WHITE PAPER

ASSESSING SECONDARY AND CUMULATIVE EFFECTS WITHIN THE ETDM PROCESS

Prepared by

Florida Department of Transportation
Central Environmental Management Office

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ASSESSING SECONDARY AND CUMULATIVE EFFECTS WITHIN THE ETDM PROCESS

OVERVIEW

There are over 40 separate federal and state laws governing environmental review of transportation projects. With the adoption of Section 1309 of the Transportation Equity Act for the 21st Century (TEA21), Congress called for streamlining the environmental permitting process for transportation projects. On February 3, 2000, the environmental streamlining process in Florida began with a summit meeting of federal and state, environmental and transportation agency leaders. Through this summit, a commitment to begin the environmental streamlining process was established. More than 50 representatives from over 28 agencies worked together with the Florida Department of Transportation (FDOT) and US Department of Transportation (USDOT) in a series of multi-agency meetings to develop their shared vision of the streamlining process.

By January 2001, the environmental streamlining effort in Florida had resulted in a conceptual process and implementation strategy that was entitled Florida's Efficient Transportation Decision Making (ETDM) Process. The process includes an Environmental Technical Advisory Team (ETAT) for each FDOT District. Each ETAT is composed of transportation and resource agencies that perform reviews much earlier in the planning process than exists today. Projects undergo a level of review and recommendation by ETAT members at planning and programming phases. An implementation tool called the Environmental Screening Tool (EST) has been developed to help with this review is based on Geographic Information System (GIS) software that uses the extensive geographic data library of the University of Florida GeoPlan Center.

Several Task Groups were established in March 2001 to address specific issues and problems with the conceptual ETDM Process. The purpose of one of these Task Groups was to define a process for evaluating secondary and cumulative effects, presumably with a structure that could be incorporated in ETAT reviews using GIS software. The results of this Task Groups' work is presented in a white paper entitled "Secondary and Cumulative Impacts Task Group" dated October 2001. A copy of this working paper is contained in Appendix A.

In January 2004, a second Task Group was formed to further evaluate methods for Secondary and Cumulative Effects (S&CE) Evaluation. This task was undertaken in response to comments received from participants of the Statewide ETDM Training Classes requesting the Central Environmental Management Office (CEMO) to provide more clarity of the process for evaluating potential secondary and cumulative effects. This White Paper summarizes the work of the second S&CE Task Group and provides recommendations for improving S&CE Evaluation within the ETDM Process.

Task Group Organization

The S&CE Task Group was formed to re-examine how secondary and cumulative effect evaluations are conducted in the Efficient Transportation Decision Making (ETDM) Process and to recommend specific actions for improving the evaluation process.

The S&CE Task Group consisted of representatives from the FDOT, FHWA, Metropolitan Planning Organizations, and federal and state environmental regulatory and management agencies. The Task Group met on two occasions for workshops held on January 14-15, 2004 and March 18, 2004 in Tallahassee, Florida. At the initial meeting, the Task Group was split into three subgroups to focus on issues associated with specific resource types. The Natural Resources, Cultural Resources, and Sociocultural Resources subgroups each held one workshop. The Cultural and Natural Resources subgroup meetings were held in Tampa, Florida on February 6, 2004 and February 19, 2004 respectively, and the Sociocultural Resource subgroup meeting was held in Tallahassee, Florida on February 24, 2004. Meeting objectives and support documents were prepared for each meeting to facilitate the Task Group discussions. Meeting summaries are provided in Appendix B.

Secondary and Cumulative Effects Task Group

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Task Group Chairman

Natural Resources Subgroup	
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Sociocultural Resources Subgroup	
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Nancy Model	WFRPC
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Task Group Objectives

The primary goal of the Task Group was to assess and develop a method for evaluating secondary effects and cumulative effects within the ETDM Process. In order to achieve this goal, the FDOT Central Environmental Management Office provided the following objectives to the Task Group:

- Define cumulative effects, secondary effects, and other key terms.
- Define the interrelationship between Federal, State, MPO, and local planning agency processes.
- Conduct a literature review and define best practices in other states.
- Identify how to accomplish secondary and cumulative effects evaluations based on the defined interrelationships of planning agency processes.
- Determine standard analysis to support evaluation of secondary and cumulative effects.

- Define area of analysis for each resource.
- Determine "off system" analyses needed to support evaluation of secondary and cumulative effects.
- Define what gets accomplished in Planning Screen and Programming Screen (i.e., when does each analysis occur).
- Identify data sets needed to perform secondary and cumulative effects evaluations.
- Identify supporting data sets on EST.
- Prioritize data needs for secondary and cumulative evaluations.
- Determine if the existing comment screens in the ETDM Environmental Screening Tool are useful, and if necessary, how they should be modified to assist in the evaluation and development of commentary on secondary and cumulative effects.
- Define expected graphic or tabular output for each analysis.
- Define functional revisions to the Environmental Screening Tool.
- Identify how to engage local governments in considering secondary and cumulative effects during local planning process.

Direct, Secondary, and Cumulative Effects Definitions

To facilitate the Task Group discussions, working definitions for direct, secondary, and cumulative effects were developed. This effort was supported by the development of a Memorandum that summarized the definitions, procedures, and evaluation guidelines used by various state and federal agencies in the United States and abroad for conducting secondary and cumulative effects evaluations. This Memorandum is provided in Appendix C. A list of Website URLs related to the evaluation of S&CE is provided in Appendix D.

Most all agencies within the United States that have conducted S&CE Evaluations use the definitions developed by the Council on Environmental Quality (CEQ) in 1997. The CEQ defines **direct effects** as those effects that occur as a direct result of an action and occur at the same time and place as the action (e.g., filling of wetlands, taking of a home or business, etc.). **Secondary effects** are reasonably foreseeable effects that occur as a result of an action but occur later in time or are removed from the action (e.g., induced growth, changes in land use patterns, etc. and resultant effects such as changes in water quality, air quality, etc.).

The CEQ defines **cumulative effects** as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other action." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Based on this definition, cumulative effects represent the direct and secondary effects of all the actions that have occurred, are presently occurring, and can reasonably be expected to occur in the future.

The CEQ's definitions for direct, secondary, and cumulative effects were reviewed and slightly modified by the Task Group. The Task Group discussed and concluded that cumulative effects include those that are beyond the control of the FDOT. However, the group agreed that guidelines developed for the assessment of cumulative effects within the ETDM Process should address all cumulative effects regardless of what agency or agencies contribute to them. The following definitions were developed by the S&CE Task Group and were used as a starting point in the development of S&CE assessment guidelines.

- *Direct Effects* – Those effects that occur as a direct result of an action and which occur at the same time and place as the action.
- *Secondary Effects* - Those reasonably foreseeable effects that occur as a result of an action but occur later in time and/or are removed from the action.
- *Cumulative Effects* – Those effects that result from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other action.
- *FDOT Induced Cumulative Effects* – Those cumulative effects that are a result of actions taken by the FDOT.

TASK GROUP RECOMMENDATIONS

Task Group deliberations were supported by the results of a literature review that summarized best practices for S&CE Evaluation from case studies conducted in the United States, Canada, and Great Britain. During the two one-day workshops of the full S&CE Task Group and the meetings of the three subgroups, several enhancements to the process for evaluating potential S&CE within the ETDM Process were recommended. These process and functional recommendations are described in this report section.

An initial determination of the Task Group was that the evaluations of secondary and cumulative effects were discrete actions that should be assessed separately in the ETDM Process. This finding is fundamental to the recommendations presented in this report. After thoughtful discussions, the Task Group decided that secondary effects should be evaluated at the project-level during the Planning, Programming and Project Development phases. Cumulative effects should be a resource-based analysis conducted during the Planning Screen. The recommended process for evaluating secondary effects and cumulative effects within the ETDM Process are presented below.

Secondary Effects Evaluation

The Task Group determined that secondary effects are project specific and should be assessed concurrent with direct effects evaluation during the Planning and Programming Screens and during Project Development. As a project advances through the Planning, Programming, and Project Development phases, the analysis of secondary effects should be refined and more specific as additional information becomes available.

During the ETDM screening events, the ETAT should review the data available in the EST and other available information to support their assessment of potential secondary effects to the resource that their agency is responsible for protecting or managing. (Recommended data sets for secondary effects evaluation are presented in the Data Needs section of this report.) Their comments should include methods to avoid or minimize negative effects and describe potential mitigation/compensation opportunities. The ETAT should recommend additional information that should be secured and studies that should be performed prior to or during Project Development. The data and studies would clarify potential effects and aid in the development of avoidance or minimization actions.

The Task Group suggested that three and five mile buffers for standard GIS analyses would be needed to support secondary effects evaluation on the EST. The Comment Forms and Summary Reports for secondary effects evaluation should be similar in look and function to those used for direct effects evaluation.

Cumulative Effects Evaluation

The Task Group determined that cumulative effects evaluation, by definition, could not be conducted for individual transportation projects. Instead, cumulative effects are associated with one or many transportation and/or land use actions that have potential cumulative effects on the resources in question. Therefore, the assessment of cumulative effects should be resource-based, and evaluated at the system-level during the Planning Screen. The system can be defined as the resources and the transportation network within a defined area. Because this analysis is performed from the perspective of the resource, the area of effect will be resource specific and may differ from resource to resource. For example, a water basin, a habitat utilized by a protected species, or a community planning area may all have different geographic areas of effect.

During this screen, the ETAT should evaluate the effect of all past, present and foreseeable future transportation and land use actions on the resource that their agency is responsible for protecting or managing. The MPO and CLCs should have primary responsibility for evaluating cumulative effects to community resources in MPO areas and non-MPO areas respectively. The Department of Community Affairs should be a reviewing agency for cumulative effects to community and social resources. The Federal Highway Administration and Federal Transit Administration should be a reviewing agency for cumulative effects for all resources. The recommended general process for evaluating cumulative effects is outlined below:

- Identify natural, cultural, or sociocultural resources of concern.
- Define the area of effect using tools within the EST to select an existing polygon or draw a new boundary. For community resources, the MPOs and CLCs should define Community Planning Areas for their evaluation.
- Document the rationale used in their determination of the selected area of effect in the EST.
- Use the EST to locate projects and resources within or near the area of effect.

- Review results of direct and secondary effect evaluations for each transportation project in the planning area including the public input for each of these projects.
- Review existing and future land use plans, DRIs, Urban service area boundaries and consider the effect of land use decisions to the resource in question.
- Consider the results of studies and other information that are not available on the EST to support the evaluation of cumulative effects.
- Consider the carrying capacity of the resource in an attempt to assess "resource sustainability".
- Provide commentary on cumulative effects of all transportation/land use actions to the natural, cultural, or community resource in question.

Data Needs

In addition to the data layers already defined for secondary and cumulative effects analysis (see Appendix E), the Subgroups identified the following new data needs for both secondary and cumulative effects evaluations:

- Historic aerials
- Utilities
- Existing land use
- Future land use
- Developments of Regional Impact (DRIs)
- Parcel boundaries
- Urban Service Area boundaries

The Task Group recommended that these data sets be secured and uploaded into the EST to the extent feasible.

Timeframe

The Task Group defined Cumulative Effects as "those effects that result from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other action". In order to undertake an analysis of cumulative effects, the Task Group established the following parameters for both "past" and "reasonably foreseeable future" actions:

- *Past Actions* should go back as far as we have historic aerial photography or other reliable data to support cumulative effects evaluation. These aerial images would provide trends about how transportation and land use actions are affecting the viability and sustainability of natural, cultural, or community resources. For example, historic aerial images would support the evaluation of the effect of development encroachment on the viability and sustainability of habitat for various species.

- *Reasonably Foreseeable Future Actions* should be defined as those occurring within a twenty-year time frame, consistent with the Long Range Transportation Plan time horizons. The projects included in the MPO Cost Affordable Long Range Transportation Plans and FDOT Cost Affordable FIHS Plans should be considered in this evaluation. The Future Land Use Plans within local Comprehensive Plans and proposed DRIs should also be considered.

Geographic Extent of Analysis

Because cumulative effects evaluation is resource-based, the Task Group determined that the area of effect was also resource specific and could differ from resource to resource. As a result, the Subgroups for cultural, natural and sociocultural resources recommended a method for defining the area of effect for their particular resources. The recommendations of each Subgroup are listed below:

Natural Resources

The Natural Resources Subgroup determined that the geographic extent of analysis differs depending on the type of natural resource (e.g. wetlands, panther, scrub jays, etc.) being assessed for cumulative effects. For several resources, such as the panther, the geographic area of effect may extend beyond the boundaries of a specific MPO or county. Therefore, the Subgroup suggested that the user have the capability within the EST to view large geographic areas to define the area of effect.

Many of the analysis areas are consistent with defined resource areas, such as drainage basins, but others are not. Therefore, it was determined that the ETAT representative should have the capability within the EST to define the geographic area of potential effect by either selecting existing polygons, such as a drainage basin, or by drawing new boundaries.

After defining the area of effect, the ETAT representatives should also provide their rationale supporting of their determination.

Cultural Resources

The Cultural Resource Subgroup determined that the geographic extent of analysis differs depending on the type of cultural and historic resource for cumulative effects evaluation. The subgroup discussed and identified the geographic extent of analysis for various cultural and historic resources in a cumulative effects analysis. The resource type and area of potential effect are listed below. The subgroup suggested that some of the resources should be avoided to the extent feasible.

Table 1
Cultural Resources Area of Potential Effect

Resource	Area of Potential Effect
Historic Structures	County
Historic District	County
Resource Groups	County
Future Sensitive Resources	County
Bridges	State
Archaeological	State
Native Lands (Tribal)	State
Cemeteries	Avoid
Burials	Avoid
Sacred Lands	Avoid

The resources with an area of potential effect at the "County" level have the potential to be locally significant only. Resources with a statewide area of potential effect have the potential to be of state significance and uniqueness. Other cultural resources are best avoided due to the procedural difficulties to mitigate.

Sociocultural Resources

The Sociocultural Resources Subgroup determined that the MPOs and CLCs should be able to conduct a cumulative effect evaluation for the entire County (or MPO area) and for smaller Planning Areas within the County or MPO area. The Analysts should be able to define the Planning Area (geographic area of potential effect) within the EST.

The cumulative effects evaluation for sociocultural resources would, at a minimum, include a County–level evaluation. The MPO or CLCs would have the flexibility to define smaller Planning Areas with the County or MPO area to conduct the evaluation.

The users should be able to view the planned transportation projects, existing and future land use, DRIs, and other sociocultural information within or near the defined Planning Area to conduct their evaluations.

Summary Reports

While the direct and secondary effects for a specific project should be contained within the Summary Report for that project, cumulative effects are not project specific and should be addressed within a separate Summary Report. In addition, because cumulative effects may extend past established geopolitical boundaries, the Summary Report for cumulative effects may be generated and provided to more than one jurisdiction or agency. The Subgroups for cultural, natural and sociocultural resources recommended a method for preparing Summary Reports and assigning a degree of effect (enhanced, minimal to none, moderate, substantial, potential dispute) for their particular resources. The recommendations of each Subgroup are listed below.

It is suggested that one Cumulative Effects Summary Report that includes the commentary and assigned degree of effect for natural, cultural and sociocultural issues is developed for each County or MPO area. The Summary Reports should be customized to include all identified areas of effect for each identified resource or sub-resource within the County or MPO area.

Natural Resources

There are many potential "sub-types" of resources (i.e., individual protected species, wetland types, etc.) within a larger resource group that should be assessed in a cumulative effects evaluation. It is important to know how past, present and future transportation and land use actions are effecting these sub-types. Therefore, the Natural Resource Subgroup suggested that the Summary Report should describe the cumulative degree of effect for each of these sub-types separately. The following Summary Report format was suggested by this Subgroup. This format allows the Analyst to define and name the area of effect for each sub-resource and assign a cumulative degree of effect.

Table 2
Natural Resources Cumulative Degree of Effect

Resource Type	Sub-type	Area of Effect	Degree of Effect
Protected Species	Bald Eagle	Unique Name or Identifier (number)	
	Panther		
Wetlands	Forested		
	Herbaceous		
Etc.			

The full list of resource types and sub-types existing within each County should be compiled for use in the EST. A pull-down list should be developed to allow the Analyst to select the appropriate resource and sub-type in question. The commentary for these resources should be documented in the EST for each sub-resource. For example, the Analyst would select the resource type and sub-type and comment about potential cumulative effects on the sub-type in question (i.e. Bald Eagle, Panther, etc.).

Cultural Resources

The Cultural Resource Subgroup suggested that Summary Report should describe the cumulative degree of effect for each of the cultural resources defined below. This Summary Report would be similar to that used for direct effects.

Table 3
Cultural Resources Cumulative Degree of Effect

Resource	Degree of Effect
Historic Structures	
Historic District	
Resource Groups	
Future Sensitive Resources	
Bridges	
Archaeological	
Native Lands (Tribal)	
Cemeteries	
Burials	
Sacred Lands	

Sociocultural Resources

The Sociocultural Resources Subgroup suggested that the Summary Report should describe the cumulative degree of effect for each the six SCE issues defined by the SCE Task Group – social, economic, land use, mobility, aesthetic, and relocation effects. The following Summary Report format was suggested by the Subgroup:

Table 4
Sociocultural Resources Cumulative Degree of Effect

Resource	Social	Economic	Land Use	Mobility	Aesthetic	Relocation
Name of county or MPO area						
Unique Name or Identifier of Planning Area 1						
Unique Name or Identifier of Planning Area 2						
Unique Name or Identifier of Planning Area 3						
Unique Name or Identifier of Planning Area 4						
Unique Name or Identifier of Planning Area 5						

The assigned degree of effect for the six SCE issues would be provided (in the boxes in Table 4) for each defined planning area. This format would allow for the efficient identification of where potential moderate or substantial cumulative effects exist for each of the sociocultural issues. For example, there may be substantial cumulative economic effects from the transportation and land use actions planned in Planning Area 2, and there could be substantial social effects to Planning Area. The Analyst should be able to define as many planning areas as needed to conduct a cumulative effect analysis.

Environmental Screening Tool Enhancements

The Task Group and Subgroups identified the following enhancements to the EST to support both secondary and cumulative effects evaluations:

- Revise the Planning and Programming Screen Comment Forms to separate secondary and cumulative effects. Cumulative effects will only be evaluated in the Planning Screen. Secondary effects will be evaluated concurrently with direct effects in both the Planning and Programming Screens.
- Add 3- and 5-mile evaluation buffers to the standard GIS analyses for secondary effects and provide quantitative results of these analyses.
- Review and add, if needed, the new data sources listed in the Data Needs section of this report for both secondary and cumulative effects evaluations.
- Provide access for all ETAT members to evaluate and provide commentary on cumulative effects in the Planning Screen.
- Increase the AXL scale limits for all users to view data when zoomed out further for both secondary and cumulative effects evaluations.
- Create a tool that provides the ability to draw the geographic area of effect on the EST for cumulative effects evaluation.
- Develop a location on the Cumulative Effects Comment Form for ETAT representatives to document the rationale for determining the area of potential effect.
- Create a tool that provides the ability to select a feature or polygon from an existing layer to use for spatial queries in cumulative effects evaluation. For example, select a basin from the basin data layer and use it to extract resource data.
- Create an application that allows users to associate a resource with one or more areas of effect.
- Revise the EST to allow the reviewer to show areas of effect on the EST map (i.e., be able to show one or more, not just all)
- Reports needed to show GIS analysis results for the defined area of effect, including the following:
  a. List of all projects within area with analysis results grid summarizing direct effects.
  b. List of the resources identified within area as specified by user.
  c. List/map of DRI's, existing land use, and future land use.

- The Summary Report for cumulative effects should be developed consistent with the format and needs described in the Summary Reports Section of this document.
- The Summary Report for cumulative effects should describe current conditions and projected future conditions of the resource area.
- The issues and methods described in this white paper will require a "how to" Handbook that provides specific instruction for conducting secondary and cumulative effects evaluations.

CONCLUSION

The S&CE Task Group worked cooperatively to identify the recommendations presented in this report. The recommendations meet all of the objectives provided to the Task Group.

APPENDIX A
WORKING PAPER – SECONDARY & CUMULATIVE IMPACTS TASK GROUP

D R A F T

Secondary and Cumulative Impacts Task Group

October 2001

Acknowledgements

The Florida Department of Transportation, Central Environmental Management Office, would like to express its appreciation to the Secondary and Cumulative Task Group members for their hard work, cooperation, and dedication to the Statewide Environmental Streamlining effort. Their technical expertise and management experience were invaluable assets in developing this report. The following are the task group participants and their respective agencies.

- Lisa Beever–Charlotte County-Punta Gorda Metropolitan Planning Organization (Leader)
- Frank Kalpakis– URS Corporation (Monitor)
- Ted Bisterfeld, U.S. Environmental Protection Agency, Region IV
- Josh Boan, FDOT CEMO
- Rich Clarendon, Hillsborough County MPO
- Dick Combs, FDOT District 1 Planning
- Terry Gilbert, Florida Fish and Wildlife Conservation Commission
- Tom Grahl, US Fish and Wildlife Service
- Lynn Griffin, Florida Department of Environmental Protection
- George Hadley, Federal Highway Administration, Florida Division
- Dennis Hardin, Florida Department of Agriculture & Consumer Services, Division of Forestry
- Todd Mecklenborg, FDOT District 7 EMO
- Alan Powell, U.S. Environmental Protection Agency, Region IV
- Bob Wheeler, Federal Highway Division, Washington Division

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The basic philosophy of environmental streamlining is to improve environmental protection, reduce conflict, and reduce permitting time. This philosophy is important to gain acceptance from transportation agencies that are charged with maintaining the public's mobility and from environmental agencies that are charged with protecting the public's natural and cultural resources. This is accomplished by considering environmental issues earlier in the planning process and allowing planners to adjust project concepts to avoid or minimize adverse impacts. Transportation project concepts have their greatest flexibility early in the planning process and irretrievable commitments of resources have not yet been made.

By January 2001, the environmental streamlining effort in Florida had resulted in a draft general procedure and implementation strategy. The procedure includes an Environmental Technical Advisory Team (ETAT) for each FDOT District. Each ETAT would be composed of transportation and resource agencies that would perform reviews much earlier in the planning process than exists today. Projects at the MPO's Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) stages would undergo a level of review and recommendation by ETAT members. An implementation tool to help with this review is an ESRI Geographic Information System (GIS) software that uses the extensive map library of the University of Florida GeoPlan Center.

Several Task Groups were established in March 2001 to address specific issues and problems with the draft ETDM process. One of these was to define a process for evaluating secondary and cumulative impacts, presumably with a structure that could be incorporated in ETAT reviews using GIS software. The inclusion of a secondary and cumulative impacts evaluation at the LRTP and TIP stage is consistent with the FHWA position paper on secondary and cumulative impacts dated April 1992 (www.fhwa.dot.gov/environment/2_c_imp.htm).

The purpose of this report is to summarize the work of the Secondary and Cumulative Impacts Task (SACIT) Group of the Environmental Streamlining Committee.

The Council on Environmental Quality (CEQ) regulations (40 CFR section 1500 - 1508) implementing the procedures of the National Environmental Policy Act (NEPA) of 1969, as amended (42 USC section 4321 et seq.) defined cumulative effects as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR section 1508.7).

Further, the CEQ regulations (40 CFR 1508.8) define several different types of effects that should be evaluated under NEPA. "Effects" include:

- *Direct effects*, which are caused by the action and occur at the same time and place.
- *Indirect effects*, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

The Final ESA Section 7 Consultation Handbook was published in March 1998 and includes a section on indirect effects and another on cumulative effects. USFWS are required to consider cumulative effects in formulating their biological opinions (50 CFR section 402.14(g)(3) and (4). The section describes cumulative effects as the following:

> Cumulative effects include the effects of future State tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in the section because they require separate consultation pursuant to Section 7 of this Act.

It should be noted that the CEQ definition of cumulative effects includes foreseeable Federal and Non-Federal action while the USFWS definition excludes future Federal action.

The key question related to secondary and cumulative impacts is a policy level discussion centering on plan consistency. Are land use plans supportive of broader plans? Are transportation, land use and resource plans of local, regional, state, and federal agencies all in sync? In Florida, consistency of inter-related local, regional, state, and federal plans is documented within the local comprehensive plan. Comprehensive plans are the launching point for long range transportation plan development by MPOs and are iterative with the Transportation Elements.

The Federal Highway Administration (FHWA) and the Florida Department of Transportation (FDOT) are responsible for disclosing foreseeable secondary and cumulative impacts of proposed projects under the National Environmental Policy Act. Today, the secondary and cumulative impacts of proposed transportation projects are typically evaluated during the project development phase. This is too late in the planning process to effectively address the potential impacts.

Transportation improvement needs are developed in response to the level and intensity of development approved in the local government comprehensive plans. Land use decisions made during the development of the comprehensive plan directly influence the infrastructure improvements required to support the allowable development levels included in the plan. Because of the secondary impacts associated with these land use decisions, which include transportation infrastructure, land development, and the potential environmental impacts caused by this development, comprehensive planners should consider these consequences during the comprehensive plan development process.

Ultimately, it is the responsibility of local governments, in coordination with resource and planning agencies, to consider secondary and cumulative impacts in the development of their comprehensive plans. For example, when land use decisions are made to support a community vision, the required transportation improvements needed to support the allowable development under the land use plan category and the impact of this development on the community and environmental resources should be considered.

The environmental streamlining process proposed for Florida includes earlier involvement by resource agencies, additional information to elected officials, and reduced project production times. The draft Environmental Transportation Decision-Making (ETDM) Process provides for an initial review by the resource and planning agencies on the Environmental Technical Advisory Team (ETAT). The ETAT has the responsibility to advise MPOs and FDOT of potential community and environmental impacts associated with the identified mobility needs that support a community vision. This project impact analysis, called the LRTP Screen, allows for early identification of environmental issues that could influence the priority, alignment, and/or future features of the candidate projects.

Figure 4-1 depicts Florida's ETDM process. Figure 4-2 shows the proposed process with secondary and cumulative impacts evaluation.

As shown in Figure 4-2, secondary and cumulative impacts of land use and transportation decisions will be evaluated at the systems level during the comprehensive plan development process. Understanding the secondary and cumulative impacts of proposed actions early in the planning process is expected to lead to improved transportation, land use, and environmental resource management decisions.

4.1 LRTP SCREEN DEVELOPMENT

Before the ETAT LRTP screen, the ETAT agency representatives will be responsible for providing the GeoPlan Center at the University of Florida with the GIS data layers listed below. This information is required for the ETAT to conduct a system-wide secondary and cumulative impacts review in the ETDM process. The appropriate ETAT members will also be responsible for providing the GeoPlan Center with agency approved updates to the data and mappings in a timely manner.

- Future Land Use Map (Local Planning Agency, MPO, or Local Government)
- Existing Land Use Map (Local Planning Agency, MPO, or Local Government)
- Maps of approved population and employment projections by TAZ – Density and growth maps (Zdata 1 and 2 files- MPO)
- Location and type of approved developments, including DRIs (Regional Planning Council or Local Governments)
- Delineated urban service area boundaries (MPO or Local Planning Agency)
- Existing and future roadway network, Needs Plan (MPO or FDOT)
- Location of existing and proposed public lands and conservation easements (WMDs or RPC)
- Existing and proposed Mitigation Areas (Resource Agencies)
- Defined neighborhoods (MPO or Local Government)
- Race/income of existing population by TAZ (MPO)
- Watersheds - basin and sub-basin (WMDs)
- Rivers and creeks (WMDs)

Figure 4-1

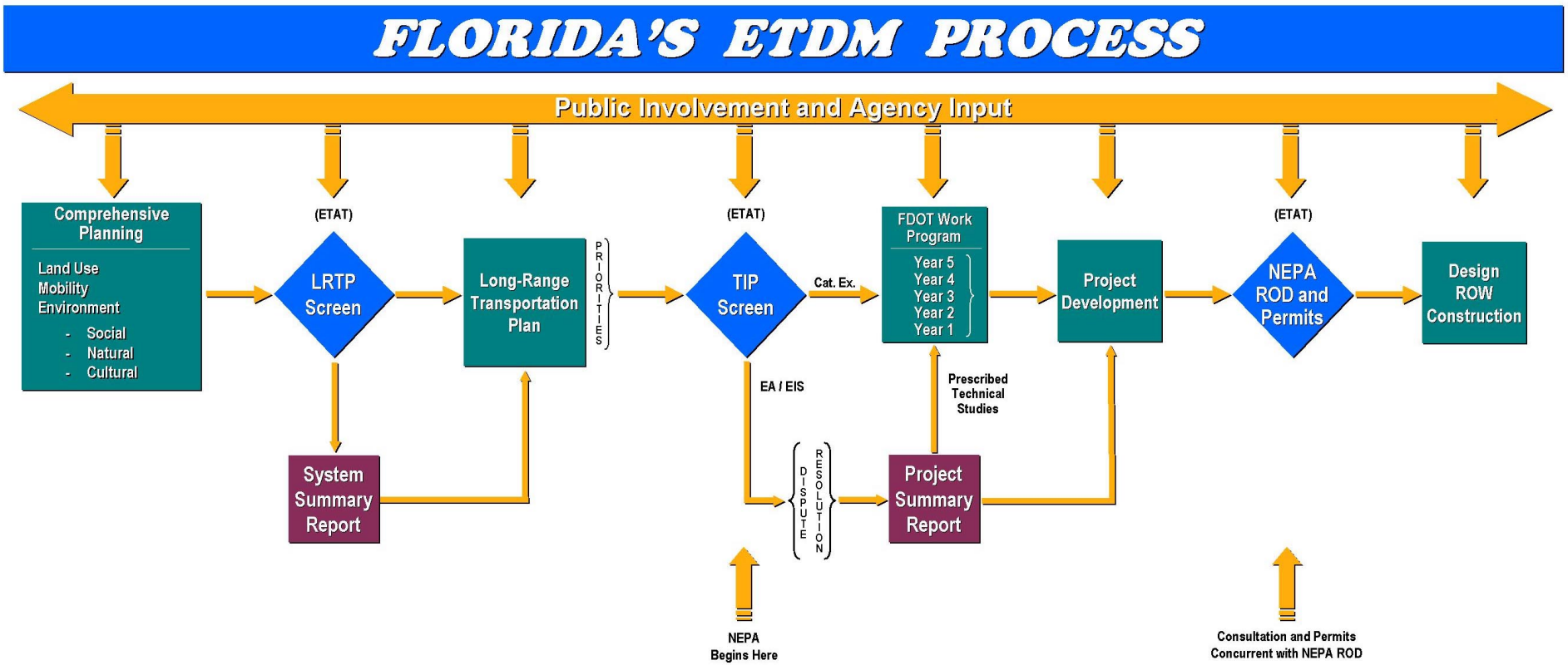
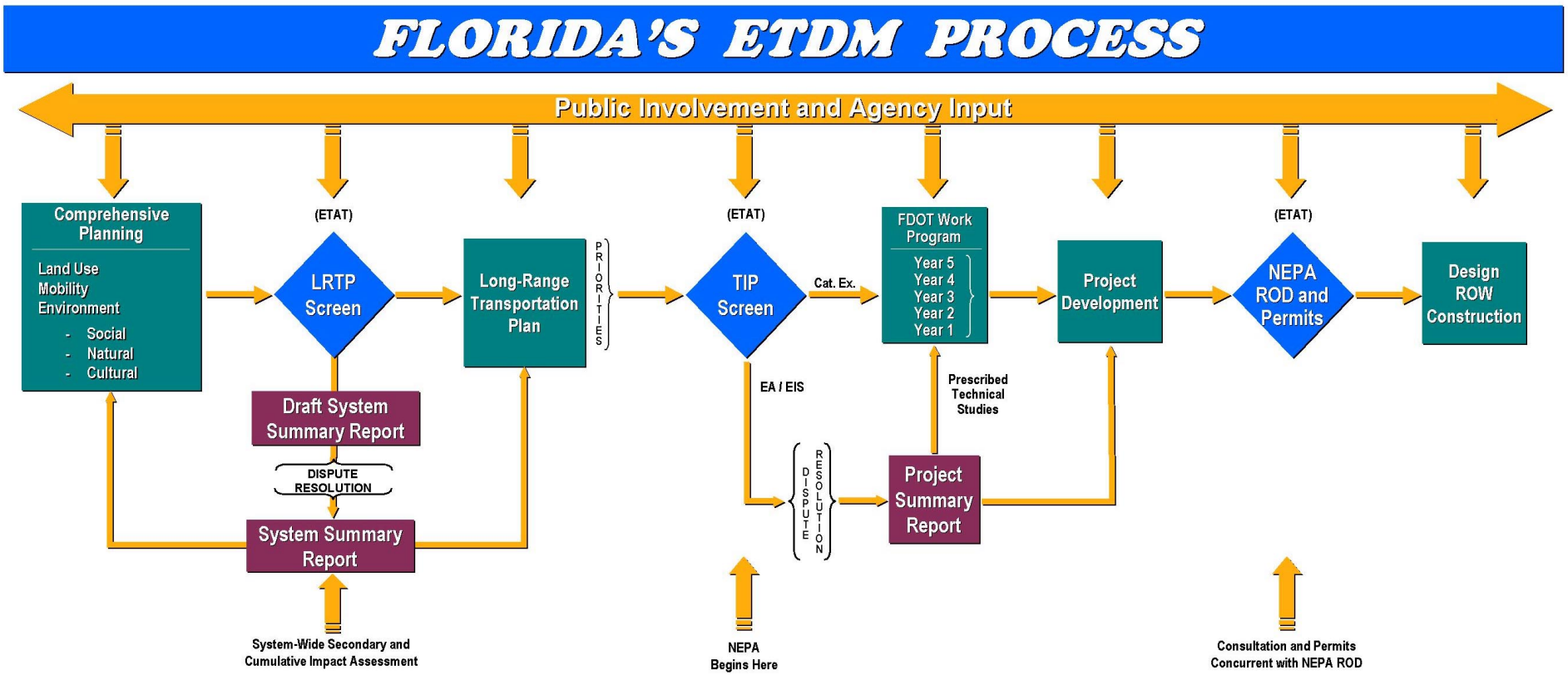

FLORIDA'S ETDM PROCESS
Public Involvement and Agency Input
Comprehensive Planning
Land Use
Mobility
Environment
- Social
- Natural
- Cultural
(ETAT)
LRTP Screen
System Summary Report
Long-Range Transportation Plan
PRIORITIES
(ETAT)
TIP Screen
Cat. Ex.
EA / EIS
DISPUTE RESOLUTION
NEPA Begins Here
FDOT Work Program
Year 5
Year 4
Year 3
Year 2
Year 1
Prescribed Technical Studies
Project Summary Report
Project Development
(ETAT)
NEPA ROD and Permits
Consultation and Permits Concurrent with NEPA ROD
Design ROW Construction

Figure 4-2


FLORIDA'S ETDM PROCESS
Public Involvement and Agency Input
Comprehensive Planning
Land Use
Mobility
Environment
- Social
- Natural
- Cultural
(ETAT)
LRTP Screen
Draft System Summary Report
DISPUTE RESOLUTION
System Summary Report
System-Wide Secondary and Cumulative Impact Assessment
Long-Range Transportation Plan
PRIORITIES
(ETAT)
TIP Screen
Cat. Ex.
EA / EIS
DISPUTE RESOLUTION
NEPA Begins Here
FDOT Work Program
Year 5
Year 4
Year 3
Year 2
Year 1
Prescribed Technical Studies
Project Summary Report
Project Development
(ETAT)
NEPA ROD and Permits
Consultation and Permits Concurrent with NEPA ROD
Design ROW Construction

- Airsheds (DEP)
- Location of prioritized resource protection areas (identified by each resource agency)
- All map coverages associated with direct impact evaluations

Priority Resource Protection Areas

The ETAT members representing agencies that are charged with managing and protecting natural and community resources will be responsible for identifying and prioritizing social and natural resource protection areas. They will also provide the following information for each area.

- Status of resource
- Important environmental characteristics or social stress factors
- Description of pertinent regulations, administrative standards and development plans, if applicable

This information will be accessible to all ETAT members through the ETDM GIS application (with a point and click feature) to assist with reviews of direct, secondary, and cumulative impacts.

4.2 LRTP SCREEN

The ETAT will be responsible for identifying the potential secondary and cumulative impacts of candidate transportation improvements and land use decisions from the perspective of the resources that their agency is responsible for protecting and/or managing. The land use, transportation, socio-economic and environmental data described previously will assist the ETAT members to formulate an opinion of potential secondary. This information and the collective results of the direct impact evaluations will form the basis for identifying potential cumulative impacts.

The ETDM GIS application will include a pull down menu listing the potential secondary and cumulative impact issues. The following issues should be included in the initial pull down list:

Land Use

- Conversion of land use to higher intensity use
- Creation of interstate hubs

Air and Water

- Air emissions
- Disruption of sheetflow: severing of watersheds
- Hardening or rerouting of creek or river
- Water quantity and quality of wetlands
- Water quantity and quality of surface water features

- Water quantity and quality of designated waters
- Water quantity and quality of groudwater
- Water quantity and quality of springs

Plants and Animals

- Disturbance to listed species and wildlife movement
- Severing/removing edge of listed species territory

Community

- Loss of economic vitality
- Loss of historic or archeological resources/context
- Splitting of downtowns
- Splitting of neighborhoods
- Viewsheds (bridge projects)

Mobility

- Induced travel

The ETAT members will select one or more issues and provide commentary for each selected issue. Their comments will be based on a review of the system-wide environmental, transportation, and land use data and the identified direct impacts associated with a proposed transportation project. Comments will be recorded in a "comment field" and will be categorized by system-wide and project specific recommendations. The following comments will be provided:

- Magnitude of proposed action (high, moderate, low)
- Significance of the proposed action to environmental and community resources
- Basis for determination (method)
- Recommendations of proposed actions or project design features that could improve an at-risk resource or rectify past actions that placed a resource at risk
- Avoidance / mitigation options and recommendation
- Recommendation for technical studies

Additional advice provided by the ETAT regarding secondary and cumulative impacts at the LRTP Screen could include the following:

- Reconsideration of a candidate transportation improvement concept.
- Consideration of amending the future land use plan and allowed development thresholds.
- Identification of issues that should be considered at a project level. These issues should be forwarded to the ETAT Coordinator to influence scoping decisions.

4.3 DRAFT SYSTEM SUMMARY REPORT

The FDOT ETAT Coordinator will be responsible for reviewing the ETAT comments on potential secondary and cumulative impacts, summarizing these results, and developing recommendations for addressing the stated impacts. The cumulative impacts will be based on a comprehensive review of all potential direct and secondary impacts as it relates to both the base line quality of environmental and community resources and the level of change that a future land use plan or planned transportation improvements could facilitate. The FDOT ETDM Coordinator will summarize these comments in a Draft System Summary Report.

The Draft System Summary Report will be electronically submitted to the ETAT members for review and comment. Submitted ETAT comments will be reviewed by the ETAT Coordinator for his consideration and preparation of a Final System Summary Report. The ETAT Coordinator will be responsible for coordinating with appropriate ETAT members and others to address unresolved issues.

4.4 FINAL SYSTEM SUMMARY REPORT

This System Summary Report will contain agency comments, issues and recommended actions to address secondary and cumulative impacts. The report will also contain project information and agency comments about potential direct impacts. The report will be used by the MPO and FDOT to prioritize transportation improvements in the LRTP and Florida Intrastate Highway System Plan. The report will also be provided to local comprehensive planners for their consideration when making land use, transportation, and other policy decisions. It will also be used by the ETAT Coordinator to influence class of action and project scoping decisions.

Secondary and cumulative impacts are most effectively addressed at the system-wide level during the MPOs long-range transportation planning and local government comprehensive planning process. Previous difficulties in addressing secondary and cumulative impacts are related to the project level evaluations that currently characterize the NEPA process. This is too late in the process.

Recommendations from resource agencies regarding potential secondary and cumulative impacts of proposed transportation projects and land use plans should be considered in the LRTP and Comprehensive Plan development process. By identifying foreseeable consequences of actions and impacts on resources that are at risk, decision-makers can avoid costly mistakes.

This approach requires resource agency representatives to review issues not only as regulators but as scientists, planners, and civic leaders. This change in role needs to be embraced by the resource agency leadership to allow their staff to provide comments and recommendations freely and without negative consequence.

The intent of the recommended process is that the secondary and cumulative impact evaluation of transportation and land use decisions is eventually ingrained in the comprehensive planning process. Therefore, when transportation needs are identified in response to the existing development and future growth allowed in a local government Future Land Use Plan, the secondary and cumulative impacts of those decisions are considered.

APPENDIX B
TASK GROUP MEETING SUMMARIES

Secondary and Cumulative Effects Task Group
January 14-15, 2004

MEETING NOTES

Meeting Overview

Leroy Irwin opened the meeting with an explanation of the expectations for the work group. Frank reviewed the handouts and explained the plan for accomplishing the group's objectives. The proposed process includes the following:

January 14-15	*Full Task Group Meeting*
February	Sub Group Meetings for Focus Areas (Natural Resources, Sociocultural Resources, Cultural and Historic Resources)
March	Second Full Task Group Meeting
Late March	Draft White Paper
April	Final White Paper

Overview of Florida's Planning Process

Frank led a discussion of Florida's Planning Process and described the interrelationship of the Comprehensive Planning, MPO Long Range Planning and FDOT Planning processes.

Review Task Group Objectives

The group reviewed the Goals and Objectives as outlined in the handouts, and no changes were suggested.

Define Secondary and Cumulative Effects

The group reviewed and edited the definitions presented in the handouts as follows:

- "Direct Effects" - no changes
- "Secondary Effects" - change "or" to "and/or"
- "Cumulative Effects" - delete "on the environment" and delete the "s" in "results"
- FDOT Induced Cumulative Effects - delete the word "direct"

Review October 2001 SCE White Paper and Summary of Best Practices

The Task Group reviewed the key findings and information presented in the October 2001 SCE White Paper and the Summary of Best Practices. This led to a discussion of how to measure effects for "past" and "reasonably foreseeable future" actions. It seemed to be the consensus of the group that defining and measuring these effects may vary by resource and will need to be addressed by the smaller workgroups. A twenty-year time frame was suggested for reasonably foreseeable future because it is consistent with the LRTP time horizons and would work well within the ETDM Process.

Resource agencies should look at the "system" as a whole in the planning screen. The system can be defined as the resources and the transportation network. The group felt that resource agencies should comment on S&C effects during both the planning and programming screens. It was suggested that during the planning screen, we should evaluate the carrying capacity of the resource. During the programming screen, we should re-confirm the analysis or evaluate additional information if it has become available. In both screening events, the resource agencies should comment on mitigation/compensation opportunities, and provide recommendations on design to help develop cost estimates.

Brainstorming

The group discussed and provided the following responses to several questions as part of a "brainstorming" exercise.

1. What decisions might be made based on evaluations?
    - Preferred alternative
    - Road design and features
    - MPO priorities
    - Cost estimates
    - Mitigation options
    - Impact avoidance, minimization
    - Changes to other projects
    - Alternative modes
    - No-build alternative
    - Land use changes
    - Identification of special studies
2. How will the results be used?
    - No build
    - Mitigation
    - Alter design
    - Lead to special studies
    - See previous list
3. How will we accomplish S&CE evaluations?
    - Resource and system-based focus
    - County-wide or project-level reviews
    - "System" could be natural system or transportation system
    - Data needs - transportation system and all associated data, DRIs, etc.

Accomplishing S&CE Evaluations

Data Review - Each person was tasked with reviewing the EST data list to identify the core data layers needed to conduct S&CE evaluations and to identify essential data that are missing from the list.

The group identified the following analysis tools and support data that would be helpful for S&CE evaluations:

- Ability to draw the geographic area of analysis on the EST
- Ability to select a feature from an existing layer to use for spatial queries. For example, select a basin from the basin data layer and use it to extract resource data
- Add 3 and 5 mile buffers to the standard GIS analyses for S&CE
- All agencies should be able to comment on S&CE in both Planning and Programming screens
- Summary Report should assign the worse case on 1st page and then provide breakdown on subsequent pages
- Process could be used by others for cumulative assessment, plans, mitigation banks
- Existing infrastructure data such as sewers and stormwater could tell us where we have capability to expand development. If data doesn't exist with the specific features, then the Urban Service Area boundaries could be used.
- Comprehensive Plan data sets need to be identified by DCA.

General Approach Defined

A general approach for conducting S&CE evaluations was discussed by the Task Group. The details about how S&CE evaluations will be conducted for natural, cultural, and sociocultural resources will be further defined in sub-groups. The following key features were defined for the "big picture" approach for S&CE evaluations.

- S&CE evaluations should be conducted in Planning Screen and Programming Screen. During the planning screen, we should evaluate the carrying capacity of the resource. During the programming screen, we should re-confirm the analysis or evaluate additional information if it has become available.
- A systems-level and resource-based approach will be used for S&CE evaluations
- Data needed to support S&CE evaluations will be available on the EST to conduct standard evaluations. Other data would be available to support "off-system" evaluations. The sub-groups will identify data needs and evaluations.
- The ETAT will provide commentary on potential S&CE of candidate transportation projects similar to the method used for providing commentary for direct effects.

The System Summary Report should assign the worse case "degree of effect" provided by the ETAT/ETDM Coordinator. Subsequent pages would provide the commentary and assigned degree of effect for each ETAT member. An alternative could include having an S&CE Summary Report and providing the "degree of effect" for each of the resources evaluated.

Next Steps

The following sub-groups were identified to discuss how to accomplish S&CE evaluations within the ETDM Process. These groups will meet in February.

Natural Resources	Cultural Resources	Sociocultural Resources
Terry Gilbert	George Ballo	Jennifer Wolf
Lynn Griffin	Marty Peate	Nancy Model
Jeff Weller	Mark Easley	George Ballo
Clark Hull	Ken Hardin	Suraya Teeple
Terry Bates	George Hadley	Ken Metcalf
Rick Ruebsamen	Mike Konikoff	Pauline Blankenship
Dick Combs	Brian Yates	Alexi Thomas
Ruth Roaza	Frank Kalpakis	Robert Magee
Mark Easley		Cathy Kendall
Tunis McElwain		Gwen Pipkin
Frank Kalpakis		Frank Kalpakis
Josh Boan		

The following topics will be discussed:

- Discuss concerns with general approach
- Determine geographic extent of analysis for each resource
- Determine supporting data needed for evaluations
- Determine data layers to support standard analyses and “off-system” analyses
- Detail S&CE evaluation from resource perspective

The sub-groups will meet in February and bring results back to the next group session.

- Summary of Action Items
- Frank will summarize meeting and set up subgroups.
- Homework for all:
- Review handouts and research papers
- Identify methodologies useful for evaluations
- Verify data sets to make sure we have everything needed
- Identify standard analyses
- Ruth will provide examples of summary reports for next meeting

Secondary and Cumulative Effects Task Group
Cultural and Historic Resources Subgroup
February 6, 2004

MEETING NOTES

Attendance

George Ballo, CEMO
Ken Hardin, Janus Research
Marty Peate, URS
Frank Kalpakis, URS
Mark Easley, URS

Meeting Overview

Frank opened the meeting with an explanation of the expectations for the subgroup and discussed the supporting handouts for the meeting.

The group decided that environmental scientist generally have a good understanding on how to evaluate secondary effects of transportation improvements on cultural and historic resources. However, they also generally have a weak knowledge of how to identify and evaluate cumulative effects. Therefore, the focus of the meeting was on how to conduct a cumulative effects evaluation from the perspective of cultural and historic resources.

Geographic Extent of Analysis

The subgroup determined that for cumulative effects analysis, the geographic extent of analysis differs depending on the type of cultural and historic resource. The subgroup discussed and identified the geographic extent of analysis for various cultural and historic resources in a cumulative effects analysis. The resource type and area of potential effect are listed below. The group felt that some of the resources should be avoided to the extent feasible.

Resource	Area of Potential Cumulative Effect
Historic Structures(National Register)	County
Cemeteries	Avoid
Burials	Avoid
Historic District	County
Resource Groups	County
Bridges	State
Archaeological	State
Native Lands (Tribal)	State
Sacred Lands	Avoid
Future Sensitive Resources	County

Data Layers

The subgroup determined that all of the data layers defined in the Cultural Resource Task Group White Paper are needed for Secondary and Cumulative Evaluations also. No additional data layers were identified.

Secondary and Cumulative Effects Task Group
Natural Resources Subgroup
February 19, 2004

MEETING NOTES

Attendance

Mary Mittiga, US Fish and Wildlife Service
John Wrublik, US Fish and Wildlife Service
Terry Gilbert, Florida Fish and Wildlife Conservation Commission
Mark Sramek, National Marine Fisheries Service
Dick Combs, FDOT D1
Josh Boan, FDOT CEMO
Frank Kalpakis, URS
Mark Easley, URS
Ruth Roaza, URS

Meeting Overview

Frank opened the meeting with an explanation of the expectations for the subgroup and described the supporting handouts for the meeting.

General Process for Conducting Cumulative Effects Evaluation

The subgroup decided that direct and secondary effects should be a project specific analysis, and cumulative effects should be conducted at the systems level. Therefore, secondary effect analyses should be conducted during the review of direct effect evaluations for specific projects during the Planning and Programming Screens and during project development.

Cumulative effects analyses are not tied to a single project, but instead associated with one or many transportation and/or land use actions that have potential cumulative effects on the resource in question. Therefore, cumulative effect evaluations should be conducted during the Planning Screen from the perspective of the resource. It should consider all transportation and land use actions that are planned in the foreseeable future.

The general process should include:

- ETAT identifying resources of concern
- ETAT representatives defining the area of interest (effect)
- Use EST to locate projects and resources in the area of interest
- Provide commentary on cumulative effects of all transportation/land use actions to the resource in question

Geographic Extent of Analysis

The subgroup determined that for cumulative effects analysis, the geographic extent of analysis differs depending on the type of natural resource (e.g. wetlands, panther, scrub jays, etc.). Many of the analysis areas are congruent to defined resource areas, such as drainage basins, but others are not. Therefore, the subgroup felt that the EST should provide the capability to select or draw polygons to define the geographic area of potential effect.

For several resources, such as the panther, the geographic area of interest may be larger than the County extent, so the EST should provide the capability to view the larger areas on the screen.

Data Layers

In addition to the data layers already defined for secondary and cumulative effects analysis, the subgroup identified the following new data needs for secondary and cumulative effects evaluations:

- Historic aerials (GeoPlan will research availability)
- Existing land use
- Future land use
- DRIs
- Parcel boundaries

The data layers identified in the previous Secondary and Cumulative Task Team White Paper should be included also.

EST Enhancements

The following EST enhancements were suggested to effectively accomplish Secondary and Cumulative Effects Evaluations:

1. Create tool to select or draw polygons depicting area of interest
2. Summary Report should describe current conditions and projected future conditions in the project area
3. Review and add new data sources above to SACE if needed
4. SACE AXL scale limits need to be increased to all users to see data when zoomed out further
5. Crate application that allows user to associate a resource with one or more areas of interest
6. Revise Planning and Programming Screen Comment Forms to separate Secondary and Cumulative Effects – Cumulative Effects only in Planning Screen
7. Show areas on the map (be able to show one or more, not just all)

8. Reports needed to show GIS results of area of interest analysis, including the following:
   a. list of all projects within area with analysis results grid summarizing direct effects
   b. list of the resources identified within area as specified by user
   c. list/map of DRI's, existing land use, and future land use

Secondary and Cumulative Effects Task Group
Sociocultural Resources Subgroup
February 24, 2004

MEETING NOTES

Attendance

George Ballo, Central EMO
Nancy Model, West Florida RPC
Cathy Kendall, FHWA
Alexi Thomas, GeoPlan
Frank Kalpakis, URS

Meeting Overview

Frank opened the meeting with an explanation of the expectations for the subgroup and discussed the supporting handouts for the meeting.

General Process for Conducting Cumulative Effects Evaluation

The approach defined by the Natural Resource subgroup was presented. The Sociocultural Resources subgroup agreed with the general approach of evaluating secondary and cumulative effects separately. This would include evaluating secondary effects for each candidate project during the Planning and Programming Screens, and evaluating cumulative effects at the systems level during the Planning Screen.

The general process for conducting cumulative effects evaluations should include:

- MPOs and CLCs define Planning Areas
- Use EST to locate projects and community resources in the Planning Areas
- Review results of direct effects for each project in the planning area including the public input for each of these projects
- Review other data on or off the EST to support the evaluation
- Provide commentary on cumulative effects of all transportation/land use actions to the six defined sociocultural issues in each Planning Area and for the County or MPO area

Geographic Extent of Analysis

The subgroup suggested that for cumulative effects evaluations, the MPOs and CLCs should be able to conduct the analysis for the entire County (or MPO area) and for smaller Planning Areas within the County or MPO area. The users should be able to define the Planning Areas within the EST by selecting or drawing polygons to define the Planning Area (geographic area of potential effect). They should be able to view the planned transportation projects within or near the defined Planning Area. Existing and future land use, and other sociocultural information should be assessable to conduct the evaluations.

Summary Report

The subgroup suggested that the Summary Report should describe the Cumulative Degree of Effect for each the six SCE issues defined by the SCE Task Group – social, economic, land use, mobility, aesthetic, and relocation effects. The following Summary Report format was suggested by the committee:

Cumulative Degree of Effect

		Social	**Economic**	**Land Use**	**Mobility**	**Aesthetic**	**Relocation**
Areawide	Hillsborough County						
Planning Area 1	Brandon						
Planning Area 2	South County						
Planning Area 3							
Planning Area 4							
Planning Area							

This format would allow for the easy identification of where potential moderate or substantial cumulative effects exist for each of the sociocultural issues. For example, there may be substantial cumulative economic effects from the transportation and land use actions planned in Planning Area 1 to the economy… or to mobility. And there could be substantial social effects to Planning Area 2 from the planned transportation and land use actions affecting that area.

The user should be able to define as many planning areas as needed to conduct a cumulative effect analysis.

Data Layers

The subgroup suggested that the sociocultural data layers identified by the SCE Task Group would be needed for secondary and cumulative effects evaluation. In addition, the following data sets would be useful for cumulative effects evaluation:

- Historic aerial photography (GeoPlan will provide inventory of existing data)
- Urban service areas
- Utilities (might indicate where growth could occur)

Responsibility

The subgroup suggested that the following ETAT members should participate in the secondary and cumulative effects reviews for sociocultural issues:

- MPOs in MPO areas (working closely with District CLCs)
- FDOT in non-MPO areas
- DCA in all areas
- FHWA in all areas
- FTA in all areas

Secondary and Cumulative Effects Task Group
March 18, 2004

APPROACH FOR SECONDARY AND CUMULATIVE EFFECTS EVALUATIONS WITHIN THE ETDM PROCESS

How to Conduct Secondary Effects Evaluation

Direct and secondary effects should be a project specific analysis:

- Secondary effect analyses should be conducted during the Planning and Programming Screens and during project development.
- During the programming screen, we should re-confirm the analysis or evaluate additional information if it has become available. In both screening events, the resource agencies should comment on mitigation/compensation opportunities, and provide recommendations on design to help develop cost estimates.

How to Conduct Cumulative Effects Evaluation

- Cumulative effects analyses are not tied to a single project, but instead associated with one or many transportation and/or land use actions that have potential cumulative effects on the resource in question.
- Cumulative effects should be conducted at the systems level. The ETAT should look at the "system" as a whole in the Planning Screen. The system can be defined as the resources and the transportation network. It was suggested that during the planning screen, we should evaluate the carrying capacity of the resource.
- Cumulative effect evaluations should be conducted during the Planning Screen from the perspective of the resource.
- It should consider all transportation and land use actions that are planned in the foreseeable future.

Natural and Cultural Resources

- ETAT identifies resources of concern
- ETAT representatives define the area of interest (effect)
- Use EST to locate projects and resources in the area of interest
- Provide commentary on cumulative effects of all transportation/land use actions to the resource in question

Sociocultural Resources

- MPOs and CLCs define Planning Areas
- Use EST to locate projects and community resources in the Planning Areas
- Review results of direct effects for each project in the planning area including the public input for each of these projects

- Review other data on or off the EST to support the evaluation
- Provide commentary on cumulative effects of all transportation/land use actions to the six defined sociocultural issues in each Planning Area and for the County or MPO area

Analysis Period for Cumulative Effects Evaluation

- Past – should go back as far as we have historical aerial photography
- Foreseeable Future - twenty-year time frame because it is consistent with the LRTP time horizons and would work well within the ETDM Process

Geographic Extent of Analysis

Natural Resources

The Natural Resource Subgroup determined that for cumulative effects analysis, the geographic extent of analysis differs depending on the type of natural resource (e.g. wetlands, panther, scrub jays, etc.). Many of the analysis areas are congruent to defined resource areas, such as drainage basins, but others are not. Therefore, the subgroup felt that the EST should provide the capability to select or draw polygons to define the geographic area of potential effect.

For several resources, such as the panther, the geographic area of interest may be larger than the County extent, so the EST should provide the capability to view the larger areas on the screen.

Cultural Resources

The subgroup determined that for cumulative effects analysis, the geographic extent of analysis differs depending on the type of cultural and historic resource. The subgroup discussed and identified the geographic extent of analysis for various cultural and historic resources in a cumulative effects analysis. The resource type and area of potential effect are listed below. The group felt that some of the resources should be avoided to the extent feasible.

Resource	Area of Potential Cumulative Effect
Historic Structures(National Register)	County
Cemeteries	Avoid
Burials	Avoid
Historic District	County
Resource Groups	County
Bridges	State
Archaeological	State
Native Lands (Tribal)	State
Sacred Lands	Avoid
Future Sensitive Resources	County

Sociocultural Resources

The Sociocultural Resources Subgroup suggested that for cumulative effects evaluations, the MPOs and CLCs should be able to conduct the analysis for the entire County (or MPO area) and for smaller Planning Areas within the County or MPO area. The users should be able to define the Planning Areas within the EST by selecting or drawing polygons to define the Planning Area (geographic area of potential effect). They should be able to view the planned transportation projects within or near the defined Planning Area. Existing and future land use, and other sociocultural information should be assessable to conduct the evaluations.

Data Needs

In addition to the data layers already defined for secondary and cumulative effects analysis, the subgroup identified the following new data needs for secondary and cumulative effects evaluations:

- Historic aerials (GeoPlan will research availability)
- Utilities (might indicate where growth could occur)
- Existing land use
- Future land use
- DRIs
- Parcel boundaries
- Urban Service Area boundaries
- Data needs identified by Cultural Resource Task Group

Summary Report

The Sociocultural Resources Subgroup suggested that the Summary Report should describe the Cumulative Degree of Effect for each the six SCE issues defined by the SCE Task Group – social, economic, land use, mobility, aesthetic, and relocation effects. The following Summary Report format was suggested by the committee:

Cumulative Degree of Effect

		Social	Economic	Land Use	Mobility	Aesthetic	Relocation
Areawide	Hillsborough County						
Planning Area 1	Brandon						
Planning Area 2	South County						
Planning Area 3							
Planning Area 4							
Planning Area							

This format would allow for the easy identification of where potential moderate or substantial cumulative effects exist for each of the sociocultural issues. For example, there may be substantial cumulative economic effects from the transportation and land use actions planned in Planning Area 1 to the economy… or to mobility. And there could be substantial social effects to Planning Area 2 from the planned transportation and land use actions affecting that area.

The user should be able to define as many planning areas as needed to conduct a cumulative effect analysis.

This approach could be used for natural and cultural resources.

EST Enhancements

The group identified the following analysis tools and support data that would be helpful for S&CE evaluations:

- Ability to draw the geographic area of analysis on the EST
- Ability to select a feature from an existing layer to use for spatial queries. For example, select a basin from the basin data layer and use it to extract resource data
- Add 3 and 5 mile buffers to the standard GIS analyses for Secondary Effects
- All ETAT members should be able to comment on Cumulative Effects in Planning Screen
- Summary Report should assign the worse case on 1st page and then provide breakdown on subsequent pages
- Create tool to select or draw polygons depicting area of interest
- Summary Report should describe current conditions and projected future conditions in the project area
- Review and add new data sources above to S&CE if needed

- SACE AXL scale limits need to be increased to all users to see data when zoomed out further
- Crate application that allows user to associate a resource with one or more areas of interest
- Revise Planning and Programming Screen Comment Forms to separate Secondary and Cumulative Effects – Cumulative Effects only in Planning Screen –Secondary Effects in both Screens
- Show areas on the map (be able to show one or more, not just all)
- Reports needed to show GIS results of area of interest analysis, including the following:
  a. List of all projects within area with analysis results grid summarizing direct effects
  b. List of the resources identified within area as specified by user
  c. List/map of DRI's, existing land use, and future land use

Responsibility

The Sociocultural Resource Subgroup suggested that the following ETAT members should participate in the secondary and cumulative effects reviews for sociocultural issues:

- MPOs in MPO areas (working closely with District CLCs)
- FDOT in non-MPO areas
- DCA in all areas
- FHWA in all areas
- FTA in all areas

APPENDIX C
MEMORANDUM – INDIRECT (SECONDARY) EFFECTS & CUMULATIVE EFFECTS

INDIRECT (SECONDARY) EFFECTS AND CUMULATIVE EFFECTS

1.0 INTRODUCTION

As part of the Florida Department of Transportation's (FDOT) commitment to development of the Efficient Transportation Decision Making (ETDM) Process, several task groups were established to address specific issues associated with the process. The objective of one of these task groups is to define a process for evaluating secondary (indirect) and cumulative impacts.

In accordance with FDOT CEMO Task Work Order 21, Secondary and Cumulative Impact Guidance, URS has undertaken efforts to adequately define indirect (secondary) effects and cumulative effects for the purpose of the ETDM Process as well as outline currently accepted methods of evaluation. In consideration of this objective, URS has researched the definitions of indirect and cumulative effects and the procedures for assessment advocated by the National Environmental Policy Act of 1969 (NEPA), the Executive Office of the President, Council on Environmental Quality (CEQ), the Florida Highway Administration (FHWA), other Federal agencies, key state transportation departments, and researchers in the field of environmental impact assessment. The results of this research are documented in this memorandum.

Numerous reference materials were consulted in the preparation of this memorandum, including the following:

- CEQ, "Considering Cumulative Effects Under the National Environmental Policy Act," January 1997;
- FHWA, "Position Paper: Secondary and Cumulative Impact Assessment in the Highway Planning Process," April 1992;
- U.S. Environmental Protection Agency (EPA), "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," May 1999;
- North Carolina Department of Transportation (NCDOT), "Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Volumes I and II," November 2001;
- Wisconsin Department of Transportation (WDOT), "Indirect and Cumulative Effects Analysis for Project-Induced Land Development, Technical Reference Document;"
- Maryland State Highway Administration, "Secondary and Cumulative Effects Analysis Guidelines," June 28, 2000;
- University of Manchester (G.B.) Environmental Impact Assessment Centre, "EIA Newsletter 14," Summer, 1997;
- Stephen C. Trombulak and Christopher A. Frissell, "Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities," Conservation Biology, February 2000;
- Richard T. T. Forman, "Estimate of the Area Affected Ecologically by the Road System in the United States," Conservation Biology, February 2000;

- Richard T. T. Forman and Robert D. Deblinger, "The Ecological Road-Effect of a Massachusetts (U.S.A.) Suburban Highway," Conservation Biology, February 2000;
- Anthony P. Clevenger and Nigel Waltho, "Factors Influencing the Effectiveness of Wildlife Underpasses in Banff National Park, Alberta, Canada," Conservation Biology, February 2000; and
- David T. Hartgen, "Highways and Sprawl in North Carolina," University of North Carolina at Charlotte, September 24, 2003.

2.0 DEFINITIONS OF DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

NEPA directs Federal agencies to examine the consequences of proposed activities in the light of an overall goal to protect and enhance the human environment. The agencies must examine direct and observable effects plus those that may be indeterminate and not easily recognized. Effects that can be both difficult to identify and evaluate are grouped into the general categories of secondary (indirect) and cumulative effects.

Before the indirect and cumulative effects evaluation methods can be discussed, it is first necessary to define the terms. CEQ regulations (40 CFR 1500-1508) implementing the procedures of NEPA provides the most widely accepted definitions of indirect and cumulative effects in use nationwide by Federal and state agencies and departments.

2.1 Executive Office of the President - Council on Environmental Quality

In its publication "Considering Cumulative Effects Under the National Environmental Policy Act, January 1997," the CEQ defines direct, indirect, and cumulative effects in 40 CFR, 1507.7 and 1508.8. For clarification, the terms "effects" and "impacts" are used synonymously in the CEQ regulations.

The CEQ differentiates direct and indirect effects from the term "cumulative impact" which is "…is the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions…"

40 CFR, Sec. 1508.7 - Cumulative Impact

"Cumulative impact" is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 CFR, Sec. 1508.8 - Effects

"Effects" include direct and indirect effects:

- "Direct effects," are caused by the action and occur at the same time and place.
- "Indirect effects," are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in these regulations are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency or department believes that the effect will be beneficial.

In 1998, the CEQ issued a handbook on cumulative effects that organizes such effects into four types:

- **Type 1.** Repeated "additive" effects from a single proposed project;
- **Type 2.** Stresses from a single source that interact with receiving data to have an interactive net effect;
- **Type 3.** Effects arising from multiple sources (projects, point sources, or general effects associated with development) that affect environmental resources addictively; and
- **Type 4.** Effects arising from multiple sources that effect environmental resources in an interactive fashion.

In addition to the CEQ definitions of indirect and cumulative effects, other agencies and departments were looked to for slight variations on the definitions; definitions that might better suit the purposes of a streamlined environmental process such as ETDM.

2.2 U.S. Department of Transportation - Federal Highway Administration

The FHWA utilizes the CEQ definitions previously referenced for direct, indirect, and cumulative impacts.

The USDOT defines the term "secondary effects" as "those effects, which can foreseeably occur due to the proposed action, such as activities that "induce new facilities and activities." The USDOT refers directly to the CEQ guidelines for the definition of "indirect effects," but refers to them as "secondary or foreseeable effects."

2.3 U.S. Environmental Protection Agency

EPA utilizes the CEQ definitions previously referenced for direct, indirect, and cumulative impacts. In broad terms, cumulative impacts refer to the accumulation of human-induced changes in valued environmental components over time and across space in an addictive or interactive manner.

2.4 North Carolina Department of Transportation

Like FDOT, NCDOT has been actively exploring the concept of streamlining their environmental process for highway projects. In their publication "Guidance for Assessing Indirect and Cumulative Impacts of Transportation in North Carolina" (November 2001), NCDOT has looked at the practices of indirect and cumulative impact assessment in the states of Florida, Wisconsin, and Illinois for comparison with NCDOT procedures.

NCDOT utilizes the CEQ definitions for direct, indirect, and cumulative effects. For indirect effects, NCDOT adds the following:

> "There are three main forms of indirect effects: encroachment-alteration effects, induced growth effects, and induced growth-related effects."

2.5 Wisconsin Department of Transportation

WDOT is currently working with FHWA to streamline its environmental assessment practice and is developing screening worksheets to use as a component in their environmental impact statements. WDOT utilizes the CEQ definitions previously referenced for direct, indirect, and cumulative effects.

2.6 Maryland Department of Transportation

The Maryland Department of Transportation (MDOT) State Highway Administration (SHA) has published a document titled "Secondary and Cumulative Effects Analysis Guidelines" (June 28, 2000) for use in their environmental process for transportation projects. In that publication, MDOT utilizes the CEQ definitions previously referenced for direct, indirect, and cumulative effects. MDOT combines their analysis of indirect and cumulative effects into a single Secondary and Cumulative Effects Analysis (SCEA) summary.

2.7 Canadian Environmental Assessment Research Council - Canada

The Canadian Environmental Assessment Research Council (CEARC) defines a cumulative impact as: "Cumulative effects can occur when impacts on the natural and social environments take place so frequently in time or so densely in space that the effects of individual projects cannot be assimilated. They can also occur when the impacts of one activity combine with those of another in a synergistic form."

2.8 Environmental Assessment Impact Centre - United Kingdom

In extensive documents published by the Environmental Impact Assessment Centre, University of Manchester, cumulative impacts refer to the accumulation of human-induced changes in valued environmental components over time and across space in an addictive or interactive manner. The concept of cumulative impacts reflects a broadened perspective on the nature of human-environment interactions. This perspective acknowledges:

- **Sources of cumulative impacts**. Environmental changes may originate not only from single projects, but also from interactions of multiple projects, similar or different in kind.
- **Pathways of accumulation**. Environmental changes may accumulate through addictive or interactive processes. Addictive processes are summative in that one unit of environmental change may be added or subtracted from a previous unit. Processes are interactive when net accumulation is more or less than the sum of all environmental changes.
- **Types of cumulative impacts**. Resulting environmental changes may be differentiated, generally according to temporal and spatial attributes. Examples include time crowding (increasing impacts over time), time lag (delayed impact), space crowding (increasing density of impacts in an area), cross boundary movement (impact occurs away from the source), and fragmentation (break-up of contiguous areas).

3.0 METHODOLOGIES OF ASSESSMENT FOR INDIRECT AND CUMULATIVE EFFECTS

NEPA directs Federal agencies to examine the consequences of proposed activities in the light of an overall goal to protect and enhance the human environment. The agencies must examine direct and observable effects plus those that may be indeterminate and not easily recognized. Effects that can be both difficult to identify and evaluate are grouped into the general categories of secondary (indirect) and cumulative effects.

This section outlines the methodologies established to conduct indirect and cumulative effects assessments. The same agency and department publications were consulted for their prescribed methods of indirect and cumulative impact assessment.

3.1 Executive Office of the President - Council on Environmental Quality

While there is no cookbook method of assessing cumulative impacts, CEQ developed a handbook entitled “Considering Cumulative Effects under the NEPA” (CEQ 1997). It provides the most comprehensive and useful information to date on practical methods for addressing cumulative effects in NEPA documents.

Determining the cumulative environmental consequences of an action requires delineating the cause and effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. There is a close relationship between impact assessment and environmental planning and many of the methods developed for each are applicable to cumulative effects analysis. The unique requirements of cumulative effects analysis (focus on resource sustainability and the expanded geographic and time boundaries) must be addressed by developing an appropriate conceptual model. To do this, a suite of primary methods can be used: questionnaires, interviews, and panels; checklists; matrices; networks and system diagrams; modeling; trends analysis; and overlay mapping and GIS. As with project-specific events, tables and matrices can be used to evaluate cumulative effects. Special methods are also available to address the unique aspects of cumulative effects including carrying capacity analysis, ecosystem analysis, economic impact analysis, and social impact analysis.

The CEQ identifies eight principles of cumulative effects analysis:

1. Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.

2. Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal or private) has taken the action.

3. Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.

4. It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.

5. Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.

6. Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.

7. Cumulative effects may last for many years beyond the life of the action that caused the effects.

8. Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

Today, there are two basic approaches to addressing cumulative effects analysis: the impact assessment approach and the planning approach.

The impact assessment approach views cumulative effects analysis as an extension of environmental impact assessment. The planning approach regards cumulative effects analysis as a correlate of regional or comprehensive planning. While the impact assessment approach more closely parallels current NEPA practice, an optimizing approach based on a community derived vision of future conditions may be preferable in the absence of reliable thresholds for the resources, ecosystems, and human communities of concern. In fact, the planning approach to cumulative effects analysis is becoming more common within agencies and intergovernmental bodies as they embrace the principles of ecosystem management and sustainable development. These two approaches are complimentary and together constitute a more complete cumulative effects analysis methodology, one that satisfies the NEPA mandate to merge environmental impact assessment with the planning process.

A study specific methodology is necessary for conducting a complete cumulative effects analysis. The primary methods for conducting the analysis are:

- Questionnaires, interviews, and panels to gather information about the wide range of actions and effects needed for a cumulative effects analysis.
- Checklists to identify potential cumulative effects by reviewing important human activities and potentially affected resources.
- Matrices to determine the cumulative effects on resources, ecosystems, and human communities by combining individual effects from different actions.
- Networks and system diagrams to trace the multiple, subsidiary effects of various actions that accumulate upon resources, ecosystems, and human communities.
- Modeling to quantify the cause-and-effect relationships leading to cumulative effects.
- Trends analysis to assess the status of resources, ecosystems, and human communities over time and identify cumulative effect problems, establish appropriate environmental baselines, or project future cumulative effects.

Overlay mapping and GIS to incorporate locational information into cumulative effects analysis and help set boundaries of the analysis, analyze landscape parameters, and identify areas where effects will be the greatest.

Two aspects of cumulative effects analysis warrant special analysis methods: the need to address resource sustainability, and the need to focus on integrated ecosystems and human communities. Carrying capacity analysis has been applied to a wide range of resources to address cumulative effects. Ecosystem analysis requires landscape-scale measures. Analyzing cumulative effects on human communities requires specific economic impact analysis and social impact analysis methods.

These special methods are:

- Carrying capacity analysis identifies thresholds and provides mechanisms to monitor the incremental use of unused capacity.
- Ecosystem analysis addresses biodiversity and ecosystem sustainability. The ecosystem approach uses natural boundaries such as watersheds and eco-regions and applies new ecological indicators such as indices of biotic integrity and landscape pattern.
- Economic impact analysis consists of establishing the region of influence, modeling the economic effects, and determining the significance of the effects.

Social impact analysis addresses the sustainability of human communities by focusing on key social variables such as population characteristics, community and institutional structures, political and social resources, individual and family changes, and community resources and projecting future effects using social analysis techniques such as linear trend projections, population multiplier methods, scenarios, expert testimony, and simulation modeling.

3.2 Federal Highway Administration

The FHWA implements NEPA and CEQ guidelines with its environmental regulations at 23 CFR 771. The regulation describes documentation requirements and procedures for environmental clearances. Concerning indirect and cumulative impacts, the FHWA regulation interprets the CEQ guidelines in a unique way. These impacts are referenced when justification is required for the use of categorically excluded actions which do not induce indirect significant impacts to planned growth or land use or do not otherwise either individually or cumulatively have any significant impacts.

FHWA provides guidance on conducting cumulative and indirect effect assessments in "Position Paper Secondary and Cumulative Impact Assessment in the Highway Project Development Process," April 1992. In it, FHWA spells out the following steps in conducting an assessment of cumulative impacts:

- The consideration of possible secondary or cumulative effects should begin in the planning stages of the highway project development process. Early activities can provide indications of links that a proposed project may have with other programmed development and area-wide resource management plans for wetlands, air quality, water quality, etc. Such plans may indicate an area is planned to absorb specific primary, secondary, and cumulative impacts in balancing developmental needs with environmental protection. Describing a project's association with (or as an element of) these kinds of plans in an environmental document may in some cases be sufficient to describe the expected cumulative and secondary effects of the proposal. MPOs and other development and resource protection agencies should be contacted early in the process.

- In cases where an area has conducted little or no resource planning, the assessment of secondary and cumulative impacts can be more difficult. Often, these areas have done little in the way of planning for development as well. The

limited information available will mean more effort will be required to contact and coordinate with various sources having knowledge about changes occurring in the area of the project. Local entities such as zoning boards, water quality control districts, and building inspection agencies can be of assistance. In these circumstances, past history can be the best indicator of future development patterns.

- Once information about the project area is available, it should be determined whether developmental changes are occurring and whether continued growth in the future is expected. The same would also apply to current and anticipated changes to environmental resources. Include information on the susceptibility of the resource base to changes known to be related to highway improvements.

- Information on development trends in the area should then be related to the scope of the project. The area to consider should be that defined by the project's area of influence. The project's area of influence may be defined as appropriate, considering the type of project being proposed, condition of the existing facility, and other factors: capacity, access, etc. However an acceptable general guideline for determining the area of influence is the geographic extent to which a project will affect traffic levels.

- Potential cumulative impacts, in particular, must be considered over a specified period of time in order to assess the influence of a given action. On highway projects, design life is often used as a measure of how long a facility remains effective and has a contributing influence on the transportation system. Design life could also be used to place limits on the influence a specific project proposal would have on potential indirect and cumulative effects. Although secondary and cumulative impacts may carry forward for many decades, the actual time of influence attributable to a single project should generally diminish as the facility approaches its design life. Therefore, it is recommended that design life be used as the maximum period of time that a project can be expected to contribute to potential indirect and cumulative impacts.

- Assess the indirect effects of a highway improvement by analyzing the planned and potential development for the area influenced by the project over the life of the facility. The projected impacts of this development in total would be an adequate estimate of the indirect and cumulative effects on environmental resources in the area.

- If this estimate indicates there is little or no anticipated future change, there is no need to continue the analysis. The conclusion would be that the highway improvement, regardless of its direct impacts, would likely have no indirect effects. However, if future area-wide impacts are indicated, the contribution of the project should then be estimated by judging how directly the highway improvement influences the subsequent development. If the influence is low, the

contribution of the highway is likewise low; the proposal has minor or no indirect and cumulative impact. If, however, the highway has a clear link to or was planned to promote the subsequent development, the contribution is high and indirect/cumulative impacts attributable to the project are likely great.

After the analysis is complete, a valid question will remain: before a proposed highway improvement is determined to cause potential indirect and cumulative effects, what can and should be done to mitigate the adverse impacts? Consistent with existing FHWA regulations mitigation proposals must be both reasonable and related to project impacts. However, the opportunities for environmental enhancement that are now available under the highway program may greatly expand our view of traditional mitigation. Changing a proposed transportation improvement to lessen its contribution of indirect effects may likely result from a combination of mitigation and enhancement measures that address area-wide concerns, not just the immediate influence of the project. Unfortunately, measures that would be appropriate to offset the most future developmental impacts in the area of a project often will be beyond the control and funding authority of the highway program. In these situations the best approach would be to work with local agencies that can influence future growth and promote the benefits of controls that incorporate environmental protection into all planned development.

3.3 Environmental Protection Agency

According to the EPA, evidence is increasing that the most devastating environmental effects may result not from the direct effects of a particular action but from the combination of individually minor effects of multiple actions over time. Most environmental effects can be seen as cumulative because almost all systems have already been modified, even degraded by human actions.

Determining the cumulative environmental consequences of an action requires delineating the cause and effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. The analyst must identify the interactions that substantially affect the resources. Then they must describe the response of the resource to this environmental change using modeling, trends analysis, and scenario building when uncertainties are great. The significance of cumulative effects depends on how they compromise with the environmental baseline and relevant resource thresholds such as regulatory standards. Undoubtedly, the consequences of human activities will vary from those that were predicted and mitigated. This becomes even more problematic with cumulative effects; therefore, monitoring the accuracy of the predictions and the success of mitigation is necessary.

Successful analysis of cumulative effects depends on the careful application of individual methods, techniques, and tools to the environmental impact assessment at hand. The requirements of cumulative effects analysis must be addressed by developing an appropriate conceptual model. To do this, a suite of primary methods can be used: questionnaires, interviews, and panels; checklists, matrices; networks and system diagrams; modeling; trends and analysis; and overlay mapping and GIS. As with project specific effects, tables and matrices can be used to evaluate cumulative effects.

From a highway perspective, cumulative effects assessment is used to determine the cumulative commercial and residential development and highway construction associated with urban sprawl.

In conducting a cumulative effects analysis, EPA looks the following major review areas:

1. **Resources and ecosystems components**. Identify the specific resources and ecological components that can be affected by the incremental effects of the action and other actions in the same geographic area.

2. **Geographic boundaries and time period**. Delineate the appropriate geographic areas including natural ecological boundaries and evaluate the time period of the project's effects. Estimate the length of time the effects of the proposed action will last.

3. **Past, present, and reasonably foreseeable future actions**. Whether the environment has been degraded and to what extent; whether ongoing activities in the area are causing impacts; and the trends for activities and impacts in the area.

4. **Describing the condition of the environment**. The current condition is used as a benchmark for comparing the environmental effects of the alternatives when combined with the impacts of other actions. How conditions have changed over time and how they are likely to change in the future.

5. **Using thresholds to assess resource degradation**. Thresholds should be represented by a measurement that will report the change in resource condition in meaningful units.

3.4 North Carolina Department of Transportation

NCDOT, in conjunction with the North Carolina Department of Environment and Natural Resources (NCDENR), developed a guidance document or policy in January 1999 for evaluating the indirect and cumulative effects of transportation projects. The publications are called: "Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Volume I: Guidance Policy Report" and "Volume II: Practitioner's Handbook" (November 2001).

According to the guidance documents, the Federal statute most relevant to the assessment of indirect effects is NEPA, as amended. While NEPA does not specifically refer to indirect effects, it contains two sections that are related to indirect effects as a concern for Federal projects. First, in NEPA 42 USC 4331, Section 101(b), NEPA makes it the responsibility of the Federal Government to:

> "…assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings…attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences…and preserve important historic, cultural, and natural aspects of our national heritage…".

In addition, it states in NEPA 42 USC 4332, Section 102(c):

> "…the Federal Government shall include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on the environmental impact of the proposed action and any adverse environmental effects which cannot be avoided should the proposal be implemented.

Although it requires that agencies take a hard look at all significant environmental impacts, NEPA demands a procedural process, not a substantive result. Agencies are required to analyze all reasonably foreseeable significant impacts but need not place environmental concerns above the project's positive economic development, access, safety, or other benefits and goals. NEPA's focus is on disclosure, discussion, and informed decision making. While direct indirect and cumulative effects must all be evaluated for environmental impact, the focus of the inquiry should be on the significance of any impacts regardless of type, rather than on classification of and differentiation between primary, secondary, or cumulative impacts.

Scoping is the key to proper and timely identification and analysis of indirect and cumulative effects. Scoping provides the best opportunity to identify potentially significant issues, set appropriate boundaries for the analysis and identify relevant past, present, and future actions. Scoping also allows for the setting of the environmental baseline for which all impacts are compared.

Empirical evidence indicates that transportation investment and changes in land use occur only in the presence of other factors such as supportive local land use policies and development incentives, availability of developable land, and a good investment climate. Proposed transportation improvements are often planned to support an area's economic development goals. In this case, the anticipated economic growth and land use conversion from that growth are to be treated as indirect effects of the transportation project.

Once potential indirect and cumulative effects have been identified, a variety of quantitative and qualitative tools can be employed in the analysis of the effects. The first step is to assess the potential and magnitude of project-induced growth. Once the level of induced growth has been assessed, impacts on the natural environment arising from development can be evaluated. Quantitative and qualitative techniques for analyzing indirect effects include the following:

- Literature review and comparative case analysis,
- Scenario writing,
- Trend extrapolation,
- Expert panel surveys/delphi technique,
- Build-out/carrying capacity analysis,

- Regression/econometric techniques,
- Gravity models, and
- Integrated land use transportation models.

NCDOT guidance document presents a framework and supporting methods suggested for indirect/cumulative impact assessment. The framework is outlined as follows:

1. Developing the Scope of the Indirect/Cumulative Impact Assessment
    a. Define the study area boundaries
    b. Identify the study area's direction and goals
    c. Inventory notable features
    d. Identify impact-causing activities of the proposed action and alternatives
    e. Identify potential indirect and cumulative effects for analysis
2. Analysis of Indirect/Cumulative Effects
    a. Analyze indirect and cumulative effects
    b. Evaluated analysis results
3. Assessing the Consequences
    a. Assess the consequences and develop appropriate mitigation and enhancement strategies

As an aside, in a report by David T. Hartgen, Professor of Transportation Studies, University of North Carolina at Charlotte, titled, "Highways and Sprawl in North Carolina" (September 24, 2003), he addresses the question, "do highways cause sprawl"? In other words, is an indirect effect of highway construction urban sprawl and population growth in the vicinity? He finds that the answer is, road improvements generally have minor effects on growth rates and most road improvements do not cause or result in growth or sprawl. He concludes his study by saying, "transportation investments appear to be generally blunt and inefficient means of spurring development or of preventing it. Most growth will occur in the absence of road improvements."

3.5 Wisconsin Department of Transportation

Like Florida, Wisconsin is currently working with FHWA to streamline the state's environmental assessment practice and is developing screening worksheets to use as a component in their environmental impact statements.

WDOT has published a report titled "Indirect and Cumulative Effects Analysis for Project-Induced Land Development - Technical Reference Guidance Document." Its purpose is to provide a framework for conducting indirect and cumulative effects analysis with an emphasis on land use planning, regulation, and the relationship between transportation and land use. Changes in land use are the focus of this guidance.

The analysis framework is divided into seven steps:

1. Define the project study area
   a. Traffic-shed, commutershed, 20-year growth boundary, and interview
2. Analyze the existing patterns and trends for land use and development
   a. Existing land use patterns
   b. Land use related trends
   c. Overall character of the area now and in the future
3. Analyze the extent of land use planning and regulation
   a. Inventory and analysis of land use plans
   b. Inventory and analysis of regulations
   c. Implementation of plans
   d. Overall character of the area now and in the future
4. Understand the type of transportation project
   a. Project design characteristics such as location, access management, capacity, travel patterns, traffic control, etc.
5. Assess the potential for project induced land development
   a. Use previously produced analysis, identify the unknown, analyze the unknown, describe the potential effects, evaluate compatibility with land use plans, produce an initial opinion, form a land use task force, utilize a panel of experts, produce project influenced future land use pattern scenarios, and produce induced growth scenarios
6. Assess potential consequences to the human environment
   a. Location and type of known development
   b. Location of unknown development
7. Describe tools to manage land development
   a. Transportation facility design and access management
   b. Planning
   c. Regulation
   d. Education

3.6 Maryland Department of Transportation

Maryland combines their analysis of Indirect and Cumulative Effects into one SCEA summary.

An example of an indirect effect is commercial and residential development following construction of a highway or the addition of new access points to a highway. This may occur when local governments or developers identify planned development that will not proceed without a specific project or transportation alternative. This may also occur when zoning or land use changes that may occur based on professional judgment as a result of each project alternative retained for detailed study.

An example of cumulative effects includes an incremental loss of wetlands under the nationwide permit program, forest fragmentation related to roadway right-of-way construction and other development over time, population declines in nesting birds from multiple tree harvests over time, increase in stormwater peak flows and pollutant loadings from commercial and residential development, and decrease in active farmlands due to development pressures.

The Maryland SHA has published "Secondary and Cumulative Effects Analysis Guidelines" (June 28, 2000). The guidelines provide a consistent framework for an efficient SCEA. It contains the general procedures for preparing a SCEA. The appropriate level of analysis must be determined on a project-by-project basis. The SCEA is conducted concurrently with other technical environmental analyses during the "alternatives retained for detailed study" stage and must be completed for each build alternative.

SCEA Scoping

- ***Resources***. Identification of resources that are directly impacted by the conceptual alternatives using only readily available data.
- ***Geographic Boundary***. Establish a single SCEA boundary. The SCEA boundary will be considerably larger than the project study area boundary since it captures a large area of influence for a project in addition to the immediate area of impact.
- ***Timeframes***. Establish a general time frame that covers the past, present, and reasonably foreseeable future for the project SCEA. Types of past data may include historic events in the area such as the opening of a bridge or major roadway, closing of a military base, opening of a major employment or residential center, etc. The project's design year should be used as the reasonably foreseeable future time frame because the design year traffic is based on the county's future land use assumptions.

Analysis

The analysis begins following the request for concurrence on the alternatives retained for detailed study. The analysis should include only readily available data.

- ***Data Collection***. Collect the readily available data regarding environmental and socio-economic data identified during scoping.
- ***Regulatory Programs***. Identify the regulations and laws governing each resource.
- ***Resource Land Use Mapping***. Prepare maps showing the natural and socio-economic resources within the SCEA boundary. Overlay the past, present, and future land uses from the SCEA time frame and describe them. For secondary impacts discuss any local zoning implications and identify changes in land use and level of development that may occur as a result of the project. Clearly identify known development proposals/land use changes that can occur only if the project is built. For cumulative impacts identify other development that is not dependent on the project.

Methodologies

The most appropriate methods of analysis are trends analysis, overlays, matrices, and interviews (same as CEQ).

- ***Trends Analysis***. This method generally involves a qualitative discussion of impacts to a resource over time. Past and current effects can allow an informed projection of likely future effects within the SCEA boundary.
- ***Overlays***. This involves overlaying present and future land use maps over existing environmental resources and quantitatively and qualitatively describing the impacts to those resources.
- ***Matrices***. This involves using a table to compare impacts to a resource over time and is the most useful tool to clearly display the results of a trends analysis or overlay process.
- ***Interviews***. This allows local experts to answer questions about potential effects.

Perform the SCEA

- Based on the above methods, analyze and identify impacts to resources from other actions (past, present, and future) including secondary effects from each alternative. These impacts are then added to the direct impacts associated with each alternative to calculate the cumulative impacts on each resource for each alternative.

3.7 Environmental Impact Assessment Centre, University of Manchester (U.K.)

One reason that cumulative impacts are seldom addressed effectively is that they are not considered early enough in the assessment process. If cumulative impacts are not considered until the environmental impact assessment project is nearly complete, which is typical, there may be insufficient time to identify and characterize the impacts of the other actions affecting the resources. To avoid this problem, the appropriate other agencies and individuals should be contacted as soon as the affected resources are identified, and request information about other actions that may affect those same resources.

The CEARC defines a cumulative impact as: "Cumulative effects can occur when impacts on the natural and social environments take place so frequently in time or so densely in space that the effects of individual projects cannot be assimilated. They can also occur when the impacts of one activity combine with those of another in a synergistic form."

The Canadian Environmental Assessment Act (1995) requires the consideration of any and all cumulative environmental effects that are likely to result from a project and an assessment of their significance.

An outline to assess cumulative effects was prepared by Davies (1992):

1. Define the boundaries of project related effects (or as we have done in the past, the area of potential effect (APE).

2. Identify pathways through which the anticipated environmental effects of a project are expected to occur.

3. Identify relevant past and existing projects and activities, their impacts on the environment of the proposed project and the pathways through which those impacts occur.

4. Identify future projects and activities and their potential linkages via impact pathways to the proposed project.

5. Identify valued ecosystem components (VECs) that exist within the zone of influence of the proposed project.

6. Through linked pathways, assess the possible interactions among the environmental effects of the proposed project and the environmental effects of past, present, and future projects and activities.

7. Determine the likelihood and significance of the cumulative effects of the proposed project on the VECs.

8. Identify appropriate mitigation and monitoring measures.

4.0 FINDINGS

In summary, the definitions of direct, indirect, and cumulative effects in use by most government agencies and departments are those prescribed by the CEQ in 40 CFR 1507.7 and 1508.8.

- "Direct Effects" are caused by the action and occur at the same time and place.
- "Indirect Effects" are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
- "Cumulative Effects" result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The methodologies for assessment of indirect and cumulative effects differ only slightly from agency to agency but all seem to be based on criteria outlined by the CEQ. The CEQ identifies two basic approaches to addressing cumulative effects analysis: the impact assessment approach and the planning approach. Of the two, outlined below, the planning approach seems to be consistent with the general direction of ETDM.

- The impact assessment approach views cumulative effects analysis as an extension of environmental impact assessment and closely parallels current NEPA practice.
- The planning approach regards cumulative effects analysis as a correlate of regional or comprehensive planning. It represents an optimizing approach based on a community derived vision of future conditions and is preferable in the absence of reliable thresholds for the resources, ecosystems, and human communities of concern.

According to the CEQ, the planning approach to cumulative effects analysis is becoming more common within agencies and intergovernmental bodies as they merge the principals of ecosystem management with sustainable development. The two approaches are complimentary and together constitute a complete cumulative effects analysis methodology, one that satisfies the NEPA mandate to merge environmental impact assessment with the planning process.

The CEQ recommends a comprehensive seven-step study specific methodology for conducting a complete indirect and cumulative effects analysis that is described earlier in this memorandum. FHWA's "Position Paper - Secondary and Cumulative Impact Assessment in the Highway Project Development Process" (April 1992), also described earlier in this memorandum, identifies a similar comprehensive eight-step indirect and cumulative effects analysis process. Also useful from a transportation planner's perspective are the methodologies outlined by NCDOT, WDOT, and the Maryland SHA. All the methodologies described are similiar; some are slightly more detailed than others.

Maryland's "Secondary and Cumulative Effects Analysis Guidelines" (June 28, 2000), may be the most applicable to the ETDM process and is outlined in detail earlier in this memorandum. Maryland provides a four-step process of analysis intended to be used with "alternatives retained for detailed study."

Consistent with the principals behind ETDM, the Maryland SCEA guidelines emphasize scoping, or early agency coordination to identify potentially affected resources using readily available data; the establishment of a geographic boundary of indirect and cumulative effects; and a general time frame for potential impacts, such as the project design year or design life. Resource land use mapping is developed to overlay the past, present, and future land uses from the SCEA time frame including other development that is not dependent on the project. Trends analysis is then conducted and matrices developed to compare the impacts to resources over time. The information gleaned from this analysis is then combined with the direct impacts associated with the project to calculate the cumulative effects on each resource for each alternative.

APPENDIX D
SECONDARY AND CUMULATIVE EFRFECTS RELATED WEBSITE URLs

Secondary and Cumulative Effects
Related Website URLs

1. CEQ, "Considering Cumulative Effects Under the National Environmental Policy Act," January 1997

   http://ceq.eh.doe.gov/nepa/ccenepa/ccenepa.htm

2. FHWA, "Position Paper: Secondary and Cumulative Impact Assessment in the Highway Project Development Process," April, 1992

   http://www.dot.ca.gov/ser/vol1/sec1/ch1fedlaw/PosPaper.pdf

3. U.S. Environmental Protection Agency (EPA), "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," May, 1999

   http://www.epa.gov/compliance/resources/policies/nepa/cumulative.pdf

4. North Carolina Department of Transportation (NCDOT), "Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Volumes I and II," November 2001

   Volume I: Guidance Policy Report
   http://www.ncdot.org/planning/pe/naturalunit/ICI_Guidance_Volume1.pdf

   Volume II: Practitioner's Handbook
   http://www.ncdot.org/planning/pe/naturalunit/ICI_Guidance_Volume2.pdf

5. Wisconsin Department of Transportation (WDOT), "Land Use in Environmental Documents: Indirect and Cumulative Effects Analysis for Project-Induced Land Development, Technical Reference Guidance Document"

   http://environment.transportation.org/environmental_issues/secondary_indirect_cumulative_impacts/techguidwholedoc.pdf

6. Maryland State Highway Administration, " Secondary and Cumulative Effects Analysis Guidelines," June 28, 2000

   http://www.sha.state.md.us/improvingourcommunity/oppe/scea/other/6-28-00Guidelines.pdf

7. University of Manchester (G.B) Environmental Impact Assessment Centre, "EIA Newsletter 14, Summer, 1997

   http://www.art.man.ac.uk/EIA/eiac.htm
   Choose "EIA Centre Publications"
   Choose "EIA Newsletters"
   Scroll down to "1997 Newsletter 14"
   Scroll down to "Cumulative Impacts and EIA"

8. Stephen C. Trombulak and Christopher A. Frissell, "Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities," Conservation Biology, February 2000

   http://www.conbio.org/SCB/Publications/ConsBio/
   Go to "Browse/search table of contents"
   Choose "February-n1" in "2000-Volume 14"
   Scroll down to 18
   Click on "full text article" or pdf
   Pay $25.00 by credit card to read the article

   9, 10,11
   See 8 above for instructions.

12. David T. Hartgen, "Highways and Sprawl in North Carolina," University of North Carolina at Charlotte, September 24, 2003

    http://www.johnlocke.org/acrobat/policyReports/highways-report.pdf

APPENDIX E
AVAILABLE EST DATASETS

Secondary and Cumulative Effects: Contains data sets for the determination of possible secondary and cumulative effects within the proposed project study area.

ETDM DATASET	DESCRIPTION	SOURCE	TYPE	FGDL STATUS	UPDATE YEAR	SCALE OR RESOLUTION
AQUAP	Florida Aquatic Preserve Boundaries	FMRI	Polygon	-	1997	1:24,000
BASINS	Drainage Basins	FDEP	Polygon	-	1997	1:24,000
BEARRDKILL	FWC Bear Road Kills		Point			
BKPRIO	Greenways Trails Prioritization Project Biking Trails Priorities	UF	Polygon	-	2001	N/A
BROWNFIELD	Brownfield Location Boundaries	FDEP	Polygon	New	2001	N/A
CARL98	CARL Projects	FNAI	Polygon	-	1998	Variable
CENBLK	2000 Census Blocks	USCB	Polygon	New	2000	1:100,000
CENTER_LANE_CNT	Number of center lanes	Subset of RCI	Line		2001	
CLAN99	Conservation and Recreation Lands 1999	UF	Polygon	-	1999	Variable
COUNTY	US Census Counties 2000	USCB	Polygon	New	2000	1:100,000
DEPGWI	FDEP Generalized Well Information System	FDEP	Point	-	1997	1:24,000
DOTBND	FDOT District Boundaries	FDOT	Polygon	-	1999	N/A
DRI_7	Development of Regional Impact (DRI)		Polygon			
EAGLE00	FWC Eagle Sightings		Point			
EMABND	DEP Ecosystem Management Areas	FDEP	Polygon	-	1996	1:250,000
EQPRIO	Greenways Trails Prioritization Project Equestrian Trails Priorities	UF	Polygon	-	2001	N/A
EXIST_LU_22	Existing Landuse		Polygon			
FLEO99	Florida Natural Areas Inventory Element Occurrence	FNAI	Point	-	1999	N/A
FLFIA	Florida Forest Inventory and Analysis	USFS	Point	-	1999	Unknown
FLUCCS1	Generalized Florida Landuse/Land Cover	Derived from LU95	Polygon		1995	
FNAICA	FNAI Conservation Areas Zone A	FNAI	Polygon	-	1995	1:123,000
FNAIMA	Florida Natural Areas Inventory Managed Areas	FNAI	Polygon	Update	2001	1:24,000
FTRLUN	North Florida Future Land Use	SWFRPC	Polygon	-	Unknown	1:126,720
FTRLUS	South Florida Future Land Use	SWFRPC	Polygon	-	Unknown	1:126,720
FUNCLASS	FDOT Road Characteristics Inventory - Functional Road Classifications	FDOT	Line	New	2001	1:24,000
FUTURE_LU	County Future Land Use		Polygon			
FWCMAS	Fish and Wildlife Conservation Commission Management Areas	FFWCC	Polygon	-	Unknown	N/A
GAP_LCOV	Florida Land Cover	FCFWRU	Grid	-	1994	N/A
GFCHAB	GFC Habitat and Landcover - grid	FFWCC	Raster	-	1990	N/A
GFCHOT	GFC Biodiversity Hot Spots - grid	FFWCC	Raster	-	1990	N/A
GFCSHA	GFC Strategic Habitat Conservation Areas - grid	FFWCC	Raster	-	1990	N/A
GFCWET	GFC Priority Wetland Habitats - grid	FFWCC	Raster	-	1990	N/A
GWBTH	Greenways Project: Off-Road Bicycling Trailheads	UF	Point	-	1998	N/A
GWBTHP	Greenways Project: Off-Road Bicycling Trailheads modified by Public Comment	UF	Point	-	1998	N/A
GWBTR	Greenways Project: Off-Road Bicycling Trails	UF	Line	-	1998	N/A
GWBTRL	Greenways Project: Off-Road Bike Trails modified by Public Comment &Private Landowner Comment	UF	Line	-	1998	N/A
GWBTRP	Greenways Project: Off-Road Bicycling Trails modified by Public Comment	UF	Line	-	1998	N/A

Secondary and Cumulative Effects: Contains data sets for the determination of possible secondary and cumulative effects within the proposed project study area.

ETDM DATASET	DESCRIPTION	SOURCE	TYPE	FGDL STATUS	UPDATE YEAR	SCALE OR RESOLUTION
GWECOP	Greenways Project: Ecological Network Model Results modified by Public Comment	UF	Raster	-	1998	N/A
GWETH	Greenways Project: Equestrian Trailheads	UF	Point	-	1998	N/A
GWETHP	Greenways Project: Equestrian Trailheads modified by Public Comment	UF	Point	-	1998	N/A
GWETR	Greenways Project: Equestrian Trails	UF	Line	-	1998	N/A
GWETRL	Greenways Project: Equestrian Trails modified by Public Comment and Private Landowner Comment	UF	Line	-	1998	N/A
GWETRP	Greenways Project: Equestrian Trails modified by Public Comment	UF	Line	-	1998	N/A
GWHTH	Greenways Project: Hiking Trailheads	UF	Point	-	1998	N/A
GWHTHP	Greenways Project: Hiking Trailheads modified by Public Comment	UF	Point	-	1998	N/A
GWHTR	Greenways Project: Hiking Trails	UF	Line	-	1998	N/A
GWHTRL	Greenways Project: Hiking Trails modified by Public Comment and Private Landowner Comment	UF	Line	-	1998	N/A
GWHTRP	Greenways Project: Hiking Trails modified by Public Comment	UF	Line	-	1998	N/A
GWMTH	Greenways Project: Multi-use Trailheads	UF	Point	-	1998	N/A
GWMTHP	Greenways Project: Multi-use Trailheads modified by Public Comment	UF	Point	-	1998	N/A
GWMTR	Greenways Project: Multi-use Trails	UF	Line	-	1998	N/A
GWMTRL	Greenways Project: Multi-use Trails modified by Public Comment and Private Landowner Comment	UF	Line	-	1998	N/A
GWMTRP	Greenways Project: Multi-use Trails modified by Public Comment	UF	Line	-	1998	N/A
GWPEAX	Greenways Project: Priority Ecological Areas (After Exclusion of Incompatible Areas)	UF	Raster	-	1998	N/A
GWPTH	Greenways Project: Paddling Trail Access Points	UF	Point	-	1998	N/A
GWPTR	Greenways Project: Paddling Trails	UF	Line	-	1998	1:24,000&1:100,00
HKPRIO	Greenways Trails Prioritization Project Hiking Trails Priorities	UF	Polygon	-	2001	N/A
HY100P	USGS 1:100,000 Hydrography - Polygons	USGS	Polygon	-	1987	1:24,000
HY24L	USGS 1:24 000 Hydrography - Lines	USGS	Line	Update	1990	1:100,000
HY24P	USGS 1:24 000 Hydrography - Polygons	USGS	Polygon	Update	1990	1:100,000
LEFT_LANE_CNT	Number of left lanes	Subset of RCI	Line		2001	
LU95	Landuse from 5 WMD		Polygon		1999	1:40,000
MAJHWYS_DEC03	Major Highways		Line			
MAJRDS_DEC03	FDOT - Major Roads		Line			
MANGRV	Florida Mangroves	USFWS	Polygon	-	1999	1:24,000
MANTEE	Florida Manatee Zones	FMRI	Polygon	-	1999	1:40,000
MJRIVL	Major Rivers of Florida - Lines	FDEP	Line	-	1989	N/A
MJRIVP	Major Rivers of Florida - Polygons	FDEP	Polygon	-	1989	N/A
MUPRIO	Greenways Trails Prioritization Project Multi-use Trails Priorities	UF	Polygon	-	2001	N/A
NUMBER_OF_LANES_DEC03	Number of Lanes		Line			
PDPRIO	Greenways Trails Prioritization Project Paddlin	UF	Polygon	-	2001	N/A

Secondary and Cumulative Effects: Contains data sets for the determination of possible secondary and cumulative effects within the proposed project study area.

ETDM DATASET	DESCRIPTION	SOURCE	TYPE	FGDL STATUS	UPDATE YEAR	SCALE OR RESOLUTION
PLACE2000	2000 Census Designated Places	USCB	Polygon	New	2000	1:100,000
PTSINT	Points of Interest	UF	Point	-	1994	VARIABLE
PUBLIC_PINELANDS	Pinelands from LU95 within Public lands from FNAIMA		Polygon			
RDS24	USGS 1:24,000 Roads	USGS	Line	Update	1998	1:24,000
RIGHT_LANE_CNT	Number of right lanes	Subset of RCI	Line		2001	
SEAGRS	Seagrass Beds Along CoastLine	FMRI	Polygon	-	varies	varies by source
SENSHR	Florida's Environmentally Sensitive ShoreLines	FMRI	Line	-	1999	1:24,000
SHPO_BRIDGES	Historic Bridges	BAR	Line	New	2002	1:100,000
SHPO_CEM	Historic Cemeteries	BAR	Polygon	New	2002	1:100,000
SHPO_NR	National Register of Historic Places	BAR	Polygon	New	2002	1:100,000
SHPO_RGRP	Resource Groups	BAR	Polygon	New	2003	1:100,000
SHPO_SITES	Archaeological Sites	BAR	Polygon	New	2003	
SHPO_STRUC	Historic Structure Locations	BAR	Point	New	2002	1:100,000
SHPO_SURVEYS	Field Survey Project Boundaries and Attributes	BAR	Polygon	New	2003	1:100,000
SPOWTR	Special Outstanding Florida Waters	FDEP	Polygon	-	1995	1:24,000
SRLU95_UP	Suwannee River Water Management District 1995 Land Use Update	SRWMD	Polygon	New	1996	1:40,000
STREAM	Streams	USGS/FDEP	Line	-	1994	1:100,000
SV_ANALYSIS_AREAS	ETDM Project Buffers		Polygon			
SV_SEGMENTS_ALT	ETDM Projects		Line			
TNCERC	TNC Ecological Resource Conservation Areas	FNAI	Polygon	-	1991	1:500,000
TRL02EA	2002 Existing recreational trails	DEP	Line		2001	
TRL02PA	2002 Proposed recreational trails	DEP	Line		2001	
TRL03EA	Existing Recreational Trails 2003	Varied	Line	Update	2003	varies by source
TRL03PA	Proposed Recreational Trails 2003	Varied	Line	Update	2003	varies by source
TRLORV	Off Road Vehicle Recreational Trails 2002	Varied	Polygon	New	2002	varies by source
URBANAREAS	2000 U.S. Census Urban Areas and Clusters	USCB	Polygon	New	2002	1:100,000
WILDRIVER	Wild and Scenic Rivers	FDEP	Line		1989	
WILDOBS	FWC Wildlife Observations		Point			
WTRWPC	FDEP Watershed Planning and Coordination Water Quality Data	FDEP	Polygon	-	1999	1:24,000