Comment 1:
Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.
Basis for Comment:
It is the stated intent of the project to induce ecological changes to the vegetation, topography, and faunal use. It is also clear from the Limited Reevaluation Report (LRR) that the ability to predict these changes is somewhat limited. Similarly, it is clear from the LRR that other projects, such as degrading various levees, are also being contemplated and even planned. An effective data collection and management (monitoring) program with a good geospatial distribution of sample points and targeted functions, such as forage areas, fish populations, depth of organic material in sloughs, velocities, discharges related to rainfall and to the actual operational history, maintenance activity (culvert cleaning or repair), etc., would be extremely beneficial in validating this project and in substantiating the predicted direct, cumulative, and secondary effects of future actions under consideration. Monitoring and data collection should also address the Northwest Shark River Slough because the project will reduce water to that system by 45%.
Significance – High:
The project represents an opportunity to dramatically increase the understanding of how this particular ecosystem will respond to manipulations. That knowledge will directly affect the efficacy of all future decisions.
Comment Cross-referencing:
(2) Comment: *The project report assumes that there will be a sufficient amount of source water to raise the elevations in the L-29 Borrow Canal.* This comment links to consensus comment #2, especially with reference to degrading projects and how they may affect water sources.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A strong, if only outlined, plan to assess the effects that the implementation of this action has on the affected area, with the understanding that the affected area extends beyond the study area and the assessment area. To be effective, the data collection and management (monitoring) plan should extend for several years (at least 5) beyond the completion of construction of the last cumulative element.

Response to Comment 1:. See "Monitoring Plan Framework" below.

The authorizing legislation cited "environmental benefits" but authorized the construction of "modifications…to improve *water deliveries* (editors' emphasis*)* into the Park, and shall, to the extent practicable, take steps to restore the natural hydrological conditions in the Park." The 2007 Congressional Managers' language likewise directed the Corps of Engineers to meet certain hydrologic targets related to average and peak flows into the Park. While we recognize the relationship between hydrology and ecological

characteristics, we chose hydrologic targets as surrogates for marsh and slough habitats, because there are numerous published reports relating the two, some of them cited in the LRR. We did not use an ecological model to predict outputs of the alternatives, substituting hydrologic targets (stage/duration to maintain tall marsh; stage and duration to support re-conversion to sloughs). As explained in Appendix E these hydrologic targets were correlated according to the experience of Park and Corps ecologists and published information. Nonetheless, it is probably true that the greater Everglades ecosystem, and Everglades National Park, is one of the most intensively measured, monitored and studied ecosystems in the United States (see the Monitoring Plan Framework included at the end of Appendix E, and below).

There is real time data collection at a vast network of stations and gauges, most of it readily available over the internet from the Corps Jacksonville District website, the SFWMD website, the Everglades National Park website or the USGS website called SOFIA. There is an existing stage/groundwater monitoring network setup within WCA-3A, WCA-3B, NESRS, NWSRS and SRS as well as stage and flow data at all control structure that are a part of the C&SF system. In addition bimonthly the USGS does field measurement of flows through the 19 sets of culverts delivering water into NESRS. Please view Fig D-1, Hydrology and Hydraulics Appendix (Appendix D) which shows locations of monitoring gages in the Park and adjoining areas and Table D-1 lists the gages that are relevant to the analysis from the LRR that are located within NESRS. The document and the planning team assume that measurements at these stations will continue. There are also numerous water quality monitoring stations at points where water enters the Park. The Park conducts its own studies and monitoring of many habitat areas, particular species and, especially, threatened and endangered species and their habitats.

Monitoring Plan Framework

This framework provides an overview of the environmental monitoring that will be conducted to measure ecological response both upstream and downstream of the Tamiami Trail modifications. The intent of this overview is not to provide a project level monitoring plan, but rather to briefly describe other monitoring initiatives that will be relied upon to assess project performance. While this Limited Reevaluation Report (LRR) authorizes only hydrologic monitoring to assess whether actual improvement in water deliveries is occurring south of Tamiami Trail, a number of ongoing and/or proposed monitoring programs conducted under other authorities will be utilized to measure ecological response. Additionally, the proposed monitoring programs will also be targeting assessment of reduced water flows to Northwest Shark River Slough resulting from implementation of the proposed modifications. Results of the monitoring and assessment activities will be summarized every two years in the Restoration, Coordination and Verification (RECOVER) biennial System Status Report (SSR), primarily written to document the cumulative performance of CERP projects.

There are two general categories of monitoring that will be used to assess the ecological effects of the Tamiami Trail modifications; system-wide (or landscape level) monitoring

and project level monitoring programs. System-wide monitoring is primarily coordinated through the RECOVER Monitoring and Assessment Plan (MAP) which includes components conducted by U.S. Army Corps of Engineers (USACE), USGS, Everglades National Park (ENP), and through the Everglades Division of the South Florida Water Management District (SFWMD). The National Science Foundation (NSF) funded Long Term Ecological Research program (LTER) conducts monitoring in the Taylor and Shark slough/river/estuary transition zones primarily through Florida International University. Together, results from these monitoring programs will allow the USACE to develop a comprehensive, information-based view of the ecological effects of projects like the Tamiami Trail LRR that are expected to have a significant impact on the ecological function and pattern of the landscape. Summary analyses presented in the SSR are based on the combined sampling funded by the various authorities listed above.

The system-wide programs that will collect information in WCA-3B and Northeastern Shark River Slough in order to detect change in ecological conditions due to the Tamiami Trail modifications include:

1) Hydrologic monitoring network–More than one hundred permanent water stage monitoring stations are distributed across the Everglades Restoration Area that deliver hourly measurements of the water surface. The Everglades Depth Estimation Network (EDEN-USGS) consolidates the hydrologic information and interpolates a water surface for the entire area each day.
2) Soil nutrient mapping–Soil cores from across the everglades restoration area are collected in order to produce an accurate map of soil nutrient conditions. This program detects water quality impacts throughout the ecosystem at decadal intervals.
3) Vegetation mapping program–Every five years the entire Everglades ecosystem is systematically photographed and each image is classified by vegetation type. This program allows for the detection of vegetation community changes that occur at the scale of acres to square miles.
4) Marl prairie/slough gradients monitoring project–Every two years a comprehensive set of transects that cross the Shark River slough/Marl prairie ecotone are monitored in order to detect fine scale shifts in vegetation species compositions. These shifts are closely correlated with the quantity of water passing through the Shark River Slough.
5) Ridge and slough flow pattern monitoring–Biennial surveys of plant species composition are related to water depth patterns along the historically predominate direction of flow through WCA-3A and 3B. These transects should capture the return to normal ridge and slough pattern that is expected to occur when these areas begin to experience a more natural pattern of water flow as barriers to flow are removed.
6) Regional Environmental Monitoring and Assessment Program (REMAP)-Fine scale vegetation monitoring, change analysis, micronutrient levels (Phosphorus, Nitrogen, and Sulfur). This U.S. Environmental Protection Agency program fills gaps in fine scale vegetation and micronutrient monitoring that is not conducted by other projects.
7) Periphyton mat cover structure, composition and aquatic fauna regional population–Quarterly samples of these rapidly changing microbial and animal communities are broadly indicative of seasonal patterns. Continuous monitoring of highly variable communities allows us to tease apart the relative importance of hydrologic events such as drydowns in determining ecological health, and to differentiate threshold

8) Crayfish abundance in relationship to hydrologic pattern–Crayfish abundance patterns are monitored quarterly much like the periphyton and aquatic fauna program. The analysis of these patterns is similar to the periphyton and aquatic fauna program.
9) Wading bird colony location, size and timing–Continuous surveys of wading bird colonies are conducted with small aircraft throughout the ecosystem. Changes in the location, timing, and size of wading bird colonies are expected to be broadly indicative of recovery of the historical ecosystem patterns that are expected to occur as the ecosystem progresses.
10) LTER monitoring–The LTER program is focused on freshwater marsh to estuarine transition zones along the major water flow paths of the Southern Everglades ecosystem. Water volume, water stage, micronutrient levels, plant productivity patterns, and basal food web features (invertebrates and fishes) are sampled at relatively fine scales of resolution. These samples are used to develop predictive models that shape expectations for positive system response and/or deterioration of the ecosystem.

Project level monitoring may be required by three CERP projects that are focused on the WCA 3B to Tamiami Trail to NE Shark River Slough transition area; Comprehensive System Operation Plan (CSOP), Decompartmentalization (DECOMP) and ENP Seepage Management. These three projects will have regulatory requirements for monitoring endangered species and other permit specific criteria, and may produce more detailed monitoring plans based on the deliberations of the CERP Project Delivery Teams. Potential for overlap/redundancy between project-level and system-wide monitoring is recognized, and RECOVER has initiated a process to coordinate the various monitoring projects in order to facilitate change analysis, eliminate redundancy and optimize monitoring efforts.

The aggregation of information provided by these monitoring programs should yield a precise and revealing characterization of the changes that occur to a cross-section of organisms across a spatially integrated landscape as a consequence of the modifications made to Tamiami Trail. These organisms should cumulatively represent the effects of changes on the ecosystem, and should also provide the USACE the ability to detect and remedy any problematic shifts to the ecosystem that arise in a rapid and cost-effective manner.

In addition to the physical monitoring programs, predictive models for ridge and slough development/recovery based on shifts in hydropattern are being developed to frame the assessment data with the expectations of change that we have for the area of project influence. Modeling tools are essential for teasing apart the changes in vegetation pattern that we would expect to see as a part of normal fluctuations in climate versus the changes in vegetation that are caused by the project-related alterations in the landscape. The ridge and slough recovery model is primarily being developed by the Everglades division of the SFWMD. Since changes to the Tamiami Trail will profoundly alter the spatial distribution of water delivered to Florida Bay, we expect that the monitoring of the

freshwater marsh to estuarine transition to demonstrate direct effects of the project. The set of predictive models will be used to specifically characterize the differences in conditions in the ecosystem that were caused by the alterations made to the Tamiami Trail and/or other CERP related projects.

Comment 2:
The project report assumes that there will be a sufficient amount of source water to raise the elevations in the L-29 Borrow Canal.
Basis for Comment:
It is clear from the TT LRR that some of the structures are gravity operated and others are operated manually or by sensors. One structure is equipped with a pump for returning water to the canal above the structure. It is obvious that the levels in the L-29 Borrow Canal (L-29BC) are controlled by the cumulative effect of the operational schedules of the structures. It is also apparent that the waters have demands such as irrigation. The LRR does not address the operational schedule of these structures nor does it include a reference to a commitment by the operational entity. Questions of the prioritization of environmental need as it relates to other needs have arisen.
Significance – High:
The issue is considered of high significance because without source water to the L-29BC, the project cannot perform as designed.
Comment Cross-referencing:
(1) Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* Water levels within all source compartments should be monitored.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • Structure operations summary. (Details would be lengthy and unwarranted.) A summary should be supplied for each structure contributing to the L-29BC water levels.

Response to Comment 2:
The spreadsheet analysis considered historical flow volumes that were delivered to ENP (which are typically discharged through the S-12's) and simply redistributed the volume based on the MWD target distribution (45% west and 55% east). Based on historical deliveries of flows into ENP there will be sufficient amount of source water. How the actual redistribution of flows would occur was not evaluated as part of the LRR study. This will be considered as part of the Seepage and Conveyance feature of the MWD project, this study will be incorporated into the Combined Structural and Operational Plan (CSOP) which will determine the final operational plan for the combined MWD and C-111 projects. In simple terms this evaluation inserted 55% of the historical flow delivered to ENP and placed it into NESRS as long as there was not a stage violation in the L-29 BC.

Appendix D Section 2 describes the existing structures that influence canal levels within the project area. In addition it also lists most of the monitoring gages within NESRS. Appendix D Section 3 describes the exiting operations of the structures that influence this reach of canal/NESRS.

There is an existing stage/groundwater monitoring network setup within WCA-3A, WCA-3B, NESRS, NWSRS and SRS that will continue to be used.

Comment 3:

The report does a poor job of describing the overall general pattern of water flow through the system and describing what areas will be impacted by different alternatives.

Basis for Comment:

This comment is based on a need to better understand what we are trying to change and what area(s) will be impacted by different alternatives. The primary issue lies in the lack of clear explanation of the present and expected flow patterns. For example, Figure 1-2 indicates that the Shark River Slough lies fully east of L67. Other figures show a different configuration. In addition, canals and structures are labeled in various figures throughout the document; however, these figures do not give the reader the understanding of flow direction. In fact, no one figure contains all the structures, even within a given subarea. All levees, canals, and downstream roads could act to direct flow and should be shown on the figures. Thus, it is difficult to determine how the different bridge locations and sizes might impact this very important flow pattern. It is also not clear that all levees, roads, canals, and structures are labeled. How the flows from the bridge will positively affect the ecosystem 8 or 9 miles to the west of the bridge opening, and not necessarily downstream, is not readily apparent. There is a presumption that a bridge at either end (east or west) without a bridge at the other end, will result in rehydration of both ends of the project area. Much of this may be resolved by improving the description, figures, and maps of the current and expected flow patterns.

Significance – High:

The understanding of where the water comes from, where it will go, and how it is controlled is critical to the validity of the performance measures.

Comment Cross-referencing:

(1) Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* Post-construction monitoring will tell us how well the completed project achieves the flows that were predicted and desired.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- A flow vector map (or series) that shows the present direction of flow, particularly south of the road;
- A flow vector map that shows the expected flow directions, particularly for the four finalist alternatives;
- Improved figures that are consistent in their depiction of where the Shark River Slough lies and its primary flow pattern; and
- A series of maps that show all structures, culverts, levees, canals, and roads that might influence flow.

Response to Comment 3: The report is intended to address only flow from the E-W oriented L-29 Canal in the road segment studied, directly into the Park lands South of the Trail. (i.e., N-S flow into the Park. It does not address flow into WCA3A or 3B. The Park area directly South of the Trail is not characterized by abrupt topographic changes,

so the simple spreadsheet model was felt by the team to be a good approximation of real-world behavior. Flow patterns from L-29 into the Park are very simple in the project area (from L-67A on the west to S-334 on the east) and follow three general rules: 1) When stage constraints within NESRS/L-29 BC allow for releases into NESRS water will be discharged through S-333 and be distributed through the L-29BC to the 19 sets of culverts through the existing Tamiami Trail Embankment. 2) When stages in WCA-3A require regulatory releases and stage constraints prevent the release of flows into NESRS. Water will be sent to the South Dade Conveyance System (SDSC) via the L-29 BC utilizing equal discharges through S-333 and S-334 if capacity is available in the SDCS. 3) Water supply releases from WCA-3A to the SDCS via the L-29 BC utilizing equal discharges through S-333 and S-334. Fig 4-6 shows the locations of the culvert sets on the top line ("existing"). The previous Fig (4-4) shows flow in cross-section view with the L-29 canal on the left, a cross section of a culvert and the Park on the right.

While the S-355 A and B structure are constructed they are not currently used to discharge water from WCA-3B to the L-29 BC then onto NESRS. Until the modifications of the Tamiami Trail allow for the increased stages in the L-29 BC the existing stage constraints on the system prevents the releases from the S-355 A & B structures. A similar dilemma exists for the S-356 pump station which returns seepage to NESRS that seeps east into the L-31N BC.

Appendix D Section 3 (pg D-3) discusses the current operations of the L-29 BC, which is the source of water delivery to NESRS. This report is focused on how water is moved from the L-29BC to NESRS via flowing through Tamiami Trail, whether culverts or bridges are used to add more conveyance through the embankment. The Seepage and Conveyance features of the MWD Project will actually be the method at which water is moved through the system.

Until the Seepage and Conveyance features of the MWD Project are constructed, water will be delivered by one structure (S-333) at the "bottom" (lower end of the drainage) of WCA-3A. The releases from S-333 are part of a regulation schedule for WCA-3A and are typically dependent on a Rainfall Based Management Plan and at times are dependent on stage and could require regulatory releases to the maximum extent practicable based on downstream constraints. The C&SF project is a multi-purpose project and other consideration for water releases must also be evaluated, such as water supply release and retention of water to avoid flooding endangered Cape Sable seaside sparrow habitat during the dry season (when flows are generally low).

Water flow will be monitored, as it is now. To address each bullet in the comment, please consider the following:

- Flow in the "benefits" segment is assumed to be generally N-S
- Flow vectors will be similar under all 4 finalist alternatives. Only the volume and location of the bridge segment would change.
- The Shark River Slough is a general designation for the slightly deeper center of the historic flow-way. It is clearly visible on all of the false-color base photos,

Comment 4

There is considerable uncertainty about the origin of ridge and slough topography in the Everglades and how best to restore it in areas where it is degraded. This report does not address these uncertainties and does not contain persuasive justifications for the validity of the performance measures used for estimating the ecological benefits of restoring ridge and slough processes and ultimately ridge and slough topography.

Basis for Comment:

The TT LRR has three main environmental planning objectives (page 4-6), one of which is to "Restore processes that produce and maintain ridge and slough topography." The three performance measures selected for restoring ridge and slough processes are number of sloughs crossed by bridges (2.A), difference in average water velocity in the marsh and at the road (2.B), and flows into North East Shark River Slough (NESRS) via bridge (2.C).

The LRR fails to describe what exactly these ridge and slough processes are. Subsequently, how these performance measures will impact ridge and slough forming processes is not explained in either the LRR or in Appendix E. The underlying assumptions and the degree of uncertainty associated with these performance measures are never discussed and fully evaluated. Unfortunately, there is considerable uncertainty associated with each of them. What the likelihood is that the various alternatives considered will actually restore the ridge and slough topography is not addressed.

The first performance measure is the number of sloughs crossed by bridges (2.A), and it is justified as a performance measure because "Situating a bridge directly upstream of a degraded slough would maximize the potential for storm flow velocities to maintain sloughs by removing excess organic sediment …" (page E-5). The justification assumes that ridge and slough formation and/or maintenance is a result of erosion and deposition. There is no compelling scientific evidence to support this assumption. In Appendix E, the whole rationale for this measure is given in just one line with not a single reference to a published or unpublished study in support of it. If scouring of organic matter from sloughs immediately downstream of the bridge does occur, this material would presumably be deposited in sloughs further south. This potential secondary effect is not discussed.

The second performance measure is the difference in average water velocity in the marsh (6,000 ft from bridge) and at the road (2.B). This use of difference in flow velocity is even more poorly justified as a performance measure of ridge and slough processes than is the number of sloughs crossed. In fact, as defined, this performance measure is the inverse of the previous one. The discussion of this measure states that high velocities at the bridge are bad because they cause scour that would result in the deposition of sediment fans (page E-6). "The ideal situation is for the ENP lands to have marsh like velocities from the bridge south" (page E-5). There is no explanation of how this performance measure is linked to ridge and slough processes. No published or unpublished studies are cited that justify the use of this performance measure. This is disturbing because this performance measure is one of the four used to screen the various project alternatives.

Should these two apparently conflicting measures be resolved, the extent of the effect of the first (high velocity) southward will be limited once the flows reach the second (low velocity) target, severely limiting the first's effect throughout the assessment area and calling into question the projected increase in habitat units.

The third performance measure (2.C) that is putatively related to ridge and slough processes is "flows into NESRS provided via bridge." Increased flows, and presumably duration of high water, in sloughs are expected to promote the growth of "open water vegetation." Although only a surrogate measure of potential changes in slough hydrology, this performance measure can be linked to ridge and slough processes using the existing literature on primary production and litter decomposition in the Everglades [see Givnish et al. (2007) and references therein; McVoy and Tarboton (2004) cited in Tarboton et al. (2004)]. Unfortunately, no effort was made to present the scientific foundation of this performance measure.

The expectation is high in the LRR that increasing discharge from the L29 canal into NESRS will eventually result in the restoration of its ridge and slough topography. Because of the uncertainties about the process of ridge and slough formation and how best to restore them, it is essential that post-project monitoring be done to document whether this actually occurred or not (i.e., see Consensus Comment #1).

In summary, one of the supposed ecological benefits of the proposed project, restoring ridge and slough processes, has been estimated on the basis of poorly justified and sometimes contradictory assumptions about how hydrology and ridge and slough forming processes are linked. Links between duration of flooding and flow velocity and ridge and slough processes have been postulated and justified in the published literature on the Everglades, but almost none of this literature is used or even cited. Only performance measures for which a reasonable link between hydrology and ridge and slough processes should be used. In the LRR and Appendix E, only one performance measure, 2.C, is linked to ridge and slough processes in any meaningful way.

References:

Givnish et al. (2007) Vegetation differentiation in the patterned landscape of the central Everglades: Importance of local and landscape drivers. *Global Ecology and Biogeography* 17:384–40.2.

Tarboton et al. (2004) Habitat Suitability Indices for Evaluating Water Management Alternatives, South Florida Water Management District, West Palm Beach, Florida.

Significance – Medium:

Although the three selected performance measures for the restoration of ridge and slough processes are poorly justified and to some extent contradictory, it is likely that increasing the volume of water discharged into NESRS will benefit the restoration of its ridge and slough topography to some extent. Thus, although the performance measures chosen are flawed and inadequately justified, they are sufficient for comparative purposes. It is unlikely that developing alternative performance measures of restoring ridge and slough processes would alter the outcome of the selection process.

Comment Cross-referencing:

(1) Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* Because of the considerable uncertainties associated with performance measures of ridge and slough processes, it is essential to monitor the effect the project had on restoring ridge and slough topography.

(12) Comment: *The report should briefly describe potential secondary impacts.* Secondary effects of downstream deposition of excess organics removed by increased water flow in sloughs are related to this comment.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded:

1. In Appendix E, there needs to be a discussion of current theories, and evidence for and against them, about processes that control ridge and slough development and maintenance with an emphasis on how these processes are influenced by duration and depth of flooding and by water velocity.
2. A justification for performance measure 2.A is needed and it needs to be reconciled with performance measure 2.B. If this reconciliation cannot be done, performance measure 2.A should be deleted from the list of performance measures used in the evaluation of project alternatives.
3. A more detailed justification for performance measure 2.B is needed that explains how it is linked to ridge and slough processes. Because high velocities at the bridge could locally scour away this topography, the possible negative impacts of constructing a bridge on ridge and slough topography should be considered.
4. For performance measure 2.C, how it relates to ridge and slough processes needs to be discussed in more detail in light of the most recent theories on ridge and slough formation and maintenance. One possible approach that could be used is the habitat suitability indices as described in Tarboton et al. (2004).

Response to Comment 4:

The ridge and slough paper developed in the South Florida Ecosystem Restoration Task Force was cited, but the team recognizes that its treatment of the importance of sheet flow and velocity is still under discussion. It is thought that a corrugated landscape is created and maintained by processes influencing differential deposition (on ridges) and erosion (in slough bottoms) during relatively high flow periods. It is also hypothesized that great reductions in flow, especially high volume flow, in the WCAs and NESRS, due to construction of the Trail and the enclosure of the Water Conservations Areas as a component of the C&SF system, have led to deposition of sediment in the valleys of the ridges, evening out the differences between highs and lows. In addition within NESRS it is hypothesized that the reduced stages since the enclosure of the Water Conservation Areas has resulted in areas experiencing a greater amount of oxidation/settlement of muck layers reducing the differential between the ridge and slough environment and has resulted in a greater potential for muck fires.

We have modified the text of the final LRR in Section 4.4.1.2 to reduce the emphasis contained in the draft LRR on the linkage of slough crossings (pm 2A) and differential flow (pm 2C) to the ridge and slough processes. The benefit area for the "velocity" PM is only 6,848 acres, or a narrow strip of land immediately south of the road. This is the area where obvious sediment fans are visible on aerial photos. The "velocity" PM makes a relatively small contribution to the overall HU score.

In addition, the following section will be added to clarify the link between hydrology and ecological processes:

Links between Hydrology and Ecological Performance

As cited earlier in the report, this study team was tasked with immediately improving water deliveries and adopting an adaptive management approach toward restoring flows to ENP. The ultimate purpose of the water deliveries is to result in a positive ecological response. Science cannot accurately predict how a dynamic ecosystem will react to a change in hydrology. Therefore, the best method available involves "proxies" and "indicators" which the team believes will produce positive results for the ecosystem. The performance measures used in this LRR, characterized in Appendix E as "hydro-ecological performance measures," use past studies as well as the best professional judgment of a multi-agency team to predict when positive changes will occur. It is because of this uncertainty that an adaptive management approach is crucial to restoring the Everglades.

Some of the performance measures used in this analysis do not imply a direct relationship between hydrology and ecology. For example, the PMs "average annual flow volumes" and "difference between average velocity in marsh and average velocity at road" are hydrologic measures which the biologists and ecologists on the team felt would represent positive outcomes for the total ecosystem. The team chose hydrologic targets as surrogates for marsh and slough habitats, as this is widely accepted and there are numerous published reports relating the two.

The mechanisms that control the formation and maintenance of ridges and sloughs are still poorly understood (Science Coordination Team 2003, McVoy and Tarboton 2004). Nevertheless, several models of ridge and slough topography have been proposed (McVoy and Tarboton 2004, Ross et al. 2006, Givnish et al. 2007). McVoy and Tarboton (2004) stress that ridge and slough topography is a function of water depth, water depth variation (seasonal fluctuation), flow velocity, and flow direction. Consequently, the team felt that these factors are reasonable proxies for alternative analysis.

There are, however, three performance measures that are directly linked to a species. The subset of performance measures entitled "Restore Vegetative Communities" includes measures of number of days at certain water depths during the rainy season, as well as average water depths. These measures are based on optimum conditions for the white water lily (Nymphaea odorata), a species characteristic of open sloughs in the Park. These conditions are based on research from Dr. Jenny Richards mesocosm studies at Florida International University (Bi-annual Report for CA H5297-05-0013 Hydrologic Requirements of Aquatic Slough Vegetation, January 22, 2008).

NESRS historically was part of the ridge and slough ("corrugated") Everglades landscape. Sloughs are conspicuous and major landscape features in the southern Everglades and are the main pathway of water flow through the natural Everglades. The

slough community is present in areas with the longest hydroperiods and the deepest water that rarely dries out. It also has a distinct plant community which is a mixture of floating, submerged species and sometimes emergent species.

A dominant and characteristic species of pre-drainage native sloughs is the white water lily. Over the past 40 years of hydrologic isolation from the ecosystem to the north, NESRS has largely converted to a drier community of mixed sawgrass with very little white water lily. White water lily is more abundant in deeper slough habitats and areas less subject to drydown events. Paleoecological studies indicate that pre-drainage ENP slough communities were once dominated by white water lily and banana lily prior to the widespread artificial drainage of slough communities. Many scientific studies and field observations indicate areas with conditions with deep water and few drydown events are where white water lily does better than other plants and is more abundant than other species. The vegetation suitability performance measures measure the hydrologic conditions that favor slough vegetation, particularly the white water lily, and rank favorably those alternatives that are best able to mimic those conditions. The other performance measures represent hydrologic targets used as surrogates for marsh and slough habitat improvement.

Monitoring

Monitoring for the restoration of corrugated topography would have to be on the scale of aerial photography, and would likely occur over decades rather than rapidly. We do not concur that this is an essential characteristic to monitor, but velocity just south of the trail as well as some distance into the marsh would be.

Responses to Recommendations for Resolution Points:

1. Do not concur. Our direction is to increase flows while reducing velocity differences to the extent practicable. We have dropped the “ridge and slough” characterization from the velocity change PM because it is not necessary to discuss the benefits of sheet flow over culvert flow.
2. PM 2A was not used to score the “velocity” performance. This PM is measuring location and linkages.
3. Do not concur. A bridge will cause a lesser acceleration of flows than the existing culverts, which concentrate high velocity flows through their relatively narrow openings. That is the point of this PM.
4. Perf. Measure 2C was not used for initial screening. Only 2B, the velocity change PM, was used to screen alternatives. Several sections of the report text and tables were modified to minimize the combining of this differential flow distribution PM and ridge and slough processes.

Comment 5

Within the context of evaluating the alternatives, clarification is needed regarding third-party costs related to the project.

Basis for Comment:

The TT LRR provides a reasonably clear discussion of real estate acquisitions required for each alternative (Appendix F).

Six privately owned parcels have been identified as affected by the project and have been authorized for acquisition. The owners are:

- Florida Power and Light
- Radio One
- Jesse E. and Sally L. Kennon (Coopertown)
- Stan Carlin and M. A. Carlin (Gator Park)
- Helen V. Farace (Everglades Safari)
- Lincoln Financial Media.

Generally, acquisitions related to these parcels are either permanent easements or temporary construction easements. These real estate costs, most of which are to be borne by Department of Interior (DOI), have been addressed in the alternative evaluations. The real estate cost discussion also includes a separate category of costs listed as "damages." Given the descriptions of the effects of flooding on the private properties, it appears likely in some cases that future business operations may be impacted. Consequently, the project cost to the private businesses may be more than the real estate value. For example, the revised site configurations may require modifications to the remaining site and structures. Acquisition of the entire parcel might be more practical. Understanding that real estate acquisition is a process of negotiation, more detail clarifying what has been included in the damages cost estimate category would be helpful.

Temporary construction easements are indicated for most of the business access points to the raised road section. The LRR implies that necessary permanent modifications to the access roadways will be performed as part of the construction contract. A clarification of this issue would be helpful.

The airboat ecotourism business associated with three of the businesses (Coopertown, Gator Park, and Everglades Safari) is estimated to bring in 300,000 visitors annually. The LRR acknowledges the possibility of some loss of business income to adjacent businesses during the construction period. These negative impacts can be mitigated with access management activities during construction. However, these third-party cost should be considered when evaluating alternatives.

Significance – Medium:

This comment is considered to be of medium significance because the implication is that these issues have been addressed. However, additional clarification in the report would be an improvement.

Comment Cross-referencing:

None.

Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • Additional detail and clarification on third-party "damages" cost; • Clarification that access modifications will be included in the construction scope; • Clarification and confirmation that temporary business loss costs have been considered in evaluating alternatives.

Response to Comment 5:
The "Damages" that are addressed in the Real Estate Appendix (Appendix F) are referenced as "Lands and Damages" due to the general template for real estate plans. Any "damages" that would be envisioned for the properties would be part of the "cost to cure" evaluation that the acquiring agency would have to take into consideration. For the Corps' portion, the Airboat Association of Florida is the only parcel that will require an acquisition of a real estate interest. At this time, it is predicted that the Corps will acquire a perpetual and occasional flowage easement for this site. The full impact to this tract and the associated cost to cure evaluation are unknowns at this time; therefore, the Corps has placed the estimated fee simple value of the property into the "Lands and Damages" costs. Should the cost to cure exceed fee simple value, the Corps would have to reconsider its acquisition of the easements since the fee value will be the highest cost that would be allowed for the parcel.

Regarding the Temporary Construction Easement comment, the Real estate Appendix (Pg. F-5) states:
Temporary work area easements will be required from private landowners if modification of the roadway requires an increase in elevation at the access to their property.

That sentence should be modified to state:
Temporary work area easements to access the owner's land will be required if modification of the roadway requires a ramp to the owner's property for safe ingress and egress from the roadway. This modification will be conducted as part of the construction contract.

The loss of business is typically not a compensable item, mainly due to the fact that courts have found that any such loss is too speculative in nature. In addition, federal regulations and policies prohibit this type of compensation. Any perceived loss in business will be ameliorated by the management of traffic and those costs are handled elsewhere in the LRR. The bridge itself will be located 50' south of the Tamiami Trail right-of-way and hence will not impact the businesses negatively. The road raising may have some minor effect on the businesses since the public may incur some minor delays in actually accessing these sites; however, visitors are not readily able to go to a competing site elsewhere since these are the only three businesses that handle this type of ecotourism within the county. Any road access ramps that the Corps constructs as part of the construction contract on the commercial airboat sites themselves will be minor and will be accomplished quickly.

Comment 6

The report organization and presentation need improvement. The report includes numerous inconsistencies, lacks some references, and some figures are unclear.

Basis for Comment:

The TT LRR is poorly organized, introduces concepts in a haphazard manner, is supported by unclear graphics, and contains a large number of inconsistencies. The result is that the reader is left to piece the details of the plan together on his own. This comment is based in the premise that the plan should be understandable by readers with only a rudimentary knowledge of the Everglades and the existing drainage system. An incomplete and brief series of examples is included:

1. Figure ES-1 on page ii refers to S-333 and S-334 in the caption but these are not shown in the figure. The caption also refers to the study area, which also is not in the figure. Later, the reader learns that the study and project area are not the same as the assessment area, which is also different from the area used by the spreadsheet model. The Shark River Slough is located in the graphic to the West of the Project Area, setting the stage for misinterpretations of references to NE or NW Shark River Slough in subsequent reading. The interested, but as yet uninformed, reader does not know where S-333 and S-334 are and probably does not even know what they are. The informed reader, who knows what they are, may not know which side is upstream and how they operate.

2. Consistency: Table 4-3, page 4-21 includes a column titled "Average Annual Cost per HU." Later (page 4-40, section 4.5.3.1.), HU is equated to "output." Subsequently, Tables 4-10 and 4-11 list average annual cost per output. The values in the latter two tables are not the same as the values in the first table. The change in nomenclature and inconsistency in values creates confusion. Compounding the confusion is the fact that the actual habitat units remain the same among the tables.

3. The use of literature values in lieu of study values may be acceptable, but the value of relying on the literature is reduced when the constituents are so vastly different as those in Tables 3-1 and 3-2.

4. The Annex, and most documents dealing with compliance with various laws, often state that the plan is in compliance or that the stated concern is insignificant. Simply stating that there is no adverse impact is not a proof. Citations would be beneficial. See Annex A, sections 2.2.4 and 2.3.2.2 as examples.

5. Fig 4-2 does not have a legend and the labels are unclear. The resolution of Fig 4-3 makes it unintelligible.

Significance – Medium:

It is apparent that correcting these problems will not change the outcome of the decision. It is valuable because correcting these now will save countless hours in later years when other readers, not having the benefit of the supporting documents or the existing staff, will struggle to determine the intentions of the LRR.

Comment Cross-referencing:
(1) Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* Monitoring will be eased if it is clear what is to be monitored. (2) Comment: *The project report assumes that there will be a sufficient amount of source water to raise the elevations in the L-29 Borrow Canal.* A more clear presentation would have made the missing operational element apparent from the beginning. (3) Comment: *The report does a poor job of describing the overall general pattern of water flow through the system and describing what areas will be impacted by different alternatives.* The review team still does not have a good presentation of overall flow vectors. (4, 7, 8, 9, 10, 12) A clear presentation or appropriate citations could obviate the comments entirely.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded: • Conduct an editorial and quality control review consistent with standards of editing provided to other publications. Prepare the document with the standards of English Composition as a guide. Lay foundations, build, connect, and conclude.

Response to Comment 6:

This LRR followed the expected standard USACE report format. It is consistent in its organization with other similar USACE documents. In addition, it is a "reevaluation report" which frequently references back to the Tamiami Trail RGRR/FSEIS of 2005, making it a challenge to convey the full story without re-writing the earlier document. We have continued to revise and edit the report in hopes of making it more consistent and easier to read.
Culvert locations are shown on Fig. 4-6. Water flow patterns are artificial, basically N-S through the existing culverts. Flow patterns north of L-29 are irrelevant because there is only one outlet; see response to comment 3 above.

Fig 1-2 shows the locations of S-333 and S-334. They delimit the eastern and western ends of the project. The Project Area is shown on Fig 1-1 and is the stretch of Trail proposed for modification. The effects area is shown on 2 maps, Figs 4-2 and 4-3; the size of this area is stated in Table 4-3 to be 63,195 acres. More detailed maps showing more exact location of SRS are in the LRR text, if not in the Executive Summary.

Expressing output as HU is a Corps convention. Appendix E goes into detail on how values in each column were calculated

In response to the specific sub-comments:

(1) We edited the caption to Figure ES-1 so that it better describes the content of the graphic.

(2) Consistency. The team has spent much time searching for inconsistencies throughout the report. For the tables cited, we added explanatory text preceding Tables 4-9, 4-10, 4-11 to explain why these cost estimates for the final four alternatives differ from the cost estimates for those alternatives presented in Table 4-3. We also added text in Section 6.3 to explain why and how the final cost estimate for the recommended plan differs from the estimate provided in Table 4-10.

(3) The information on water quality was an excerpt from a more detailed discussion in the Tamiami Trail RGRR/FSEIS of 2005, which is generally incorporated into this LRR by reference. It was provided only to indicate that these considerations were evaluated.

(4) The "Compliance" documents are indeed boiler plate language required by Corps and Park planning requirements for projects (in the case of the Corps) anticipating discharge of materials into wetlands of the United States, and in the case of the Park, for proposed actions in Park lands.

(5) We expanded the caption of Figure 4-2 and the text associated with Figure 4-2 to describe the contents of the graphic rather than develop a legend within the graphic. We recognize that many would prefer the resolution of Figure 4-3 to be better, but it is the best graphic available.

Comment 7

The two performance measures developed to estimate the restoration of "Fish and Wildlife Resources" are of little relevance for predicting the impacts of a Tamiami Trail Modification project on North East Shark River Slough fish or wildlife populations.

Basis for Comment:

There are long-standing concerns about the decline of wildlife in the Everglades, especially wading birds. The two performance measures used to estimate wildlife benefits from various project alternatives do not deal with any species or group of species that are of concern. The only wildlife benefits assessed are an assumed decrease in road kill for unspecified animals (4.A) by constructing a bridge or bridges and an assumed increase in unspecified animals moving into North East Shark River Slough (NESRS) under the bridge from WCA-3 (4.B). These performance measures are functionally circular and are not directly related to fish and wildlife populations.

Because there are 261 animal deaths per mile of road per year (E-11), it is assumed that constructing a one mile bridge will automatically reduce animal deaths by this amount. (This assumes that animals will never use the bridge for any purpose.) The data presented do not indicate whether animals killed were moving into or out of NESRS. If these animals include a variety of avian species, the assessment may be completely erroneous. The assessment does not address the predicted increase in faunal populations that are presumed to occur when the project is completed. If this prediction is true, then the number of animals killed on the remaining roadway may increase. In any case, the number of animals killed annually is insignificant compared to the total number of animals found in NESRS and WCA-3. As a measure of the estimated benefits of various alternative projects on animal populations, this performance measure is trivial, is possibly erroneous, and is based on a circular argument.

Performance measure 4.B, potential connectivity of WCA-3B marsh and NESRS, is also simply a function of the total length of bridges that will replace roadway. No evidence is presented that animal populations in NESRS have been adversely affected by the building of the Tamiami Trail, especially due to the road reducing the number of animals that historically migrated from what is now WCA-3A into NESRS. The report ignores that animals can still migrate into NESRS from the east, west and south. Increased migration from NESRS into WCA-3A as a result of inserting a bridge or bridges along the Tamiami Trail is not considered. Consequently, the potential spread of exotic species like pythons from Everglades National Park into WCA-3 is ignored.

The performance measure of connectivity, 4.B, is based on the potential future project of degrading the L-29 Levee. It is noted, however, in Appendix E and ignored in the rest of the report that "…this marsh to marsh connectivity would also require degrading the L-29 Levee that encloses WCA-3 impoundments. Degrading the L-29 levee is not authorized under the Modified Water Deliveries (MWD) legislation." (E-12). As far as we are aware, degrading the L-29 Levee is also not contemplated as part of the Comprehensive Everglades Restoration Plan (CERP). In short, this is an indefensible performance measure because it is based on another project that is never likely to happen. Nevertheless, this performance measure was used as one of four screening measures.

In short, the two performance measures used to estimate the benefits to animal populations in NESRS of various TTM alternatives are trivial (4.A), possibly erroneous (4.A), based on circular

arguments (4.A and 4.B), and are unjustifiable (4.B). Although it is likely that some animal species will benefit from inserting a bridge or bridges along Tamiami Trail, neither the animal species that would benefit nor how much populations of these species would benefit are addressed in the report.
Significance – Medium:
Both performance measures are simply functions of bridge length. Consequently, they are inherently of little use in evaluating project alternatives. In addition, performance measure 4.A provides at best only a trivial estimate of animal benefits and 4.B is based on an assumption about the future degradation of the L-29 levee. Although the benefits to animal populations were estimated poorly, this does not affect the justification for the project or invalidate the overall evaluation of the alternatives. In reality, some animal species would benefit from most of the alternatives proposed and this benefit would probably be to some extent a function of the total length of the bridge(s).
Comment Cross-referencing:
1. Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* Because the actual benefits to fish and wildlife of the TTM project alternatives were not estimated, such benefits will need to be demonstrated by post-project monitoring as proposed in Comment #1.
Recommendations for Resolution:
To resolve these concerns, the report would need to be modified: • Drop the current performance measures, 4.A and 4.B; • Develop more suitable performance measures that focus on species or groups of species of concern such as wading birds, alligators, deer, etc.

Response to Comment 7:

The interagency team chose to utilize hydrologic performance measures as surrogates for fish and wildlife populations. The screening chapter refers to other performance measures utilized in the 2005 RGRR/EIS, where the team could not estimate improvements to fish populations. We are basing our estimates of performance on improvement to wetland habitat, specifically deep water, long hydroperiod habitat at the center of NESRS, where there are gauges in place to monitor attainment of targets. Since current populations fluctuate widely depending on regional rainfall and season, we do not plan to set up elaborate hypotheses regarding the effect of this project's partial re-hydration on part of the system. Our direction from Congress was to identify a plan that would complete the Modified Water Deliveries improvements to Tamiami Trail so that further efforts under other authorizing legislature could proceed. We chose to use average flows, maximum rainy season flows, and marsh stages and durations as surrogates for fish, alligators, plant species and other habitat parameters.

As part of CERP, the Decompartmentalization of Water Conservation Area 3 (Component QQ6_D13R) has many components. One of which is the removal if the L-29 Levee and Canal (south of WCA-3A and 3B) to restore sheetflow into Everglades National Park.

Regarding developing alternative PMs, we do not concur. We were responding to lack of data on specific species, and knowledge of requirements for the vegetative dominants of sloughs and long-hydroperiod marshes. With an apology for the "if you build it, they will come" analogy, we did use targets for slough and deep marsh vegetation. In addition, three of our performance measures (those in the "restore vegetative communities" group) are directly linked to the hydrologic requirements for the white water lily, a native Everglades ridge and slough species.

Comment 8:
The introduction needs a better description of how the models were used. Specifically, it is unclear if the spreadsheet model was used only to compare alternatives or if it is being used in a predictive capacity.
Basis for Comment:
The report states that "The spreadsheet model does a very good job of interpreting the general trends that increased inflows would produce within NESRS as measured at the NESRS2 monitoring gage. However, stage predictions should not be considered absolutes from this analysis. This analysis is a simplification of a very complicated system developed for a [sic] comparison purposes among all of the different alternatives." It is not clear from this statement if the model was used to make predictions of water levels resulting from the project that occur in other sections of the document. Thus, the stated intended purpose may have been at odds with the apparent use.
Significance – Medium:
A clearer understanding of how the model was used and the level of reliability of the results would help to determine the reliability of the alternatives.
Comment Cross-referencing:
1. Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* Post-construction monitoring will help to determine the level of accuracy provided by the model.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A brief summary of the model (perhaps in the introduction or at the beginning of Chapter 4), describing its use(s) in evaluating the alternatives, and the reliability of the evaluations based on the model results.

Response to Comment 8:

The spreadsheet analysis was not developed to be a predictive model but rather a comparative analysis. It was developed to be an analysis that incrementally looked at stage increases in the L-29 borrow canal and the ability to deliver additional flow volume into NESRS due to that stage increase. The model did predict stages increases in relation to increase flows but should not be considered a predictive model

It is typical for studies that are performed within the Greater Everglades system to use hydrologic outputs as a function of ecological benefits/impacts. Vegetation changes/survival are dependent upon certain hydroperiods (depths, durations, etc.).

This consideration has been added to Section 4 of the main report and Appendix E.

Comment 9:

The report sometimes does not make clear that hydrologic and other indirect measures are used as surrogates for ecological processes and communities.

Basis for Comment:

Of the ten performance measures (E-3) used in the evaluation of alternatives, five are hydrological measures (water depth, duration of flooding, water velocity, etc.) that are assumed to be linked to ridge and slough processes (2.B and 2.C) or to restoring vegetation (deep marsh) communities (3.A, 3.B, and 3.C). These assumed linkages are in some cases problematic (see Comment # 4). In fact, with the arguable exceptions of performance measures 4.A and 4.B (see Comment # 7), there are no direct ecological performance measures.

In the report, instead of using the designator of a performance measure from Appendix D, e.g., 3.B, in some tables, e.g., Tables 4-6 and 4-13, "ridge and slough process" and "slough vegetation suitability" are used as headings. This is misleading because there are no direct performance measures of either, such as a predicted change in the area of deep marsh vegetation.

Because most of the estimated ecological benefits are based on assumed relationships between hydrology or some other indirect measure and ecological processes or communities, these benefits are far from certain. Consequently, post-project monitoring is needed to be sure that such benefits actually accrued from the project.

Significance – Low:

This is a minor editorial problem in the report.

Comment Cross-referencing:

(1) Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.*

(4) Comment: *There is considerable uncertainty about the origin of ridge and slough topography in the Everglades and how best to restore it in areas were it is degraded. This report does not address these uncertainties and does not contain persuasive justifications for the validity of the performance measures used for estimating the ecological benefits of restoring ridge and slough processes and ultimately ridge and slough topography.*

(7) Comment: *The two performance measures developed to estimate the restoration of "Fish and Wildlife Resources" are of little relevance for predicting the impacts of a Tamiami Trail Modification project on North East Shark River Slough fish or wildlife populations.* Both comments discuss the problems of using hydrologic and other measures as surrogates for ecological processes and communities.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- The designator of a performance measure, or a brief description of it, should be used consistently in the report as in Table 4-5.

Response to Comment 9:

The report's language has been clarified even more. We stated in app. E that we used hydrologic surrogates for marsh restoration because: (1) they are easy to monitor; and (2) we had a consensus on targets for stage and hydroperiod of plant communities. In addition, in Section 4.4.1.3, we have also added a section entitled "Links between hydrology and ecological performance" to better describe this relationship.

In several locations in the report, we have replaced 'ridge and slough processes" and "slough vegetation suitability" with the name of the specific performance measures (e.g. in Table 4-3 and Table 4-6).

Comment 10:
The potential for releasing mercury as a result of the project construction should be addressed.
Basis for Comment:
Mercury contamination has been for many years a concern in the Everglades, but is not mentioned in the report. Although it can reasonably be assumed that replacing one mile of roadway with a bridge will not alter the amount, if any, of mercury entering the Everglades from Tamiami Trail, it is possible that in situ mercury may be released because of disturbances to soils caused by construction activities. This possibility is not addressed in the report.
Significance – Low:
It is unlikely that the proposed Tamiami Trail Modification will have long-term consequences for mercury inputs into Everglades National Park. Including a discussion of the potential for mercury release due to construction activities is primarily needed to reassure fishermen and others that the potential for a short-term spike in mercury has been considered in the TT LRR.
Comment Cross-referencing:
None.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A short discussion of the potential for releasing *in situ* mercury in the project footprint and immediately downstream from it due to construction activities.

Response to Comment 10:
Mercury loading to the project area is primarily due to atmospheric sources. Methyl mercury is the mercury compound of concern. Methylation of mercury is currently linked to conditions that favor the bacteria that methylates mercury. One of the main factors is sulfur. Sulfur compounds are used as agricutural amendments. Nothing associated with this bridge construction or the finished project conditions are expected to increase atmospheric mercury loading to this area or cause an increase in factors that favor methylation of mercury in the project area.

The source water for the Mod Waters, eastern Tamiami Trail project will continue to be WCA-3A, through gate S-333. Since the source is the same, no change in mercury concentrations is expected.

Comment 11:

Within the context of evaluating alternatives, the road user costs (RUCs) should be included in the cost estimate.

Basis for Comment:

There is no indication within the discussion of costs in the TT LRR that Road User Costs (RUCs) have been considered. While RUCs do not directly affect project funding requirements, in transportation project planning it is recommended practice to include RUCs in comparing alternative design approaches.

The calculation of RUCs provides information enabling the designer to make better informed decisions in regards to staging, allowable work hours, project delivery method, and the actual design itself. Therefore, before a scheme is finalized, traffic volumes should be evaluated on a 7 day 24 hour basis. Staging should be evaluated for potential queues. Often, queues can be avoided by simply allowing lane closures only during non-peak hours. If the proposed design alternative reveals substantial RUCs, an alternative scheme that reduces these costs may be a better choice.

More specifically, planners and designers should consider RUCs as a factor in decision making with regard to:

Evaluation of Design Alternatives
Selection of Traffic Control Plan (TCP) Phasing
Selection of Project Delivery Options.

The Alternative Plans considered in the LRR are similar in scope. All include a 1-mile bridge structure. Given the similarity, RUCs may not be a determining factor in alternative selection. Nevertheless, good practice suggests that a basic analysis be performed. It is reasonable to assume that differences in stage elevations among alternatives may require differences in road section mitigation and consequently different work zone lengths. The LRR should confirm that RUCs have been considered and were not a determining factor in alternative selection.

Significance – Low:

It does not appear likely that RUCs would influence alternative selection or affect required project funding; however, to be complete it should be addressed.

Comment Cross-referencing:

None.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include: • A confirmation that a basic RUC analysis has been performed for each alternative and that RUC is not a determining factor in alternative selection.

Response to Comment 11:

We have not performed detailed estimates of Road User Costs (RUC) or included them in the cost estimate of the final alternatives. We did consider some factors that may affect traffic delays and RUC and conclude that the differences of these factors among alternatives would not be significant enough to affect the selection of a recommended alternative. We considered the following:

- The bridge of the final four alternatives would be constructed adjacent to the existing roadway rather than within the existing road alignment. Bridge construction would not significantly impact traffic flow.
- All final alternatives include reinforcing the same length of road. The entire length of road within the project limits would be re-worked.
- Weekend traffic will remain two-way, barring unforeseen construction constraints. Weekends are when a majority of the traffic is evident.
- The main difference among alternatives would the duration of construction for the different road heights.
- Staging areas would be the same for all alternatives. There are very limited locations for staging in the area.
- Allowable work hours would be daylight due to the high traffic speeds in this area rather than because of volume of vehicles.

During design, a traffic control plan would be performed for the selected alternative, lane closures would be based on this analysis. The traffic control plan would minimize, to the extent practicable, impacts to traffic, residences, and businesses. The additional factors offered with the comment, including staging, work hours, 24 hour traffic counts, would be considered.

We revised the LRR/EA (Section 5.9 Transportation) to recognize consideration of impacts to traffic and that there would not be substantial differences in traffic delays and RUC among the final alternatives.

Comment 12:

The report should briefly describe potential secondary impacts.

Basis for Comment:

Section 5.22 on page 5-51 contains one paragraph on secondary impacts, which refers the reader to discussions “throughout Section 5" for details. Section 5 contains a very lengthy and complete discussion of cumulative impacts and discussions of direct and cumulative impacts to listed species, but secondary impacts are obscured. The TT LRR defines secondary impacts well, but fails to mention that these may be either inside or outside the study area or the Everglades National Park. Secondary impacts may be either positive or negative. It is recognized that neither cumulative nor secondary impacts can be quantified and may only be described in somewhat speculative terms. The value, in particular in this instance, is in defining parameters that the team or other interested parties may choose to evaluate during and after project implementation (see Comment 1), which could significantly increase the knowledge and understanding of either the Everglades or the secondarily impacted study site. Examples discussed as potential secondary impacts include:

1. East Coast reefs. If less water is discharged to the East Coast of Florida, presumably with a lowered load, local nearshore waters may experience an improvement.

2. The North West Shark River Slough (SWSRS), west of the L67, will have the hydraulic load reduced by 55%. This may be a primary impact and it may be addressed elsewhere, but since it is outside the assessment area, discussing it as a secondary impact may be warranted.

3. The southern Everglades will experience an alteration in water flow unless it can be shown that evapotranspiration and groundwater recharge will account for all the additional water south of the assessment area boundary. The additional water could be addressed as an offsite secondary impact. Increased inputs of fresh water into Florida Bay, if any, could be an important secondary benefit of the project.

4. The southern Everglades supports fauna of interest, in particular the American Crocodile. The habitat of these species may or may not be altered, even if only shifted geospatially, by the alteration of the geographical location or intensity of the salinity gradient between the Everglades and the marine fringe.

5. Geospatial shifts in nesting and foraging habitats of wading, diving, and predatory birds may occur.

6. The Northeast Shark River Slough (NESRS) tree islands may be affected by post project changes in water depths. Levels can be expected to be higher in the NESRS and lower in the NWSRS.

7. WCA-3A and WCA-3B can be expected to have altered hydrology, which may constitute a secondary effect.

Significance – Low:
The significance to this particular plan is low, but a more thorough examination and discussion of potential secondary effects is very desirable. The significance to future plans, similar plans, work being conducted by others, and the monitoring recommended in Comment 1 is high.
Comment Cross-referencing:
1. Comment: *Each of the processes and functions included in the performance measures directly or as contributing functions should be monitored under a plan with significant geospatial dispersion.* A well designed monitoring program could add detail to the level of both positive and negative secondary affects.
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A complete, if speculative, list of expected or potential positive and negative secondary affects, the hypothesized causative agent, and a general description of the potential outcome.

Response to Comment 12:

Secondary impacts of this project will be:

1) The potential of reducing the number of high water days within Water Conservation 3A that impacts the endangered Everglades Snail kite. The current operational schedule has closure criteria set on the S-12's for the protection of the Cape Sable seaside sparrow. By increasing our ability to move water to the east this should have a positive impact to stages within WCA-3A. However, the analysis for the LRR did not evaluate this process because this would require an operational model that will take place under the Combined Structural and Operational Plan.
2) As flows are increased into North East Shark River Slough stages will also be increased within the area. This will have a secondary impact of increasing seepage to the east (towards L-31N). However, under the original 1992 General Design Memorandum it was anticipated to back pump this water back into the L-29 Borrow Canal with a pump station (S-356). A portion of the pump station was constructed in 2002 with a capacity of 500 cfs. The scale back was based the selected plan for the 8.5 Square Mile Area portion of the project. The 1992 GDM had seepage water pumped north to the L-29 BC while the selected/constructed plan moves this water south.
3) With the redistribution of flow from NWSRS to NESRS the western part will see a change to more natural hydro-periods which would be a benefit to the area.

Examples provided are not applicable.

Section 5.22, Secondary Impacts, will be expanded to include the following text:

> Providing a greater capacity for the conveyance of flows under Tamiami Trail would provide opportunities (See Section 4.2.2) for:

1. The delivery of more water into the eastern ENP and NESRS, restoring the balance of distribution between eastern and western deliveries, as proposed in the MWD GDM.

2. Restore seasonal flooding and timing of deliveries that would enhance suitability for native vegetation and decrease the potential for invasive species colonization.

3. Increase the quantity of water into NESRS, which would increase the quality and quantity of ridge and slough habitat.

Anticipated beneficial secondary impacts of the project are discussed in Appendix E, Environmental Benefits Analysis, and throughout Section 5.0, Environmental Effects of Alternatives. Potential ecological benefits include the restoration of ridge and slough processes, the restoration of vegetative communities, and the restoration of fish and wildlife resources.

Improvements to NESRS inside ENP could be realized through a potential increase in water levels of up to two feet.

In addition to those benefits within the area downstream from Tamiami Trail, the project would provide greater flexibility for increased water releases. This would reduce the need for storage of water in WCAs, which would decrease ponding and promote sheet flow. The WCA-3A ecosystem would potentially experience less frequent adverse high stages in its southwestern corner.