Disposition of Storm-Generated Debris:

An Analysis of the Composition, Handling, Disposal, and Potential Reuse of Storm-Generated Debris in Louisiana Coastal Restoration Projects

INTRODUCTION

Hurricanes Katrina and Rita created over 46 million cubic yards (22 million tons) of debris. Means by which to dispose of that debris in ways other than traditional methods, e.g. landfilling, should be explored and their ultimate use in coastal restoration is worthy of evaluation. It is reasonable however, that due to the complex ecosystem that is coastal Louisiana, careful assessment of chemical and physical components of debris and how those components may affect the system should be initiated. Aside from the environmental ramifications of using debris, there are also local, state, and federal regulatory compliance issues that must be addressed as well.

Hurricanes Katrina and Rita have caused widespread damage in coastal Louisiana. As a result of these two catastrophic events, over 46 million cubic yards of debris, which consists of vegetative matter (green waste), construction and demolition (C&D) debris, household appliances (white goods), and automobiles has been generated in the state. Collection, transportation, and disposal of storm-generated debris are being managed primarily by the Federal Emergency Management Agency (FEMA) and the U. S. Army Corps of Engineers (USACE). The objectives of this paper are to:

- Provide an overview of the current state of the debris management mission in the two heaviest impacted areas of the state: southwestern Louisiana and the greater New Orleans (North Shore of Lake Pontchartrain, Orleans/ Plaquemines, Parishes) area
- Discuss basic characteristics of storm-generated debris and composition
- Provide a brief analysis of the efficacy of using select storm-generated debris in coastal restoration projects and a discussion on environmental and ecological implications inherent in their use

STORM DEBRIS – CURRENT STATE AND COMPOSITION

The volume and composition of storm debris varies by geographic region across the storm-affected areas of Louisiana. Green waste appears to be the dominant waste type in southwestern Louisiana and the undeveloped areas of the north shore of Lake Pontchartrain while the more densely populated Greater New Orleans area have significantly higher volumes of C&D debris and white goods.

Southwestern Louisiana. Providence Engineering has, though contractual agreements with the Louisiana Department of Transportation and Development (LDOTD), been involved in monitoring the collection and disposal of green waste, C&D debris, and white goods along state highways in a five-parish area - Calcasieu, Beauregard, Allen, Jeff Davis, and Cameron Parishes. Most of the debris collected under the LDOTD contract was green waste which consisted primarily of tree limbs, tree trunks, and tree stumps in all five parishes. In addition, marsh grass waste was ubiquitous in Cameron Parish while white goods were an extremely small fraction of the total debris collected. Green waste constituted the majority of the debris collected in the Lake Charles and Sulphur metro areas. Most of the disposal sites in southwestern Louisiana were authorized to accept only green waste. Of those, some were permitted for disposal only and some were permitted for the burning of debris. Debris piles that contained a mixture of vegetative and C&D debris, or contained only C&D debris, were hauled to sites authorized for C&D disposal. Only a small portion of the debris collected in the southwestern part of the state contained uncontaminated concrete and brick.

North Shore – Lake Pontchartrain. Clean-up of the north shore of Lake Pontchartrain was relatively quick after Hurricane Katrina because this area did not experience standing floodwater for a significant amount of time. The highly populated area adjacent to Lake Pontchartrain and the storm surge that flooded that area, created a mixture of storm-generated debris that contained green waste and sediments carried inland by the surge, and significant volumes of C&D debris. High winds caused extensive damage to nearly all of the mature timber in St. Tammany and Washington Parishes. Approximately 65% of the volume of debris collected north of Interstate 12 to date has been green waste. C&D debris, including wood, metal, brick, and concrete, has been generated in all portions of the north shore area (with some white goods as well). Of this demolition debris, it appears that only a small percentage of it is clean concrete and brick and these materials are commingled with the other waste streams.

Subsequent phases of the debris mission will include collection of demolition debris from storm-damaged homes and C&D debris from the extensive amounts of new residential and commercial construction that is anticipated for that area. This debris will primarily consist of water-damaged sheetrock, insulation, roofing materials, boards, and small amounts of brick and concrete. This debris will also contain small amounts of asbestos containing material (ACM's) and lead-contaminated material and will be disposed of at Louisiana Department of Environmental Quality (LDEQ) authorized storm-generated debris disposal sites. No segregation of this material is being performed at this time and none is anticipated.

Orleans and Plaquemines Parishes. Orleans Parish did not allow open burning of green waste and much of this material was shredded and stockpiled for future use. Stumps and other large items were sent for disposal. Residential cleanup of Orleans Parish has created large piles of commingled material including green waste, white goods, household electronic devices (computers and televisions), furniture, appliances, automobiles, water-damaged interior building materials, and some household hazardous waste. The age of several of the homes in Orleans parish has been a factor

in determining the final disposition of large amounts of the debris. Many of the damaged homes contain lead paint and ACM's. These materials require special handling by the contractors performing the debris removal. Additionally, the presence of Formosan termites in the greater New Orleans area have required the Louisiana Department of Agriculture and Forestry (LDAF) to issue a ban on the transportation of any storm-generated debris out of the immediate area.

A significant percentage of debris collected in lower Plaquemines Parish consisted of green waste that was carried inland by the storm surge and boats that were lifted out of the water and taken inland. In addition to the homes and other structures, several crude oil, diesel fuel, and jet fuel tanks were ruptured and their contents were released into the floodwaters. These petroleum products formed a thin layer on the water surface and were dispersed for miles in each direction covering much of the landscape and remnants of structures once the floodwaters receded. In essence, the storm created an entire parish of commingled debris of all types. All of the debris being collected in lower Plaquemines Parish, with the exception of white goods and household hazardous waste, is being transported for disposal to LDEQ authorized storm debris disposal sites.

As a result of the extensive flooding and health concerns associated with the floodwaters, green waste was handled with extreme caution in these two areas. Green waste was collected from within the right-of-ways and transported to designated staging areas or to authorized storm debris disposal sites.

CURRENT RESTORATION TECHNIQUES RELEVANT TO DEBRIS DISPOSITION ISSUE

Since the inception of the Louisiana coastal restoration effort, local, state, and federal resource and regulatory agencies have evaluated innovative technologies using available materials for coastal restoration projects. Several such coastal restoration efforts are discussed briefly in the subsequent sections.

Green waste. Perhaps the most noted coastal restoration effort using green waste has been the Louisiana Department of Natural Resources (LDNR) Parish Coastal Wetland Restoration Program, otherwise known as the Christmas Tree Program, which was initiated in 1989. Brush fence enclosures have been used in open waterbodies, abandoned oilfield canals, inland lakes, along the Gulf Intercoastal Waterway etc. and are effective in slowing fetch and trapping sediments. Christmas trees have proven to be an effective material for brush fences as they are large yet lightweight, easy to transport, and they allow movement of water and sediments without creating a barrier. Christmas trees are a plentiful source of clean fill material (free of contaminants) and have no significant adverse effects on water quality.

Composted Matter. Attempts to evaluate the use of compost (green waste) for coastal restoration projects have been initiated. The Compost Demonstration Project in Cameron Parish (CS-26) was authorized by Coastal Wetlands Planning, Protection, and

Restoration Act (CWPRA) to demonstrate, under field conditions, the influence of compost in establishing vegetation on newly deposited dredge material in open water. The objectives of the project were to:

- Evaluate the effectiveness of using tree trimmings as compostable material and compost-amended material in providing a growth medium for emergent vegetation
- Determine settlement rates of compost amended materials and tree trimmings

The project involved construction of three containment cells that were to be filled with compost (consisting of a mixture of hardwoods and some conifers) and/or dredge material. The Monitoring Plan developed for the project listed potential limitations for the proposed use including…..*while it is likely that no difference in dissolve oxygen and soil Eh would be detected between the compost marsh and nearby marshes, the water draining from the natural and compost marshes could differ in chemical composition, which could lead to different levels of stress on organisms in adjacent aquatic habitats.* The hypothesis was not fully tested as the CWPPRA Task Force de-authorized the project in January of 2002 due to, among other issues, logistical problems regarding staging and storing of compost materials.

Rock/Limestone Materials. Use of rock and limestone material has been an effective tool for coastal restoration, particularly in shoreline stabilization projects. These projects have been used across coastal Louisiana and include, but are not limited to the following CWPPRA projects: the Bayou Chevee Shoreline Protection Project in Orleans Parish; the Barataria Bay Waterway West Side Restoration Project in Jefferson Parish; the Cameron Prairie Refuge Shoreline Protection Project in Cameron Parish; and the Pointe-Au-Fer Hydrologic Restoration Project in Terrebonne Parish. Rock/concrete materials generated from the storm, provided that they are of sufficient size and free of contaminants, may have application for shoreline stabilization projects.

FEASIBILITY OF USING DEBRIS IN COASTAL RESTORATION PROJECTS

Among the inherent questions in the evaluation process of determining the efficacy of using storm-generated debris for coastal restoration projects are environmental, regulatory, and logistical issues. Potential impacts to water quality, the regulatory implications of using debris in sensitive coastal wetland systems, and the processing/storage/transport of the debris itself must be considered.

Water Quality. The use of green waste in connection with coastal restoration projects is not expected to result in water quality impacts of any significant and enduring nature. The added biomass from green waste, which is consistent in its nature with the biomass extant in coastal wetland ecosystems, will be naturally assimilated. Localized, short-term effects on dissolved oxygen levels could result because of the added biochemical oxygen demand from the microbial breakdown of some components of the green waste

biomass. The possible short-term and localized effect cannot be expected to result in any measurable harm or injury to coastal ecosystems.

The use of concrete/brick debris, so long as it is free of contamination with any chemicals (e.g., solvents, paints, petroleum derivatives, etc.) is not expected to result in any significant and enduring adverse impacts. In coastal wetland habitats, the concrete materials will be quickly invested and covered with biological growth of epilithic algae and other microorganisms, thereby camouflaging the appearance of the debris and consequently not be in violation of the general criterion for aesthetics as promulgated in the Louisiana Surface Water Regulations at Louisiana Administrative Code (LAC), Title 33:IX.1113.B.1.

The use of other types of debris including white goods, vehicles, and construction debris such as gypsum wall board, painted lumber, plywood, and particle board, asphalt shingles, electrical and plumbing materials is considered to have the potential to result in adverse impacts on water quality in coastal wetland ecosystems. Not withstanding the effort to remove potential chemical contaminants from these types of materials, their placement in wet environments of the coastal zone will have the potential for the eventual leaching of chemical contaminants, including petroleum derivatives, paint and solvent constituents, inorganic chemicals such as sulfates and certain toxic metals such as chromium, copper, lead, and mercury. Further beyond the potential for leaching of chemical contamination, the placement of white goods, vehicles, and certain construction debris (as described above) in wet environments of the coastal zone will violate the general criterion for aesthetics established by the Louisiana Surface Water Quality Standards (LAC 33:IX.113.B.1)

Regulatory Issues. State and federal agencies regulate activities in coastal Louisiana. Deposition of fill material, including green waste, into wetlands, waterbodies, and “other” waters of the United States is under the jurisdiction of the USACE under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. The LDNR Coastal Management Division regulates activities in the Louisiana Coastal Zone that may affect coastal waters and exercises this authority through its Coastal Use Permitting program. Additionally, for those projects requiring Section 404 authorization, Water Quality Certification (WQC) under Section 401 of the Clean Water Act is required by the Louisiana Department of Environmental Quality. A requirement for WQC authorization is that fill materials deposited into regulated waters of the state must be free of contaminants.

Resource agencies with individual mandates to protect fish and wildlife resources also play a pivotal role in the wetland permitting review process. These agencies include the National Marine Fisheries Service, the US Fish and Wildlife Service, and the Louisiana Department of Wildlife and Fisheries. These agencies will not only assess effects on water quality but will focus on issues including, but not limited to, *Essential Fish Habitat*, threatened and endangered species, and oyster resources. Use of debris in coastal restoration projects will most likely be exposed to a high level of scrutiny by these agencies.

Debris Logistics. Important factors to consider when evaluating the feasibility of using storm-generated debris in coastal restoration projects are the logistic and transportation aspects. Much of the clean green waste of the overall debris stream has been generated in areas north of the Interstate 12 corridor in the eastern part of the state and several miles inland in the western part of the state. Green waste, if it were to be used for coastal restoration projects, would have to be segregated before collected, loaded and transported to an authorized staging area, processed, and then reloaded and transported by truck to the project locations. In most instances, the material will not be able to be transported directly to the project location by truck. It is anticipated that, subject to project accessibility, the material would have to be loaded onto a barge or other means of transportation by water for the material to reach the ultimate end use location.

In addition to the transportation of the debris, the roadside/curbside segregation, processing, and staging of the debris must be considered. Each process that the debris must go through prior to the ultimate end use adds substantial cost to the overall project. These added costs for segregation, processing, and storage in addition to the transportation costs may serve as a deterrent for using storm-generated debris in coastal restoration projects.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions. From a water quality and regulatory standpoint, storm-generated debris that appear to be the most practical in coastal restoration projects are uncontaminated concrete and green waste. As discussed, these or similar materials have been used successfully in previous restoration projects and it does not appear that their use, under certain conditions, will result in water quality degradation. Clean C&D debris, provided it is of sufficient size and is free of contaminants, may be suitable for shoreline restoration projects. The use of white goods, vehicles, and construction debris such as gypsum wall board, painted lumber, plywood, and particle board, asphalt shingles, electrical and plumbing materials is considered to have the potential to result in adverse impacts on water quality in coastal wetland ecosystems and would therefore not be applicable in coastal restoration projects.

Recommendations. To determine the efficacy of using these debris types in coastal restoration projects, volumetric estimates of stockpiled and as yet uncollected material, both green waste and concrete C&D debris, should established. It will be critical that debris composition in terms of potential contaminants is identified. Locations of currently stock-piled debris should be identified as well to determine handling and transportation logistics for those debris sources that may be used. Localized restoration needs for the material(s) should be identified to affect their most cost-effective uses, as location and volume of debris will affect practicability of use in terms of handling and transportation costs.

Green waste may have application in projects similar to those used in the DNR Christmas Tree Program as brush fence fill material, provided it can be processed in a manner to mimic the physical attributes of trees currently in use. Additionally, green waste, either in chipped, segmented, or composted form, perhaps combined with dredged material, may have applications under favorable environmental conditions in providing substrate in shallow open water areas that would promote establishment of emergent wetland vegetation. Under certain conditions there may be applications for using composted materials to fill netted enclosures (e.g. geo-tubes) for use in fetch reduction and to promote sediment accretion along eroding shorelines. In all cases, the critical step in evaluating use of debris in coastal restoration projects is whether or not that material is free of contaminants that could result in water quality degradation.

Finally, it is recommended that LDNR and all relevant local, state, and federal agencies consider formulating a comprehensive plan for the disposition of debris in future storm events. The plan could include, but not be limited to, segregation criteria that could be employed immediately after storms so that relatively clean materials could subsequently be used and identification of staging areas for debris stock piles.