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PHASE I FINDINGS: RESEARCH AND
REPORT ON TRANSIT SYSTEM
EVALUATION METHODOLOGIES

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PHASE I FINDINGS: RESEARCH AND
 REPORT ON TRANSIT SYSTEM
 EVALUATION METHODOLOGIES

PREPARED FOR: STATE OF MICHIGAN
 DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION
 BUREAU OF URBAN AND PUBLIC TRANSPORTATION

MARCH 26, 1979

Peat, Marwick, Mitchell & Co.

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
WHY TRANSIT PERFORMANCE EVALUATIONS ARE CONDUCTED	1
EXPERIENCE WITH TRANSIT PERFORMANCE EVALUATION	4
THE PROCESS FOR DEVELOPING A PERFORMANCE EVALUATION METHODOLOGY	24
PRELIMINARY FRAMEWORK FOR TRANSIT PERFORMANCE EVALUATION IN THE STATE OF MICHIGAN	28
APPENDIX A: THE USE OF STANDARDS IN TRANSIT PERFORMANCE EVALUATION	
APPENDIX B: REFERENCES	

LIST OF EXHIBITS

FIGURE NUMBER	TITLE	PAGE
1	STRUCTURE FOR PERFORMANCE PLANNING AND ANALYSIS	7
2	PERFORMANCE INDICATORS FOR TRANSIT EVALUATION	9
3	INDICATORS OF TRANSIT EFFECTIVENESS USED BY U.S. AND CANADIAN TRANSIT SYSTEMS	11
4	PERFORMANCE INDICATORS STANDARDS AND DATA COLLECTION PROCEDURES FOR TRANSIT EVALUATION	12
5	REVIEW OF EVALUATION METHODS AND USE OF EVALUATION RESULTS	15
6	ELEMENTS OF A TRANSIT EVALUATION METHODO- LOGY	26
7	PRELIMINARY FRAMEWORK FOR PERFORMANCE EVALUATION IN THE STATE OF MICHIGAN	29

PHASE I FINDINGS: RESEARCH AND REPORT ON TRANSIT SYSTEM
EVALUATION METHODOLOGIES

This working paper documents Phase I of a four phase project ^{1/} being conducted to develop and test a performance evaluation methodology for mid-sized transit systems in the State of Michigan.^{2/} In this phase a review of the application and use of existing performance evaluation approaches was conducted to provide insights and direction for the remainder of the project. The review of transit system evaluation methodologies currently being used in the United States, and selected transit systems that have conducted or have been the subject of performance evaluations provides an illustration and summary of:

- . the reasons for transit performance evaluations;
- . the experience with transit performance evaluation;
- . the process for establishing a performance evaluation methodology; and
- . together, this information has been used to develop a preliminary framework for transit performance evaluation in Michigan.

WHY TRANSIT PERFORMANCE EVALUATIONS ARE CONDUCTED

Public involvement in the provision of transit services has increased dramatically since the early 1960's. Transit service, once operated exclusively by private enterprise, is now viewed as a public service which provides benefits to the community and therefore merits public support. The increased public role in the provision of transit service, however, has involved significant increases in public spending for transit capital and operating expenses and has been accompanied by an emerging concern for the

^{1/} The four phase are: (I) Research and Report on Transit System Evaluation Methodologies; (II) Develop an Evaluation Methodology; (III) Conduct a Pilot Performance Evaluation; and (IV) Prepare a Performance Evaluation Manual and Training Materials.

^{2/} Systems for which the performance evaluation approach is being developed include Grand Rapids, Flint, Saginaw, Kalamazoo, Ann Arbor, Lansing, and Jackson Michigan.

effectiveness and efficiency of transit service management and operation.

The interest in the effectiveness of transit operations reflects a concern about whether transit services are meeting the specific goals and objectives established through local, state, and federal policy. The question is often asked; is transit serving the needs and accomplishing the objectives it is intended to accomplish? The concern for efficiency reflects an interest in assuring the proper use of the resources consumed to provide transit services. Citizens and public officials demand the delivery of the maximum amount of service possible for the resources expended. This concern is particularly acute during the present environment of stress on funds which must be allocated among a variety important public services.

The Intent of Transit Evaluation

As a result of these concerns routine evaluations of transit performance are becoming more common. These evaluations are intended to:

- . provide information on how public funds are being spent for transit service;
- . determine whether transit services are being provided in an efficient and effective manner;
- . identify areas where transit services may be deficient; and
- . identify opportunities to improve transit service performance.

Independent of the type of methodology used to perform the evaluation, the frequency of the evaluation, or the specific use or audience for the evaluation results, transit performance evaluations are also being conducted to satisfy the growing need for public accountability within the transit industry.

Typical Uses of Evaluation Results

The results of transit system performance evaluations are being used in a variety of different ways throughout the United States. The Massachusetts

Bay Transportation Authority (MBTA) has, for example, developed a performance evaluation approach that focuses on the assessment of transit routes in order to identify those routes that should be modified or eliminated because of substandard performance. In Pennsylvania, transit evaluation results are used to provide input in important resource allocation decisions. The amount of state funds received by each transit property in Pennsylvania is determined, in part, by the results of a transit performance evaluation. Evaluation results are also used to improve internal management and the delivery of transit service.

Increasingly, the results of transit evaluations are being used to meet specific legislative requirements that transit systems be accountable to public and legislative bodies. California, for example, requires all transit systems to be evaluated triennially. Local Transportation Fund (LTF) revenues, provided by the California state sales tax to improve local transit, will be allocated only to transit systems that have transmitted reports on their performance beginning with the 1981-82 fiscal year.

The Michigan Situation

This project is concerned with the development and testing of a performance evaluation methodology for mid-sized transit systems in Michigan. It represents an important effort by the State of Michigan to increase the accountability of transit systems, and to promote increased efficiency and effectiveness of transit system management and operation.

Two important State legislative bills, both approved by the Governor of Michigan in October 1978, provide the impetus for the development and application of a transit system reporting and evaluation methodology in Michigan:

Public Act 444 - Two sections of this Act call for reporting and evaluation of public transit in Michigan. Section 10e(c)(vii) identifies information that must be submitted annually to the state department of transportation to evaluate and approve the annual transportation program. Section 10h(i)(b) specifies that reports documenting progress in approved programs using state funds must be submitted to the state transportation commission on forms authorized by the Federal Department of Transportation.

Public Act 468 (Section 3(1) and (2)) - specifies that each department of agency must prepare a report for the State Department of Management and Budget and the State legislature establishing key resource and performance data which will be used to demonstrate the efficiency and effectiveness of each program or project. In addition, if a program will not meet its performance commitments, the department must prepare a written report explaining why performance was below the anticipated level of productivity and why commitments cannot be met.

Public Acts 444 and 468 require that both the transit authorities and the state entities involved in transit program development and implementation report to the State legislature on the efficiency and effectiveness of transit systems and their ability to satisfy the goals and objectives established for transit service.

EXPERIENCE WITH TRANSIT PERFORMANCE EVALUATION

A review of current activity in the United States in the field of transit performance evaluation is provided in this section. The section begins by describing the basic elements of evaluation methodologies. The remainder of the section discusses the experience of transit properties that have conducted or have been the subject of performance evaluations. Comparisons are made between large and small transit systems and their current efforts to conduct performance evaluations.

Basic Elements of Evaluation Methodologies

A review of current transit performance evaluation activity reveals that while there is considerable variation among transit evaluation methodologies, each methodology includes the following basic elements:

- . identification or establishing of transit goals and objectives;
- . development of performance indicators and standards;
- . preparation of a data base; and
- . application of an evaluation approach with specific analysis techniques.

Each of these elements is briefly discussed below:

- . Goals are broad statements of intended results. A goal describes the basic purpose of providing a service or performing a functional activity of service delivery. For example a goal describing the basic purpose of providing transit service might be:

"to provide an effective alternative to the use of the private automobile"

Alternatively, an example of a goal for performing a functional activity of service delivery might be:

"to assure that the active vehicle fleet is routinely maintained"

A transit system may have a number of goals which relate to the basic purpose and functional activities of service delivery. Each goal should address the intended results and should serve as a suitable base for developing objectives.

- . Objectives describe the manner in which a transit operator intends to fulfill a stated goal. Objectives are more specific than goals, and should set forth an action to meet a goal. In keeping with the two examples provided above, objectives of transit service might be:

"To increase transit ridership" and "To maintain a schedule for vehicle maintenance based on vehicle use."

Objectives should be measureable; being measurable, they provide a means to monitor performance. There can be a number of objectives developed for any one goal. In developing objectives one must identify the key factors which have a bearing on achieving a goal.

- . Performance Indicators are quantifiable criteria or measures which permit the objective evaluation of performance. Following the examples presented for goals and objectives, pertinent performance measures might be:

"Passengers per capita;"

"Passengers per vehicle mile;"

"Vehicle washings per number of days operated;" and

"Vehicle tune-up per number of miles operated."

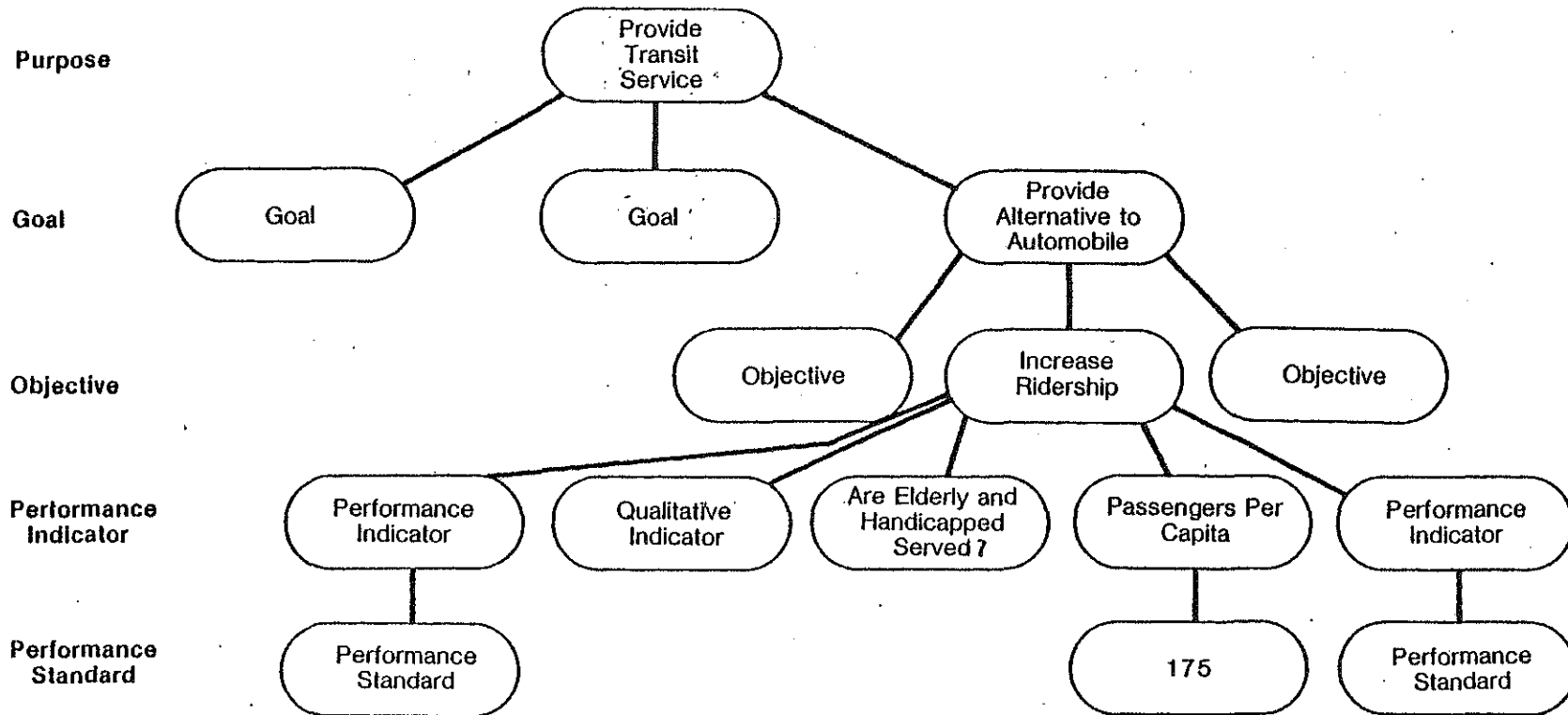
A number of performance measures may be needed to provide the necessary degree of management control over performance. It is important, however, to be selective in the development of performance indicators since the number of these indicators effects the magnitude of data gathering required. While the information gathered may be useful, the cost of gathering and analyzing data is an incentive to be selective in establishing performance indicators.

- . Performance Standards are the values assigned to each performance indicator representing the desired or acceptable level of performance. For example, the standard for "passengers per capita" might be set at "10 percent", for "passengers per vehicle-mile," at "3", for "vehicle washing," at "every four days of operation" and for "vehicle tune-up," at "every "10,000 miles." The assigned values must be based on factors relevant to each transit system. Performance standards will not necessarily be uniform for all systems in a region or state.

Exhibit 1 displays the hierarchical relation among goals, objectives, performance indicators and standards. As shown on this exhibit, performance indicators and standards are developed based on established goals and objectives. As conditions change or circumstances warrant, revisions may be necessary at any level of the hierarchy.

- . Data Base - Represents the information required to evaluate transit performance. The data base requirements are determined by the performance indicators. Without a consistent data base, one which (1) maintains a constant set of definitions, (2) is the result of routine data gathering, and (3) reflects systematic reporting, transit performance evaluation is not possible. Data must be gathered on the cost of providing transit, the revenue available to operate service, the operating characteristics, including level of service and fleet description, and vehicle utilization (ridership) to conduct a complete performance evaluation. In support of data base requirements, Section 15(a) of the Urban Mass Transportation Act of 1964, as amended, required that the Secretary of the U.S. Department of Transportation develop, test, and prescribe a public mass transportation reporting system and a uniform system of accounts and records. Eligibility for UMTA Section 5 capital and operating assistance will be contingent upon satisfaction of Section 15 reporting requirements after July 1, 1978. Among other things, this report system is designed to generate much of the information needed to monitor and evaluate transit performance.
- . Evaluation Approach and Analysis Techniques are used to systematically assess performance against goals and objectives using available data. Approaches vary among the methodologies currently in use. The type of evaluation approach and analysis techniques used to evaluate transit performance should be developed based on the desired level of detail

EXHIBIT I
STRUCTURE FOR PERFORMANCE PLANNING AND ANALYSIS



for the analysis, the intended use of analysis results, and the resources available to conduct the evaluation. The approach can rely on an assessment of performance by examining a set of performance indicators for a system over time, against established standards, in comparison with indicators for similar system peers, or against industry norms to identify apparent shortcomings in performance that merit further investigation. Evaluation of performance based on an assessment of these performance indicators is a first step in the process of identifying management and operation deficiencies and opportunities for modification and improvement.

The evaluation approach could also be based on investigative interviews intended to assess performance, identify problems, and suggest remedial action. Often preliminary interviews are conducted with key management to gain perspective and initial insights about the organization, service operations, and delivery. These interviews can be followed by more detailed interviews and analysis in areas which merit further investigation.

A comprehensive evaluation approach may include both an assessment based on the examination of performance indicators together with a series of investigative interviews.

Of the elements described above there is currently considerable interest in the development and use of performance indicators, performance standards, and uniform data bases. The interest in the development and use of data focuses largely on the Section 15 reporting requirements; transit systems are currently implementing Section 15 reporting consequently, much of the recent literature on transit evaluation discusses the potential use of the expected data from this system by local, state, and federal governments.

Interest in performance indicators has focused on which indicators are needed to conduct a meaningful evaluation of transit performance. To illustrate this focus Exhibit 2 displays a list of transit performance indicators which can be used to measure the efficiency, effectiveness and overall performance of transit service.^{1/} This list represents specific indicators and areas of evaluation often considered fundamental to performance evaluation.

^{1/} "Performance Indicators for Transit Management", Gordon J. Fielding, Roy E. Glauthier, and Charles Lave, Institute of Transportation Studies and School of Social Sciences University of California, Irvine, California. 1978.

EXHIBIT 2

PERFORMANCE INDICATORS FOR TRANSIT EVALUATION

EFFICIENCY:

As Measures of:

Revenue Vehicle Miles Per Employee
Total Vehicle Miles Per Employee
Revenue Vehicle Hours Per Employee

Labor Productivity

Revenue Vehicle Miles Per Vehicle
Total Vehicle Miles Per Vehicle
Revenue Vehicle Hours Per Vehicle

Vehicle Utilization

Operating Expense Per Seat Mile
Operating Expense Per Revenue Vehicle Mile
Operating Expense Per Total Vehicle Mile
Operating Expense Per Revenue Vehicle Hour

Expense Per Produced
Output Unit

Energy Consumption Per Revenue Vehicle Mile
Energy Consumption Per Total Vehicle Mile
Energy Consumption Per Revenue Vehicle Hour

Energy Efficiency

EFFECTIVENESS:

Percent Population Served
Revenue Passengers Per Service Area
Population
Total Passengers Per Vehicle
Revenue Passengers Per Revenue Vehicle Mile
Revenue Passengers Per Revenue Vehicle Hour

Accessibility

Utilization of Service

OVERALL:

Operating Expense Per Total Passenger
Operating Expense Per Revenue Passenger
Operating Expense Per Passenger Mile

Expense Per Consumed
Output Unit

Exhibit 3 illustrates the type of performance indicators currently being used to conduct transit systems evaluations in the United States and Canada. This Exhibit was developed from the results of a survey conducted under a grant from the Planning Research and Evaluation Division of UMTA. ^{2/} The survey focused on the evaluation of transit service effectiveness. This exhibit shows the current use of specific performance indicators to evaluate transit performance. The information is presented by system size, defined by the number of peak hour buses. Systems ranged from those with three buses to systems with over 1000 peak hour buses. The survey results are considered representative of bus systems in the United States which currently conduct self-evaluation and use performance indicators.

Several conclusions can be drawn from a brief review of Exhibit 3:

- . few transit systems use a comprehensive or complete set of indicators to evaluate the effectiveness of transit performance;
- . large transit systems currently make greater use of performance indicators to evaluate system effectiveness than do medium and small systems; and
- . schedule adherence, loading factor, headways, passengers per vehicle mile, and revenue/cost, are the most frequently used indicators to evaluate transit system effectiveness.

The results of the survey conducted by the Massachusetts Bay Transportation Authority (MBTA) and the Tidewater Transportation District Commission (TTDC) also reveal important findings about the transit performance standards the data collection procedures of transit properties. Exhibit 4 includes selected examples from the survey results of performance indicators, the types of standards that have been developed for these indicators, how data are collected, and

^{2/} A mail back survey was sent to 240 transit properties in the United States and Canada to gather information on transit evaluation programs. The Massachusetts Bay Transportation Authority (MBTA) and the Tidewater Transportation District Commission, (TTDC) Norfolk, Virginia conducted the survey and prepared a report currently in draft form.

EXHIBIT - 3

INDICATORS OF TRANSIT EFFECTIVENESS
USED BY U.S. AND CANADIAN TRANSIT SYSTEMS

CRITERIA	NUMBER OF PEAK HOUR BUSES					
	1 - 50	51 - 100	101 - 200	201 - 300	301 - 400	401 +
Accessibility			2	1		-
Accidents/Safety						2
Bus Route Spacing	3	1		1		5
Bus Stop Spacing	1		1	1		5
Complaints					1	5
Cost/Passenger Mile						1
Cost/Route/Day	1					
Headways	2	2	2	3		7
Loading Factor	1	3	5	2	1	12
Lost Runs						4
Miles/Trouble Call						2
Passengers/Vehicle Hour	1	1	4	1		7
Passengers/Vehicle Mile	5		4	1		6
Passenger Shelters			1	1		3
Passenger/Trip		1				1
Passenger/Vehicle				1		
Revenue Cost	6	2	2	1		4
Revenue/Hour	1			1		
Revenue/Mile			1			2
Revenue/Route/Day	1					
Revenue Hours/Total Hours				1		
Ridership Trend						2
Schedule Adherence	5	4	1	4	1	10
Service Improvement						1
Subsidy/Passenger	1					6
Telephone Information			1			
Transferring (Directness)	2	1	3	2		3
Travel Speed				2		1
Vehicle Age				1		
Vehicle Interior				1		
None	9	6	2			
TOTAL NUMBER OF RESPONDENTS	20	10	11	4	1	16

EXHIBIT 4

PERFORMANCE INDICATORS STANDARDS
AND DATA COLLECTION PROCEDURES
FOR TRANSIT EVALUATION

<u>PERFORMANCE INDICATOR</u>	<u>DESCRIPTION OF STANDARDS</u>	<u>HOW DATA ARE COLLECTED</u>	<u>HOW OFTEN DATA ARE COLLECTED</u>
Schedule Adherence	Based on time of day, headways, point along route Range: On time = ± 5 minutes 80-90% of trips should meet standard.	Peak load checks, onboard checks, traffic inspector reports, time cards at terminal points.	Range: Monthly to as needed.
Travel Speed	Based on route type.	Developed from accumulated statistics.	Range: Monthly to 1/year.
Accidents	Compared to previous year, accidents/mile.	Developed from accumulated statistics.	Monthly
Complaints	Compared to previous year, deviation from system average, complaints/operators, maintenance complaints/month.	Customer complaints, system checks.	Range: Monthly to as needed.
Miles/Trouble Call	10,000 miles/call 2,500 miles/call/month	Developed from accumulated statistics.	Monthly
Lost Runs	99.9% of runs must be completed. 5 runs lost/month, zero desired	Developed from accumulated statistics.	Range: Daily to irregularly.

the current frequency of data collection by transit systems. Appendix A presents a detailed reporting of these survey results with a more extensive listing of indicators and a more detailed review of the type of standards and data collection procedures that are currently being used.

Examination of the performance standards included in Appendix A reveals that standards can be set in various ways for each performance indicator. Some transit systems have developed more complex standards which are applied based on the population, income, and density of a specific section of the transit service area, while other transit systems use standards that are more simple and are uniformly applied throughout the transit area.

Review of the data gathering practices reported in Appendix A indicates that there is considerable variation among transit properties in the frequency of data reporting. It is expected, however, that implementation of Section 15 reporting requirements will result in more uniform data collection and reporting practices.

Transit Services That Have Conducted Evaluations

The survey conducted by the MBTA and TTDC discussed above describes some important differences between the current evaluation practices of small and medium sized transit properties (operating under 400 buses) as compared to large transit properties (operating over 400 buses). Some of the major differences are that small and medium sized systems often do not:

- . use a wide range of explicit service evaluation indicators.

One-third of the 48 survey respondents do not use any explicit (formal) evaluation criteria;

- . (typically) conduct comprehensive service evaluation;

- . feel that they have sufficient management, planning, or administrative staffs with capability and time to conduct comprehensive evaluations of transit service;
- . prepare extensive written reports or other documentation of data.

The remainder of this section will highlight some of the evaluation practices of both small and large transit systems in the United States. Although evaluations are currently conducted more frequently and in greater depth by large transit systems, the discussion has considerable relevance for small and medium sized systems.

Exhibit 5 provides an overview of the evaluation methods currently used by transit systems in their on-going self-evaluations and in evaluations conducted through independent management and performance reviews. The exhibit also illustrates the use of evaluation results.

Traditionally, transit system evaluations have served as a mechanism to assist in the development and planning of transit operations. Many transit systems have adopted standards for service effectiveness based on those prepared in 1958 by the National Committee on Urban Transportation. Using these standards, transit systems have typically collected and analyzed data on:

- . the level of transit service provided, including route spacing, stop spacing, headways, and route, vehicle, and seat miles of service; and
- . vehicle utilization and performance, including peak and non-peak hour ridership, load factors, transferring, schedule adherence, and vehicle speed.

Based on the evaluation of service levels, utilization, and performance, decisions are made to expand, reduce, or modify service on a route by route basis.

EXHIBIT 5

REVIEW OF EVALUATION METHODS
AND USE OF EVALUATION RESULTS

<u>TRANSIT SYSTEM EVALUATED</u>	<u>OVERVIEW OF THE EVALUATION METHODOLOGY</u>	<u>USE OF EVALUATION RESULTS</u>		
		<u>System Effectiveness: Assist in Transit System Development and Planning</u>	<u>Service Efficiency: Monitor Performance and Diagnose Problems</u>	<u>Allocate Resources to Promote Efficiency and Effectiveness</u>
<u>Bucks County, Pennsylvania</u>	Uses the set of performance standards adapted from the National Committee on urban transportation in 1958. Threshold levels are identified to determine the level of service provided to specific trip generators based on density. Criteria for new services and service expansion are included. These service standards are used for ongoing self-evaluation.	X		
<u>Capital District Transportation Authority-Albany</u>	An evaluation method was developed to assess the overall operating efficiency of the CDTA including the efficiency of each of the functional areas. The initial evaluation results were used as a diagnostic tool to identify areas with excessive cost or other deficiencies. Performance of CDTA was compared over time and with other transit systems using performance indicators. Detailed investigations followed to quantify weakness and identify improvement strategies. The evaluation was performed through an independent management review.		X	
<u>CTA-Chicago, Illinois</u>	Interviews with management and examination of data and information in several functional areas were used to identify opportunities for cost savings and management improvements. These opportunities were then examined in depth to determine the validity of preliminary findings and estimate the extent of possible cost savings.	X	X	

15

EXHIBIT 5 (continued)

<u>TRANSIT SYSTEM EVALUATED</u>	<u>OVERVIEW OF THE EVALUATION METHODOLOGY</u>	<u>System Effectiveness</u>	<u>Service Efficiency</u>	<u>Resource Allocation</u>
<u>Dade County</u>	<p>Uses a set of performance standards adapted from the National Committee on Urban Transportation. The method focuses on service effectiveness. The standards are used for on-going self-evaluation.</p>	X		
<u>Fort Worth-CITRAN</u>	<p>Uses a set of performance standards adapted from the National Committee on Urban Transportation as the basis of service planning. In addition, indicators are used to monitor and evaluate system performance, fleet performance, maintenance activity and system personnel. Performance data are used to develop trends and diagnose problems. Standards have not been formally established and will probably not be until management has accumulated historical data to assess performance, understand causal relationships and establish standards that can be achieved through management action. The method is used for ongoing self-evaluation.</p>	X	X	
<u>Jacksonville Transportation Authority</u>	<p>This methodology focuses on the review of new services. Transit services are extended to a new area in response to residents' requests. Population density, accessibility, street conditions, demographics and trip generators are assessed. Service costs are compared to estimated revenue based on ridership estimates. New routes have one year to become established. After 10 months passengers per mile and cost/revenue are assessed. Trends must indicate achievement of system minimum</p>	X		

EXHIBIT 5 (continued)

<u>TRANSIT SYSTEM EVALUATED</u>	<u>OVERVIEW OF THE EVALUATION METHODOLOGY</u>	<u>System Effectiveness</u>	<u>Service Efficiency</u>	<u>Resource Allocation</u>
<u>MBTA-Massachusetts Bay Transportation Authority (Boston)</u>	<p>performance or the route is cancelled after 12 months. The method is used for ongoing self-evaluation.</p> <p>A service policy for surface public transportation has been established based on selected indicators of transit efficiency and effectiveness. MBTA provides transit service to 79 cities and towns. Although the jurisdictions subsidize service the MBTA is responsible for determining which routes operate and therefore receive funds. Routes that perform below established standards are analyzed by the MBTA and representatives from communities. The analyses identify services that "drain" MBTA resources without sufficient off-setting benefits. Standards for new routes and service extensions are also used. The method is for ongoing self-evaluation.</p>	X		X
<u>Metro Transit- Seattle</u>	<p>Passenger performance standards have been established to determine whether transit routes are (effective) serving the community in the most efficient manner. Standards based on ridership (passengers per trip and bus hour) under different operating conditions (headways, time of day, population density) were developed. Service levels are increased or reduced in accord with performance in relation to standards. New route standards which allow for increasing ridership also exist. The method is for ongoing self-evaluation.</p>	X		X

EXHIBIT 5 (continued)

18

<u>TRANSIT SYSTEM EVALUATED</u>	<u>OVERVIEW OF THE EVALUATION METHODOLOGY</u>	<u>System Effectiveness</u>	<u>Service Efficiency</u>	<u>Resource Allocation</u>
<u>Metro-Washington, D.C.</u>	<p>Performance measures are used to evaluate overall efficiency and effectiveness of management and operations. Actual performance is compared to performance objectives established annually. Monitoring performance through the use of indicators is intended to serve as an early warning system. Assessments are made to identify deficiencies and rectify problems. Performance indicators are also used in the budgeting process. Operating departments must demonstrate the effect on performance that will result from a reduction in budget. The method is for ongoing self-evaluation.</p>	X	X	X
<p><u>MTC-Metropolitan Transportation Commission San Francisco Bay Area</u></p> <p>A.C. Transit BART Golden Gate Muni Sam Trans Santa Clara</p>	<p>Performance audits of transit systems performed by an independent evaluator or auditor have been instituted. The intent of evaluation is to:</p> <ul style="list-style-type: none"> . determine whether goals have been established and the degree to which goals and objectives are being accomplished, in terms of measurable results and informed judgements; . judge the validity of current assessments of performance; and . determine whether services are operating in the most efficient manner. 	X	X	X

EXHIBIT 5 (continued)

<u>TRANSIT SYSTEM EVALUATED</u>	<u>OVERVIEW OF THE EVALUATION METHODOLOGY</u>	<u>System Effectiveness</u>	<u>Service Efficiency</u>	<u>Resource Allocation</u>
<u>Montgomery Area Transit System (Alabama)</u>	<p>Evaluation is performed by assessing performance over time and against the objectives set by the transit operators using performance indicators. In depth analysis are also conducted using investigative interviews documented in a guide which addresses overall performance and performance in each functional area of a transit system.</p> <p>Currently transit systems must be evaluated to be eligible for state operating assistance. Ultimately evaluation results may effect the relative allocation of funds among systems in the San Francisco Bay Area.</p> <p>Data is collected monthly by the transit system and evaluated Quarterly by the Montgomery Department of Planning and Development. System-wide and route specific information on revenue, cost, and ridership is evaluated. Standards for (1) revenue/hour, (2) passengers/mile, (3) subsidy/passenger and (4) net cost/hour are used to evaluate service and make service modifications. This method is used for onlging self-evaluation.</p>	X		
<u>Nashville</u>	<p>The criteria passengers per vehicle hour is used as follows to evaluate transit performance:</p> <ul style="list-style-type: none"> . <u>Continue Route</u>-if route ridership per hour exceeds 90% of the system average. . <u>Review Route</u> if ridership per hour falls between 70% and 80% of the system average. 	X		

EXHIBIT 5 (continued)

TRANSIT SYSTEM EVALUATED

OVERVIEW OF THE EVALUATION METHODOLOGY

System Effectiveness

Service Efficiency

Resource Allocation

- . Recommend Improvements or Discontinuation if route ridership falls between 60% and 70% of system average.
- . Continue Service at 6 Month Intervals or Discontinue if route ridership falls below 60% of system average.

This method is used for ongoing self-evaluation.

A state wide evaluation methodology was developed which includes both operating and financial guidelines. Assessment includes both a service and financial perspective. Major deviations from performance standards set by the State are used by PennDOT (1) as diagnostic measures, (2) to negotiate for improved performance and adjusted service levels, and (3) to allocate subsidies.

PennDOT financial guidelines are aggregate cost models by mode and major functional area of the transit property. They are used to evaluate the expected level of expense based on the level of service provided. The financial guidelines can also be used to assist PennDOT in allocation decisions for subsidy funding.

This evaluation method is to be used annually by the State.

X

X

X

PennDOT -(for evaluation of all transit systems in Pennsylvania)

EXHIBIT 5 (continued)

TRANSIT SYSTEM EVALUATED

San Diego Transit Corporation

OVERVIEW OF THE EVALUATION METHODOLOGY

Two methods are used to evaluate performance of this transit system. The one method is similar to that used for the MTC transit properties, described above. This method evaluates overall performance in each functional area using investigative interviews and detailed analysis. A guide is used by the evaluator to evaluate the efficiency and effectiveness of performance. This method has been used by an independent evaluator conducting a comprehensive performance and management review.

The second method is a simplified diagnostic aid for transit system system analysis. Each route is evaluated by comparing its performance with that of other routes and with its own performance over time. A positive score means the route is performing at or above standard; a negative score indicates poor performance. Improvement efforts focus on routes with negative scores. Routinely gathered data on ridership, operating characteristics, costs, and revenues are used in the evaluation which includes nine performance indicators. This method is used for ongoing self-evaluation.

System Effectiveness

X

X

Service Efficiency

X

X

Resource Allocation

X

EXHIBIT 5 (continued)

TRANSIT SYSTEM EVALUATED

SEPTA- Pennsylvania

OVERVIEW OF THE EVALUATION METHODOLOGY

In 1976 a management study was conducted of SEPTA through an independent assessment. Interviews were held with key management. Activities were reviewed in each functional area. Peer comparisons were made of certain performance indicators. Specific recommendations were made in functional areas and for management practices. In addition overall recommendations were made regarding the need for:

- . policy guidelines;
- . a data collection and monitoring system;
- . performance standards and management objectives.

This evaluation was presumably a one time effort.

Tri-Met Portland
Oregon

This evaluation method focuses on new services. Four basic objectives described by quantified indicators and standards are used. The objectives relate to (1) convenience, (2) access (3) speed, and (4) cost. Cost is the most important objective. In addition new services must generally cover 30% of its costs through revenues. Analysis by a technical committee of the transit authority and community input and review are the final factors in implementing and expanding service. Service standards are also used to evaluate existing services. This method is used for ongoing self-evaluation.

System Effectiveness

X

Service Efficiency

X

Resource Allocation

X

Increasingly, however, transit evaluation methodologies have begun to incorporate and emphasize a concern for the efficiency of service delivery and management performance. Transit evaluations serve as an aid for assessing management performance and for diagnosing problems such as abnormal cost in relation to service. This emphasis on efficiency reflects the current concern for rising costs and scarce resources for public services discussed in the Introduction.

The evaluation of the Capital District Transportation Authority (CDTA), Albany, New York, ^{1/} emphasized the efficiency of transit operations. The evaluation methodology included investigative interviews and an analysis of performance indicators, assessing CDTA performance (1) in comparison to other systems of similar size, and (2) over a 6-year time period. The results of these analyses served as a diagnostic tool to identify potential deficiencies in operating performance where the cost of service delivery appeared excessive. The following areas were recommended for detailed study based on the results of the diagnostic analysis:

- . system schedule speed;
- . biddable tripper, extra list mix;
- . vehicle utilization; and
- . insurance costs.

Detailed investigations were subsequently conducted to identify the causes of apparent deficiencies in selected areas, quantify their magnitude, and recommend improvement strategies.

^{1/} This evaluation is currently being conducted by Peat, Marwick, Mitchell & Co. The report documenting evaluation results and recommendations will be available in April 1979.

A third use of evaluation results is to allocate resources. At least two of the evaluation methodologies described in Exhibit 5 were explicitly developed, at least in part, to allocate resources for transit based on both the efficiency and effectiveness of transit performance. PennDOT uses its evaluation results to allocate resources among competing transit systems, while the MBTA uses its evaluation results to allocate resources throughout the region among elements of the surface transit system competing for resources. PennDOT's operating guidelines include an incentive system in which improvement in performance is reinforced by increased allocations.

The MTC evaluation was not explicitly developed as a tool for the allocation of resources among transit properties in the San Francisco Bay Area. Rather, the methodology emphasizes system effectiveness and the efficiency of performance. In the future, however, allocation of resources among MTC transit properties may become contingent on their having been responsive to improvement opportunities identified during performance evaluations.

THE PROCESS FOR DEVELOPING PERFORMANCE EVALUATION METHODOLOGY

Before a transit performance evaluation methodology is developed, the following issues must be addressed:

Audience - For whom is transit performance being evaluated:

Who will use the evaluation results?

Purpose - Why are transit performance evaluations being conducted: How will the evaluation results be used?

Level of Detail - How extensive should the evaluation be?

Will the evaluation address overall system performance, route specific performance, or analysis of each of the functions and activities performed by the transit property.

Frequency of Evaluation - How often will an evaluation be conducted? How often must data be gathered, reported, and analyzed?

Resource Availability - What is the appropriate level of resources to be used for conducting transit performance evaluations?

Exhibit 6 illustrates the relation among the first four concerns listed above. The audience or user group is an important consideration in the development of a performance evaluation methodology. This will influence the purpose of the evaluation, the level of detail involved, and potentially the frequency of evaluation. The two primary audiences for transit performance evaluation are: (1) external organizations and interests; and (2) internal management. External interests include the general public, state and local public officials, state and local funding agencies, and administrative agencies including departments of transportation, management and budget, and planning.

Although the use of evaluation results varies among the different external audiences, the general purposes of conducting performance evaluations for external reporting are typically to assure accountability, diagnose problems, enable a comparison of performance relative to the goals established by the Government for meeting community transportation needs, and allocate resources. Transit evaluation can also serve the important role of educating the general public and public officials about the cost implications of meeting level of service improvements.

As illustrated in Exhibit 6, in most instances, a systemwide evaluation is appropriate for external reporting. When specific problems are diagnosed it is often appropriate to evaluate transit performance in greater detail, considering route and functional performance, including (1) transportation

EXHIBIT 6
ELEMENTS OF A TRANSIT EVALUATION METHODOLOGY

	AUDIENCE	PURPOSE	LEVEL OF DETAIL				FREQUENCY OF EVALUATION						
			System Wide	Route	Function	Activity	Annual	Biannual	Quarterly	Monthly	Weekly	Daily	
EXTERNAL AUDIENCE	General Public	<ul style="list-style-type: none"> Accountability/Information Clarify performance expectations in relation to objectives 	X										<p>Frequency of evaluation will be determined by policy decisions which consider:</p> <ul style="list-style-type: none"> the needs of the audience the purpose for the evaluation and use of evaluation results; and the resources available to finance the evaluations. <p>Evaluations should be conducted more frequently for internal management than for external reporting purposes.</p>
	Public Officials	<ul style="list-style-type: none"> Accountability/Information Assess management and diagnose problems Clarify performance expectations in relation to objectives Resource allocation 	X		X								
	Funding Agencies	<ul style="list-style-type: none"> Accountability/Information Transit development and improvement Resource Allocation 	X		X								
	Administrative Agencies	<ul style="list-style-type: none"> Accountability/Information Transit development and improvement Assess management and diagnose problems Resource allocation Management control and monitoring 	X	X									
	Transit Management	<ul style="list-style-type: none"> Transit development and improvement Assess management and diagnose problems Management control and monitoring 	X	X	X								
INTERNAL AUDIENCE			X	X	X	X							
			X	X	X	X							

Frequency of evaluation will be determined by policy decisions which consider:

- the needs of the audience
- the purpose for the evaluation and use of evaluation results; and
- the resources available to finance the evaluations.

Evaluations should be conducted more frequently for internal management than for external reporting purposes.

operations, (2) vehicle maintenance, (3) general maintenance, (4) planning and marketing, and (5) general administration.^{1/}

Transit performance evaluations conducted for internal management should be more detailed and performed more frequently than those conducted for external audiences. Transit management is concerned with: (1) transit service development and improvement; (2) the assessment of management and diagnosis of problems; and (3) management control and monitoring.

Although transit performance evaluations conducted for use by internal management may begin with an overall assessment of systemwide efficiency and effectiveness, it is generally appropriate to follow this analysis with more detailed review of functional or route performance. When problems or opportunities for improvement are identified, analysis of specific activities may be necessary to quantify the magnitude of a problem and subsequently identify strategies to improve transit performance.

A critical factor that affects both the level of detail and frequency at which transit evaluation can be conducted is resource availability. To insure that evaluation efforts are not more ambitious than resources permit, it is important to consider resource constraints both:

1. during the development of the evaluation methodology; and
2. when deciding how frequently all or part of the evaluation methodology must be applied and results reported.

An evaluation methodology may be developed that includes elements with increasing levels of detail. The less detailed elements can be applied more frequently. Detailed evaluations could be conducted only when initial results warrant further analysis. Alternatively, more detailed analyses can be conducted at infrequent intervals, recognizing the importance of regular feedback and monitoring of transit services.

^{1/} Transit systems include these five basic functional areas, each of which includes numerous activities. The first three functional areas include those activities which directly affect the provision of transit service: transportation operations; revenue vehicle maintenance; and general maintenance. The last two functional areas address the support activities of the transit operator: planning and marketing and general administration.

PRELIMINARY FRAMEWORK FOR TRANSIT PERFORMANCE
EVALUATION IN THE STATE OF MICHIGAN

Based on a review of performance evaluation methodologies developed and applied in the United States, examination of the legislated mandate for performance evaluation in the State of Michigan and informal discussions with members of the Project Steering Committee, a preliminary framework for performance evaluation in the State of Michigan is set forth in Exhibit 7. Each of the characteristics shown in this exhibit are suggested by recently enacted state law and reflect insights from the evaluation methodologies currently being used in the transit industry today. They are briefly described below.

- . Audience. This evaluation methodology is being prepared by the Michigan Department of Transportation, in response to recently enacted Public Acts 444 and 468. Consequently, the audience for the evaluation results would include at a minimum various state interests, including the Departments of Transportation and Management and Budget and the State Legislature. In addition local communities and transit operators would also benefit from the results of the transit evaluation within their area. The results can provide diagnostic information for an early warning of potential performance deficiencies which merit further investigation.
- . Purpose. Sufficient information should be gathered and analyzed to permit an assessment of the accountability of transit systems and to promote efficient use of public funds for transit service.
- . Level of Detail. At a minimum the evaluation should assess the overall efficiency of the transit system as well as efficiency within basic functional areas.
- . Frequency of Evaluation. Evaluations should be conducted at least on an annual basis conjunction with the annual budget and review activities of the state. More frequent evaluations may be justified over-time based on (1) the results of previous evaluations, (2) the need to monitor service progress, and (3) the availability of funds.

The data gathering instruments for transit evaluations should be designed to minimize additional data requests. To the extent possible, for data gathering should take advantage of Section 15 reporting system required by federal and state law. Other information requirements may include those identified in Public

EXHIBIT 7

PRELIMINARY FRAMEWORK FOR
PERFORMANCE EVALUATION IN THE STATE OF MICHIGAN

Characteristics of the Evaluation Methodology

Audience(s)

Michigan Department of Transportation
Michigan Department of Management and Budget
Michigan State Legislature: Senate and House Appropriations
Committees fiscal agencies and at large
State Transportation Commission
Transit Operators
Local Communities

Purpose

Increase Transit's Public Accountability
Promote Transit Efficiency

Frequency

Annually

Issues to be Resolved

Resources to be Devoted to Performance Evaluation

Level of Detail

Acts 444 and 468 which request information on (1) projected capital improvements, (2) program performance commitments for the up-coming year including statements of anticipated productivity, and (3) as necessary, justification of why a program could not meet productivity or performance commitments of the previous year.

Among the issues to be resolved for the development of an evaluation methodology for mid-sized transit systems in Michigan are the amount of resources to be devoted to the performance evaluation and level of detail of the evaluation. As discussed in this report, the detail at which an evaluation can be conducted is directly influenced by the amount of funds available for conducting and reporting on the evaluation.

APPENDIX A
THE USE OF STANDARDS IN
TRANSIT PERFORMANCE
EVALUATION

APPENDIX A

<p><u>EVALUATION CRITERIA</u></p>	<p><u>STANDARD</u></p>	<p><u>DATA COLLECTION</u></p>															
<p>ACCIDENTS</p>	<ul style="list-style-type: none"> . 64 accidents per million miles . Comparison with previous year's rate of traffic and passenger accidents per 100,000 miles. 	<ul style="list-style-type: none"> . Data Collected By: <ul style="list-style-type: none"> . Training and Safety Specialists . Maintenance and Management Analysts . Frequency of Data Collection: <ul style="list-style-type: none"> . Monthly 															
<p>BUS ROUTE SPACING</p>	<ul style="list-style-type: none"> . Within approximately one-half mile walking distance, except in remote areas. . <table border="0" style="display: inline-table; vertical-align: top;"> <tr> <td style="padding-right: 20px;"><u>Pop. Density</u></td> <td style="padding-right: 20px;"><u>Route Spacing</u></td> <td><u>Walking Distance</u></td> </tr> <tr> <td>Urban Area</td> <td>1/2 mile</td> <td>1/4 mile</td> </tr> <tr> <td>3600 persons per sq mile</td> <td>(6-8 blocks)</td> <td>(3-4 blocks)</td> </tr> </table> . <table border="0" style="display: inline-table; vertical-align: top;"> <tr> <td style="padding-right: 20px;">Suburban</td> <td style="padding-right: 20px;">1 mile</td> <td>1/2 mile</td> </tr> <tr> <td>1800-366 persons per sq. mile</td> <td>(12-14 blocks)</td> <td>(6-7 blocks)</td> </tr> </table> . Five minute walk to bus stop . Categorized by number of passengers walking less than one block, two blocks or three blocks from bus . 70% of population in the service area should be within 1/4 mile of an existing route. 	<u>Pop. Density</u>	<u>Route Spacing</u>	<u>Walking Distance</u>	Urban Area	1/2 mile	1/4 mile	3600 persons per sq mile	(6-8 blocks)	(3-4 blocks)	Suburban	1 mile	1/2 mile	1800-366 persons per sq. mile	(12-14 blocks)	(6-7 blocks)	<ul style="list-style-type: none"> . Data Collected By: <ul style="list-style-type: none"> . Transit Planning Department . Scheduling Department . Frequency of Data Collection: <ul style="list-style-type: none"> . Yearly . Every two or three years . As needed
<u>Pop. Density</u>	<u>Route Spacing</u>	<u>Walking Distance</u>															
Urban Area	1/2 mile	1/4 mile															
3600 persons per sq mile	(6-8 blocks)	(3-4 blocks)															
Suburban	1 mile	1/2 mile															
1800-366 persons per sq. mile	(12-14 blocks)	(6-7 blocks)															

A-1

EVALUATION
CRITERIA

STANDARD

DATA COLLECTION

BUS STOP SPACING

- . Residential Areas--max. 660 feet
Commercial Areas--max. 440 feet
- . Express (Freeway) - one mile or more
- Express (Arterial-Intersection
with other transit routes or
major traffic generator
Local - Every 600-1250 feet
- . 400-1500 feet and average 750 feet
CBD may be 400 feet or less
- . Every 500-1000 feet in residential
areas. Commercial and industrial
stops based on existing and pro-
jected density patterns.
- . Not less than 660 or greater than
2,000 feet.
- . In low density areas quantitative
standards are not used.

- . Data Collected By:
 - . Planning and Evaluation Department
 - . Traffic Superintendent
- . Frequency of Data Collection:
 - . As needed
 - . Rarely

COMPLAINTS

- . 1 Quartile deviation from system
average complaints per 100 revenue
hour for the quarter being evaluated
by type of complaint and route.
- . Comparison to previous year's rate by
category.
- . Driver complaints at 2.5 per driver per
year. Vehicle and shelter complaints
18 per month.
- . Informal

- . Data Collected By:
 - . Customer Service Department
 - . Department of Community Affairs
 - . Transportation and Marketing Departments
 - . Schedule Department
 - . Information Operator/Management Analyst
- . Frequency of Data Collection:
 - . Daily and comiled every three or four weeks
 - . Monthly
 - . As needed

EVALUATION
CRITERIA

STANDARDS

DATA COLLECTION

EXCLUSIVE BUS LANE

- . Transit volume on exclusive lane should equal and in the future exceed the maximum number of passengers that can be carried by private automobiles operating in the same lane
- . 40-50 buses per lane hour on freeways
25-30 buses per lane hour on arterials

- Data Collected By:
- . Planning Section
- Frequency of Data Collection:
- . Rarely
 - . When routes proposed

HEADWAYS

- . Minimum 60 minutes (if demand does not warrant 60 minute headway service should be examined, modified or terminated.)
 - . Headways set to maintain the following load standards
 - . Early AM - 100%
 - . Peak (average peak hour - 125%)
 - . Peak (peak 15 minutes - 150%)
 - . Week Day (off peak) - 100%
- If this results in excessive headways use 50% load or 60 minute maximum

- Data Collected By:
- . Operations and Service Planning
 - . Director of Service Development
 - . Evaluation Division
 - . Transit Planner and Scheduler
 - . Schedule Department
- Frequency of Data Collection:
- . Daily basis rotating throughout system
 - . Monthly
 - . Five times a year
 - . Three times a year
 - . As needed
 - . Rarely

	Local	Cross Town
. Type of Service	Express Feeder	Collector Distributor
Weekday Peak	15 minutes	15 minutes
Weekday Base	30	30
Saturday	30	20
Sunday	60	30
Evenings	60	30
Owl	60	60

- . Peak and Midday - 30 minutes; Evening - 60 minutes

EVALUATION
CRITERIA

HEADWAYS (continued)

STANDARDS

- . Peak 15 minutes; off peak 30 minutes or passengers per vehicle must not exceed 75.
- . Peak - 15 minutes, Off Peak - 30 minutes, Late Evening 60 minutes
- . Peak 20 minutes, Off Peak 30 minutes

	<u>Weekdays</u>	
	<u>Peak</u>	<u>Off Peak</u>
Urban Trunk Lines	30 minutes	40 minutes
Suburban Trunk Lines	40	60

- . Maximum Headway set by time for one round trip.
- . Ten or more dwelling units/acre

<u>Median Household Income</u>	<u>Peak</u>	<u>Base</u>	<u>Evening</u>
\$5,000(-)	10 minutes	20	30
\$5,000-\$10,000	10	20	60
\$10,001-\$15,000	30	60	90
\$15,000(+)	30	40	90
. Six to Ten dwelling units/acre			
\$10,000-\$15,000	30	40	90
\$15,000(+)	30	60	90
. Two to Six dwelling units/acre			
\$5,000(-)	20	30	60
\$5,001-\$10,000	30	40	90
\$10,001-\$15,000	30	60	90
\$15,001(+)	40	60	-

DATA COLLECTION

7-V

EVALUATION
CRITERIA

LOADING FACTOR

STANDARD

- . Passengers as a percent of seated capacity

<u>Route Type</u>	<u>Base</u>	<u>Peak</u>
Shuttle	175%	175%
Express	100	125
Arterial	600	150

- . Average Peak Load Factor 157-k84% and single largest run during am peak 167-222%
- . Maximum 55 passengers per vehicle providing no more than six standees for 20 minutes
- . 100% peak load factor for express service and 125% for arterial service
- . Average number of seats filled 5, no maximum
- . Average load factor minimum .30% and maximum .90%
- . Maximum loading standards

	<u>Express</u>	<u>Arterial</u>
Peak Hour	100%	100%
Non Peak	75	75
Night	75	75
Weekend	75	75

- . Peak 150% if over 150% headway reduced to bring load to 125%. If under 100% headway increased to bring load to 125%

DATA COLLECTION

Data Collected By:

- . Spare drivers and supervisors by boarding and alighting checks
- . Passenger counting program
- . On board survey
- . Operators report standees
- . Scheduling Department
- . Planning Department
- . Service Evaluator
- . Temporary employees
- . Radioed by drivers
- . Traffic checkers or inspectors
- . Traffic Division

Frequency of Data Collection:

- . Daily basis rotating throughout the system
- . Major routes every 10-15 days
- . minor routes 1-3 times year
- . Monthly
- . Quarterly
- . Three times a year
- . Annually
- . When standees present
- . Minimum once every five years, prefer annually on major routes
- . Once every 14 months
- . As needed
- . Two weekdays one Saturday and one Sunday each year

EVALUATION
CRITERIA

STANDARD

DATA COLLECTION

LOADING FACTOR
(continued)

- . Feeder, Crosstown, Inter-town
 - Peak 30 minutes 140%
 - Total peak 120
 - Midday 100
 - Evening 100
- Intra-community
 - Peak 30 minutes 120%
 - Total peak 110
 - Midday 100
 - Evening 100
- Linehaul-Service Scheduled to yield average loads less than 100% to allow excess capacity for ridership growth.
- . No more than 20 standees/bus. No passenger should have to stand more than 20 minutes
- . Peak period-passenger loads not to exceed 135% of bus capacity 60% of the time -- no standees for more than 20 minutes. Off peak -- No Standees.

COST RUNS

- . 99.9% of all scheduled trips must be completed.
- . No more than 5 runs per month lost due to mechanical reasons. (Standard Based on time series data.)

- Data Collected By:
- . Operations planning
 - . Maintenance and management analysts
- Frequency of Data Collection:
- . Collected daily compiled quarterly
 - . Collected daily compiled monthly

MILES/TROUBLE CALL

- . 10,000 revenue miles/trouble call
- . 2,500 miles/trouble call (developed from time series data)

- Data Collected By:
- . Operations Planning
 - . Maintenance and Management Analysts
- Frequency of Data Collection:
- . Monthly

EVALUATION
CRITERIA

PASSENGERS PER VEHICLE HOUR

STANDARD

- . Planning Guidelines:
 - Service increase - greater than 40
 - Service continuation - 20-39.9
 - Service decrease - 10-19.9
 - Service elimination - less than 9.9
- . Continue Route -ridership exceeds 80% of system average
- Review Route - ridership falls between 70% and 80% of system average
- Improve or Discontinue - ridership falls between 60% to 70% of system average
- Continue in 6 month intervals or Discontinue ridership falls below 60% of system average
- . Minimum passengers per hour for each route urban-33, suburban 20.
- . Regular routes 30/hr
 - Routes serving 75% transit dependent (no auto) 20/hr
 - Routes serving 15% elderly or handicapped 20/hr
- . Standards for new service
 - Weekday 22/hour
 - Saturday 15/hour
 - Sundays and Holidays 10/hour
- . Standards for peak and off peak are based on population density of a route's service area
- . Standards for peak and off peak are based on population density of a route's service area

DATA COLLECTION

Data Collected By:

- . Finance Department
- . Schedule Department
- . Planning and Marketing Departments
- . Transportation Planner and Accountant
- . Transportation Engineer
- . Accounting
- . Service Planning Department
- . Research and Planning Division
- . Route planner
- . Checkers collect on board data
- . Drivers recorded on a counter and record total passengers and transfers at the end of each day

Frequency of Data Collection:

- . Daily
- . Monthly
- . Five times per year
- . Four times per year
- . Three times per year
- . Every 16 months (average)
- . As needed

EVALUATION
CRITERIA

STANDARD

DATA COLLECTION

PASSENGERS PER VEHICLE HOUR
(continued)

Peak - 2,500 persons sq. mi 22/hour
13,000 persons sq. mi 63/hour
Midday - 2,500 persns/sq. mi. 12/hour
13,000 persons sq. mi 52/hour

PASSENGERS PER VEHICLE MILE

- . Acceptable - over 1.5
- Continue to Evaluate - 1.0 to 1.5
- Unacceptable - Less than 1.0

- . System Overall Average 2.6
- Acceptable per route 1.5 to 2.0
- To be reevaluated Below 1.5

- . Route range .3-6.1

- . Any route with less than 50% of the system average passengers per vehicle mile should be cut.

- . Minimum - 2.52, Goal 3.0

- . Comparison to previous year rate

- . 600(+) passengers/day - Good
- 500 or less passengers/day - below average
- 300 or less passengers/day - improve or reduce

- . 1.0 or more is acceptable

- . Less than .5 unacceptable

- . Regular Routes
- Peak- 2.5
- Offpeak- 1.5
- Routes serving 75% or more transit dependent (without auto) or 15% elderly or handicapped
- Peak- 2.5
- Offpeak- 1.0

Data Collected By:

- . Finance Officer
- . Planning Department
- . Spare drivers
- . Temporary employees
- . Drivers tally
- . Through registering fare box
- . On board checkers
- . On board surveys
- . Operations Supervisor
- . Planning Department
- . Schedule Department
- . Accounting Department
- . Service Planning
- . Research Officer
- . Planning and Marketing

Frequency of Data Collection:

- . Daily
- . Collected daily reported weekly
- . monthly
- . At least every two months
- . Three times a year
- . Two times a year
- . Annually
- . Average for all routes every 16 months
- . As needed

A-8

<u>EVALUATION CRITERIA</u>	<u>STANDARDS</u>	<u>DATA COLLECTION</u>
PASSENGERS PER VEHICLE MILE (continued)	<ul style="list-style-type: none"> . 1.5 minimum accepted for 1978 . Local service - 2.5 in peak 1.5 all day Express 250 passengers/bus hour 	
PASSENGER SHELTERS	<ul style="list-style-type: none"> . A valid location for a shelter must: <ul style="list-style-type: none"> . have sufficient lighting . not impede visibility . have a minimum of 100 boarding passengers from 6:30 a.m to 6:30p.m., . allow for proper snow clearance, . have the consent of the land owner . Sites are selected based on the following variables; <ul style="list-style-type: none"> . weather . patronage . frequency . geographic service area . space available . scope of site . overhead obstruction . isolation . impact on adjacent buildings . impact on neighborhood characteristics . importance to urban fabric and clarity of transit . Shelters will be provided if: <ul style="list-style-type: none"> . serves senior citizen complex and/or handicapped. . serves one or more major activity centers . serves a major transfer point, a point of major ridership or the loop or terminus of a route or . serves a route which has a large headway 	<p>Data Collected By:</p> <ul style="list-style-type: none"> . Planning Section . O-D Survey . available in house data . field inspections <p>Frequency of Data Collection</p> <ul style="list-style-type: none"> . Not regularly

A-9

EVALUATION
CRITERIA

REVENUE/COST

STANDARD

- . Regular Route 30%
- . Premium Route 50
- . School Route 10
- . Contract/Manifest 100
- . Industrial 50
- . Community Based 20
- . Routes serving 75% transit dependent (without auto.) or 15% elderly or handi-capped) half of above values
- . Over 50% acceptable 30-50% evaluate
- . Under 30% unacceptable
- . Actual vs. budgeted
- . System wide standard 30% routes under 20% evaluated
- . 50%
- . 47%
- . 45%
- . 25%
- . Evaluate the ratio of fare paid to trip length cost and performance
- . lowest 25% of existing routes are evaluated
- . minimum 50% of system average are evaluated.

DATA COLLECTION

Data Collected By:

- . Planning Department
- . Scheduling Department
- . Finance Department
- . Checkers
- . Operations and Planning
- . Treasury
- . Fare box checks/readings
- . Drivers record daily ridership on day cards
- . Staff accountant
- . Controller
- . Supervisor of Schedules
- . Director of Budget
- . On board survey

Frequency of Data Collection:

- . Collected daily reported monthly
- . Monthly
- . Quarterly
- . Three times a year
- . Semiannually
- . Annually
- . Every two to three years
- . On board surveys - once/year/route
- . Stationary counts - four/year/route
- . Revenue passengers/route - calculated quarterly
- . Revenue cost - calculated and analyzed annually
- . As required
- . Random

RIDERSHIP TREND

- . Deviations of 10% or more from the average system-wide ridership trend are evaluated.

Data Collected By:

- . Treasury/farebox revenue count
- . Operations Research
- . Transit Planning
- . Drivers

A-11

<p style="text-align: center;"><u>EVALUATION CRITERIA</u></p>	<p style="text-align: center;"><u>STANDARD</u></p>	<p style="text-align: center;"><u>DATA COLLECTION</u></p>										
<p>RIDERSHIP TREND (continued)</p>	<ul style="list-style-type: none"> . Deviations of 10% or more from the previous month's ridership for each route are evaluated. 	<p>Frequency of Data Collection:</p> <ul style="list-style-type: none"> . Collected daily analyzed semiannually . Monthly 										
<p>SCHEDULE ADHERENCE</p>	<ul style="list-style-type: none"> . 0 minutes early 3 minutes late . 0 minutes early 3 minutes late . 1 minute early 3 minutes late . 1 minute early 5 minutes late. . 1 minute early - 3 minutes late for 85% of peak trips and 95% of base period and late evening . 2 minutes early to 3 minutes late . 80% of peak trips should be 0-5 min late 90% of midday and Saturday trips should be 0-5 minutes late Night and Sunday 95% of trips should be 0-3 minutes late. . On time 0-5 minutes late <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Headway</th> <th>On Time</th> </tr> </thead> <tbody> <tr> <td>10 min</td> <td>75%</td> </tr> <tr> <td>10-30 min</td> <td>85%</td> </tr> <tr> <td>30-60 min</td> <td>95%</td> </tr> <tr> <td>Special</td> <td>95%</td> </tr> </tbody> </table> 	Headway	On Time	10 min	75%	10-30 min	85%	30-60 min	95%	Special	95%	<p>Data Collected By:</p> <ul style="list-style-type: none"> . Traffic checkers on board . Traffic checkers at stationary points . Street supervisors . Transit Planning . Marketing and Research . Service Evaluation . Schedules . Director of Research and Schedules . Transit Operations . Supervisor of Data Collection <p>Frequency of Data Collection:</p> <ul style="list-style-type: none"> . Daily rotating throughout the system . Three trips randomly every two days . Weekly with monthly summary by route . Bimonthly all routes . Monthly for all routes . Major routes every 10-15 days . Minor routes 1-3 times/year
Headway	On Time											
10 min	75%											
10-30 min	85%											
30-60 min	95%											
Special	95%											
<p>SERVICE IMPROVEMENTS</p>	<ul style="list-style-type: none"> . New routes should achieve 75% of system wide average passengers/mile or passengers/hour by end of 90 day trial period. Trial period may be extended after 90 days if ridership is increasing. . New all day service should be initiated only if 600 passengers/day can be expected 	<p>Data Collected By:</p> <ul style="list-style-type: none"> . Manager of Bus Scheduling . Operations/Service Planning . Treasury Department . Operations Research 										

A-12

<u>EVALUATION CRITERIA</u>	<u>STANDARD</u>	<u>DATA COLLECTION</u>
SERVICE IMPROVEMENTS (continued)	<ul style="list-style-type: none"> . New radial routes should be as direct as possible . New suburban and rural routes should be operated express for the greatest length feasible . New crosstown routes-should intersect the maximum number of radial routes and provide access to optimal number of major activity centers. . Factors used to rank neighborhoods for transit service improvement potential <ul style="list-style-type: none"> . median income . population/residential area . population . autos/person . % elderly and youth . # trips generated by zone . First priority - improve service on existing routes which meet productivity standards and require service improvement. Second priority - improve poor economically performing routes and implement new services. 	<p>Frequency of Data Collection:</p> <ul style="list-style-type: none"> . Service requests reviewed quarterly . Work Program updated annually
SUBSIDY/PASSENGER	<ul style="list-style-type: none"> . 80% subsidy/passenger maximum 1978 . \$.94 subsidy/passenger . \$1.25 subsidy/passenger average on any route . \$1.50 subsidy/passenger on individual runs on a route. 	<p>Data Collected By:</p> <ul style="list-style-type: none"> . Service and Operations Planning . Director of Routes and Schedules . Account/Management Analyst fare box count . Drivers daily record <p>Frequency of Data Collection:</p> <ul style="list-style-type: none"> . Ridership collected daily, costs are allocated semi annually. . Monthly . Quarterly by route, as needed by run

EVALUATION
CRITERIA

STANDARD

DATA COLLECTION

TRANSFERRING

- . 20% system wide rate or less is acceptable
- . Maximum 40% of total boarding passengers
- . If more than 30% of a route's riders require a specific route transfer new or through routes should be established or scheduled transfers should be created within a 5 minute maximum wait time.
- . Maximum 25% of passengers by route
- . No more than 25% of riders should require more than 1 transfer to complete a trip
- . Where 20% or more riders/hours transfer between routes, the 2 routes become candidates for linkage
- . Where a route extension of 1 mile or less would eliminate a transfer for 20% of the riders the extension should be implemented.

- Data Collected By:
- . Collecting transfer tickets
 - . Tabulating drivers records
 - . Drivers and Dispatchers
 - . Schedules
 - . Transportation Planner
 - . Service Planning and Operations Department
- Frequency Data Collection:
- . Daily
 - . Quarterly
 - . Annually

TRAVEL SPEED

- . average speed 11 mph maintain or improve
- . Local 15 mph
- Express on arterials 20-25 mph
- Express on Freeway 30-40 mph

- Data Collected By:
- . Planning division
 - . Schedules and actual run time
- Frequency of Data Collection:
- . Monthly
 - . Annually

A-13

APPENDIX B
PHASE I REFERENCES

APPENDIX B

PHASE I REFERENCES

REFERENCES IDENTIFIED IN THE FINAL STUDY DESIGN

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