City of Boulder
Transportation Metrics

Metric (mět'rĭk) – a standard of measurement

Spring 2008
Transportation Metrics -- Presentation Elements

- **TMP Context**
- **Quantitative Metrics**
  - Resident Diary & Employee Surveys
  - Vehicle Counts
  - Bicycle Counts
  - Transit Ridership
- **Performance Metrics**
  - Travel time study
  - Level of service
- **Synthesis**

Broadway Travel Time Survey

Optimal Travel Time = 10.95 Minutes
Transportation Master Plan – system monitoring

- Set the context of monitoring and progress reporting
- 1989 TMP -- lacked good information on travel behavior
  - Initiated efforts to fortify understanding → resident diary and employee survey
- 1996 TMP – built on base of new modal information
89-96 Modal Assumptions

Figure 3-3. Analysis: Mode Share Objectives

<table>
<thead>
<tr>
<th>% of Daily Person Trips</th>
<th>1989 TMP</th>
<th>Survey Data*</th>
<th>2020 Objective</th>
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<td></td>
<td>1989 estimate</td>
<td>2010 objective</td>
<td>1990 actual</td>
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<td>SOV</td>
<td>73</td>
<td>&lt;15=58</td>
<td>47</td>
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<td>1</td>
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<td>TOTAL</td>
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* based on resident diaries, employee surveys, traffic counts, regional origin & destination study and related sources

- Original TMP SOV Reduction: "shift 15% away from SOV" 15 + 73 = 21% reduction
- Actual Reduction '90-'94
  3 + 47 = 6% reduction
- Proposed Reduction by 2020
  19 + 44 = 43% reduction

- original TMP objective: shift 15% of daily SOV trips to other modes by 2010
- TMP update direction: no growth in long-term vehicle traffic (requires reducing single-occupant vehicle trips to 25% by 2020)
Metrics – Resident Diary and Employee Surveys

- Resident Diary and Employee Surveys
- Initiated to better understand Boulder travel behavior
- Started in 1990, alternate years
- Margin of error +/- 1% to 2%
- Useful to identify travel trends over time

### Table 1: Modal Shift of Work Commute Trips

<table>
<thead>
<tr>
<th>Year</th>
<th>Single-Occupancy Vehicle</th>
<th>Multiple-Occupancy Vehicle</th>
<th>Transit</th>
<th>School Bus</th>
<th>Bicycle</th>
<th>Foot</th>
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### Figure: Resident Valley Resident Diary Survey - Modal Shift of All Trips

- Modal Shift of All Trips: 1990 - 2005
- Linear (Multiple-Occupancy Vehicle): 0.0% to 50.0%
- Linear (Bicycle): 0.0% to 15.0%
- Linear (Single-Occupancy Vehicle): 0.0% to 30.0%
- Linear (Transit): 0.0% to 10.0%
- Linear (Foot): 0.0% to 5.0%

### Figure: Boulder Valley Employee Survey - Modal Shift of Work Commute Trips

- Modal Shift of Work Commute Trips: 1990 - 2005
- Linear (Multiple-Occupancy Vehicle): 0.0% to 50.0%
- Linear (Bicycle): 0.0% to 15.0%
- Linear (Single-Occupancy Vehicle): 0.0% to 30.0%
- Linear (Transit): 0.0% to 10.0%
- Linear (Foot): 0.0% to 5.0%
Boulder Valley Resident Dairy Survey
Modal Shift of All Trips

<table>
<thead>
<tr>
<th>Year</th>
<th>Single-Occupancy Vehicle</th>
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<th>Transit</th>
<th>School Bus</th>
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Metrics – Employee Survey
Modal Shift Commute Trips

Boulder Valley Employee Survey
Table 1: Modal Shift of Work Commute Trips

<table>
<thead>
<tr>
<th>Year</th>
<th>Single-Occupancy Vehicle</th>
<th>Multiple-Occupancy Vehicle</th>
<th>Foot</th>
<th>Bicycle</th>
<th>Transit</th>
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<td>2%</td>
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</table>
Metrics – Resident vs. Non-resident Commute Trips

Boulder Valley Employee Survey
Modal Split Boulder vs. Non-Boulder Residents for Work Trips
Metrics – Progress toward community modal shift goals
**Metrics – Resident & Employee Survey Observations**

- **Residents are using cars less for all trips**
  - SOV decreased 44% to 38%
  - Transit increased 1% to 4%
  - Bicycle increased 9% to 14%

- **Employees commuting are using cars less**
  - SOV decreased 73% to 69%
  - Transit increased 2% to 10%
  - Bike decrease in 2005 under review
Metrics – Resident & Employee Survey Observations

- Resident and non-resident commute travel behavior significantly different
  - Non-resident SOV – 80% vs. Resident SOV – 53%
  - Non-resident Transit – 6% vs. Resident Transit – 15%

- Making progress toward modal objectives
Metrics – Vehicle Counts

- Boulder Valley Program
  - Travel entering/exiting city
  - 18 stations
  - Data since 1993
- Arterial Program
  - Internal travel
  - 18 stations
  - Data since 1983
Metrics – Boulder Valley Travel Patterns

Boulder Valley Count Program 2007 Quadrant Travel Patterns

- North (Lyons): 12,094
- West (Foothills): 22,028
- South (Golden, Jefferson County): 21,486
- East (Lafayette, north Louisville, Erie): 58,126
- Northeast (Longmont, Niwot, Weld): 72,228
- Southeast (south Louisville, Broomfield, Superior, Denver - Metro): 88,511
Metrics – Boulder Valley Travel Trends

- 275,000 vehicles daily enter/exit the city in 2007
- Every street morning inbound – evening outbound bias
- 2% Annual increase
- 25% more travel than 1994 levels
Metrics – Boulder Valley
Travel – Accumulation Curve

Traffic Entering and Exiting Boulder Valley 2007

- Hourly Vehicle Volume (vph)
- Time period

07 Differential Accumulation
07 Outbound
07 Inbound
Metrics – Arterial Travel Trends

- 1% annual increase
- ½ growth rate in Boulder Valley travel (2%)
- ¼ growth rate in regional travel (4%)
- 2001 peak traffic year
- 7% more travel than 1994 levels
Metrics – Arterial Travel Trends

Five-Year Trend Analysis
Arterial and Boulder Valley Count Program Comparison

- Arterial Program Growth Rate -- 1.11% APR
- Boulder Valley Growth Rate -- 1.87% APR
Metrics – Bicycle Counts

- Analysis and understanding in infancy
- 12 multiuse path count stations
- Data since 1998
- Bike travel characteristics different from vehicles
Metrics – Bike Counts

- Tuesday peak day for bike travel
- Jul./Aug. peak months
- Dec./Feb. low months
- Bike use <---> daytime temperature correlated
- Boulder Creek Station bike use down slightly over last 5 years
Metrics – Transit Ridership

- **Ridership Counts**
  - Monthly cumulative totals by service type 1981-Present
  - Average daily riders by route 1997-Present

- **Ride Checks**
  - Detailed rider surveys performed periodically on specific routes as requested.
  - Boardings and alightings per route according to time and location
Metrics – Transit Ridership

RTD Local Services: Yearly Boardings
Denver Metro, Boulder, Longmont
Average Daily Boardings 1981 - 2007

Year

Boardings

1981 - 2007

Regional
Local
Metrics – Transit Ridership
Boulder: Local and Regional Services
Average Daily Boardings per Month: 1997 – Present

Average Boardings Per Day 1997-2007

Boardings

January February March April May June July August September October November December Year Avg.

Month

### Metrics – Travel time study

**How long is forever?**

- **Travel time study initiated** 1986
- **Five corridors**
  - Three north-south → 28th, Broadway, Foothills
  - Two east-west → Valmont/Edgewood, Arapahoe
- **Citizen perspective** → It takes forever to get across town . . .
- **The reality is** 10 to 15 minutes
Metrics – Travel time
Arapahoe Ave. (9th to 55th)

Arapahoe Avenue Travel Time Survey
(9th Street to 55th Street)

Optimal Travel Time = 5.19 Minutes
**Metrics – Travel Time**

**Balsam/Valmont (9th to 55th)**

**Edgewood/Valmont Travel Time Survey** (9th to 55th)

- Mean Travel Time (minutes): 10.38
- 9.87
- 9.60
- 10.23
- 10.27
- 10.00
- 9.83
- 8.95
- 8.20
- 10.22


**Average Daily Traffic Volume (vpd)**

- Optimal Travel Time = 6.24 Minutes

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**Bar Graph**

- Mean Total Trip Time
- Composite Corridor Traffic Volume
- Linear (Composite Corridor Traffic Volume)
28th Street Travel Time Survey (Table Mesa Drive to Kalmia Avenue)

Mean Travel Time (minutes)

Optimal Travel Time = 5.99 Minutes
**Metrics – Travel time**

**Broadway (Violet to Greenbriar)**

- **Mean Travel Time (minutes):**
  - 13.93
  - 14.55
  - 14.78
  - 15.37
  - 15.10
  - 15.15
  - 18.33
  - 17.82
  - 15.02
  - 15.32

- **Year:**
  - 1986
  - 1988
  - 1990
  - 1992
  - 1994
  - 1996
  - 1998
  - 2000
  - 2002
  - 2004
  - 2006

**Optimal Travel Time = 10.95 Minutes**
Foothills Parkway Travel Time Survey
(S. Boulder Road to Diagonal Highway)

Mean Travel Time (minutes)

Optimal Travel Time = 4.70
Metrics – Travel Time
Corridor Comparison

How Long is Forever?

% of Optimal Travel Time

Year


Optimal Travel Time
Broadway
Edgewood/Valmont
28th Street
Arapahoe Avenue
Foothills Parkway
Metrics – City-wide Level of Service Analysis

- Peak hour traffic monitored at all traffic signals
- 131 signalized intersections
- TMP standard -- limit congestion to 1994 levels = 20 % of system
Metrics – City-wide Level of Service Analysis

Boulder’s Building Traffic Pattern

Sta No. 7008 - Canyon Blvd wo 23rd St
2007 Weekday ADT - 27,265 vpd
Metrics – Level of Service

AM Peak

Noon Peak
Metrics – Level of Service

PM Peak

Critical Peak
# Metrics – Level of Service

## Intersection Data

<table>
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<tr>
<th>Data Year</th>
<th>Total #</th>
<th># at LOS E or F in Any Peak Hour</th>
<th>% of Total</th>
<th># at LOS E or F in AM Peak Hour</th>
<th>% of Total</th>
<th># at LOS E or F in Noon Peak Hour</th>
<th>% of Total</th>
<th># at LOS E or F in PM Peak Hour</th>
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## Individual Movement Data

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Transportation Metrics – Synthesis

- Vehicle travel increasing, but at slower rate than the region (1% - 2% - 4%)
- Bicycle travel → need to better understand data and influences
- Transit travel experienced strong growth → 6%
Transportation Metrics – Synthesis

- Vehicle system performance maintained over last 20 years
- Performance maintained through more sophisticated timing strategies and strategic investments
- We need to develop performance monitoring for all modes