ASSESSING THE EXTENT AND DETERMINATES OF INDUCED GROWTH

FHWA/MT-13-004/8216

Final Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

in cooperation with
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

June 2013

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RESEARCH PROGRAMS

MDT

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Assessing the Extent and Determinates of Induced Growth

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16. Abstract

Transportation improvements affect the accessibility of places, which in turn can result in changes in land use in combination with factors that support or discourage development (such as land prices, market demand, local land use regulations, and environmental constraints). Due to the uncertainty involved in forecasting the indirect effects of transportation projects on land use, transportation agencies nationally have struggled in identifying the appropriate level of analysis for this issue, in some cases resulting in litigation and project delays. The objective of this research was to identify a Montana-specific, consistent, legally defensible, and efficient process for assessing the indirect land use and environmental effects of transportation projects for the Montana Department of Transportation (MDT). Case law, guidance documents in other states, surveys, interviews, and reviews of existing MDT environmental documents were used to develop an Indirect Effects Desk Reference. The Desk Reference provides an overview of key definitions and regulatory requirements, and provides practitioners with a step-by-step screening process to determine if further analysis is warranted. The screening process relies on information of the characteristics and location of the project readily available early in the project development process. Where detailed analysis is necessary, a detailed analysis framework process is provided in the Desk Reference that includes recommendations on the analysis methodologies most applicable to the data available in different portions of Montana. Finally, recommendations for updating the Desk Reference materials over time are presented, including a recommendation to incorporate the screening and detailed analysis frameworks in MDT's Environmental Manual. The results of this research should be useful not only to Montana, but to other western states in the Rocky Mountain and Great Plains regions of the U.S. that share similar land use, environmental, and growth trends.

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Acronyms

AADT ..... Annual Average Daily Traffic
AASHTO ..... American Association of State Highway and Transportation Officials
ACS ..... American Community Survey
ADA ..... Americans with Disabilities Act
ADT ..... Average Daily Traffic
APA ..... Administrative Procedure Act
APF ..... Adequate Public Facilities
ARM ..... Administrative Rules of Montana
CAD ..... Computer Aided Design
Caltrans ..... California Department of Transportation
CAPS ..... Crucial Areas Planning System
CE ..... Categorical Exclusion
CED ..... Community Economic Development
CEQ ..... Council on Environmental Quality
CEQA ..... California Environmental Quality Act
CFR ..... Code of Federal Regulations
CLF ..... Conservation Law Foundation
CSKT ..... Confederated Salish and Kootenai Tribes
CTPP ..... Census Transportation Planning Package
DEQ ..... Department of Environmental Quality
DFIRM ..... Digital Flood Insurance Rate Map
DOT ..... Department of Transportation
DRI ..... Development of Regional Impact
DWQ ..... Division of Water Quality
EA ..... Environmental Assessment
EIS ..... Environmental Impact Statement
EPA ..... Environmental Protection Agency
FEIS ..... Final Environmental Impact Statement
FEMA ..... Federal Emergency Management Agency
FHWA ..... Federal Highway Administration
FONSI ..... Finding of No Significant Impact
GIS ..... Geographic Information Systems
HOV ..... High Occupancy Vehicle
ICE ..... Indirect and Cumulative Efforts

ICI ..... Indirect and Cumulative Impact
KMTP ..... Kearl Module Transportation Project
LBG ..... The Louis Berger Group, Inc.
LED ..... Local Employment Dynamics
LEHD ..... Longitudinal Employer-Household Dynamics
LUAM ..... Land Use Allocation Model
LUSDR ..... Land Use Scenario Developer
MCA ..... Montana Code Annotated
MDEQ ..... Montana Department of Environmental Quality
MDT ..... Montana Department of Transportation
MEPA ..... Montana Environmental Policy Act
MPO ..... Metropolitan Planning Organization
NAICS ..... North American Industry Classification System
NAIP ..... National Agriculture Imagery Program
NCDENR ..... North Carolina Department of the Environment and Natural Resources
NCDOT ..... North Carolina Department of Transportation
NCHRP ..... National Cooperative Highway Research Program
NCWF ..... North Carolina Wildlife Federation
NEPA ..... National Environmental Policy Act
NHDOT ..... New Hampshire Department of Transportation
NPDES ..... National Pollutant Discharge Elimination System
ODOT ..... Oregon Department of Transportation
OEP ..... Office of Energy and Planning
PLACE ..... Practical Landscape Assessment for Conservation and Enhancement
PNREAP ..... Pacific Northwest Regional Economic Analysis Project
ROD ..... Record of Decision
RSA ..... Resource Study Areas
SCEA ..... Secondary and Cumulative Effects Analysis
SEIS ..... Supplemental Environmental Impact Statement
SF ..... Summary File
SHA ..... State Highway Administration
SIC ..... Standard Industrial Classification System
SRF ..... State Revolving Fund
TAD ..... Traffic Analysis District
TAZ ..... Traffic Analysis Zone
TEL ..... Tolled Express Lanes

TIP ..... Transportation Improvement Plan
TRB ..... Transportation Research Board
TRD ..... Transfer of Development Rights
TSA ..... Traffic Sensitivity Analysis
TxDOT ..... Texas Department of Transportation
UDOT ..... Utah Department of Transportation
ULAM ..... Urban Land Use Allocation Model
USACE ..... United States Army Corps of Engineers
USC ..... United States Code
USDA ..... United States Department of Agriculture
USDOT ..... United States Department of Transportation
USFWS ..... United States Fish and Wildlife Service
USGS ..... United States Geological Survey
WisDOT ..... Wisconsin Department of Transportation
WSDOT ..... Washington State Department of Transportation

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1 Introduction

Transportation projects alone cannot change surrounding land use. However, in the presence of other supportive conditions (such as land prices, market demand, local land use regulations, and environmental constraints), transportation improvements can affect the accessibility of places, which in turn can have an impact on land use and the environment (see Figure 1). A new interchange may encourage complementary development (such as gas stations, hotels, and "big box" stores) if land is available and market and regulatory conditions support it. New transportation corridors have the potential to alter the pattern of growth in a region, shifting a portion of future growth to locations with increased relative accessibility. The widening of a highway may reduce travel times to a city, airport, or recreation destination that in turn could support a change in land use in rural areas. Land use changes can in turn affect the performance of the transportation system through the generation of additional trips.

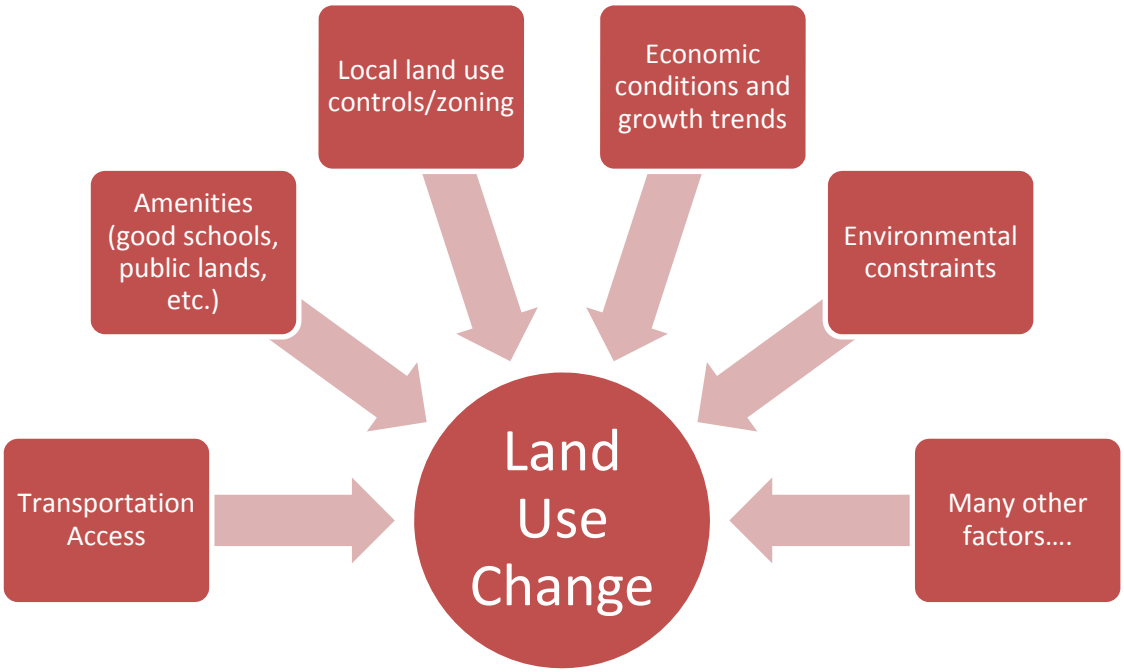

Figure 1: Factors that Impact Land Use Change

Consideration of the potential indirect effects of transportation projects on land use is required for compliance with the National Environmental Policy Act (NEPA) and Montana Environmental Policy Act (MEPA), as implemented through regulations and interpreted by the courts (see Section 1.1 and Chapter 2). Due to the uncertainty involved in forecasting the effects of transportation projects on land use, transportation agencies nationally have struggled in identifying the appropriate level of analysis for this issue, in some cases resulting in litigation and project delays. For the largest transportation projects, it may be obvious that some analysis of indirect effects on land use is necessary, but the selection of an appropriate methodology based on the circumstances of the project may be a challenge. A different type of challenge is efficiently addressing indirect effects for the vast majority of routine transportation projects that have little to no potential to encourage land use change (such as bridge replacements and safety

improvements that do not increase capacity). Finally, many of the existing methodologies and guidance for assessing indirect effects were developed without taking into consideration the rural environment in which many projects are located.

The objective of this research was to identify a Montana-specific, consistent, legally defensible, and efficient process for assessing the indirect land use and environmental effects of transportation projects for the Montana Department of Transportation (MDT). The product of this research is an Indirect Effects Desk Reference (see Appendix 1). The Desk Reference provides an overview of key definitions and regulatory requirements, and provides practitioners with a step-by-step screening process to determine if further analysis is warranted. The screening process relies on information of the characteristics and location of the project readily available early in the project development process. Where detailed analysis is necessary, a detailed analysis framework process is provided in the Desk Reference that includes recommendations on the analysis methodologies most applicable to the data available in different portions of Montana.

The text of this Final Report documents the research process that informed the development of the Indirect Effects Desk Reference. Chapter 2 documents the results of a case law and literature review, including review of the indirect effects assessment guidance documents used in other states. Chapter 3 provides the results of a review of existing MDT practice in addressing indirect effects, including review of MDT environmental documents and surveys, and interviews of environmental document preparers and reviewers. Chapter 4 summarizes the development of the indirect effects screening process described in the Desk Reference, while Chapter 5 describes the indirect effects detailed analysis process. Finally, recommendations for updating the Desk Reference materials over time are presented, including a recommendation to incorporate the screening and detailed analysis frameworks in MDT's Environmental Manual.

1.1 Regulatory Framework and Definitions

The distinction between direct, indirect, and cumulative impacts originates from the Council on Environmental Quality's (CEQ's) regulations implementing the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations (CFR) 1500-1508). In Montana, similar but distinct definitions of these terms are provided under the Montana Environmental Policy Act (MEPA), a state-level environmental review requirement (Montana Code Annotated (MCA) Title 75 Chapter 1).

- **Direct impacts** are "caused by the action and occur at the same time and place" (40 CFR §1508.8).

- **Indirect effects** are those effects that ". . . are caused by the action and are later in time and 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" (40 CFR §1508.8(b)).

Three types of indirect effects were identified in the National Cooperative Highway Research Program (NCHRP) Reports 403 and 466 (Louis Berger Group, Inc. (LBG) 1998 and LBG 2002):

- **Encroachment-Alteration Effects**—Alteration of the behavior and function of the affected environment caused by project encroachment (physical, chemical, or biological) on the environment. Examples of encroachment-alteration effects include impacts to wildlife from habitat fragmentation or changes in water quality that are attributable to the project.

- **Induced Growth Effects**—Changes in the intensity of the use to which land is put that are caused by the action/project. These changes would not occur if the action/project does not occur. For transportation projects, induced growth is often attributed to changes in accessibility caused by the project.

- **Induced Growth Related Effects**—Alteration of the behavior and function of the affected environment attributable to induced growth (e.g., loss of wildlife habitat and increased impervious surface cover attributable to induced growth).

- **Cumulative effects** are "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). According to the Federal Highway Administration's (FHWA) "Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process" (2003), cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a proposed project.

MEPA was modeled after NEPA and contains very similar requirements to NEPA for state agency actions. The rules for implementing MEPA adopted by MDT use the term "secondary impacts," instead of indirect effects, and define secondary impacts differently from the CEQ NEPA definition. According to MDT's MEPA rules, Administrative Rules of Montana (ARM) 18.2.36 (18), "secondary impact" means a further impact to the human environment that may be stimulated or induced by or otherwise result from a direct impact of the action.

The MEPA definition does not refer to "reasonably foreseeable" effects or reference specific examples of the type of impacts to be considered. Despite these differences, the intent of the MEPA definition of secondary impacts is the same as the definition of indirect effects under NEPA. The MDT MEPA procedures state that "human environment" includes but is not limited to biological, physical, social, economic, cultural, and aesthetic factors that interrelate to form the environment.

In addition, induced growth is among the factors to be considered in determining impact significance under MEPA (ARM 18.2.238 (c) "growth-inducing or growth-inhibiting aspects of the impact, including the relationship or contribution of the impact to cumulative impacts").

Similar to NEPA, MEPA also requires consideration of cumulative impacts.

This report is focused on induced growth and induced growth related indirect effects. Although typically used interchangeably, note that the term "indirect land use effects" is used instead of "induced growth" in this report because the effect of a particular project may be shifts in the location of development within a region and not necessarily "new growth." Encroachment-alteration indirect effects are not addressed in this report because they are relatively straightforward and are typically addressed in the same manner as direct impacts in NEPA documents. Similarly, this report does not provide guidelines for evaluating cumulative effects. Resources addressing cumulative impacts include:

- American Association of State Highway and Transportation Officials (AASHTO), Center for Environmental Excellence, "Practitioner's Handbook 12 - Assessing Indirect Effects and Cumulative Impacts under NEPA" (2011).

- Federal Highway Administration, "Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process" (2003).

- Transportation Research Board, NCHRP Project 25-25 (Task 43): "Legal Sufficiency Criteria for Adequate Indirect Effects and Cumulative Impacts Analysis as Related to NEPA Documents" (LBG et al. 2008).

- CEQ, "Considering Cumulative Effects under the National Environmental Policy Act" (1997).

2 Case Law and Literature Review

2.1 Case Law Review

2.1.1 National Environmental Policy Act

The Council on Environmental Quality (CEQ) regulations implementing NEPA require that agencies consider indirect effects in their decision-making process when undertaking a major federal action. Indirect Effects are defined as those "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" and "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 ecosystem" (40 CFR §1508.8(b)).

As NEPA does not provide for an independent cause of action, Federal agencies are subject to the Administrative Procedure Act (APA) when their actions are challenged in court. Under the APA, the action of agencies must be final (ripe) before a decision can be challenged in a court. A final agency action is the issuance of a Record of Decision (ROD) on an Environmental Impact Statement (EIS) or Finding of No Significant Impact (FONSI) on an Environmental Assessment (EA).

Most legal challenges regarding NEPA are brought under Section 102, which concerns the agency's procedures rather than the substance of the environmental document produced. Procedural challenges are afforded a broad standard of review under the APA known as the "arbitrary and capricious" standard of review. Under this standard, the agency's final action (ROD/FONSI) will be set aside if the plaintiff can prove that the agency acted in a way that was "arbitrary, capricious, an abuse of discretion or otherwise not in accordance with the law" (5 United States Code [USC] §706(2)(A)) by issuing the ROD or FONSI. The Courts have consistently reminded us that Congress was quite specific with the procedural requirements under Section 102 of NEPA and that they should be followed "to the fullest extent possible." In this type of case, an agency will generally be challenged on the methodology that was used for a particular analysis.

Substantive challenges call into question the adequacy of an EIS under Section 101 of NEPA and are afforded a much narrower standard of review than procedural challenges. Circuit Courts of Appeals commonly employ the "reasonableness" test to determine the adequacy of the discussion of environmental consequences in a substantive challenge, which consists of ensuring that the agency takes a "hard look" at the consequences of the proposed project. This standard for judicial review under NEPA comes from the decision in *Calvert Cliffs' Coordinating Committee v. Atomic Energy Commission* 449 F.2d 1109 (1971) where the Court explained that based on the language used in NEPA, the intent of Congress was to give more flexibility to an agency's discretion when it comes to substantive aspects of NEPA under Section 101. In this type of case, an agency will generally be challenged on its findings or conclusions with regards to the analysis of impacts on a resource.

2.1.1.1 Precedent-Setting NEPA Cases

This section summarizes the key court decisions regarding the assessment of indirect effects under NEPA. "Because MEPA is modeled on NEPA, Montana courts find federal case law persuasive in analyzing whether MEPA requirements are met" (*Ravalli County Fish and Game Association v. Montana Department of State Lands* 273 Mont. 371, 377 (1995)). The following cases are examples of precedent-setting cases involving the analysis of indirect effects that have likely shaped the Montana Court's opinions as well. These cases have set the foundation for the way courts across the country look at NEPA challenges with regards to the analysis of induced growth as an indirect effect. This is not intended to be a comprehensive review of all cases that have involved indirect effects.

City of Davis v. Coleman, 521 F.2d 661 (1975) is a Ninth Circuit case involving a proposal to build an interstate highway interchange to stimulate and service future development in a rural area. Neither an environmental assessment nor an EIS was prepared. Instead, a three-page "Negative Declaration of Environmental Impact" was issued. This declaration neither identified nor discussed the commercial and industrial development that would likely spring up around the interchange, located in a "sparsely populated agricultural area," instead assessing only the direct impacts related to the construction of the interchange. The court held that the failure to identify and analyze the project's indirect effects violated NEPA, and noted the significance of the growth-inducing effects of the proposed development, which were essential to the project objectives. Although uncertain, these effects were reasonably foreseeable, and indeed probable. Not being able to predict the exact type of development that would occur could not be used as an excuse for failing to prepare an EIS evaluating the indirect effects of the project. Reasonable forecasting of project-induced development must be conducted in an EIS.

Kleppe v. Sierra Club 427 U.S. 390 (1976) is one of the earliest, continually referenced cases that deals with the extent to which [indirect and cumulative] impacts must be analyzed. The Supreme Court determined that it was not necessary for the Department of Interior to complete a comprehensive environmental impact statement, considering *all* of the possible impacts that might result from the result of one mining project in the region (*emphasis added)*. This case established that there are limits to what can be expected on an agency when considering the impacts of a major federal action under NEPA. However, although agencies are not required to consider *all* of the impacts, they are required to consider the ones that are reasonably foreseeable and the Courts expected an adequate discussion of these impacts as seen in later cases.

Coalition for Canyon Preservation v. Bowers, 632 F.2d 774 (1980) was a case involving a proposal to widen a 17.38 km (10.8 mile) section of a narrow, two-lane federal highway that connected four small, rural towns in northern Montana and served as the primary access road into Glacier National Park. The widening would create a 26.8 m (88 foot) wide, four-lane highway, including 3.05 m (10 foot) parking lanes with new curbing and other improvements in the sections passing through the towns, resulting in the relocation of several businesses. The EIS admitted that the wider four-lane highway could result in project-induced development, but did not assess the indirect impacts of such growth. The Ninth Circuit Court held that the EIS's failure to assess this foreseeable development violated NEPA, as it did not analyze secondary effects.

In *Sierra Club v. Marsh* 769 F.2d 868 (1st Cir 1985) (also known as *Sierra Club I*), the Court set forth a three-part test, using the 1978 CEQ regulations as a guide, to determine if a particular set of impacts is definite enough to take into account or too speculative to warrant consideration:

1. With what confidence can one say that the impacts are likely to occur?
2. Can one describe them now with sufficient specificity to make their consideration useful?
3. If the decision maker does not take them into account now, will the decision maker be able to take account of them before the agency is so firmly committed to the project that further environmental knowledge, as a practical matter, will prove irrelevant to the government's decision?

Sierra Club v. Marsh involved the Court's review of an EA that was prepared for a proposal to build a port and causeway on rural Sears Island in Maine. It was inevitable that development would occur as a result of the construction on the island, as the Court concluded after a review of the administrative record which included a municipal response plan and another EA that projected further industrial development after construction of the cargo port. The Court further assessed whether there was sufficient information available at the time to make their consideration useful. It was concluded that a marketing study in addition to the municipal response plan provided enough information to be included in an EIS, satisfying the specificity question. Third, once the causeway and port were built, the pressure to develop the rest of the island could prove irresistible. Therefore, delaying the preparation of an EIS until a later time would result in environmental knowledge that would not offer the decision maker a meaningful choice about whether to proceed. This satisfied the third part of the test. As a result, the Maine Department of Transportation (DOT) was required to prepare an EIS.

The story of Sears Island continued in Sierra Club v. Marsh 976 F.2d 763 (1992) *(Sierra Club IV)* which involved a challenge to the adequacy of the indirect effects analysis prepared in the Maine DOT EIS. The EIS in this matter restricted its indirect effects analysis to four light-dry industries. Plaintiffs complained that the evaluation was inadequate because it did not evaluate heavy industries. Heavy industries would involve upgrades to water and sewer on the island that were previously determined not to be feasible and were therefore left out of the evaluation. Although the Sierra Club challenged this decision by the agency, the Court held that "the likelihood of these industries developing on Sears Island is too speculative to be reasonably foreseeable." The Court upheld the EIS as a reasoned decision based on the agencies' evaluation.

In *Friends of the Bitterroot v. USDOT* (1999), Plaintiffs challenged the adequacy of a Final Environmental Impact Statement (FEIS) issued by the Department of Transportation for the expansion of U.S. Highway 93 in western Montana. Plaintiffs appealed to the Ninth Circuit to reverse the District Court's ruling that the growth-inducing impact analysis in the FEIS was sufficient. However, in this unpublished opinion, the Ninth Circuit agreed with the Montana District Court, noting that the "record reflects a reasoned and reasonable consideration of the causes of past and future growth in the valley" noting that the Agencies did not ignore the potential impact of induced growth since the "FEIS acknowledges that expansion alternatives may have growth-facilitating effects." The FEIS noted that growth would occur independent of

improvements to U.S. Highway 93 due to the economic base of the area, and not due to access. The FEIS also identified other "known related projects" and summarily discussed why cumulative impacts were not expected. The majority of the Court found the discussion to be adequate and affirmed the District Court's ruling.

2.1.1.2 Recent NEPA Cases

The following highway projects and cases all involve challenges to EISs that were prepared for major transportation projects. In each case the state transportation agency and Federal Highway Administration (FHWA) were being challenged on their analysis of the projects potential to induce growth in the area. Through these decisions, Courts relayed valuable insight into what constitutes an adequate analysis. Some of the lessons learned include:

- The conclusion that growth will not be induced by the proposed project will not hold if the environmental document itself contradicts this finding. A discussion within the analysis is required on this issue, and not just a conclusory statement that growth will or will not occur.
- Agencies may not hand select which information to include in the EIS and which information to leave out, even if they feel it is speculative. Even if the conclusion of the induced growth study does not support the preferred alternative, actions must be accounted for and disclosed.
- Agencies must be aware of statements made elsewhere in the EIS that are then contradicted in the analysis of indirect effects and cumulative impacts.
- The integrity of the NEPA public review process matters—assumptions underlying data and methodologies used in an indirect effects evaluation must be presented accurately.

Legacy Parkway, Utah

In *Utahns v. FHWA, et al.* 305 F.3d 1152 (2002), Appellants challenged the ROD issued by FHWA as the result of an FEIS prepared by Utah Department of Transportation (UDOT). Federal approval was required for the proposed Legacy Parkway because of its connection to the interstate highway system. Plaintiffs challenged multiple analyses in the FEIS and while the Tenth Circuit Court of Appeals found several aspects of the FEIS inadequate, the analysis of growth impacts was not among them. Appellants alleged the FEIS presents a "circular logic" in that local land use plans had already been modified to accommodate the growth that would result from the proposed new 22.53 km (14 mile) Legacy Parkway. The project had been under consideration for six years, and Appellants felt that this consideration and the expectation of sprawl had already influenced local planning efforts. The Court disagreed with this presumption, noting that there is precedent allowing for "agencies to rely on local planning documents in an EIS to establish that a proposed highway will not result in further growth" and cited *City of Carmel-by-the-Sea (1997)* pointing out that these documents may in fact show that growth is already expected, but it may not necessarily be because of the proposed project. In addition to referencing local plans in the EIS, agencies consulted with local planners to determine whether the Legacy Parkway would be a catalyst to growth in the area. The Court appeared to give more weight to the advice of planners rather than plans, and found that the agencies took adequate steps in their data collection.

I-11400, Utah

In *Davis v. Slater* 148 F. Supp. 2d 1195 (2001), Plaintiffs sought a preliminary injunction from the Utah District Court, on construction of a highway project (I-11400) in Salt Lake County. The twenty-six million dollar project involved several components including a new freeway interchange, a new bridge and highway though the Jordan River Parkway and over the Jordan River, as well as other road and highway improvements. One of several issues raised was that FHWA, as the lead agency, did not consider fully the impact of induced growth. The EA concluded that the project would not induce growth in the area because even absent the project "development in the area has already been intense and rapid…and that current zoning practices in the areas suggest the same conclusion." The District court decided that FHWA took the requisite "hard look" at this impact and that its analysis satisfied NEPA.

However, the Tenth Circuit Court found that the EA contained an inadequate discussion of impacts including induced growth on appeal in *Davis v. Mineta* 302 F.3d 1104 (2002). The Court explained "a conclusory statement that growth will increase with or without the project, or that development is inevitable, is insufficient; the agency must provide an adequate discussion of growth-inducing impacts." The Court pointed out that the EA itself acknowledges that "the rate of development on lands east of the Jordan River may increase as a result of the project." The Court also referred to a comment letter from the Environmental Protection Agency (EPA) stating that increased growth would result from the project and that the EPA disagreed with the FONSI because all impacts have not been fully identified and assessed. The EA contained a graphic analysis of socioeconomic growth in the area from 1970 and extrapolated through 2020, and showed that continued growth was anticipated. However the Court explained that the graph "contains no discussion or comparison of the local effects in the areas directly impacted by this project of induced growth caused by the extension of I-11400 South as compared to a no-build alternative or the use of other alternatives." The Court of Appeals found that FHWA's omission of a discussion on induced growth was arbitrary and capricious. The case was remanded to the District Court, however, immediately prior to this decision, FHWA withdrew its FONSI based on input from UDOT concerning its intended changes to the proposed project and the *Davis* case was dismissed as moot.

FHWA eventually prepared an FEIS for this project and issued a ROD on September 13, 2005. Two years after the ROD was issued, this FEIS was challenged again in the District Court Jones v. Peters 2007 U.S. Dist. Lexis 70332 (2007), using many of the same arguments as previously presented in *Davis v. Slater* in 2001. Plaintiffs alleged that the FEIS did not adequately analyze the cumulative impact of the 11400 South project taken together with other transportation projects in the area "other than to say that they may have some effect." In addition to Plaintiffs assertion that the FEIS overlooked cumulative impacts on pedestrians, equestrians, bicyclists, farmlands, residential and commercial relocations, and economic and social conditions, Plaintiffs also submit that all of the proposed transportation projects in the southwest portion of the Salt Lake Valley should have been studied and evaluated in a comprehensive regional environmental impact statement. The agencies attempted to validate their analysis by explaining that the summary presented in the FEIS was the result of an interdisciplinary workshop on cumulative impacts of the 11400 South project.

The District Court decided that a regional EIS prepared for all transportation projects was not required and explained "the fact that projects originate in a regional transportation plan addressing regional transportation needs does not *require* that their environmental impacts be evaluated in a single EIS." Nevertheless, effects of the other regional projects were taken into consideration in the traffic modeling in the FEIS and the Court found this to be adequate for purposes of analysis.

I-93 Improvement Project, New Hampshire

A Final EIS was issued in April 28, 2004 by FHWA and New Hampshire Department of Transportation (NHDOT) proposing the widening of a 32.19 km (20 mile) segment of I-93 from the Massachusetts state line to Manchester, New Hampshire. A ROD was issued on June 28, 2005 approving the Four Lane Alternative. Conservation Law Foundation (CLF) challenged the issuance of this ROD in 2007 in *CLF v. FHWA* 2007 DNH 106 in the New Hampshire District Court**.**

CLF's indirect and cumulative impacts argument stems from the use of outdated population growth forecasts from the Office of Energy and Planning (OEP) presented to the Delphi Panel that was assembled for purposes of identifying the induced growth effects that the project would have on the area. The original OEP forecast given to the Panel was based on 1990 Census and the Delphi Panel used this forecast to develop a baseline population growth forecast which was used in the FEIS. The Panel was later given an updated OEP forecast, which was approximately ten percent higher than the original, which was also used by the Panel to develop a revised baseline population growth forecast. However, the original forecast prepared was the only one presented in the FEIS. The Defendants failed to justify the reasoning for not including the second, revised baseline forecast in the FEIS and the Court ruled that this decision was in error.

Although the Delphi Panel's forecast was used in predicting the indirect effects of induced growth, water quality and wildlife resulting from the proposed project in the area and these results were presented in the FEIS, the results of the forecast's applications to traffic projections and effects on air quality, was not presented in the FEIS and this decision was also challenged by CLF. Defendants claimed that the Delphi Panel's induced population growth forecast is too speculative to be used in traffic projections. Several reasons were cited by the Defendants including concern over the validity and subjectivity of the Delphi process, and the difficulty in assessing the interactions among the relevant variables in the quantification of induced population growth. The Defendants also claimed that the OEP forecast was prepared with knowledge of the proposed project. The Court responded to these reasons by pointing out that "forecasts are always marked by a degree of uncertainty, yet NEPA often requires agencies to forecast uncertain events…an agency may not treat a foreseeable effect as nonexistent simply because the magnitude of the effect is difficult to quantify". The Court explained that the Defendants had used the Delphi Panel for forecasting induced growth, but did not adequately explain why induced growth was not included as a factor in the traffic projections. The Court offered that "Defendants should have performed the (Traffic Sensitivity Analysis) TSA, disclosed its results in the FEIS, and explained why the analysis did not affect their decision to proceed with the Four Lane Alternative," and that, "their failure to do so was error".

Finally, Defendants argued that the forecast was not included in the FEIS because the additional traffic predicted by the TSA was not significant. The Court disagreed with this reasoning, stating that "reliable information produced by the agency's own experts that casts doubt on the agency's statements concerning a selected alternative's effectiveness is not insignificant". The Court explained that the additional traffic projected by the TSA is significant in that it will have indirect effects on secondary road traffic and air quality, and that the "unexcused failure to disclose these effects in the FEIS was arbitrary and capricious".

The Court ruled that FHWA and NHDOT prepare a Supplemental EIS (SEIS), and to include in it a consideration of how the Delphi Panel's population forecasts of induced population growth will impact the effectiveness of the Four Lane Alternative as a traffic congestion reduction measure. The SEIS must also address how the indirect effects of induced population growth will impact air quality and traffic on secondary roads.

Winston-Salem Northern Beltway, North Carolina

On March 29, 1996, the North Carolina Department of Transportation (NCDOT) published the FEIS for the Western Section of the Winston-Salem Northern Beltway project. The ROD was issued by FHWA on May 7, 1996 and one day later, FHWA announced that the Transportation Improvement Plan (TIP) for the Winston-Salem metropolitan area was no longer in conformance with the requirements of the Clean Air Act. Since the ROD had already been issued for the Western Section the day before, the project was still eligible for federal funding and would not be affected by the non-conformity announcement. Prompted by a lawsuit initiated against FHWA and NCDOT regarding the non-conformity announcement, FHWA withdrew the previously issued ROD, which reopened the NEPA process. The pending lawsuit became moot and the Court entered an order of dismissal on June 29, 1999. In June 2001, North Carolina Alliance for Transportation Reform, Inc. and Friends of Forsyth County filed a motion for the award of attorney's fees and expenses in the North Carolina Middle District Court, which required that the Court examine the issues raised with regards to the 1996 FEIS in *North Carolina Alliance for Transportation Reform v. Slater* 151 F. Supp. 2d 661 (2001).

In order for the Plaintiffs to be entitled to fees and expenses under the Equal Access to Justice Act at 28 USC §2412(d)(1)(A), the Court must find that the position taken by the Defendants was not "substantially justified." The Plaintiffs argued that FHWA was not substantially justified in the production and approval of an inadequate FEIS for the Western Section, which required the Court to examine whether the FEIS complied with NEPA. Plaintiffs made several claims of inadequacy throughout the FEIS, including the indirect effects and cumulative impacts analyses.

Plaintiffs argued that "the FEIS should have more fully analyzed the growth-inducing effects these interchanges would have because 'a large interchange on a major interstate highway in an agricultural area where no connecting road currently exists will have a substantial impact on a number of environmental factors'". The Court compared this argument to that in *City of Davis v. Coleman* in that western Forsyth County has significant growth potential and although "demographic trends indicate that the area affected by the Western Section is growing faster than

other parts of Forsyth County…this does not necessarily mean that the proposed project would have no effect on the amount or pace of development." The Court pointed to a contradiction on page 4-22 of the FEIS where in the discussion on the economic impact of the project it is acknowledged that the proposed Northern Beltway "would potentially serve as a catalyst for regional economic development." The Court felt that this underscored the need for a complete analysis and subsequently found that FHWA neglected their statutory duty under NEPA.

The Court found six shortcomings in the FEIS and a violation of NEPA. The Plaintiffs were successful in their case and found to be entitled to the recovery of attorney's fees and expenses under the Equal Access to Justice Act.

Texas State Highway 99, Segment E

In *Sierra Club v. FHWA* 435 Fed. Appx. 368 (2011), the Sierra Club appealed to the Fifth Circuit Court challenging FHWA's methodology for analyzing the potential for induced growth resulting from the construction of Segment E of Texas State Highway 99. The methodology used by the defendants included the use of an expert panel, which is consistent with recommended methodologies (LBG 2002, p.72). The Panel used by the agencies in this case consisted of twenty-eight "knowledgeable members of the Houston community with firsthand experience in planning or development in the government, education, and private sectors." Through the use of this Panel, information on reasonably foreseeable projects was compiled by contacting various developers in the project area "to determine location, percent build-out (as of September 2006), proposed build-out date, and approximate total number of structures proposed in each subdivision currently under construction or proposed within the study area." The Court found this method to be acceptable and upheld the ruling of the lower court that the FHWA and Texas transportation agencies decision to issue the ROD was not arbitrary or capricious.

I-65/U.S. 31 Connector, Kentucky

In *KEEP v. FHWA* Case No. 1:10-CV-00154-R (2011), FHWA's analysis of growth inducing impacts was challenged in the U.S. District Court of Western Kentucky. FHWA published an FEIS for the I-65/U.S. 31 connector road and issued a ROD in April 2010. In its consideration of induced growth impacts, FHWA did not include a 2.39 square-km (591 acre) tract of undeveloped land that had already been purchased and rezoned for industrial use as Phase I of an industrial economic zone, arguing that it was not necessary to analyze growth induced by an action other than their own. Since the purchase and rezoning of the parcel occurred prior to the FEIS, defendants felt that this proved the land was to be developed with or without the proposed connector road project. The court agreed with this approach.

FHWA did conclude that the project would spur industrial growth at Phase II, which had not yet been purchased or zoned. However, they were unable to predict the type of industry and air emissions that would occur at Phase II, so they were unable to perform a detailed air quality analysis under indirect effects. They also did not analyze "the negative redistributive effect/development shift associated with the Transpark accessibility provided by the Project as an adverse indirect economic effect" because it was not possible to forecast the type of industry that

may occupy Phase II for such an analysis. The court supported this approach as well, noting that a "crystal ball inquiry" is not required.

Monroe Connector, North Carolina

In *North Carolina Wildlife Federation v. North Carolina Department of Transportation et al*., Case No. 5:10-CV-476-D (2011), North Carolina Wildlife Federation (NCWF) alleged that NCDOT violated NEPA by failing to properly analyze the growth-inducing impact of the proposed 32.19 km (20 mile) Monroe Connector/Bypass because of the improper use of data. Specifically, NCDOT analyzed the No Build and Build scenarios in a quantitative analysis using the Regional Travel Demand Model. The Model contained data which already contemplated building the project. The same data was used in the traffic analysis of both build and no-build alternatives, and portions of the data was also used in the analysis of growth-inducing impacts. Specifically, one of the factors used in the induced growth analysis (travel time to employment) included the effect of the project in both the No Build and Build scenarios. NCDOT did not deny that this was the case, but they explained that they "took extensive steps" to ensure that the data was appropriate, including interviews of local planners and MPO staff on several occasions to confirm that it was appropriate to use this data. The U.S. District Court for Eastern District of North Carolina found that NCDOT demonstrated a thorough effort "to ensure that their data and analyses were proper" and that in this effort, did not violate NEPA.

The plaintiffs appealed the District Court decision. In May 2012 the District Court decision on the Monroe Connector/Bypass was overturned by the 4th Circuit Court of Appeals in *North Carolina Wildlife Federation v. North Carolina Department of Transportation*, Case No. 11-2210. In responding to comments from the public and the U.S. Fish and Wildlife Service during the NEPA process, NCDOT incorrectly stated that the proposed project did not influence the socioeconomic data used in the No Build scenario. The Circuit Court found that this mischaracterization of the data underlying the No Build scenario was contrary to the public disclosure and transparency requirements of NEPA. The case highlights the importance of ensuring candid disclosure of the assumptions embedded in the data/methods used in an indirect effects analysis during the NEPA process, particularly when the assumptions are questioned in comments from other agencies and the public.

2.1.2 Montana Environmental Policy Act

The Montana Environmental Policy Act (MEPA) was enacted in spring 1971, before the 1972 Montana Constitutional Convention (Everts and Mundinger 2009). MEPA reflects many of the environmental considerations incorporated in the 1972 Constitutional Convention. The Montana Constitution includes an inalienable right of all citizens to a "clean and healthful environment" (Constitution of Montana, Article II, Section 3). The Montana Constitution also states that "the state and each person shall maintain and improve a clean and healthful environment in Montana for present and future generations" and indicates that the Montana legislature is responsible for protecting the environment from degradation (Constitution of Montana, Article IX, Section 1). Legislative amendments to MEPA in 2003 note that the Montana Legislature is, "mindful of its constitutional obligations under Article II, Section 3, and

Article IX of the Montana constitution, has enacted the Montana Environmental Policy Act" (MCA 75-1-102(1)).

MEPA was modeled after NEPA and has many similarities to its Federal counterpart both in process and intent. MEPA requires state agencies to use a "systematic, interdisciplinary approach" in the analysis of State actions that have an impact on the human environment. The Administrative Rules of Montana (ARM) 18.2.238 state that:

> (1) …the agency shall determine the significance of impacts associated with a proposed action. This determination is the basis of the agency's decision concerning the need to prepare an EIS and also refers to the agency's evaluation of individual and cumulative impacts in either EAs or EISs. The agency shall consider the following criteria in determining the significance of each impact on the quality of the human environment:
>
> ***(c) growth-inducing or growth-inhibiting aspects of the impact, including the relationship or contribution of the impact to cumulative impacts;***

Under MEPA, an EA is required for state actions and state-permitted actions. There are provisions for categorical exclusions to a MEPA review. An EIS is required if there is a major state action and the impacts will significantly affect the environment. The Montana Supreme Court has held that MEPA is procedural, not substantive (*Friends of the Wild Swan v. Department of Natural Resources and Conservation* CDV-97-558 (1998)), and in 2003 MEPA's purpose section was modified to emphasize this point, stating "MEPA is procedural, and it is the Legislature's intent that the requirements of MEPA provide for adequate review of state actions in order to ensure that (a) environmental attributes are fully considered in enacting laws to fulfill constitutional obligations, and (b) the public is informed of the anticipated impacts in Montana of potential state actions" (MCA 75-1-102(1)). Additionally, "a challenge to an agency action under [MEPA] may only be brought against a final agency action and may only be brought in district court or in federal court, whichever is appropriate" (MCA 75-1-201(5)(a)(i)). As with NEPA, an agency action is constituted by the issuance of the FONSI, ROD, or a permit.

Senate Bill No. 377 [2001] established time limits and procedures for conducting environmental reviews. The bill defined specific terms used in MEPA, it required that legal challenges to actions under MEPA may be brought only in District Court or federal court within 60 days of a final agency action, and it provided an exception to the permitting time limits if Board review of certain agency decisions is requested (MCA 75-1-201(5)(a)(ii)(iii)).

A review of MEPA in the Montana Courts, as presented in "A Guide to the Montana Environmental Policy Act" notes that as of 2009, the issue of cumulative impacts has been litigated in the Montana Courts eight times and in six of those cases, the State has prevailed. The review also presented the categories of action that had been the most commonly mitigated in the Montana Courts as of 2009. The most popular topics were timber sales and mining permits with nine cases and five cases court-resolved, respectively. (There are three pending MEPA lawsuits for a total of eight MEPA mining permit litigation cases since 2009.) The action of "State Road Construction" had only been litigated one time at the time of the 2009 review (pp. 8-10). The most commonly litigated MEPA issue is whether the state agency should have conducted a

MEPA analysis, usually an EIS. The second most common is whether the state agency's MEPA review (EA or EIS) was adequate.

In 2000, a MEPA case went before the Montana Supreme Court that touched on induced growth. In Montana Environmental Information Center v. Montana Dept of Transportation, 994 P.2d 676 (2000), plaintiffs challenged MDT's decision not to pursue a supplemental EIS to the 1991 Forestvale Interchange Draft EIS (DEIS). The Court felt that in the eight years that had passed since the MDT had issued the DEIS, the patterns of development in Helena, and the development around the Capitol Interchange were significant enough circumstances to require a supplemental EIS under MEPA, proving that the issue of induced growth is on the Montana Court's radar.

A 2012 MEPA case involving indirect effects is *County of Missoula, National Wildlife Federation, et al. v. Montana Department of Transportation, et al*. This case dealt with the transport of oversized loads thorough Montana on rural roads, which were in need of numerous upgrades and/or modifications in order to accommodate the loads. Montana Department of Transportation prepared an Environmental Assessment under MEPA (Plaintiffs' Brief in Support of Motion for Preliminary Injunction (2011)). In its "*Memorandum and Order on Cross Motions for Summary Judgment,"* the District Court found that MDT failed to consider the significance criteria in ARM 18.2.238, with regard to turnouts. It stated that "determining the growth-inducing or inhibit aspects, precedential effects, and severity and duration of impacts resulting from construction of the turnouts is largely dependent upon whether the turnouts will be permanent or temporary." It further concluded that in failing to determine, as part of the environmental review process, whether turnouts would be temporary, MDT failed to determine the scope of the project. The Court held that MDT's decision to approve the Kearl Module Transportation Project (KMTP) permit without first determined the scope of the project violated ARM 18.2.238, and is "arbitrary, capricious, and not in accordance with the law" (decision issued February 17, 2012*).* The EA was remanded back to MDT to conduct an environmental review to determine whether the turnouts will be permanent or temporary and assess the impacts accordingly. Additionally, evidence relating to Imperial's use of alternate routes to transport reconfigured KMTP modules was remanded to MDT for its consideration pursuant to MCA 75-1-201(c)(3).

2.2 Review of Montana State Statutes Regarding Land Use

Growth policies, zoning, and subdivision regulations are all important tools in determining the future of development in Montana. This section provides an overview of Montana land use statutes that grant the authority for counties and local communities to conduct land use planning (e.g., growth policies), and enact regulations controlling the type and form of future development (e.g., subdivision and zoning regulations). Understanding the Montana regulatory framework for land use is important to properly considering land use regulations in the assessment of potential indirect land use effects of transportation projects. A key finding is that the likelihood of the growth patterns desired in the local growth policy becoming reality depends on the strength of the enforceable zoning and subdivision regulations adopted consistent with the policy.

State-level requirements related to land use planning and regulation are contained in Title 76 of the MCA: Land Resources and Use. Key sections are summarized below.

2.2.1 Title 76, Chapter 1: Planning Boards

MCA Title 76, Chapter 1 allows cities, towns, and counties to create planning boards, and provides the procedures for creation of planning boards. The basic function of the planning board is to provide advice to the local government officials on land use planning and development issues. It is important to note that cities and counties are not bound by planning board recommendations.

If requested to do so by the local government, the planning board can develop growth policy. The statutory requirements with respect to the contents of the growth policy are discussed in Section 2.3.1.1 of this report. In addition to growth policies, the planning board is authorized to propose policies for subdivision plats; the development of public ways, public places, public structures, and public and private utilities; the issuance of improvement location permits on platted and unplatted lands; or the laying out and development of public ways and services to platted and unplatted lands.

The MCA also provides rules for planning board membership (e.g., generally a nine member minimum for city-county planning board), meetings, and funding (including authorization for local tax to fund planning boards). Rules are provided for establishing jurisdictional boundaries of planning boards and the process for expanding jurisdictional boundaries. For city-county planning boards, the jurisdictional area "shall include the area within the incorporated limits of the city and such contiguous unincorporated area outside the city as, in the judgment of the respective governing bodies, bears reasonable relation to the development of the area involved" (MCA 76-1-504). If requested by local government officials, planning boards are allowed to conduct specific planning projects within the county and outside of the jurisdictional area of a city-county planning board.

2.2.1.1 MCA 76-1-601: Growth Policy

Although not required, local governments in Montana are allowed to adopt growth policies that provide general planning direction to the location and form of future development within their jurisdiction. A growth policy must be adopted in order for a local government to enact zoning regulations to implement the policy. Subdivision regulations are also required to be consistent with the growth policy. The local government is required to give consideration to the growth policy in making certain types of decisions, such as approving new or modified public buildings and infrastructure. However, the state law emphasizes that the growth policy itself is not a regulatory document and cannot be used as the sole basis to "withhold, deny, or impose conditions on any land use approval." As result, the likelihood of the growth patterns desired in the growth policy becoming reality depends on the strength of the enforceable zoning and subdivision regulations adopted consistent with the policy.

According to MCA 76-1-604, residents of the area covered by a growth policy can adopt, revise, or repeal a growth policy by petition for a ballot initiative or referendum. The petition must contain the signatures of 15 percent of qualified voters in the area covered by the growth policy.

Table 1 summarizes the required and optional elements of a growth policy. Local communities have discretion in determining the degree to which each of the required elements is addressed. Optional elements of growth polices include neighborhood plans and infrastructure plans. If the jurisdiction completes and adopts an infrastructure plan that is compliant with the growth policy statute and the area covered by the plan is zoned, subdivisions proposed in the subject area would be exempt from providing an environmental assessment, public hearings, and from review under the primary subdivision review criteria. For more information on growth policies, refer to "Montana's Growth Policy Resource Book" (Montana Department of Commerce, 2009).

Table 1: Required Elements of Growth Policies under MCA 76-1-601

Required Elements
Statement of community goals and objectives as well as a description of policies, regulations, and other measures to be implemented in order to achieve the goals and objectives.
Maps and text describing an inventory of the existing characteristics and features of the jurisdictional area, including land use, population, housing needs, economic conditions, local services, public facilities, natural resources, and sand and gravel resources.
Projected trends for the life of the growth policy for each of the following elements: land use, population, housing needs, economic conditions, local services, and natural resources.
A strategy for development, maintenance, and replacement of public infrastructure, including drinking water systems, wastewater treatment facilities, sewer systems, solid waste facilities, fire protection facilities, roads, and bridges.
An implementation strategy that includes: a timetable for implementing the growth policy, a list of conditions that will lead to a revision of the growth policy, a timetable for reviewing the growth policy at least once every five years, and revising the policy if necessary.
A statement of how the governing bodies will coordinate and cooperate with other jurisdictions (e.g., between a city and the surrounding county).
An explanation of how the governing body will evaluate and make decisions regarding proposed subdivisions with respect to the "public interest" criteria established in MCA 76-3-608 (3)(a). The public interest criteria are agriculture, agricultural water user facilities, local services, the natural environment, wildlife and wildlife habitat, and public health and safety.
A statement explaining how public hearings regarding proposed subdivisions will be conducted.
An evaluation of the potential for fire and wildland fire in the jurisdictional area.

2.2.2 Title 76, Chapter 2: Planning and Zoning

Zoning districts in Montana can be enacted by cities, towns, and counties (outside incorporated areas). In unincorporated areas, citizens can also create zoning districts by obtaining signatures of 60 percent of affected property owners (MCA 76-2-101). Zoning is authorized, but is not required. County and municipal zoning is required to be consistent with the growth policy and designed to: secure safety from fire and other dangers; promote public health, public safety, and general welfare; and facilitate the adequate provision of transportation, water, sewerage, schools,

parks, and other public requirements. Other issues that must be considered in adopting zoning regulations include: provision of adequate light and air, the effect on motorized and non-motorized transportation systems, supporting compatible urban growth, the character of the district and its suitability for particular uses, conserving the value of buildings, and encouraging the most appropriate use of land throughout the jurisdictional area. County zoning regulations must, as nearly as possible, be made compatible with the zoning ordinances of nearby municipalities.

Municipalities are allowed to enforce their zoning and subdivision regulations beyond municipal boundaries if there is no county zoning in place. The limits of municipal zoning/subdivision regulations outside the incorporated area are as follows: up to 4.83 km (3 miles) beyond the limits of a city having a population of 10,000 or more, up to 3.22 km (2 miles) beyond the limits of a city having a population of less than 10,000 and more than 5,000, and up to 1.61 km (1 mile) beyond the limits of a city or town with a population less than 5,000 and more than 1,000 (MCA 76-2-310). In order to enforce these regulations in an unincorporated area, two representatives from the unincorporated area must be appointed to the city planning board attempting to exercise regulation. If no board exists, one must be created in order to allow the unincorporated area proper representation.

Montana state law gives special protections from zoning requirements to agricultural and certain natural-resource based industries. For example, county zoning is prohibited from regulating lands used for grazing, horticulture, agriculture, or the growing of timber.

Counties and municipalities are authorized to establish permitting systems and fees to implement zoning. Zoning variances can be granted where the variance is not contrary to the public interest, where, owing to special conditions, a literal enforcement of zoning regulations will result in unnecessary hardship.

2.2.3 Title 76, Chapter 3: Local Regulation of Subdivisions

Subdivision regulations are required for all cities, counties, and towns according to the Montana Subdivision and Platting Act and are the most commonly used tool for regulating development at the local level. A growth policy is not required to adopt subdivision regulations, but if a growth policy has been adopted, the subdivision regulations must be consistent with the growth policy. MCA Title 76, Chapter 3 addresses the requirements for subdivision plats, the subdivision review process, survey requirements, and requirements for local subdivision regulations. In general terms, a subdivision is a division of land creating a parcel or parcels of less than 0.65 square-km (160 acres) in size each. A subdivision has a specific legal definition in MCA 76-3-103(15):

> *"Subdivision" means a division of land or land so divided that it creates one or more parcels containing less than 160 acres that cannot be described as a one-quarter aliquot part of a United States government section, exclusive of public roadways, in order that the title to or possession of the parcels may be sold, rented, leased, or otherwise conveyed and includes any re-subdivision and further*

> *includes a condominium or area, regardless of its size, that provides or will provide multiple space for recreational camping vehicles or mobile homes.*

Local subdivision regulations address the design and standards for lots, streets, grading, drainage, open space, utility easements, and water rights issues (including ditch easements). Among other requirements, local subdivision regulations are required to identify areas where subdivision development is prohibited because of natural or human-caused hazards (unless the hazard can be overcome with mitigation measures). An environmental assessment is required to accompany the subdivision application (with some exceptions).

Subdivision regulations may authorize the governing body to grant variances from the regulations when strict compliance will result in undue hardship and when it is not essential to the public welfare. The variances request must be based on specific variance criteria in the municipality's subdivision regulations. Except for certain "minor subdivisions," public hearings are required on variance requests.

If a municipality has adopted a growth policy, the municipality is permitted (not required) to adopt special subdivision regulations to promote cluster development and preserve open space. Cluster development regulations are required to establish a maximum size for each parcel in a cluster development, a maximum number of parcels in a cluster development, and a minimum size of preserved open space. Land protected as open space on a long-term basis must be identified on the final subdivision plat, and the plat must include a copy of or a reference to the irrevocable covenant. As described in MCA 70-17-203, a covenant is a permanent dedication that runs with the land. The purpose of this is to prohibit further subdivision, division, or development of the open space lots or parcels (MCA 76-3-509(c)). Municipalities may adopt regulations that encourage cluster development by providing shorter review time periods and exemptions from certain other subdivision regulation requirements such as environmental assessment (MCA 76-3-603), review criteria (MCA 76-3-608(3)(a)), and park dedication requirements (MCA 76-3-621).

Local subdivision regulations are generally not allowed to be more stringent than state regulations or guidelines that address the same issue. A process exists for localities to demonstrate why a particular regulation more strict than state standards is essential, which includes the submission of a written finding that references information and peer-reviewed scientific studies, to be prepared after public hearing and public comment. Under MCA 76-3-511, it must be proven that the proposed stricter requirement is necessary to protect public health or the environment, that it can mitigate harm to public health or the environment and that it is achievable under current technology. Subsequently, individuals may challenge a local regulation if they believe it is stricter than a state standard by petitioning the governing body to review the regulation. The governing body may either revise the regulation or provide a written finding for its necessity as described above.

2.2.4 Title 76, Chapter 4: State Regulation of Subdivisions

MCA Title 76, Chapter 4 authorizes the Montana Department of Environmental Quality (MDEQ) to adopt rules and standards to provide the basis for approving subdivisions for public

and private water supply, sewage disposal, solid waste disposal, and storm drainage systems (MCA 76-4-104). The objective of Title 76, Chapter 4 is to protect the quality and potability of water for public water supplies and domestic uses, as well as to protect the quality of water for other beneficial uses, including uses relating to agriculture, industry, recreation, and wildlife.

Title 76 Chapter 4 defines subdivisions differently than MCA Title 76 Chapter 3. Under Chapter 4, a subdivision subject to MDEQ review is "only those parcels of less than 0.08 square-km (20 acres) which have been created by a division of land." The MDEQ reviews divisions of land comprising less than 0.08 square-km (20 acres), as well as condominiums and recreational camping vehicle and mobile home parks. The MDEQ has developed design standards, operations and maintenance manuals (also known as "circulars") which are available on the MDEQ website, and provides standards for wastewater treatment systems, water supply development, and storm drainage systems. The state regulations also set minimum separation distances between water supply sources and potential contamination sources such as wastewater treatment systems, surface waters, and floodplains. The regulations and subdivision review are structured to prevent pollution problems through the proper design, location, operation, and maintenance of sanitation facilities.

2.3 Literature Review

2.3.1 National Research and Guidance

The following provides a listing of relevant guidance, guidebooks, handbooks, and other materials that have resulted from the research of assessing induced growth and its impacts as indirect effects.

2.3.1.1 NCHRP Report 403: Guidance for Estimating the Indirect Effects of Proposed Transportation Projects (LBG 1998)

In response to the need for guidance on indirect effects, the National Cooperative Highway Research Program (NCHRP) initiated Project 25-10 (1), "Guidance for Estimating the Indirect Effects of Proposed Transportation Projects." Report 403 is a manual that presents an eight-step framework for estimating indirect effects and was developed with the objective of developing an analysis framework, guidelines, and supporting methods to identify, understand, describe, and evaluate indirect effects of transportation projects. The eight-step process has been adopted by numerous states across the country, and adapted to fit their specific needs. Report 403 and its accompaniment Report 466 (LBG 2002) are two of the most frequently referenced documents written on the topic of indirect effects.

2.3.1.2 NCHRP Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects (LBG 2002)

This report was prepared under NCHRP Project 25-10 (2), as an update and companion to NCHRP Report 403. It is cited as "the core practitioners' guidance document" and provides further elaboration on the steps that were developed in Report 403 for the use of practitioners.

Report 403 defined a step-by-step process that has since been adopted by numerous states and adapted to fit their specific needs. The first step of Initial Scoping was added in Report 466 to create what is commonly referred to as "the 8-step process."

1. Initial Scoping for Indirect Effects Analysis
2. Identify the Study Area's Various Directions and Goals
3. Inventory Notable Features
4. Identify Impact-Causing Activities of the Proposed Action and Alternatives
5. Identify Potentially Significant Indirect Effects for Analysis
6. Analyze the Identified Potentially Significant Indirect Effects
7. Evaluate the Analysis Results
8. Assess the Consequences and Develop Mitigation

Step 4b of this process explains the general issues for identifying potentially significant indirect effects and delineates three categories of transportation-related induced growth effects as follows:

1. Projects Planned to Serve a Specific Development

This category occurs when the proposed transportation facility would serve a specific development at an existing or proposed activity center (e.g., a highway interchange for a planned residential subdivision). This type of effect is common when land development is part of the purpose and need for the project, and the highway and land development projects are interdependent. This category is associated with highway, transit, and rail modes.

In this case, the land development proposal is an indirect effect of the highway project. There should be a high level of confidence that the effects will occur and as well as a high level of specificity about the nature, extent, and timing of the effects. Because the land development is the transportation project's reason for being, there should be a high need to know the effect so the costs of land development can be weighed against the benefits.

2. Projects that Would Likely Stimulate Land Development Having Complimentary Functions

This category of induced growth occurs when the proposed transportation facility will likely stimulate supporting and/or complementary land uses such as gas stations, restaurants, and hotels at highway interchanges. This category is associated with all transportation modes.

The confidence that the effects will occur, specific knowledge about the effects, and the need to know about the effects vary with the circumstances of the project. In some cases—e.g., port or airport landside facilities—specific land development proposals by other entities may have been formed in reaction to, or in conjunction with, the proposed transportation project. In such cases, the land-development and related effects should

be treated as indirect effects of the transportation project. The extent and nature of eventual landside development can be forecast from market studies, infrastructure capacity, and other factors. In other cases, confidence and specificity about the likelihood of complementary development can be identified from studies of comparable situations.

3. Projects That Would Likely Influence Intraregional Land Development Location Decisions

This category of induced growth occurs when the proposed transportation facility will likely influence decisions about the location of growth and development among various locations within a region (intraregional development shifts). If conditions in a region are generally favorable for growth, a highway project becomes one of the many factors that influence where development will occur. This category is associated with highway and transit modes.

On a regional basis, the impact of highway and transit projects on economic growth appears to be minimal; however, the localized effect of such projects on land use can be substantial. If the conditions for development are generally favorable in a region—i.e., the region is undergoing urbanization—then highway and transit projects can become one of many factors that influence where development will occur.

2.3.1.3 NCHRP Report 423A: Land Use Impacts of Transportation – A Guidebook (Parsons Brinckerhoff Quade and Douglas 1998)

This guidebook provides a primer of the causes of changes in land use and reviews the different approaches that can be used to analyze land use impacts resulting from transportation projects and plans/policies, and for the purpose of collecting data for models. It examines the reasoning and logic for choosing one method of analysis over another, and emphasizes a local approach rather than a one-size-fits-all methodology. The guidebook also notes strengths and weaknesses in different approaches, and some common misconceptions that have been applied over the years in assessing the potential for growth.

2.3.1.4 NCHRP Report 456: Guidebook for Assessing the Social and Economic Effects of Transportation Projects (Forkenbrock and Weisbrod 2001)

This early report provides a four-step process for estimating the effects of economic development. Step 4 is to estimate the indirect, induced, and dynamic effects on economic development; for example, the "domino effect" that business activity can have on an area. The term "dynamic effects" are used to describe substantial effects on a region's economy that may lead to changes in labor costs, changes in land and building prices, and workforce migration.

2.3.1.5 NCHRP Project 8-36 (Task 4): The Use of Expert Panels in Analyzing Transportation and Land Use Alternatives (Parsons Brinckerhoff Quade and Douglas 2002)

This report discusses expert panels, especially those utilizing the Delphi Method, and under what circumstances their use is most helpful. It presents detailed guidelines entitled "six steps for a successful panel" which resulted from six case studies whose backgrounds are integrated into the guidelines as examples.

2.3.1.6 FHWA: Interim Guidance: Questions and Answers Regarding Indirect and Cumulative Impact Considerations in the NEPA Process (FHWA 2003)

This "Questions and Answers" section of the Environmental Guidebook addresses indirect and cumulative impact considerations in the context of the NEPA process. The topics covered include the definitions of and differences between direct, secondary, indirect, and cumulative impacts; what to do when data needed for determining "reasonably foreseeable" actions are unavailable; FHWA's specific policy and requirements regarding indirect and cumulative impact analysis in the NEPA process; and specific strategies for addressing indirect and cumulative impacts, as well as requirements for discussing mitigation. These questions and answers also cover legal topics, such as FHWA's legal authority to mitigate environmental impacts identified in the NEPA process, and include a short review of the case law that addresses the definition of "reasonably foreseeable" actions.

2.3.1.7 Executive Order 13274: Indirect and Cumulative Impacts Work Group Baseline Report (ICF Consulting 2005)

This report presents "baseline" information developed for the Indirect and Cumulative Impacts Work Group. The purpose of the baseline assessment was to describe existing legal requirements, practices, and challenges being faced in regard to indirect and cumulative impacts; describe opportunities to improve the analysis of indirect and cumulative impacts and interagency agreement on these issues; and to develop recommendations for consideration by the Interagency Task Force that was established under Executive Order 13274. This document was designed both for the Task Force, and for practitioners in transportation and resource agencies to provide a common understanding of requirements, resources, and mechanisms currently available to improve the analysis, documentation, and mitigation (avoidance, minimization, and compensation) of indirect and cumulative impacts.

2.3.1.8 Handbook on Integrating Land Use Considerations into Transportation Projects to Address Induced Growth (ICF Consulting 2005b)

This handbook was the result of research conducted under NCHRP Project 25-25 (Task 3) which was titled "Assessment and Mitigation Strategies for Land Development: Impacts of Transportation Improvements." The research and resulting handbook focus on case studies and interviews conducted that reveal how certain states transportation agencies were engaging with the land use planning process. It examined growth planning efforts at the local, state, and regional level. It also looked at the methods that state transportation agencies were using to analyze land use changes, including the use of Delphi Panels, quantitative methods, and

modeling. It also provided strategies for avoiding undesirable land use impacts from transportation projects, which include a number of regulatory controls, plans, easements, and the use of Context Sensitive Solutions.

2.3.1.9 NCHRP Project 25-25 (Task 11): Indirect and Cumulative Impacts Analysis (Stanley 2006)

This study reviews the requirements for indirect and cumulative impacts analysis and mitigation under major environmental regulations. The study recommends a collaborative process where all agencies should agree on a shared vision which consists of the following elements: clarity of process expectations, understanding of statutory and regulatory tensions, defined outcomes, and commitment to participation in the process. A transparent and well-documented case-by-case analysis is encouraged for adequate indirect and cumulative impacts analysis with an emphasis on interagency coordination.

2.3.1.10 NCHRP Project 25-25 (Task 22): Forecasting Indirect Land Use Effects of Transportation Projects (Avin et al. 2007)

The intent of Task 22 is to provide additional information on selected land use forecasting methodologies based on the in-depth interviews of six practitioners and a literature review. The study highlights six approaches/tools for forecasting land use change in response to transportation improvements. This report notes that it is meant to be used as a supplement to NCHRP Report 466 (LBG 2002).

2.3.1.11 NCHRP Project 25-25 (Task 43): Legal Sufficiency Criteria for Adequate Indirect Effects and Cumulative Impacts Analysis as Related to NEPA Documents (LBG 2008)

This report reviewed and analyzed federal and state guidance, published literature, court decisions, and actual EISs in terms of the development of criteria for analyzing indirect effects and cumulative impacts. Precedent setting court cases on the topic were reviewed and cross-referenced with more recent cases to show the extent or "reach" of the decision in helping to set a precedent. Six major projects, their environmental documentation, and resulting court cases were analyzed to determine the factors in the case being decided in favor of or against the government. The supplemental or new EISs that resulted from the lawsuit were also reviewed for the purpose of a more close-up examination of recent developments in indirect effects and cumulative impacts analysis. Lessons learned were extracted from these cases and incorporated into a guidebook of best practices.

2.3.1.12 Federal Highway Administration: Interim Guidance on the Application of Travel and Land Use Forecasting in NEPA (FHWA 2010)

This interim guidance addresses the issues encountered in applying travel and land use forecasting in environmental analysis, specifically in the analysis of induced land development and indirect and/or cumulative effects under NEPA. Use of the guidance is voluntary and is the first of its kind from FHWA to address this issue. It is accompanied by a thorough case law review. Webinars and trainings were conducted with the states in 2010 and feedback on the

guidance was accepted until September 2010. As of June 2013, final guidance has not yet been issued.

2.3.1.13 AASHTO, Center for Environmental Excellence: Practitioner's Handbook 12 - Assessing Indirect Effects and Cumulative Impacts under NEPA (2011)

Under the topic of Indirect Effects, this handbook acknowledges that "the issue of induced growth arises most frequently and presents the greatest conceptual and technical challenges for practitioners", and chooses to focus this section solely on induced growth. It provides three questions to consider in determining the chain of causation:

- Does the project have the potential to increase mobility and/or accessibility? If so, in what geographic area is increased accessibility likely to occur?
- Is the increased accessibility likely to cause changes in development patterns (timing, type, location, or amount)? If so, where are those changes in development likely to occur?
- What impacts are likely to result from changes in development patterns that are caused by the project? What specific types of resources could be impacted?

The handbook outlines a step by step approach, consistent with many of the other documents referenced in this literature review.

2.3.2 State-Level Guidance

The guidance, guidebooks, and other materials noted above provide an excellent context for understanding the concept of induced growth and its results as indirect effects. The practice of analyzing these effects however, will need to vary from state to state and sometimes even at the local level. To this extent, several states have provided guidance to their planners and practitioners on how to analyze induced growth and indirect impacts in general in their state. There is no one size fits all approach to assessing the potential for induced growth. The analysis will also vary depending on the type of project. A general overview of state-specific guidance documents is provided below, with a more detailed review of select screening criteria/guidance provided as part of Section 4.2.

2.3.2.1 Texas Department of Transportation (TxDOT)

Revised Guidance on Preparing Indirect and Cumulative Impact Analyses (TxDOT 2010): ftp://ftp.dot.state.tx.us/pub/txdot-info/env/impact_analyses.pdf

The Texas Department of Transportation recently published this update to their 2006 guidance. This revision provides clear guidance for preparers on how to determine what is reasonably foreseeable and makes it a point to differentiate between indirect effects and cumulative impacts. It refers readers to the three part test adopted by the Court in Sierra Club v. Marsh 976 F. 2d 763, 767 (1st Cir. 1992) (*Sierra Club IV*) for determining the certainty of impacts and points to state-specific legal precedent. The Guidance explains the nexus of economic development and purpose and need statements, as well as explains how this nexus triggers the need for a

discussion of the environmental impacts, from an indirect and cumulative perspective, alongside the discussion of the positive economic benefits that are expected. It provides a screening tool to help determine whether indirect effects need to be analyzed at the categorical exclusion level. The Guidance promotes an adapted eight-step process originating from NCHRP Report 466 which stresses the importance of early scoping. Throughout the document, clear examples of analyses are presented for each of the seven steps of the TxDOT process.

2.3.2.2 Wisconsin Department of Transportation (WisDOT)

Guidance for Conducting an Indirect Effects Analysis (WisDOT 2007):
http://www.dot.wisconsin.gov/localgov/land/effects.htm

The Wisconsin Department of Transportation Bureau of Equity and Environmental Services is working to develop, revise, and implement department policies for the indirect and cumulative impacts of transportation projects. In support of this effort, WisDOT hosted a peer exchange in August 2005 to share experiences and best practices with five other state DOTs and representatives from FHWA. The result is a detailed report that highlights the best practices that came out of the peer exchange discussions and provides an instructional summary of key terms as presented by FHWA in an effort to outline goals and next steps for addressing indirect and cumulative impacts in Wisconsin.

WisDOT's indirect effects guidance recommends two types of indirect effects be examined: "(1) Project encroachment effects and (2) Project influenced effects. Project influenced effects correspond to the induced growth-type effects described in NCHRP Report 466. The WisDOT Guidance provides a six step approach in the analysis and review of indirect effects, modeled after the eight-step approach in NCHRP Report 466. The document stresses interagency coordination and public participation throughout the scoping process as well as in the analysis phase. Although the type of analysis that will be necessary should be determined on a case-by-case basis, WisDOT suggests a qualitative approach to analyzing indirect effects rather than the use of computerized models. WisDOT also stresses the importance of documenting the consideration of all information used in the process; whether or not it is complete. The Guidance recommends using a "value neutral" approach by being careful not to refer to development that may be an effect of a project as "good" or "bad." This value neutral approach recognizes that individual local governments may differ on their views of development, and some view it as a positive effect.

2.3.2.3 North Carolina Department of Transportation / Department of Environment and Natural Resources

Guidance on Indirect and Cumulative Impact Assessment of Transportation Projects in North Carolina (NCDOT 2001):
http://www.ncdot.gov/doh/preconstruct/pe/ICI_Guidance.html

NCDOT has had guidance in place on indirect and cumulative effects (ICE) since 2001; however, it has continued to update its guidance in recent years. NCDOT's 2001 guidance (also available through FHWA's website) was updated in 2004 to include a pre-screening process

which is intended to precede the already established eight step process used in assessing ICEs for transportation projects. The pre-screening process incorporates guidance already in use from North Carolina Department of the Environment and Natural Resources' (NCDENR) Division of Water Quality (DWQ) on the assessment of indirect and cumulative impacts for the express purpose of dealing with Section 401 Water Quality Certification.

The pre-screening process is intended to take place during systems planning as the project's design concept and scope begin to take shape. The pre-screening describes which types of CE's may require the eight-step Indirect and Cumulative Impact (ICI) assessment and notes that pre-screening is not necessary for EIS-level projects, since it has already been established that the eight-step process will be initiated on all projects classified as Environmental Impact Statements. The eight-step assessment will also likely be needed for urban projects for principal arterial and/or minor arterial system roadways, and for rural projects for arterial and/or major collector roadways. The revised guidance describes what these types of projects consist of as well. Certain types of land use changes such as the change in accessibility by lowering the travel time by five minutes or more, thereby increasing the attractiveness of an area; will also warrant the eight-step assessment. Additionally, it is suggested that the eight-step process be initiated for projects located in an area where the population and/or employment of an area is increasing greater than two percent per year, where public water and sewer are available or planned, and if there is weak or no growth management policy for the area. The revised guidance also provides an example of a statement to include in the documentation, should it be found that the eight-step process was not warranted.

Also in 2004, a memorandum was released with the purpose of describing the manner in which the NCDOT/NCDENR ICI Assessment Procedures can incorporate water quality considerations. The goal being that by incorporating such procedures into the ICI assessment guidance, the assessment can provide the basis for addressing cumulative impacts as required by the Department of Environment and Natural Resources, Division of Water Quality to implement Section 401 of the Clean Water Act.

2.3.2.4 California Department of Transportation (Caltrans)

Guidance for Preparers of Growth-related, Indirect Impact Analysis (Caltrans 2005/updated 2006):
http://www.dot.ca.gov/ser/cumulative_guidance/approach.htm

This guidance deals specifically with surface transportation projects in California that are subject to NEPA and/or the California Environmental Quality Act (CEQA). The guidance notes that highway projects built along a new alignment and/or provide new access will typically require a growth-related impacts analysis. Six chapters are provided for approaching this analysis including a discussion of the concepts of "reasonably foreseeable" and "causality" as related to assessing growth-related impacts as well as a chapter which provides a screening approach for identifying the need for, and extent of a growth-related impact analysis. This guidance was prepared to address California's specific challenges and emphasized early communication, coordination, and involvement among federal, state, and local agencies to avoid conflict and delay.

In addition to this guidance, support documents are also provided on Caltrans' website as "issue papers." An issue paper on Defining Resource Study Areas (RSA) is also provided for planners. This paper suggests planners take advantage of the scoping process to use the expertise of other agencies in helping to identify an appropriate RSA and cautions against using political boundaries for an RSA. An in-depth issue paper on Data Gathering is also available and includes a discussion on ways to identify existing data and steps to take when no data is available. It also includes information about which agencies to contact and the types of data they maintain. It includes information on data generation techniques such as interviews and the use of expert panels, including Delphi Panels, and when such techniques are appropriate. This paper also provides actual examples of questions to ask planning agencies, councils of government, resource specialists, and advocacy organizations to aid in collecting data for analysis.

2.3.2.5 Oregon Department of Transportation (ODOT)

A Guidebook for Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements (ODOT 2001):
http://www.oregon.gov/OPRD/PLANS/docs/

The Oregon Department of Transportation offers a Guidebook for Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements that was prepared by Portland State University and published in April 2001. It is geared towards planners and environmental specialists working at ODOT, and is located on FHWA's website. The report provides a framework for evaluating the indirect impacts of highway improvements on land use. The report refers to the NCHRP Report 403 as "the most comprehensive source on methods" and explains that the methods explained in Report 403 have been adapted to apply to estimating indirect land use for the ODOT report.

The ODOT report provides instruction on choosing a study area and gathering the appropriate policy, land use, and facility data in order to conduct an analysis on the indirect effects to land use. It also instructs which other impacts to consider in the analysis. The report provides a helpful table for assessing indirect effects by listing the change variable and its data source, and then providing a range of values and the potential for land use change based on those values on a scale of low to high. The report provides a sample analysis which is presented as a journal showing each step that the analyst would go through in the process, as well as a sample land use report.

2.3.2.6 Maryland State Highway Administration (Maryland SHA)

Indirect and Cumulative Effects Analysis Guidelines (Maryland SHA Revised 2007):
http://roads.maryland.gov/OPPEN/2007_Guidelines.pdf

The Maryland State Highway Administration (SHA) Indirect and Cumulative Effects Analysis Guidelines were last revised in 2007. Unlike some states, Maryland SHA requires that a single boundary for analysis be determined, which may include all other overlapping sub-boundaries, using the outermost boundaries to establish the overall study area boundary. This study area may

include the areas affected by traffic, census tracts, county planning areas, sewer and water service, and others. For the establishment of time frames, the guidelines recommend using historic events that would have had a major effect on population growth, land use, and resources.

The guidance emphasizes the importance of utilizing existing data to assess indirect and cumulative effects. The recommended analysis approaches include trend analysis, overlays, matrices and interviews. A notable feature of the Maryland SHA guidance is the special attention given to addressing indirect and cumulative effects in categorical exclusions, including screening criteria/questions to consider in determining if an analysis is necessary. Examples of indirect and cumulative effects analysis documentation for categorical exclusions are also provided.

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3 Review of Existing MDT Practice

3.1 Introduction

The purpose of the research described in this section was to understand MDT's current practices in addressing indirect land use effects in MEPA and NEPA documentation. This understanding was used to develop the indirect effects screening and detailed analysis framework (Indirect Effects Desk Reference: Appendix 1). It is important to note that the purpose of this section was not to assess the legal sufficiency of past environmental reviews or to critique existing practice. Instead, this material was intended to benchmark current practice in relation to best practices for addressing indirect land use effects and to provide constructive, forward-looking suggestions on how the state of the practice can be advanced.

The review of MDT's existing practice was accomplished through two methods:

- Informal interviews with ten MDT staff responsible for preparing and/or reviewing indirect effects assessments. (Section 3.2)
- Survey of resource agencies that review MDT environmental documents. (Section 3.3)
- Review of nineteen MDT environmental documents, including Categorical Exclusions, Environmental Assessments, and Environmental Impact Statements. (Section 3.4)

Section 3.5 describes the overall conclusions and recommendations from the activities listed above.

3.2 MDT Staff Interviews

In order to gather issue and information trends on the way indirect land use effects are addressed in MDT environmental documents, informal interviews were conducted with MDT Project Development Engineers, environmental staff, and legal staff during the month of July 2012.

These interviews were intended to discuss key projects involving unique circumstances surrounding the potential to assess induced growth. The interviews were also intended to uncover issues encountered in assessing indirect land use effects including knowledge of the appropriate methodologies, comments/coordination with resource agencies, and the availability of the necessary data and resources to complete this aspect of MEPA/NEPA environmental documentation.

3.2.1 Interview Methodology

The Louis Berger Group, Inc. (LBG) research team was provided with a contact list of ten MDT District Project Development Engineers, environmental staff, and legal counsel to interview for this task. Initial contact with these individuals was made via email, with an introduction to the project and a link to an online screener survey. The screener survey was developed to better gauge the level of involvement each of these contacts has had in the analysis of induced growth—whether through direct experience with the preparation of such an analysis or through

review of an analysis prepared by a consultant. Telephone interviews were then scheduled with each participant according to the availability that they indicated in the survey. General interview questions were developed in advance of the interviews and vetted by members of the research panel prior to use. The interview questions addressed the familiarity of the interview candidates with indirect effects, strengths/weaknesses of MDT's current approaches to addressing indirect effects, and information on specific projects that posed unique challenges with respect to induced growth issues. To ensure candid responses, the interview participants were assured that their identities would not be disclosed in the project report. The interview questions are reproduced below.

General questions for each participant:
1. What is your understanding of the meaning of the term "induced growth" as it relates to transportation projects?

2. Do you think transportation projects in Montana typically respond to growth that will occur regardless of the project, or do you see a role for transportation projects in encouraging growth or shaping location of future growth?

3. In your experience, how are transportation project-related growth impacts perceived by different groups in Montana (positive benefit vs. negative "impact" of unwanted growth)? Local residents, regulatory agencies, transportation planners, environmental groups, federal land agencies etc.

4. In general, what do you see are the strengths and weaknesses of the way induced growth or indirect land use changes are currently addressed in MDT environmental documents?

5. Do you think the level of effort expended on induced growth issues in environmental review of transportation projects currently is just about right, too high or too low? Why?

For those who responded in the screener survey that they have experience in assessing induced growth:
Regarding specific projects where indirect land use issues were addressed as noted in screener survey.

- Name and location of project
- Basic project scope- e.g. 5 miles of widening, new interchange, new arterial road etc.
- NEPA, MEPA or Both
- Type of documentation prepared- CE, EA, EIS
- Approx. year environmental review completed
- Lead responsibility for indirect effects analysis portion of environmental document- MDT or consultant?

- Describe the analysis methodology used/factors considered in reaching conclusions on indirect land use effects of this project. (land availability, travel time changes, local zoning etc.)

- Did you use any national level guidance/research documents or guidance documents from other states in preparing the indirect land use effects assessment? Which ones? If yes, were the guidance documents helpful? What about it was applicable /inapplicable to Montana conditions?

- Were resource agencies (EPA, USFWS, ACOE, DEQ etc) consulted in the development of the indirect effects methodology? Did they have any comments prior to the final decision? If yes, what were their concerns and recommendations? How were their concerns ultimately addressed?

- If the project was many years ago, how did land use in the project area eventually develop? Were the conclusions in the analysis correct?

3.2.2 Interview Results

3.2.2.1 MDT Legal

Interviews with legal staff indicated a general perspective that MDT is attempting to respond to growth that has already occurred by providing infrastructure upgrades, however it was acknowledged that this may also create more opportunities for businesses that cater to the traveling public.

Recent experience with the Kearl Module Transport Project MEPA case (County of Missoula, National Wildlife Federation, et al. v. Montana Department of Transportation, et al. (2012)) was discussed during interviews with MDT legal. In 2010, MDT prepared an Environmental Assessment under MEPA for the Kearl Module Transport Project, followed by a Finding of No Significant Impact in 2011. The project involved a request by Imperial Oil for oversized load permits, encroachment permits and utility occupancy permits from MDT to facilitate the transport of heavy equipment through Montana to Alberta Oil Sands. The infrastructure improvements proposed to be conducted by Imperial Oil included utility relocations, modification or installation of traffic control devices, modification to 22 existing highway turnouts and construction of 53 new turnouts, among other improvements. The MEPA review did not state whether the new turnouts would be temporary or permanent, which the court found to be an error that prevented a proper consideration of induced traffic impacts. If the turnouts were permanent, then this project could encourage other oversize loads to use the same route to Canada, resulting in additional impacts not considered in the EA. The EA was remanded back to MDT to conduct an environmental review that includes a determination of whether the turnouts will be permanent or temporary and assess the impacts accordingly. Although Imperial Oil has since withdrawn its request to transport overweight loads through Montana, the case provides an example of an issue that could occur on other similar projects.

3.2.2.2 MDT Environmental

MDT environmental staff indicated a high level of interest and need for a standardized process for analyzing induced growth resulting from transportation projects in Montana under MEPA and NEPA. While staff noted that many transportation projects are a response to growth that is occurring or has already occurred, there are projects that do not follow this trend or could influence the pattern of future development. While much of Montana remains in a rural state, there are areas that are experiencing steady growth such as the Helena Valley, Missoula, Billings, Bozeman, and Kalispell. For projects in these areas, MDT has instructed its consultants to look for indicators of growth pressure including plat changes, subdivision applications, and septic tank/utility applications as part of the assessment of induced growth issues.

Most projects qualify as Categorical Exclusions (CE), resulting in this being the most common type of environmental document being prepared by MDT under both MEPA and NEPA. Since these CE documents are typically prepared by environmental engineers, it was noted that a checklist or flowchart would be most helpful to assist in the preparation and also to allow MDT to be able to provide a simple and consistent methodology to its consultants.

3.2.2.3 MDT Project Engineering

The MDT project engineering interviewees have generally been closest to the process of analyzing induced growth and reviewing the analysis of others/consultants and have experienced the need for a standardized process/methodology. The desire for growth, or resistance to it, depends greatly on the geographic location within the state. The eastern part of the state has been experiencing growth related to the Bakken oil shale project; however this growth is not a result of MDT projects.

It was explained that many MDT projects qualify as CEs. Based on a review of the CE checklists that MDT uses (narrative and programmatic), it appears that they do not specifically inquire about induced growth, but they do ask about the rate of residential and commercial growth in the proposed project's area. In order to answer these questions, it was indicated that practitioners will usually rely on their institutional knowledge and familiarity with the project area; it was also indicated that certain types of U.S. Census data is not always available for rural parts of Montana.

For projects that are in a more urban setting, MDT will generally look at traffic numbers and planning documents, in order to predict the likelihood of induced growth. Some cities were noted as being more active than others in dictating their plans for growth. Additionally, MDT has been increasing its corridor study efforts, which will streamline the environmental process and help to identify the potential for induced growth.

With the exception of the FHWA and U.S. EPA, other agencies have not voiced concerns on the topic of induced growth. MDT wishes to maintain a collaborative relationship with the resource agencies and expects that the Army Corps of Engineers may also look at MDT's induced growth analyses as part of their Clean Water Act §404b(1) analysis. It was noted that most of the growth concerns come from local residents and/or environmental groups who wish to preserve the rural nature of their surroundings. Examples of projects where induced growth was an issue included U.S. 93 Ninepipe/Ronan EIS (tribes and towns were concerned about induced growth

and asked for additional studies) and Russell Street, Missoula EIS where confusion about the appropriate level of analysis led to FHWA completing most of the analysis.

Staff reported local residents sometimes raise induced growth issues when MDT is approached by private developers to grant permits for right of way access. While there is usually a land use or growth plan in place that governs in these circumstances, it is important to note that some rural areas do not have such plans or local processes. Local residents are concerned that increasing the number of access points will encourage subdivisions and new growth.

MDT prepared a DEIS for the Billings Bypass, which was released in August 2012. While this area is already experiencing planned growth, it is expected that some of the alternatives may accelerate the rate of this planned growth. Subsequently, the potential for additional housing opportunities are being evaluated. This project has been earmarked since the development of County and City growth plans in 2008 and the knowledge of this project has undoubtedly influenced plans for land use in the area.

3.2.2.4 Conclusions

Nearly all MDT interview participants indicated the need and desire for a standardized process to analyze induced growth to be used in-house on CEs and to provide to consultants for their use in preparing EISs and EAs. Practitioners feel that the guidance that is available currently is applicable only to very large cities, but not the small cities that exist in Montana. While some cities have taken the initiative to develop growth plans, rural areas may not have such processes and it is not clear how to address this situation, especially when the project is a CE.

While the tendency has been to assume that MDT projects are in response to growth, there is the acknowledgment and understanding that the transportation-land use relationship is more complex. The existing induced growth analysis practice can be improved on by putting a standard procedure into place

3.3 Survey of Other State and Federal Agencies

3.3.1 Purpose and Methodology

As part of evaluating other state and federal agency policies, procedures, and practices, it was determined that it may be beneficial to reach out to outside agency personnel to identify issues and methods of particular relevance for Montana. In order to identify potential topics or issues of concern, a brief online survey was developed for distribution to targeted contacts at agencies with which MDT deals with on a regular basis.

On September 27, 2012, an email was sent to the eight agency contacts provided by MDT. This email contained a brief explanation of the research being conducted for MDT, as well as a link to the online survey. On October 11, a follow up email was sent to the same contacts, in an attempt to increase participation. The following agencies were contacted:

- Federal Highway Administration (FHWA)
- FHWA (Western Federal Lands Highway Division)

- U.S. Army Corps of Engineers (USACE)
- USACE - Omaha District
- U.S. Environmental Protection Agency (Region 8)
- U.S. Fish and Wildlife Service (USFWS)
- Montana Department of Environmental Quality

3.3.2 Survey Results

Four responses were received in total. The agencies that responded to the survey expressed support for this research and a desire to be a part of the development of methodology. Their responses are summarized below.

The U.S. Army Corps of Engineers (Corps) indicated that they have, at some time, provided comments on MDT environmental documents concerning induced growth and/or land use changes. The comments they have provided have dealt with impacts to aquatic resources, specifically within parcels that may be developed because they are adjacent to proposed improvements to highways and access points. The respondent indicated that the Corps has been a participant in interagency collaboration where induced growth was a topic of discussion and also confirmed that the Corps does consider indirect changes in land use to be a "secondary impact" as defined under Section 404 of the Clean Water Act. Although it was indicated that the Corps had not been part of a recent transportation project where mitigation for indirect land use effects was required as a permit condition, it was noted that the subject of induced growth is a topic of concern with the agency because cumulative development of watersheds is difficult to reverse or offset with mitigation.

The Western Federal Lands Division of FHWA responded that they had not provided any comments related to induced growth or land use changes on MDT environment documents. The agency indicated that they have been involved in interagency collaboration where induced growth was a topic of discussion and they do consider indirect changes in land use to be a "secondary impact" as defined under Section 404 of the Clean Water Act. FHWA had not had a recent transportation project where mitigation for indirect land use effects was required as a permit condition. The FHWA explained that they do consider induced growth to be a topic of concern at the agency because some of their projects include paving an existing gravel or dirt road and they receive quite a few public comments on these types of projects- expressing concern that the paving of a particular road might induce growth. The FHWA noted that they are very excited to learn that this analysis is moving forward and emphasized the need for this research in Montana and other states as well.

The USFWS also responded that they had not provided any comments related to induced growth or land use changes on MDT environmental documents. The agency indicated that they have been involved in interagency collaboration where induced growth was a topic of discussion and they do consider indirect changes in land use to be a "secondary impact" as defined under Section 404 of the Clean Water Act. The agency was not aware of any recent transportation projects where mitigation for indirect land use effects was required as a permit condition. They do consider induced growth to be a topic of concern at the agency because of its effects on wildlife, habitat and threatened and endangered species.

The Montana Department of Environmental Quality (MDEQ) also completed the survey. It was indicated that MDEQ has not provided any comments related to induced growth or land use changes on MDT environmental documents and that MDEQ has not been involved in interagency collaboration where induced growth was a topic of discussion. The agency responded that it does consider indirect changes in land use to be a "secondary impact" as defined under Section 404 of the Clean Water Act. The subject of induced growth is a concern to MDEQ during environmental review of projects under the State Revolving Fund (SRF) program. They noted that other programs do not generally look at growth, but questioned what is considered to be significant growth that would require an EIS.

3.4 Review of MDT Environmental Documents

The objective of reviewing MDT environmental documents was to understand the methods and assumptions currently being used to address indirect land use effects.

3.4.1 Document Review Methodology

A non-random sample of nineteen MDT environmental documents was obtained through the MDT environmental review website and through contacts with interview participants. Documents were selected to include a mix of CEs (six documents), EAs (seven documents), and EISs (six documents). Projects were also selected to include a variety of geographic locations throughout the state (including both urbanizing and rural areas) and to represent a range of different project types frequently undertaken by MDT. Larger projects with known potential for indirect land use effects issues were also included as these projects were expected to demonstrate the most advanced analysis techniques currently in use in Montana. The following sections of each of the selected environmental documents were reviewed: project description, land use impacts, economic impacts, and cumulative impacts. Indirect land use impacts were often discussed in one or more of these sections. The indirect land use effects approach was summarized and representative quotes from each document were summarized in tabular format.

3.4.2 Document Review Results

Tables 2, 3, and 4 summarize the projects reviewed by environmental document type. Overall, the review indicated that indirect land use effects assessment in Montana is an ad hoc process. Several documents (particularly the more complex EISs) provided well-thought out explanations of the relationship between the project and potential future land development. However, none of the documents reviewed cited indirect effects guidance or research documents (such as NCHRP Report 466 or MDT's Environmental Manual) or followed a clearly defined assessment process. Some documents reached a conclusion of "no effect" without providing an explanation of the basis for the conclusion. A reoccurring theme in the documents reviewed was statements that indirect land use effects are too speculative or uncertain to meaningfully assess. Quantitative tools for indirect effects analysis are rarely used in Montana, with one of the exceptions being the expert panel approach used in the 2003 I-15 corridor EIS in Helena. Given that most projects maintain that the change in transportation access will not be a decisive factor in future development patterns, the document review suggests that the screening process (Section 4.3) will

likely be the most important and used product of this research project. The screening process provides a structured way of considering the factors that contribute to induce growth and to develop a record that supports the conclusions regarding whether or not induced growth is reasonably foreseeable.

Table 2: Categorical Exclusions

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
Ashland East NH 37-2(24)63	2011 (Programmatic CE Approval)	Rosebud and Powder River Counties	Reconstruction of 11.10 km (6.9 miles) of U.S. 212, including substantial changes to the horizontal and vertical alignments, the addition of a truck climbing lane, and a new bridge over Otter Creek.	Checklist noted lack of growth pressure (no high rate of residential or commercial growth) in the project area. Alignment and Grade Review contained the following general consideration of the role of the project in relation to other improvements and economic development: "U.S. 212 connects interstate population and commerce centers and is the major east-west route in southeastern Montana south of Interstate 94. This project is part of the overall plan to improve the U.S. 212 corridor. By itself, the project will have a minor impact to traffic volumes and the economy of the area. However, it is anticipated that the truck traffic will increase substantially and overall traffic volumes will increase somewhat as a result of the overall corridor improvement. These increases may provide an economic benefit to the area."
Bench Boulevard-Billings MT 1036(1)	2010	Yellowstone County	Reconstruction of Bench Boulevard between Lincoln Lane and U.S. 87, including addition of two-way left turn lane.	CE states the project would have no indirect effect on land use and is consistent with growth policy and long-range transportation plan. Rationale for conclusion of no effect on land use not supported in the text (consistency with growth policy does not necessarily equate with no effect on land use).
Brockton-East NH 1-10(46)626	2001	Roosevelt County (primarily within Fort Peck Indian Reservation)	Reconstruction of 21.73 km (13.5 miles) of U.S. 2, including alignment shifts.	CE states project "will not induce significant land use changes or promote unplanned growth. There will be no significant affects on access to adjacent properties or present traffic patterns." Rationale for this conclusion is not supported. The CE also cites long-term economic benefits from provision of safer and more efficient route.

(Table 2 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
Flathead River- 3 KM (1.86 miles) East of Kalispell BR 9015(44)	2005	Flathead County	Bridge replacement slightly downstream of existing bridge. Reconstruction of approach roadways. Existing bridge is one lane and replacement will accommodate two lanes. Approximately 1,700 Average Daily Traffic (ADT) currently and 3,500 ADT by 2026.	Land use section of CE states "the proposed road realignment and bridge replacement would not cause notable changes to adjacent land uses, encourage new or undesirable growth or development, eliminate or substantially alter access to adjacent properties or alter real property values." Cumulative impacts section contains a more detailed discussion of growth issues and acknowledges the project may indirectly contribute to further growth in the Flathead Valley by making commuting to and from Kalispell easier. However, the analysis concludes there are too many other factors influencing growth to make accurate predictions about when and where it will occur. The overall conclusion was that "replacing the existing bridge would not substantially change the character of the much of the project area or cause current property owners and developers to build faster or any differently than they would have without the proposed project. For these reasons, it is not believed that replacing the existing bridge would be a major cause of additional residential growth and development in the Kalispell area."
NH 62-1(10)0 MT 16- Culbertson	2012 (Programmatic CE Approval)	Roosevelt County	Rehabilitation of 0.64 km (0.4 miles) of MT 16, including resurfacing, address drainage issues, and provide curb and gutter, Americans with Disabilities Act (ADA) ramps, and repair or replace sidewalk. 1,270 Annual Average Daily Traffic (AADT) current, AADT 1,560 in 2032.	CE checklist noted lack of growth pressure (no high rate of residential or commercial growth) in the project area.
30 KM (18.64 miles) Northeast of Glendive NH 20-1 (5)19	2008	Dawson and Richland Counties	Reconstruct 16.09 km (10 mile) segment of MT 16 with no change in capacity.	CE states no effect on land use other than minor amounts of right-of-way acquisition. No explanation/rationale given to support the conclusion.

Table.3: Environmental Assessments

				EA assumed that transfer of MDT's excess lands to CKST would not substantially changed land use because they are located in rural areas and have little development currently. The contribution of transportation projects to growth was acknowledged, but was dismissed as too uncertain to analyze and unlikely to result in notable cumulative impacts on land use. "Improving highways may contribute to new growth and developments within the region. However, many of the limited actions proposed for state-maintained roads alone would not cause more people or businesses to move to the area." "Although it appears growth will continue in the area, there is no guarantee that there will be further development, or if there is, when such growth might happen. Because of these unknowns, it is impossible to predict what specific types of impacts might occur as a result of MDT's projects and developments by others. Given present circumstances, such development would likely occur independently of the improvements that may be implemented on state-maintained roads on the Reservation and adjoining counties. For this reason, the proposed land exchange, when considered with other reasonably foreseeable developments by MDT and others, would not likely result in notable cumulative effects on land use."
MDT/CSKT Land Exchange (MEPA Only) F-5-1(9)6	2003	Flathead Indian Reservation	Land exchange agreement with the Confederated Salish and Kootenai Tribes (CSKT) to provide land for wetland mitigation and right-of-way for the U.S. 93 north project and other projects within the Flathead Indian Reservation.	

(Table 3 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
Belfry-North F STPP 72-1(1)10 CN 1016	2004	Carbon County	Reconstruct 17.86 km (11.1 miles) of MT 72 between S-308 and U.S. 310 on a new alignment to address safety issues.	Induced growth issues were dismissed with appropriate reference to facts—the lack of capacity expansion and the distance to major destinations (Billings). "The proposed build alternatives are not likely to induce population growth. MT 72 would remain a two-lane highway; therefore, improvements would not increase capacity. Even with the improvements to the road and the affordability of property in the area, growth is not likely to increase because MT 72 is not very close to Billings and is not likely to become a commuter's route. The improved road would not be expected to bring additional traffic to the area that would not be there under current conditions."
Red Lodge North STPP 28-2(25)70	2009	Carbon County	Reconstruct U.S. 212 from Red Lodge to Boyd, including intersection improvements, turning lanes and passing lanes.	The relationship of the project to several proposed developments was discussed and it was explained that the project would serve these developments, but was not a driving factor in the developments occurring. Induced traffic was briefly discussed and it was noted that no additional capacity was being provided (except for passing lanes in rural areas). The project initially involved two-way left turn lanes in Red Lodge. However, comments from the City of Red Lodge during scoping suggested that two-way left turn lanes may encourage commercial strip development in northern Red Lodge inconsistent with local plans. The two-way left turn lanes were dropped as an aspect of the project in northern Red Lodge and MDT worked cooperatively with Red Lodge to develop an Access Management Plan for this area.

(Table 3 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
Culbertson East to North Dakota (2008) MT 1-10(61)645	2008	Roosevelt County	Reconstruct and widen 35.41 km (22 mile) section of U.S. 2 to four lanes. Economic development is a portion of the need for the project (based on the U.S. 2 / MT 16 TRED Study).[1]	Unlike most MDT documents, indirect and cumulative impacts were considered together in a single section of this document. The discussion of induced economic growth and development impacts generally concluded that these types of effects are difficult to forecast because they are dependent on many other factors such as the presence of scenery, availability of jobs, cost of gasoline, and mortgage interest rates. A conclusion of no impacts was supported through reference to the levels of out-migration of people in the region and the lack of recent economic growth in the study area. A type of comparative analysis was taken to support the point that transportation is not the main factor in growth "similarities in the development of Eastern Montana communities on and off the Interstate system since its development suggest that a four lane road is not a panacea to development. No MDT study involving Montana's U.S. 2 corridor to date has concluded that its four-lane expansion is justified on the basis of expected economic impacts alone." Also noted that growth is occurring in Bitterroot Valley and Flathead Valley in areas without adequate roads."

[1] The U.S. 2/MT 16 TRED Study identified potential economic opportunities in the study area based on technical analysis and 120 interviews with local and regional developers and planners; representatives from the grain, energy, and tourism industries; business owners; freight forwarders and carriers; and elected officials. Using a risk analysis process, a panel of local and regional economic experts quantified the likelihood that each opportunity would occur with or without a four-lane corridor (http://www.mdt.mt.gov/pubinvolve/us2tred/).

(Table 3 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
I-90 East Belgrade Interchange Project	2008	Gallatin County	New I-90 interchange and connector roadways improving access to the Gallatin Airport on the north side of the interchange and planned development planned on the south side of the interchange.	Brief qualitative discussion acknowledges that changes in transportation accessibility could influence the location of growth, but concludes that growth patterns would be more affected by other factors, such as local land use planning decisions. Non-transportation related factors that influence the likelihood of land being developed are listed (land use policies, economic trends, infrastructure, etc.), but these factors are not analyzed in detail.
Lewistown - West Overpass NH 57-3(34) 79	2003	Fergus County	U.S. 87 improvements, including two-way left turn lane and access management.	Concluded no impact on overall growth rates because of lack of capacity expansion. Acknowledged that the project may facilitate commercial and industrial development in certain areas and qualitatively addressed for potential for impacts on environmental resources. MDT agreed to purchase a 1.29 square-km (320 acre) property near the airport that could be developed as an industrial park as part of this project. "The timing and scale of this development are uncertain at this time, but large-scale development could have a localized impact on such things as stormwater runoff and traffic operations with the construction of new roadways and other impervious surfaces. Without knowing what types of development would be involved, it is impossible to make a determination of impacts to other social, economic, or environmental concerns; however, given the natural character of the property, there would be no floodplain, farmland, T&E, cultural, hazardous waste, wetlands, or wildlife impacts anticipated."
Marysville Road Improvement Project TCSP 25(43)	2006	Lewis and Clark County	11.27 km (7 miles) of resurfacing and other improvements to rural gravel road. Very low traffic volumes (439 vehicles per day in design year).	EA stated that no change expected in current growth trends and development patterns based on lack of capacity expansion. Development limited by mountainous terrain.

Table 4: Environmental Impact Statements

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
U.S. 212 Reconstruction, Rockville to Laurel NH 4-1(21)43	2009	Carbon and Yellowstone Counties	Reconstruct the existing two-lane U.S. 212 on new alignment as a four-lane facility.	The document acknowledges the potential for the project to change the location of future growth, but states that "it is impossible to predict exactly where and when this growth would occur." The document also states that other factors such as "the availability of jobs; the quality of life; property taxes; and the quality and availability of schools and other public services" will have a much greater effect on future land use than the reconstruction of U.S. 212. The document lists the locations along the corridor where indirect land use effects would be most likely (e.g., at intersections with existing roadways).

(Table 4 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
I-15 Corridor, Montana City to Lincoln Road NH 15-4(65)196	2003	Jefferson and Lewis & Clark Counties	Two new interchanges and improvements to existing interchanges.	Indirect land use impacts were assessed using an expert panel (Land Use Advisory Group) consisting of local planners, business interests, and environmental groups. The total amount of growth in Helena Valley was not changed, but the location of growth was adjusted by the Land Use Advisory Group. Sensitivity testing was performed using a travel demand model to determine how the Land Use Advisory Group's estimates of shifts in household and employment would affect traffic generation. However, the scenarios evaluated by the Land Use Advisory Group (north and south interchanges separately) did not include the situation covered by the preferred alternative, which included both north and south interchanges. The project team concluded that the no build land use scenario would be most representative of the preferred alternative. A qualitative analysis of the interchange improvements includes detailed consideration of the type of development that could occur in the vicinity of interchanges under existing zoning.

(Table 4 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
Kalispell Bypass NH 5-3 (59) 109	Reevaluation (2006)	Flathead County	12.23 km (7.6 mile) bypass on the west side of Kalispell. The reevaluation was prepared to address changes in the design of the project since a previous ROD in 1994. The changes included the use of grade-separated interchanges instead of intersections.	A land use advisory committee was utilized to address growth issues as part of the U.S. 93 Somers to Whitefish West FEIS (the document being reevaluated). The potential for shifts in the location of development was acknowledged, with east-west county roads in particular expected experience increased development as a result of the project. The reevaluation concludes: "The proposed design changes are not expected to substantively alter the project's effects on future land use, as reported in the FEIS. While the bypass as currently designed closely follows the alignment proposed in 1994, it has changed from an at-grade facility with intersections to a free flowing facility with access only provided at grade-separated interchanges. Because of this restricted access, the current bypass would not induce development between interchanges, but could continue to concentrate development near interchanges." No further discussion of the potential for development near interchanges is provided.
U.S. Highway 93 Ninepipe/Ronan Improvement Project NH-F 5-1(9) 6F	2008	Lake County	Improvements to 18.02 km (11.2 miles) of U.S. 93, including passing lanes, widening to four lanes, and two-way left turn lanes in certain sections.	FEIS states effects on land use will be limited because of implementation of an access management plan, economic factors that influence growth, and lack of an effect on traffic volumes. Qualitative comparison of the effects of the alternatives on local access. Also addressed effects on travel times. Overall conclusion was that indirect land use effects were speculative.

(Table 4 continued)

Project Name	Environmental Document Date	Project Location	Project Description	Indirect Land Use Effects Analysis
Reconstruction of U.S. 2 between Columbia Heights and Hungry Horse F 1-2(39) 138	1995 (FEIS) and 2002 (Reevaluation)	Flathead County	Reconstruct and widen 7.08 (4.4 miles) of U.S. 2 to four lanes.	Qualitative discussion acknowledges potential for commercial strip development associated with tourism and increased population. Potential to accelerate and concentrate growth in the project area. Reduced travel times to Hungry Horse and other destinations, such as Glacier National Park. Mitigation included purchase of land to prevent incompatible development and funding of local planning initiatives that led to the Canyon Plan, which was incorporated into the 1994 Flathead County Master Plan. Subsequent reevaluation contained a strong qualitative assessment of growth issues that considered growth rates, available land, travel time savings, water infrastructure needs, and past development patterns.
U.S. 2, Havre to Fort Belknap PLH-TCSP 1-6(44)384	2004	Fort Belknap, Hill and Blaine Counties	Reconstruct 72.42 km (45 mile) section of U.S. 2 as an improved two- lane highway (with 2.44 m (8-ft) shoulders) and passing lanes.	"The economic study conducted for this project examined the reliance of the region's economic development strategy on infrastructure needs. The study concludes that capacity improvements to U.S. 2 are unlikely to induce development, but safety and operational improvements can help sustain the region's economy and ensure the potential for future growth. Proposed highway improvements are therefore not expected to induce growth beyond current population projections for Hill and Blaine Counties, and there would be no anticipated substantial, foreseeable, induced development due to improvements."

3.5 Conclusions

Based on the interviews and environmental document reviews, the following recommendations were developed to advance the practice of indirect land use effects assessment in MDT environmental documents.

- **Consistency improvements**. Greater methodological consistency between different MDT Districts and projects can be achieved through the application of the screening and detailed analysis framework and guidance developed through this project.

- **Support conclusions with additional data and analysis.** For example, the statement that the change in transportation accessibility will not be important in comparison to other factors can be supported by discussing the effect of the project on travel times to major destinations, and mapping/analysis of the other factors influencing the likelihood of development (e.g., available land, zoning, water/sewer infrastructure, and economic growth trends).

- **Address potential indirect effects on environmental resources from changes in growth patterns.** When growth impacts are reasonably foreseeable, NEPA requires evaluation of environmental impacts, thus it is important to draw conclusions on how the expected change in growth patterns could affect specific valued or vulnerable aspects of the environment. Depending on the project, this could be as simple as describing the resources present in the area of the greatest growth pressure (based on readily available Geographic Information Systems (GIS) data), the protections afforded these resources, and a qualitative assessment of the potential for induced development to impact the resource.

- **Integrate transportation and land use forecasting on major projects.** Assumptions about future population and employment growth are a crucial variable in assessing the degree to which alternatives address the purpose and need, noise impacts, and air quality impacts. FHWA is recommending an integrated approach to land use and travel forecasting through interim guidance. Under this framework, any indirect land use effects would be quantified and incorporated into the traffic forecasts, noise, and air quality analyses. This advanced approach would most likely only be applicable to the larger EIS projects that involve reasonably foreseeable growth impacts. Montana already has some experience with this approach through documents such as the I-15 Corridor: Montana City to Lincoln Road EIS that integrated the land use panel's findings into the traffic modeling.

4 Indirect Land Use Effects Screening Criteria

4.1 Introduction

Land use decisions in Montana are regulated at the local level. However, certain MDT transportation projects can produce consequences (whether intentional or unintentional) on land development patterns that need to be considered in state or federal environmental review processes. The environmental review process is intended to "count what counts" by focusing limited resources on the most important issues for each project and avoiding unnecessarily complex analyses and documentation. This section provides background information on the criteria developed for determining when further detailed indirect effects analysis is needed for MDT projects being reviewed under NEPA and/or MEPA.

Section 4.2 documents the review of existing screening methodologies used in other states. Section 4.3 provides an overview of the indirect effects screening methodology for MDT projects. More detailed guidance on the screening process is provided in the Indirect Effects Desk Reference (Appendix 1), along with example applications of the screening methodology to hypothetical projects.

A key objective was to ensure the screening methodology is user-friendly and can be completed with minimal data collection effort early in the project development process. It is expected the vast majority of MDT transportation projects will not require detailed analysis based on this methodology.

4.2 Review of Existing Indirect Effects Screening Methodologies

Existing screening methodologies used in other states were reviewed to inform the development of a Montana-specific methodology. The review identified many commonalities in the screening criteria across the various state guidance documents, indicating a degree of consensus in the practice on the relevant considerations to determine whether a detailed indirect effects assessment is needed. Nevertheless, each state has defined the criteria and process differently to suit their needs, emphasizing certain factors more or less than others. All the screening criteria appear to be based on or influenced by NCHRP Report 466: "Desktop Reference for Assessing the Indirect Effects of Transportation Projects" (LBG 2002). NCHRP Report 466 did not explicitly include a screening methodology, but did provide guidelines on the factors that influence the potential for transportation projects to create indirect effects.

The sections below summarize the screening processes used in Texas, California, Wisconsin, and North Carolina, including a summary of unique features, screening factors, and data requirements.

4.2.1 Texas Department of Transportation Screening Tools for Categorical Exclusions

Appendix C of TxDOT's 2010 "Revised Guidance on Preparing Indirect and Cumulative Impacts" report presents an indirect effects screening methodology intended for CEs.[2] The methodology is presented in the form of a flowchart with a series of yes/no questions that determine whether further analysis is needed.

The TxDOT guidance provides an excellent model for clearly written screening methodology directions and a step-by-step process that minimizes the potential for incorrect application or misunderstandings of the requirements. The screening factors are listed in the form of questions and several hypothetical example analyses are provided to illustrate the point that the same project may or may not require a detailed indirect effects assessment depending on the context. A checklist table is provided to document the conclusions regarding each of the screening factors. Figure 2 provides the TxDOT screening process flowchart.

The screening factors used by TxDOT place a heavy emphasis on ensuring that projects intended to promote economic development are identified, which is reasonable given the legal challenges that have been experienced by projects that have had a disconnect between the stated project purpose and the conclusions regarding indirect land use effects (see Chapter 2). Projects including an economic development purpose automatically require detailed analysis under this methodology.

Projects that add capacity (defined as travel lanes) automatically require detailed analysis under the TxDOT methodology. This requirement may be overly conservative because it does not account for widening projects located in a land use context where no growth is possible due to lack of available land, local land use controls, or other constraints.

4.2.1.1 Screening Factors and Data Requirements

The following factors are considered in TxDOT screening methodology for indirect effects:

- Project adds capacity to the transportation system (e.g., additional travel lanes on existing road, new road, new interchange, etc.).
- Economic development is an aspect of purpose and need statement, the project is designed to serve a specific development, or economic development cited elsewhere in project documentation as a benefit.
- Project effect on access and mobility.
- Land availability for development/redevelopment.
- Project location—suburban fringe vs. rural or urban.
- Population/employment growth in the project area.

The screening factors related to the project description (whether or not the project adds capacity or economic development is included in the purpose and need, location relative to suburban fringe) should not require any data collection. Some level of research/analysis could be needed

[2] TxDOT processes projects as CEs that would be processed as EAs in most other states through a programmatic agreement with FHWA (http://www.environment.fhwa.dot.gov/strmlng/tx_cea.pdf).

to support conclusions regarding impacts on accessibility, land availability, and population/employment growth in the project area. No guidance is provided on the appropriate data sources or minimum level of documentation required to complete the screening analysis.

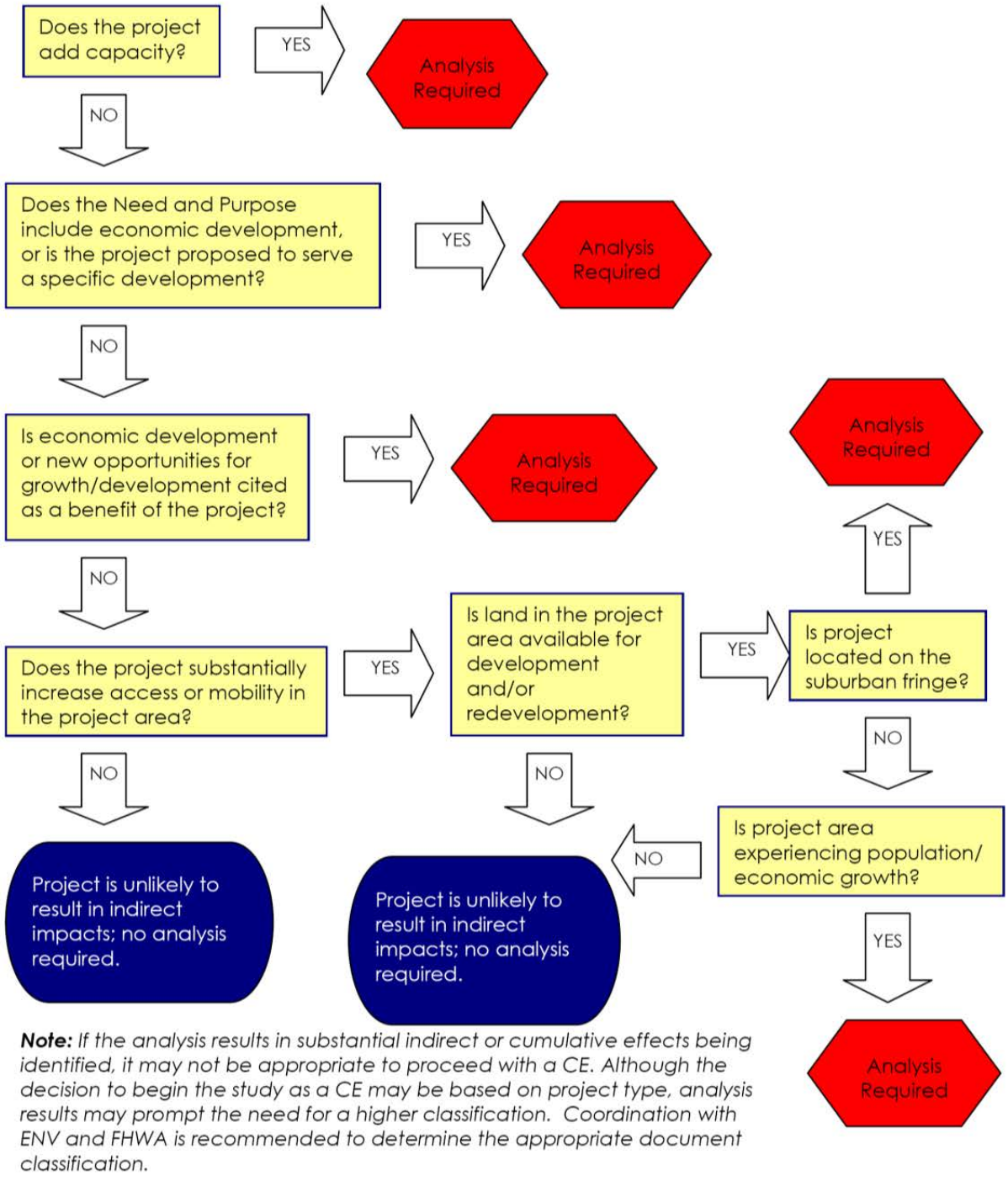

Figure 2: TxDOT Screening Process for Categorical Exclusions (TxDOT 2010, p. 99)

4.2.2 California Department of Transportation (Caltrans) First Cut Analysis for Indirect Effects

Caltrans has developed a "first-cut" analysis framework for indirect effects applicable to all types of environmental documents (Caltrans 2005/updated 2006). The Caltrans guidance recognizes that there is a continuum of projects from those clearly requiring detailed analysis to those clearly not requiring any analysis. The most difficult projects to address are those projects in the middle of the continuum; and this is the type of project the first cut analysis is intended to address.

The Caltrans process is organized around a straightforward flow chart that provides clear step-by-step guidance (Figure 3). One unique feature of the Caltrans methodology is that it starts with accessibility as the first factor to consider in the flowchart. If there is no accessibility improvement, there is no need to continue the screening process. This approach is very logical because accessibility change is the critical element through which transportation improvements can influence land use change.

Another unique feature is that the Caltrans first-cut screening takes into account the potential for resources of concern to be impacted by project-related growth. Even if there is potential for project-related growth, a detailed indirect effects analysis is not required if the growth does not have the potential to impact environmental resources of concern. In theory this is a reasonable factor to include because ultimately NEPA is about considering environmental impacts and the consideration of induced growth is just an intermediate step to determining the reasonably foreseeable environmental impacts related to this growth. However, there are numerous judgments involved with determining what the "resources of concern" are for a particular project area, which could result in a legal risk if a particular resource potentially impacted by project-related growth is overlooked or there is a disagreement over whether a resource is important. It is likely that any new growth would have an impact on some aspect of environment, even after accounting for environmental permitting requirements. In addition, project-related growth and associated additional trips could impact the traffic performance of the transportation project itself, even if no sensitive resources are present. These issues are best dealt with in detailed analysis; therefore, taking into account the potential for resource impacts as a decision factor in the MDT screening methodology is not recommended.

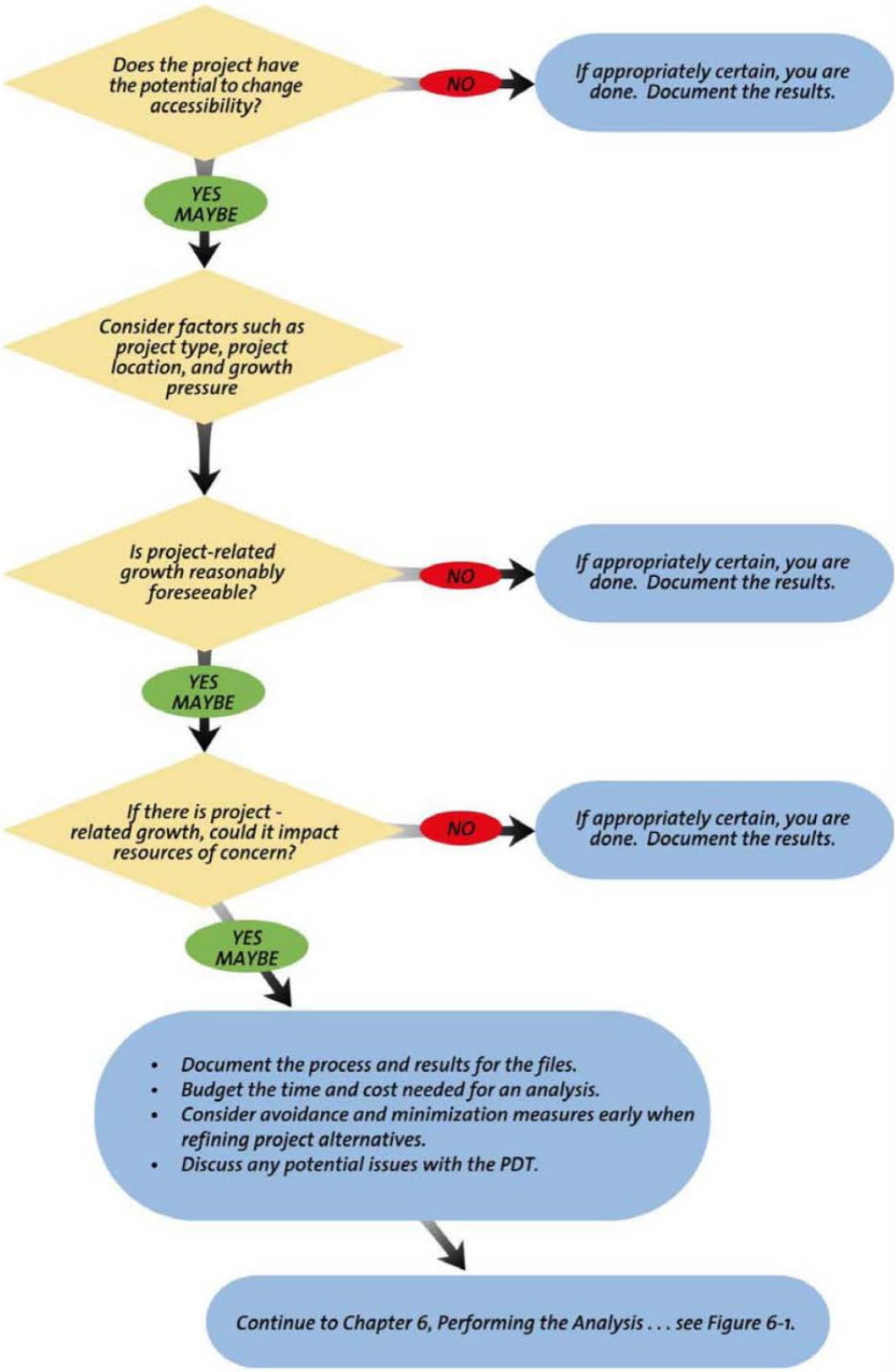

Figure 3: Caltrans "First Cut" Screening for Growth-Related Impacts (Caltrans 2005/updated 2006, p. 5-3)

4.2.2.1 Screening Factors and Data Requirements

- Accessibility—considered through indicators such as changes in the number of trips, effect on travel time and speeds, change in level of congestion or Level of Service, etc.

- Project type—classified based on types not likely to cause indirect effects (e.g., changes on an existing facility that do not change capacity pavement rehabilitation, shoulder widening, etc.), projects that may cause indirect effects (adding HOV or mixed-flow lanes to an existing facility), and projects likely to cause indirect effects (new roads, new intersections or interchanges, etc.).

- Project location—considerations related to project area classification as urban, rural, suburban, or suburban/urban fringe.

- Growth pressure—the amount and intensity of growth occurring in the project area as assessed through various methods and indicators (Census data, review of planning documents, discussions with local planners, land availability and price, infrastructure availability, regional economic trends, and vacancy rates).

- Induced growth impacts on resources of concern.

The project type and location factors should not require data collection. Data collection, analysis, and professional judgment may be required to reach conclusions regarding the accessibility and growth pressure factors. The Caltrans guidance provides some recommendations on data sources (California-specific and national).

4.2.3 Wisconsin Department of Transportation (WisDOT) Pre-Screening Worksheet

WisDOT requires detailed indirect effects analysis for EISs, but does provide a screening guidance for EAs and documented categorical exclusions (referred to as Environmental Reports in Wisconsin) (WisDOT 2007).

The format of WisDOT's guidance is a relatively comprehensive list of screening factors to consider. However, no flowchart or defined process for considering each of the factors or guidance on what combinations of factors triggers the need for detailed analysis is provided. This approach has advantages in terms of allowing flexibility to focus on the most relevant factors for a particular project, but has disadvantages in terms of ensuring predictability in the process. The lack of a clear process also increases the importance of the judgment and experience of the analyst for each project.

Also of note, the methodology includes a quantitative guideline threshold of a five minute travel time savings, which was also used as a screening threshold in the NCDOT screening methodology.

4.2.3.1 Screening Factors and Data Requirements

- Project Design Concepts and Scope—Do the project design concepts include any one of the following?
    - Additional thru travel lanes (expansion)
    - New alignment
    - New and/or improved interchanges and access
    - Bypass alternatives

- Project Purpose and Need—Does the project purpose and need include: economic development in part or full (i.e., improved access to a planned industrial park, new interchange for a new warehouse operation)?

- Facility Function—What is the primary function of the existing facility? What is the proposed facility?
    - Urban arterial
    - Rural arterial

- Project Location (location can be a combination)
    - Urban (within an Metropolitan Planning Area)
    - Suburban (part of larger metropolitan/regional area, may or may not be part of an metropolitan planning area)
    - Small community (population under 5,000)
    - Rural with scattered development
    - Rural, primarily farming/agricultural area

- Improved Travel Times to an Area or Region—Will the proposed project provide an improvement of five or more minutes?

- Land Use and Planning
    - What are the existing land use types in project area?
    - What do the local plans, neighborhood plans, and regional plans indicate for future changes in land use?
    - What types of permitted uses are indicated in the local zoning?
    - Would the project potentially conflict with plans in the project area? (e.g., capacity expansion in areas in which agricultural preservation is important to local government(s)?)

- Population/Demographic Changes
    - Have the population changes over past 5, 10, and 20 years been high, medium, low growth rate vs. state average over same period? (i.e., U.S. Department of Agriculture (USDA) defines high growth in rural areas as greater than annual population growth of 1.4 percent.)

  - What are the projections for the future for population? (Use Wisconsin Department of Administration projections)
  - Have there been considerable changes for population demographics and employment over the past 10 – 20 or more years?

- Rate of Urbanization
  - Does the project study area contain proposed new developments?
  - What are the main changes in developed area vs. undeveloped areas over past 5, 10, and 20 years?
  - Have there been significant conversions of agricultural land uses to other land use types, such as residential or industrial?

- Public, State and/or Federal Agency Concerns—Have local officials, federal and/or state agencies, property owners, stakeholders, or others raised concerns related to potential indirect effects from the project? (e.g., land use changes, "sprawl," increase traffic, loss of farmland, etc.)

4.2.4 North Carolina Department of Transportation (NCDOT) Pre-Screening

The NCDOT pre-screening methodology considers indirect and cumulative impacts together (LBG 2004). This was a common practice at the time the NCDOT guidance was developed, but subsequently the practice has evolved to clearly distinguish between indirect and cumulative impacts by addressing them in separate sections of environmental documentation to ensure both are addressed to meet legal sufficiency requirements (see NCHRP Project 25-25 (Task 43) for more discussion of this shift). As evidence of this change in the practice, TxDOT's 2010 screening methodology has separate checklists for indirect effects and cumulative impacts. Some of the screening factors are the same, but others (such as resource condition and trends) are unique to cumulative impacts.

A unique advantage of the NCDOT methodology is that it uses quantitative benchmarks for several indicators, including change in accessibility (travel time savings) and growth trends. Also a disadvantage, some of the quantitative thresholds could be challenged or are subject to interpretation. For example, the growth rate of an area could vary depending on the geographic scale of analysis used (region-wide, county, municipality, etc.).

Certain types of CEs are exempt even from the need to conduct pre-screening, such as installations of noise barriers, fencing, and pavement markers; improvements to rest areas and weigh stations; and non-construction activities

A disadvantage of the NCDOT methodology is that the presence of even one factor supportive of growth (such as water/sewer availability) is enough to trigger the need for a detailed analysis, even if there is less than five minutes of travel time savings. The flowchart requires binary responses (e.g., market for development has to be characterized as either "strong" or "weak"), which may be too simplistic. Figure 4 provides the NCDOT screening checklist.

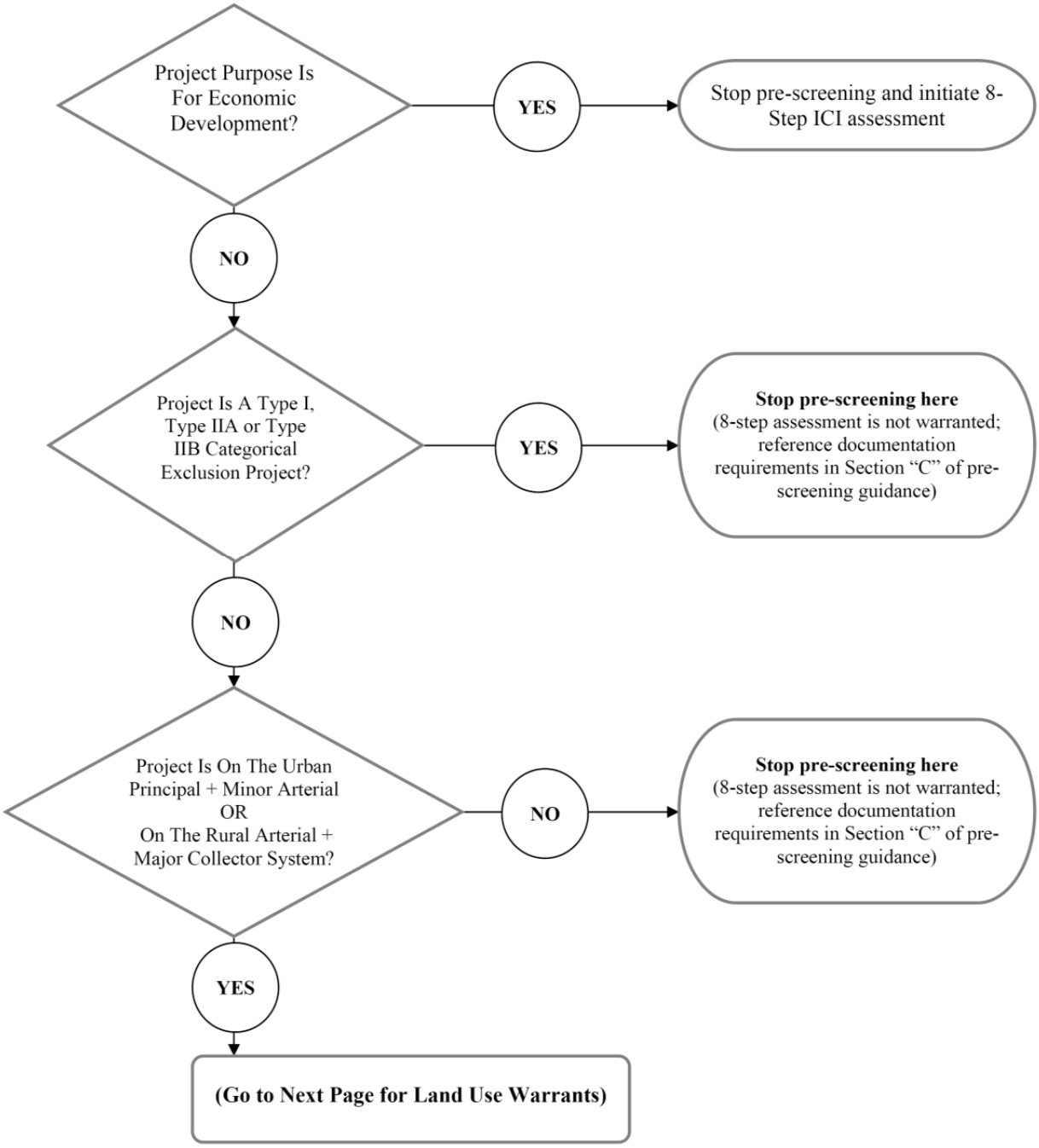

Figure 4: NCDOT Indirect and Cumulative Impacts Pre-Screening Decision Tree (LBG 2004, p. 9)

Potential Land Use Change Warrants 8-Step ICI Assessment?			
Demographic, Land Use and Planning Considerations		**Highway System Access Change**	
		> 5 minute travel time reduction between residential and employment centers	< 5 minute travel time reduction between residential and employment centers
Population/ Employment Change	>2% annual increase	**Yes**	**Maybe**
	<2% annual increase	**Maybe**	**No**
Water/Sewer	Available or Programmed	**Yes**	**Maybe**
	Not Available or Programmed	**Maybe**	**No**
Development Market/Available Land	Strong	**Yes**	**Maybe**
	Weak	**Maybe**	**No**
Growth Management Policy	None or Weak	**Yes**	**Maybe**
	Strong	**Maybe**	**No**

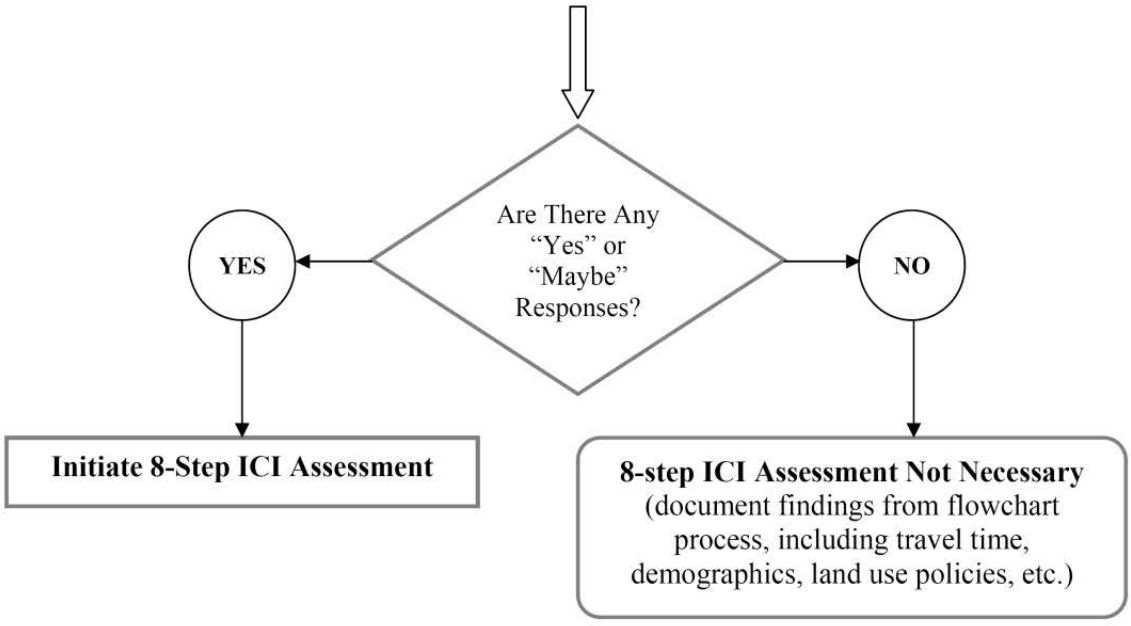

Figure 4: NCDOT Indirect and Cumulative Impacts Pre-Screening Decision Tree (LBG 2004, p. 10)

4.2.4.1 Screening Factors and Data Requirements

- Project Design Concept and Scope Considerations
  - Project Purpose and Need and Project Type—Detailed analysis is recommended for projects with an economic development aspect of the purpose and need statement. Guidance is also provided on the appropriateness of the screening methodology with respect to the environmental classification of the project—the type of CE or EA. NCDOT requires the use of their detailed assessment methodology for all EIS-level projects.
  - Facility Function—Note higher potential for indirect effects associated with facilities that serve interstate and intercounty traffic, and to a lesser extent intracounty traffic.
  - Change in Accessibility—Potential for land use change is strong if the travel time savings between the areas served by the project and major centers of activity (such as a central business district) is five minutes or greater.

- Demographic, Land Use, and Planning Considerations
  - Population and Employment Trends—Area considered to be growing if the growth rate is greater than 1-2 percent per year.
  - Rate and path of urbanization—Involves consideration of multiple factors, such as water and sewer service boundaries, proposed developments, and growth management policies.

- Public Involvement and Agency Coordination—Comments during NEPA outreach process expressing concerns about the potential for indirect land use effects may suggest the need for a more detailed analysis of this issue. This is an important factor to include because "controversy" is one of the unusual circumstances that can elevate a CE to a higher level of environmental review (such as an EA).

4.3 Overview of the Indirect Effects Screening Process

This section provides an overview of the indirect effects screening methodology for MDT projects based on the research presented above; a more detailed explanation is located in the Indirect Effects Desk Reference (Appendix 1). Figure 5 provides a flowchart to the indirect land use effects screening process. The analyst continues through the flowchart until a box is reached stating no further analysis is needed or that a detailed analysis is needed. The screening flowchart is structured in such a way that the level of analysis is tailored to the potential for a particular project to result in indirect changes in land use. For example, some projects (such as a bridge replacement on the same alignment with no capacity increase) are exempted from screening at the first step and do not need to go through the remaining steps of the process. Similarly, if a project does not substantially change accessibility, there would be no need to continue beyond Step 3. For projects that do change accessibility, further screening analyses considering availability of developable land and growth pressure may be needed to reach a conclusion on whether or not detailed analysis is needed.

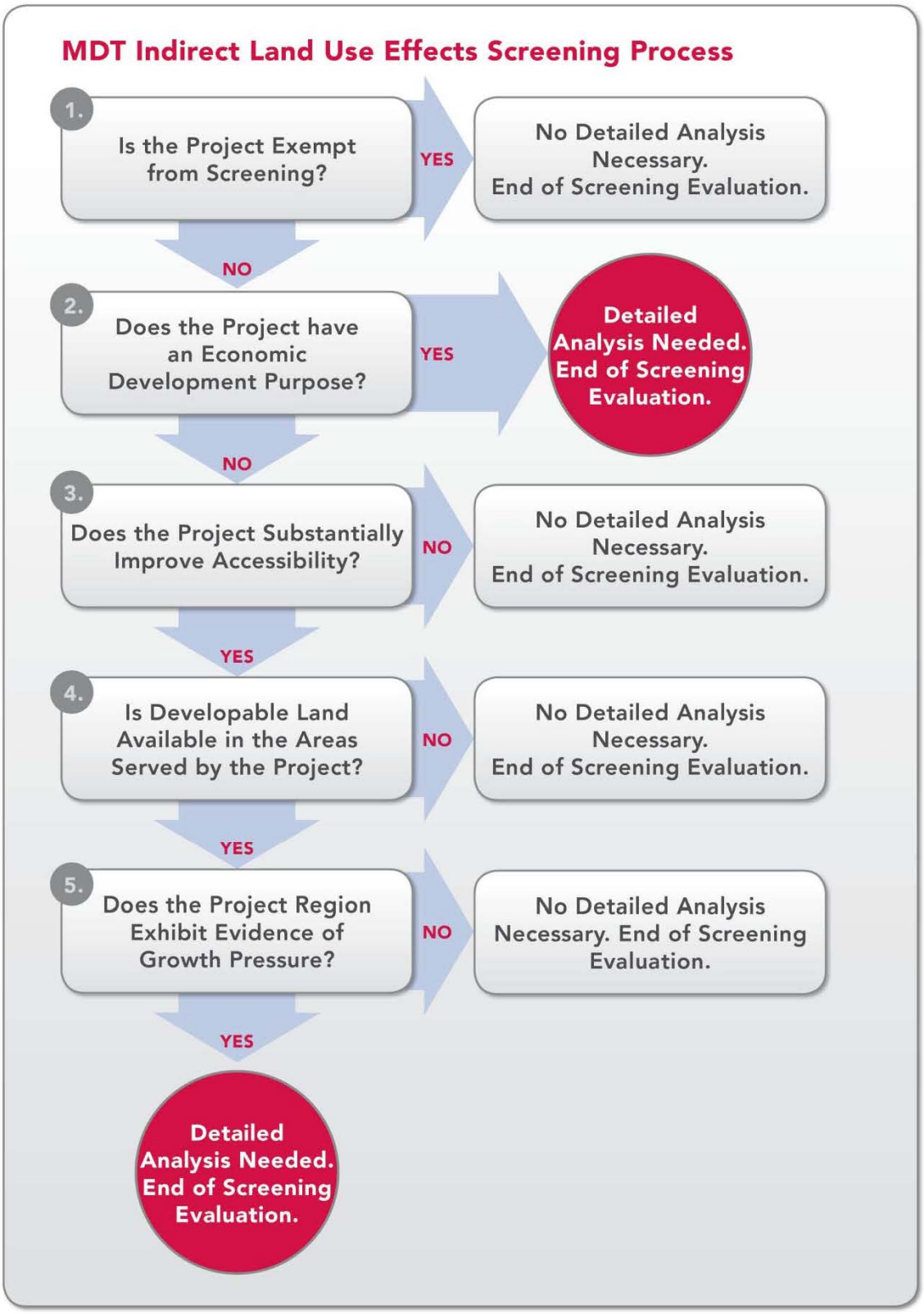

Figure 5: MDT Indirect Land Use Effects Screening Process

Step 1: Is the Project Exempt from Screening?

Based on their basic characteristics, certain types of projects do not have the potential to result in indirect land use effects, regardless of the context of where the project is located. Examples of exempt projects include highway maintenance and rehabilitation on the same alignment with no increase in capacity.

Step 2: Does the Project have an Economic Development Purpose?

A key conclusion from numerous legal challenges of transportation projects is the importance of a rigorous evaluation of the environmental consequences of induced growth if such growth is used as a rationale for the project. This step includes review of the purpose and need statement, local plans, and project-specific circumstances (such as a project designed to serve a specific development). A detailed analysis should be conducted if the project has an economic development purpose (the results of which may help to support the economic development benefits of the project or lead to a decision to modify the purpose and need if economic development is unlikely to be caused by the project).

Step 3: Does the Project Substantially Improve Accessibility?

Accessibility is the ease with which people can reach goods, services and activities. A list of projects that usually have the potential to substantially improve accessibility (new roadway, new interchange, etc.) is provided in the Indirect Effects Desk Reference along with guidelines for evaluating travel time savings to document whether or not the degree of accessibility change is large enough to warrant further evaluation of potential indirect land use effects.

Step 4: Is Developable Land Available in the Areas Served by the Project?

Even if a project increases accessibility, it will not result in land use change if the area of influence around the project does not contain developable land. For example, a project surrounded by federal land will typically not have the potential to change land use. In general, land already developed can be considered committed to another use and not available for development. The exception would be in an urban area where a transportation improvement could help encourage redevelopment of existing developed land to higher density uses. Unlike the previous steps of the screening methodology, Step 4 requires delineation of study area boundaries to define the area considered in the evaluation of the availability of developable land. The Indirect Effects Desk Reference provides guidance on setting the study area boundary and data sources for determining whether or not developable land is available.

Step 5: Does the Project Region Exhibit Evidence of Growth Pressure?

Even with ample land available and excellent accessibility, no development (induced or otherwise) will occur if the region where the project is located is not experiencing population and/or employment growth. There is no threshold growth rate that definitively indicates growth pressure, but regions with a pattern of declining population clearly can defined as not

experiencing growth pressure (unless information is available that the past trend is changing due to other factors, such as with the oil boom in parts of eastern Montana). The Indirect Effects Desk Reference provides guidance on the indicators and data sources that can be used to assess the relative degree of growth pressure in the project area.

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5 Indirect Land Use Effects Detailed Analysis Framework

Section 5.1 provides an overview of the step-by-step detailed indirect land use effects analysis framework developed during this research project. The complete guidance for each step of the detailed analysis process is provided in the Indirect Effects Desk Reference (Appendix 1).

Section 5.2 provides a review of the methodologies available for analyzing indirect land use effects in detail and discusses the appropriateness of each methodology in various locations within Montana. It also provides guidance on data collection and Montana-specific data sources to support indirect effects analysis. The methodologies most likely to be useful in Montana are also discussed in the Indirect Effects Desk Reference.

5.1 Overview of the Detailed Analysis Framework

The detailed analysis framework is organized around the seven steps illustrated in Figure 6. Prior to beginning a detailed analysis, a screening analysis should be conducted. The detailed analysis framework assumes the screening analysis presented in Section 4.3 results in the conclusion that a detailed analysis is necessary for a particular project. As noted earlier, the majority of MDT projects are not anticipated to need detailed analysis based on the screening analysis process.

The detailed analysis framework steps share much in common with previous national and state-specific guidebooks on indirect effects analysis, including NCHRP Report 466. However, the MDT detailed analysis framework differs from the eight-step process in NCHRP Report 466 in several respects, one of the most important being the inclusion of a step devoted to the assessment of the future No Build condition land use. As discussed further throughout the guidance presented below, properly establishing a "clean" No Build condition is an essential part of forecasting the potential indirect land use effects of transportation projects.

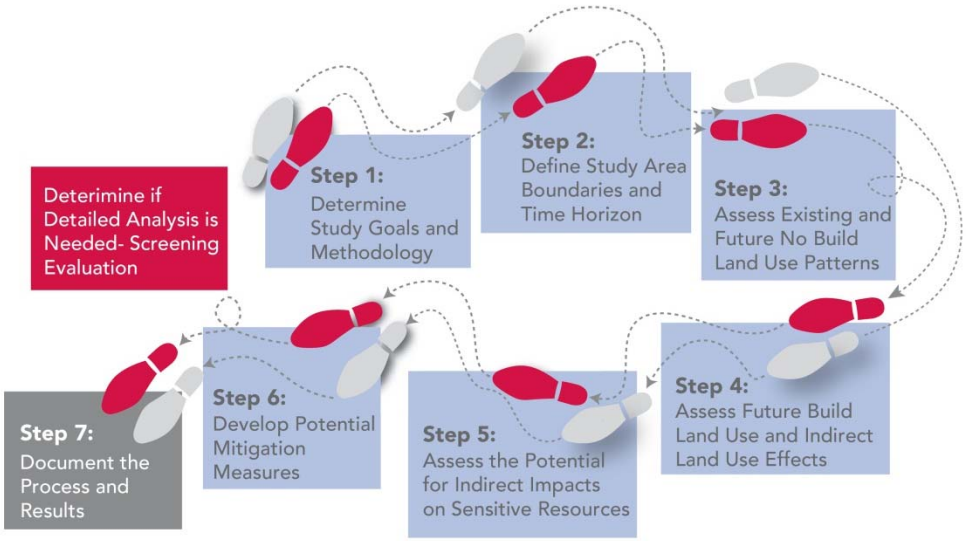

Figure 6: Indirect Effects Detailed Analysis Process

Step 1: Determine Study Goals and Methodology

Every project requiring an indirect land use effects analysis is different in terms of land use context, concerns of local residents, resource agency involvement and environmental resources. The time and resources to analyze indirect land use effects are limited; therefore, it is necessary to identify and focus on the "key issues" relevant to understanding the impacts of the project. The objective of Step 1 is to "right-size" the indirect effects analysis by: (1) determining the goals and objectives for the study (e.g., the questions the study should answer), and (2) choosing an analysis approach and the appropriate tools to meet the goals of the study.

Step 2: Define Study Area Boundaries and Time Horizon

Step 2 of the indirect effects assessment identifies explicit study area boundaries and a time frame for the analysis, and explains the process by which these boundaries were selected. Various methodologies for establishing study area boundaries are described, including political/geographic boundaries, commuteshed, growth policies, growth boundaries, watershed and wildlife habitat boundaries, and public involvement/interviews.

Step 3: Assess Existing and Future No Build Land Use Patterns

Indirect land use effects are the incremental change in land use attributable to the transportation project—representing growth that would not have otherwise occurred. In order to determine the incremental effect of the project, it is first necessary to analyze the future land use conditions without the proposed project as the baseline for comparison. Accurately defining the No Build condition is key to accurately presenting the potential indirect effects of a transportation project. Therefore, prior to developing the No Build scenario, a comprehensive inventory of existing land use and planning information for the study area should be compiled. Data sources for identifying existing conditions and trends are described, including various national and Montana-specific socioeconomic data sets.

Step 4: Assess Future Build Condition, Land Use Conditions and Indirect Land Use Effects

Step 4 involves carrying out the methodology or methodologies selected in Step 1 to assess qualitatively and/or quantitatively the potential location and magnitude of indirect land use effects. The details of Step 4 are heavily dependent on the specific methodologies being utilized. However, regardless of the methodology, the No Build and Build condition analyses are compared—the difference is the indirect effect of the project.

Indirect land use effects are typically first calculated initially in terms of population, households, and employment. These may be converted to other indicators such as land conversion to certain land use types based on density assumptions derived from existing land use patterns or the relevant literature. The ad hoc allocation model presented in NCHRP Project 25-25 (Task 22) provides default density levels that can be used in various contexts, but it is generally advisable to obtain density information specific to the study area (or sub-areas within the study area when there is a substantial density gradient between a city center and outlying rural areas). Further

detailed guidance on best practices for estimating land cover change from population and employment growth is provided in the book titled Urban Land Use Planning (Kaiser et al. 1995).

For Montana, a tremendous amount of valuable information can be gained from the Montana Cadastral Database. The database includes information on the number of housing units per parcel and thus could be used to help understand existing density levels in the study area.

The results of Step 4 should be summarized in a narrative, supported by tables and maps.

Step 5: Assess the Potential for Indirect Impacts on Sensitive Resources

Step 5 deals with assessing the impact of indirect land use change on environmental resources and communities. Typical resources analyzed for indirect effects include agricultural land, water resources, wildlife habitat, wetlands, cultural resources, and social and economic conditions. Public involvement and agency coordination should be an important component in ensuring that relevant resources are considered in the analysis. The indirect effects assessment should make use of the best available data on environmental and community conditions, it is not typically necessary to create new data or conduct extensive field work as is typically done with direct impact analysis. The Indirect Effects Desk Reference provides detailed information on the trends affecting key resources and data sources that can be used.

Step 6: Develop Potential Mitigation Measures

If no adverse impacts area identified as result of the detailed analysis, no mitigation discussion is necessary. However, if adverse impacts are identified, a discussion of mitigation that could be implemented by MDT or others is warranted.

Mitigation for direct, indirect or cumulative impacts is not required by NEPA, which only requires that possible mitigation be disclosed. Mitigation under MEPA must be enforceable by the project sponsor; therefore, many planning-type actions within the purview of local governments are not available as mitigation measures under MEPA to MDT. Neither MEPA nor NEPA are a substitute for local land use planning and zoning. Nevertheless, for NEPA compliance it is important to identify mitigation techniques for indirect effects and to provide information to decision-makers, state/federal agencies, local and regional governments, and the public about what techniques could be useful and who has authority to impose or implement those mitigation techniques and/or controls. Mitigation strategies typically discussed in indirect impact assessments include: access management, zoning and comprehensive planning, transfer of development rights, growth management regulations, resource management and preservation regulations, land acquisitions and conservation easements, and incentives for infill development. The discussion for NEPA purposes does not obligate any agency to undertake these mitigation measures; it is only for disclosure purposes.

Specific to Montana, the MDT research program's "Transportation and Land Use Toolkit" provides a summary description of the available planning strategies for mitigating indirect land use effects available to local communities, including the advantages/disadvantages of each, and implementation recommendations specific to Montana (Mazur 2010). These strategies include:

- Growth Policies
- Land Use Regulations
- Concurrency & Adequate Public Facilities (APF) Ordinances
- Development of Regional Impact (DRI) Review
- Frontage Road Requirements
- Impact Fees
- Transportation Utility Fees
- Trip Credits
- Density Awards and Bonuses
- Transfer of Development Rights (TDR)
- Access Management
- Urban Growth Boundaries
- Rural Land Conservation Easements

Step 7: Document the Process and Results

The indirect effects assessment should be documented in a technical report organized around the steps of the analysis process. Under each step, explanation should be provided for what the analyst did and why they made those particular decisions. The report should conclude with a discussion of the study conclusions regarding the expected effect of the project on land use as well as related indirect impacts on environmental resources. Mitigation measures, and major uncertainties associated with the analysis should also be included. The indirect effects technical report will likely be too lengthy to include directly in the body of the NEPA/MEPA document and should instead by summarized and incorporated by reference.

The public involvement process needs to be fully documented to provide the following information for the record:

- Time and place of the meeting
- Meeting agenda and format
- Attendees
- Material presented and hand outs
- Summary of comments and discussion at the meeting
- Disposition of comments

5.2 Review of Indirect Effects Detailed Analysis Methodologies

There is no single standard method for analyzing indirect effects, unlike other environmental topics where there is a highly structured methodology (e.g., noise - where FHWA's Traffic Noise Model is the only permitted methodology and the standards for assessing impacts are set by federal regulation and state policy). Rather, there are a large range of qualitative and quantitative analysis methods that are considered acceptable. The selection of a method or methods for application is done on a case-by-case basis considering factors specific to individual projects. It is not necessary to select a single methodology, frequently a combination of methodologies is

necessary (American Association of State Highway and Transportation Officials (AASHTO) 2011). Factors to consider in selecting an analysis method for an indirect effects assessment include:

- Magnitude of potential induced-growth effects (based on initial screening evaluation of drivers of induced growth).
- Strengths and limitations of each available tool in the context of the specific project (including availability of the relevant data for the study area, such as population and employment projections, recent orthophotography, parcel boundaries, zoning, and environmental features).
- Relationship to other analyses in NEPA process (e.g., compatibility with modeling or other analyses that are being done for other purposes, such as traffic forecasting).
- Agency and public expectations (e.g., preferences for a specific method that has been used in previous studies).
- Cost and schedule constraints.
- Necessary output to meet needs of study/address environmental impacts. For example, if stormwater is a key issue for project and a quantitative analysis of the change in impervious surface cover is desired, a quantitative analysis of land use change will be necessary.
- Geographic scope considerations, such as the applicability of the method to a study area of a certain size or the minimum level of geographic detail needed in the results. For example, a projection of population change at the municipality level may not be appropriate to estimate environmental impacts in specific areas within the municipality.
- The availability of appropriate staff (e.g., a methodology using a travel demand model may require a transportation modeling expert).

Numerous guidebooks covering methodologies available for indirect effects analysis are available, most recently NCHRP Project 25-25 (Task 22): "Forecasting Indirect Land Use Effects of Transportation Projects" (Avin et al. 2007). It is not the intent of this research project to duplicate prior efforts. Instead, the methodologies from this report are summarized below and reviewed for their applicability to Montana. Refer to NCHRP Project 25-25 (Task 22) for the details of each methodology (Avin et al. 2007).

Unlike the screening process, the detailed analysis methods discussed below require a team with varying degrees of specialized education and experience. At a minimum, an individual with a background in NEPA/MEPA, land use planning and an understanding of the theoretical underpinnings of transportation-land use interactions is needed to structure the analysis. More advanced forms of collaborative judgment, such as the Delphi Panel, should be undertaken by individuals with experience applying these approaches in other locations. Travel demand model-based methods should be operated by MDT staff or consultants with appropriate experience.

5.2.1 Planning Judgment

5.2.1.1 Overview

Planning judgment relies on the experience of the practitioner, the relevant planning literature, and on an assessment of local trends and forecasts to assess indirect land use impacts. Planning

judgment is an essential component of all indirect land use effects studies. Planning judgment may be supplemented with more complex quantitative analysis and modeling for the most complex and controversial projects, like a new bypass or connector roadway. For smaller projects, such as single new interchange or minor widening, planning judgment may be the only methodology required. The key advantages of planning judgment include its transparency, low time and cost requirements, and flexible data requirements. A potential disadvantage of planning judgment used alone is that it can be difficult to develop supportable quantitative forecasts of land use change (if such forecasts are desired for a particular project). Planning judgment is also highly influenced by the biases of the individual analyst—this weakness can at least be partially overcome through collaborative judgment approaches discussed in Section 5.2.3.

5.2.1.2 Applicability in Montana

Planning judgment is an essential component of indirect effects analysis and thus is applicable to all types of transportation projects in Montana.

5.2.1.3 Cost and Expertise Requirements

The cost of planning judgment is typically relatively low relative to other methods that may involve extensive data collection and quantitative analysis. The method is best employed by planners with a strong foundation in the literature of transportation-land use interactions. Planning judgment (and all methodologies) are most effective when the analyst can write well and tell a plausible story of how the proposed project is likely to affect land use and the supporting facts considered in reaching that conclusion. Experience in scenario writing may be useful in this regard, although it is important to understand that indirect effects analysis is very different from typical scenario planning where the objective is to identify the future conditions preferred by community.

5.2.1.4 Examples

An excerpt of planning judgment utilized as the exclusive analysis methodology in an EIS is provided below. Ideally supporting details, references and analysis for each of the summary points below would be documented in the EIS or indirect effects technical report.

Example: Reconstruction of U.S. 2 between Columbia Heights and Hungry Horse, 2002 Reevaluation of the 1995 FEIS

The likelihood that reconstruction of U.S. 2 between Columbia Heights and Hungry Horse project would cause significant new land development or would induce substantial new growth in the project area or other portions of Flathead County is viewed as low. This conclusion is based on the following considerations.

- While Flathead County has generally experienced rapid population growth and development over the past two decades, growth and new development in the Columbia Falls area has lagged notably behind other communities in the county. Reports prepared by the Flathead County and Tri-City Planning Offices websites show that the rates of residential development, land subdivisions, and annexations in the Columbia Falls area have been consistently below those in the Kalispell and Whitefish area.

- Unless developers acquire and consolidate ownership on adjoining properties, current landholdings are relatively small and offer few opportunities for major new developments adjacent to U.S. 2 in the project corridor.
- Travel times through the corridor would be reduced and accessibility enhanced with the proposed improvements, particularly during peak summer travel months. However, since the project is only 7.2 km (4.5 miles) in length, the overall savings in travel time resulting from highway reconstruction would be small for residents commuting between "canyon" communities and other Flathead Valley locations. The savings in travel times would not be substantial enough to cause major changes in development patterns in this portion of Flathead County.
- Capacity and water quality problems exist with the privately owned water distribution system in Columbia Heights. Without substantial improvements to the system by the present owner or the acquisition and subsequent upgrading of the system by a local water district, the domestic water supply will continue to pose a limitation on the development potential of the area.
- An expanding county population, high numbers of seasonal visitors to the Flathead-Glacier Region, convenient highway access, and a sufficient quantity of affordable land are all factors viewed as favorable to new land development. These attractive conditions have existed in the area for at least the past twenty years, yet very little new development has occurred in or near the project corridor.

In short, there are few, if any, reasons to believe that upgrading this section of U.S. 2 from two-lanes to a four-lane configuration will cause current property owners and developers to build faster or any differently than they would have without MDT's highway improvements.

5.2.2 Comparative Case Analysis

5.2.2.1 Overview

A comparative case analysis is a qualitative methodology that involves comparing a like area where a similar project has been completed to the area of concern where a project is proposed. The most important consideration in using a comparative case analysis approach is that the proposed project and the case study project(s) are very similar in size; project type, location, and design. The comparative case analysis method is most applicable when a good case study project is available with sufficient data on before and after conditions to estimate the indirect effects of the case study project. If no appropriate case study projects can be located, then another analysis methodology should be considered instead. In addition to the difficulty associated with identifying comparable projects, a second drawback associated with comparative case analysis is the need to determine the conditions in the area before the case project was completed (e.g., a retrospective analysis to determine past conditions). It is difficult to estimate which portion of past development can be attributed to a particular transportation project versus development that would have occurred anyway without the transportation project. There are no controlled experiments to accurately measure transportation-land use interaction in way that excludes the influence of all the other factors that influence development patterns.

The selection of comparative case(s) should take into account the time lag between the completion of a transportation project and indirect land use effects. Indirect land use effects tend

to occur slowly over time, with changes continuing to transpire 20, 30, or more years after the transportation improvement. For example, a project completed in the last five years probably would not be a good case study because of the lag time in land use effects. On the other hand, projects completed farther in the past are likely to have occurred in an environment with different policy and planning objectives than exist today (e.g., current land use policy could limit indirect effects in comparison to past development).

5.2.2.2 Applicability in Montana

There are no inherent data availability limitations that would make comparative case analysis impracticable in Montana. However, particular care should be taken in selecting comparable projects with similar growth pressure characteristics. Where possible, comparable projects should be from the same general region as the proposed project to help ensure similar growth pressure characteristics. Swanson defines five regions of Montana as shown Figure 7 (Swanson, 2006). Growth pressure varies substantially even within the regions defined by Swanson; therefore, it is important document the justification for the representativeness of the comparable projects.

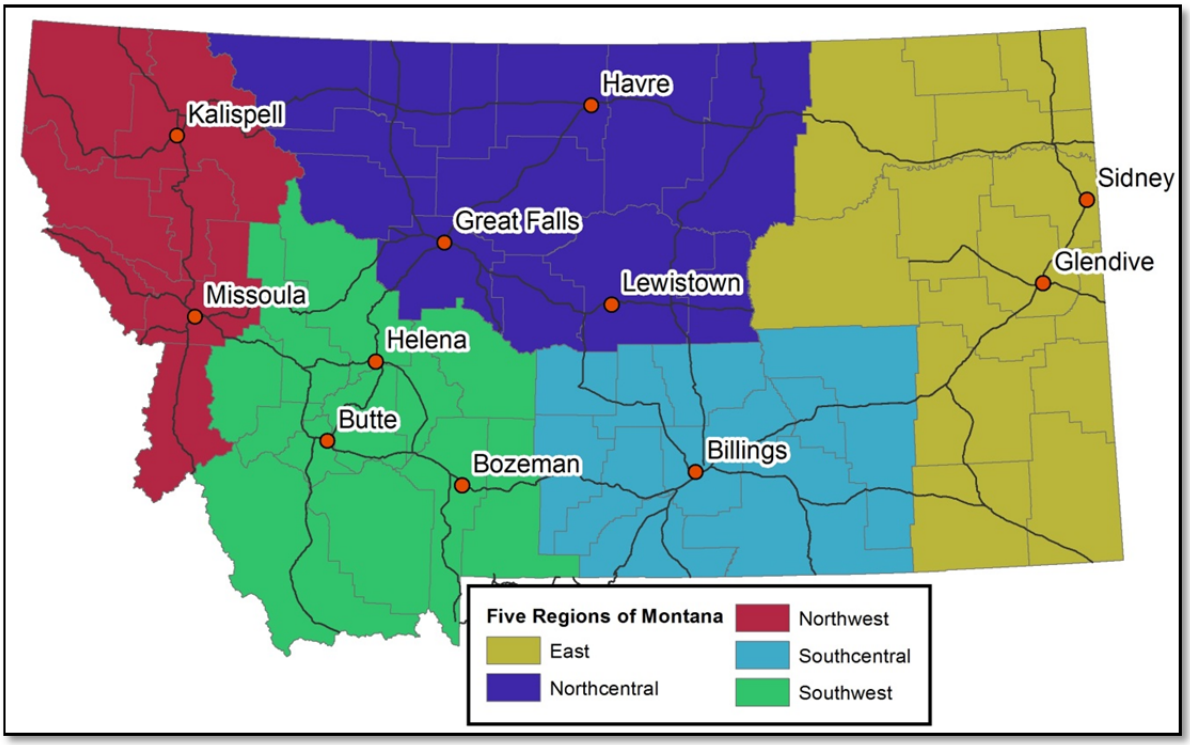

Figure 7: Regions of Montana (Swanson 2006)

5.2.2.3 Cost and Expertise Requirements

The comparative case analysis approach relies heavily on planning judgment to determine the reasonableness of the case study projects and in the process of applying the information from the case studies to the indirect effects analysis of the proposed project. The key data requirement is information on past and current conditions for each case study project. If this data is available,

the method would be relatively inexpensive to implement in comparison to most quantitative techniques and the more involved qualitative techniques (e.g., Delphi Panels). However, in most situations the necessary case study data on development patterns would not be readily available and would be time consuming to collect through methods such as analysis of aerial photography time series, review of local development permit records, and interviews with knowledgeable local planning staff.

5.2.2.4 Examples

The comparative case method is not commonly used and no readily available NEPA or MEPA documents for transportation projects utilizing this approach were located through several online searches.

5.2.3 Collaborative Judgment

5.2.3.1 Overview

Collaborative judgment methods build on individual planning judgment by incorporating input from other people knowledgeable of the study area to inform conclusions about future land use conditions. Collaborative judgment can be used as a method itself or used in combination with other methods. For example, local experts could be used to review the reasonableness of the growth projections obtained with another methodology.

There are a wide range of different options to using collaborative judgment. At the most basic level, surveys of local experts, stakeholders, and professionals can be invaluable in developing assumptions and assessing future conditions. Survey techniques can include informal conversations; formal inquiry following an instrument administered by mail, phone, or interview; or discussions or meetings of a collaborative task force or panel.

The most structured consultation method is the Delphi technique. The Delphi technique is a survey research technique directed toward the systematic solicitation and organization of expert intuitive thinking from a group of knowledgeable people (Linestone and Turoff 1975). It provides a means for arriving at an informed, objective judgment based upon a variety of sometimes conflicting opinions. Each member of the Delphi panel is asked to answer a questionnaire addressing the indirect effects of a transportation project. The responses are shared with the panel, but the answer of each individual panel member is kept anonymous. The questionnaire is then repeated, and each panel member may revise their estimates based on the responses of the other panel members. A carefully structured Delphi panel with diverse membership can improve public acceptance of the results of the panel, particularly for controversial projects or projects where there is considerable uncertainty about the magnitude of potential indirect effects. However, a Delphi panel that does not reach consensus (e.g., the results for the individual members do not converge) can make it difficult to explain and draw conclusions about indirect effects in an environmental document. Some practitioners have attempted to summarize the results of Delphi panels with divergent views through blended average (average of the median and the mean; see Parsons Brinckerhoff Quade and Douglas 2002); however, this approach is not universally accepted.

Expert panels or detailed interviews with local real estate, government, and industry leaders may be a workable substitute for the Delphi method when panelists would be unable to participate in an iterative process. Less formal methods (e.g. interviews) lack the feedback and review features of a Delphi panel, but may be used to construct or confirm assumptions employed in other qualitative or quantitative techniques. Project task forces made up of a representative mix of community stakeholders can also help define forecast techniques and results, especially when coupled with public outreach meetings or charettes designed to gauge the range of community expectations regarding project induced growth. Task force and outreach techniques can also serve to build consensus that would promote broad acceptance of findings.

5.2.3.2 Applicability in Montana

Collaborative judgment has been used for several MDT projects in the past and the method is particularly well suited to Montana because the rural areas that comprise the majority of the state lack travel demand models and access to other tools that can enable quantitative modeling of indirect land use effects. Given the uncertainty involved in estimating indirect land use effects, collaborative judgment approaches offer a robust way of incorporating multiple viewpoints into the impact assessment process.

5.2.3.3 Cost and Expertise Requirements

The cost of collaborative judgment approaches varies considerably depending on the structure of the approach, and number of local experts contacted. Informal consultation or small meetings with local experts are relatively low cost compared to detailed quantitative modeling efforts. The time and coordination efforts to convey a Delphi panel can be extensive and depend on the size of the panel and the number of survey iterations conducted.

Individuals experienced in public outreach and facilitation are important to effective use of collaborative judgment methods. More specialized training and experience is required to implement a Delphi Panel as the design of the survey instrument and the process for interpreting the results are very important.

5.2.3.4 Examples

Collaborative judgment approaches are widely used in the field of indirect land use effects assessment. Three examples are provided below.

Example: I-15 Corridor Montana City to Lincoln Road, 2003

The 2003 I-15 Corridor Montana City to Lincoln Road FEIS considered indirect land use effects by using an expert panel referred to as the Land Use Advisory Group. The nine-member Land Use Advisory Group included representatives of Lewis & Clark County, Jefferson County, City of Helena, Growing Friends, Plan Helena, Prickly Pear Land Trust, Helena Area Chamber of Commerce, and local business owners. The Land Use Advisory Group met in August 2001 to develop future land use forecasts. The forecasts assumed that the total level of growth in the Helena Valley would not be changed by the alternatives, but the location of growth could be affected. The household and employment regional control totals were for a 2025 analysis year and were extrapolated from U.S. Census population projections. The Land Use Advisory Group created forecasts for the following scenarios:

- 2025 No Build—no new interchanges
- 2025 New Interchange North—new interchange north of Cedar Street (e.g., Custer Avenue or Forestvale)
- 2025 New Interchange South—new interchange between Capitol interchange and the Montana City interchange

Figure 8 summarizes the analysis results for each of the three scenarios in terms of households, retail employment, and non-retail employment.

Among other improvements, the preferred alternative from the 2003 FEIS included both the north (Custer Avenue) and south Helena interchanges. This was not a scenario explicitly considered by the Land Use Advisory Group in 2001. The preparers of the FEIS concluded that the Land Use Advisory Group's No Build condition forecast best represented a balance of growth between the north and south interchanges. Therefore, the incremental indirect land use effect (the difference between the No Build and Build) was not addressed quantitatively in the 2003 FEIS. The FEIS did provide a qualitative description of the potential for indirect land use effects in the vicinity of each interchange along the 19.31 km (12 mile) study corridor based on planning judgment.

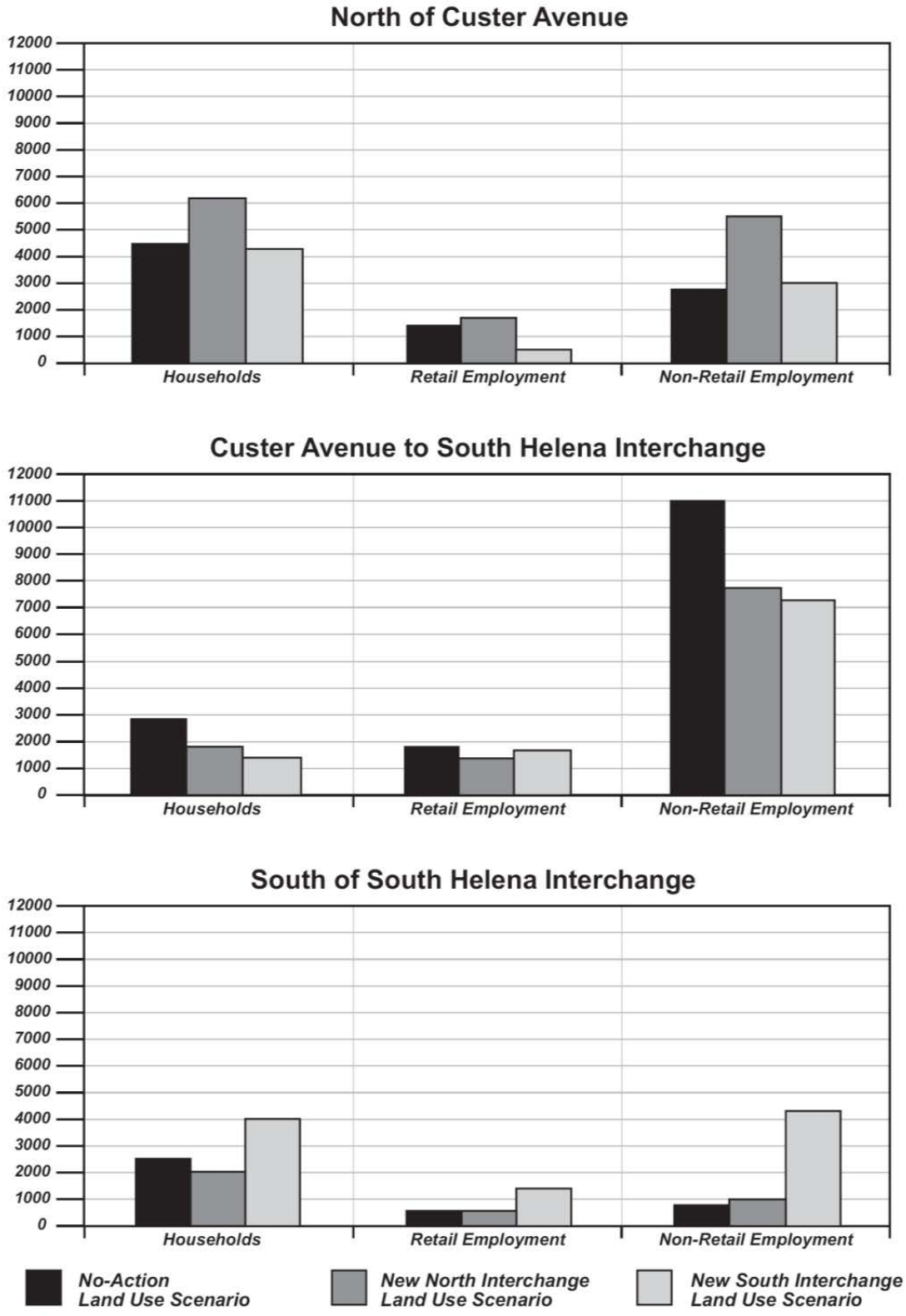

Figure 8: I-15 Corridor Montana City to Lincoln Road 2025 Land Use Projections (Carter Burgess 2003, p. 3-18)

Note: Y Axis is number of households, retail employment and non-retail employment

Example: I-93 Improvements (Salem to Manchester), New Hampshire - FEIS, 2004

The basic purpose of the I-93 Salem-Manchester project is to improve transportation efficiency and reduce safety problems associated with this approximately 31.87 km (19.8 mile) segment of highway from the Massachusetts/New Hampshire State line to Manchester, New Hampshire. The main element of the project involves widening I-93 from the existing two-lane highway in each direction to a four-lane highway in each direction. The project also includes reconstruction of existing interchanges, new park-and-ride lots, and expanded commuter bus service to Boston.

To facilitate the assessment of induced growth and land use change attributable to the I-93 project, the NHDOT and FHWA utilized the Delphi Technique. The 16-member expert panel included representatives from the real estate industry, academics specializing in planning and environmental resource analysis, members of public interest groups, members of local planning boards, and a regional water pollution control agency. Through application of the Delphi Technique, the panel members allocated 2020 population and employment growth to 29 communities in a secondary impact study area. There was considerable variation in the response of individual panelists, ranging from the Build Alternative having no effect on growth, to large effects on growth. The results of the Delphi Technique process were summarized through the use of a blended average—the average of the median and the mean. The blended average method gives some weight to very high and low outlying values, but gives less weight to these values than using a mean. The expert panel's blended average allocations indicated a five-percent increase in population and employment under the Build Alternative when compared to the No Build Alternative. The results of the indirect effects analysis were shared with the public in a series of five public information meetings on secondary impacts.

The blended average population and employment allocations were used as the basis for estimating potential land consumption and related environmental impacts, utilizing GIS data of important environmental features, existing build-out analyses and calculations of the area of land available for development. For most environmental resources, impacts were discussed qualitatively due to "uncertainty about the size, type, and location of such future development." To mitigate for potential growth-related indirect effects, NHDOT has committed to a 3.5 million dollar Community Technical Assistance Program to provide planning assistance to local communities.

Example: North I-25 EIS, Colorado DOT, 2011

The North I-25 project involves widening I-25 with general purpose lanes and Tolled Express Lanes (TEL) and reconstruction of substandard interchanges to accommodate future travel needs. Express bus service would operate in the TEL to connect northern Colorado communities to downtown. Commuter bus service along U.S. 85 would connect Greeley with downtown Denver with stops at the communities along the route. The Preferred Alternative also includes commuter rail transit service from Fort Collins to the anticipated FasTracks North Metro end-of-line. Service to Denver would travel through Longmont and along the FasTracks North Metro Corridor.

Indirect land use impacts were evaluated using a local expert panel. The panel consisted of municipal planners from Dacono, Firestone, Fort Collins, Frederick, Greeley, Longmont, Loveland, Mead, and Windsor. Also on the panel were representatives from two large

developers who have projects in the area, and agency representatives from North Front Range Metropolitan Planning Organization, Denver Regional Council of Governments, FHWA, and Colorado Department of Transportation. The panel convened in October 2006 during which current induced growth research was described, along with the current "drivers" of growth.

Prior to the meeting a package was sent to invitees with information on the alternatives, the role of the expert panel, and future population and employment data. In preparation for the meeting, expert panel members were asked to consider the following issues when considering where future housing and employment growth could most likely occur based on the alternatives identified:

- What are the political or physical restrictions to growth (community boundaries/planning areas, environmental features)?
- What areas will allow new job growth?
- What types of employment or housing will develop?
- Is rezoning to more transit-supportive densities being considered?
- Is redevelopment anticipated within established areas of the corridor?
- What restrictions do the provision of services (sewer, water, utilities) present?
- What will the future land use be in the area with the No-Action Alternative?
- What role will future transportation facility improvements (e.g., interchange upgrades, express lanes) play in the distribution of land use?
- What, if any, are the potential changes to land use or the location of employment and housing associated with completion of either of the transit alternatives (Bus Rapid Transit vs. Commuter Rail)?

At the meeting, a brief overview of the alternatives and the background material was provided to orient participants. A brief discussion of research on induced growth associated with transportation improvements was also provided. Facilitators then led the group through a discussion on each alternative and solicited feedback on potential changes in future land use patterns that could result under each of the three alternatives. The expert panel provided a general discussion of expected trends, which are summarized in Figure 9.

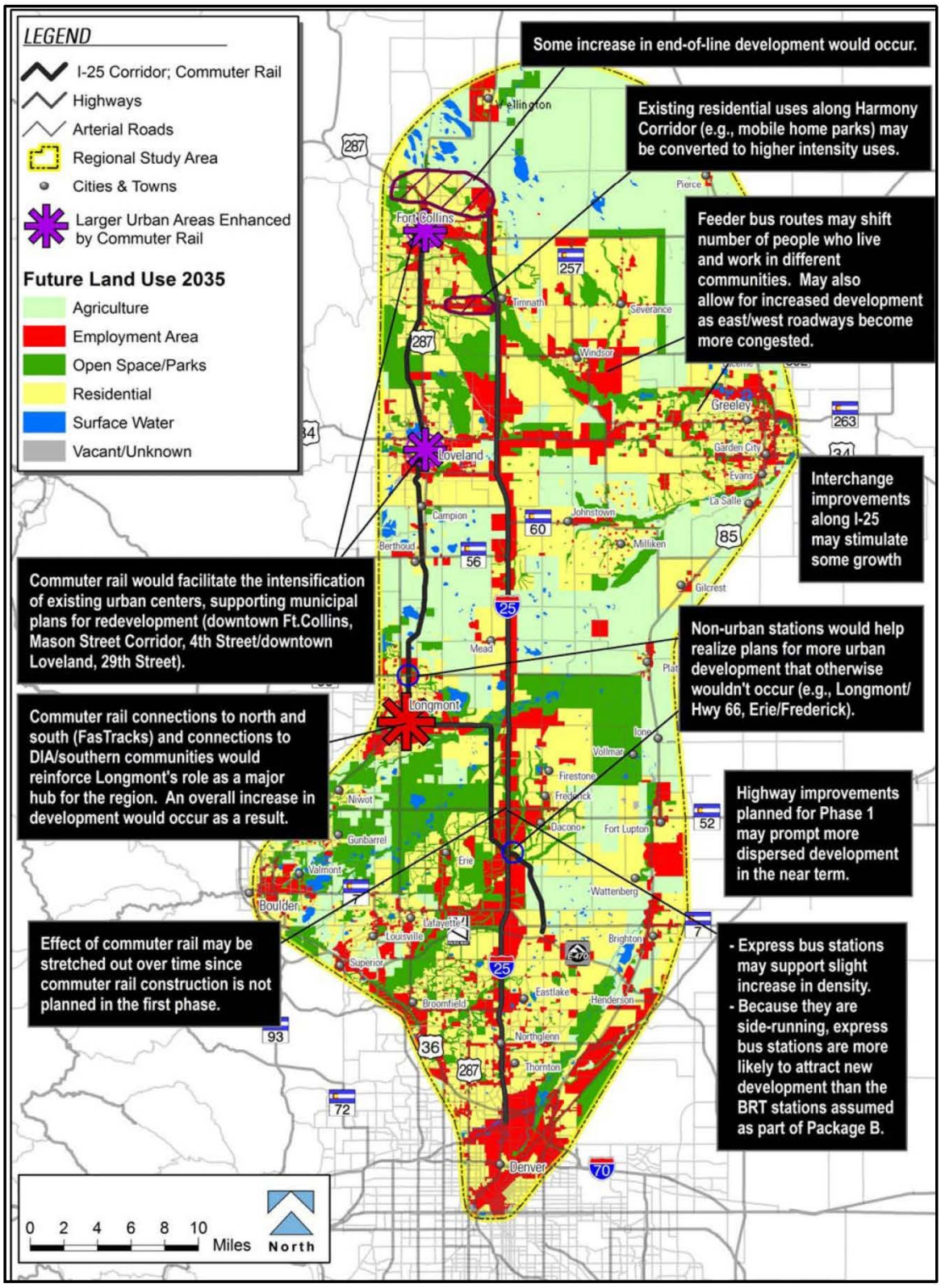

Figure 9: North I-25 Indirect Land Use Effects Summary
(Colorado Department of Transportation 2011, p. 3.1-20)

5.2.4 Allocation Models

5.2.4.1 Overview

In conjunction with planning judgment or collaborative judgment, allocation models can allow the analyst to distribute a defined amount of indirect land use change at a disaggregate level (e.g., to Traffic Analysis Zones). Typically a set of allocation rules that work through GIS-based spatial datasets they are tools used to (1) allocate aggregate (e.g., regional or county) forecasts of population and employment to the smaller geographies necessary to evaluate the land-development impacts of a specific transportation project, and (2) convert those forecasts to an amount of land development, by type (e.g., residential, commercial) (Avin et al. 2007).

Allocation models are best for addressing the question of where growth will occur at the local level. The question of how much growth will occur with vs. without the project will likely need to be estimated with other methods—planning judgment, collaborative judgment, or output of travel demand models.

Refer to NCHRP Project 25-25 (Task 22) for a summary of available existing allocation models, including Land Use Evolution and Impact Assessment Model (LEAM), Land Use Scenario Developer (LUSDR), PlanMaster, TELUS/TELUM, Urban Land Use Allocation Model (ULAM), and What If? Planning Support System (Avin et al. 2007). The conclusion of Task 22 was that existing allocation models are probably not appropriate for relatively small jurisdictions looking to evaluate the impacts of a single project.

NCHRP Project 25-25 (Task 22) also provides direction for developing an ad-hoc step-by-step allocation model instead of using an existing free or commercial model. The ad-hoc model steps include:

1. Determine the Supply of Buildable Land
2. Allocate Population and Population Growth to Sub-Areas
3. Determine Site Requirements
4. Convert Population and Employment to Land Use
5. Repeat Process with the Transportation Project Included

5.2.4.2 Applicability in Montana

Existing allocation models are generally designed for use by Metropolitan Planning Organizations (MPOs) or other regional organizations with continuous and on-going transportation and/or land use planning responsibilities. The existing models are generally not designed for evaluating a single transportation project. Therefore, the use of an ad-hoc allocation model will generally be the most efficient application of this methodology in Montana. An important advantage of the ad hoc model is that it is easy to tailor the model to the available data—which is generally the greatest in more developed areas the least in rural areas. Allocation models can be a good middle ground when the project team feels the complexity of the project impacts will not be fully captured by planning judgment and collaborative judgment alone, but there is not sufficient data or resources for more complex methods based on four-step travel demand models or integrated transportation-land use models.

5.2.4.3 Cost and Expertise Requirements

Allocation models and ad hoc models in particular are relatively straightforward to use, typically requiring little more than GIS and spreadsheet skills, combined with planning knowledge to develop appropriate "rules" for the model that make sense given the characteristics of the study area. The cost of ad hoc allocation models in particular is low, with the primary cost variable being the number and complexity of GIS datasets incorporated in the analysis.

5.2.4.4 Examples

No examples of environmental documents using a simple allocation model alone as the basis for a transportation project indirect effects evaluation were located in the literature review conducted for this study. This result is not surprising given that allocation models are not designed to answer the question of what the incremental effect of a transportation project might be on future land use patterns. However, allocation model principals are frequently used in combination with other methods (including travel demand model based methods as discussed in the next section). The example project below utilized allocation model rules to estimate the land use conversion impacts of population and employment change estimated using a simple gravity model. A similar method could be used on an MDT project by replacing the gravity model input of incremental change with the results of a collaborative judgment exercise.

Example: Gaston East-West Connector Quantitative Indirect and Cumulative Effects Study, North Carolina Turnpike Authority, 2011

The North Carolina Turnpike Authority proposes to construct a 35.41 km (22 mile) controlled-access toll road extending from I-85 west of Gastonia in Gaston County to I-485 near the Charlotte-Douglas International Airport in Mecklenburg County, North Carolina.

Population and employment change at the Traffic Analysis Zone (TAZ) level was projected using the simple gravity model methodology. In order to assess potential impacts on environmental resources resulting from future development, it was necessary to convert the No Build and Build condition household and employment projections into estimates of land use change. This section explains the residential and employment land conversion methodologies, and the methodology used to estimate buildable land and limit the level of development that could reasonably be accommodated within each zone.

Residential Land Conversion: The acreage of land that would be converted to residential-related uses in the future was projected based on density information from a GIS database of 44 approved developments in Gaston County provided by the Gastonia City Planning Department. Excluding five developments consisting solely of apartments, the weighted average density (by land area) of the remaining developments in the database was 3.2 units per acre. The exclusion of apartments helps ensure that the average density is conservative. In addition, given that slightly lower densities could be expected in other portions of the study area not covered by the Gaston County database (e.g., parts of York County), this density was lowered to an even 3.0 units per acre for the purpose of projecting future residential land conversion. Residential land conversion for the No Build and Build conditions was calculated for each zone in the study area by dividing the growth in households from 2005 to 2035 by the density factor of 3.0.

Employment Land Conversion: A comparable database of recent commercial and industrial developments was not available for the purpose of making projections about employment density. Therefore, the existing density of employment was calculated based on the study area employment estimates for 2005 and the area of land devoted to commercial, industrial or institutional uses. The employment density factor for the study area is 3.5 employees per acre of commercial/industrial/institutional land. This factor is considered conservative (likely to overestimate rather than underestimate) potential impacts because it is skewed by large parcels containing substantial areas of undeveloped land. Employment-related land conversion for the No Build and Build conditions was calculated for each zone in the study area by dividing the growth in employment from 2005 to 2035 by the density factor of 3.5.

Buildable Land Estimates: The gravity model formulation used to reallocate households and employment based on changes in accessibility did not include any cap on the amount of development that could occur in any one TAZ. To account for development constraints in the TAZ-level household and employment allocations for the study area, an analysis of buildable land by zone was conducted. The following constraints were excluded from the buildable land area:

- Existing roads and right-of-ways—estimated using a 30.48 m (100 foot) buffer on the centerline of interstates and a 9.14 m (30 foot) buffer on the centerline of all other road types. For the Build condition assessment only, the right-of-way boundary of the Preferred Alternative was added as a constraint on buildable land.
- Existing developed land.
- Wetlands—based on the USFWS National Wetlands Inventory mapping.
- Rivers, streams, and lakes—based on the United States Geological Survey (USGS) National Hydrography Dataset and the applicable riparian buffer requirements for the study area.
- 100-year floodplain—based on the Federal Emergency Management Agency's (FEMA) Digital Flood Insurance Rate Maps (DFIRMs) for Gaston, Mecklenburg, and York counties.
- Conserved land.

The amount of household and employment growth was reduced in certain zones under both the No Build and Build conditions so that the total buildable land area for that zone would not be exceeded.

5.2.5 Four-Step Travel Demand Model-Based Methods

5.2.5.1 Overview

The four steps of the typical travel demand model are trip generation, trip distribution, mode choice, and traffic assignment. The four-step travel demand model lacks feedback loops between travel assignment and land use allocations. Specifically, as travel times increase due to congestion, this diminishes accessibility along congested corridors for a future forecast date. This information on accessibility thus needs to be considered in making land-use allocations since accessibility is a key determinant of where future growth will occur. Ideally, traffic assignment and land-use allocations needs to inform each other in a dynamic way (Avin et al.

2007). Although not designed for this purpose, four-step travel demand models can still provide information useful to the evaluation of indirect land use effects.

One approach, the simple gravity model, is based on the observation that the overall attractiveness of an area to potential residents is a function of the capacity of an area for development (vacant developable land in valued and affordable locations), and accessibility to employment and activity centers, among other things. The gravity model can use zone to zone travel time information from travel demand models calculates the change in accessibility to employment as a result of the project to relocate population growth in the Build condition. The zones with the greatest increase in accessibility would experience the largest indirect increase in population. A similar approach can be used to estimate indirect employment shifts, using accessibility to population centers or accessibility to a combination of population and employment. An important assumption underlying the gravity model is that the regional scale growth will not change as a result of the transportation project—only the distribution of growth may change (this assumption is supported by the literature as discussed in the Section 2.4 of this report). Refer to NCHRP Report 466 (LBG 2002) for details of the simple gravity model equations.

Another (simpler) approach to using travel demand model output in indirect effects analysis is to use the zone to zone travel time results to identify the areas receiving the greatest accessibility increase and then assess potential impacts within those areas based on planning judgment, collaborative judgment, assessment of development constraints and other methods.

5.2.5.2 Applicability in Montana

Four-step travel demand model based methods should be considered for projects located in the areas of Montana covered by travel demand models (currently Billings, Missoula, Great Falls, Bozeman, Butte, Helena, Belgrade, Laurel, and Kalispell) and the travel demand model is already being utilized in the development of future traffic forecasts for the project. In these cases, the additional cost of using the travel demand model output will be relatively low because the work to setup and run the model for various scenarios will have already been done for the traffic studies. However, some additional modeling work may still be required. For example, it is advisable to prepare initial model runs for the No Build and Build condition using the same (No Build) land use assumptions. After the indirect effects analysis, the incremental land use change attributable to the project should be added back into the travel demand model to produce a Build condition run that incorporates the additional traffic generated by the land use shifts associated with the project.

Four-step travel demand model based methods are not applicable in the rest of Montana outside the nine cities listed above that already have an existing model (MDT 2013).

5.2.5.3 Cost and Expertise Requirements

Travel demand models can be complex and time consuming to effectively utilize in the environmental review process. They also require skilled travel demand modelers to operate. Post-processing the travel demand model output and calculating accessibility indices for the gravity model method also requires a relatively high degree of expertise in travel demand models and database programs.

5.2.5.4 Examples

There are a few examples of gravity model applications available in transportation project EISs including the Winston-Salem North Carolina Northern Beltway EIS from 2007, the New Hampshire I-93 Improvements SEIS from 2010, and the North Carolina Gaston East-West Connector FEIS from 2011. No examples of the use of this method were located in the Rocky Mountain west region.

5.2.6 Integrated Transportation-Land Use Models

5.2.6.1 Overview

Integrated transportation-land use models are the most complex and data intensive tools for analyzing indirect effects. These models are different from the standard four step travel demand models in that they explicitly account for the relationship and feedback between transportation and land use. These models typically are run in multiple time steps, with congestion in one step influencing the location of households and employment in the next step. The application of most of the integrated models involves a level of effort that exceeds that necessary or appropriate for a project-specific application. In addition, most are oriented toward broader policy evaluations as opposed to project-specific application. For these reasons, integrated models are often applied at a regional scale rather than at a project scale.

Examples of integrated models discussed in NCHRP Project 25-25 (Task 22) include DRAM/EMPAL, MEPLAN, POLIS and Urbansim (Avin et al. 2007). A detailed review of integrated urban models, prepared under Transit Cooperative Research Program Project H-12, is available from Miller et al. (1998).

5.2.6.2 Applicability in Montana

There are no existing transportation-land use models in Montana; therefore, this methodology is not currently applicable anywhere in the state. The cost and data requirements of integrated transportation-land use models are such that it would not be practicable or appropriate to attempt to develop one within the NEPA/MEPA process of an individual transportation project. Should an integrated transportation-land use model be developed in the future in Montana (such as by an MPO), it should be considered for use in project-level evaluations of indirect effects for major transportation projects.

5.2.6.3 Cost and Expertise Requirements

Even when an existing model is available, all integrated transportation and land-use models are data intensive. A high level of expertise and time is required; making integrated transportation-land use models the most expensive methodology for assessing indirect land use effects.

Example: Circ-Williston EIS, Vermont, 2007

The preferred alternative for Circ-Williston Transportation project involves a new 5.63 km (3.5 mile), four-lane boulevard between I-89 in Williston and VT 117/VT 289 in Essex, Vermont, including a new bridge crossing of the Winooski River. The EIS was prepared as a result of litigation that included indirect and cumulative impact issues.

The primary analysis tool for assessing the influence of the alternatives on land use change was the Land Use Allocation Module (LUAM) of the Chittenden County transportation model. LUAM allocates household and employment growth to Traffic Analysis Zones based on accessibility (e.g., travel time), zoning, and land use development constraints (e.g., wetlands, steep slopes, etc.). The model operates in five year increments with iterative feedback between changes in accessibility due to improvements in the transportation system, and congestion attributable to growth and new development patterns. The use of LUAM was recommended during consultations with agencies and the public during scoping, and this type integrated land use-transportation model is advocated as a "best practice approach" for land use modeling.

The application of LUAM was limited to the boundaries of Chittenden County. To analyze land use change outside of Chittenden County, a separate transportation model, the Vermont Statewide model, was utilized. An accessibility index was created to measure the relative changes in attractiveness of particular areas for a development as a result of the alternatives. The accessibility index was used to proportionally reallocate statewide control total household and employment forecasts between zones based on the changes in accessibility under each alternative. The control total inputs into the Chittenden County analysis with LUAM were adjusted based on the results of the Vermont Statewide Model analysis to reflect the potential for shifts of households and employment from Chittenden County to the surrounding counties.

5.2.7 Conclusions

Based on the evaluation of various methodological approaches in the context of Montana, the preferred methodology for detailed analysis is a combination of collaborative judgment (to determine No Build vs. Build incremental change taking into account knowledge of local conditions) and allocation models (to determine the allocation of growth to specific sub areas, taking into account known constraints). Planning judgment is necessary to structure the analysis and interpret the results.

Four-step travel demand model based methods are potentially applicable within the Billings, Missoula, Great Falls, Bozeman, Butte, Helena, Belgrade, Laurel, and Kalispell areas. However, even within these areas, the cost and specialized expertise required to use travel demand-model based methods limits their applicability for indirect effects analysis to only the largest projects. Integrated transportation-land use models do not exist in Montana and are therefore not applicable at the present time.

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6 Adaptive Management Strategy for the Indirect Effects Desk Reference

6.1 Introduction

As time passes, elements of the indirect effects evaluation framework presented in the Indirect Effects Desk Reference (Appendix 1) may require updating to incorporate consideration of new methods and data sources, evolving conditions in the state's resources, the type and pattern of land development, and the characteristics of proposed transportation improvements. Innovations in effective practices, changes and clarifications in the NEPA or MEPA regulations, or legal decisions may also require update in the framework. In addition, it may be of particular importance to modify the framework following its initial implementation based on feedback from practitioners and to adjust to any unforeseen implementation issues. This section of the report provides recommendations on how the MDT can best prioritize and allocate resources to ensure the indirect effects assessment framework remains practical and current. The four key recommendations are as follows:

1. Incorporate the indirect effects guidance in the MDT Environmental Manual.
2. Establish a technical review committee to evaluate feedback, review need for updates, and make decisions on changes.
3. Implementation monitoring, including mechanisms for soliciting and tracking feedback from practitioners.
4. Update data sources/references as new data and tools become available.

6.2 Recommendation #1: Incorporate Indirect Effects Guidance in the MDT Environmental Manual

Incorporation of the screening and detailed indirect effects evaluation frameworks in the MDT Environmental Manual will assist with both the dissemination of the product of this research project and provide an existing structure (including a review committee and revision process) for revising the indirect effects frame work over time. This section provides background information on the existing MDT Environmental Manual, followed by specific recommendations for incorporating the Indirect Effects Desk Reference into the manual.

6.2.1 Environmental Manual Background

The MDT Environmental Manual was developed by the MDT Environmental Services Bureau to provide guidance to Department and consultant personnel performing environmental investigations and preparing environmental documents for MDT projects (MDT 2010). The Environmental Manual covers all of the environmental discipline-specific topics typically addressed in the environmental review process, along with specific guidance and policy for implementing MEPA and NEPA for MDT projects (e.g., determining the level of review required, preparing environmental documents, involving the public, and tracking environmental commitments, among other topics).

6.2.1.1 Environmental Manual Revision Process

The MDT Environmental Manual is expected to be updated periodically and a formal process has been established for updates. The revision process is excerpted below (MDT 2010).

1. All proposed revisions should be submitted to the Environmental Services Bureau Chief. The Revision Request Form (provided in the manual) should be used for the submittal.

2. A Review Committee will meet twice yearly, or as necessary, to review the proposed changes.

3. The Review Committee will consist of one member from each of the Bureau's Sections (Engineering, Resources, and Hazardous Waste) and will be chaired by the Bureau Chief. Members will be selected and replaced at the discretion of the Bureau Chief.

4. The Committee will submit their recommendations and will meet with the Environmental Services Bureau Chief to determine if the proposed revisions should be incorporated into the Manual.

5. If the revisions represent a policy change, the revisions will be presented to the appropriate entity.

6. If the Manual will be revised as recommended, a memo describing the revision will be distributed by the Environmental Services Bureau Chief and posted on the Montana Department of Transportation website.

6.2.2 Recommendations for Incorporating Indirect Effects Screening Analysis

With respect to indirect effects, the existing Chapter 25 of the MDT Environmental Manual is primarily based on material from the eight-step process provided in NCHRP Report 466 (LBG 2002). The NCHRP Report 466 process is focused on detailed analysis of indirect effects and detailed analyses are expected to relatively rare in Montana given that types of typical projects undertaken by MDT are not conducive to indirect changes in land use. Therefore, the existing indirect effects section of the Environmental Manual should be replaced with the step-by-step screening process tailored to Montana provided in the Indirect Effects Desk Reference. Example applications of the screening analysis framework could be included in an appendix to aid practitioners in understanding the process.

Creative use of technology could improve the implementation of the screening analysis process. To improve compliance and continuity throughout the project development process, the screening analysis could be implemented as an online tool. Several states (including Florida) have developed or are in the process of developing web-based mechanisms of tracking the environmental review process and reducing paperwork (FDOT 2013).

Finally, the indirect effects screening analysis process should be incorporated into MDT's existing CE checklist through one new question prompting the screening steps to be considered.

6.2.3 Recommendations for Incorporating Indirect Effects Detailed Analysis

The detailed analysis process described in the Indirect Effects Desk Reference can be summarized in the Environmental Manual, but details of each step, associated guidance, and resources should be provided in an appendix to the Environmental Manual due to their length. Another reason for providing these materials in an appendix is that detailed indirect effects assessments are expected to be relatively uncommon. Example applications of the detailed analysis framework should be included in the appendix to aid practitioners in understanding the process.

6.3 Recommendation #2: Establish Technical Review Committee

The MDT Environmental Manual Review Committee will be the final authority on the approval of changes to the indirect effects- related portions of the Environmental Manual. However, a separate indirect effects-focused review committee would be useful to guide the adaptive management implementation of the new procedures and to develop recommendations for possible revisions for consideration by the Environmental Manual Review Committee.

The indirect effects technical review committee would primarily consist of MDT environmental and engineering staff, but it would also be beneficial for the Montana Division of FHWA to be represented to ensure changes to the framework are consistent with the latest federal initiatives regarding NEPA implementation. Non-voting members from the consultant community and interested resource agencies (such as the U.S. Army Corps of Engineers) could also be invited to participate and inform the direction of committee. It is anticipated that quarterly or semi-annual committee meetings/conference calls would be sufficient to coordinate any revisions that may be needed.

6.4 Recommendation #3: Implementation Monitoring

The screening and detailed analysis frameworks recommended as a result of this research project represent a change in the existing ad-hoc project-by-project approaches to evaluating indirect effects. As with any change in organizational practice, full adoption of the new framework will take time. Throughout the implementation process, it will be important to provide support for any questions that may arise from practitioners and to track any reoccurring implementation issues. Once the new framework is tested in practice, it may be beneficial to make changes to the framework to make the process as smooth and straightforward as possible. The details of any implementation monitoring plans can be further refined by the indirect effects technical review committee discussed in Section 6.3.

6.4.1 Recommendations for Soliciting Feedback from Practitioners

Several months after the rollout of the new indirect effects guidance, feedback from practitioners could be obtained at low-cost through many readily available and free web-based survey tools. The key to the survey implementation will be to target those practitioners that have used the new framework on actual projects. This could be accomplished by providing the link to the web-

based survey when a consultant submits a draft environmental document containing an indirect effects screening analysis and by providing the survey link to MDT staff responsible for preparing or reviewing indirect effects analyses. The survey should be anonymous to ensure candid responses. Potential survey questions focused on the screening analysis portion of the framework are provided below.

- Have you used the new indirect effects screening analysis process provided in the 2013 version of the MDT Environmental Manual? (yes/no)
- (If yes) How many projects have you used it on? (select number)
- What types of projects did you use it on? (select one or more types from list—bridge replacement, widening, new alignment, intersection improvements, etc.)
- On average, how many hours per project did it take you or staff to gather the necessary data and complete the documentation for the indirect effects screening? (select number of hours)
- How easy/difficult did you find it to understand and implement the screening procedure? (scale of 1 to 10 with 1 being very difficult to implement and 10 being very easy to implement)
- What were the main reasons for your rating in the question above? (open ended response)
- What recommendations do you have for potential improvements to the screening process and associated guidance? (open ended response)

A summary of the survey results could be shared with the indirect effects technical review committee for consideration in prioritizing future revisions to the indirect effects analysis framework.

6.4.2 Recommendations for Soliciting Feedback from Resource Agencies

Similar to the practitioner survey described above, resource agency contacts involved in the review of MDT environmental documents could be surveyed for their perceptions of the indirect land use effects framework. It would be useful to determine whether resource agencies find the screening process useful in meeting their agency-specific mandates (such as the U.S. Army Corps of Engineers and the requirement to consider "secondary impacts" to waters of the U.S. under the Section 404(b)(1) Guidelines before issuing a Section 404 Permit). The list of agencies to survey could include:

- U.S. Army Corps of Engineers, Omaha District
- U.S. Environmental Protection Agency, Region 8
- U.S. Fish and Wildlife Service
- Federal land management agencies—National Park Service, Bureau of Land Management, U.S. Forest Service, etc.
  Montana Department of Environmental Quality

6.5 Recommendation #4: Updating Data Sources

The datasets and guidance documents referenced throughout the indirect effects framework will become out of date over time. As new tools and updated data becomes available, there is a need

to periodically review and update the framework and associated guidance documents. This effort could be coordinated by the indirect effects technical review committee. It is recommended that the guidance be reviewed for potential updates to data sources at least every five years.

One strategy for reducing the effort needed to keep the guidance up-to-date could be to store the guidance documents in a Wiki format. A wiki is a website which allows its users to add, modify, or delete its content via a web browser. Minor edits can easily be made over time by numerous users. This is much less time consuming than the effort that is required to produce a complete new version of a typical guidance document. The users allowed to edit the guidance could be restricted to select members of the indirect effects technical review committee. One example of this approach is the Missouri Department of Transportation's "Engineering Policy Guide"—the following link shows the noise policy section as an example of the format (Missouri Department of Transportation 2013): http://epg.modot.org/index.php?title=127.13_Noise.

The recent NCHRP Project 25-25 (Task 77):"Strategic Options of Inventorying and Updating Environmental Guidance and Links" provides several recommendations applicable to keeping indirect effects guidance up-to-date, including the need to routinely check and update hyperlinks to outside data sources within the guidance documents (ICF International 2012). There are automated software solutions that can assist in the link update process. MDT should consider establishing a work flow for periodic reviews and assign staff responsibility for keeping specific sections of the indirect effects guidance current.

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7 Conclusion

Land use planning in Montana is conducted by local governments and is not within the purview of MDT. In addition, future land use change is inherently uncertain, involving a complex interaction of many factors, including transportation. Nevertheless, MDT is obligated to consider "reasonably foreseeable" indirect land use and environmental effects of proposed transportation projects subject to MEPA and/or NEPA. As part of this research project, interviews and environmental document reviews were conducted to assess the state of the practice of indirect land use effects assessment in MDT environmental documents. Recommendations developed included making improvements to methodological consistency among MDT regions and projects, supporting conclusions with additional data and analysis, addressing potential indirect effects on environmental resources from changes in growth patterns, and integrating transportation and land use forecasting on major projects.

To develop clear and defensible criteria for determining when further detailed indirect effects analysis is needed for MDT projects being reviewed under NEPA and/or MEPA, LBG reviewed existing screening methodologies used in other states and developed a screening methodology for MDT projects. The screening methodology that was developed was intentionally designed to be user-friendly and able to be completed with minimal data collection efforts early in the project development process. The screening process includes five steps, evaluating each of the following questions:

1. Is the Project Exempt from Screening?
2. Does the Project have an Economic Development Purpose?
3. Does the Project Substantially Improve Accessibility?
4. Is Developable Land Available in Areas Served by the Project?
5. Does the Project Region Exhibit Evidence of Growth Pressure?

When it is determined from the initial screening process described above that further detailed indirect effects analysis is needed for MDT projects being reviewed for environmental compliance, it is important to follow a defensible, well developed process consistently. This report provides a step-by-step process and toolkit of methodologies available for analyzing indirect land use and induced growth effects in detail and discusses the appropriateness of each methodology in various locations within Montana. Although the majority of MDT projects are not anticipated to need detailed analysis based on the screening analysis process, those projects that do should adhere to the following detailed analysis framework that is organized around seven steps:

1. Determine Study Goals and Methodology
2. Define Study Area Boundaries and Time Horizon
3. Assess Existing and Future No Build Land Use Patterns
4. Assess Future Build Land Use and Indirect Land Use Effects

5. Assess the Potential for Indirect Impacts on Sensitive Resources

6. Develop Potential Mitigation Measures

7. Document the Process and Results

As time passes, elements of the indirect effects evaluation framework may require updating to incorporate consideration of new methods and data sources, evolving state resources, changes in land development patterns, innovations in effective practices, and changes and clarifications in the NEPA or MEPA regulations. The concluding section of the report provides four recommendations on how the MDT can best prioritize and allocate resources to ensure the indirect effects assessment framework remains practical and current, including incorporating the indirect effects guidance in the MDT Environmental Manual and establishing a technical review committee to evaluate feedback, review need for updates, and make decisions on changes.

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APPENDIX 1: INDIRECT EFFECTS DESK REFERENCE

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1 Introduction

This Desk Reference for Indirect Effects Assessment provides step-by-step guidance for addressing indirect land use effects (also known as induced growth or secondary impacts) in the environmental review documentation of transportation projects in Montana. Chapter 2 provides the regulatory definition of indirect effects and related terms. Chapter 3 provides an initial screening framework designed to identify those projects warranting further evaluation of indirect effect issues. The screening analysis is based on information readily available early in project development. For most projects, the screening analysis will be the only review required. Section 4 provides the detailed analysis framework for larger projects where the need for analysis cannot be dismissed through application of the screening criteria. For details of the development process for the analysis process described in this Desk Reference (including the review of indirect effects guidance materials used in other states), refer to Final Report for the "Assessing the Extent and Determinates of Induced Growth" research project.

2 Regulatory Framework and Terminology

The distinction between direct, indirect, and cumulative impacts originates from the Council on Environmental Quality's (CEQ's) regulations implementing the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations (CFR) 1500-1508). In Montana, similar, but distinct definitions of these terms are provided under the Montana Environmental Policy Act (MEPA), a state-level environmental review requirement (Montana Code Annotated (MCA) Title 75 Chapter 1).

- **Direct impacts** are "caused by the action and occur at the same time and place" (40 CFR §1508.8).

- **Indirect effects** are those effects that ". . . are caused by the action and are later in time and 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" (40 CFR §1508.8(b)).

Three types of indirect effects were identified the National Cooperative Highway Research Program (NCHRP) Reports 403 and 466 (Louis Berger Group, Inc. (LBG) 1998 and LBG 2002):

- **Encroachment-Alteration Effects**—Alteration of the behavior and function of the affected environment caused by project encroachment (physical, chemical, or biological) on the environment. Examples of encroachment-alteration effects include impacts to wildlife from habitat fragmentation or changes in water quality that are attributable to the project.

- **Induced Growth Effects**—Changes in the intensity of the use to which land is put that are caused by the action/project. These changes would not occur if the action/project does not occur. For transportation projects, induced growth is often attributed to changes in accessibility caused by the project.

- **Induced Growth Related Effects**—Alteration of the behavior and function of the affected environment attributable to induced growth (e.g., loss of wildlife habitat and increased impervious surface cover attributable to induced growth).

Cumulative effects are "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). According to the Federal Highway Administration's (FHWA) "Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process" (2003), cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a proposed project.

MEPA was modeled after NEPA and contains very similar requirements to NEPA for state agency actions. The rules for implementing MEPA adopted by MDT use the term "secondary impacts," instead of indirect effects, and define secondary impacts differently from the CEQ NEPA definition. According to MDT's MEPA rules, Administrative Rules of Montana (ARM) 18.2.36 (18), "secondary impact" means a further impact to the human environment that may be stimulated or induced by or otherwise result from a direct impact of the action.

The MEPA definition does not refer to "reasonably foreseeable" effects or reference specific examples of the type of impacts to be considered. Despite these differences, the intent of the MEPA definition of secondary impacts is the same as the definition of indirect effects under NEPA. The MDT MEPA procedures state that "human environment" includes but is not limited to biological, physical, social, economic, cultural, and aesthetic factors that interrelate to form the environment.

In addition, induced growth is among the factors to be considered in determining impact significance under MEPA (ARM 18.2.238 (c) "growth-inducing or growth-inhibiting aspects of the impact, including the relationship or contribution of the impact to cumulative impacts.")

Similar to NEPA, MEPA also requires consideration of cumulative impacts.

This Desk Reference is focused on induced growth and induced growth related indirect effects. Although typically used interchangeably, note that the term "indirect land use effects" is used instead of "induced growth" in this Desk Reference because the effect of a particular project may be shifts in the location of development within a region and not necessarily "new growth." Encroachment-alteration indirect effects are not addressed in this Desk Reference because they are relatively straightforward and are typically addressed in the same manner as direct impacts in NEPA documents. Similarly, this Desk Reference does not provide guidelines for evaluating cumulative effects. Resources addressing cumulative impacts include:

- American Association of State Highway and Transportation Officials (AASHTO) Center for Environmental Excellence, "Practitioner's Handbook 12, Assessing Indirect Effects and Cumulative Impacts under NEPA" (2011).

- Federal Highway Administration, "Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process" (2003).

- Transportation Research Board, NCHRP Project 25-25 (Task 43): "Legal Sufficiency Criteria for Adequate Indirect Effects and Cumulative Impacts Analysis as Related to NEPA Documents" (LBG et al. 2008).

- CEQ, "Considering Cumulative Effects under the National Environmental Policy Act" (1997).

3 Indirect Effects Screening Analysis

3.1 MDT Screening Process

Figure 1 provides a flowchart to the indirect land use effects screening process. The analyst continues through the flowchart until a box is reached stating no further analysis is needed or that a detailed analysis is needed.

3.1.1 What Types of Environmental Documents Does the Screening Process Apply To?

The screening process has been designed to be applicable to the following types of NEPA and MEPA documents: narrative Categorical Exclusions (CE), Environmental Assessments (EA), and Environmental Impact Statements (EIS). The same basic considerations determine whether indirect effects need to be analyzed and these considerations are independent of the environmental classification of the project. However, note that most CEs will only need to complete the first step of the process—documentation that the project type is exempt from screening.

3.1.2 How Much Documentation is Needed to Support Decisions in the Screening Process?

A brief discussion of the rationale should be provided in the record to support the selection of a "yes" or "no" answer to each question considered. This could range from one sentence to several pages. The level of documentation necessary will vary substantially depending on the question and the specifics of each project. In general, the more clear-cut the answer to a particular question is, the less documentation is needed. More documentation is generally needed for the "borderline" cases. Including tables, charts or maps can be useful if it is necessary to address the questions on developable land and growth pressures.

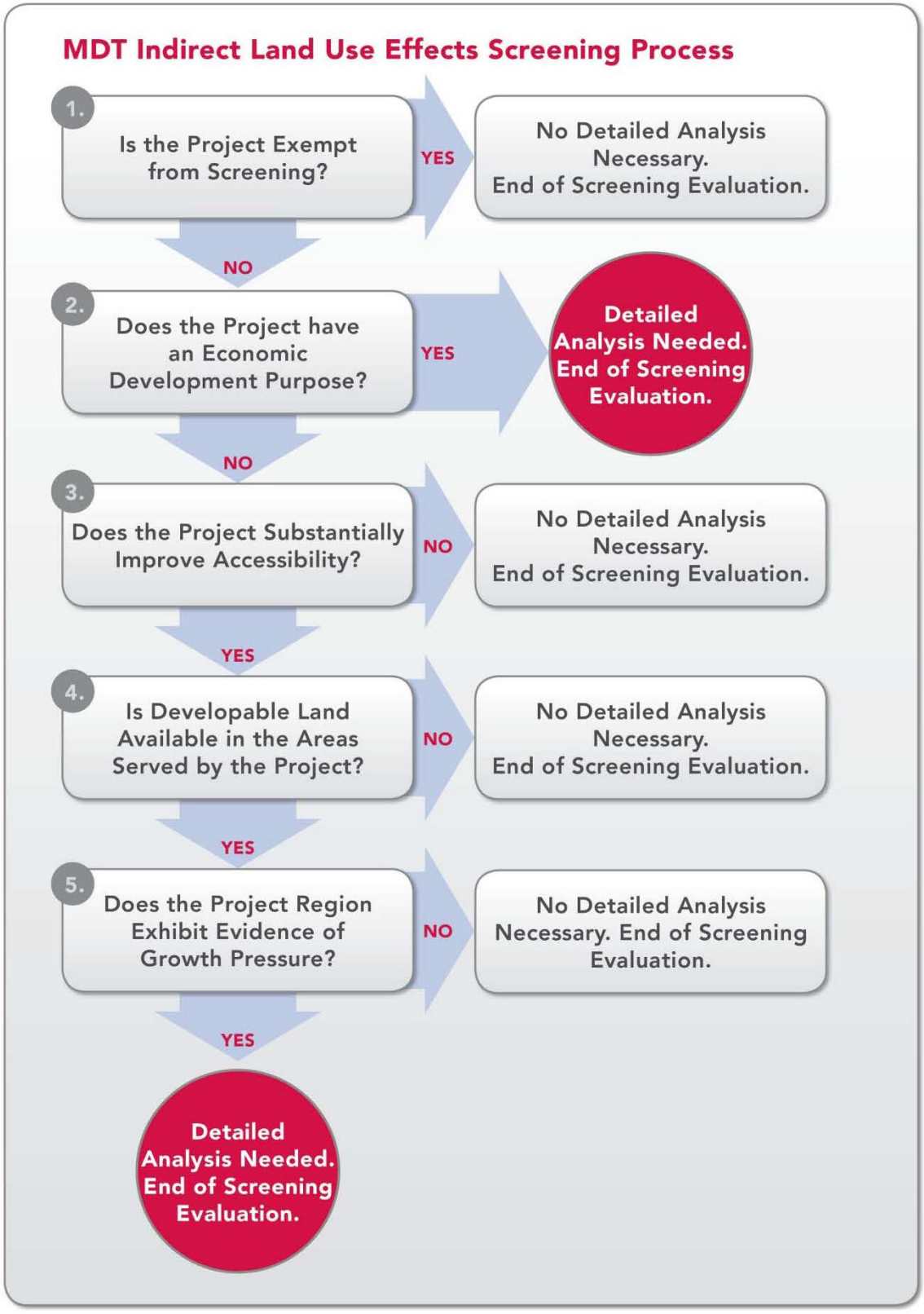


Figure 1: MDT Indirect Land Use Effects Screening Process

3.1.3 Guidance on Using the Screening Checklist

Step #1: Is the Project Exempt from Screening?

Based on their basic characteristics, certain types of projects do not have the potential to result in indirect land use effects, regardless of the context of where the project is located. Table 1 summarizes the exempt projects and rationale for their exemption from further indirect effects screening. The answer to this question should be yes if the project is listed in Table 1.

Step #2: Does the Project have an Economic Development Purpose?

A key conclusion from numerous legal challenges of transportation projects is the importance of a rigorous evaluation of the environmental consequences of induced growth if such growth is used as a rationale for the project. The answer to this question should be yes if any of the following conditions are met:

- The purpose and need statement for the project includes economic development/growth or similar language such as "creating economic opportunities" or "expanding employment."

- Economic development/growth is cited as a benefit of the project anywhere in the environmental documentation. This criterion is in reference to long-term/permanent economic growth. Temporary economic benefits/jobs resulting from construction spending do not trigger a yes answer to the question posed in Step #2.

- The project was explicitly considered in growth policies or other local land use plans and these plans concluded the project could influence the magnitude or location of future growth.

- The project serves a specific development (existing or planned). Examples include turning lanes for a new development, access roads to support development, new interchanges, or intersections for a new development etc.

A yes answer to question 2 requires a detailed analysis (the results of which may help to support the economic development benefits of the project or lead to a decision to modify the purpose and need if economic development is unlikely to be caused by the project). A no answer leads to Step #3.

Table 1: Projects Exempt from Indirect Effects Screening

Project Type	Source	Rationale
CE(c) list projects (23 CFR 771.117(c))	CE(c)	CE(c) projects do not increase automobile or transit capacity or involve other changes in access that could affect land use.[3]
Modernization of a highway by resurfacing, restoration, rehabilitation, reconstruction (within existing ROW), adding shoulders, with no increase in capacity or access (e.g., not adding turning lanes, climbing lanes, interchanges, intersections, etc.)	CE(d)-modified conditions	Highway maintenance and rehabilitation on the same alignment with no increase in capacity does not increase accessibility; therefore there is no potential for land use change attributable to the project. Highway rehabilitation projects that include auxiliary lanes, HOV/HOT lanes, turning lanes, climbing lanes, or other changes in capacity or access should be reviewed through the screening process.
Bridge rehabilitation, reconstruction, or replacement (on same alignment with no increase in travel lanes) or the construction of grade separation to replace existing at-grade railroad crossings.	CE(d)-modified conditions	Bridge reconstruction or replacement on the same alignment with no additional travel lanes does not increase accessibility; therefore there is no potential for land use change attributable to these types of projects. Bridge replacements that include additional capacity or changes in access control should be reviewed through the screening process.
Construction of new bus or rail storage and maintenance facilities in areas used predominantly for industrial or transportation purposes where such construction is not inconsistent with existing zoning and located on or near a street with adequate capacity to handle anticipated bus and support vehicle traffic.	CE(d)	Bus storage and maintenance facilities do not have the potential to influence surrounding land use because they do not change accessibility.
Rehabilitation or reconstruction of existing rail and bus buildings and ancillary facilities where only minor amounts of additional land are required and there is not a substantial increase in the number of users, or alterations to existing buildings.	CE(d) and Administrative Rules of Montana (ARM) 18.2.261	Improvements to existing buildings do not have the potential to influence surrounding land use because they do not change accessibility.

[3] Pedestrian and bicycle facilities are included on the CE(c) list and could cause land use effects in unusual circumstances where a very high number of bicycle users was attracted to a particular urbanized corridor and complementary commercial uses were established to cater to bicyclists. However, this type of situation is rare enough (especially in Montana) that pedestrian and bicycle facilities can be exempted from completing the screening process and exceptions identified on a case-by-case basis.

Step #3: Does the Project Substantially Improve Accessibility?

Accessibility is the ease with which people can reach goods, services and activities. The answer to this question should be yes if the proposed project involves any of the following:

- New roadway.
- Adding travel lanes to an existing roadway.
- New interchange/intersection.
- New alignment commuter rail, light rail, or bus rapid transit.
- Modification to an existing interchange/intersection that provides access to previously inaccessible land.
- Project reduces travel time from the project area to a population/employment center (city or town) or regional destination (such as an airport) by five minutes or more. Small increments of travel time savings are often not perceived as substantial to individuals because they amount to a small portion of an overall daily personal transportation "budget" and are not perceived as useable (Forkenbrock and Weisbrod 2001). In addition, travel time savings are usually analyzed in increments no lower than five minutes because in responses to travel surveys people often express answers and preferences in five-minute increments even when not instructed to do so (Hanson and Schwab 1995).
- Changes in access control, such as removing the limited access designation of a roadway.
- New intermodal freight facilities or freight railroad capacity expansions/new freight lines.
- New airports or major capacity expansions of existing airports.

The following types of projects usually do not improve accessibility to a degree that would influence land use change, but may under unusual circumstances. In general, if the project area is not congested and is not located in a growing region (see Step #5), these type of borderline projects will often result in a no answer.

- Turning lanes
- Auxiliary lanes
- Climbing lanes
- High Occupancy Vehicle lanes of High Occupancy Toll lanes
- New or expanded bus service

The conclusion regarding the accessibility effects of a specific project should be supported with quantitative information on the effect of the project where possible—such as the effect of the project on traffic volumes/trips, change in Level of Service, and likely effect on speeds and access to activity centers.

If the answer to question #3 is no, no further analysis is necessary. If the answer is yes, continue to Step #4.

Step #4: Is Developable Land Available in the Areas Served by the Project?

Even if a project increases accessibility, it will not result in land use change if the area of influence around the project does not contain developable land. For example, a project surrounded by federal land will typically not have the potential to change land use. In general, land already developed can be considered committed to another use and not available for development. The exception would be in an urban area where a transportation improvement could help encourage redevelopment of existing developed land to higher density uses.

Unlike the previous steps of the screening methodology, step 4 requires delineation of study area boundaries to define the area considered in the evaluation of the availability of developable land. The study area size should be based on the extent of the area where accessibility improvements could occur and may require some judgments about the extent of the influence of the project. A major new roadway or capacity expansion of an existing roadway could affect an entire region. A new interchange in an area with no existing interchanges for many miles could have a relatively large area of influence (e.g., 8.02 km (5 mile) radius), while a new interchange in a more urbanized area with numerous existing interchanges in close proximity would have a smaller, more localized area of influence (e.g., approximately 1.61 km (1 mile) radius or even smaller). The study area should be proportional to the size of the project and the relative change in accessibility provided by the project relative to existing conditions or a future No Build condition. The study area can be supported through reference to information on travel time savings, anticipated effects on route choices and other transportation indicators. More detailed information on considerations in setting study area boundaries is provided in Section 4.

Once a study area boundary is established, the following are some of the issues that can be considered in determining if developable land is available. Additional guidance on the data sources for each of these topics will be covered in the detailed analysis technical memorandum.

- Environmental Constraints—Steep slopes in mountainous areas, waterbodies, wetlands, 100-year floodplain, etc.
- Land Ownership Constraints—Federal land management agency properties, conservation easements, local, regional or state parks, utilities, etc.
- Land committed to other uses and unlikely to change, such as various mining sites, oil and gas well fields, and industrial developments.
- Land where development is prohibited by local land use controls. The use of local land use plans as a basis for concluding land is not available for development requires some supporting justification to prove the land use controls are not likely to change in response to development pressure. This could include a review of the past patterns of variances being granted and/or a discussion with local planning staff. Note that growth plans are not binding. Even zoning regulations could be changed in response to growth pressure.

Determinations involving the availability of land for development require professional judgment and should be documented for the record. If it is concluded that there is no developable land available, a rough map can be added to the project documentation showing the project limits, study area boundary and the location of the development constraints that led to the conclusion that no land was available.

If the answer to this question is no, no further analysis is necessary. If the answer is yes, continue to Step #5.

Step #5: Does the Project Region Exhibit Evidence of Growth Pressure?

Even with ample land available and excellent accessibility, no development (induced or otherwise) will occur if the region where the project is located is not experiencing population and/or employment growth. There is no threshold growth rate that definitively indicates growth pressure, but regions with a pattern of declining population clearly can defined as not experiencing growth pressure (unless information is available that the past trend is changing due to other factors, such as with the oil boom in parts of eastern Montana).

Figure 2 shows the pattern of population growth rates in Montana at the county level between 2000 and 2010 based on U.S. Census data. The map illustrates that many of the fastest growing areas of Montana are in the western mountains and surrounding the cities of Kalispell, Missoula, Helen, and Bozeman. Other counties in parts of central and eastern Montana have experienced no notable population change or the population has declined. Table 2 also provides the county-level population growth information in greater detail for each county.

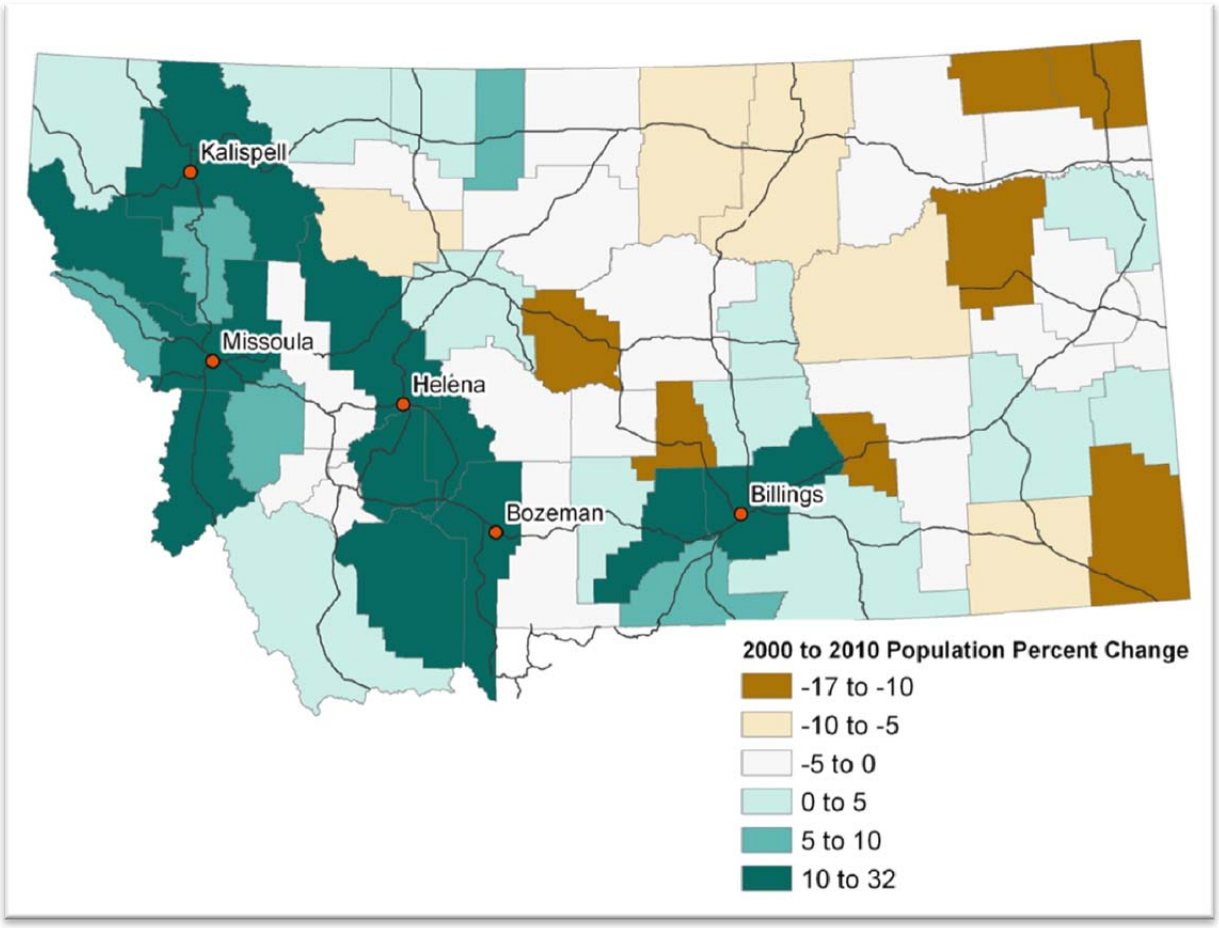


Figure 2: Montana Population Growth by County, 2000 to 2010

Table 2: Montana Population Growth by County, 2000 to 2010

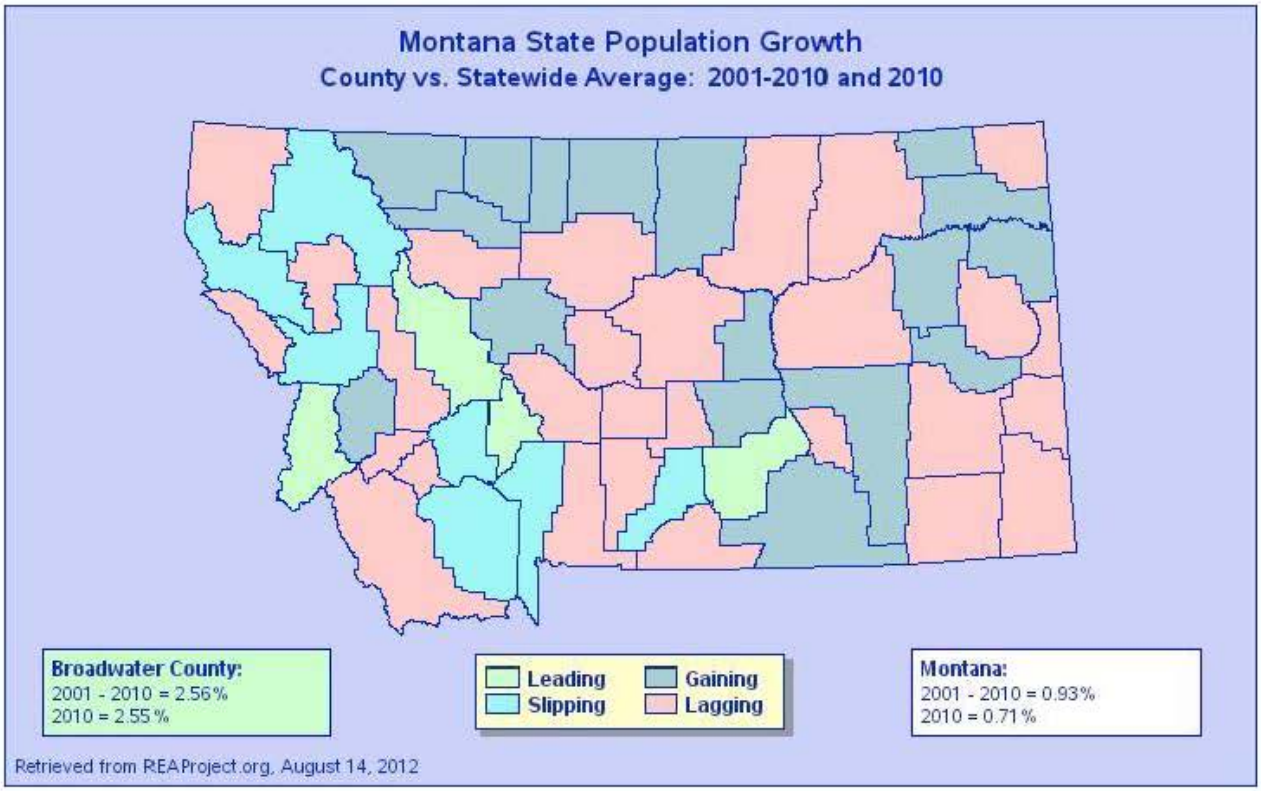
County	2010 Population	2000 Population	Change	2000-2010 Percent Change
Beaverhead	9,246	9,202	44	0.48%
Big Horn	12,865	12,671	194	1.53%
Blaine	6,491	7,009	-518	-7.39%
Broadwater	5,612	4,385	1,227	27.98%
Carbon	10,078	9,552	526	5.51%
Carter	1,160	1,360	-200	-14.71%
Cascade	81,327	80,357	970	1.21%
Chouteau	5,813	5,970	-157	-2.63%
Custer	11,699	11,696	3	0.03%
Daniels	1,751	2,017	-266	-13.19%
Dawson	8,966	9,059	-93	-1.03%
Deer Lodge	9,298	9,417	-119	-1.26%
Fallon	2,890	2,837	53	1.87%
Fergus	11,586	11,893	-307	-2.58%
Flathead	90,928	74,471	16,457	22.10%
Gallatin	89,513	67,831	21,682	31.96%
Garfield	1,206	1,279	-73	-5.71%
Glacier	13,399	13,247	152	1.15%
Golden Valley	884	1,042	-158	-15.16%
Granite	3,079	2,830	249	8.80%
Hill	16,096	16,673	-577	-3.46%
Jefferson	11,406	10,049	1,357	13.50%
Judith Basin	2,072	2,329	-257	-11.03%
Lake	28,746	26,507	2,239	8.45%
Lewis and Clark	63,395	55,716	7,679	13.78%
Liberty	2,339	2,158	181	8.39%
Lincoln	19,687	18,837	850	4.51%
Madison	7,691	6,851	840	12.26%
McCone	1,734	1,997	-263	-13.17%
Meagher	1,891	1,932	-41	-2.12%
Mineral	4,223	3,884	339	8.73%
Missoula	109,299	95,802	13,497	14.09%
Musselshell	4,538	4,497	41	0.91%
Park	15,636	15,694	-58	-0.37%
Petroleum	494	493	1	0.20%
Phillips	4,253	4,601	-348	-7.56%
Pondera	6,153	6,424	-271	-4.22%

(Table 2 continued)

County	2010 Population	2000 Population	Change	2000-2010 Percent Change
Powder River	1,743	1,858	-115	-6.19%
Powell	7,027	7,180	-153	-2.13%
Prairie	1,179	1,199	-20	-1.67%
Ravalli	40,212	36,070	4,142	11.48%
Richland	9,746	9,667	79	0.82%
Roosevelt	10,425	10,620	-195	-1.84%
Rosebud	9,233	9,383	-150	-1.60%
Sanders	11,413	10,227	1,186	11.60%
Sheridan	3,384	4,105	-721	-17.56%
Silver Bow	34,200	34,606	-406	-1.17%
Stillwater	9,117	8,195	922	11.25%
Sweet Grass	3,651	3,609	42	1.16%
Teton	6,073	6,445	-372	-5.77%
Toole	5,324	5,267	57	1.08%
Treasure	718	861	-143	-16.61%
Valley	7,369	7,675	-306	-3.99%
Wheatland	2,168	2,259	-91	-4.03%
Wibaux	1,017	1,068	-51	-4.78%
Yellowstone	147,972	129,352	18,620	14.39%

In addition to U.S. Census data, the Montana Census and Economic Information Center (CEIC) maintains data sources and links to other websites that include valuable demographic, economic, and employment data. For example, CEIC produces maps with population and business patterns (http://ceic.mt.gov/cntybuspat.asp).

Another source for economic and demographic data is the Regional Economic Analysis Project (REAP) (http://montana.reaproject.org/). This site offers an interface to examine economic characteristics by county and compare them to the state, or compare the state to the country. One example is LSGL (Leading, Slipping, Gaining, Lagging) analysis of population and economic characteristics. A user can select a county and automatically generate a report that compares that county to the state. Figure 3 highlights the type of information available from this resource for Broadwater County. Each quadrant of the LSGL chart portrays the performance of all 56 Montana counties corresponding with their long-term (2001-2010) and near-term (2010) performance relative to their respective statewide averages of 0.93 percent over 2001-2010 and 0.71 percent over 2010:



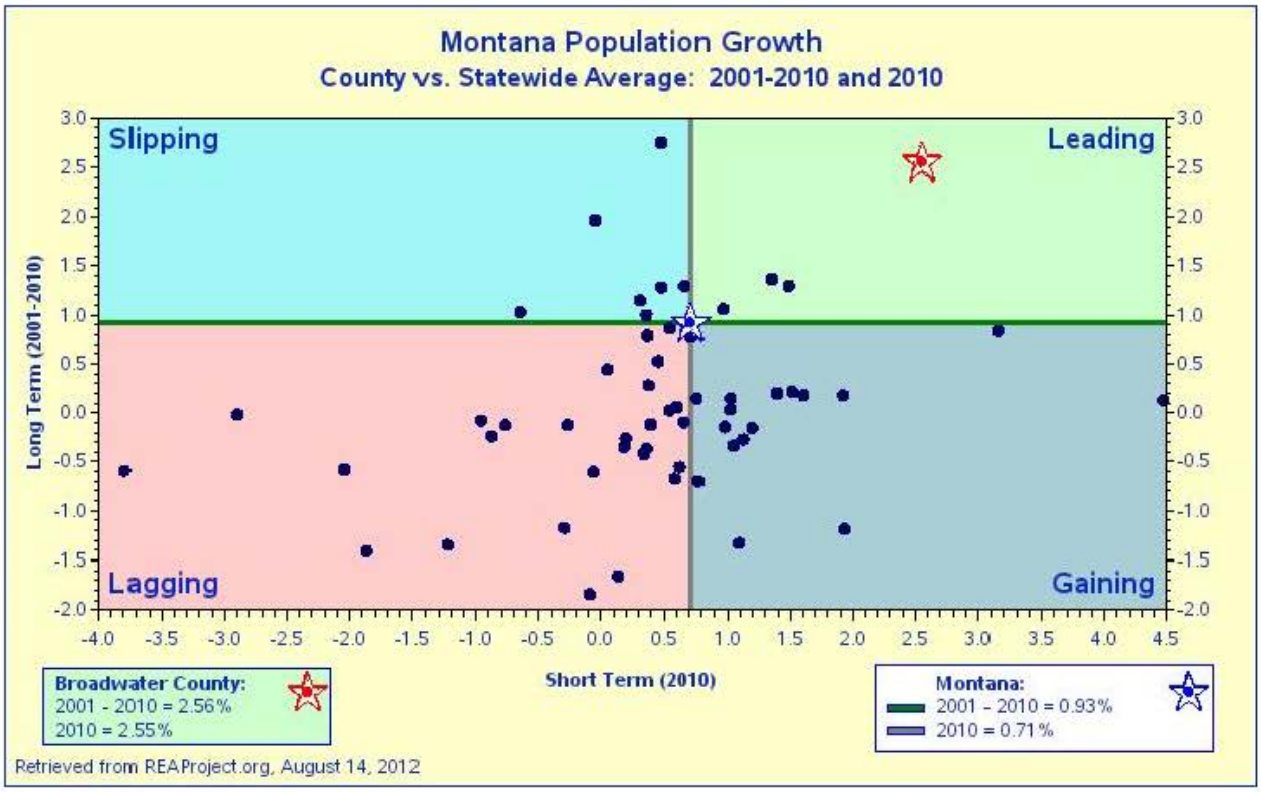


Figure 3: Montana Leading, Slipping, Gaining, Lagging Map and Chart (REAP, REAProject.org)

- **Leading counties** (top-right quadrant)...are counties whose average annual population growth rate surpassed the statewide average both long-term (0.93 percent) and near-term (0.71 percent).
- **Slipping counties** (top-left quadrant)...are counties whose long-term average annual population growth rate exceeded the statewide average (0.93 percent), but whose near-term growth has "slipped" by falling below the states average (0.71 percent).
- **Gaining counties** (bottom-right quadrant)...are counties whose long-term average annual population growth rate fell below the statewide average (0.93 percent), but whose near-term growth has "gained" by registering above the average (0.71 percent) statewide.
- **Lagging counties** (bottom-left quadrant)...are counties whose average annual population growth rate fell under the statewide average both long-term (0.93 percent) and near-term (0.71 percent).

Other indicators of growth pressure that can be considered include mapping of land use change over time in the project area, septic system applications to local governments, building permits, vacancy rates, existing infrastructure, and discussions with local planners. Consideration of one or all these additional factors is not required, but can be useful if the data is readily available and if it is not clear from the population and employment growth data whether or not the region is growing. Even a field review of the project area and surrounding lands can provide an indication of the age of existing developments and whether new developments are in progress. A discussion with local planning staff can be a very efficient way to determine where the most development activity is occurring in a particular area.

The location of the project is also a consideration when reaching conclusions about growth pressure. The answer to the question in Step #5 will likely be yes if the project is located in the path of urbanization outside an expanding metro area, but within commute distance (one hour or less) or the project is located near natural amenities that attract rural residential development, such as a National Park.

The answer to Step #5 should be no if the project area and surrounding region have remained relatively constant in terms of population and employment levels considering the most recent available data or the project is located in a remote rural area where there is no evidence of development currently or reason to expect the area would be attractive to development in the future.

Growth plans and zoning can also be a consideration in determining the relative degree of support for growth in area. If local land use plans explicitly considered the proposed project in the evaluation of future land use conditions, this information could be used to help support the conclusion of whether or not indirect land use effects would be expected. Note that growth plans are not binding regulations.

If the answer to this question is yes, this indicates there is a need for a more detailed analysis because multiple indicators are suggesting the potential for indirect land use impacts. If the answer is no, no further evaluation is needed. The basis for the conclusion regarding growth pressure should be documented, including reference to the data sources relied on.

3.1.4 Other Considerations

The screening questions and flowchart are designed to ensure consideration of the most important factors that determine whether indirect land use effects are reasonably foreseeable and should be considered in greater detail. However, they are not an all-inclusive list of every factor that could be considered in deciding if a detailed analysis was necessary. For example, public outreach during the scoping of an EIS could indicate substantial public concern about indirect land use effects. In this case it could be appropriate (but would not be required) to conduct a more detailed analysis than would be required by the screening process. These types of decisions on the level of analysis are highly dependent on the specifics of the project and the project area. The most important aspect for legal sufficiency is to document the rationale for the decisions made regarding the level of analysis.

3.2 Application of Screening Process to Example Projects

Hypothetical projects were developed for test application of the screening. The projects are based on actual MDT projects, but the details of the projects have been modified for purposes of these examples.

3.2.1 U.S. 2 Reconstruction, Roosevelt County

This hypothetical project involves reconstruction of 32.19 km (20 miles) of a two-lane section of U.S. 2 near Poplar, in Roosevelt County. The project includes minor alignment shifts of up to 15.24 m (50 feet) (including additional right-of-way acquisition), but does not increase travel lanes. Four bridges will be replaced. The project is being processed as a CE (d). Surrounding land use is rural, primarily livestock grazing land.

1. Is the Project Exempt from Screening?

   No. The project is not exempt from indirect effects screening because it involves reconstruction that requires additional right-of-way.

2. Does the Project have an Economic Development Purpose?

   No. The purpose of the project is to make safety improvements and economic development is not an aspect of the purpose and need statement. Long-term economic development is not listed as a benefit of the project in the CE (d) or other project documentation.

3. Does the Project Substantially Improve Accessibility?

   No. The project does not increase capacity and is not expected to have any effect on traffic volumes or speeds. Therefore, the project does not have the potential to result in indirect land use effects and no further evaluation is required.

3.2.2 U.S. 212 Reconstruction, Carbon County

This hypothetical project involves reconstruction and upgrade of 32.19 km (20 miles) of U.S. 212 near Red Lodge, including substantial changes in the horizontal and vertical alignments and the addition of a truck climbing lanes in several locations. The project proceeds through rolling terrain that consists of a mixture of forest and agricultural land used primarily for grazing and some dry-land farming, as well as rural residential developments outside of Red Lodge. Ten miles of the project is located within the Custer National Forest. The route is the major east-west route in southeastern Montana for truck movements. Travel speeds are constrained by steep grades and curves, in combination with the lack of truck climbing lanes. The improvements are expected to increase safety and travel speeds.

1. Is the Project Exempt from Screening?

   No. The project is not exempt from indirect effects screening because it involves additional capacity (truck climbing lanes).

2. Does the Project have an Economic Development Purpose?

   No. The purpose of the project is to make safety improvements and economic development is not an aspect of the purpose and need statement. Long-term economic development is not listed as a benefit of the project in the CE (d) or other project documentation.

3. Does the Project Substantially Improve Accessibility?

   Yes. The combination of truck climbing lanes and horizontal/vertical alignment changes is expected to increase travel speeds by 16.9-32.19 kph (10-20 mph) in some areas; which corresponds to up to 10 minutes of travel time savings for trips to and from a major activity center (Billings) and intermediate destinations such as Laurel. The improvements will also improve travel times from the Red Lodge area to major recreational destinations such as Yellowstone National Park.

4. Is Developable Land Available in the Areas Served by the Project?

   Yes, for a portion of the alignment. No development is possible along the 16.09 km (10 miles) of the alignment within the Custer National Forest or within built-up areas in Red Lodge. However, undeveloped grazing land is available south of the City of Red Lodge, outside the National Forest. Other development constraints such as conserved land, steep slopes, and wetlands were considered to develop a constraints map. The analysis showed over 4.05 square-km (1,000 acres) of developable land within 0.80 km (0.5 mile) of the alignment, suggesting that land availability would not preclude indirect land use effects. The roadway is not limited access, thus additional local roads and driveway connections could be constructed to serve new developments.

5. Does the Project Region Exhibit Evidence of Growth Pressure?

Yes. The Census Blocks containing the developable land most likely to be affected by the project grew between 2000 and 2010 at a rate of 2.5 percent per year. Aerial photography shows numerous recent residential developments accessing U.S. 212 south of the City of Red Lodge. The population of Carbon County increased from 2000 to 2010 at an annual rate of 0.54 percent. The data shows nearly 80 percent of the growth occurring in the county occurred in the Red Lodge area. The available projections from the Montana Department of Commerce suggest continued growth in the county through 2030. Factors attracting people to the Red Lodge area include proximity to the Beartooth Mountains and associated recreational opportunities. The city is a gateway community to Yellowstone National Park and the Absaroka-Beartooth Wilderness. Retirees and part-time residents have been a major component of growth in the area. Economic growth has been primarily in the tourism and service sectors.

The existing land use along U.S. 212 is commercial (including uses catering to tourists, such as motels), with large areas of undeveloped land. Red Lodge has established an urban growth boundary and there is land along U.S. 212 available for development within the growth boundary, as well as potential for land use change outside the jurisdiction of Red Lodge. The City's future land use map shows the area around U.S. 212 as a "community entrance" The 2008 growth policy planning objectives for this area include developing access management plan and performance standards to ensure the aesthetically compatible development in the community entrances and prevent commercial strip development inconsistent with the historic character of the city. The City of Red Lodge has established zoning, but the zoning regulations have not been updated to enforce the goals of the 2008 growth policy.

The conclusion that the project area exhibits growth pressure is further supported by the geographic location of the project within one hour of the rapidly expanding Billings and the role of the Red Lodge area as a gateway to federal lands that are attractive for amenity-oriented residential development.

Based on this screening assessment, a detailed indirect land use effects study will be conducted for this project.

3.2.3 Reserve Street Intersection Improvements, Missoula County

This project involves additional turning lanes and signal timing improvements at three intersections in downtown Missoula. The project is intended to address safety and peak period congestion. Land use in the project area consists almost entirely of developed land, including residences, commercial strip development and community facilities.

1. Is the Project Exempt from Screening?

   No. The project is not exempt from indirect effects screening because it involves additional turning lanes.

2. Does the Project have an Economic Development Purpose?

No. The purpose of the project is to make safety improvements and economic development is not an aspect of the purpose and need statement. Long-term economic development is not listed as a benefit of the project in the CE (d) or other project documentation.

3. Does the Project Substantially Improve Accessibility?

   No. The project would reduce average travel times through the corridor by two minutes or less during the most congested period. The project does not involve intersection improvements intended to serve a specific development. Therefore, the project does not have the potential to result in indirect land use effects and no further evaluation is required. This conclusion is further supported by the lack of available land for development in the project area.

4 Indirect Effects Detailed Analysis

This section provides a step-by-step process and toolkit of methodologies available for analyzing indirect land use effects and discusses the appropriateness of each methodology in various locations within Montana. For more details on this topic, see Section 7 in the Final Report. This section also provides guidance on data collection and Montana-specific data sources to support indirect effects analysis.

The detailed analysis framework is organized around the seven steps illustrated in Figure 4. Prior to beginning a detailed analysis, a screening analysis should be conducted. The detailed analysis framework presented below assumes the screening analysis presented in Section 5 of the Final Report results in the conclusion that a detailed analysis is necessary for a particular project. As discussed in this section, the majority of MDT projects are not anticipated to need detailed analysis based on the screening analysis process.

4.1 Step 1: Determine Study Goals and Methodology

The objective of Step 1 is to "right-size" the indirect effects analysis by: (1) determining the goals and objectives for the study (e.g., the questions the study should answer) and (2) choosing an analysis approach and the appropriate tools to meet the goals of the study. Step 1 is interrelated with Step 2, the determination of study area boundaries. Study area boundaries do influence what methodologies may be appropriate for a particular project. However, it is advisable to begin with at least a basic idea of the analysis goals and methodology before finalizing the study area to be used for the analysis.

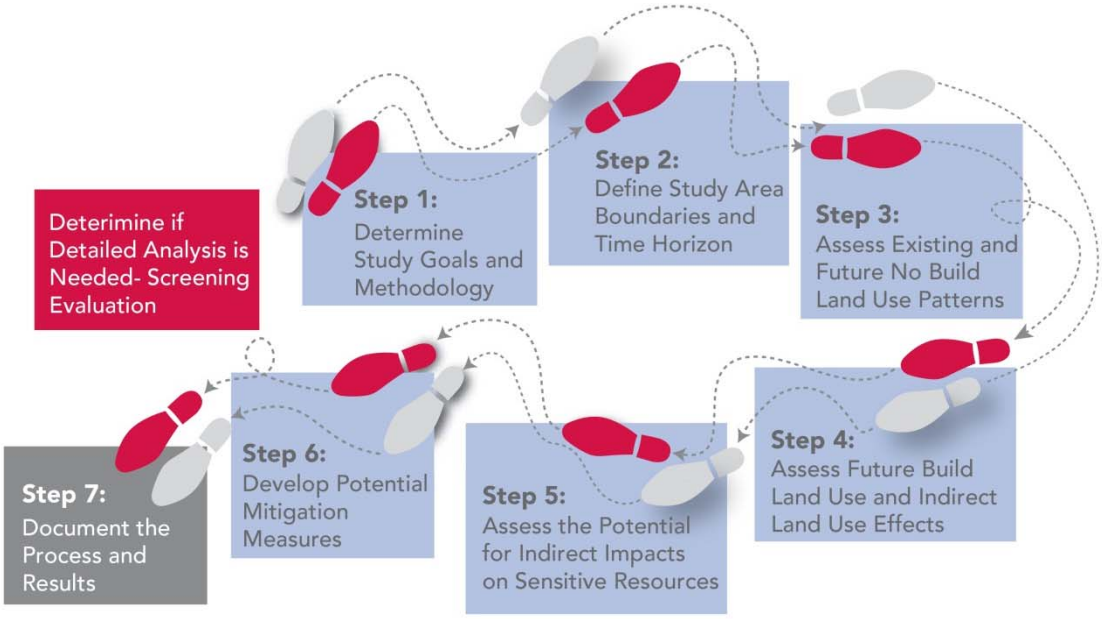


Figure 4: Indirect Effects Detailed Analysis Process

4.1.1 Determine Study Goals

Every project requiring an indirect land use effects analysis is different in terms of land use context, concerns of local residents, resource agency involvement, and environmental resources. The time and resources to analyze indirect land use effects are limited, therefore it is necessary to identify and focus on the "key issues" relevant to understanding the impacts of the project and not to produce encyclopedic documentation of every possible indirect effect. Before methodologies can be selected or study area boundaries established, an initial statement of study objectives is required. Determination of indirect effects study goals at the start of an indirect effects study is of similar importance to determining the purpose and need of transportation project near the start of NEPA and MEPA—the goals drive the entire analysis process that follows. Table 3 provides some hypothetical study goals for three example projects.

Considerations in determining study goals include the following:

- **Indirect Effects Screening Analysis Results.** The screening analysis framework (Chapter 5 in the Final Report) provides early indicators of potential induced growth impacts by examining the project accessibility effects, the availability of developable land and growth pressure patterns in the region. For example, based on the screening analysis it may be possible to determine whether the scope of the indirect effects study can focus in on potential commercial development on a few parcels or needs to consider effects on residential development patterns across an entire region. Knowing the type and scope of potential impact narrows the range of appropriate methodologies, and helps provide a rationale for the formal study area boundary established under Step 2. For an analysis focused on a specific kind of development in a small geographic area, an

analysis methodology based on outputs of regional travel demand modeling may not provide sufficient resolution to address the goal of the study. The same model could be appropriate for examining regional scale issues.

- **Public and agency outreach.** Involvement of other agencies and public is critical to scoping indirect land use effects—whether accomplished through formal NEPA scoping for an EIS or informally. Public and agency scoping comments can be analyzed for statements related to induced growth specifically, as well as for other information related to analyzing indirect effects such as land use change patterns, environmental and community resources potentially affected by the project. An effective way to solicit more direct feedback on the study goals (and methodology) is to circulate the draft scope of work to resource agency partners for review and comment and provide the document for public review through the project website. Small group meetings between the State Department of Transportation (DOT) staff conducting the study and interested groups/individuals can be an effective way of sharing information, utilizing local knowledge of the project area and demonstrating that local viewpoints are being taken seriously in the environmental review process.

- **Scoping for other environmental topics.** Scoping activities for other environmental topics can help inform the indirect effects analysis by identifying the important environmental resources that could experience indirect effects as a result of induced growth. Understanding key environmental resources can help focus the indirect effects analysis as land use forecasts are developed to support a specific type of environmental impact analysis. For example, for a project where water quality is a key issue, it may be desirable to quantify the impact of induced growth in terms of impervious surface cover change and utilize watershed boundaries as the basis for the study area. The decision to focus on impervious surface cover as an indicator will further influence the types of methodologies considered.

Document the determination of the study goals (or questions to be answered by the study) for the administrative record. The study goals can be revised throughout the process and there is nothing wrong with the study process leading to further inquiry in areas that were not originally considered. However, the analyst should reexamine the goals frequently as the study progresses to ensure they will be met.

Table 3: Example Study Goals

Project	Example Study Goals
New Interstate Interchange in undeveloped area near airport, zoned for commercial and industrial	1) Quantify and spatially locate the potential induced commercial and industrial growth (square footage and employment) along the feeder roads to the new interchange, taking into account proposed changes in local zoning. 2) Quantify potential indirect impact on habitat of a threatened plant species to support mitigation plan development and negotiations with resource agencies.
New 32.19 km (20-mile) Limited Access Bypass	1) Assess generalized potential for regional scale changes in household and business location decisions based on accessibility change. Will the new highway fundamentally alter the location and timing of development in rural areas in the county as suggested by environmental protection focused stakeholders? 2) Examine interchange-level indirect land use effects in greater detail to ensure consistency with development objectives of the affected municipal governments.
State Highway Widening, from one lane in each direction to two lanes in each direction	1) Qualitatively rate potential for indirect effects on parcels adjacent to the roadway, taking into account development constraints and explicitly incorporating input of local experts (local government, business, and environmental groups).

4.1.2 Determine Study Methodology

There is no single standard method for analyzing indirect effects, unlike other environmental topics where there is a highly structured methodology (e.g., noise - where FHWA's Traffic Noise Model is the only permitted methodology and the standards for assessing impacts are set by federal regulation and state policy). Rather, there are a large range of qualitative and quantitative analysis methods that are considered acceptable. The selection of a method or methods for application is done on a case-by-case basis considering factors specific to individual projects. It is not necessary to select a single methodology, frequently a combination of methodologies is necessary (AASHTO 2012). Factors to consider in selecting an analysis method for an indirect effects assessment include:

- Magnitude of potential induced-growth effects (based on initial screening evaluation of drivers of induced growth).
- Strengths and limitations of each available tool in the context of the specific project (including availability of the relevant data for the study area, such as population and employment projections, recent orthophotography, parcel boundaries, zoning, and environmental features).
- Relationship to other analyses in NEPA process (e.g., compatibility with modeling or other analyses that are being done for other purposes, such as traffic forecasting).
- Agency and public expectations (e.g., preferences for a specific method that has been used in previous studies).

- Cost and schedule constraints.
- Necessary output to meet needs of study/address environmental impacts. For example, if stormwater is a key issue for project and a quantitative analysis of the change in impervious surface cover is desired, a quantitative analysis of land use change will be necessary.
- Geographic scope considerations, such as the applicability of the method to a study area of a certain size or the minimum level of geographic detail needed in the results. For example, a projection of population change at the municipality level may not be appropriate to estimate environmental impacts in specific areas within the municipality.
- The availability of appropriate staff (e.g., a methodology using a travel demand model may require a transportation modeling expert).

Numerous guidebooks covering methodologies available for indirect effects analysis are available, most recently NCHRP Project 25-25 (Task 22): "Forecasting Indirect Land Use Effects of Transportation Projects" (Avin et al. 2007). It is not the intent of this research project to duplicate prior efforts. Instead, this report's methodologies are summarized below and reviewed for their applicability to Montana. Refer to NCHRP Project 25-25 (Task 22) for the details of each methodology.

4.1.2.1 Planning Judgment

Overview

Planning judgment relies on the experience of the practitioner, the relevant planning literature, and on an assessment of local trends and forecasts to assess indirect land use impacts. Planning judgment is an essential component of all indirect land use effects studies. Planning judgment may be supplemented more complex quantitative analysis and modeling for the most complex and controversial projects like a new bypass or connector roadway. For smaller projects, such as single new interchange or minor widening, planning judgment may be the only methodology required. The key advantages of planning judgment include its transparency, low time and cost requirements, and flexible data requirements. A potential disadvantage of planning judgment used alone is that it can be difficult to develop supportable quantitative forecasts of land use change (if such forecasts are desired for a particular project). Planning judgment is also highly influenced by the biases of the individual analyst—this weakness can at least be partially overcome through collaborative judgment approaches discussed in Section 2.2.3.

Applicability in Montana

Planning judgment is an essential component of indirect effects analysis and thus is applicable to all types of transportation projects in Montana.

Cost and Expertise Requirements

The cost of planning judgment is typically relatively low relative to other methods that may involve extensive data collection and quantitative analysis. The method is best employed by planners with a strong foundation in the literature of transportation-land use interactions. Planning judgment (and all methodologies) are most effective when the analyst can write well and tell a plausible story of how the proposed project is likely to affect land use and the supporting facts considered in reaching that conclusion. Experience in scenario writing may be

useful in this regard, although it is important to understand that indirect effects analysis is very different from typical scenario planning where the objective is to identify the future conditions preferred by community.

4.1.2.2 Collaborative Judgment

Overview

Collaborative judgment methods build on individual planning judgment by incorporating input from other people knowledgeable of the study area to inform conclusions about future land use conditions. Collaborative judgment can be used as a method itself or used in combination with other methods. For example, local experts could be used to review the reasonableness of the growth projections obtained with another methodology.

There are a wide range of different options to using collaborative judgment. At the most basic level, surveys of local experts, stakeholders, and professionals can be invaluable in developing assumptions and assessing future conditions. Survey techniques can include informal conversations; formal inquiry following an instrument administered by mail, phone, or interview; or discussions or meetings of a collaborative task force or panel.

The most structured consultation method is the Delphi technique. The Delphi technique is a survey research technique directed toward the systematic solicitation and organization of expert intuitive thinking from a group of knowledgeable people (Linestone and Turoff 1975). It provides a means for arriving at an informed, objective judgment based upon a variety of sometimes conflicting opinions. Each member of the Delphi panel is asked to answer a questionnaire addressing the indirect effects of a transportation project. The responses are shared with the panel, but the answer of each individual panel member is kept anonymous. The questionnaire is then repeated, and each panel member may revise their estimates based on the responses of the other panel members. A carefully structured Delphi panel with diverse membership can improve public acceptance of the results of the panel, particularly for controversial projects or projects where there is considerable uncertainty about the magnitude of potential indirect effects. However, a Delphi panel that does not reach consensus (e.g., the results for the individual members do not converge) can make it difficult to explain and draw conclusions about indirect effects in an environmental document. Some practitioners have attempted to summarize the results of Delphi panels with divergent views through blended average (average of the median and the mean; see Parsons Brinkerhoff Quade and Douglas 2002); however this approach is not universally accepted.

Expert panels or detailed interviews with local real estate, government, and industry leaders may be a workable substitute for the Delphi method when panelists would be unable to participate in an iterative process. Less formal methods (e.g. interviews) lack the feedback and review features of a Delphi panel, but may be used to construct or confirm assumptions employed in other qualitative or quantitative techniques. Project task forces made up of a representative mix of community stakeholders can also help define and refine forecasts techniques and results especially when coupled with public outreach meetings or charrettes designed to gauge the range of community expectations regarding project induced growth. Task force and outreach techniques can also serve to build consensus that would promote broad acceptance of findings.

Applicability in Montana

Collaborative judgment has been used for several MDT projects in the past and the method is particularly well suited to Montana because the rural areas that comprise the majority of the state lack travel demand models and access to other tools that can enable quantitative modeling of indirect land use effects. Given the uncertainty involved in estimating indirect land use effects, collaborative judgment approaches offer a robust way of incorporating multiple viewpoints into the impact assessment process.

Cost and Expertise Requirements

The cost of collaborative judgment approaches varies considerably depending on the structure of the approach, and number of local experts contacted. Informal consultation or small meetings with local experts are relatively low cost compared to detailed quantitative modeling efforts. The time and coordination efforts to convey a Delphi panel can be extensive and depend on the size of the panel and the number of survey iterations conducted.

Individuals experienced in public outreach and facilitation are important to effective use of collaborative judgment methods. More specialized training and experience is required to implement a Delphi Panel as the design of the survey instrument and the process for interpreting the results are very important.

4.1.2.3 Allocation Models

Overview

In conjunction with planning judgment or collaborative judgment, allocation models can allow the analyst to distribute a defined amount of indirect land use change at a disaggregate level (e.g., to Traffic Analysis Zones). Typically a set of allocation rules that work through Geographical Information Systems (GIS)-based spatial datasets. They are tools used to (1) allocate aggregate (e.g., regional or county) forecasts of population and employment to the smaller geographies necessary to evaluate the land-development impacts of a specific transportation project, and (2) convert those forecasts to an amount of land development, by type (e.g., residential, commercial) (Avin et al. 2007).

Allocation models are best for addressing the question of where growth will occur at the local level. The question of how much growth will occur with vs. without the project will likely need to be estimated with other methods—planning judgment, collaborative judgment, or output of travel demand models.

Refer to NCHRP Project 25-25 (Task 22) for a summary of available existing allocation models, including Land Use Evolution and Impact Assessment Model (LEAM), Land Use Scenario DevelopeR (LUSDR), PlanMaster, TELUS/TELUM, Urban Land Use Allocation Model (ULAM), and What If? Planning Support System (Avin et al. 2007). The conclusion of Task 22 was that existing allocation models are probably not appropriate for relatively small jurisdictions looking to evaluate the impacts of a single project.

NCHRP Project 25-25 (Task 22) also provides direction for developing an ad-hoc step-by-step allocation model instead of using an existing free or commercial model. The ad-hoc model steps include:

1. Determine the Supply of Buildable Land
2. Allocate Population and Population Growth to Sub-Areas
3. Determine Site Requirements
4. Convert Population and Employment to Land Use
5. Repeat Process with the Transportation Project Included

Applicability in Montana

Existing allocation models are generally designed for use by Metropolitan Planning Organizations (MPOs) or other regional organizations with continuous and on-going transportation and/or land use planning responsibilities. The existing models are generally not designed for evaluating a single transportation project. Therefore, the use of an ad-hoc allocation model will generally be the most efficient application of this methodology in Montana. An important advantage of the ad hoc model is that it is easy to tailor the model to the available data—which is generally the greatest in more developed areas the least in rural areas. Allocation models can be a good middle ground when the project team feels the complexity of the project impacts will not be fully captured by planning judgment and collaborative judgment alone, but there is not sufficient data or resources for more complex methods based on four-step travel demand models or integrated transportation-land use models.

Cost and Expertise Requirements

Allocation models and ad hoc models in particular are relatively simple and straightforward to use, typically requiring little more than GIS and spreadsheet skills, combined with planning knowledge to develop appropriate "rules" for the model that make sense given the characteristics of the study area. The cost of ad hoc allocation models in particular is low, with the primary cost variable being the number and complexity of GIS datasets incorporated in the analysis.

4.1.2.4 Four-Step Travel Demand Model-Based Methods

Overview

The four steps of the typical travel demand model are trip generation, trip distribution, mode choice, and traffic assignment. The four-step travel demand model lacks feedback loops between travel assignment and land use allocations. Specifically, as travel times increase due to congestion, this diminishes accessibility along congested corridors for a future forecast date. This information on accessibility thus needs to be considered in making land-use allocations since accessibility is a key determinant of where future growth will occur. Ideally traffic assignment and land-use allocations needs to inform each other in a dynamic way (Avin et al. 2007).

Although not designed for this purpose, four-step travel demand models can still provide information useful to the evaluation of indirect land use effects.

One approach, the simple gravity model, is based on the observation that the overall attractiveness of an area to potential residents is a function of the capacity of an area for development (vacant developable land in valued and affordable locations) and accessibility to employment and activity centers, among other things. The gravity model can use zone to zone travel time information from travel demand models calculates the change in accessibility to employment as a result of the project to relocate population growth in the Build condition. The zones with the greatest increase in accessibility would experience the largest indirect increase in population. A similar approach can be used to estimate indirect employment shifts, using accessibility to population centers or accessibility to a combination of population and employment. An important assumption underlying the gravity model is that the regional scale growth will not change as a result of the transportation project—only the distribution of growth may change (this assumption is supported by the literature as discussed in Section 3 of the Final Report). Refer to NCHRP Report 466 (LBG 2002) for details of the simple gravity model equations.

Another (simpler) approach to using travel demand model output in indirect effects analysis is to use the zone to zone travel time results to identify the areas receiving the greatest accessibility increase and then assess potential impacts within those areas based on planning judgment, collaborative judgment, assessment of development constraints and other methods.

Applicability in Montana

Four-step travel demand model based methods should be considered for projects located in the areas of Montana covered by travel demand models (currently Billings, Missoula, Great Falls, Bozeman, Butte, Helena, Belgrade, Laurel, and Kalispell) and the travel demand model is already being utilized in the development of future traffic forecasts for the project. In these cases, the additional cost of using the travel demand model output will be relatively low because the work to setup and run the model for various scenarios will have already been done for the traffic studies. However, some additional modeling work may still be required. For example, it is advisable to prepare initial model runs for the No Build and Build condition using the same (No Build) land use assumptions. After the indirect effects analysis, the incremental land use change attributable to the project should be added back into the travel demand model to produce a Build condition run that incorporates the additional traffic generated by the land use shifts associated with the project.

Four-step travel demand model based methods are not applicable in the rest of Montana outside the nine cities listed above that already have an existing model (MDT 2013).

Cost and Expertise Requirements

Travel demand models can be complex and time consuming to effectively utilize in the environmental review process. They also require skilled travel demand modelers to operate. Post-processing the travel demand model output and calculating accessibility indices for the gravity model method also requires a relatively high degree of expertise in travel demand models and database programs.

4.1.2.5 Conclusions

Based on the evaluation of various methodological approaches in the context of Montana, the preferred methodology for detailed analysis is a combination of collaborative judgment (to determine No Build vs. Build incremental change taking into account knowledge of local conditions) and allocation models (to determine the allocation of growth to specific sub areas, taking into account known constraints). Planning judgment is necessary to structure the analysis and interpret the results.

Four-step travel demand model based methods are potentially applicable within the Billings, Missoula, Great Falls, Bozeman, Butte, Helena, Belgrade, Laurel, and Kalispell areas. However, even within these areas, the cost and specialized expertise required to use travel demand-model based methods limits their applicability for indirect effects analysis to only the largest projects. Integrated transportation-land use models do not exist in Montana and are therefore not applicable at the present time.

4.2 Step 2: Define Study Area Boundaries and Time Horizon

The indirect effects assessment should identify explicit study area boundaries and a time frame for the analysis, and explain the process by which these boundaries were selected.

4.2.1 Study Area Boundaries

The initial screening-level analysis (Chapter 4 in the Final Report) provides the basis for drawing initial conclusions about the potential extent of indirect effects associated with a transportation project. The study area boundaries should be set to include the extent of the expected indirect effects. The study area boundary for indirect effects analysis is typically broader than the study areas used for direct effects analysis. In general, the study area should be smaller for projects where only localized effects are expected (such as adjacent to relatively small new roadway providing access to a specific development) and larger for projects where the potential extent of land use effects is regional in scale (such as a new limited access bypass substantially altering accessibility).

The study area boundaries could be criticized if they are not large enough to include all reasonably foreseeable indirect effects. However, a study area that is too large unnecessarily increases data gathering requirements, and diminishes the effects of an individual project. The following types of factors as methods for defining study area boundaries. One of the best ways to ensure that the study area boundaries are reasonable is to provide mapping and discussion of how each of these factors was considered.

- **Political/Geographic Boundaries.** It may be convenient for data collection and reporting to define the indirect effects study area in terms of town or county boundaries. This approach is acceptable as long as the town or counties selected for the study area encompass all of the potential areas where the project could affect land use patterns. Other types of boundaries, such as mountain ranges can be appropriate for defining study areas in terms of specific valleys in Montana.

- **Commuteshed.** The commutershed method is most useful for projects that cross from a rural or urbanizing area into an urban area (WisDOT 2007). It may be less applicable to projects in Montana located entirely within rural areas. However, the commuteshed concept can be applied to other non-city destinations that serve as an attractive factor for certain types of development, such as a National Park. The commuting range should be defined based on location-specific data when possible, such as origin-destination surveys or U.S. Census Journey to Work data. A study area based on the commuteshed method should take into account both the existing commuteshed of the city or other attraction and the change in the size of the commuteshed attributable to the transportation project.

- **Growth Areas/Growth Policies.** In many developing areas, county, or local governments may have defined the areas where future growth is expected/encouraged through growth policies. This information can be used to select study area boundaries based areas of planned future development could potentially be affected by the transportation project. An important consideration in using this approach is that growth policies are not enforceable regulations and the future land use patterns could occur in patterns that were not considered in local land use planning.

- **Growth boundaries.** This strategy is potential applicable to projects located in Missoula, Bozeman, and Kalispell.

- **Watershed and Habitat Boundaries.** Watershed and wildlife habitat boundaries may be the appropriate basis for selecting study area boundaries where direct and indirect impacts on water or wildlife resources are a primary focus of the environmental review of a transportation project. Watershed and wildlife habitat boundaries are also recommended as the basis for establishing study area boundaries for cumulative impact assessment (U.S. Environmental Protection Agency (EPA) 1999 and California Department of Transportation (Caltrans) 2005/updated 2006, for example). Therefore, the use of consistent watershed and habit boundaries for both indirect effects and cumulative impacts may reduce data collection needs and make the presentation of the various analyses easier for the public and agency reviewers to understand. If the same boundaries are used for indirect and cumulative impacts, it is important to ensure that the boundaries meet the requirements for both topics.

- **Interviews and Public Involvement.** Public involvement and agency coordination can be incorporated into the selection of study area boundaries through the scoping process. The proposed study area boundaries can be provided for review on the project website and discussed at public information meetings to solicit feedback prior to completing the analysis.

4.2.2 Study Area Time Horizon

Land use changes occur gradually over time, and may not be apparent for many years after construction of a project is completed. For this reason, the time horizon for a detailed analysis of indirect land use effects should be at least 20 years. The time horizon for the indirect effects assessment should be consistent with the analysis year used for other portions of the

environmental document, unless the environmental document analysis year is less than 20 years from the present or the timing of the indirect land use effects of the project are well understood and expected to occur in the short-term. This approach is consistent with typical transportation planning practice that commonly uses a 20-year outlook for EIS-type projects where a detailed indirect effects study would be most likely. The 20-year planning horizon is also consistent with the outlook of MPO long-transportation plans that may be utilized as a source of socioeconomic and other data in an indirect effects study. The use of the horizon of the most accurate planning document available and/or the long-range transportation plan for a region as the basis for a temporal boundary is accepted as appropriate by a majority of transportation and resource agency staff (e.g., Executive Order 13274 Indirect and Cumulative Impacts Workgroup; ICF Consulting 2005). As with the geographic study area boundaries, the basis for the study time horizon should be documented for the record.

4.3 Step 3: Assess Existing and Future No Build Land Use Patterns

Indirect land use effects are the incremental change in land use attributable to the transportation project—representing growth that would not have otherwise occurred. In order to determine the incremental effect of the project, it is first necessary to analyze the future land use conditions without the proposed project as the baseline for comparison. Accurately defining the No Build condition is key to accurately presenting the potential indirect effects of a transportation project. Therefore, prior to developing the No Build scenario, a comprehensive inventory of existing land use and planning information for the study area should be compiled.

4.3.1 Data Collection for Existing Conditions

The FHWA Interim Guidance indicates that transportation investments are just one of many factors influencing land development decisions (FHWA 2003). Therefore, an understanding of community goals, combined with a thorough knowledge of demographic, economic, and social trends is essential in understanding the dynamic of project-related land use change.

Information on some of the topics below (such as summarizing relevant local land use plans) is a typical part of the development of an EA or EIS. It is not necessary to duplicate this work in the detailed indirect effects study—simply cross reference the relevant document that already contains the pertinent information and focus on other topic areas that have not been addressed elsewhere in the environmental document.

4.3.1.1 Population and Households

The most current population and household data should be retrieved from the U.S. Census Bureau for the smallest geographic area for which data is available. The smallest census geography is the block, followed by the block group and tract. These census geographies are based on population so the actual land area in each can vary significantly. In addition to the Census, there are numerous other data sets available to help compile population and household information. However, these sources often generally allow queries for larger geographic areas (i.e., municipal, county, etc.). The timeliness of data will often depend on the geographic area for which queries are run. The following provides an overview of data repositories that can be

accessed to help build a community profile. Many sources have specific limitations which are also identified.

4.3.1.2 National Data Sets

Two of the primary national datasets include the decennial Census and American Community Survey (ACS) – both maintained by the U.S. Census Bureau. Conducted every 10 years, data compiled during the decennial Census is released incrementally for different geographic areas. The block and block group level data are often the last to be released. Information collected and reported from the decennial Census often changes between census periods. Users should keep in mind that additional changes in reporting are possible in the future. Information on racial and ethnic composition should be retrieved from the decennial Census; the majority of other data will need to be retrieved from ACS. However, depending on when the last Census was conducted, it may be appropriate to collect racial and ethnic data from ACS. ACS provides current demographic, social, economic, and housing information about the Country's communities each year.

The ACS publishes single-year data for all areas with populations of 65,000 or more. Areas with populations less than 65,000 will require the use of multiyear estimates to reach an appropriate sample size for data publication. In 2008, the U.S. Census Bureau began releasing 3-year estimates for areas with populations greater than 20,000.

The first 5-year estimates for all census tracts and block groups began in 2010. The multiyear estimates will be updated annually, with data published for the largest areas in 1-, 3-, and 5-year formats, and for those meeting the 3-year threshold in both 3- and 5-year formats. Even the smallest communities will be able to obtain ACS data based on 5-year estimates annually.

The following provides an overview of websites that can be accessed to help retrieve Census and ACS data.

American FactFinder. This is the official data repository of the U.S. Census Bureau and provides access to data collected through the decennial Census, ACS, Puerto Rico Community Survey, Population Estimates Program, Economic Census, and Annual Economic Surveys. Data is available for metro- and micro-politan statistical areas, states, counties, places, and census geographies, among others.

The smallest census geography for which this information is available will depend on the data set and indicator. It is important to note that only population and racial data is available on the block level (Summary File (SF) 1 from the decennial Census). While this is a great resource, it will likely take the user some time to become familiar with the platform interface. It can be difficult to manipulate and leave users unsure as to which data sets are actually available. It is recommended that users reference the tutorial prior to use. A link on the website informs users as to when specific data set will become available.
Website: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

The U.S. Census Bureau also maintains an FTP site where users can build their own data sets. Depending on the user, this may be an easier system than trying to navigate the abovementioned

interface. It should be noted that this is not an intuitively obviously process and is likely to require multiple uses to become familiar with the easiest way to manipulate the data. Users are encouraged to review the appropriate technical document found on the link below to fully understand how to manipulate the data sets (http://www.census.gov/acs/www/data_documentation/summary_file/). ACS provides tech support to help navigate the data and can be reached at 301-763-INFO (4636) or 800-923-8282. The FTP site can be accessed via the following link: http://www2.census.gov/.

National Historic Geographic Information System. This relatively new website provides U.S. Census data from 1790 to the present. It includes GIS shapefiles of geographic areas as they were defined during each census period and facilitates the mapping and comparison of population and household characteristics over time. Tabular data in a standardized format is available and shapefiles come with data projected, coastlines clipped, metadata, and standardized geographic identifies to make analysis of numerous years easy to prepare. Given the sheer magnitude of the data, it is being released incrementally and is currently available for 1970 through 2010.
Website: https://www.nhgis.org/

Census Transportation Planning Package Data. The Census Transportation Planning Package (CTPP) is a set of special tabulations historically compiled from the decennial Census and more recently from 3-year ACS estimates for transportation planners. With the replacement of the decennial census long form with the ACS, future CTPPs will be based on the ACS. The current CTTP is based on 2006-2008 ACS data for places having 20,000 or more residents. An update to this is anticipated in mid-2013 and will be based on 2006-2010 ACS data and therefore include data on the census tract level (areas of less than 20,000 people). The tool is designed to help practitioners understand where people are commuting to and from and how they travel to these places. The data set is unique in that it includes commuter flows and Excel files contain over 200 tabs and cross tabs for data manipulation. The CTPP is divided into three parts: Part 1 contains residence-based data summarizing worker and household characteristics, Part 2 contains place-of-work based data summarizing worker characteristics, and Part 3 contains journey-to-work flow data.

Traffic Analysis Zone (TAZ) and Traffic Analysis District (TAD) boundaries delineated for the 2006-2010 CTPP are now available on the U.S. Census Bureau's FTP site (see link above or on the CTPP website). The website also provides a link to a number of reports from the National Cooperative Highway Research Program that provides an overview of the utility of this application and data manipulation. Available data can be used in defining commutesheds. This is a valuable tool particularly for small to medium sized MPOs that cannot afford to conduct detailed travel surveys.

For the ease of the user, the website includes a software tutorial. The following websites should be referenced when using the CTPP: http://www.fhwa.dot.gov/ctpp/ and http://www.trbcensus.com/.

4.3.1.3 Montana Data Sets

In addition to national data sets, there are a number of data clearinghouses maintained by various agencies across Montana. The following provides an overview of these agencies.

Census and Economic Information Center. This resource serves as a data repository of Census and ACS information. Easily retrieved and exportable files are available for counties, places, reservations, and legislative and school districts for population, race, and household characteristics. Population projections for municipalities across Montana through 2030 are available at: http://ceic.mt.gov/Demog/project/proj_mt_pop_total_08.pdf.

It also provides summary files of available geographies from the Bureau of Economic Analysis, Census of Agriculture, construction permits, and major employers, among others, as well as GIS layers. A list of and link to external resources is also provided.
Website: http://ceic.mt.gov/Index.asp

Montana Department of Commerce. General county and statewide housing, economic, and demographic reports and statistics are embedded in the Consolidated Plan. Statistics are presented in PDF form and are from data retrieved in late 2007.
Website: http://housing.mt.gov/CP/economicdemographicanalysis.mcpx

Metropolitan Planning Organizations. There are three MPO regions in Montana: Missoula; Great Falls; and Billings. Each is embedded within municipal or county planning departments. MPOs generally prepare population and employment projections for a period of 20-30 years in the future as inputs to the travel demand model. The following provides an overview of projections available from each of the MPOs.

- Missoula County Office of Planning and Grants. Missoula County maintains household and employment estimates and projections for Missoula and Ravalli counties on the block group level. Data is available for 2010 and 2040, and indicators include households, average household size, and employment. The Missoula MPO region includes those areas within the urbanized area of Missoula County. TAZs in this area, and subsequently household and employment projections, are on the block level. Those areas in Missoula County that are part of the planning area (where growth is anticipated to occur over the next 20 years) but outside the urbanized area as well as those other parts of Missoula and Ravalli counties that are not part of the MPO region, data is presented on the block group level. Data is available upon request from the Office of Planning and Grants.
  Website: http://www.co.missoula.mt.us/opgweb/default.htm

- City of Great Falls Planning and Community Development. Population and employment forecasts are currently available through 2030. These projections were prepared on the TAZ and census block level for the transportation study area which includes the City of Great Falls, Malmstrom Air Force Base, the unincorporated community of Black Eagle, Great Falls International Airport, and nearby suburban development. Projections indicate that approximately 85 percent of future growth in Cascade County will be concentrated in this area. An update to the current transportation plan is anticipated to begin in early 2013 and will include revised projections.

Website: http://www.greatfallsmt.net/planning/transportation-planning

- Yellowstone County Planning Board. This jurisdiction is the designated MPO for the area and oversees transportation planning for the Billings Urban Area. The planning area includes the City of Billings and an area extending approximately 7.24 km (4.5 miles) from the city boundary. Population and employment projections at the TAZ level are currently available through 2030 and available from MDT.
  Website: http://www.ci.billings.mt.us/index.aspx?NID=514

- Montana State Library**.** In addition to a robust natural resource data repository, this resource includes a number of GIS layers under Cultural and Demographic headings that provide population information for various census geographies.
  Website: http://nris.mt.gov/gis/default.asp

4.3.1.4 Employment and the Economy

Both Census and ACS data include information specific to employment, labor force, and other economic indicators. Additional data clearinghouses such as those mentioned below can provide more current data than either the Census or ACS, sometimes on a larger geographic scale though, as well as easy-to-use interfaces that allow for specific queries that may fall outside of the normal Census reporting system (i.e., a 8.04 km (5 mile) radius from a specific location) and visual representation of statistics.

Longitudinal Employer-Household Dynamics (LEHD). This resource contains confidential longitudinal linked employer-household microdata. This integrated microdata is generated by the U.S. Census Bureau using data collected for federal and state administrative purposes as well as from confidential U.S. Census Bureau surveys and censuses. The LEHD can support assessments of employment concentrations and commutesheds.

A subset of this is the Local Employment Dynamics (LED) program, which is a voluntary partnership between state labor market agencies and the U.S. Census Bureau to develop information about local labor market conditions. The following provides a brief summary of the tools that are available from this resource.
Website: http://lehdmap.did.census.gov/

- **Community Economic Development (CED) HotRepor t** – allows users to create customized queries about the economy, transportation, housing, schools, top industries, and employment sectors, among other indicators. The easy-to-use interface provides information on the county level and reports conditions through the use of charts, maps, table, and text.
- **Quarterly Workforce Indicators** – provides employment information and is reported using both the North American Industry Classification System (NAICS) and Standard Industrial Classification System (SIC) industry sector codes. Information is reported for states, geographic areas, industry, year and quarter, sex, age, and ownership. It also includes net job gains and losses from the fourth quarter of 2007 to the present.
- **OnTheMap** – this resource is an online mapping and reporting tool identifying where workers are employed and live. Comparison reports include worker characteristics and

the tool allows for customized filtering that includes age, earnings, and industry sectors. Data is currently available for 2002 through 2010 for 49 states, including Montana. Queries can be run for specified geographic areas including zip codes, cities, and small census geographies, among many others. There are multiple geographic selection options for determining the area of analysis including county, ArcGIS layer, freehand, ring/buffer, donut, and plume.

- **Industry Focus** – allows users to identify top industries and workers within a specified geographic area. The summary shows how a particular industry compares to others as well as the characteristics of people working in a particular sector.

U.S. Department of Labor, Bureau of Labor Statistics, and Bureau of Economic Analysis. These resources provide essential background information on laws, regulations, and policies, as well as data sets on labor markets, unemployment and employment, wages and earnings, inflation and prices, consumer expenditures, occupational openings, and disabilities, among other issues. Data is typically reported for larger geographic areas such as metro- and micro-politan statistical areas and counties, among others. However, information is updated monthly with key employment and economic indicators not available from annual sources such as ACS. Information retrieved from these sources can be supplemented with data available from the abovementioned Longitudinal Employer-Household Dynamics to prepare a more robust employment and economic picture of a community.
Websites: U.S. Department of Labor - http://www.dol.gov/;
U.S. Bureau of Labor Statistics - http://www.bls.gov/;
U.S. Department of Commerce, Bureau of Economic Analysis - http://www.bea.gov/index.htm

Regional Economic Analysis Project. Information found on this website is developed, operated, and maintained by the Pacific Northwest Regional Economic Analysis Project (PNREAP), a not-for-profit 501(c)(3). This resource allows for easy retrieval of statistics from the Bureau of Economic Analysis from 1969 to 2011. Queries can be run on the county, metropolitan statistical area, and metro/non-metro state level. Available indicators include population, total personal income, per capita income, total employment, total earnings, and average earnings per job. Other queries can be run but the years for which data is available varies somewhat. Additional analysis methods include comparative trends analysis and indicators, major components of income, shift-share analysis, industry share & performance, and income structure & growth. This website is easy to navigate and run queries from; however, information is presented on the computer screen and not in a file that can be exported. Data can easily be copied/pasted to an Excel file or some other format.
Website: http://montana.reaproject.org/

Paid Services. There are a number of paid services that can assist practitioners in the preparation of demographic and economic profiles of selected geographies. These resources are relatively similar in terms of their overall capability; however, the geographic area and years for which data is available varies by source. They allow users to work with an interactive platform to run queries for a wide range of indicators and often include population estimates and projections (generally about five years) for smaller geographic areas which may be useful in the majority of Montana that is not located in an MPO region. Some allow users to add in a GIS

layer, identify a radius from a specific location, concentric circles, and donut rings for customized data sets. Some such sources include:
Websites: ESRI Community Analyst - http://www.esri.com/;
Social Explorer - http://www.socialexplorer.com/pub/home/home.aspx;
GeoLytics - http://www.geolytics.com/Default.asp

4.3.1.5 Agriculture

Agriculture is the number one industry in Montana and generated 2.6 billion dollars in income in 2010 (Montana Department of Agriculture 2012). Loss of agricultural land is a potential impact of residential and commercial development over time—either direct conversion to developed uses or conversion of traditional agricultural production land to "hobby farms." The United States Department of Agriculture (USDA) Census of Agriculture provides detailed information on number of farms/ranches, farm revenue, farm employment, the area in farmland, and other indicators. The census is conducted every five years. The most recent version of data currently available is for 2007. Past censuses can be used to define trends in agriculture over time for specific counties. However, there are several limitations associated with the data that need to be considered. For example, if the data shows that the amount of land in farms has decreased for a given county, it is not possible to determine the spatial location of that land, if the land was sold to a developer for home sites, if it was used as a commercial building location, or if it has simply fallen out of the agricultural production stream for some unknown reason (Johnson 2004). Customized tables of Census of Agriculture data can be generated from the following website: http://quickstats.nass.usda.gov/.

4.3.1.6 Land Use/Land Cover

Mapping existing land use/land cover is an important prior to assessing how land use might change in the future with and without the proposed transportation project. Data sources for mapping land cover include the following:

- Montana Land Cover Framework 2010. A Montana-specific product of the Montana Natural Resource Heritage Program. The map is adapted from the Northwest ReGAP project land cover classification, which used 30 m (98.43 foot) resolution multi-spectral satellite imagery acquired from 2002 through 2005. Due to the coarse resolution, this dataset is most appropriate for characterizing general patterns of land use across a large area, such as an entire county or group of counties. The data is not appropriate for characterizing land use at smaller scales, such as in the parcels surrounding a specific interchange. The dataset is available from the Montana GIS Portal (http://gisportal.msl.mt.gov/).
- United States Geological Survey (USGS) 2006 National Land Cover and Impervious Surface Database. The 30 m (98.43 foot) resolution USGS land cover data has similar use constraints as the Montana Land Cover Framework dataset—generally intended for regional-scale analyses.
- Local Land Use Datasets. Some Montana Towns and Counties have prepared GIS mapping of land use within their jurisdiction. This information is generally of a much higher resolution than the national and statewide datasets discussed above. The analyst should review the metadata associated with local GIS data prior to use to ascertain the

year the dataset was created and the general methodology employed. The accuracy of the data for the study area can be checked via comparison with recent orthophotography.

- Montana Cadastral Data. Montana has a unique GIS resource not available in most states for assessing land use—a statewide parcel database. The database includes information on the use of each parcel for taxation purposes that can be used to assess land use patterns. The data and associated metadata/limitations are available online at the following website: http://giscoordination.mt.gov/data.asp#Cadastral.
- Orthophotography. Various sources of orthophotography are available for all areas in Montana. National sources include the USDA's National Agriculture Imagery Program (NAIP), which produces frequent updates (at the time of this report, the latest coverage for Montana was from 2011). The 1 m (3.28 foot) resolution NAIP imagery program data is available for download by county from the following website: http://datagateway.nrcs.usda.gov/.

A variety of current and historic orthoimagery is available from the USGS National Map (http://nationalmap.gov/viewer.html). Orthoimagery for specific areas may also be available from county governments. For example, a phone call to Bozeman GIS found that the 2007 aerial photos (15.24 cm (6 inch) resolution) available online via their GIS website are soon to be replaced with a set flown in 2012. In other areas there are special studies that have included aerial photos, such as the natural color and color infrared high-resolution photos (0.30 m (1 foot) resolution) for the Flathead Valley north of Flathead Lake that were flown in 2009.

Regardless of the source, a disadvantage of orthoimagery for land use analysis is that it is not possible to directly compute various summary statistics regarding land use without further analysis. For a relatively small study area, it may be feasible to manually digitize general land use categories in GIS by drawing polygons over the relevant areas of the ortho photo. This approach is not feasible for larger study areas that include entire towns or counties, but commercial software is available (such as "Feature Analyst") that can automate the land use mapping process where no appropriate existing data is available from other sources.

Land use data should be summarized in tabular format and mapped to depict the variations in land use patterns within the study area.

4.3.1.7 Growth Plans, Zoning, and Subdivision Regulations

Growth plans, zoning, and subdivision regulations for the counties, towns, and cities comprising the study area should be obtained from the relevant local governments. This information may be available online for some, but not all jurisdictions. Once the data is gathered, the various plans and regulations need to be reviewed and summarized—focusing on those specific areas where the project is most likely to influence land use.

The Department of Commerce maintains a data set for county growth policies. This data set was first created in 2008 and is updated on a roughly annual basis. It was last updated in July 2011 and should be updated again soon. Shapefiles are available upon request but are not posted on the web. They have maps on their website based on 2009 data for counties and 2010 data for cities and towns. There is a goal to update the following maps soon as well:

http://comdev.mt.gov/content/CTAP/images/Countygrowthpolicies and http://comdev.mt.gov/content/CTAP/images/MunicipalgrowthpoliciesJanuary10.

There is no statewide compilation of areas of Montana with zoning.

4.3.1.8 Water and Sewer Service Areas, and Septic-Suitable Soils

Information on water and sewer service areas, and septic-suitable soils provides an important indicator of development potential for the assessment of indirect land use effects analysis. Many types of higher density development require water and sewer service and may not be able to locate in areas lacking this service. Water and sewer service may be extended to new areas in the future, so it is important to gather information on the extent of existing service as well as any planned future extensions.

The only sewer and water service area boundary information available online through the state GIS portal are: the water and sewer district boundaries for Flathead County, sanitary and storm sewer lines for the City of Red Lodge, and storm sewer lines for the City of Butte. Water and Sewer District boundaries that the GIS Boundaries Administrator has received that are not available through the Montana GIS portal are listed in Table 4, and would be available on request.

Table 4: Water and Sewer District Boundary GIS Layers in Montana

Name	Date	Approval	Type
Simms County Sewer District	11-May-77	5/24/1977	Sewer
Black Eagle Cascade County Water and Sewer District	12-Dec-02	12/16/2002	Water & Sewer
Antelope County Water and Sewer District	21-Oct-82	10/26/1982	Water & Sewer
Stockett Water and Sewer District	01-Jul-91	7/8/1991	Water & Sewer
Sun Prairie Village County Water and Sewer District	06-Jun-89	7/14/1989	Water & Sewer
Madison County Alder Water and Sewer District	11-Apr-00	5/17/2000	Water & Sewer
Upper and Lower River Road County Water and Sewer District	14-Jun-01	6/18/2001	Water & Sewer
Outlook County Sewer and Water District	03-Apr-79	1/15/1980	Water & Sewer
Phillips County Zortman Water and Sewer District	09-Aug-99	12/1/1999	Water & Sewer
Seeley Lake-Missoula County Water District	16-Apr-78	12/9/1986	Water
Sun Prairie County Water District	24-Sep-74	1/10/1986	Water
Vaughn- Cascade County Sewer District	26-Jun-72	7/24/1972	Sewer
County Water District of Billings Heights	27-Aug-58	8/11/1978	Water
Gore Hill County Water District	12-Jul-74	8/13/1976	Water
**Data can be requested from the Montana Spatial Data Infrastructure Boundaries Steward, Erin Fashoway, at efashoway@mt.gov or (406)444-3115			

A list of available resources at city, county, and tribal levels has been compiled by the following efforts:

- Contacting state GIS departments (Montana Natural Resource Information System of the Montana State Library, Montana Department of Environmental Quality) and organizations (Montana Land Information Advisory Council, Montana Association of GIS Professionals, Montana Association of Counties, Montana League of Towns and Cities) to find if this information has previously been compiled;
- Contacting counties in order of most populated to least populated, with effort waning when contacts begin to produce no results;
- Contacting towns/cities in order of most populated to least populated, with effort waning when contacts continue to produce no results. (Additional info on this from county contacts, asking them if any towns/cities in the county had GIS departments, and asking for contact names and phone numbers.)

The compilation of this investigation is presented in two tables in Appendix 2: GIS Contacts and Resources List. The tables were created on a listing from the U.S. Census of (1) Counties, and (2) Cities, towns, and census-designated places. These listings were sorted from highest population to lowest population, and contacts were initiated in order of highest to lowest population. The tables compiled in Appendix 2 are a "moving target" with respect to GIS capabilities, GIS data, and specific contacts, but should be useful for finding GIS data from local governments in the vicinity of specific projects.

- Sewer and Water Services in Cities/Towns: Every city has some sort of engineering department / public works department that possesses drawings showing water and sewer service areas. Some of these have been transposed to GIS from old engineering Computer Aided Design (CAD) programs and other legacy systems.

- Sewer and Water Services Outside of Cities/Towns: Often it may be assumed that city and water infrastructure will eventually be extended to the city/town limits, so that the boundary of that infrastructure may be approximated by city/town limits. More problematic to the questions concerning induced growth are those public water and sewer systems that exist outside of incorporated cities and towns. In Montana, these are organized as "County Water and Sewer Districts" (http://codes.lp.findlaw.com/mtcode/7/13/22/). Examples of county water and sewer districts in Gallatin County include: Gallatin Gateway Water and Sewer District (http://www.gatewaywsd.com/), and Big Sky Water and Sewer District (http://www.bigskywatersewer.com/).

  Some counties have GIS layers of the boundaries of water and sewer districts, noted in the table in Appendix 2. All water and sewer districts must be registered with the Secretary of State, but that data is not easy to obtain and geographic data must be extracted from the legal descriptions. If water and sewer district boundary information is not available in a specific project area from an existing county GIS department, the most direct and correct data will be obtained from the county clerk and recorder.

4.3.2 Land Use Assumptions for Future No Build Condition

4.3.2.1 Gather Information on Existing Projections and Trends

County and municipal-level growth plans and other local planning documents (such as Missoula's Urban Fringe Development Assessment) may contain location-specific forecasts of future population and employment growth. The age and methodology of these existing forecasts should be critically evaluated before utilizing it in a NEPA study (see Appendix A to Title 23 CFR Part 450: Linking Transportation Planning and NEPA Processes). In some cases it may be necessary to update an existing forecast to take into account events and trends that were not considered at the time of the forecast (e.g., the effect of unconventional shale oil development on population and employment in eastern Montana).

In an area with an existing travel demand model (such as Billings, Missoula, Great Falls, Bozeman, Butte, Helena, Belgrade, Laurel, and Kalispell), forecasts of future population levels may be available at a traffic analysis zone level. However, for most other parts of Montana, population forecasts are not typically available at geographic levels smaller than counties. The latest publicly available county-level population forecasts were prepared for the Montana Census and Economic Information Center in 2008. The 2008 population forecasts are becoming dated, but could be used in the absence of other information or to supplement/confirm the reasonableness of other data sources. The U.S. Census Bureau does not have a current set of state population projections (the latest projections were released in 2005) and currently has no plans to produce them.

4.3.2.2 Determine Whether or Not Existing Projections Include the Effect of the Project

Unfortunately, there is often limited documentation associated with existing population, employment, and land use forecasts. In many cases transportation may not have been considered at all. In other cases, local level projections may have considered proposed transportation projects in determining the allocation of growth to specific zones. The analyst should gather the available documentation associated with the existing forecasts and follow-up with the organizations that generated the forecast to resolve any uncertainties. It is particularly important for these meetings/phone calls to be documented for the administrative record to support the selection of the No Build land use forecast. Refer to NCHRP Project 25-25 (Task 22) for further detailed guidance on untangling the assumptions embedded in existing land use forecasts (Avin et al. 2007).

4.3.2.3 Define No Build Population, Employment and Land Use Patterns

If it is determined that the project was not accounted for in existing projections, these projections should serve as the basis for defining future No Build conditions. If the project effects were considered, the existing projections may best represent the Build condition. In this situation, it is necessary to construct a separate No Build land use scenario. The No Build scenario can be developed using the same types of tools described in Section 4.1, but in this case the objective is to determine the land use effect of the project not occurring.

4.4 Step 4: Assess Future Build Conditions, Land Use Conditions, and Indirect Land Use Effects

Step 4 involves carrying out the methodology or methodologies selected in Step 1 to assess qualitatively and/or quantitatively the potential location and magnitude of indirect land use effects. The details of Step 4 are heavily dependent on the specific methodologies being utilized. However, regardless of the methodology, the No Build and Build condition analyses are compared—the difference is the indirect effect of the project.

Indirect land use effects are typically first calculated initially in terms of population, households, and employment. These may be converted to other indicators such as land conversion to certain land use types based on density assumptions derived from existing land use patterns or the relevant literature. The ad hoc allocation model presented in NCHRP Project 25-25 (Task 22) provides default density levels that can be used in various contexts, but it is generally advisable to obtain density information specific to the study area (or sub-areas within the study area when there is a substantial density gradient between a city center and outlying rural areas) (Avin et al. 2007). Further detailed guidance on best practices for estimating land cover change from population and employment growth is provided in the book titled Urban Land Use Planning (Kaiser et al. 1995).

For Montana, a tremendous amount of valuable information can be gained from the Montana Cadastral Database. The database includes information on the number of housing units per parcel and thus could be used to help understand existing density levels in the study area.

The results of step 4 should be summarized in a narrative, supported by tables and maps.

4.5 Step 5: Assess the Potential for Indirect Impacts on Sensitive Resources

4.5.1 Identify Resources for Analysis

The indirect effects assessment should identify specific elements of the natural and human environment that are the focus of the analysis, and explain how these resources were selected for analysis.

It is important to note that for induced growth and induced growth-related indirect effects, the direct impacts of the project are not a consideration in selecting the resources for analysis. Typical resources analyzed for indirect effects include agricultural land, water resources, wildlife habitat, wetlands, cultural resources, and social and economic conditions. Public involvement and agency coordination should be an important component in ensuring that relevant resources are considered in the analysis. The indirect effects assessment should make use of the best available data on environmental and community conditions, it is not typically necessary to create new data or conduct extensive field work as is typically done with direct impact analysis.

4.5.2 Characterize the Existing Condition of the Resources

Once the resources for analysis are selected, the condition of the resource within the study area should be described through reference to the appropriate literature and through the use of various GIS databases. This section describes the data sources available for eight notable features chosen for their value/vulnerability and regional differences. As noted in the previous section, not every possible resource will need to be analyzed for every project.

- Rivers and Streams
- Wetlands and Riparian
- Floodplains
- Working Lands
- Species of Concern
- Ecological Communities of Concern
- Other Wildlife Species and Habitat
- Conserved Land and Open Space
- Community and rural character

4.5.2.1 Rivers and Streams

Major GIS resources with respect to water resources include the following:

- National Hydrography Dataset – U.S. Geological Survey product that provides detailed mapping of streams, lakes, rivers, and other water features, including attribute data that can be used for flow analysis (http://nhd.usgs.gov/).
- Montana 2010 Total Maximum Daily Loads (TMDL) 305b Assessment Units – A Montana-specific product of the Department of Environmental Quality that links streams to water quality/quantity information. Assessment data includes potential causes for reaches not attaining beneficial uses (including chronic de-watering).
- Montana Fish Wildlife and Parks Dewatered Streams – Montana Fish, Wildlife, and Parks maintains a GIS layer of dewatered streams (not complete, only those of interest for fisheries issues).
- Some of the more densely populated cities and counties are developing their own data. For example, Bozeman is currently performing its own updated survey and mapping of streams and rivers.

Montana has approximately 96,161.52 km (59,752 miles) of perennial streams; 494,722 km (307,406 miles) of intermittent and ephemeral streams; 21,104.94 km (13,114 miles) of ditches and canals; and 2,888.41 square-km (713,742 acres) of lakes, reservoirs, and wetlands (Montana Department of Environmental Quality (MDEQ) 2012a). The most useful references for considering the status and vulnerability of streams and rivers in Montana are those created by the Montana Department of Environmental Quality (MDEQ) in their water quality regulatory role (MDEQ 2012a; MDEQ 2012b). As of 2012, the majority of the streams and rivers assessed (75 percent) were considered to be impaired (not meeting all beneficial uses), primarily from non-point sources. The three most common causes of impairment identified were sediment/siltation; alteration in stream-side or littoral vegetative covers; and low flow alterations. Grazing in riparian or shoreline zones is the most common confirmed source associated with impairments.

Chronic de-watering due to irrigation withdrawals is another common adverse impact to rivers and streams in Montana. The Teton, Upper Missouri, Jefferson, Madison, Upper Clark Fork, and Bitteroot Basins are over-allocated and closed to new surface water rights.

The primary regional differentiation in streams and rivers in Montana is their position relative to the Continental Divide. The west side of the Continental Divide is the "wet" side of the mountains, and comprises a portion of the Columbia River basin. This drainage area represents only 17 percent of the area of Montana, but accounts for 53 percent of the annual surface flow. On the eastern, arid side of the Continental Divide, the Missouri River and its tributaries drain 56 percent of the state and contribute 17 percent of the annual surface flow, and the Yellowstone River drains 24 percent of the state contributing 21 percent of the annual surface flow in the state. The Saint Mary's River flows north to the Arctic Ocean, draining 1 percent of the State's area and providing 2 percent of the State's annual surface flows.

Increasingly, riparian buffers are protected by local and state regulations. There may be additional data and regulations in the more densely populated cities and counties. For example, in Bozeman and Lewis and Clark County, setbacks of 15.24 m to 76.2 m (50 to 250 feet) are required for specific streams in order to promote preservation of a vegetated riparian buffer.

4.5.2.2 Wetlands

The primary GIS data sources for analyzing wetlands include the following:

- Montana Natural Heritage Program Riparian and Wetland Mapping – Montana-specific, ground-truthed; current status of this program mapping is available at the following website: http://mtnhp.org/nwi/NWI_Status_map.asp.
- National Wetland Inventory – National database created via aerial photos by U.S. Fish and Wildlife Service (http://www.fws.gov/wetlands/).

The best reference for investigating the quality and vulnerability of wetland and riparian resources is the MDEQ Wetland Program (MDEQ 2008). Montana has lost approximately one-third of its naturally occurring wetland areas since settlement. Riparian areas make less than 4 percent of the State's area, but provide essential habitat for over 60 percent of species identified as having the greatest conservation need (MDEQ 2005). Threats to wetland and riparian areas include drought, non-native and invasive species, oil and gas exploration, development and urban growth, agriculture, and inappropriate recreational use.

There are regional differences in the types of wetlands based upon differences in climate, geology, soils, hydrology, and plant and animal communities. The majority of the Central Front and Eastern Plains fall within the Western Great Plains and Northern Great Plains Land Resource Regions (USACE 2010a), whereas the Western Mountains and mountain fringes in the Central Front are within the Rocky Mountain Forest and Rangeland Land Resource Region (USACE 2010b). Regulatory protection (and judicial interpretation of regulatory protection) of headwater and isolated wetlands has varied through time.

As a result of its diverse topography, wide range of elevation, and complex geology and hydrology, Montana's Western Mountains Region has a variety of wetland types, from lower

elevation marshes to alpine wet meadows and fens. In intermountain valleys, wooded vernal pools are also common, and are important habitat for amphibians. Western region wetlands, particularly fens and wet meadows, boast high plant diversity, and sometimes feature species of concern like Sparrow's egg lady's slipper. Streams and smaller rivers, depending on their gradient, typically have well-developed riparian areas lined with willow and cottonwood; these riparian forests are often flooded well into June as snowmelt swells the rivers. Larger rivers like the lower Clark Fork, Bitterroot and Yellowstone have extensive floodplains with a matrix of wetlands and riparian vegetation, although these are increasingly being lost to development.

Lying in the rainshadow of the Rocky Mountains and the high island mountain ranges, the Central Front Region receives less snow and rainfall than the area to the west. Along the northern Rocky Mountain front, slope wetlands, particularly fens, are common, with closed depressional wetlands becoming more frequent as the foothills meet the Glaciated Plains. North of the Missouri, especially through the Charles M. Russell Wildlife Refuge, greasewood flats are extensive. In the unglaciated Great Plains between the Missouri River and Yellowstone Rivers, heavy clay soils frequently hold moisture into late spring or early summer, forming extensive, shallow ponds with emergent vegetation, that support large populations of waterfowl. In contrast, the southern part of the Central Region, which is hillier and drier, has fairly few wetlands. However, floodplain forests are common throughout this region, with a mix of cottonwood, box elder, and willows. Unfortunately, Russian Olive is become invasive in these floodplains, particularly in the Clark's Fork of the Yellowstone and the Bighorn River.

The Eastern Plains Region is a study in contrast. North of Route 2, the Glaciated Plains are characterized by abundant prairie potholes, which increase in size and density to the east. This is part of the larger Prairie Pothole Region extending from Alberta to Iowa, an area often described as "the Duck Factory" for its importance to successful waterfowl reproduction. Although the hydrologic connections between potholes are complex and not fully understood, these wetlands typically appear as small, isolated basins with wetland vegetation around small open water areas, often drying by mid to late summer. Although less common, large alkaline marshes are also found in the pothole area, generally drying completely by mid-summer. Only in the easternmost part of the region, around Manning Lake and The Medicine Lake Wildlife Refuge, are there large, permanent wetlands with typical marsh vegetation. South of the pothole region, however, wetlands are scarce; in this area, too, streams are only occasionally perennial. Most wetlands are the result of human efforts to hold water through the season, either by damming small streams or excavating springs and seeps. Except along the perennial large rivers of the Eastern Plains, where cottonwood, box elder and green ash have established, riparian areas occur as narrow stringers, with chokecherry and snowberry more common than the larger trees.

4.5.2.3 Floodplains

The key data sources for floodplains include the following:

- Federal Emergency Management Flood Insurance Rate Maps – These are the standard federal maps showing the floodway and 100-year floodplain. These are not available digitally for large portions of Montana. Scanned maps are available where the digital GIS data is not available. Areas with Digital Flood Insurance Rate Maps (DFIRMs) available can be identified using the following website:

http://gis1.msc.fema.gov/Website/newstore/viewer.htm. The status of Federal Emergency Management Agency (FEMA) map modernization efforts by county in Montana is available here: http://dnrc.mt.gov/wrd/water_op/floodplain/mapping.asp.

- Local Studies – Local Data such as studies of the Clark Fork River and Yellowstone River floodplains is available through the Montana GIS Portal. Other local studies may be available on request.

Floodplains are subject to development, agriculture, residential, and recreational pressure, as discussed previously concerning riparian corridors.

4.5.2.4 Working Lands

Working lands – those used for farming, ranching, or timber -- are of importance in Montana. The category most easily approached is farmlands and irrigated farmlands. The GIS data most useful for examining farmlands are listed.

- National Resource Conservation Service Soil Maps -- Soils that are prime farmlands, farmlands of statewide importance and significant if irrigated are identified in the soil maps.
- Revised Final Land Unit Classification – A Montana-specific product of the Department of Revenue (updated continuously, parcel-resolution). This data can be used to differentiate between agricultural and timber lands.
- Montana Water Rights – The 'Points of Use for Irrigation' data can be used to approximately locate areas under irrigation.

An approach to identifying significant grazing and timber lands that requires access to additional data sets and GIS analyses is used by the Missoula Rural Initiatives PLACE (Practical Landscape Assessment for Conservation and Enhancement) Program (http://www.co.missoula.mt.us/rural/PLACE/ConservationResourcesAtlas.htm).

The American Farmland Trust has found that Montana has been losing approximately 0.14 square-km (35 acres) of farmland per day to the pressures of urban sprawl and low density development (American Farmland Trust 2012). Ranchlands in the Central Front region are threatened primarily due to low-density development (http://www.farmland.org/resources/fote/states/map_montana.asp). New centers of development pressure are threatening ranchlands in the vicinity of the oil and gas development boom in the Eastern Plains.

The real estate market has placed development pressures on private timber lands in the Western Mountains as well (U.S. Forest Service 2005). Several major timber companies have converted their land holdings to residential areas, vacation homes, and resort developments.

4.5.2.5 Species of Concern

Data for occurrences of Species of Concern are maintained by the Montana Natural Heritage Program. "Species of Concern" is a category that includes many of the designations and listings of other agencies, such as those in Table 5.

Table 5: "Species of Concern" - Designations and Listings of Other Agencies

Agency	Designations/Listing that Qualify as "Species of Concern"
U.S. Forest and Wildlife Service	Threatened Endangered Delisted -- monitored
U.S. Forest Service	Threatened Endangered Sensitive
Bureau of Land Management	Sensitive Special Status
Montana Fish Wildlife and Parks Comprehensive Wildlife Conservation Strategy	Tier I Tier II Tier III Tier IV

(Hyalite Environmental, LLP 2012, p. 13)

In addition to these categories, each species of plant and animal has been assigned a global and state ranking (http://fieldguide.mt.gov/statusCodes.aspx#msrc).

Because the data is sensitive, it is not made available in a portable GIS format. It is available as listings with related geographic information on a coarse scale in the following datasets:

- Montana Natural Heritage Program Generalized Observations – this is a Montana-specific database of general areas of observations of species of concern; it also includes specification of ranges for these species (summer, winter, year-round, migration, and historic).
- Endangered Species Program – U.S. Fish and Wildlife Service database of Threatened and Endangered Species in each county (not GIS data, but geographic information that allows the data to be manually plotted).
- Montana Natural Heritage Program Detailed Data – this data is available at a relatively local scale for single species queries, with data reported on a 93.24 square-km (36 square-mile) (township) scale (again, not GIS data but data with a geographic component that can be manually plotted).
- Montana Natural Heritage Program Query – the Montana Natural Heritage Program will produce a PDF map of their data showing locations and occurrences of species of concern. This data can be imported and rubber-sheeted to a GIS system.

4.5.2.6 Ecological Communities of Concern

The Montana Natural Heritage Program is developing a list of specific ecological communities found in Montana, and ranking the relative sensitivity or vulnerability of those ecological communities (http://mtnhp.org/docs/Community_list_2002.pdf). Ecological communities are defined by unique assemblages of species, climate, soil, topography, and other conditions. These communities are important to the management of natural resources and present an alternative to the species-by-species management approach.

In that same report, the ecological communities that have been recognized in Montana are listed, with their State and Global rankings.

Geographic information for the locations where these ecological communities are dominant on the scale of 1.61 by 2.41 km (1 by 1.5 mile) quadrants is available via an online map viewer available on the following website: http://mtnhp.org/MapViewer/?t=1&es=4234. This is not sufficiently fine-scaled for site-specific analysis, but may be used as an indicator.

4.5.2.7 Other Wildlife Species and Habitat

Montana Fish, Wildlife, and Parks has an online mapping program called "Crucial Areas Planning System" (CAPs) available at the following website: http://fwp.mt.gov/gis/maps/caps/. The Montana Fish, Wildlife, and Parks mapping service is "aimed at future planning for a variety of development and conservation purposes so fish, wildlife, and recreational resources can be considered earlier." This mapping project has identified key species and addresses habitat connectivity issues.

The data from CAPs system is directly applicable to assessment of potential impacts to habitat, on a landscape scale.

Montana Fish, Wildlife, and Parks GIS data is downloadable from the following website: http://fwp.mt.gov/doingBusiness/reference/gisData/dataDownload.html. Layers include fish species distribution, and the habitat and range of antelope, bighorn sheep, bison, black bear, dusky grouse, elk, gray partridge, gray wolf, moose, mountain goat, mountain lion, mule deer, pheasant, ruffed grouse, sage grouse, sharp-tailed grouse, spruce grouse, white-tailed deer, and wild turkey.

Montana Fisheries information is available from the following website: http://fwp.mt.gov/fishing/mFish/default.html.

Additional detailed data is available in Habitat Conservation Plan Documents:

- Montana Department of Natural Resource Conservation Habitat Conservation Plan for Forested State Trust Lands - Includes species accounts for bull trout, Canada lynx, Grizzly Bear, Red band trout, and westslope trout. (State lands are distributed throughout the Western Mountains and Central Front geographic regions.) (http://www.dnrc.mt.gov/HCP/Documents.asp)
- Natural Resources Conservation Service Habitat Conservation Strategy for Greater Sage Grouse - Sage grouse core areas are located in the Central Front and Eastern Plains geographic regions (http://www.mt.nrcs.usda.gov/technical/ecs/biology/sagegrouse/sagegrous_strategy.html) .
- Plum Creek Timber Company Native Fish Habitat Conservation Plan - Particularly significant for bull trout. Plum Creek has extensive land holdings in the Western Mountain and Central Front geographic regions (http://www.fws.gov/montanafieldoffice/Endangered_Species/Habitat_Conservation_Plans/Plum_Creek_HCP/Home_pcfeis.htm).

- Burlington Northern / Santa Fe (BNSF) Railroad Habitat Conservation Plan - Addresses grizzly bear habitat. BNSF has extensive land holdings and operations in the Mountain West geographic region (http://www.fws.gov/montanafieldoffice/Endangered_Species/Habitat_Conservation_Plans/BNSF_HCP.html).
- Great Plains Wind Energy Habitat Conservation Plan – Addresses whooping crane, lesser prairie-chicken, interior least tern, and piping plover. Area of interest includes minor northeast portion of the Eastern Plains in Montana (http://www.greatplainswindhcp.org).

The geographic regions—Western Mountains, Central Front, and Eastern Plains—are significantly different habitats. Each category has species of concern and habitat preservation issues. The primary habitat threats in the Western Mountains and western portion of the Central Front are valley bottom development (residential, transportation, logging, agriculture) and encroachment of development into the higher elevations. The primary habitat threats in the eastern Central Front and Eastern Plains include the same kinds of development as in the western portion of the state, with the added impacts of energy development (oil and gas, coal, and wind). Generally there is greater development pressure near centers of population, which are primarily in the western portions of the State. Throughout the State there is habitat threat related to climate change. A summary of some of the habitat and connectivity threats to Species of Concern is available at the following website: http://fwp.mt.gov/fwpDoc.html?id=44423.

4.5.2.8 Conserved Land and Open Space

The Montana Natural Heritage Program maintains three layers that pertain to conserved land:

- Public Lands and Private Conservation Lands – includes land owned by local, state, and federal agencies, land trusts, and other private conservation organizations, updated annually.
- Managed Areas – boundaries within public lands that show areas managed separately.
- Conservation Easements – contains parcels on which a qualified Land Trust has place a Conservation Easement in cooperation with the land owner, updated annually.

A list of land trusts working in each county of Montana is available at the following website: http://findalandtrust.org/states/montana30.

Open Space can be investigated via GIS databases of several development indicators – distance to roads (4-wheel drive, local, or highways) is the most common. Roads and other indicators of development are available through the Montana GIS portal.

4.5.2.9 Community and Rural Character

Community character can be analyzed based on a combination of many different factors, including land use patterns socioeconomic characteristics, traffic, visual resources, historic properties, and other considerations. Distinct community character types in Montana include vast rural landscapes, small towns and vibrant downtowns of small cities. Local planning documents are an excellent source of information on the features are particular community considers defining or important.

4.5.3 Characterize the Future No Build Condition of the Resources

The future No Build land use projection should be reviewed and used to describe potential impacts on the resource in the absence of the proposed project. This effort could include quantification of habitat loss in specific areas or increases in impervious surface cover. However, quantification is not necessary for a legally sufficient analysis; the general trends affecting the health of each resource can be described based on the available literature. This portion of the indirect effects assessment should be coordinated with the cumulative impact assessment.

Typical methods for estimating environmental impacts based on land use change include purely qualitative descriptions of the location and magnitude of potential effects, impact calculations based on simple assumptions about land consumption per unit of household and employment growth, and trend analyses of future impacts based on the historical relationship between land use change and environmental impacts. The type of analysis largely depends on the type of land use forecasting employed, with the more detailed modeling approaches producing information better suited for the quantitative analysis of environmental impacts. Regardless of the methodology used, document how the methodology was selected, allow for public and agency input, and consider the effect of planning and environmental regulations in determining the ultimate environmental effect.

4.5.4 Characterize the Future Build Condition of the Resources and Assess Indirect Effects

The indirect land use effects of the project should be used to discuss the likely indirect impact on the resources selected for analysis. The indirect effect is the difference between the No Build and Build conditions of the resource.

4.6 Step 6: Develop Potential Mitigation Measures

If no adverse impacts area identified as result of the detailed analysis, no mitigation discussion is necessary. However, if adverse impacts are identified, a discussion of mitigation that could be implemented by MDT or others is warranted.

Mitigation for direct, indirect or cumulative impacts is not required by NEPA, which only requires that possible mitigation be disclosed. Mitigation under MEPA must be enforceable by the project sponsor; therefore many planning-type actions within the purview of local governments are not available as mitigation measures under MEPA to MDT. Neither MEPA nor NEPA are a substitute for local land use planning and zoning. Nevertheless, for NEPA compliance it is important to identify mitigation techniques for indirect effects and to provide information to decision-makers, state/federal agencies, local and regional governments, and the public about what techniques could be useful and who has authority to impose or implement those mitigation techniques and/or controls. Mitigation strategies typically discussed in indirect impact assessments include: access management, zoning and comprehensive planning, transfer of development rights, growth management regulations, resource management and preservation regulations, land acquisitions and conservation easements, and incentives for infill development.

The discussion for NEPA purposes does not obligate any agency to undertake these mitigation measures; it is only for disclosure purposes.

Wisconsin DOT's Guidance for Conducting an Indirect Effects Analysis recommends using a table or matrix outlining the various mitigation activities with the respective agency/stakeholder that has the authority to implement them. The mitigation discussion should also note which mitigation measures are already being implemented or are planned to be implemented. WisDOT guidance recommends that for potential mitigation measures not currently being implemented, the likelihood of the mitigation being implemented should be discussed.

Specific to Montana, the MDT research program's "Transportation and Land Use Toolkit" provides a summary description of the available planning strategies for mitigating indirect land use effects available to local communities, including the advantages/disadvantages of each and implementation recommendations specific to Montana. These strategies include:

- Growth Policies
- Land Use Regulations
- Concurrency & Adequate Public Facilities (APF) Ordinances
- Development of Regional Impact (DRI) Review
- Frontage Road Requirements
- Impact Fees
- Transportation Utility Fees
- Trip Credits
- Density Awards and Bonuses
- Transfer of Development Rights (TDR)
- Access Management
- Urban Growth Boundaries
- Rural Land Conservation Easements

4.7 Step 7: Document the Process and Results

The indirect effects assessment should be documented in a technical report organized around the steps of the analysis process. Under each step, explanation should be provided for what the analyst did and just as importantly, why they made particular decisions. The report should conclude with a discussion of the study conclusions regarding the expected effect of the project on land use, related indirect impacts on environmental resources, mitigation measures, and major uncertainties associated with the analysis.

The public involvement process needs to be fully documented to provide the following information for the record:

- Time and place of the meeting
- Meeting agenda and format
- Attendees
- Material presented and hand outs
- Summary of comments and discussion at the meeting

- Disposition of comments

The indirect effects technical report will likely be too lengthy to include directly in the body of the NEPA/MEPA document and should instead by summarized and incorporated by reference.

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APPENDIX 2: GIS CONTACTS AND RESOURCES LIST

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Information and Contacts for Select GIS Departments
City, Town and Census Designated Places

NAME	Pop Rank	GIS Dept (5)	Aerial Photos		Sewer and Water District Boundaries (1)	Notable Features	Contact (3)	GIS Website
Billings city		GIS	6-inch	2009	GIS	no	Tom Tully 657-3062	
Missoula city	2	GIS	3-inch	2006(4)	GIS	yes	Dan Jordan 552-6089	
Great Falls city	3	IT	6-inch	2009	PW	partial	Pat Halcro 455-8423	http://www.greatfallsmt.net/fiscalservices/computer-mapping-and-addressing
Bozeman city	4	GIS	6-inch	2012	GIS	yes	Jon Henderson 582-2250	http://www.bozeman.net/Departments-(1)/Information-Technology/GIS.aspx#.UBbzRWHO2K4
Butte-Silver Bow (2)	5	GIS	partial	varies	GIS	partial	Steve Foreman 497-6260	http://www.co.silverbow.mt.us/departments/gis.asp
Helena city	6	GIS	6-inch	2012	GIS	yes	Eric Spangenberg 447-8389	http://www.co.lewis-clark.mt.us/gis/
Kalispell city	7	GIS	6-inch	2006	PW	no	Carol Davies 758-7943	
Havre city	8	no			AutoCAD	no	Robb Gaskill 265-4941	http://www.ci.havre.mt.us/index_files/Page1280.html
Anaconda-Deer Lodge County (2)	9	SF	partial	varies	SF	yes	Jay Slocum 533-8258	http://anacondadeerlodge.mt.gov/super/gis.aspx
Helena Valley Southeast CDP	11	GIS	6-inch	2012	GIS	yes	Eric Spangenberg 447-8389	http://www.co.lewis-clark.mt.us/gis/
Helena Valley West Central	12	GIS	6-inch	2012	GIS	yes	Eric Spangenberg	http://www.co.lewis-clark.mt.us/gis/

NAME	Pop Rank	GIS Dept (5)	Aerial Photos		Sewer and Water District Boundaries (1)	Notable Features	Contact (3)	GIS Website
CDP							447-8389	
Livingston city	15	GIS	30-cm(6)	2011(6)		yes	Erica Hoffman 222-4197	
Whitefish city	18	GIS			AutoCAD	no	Dave Taylor 863-2410	http://www.whitefish.govoffice.com/index.asp?Type=B_BASIC&SEC={8EECE839-6EEC-4815-BDFB-FDD349C2CF02}
Lewistown city	19	no			AutoCAD	no	Duane Ferdinand 535-1775	http://www.cityoflewistown.com/site/images/stories/pdfs/zoning%20map%207-11-08.pdf
Sidney city	21						Terry Meldahl pub works dir 433-2809	http://cityofsidneymt.com/files/cityofsidneyzoning.pdf
Columbia Falls city	23						Susan Nicosia 892-4388	
Polson city	24	GIS			pending	no	Tony Porrazzo 883-8215	
Helena Valley Northwest CDP	30	GIS	6-inch	2012	GIS	yes	Eric Spangenberg 447-8389	http://www.co.lewis-clark.mt.us/gis/
Libby city	40	SF	1-foot	2009		no		
Red Lodge city	48	GIS			yes	yes	Tom Kohley 425-2071	
East Helena city	51	GIS	6-inch	2012	GIS	yes	Eric Spangenberg 447-8389	http://www.co.lewis-clark.mt.us/gis/
Helena West Side CDP	69	GIS	6-inch	2012	GIS	yes	Eric Spangenberg 447-8389	http://www.co.lewis-clark.mt.us/gis/
Troy city	94	SF	1-foot	2009		no		

(1) Location of data: GIS -- GIS department; PW -- Public Works department;

(2) Consolidated City-County Government

(3) All (406) area code

(4) New aerial photos contracted to be flown in 2013

(5) GIS Dept: yes -- stand alone; IT -- in Information Technology; SF -- coordinated with Superfund

(6) These photos are pulled through their ESRI license from BING

Information and Contacts for GIS Departments
Counties

Name	Population Rank	GIS	Sewer and Water District Boundaries	Notable Features	Contact [1]	GIS Website	Interactive Online Mapping
Yellowstone	1	yes	yes	no	Annette Cabrera 256-2812	http://www.co.yellowstone.mt.gov/mapping/	http://www.co.yellowstone.mt.gov/mapping/maplinks.asp
Missoula	2	yes	yes	yes	Doug Burneson 258-4227	http://www.co.missoula.mt.us/gis/	no -- data from ftp://www.co.missoula.mt.us/surveyor/
Flathead	3	yes	yes	yes	Mindy Cochran 758-5540	http://flathead.mt.gov/gis/	http://maps.flathead.mt.gov/ims/default.aspx
Gallatin	4	yes	yes	yes	Allan Armstrong 582-3060	http://www.gallatin.mt.gov/public_documents/gallatincomt_gis/gis%20home%20page	http://gis.gallatin.mt.gov/general_viewer/
Cascade	5	yes	yes	yes	Tom Mital 454-6727	http://departments.cascadecountymt.gov/geographicinformationsystem	http://gis.cascadecountymt.gov:8399/CascadeCountyGIS/mapviewer.jsf?width=717&height=532
Lewis and Clark	6	yes	yes	yes	Eric Spangenberg 447-8389	http://www.co.lewis-clark.mt.us/gis/	http://www.co.lewis-clark.mt.us/information-technology/gis-maps/wwwhelenamontanamapsorg.html
Ravalli	7	yes	no	no	Kelli Chrisopherson (406)375-6622	http://rc.mt.gov/gis/default.mcpx	no -- data from ftp site (user name: gispub password: 4ThePublic)
Silver Bow	8	yes	partial	partial	Steve Foreman 497-6260	http://www.co.silverbow.mt.us/departments/gis.asp	no
Lake	9	yes	partial	no	Wendy Largent 883-7212	http://www.lakecounty-mt.org/gis/map_disclaimer.html	no

Name	Population	GIS	Sewer and Water	Notable Features	Contact [1]	GIS Website	Interactive Online Mapping
Lincoln	10	yes	no	no	Kristen Smith 283-2460	http://www.lincolncountymt.us/planning/GIS.html	no
Hill	11		unknown		Bill Albee 265-5481	http://hillcounty.us/Planning_and_Rural_Addressing.html	no
Park	12	yes	partial	no	Erica Hoffman 222-4197	http://www.parkcounty.org/departments/GIS/InteractiveMaps.html	
Glacier	13						
Big Horn	14						
Custer	15		unknown		commissioners 874-3350		
Fergus	16	yes	no	no	Pam Vosen 535-9046	http://www.co.fergus.mt.us/index.php/government/planning-office	no
Sanders	17	yes	no	no	Lori Kaharl 827-6920	http://www.sanderscounty.mt.gov/Pages/LandServices.html	-
Jefferson	18	yes	no	no	Melissa Morris 225-4156	http://jeffco.mt.gov/maps/index.html	no -- data from ftp site (user name: public, password: public)
Roosevelt	19	yes	no	no	Clayton Vine 653-6208	http://www.rcgis.org/aboutme.htm	
Carbon	20	yes	yes	yes	Tom Kohley 425-2071	no	no
Richland	21	yes	no	no	Chris Viets 433-2106	no	
Deer Lodge	22	SF	no	partial	Jay Slocum 533-8258	http://anacondadeerlodge.mt.gov/super/gis.aspx	no -- data from ftp://www.co.missoula.mt.us/surveyor/
Beaverhead	23	yes	unknown		Scott Marsh 683-3757	http://www.beaverheadcounty.org/html/gis___rural_addressing.html	
Rosebud	24						

Name	Population	GIS	Sewer and Water	Notable Features	Contact [1]	GIS Website	Interactive Online Mapping
Stillwater	25	yes	unknown		Carol Arkell 321-1997	http://www.stillwater.mt.go/GIS/default.asp	no
Dawson	26						
Madison	27	yes	no	no	Karen Brown 843-4254	http://madison.mt.gov/departments/gisite911/gisit.asp	no
Valley	28	yes	unknown		Rene Clampitt 228-6222	http://valleycountymt.net/gis.html	
Powell	29	yes	unknown		Brian Bender 846-9729	http://powellcountymt.gov/janda/inner.php?PageID-180	
Blaine	30						
Pondera	31						
Teton	32	yes	unknown		Joe Zahara 466-3406	http://www.tetoncomt.org/Rocky%20Mountain/index.aspx	
Chouteau	33	yes	unknown		Jodie Butler 622-5451		
Broadwater	34	yes	no	no	Nicole Brown 266-9211		
McCone	49	yes	unknown		Nancy Stempel 485-2347	http://www.mccone.mt.gov/gis.html	no

(1) -- all phone numbers are within the (406) area code

Note: Mapping capabilities and contacts for specific counties may also be gleaned from the Rural Addressing / 9-1-1 Inventory at https://app.mt.gov/psap/index.html .

Information and Contacts for GIS Departments
Tribes

NAME	GIS Dept	Notable Features	Contact	GIS Website
Confederated Salish & Kootenai	yes	yes	Pete Gillard 883-2888x7205	http://www.cskt.org/tr/gis.htm
Blackfeet Nation	yes	no	Cliff Ollinger 338-2667x2275	http://www.blackfeetnation.com/
Chippewa Cree Tribe of Rocky Boy's Reservation	Unknown		Angela Belcourt 395-4478	http://www.rocky.org
Gros Ventre & Assinbone of Fort Belknap Reservation	yes	no	Cody Chambeau 353-8412	http://www.ftbelknap.org/
Crow Tribe (Apsaalooke Nation)	Unknown		638-2962	
Fort Peck Assiniboine and Sioux	yes	yes	Johnny Doney 768-2357	http://www.fortpecktribes.org/
Northern Cheyenne	Unknown		477-6284	

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