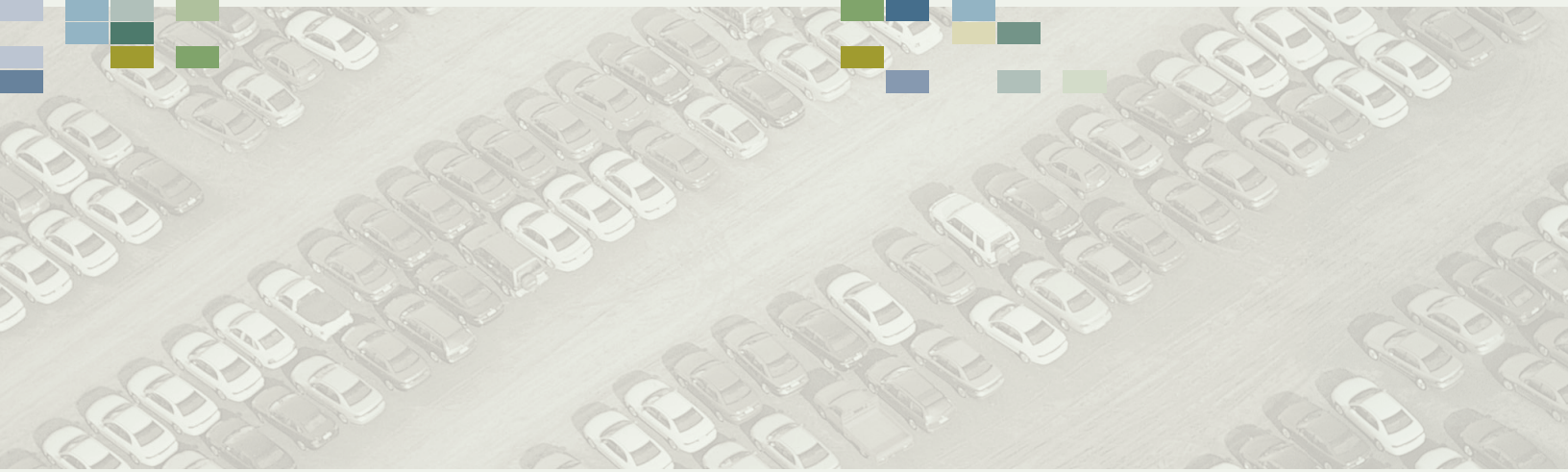




ACRP
REPORT 34

AIRPORT
COOPERATIVE
RESEARCH
PROGRAM



TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Handbook to Assess the Impacts of Constrained Airport Parking **Executive Summary**

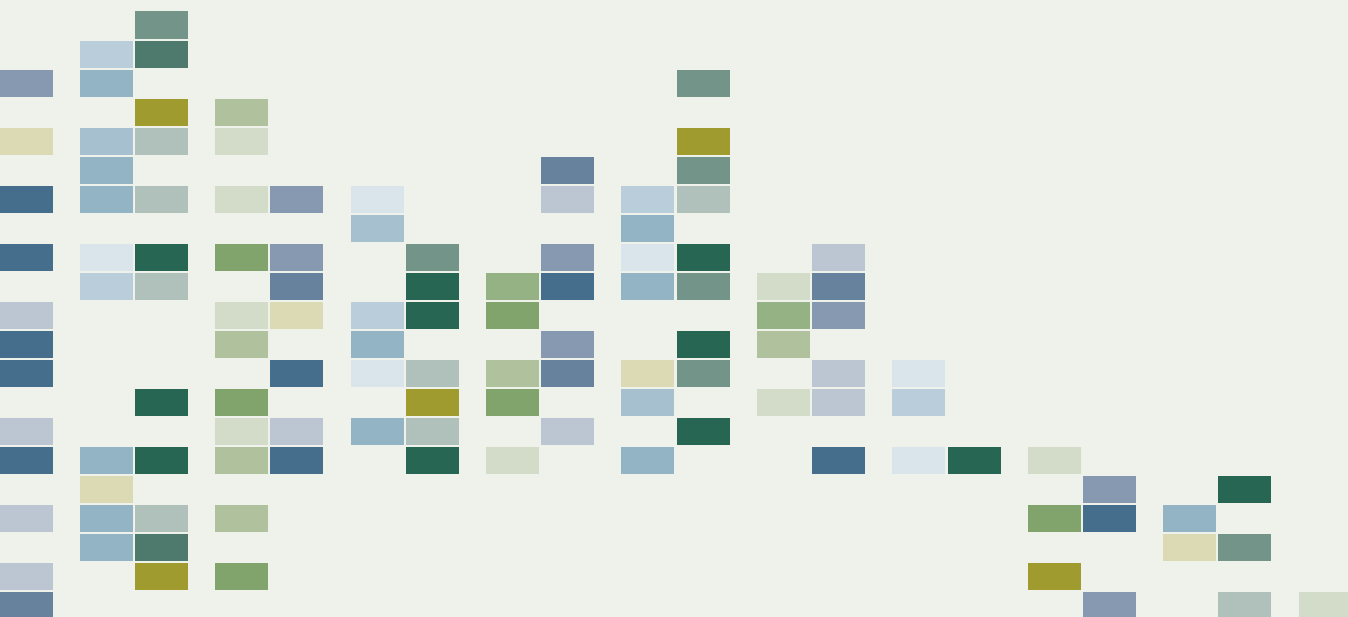
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The intent of **ACRP Report 34: Handbook to Assess the Impacts of Constrained**



Airport Parking is to assist airport operators and others—*such as external policymakers, metropolitan planning organizations, and those working on issues related to constrained airport parking*—in assessing the impacts of constrained public and employee parking at airports.





INTRODUCTION

ACRP Report 34: Handbook to Assess the Impacts of Constrained Airport Parking

was prepared to document the research findings of ACRP Project 10-06. The handbook is intended to assist airport operators and others—*such as external policymakers, metropolitan planning organizations, and those working on issues related to constrained airport parking*—in assessing the impacts of constrained public and employee parking at airports.

At most airports, the provision of on-site parking—particularly if the parking supply is constrained or is anticipated to become constrained—is a high-profile and sometimes politically charged subject for several reasons, including the following:

- *Revenues generated from public parking are a major source of funding at most airports and are often the highest nonaeronautical revenue source available to airport operators in support of ongoing airport operations and capital investments.*
- *A constrained parking supply can add stress to the airline passengers' airport experience. Airline passengers may view parking difficulties, such as searching for an available space or being redirected to a different parking facility, as an obstacle to boarding their flight and some time-constrained airline passengers may be concerned about missing their flights.*
- *The airport parking supply is used by a large percentage of airline passengers and airport employees, even when viable high-occupancy vehicle (HOV) modes serve the airport.*
- *Vehicle trips generated by airline passengers accessing the airport and associated vehicle emissions are often a focus in areas where traffic congestion and air quality are local concerns. Constrained parking conditions can exacerbate these problems related to airport-generated vehicle trips.*

Constrained airport parking is a complex issue. The nature of the constraints varies from airport to airport. The operating environment, customer base, and goals and objectives for an airport parking system (i.e., the context in which constrained parking and its solutions are evaluated) vary from airport to airport. Consequently, the effectiveness of strategies implemented to manage or resolve constrained parking and the effects of implementing those strategies are unique to each airport. Strategy implementation may result in impacts on the financial resources of the airport enterprise; trips generated by airline passengers and the effects of those airport access and egress trips on the airport, local, and regional roadway systems; emissions generated from airport access and egress trips; and the parking customer's perception of level of service.



THE HANDBOOK

This Handbook is intended to serve as a planning resource for airport operators and others involved in assessing the impacts and understanding the effects of potential strategies for addressing constrained airport parking. The Handbook includes a description of the types and causes of constrained airport parking, strategies to address constrained airport parking, tools and methodologies to predict the outcome of strategies being considered to manage the effects of constrained airport parking, an approach for selecting the appropriate strategies for the airport of concern, and ways to measure the results of the strategies implemented.

For airports where constrained parking exists or is anticipated, the Handbook is intended to facilitate an understanding, anticipation, and evaluation of changes in airport parking strategies to address constrained parking conditions.

The Handbook is designed to be informational and practical. The format is flexible so that users of the Handbook with varying levels of experience with constrained parking can draw on specific chapters of the Handbook to meet immediate needs or work through the Handbook from beginning to end to comprehensively address a current or anticipated constrained parking situation.

This research project was guided by an ACRP project panel of airport professionals with a thorough understanding of the topic. The panelists played an active role in the research and development of the Handbook. The underlying research for the Handbook included information gathered from staff at 15 U.S. airports and subsequent analysis of data from a subset of these airports, as well as development and testing of a predictive tool for estimating the effects of implementing various strategies to resolve constrained parking conditions.

All 15 airports whose representatives participated in this research experienced parking constraints at some point in the 10-year period between 1998 and 2008, and they were selected to represent a cross-section of characteristics of U.S. airports in relation to public parking (see **table 1**). The research for this project was conducted in 2008 and 2009, a period of declining airline passenger activity resulting from a global economic downturn. Thus, most airports were not experiencing ongoing constrained parking conditions at the time of this research, but staff were able to draw on historical experience and data to provide perspective to the research team as well as to present information on strategies implemented to address constrained airport parking in the past.

The predictive tool for estimating the effects of adopting a variety of parking strategies to resolve constrained public parking was developed using stated preference survey data collected by the research team at 14 of the 15 airports. The purpose of the stated preference survey was to develop an understanding of airline passenger choices related to constrained airport parking and to provide insight into ways to predict airline passenger mode choice behavior in response to implementing those strategies being considered to alleviate constrained parking. The predictive tool, a Microsoft Excel-based forecast model, allows users to test different outcomes based on airline passenger behavior when faced with choices such as increased parking prices and transit options with varying levels of service and cost. The predictive tool can be downloaded from the TRB website.

table 1 Characteristics of the 15 Airports Participating in ACRP Project 10-06 Research

Airport	Hub Classification ¹	Policy or Public Sentiment Influences Decisions Related to Parking Supply	Within a Competing Airport System	Privately Operated Off-Airport Parking Available	HOV Mode Share	
					Scheduled HOV Modes ²	All HOV Modes ³
Boston Logan International (BOS)	Large	✓	✓	✓	14%	24%
Chicago O'Hare International (ORD)	Large		✓	✓	13%	13%
McCarran International (LAS)	Large				n/a	20%
Miami International (MIA)	Large		✓	✓	1%	8%
San Diego International (SAN)	Large	✓		✓	1%	12%
Seattle-Tacoma International (SEA)	Large	✓		✓	2%	19%
Tampa International (TPA)	Large			✓	n/a	4%
Washington Dulles International (IAD)	Large		✓		1%	5%
Bob Hope (BUR)	Medium	✓	✓	✓	1%	5%
Oakland International (OAK)	Medium		✓	✓	12%	15%
Port Columbus International (CMH)	Medium		✓	✓	n/a ⁴	7%
Portland International (PDX)	Medium	✓		✓	7%	10%
San Antonio International (SAT)	Medium		✓	✓	n/a	n/a
Huntsville International (HSV)	Small		✓	✓	n/a	n/a
Tulsa International (TUL)	Small		✓	✓	n/a	n/a

notes:

HOV High-occupancy vehicle

n/a Data are not available or not applicable

¹ Hub size is defined by the Federal Aviation Administration for commercial service airports based on the community's share of total U.S. passenger boardings accommodated. Large-hub airports accommodate 1% or more of annual passenger boardings; medium-hub airports accommodate at least 0.25%, but less than 1% of passenger boardings; and small-hub airports accommodate at least 0.05%, but less than 0.25% of passenger boardings in the United States and its territorial possessions.

² Scheduled HOV modes include public transportation plus privately operated buses and vans that run on a fixed schedule.

³ All HOV modes include shared-ride vans and charter vehicles, in addition to the scheduled HOV modes listed above. Courtesy shuttles are not included.

⁴ At CMH, scheduled HOVs are included with other categories, so the scheduled HOV mode share is unknown.

sources:

Airports Council International–North America, *Airport Traffic Reports, "2007 Final Traffic Count,"* accessed November 2008 (hub classifications–total passengers); Federal Aviation Administration, *Airport Hub Classifications, November 2008* (hub classifications); DMR Consulting and Ricondo & Associates, Inc., based on interviews with airport representatives conducted between November 2008 and February 2009 (airport characteristics other than hub classification).



A BRIEF OVERVIEW: Effects of Constrained Parking at Airports

The research team investigated several key issues regarding the relationship between constrained public parking and airline passenger mode choice behavior. The value of the predictive tool developed for this research project in evaluating strategies being considered to address constrained parking was also assessed.

The main findings of the research conducted under ACRP Project 10-06 are:

Constrained public parking conditions at airports lead to increased use of passenger pickup and drop-off modes at a higher rate than to increased use of HOV modes.

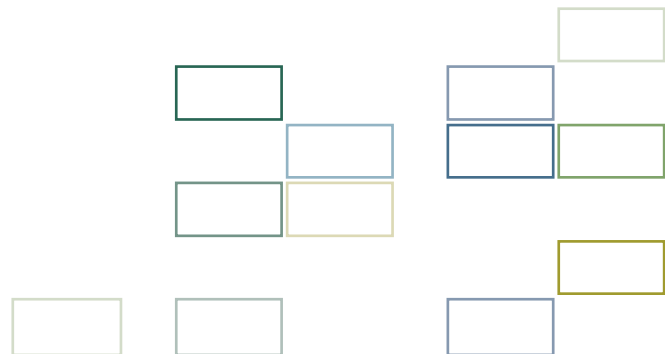
This mode shift, from an airline passenger driving to the airport and parking a private automobile for the duration of the trip (i.e., two ground access trips) to an airline passenger being dropped off and picked up at the airport by a friend or relative (i.e., four ground access trips), not only results in increased curbside congestion, but also in increased vehicle trips to and from the airport, increased regional roadway congestion, and increased vehicle emissions. This understanding of mode shifts is critical when policymakers evaluate the advantages and disadvantages of policy-driven airport parking constraints.

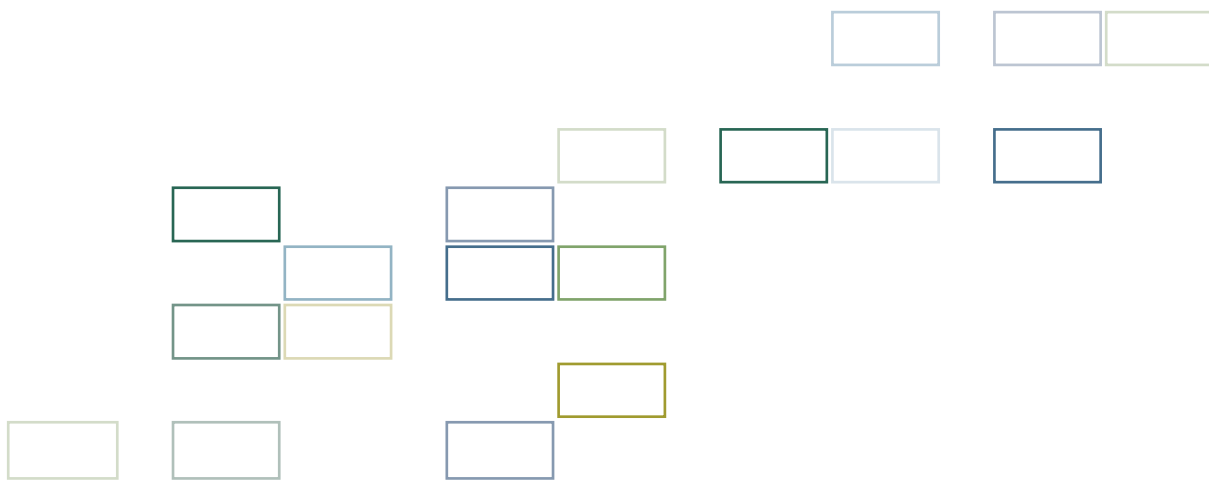
Constrained parking at one airport in a competing system of airports is not a significant factor influencing airline passengers' choice of competing airports.

Airline passengers in metropolitan areas served by multiple airports that offer commercial airline service tend to consider other airports when planning their trips; however, the cost of the flight and minimizing the travel time of the airline trip were the most important considerations influencing airline passenger choice of airports. The availability of parking at any of the competing airports in the system was not a significant determinant of airline passenger choice of airports.

A constrained parking forecast model developed based on data from a stated preference survey can be a valuable prediction tool for airport operators to use in developing an understanding of airline passenger behavior resulting from implementation of a strategy to address constrained airport parking.

This research project included development of a general airport parking forecast model that can be downloaded from the TRB website and used by U.S. airport operators and others to test policy considerations related to constrained parking at a planning level. To use the model, analysts must either have mode-share distribution information for the airport or have a general understanding of the mode-share distribution at the airport under consideration. The value of the stated preference survey and constrained parking forecast model has been demonstrated through this research project. These tools were proven to be valid and useful, and can be developed for a specific airport environment by adopting the methodology recommended in the Final Report for ACRP Project 10-06, which includes recommended refinements to the stated preference survey and is available on the TRB website.

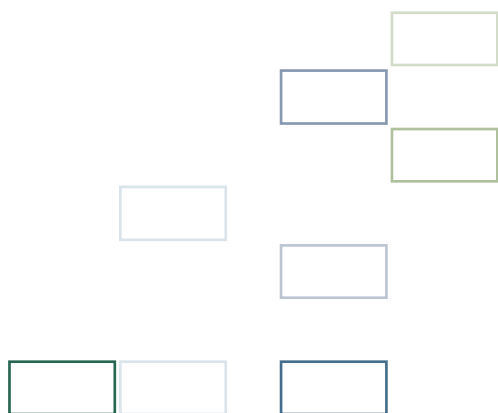




Although airport operators implement a wide range of strategies to manage constrained parking, they typically rely on a general sense of the effectiveness of the strategies rather than formal analysis to measure and quantify the results.

Airport operators typically do not collect and retain the full scope of data needed to effectively quantify the outcomes of the strategies implemented. To quantify whether the implemented strategies achieved airport management’s desired objective, data characterizing the parking conditions must be collected and maintained both before and after the strategy is implemented. The decision to collect data to support an understanding of the effects of specific strategies implemented involves examining the tradeoff between the time and cost of data collection and the usefulness or benefit of the information to be obtained.

Most airport operators tend to believe that employee parking constraints are easier to solve than public parking constraints.



Typically, airport employees drive to the airport in single-occupant vehicles, and airport operators tend to find solutions to accommodate the demand for employee parking rather than to influence employee commute behavior for several reasons: (1) peaks in airport employee parking demand are easier to accommodate because they are more predictable and less pronounced than peaks in public parking demand, (2) airport operators typically have more flexibility in locating areas to accommodate employee parking as opposed to public parking, (3) public transit service schedules may not accommodate employee work shift schedules and thus may not be a viable option for many employees, and (4) airport operators may be obligated to provide parking for airport tenant employees under use and lease agreements with those tenants. Although many airport operators offer programs or incentives to encourage their own employees to share rides or use transit, a collective effort among the airport operator and airport tenant employers may be necessary to significantly reduce the demand for employee parking at an airport or to reduce the number of employee commute trips to and from the airport.



HOW TO USE THE HANDBOOK

The Handbook is structured to address the steps an airport operator would take to fully assess the effects of constrained parking, as well as the effectiveness and effects of strategies considered to manage or resolve constrained parking as follows:

- 1) Predict when upcoming constraints may occur,
- 2) Identify a menu of strategies to resolve constraints and their potential outcomes,
- 3) Select strategies to manage or resolve the constrained parking situation—identify potentially viable strategies and predict their potential outcomes, and
- 4) Evaluate the effectiveness of strategies adopted to manage or resolve the constrained parking situation.

It is anticipated that the needs of the users of this Handbook will vary—some users may desire a quick solution to an infrequent constrained parking event, while other users may be considering long-lasting strategies that require capital investment or executive or regulatory approval. The Handbook, therefore, is structured so that users can reference specific topics as needed, or follow the Handbook from beginning to end to fully assess the constrained parking situation and the options available to manage or resolve the constraints.

chapters 1 through 3 of the Handbook provide a general understanding of the airport parking environment, the constrained airport parking environment, and the value of a clearly defined set of goals and objectives in selecting strategies to alleviate the constrained parking condition. Users of the Handbook should review these chapters because they define the terminology and establish a common framework for interpreting the guidance provided in the following chapters.

chapters 4 through 8 of the Handbook lead the user through the steps necessary to anticipate a constrained public parking situation, identify strategies to address constrained public parking appropriate to the airport environment, and evaluate the effectiveness of those strategies, both before and after implementation.

chapter 9 covers issues related to constrained employee parking conditions at airports. Compared to public parking, airport operators tend to collect less data on constrained employee parking, expend fewer resources to track trends, and explore and implement fewer strategies to address employee parking constraints other than increasing supply; thus, information on constrained employee parking is covered in one chapter that discusses the employee commute environment, provides an overview of strategies an airport operator can consider to address constrained employee parking (such as influencing employee commute behavior), and provides guidance on how to evaluate the effectiveness of implemented strategies.

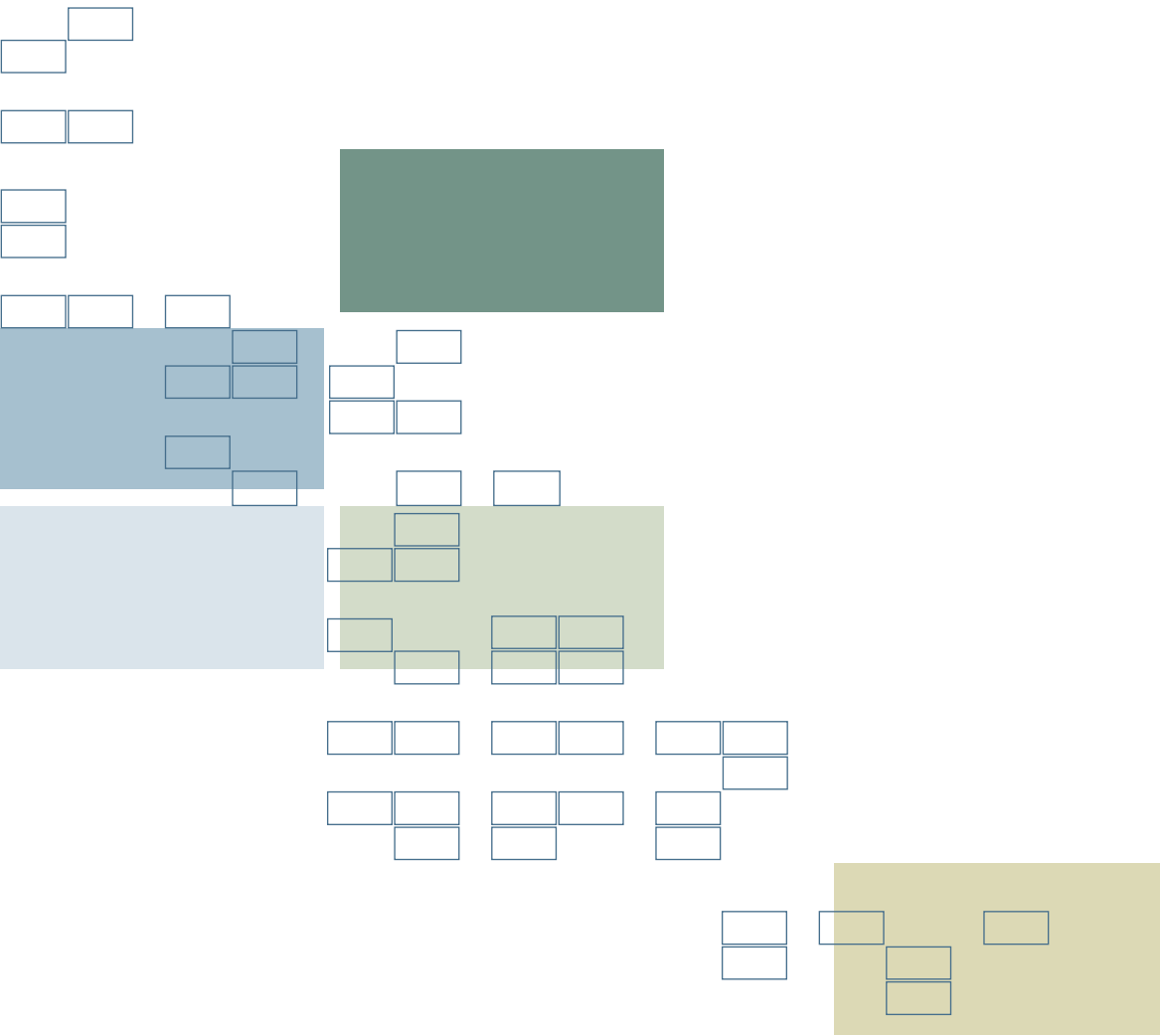
The Handbook also provides information on, and instructions for the use of, the predictive general airport constrained parking forecast model. This model can be downloaded from the TRB website and used by U.S. airport operators and others to test policy considerations related to constrained public parking at a planning level.

Each airport operator faces a unique set of challenges related to constrained parking and the potential strategies that may be considered to alleviate the constraint. It is useful, however, to understand how operators of other airports have handled similar challenges and whether or not they were successful. Therefore, to illustrate specific experiences, this Handbook includes case studies, which were primarily developed from those airports participating in this research project. The information provided in the case studies is based on the conditions at those airports at the time the airport representatives were interviewed (late 2008 through early 2009). Specific interview dates are identified in the references section of the Handbook.



An airplane symbol (similar to the one at the left) is used to denote an applicable case study in the Handbook.

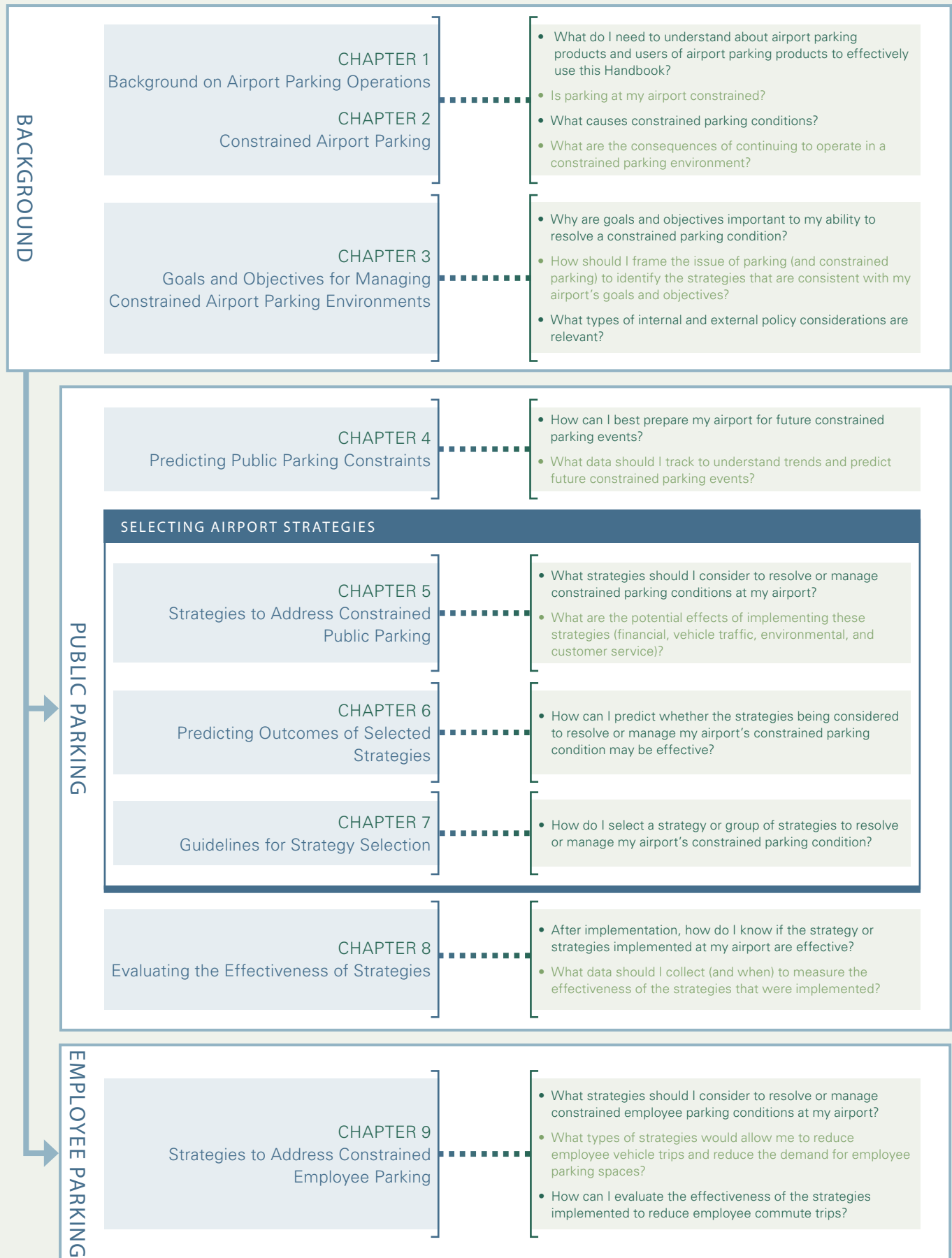




Finally, a glossary of terms is provided at the end of the Handbook to serve as a reference for users of the Handbook. The majority of these terms are defined in Chapters 1 and 2.

The Handbook is structured to facilitate an airport operator's ability to select strategies to alleviate parking constraints based on the individual needs of that airport operator. The main functional components of the Handbook are illustrated in **figure 1**. This figure presents a diagram of the relationships among and between the components and individual Handbook chapters. This figure also presents a series of questions that a user of the Handbook may have that can guide the user to relevant chapters of the Handbook.

figure 1 Guide to Contents and Structure of the Handbook



CHAPTER 1
Background on Airport Parking Operations

CHAPTER 2
Constrained Airport Parking

CHAPTER 3
Goals and Objectives for Managing
Constrained Airport Parking Environments

- What do I need to understand about airport parking products and users of airport parking products to effectively use this Handbook?
- Is parking at my airport constrained?
- What causes constrained parking conditions?
- What are the consequences of continuing to operate in a constrained parking environment?

- Why are goals and objectives important to my ability to resolve a constrained parking condition?
- How should I frame the issue of parking (and constrained parking) to identify the strategies that are consistent with my airport's goals and objectives?
- What types of internal and external policy considerations are relevant?

CHAPTER 4
Predicting Public Parking Constraints

- How can I best prepare my airport for future constrained parking events?
- What data should I track to understand trends and predict future constrained parking events?

SELECTING AIRPORT STRATEGIES

CHAPTER 5
Strategies to Address Constrained
Public Parking

- What strategies should I consider to resolve or manage constrained parking conditions at my airport?
- What are the potential effects of implementing these strategies (financial, vehicle traffic, environmental, and customer service)?

CHAPTER 6
Predicting Outcomes of Selected
Strategies

- How can I predict whether the strategies being considered to resolve or manage my airport's constrained parking condition may be effective?

CHAPTER 7
Guidelines for Strategy Selection

- How do I select a strategy or group of strategies to resolve or manage my airport's constrained parking condition?

CHAPTER 8
Evaluating the Effectiveness of Strategies

- After implementation, how do I know if the strategy or strategies implemented at my airport are effective?
- What data should I collect (and when) to measure the effectiveness of the strategies that were implemented?

CHAPTER 9
Strategies to Address Constrained
Employee Parking

- What strategies should I consider to resolve or manage constrained employee parking conditions at my airport?
- What types of strategies would allow me to reduce employee vehicle trips and reduce the demand for employee parking spaces?
- How can I evaluate the effectiveness of the strategies implemented to reduce employee commute trips?