# Development of a Short Course:
# Introduction to the 2000 Highway Capacity Manual

For the

## Alabama Department of Transportation


By

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**15. Supplementary Notes**

**16. Abstract**

This project developed a one-day short course on the 2000 Highway Capacity Manual (*HCM2000*) for the Alabama Department of Transportation (ALDOT). The *HCM2000* has been under continuous development for more than a decade, and the 2000 edition constituted a substantial improvement from the previous edition.

The short course discussed the general content of the *HCM2000*, identified changes incorporated into the 2000 edition, and reviewed typical applications of capacity techniques. The University Transportation Center for Alabama taught the course six times to 178 individuals at four ALDOT Division offices across the State (Birmingham, Guntersville, Mobile, and Montgomery) in the spring and summer of 2002.

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# Executive Summary

The *Highway Capacity Manual-2000 (HCM2000)* is the world's most authoritative document on this topic. Elementary concepts of highway capacity have been in use for over 50 years, but during the past 15 or so years extensive research has been directed towards perfecting analytical tools to analyze capacity for multiple transportation facilities and situations. Consequently, the *HCM2000* contains 1100 pages and 31 chapters, organized into five separate parts. It represents a concentrated, multi-agency effort by organizations like the Transportation Research Board, the Federal Highway Administration, the American Association of Highway and Transportation Officials, and others.

This project developed a one-day short course on the *HCM2000* for the Alabama Department of Transportation (ALDOT). The short course discussed the general content of the *HCM2000*, identified changes incorporated into this edition, and reviewed capacity procedures for several situations. The University Transportation Center for Alabama taught the course six times to 178 individuals at four ALDOT Division offices across the State (Birmingham, Guntersville, Mobile, and Montgomery) in the Spring and Summer of 2002.

# Section 1.0
# Introduction

## The Highway Capacity Manual

Elementary concepts of highway capacity have been in use for over 50 years, and several versions of the *Highway Capacity Manual* (HCM) have been published. The most recent edition was published in 2000, and the *Highway Capacity Manual-2000 (HCM2000),* is the world's most authoritative document on this topic. It contains 1,100 pages and 31 chapters, organized into five separate parts. It represents a concentrated, multi-agency effort by organizations like the Transportation Research Board (TRB), the Federal Highway Administration (FHWA), the American Association of Highway and Transportation Officials (AASHTO), and others.

*HCM2000* has been under continuous development for more than a decade, to meet the changing analytical needs of the transportation community, and to provide the evaluation tools needed by today's transportation professional. Significant changes have been made to many chapters since the previous edition. For example, specific procedures have been included for evaluating over-saturated conditions. Entirely new analysis procedures have been derived for freeway systems and two-lane highways. Guidance is also provided for topics like evaluation of interchanges, and application of computational simulation models.

Whereas previous editions focused on the analysis of individual points or road segments, *HCM2000* goes beyond that to provide methods for evaluation of entire facilities, corridors, and area-wide transportation systems. Two distinct versions of *HCM2000* are available—metric and U.S. customary units. Regardless of the version selected, a CD-ROM is available and contains audio and visual elements as well as search aids to enhance the readability and understanding of the presented material.

## Overview

The five parts of the *HCM2000* provide a logical method of presenting the information. They are intended to make it easier for the ever-widening range of professionals who depend upon *HCM2000* to find the information they need without having to review the entire document. The five parts of *HCM2000* include:

- Part I: Overview (Chapters 1-6) This part introduces the reader to basic capacity and level-of-service (LOS) concepts. It describes various applications and includes broad, generic decision-making tools and guidelines. It also includes a glossary of terms that are used throughout the remainder of *HCM2000*.

- Part II: Concepts (Chapters 7-14) This part includes a discussion of the basic capacity parameters for each facility type. It provides default values that can be used in capacity calculations in the absence of actual field data, and example service volume tables for use

in general planning applications. The anticipated accuracy and precision that can be expected from each of the analysis procedures in *HCM2000* are also discussed.

- Part III: Applications (Chapters 15- 27) The third part contains the step-by-step procedures recommended for use in evaluating each of the different facility types, including both uninterrupted and interrupted flow facilities. Together, these chapters reflect much of what was contained in the 1997 edition of the HCM, though many of the procedures have been updated and entirely new analytical procedures are presented.

- Part IV: Corridor and Area Wide Analysis (Chapter 28-30) Part four contains material that is entirely new to the HCM. For example, it provides methods for aggregating the results of Part III analyses into facility, corridor, or area wide assessments. A single level-of-service estimate is not provided in these cases; rather, a number of key performance measures are estimated, the values of which are summarized in a " report card" type format. It is intended to address the emerging needs of transportation professionals to consider system-wide performance characteristics on a more holistic basis.

  This is the initial attempt to incorporate such a complex analysis into the national capacity manual. Since *HCM2000* is not yet comprehensive with respect to all elements of the transportation system, it must also make some initial simplifying assumptions for some cases. Nevertheless, the procedures described in this part constitute a significant advancement in the state of practice.

- Part V: Simulation and Other Models (Chapter 31) This final part also includes material that is entirely new to HCM. It suggests appropriate applications of simulation models, provides numerical examples, and includes an extensive reference list.

The titles of the various chapters are very informative in understanding the nature of the *HCM2000,* and are listed in Table 2-1 for the benefit of those reading this report:

**Publication of the New Manual**

The enhancements presented in *HCM2000* were prepared under the organization and leadership of the Highway Capacity and Quality of Service Committee (Committee A3A10) of the Transportation Research Board. Many organizations, like the FHWA, AASHTO, the National Cooperative Highway Research Program, and others, played primary roles in the significant amount of research conducted, the strenuous efforts to produce new/improved analytical procedures, and the long path to develop the revised HCH.

Since continuous future improvements are expected for capacity methodologies, the *HCM2000* was published in formats that facilitate changes to the document. It is available in both a three-ring binder version and a CD version. Both are published by the Transportation Research Board, and may be purchased using the address shown in Table 2-2.

**Table 2-1 Chapters in *HCM2000***

| | |
|---|---|
| Part I: Overview | |
| 1 | Introduction |
| 2 | Capacity And Level-Of Service Concepts |
| 3 | Applications |
| 4 | Decision Making |
| 5 | Glossary |
| 6 | Symbols |
| 7 | Traffic Flow Parameters |
| Part Ii: Concepts | |
| 8 | Traffic Characteristics |
| 9 | Analytical Procedures Overview |
| 10 | Urban Street Concepts |
| 11 | Pedestrian And Bicycle Concepts |
| 12 | Highway Concepts |
| 13 | Freeway Concepts |
| 14 | Transit Concepts |
| Part Iii: Methodologies | |
| 15 | Urban Streets |
| 16 | Signalized Intersections |
| 17 | Unsignalized Intersections |
| 18 | Pedestrians |
| 19 | Bicycles |
| 20 | Two-Lane Highways |
| 21 | Multilane Highways |
| 22 | Freeway Facilities |
| 23 | Basic Freeway Segments |
| 24 | Freeway Weaving |
| 25 | Ramps And Ramp Junctions |
| 26 | Interchange Ramp Terminals |
| 27 | Transit |
| Part IV: Corridor And Areawide Analyses | |
| 28 | Assessment Of Multiple Facilities |
| 29 | Corridor Analysis |
| 30 | Areawide Analysis |
| Part V: Simulation And Other Models | |
| 31 | Simulation And Other Models |

**Table 2-2 Purchase Address for HCM2000**

Transportation Research Board
2101 Constitution Avenue
Washington, D.C. 20418
(202) 334-3214
(202) 334-2519 fax
TRBsales@nas.edu
http://trb.org/trb/bookstore/

# Section 2.0
# Organization And Conduct Of The Project

In 2000, ALDOT found a need for widespread training of its employees on both the principles of capacity and *HCM2000*. Dr. John McFadden of the University of Alabama proposed to conduct a training project through the University Transportation Center for Alabama (UTCA). The ALDOT Research Advisory Committee approved the proposal as a one-year project, and a "Letter of Direction" was issued to begin work on December 4, 2000. ALDOT set up a Project Advisory Committee composed of the following individuals:

- Mr. Don Arkle, Design Engineer
- Mr. J.F. Horsley, Third Division Engineer
- Mr. John Lorentson, Maintenance Engineer
- Mr. James Keith, RAC Liaison
- Mr. Gordon Brown, FHWA

**Preparation of Training Materials**

In the spring Semester of 2000, Dr. McFadden and several transportation graduate students studied the *HCM2000* and identified appropriate instructional materials for the course. Then they prepared comprehensive training materials, examples of which may be found in the appendix of this report. Dr. McFadden's training materials were of three different types:

- HCM Notes For each chapter, a short narrative was developed to describe the materials contained in that chapter. The notes also indicated if there were significant changes in the chapter, if the chapter was new, or if it contained some materials that were new.

- HCM Examples For chapters 15 and 18-27, examples were provided. They were either the same as actual examples in the HCM 2000 or similar to them. Included were forms for performing analyses and examples of solved problems.

- HCM Presentation A PowerPoint presentation was prepared for each chapter of the *HCM2000*. The presentations consisted primarily of narrative listings of information (bullet lists), tables and illustrative graphics (many of which were scanned directly from the HCM).

Taken together, the notes, examples and PowerPoint presentations formed a very comprehensive set of training materials.

In the late spring, the project hit a serious snag when Dr. McFadden accepted employment elsewhere, effective August 15, 2001. Efforts were made to accelerate the instruction sessions to no avail. As an alternative, a plan was developed to have Dr. McFadden complete the instruction as a private consultant to UTCA in the fall of 2001 or spring of 2002. This plan was not acceptable to his new employer.

At this point, UTCA requested approval of a new project Principal Investigator (PI), an extension of the project time period, and the use of a consultant for the instruction of the short course. Consequently, ALDOT approved Dr. Daniel S. Turner as the PI; May 31, 2002 as the new ending date; and Dr. Steven L. Jones, Jr. of the University of Alabama in Birmingham (UAB) as the instructor. Due to the difficulty in scheduling the short course presentations, ALDOT later extended the project time frame until June 30, 2002.

Dr. Jones reviewed the extensive training materials prepared by Dr. McFadden, and provided an introductory section to help students understand the materials during the training sessions. UTCA edited, formatted, and printed the materials to compose the training manual. A small sample is shown in the appendix.

# Section 3.0
# Short Course Delivery

UTCA worked with representatives of the ALDOT Training Bureau to advertise and schedule the short course sessions. ALDOT agreed to offer the course in the training rooms of four of its Division Offices (Guntersville, Birmingham, Montgomery, and Mobile). This provided a good geographical distribution and made it possible for any ALDOT employee to attend the course without lengthy travel. It also assisted UTCA because ALDOT audiovisual equipment was already in place, and ALDOT training personnel assisted in the advanced arrangements, participant registration, and other administrative tasks.

ALDOT advertised the short course in the late spring of 2001. It was well received, with about 300 employees registering for it. This was considerably more than the 100-125 individuals that had been anticipated during the planning of the short course. At this point ALDOT approved additional funding for the printing of more training manuals, for additional instructor services, and for miscellaneous UTCA support to handle the additional attendees.

**Short Course Instructor**

The instructor was Dr. Steven L. Jones, Jr., an Assistant Professor of Civil Engineering at UAB. His credentials were particularly well suited for this course. He acquired B.S. and M.S. degrees in civil engineering from Auburn University, and a doctorate from the University of Virginia. While at the University of Virginia, he held Graduate Research Assistant and a Research Scientist positions at the Virginia Transportation Research Council. Dr. Jones has ten years of consulting engineering experience with three firms in two states, and is currently the Manager of Traffic Operations for USInfrastructure, Inc., in Birmingham.

Dr. Jones' specialty areas are in traffic engineering and transportation planning. He is familiar with capacity concepts, having taught them to his students and having used them on the job. His work experience includes many of the topics found in the *HCH2000*, including over a hundred traffic signal designs, numerous traffic impact studies, multimodal transportation issues, pedestrian operations, safety, and ITS applications.

**Scheduling Class Sessions**

Scheduling the class sessions was more difficult than normal for two reasons. First, Dr. Jones joined the project after it was well underway, and his calendar was already very full. It was difficult to find open dates in his schedule that matched open dates for the ALDOT training classrooms at Division offices. Second, even though ALDOT employees oversubscribed course enrollment, not all of these employees actually used capacity techniques on the job or needed capacity training. Thus it was difficult for the ALDOT Training Bureau to predict exactly how many individuals would actually show up on any given training date.

The ALDOT central office Training Bureau handled the general scheduling arrangements. Due to the difficulties mentioned in the previous paragraph, the scheduling process was sometimes exploratory in nature. For example, Dr. Jones initially taught one session at ALDOT's central office in Montgomery to determine the appropriateness of Dr. McFadden's training materials, and to get a feel for the attendance level and technical backgrounds of the ALDOT attendees. The consensus was that minor enhancements were needed in the training materials, and that the majority of the attendees had little or no previous experience in capacity techniques or knowledge of the HCM.

After the initial offering of the short course, the ALDOT Training Bureau scheduled the remaining instructional dates and locations. These, along with the number of participants at each session, are shown in Table 3-1.

**Table 3-1: Short Course Offerings**

| Date | ALDOT Office | City | Attendees |
|---|---|---|---|
| May 3 | Central Office | Montgomery | 30 |
| June 7 | First Division | Guntersville | 23 |
| June 12 | Third Division | Birmingham | 40 |
| June 15 | Ninth Division | Mobile | 35 |
| July 29 | Central Office | Montgomery | 26 |
| July 30 | Central Office | Montgomery | 24 |
| | | Total Participants | 178 |

# Section 4.0
# Course Evaluation

## Evaluation Data

Course participants were requested to complete a UTCA "Professional Development Evaluation Form" at the conclusion of training (see the appendix a copy of the evaluation form). The returned questionnaires were tabulated to evaluate the course, the instructor, and other pertinent factors.

The form was used to gather two distinct types of feedback. The initial block of five questions dealt with topics like the overall quality of the course and instruction, and whether the course was useful to the participant and his/her friends. The second set of questions dealt with issues like the course objectives, the instructional workbook, the room, and similar instructional environment factors. Of the 178 course participants, 84% returned evaluation forms. The numerical scores were tabulated, and the mean scores and standard deviations were calculated. Analyses were conducted for each training session, and for the cumulative training. In addition, the participant comments were compiled for analysis.

## Evaluation Results

The cumulative scores are reflected in Table 4-1. Evaluation scores were translated so that the most favorable score was 5.0, and the least favorable score was 1.0. For purposes of this report, the questions were sorted in order of declining evaluation results for both blocks of questions.

**Table 4-1: Tabulation of Course Evaluation Forms**

| Evaluation Topic | Ave Score | Std Dev |
|---|---|---|
| **I - Course and instruction quality, usefulness, etc**. | | |
| Instructor knowledgeable? | 4.62 | 0.72 |
| Instructor's teaching method? | 4.13 | 0.66 |
| Overall course quality? | 3.80 | 0.81 |
| Course help with your job? | 3.61 | 1.03 |
| Recommend course to co-worker? | Yes = 62% | No = 38% |
| **II - Objectives/goals, preparation, punctuality, room, etc**. | | |
| Instructor prepared/organized? | 4.18 | 0.79 |
| Course objective met? | 3.93 | 0.78 |
| Course stayed on schedule? | 3.87 | 0.98 |
| Course description accurate? | 3.85 | 0.84 |
| Meeting room appropriate? | 3.78 | 1.09 |
| Handout materials useful to me? | 3.75 | 0.92 |
| Meeting room comfortable? | 3.59 | 1.14 |
| Student's course goals were met? | 3.52 | 0.85 |

**Evaluation of First Block of Questions**

The initial group of questions on the evaluation form concerned the participants' opinions about the quality of the instruction and of the course. Several interesting conclusions may be drawn from the tabulated responses.

- The highest average evaluation score was for the category "Instructor's Knowledge." Almost two-thirds of the course participants gave Dr. Jones the maximum score.

- The second highest evaluation was for the category "Instructor's Teaching Method." Both instructors' knowledge and instructor's teaching methods received small standard deviations, meaning that participants agreed closely for these questions.

- The lowest average evaluation score was given for the question "Will the course help with your job?" The average score for this question was significantly below the scores for the other questions for this block. It also had the highest standard deviation for the first block of questions, indicating a wide spread of responses. The average response for this question was about halfway between "probably" and "not sure."

- 38% of the attendees indicated that they would not recommend this course to other individuals. Coupled with the previous response, it indicates an extremely large number of participants not benefiting form the course and not being willing to recommend it to others.

**Evaluation of Second Block of Questions**

The second portion of the evaluation form concentrated on issues like course objectives, adequacy of preparation, suitability of the room, etc. These questions provide secondary feedback, since these topics are not as important as "block one" to the success of the course. However, these questions provide feedback that can be used to improve future versions of the course.

- The first conclusion that can be drawn from this portion of the questionnaire is that the attendees gave lower evaluations scores to the entire second block of questions.

- Among the questions on this portion of the questionnaire, the "Instructor was Prepared/Organized" question received the highest average scores. This continues the high ratings from the initial block of questions, where Dr. Jones received excellent scores.

- The lowest average scores were for the question, "Student's Course Goals were meet." This is not surprising. As indicated by responses to the first part of the questionnaire, a large portion of the attendees did not benefit from the instructional material, and could not use it on their jobs. It is no wonder that many students did not feel that their goals were met.

- The meeting rooms received generally low average scores concerning both their appropriateness and level of comfort.

**Participants' Written Comments**

The participants were encouraged to write comments on the evaluation form. More than half of the returned questionnaires included written remarks. This is highly unusual and indicates that the participants had strong convictions about this course. They sometimes provided detailed reasons for their responses to the questions, suggestions for improvements of the course, or criticisms. The following summarizes the most prevalent comments.

- More the one-third of the writing comments requested more training on this topic or training in greater depth. One example quote was, "due the extensive nature of this course and this material, a longer period or multiple classes should be implemented." Another typical quote was, "A more detailed course using computer software, particularly dealing with signalized intersections, is needed."

- A second prevalent type of comment was a request that coffee be provided. About 20% of the written comments included this (sometimes belligerent!) request.

- A third popular response was some form of positive comment about Dr. Jones' instruction. It appeared on about 15% of the responses.

- A large number of participants asked that ALDOT be more selective in picking the audience for this training in the future. One out of six attendees commented that the audience should be limited to those who are capable of handling analytical and rigorous theoretical models like those used in capacity techniques.

- More than 10% of attendees made harsh remarks about the classroom.

- For the last two sessions, apparently the course notice erroneously indicated that a MUTCD class would be taught. Many attendees were disappointed to find that a "capacity" course was being taught. The large number of written remarks of this nature and the low evaluation scores reflect the participant's disappointment.

- Only two other questions to receive multiple comments. One involved the delayed starting time for the initial teaching date in Montgomery, which was caused by difficulty in setting up the projection equipment. The other one involved the suitability of the textbook and the slides–several participants commented that writing on the slides was too small when extensive flowcharts or analytical procedures were shown.

**Summary of Evaluations**

The prevalent themes from written comments are closely supported by the other evaluation data gathered by the forms. First, it is quite clear that Dr. Jones was respected as an instructor. Second, there was an overwhelming response that a significant portion of the audience was not qualified for the rigorous analytical material used in capacity calculations. Having these people attend the training greatly restricted the material that could be offered, limiting it to the most simplistic of explanations. This restricted the amount that could be taught to qualified people who desired to use capacity methods in their daily jobs. The third conclusion is that more training is needed, and in greater detail.

# Section 5.0
# UTCA Technology Transfer Policy Requirements

UTCA has an administrative policy with specific requirements for preparing and conducting technology transfer projects like this *HCM2000* Short Course. After the training session, the PI must submit a course-end report to UTCA headquarters. This section of the final report constitutes the required course-end report, and addresses the ten required topics in the following text.

*1) Course announcement/brochure* – ALDOT handled all announcements and scheduling for the *HCM2000* Short Course, so there was no formal announcement or brochure.

*2) Attendance list, with names, addresses, and telephone numbers* – This material was generated by ALDOT training coordinators and was retained by ALDOT. Copies of the attendance rosters were placed in the project file at UTCA headquarters on the UA campus.

*3) Date, time, and location of the course offerings* – The dates and locations of training sessions have been previously reported in Table 3-1 of this report. Classes started at 8:00 a.m., and adjourned at 4:00 p.m.

*4) Copy of the agenda* – The participant workbook (course notes) included an agenda page; topics were covered sequentially from the workbook.

*5) Copy of the course notes* – The participant workbook is on file at UTCA headquarters. In addition, copies were provided to ALDOT. A brief sample of the course notes may be found in the appendix of this report.

*6) Copy of visual aids (slides, PowerPoint on a CD, etc.)* – PowerPoint and printed copies of the visual aids were placed in the project file at UTCA headquarters. In addition, copies were provided to ALDOT.

7) *Copy of the evaluation form and a tabulation of the results* – The evaluation form is included in the Appendix, and the course evaluation was discussed in section 4.0 of this report.

*8) Other pertinent materials* – There were no other pertinent materials.

*9) A financial summary of all sources of income, amount of registration fee, total collected from participants, itemized costs, and balance of income less expenses* – Since the ALDOT project funds covered the entire cost to prepare and teach the short course, there were no participant registration fees, and there is no separate financial report of instructional revenues and expenses.

10) *A short written summary of successes and lessons learned* – As illustrated in the evaluation portion of this report, the course was heavily attended and well received by most participants. But, as covered in the "evaluation" portion of this report, many of the participants were not technically qualified to attend a rigorous capacity instructional session. Consequently, the classroom material had to be diluted to the point that those most needing the training did not get the rigorous material that they needed to improve their job performance.

# Section 6.0
# Acknowledgements

The authors gratefully acknowledge the support of ALDOT in the funding, preparation and conduct of this course. The members of the ALDOT Research Advisory Committee are specifically thanked for their guidance. Mr. Willie Franklin and Ms. Karen Doyle of the ALDOT Training Bureau were patient and helpful in coping with the change in project PI and with the increased course registration. ALDOT training personnel in Mobile, Montgomery, Guntersville and Birmingham were very supportive in arranging the individual short course sessions.

Dr. Steven Jones deserves special praise for stepping in to serve as the course instructor. His efforts were appreciated by UTCA, and certainly by the course participants.

Thanks are also extended to Ms. Dona Sulzmann and Ms. Joy Curry, UTCA Administrative Secretaries, and Ms. Nell Vice, Civil Engineering Department Administrative Secretary, for their work in preparing and printing the workbook, arranging travel, coordinating with ALDOT division training coordinators, and otherwise completing course arrangements.

Finally, thanks are extended to the many students and staff members of the Civil & Environmental Engineering Department of the University of Alabama. It would not have been possible to prepare and teach the short course on time without their help.

# Section 7.0
# Appendix

**A** – Samples of Course Training Materials

**B** – UTCA Professional Development Evaluation Form

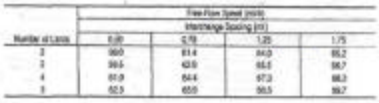
**Appendix A**
**Figure A-1: Sample of Dr. McFadden's "HCM-presentation" materials.**

## Sensitivity Of Results To Input Variables

- Calibrate FFS and demand adjustments
  - –Based on field conditions
- FFS Sensitive to
  - –Avg. interchange spacing for spacing
    - For rural freeways : under 1.25 mi

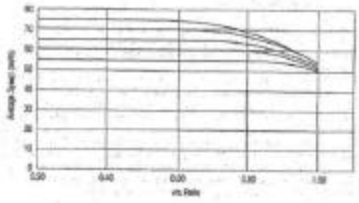
## Sensitivity Of Results To Input Variables (Contd..)

–No. of lanes in one direction



– v/c ratio in the range 54% to 80%

## Freeway Speed And v/c Ratio



## Applications

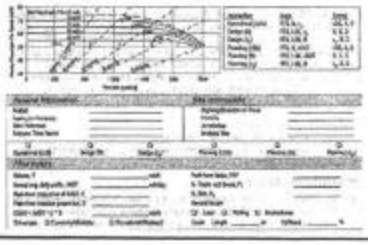
- Operational
  - – Primary output = LOS
  - – Secondary output = density and speed
- Design
  - – Primary output = no. of lanes and desired flow rate
  - – Check for the adequacy of no. of lanes

## Applications (Contd..)

- Planning
  - – Primary output = LOS/no. of lanes/ flow rate
  - – Input = estimates, HCM default values, and local default values

## Computational Steps

- Segmenting the freeway
  - – To achieve uniform traffic conditions



**Appendix A**
**Figure A-2: Example of Dr. McFadden's "HCM Notes" materials.**

## CHAPTER-1

**Course Objectives**

- To highlight the content and major methodological changes from the 1997 updates and the 1994-HCM
- Demonstrate the application to insure full working knowledge and understanding of 2000-HCM to traffic operations & problems

**Course Outline**

- I. Overview
- II. Concepts
- III. Methodologies
- IV. Corridor and Areawide Analyses
- V. Simulation and other models

**Overview**

- About HCM-2000
  - HCM-2000 published in two versions:
  - Metric units
- U.S. customary units
  - Two formats:
  - Book (5 parts, 31 chapters)
  - CD-ROM (hyperlinked book with user-interactive tutorials)
- No official TRB approved calculation software
- For additional information
  - http://national-academies.org/trb/hcm

**Part I: Overview**

- Deals with:
  - An overview of basic concept of LOS and capacity
  - Discussion of the application of the above concepts
  - Description of policy decision making
  - A glossary of terms and a list of symbols

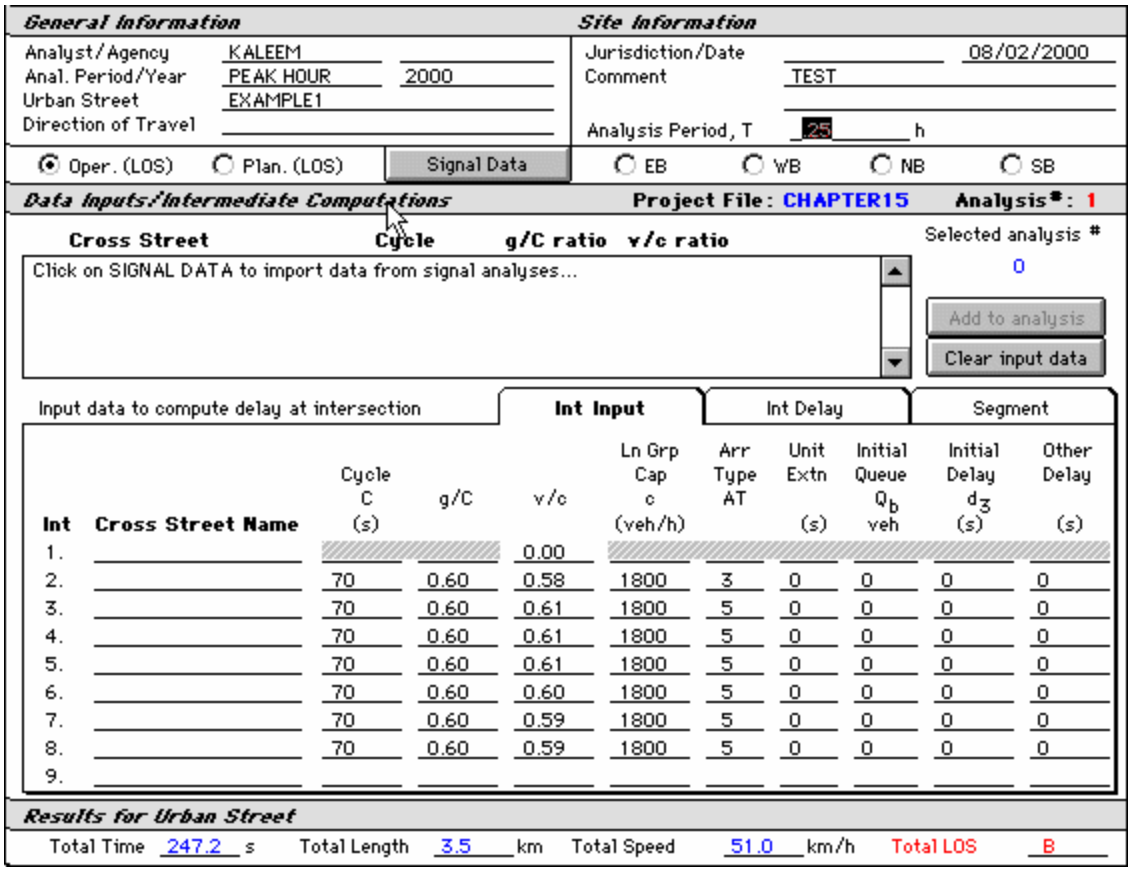
**Part II: Concepts**

- Deals with:
  - Description of concepts
  - Estimated default values for use in the analytical work presented in Part III

**Appendix A**
**Figure A-3: Sample of Dr. McFadden's "HCM example" materials.**

## CHAPTER 15
## Urban Streets

The urban streets module is used to perform analyses of urban streets with signalized intersections spaced at 3.0 km or less. It is arranged in a worksheet format, and is structured to provide quick and easy access to data input fields, intermediate calculation outputs, and overall analysis results. The worksheet layout is presented below. Key features are highlighted and described in the following sections.



*General Information*

| | | | |
|---|---|---|---|
| Analyst/Agency | KALEEM | | |
| Anal. Period/Year | PEAK HOUR | 2000 | |
| Urban Street | EXAMPLE1 | | |
| Direction of Travel | | | |

*Site Information*

| | | | |
|---|---|---|---|
| Jurisdiction/Date | | 08/02/2000 | |
| Comment | TEST | | |
| Analysis Period, T | 25 | h | |

Oper. (LOS) | Plan. (LOS) | Signal Data | EB | WB | NB | SB

*Data Inputs/Intermediate Computations* — Project File: CHAPTER15 — Analysis#: 1

Cross Street | Cycle | g/C ratio | v/c ratio

Click on SIGNAL DATA to import data from signal analyses...

Selected analysis #: 0

Add to analysis | Clear input data

Input data to compute delay at intersection | Int Input | Int Delay | Segment

| Int | Cross Street Name | Cycle C (s) | g/C | v/c | Ln Grp Cap c (veh/h) | Arr Type AT | Unit Extn (s) | Initial Queue $Q_b$ veh | Initial Delay $d_3$ (s) | Other Delay (s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | | | | 0.00 | | | | | | |
| 2. | | 70 | 0.60 | 0.58 | 1800 | 3 | 0 | 0 | 0 | 0 |
| 3. | | 70 | 0.60 | 0.61 | 1800 | 5 | 0 | 0 | 0 | 0 |
| 4. | | 70 | 0.60 | 0.61 | 1800 | 5 | 0 | 0 | 0 | 0 |
| 5. | | 70 | 0.60 | 0.61 | 1800 | 5 | 0 | 0 | 0 | 0 |
| 6. | | 70 | 0.60 | 0.60 | 1800 | 5 | 0 | 0 | 0 | 0 |
| 7. | | 70 | 0.60 | 0.59 | 1800 | 5 | 0 | 0 | 0 | 0 |
| 8. | | 70 | 0.60 | 0.59 | 1800 | 5 | 0 | 0 | 0 | 0 |
| 9. | | | | | | | | | | |

*Results for Urban Street*

Total Time 247.2 s | Total Length 3.5 km | Total Speed 51.0 km/h | Total LOS B

Application Types: There are two application types in the urban streets module. They are operational (LOS), and Planning (LOS).

**Input**

**Default Values** Default values are provided for each input data field. The default values are as specified in HCM 2000.

**Appendix B**
**Figure B-1: UTCA Professional Development Evaluation Form**

**UTCA**
University Transportation Center for Alabama
The University of Alabama  The University of Alabama at Birmingham  The University of Alabama in Huntsville

Professional Development Evaluation Form

Course Title: _____
Instructor: _____
Date: _____

**Please read the following questions carefully, and mark the appropriate response.**

1. The overall quality of the course was
   ☐ excellent ☐ good ☐ average ☐ fair ☐ poor

2. The instructor's method of teaching was
   ☐ very effective ☐ somewhat effective ☐ neutral ☐ somewhat ineffective ☐ very ineffective

3. The instructor's knowledge of the course subject was
   ☐ excellent ☐ good ☐ average ☐ fair ☐ poor

4. Will this course help you with your job?
   ☐ definitely ☐ probably ☐ not sure ☐ a little ☐ no way

5. Would you recommend this course to a friend/co-worker?
   ☐ yes ☐ no

**Please respond using a scale of 1 to 5:**
*5 = strongly agree  4 = agree  3 = mixed feelings  2 = disagree  1 = strongly disagree*

a) My goals for attending this course were met. ☐
b) Course objectives, as presented by the instructor, were met. ☐
c) The course description accurately reflected the course content. ☐
d) The course met according to the scheduled time. ☐
e) The instructor was prepared and organized. ☐
f) The meeting room was an appropriate setting for the subject matter. ☐
g) The meeting room was comfortable. ☐
h) The handouts/materials obtained in the course will be useful to me. ☐

Your comments will be appreciated.

_____
_____
_____