Guidance on Preparing Indirect and Cumulative Impact Analyses
Texas Department of Transportation
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Introduction

This guidance addresses cumulative impacts analyses for Texas Department of Transportation (TxDOT) projects that are subject to National Environmental Policy Act (NEPA). The Federal Highway Administration (FHWA) and the Council on Environmental Quality (CEQ) regulations both require that potential environmental impacts be considered during the NEPA process.

NEPA requires that any agency proposing any major federal action which may significantly affect the environment to complete a study to consider the environmental impacts of the proposed action, any unavoidable adverse environmental impacts, and the relationship between local short term uses of the environment and term productivity (42 U.S.C. §4332(c)). Many TxDOT highway construction projects fall under this requirement because they are federally funded.

Projects are typically included into one of three classes:

- Categorical Exclusions (CE): projects in which there are clearly no significant impacts.
- Environmental Assessments (EA): projects in which the significance of impacts is not clearly known.
- Environmental Impact Statements (EIS): projects in which there are significant impacts.

There are three types or categories of effect (or impact) that must be considered consider during the NEPA process; direct, indirect, and cumulative (40 C.F.R. §1508.25). Identifying direct effects, which are those effects caused directly by our activities, at the same time, and in the same place, is relatively simple and straightforward. Identifying and analyzing indirect effects, which are effects related to transportation project activities, but occur later in time, at some distance from the project, and are in the chain of cause-and-effect relationships, tends to be a more complex task and to generate more disagreement. But as complex as indirect effects may be, the cumulative effects analysis generates the most complex issues and is easily the most misunderstood. This Guidance attempts to clarify the requirements of the cumulative and indirect impacts analysis.

Cumulative impacts are the incremental impacts that the project's direct and indirect effects have on a resource in the context of the myriad of other past, present, and future effects on a resource from unrelated activities. This category of effects has generated numerous legal challenges to transportation projects during the past few years.

It is important that TxDOT conduct indirect and cumulative effects analyses in an efficient, consistent, legally sufficient, and logical manner. There are some key court cases that help define basic issues that TxDOT must address, and there are a handful of review and research papers available that document the best practices in an accessible manner.

TxDOT has considered the relevant court cases and guidance from other federal and state agencies in preparing this guidance. A step-by-step approach is provided based on these sources. This eight-step-approach may help guide NEPA study development and implementation, quality control, and other reviews.

Although it is important that all of the identified analytic elements be incorporated into a cumulative effect analysis, common sense must prevail. The goal of our analyses and documentation is to support good decisions and to enable effective public participation. TxDOT's written documents should be readable so as to be readily understood by our audience. The analysis and documentation should merge with and "flow" smoothly within the overall NEPA (or other compliance) record.

Definitions

Before we discuss the recommended approach to address cumulative impacts we first need to provide some definitions of the more important terms.

Cumulative impacts

> "...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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."
> (40 CFR 1508.7)

Direct impacts

> Direct impacts are caused by the action and occur at the same time and place (40 C.F.R. § 1508.8).

Indirect impacts

> Indirect (secondary) impacts are caused by the action and are later in time and farther removed in distance, but are still reasonably foreseeable. Indirect impacts 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. (40 C.F.R. § 1508.7)

Note: The terms "effect" and "impact" are used synonymously in the CEQ regulations and in this guidance paper.

Note: The term "secondary" impact does not appear in the CEQ regulations or guidance, while it is used in FHWA's *Position Paper: Secondary and Cumulative Impact Assessment in the Highway Project Development Process* (April 1992). CEQ uses the term "indirect" impacts synonymously to "secondary" impacts. For the purpose of this guidance we will use only the term "indirect."

Reasonably foreseeable

Courts have defined "reasonably foreseeable" as an action that is "sufficiently likely to occur, that a person of ordinary prudence would take it into account in making a decision." *Sierra Club v. Marsh*, 976 F.2d 763, 767 (1st Cir. 1992) (Sierra Club IV). Courts have also recognized that "An environmental impact is considered 'too speculative' for inclusion in an EIS (Environmental Impact Statement) if it cannot be described at the time the EIS is drafted with sufficient specificity to make its consideration useful to a reasonable decisionmaker." *Dubois v. U.S. Dept. of Agriculture*, 102 F.3d 1273, 1286 (1st Cir. 1996).

Factors that indicate that an action or project is "reasonably foreseeable" for the purposes of cumulative impacts analysis include: whether the project has been Federally approved; whether there is funding pending before any agency for the project; and whether there is evidence of active preparation to make a decision on alternatives to the project. *Clairton Sportmen's Club v. Pennsylvania Turnpike Commission*, 882 F. Supp 455 (W.D. Pa 1995).

The following list, though not exhaustive, suggests some reasonably foreseeable actions or projects that are to be included in a cumulative impacts analysis:

- A project is located in a local or regional comprehensive land use plan
- A subdivision plat which has been filed with the local government, county or other plat-approving agency
- Population/development trends which are identified in local or regional comprehensive land use plans
- Planned transportation improvements by city or county governments
- Local or regional infrastructure projects that could impact resources (schools, hospitals, etc.)
- Actions that may influence the decision making

The following are usually are not considered to be reasonably foreseeable:

- Possible, but not likely actions
- Actions that have little or no influence on the transportation decision

Significance

The term "significance" also requires a review and consideration of case law. Almost every transportation project that would be recognized as major federal action, no matter how limited in scope, has some adverse impact on the environment. In deciding whether a project will significantly impact the environment, case law suggests that agencies should review the proposed action in light of the extent to which the action will cause adverse environmental effects in excess of those created by existing uses in the affected area and the absolute quantitative adverse environmental effects of the action itself, including the cumulative harm that results. In any proposed major federal action, the public must have an opportunity to submit factual information on this issue which might bear on the department's threshold decision of significance. *Hanley v. Kleindienst*, 471 F.2d 823 (2nd Cir. 1972, *cert. denied*, 412 U.S. 908 (1973).

Discussion

Case law also provides some guidance on the standards that must be met in regard to cumulative impacts. NEPA analyses must include useful evaluation of the cumulative impacts of past, present, and future projects. The court in *Carmel-by-the-Sea v. U.S. Dep't of Transp.,* 123 F.3d 1142, 1160 (9th Cir.1997) found that this means the environmental analysis must evaluate the combined effects of past, present and future projects in sufficient detail to be "useful to the decisionmaker in deciding whether, or how, to alter the program to lessen cumulative impacts." *See also, Neighbors of Cuddy Mountain v. U.S. Forest Service*, 137 F.3d 1372, 1379-80 (9th Cir.1998) ("To 'consider' cumulative effects, some quantified or detailed information is required. General statements about 'possible' effects and 'some risk' do not constitute a 'hard look' absent a justification regarding why more definitive information could not be provided.").

The Carmel-by-the-Sea court acknowledged that the EIS considered the impacts in the individual resource discussions and in a separate section, but noted that the analyses were "not lengthy, and taken either separately or together" they failed to satisfy NEPA. 123 F.3d at 1160. The critical component missing from the analysis was how the past and future projects interact with the present project to cumulatively impact the area resources. Id.

Factors that indicate that an action or project is reasonably foreseeable for the purposes of cumulative impacts analysis include: whether the project has been federally approved; whether there is funding pending before any agency for the project; and whether there is evidence of active preparation to make a decision on alternatives to the project. *Clairton Sportmen's Club v. Pennsylvania Turnpike Comm'n*, 882 F. Supp 455 (W.D. Pa 1995).

A cumulative impacts analysis should identify the area in which the effects of the proposed project will be felt; the impacts that are expected in that area from the proposed project; other actions – past, present, and proposed, and reasonably foreseeable – that have or are expected to have impacts in the same area; the impacts or expected impacts from these other actions; and the overall impact that can be expected if the individual

impacts are allowed to accumulate. *Grand Canyon Trust v. Federal Aviation Admin.*, 290 F. 3d 339 (D.C. Cir 2002); *Fritiofson v. Alexander*, 772 F.2d 1225 (5th Cir. 1985).

In *Fritiofson* the court stated that "the CEQ regulations [indicate] that a meaningful cumulative-effects study must identify: (1) the area in which effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions--past, proposed, and reasonably foreseeable--that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate. *Fritiofson v. Alexander*, 772 F.2d at 1245.

There is no single formula available for determining the appropriate scope and extent of a cumulative impact analysis. Ultimately, the practitioner must determine the methods and extent of the analysis based on the size and type of the project proposed, its location, potential to affect environmental resources, and the health of any potentially affected resource.

A cumulative impact analysis builds upon information derived from the direct and indirect impacts analyses. This makes it tempting to postpone the cumulative impact analysis until the direct and indirect impact analyses are well under way. **Potential cumulative impacts should be considered as early as possible, preferably during scoping,** to identify potential direct and indirect effects. Such early consideration of cumulative impacts may also facilitate the design of alternatives so as to avoid or minimize impacts. Therefore, do not defer the consideration of cumulative impacts. Instead, as you begin to consider a project's potential direct and indirect impacts, start outlining the potential cumulative impacts as well. Once more information about direct and indirect impacts becomes available, use it to further refine the cumulative impact analysis.

Unlike direct impacts, quantifying cumulative impacts may be difficult, since a large part of the analysis requires projections about what may happen in a project area. Actions taken by agencies and individuals other than TxDOT also have to be considered, although TxDOT has no authority outside the department's rights-of-way.

Use resources from the environmental document, as well as other information, such as local plans, interviews with local government, the results of local bond elections, as well as the existence of local hospital, school or other special districts.

The single most important part of the process is to use your professional judgment and an interdisciplinary process to assist decision makers in including cumulative impacts in their decision making.

What Impacts are Included?

Direct impacts are included in a Cumulative Impacts Analysis. This information should be gathered from the sections of the environmental document where the direct impacts of the project are discussed. Relevant impacts may include impacts to wetlands, changes in land use, endangered species, as well as other impacts.

Indirect impacts are included in a Cumulative Impacts Analysis. These impacts are those related to the project development but which occur later in time and distance. Indirect impacts may include land development occurring after a project is constructed – access to a previously undeveloped property may result in the property being developed.

Cumulative impacts include direct and indirect impacts, as well as the actions of other agencies. For instance, The Texas Parks and Wildlife Department may have developed a state park within a project area, in addition to an elementary school being developed in a project area. While not a result of a TxDOT project, these land uses should be included as a cumulative impact.

When is a Cumulative Impact Analysis Required?

The CEQ regulations require that all federal agencies consider the cumulative effects of any proposed action. The level of the environmental study document being prepared will give you some idea about when the analyses should be prepared.

Categorical Exclusion (CE): Not Required. These projects are by definition minor projects without significant environmental impacts, and as such should not require a cumulative impact analysis. There may be unusual circumstances requiring such an analysis, but this should be very rare. *If additional capacity is added, you should address indirect and cumulative impact issues.*

Environmental Assessment (EA): Generally is required. These are projects in which the significance of environmental impacts is unknown. As one of the primary purposes of the EA is to help decision makers decide whether or not an EIS is needed, you will need to conduct an initial environmental impact analysis. The degree to which resources may be impacted will determine the extent of the cumulative impact analysis needed. Where direct and indirect effects are found to be present, you will need to complete a full cumulative impacts study. When your project is large, complex and in an environmentally sensitive area, the cumulative impact analysis should mirror what is done for an EIS.

Environmental Impact Statement (EIS): Absolutely is required. These are projects in which there are anticipated significant environmental impacts, and the scope of the project is such that a Cumulative Impact Analysis may assist decision makers in making decisions of project scope, design and location. In general, the cumulative impact analysis should include substantial information about resources, reasonably foreseeable effects.

Conducting a Cumulative Impact Analysis

The cumulative impact analysis should begin early in project development, usually during the scoping process. As the process continues, use the information to further refine the cumulative impact analysis.

The following eight steps serve as guidelines for identifying and assessing cumulative impacts:

1. Identify the resources to consider in the analysis;
2. Define the study area for each affected resource;
3. Describe the current health and historical context for each resource;
4. Identify direct and the indirect impacts that may contribute to a cumulative impact;
5. Identify other reasonably foreseeable actions that may affect resources;
6. Assess potential cumulative impacts to each resource;
7. Report the results; and,
8. Assess and discuss mitigation issues for all adverse impacts.

Note on formatting: It may be appropriate to identify the resources included in the analysis (step 1), then applying steps 2 – 6 to each resource, rather than doing each step and re-listing each resource under every step. Steps 7 and 8 can be done at the end.

Step 1: Identify the resources to consider in the analysis

The first step in performing the cumulative impact analysis is to identify which resources to consider in the analysis. List each resource area for which the project could cause direct or indirect impacts. **If a project will not cause direct or indirect impacts on a resource, it will not contribute to a cumulative impact on the resource**. The cumulative impact analysis should focus on: 1) those resources substantially impacted by the project: and 2) resources currently *in poor or declining health* or at risk even if project impacts are relatively small.

There is a caveat – if the impacts caused by the TxDOT project are minor, but actions by other agencies/developers cause substantial impacts, this should be included. The key factor is whether there are substantial impacts on the resource under consideration, not whose actions are causing the impacts. In other words, the impacts can be substantial even if the impact of TxDOT's proposed action is minimal. Regardless of the cause, the health of the resource should be discussed.

Step 2: Define the study area for each resource

Cumulative impacts are considered within spatial (geographic) and temporal boundaries. By defining a Research Study Area (RSA) for each resource, you will identify the geographic boundaries for each resource to be included in the cumulative impact analysis.

ENV specialists (biologists, archeologists, historians, and water quality specialists) can help to identify appropriate RSA boundaries for each resource in the cumulative impact analysis based on their knowledge of the resources and regulatory mandates. Public agency representatives and interested citizens may also offer input during the scoping process.

Geographic Resource Study Areas

Many approaches are available to define a study area for a cumulative impact analysis. The following examples describe ways to identify the RSA for a few specific resources:

- **Wetlands and water quality**. Identify the drainage basin (watershed) or sub-basins in which the project would be located. If necessary, consult with ENV specialists to discuss potential RSAs.

- **Archeological resources.** Identify prehistoric and/or historic archaeological sites in the project vicinity. Determine the geographic context for the type of archaeological resources being affected. This is most efficiently done by consulting with cultural resource professionals and the project's historic property survey report. A context will be described in this document, typically including a discussion of geographic range or distribution of sites.

- **Historic architectural resources.** Identify historic districts and neighborhoods containing affected buildings or structures. Project-specific historical resource analyses typically define the geographic context needed to understand the historic significance of a structure (e.g., period of significance and neighborhood, community, or resource type).

- **Threatened and endangered species.** Determine the local population of individual species and a general study area by considering the range, sub-range, or population distribution for the species, as well as information provided in the Affected Environment analysis for the proposed project. Consult biologists specializing in particular species for assistance in defining reasonable RSAs. (As mentioned previously, this guidance is for NEPA compliance only: it is; not intended for cumulative impact analyses associated with the Biological Assessments prepared to comply with Section 7 of the ESA.)

- **Community disruption/disruption/displacement.** Consult the project's community impact assessment to identify neighborhood or community boundaries or potential environmental justice populations using census or other data. General plans and specific or subarea plans also suggest study area boundaries for local neighborhood associations.

Temporal Resource Study Areas

Cumulative and indirect impact analyses should include a time frame as well as a geographic study area. There is no predetermined timeframe for establishing, and the time frames chosen should reflect the study area, the project and how important resources fit in. Choose past and future time frames based on what has happened in the area. For instance, when did land development decrease the quality and health of a particular resource? If population and in-migration increased substantially in 1970, that would be a good "past" year. The idea is to use a timeframe that goes back far enough to provide a reasonable historical context, that is, to tell the story about the current state of the resource.

A "future" year should also be selected. As with historical timeframe, the projected year should be based on providing a reasonable context to estimate the future state of the resource. This may be when a proposed development (subdivision or regional shopping mall as examples) is complete. Another example is using the long range transportation plan horizon year.

After describing the temporal study years, you should also describe why the years were selected. Describing the rationale for why the temporal study years were selected allows decision makers and interested readers to know the reasons behind the study years.

3. Describe the current status/viability and historical context for each resource

The purpose of Step 3 is to begin to "tell the story of the resource" by: A) describing the current health, condition, or status of the resource within the RSA and B) providing historical context for understanding how the resource got to its current state. The product in this step will summarize the current health of the resource and its historical context. Once the health and historical context of these resources is described, the effects of future actions on these resources will be assessed (Steps 4 and 5).

Current Health of the Resource

"Health," as it is used here, refers very broadly to the overall conditions, stability, or vitality of a resource, regardless of whether it is natural (e.g., a wetland) or social (e.g., a community). There are a variety of ways to determine the current health of status of the resource within the RSA. The practitioner may rely on his or her professional expertise, consult the technical specialist on the project team, consult other resource specialists, access data sources, review other environmental documents near the project, or use any

combination of methods to gather information. The information in the "Affected Environment" section of the proposed project's environmental document can provide a useful starting point for the assessment. However, rather than using the project study area for the geographic boundary, use the RSA determined in Step 2.

The health or status of the resource should include a description of recent trends affecting it. These recent trends are meant to help complete the picture of the current condition of the resource. (Recent trends are distinct from the more long-range historical context that will be considered below) Many circumstances might indicate a trend that could affect the resource. Examples include: government decisions (e.g., a recent zoning change or preparation of a habitat conservation plan), community preferences (e.g., passage of a measure to protect a historical downtown neighborhood), demographic changes (e.g., a shift in population growth rate), or natural phenomena (e.g., changes resulting from a hurricane, flood, or fire).

These trends may indicate whether the health of the resource is improving, stable, or in decline. This is valuable to the analysis in two ways: first, it will help the practitioner to focus the cumulative impact analysis more closely on the resources that are in decline and second, it may help the practitioner to propose more effective mitigation in Step 8 of the analysis.

In some cases it is clear that a resource is in good health. For example, if a historic district consists of multiple buildings that have retained their original character, this would indicate that the health of the historic district is good or excellent. In some cases it is also clear that resource is in poor health, such as when a species is listed as Threatened or Endangered, or when major streams within the proposed project's RSA are listed on the federal Clean Water Act Section 303(d) list of impaired waters.

Similarly, in some cases it will be easy to determine the effect of recent trends on the health of a resource. If a historic district includes many abandoned historic buildings, and the local City Council has recently approved building permits that could demolish some of the historic buildings and construct new high-rise buildings in their place, these trends could indicate that the condition of the historic district is declining. If an organization funded and implemented a plan to clean up a polluted stream, including protecting riparian habitat, providing an appropriate buffer, and committing to long-term monitoring and adaptive management, this might lead to an improvement in the stream's water quality.

Historical Context of the Resource

The goal of identifying the historical context is to give the reader (decision maker) a reasonable explanation of how the resource got to its current state. Providing historical context is not the same as providing a list of every project or action that has affected the resource over time. It is not realistic or necessary to provide an exhaustive "laundry list" of projects throughout the years. Rather, the historical context should identify key

historical patterns or activities that have contributed to the current condition of the resource.

To describe the historical context of a resource, begin by identifying key patterns or activities in the past that have influenced it. These will often be notable changes to the region's land use or demographic patterns. Then characterize the nature of the influence that these patterns or activities have had on the resource.

To describe the historical context, use historical information. This information may be quantitative, qualitative, or both. Quantitative information is useful for determining trends over time, but it is not always available. A qualitative description can also be useful in providing historical context. The goal is to tell the story about the resource. If there is not enough quantitative data, then use qualitative information. Conversely, even if a lot quantitative information is available, it may not all be relevant to the analysis. Unless it is useful to the analysis, do not include it. For each resource, the practitioner uses his or her professional judgment to decide how to best communicate the historical context, although quantitative data are generally preferred.

These examples show that the historical context, current health and trends of a resource can be described with a few sentences. You only need to use enough data or words to tell the story about each resource.

Three Examples of Historical Context

Example 1: Farmland

The project is located in a rural area that is now developing into suburban land uses. Since approximately 1980, more than 1000 acres of land used to produce corn and sorghum have been converted to residential and commercial land uses. The project will contribute an additional seven acres of farmland lost, with indirect impacts of 40 acres (new commercial strip center planned).

Example 2: Wetlands

The project crosses a stream. While the stream is not navigable, it is subject to the jurisdiction of the U. S. Army Corp of Engineers under Section 404 of the Clean Water Act. Past land development has been minimal, but approximately .25 acres of the stream have been disturbed by another infrastructure project. When added to the .15 acres of stream affected by our project, the cumulative effect of the direct and other previous impacts total .40 acres. There is no other development planned in the area.

Example 3: Community Cohesion

The project is located in an area where there is a substantial Hispanic population. The project has two build alternatives and the no-build alternative. Alternative A follows the existing alignment. Development has occurred along the existing roadway. Alternative A affects 25 single family residences, two churches and a park and requires 8 acres of additional right of way. Alternative B bypasses the existing location, with two residential displacements and a total of 25 acres of new right of way. The no-build alternative does not have any direct impacts.

Current development plans along the existing location (Alternative A and No-Build) indicate the development of a single family subdivision of 127 units, and a commercial strip center. The total impact of these third party actions is the conversion of 222 acres. These developments are occurring regardless of the TxDOT project.

Alternative B which bypasses the community currently has no development planned.

Direct + Indirect + Third Party Actions

Alternative	Direct + Indirect Acres	Third Party Actions Acres	Cumulative Acreage
A	8 + 0	222	230
B	25 + 0	0	25
No-Build	0 + 0	222	222

Given that the population is predominately Hispanic, there is an impact on a minority population. Alternative A would cause a disruption to the community because of the further loss of property to development. With Alternative B, on new alignment, there should be no increased community disruption as the community is located along the existing roadway.

4. Identify direct and indirect impacts of the project that might contribute to a cumulative impact

A cumulative impact analysis must look at the impacts of a proposed project in combination with the impacts of other past, present and reasonably foreseeable projects identified within and RSA.

Step 4 helps to identify the direct and indirect impacts for each of the proposed project alternatives on the resources identified in Step 1. It is important to differentiate each alternative's potential to contribute to cumulative impacts.

Direct impacts: The cumulative impacts analysis should summarize the direct impacts of the project. Only those resources chosen for a cumulative impact analysis should be included, however. The information may be presented in a table, referring back to the text of the environmental document for more information on the direct impacts.

Indirect impacts: These are impacts related primarily to changes in land use, although there may be changes in travel patterns and access when a toll project is constructed. When a TxDOT project is constructed, an indirect impact may occur when land in the project area develops. For instance, if TxDOT constructs a bypass or relief route around a town, restaurants, gas stations and other forms of development may relocate to the bypass in order to get more business from intercity traffic.

Land use impacts are not the only area to consider. As mentioned above, changes in travel patterns may occur if a toll project is constructed on an existing corridor. For instance, changes in access from the original/current design could decrease sales at a store dependent on drive-in traffic or divert traffic through adjacent neighborhoods.

In general, projects on new location or projects in which there is a dramatic change in travel lanes (i.e., from two to six lanes with grade separations) are more likely to cause indirect impacts than projects in areas which are already developed, or involve a smaller increase in capacity (i.e., from two to four lanes)

To evaluate the potential for indirect impacts, you should evaluate the likelihood of development in the project area following project construction. To do this, use the following:

-- Look at population and land use trends in the project area. How has the area developed? Are people building in the area?

-- Check with the city or county with land use planning control in the project area. Are there plans/plats in the project area currently under review? Do the city planners expect the project to spur development?

Note: Use your professional judgment, as well as discussions with the city or county in the project area, as well as any other experts in the area to determine what development is *probable*. For instance, if a developer has a good track record in completing platted developments, the proposed development is likely to be developed.

Examples:

Example 1: Project Z is proposed to bypass the City of Whoville. According to the city, there are plans for several local businesses to relocate to the western terminus of the proposed bypass, to maximize intercity travel stops. The developments will not occur in this location if the bypass is not constructed. The local businesses planning to relocate from the central city include a gas station and a bakery/restaurant. In addition, the city planners indicate that two fast food restaurants are planning to locate new franchises in Whoville and plan to locate at the western terminus of the proposed bypass. If the bypass is not built, these developments will not be located there.

Given that there are no frontage roads along the bypass, it is likely that only the termini and interchanges will experience land development. At this time, only the western terminus has development proposed. Beyond the land use changes discussed, there are no other developments planned.

In addition to the 20 acres of land converted from agricultural to retail/commercial as a result of businesses relocating along the new corridor, an indirect impact of the bypass could be the further deterioration and abandonment of the central city as a result of the new corridor.

Alternative	Direct + Indirect Acres	Third Party Actions Acres	Cumulative Acreage
Build	100 + 20	0	120
No-Build	0 + 0	0	0

If the acreage includes wetlands, endangered species habitat, or other resources, this information should also be included.

Example 2: US B is proposed to be widened from two to four lanes between SH C and the US B business route in Happy Dale. Eight acres of additional right-of-way will be required. The roadway is located in a primarily rural area, with large tracts of land use for farming and grazing. According to the City of Happy Dale and Happy County officials, there is no additional development planned in this area. The direct impact of the project will be to convert eight acres of farm land to public use (note: if the acreage included wetlands, endangered species habitat, or other resources, this information should also be included)

Alternative	Direct + Indirect Acres	Third Party Actions Acres	Cumulative Acreage
Build	8 + 0	0	8
No-Build	0	0	0

Example 3: During interviews with City X during the community impact assessment, it is learned that the city was planning to acquire the property surrounding the proposed corridor for open space preservation and an area park due to the natural features of the property including bluffs, streams and tree density. However, if this new location project is approved, the increased traffic and noise of the highway would not fit with the community park setting they were planning. As a result, the City would cancel the park project. The primary direct impact of the project would be the amount of open land converted for highway use. The indirect impact would be the cancellation of the park project.

Use the information in Step 4 to combine it with the impacts of other reasonably foreseeable actions (Step 5) in order to perform the cumulative impact analysis (Step 6).

5. Identify other reasonably foreseeable effects

Evaluate Available Data

Step 1 and 2 of this guidance identified the resources to consider in the cumulative impact analysis and the geographic area to be considered for each resource (RSA). The procedures set forth in Step 3 help with describing the health of the resource by discussing the historic context and current; trends affecting the sustainability of each resource. Step 4 identifies direct and indirect project impacts that could contribute to a cumulative effect. The purpose of Step 5 is to identify other current and reasonably foreseeable projects to be considered in the cumulative impact analysis.

First, identify current and reasonably foreseeable transportation and non-transportation projects within the RSA for each resource in the cumulative impact analysis. Keep in mind that CEQ regulations, as reflected in FHWA's *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (Interim Guidance, January 2003), require cumulative and indirect impact analyses to focus on actions "that are likely or probable, rather than those that are merely possible.

When identifying reasonably foreseeable actions, evaluate each project or action on the project list to determine where it is probable enough to be evaluated or too speculative to warrant consideration. For example, while a general plan is an excellent starting point to identify reasonable foreseeable local development projects, it may be necessary to consult other sources and experts to refine the cumulative impact assessment. Not all projects presented in a general plan or master plan may be constructed. Thus the cumulative impact analysis should only include those projects with a reasonable expectation of construction. On the other hand, there may be projects that are not included in the general plan (particularly if it has not been updated recently) that, if left out of the analysis, might underestimate cumulative impacts.

Similarly, including only plans that have been funded (financially constrained) could underestimate potential project cumulative impacts, because many viable projects may be in the early planning stage. CEQ advises practitioners to consult with the staff of an appropriate agency to identify reasonably foreseeable future actions based on that agency's planning process. Project scoping can provide an opportunity for these agency discussions. For further information, refer to chapter 2 of CEQ's guidance document, *Considering Cumulative Effects under the National Environmental Policy Act* (1997).

Qualitative and Quantitative Data

Both quantitative and qualitative data are appropriate to use in evaluating cumulative and indirect impacts. Quantitative data are preferable, and should be used whenever relevant data are available. However, qualitative data are also important, particularly to those analyses more dependent on human perception, such as aesthetics or community disruption.

Incomplete or Unavailable Information

Use the best data you have available. In cases where data are incomplete or unavailable, communicate with experts, individuals and cooperating agencies as soon as possible, because such communication can lead to addition opportunities for data collection and help all participants reach an understanding concerning the availability and acceptability of relevant information. When preparing an Environmental Impact Statement where there is incomplete or unavailable information for a reasonable foreseeable significant adverse effect, refer to CEQ's guidance at 40 CFR 1502.22. It lays out principles regarding what to say about the incomplete or unavailable information, and when to obtain additional information.

A general rule of thumb in preparing NEPA documents is to be clear on what information was available and analyzed. The NEPA document should be viewed as a disclosure document – NEPA is an open process. NEPA does not require an answer that will satisfy everyone; rather, NEPA requires a well-researched and reasoned decision based on a hard look at the best available information.

Document Data Sources

Be sure to document the assumptions and methods used to identify projects included in the analysis, the agencies and experts consulted, and any other research. It may not be necessary to identify the sources that were consulted in the final document, but it is important to maintain a record of methods, assumptions, and analyses. This is especially important when data are scarce.

Step 6: Identify and assess cumulative impacts

After the RSAs have been identified for each affected resource (Step 2), the health of the resources had been assessed and put into historical context (Step 3), the direct and indirect impacts of the proposed project have been identified (Step 4), and the direct and indirect impacts of other reasonably foreseeable actions have been assessed (Step 5), the information is ready for analysis. In Step 6, the information is reviewed and analyzed

Review the Information Gathered

The information gathered to define the RSA and to define the context for the resource should provide a sense of the health of the resource. Developing the list of actions to include in the cumulative impact analysis will also provide insight into the prospective changes with the RSA, and how those changes will affect resources. This review will

also provide a sense of the amount and quality of data that will be available to conduct the cumulative impact analysis.

Assess the Cumulative Impacts

The proposed project's cumulative impacts can be assessed using a variety of methods and tools that are suited to different levels of analysis. The practitioner, with appropriate input as needed, selects the methods(s) and tool (s) on a case-by-case basis for each resource being analyzed. Chapter 5 of CEQ's *Considering Cumulative Effects* describes a variety of methods or tools – both qualitative and quantitative – for evaluating cumulative impacts. These range from simpler methods that may require less time and financial resources, such as matrices or mapping overlays, to data-intensive methods such as modeling or trends analysis. Table 5-3 on pages 56-57 of the CEQ document describes these methods, as well as their strengths and weaknesses.

The method(s) used may vary depending on the resource considered, the type of available information, and the scale of the proposed project. More than one method can be used to assess cumulative impacts on a single resource. For example, the cumulative analysis of a species could combine Geographic Information Systems (GIS) mapping and consultation with species experts. GIS would show historical and anticipated changes in the size and location of species habitat, and the consultation would provide information on the condition of the species, and the species' ability to adapt to anticipated biological stressors.

Drawing Conclusions

In previous steps, the practitioner collected data and information and applied a method(s) to analyze this information. Based on that analysis, the practitioner now draws conclusions about the cumulative impacts to resources by applying professional judgment to the results, and by coordinating with technical experts as warranted.

First, the practitioner answers the question, "Is there a cumulative effect?" If the results of the analysis indicate that the proposed project, in combination with other actions, would affect the health of the resource or a trend associated with a resource, the practitioner can conclude that the proposed project will contribute to a cumulative effect (either beneficial or adverse).

Next, the practitioner uses the results of the analysis to characterize the severity or magnitude of the cumulative effect. Consider the following question: "What do decision-makers need to know abut the status of this resource within the RSA?" The practitioner should document the following for each resource:

- The health, status or condition of the resource as a result of past, present and reasonably foreseeable impacts.

- Avoidance and Minimization. Any project design changes that were made or additional opportunities that could be taken, to avoid and minimize potential impacts in light of cumulative impact concerns.

The CEQ guidance discusses using the concepts of context and intensity in making impact conclusions. Consider the context and intensity of the proposed project's cumulative impacts. This will help the practitioner to make conclusions about the severity of these impacts. Chapter 4 of CEQ's *Considering Cumulative Effects* provides additional information on assessing the magnitude and significance of cumulative impacts. For most resources, the NEPA cumulative impact analysis conclusion will not require a description of the severity of impact (e.g., substantial, moderate, minor, significant) unless the method specifically reports results in such terms.

Once the cumulative impact analysis is complete, compare the results of the cumulative impact analysis with the results of the direct and indirect impact analyses of the proposed project. This comparison can test the soundness of the conclusions about each resource. For example, if the direct project impacts would result in a 0.2-acre loss of wetland habitat in an RSA that contains more than 100 acres of similar habitat, a severe cumulative impact would not be anticipated. However, recognize that if this same 0.2-acre impact happens to affect an extremely rare or limited resource, the cumulative impact may be considered substantial.

Step 7: Report the results

The purpose of Step 7 is to document the results of the step-wise cumulative impact analysis process. The audience for the information presented in this step is decision-makers and interested members of the public. The product of Step 7 will typically be the information included in the NEPA document. It is a summary of the analysis approach and conclusions. This summary should include the identification of resources considered in the analysis, the RSA for each resource, and the conclusions concerning the health and historical context of understanding the resource (Steps 1 through 3). Step 7 also presents project impacts that might contribute to a cumulative impact (Step 4), other reasonably-foreseeable actions considered in the cumulative impact analysis (Step 5), and the conclusion of the analysis as outlined in Step 6.

The information presented in Step 7 is a summary, consistent with NEPA disclosure requirements, to present information to decision-makers and the interested public. Therefore, it is important for the practitioner to clearly state the conclusions of the analysis. Include information about the methods and assumptions underlying the analysis.

Describe the Analyses, Methods or Processes Used

Briefly state how the impact analysis was conducted. For example, you may have plotted GIS overlays of proposed actions (developments) and known locations of an endangered plant species. Briefly explain this approach and include any of the figures or data used to

draw conclusions if they provide illustration or clarification. Provide references or footnotes as needed to documents sources.

Explain the Assumptions

Explain any limitations that were faced in conducting the analysis. Reviewers will need to know how conclusions were reached in situations for which there were data gaps, scarce information, or limitations or obstacles associated with obtaining the data (e.g., data were cost prohibitive). If models were used, summarize the assumptions on which the models are based.

For the purposes of NEPA disclosure, the cumulative effects discussion should compare the cumulative impacts of each alternative. A typical statement might say, "Alternative A would adversely affect 0.4 acre of bottomland hardwoods. Alternative A, in combination with other actions, contributes to an adverse cumulative impact to bottomland hardwoods, while Alternative B does not."

Where to Place the Indirect and Cumulative Impact Analyses in the Environmental Document

The document should include information on the results of the analysis, any assumptions used as well as any analytical methods used. This cannot be overstated – the decision maker (as well as any other reader) should be able to determine not only what you concluded, but how and why you concluded what you did.

Note: The Indirect Impacts and Cumulative Impacts Analysis should be a separate section of an EIS to effectively show all the cumulative impacts. The cumulative impacts analysis should compare reasonable/feasible alternatives fully considered in the environmental document.

For an EA, the level of the cumulative impact analysis will determine how/where the analysis is located in the document. To aid in reading more complex documents, the indirect impact analysis should be in a separate section from the cumulative impact analysis.

Step 8: Assess the Need for Mitigation

FHWA's NEPA regulations in 23 CFR 771.105(d) calls for the consideration of mitigation for all adverse impacts. Mitigation should be considered for any impact disclosed in the environmental document, whether direct, indirect, or cumulative. For

more information about presenting mitigation, see CEQ's discussion of mitigation in *NEPA's Forty Most Asked Questions* (nos. 19a and 19b).

Determining the feasible mitigation measures for a cumulative impact can be difficult. In many cases, a cumulative impact results from the combined actions of numerous agencies and private entities. The requirement to implement a potential mitigation measure to address an indirect or cumulative impact is often beyond the jurisdiction of FHWA, TxDOT, or other cooperating agencies.

For example, mitigation measures for air quality impacts might require numerous local communities to modify their general plans to reduce the amount of planned development and reduce the number of vehicle miles traveled within the geographic study area. TxDOT and FHWA do not have the authority to implement the necessary planning decisions, obtain local legislative approvals, or change the regional distribution of future development. Therefore, disclosure of mitigation for cumulative impacts is not based on or limited to specific mitigation measure that can be implemented be the lead agency.

If it is not possible to identify a mitigation measure, the discussion may consist of listing the agencies that have regulatory authority over the resource and recommending actions those agencies could take to influence the sustainability of the resource. By doing so, the needed mitigation would be disclosed to the public and reviewing agencies even though it could not be implemented by TxDOT. Once disclosed, the information could be used to influence future decisions or to help identify opportunities for avoidance and minimization when other projects are proposed. For more information about mitigation by other see CEQ's discussion of mitigation in *NEPA's 40 Most Asked Questions*, no. 19b.

Using the 8-Step Approach: A Hypothetical Example

To assess the potential for cumulative impacts, the practitioner determines the potential for past trends and current and reasonably foreseeable future actions, in combination with the proposed project, that affect the health of the resource.

Below is a brief outline of how to use the steps, with a hypothetical example for wetlands:

Step 1: The project will have direct or indirect impacts to wetlands; therefore, it is included in the resources to consider for cumulative impacts assessment.

Step 2: Based on consultation with ENV biologists and wetlands specialist, you determine that the relevant resource study area (RSA) is the drainage basin.

Step 3: The context: Currently the area is being used for farming, and has relatively intact wetland complexes. Current acreage: 5,000 acres. Historically (pre-settlement), the area contained abundant wetland resource. The resources have been disturbed by agricultural activities over the past 150 years. In recent years, urban development has increased the

pace of wetland loss. The trend: Rapid development is continuing, and is expected to accelerate over the next 20 years.

Step 4: This project will have seven acres of direct and indirect impacts to wetlands in the RSA.

Step 5: You have identified reasonably foreseeable actions in the wetlands RSA, and the associated impact to wetlands. These reasonably foreseeable actions include five new housing developments, two new business parks, and several transportation improvements. Based on available environmental documents, discussions with wetlands experts, and other information you have collected about these action, you estimate that 1000 acres of wetlands will be adversely affected by reasonably foreseeable actions.

Step 6: You used a trends method to analyze the cumulative effect of the wetlands over time. You also consulted with ENV biology staff and regulatory experts to analyze the effect of cumulative stresses (fragmentation, pollution, sedimentation) to the values and functions of wetlands in the RSA.

Step 7: You concluded that there will be substantial cumulative impacts to wetlands within the RSA given past, current, and reasonably foreseeable actions. Your analysis shows that your project will account for seven acres of the 1,000 acres of potential cumulative impacts to wetland. You conclude that the wetland impacts associated with your project will be cumulatively minor in comparison to the impacts of other current and reasonably foreseeable projects.

Step 8: Based on your analysis of the status of wetlands in the RSA, you recommend that compensatory mitigation required for the project impacts be located proximate to existing wetland mitigation areas or wildlife refuges.

What resources are available?

FEDERAL HIGHWAY ADMINISTRATION
Question and Answers Regarding the consideration of Indirect and Cumulative Impacts in the NEPA Process. (Interim Guidance, January 2003)
http://environment.fhwa.dot.gov/guidebook/Gimpact.htm

COUNCIL ON ENVIRONMENTAL QUALITY
Considering Cumulative Effects under the National Environmental Policy Act (1997)
http://ceq.eh.doe.gov/nepa/ccenepa/ccenepa.htm

Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (2005)
http://ceq.eh.doe.gov/nepa/regs/Guidance on CE.pdf

ENVIRONMENTAL PROTECTION AGENCY
Consideration of Cumulative Impacts in EPA Review of NEPA Documents (1999)
http://ceq.eh.doe.gov/neap/ccnepa/ccnepa.htm

US GEOLOGICAL SURVEY (USGS)
http://geography.usgs.gov/

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP)
Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects (2002)

CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS)
Guidance for Preparers of Cumulative Impact Analysis Approach and Guidance (2005)
http://www.dot.ca.gov/ser/cumulative_guidance/approach.htm

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Indirect and Cumulative Impacts Guidance
http://www.ncdot/org/doh/preconstruction/pe/ici_guidance.htm

MARYLAND STATE HIGHWAY AGENCY
Secondary Cumulative Effects (SCEA) Analysis (2000)
http://www.sha.state.md.us/ImprovingOurCommunity/oppe/scea/index.asp

OFFICE OF THE STATE DEOMOGRAPHER
University of Texas at San Antonio.
http://txsdc.utsa.edu

TEXAS COMPTROLLERS OFFICE
Texas Economy.
http://www.window.state.tx.us/ecodata/popdata/popfiles

TEXAS NATURAL RESOURCE INFORMATION SYSTEM (TNRIS)
http://www.tnris.state.tx.us

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ)
http://tceq.state.tx.us