass, wood chips, straw, or synthetic material on the soil. Mulch holds moisture, lessens temperature extremes and retards erosion on steep slopes during seed establishment. Soils that cannot be seeded due to the season should be mulched to provide temporary protection.

**Erosion & Sediment Control Blankets** are machine-produced mats of straw or other fibers held together with netting that provide temporary or permanent stabilization in critical areas, such as slopes or channels, so that vegetation may be established. These blankets often contain seeds to help establish vegetation.

**Surface roughening**, using heavy equipment, creates horizontal grooves across the slope which reduces runoff velocity/erosion and aid the growth of seed. Roughened slopes should be immediately seeded and mulched.

## B. Structural Controls

Structural controls divert flows away from disturbed areas, reduce runoff velocities, filter sediment and remove sediment by ponding. Various types of structural controls are described below.

*Temporary structures* are installed before and during construction. After removing temporary storm water controls the area should be vegetated.

*Permanent structures* remain after construction.

*Diversion ridges, berms or channels of stabilized soil* can divert runoff from disturbed areas or sediment-laden runoff into sediment basins. If diversions will remain in place more than 30 days, they should be covered with temporary or permanent vegetation. Diversions must have enough slope to assure drainage, but not enough to cause erosion within the channel. Allow sufficient room around diversions to permit machine re-grading, if needed. The maximum allowable drainage area is five acres.

*Silt fences* are typically used below disturbed areas to capture sediment from sheet flow. Six to eight inches of the fence material should be buried in a trench about four inches deep and four inches wide. Silt fences that are not buried have no useful function and are a waste of money. The maximum slope length behind a fence is typically 100 feet with maximum gradient of two horizontal feet to one vertical foot (2:1 or 45 degree slope). Silt fences should never be installed across streams, whether flowing or intermittent. They may be placed in minor swales or ditch lines where the maximum contributing drainage area is no more than two acres. The fencing must be maintained and sediment removed when deposits reach one-half the fence height. After the fence is no longer needed, the area should be graded, seeded and mulched.

*Straw bale barriers* are also used on small disturbed areas to capture sediment from sheet flow. The drainage area must be restricted to 1/8 acre per 100 feet of barrier. Maximum gradient behind the barrier is three horizontal to one vertical. The barrier must be located so that the water

depth does not exceed one foot at any point. Straw bales, with bindings oriented around the sides, shall be entrenched a minimum of four inches and anchored with two stakes driven toward the previously laid bale. Straw bales that are not buried are improperly installed, have no useful function, are a waste of money, and could result in substantial fines due to improper placement and subsequent sediment discharge.



*Silt fence and straw bale usage - TXI straw bale, silt fence and matting BMPs*

Gaps between bales shall be wedged with straw. Loose straw scattered immediately uphill increases barrier efficiency. Under no circumstances should straw bale barriers be placed in flowing streams. For minor dry swales, the end bale bottoms shall be higher than the middle bale top to assure runoff will not flow around the barrier. Repair damaged bales, end runs and undercutting. Remove sediment when it reaches one-half barrier height. When upslope areas are stabilized, remove bales and grade, seed and mulch barrier line.

**Sediment basins** allow retention and deposition of sediment prior to discharge or recycling. Sediment basins are made by diking, excavating or a combination of the two. Because of typical basin shapes and embankment side slope requirements of 2:1 or less, the capacity of the basin may be estimated by using the trapezoidal rule approximation of  $40\% \times \text{height} \times \text{surface area}$ . Sediment should be removed when the volume has been reduced to 27yd<sup>3</sup> per acre drainage area. The length should be twice the width, with maximum surface area and outlet as far from the inlet as possible. If using a dike, it must be well compacted and vegetated, with an outlet pipe or coarse aggregate spillway. Install basins prior to construction but not in flowing streams. Use diversions to direct drainage to basins.

**Riprap outlet protection** is placed at the outlet end of culverts or channels to reduce the depth, velocity and energy of water so that the flow will not erode the receiving stream.

**Check dams** are small dams constructed across swales or drainage ditches (lateral or wing ditches) to reduce flow velocity and erosion. They are not used in flowing streams. Check dams can be constructed of stone, straw bales, or logs, with a maximum height of two feet. The check dam center must be at least 6 inches lower than the outer edges to prevent erosion around the edges. The maximum spacing between dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam. Accumulated sediment should be removed from behind the check dams when it reaches one half the dam height. Erosion around dam edges should be corrected immediately, insuring that the dam center is six inches lower than the edges. In grass-lined ditches, grass must be established prior to dam removal. The dam site should be seeded and mulched or sodded, as needed. This practice is limited to small open channels that drain 10 acres or less.

**Construction entrance/exits** are aggregate stabilized site entrances which reduce sediment tracked onto public roads. Aggregate should be at least six inches thick and 50 feet long. Tire washing may also be needed.

**Housekeeping Practices.** Pollutants that may enter storm water from construction sites because of poor housekeeping include various petroleum products, paints, , solvents, litter, debris, sanitary waste and sediment from unstabilized areas. Good housekeeping practices include:

- designated areas for equipment maintenance and repair;
- waste receptacles at convenient locations;
- regular collection of waste;
- protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic or hazardous materials; and
- adequately maintained sanitary facilities.

**Post Construction/Storm Water Management Measures.** The Construction General Permit requires the SWPPP to describe measures that will be installed to control pollutants in storm water after construction is complete. These controls include, but are not limited to, one or more of the following:

**Retention Ponds** provides complete onsite storage and treatment of a specific volume of storm water runoff by using infiltration, evaporation and recycling. The average volume is typically the first inch or half inch of storm water runoff containing the first flush of pollutants.

**Vegetated swales and natural depressions** are grass-lined areas that filter sediments from runoff thus helping to prevent erosion. Vegetated swales should have side slopes of 4:1 or less. Erosion and sediment controls shall be constructed and the stabilization measures shall be applied in the order that was indicated in the implementation sequence. It is important that employees are aware of the SWPPP and that it is readily available. The owner or prime contractor must inspect and maintain controls, recording damages or deficiencies and corrective measures.

## **Pre-Mining Phase**

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**The pre-mining phase of a project requires advanced planning of the mining process itself and consideration of post-closure options for the site.** The property to be mined should be evaluated to determine whether a sufficient amount of reserves of adequate quality exist in order to profitably mine the site. This evaluation also typically includes the location of the property with respect to existing transportation networks and the end market.

### **A. Site Evaluation**

The targeted property to be mined should be evaluated in terms of how the overall mining process will take place. This is typically called a Mine Plan. It typically includes location of processing plant, office and support facilities, haul road and/or access routes, product staging areas and overburden placement. An evaluation of the soil type(s) in the area planned for mining is valuable. Susceptibility of erosion to these soils should be known in the pre-planning stages. Since sands, silts and clays act differently when worked by earthmoving equipment, knowledge of the soil type(s) can

reduce the cost incurred during site preparation. Detailed soil survey maps for each parish are available at the United States Department of Agriculture (USDA).

It is a prudent practice to evaluate whether or not wetlands exist on the property under consideration for mining. The evaluation should be performed by an experienced wetlands scientist following the 1987 U.S. Army Corps of Engineers' Wetland Manual. This process may also be performed by personnel from the appropriate District Office of the U.S. Army Corps of Engineers. Although the US Army Corps of Engineers can perform a wetland evaluation, however, it typically takes longer for them to conduct this evaluation. Not performing a wetland evaluation can lead to serious violations, including mitigation of impacted wetlands within the same watershed area, if it is found later that wetlands existed and were impacted without an appropriate U.S. Army Corps of Engineers permit.

## **B. Understanding Site Drainage**

It is important to determine the pre-existing drainage patterns and the areas where concentrated flow may exit for a potential mine site. Drainage areas are those locations of the site where runoff will flow in one preferential direction or towards particular discharge points. Understanding these factors will greatly enhance your selection and design of appropriate sediment control structures (i.e., BMPs) such as culverts, to minimize any adverse impacts to the site.

### **1. Surface Water Flow**

Identifying the receiving waters (i.e., lake, stream, pond or wetland) is vital before site preparation can take place. If sensitive water bodies are downstream (i.e., wild and scenic rivers, recreational streams, natural aquatic sites, private ponds and lakes or receiving streams listed on the 303(d) list) extra erosion controls may be needed. The LDEQ and USEPA Region 6 are in the process of developing total maximum daily loads (TMDL) for all of the water bodies within the state that are not meeting their designated uses. If the TMDL has already been developed, it may not allow additional inputs to the receiving stream. Any new activity located near the water body would then have to either purchase waste load allocations from existing permitted discharge facilities on the receiving stream or design their facility to completely recycle their intended wastewater and stormwater. Therefore it is important to know which water bodies have had TMDLs developed for them or are scheduled for TMDLs. This information can be found at LDEQ's website located at: <http://www.deq.louisiana.gov/planning/wqireports/2004wqireports.htm>.

Understanding site drainage can be obtained by using the appropriate United States Geological Survey (USGS) Topographic Quadrangle map(s) for the area in question and studying the drainage features across the property. These maps show changes in elevation by a series of contour lines. These lines can be used to determine slope of the ground surface through the site to identify drainage patterns.

Actual inspection of the property during or after a rainfall event can provide a substantial amount of information regarding how surface water flows across the subject site.

## 2. Ground Water Conditions

It is important to preserve the quality of ground water in Louisiana since approximately two thirds of the state's population relies on ground water for drinking water. Ground water comes from aquifers which transmit water through the subsurface. It is important to understand that mining of a potable aquifer can negatively affect the well yield of a potable well.

The following BMPs will help guide a ground water preservation effort:

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*It is important to preserve the quality of ground water in Louisiana since approximately two thirds of the state's population relies on ground water for drinking water.*

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- When a new sand and gravel operation is being considered, it is prudent to first check the LDOTD water well database to determine if registered public and private drinking water supply wells are located nearby.
- Perform a visual check for possible unregistered private wells in the immediate vicinity of the new sand and gravel pit (see distance guidelines below).
- The perimeter of the new sand and gravel wet mining pit should be located at least 1,000 feet from all public supply wells and at least 100 feet from all private drinking water wells. The 1,000-foot distance is based on ordinances being passed by local agencies which could prohibit new sand/gravel pits from locating within a 1,000

foot radial boundary from any water well serving an active public water system. See the Louisiana Sanitary Code distance guideline for reference.

The potential for artesian ground water conditions exists in some areas of the state. This type of situation would require the operator to obtain a National Pollution Discharge Elimination System (NPDES) Permit in order to treat any artesian water commingling with process water.

## C. Site Preparation

Site preparatory activities should be initiated at the mine site only after surface water drainage and ground water conditions are thoroughly understood.

Once the proposed mine site is understood in terms of surface water drainage and ground water conditions, site preparation can be initiated.

### 1. Construction of Access and Haul Roads

Access or secondary and/or haul roads are a necessary component of a sand and gravel mining operation, especially on large pieces of property which can require the construction of several roads. Care must be taken in the construction of those roads so as to minimize impacts to the environment. Roads should be designed to drain at all times by using crowning, graveling, compacting, ditching, and/or culverting. Proper construction and maintenance of permanent or temporary access or haul roads is of vital importance. Road systems should be kept in serviceable condition to

minimize erosion by rainfall runoff and normal vehicle use. Where necessary, road surfaces should be graveled if the base does not already contain sufficient aggregate.

*a. Crowning of Roads* – Road surfaces, when constructed, should be crowned or out-sloped to dissipate surface runoff and minimize erosion of the roadbed.

*b. Graveling and Compacting* – Graveling and compacting of the road surface allows for a more permanent and less maintenance-required road surface. It minimizes loose sediment runoff or tracking of sediment during wet periods onto public roads or highways.

*c. Ditching and Culverting* – Ditches (diversion, lateral and/or wing ditches) and culverts can be temporary or permanent drainage structures that, when adequately sized for a specific use, carry water flow from rainfall alongside or underneath a roadbed. Ditches and culverts should be sized based on anticipated rainfall events for the specific region of the state where it is being constructed. These structures should be installed at the time of roadway construction. Ditches should be sloped to prevent silting and to allow for maintenance (i.e., digging out sediment buildup). Ditches and culverts should be kept free of debris and obstructions in order for them to allow unrestricted passage of water. Typically ditches can be used for routing surface water flow away from adjacent properties offsite.

*d. Silt Fencing* – Simple, readily available and inexpensive silt fencing can aid in soil erosion caused by surface runoff provided it is installed correctly. The fencing must be installed and secured beneath the ground surface to prevent undermining or under-washing from occurring.



*Silt fence utilization – TXI structural control*

## ***2. Land Clearing and Grubbing Activities***

Experienced and trained equipment operators should be used during this stage of the mining process so that soil disturbance, compaction and displacement are only provided on those areas ready for immediate use. It is prudent construction practice to install/construct sediment holding basins before major site grading takes place. These basins can catch and hold surface runoff before it leaves the site. Additionally, diverting up-slope water around a planned area for disturbance is also good practice. It is strongly recommended that areas not be disturbed until absolutely necessary. The time of year of land clearing and grubbing activities takes place can also minimize the impact that inclement weather can have on disturbed/affected areas. If possible, disturbed areas should be temporarily stabilized or covered as soon as possible to minimize impacts on the environment.

It is very important to only clear and grub acreage needed for the immediate term. Clearing or grubbing too much land too early in the construction phase of the mining operation will dramatically increase the potential for environmental impacts from surface water runoff and will increase the costs to control runoff from the mining site.

Moreover, it is also very important to remember that no mechanized earth-moving or land-clearing equipment (i.e., bulldozers, trackhoes, graders, etc.) may be operated within a wetland without first obtaining a Section 404 wetland permit from the appropriate U.S. Army Corps of Engineers District Office.

A minimum 100-foot buffer zone is required adjacent to perennial streams and water bodies in the State of Louisiana.

## ***3. Stripping Activities***

Stripping is a term used to describe the removal of overburden material or material which is present atop the valuable sand and gravel reserves. The overburden material is typically comprised of the valuable topsoil near the immediate ground surface and then the vadose zone soil (i.e., soil above the normal water table). Composition or makeup of the overburden material is typically clay, silt and fine sand. The topsoil material can be temporarily stockpiled for future use in post-mining activities. However, physical space limitations may limit the amount of overburden material that may be stockpiled at any given time. The cost to strip the material, typically using a trackhoe and haul trucks, can outweigh the value of holding on to this material for future use. Once a mining operation has created a mine pit, concurrent reclamation allows for much of the overburden material to be placed back into the mine pit. This negates or minimizes the cost of hauling it to an area of the mine property for temporary storage.

During the stripping phase of the mining process, care should be taken to not affect or disturb too great of an area such that surface runoff cannot be controlled effectively. Such a case might allow an excessive buildup of





*Overburden Stripping Activities - MMM*

silt or clay in ditches constructed to control the surface water flow across the site. Normally, surface water flow is directed to the pit to keep the water table high in extended periods of dry weather.

It is a prudent practice and a recommended BMP to allow enough undisturbed buffer at property boundaries to provide sufficient lateral support of property lines.

## Mining Phase

### A. Dredging Activities

After stripping away overburden material to expose the mineable sand and gravel reserves, the dredging process begins. Dredging is performed by suction and pumping to a wash plant where the material is separated using a sizing screen. Water generated during the pumping process is allowed to flow back into the pit. Sand is typically separated from the gravel and either stockpiled or allowed to flow back into the pit via a sand flume. Gravel is stockpiled, conveyed or loaded into a haul truck for transport to a separate screening plant for further sizing. Sized aggregate is stockpiled onsite until its sale.



*Open pit dredging activities  
- MMM wash plant return  
into an active dredge pit*



*Wet/Dry processing – MMM conveyor  
depositing sand separated through the  
processing plant*



*Dredging activities - MMM photo of dredge in active  
dredge pond (forefront) with Wash Plant in background*

## B. Aggregate Wash Plant Area (Wet Processing)

Process wastewater is any water that is used for or results from the production, clean-up, or use of any raw material, intermediate product, finished product, byproduct, or waste product. Wastewater treatment alters the characteristics of the wastewater before discharge and it is often required to achieve compliance. Examples of treatment include pH adjustment and either physical or chemical means to settle solids prior to discharge to surface water.



*Wet/Dry processing - MMM Wash plant photo*

BMPs required during this portion of the mining process include proper berming and/or ditching of pump water from the dredge to the wash plant and back into the open pit. The pump water is typically allowed to flow back into the mining pit to avoid unpermitted process water from potentially leaving the property.

Runoff from the stockpiles should be controlled by routing this water back to the open pit. Rainfall runoff from these stockpiles should also be directed to the open pit. Other BMPs should include silt fencing, berms and vegetated buffers, as needed.

## C. Aggregate Processing Plant Area (Dry Processing)

Although significant amounts of sand and gravel are used for fill, bedding, subbase, and basecourse without processing, most domestic sand and gravel is processed prior to use. The processing of sand and gravel for a specific market involves the use of different combinations of washers, screens, and classifiers to segregate particle sizes; crushers to reduce oversized material; and storage and loading facilities.

After being transported to the processing plant, the wet sand and gravel (raw feed) is stockpiled or emptied directly into a hopper, which typically is covered with a set of parallel bars to screen trash or debris. From the hopper, the material is transported to fixed or vibrating scalping screens by gravity, belt conveyors, hydraulic pump, or bucket elevators. The scalping screens separate the oversize material from the smaller sizes. The oversize material may be directed to a crusher for size reduction, to produce crushed aggregate or manufactured sand. Crushing generally is carried out in one or two stages. Following crushing, the material is returned to the screening operation for additional sizing.

Alternatively, oversize material (>2-inch) may be used for erosion control, reclamation, or other uses. The material that passes through the scalping screen is fed into a battery of sizing screens, which generally consist of

horizontal or sloped, single or multi-deck vibrating screens. Rotating trommel screens with water sprays are also used to process and wash wet sand and gravel. Screening separates the sand and gravel into different sizes. Water is sprayed onto the material throughout the screening process in order to remove clays and other deleterious material. After screening, the sized gravel is transported to stockpiles, storage bins, or, in some cases, to crushers by belt conveyors, bucket elevators, or screw conveyors. The sand is freed from clay and organic impurities by log washers or rotary scrubbers. After scrubbing, the sand typically is sized by water classification. Wet and dry screening are rarely used to size the sand. After classification, the sand is dewatered using screws, cyclones, or hydroseparators. Material may also be rod-milled to produce smaller sized fractions, although this practice is not common in the industry. After processing, the sand is transported to storage bins or stockpiles by belt conveyors, bucket elevators, or screw conveyors.

#### **D. Maintenance Area(s)**

Good site management is critical to the control of contamination of storm water. Storm water quickly picks up pollutants from improperly stored materials, spills, and erosion. Coverage for toxic materials, site grading, channeling of storm water, preventative maintenance, and employee training are very usual and prudent to curtail potential problems associ-

ated with pollutant-laden storm water discharge. Source control should be provided for activities such as fueling, loading and unloading liquids, and outside storage of raw materials. A Spill Prevention Control & Countermeasures (SPCC) Plan must be in place to implement spill prevention and response. Ongoing inspection assures that site management is having the desired effect.



*Oil Storage – TXI Double wall tanks*



*Oil Storage – Double-wall Diesel AST - MMM*

Fuel and oil storage and handling facilities should be located some distance from the main sediment and wash water retention facility. All such facilities should be equipped with approved containment, monitoring, and collection systems. It is recommended that fuel storage be done above ground. Runoff from adjacent surfaces should be routed to a retention pond that can be monitored and cleaned in the event of a spill.

## **E. Petroleum Product Storage & Handling Area**

### **1. Regulatory Requirements**

A written SPCC Plan is required to meet federal regulatory requirements for any facility that has a total aggregate petroleum product (i.e., oil, diesel fuel, gasoline, used oil, etc.) storage capacity greater than 1,320 gallons in containers 55 gallons or greater.

### **2. BMPs**

The federal rules and regulations regarding the proper storage, handling and transfer of petroleum products are extensive. There are many types of BMPs associated with these practices. Some of the more important BMPs follow:

- During fuel transfer activities, signs should be posted instructing drivers to remain with their trucks at all times to prevent overflow or spillage.
- Fuel delivery drivers should be instructed on proper procedures, including chocking of wheels or locking brakes prior to offloading fuel, and checking that all hoses are properly disconnected prior to removing chocks or unlocking brakes for departure.
- In the event of an equipment failure all fuel transfer areas should have secondary containment adequate to contain the contents of the largest single compartment of any tank truck utilized in the facility or the discharged material should be directed to a containment pond through the use of berms and swales.
- Use drip pans or buckets at disconnection points of hoses and/or piping to collect drippage of oil.
- All storage tanks should be inspected once per month for signs of fatigue or failure that could lead to the spillage of fluid. Documentation of these inspections are required. Any item noted that is leaking, corroded, deteriorated or has a high potential for discharging oil into the environment should be promptly repaired.
- All pollution prevention equipment should be examined once per month to ensure such equipment is in good operating condition. A monthly report should be filled out by the inspector and kept onsite as part of the facility records.
- All bulk oil and lubricant storage tanks should have secondary containment for the purpose of containing any spills caused by rupture or leakage of the storage tank.
- All secondary containment structures should have a minimum free board to account for precipitation events. This freeboard is usually

110% of the capacity of the largest storage tank within the containment and should be constructed of material impervious to contents of the tank.

- All containment structures should be equipped with manually operated gate valves used solely for the drainage of rainwater that could accumulate in the containment area. If the containment structure does not have a valve, a sump should be available to allow a portable pump to drain the containment area. All manually operated valves should be locked closed when not in use.
- Accumulated rainwater should be visually inspected prior to discharge to ensure that there is no sheen due to the presence of a petroleum product. Water with a sheen should never be discharged, but may be pumped for disposal, allowed to evaporate, or removed by some other appropriate method. Documentation of this visual inspection is required.

### **3. Oil Discharge Response & Cleanup**

In the event of an oil discharge within the plant area, all manpower and equipment available should be utilized to prevent the discharge from reaching a navigable waterway. The most important steps that need to be taken are stopping the discharge and controlling its impact to the environment.

#### **Procedure to be followed in the event of a discharge:**

- The first person to notice the discharge should immediately notify the plant superintendent; the superintendent, in turn, should simultaneously implement best management practices to capture the discharge.
- Depending on the size of the spill, the Local Emergency Planning Commission (LEPC) and State Emergency Planning Commission (SEPC) should be notified.
- If possible, the source of the leak should be plugged and/or valves closed to prevent further leakage.
- A front-end loader should be immediately available to build a berm or dike with dry sand to absorb the discharge if the secondary containment should fail.
- If the discharge is too large for plant personnel to contain and clean-up, a contractor should be contacted.

After the leak is repaired, the discharged product should be recovered from the secondary containment and used as intended, if possible, or disposed of in accordance with current state and federal regulations. If contaminated sand or contaminated surface soils are generated, they must be disposed of in accordance with current state and federal regulations.

If the amount of the discharge is sufficient to be reportable or if the discharge leaves the plant property, notification should be made to the appropriate environmental department as soon as possible. The SPCC coordinator should notify all appropriate agencies immediately.

**In the event of a discharge on the concrete in the shop or other hard surface, the following procedure should be used:**

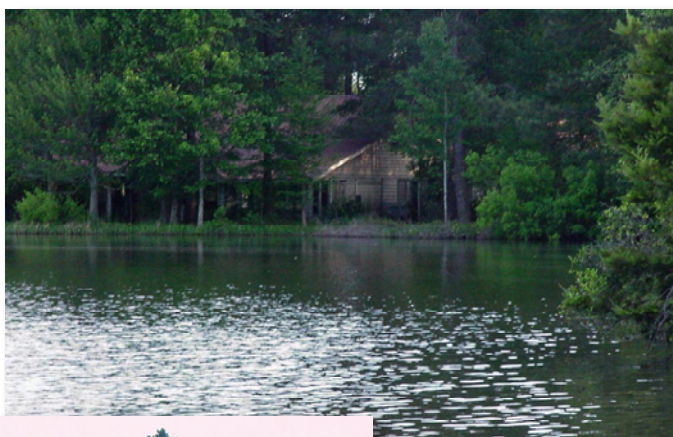
- Absorbents should be used to keep the discharge from leaving the hard surface.
- The source of the discharge should be identified and the leak rectified by whatever means necessary.
- Absorbents should be used.
- Used absorbent should be placed in a drum (labeled with USED ABSORBENT, NON-HAZARDOUS). The drum must have a lid, which is kept on at all times when not in use. The drum should have the first date the used absorbent was placed in the drum. The drum should be kept under a roofed structure to prevent storm water contamination.
- If any discharged material has left the impervious surface, the media contaminated from the discharge should be properly removed and disposed of in accordance with all applicable local, state and federal environmental regulations.

## Post-Mining Phase

### A. Site Stabilization

**The Post Mining Phase reclamation is dependent on the agreement with the landowner.** These activities may involve the stabilization of inactive mining pit or borrow areas with herbaceous perennial plants, stabilizing the soil, preventing wind or water erosion from causing on-site or off-site damage and improving the aesthetic appeal and the ability of the site to support wildlife. This practice is applicable to sand and gravel borrow areas which have had the soil profile replaced to approximate original conditions or where the soil profile has been removed.

Soil characteristics need to be evaluated to help maintain soil stability and prevent erosion. Some sites may require specific and detailed engineering plans, while others should apply general guidelines to meet site stabilization objectives. The following guidelines may be used to ease the tasks of meeting site stabilization objectives.



*Post-mining reclamation  
– TXI former dredge pit*





*Post-mining reclamation – MMM  
former dredge pit*



*Post-mining reclamation  
– TXI former dredge pond*

***Slope stability:*** Cut and fill slopes should not exceed 2:1 to provide better stability. Gentler slopes (3:1) are preferred to facilitate seeding efforts. Long slopes should be avoided to help prevent erosion and to allow access for seeding, mulching, and maintenance.

***Diversions:*** Construct diversions at tops of slopes to divert runoff away from the slope banks to a stable outlet.

***Chutes:*** Construct aggregate lined chutes or equivalent to conduct concentrated flow of water to stable outlets.

***Soil Conservation:*** Reclamation of abandoned roads require reshaping, recontouring, and resurfacing with topsoil and seeding for vegetative growth. Removal of structures such as bridges, culverts, cattle guards and signs is recommended. In addition, the regarding of sand stockpiles should be removed from property boundaries to eliminate the potential for offsite discharge from stormwater flow.

It is prudent to practice good soil conservation and seed bare ground during the post-mining phase to aid in minimizing and/or reducing the potential for stormwater to wash sediment loads from unvegetated areas into nearby waterways. Natural regeneration takes time and during that process much sediment could be washed away as sheet, rill or gully erosion over that period.

If active revegetation is selected, seeds that are conducive to the season and type of soil present should be used to vegetate any bare areas. Mulching (using hay or erosion control blankets, for example) also aids in seed germination and helps prevent or minimize sheet, rill and gully erosion. The NRCS office can help in the proper selection of the types of seeds and nutrients required for proper vegetative growth.

## **B. Debris & Waste Removal**

Typical debris from sand and gravel mining usually involves trees and shrubs generated from the land clearing stage of the mining process. These trees and shrubs may be placed back into the mined portion of the property and covered with overburden material. This debris can also be stock-piled and burned if the local Fire Marshall and state regulatory authority allows and approves of this process beforehand.

The following guidelines apply to the open burning of trees, brush, grass, wood, and any vegetation in the clearing of land, right-of-way maintenance operations, and agricultural crop burning. This includes the open burning of structures or material for fire training, open burning for management of forests and wildlife or the disposal of a fire hazard.

- Prevailing winds during the burn should be away from any city or any occupied residence likely to be affected by the smoke to the best extent possible;
- The amount of dirt in the material being burned should be minimized to reduce smoldering;
- Oils, rubber, tires, railroad ties, treated wood, and any other material creating unreasonable amounts of smoke or air pollutants may not be burned;
- No hazardous waste or material shall be burned.
- Open burning should be conducted between sunrise and before sunset. This allows for good smoke dispersion.
- Fuel should not be added outside the timelines listed above.
- An open burn should be extinguished completely to ensure smoldering of material does not persist;
- Open burning should not obscure visibility or create a traffic hazard on any public road or airport right of way;
- The following entities should be notified of when and where the open burn will occur: local fire department, municipality nearest the burn, the county sheriff's department and any military, commercial, county, municipal or private airport or landing strip that may be affected by the open burn. Many complaints and disputes can be avoided by informing people ahead of time of the open burn. It is very important to contact your local fire department. This will ensure that sufficient personnel will be available in the event that control of the burn is lost;

- Common sense precautions, such as having someone watch the fire until it is extinguished and assuring smoke doesn't impact residences or impair vehicular travel on highways, should be followed.

### **C. Property Grading**

After the mining activities are completed, grading of the property should be conducted. This minimizes non-point source stormwater pollution (i.e., sediment fines) from impacting potential pathways such as streams, creeks, tributaries, lakes, etc.



## Conclusion

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One of the best ways to mitigate environmental impacts from the sand and gravel industry in Louisiana is to establish a set of voluntary best management practices for the industry to adhere. This can be accomplished by initiating good management practices, educating our operators, and taking a more proactive stance in minimizing the problems of the past that have hurt this industry's image. We, as industry leaders, need to be actively engaged in addressing issues and taking precautions and preemptive measures. Damage control after the fact is destructive. The world is changing and we must be adaptive to these changes – good management practices in an environmentally friendly manner are synonymous with good business practice.

One can learn from the actions of others, such as the Louisiana Forestry Association and the Louisiana Farm Bureau who have worked with the loggers, landowners and farmers to increase the utilization of best management practices on their operations. Programs such as Master Logger and Master Farmer (<http://www.laforestry.com/Default.aspx?tabid=147>) have demonstrated that education and outreach programs can be very successful ways to increase the BMP compliance rate. The Master Logger Program has demonstrated a 93% BMP compliance rate and the Master Farmer Program (<http://www.lsuagcenter.com/en/environment/conservation/master%5Ffarmer/>) has been a national example for other states to follow. The sand and gravel mining industry can follow these examples and raise the public awareness of the environmental steps that the industry is taking to improve water quality within the Louisiana.

[www.laforestry.com/Default.aspx?tabid=147](http://www.laforestry.com/Default.aspx?tabid=147)

[www.lsuagcenter.com/en/environment/conservation/master%5Ffarmer/](http://www.lsuagcenter.com/en/environment/conservation/master%5Ffarmer/)

## Glossary

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**Access road** — A temporary or permanent access route for vehicular traffic.

**Aggregate** – Hard materials such as sand, gravel, and crushed stone, used for mixing with cementing or bituminous material to form concrete, mortar, or asphalt, or used alone as in railroad ballast, road base, landscaping rock, or graded fill.

**Aquifer** – A permeable underground strata of material that typically consists of various sizes of sand and gravel, that allows water to pass through.

**Artesian** – Ground water which flows to the surface under natural pressure without any pumping.

**Best management practices (BMPs)** — Management practices, developed to minimize or prevent non-point source water pollution.

**Buffer** — A relatively undisturbed section of vegetated or forested land adjacent to an area requiring special attention or protection such as a stream or lake.

**Channel** — A natural stream which conveys surface runoff water within well-defined banks.

**Contour** — An imaginary line on the surface of the earth connecting points of the same elevation.

**Contour line** — A line drawn on a map connecting points of the same elevation.

**Culvert** — Pipe made of metal, plastic, or other suitable material; installed under roads to transmit water from the roadway or side ditches, storm runoff, seeps and drains.

**Diversion berm or swale** — A diversion dam constructed across a road or a trail to remove and disperse surface runoff in a manner which adequately protects the soil resource and limits sediment transportation.

**Diversion ditch** — A drainage depression or ditch built across a slope to divert surface water from that slope.

**Ephemeral stream** — A water course generally without a well-defined channel that flows only in response to rainfall. These streams flow less than 20% of the year during normal rainfall conditions. Flows along a course that may or may not have a well-defined channel.

**Erosion** — The detachment and transportation of soil particles.

**Grade** — The slope of a road, usually expressed as a percent.

**Gravel** – Unconsolidated, naturally occurring rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, and granules.

**Ground water** – That part of the subsurface water in the zone where all the voids are filled with water. Loosely, all subsurface water as distinct from surface water.

**Gully** — An eroded channel at least 12 inches deep.

**Intermittent stream** — A watercourse that flows in a well-defined channel for 20–90% of the year during normal rainfall conditions.

**Jurisdictional waters or wetlands** — Areas subject to the regulations of the Clean Water Act of 1987; generally, concave or low lying topographic forms that collect, store, or flow water frequently enough to favor a majority of plants that are adapted to saturated soil conditions.

**Mulching** — Covering an area loosely with some material to hold soil in place and facilitate revegetation. Straw, bark, hay, or wood fibers are common mulches.

**Natural regeneration** — The planned regeneration of a forest that either uses existing trees as a source of seed or encourages sprouting from stumps or roots.

**Non-point source pollution** — Pollution which is 1) induced by natural processes, including precipitation, seepage, percolation, and runoff; 2) not traceable to any discrete or identifiable facility; 3) controllable through the utilization of best management practices.

**Nutrients** — Mineral elements in the forest ecosystem such as nitrogen, phosphorus, and potassium, usually insoluble compounds that are present naturally or they may be added to the forest environment as forest chemicals, such as fertilizer.

**Parallel or side ditch** — A drainage ditch alongside and parallel to a road.

**Perennial stream** — A watercourse that flows continuously (at least 90% of the year) in a well-defined channel.

**Permanent road** — A high specification permanent road which is maintained periodically and serves as a main artery in a network of roads.

**Point source pollution** — Sources of water pollution which can be traced to a specific discharge pipe or location.

**Pollution** — The presence in a body of water (or soil or air) of substances of such character and in such quantities that the natural quality of the environment is impaired or rendered harmful to health and life or offensive to the senses.

**Regeneration** — The young tree crop replacing older trees removed by harvest or disaster; the process of replacing old trees with young.

**Rill erosion** — An erosion process in which numerous small channels only several inches deep are formed. Occurs mainly on disturbed and exposed soils.

**Riparian** — The land adjacent to and pertaining to the banks of streams, rivers, or other water bodies with a high density, diversity and productivity of plants and animal species.

**Sand** – Granular material resulting from rock disintegration, consisting primarily of particles having a diameter in the range of 2 mm (about the size of a pinhead) to 1/16 mm (like very fine sand paper).

**Secondary road** — A road constructed for a particular use or single operation and normally abandoned upon completion of the operation.

**Sediment** — Soil material suspended in air or water which is being transported or moved from its original site; the material which is deposited.

**Sheet erosion** — The removal of a fairly uniform layer of soil from the soil surface by water runoff.

**Site preparation** — A general term for removing unwanted vegetation and other material — if necessary — and soil preparation carried out before replanting.

**Slope** — Steepness of the land expressed as the amount (in percent) of vertical fall per 100 ft. of horizontal distance.

**Soil** — The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

**Soil conservation** — Using the soil within the limits of its physical characteristics and protecting it from unalterable limitations of climate and topography.

**Stream** — A well-defined natural channel that has a flow anywhere below its headwaters greater than 5 cubic feet per second at least 50% of the time (EPA—US Army Corps of Engineers). A permanently or intermittently flowing body of water that follows a defined course.

**Stream bank** — The boundaries of a stream which contain normal flows.

**Suspended sediments** – Particles of rock, sand, soil and organic detritus carried in suspension in the water column. Typically carried by flowing water but not always the case. Very small particle size sediments (i.e., clays) may stay suspended for extremely long periods of time (i.e., months or years).

**Turbidity** – Reduced clarity of surface water because of the presence of suspended fine particles (i.e., sediment) usually in the form of clays and silts.

**Water body** — An area of standing water with relatively little or slow movement (pond, lake, bay, slough).

***Water pollution*** — Contamination or other alteration of the physical, chemical or biological properties of any natural waters of the state, or other such discharge of any liquid, gaseous or solid substance into any waters of the state, as well, or is likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life. (**EPA definition**)

***Water quality*** — A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

***Watershed area*** — All land and water within the confines of a drainage divide. Watersheds are determined by the United States Geological Survey (USGS).

***Wetlands*** — Geographic area characteristically supporting hydrophytes, hydric soils, and some saturation or flooding during the growing season.

***Wing ditch*** — A water turnout or diversion ditch constructed to move and disperse water away from the road and side ditches into adjacent undisturbed areas so that the volume and velocity of water is reduced on slopes. It is the same as a lateral or diversion ditch.



# Appendices

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## Appendix I - LDEQ Permitting Requirements

After reading the permit, any operator who is eligible for coverage under the general permit may submit the Notice of Intent (NOI) form SCC-3 to apply for automatic permit coverage. Applicants will become permittees authorized to discharge when a complete and accurate NOI is hand-delivered to the Office of Environmental Services, Permits Division or 48 hours after the postmark date on the envelope that contains the complete and accurate NOI. Submission of an NOI is an acknowledgement that the conditions of the general permit are applicable to the proposed discharge, and that the applicant agrees to comply with the conditions of the general permit. The applicant's signature on the NOI legally certifies that the applicant qualifies for coverage under the permit and agrees to comply with all terms and conditions of the authorization to discharge to waters of the State of Louisiana.

General Permit LAG490000 does not cover commercial dredging of shell or other natural resources in natural water bodies which are regulated under Section 404 of the Clean Water Act (CWA). Operators who wish to apply for a permit to commercially dredge shell or other natural resources that are regulated under the CWA Section 404 permit process must submit an individual permit application using the form SCC-2.

Site activities that include clearing, grubbing, grading, constructing roads, and/or excavation that are being conducted as part of the exploration and construction phase of a mining operation are activities that require coverage under a separate LPDES permit for storm water discharges from construction activities. Exploration and construction activities that disturb equal to or greater than one acre but less than five acres of land are regulated under LAC 33:IX.2511.B.15 and are covered under the LPDES Storm Water General Permit for Small Construction Activities (LAR200000). Exploration and construction activities that disturb five acres of land or more are regulated under LAC 33:IX.2511.B.14.j and are required to obtain permit coverage under the LPDES Storm Water General Permit for Construction Activities (LAR100000). Both of the construction storm water general permits can be accessed on the LDEQ web site at <http://www.deq.louisiana.gov/permits/index.htm/> LPDES Water Discharge General Permits. The NOI forms are available at the same web address under the subheading LPDES Water Discharge Permit Applications.

Certain land clearing and/or excavation activities require approval from the State Historic Preservation Officer prior to applying for general permit coverage. Under certain circumstances, authorization under the general permit requires coordination with the U.S. Fish and Wildlife Service (USFWS) prior to applying for permit coverage. The NOI form CSW-G for coverage under the construction general permit and the NOI form SCC-3 for coverage under General Permit LAG490000 describe which activities require coordination and/or prior approval prior to completing the NOI form to apply for general permit coverage. Although no NOI submittal

is required for coverage under general permit LAR200000, the permit eligibility conditions related to historic preservation and threatened and endangered species are described in the general permit.

### **401 Water Quality Certification**

A Water Quality Certification is issued by the LDEQ and is a statement that a proposed activity will not have an unacceptable impact on water quality, and is issued in accordance with Section 401 of the Federal Clean Water Act. A Water Quality Certification is not a permit to perform the proposed activity, but is often required in order to obtain a permit from another agency. Most Water Quality Certifications are required to obtain permits from the U.S. Army Corps of Engineers, for a permit for dredged or fill material under Section 404 of the Clean Water Act; and from the Louisiana Department of Natural Resources, for a Coastal Use Permit under Louisiana's State and Local Coastal Resources Management Act.

Applications for Water Quality Certifications generally do not need to be sent directly to the LDEQ. If a Water Quality Certification is required, the permitting agency will send a copy of the permit application to us. Regulations for issuing Water Quality Certifications can be found at LAC 33: IX.Chapter 15.

### **Appendix II - USACE Permitting Requirements**

The discharge of dredged or fill material into waters of the U.S., including wetlands as delineated using the Corps' 1987 Wetlands Delineation Manual, are regulated under Section 404 of the Clean Water Act. Such discharges may vary from the obvious site development fills to discharges associated with mechanized land clearing.

Operators should consult with the appropriate District Office of the Corps prior to performing any activity at a potential mining site. This includes "old pits" proposed for additional work. Many of these old mining sites fall under the Corps' jurisdiction. The Corps strives to make permit decisions on the least damaging practicable alternative available to the applicant. Operators should be aware that the Corps' evaluation and decision-making process typically takes between 90 and 120 days and will often result in a modified project, from that proposed, to lessen environmental impacts associated with the mining operation. In some situations this process could lead to denial of the permit request. Therefore, when evaluating a potential mining site an operator should consider ways to avoid impacts to jurisdictional waters, including wetlands that have been determined to exist on-site, prior to submitting a Department of the Army permit request.

## Appendix III - Title 33 Environmental Quality

### Title 33, Part IX, Subpart 1

#### 9. Turbidity

- a. Turbidity other than that of natural origin shall not cause substantial visual contrast with the natural appearance of the waters of the state or impair any designated water use. Turbidity shall not significantly exceed background; background is defined as the natural condition of the water. Determination of background will be on a case-by-case basis.
- b. As a guideline, maximum turbidity levels, expressed as nephelometric turbidity units (NTU), are established and shall apply for the following named water bodies and major aquatic habitat types of the state:
  - i. Red, Mermentau, Atchafalaya, Mississippi, and Vermilion Rivers and Bayou Teche—150 NTU;
  - ii. estuarine lakes, bays, bayous, and canals—50 NTU;
  - iii. Amite, Pearl, Ouachita, Sabine, Calcasieu, Tangipahoa, Tickfaw, and Tchefuncte rivers—50 NTU;
  - iv. freshwater lakes, reservoirs, and oxbows—25 NTU;
  - v. designated scenic streams and outstanding natural resource waters not specifically listed in Clauses B.9.b.i-iv of this Section—25 NTU; and
  - vi. For other state waters not included in Clauses B.9.b.i-v of this Section, and in water body segments where natural background turbidity exceeds the values specified in these clauses, turbidity in NTU caused by any discharges shall be restricted to the appropriate background value plus 10 percent. This shall not apply to designated intermittent streams.
- c. The administrative authority may exempt for short periods certain activities permitted under Sections 402 or 404 and certified under Section 401 of the Clean Water Act, such as maintenance dredging of navigable waterways or other short-term activities that the state determines are necessary to accommodate legitimate uses or emergencies or to protect the public health and welfare.

10. Flow. The natural flow of state waters shall not be altered to such an extent that the basic character and water quality of the ecosystem are adversely affected except in situations where alterations are necessary to protect human life or property. If alterations to the natural flow are deemed necessary, all reasonable steps shall be taken to minimize the adverse impacts of such alterations. Additionally, all reasonable steps shall be taken to mitigate the adverse impacts of unavoidable alterations.

11. Radioactive Materials. Radioactive materials in the surface waters of the state designated for drinking water supply use shall not exceed levels established pursuant to the Federal Safe Drinking Water Act (P.L. 93-523 et seq.).

## 12. Biological and Aquatic Community Integrity

- a. The biological and community structure and function in state waters shall be maintained, protected, and restored except where not attainable and feasible as defined in LAC 33:IX.1109. This is the ideal condition of the aquatic community inhabiting the unimpaired water bodies of a specified habitat and region as measured by community structure and function. The biological integrity will be guided by the fish and wildlife propagation use designated for that particular water body. Fish and wildlife propagation uses are defined in LAC 33:IX.1111.C. The condition of these aquatic communities shall be determined from the measures of physical, chemical, and biological characteristics of each surface water body type, according to its designated use (LAC 33:IX.1123). Reference site conditions will represent naturally attainable conditions. These sites should be the least impacted and most representative of water body types. Such reference sites or segments of water bodies shall be those observed to support the greatest variety and abundance of aquatic life in the region as is expected to be or has been recorded during past surveys in natural settings essentially undisturbed by human impacts, development, or discharges. This condition shall be determined by consistent sampling and reliable measures of selected, indicative communities of animals (i.e., fish, invertebrates, etc.) and/or plants as established by the department and may be used in conjunction with acceptable chemical, physical, and microbial water quality measurements and records as deemed appropriate for this purpose.
  - b. Assessment of Biological Integrity for Wetlands Approved for Wastewater Assimilation Projects Pursuant to the Water Quality Management Plan, Volume 3, Section 10, Permitting Guidance Document for Implementing Louisiana Surface Water Quality Standards. Wetland biological integrity will be guided by above-ground wetland vegetative productivity with consideration given to floral diversity. Due to effluent addition, the discharge area of a wetland shall have no more than a 20 percent reduction in the rate of total above-ground wetland productivity over a five-year period as compared to a reference area. The discharge area is the area of a wetland directly affected by effluent addition. For each location, the discharge area will be defined by the volume of discharge. The reference area is the wetland area that is nearby and similar to the discharge area but that is not affected by effluent addition. Above-ground productivity is a key measurement of overall ecosystem health in the wetlands of south Louisiana. Primary productivity is dependent on a number of factors, and the methods for measurement of above-ground productivity and floral diversity are found in the current Water Quality Management Plan, Volume 3, Section 10, Permitting Guidance Document for Implementing Louisiana Surface Water Quality Standards.
1. pH. The pH shall fall within the range of 6.0 to 9.0 unless natural conditions exceed this range or where otherwise specified in the table (LAC 33:IX.1123). No discharge of wastes shall cause the pH of a water

body to vary by more than one pH unit within the specified pH range for the subsegment where the discharge occurs.

2. Chlorides, Sulfates, and Total Dissolved Solids. Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Table, increases over background levels of chlorides, sulfates, and total dissolved solids may be permitted. Such increases will be permitted at the discretion of the department on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 250, and 500 mg/L for chlorides, sulfates, and total dissolved solids, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the department shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies.

3. Dissolved Oxygen. The following dissolved oxygen (DO) values represent minimum criteria for the type of water specified. Naturally occurring variations below the criterion specified may occur for short periods. These variations reflect such natural phenomena as the reduction in photosynthetic activity and oxygen production by plants during hours of darkness. However, no waste discharge or human activity shall lower the DO concentration below the specified minimum. These DO criteria are designed to protect indigenous wildlife and aquatic life species associated with the aquatic environment and shall apply except in those water bodies that qualify for an excepted water use as specified in LAC 33:IX.1109.C or where exempted or excluded elsewhere in these standards. DO criteria for specific state water bodies are contained in LAC 33:IX.1123.

- a. Fresh Water. For a diversified population of fresh warmwater biota including sport fish, the DO concentration shall be at or above 5 mg/L. Fresh warmwater biota is defined in LAC 33:IX.1105.
- b. Estuarine Waters. Dissolved oxygen concentrations in estuarine waters shall not be less than 4 mg/L at any time.
- c. Coastal Marine Waters (Including Nearshore Gulf of Mexico). Dissolved oxygen concentrations in coastal waters shall not be less than 5 mg/L, except when upwellings and other natural phenomena cause this value to be lower.

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