December 20,1999

Gulf of Mexico Hypoxia Working Group
National Oceanic and Atmospheric Administration
National Center for Coastal Ocean Science
Room 9127 1305 East-West Highway
Silver Spring, MD 20910

To the Gulf of Mexico Hypoxia Working Group:

RE: COMMENTS ON THE INTEGRATED ASSESSMENT ON THE CAUSES AND CONSEQUENCES OF HYPOXIA IN THE GULF OF MEXICO

The undersigned organizations submit the following comments on the Integrated Assessment on the Causes and Consequences of Hypoxia in the Gulf.

General Comments

Initially, we would like to commend the National Science and Technology Council's Committee on Environment and Natural Resources (CENR) for compiling such a comprehensive analysis of the existing data and applied existing models of the Mississippi/Atchafalaya watershed-Gulf system. The Assessment makes important initial findings regarding the relationship between nitrogen and the Dead Zone, sources of nitrogen entering the Mississippi River Basin, and potential strategies for reducing the levels of nitrogen reaching the Gulf.

The Integrated Assessment is an important first step. However, in order to make this effort worthwhile, the administration must ensure that state and federal agencies use the Assessment's as the basis for an action agenda aimed at addressing the root causes of nitrogen pollution in the Mississippi River Basin. Moreover, it is imperative that the research needs identified in the Assessment be incorporated into appropriate agency budget priorities and that full funding for all necessary research be appropriated by Congress. We look forward to working with the CENR and the Mississippi River/Gulf of Mexico Watershed Nutrient Reduction Task Force to ensure that the Integrated Assessment is fully utilized.

Causes of Gulf of Mexico Hypoxia

The Integrated Assessment thoroughly analyzes all factors identified within the Draft Reports, as well as the public comments submitted on the Draft Reports, as potentially contributing to Gulf of Mexico hypoxia. The Integrated Assessment finds that no single factor is alone causative, but that all factors interact to produce the Dead Zone. Nonetheless, the Assessment makes clear that only increases in nitrogen loading from the Mississippi/Atchafalaya River system can account for the magnitude of the hypoxic zone

and its increase over time, finding that no other factors, alone or in combination, can explain the overall size of the Dead Zone. The Assessment's conclusions are clearly consistent with findings in other watersheds that anthropogenic sources of nutrients have a pervasive ecological effect on shallow coastal and estuarine areas. *See, e.g.*, J.M. Burkholder et al., "Rupture of a Large Swine Waste Holding Lagoon in North Carolina, U.S.A.: Impacts on a Coastal River and Estuary," *J. Envtl. Quality* (1997); Justi et al., "Trends in Oxygen Content 1911-1984 and Occurrence of Benthic Mortality in the Northern Adriatic Sea", 24 *Estuar. Coastal Shelf Sci.* 435 (1987).

Consequences of Hypoxia in the Northern Gulf Of Mexico

The Integrated Assessment corrects the errors within Draft Report 2, finding that the consequences of hypoxia in the Gulf of Mexico are not fully known. The Integrated Assessment also makes clear that the failure of the economic assessment based on fisheries data to detect effects does not necessarily mean that effects are absent.

Prior to finalizing the discussion of effects, we would request that the authors of the Integrated Assessment review an article recently published by Benny J. Galaway, John G. Cole, Robert Meyer and Pasquale Roscigno entitled "Delineation of Essential Habitat for Juvenile Red Snapper in the Northwestern Gulf of Mexico," *Transactions of the American Fisheries Society* 128:713-726 (A copy is attached). The authors of the article find that

> a significant reduction (up to 25%) in red snapper habitat carrying capacity has been observed in association with the most recently observed expansion in the size of the hypoxic region occurring in the Gulf of Mexico around the mouth of the Mississippi River. This change, if real, may affect the level to which Gulf red snapper stocks can be rebuilt relative to historical stock levels. ... Nearshore species dependent on low-salinity conditions characteristic of the white shrimp ground assemblage ... have likely undergone much larger reduction in habitat carrying capacity because alternative low-salinity habitats are not extensive outside the hypoxic region.

"Delineation of Essential Habitat for Juvenile Red Snapper in the Northwestern Gulf of Mexico" at 722. Red Snapper and penaid shrimp are two of the most economically important species in the Gulf of Mexico. If the assumptions employed by the authors prove correct, the economic implications of this finding for Gulf fisheries are significant.

We continue to be concerned that the Integrated Assessment fails to adequately discuss the potential economic impact of disruptions in shrimp migrations. It is undeniable that the east/west movement of shrimpers resulting from changes in shrimp migration patterns could have negative economic impacts. Recent data indicate that years of strong inshore

shrimp production in Louisiana have coincided with increased landings in Texas; historically, that has not been the case. (Personal communication with Dr. James Nance, National Marine Fisheries Service). It can be inferred from this recent change that hypoxic conditions have led to a more east/west shrimp migration pattern rather than an historical migration to the offshore waters south of Louisiana. Absent other factors, this change in migration pattern undoubtedly causes Louisiana shrimpers to travel greater distances in the Gulf. Increases in distance traveled concomitantly increase the costs of doing business (i.e., gasoline, ice, etc.), and decrease profits. *See* John A. Downing et al., *Hypoxia in the Gulf of Mexico: Land and Sea Interactions*, Ch. 3 at 18 (June 28, 1999)(hereinafter "CAST" Report)(noting that increased levels of effort required to catch shrimp due to the effects of hypoxia on shrimp migration patterns decrease net revenue to the fisheries, impacting social welfare). We continue to believe that this must be addressed within the Final Integrated Assessment.

Additionally, we remain concerned regarding the methodology employed in attempting to analyze the economic effects of hypoxia. It is difficult to analyze the aggregate fisheries impact of degraded water quality by examining landings or dockside values. *See* CAST Report, Ch. 3 at 18. There are also dangers in using CPUE to estimate stock size. Consistent landings or CPUE can be clouded by governmental management systems, increased technology, improved shrimp location data, or the grouping of shrimp due to hypoxia. For example, if technology improves catch per unit effort, the model employed in the Report's analysis would assume higher stock size. Yet, this assumption would clearly be erroneous. Additionally, a finding that fishery landings are constant is not an absolute indication that the fishery is healthy. For instance, with current increases in technology it could be assumed that fisheries landings would be increasing. The fact that they are <u>not</u> may be an indication that shrimp populations are declining, or it could just as easily be the result of management measures.

Finally, although the Assessment now discusses the consequences of nutrient concentration in the Mississippi-Atchafalaya River Basin, this discussion is limited to ecological and environmental impacts. Nitrogen pollution has numerous economic costs to society. For example, data from the Environmental Protection Agency indicate that agriculture-related nutrients account for much of the degradation of water quality in rivers throughout the Basin, and significant impairment of lake acreage. . U.S. Environmental Protection Agency, *National Water Quality Inventory* (1994). Efforts to address these water quality problems have real economic costs. For example, nitrate/nitrogen levels in drinking water sources significantly increase treatment costs incurred by drinking water treatment facilities. All of the economic impacts or costs of nitrogen pollution in the Mississippi River Basin must be discussed within the Integrated Assessment.

Effects of Changing Nutrient Loads

We commend the authors of the Integrated Assessment for the thorough discussion of potential effects under a "no loading change" scenario if the Gulf of Mexico continues to suffer from annual losses of biodivesity, abundance, and biomass. Moreover, we wish to

underscore the importance of the Assessments' finding that any costs associated with reductions in nitrogen in the Mississippi/Atchafalaya river system would be offset by a number of benefits including: improved water and habitat quality within the basin; reduced soil erosion; reduced contamination of drinking water by nitrates; improved water quality for recreational use; improved recreational fisheries and wildlife; and cost-effective flood control improvements. Just as meaningful is the finding that all nutrient reduction approaches considered are expected to produce environmental benefits. The valuable environmental and ecological benefits that will accrue to the Mississippi River Basin from efforts to reduce nitrogen loadings have heretofore been largely ignored in discussions of the costs and benefits of addressing the hypoxia issue. Yet, this is an important consideration for the Mississippi River/Gulf of Mexico Nutrient Reduction Task Force, or anyone attempting to craft a strategy to address the issue of nitrogen pollution in the Mississippi River/Atchafalaya system.

Approaches For Reducing Nutrient Loads

In general, the findings of the Assessment with regard to methods for reducing nutrient loads are accurate and reflect both in-depth analysis and creative thinking. Previous sections of the Assessment address all possible factors linked to increased nitrogen levels to the Gulf, including increases in nitrogen use, the rate of flow of water to the Gulf, leveeing, damming, and channeling of the Mississippi River, and the loss of wetlands in southern Louisiana. Section 5 of the Assessment rightly notes that an optimal strategy would take appropriate advantage of the full range of possible measures to deal with hypoxia in the Gulf, including modification of farm practices, creation and restoration of wetlands and riparian ecosystems, implementation of nitrogen control on wastewater plants, and diversion of floodwaters to backwaters and marshlands of the Mississippi River delta and adjacent coastal wetlands. The advantages of such an approach extends beyond the issue of nitrogen pollution, providing the additional benefits of flood control, increased wildlife habitat, detoxification, erosion control, and reduced sedimentation of water bodies -- objectives consistent with other state and national policy initiatives. For example, restoration of wetland and riparian areas have clear implications for improvement of overall water quality, increased wildlife habitat, and flood damage reduction. These in turn create additional ecological and economic benefits.

The Assessment's discussion of changes in farm practices -- the integration of more perennial crops, the reduction of subsurface drainage, better timing of manure and fertilizer applications, and nutrient accounting -- is limited largely to the costs and effects of such changes on productivity. The discussion ignores the fact that such changes will likely work toward the farmers' long-term economic interests through more efficient use of nutrients, reduction of off-farm input costs, and reduced pollution hazards for well and pond water. We believe this issue must be addressed within the Integrated Assessment.

We are also concerned that the Integrated Assessment largely ignores the findings in Draft Report 5 that subsurface drainage ("tiling") is a significant contributor to and primary source of high nitrate loads in the Corn Belt states. In those states, there are

about 50 million acres of intensively drained farmland. Most is drained through the use of subsurface tile. In fact, there has been a significant increase in tile drainage in recent years and it is likely that this trend will continue. In these areas, elevated levels of nitrate-nitrogen concentrations in drainage water will be lost in tile-drained soil regardless of fertilizer management practices. This trend would appear to explain why, despite purported decreases in the use of fertilizers on corn, no significant decrease in nitrogen inputs to the Mississippi River has been observed: the increase in the acreage of tile-drained fields has potentially offset any reduction in fertilizer use. In light of the clear role that "tiling" plays in the levels of nitrogen entering the Mississippi River, any approach to nitrogen reduction would need to address management of these drainage systems. Given the importance of this issue, discussions of the need for management must be emphasized in the final Integrated Assessment.

We applaud the Assessment's recognition that improved management of feedlot runoff is one of the measure with the greatest estimated potential to reduce nitrogen sources to streams and rivers. However, we are distressed by the failure of the Integrated Assessment to acknowledge the particular need to address large, concentrated animal feeding operations ("CAFOs"). CAFOs contribute to nutrient pollution in several ways: emissions of ammonia, excessive and concentrated disposal of manure, lagoon leakage, and all-too-frequent total waste lagoon failures. In fact, the enormous volume of water accumulated at these factory farms is so great that the possibility of sustainable nutrient cycling back to cropland is virtually impossible. During his oral presentation on Draft Report 6 at a Mississippi River/Gulf of Mexico Hypoxia Task Force meeting, Dr. Otto Doering asserted that the threat of nutrient pollution from livestock agriculture is more significant than calculations of manure output suggest. He further indicated that this is due to the concentrated industrial manner in which animals are now raised and their wastes disposed. Dr. Doering's conclusions find support in recent publications. *See, e.g.*, Carey, et al. "The Role of the Mississippi River in Gulf of Mexico Hypoxia", 70 *Envtl. Institute Rep.* at 27 (May, 1999); Clean Water Network and Natural Resource Defense Council, *America's Animal Factories: How States Fail to Prevent Pollution from Livestock Waste* (December, 1998).

Alternatives to concentrated animal feeding exist. Most entail the redistribution of livestock back onto the farms where the feed is being produced and the manure can be economically and ecologically used as a fertilizer. This re-opens the option for sustainable nutrient cycling. Many alternatives are also associated with the increased grazing and feeding of perennial forage crops which has been acknowledged in the Integrated Assessment as a useful means for reducing nitrate pollution. Yet, the discussion of this issue within the Integrated Assessment is limited to the statement of a need to better manage feedlot runoff. Clearly, additional attention must be given this issue.

The Integrated Assessment makes passing reference to cover crops. However, no significant discussion of the use of cover crops as a mechanism to prevent leaching is included. The use of non-leguminous grasses as "catch crops" has long been a strategy for

sequestering soluble nutrients and recycling them for subsequent crops. Considerable research has already been done on this technique, much of it using cereal rye and ryegrass -- species adaptable throughout most of the Mississippi River Basin. Techniques for interseeding and overseeding these grasses have also been developed, and there would be few barriers to implementation. In truth, cover cropping should, by now, be well integrated into Best Management Practices for row crop production. Unfortunately, that change has been too slow in coming.

Finally, the Integrated Assessment fails to recognize that individual farming practices are bundled into farming systems. In a conventional farming system, installing subsurface drainage to improve potential crops yields is generally bundled with reduced use of sod-forming crops and increased use of nitrogen fertilizers. The Assessment ignores the results of studies that demonstrate the positive impact that whole farming systems -- such as organic farming -- can have on nitrogen pollution. Organic farming is an approach to agricultural production that replaces pesticides, soluble fertilizers, and monoculture with biodiversity, cultural practices, and inputs that are more environmentally friendly. Recently published results of a 15-year study reveal that nitrate leaching was 50% less under organic production systems than under the typical conventional system. Drinkwater, L.E. et al. "Legume-Based Cropping Systems Have Reduced Carbon and Nitrogen Losses", 396 (19) *Nature* 262 (1998). Another recent publication reports the large increases in nitrate leaching were found when several Illinois farm fields were converted from diverse organic rotations and management to conventional corn and soybean production. W.A. Goldstein, et al., "Impact of Agricultural Management on Nitrate Concentrations in Drainage Waters", 13 (3) *American J. of Alternative Agriculture* 105 (1998).

Adaptive Management: Action, Monitoring, and Research

We concur with the Assessment's finding that further monitoring and research are needed to reduce uncertainties. We also agree that a comprehensive program of monitoring, interpretation, modeling and research should be coupled to initial management strategies. However, as aptly pointed out within the Assessment there are always uncertainties in scientific analysis. These uncertainties should not be used as an excuse for delay in the development and implementation of an action oriented agenda to address the clearly identified causes of hypoxia. Environmental responses to reductions in nitrogen will be slow, possibly requiring decades. Continuing delay in implementation of needed management measures will only serve to increase the risk to the valuable resources of the Gulf associated with persistent hypoxia.

With regard to research, we would agree that significant attention should be accorded to research focused on the ecological effects of hypoxia. The fishery resources of the Gulf of Mexico are among the most valuable in the United States. Numerous coastal communities are dependent upon these resources. Thus, it is essential that a better understanding of the potential long-term impacts of hypoxia on the Gulf be obtained.

We also agree with the Assessments' observation of the need to better quantify the effects of on-farm practices and methods that intercept agricultural nutrients between the field and ground water and adjacent streams. Much discussion has been had regarding the number of acres converted to buffer and the number of other on farm practices adopted by agricultural interests. However, inquiries to the Natural Resource Conservation Service and Department of Agriculture have revealed very little data regarding the effectiveness of those practices in reducing nitrogen and other nutrients reaching the ground water and adjacent streams. Similarly, very little, if any, data has been produced reflecting the offsetting effect of tiling on the adoption of on farm practices and methods intended to intercept agricultural nutrients. In depth research to determine the effect of agricultural conservation efforts being pursued by state and federal agencies is essential to the development of an effective strategy to address loadings of nitrogen entering local waterbodies and eventually the Mississippi/Atchafalaya system. And detailed research is needed to help us understand the relationship between fertilizer use, mineralization of nitrogen from soil organic matter, crop rotations, and movement of nitrogen from fields to streams.

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