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COMMENTS OF THE MISSISSIPPI RIVERWISE PARTNERSHIP ON THE DRAFT HYPOXIA ASSESSMENT REPORTS

The Mississippi Riverwise Partnership (MRP), a coalition of environmental, conservation and sustainable agriculture groups that has formed to work on solutions to the Dead Zone in the Gulf of Mexico, submit the following comments on the Draft Hypoxia Assessment Reports (hereinafter Draft Reports) issued by the President's Committee on the Environment and Natural Resources (CENR).

A. General Comments

Initially, the MRP would like to thank the CENR for initiating such a comprehensive effort to analyze the existing data and applied existing models of the watershed-gulf system. This assessment of peer reviewed data pertaining to the extent, characteristics, and causes and effects (both ecological and economic) of hypoxia in the Northern Gulf of Mexico is an important first step in attempts to address nitrogen pollution within the Mississippi River Basin that contribute to the Dead Zone. These Draft Reports make 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 Draft Reports also identify important research needs.

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

1. The Findings of the Fertilzer Institute Report, although not undermining the CENR Reports, should be discussed within the Final CENR Reports

Recently a report was completed for the Fertilizer Institute entitled "The Role of the Mississippi River in Gulf of Mexico Hypoxia" (Environmental Institute Report 70, May 1999) (hereinafter Fertilizer Institute Report). Claims have been made that the Fertilizer

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Institute Report somehow undermines the findings of the CENR Draft Reports. These claims are unfounded. A careful review of the Fertilizer Institute Report reveals that there is no significant conflict between the conclusions reached in that Report and those reached within the CENR Draft Reports. In fact, the Reports agree on most issues. Common findings include: 1) a relation between phytoplankton production in the Gulf and nutrients exported from the Mississippi River; 2) the identification of agriculture as the single most significant contributor of nitrogen to the Mississippi River; and 3) a finding that anthropogenic changes in the Mississippi River basin watershed, including significant loss of wetland habitats, increased levying of the River, and increases in precipitation have influenced nutrient flux from the watershed. The sole purported disagreement between the Fertilizer Institute Report and the CENR Draft Reports is a disagreement implied within the Fertilizer Institute Report itself regarding changes in nitrogen flux in the lower Mississippi River over the past 30 years. However, a careful reading of both reports makes clear that both Reports actually reach similar conclusions. Both Report find that, although mean annual nitrogen flux has tripled in the last 30 years, little change in the annual N flux has occurred since the late 1970's or early 1980s. The only disagreement being whether nitrogen flux stabilized in 1979 or the early 1980s. Thus, the conflicts between the two reports are more fictional than real.

In the opinion of the MRP, rather than undermining the CENR Draft Reports, the Fertilizer Institute Report confirms the need for a comprehensive strategy, such as that reflected in Draft Report 5's recommendations. Those recommendations call for reforms in agricultural practices, including needed changes in manure management, restoration of riparian and wetland areas, reform of U.S. Corps of Engineers' approaches to flood control, careful design and operation of the lower Mississippi River; and reduction of point sources, including strict requirements for tertiary treatment for all new POTWs. These recommendations address all of the anthropogenic changes in the Mississippi Basin posited by the Fertilizer Institute Report as possible contributors to the Dead Zone in the Gulf and thus are fully supported by that Report. Nonetheless, to avoid claims that the CENR Reports are incomplete, we would ask that the findings of The Fertilizer Institute Report be fully analyzed prior to finalization of the CENR Reports.

2. Insufficient Attention is Given to the Pollution Caused by Concentrated Animal Feeding Operations

CAFOs can contribute to nutrient pollution through their emissions of ammonia and the often excessive and concentrated application of manure onto the land. Additionally, CAFOs often utilize enormous lagoons to store their waste and these lagoons often break or spill into surface waters, or leach into ground and surface waters. Pollution problems are compounded since these operations tend to concentrate around processing plants, with the result that certain counties and regions create more waste than the environment can possibly absorb. To its credit, Draft Topic Report 6 acknowledges that the increased concentration of animals has resulted in water quality problems (p.69).

Another useful feature of nearly all of the draft papers is acknowledgment that manure is being over applied to the land and is a significant contributor to the hypoxia in the Gulf of Mexico. Notably, Draft Topic Papers 4 and 6 note that P and N in manure is being

applied in excess of agronomic rates. Helpful recommendations are made throughout the draft papers calling for soil testing and injection of manure below the surface. Draft Topic Paper 4 also suggests that there may be critical areas in which continued manure applications should be restricted (p.23). Nearly all the draft reports call for the application of manure at agronomic rates, but Draft Topic Report 6 comes to the questionable conclusion that land application rates should be based on a nitrogen, rather than a phosphorus standard. (p.70).

One of the most glaring omissions in the papers regarding feedlot issues is the failure to recognize the damage caused by CAFO lagoon failures. Topic Report 6 states that while the authors understand that leaks from pits and lagoon cause water quality problems, they will not be considered in the analysis. Instead, "it is assumed that all manure storage units were constructed efficiently" (p. 61).

Rather than basing a model on such an erroneous assumption, the draft reports should highlight the lagoon failures that have occurred. For example, in Iowa, in a period from 1992 to 1997, there were 51 manure spills into Iowa streams, rivers, and lakes serious enough to prompt financial penalties. Overflowing manure storage lagoons were the source of the biggest spills (Iowa Department of Natural Resources Database, 1997). In the first quarter of 1998, 15 out of 22 randomly inspected manure lagoons in western Illinois were caught illegally discharging wastewater into streams. (Illinois Environmental Protection Agency, 1998). In Missouri between March 1997 and July 1998, one company, Premium Standard Farms, had at least 20 spills of hog waste, totaling more than 250,000 gallons of animal waste. (Izaak Walton League press release, 6/17/99). EPA's Office of Water, Standards and Applied Science Division has created a database of spills and other incidents from feedlots that shows dozens of fish kills and other pollution problems from lagoons. (http://www.epa.gov/ost/guide/feedlots/envimpct.pdf). the Clean Water Network and the Izaak League of America are also assembling data that shows fish kills from lagoon spills and other sources. To fully account for all nutrient loading into the Gulf of Mexico, the contribution of lagoon failures must be included.

Another pollution impact resulting from the use of open-air lagoons is the contribution to atmospheric deposition. To its considerable credit, the Draft Topic 3 Report states that "a significant portion of the N in animal manure is lost during manure storage, handling, and application," and the Draft Topic Report 4 notes that the ammonia that is mineralized from manure and other confined animal operations is one of two sources that cause the ammonium in atmospheric deposition.

CAFO lagoons also leach manure into the groundwater, an impact that is largely ignored in these analyses. An Iowa State University study found that 72% of the lagoons studied were seeping more than allowed by the state seepage standard of 1/16 inch of seepage loss a day. The report went on to say, "Since some basins were not full at the time of measurement, further analysis will be needed to adjust these rates upward to reflect the seepage that might reasonably be expected when all basins are operating at full depth." (Dr. Melvin, Iowa State University, "Preliminary Report: Measurement of Seepage from Earthen Waste Storage Structures", 1999.) Accounting for the lagoon breaks, spills and

leaching should lead to new policy recommendations in the Draft reports – that open air lagoons and other liquid manure systems used by CAFOs be banned.

Draft Topic 3 Paper acknowledges that its assessment of manure's contribution within the Nitrogen Yield Models and the Total Phosphorus Yield Model are based on considerable uncertainty. Draft Topic Report 4 calls for more research on the impacts of large-scale confined animal feeding operations. The best way of ensuring better data availability (and to make CAFOs accountable for the pollution they cause) is to require CAFOs to monitor and report on their water quality, much like other point sources. Yet, Draft Topic Report 6 infers that water quality monitoring is not recommended for polluted runoff sources.

Given the inadequate attention to lagoon failures, groundwater contamination, and the data uncertainties that even the authors of the papers acknowledge, it is clear that CAFOs are contributing more pollution to the Gulf of Mexico than is calculated in these draft papers. In his presentation on Draft Report Topic 6 Dr. Otto Doering asserted that the threat of nutrient pollution was more significant than the calculations of manure suggest. He further indicated that this was due to the concentrated industrial manner in which animals are now raised and their wastes disposed. Dr. Doering's conclusion finds support in recent publications. See, Dr. Doering's conclusion finds support in recent publications. *See, e.g.* Carey, et al. "The Role of the Mississippi River in Gulf of Mexico Hypoxia" p. 27 (Environmental Institute Report 70, 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).

There are alternatives to the livestock production that do not rely on the confinement of animals (and manure). These systems often utilize composting, pasture-based systems, and may redistribute the livestock back to the farms where the feed is being produced so the manure can be economically and ecologically used as a fertilizer. This re-opens the option for sustainable nutrient cycling. Some alternatives also feed perennial forage crops to the animals; the growth of perennial crops was acknowledged in the Draft Reports Topics 4 and 5 as a useful means for reducing nutrient pollution.

In summary, the draft papers should be revised to remedy the lack of attention given to lagoon failures, to address groundwater contamination from lagoon seepage and land application practices, and the data uncertainties that even the authors of the papers acknowledge. Expanding the discussion of these topics will make clear that CAFOs are contributing more pollution to the Gulf of Mexico than is calculated in these draft papers. As a result, support for sustainable livestock systems must be a key policy recommendation in the draft papers. In addition, the papers' policy recommendations should include banning open-air lagoons and other liquid manure systems used by CAFOs in order to address lagoon breaks, spills and leaching.

B. Specific Comments With Regard To Individual Draft Reports

Draft Report 1: Characterization of Hypoxia

Draft Report 1 thoroughly analyzes the interaction between nitrogen entering the Gulf of Mexico via that Mississippi River and its relationship to the size and extent of the Dead Zone in the Gulf of Mexico. The findings of the Draft Report 1 are clearly consistent with the finding in other watersheds that anthropogenic sources of nutrients have pervasive ecological effects on shallow coastal and estuarine areas. See, Burkholder, J.M. et al., *Rupture of a large swine waste holding lagoon in North Carolina, U.S.A.: Impacts on a coastal river and estuary,* J. Environmental 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. 435-445 (1987)

Draft Report 1 is also consistent with the findings contained in a report recently released by the Council for Agricultural Science and Technology, John A. Downing, et al., *Hypoxia in the Gulf of Mexico: Land and Sea Interactions,* (June 28, 1999) attached hereto as Appendix 1 and incorporated herein by reference (hereinafter the CAST Report). The authors of the CAST report concluded that flood and drought observations support a strong connection between river nutrients and hypoxia and that "nitrogen is the river-borne nutrient most relevant to phytoplankton production in the broad marine region contributing to hypoxia". CAST Report, Chp. 2, p. 8-12.

Draft Report 2: Ecological and Economic Consequences of Hypoxia

We are deeply concerned with the conclusions stated within this Draft Report. Within the Executive Summary, and elsewhere within the Draft Report, the authors note that "the body of published literature dealing with hypoxia was limited." They also acknowledge that the lack of obvious detrimental ecological and economic effects does not preclude the possibility of ecological and economic disaster in the future. Yet, rather than finding that there is insufficient data to reach a conclusion regarding impacts, the authors of Draft Report 2 state in fairly conclusive terms that "there is no clear indication of hypoxic effects in fisheries or fish populations in the published literature or data evaluated" (p. 50), and that the "economic assessment based on fisheries data . . . failed to detect effects attributable to hypoxia (pp. 8, 52). In the emotionally charged environment surrounding the Dead Zone issue the implication from Draft Report 2 that existing research does not support a finding of either ecological or economic harm takes on great significance, possibly much greater than that intended by the authors. The authors of Draft Report 2 must exercise caution in crafting their conclusions lest they be interpreted as the result of comprehensive analyses of significant relevant data which, in the end, may drive policy decisions.

The MRP would also assert that Draft Report 2 is far to circumscribed in its subject matter. Draft Report 2 looks only at ecological and economic impacts of hypoxia on the Gulf. The Draft Report does not address any of the ecological or economic consequences

of nitrogen pollution in lakes, rivers, and streams throughout the Mississippi River Basin as it moves down the Basin. Nitrogen pollution has numerous economic costs to society. For example, U.S. Environmental Protection data indicate that agriculture related nutrients account for much of the degradation of water quality experienced in rivers throughout the Basin and significant impairment of lake acreage in assessed waters. U.S. Environmental Protection Agency, *National Water Quality Inventory*, 1994. Nitrate/nitrogen levels in drinking water sources also significantly increases 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 fully considered.

With regard to the analysis of impacts to the Gulf, both the Executive Summary and the Conclusions of Draft Report 2 are misleading in their failure to acknowledge the possible impact of hypoxia on biodiversity. For example, the Report acknowledges that energy pulses associated with hypoxia favor short lived opportunistic species, over larger, longer lived species that better aerate sediments helping to prevent the buildup of organic matter. Yet, the Conclusion does not note these effects, nor does it discuss the significance of loss of biodiversity. Instead the Conclusion focuses primarily on "fisheries" and fish populations." The body of the Report reveals significant impacts to benthic communities that serve as prey for economically important species. Congress and the National Marine Fisheries Service both recognize the importance fisheries habitat and prey species in sustainable fisheries. See 16 U.S.C. Sections 1801-1883. Accordingly, the Conclusion must discuss impacts to prey species recognized in the text of the document. Moreover, although noting possible impacts to prey, the Report fails to discuss the uncertainties regarding the impacts that hypoxic related changes in prey species and habitat have on economically important species.

In addition, the Report's analysis of the impacts on fisheries is to four economically important species: brown shrimp, white shrimp, red snapper, and menhaden. Initially, the Executive Summary and Conclusions of the Draft Report should clearly note the limited number of species subject to the analysis. Additionally, the authors should consider inclusion of other potentially affected species that could provide additional findings. An excellent example of this would be red drum or other Sciaenids. Red drum, determined to be overfished by the National Marine Fisheries Service, is an economically important species that could be affected by hypoxia. Red drum generally feed off benthic organisms that are subjected to hypoxic conditions. Additionally, juvenile and subadult red drum spend time in coastal wetlands before moving offshore as adults to spawn. Therefore, the diet and movement patterns of adult and larval red drum may be affected by the annual occurrence of hypoxia in the Gulf.

The MRP is equally disturbed that the Executive Summary of the Report makes an apparent unequivocal finding that " [t]he economic assessment based on fisheries data ... failed to detect effects attributable to hypoxia." (p. 8). The body of the Draft Report notes that in the absence of an existing body of analysis, the study described here involved what should be viewed as an exploratory or preliminary analysis of existing data to identify possible hypoxic effects. Similarly, within the Draft Report comments regarding the many assumptions that were made, the limited number of data sets available, the fact

that proxies utilized were "rough," preface almost every discussion of data and analysis. The authors obviously thought this limitation in data was important in terms of the ecological assessment for they qualify the ecological findings with the statement that "[g]iven the limitations of the ecological assessment....". (p. 8). We find it peculiar that no similar qualifying clause is associated with findings regarding the absence of any economic impact. This is particularly curious when one considers that more is actually known about the ecological effects of hypoxia than is known about the potential and real economic effects at this point in time. For purposes of clarity, the Executive Summary and conclusions of the report must qualify the findings regarding economic impact or the lack thereof.

Moreover, the conclusions set forth within the Draft Report appear to fly in the face of the conclusions reached in the CAST Report. The authors of the CAST Report concluded that "[b]ecause hypoxia blocks and eliminated access of migrating juvenile shrimp to offshore feeding grounds, lost production is probably significant over as much as 50% of the coastal shelf of Louisiana." The CAST report also found that the fact that overall yield has shown no "striking trend" since the late 1970's "cannot be interpreted to mean that the impact of hypoxia has been minimal." CAST Report, Chp. 3, p.17. To the contrary, they conclude that

> Although declines in overall fisheries yields have not been dramatic over the period of increased hypoxia . . . CPUE (catch per unit effort) data from the brown shrimp and white shrimp fisheries in the Gulf are consistent with the hypothesis of increased environmental impact. Decadal average CPUE's have declined continuously since the 1960's, with the most rapid rate of decline between the 1980s and 1990s... A similar but less steep decline has been observed in the white shrimp fishery . . . CPUEs in these fisheries have declined by more than 25% since the 1960s . . . Although declines in the shrimp industry may be linked to changes other than hypoxia, there is no current evidence of recruitment failure; thus, the trend is consistent with the hypothesis of environmental impact.

CAST Report at Chp. 3, p. 18. The authors of Draft Report 2 should carefully consider these findings before finalizing their Report.

The MRP is also troubled that Draft Report 2 fails to adequately discuss the potential economic impact of disruptions in shrimp migrations. Draft Report 2 does look at the ecological impact of such migration disruptions and the economic impact of the possible movement of shrimpers offshore. However, no consideration is given to the existence and economic impact of east/west movement. Yet, it is undeniable that such an east/west impact can have equally negative economic impacts. A review of historical data reveals no correlation between good shrimp production in coastal Louisiana waters and landings in Texas. Recent data, however, indicate that years of strong inshore shrimp production in Louisiana coincides with increased landings in Texas . (Personal communication with Dr. James Nance, National Marine Fisheries Service). You can infer from this that hypoxic conditions have led to a more east/west shrimp migration pattern rather than a

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 CAST Report, Chp. 3, p. 18 (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).

The MRP also has concerns regarding the methodology and conclusions reached in the Draft Report 2's analysis of 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, Chp. 3, p.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 Draft Report 2'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 not could be an indication that shrimp populations are declining or it could just as easily be the result of management measures.

Additional concerns with the methodology employed include the selection of "control zone". The authors of the economic analysis note that statistical areas were grouped into three zones: Eastern Louisiana , Louisiana , and Texas . The Eastern Louisiana and Texas zones were used as a "kind of control" to distinguish between effects due to hypoxia and effects due to climate or other factors. There are obvious dangers in the use of these zones as controls. Significant differences in habitat, climate and geologic processes are found within each of these regions. These difference alone may skew the analysis of economic impacts caused by the dead zone.

The authors of Draft Report 2 acknowledge that evidence from other hypoxic zones indicates that, in the face of worsening hypoxic conditions, at some point fisheries will decline, perhaps precipitously. Shrimp are an annual crop. Changes in the stock of such annual species do not necessarily occur slowly, as is often found in more long-lived species. Instead, significant variations or reductions in stock size can occur in as little as one season. A dramatic reduction in stock size, were it to occur, would inflict potentially devastating impacts on what is economically the most important fishery in the Gulf of Mexico. Yet, Draft Report 2 includes no discussion of the impact such a potential collapse would have on the fishery, the fishermen, or the coastal communities dependent upon the fishery. A simple review of existing economic data regarding the economic value of the Gulf's shrimp fishery would reveal the magnitude of the economic impact of such a collapse. Such an analysis must be included within Draft Report 2 if the potential economic ramifications of the Dead Zone are to be fully understood.

The Report notes that SEAMAP data has not been analyzed. SEAMAP is one of the most extensive fishery databases in the Gulf. It would behoove the authors of Draft Report 2 to conduct a full analysis of this substantial database prior to issuance of their final report. It is quite possible that the SEAMAP data could provide answers to many questions regarding the ecological and economic impacts of hypoxia that remain unanswered within the Draft Report.

Draft Report 3: Flux and Sources of Nutrients in the Mississippi-Atchafalaya River Basin

Draft Report 3 contains a thorough analysis of historical streamflow and water quality data. Although possibly the most controversial of the reports, Draft Report 3 includes an analysis of all pertinent data and establishes conclusively that the states above the confluence of the Mississippi and Ohio Rivers are the major contributors of nitrogen to the Mississippi River Basin and the Gulf. The findings of Draft Report 3 are consistent with the findings of the CAST Report. In fact, the percentages assigned within the two reports to the various sources of nitrogen are consistent. The CAST report notes that agriculture has been implicated in 60% of the assessments of river water quality degradation in the United States. The Report, in analyzing the size of major nitrogen releases, also concluded that 55% of the nitrogen used or released to the basin is attributable to agricultural fertilizers, 26% from fixation by leguminous crops, 2% from human sewage and industry, 3% from nonagricultural fertilizer use, and 15% from anthropogenic nitrogen deposition through precipitation. The authors of the CAST Report thus conclude, much like the authors of the CENR Draft Report, that "[a]lthough may sources of nitrogen contribute to the problem, the sheer magnitude of N used in agriculture makes it likely that the majority of increased N transported by the Mississippi River is of agricultural origin.

Draft Report 4: Effects of Reducing Nutrient Loads to Surface Waters Within the Mississippi River Basin and Gulf of Mexico

AND

Draft Report 5: Reducing Nutrient loads, especially nitrate-nitrogen, to surface water, groundwater, and the Gulf of Mexico.

In general, the findings and recommendations of Draft Reports 4 and 5 are accurate and reflect both in-depth analysis and creative thinking. Although initial reactions from some in the agricultural community have been negative, we believe that the recommendations of Draft Report 5 reflect a creative, comprehensive approach. The Draft Report addresses all possible contributors to increased nitrogen levels to the Gulf, including increases in nitrogen use, the rate of flow of water to the Gulf, levying, damming and channeling of the Mississippi River, and the loss of wetlands in southern Louisiana. The recommendations within that Report also seek to address significant contributors of nitrogen through a combination of wetland restoration, establishment of wetlands and riparian buffers as zones for denitrification and sequestration of nutrients.

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.

We concur strongly with the authors' emphasis on the need for strategic placement of wetlands and riparian areas in the watersheds. To successfully address the Dead Zone, strategy implementation must target those areas that export high rates of nitrate-nitrogen -- the areas where they will do the most good. Random placement of wetland and riparian areas, while worthwhile, will not achieve the desired result of significant reduction in nitrogen inputs to the Basin.

The recommended changes in farm practices--the integration of more perennial crops, reducing subsurface drainage, better timing of manure and fertilizer applications, and nutrient accounting -- are also praiseworthy. Most of these recommendations, while requiring some adjustments on the farmer's part, will likely work towards their (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.

The authors also point out the importance of coupling comprehensive monitoring to any program of nitrogen mitigation. It should be obvious that there is a need to monitor actions to see if they actually work and, if so, how well. Yet, historically needed monitoring has often not occurred. Accordingly, it is essential that the need for monitoring be highlighted and not merely presumed .

We concur with Draft Report 5's conclusion that subsurface drainage (tiling) is a significant contributor to and primary source of high nitrate loads in the Corn Belt states. In the Midwest States there are about 50 million acres of intensively drained farmlands. 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 this area 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 tile-drained fields has potentially offset any reduction in fertilizer use. Yet, despite the clear role that "tiling" plays in the levels of nitrogen entering the River, Draft Report 5 spends very little time discussion management of these drainage systems. Moreover, research recommendations listed in the Draft Report fail to identify the need for additional research on efforts to encourage producer adoption of managed drainage. Given the importance of this issue, more emphasis must be accorded within the Final Report to recommendations for management of tile drainage.

Draft Report 5 also fails to acknowledge the use of cover crops as a means to reduce nitrate pollution. 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 is also too slow in coming.

Finally, Draft Report 5 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," Nature. Vol. 396 (19) pp. 262-265. (1998). Another recent publication reports the large increases in nitrate leaching found when several Illinois farm fields were converted from diverse organic rotations and management to conventional corn and soybean production. Goldstein, W.A., et al. " Impact of agricultural management on nitrate concentrations in drainage waters" American Journal of Alternative Agriculture. Vol. 13 (3) pp. 105-110 (1998).

Draft Report 6: Evaluation of Economic Costs and Benefits of Methods for Reducing Nutrient Loads to the Gulf of Mexico

The MRP is concerned with the findings of Draft Report 6. As previously stated with regard to Draft Report 2, existing studies do indicate that there is both an economic and ecological impact to the Gulf's resources as a result of the Dead Zone. The evaluation attempted by Draft Report 6 cannot be completed until a full in-depth analysis of those impacts, both economic and ecological, are assessed.

Additionally, an analysis of the "benefits" of reducing loads in the Mississippi River Basin cannot be circumscribed only to those "benefits to the Gulf of Mexico". Nutrients are responsible for significant pollution problems throughout the Mississippi River Basin and its tributaries. (See U.S. EPA, National Water Quality Inventory (1994)). Reduction of nitrogen will have benefits for these watersheds, as well as the Gulf. For example, national studies have found that the social benefits of decreasing agricultural nonpoint nutrient flux exceed private costs by a substantial margin. CAST Report, Chp. 6, p. 29. (citing Prato, T. "Summary of MSEA Socioeconomic Research" (unpublished report) Center for Agriculture, Resource and Environmental Systems, Univ. of Missouri (1995)). The economic and social benefits of nitrogen reduction for local communities throughout the Mississippi River Basin and its tributaries must be included within the analysis of economic benefits of nitrogen reduction contained within the Final Report.

Moreover, as previously discussed, the recommendations of Draft Report 5 would have additional benefits beyond the reduction of nitrogen pollution. 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 ramifications. A full analysis must be made of all of the benefits of the recommended action throughout the Mississippi River Basin.