

# **WSDOT RESEARCH REPORT GUIDELINES**

by

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Prepared for

The State of Washington  
**Washington State Department of Transportation**  
Paula J. Hammond, Secretary

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## **Section A**

# **Research Report and Interim Report**

## **GUIDELINES FOR WSDOT RESEARCH REPORTS AND INTERIM REPORTS**

Each research project will require a Research Report. Interim reports are sometimes specified in contracts of phased studies or studies that span several years. They document progress, conclusions, or recommendations at a given point in the study.

### **SUMMARY**

- Purpose: To provide a 35- to 50-page document. With minor modifications, this report should also be suitable for publication in a journal.
- Distribution: This report will be sent to WSDOT, FHWA, state DOTs, universities, libraries, the National Technical Information Service (NTIS), and other interested researchers.
- Requirements: Section A, pages 2 through 6
- Example: Section A, pages 7...

This format is intended to provide concise, abbreviated documentation of a project. Readers should be left with a brief history of the problem and the ways in which others have addressed it, an overview of the research approach and procedures used, and a thorough understanding of the findings and their implications

If a project requires more detailed, technical documentation, and thus a larger report, a Technical Report may be necessary. Please consult with the WSDOT Research Office Project Manager assigned to your contract.

### **LENGTH AND FONT**

Both research and interim reports should be no longer than 35 to 50 typewritten, double-spaced pages, including figures and tables. Margins should be 1 inch on top and bottom and 1 1/4" on the left and right. The preferred type font is Times 12.

### **STYLE**

To achieve uniformity and consistency, use *Webster's Third International Dictionary* for spelling, definition and compounding. Published standards of learned societies are accepted in questions of usage of technical terms. Other matters of style and usage are based on widely accepted style manuals such as the *Chicago Manual of Style* or *Words Into Type*.

### **PARTS OF THE RESEARCH REPORT**

- Title page
- Form 310-022, FHWA Technical Report Standard Title Page (with Abstract)
- Disclaimer
- Table of Contents (including Figures and Tables)
- Body of Report
  - Executive Summary
  - Introduction or Background

- Review of Previous Work
- Research Approach/Procedures
- Findings/Discussion
- Conclusions
- Recommendations/Application/Implementation
- Acknowledgment
- References
- Appendices

### **Title page**

The title page should include the title of the report, name(s) of the principal investigator(s), their research agency(ies), name and title of technical contact at WSDOT, type of report, title of project, name of sponsoring agency, and date of publication, using the format shown in the Section A example.

### **Form 310-022, FHWA Technical Report Standard Title Page**

You can obtain this form from the FHWA, WSDOT Research Office, or the TRAC office. The form contains an abstract, which should be self-contained and not require reference to the report to be understood. The abstract should not contain unfamiliar terms, acronyms, abbreviations, symbols, or equations. It should review the primary objectives and scope of the study; the techniques or approaches should be described only to the extent necessary for comprehension; and the findings and conclusions should be presented concisely. Key terms should be locatable in the TRB Transportation Research Thesaurus (<http://trt.trb.org/trt.asp?>)

### **Disclaimer**

The disclaimer is to read:

"The contents of this report reflect the views of the author(s), who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Department of Transportation, Federal Highway Administration, or U.S. Department of Transportation [and/or another agency]. This report does not constitute a standard, specification or regulation."

### **Body of Report**

The body of the report should be organized in the following manner:

- Executive Summary
- Introduction or Background
- Review of Previous Work
- Research Approach/Procedures
- Findings/Discussion
- Conclusions
- Recommendations/Application/Implementation

Executive Summary. Write the executive summary with the busy transportation professional in mind. It should be no longer than 10 pages and should be comprehensible apart from the larger document. It should contain a readable yet condensed description, explained within the context of the project scope and objectives, of the research findings, conclusions, and recommendations that evolved from the project. Beyond these elements, it should contain only information that is essential to an understanding of the findings and how they relate to the solution of the operation problems. *Do not summarize the full report.*

Introduction or Background. Discuss the problem that led to the study, current knowledge that can help in its solution, and the objectives and scope of the assigned research.

Review of Previous Work. Summarize or highlight the project's literature review, state-of-the-art survey, or the work that others have performed in relation to the problem at hand.

Research Approach/Procedures. Discuss the approach that was used in attempting to solve the problem. Include in the appendices forms that may have been used in soliciting information or details regarding test procedures or analyses.

Findings/Discussion. Present the research findings that evolved from the project. Include in the appendices summary data, principal mathematical formulas that have been developed, or other technical details.

Conclusions. Conclusions are concerned with general principles suggested in the findings. They are extensions of the findings beyond conditions specific to the project.

Recommendations/Applications/Implementation. Recommendations should address specific actions that WSDOT should consider. Discuss the implications of the findings in relation to standards, specifications, policies, and procedures; what they add to an understanding of the problems; and what effects they have on economy, safety, amenities, and convenience. Assess their limitations. Items recommended for implementation should be identified and necessary implementation steps listed.

## **References**

1. Arrange the reference list alphabetically by author (or publication information if no author); list only the references cited in the text.
2. Denote a reference at the appropriate place in the text (preferably after, rather than interrupting, a sentence) by the author's name and publication date in parentheses. Example: (Reed 1993)  
  
To include a page number, follow the author and date with a comma and the page number. Example: (Reed 1993, 62)
3. Do not reference any material that would not be available to readers in printed form, such as unpublished material, personal communications, telephone conversations, etc. Instead, state these references in parentheses in the text with the term unpublished data.
4. Do not repeat a reference in the list and do not use *ibid.*, *op. cit.*, or *loc. cit.* If a reference is cited more than one time in the text, repeat the author/date citation.
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## **Appendices**

Appendices should contain (1) materials that are needed to support, explain, or substantiate the main body of the report or (2) discussions whose technical nature would make them inappropriate for or disruptive to the main body of the report. Each appendix should be designated by letter and title, and references to appendices should be made at appropriate places in the text. Numbering appendices by letter (e.g., A-1, A-2, etc.) makes report production easier.

Appendices may contain the following:

- state of the art survey
- manuals and guidelines
- documentation and further elaboration of research findings
- forms
- mathematical analyses
- project statement and project working plan (including any approved revisions)

## **METRICATION**

Current WSDOT rules do *not* require that authors use the International System (SI) units. SI units in parentheses are encouraged. WSDOT recommends ASTM's *Standard Practice for Use of the International System of Units* and AASHTO's *Guide to Metric Conversion* for guidance in converting units from U.S. Customary to SI.

## **EQUATIONS**

1. Current word processing programs allow the display of stacked fractions.
2. Distinguish carefully among the following:
  - all capital and lowercase letters
  - capital O, lowercase o and 0 (zero)
  - lowercase l and number 1 (one)
  - letter X, Greek  $\chi$  and the multiplication sign  $\times$
  - prime ', apostrophe' and superscript <sup>1</sup>
  - English and Greek letters such as B and  $\beta$ , n and  $\eta$ , u and  $\mu$ , p and  $\rho$ , and w and  $\omega$
3. Number all displayed equations with arabic numerals in parentheses placed flush right, e.g.:

$$\sum 2 + n/\pi \qquad \text{(Equation 1)}$$

## **FOOTNOTES**

Do not use footnotes to the text. Incorporate such notes within the text.

## **ABBREVIATIONS, ACRONYMS, AND SYMBOLS**

Abbreviations, acronyms, and symbols must be fully defined the first time they are used in the paper; the definition should be given first, followed by the abbreviated term in parentheses.

## TABLES

1. If tables are not presented on separate pages, leave at least 1" of white space between a table and the text.
2. Number the tables consecutively with Arabic numerals and give each table a title. In longer reports or those with many tables, you may number the tables by chapter (e.g., Table 1.1, 1.2, 2.1, etc.). The title should briefly identify the table; furnish background information, describe the results given in the table, or include information provided by column heads in the text, not in the table title.
3. Refer to each table at the appropriate place in the text.
4. Give each column in the table a heading and leave plenty of space around headings.
5. Denote footnotes in tables by superscript letters.
6. Indicate the meaning of a dash (—) when it is used in a table, i.e., whether it is used to indicate missing data, incomplete research, data not applicable or unavailable, or a problem investigated but no results.
7. Check the accuracy of all totals.
8. The size of the type in tables should be no smaller than 10 point.

## FIGURES

1. Use professionally drawn graphics and charts that are clean, sharp and black on white. Shades of gray are acceptable. Mimeograph or xerox copies, pencil drawings, blueprints or ozalid prints, and negatives are **not** acceptable. For charts, use plain paper instead of graph paper and show only the main divisions.
2. Use only unscreened, black-and-white glossy prints of photographs that are sharp with good contrast. Slides, color photographs, and negatives are **not** acceptable. (WSDOT does not reprint its reports in color.)
3. If figures are not presented on separate pages, leave at least 1" of white space between a figure and the text.
4. Number figures consecutively with Arabic numerals. In longer reports or those with many figures, you may number the figures by chapter (e.g., Figure 1.1, 1.2, 2.1, etc.).
5. Refer to each figure by number at the appropriate place in the text.
6. Do not use lettering of figures smaller than 10 point.
7. Figure sizes, line weights, and letter sizes should be uniform throughout the report.
8. Each figure must have a caption.

**Example:  
Research Report  
and Interim Report**

**Research Report**  
Research Project T9233, Task 9  
GIS for Transportation Planning

**USING GEOGRAPHIC INFORMATION SYSTEMS  
FOR REGIONAL TRANSPORTATION PLANNING  
IN A GROWTH MANAGEMENT CONTEXT**

by

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Paula J. Hammond, Secretary

October 1992

**TECHNICAL REPORT STANDARD TITLE PAGE**

1. REPORT NO. <b>WA-RD 285.1</b>	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.	
4. TITLE AND SUBTITLE <b>USING GEOGRAPHIC INFORMATION SYSTEMS FOR REGIONAL TRANSPORTATION PLANNING IN A GROWTH MANAGEMENT CONTEXT</b>		5. REPORT DATE <b>October 1992</b>	
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		14. SPONSORING AGENCY CODE	
15. SUPPLEMENTARY NOTES <b>This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.</b>			
16. ABSTRACT  <b>Growth management in Washington State provides a new context for regional transportation planning. A major part of this planning involves investigation of the latest information processing techniques and interjurisdictional coordination specifically with regard to transportation and land use linkages. Geographic information system (GIS) applications for transportation can assist transportation planners with data analysis concerned with these linkages. This project has identified information needs in the context of a regional transportation planning process, particularly the needs of Regional Transportation Planning Organizations (RTPOs). Urban and rural contexts are considered. Information processing tasks are elucidated and the software functions that address these tasks are presented. Data sources are identified for urban and rural traffic forecast modeling. Institutional and technical barriers inhibiting access to data for the regional transportation planning process are discussed.</b>			
17. KEY WORDS <b>Regional transportation planning, growth management, GIS, information needs, geographic information systems, TIGER/Line, Census Transportation Planning Package</b>		18. DISTRIBUTION STATEMENT <b>No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22616</b>	
19. SECURITY CLASSIF. (of this report) <b>None</b>	20. SECURITY CLASSIF. (of this page) <b>None</b>	21. NO. OF PAGES <b>50</b>	22. PRICE

## **DISCLAIMER**

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## EXECUTIVE SUMMARY

This report documents tasks 1 and 2 of a three-part research project investigating the use of geographic information processing technology to support regional transportation planning. The Washington State Department of Transportation (WSDOT) recognizes that the emergence of a new mandate for regional transportation planning under the Washington State Growth Management Program provides a new context for the planning process. They also recognize that the use of geographic information processing technology can facilitate regional transportation plan development.

The findings documented in this report, in large part, result from two highly interactive workshops designed and implemented by the research team. Workshop participants included transportation planning professionals from the organizations responsible for plan development, as well as from other organizations representing important roles in support of transportation planning, including those offering information sources, e.g., the Census Bureau. The workshops were designed, in part, to encourage intergovernmental coordination and cooperation as mandated in the growth management program.

The purpose of the first workshop was to identify, and begin the synthesis of, the broad range of information needs for regional transportation plan development. The methodology developed for the workshop and documented in this report may be of concern to other information gathering sources interested in geographic information system (GIS) implementation. The second workshop involved a more detailed examination of the information needs, data sources, and software functions necessary for regional transportation plan development.....

## INTRODUCTION

### **RESEARCH OBJECTIVES**

The first objective of this part of the research project was to identify the informational needs of the regional transportation planning process. Information needs were developed from two one-day workshops, a literature review, a telephone survey, and a synthesis of the requirements outlined in the Growth Management Legislation.

The second objective of this research was to analyze and evaluate how the forthcoming Census Transportation Planning Package (CTPP) and TIGER/line data could support the transportation planning needs identified for the first objective. The report documents a wide range of the data and sources necessary for regional transportation planning and provides a first step of identifying specific problems associated with their acquisition and implementation.

### **THE PROBLEM**

This report documents the regional transportation planning process as mandated by the Growth Management Program created by the Washington State Legislature in 1990. It begins with a description of the planning problem and the required components for plan development. This description includes different perspectives on the regional planning problem, but ultimately recognizes that the process and information needs are similar for all jurisdictions involved in planning. The issue of scales of analysis is seen as the unifying dimension for the different institutional perspectives on the planning process.....

## **REVIEW OF CURRENT PRACTICE**

### **LITERATURE REVIEW**

Over the past several years, transportation modeling has been a large part of the planning effort of MPOs in Washington State. The Growth Management Program requires that RTPOs develop regional transportation plans and that these plans be consistent with the transportation elements of local comprehensive plans. This requirement will increase the level of effort expended on land use based travel demand modeling, which is part of the data analysis used in preparing regional transportation plans. In addition, the plan consistency required by the Growth Management Program necessitates an enhanced level of inter-jurisdictional coordination among MPOs, RTPOs, District Planning Offices, and local agencies.

During the 1980s part of the transportation planning efforts by MPOs across the U. S. was supported by the Urban Transportation Planning Package (UTPP), published by the Census Bureau. The UTPP was a special product of the 1980 Census organized for transportation planning applications. It contained population, employment, and supportive journey-to-work data. In an effort to continue support for such planning applications, the Census Bureau, in cooperation with the Federal Highway Administration (FHWA), will soon be releasing another....

## **PROCEDURES**

This section reviews the approaches and results from two one-day workshops designed and implemented by the project team. The workshop participants represented a broad cross-section of organizations responsible for the development of regional transportation plans.

### **WORKSHOP 1 INFORMATION NEEDS**

The purpose of the first workshop was to begin the process of identifying the issues associated with implementing transportation planning under growth management. A graphic outline of the workshop process displays an overview of the process (see Figure 1). The work sessions identified in the figure are described in this section.

#### **Individual Listing of Issues**

The workshop began with each of the participants reviewing a list of issues compiled from returned questionnaires. The participants were then asked to consider this list and any other additional issues, and to identify the three issues of greatest significance to them. These three issues were then listed on separate 5" x 8" index cards along with the initials of the participant.

#### **Clustering Issues to Form Working Group Themes**

Related issues were clustered together to form subjects for discussion. Each participant forwarded the card stating their most significant issue first. This grouping activity was repeated two more times, thus addressing each of the three issues chosen by each participant. When participants had more than three highly-significant issues, their additional cards were considered one at a time for association with any of the existing working group themes.....

## FINDINGS/DISCUSSION

### **SYNTHESIS OF WORKSHOP 1 RESULTS**

The issues identified in the first workshop were divided into two categories: institutional and technical concerns. As the first step in our synthesis, we combined the issues identified in the first workshop into a single database and resorted them based on their primary concerns' emphasis—institutional or technical.

#### **Institutional Issues**

Several institutional concerns were identified:

- Guidelines (roles, data, analysis),
- Identification of roles, responsibilities, cooperation (of key players and agencies),
- Criteria (data, planning, analysis),
- Standardization of LOS/Technical criteria,
- Consistency of regional transportation plans,
- Unifying multiple agency priorities,
- Staffing,
- Elected official involvement,
- Information dissemination, and
- Sources of, access to, and timeliness of data.

The above list indicates that a significant number of the issues identified in the first workshop were associated with institutional concerns. Clearly, two things were requested by workshop participants: 1) further policy-level clarification of the growth management program's transportation provisions, and 2) development of appropriate institutional guidelines. It is not in the scope of this project to develop such guidelines, but it is of interest to the WSDOT Transportation Planning Office in their ongoing efforts to provide transportation planning, a growth management program, and technical assistance to WSDOT districts, locales, and the RTPOs.....

## CONCLUSIONS

This report presents a broad framework, which captures the interplay between the regional transportation planning process and information processing technology. The breadth and depth of the material presented should provide valuable insights for those interested in both policy and technical aspects of the regional transportation planning process. This project is the first step in undertaking the information technology transfer problem for transportation analysis in growth management. We believe that further detailed issues regarding information processing can easily follow the basic structure set forth in this report.

This research has benefited from the contributions of many individuals in the regional transportation planning community. Their open interaction in the workshops has added greatly to the clarification of regional transportation planning problems. As the planning process moves forward, there is a need for this type of exchange to continue between RTPOs and individual planners.

The synthesis of the workshops' results presents several important conclusions. The first is that the regional transportation planning effort needs further policy-level guidance if it is going to meet the goals of the growth management program. This is, however, an institutional problem, and not the primary focus of this research.

The second issue that needs more deliberation concerns data access and better coordination of data sharing. This report documents data needs and has begun the data source identification process. It notes specific cases where data exist but are currently inaccessible to the planning community because of institutional barriers. A coordinated and cooperative effort to overcome unnecessary obstructions to data sharing should be further pursued.....

## **RECOMMENDATIONS/APPLICATION/IMPLEMENTATION**

From a technological standpoint, the results of this research provide a starting point for considering how the tasks of regional transportation planning under growth management intersect with current geographic information processing concepts and techniques. The issues identified demonstrate concerns regarding data sources and availability, and concerns regarding software capability. Currently, the knowledge base in both areas seems to be lacking or dispersed, based on the cross-section of input received from the workshop participants. This report's aim is to resolve this problem.

### **IMPORTANT ASPECTS OF THIS RESEARCH FOR INDIVIDUAL RTPO'S**

From a management standpoint, the process diagrams (figures 3 and 4) and task list (Table 2) developed in this report are applicable to a broad range of organizations, enabling them to better understand the nature of regional transportation planning problems and how geographic information processing technology can be applied. This information provides a starting point for the development of more detailed plans and programs to meet the needs of various organizations in the state of Washington.

Additionally, the general GIS functions described in tables 4a-4e can be used to identify the important software functions available in some software to address specific transportation planning problems. However, each MPO and RTPO must assess these functions considering its own technological needs. In general, the value of this research in addressing these types of issues is primarily at the level of individual RTPO/MPOs.

### **IMPORTANT ASPECTS OF THIS RESEARCH FOR THE OVERALL PROBLEM**

This research can make an important contribution at the intergovernmental level. It is at this level that further application and implementation of the concepts developed in this report could have the greatest effect on the regional transportation planning effort and the adoption of geographic information processing technology to support this effort...

## ACKNOWLEDGMENTS

The authors express their appreciation to the personnel of the many metropolitan transportation planning organizations throughout the U.S. who provided information for this study. Special thanks go to the personnel of the Regional Transportation Planning Organizations throughout Washington State who contributed their time during the workshops, making this study a creative undertaking. The authors would like to recognize the contributions of Elaine Murakami, Larry Blain, Garr Clark, and Glenn Miles for comments provided during the design and documentation of the workshop results. Last, but not least, the authors wish to thank Judith Lorenzo of the WSDOT Design Office (formerly with the Planning Office), as technical monitor, for allowing us the creative leash to draw these ideas together.

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# **Section B**

## **WSDOT/TransNow Reports**

## **GUIDELINES FOR WSDOT/TRANSNOW REPORTS**

When WSDOT and Transportation Northwest (TransNow) jointly fund a project, the front matter of the resulting reports will be slightly different.

Except for the differences noted below, the reports should follow all other WSDOT report guidelines.

### **RESEARCH REPORTS AND INTERIM REPORTS**

- Use the WSDOT/TransNow cover layout.
- Use the WSDOT/TransNow disclaimer (see below).

### **WSDOT/TRANSNOW DISCLAIMER**

The disclaimer is to read:

"The contents of this report reflect the views of the author(s), who is (are) responsible for the facts and accuracy of the data presented herein. This document is disseminated through the Transportation Northwest (TransNow) Regional Center under the sponsorship of the U.S. Department of Transportation UTC Grant Program and through the Washington State Department of Transportation. The U.S. government assumes no liability for the contents or use thereof. Sponsorship for the local match portion of this research project was provided by the Washington State Department of Transportation. The contents do not necessarily reflect the views or policies of the U.S. Department of Transportation or Washington State Department of Transportation. This report does not constitute a standard, specification, or regulation."

**Example:  
WSDOT/TransNow Report Cover**

**Research Report**  
Agreement GC8719, Task 9  
Motorist Information Real-Time  
TNW 2008-06  
TransNow Budget No. 65-4161

**REAL-TIME MOTORIST INFORMATION FOR  
REDUCING URBAN FREEWAY CONGESTION:  
COMMUTER BEHAVIOR, DATA CONVERSION  
AND DISPLAY, AND TRANSPORTATION POLICY**

by  
Mark Haselkorn                      Woodrow Barfield                      Jan Spyridakis  
Principal Investigator              Co-principal Investigator              Investigator

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Federal Highway Administration

June 1992