

# Monitoring and Evaluating Employer-Based Demand Management Programs

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With the growth of employer-based transportation demand management (TDM), employers and local governments need to monitor and evaluate program results. A model program for local governments to monitor the impacts of local TDM programs is suggested. The program is described by means of outlines of suggested reports and manuals; mock tables to illustrate exactly which data need to be collected; recommended wording and format for employee and manager survey questions; hypothetical findings and conclusions for recommended reports to illustrate how data should be presented and interpreted; suggested language for policy instruments involving developers in the TDM program monitoring effort; specific guidance for a transportation management association (TMA) in setting out a monitoring role in its by-laws (language suggested), contracting for survey and data processing services, and holding workshops (agenda and resources included); and recommended procedures and cautions for carrying out the evaluation of traffic generation at TDM and control sites, as well as example interpretations of results.

Employer-based transportation demand management (TDM) and transportation systems management (TSM) programs aim at reducing traffic congestion and associated problems, especially air pollution. Employers and developers undertake the programs in response to local government urging or requirements in ordinances, developer agreements, parking codes, or air quality regulations.

Although local governments usually track TDM and TSM programs through annual reporting of program activities and a survey of employees, there is much need to improve tracking and evaluation of local programs. At least, local governments need to know what employer programs are doing year by year and what program and policy changes are planned for subsequent years. When developers are required to play a role in local programs, they also should be part of the evaluation system. Local transportation management associations (TMAs) are another logical party in the evaluation, though they rarely play a strong evaluation role.

Aside from establishing roles for relevant parties, local governments face the methodological issue of what to measure and how to measure it. Sometimes local governments simply track mode share at employment sites with TSM and TDM programs. Without control sites, this measure may reveal little. In any case, mode share trends do not necessarily reveal effects on vehicle trips, trip lengths, time of trips, and other measures important to both congestion and air quality. Evaluations lacking on the subject of vehicle trip making will prevent government from encouraging appropriate TDM and TSM strategies. Such evaluations also will make it difficult

to justify either program continuation or termination, and leave the fate of TDM and TSM more to purely political considerations.

There are examples of good TDM and TSM program evaluations that should be useful to local governments. However, because the focus is on results rather than on methodology, the busy local planner or analyst is left to deduce details of the methodology or implementation particulars. Examples include the following:

- *HOV/TSM Evaluation Study, Second Year Findings*, Metro of Seattle, April, 1989. The study measures effects of employer-based programs over 3 years at a large number of study and control sites.

- *An Evaluation of Employer Ridesharing Programs in Southern California*, Erik Ferguson, Georgia Institute of Technology, presentation paper for the Transportation Research Board, July 1989. The study analyzes the effects of ridesharing programs at employment sites through regression analysis. Regression allows for assessment of the unique effects of each of several variables, including rideshare assistance, flextime, and vanpool assistance.

- *Non-Retail Commercial Office Trip Generation Study*, Parsons Brinckerhoff Quade and Douglas, Inc., for the City of Irvine, February 1988. The study assesses traffic generation at the Irvine Business Complex and sites external to the complex. Although not the main purpose of the study, it provides a method for comparing peak-period vehicle trip generation at sites with and without demand management.

- *Preliminary Evaluation of the Coastal Transportation Corridor Ordinance in Los Angeles*, Charles Blankson and Martin Wachs, University of California at Los Angeles, for the Transportation Research Board, December 1989. The study compares the effects of TDM programs at 44 firms with a control group of 117 firms, particularly comparing control and test employees relative to demographic characteristics. The study also provides statistical tests of differences in travel behavior between the two groups.

Other useful literature provides guidance on evaluating the effects of regional rideshare programs. This literature discusses the use of commuter surveys and controls, as well as issues of sampling, bias, and statistical significance. Although useful for local planners, the literature does not address the current context of TSM and TDM at employers, developers, and TMAs. Some examples that provide specific guidance on structuring evaluations include the following:

- *The Organization and Operation of Ridesharing Programs, A Manual of Current Information*, Marion Misch,

Joseph Margolin, George Washington University, and David Curry, Lawrence Glazer, Guillaume Shearin, Crain and Associates, for the NCHRP, March 1980.

- Carpool Program Evaluation, Volume II, Jarvia Shu and Lawrence Glazer, Commuter Transportation Services, Los Angeles, May 1979.

- Evaluation of Carpool Demonstration Projects, Frederick Wagner, for the FHWA, August, 1978.

An annual reporting system to track and evaluate TSM and TDM programs as carried out by employers, developers, and TMAs is suggested, based in part on work done under the support of the Santa Cruz County Regional Transportation Commission in July 1990. The system comprises five elements, each with important purposes in tracking TDM programs. Specifically, Element 1 suggests an annual report form for employers. It focuses both on employee responses to the program and on management perspectives. Element 2 outlines possible roles for a local TMA in implementing the monitoring program, including possible survey processing and help with reporting. Element 3 suggests roles for developers in monitoring, relevant conditions, and fees. Element 4 specifies a traffic monitoring system, comparing sites with and without TDM programs to gauge program effectiveness. Element 5 provides an annual report format and contents to inform local decision makers of overall program effectiveness.

## ELEMENT 1: ANNUAL REPORT, EMPLOYEE AND MANAGER SURVEYS

The first element of the monitoring program is an employer annual report. The report should be prepared annually by employers carrying out TDM programs. It would contain a brief summary of employer TDM activities for the past year and planned activities for the next year. It also would contain employee survey results. The purpose of the report is to enable local government and employers to know what TDM activities are ongoing and what results the employer perceives coming from the program. The report also should be available to the local TMA so it can track employer activities.

The employer annual report ought to be consistent across employers. To ensure consistency, the local government should develop a standard report form and survey for employers to use. The form and survey should be included in a single document or manual. The document might be called "Employer TDM Manual."

The manual should contain more than just the annual report form and survey. It should also inform and help companies in TDM. Figure 1 suggests an outline of the manual, which should provide background on the purposes of the TDM program, a summary of applicable regulations, a list of resource services and people, and suggestions for carrying out employee surveys in-house or through TMA or contract services.

- A. Jurisdiction TDM Program Highlights
  - TDM definitions and purposes
  - Legislation/requirements (e.g. TDM ordinance or air quality regulations, if in place)
  - Introduction to the Employer TDM Annual Report
- B. Resources
  - Jurisdiction staff
  - TMA personnel and program
  - Transit services and contacts
  - Ridematching services
  - Cycling routes and resources
  - Model employer program contacts
- C. Transportation Survey Procedures
  - Survey options: in-house or contract services
  - Getting an acceptable response rate (70 percent or valid random sample)
  - Model CEO letter/newsletter article supporting survey
  - Employee and manager survey
- D. TDM Annual Report
  - Name of company transportation coordinator
  - Main location and subsidiary sites
  - Company background (number of employees, job classifications, foreseeable expansions or changes in employee make-up bearing on TDM.)
  - Description of parking availability and utilization
  - Description of TDM measures to date and planned for next year
  - Summary of annual program results to date as indicated by survey
- E. Request Form
  - Check off list for information on TDM strategies, TMA, survey contractors, other company programs, ordinances, TDM conferences, literature.

**FIGURE 1** Outline of employer TDM manual.

A minimum 70 percent response rate should be set out as the goal for survey returns. An even higher response rate is preferred. Poor response rates may bias results. For example, employees interested in carpooling and transit probably are more likely to respond than those not interested. Thus, planners may conclude there is more interest in ridesharing among the population than would be the case with a higher response rate. Even if a good response rate is obtained, it is wise to pursue a sample of employees not responding to see in what ways, if any, they differ from respondents. The resulting information will provide a measure of confidence in survey results.

Random sampling is one possible way around the difficulty of obtaining survey results from a large population of employees. For large companies, a random sample can provide reliable results provided the survey sample is stratified to represent all departments and work shifts and the sample is truly random. However, a random survey should not be allowed at smaller firms because cross tabulations focusing on subsets of employees using small sample sizes will bring unreliable results.

Included in the manual ought to be a standard employee survey and manager survey. The manual should contain questions about mode of travel to work, home location, distance to work, interest in alternatives to solo driving, and other questions that are important to local agencies and air quality management districts. Also important to consider are questions about use of critical road facilities (congested streets, intersections, ramps), route-to-work, work hours, and interest in alternatives to solo driving. Because air quality regulations are developing in many localities, the survey also should allow calculation of not just mode shares but volume of trip making (by regular and occasional mode), trip length, and trip reduction. With information on trips, air quality planners can calculate vehicle-miles of travel, possible reductions, and implications for emissions. Figure 2 shows suggested questions for the key survey sections.

The manual also should include a short manager survey to assess management attitudes about TDM program development, transit and rideshare services, TMA functions, and company policy bearing on work hours, telecommuting, parking management, and other issues important for TDM program development. Figure 3 suggests questions for the manager survey.

Employers, TMA, and local government should share in the survey procedure. Employers should be responsible for survey distribution and collection. Employers should carry out the survey directly or through a survey research contractor (perhaps supported in part by the TMA). However, processing of survey results and development of summary tabulations should be centralized. Centralization would

- Reduce the analytic burden on smaller employers and the possibility of errors,
- Gain economies of scale possible in batch processing (especially with optical scanners), and
- Allow the local government to compile and review results across all employers to assess overall program effectiveness.

Probably the best way to centralize survey processing is for the survey forms to be processed and tabulated by a data

processing firm using optical scanners, presuming survey volumes justify use of scanners. The TMA could contract with the data processing firm for these services. Summary tabulations for all survey questions should be prepared for each employer. The TMA and locality staff should each review results and annually prepare summaries and interpretations of results for their decision makers and managers.

## ELEMENT 2: TMA SUPPORT

A local TMA could take several actions with respect to the TDM evaluation program:

1. Ensure that bylaws and marketing plans refer to TMA roles in the monitoring and reporting of TDM activity and results. Specifically, the following statement should be considered by the TMA for adoption under the usual Authority and Purpose Article:

The Corporation will develop baseline and annual evaluation information on employer based TDM programs in [Jurisdiction]. The purpose shall be to assess the types of TDM strategies undertaken by employers and the effectiveness of these strategies. The Corporation shall assist employers carry out transportation surveys among employees, whether directly by way of implementing such surveys at employment sites or indirectly through contract survey services. Annually, the Corporation will summarize the results of employer surveys and make these available to public entities with interest in TDM, including but not limited to the [Jurisdiction] and [name appropriate others here].

2. Contract for transportation survey and data processing services, alert all jurisdiction employers to these services, and make them available to TMA members at favorable rates. Such services should be solicited through competitive bid and a request for proposal (RFP) process. The RFP should

- Specify the number of employers and employees potentially making up the universe to be sampled;
- Specify that the response rate must be sufficient to result in statistically representative results at each company, within usually accepted confidence levels; and
- Request bids that presume low and high ranges for the number of employers and employees involved.

The TMA should price survey and data processing services on the basis of number of employees and member or non-member status. However, the price should not vary below companies of 50 or 100 employees, because some proportion of survey costs are incurred irrespective of company size.

Once a firm is selected, the TMA must manage its services. The TMA must check that response rates are met and that data entry is accurate. Some data entry errors are inevitable. Informal interviews with data entry companies suggest that error rates depend on the complexity of the data entry task. Error rates on simple mailing labels and addresses may be as low as one in several hundred, or less. Data entry errors on complex survey forms may be higher, but careful spot checking reduces errors to the range of 1 or 2 percent.

3. For employers not using survey services of the TMA, offer workshops on conducting in-house surveys. Workshops

**BACKGROUND INFORMATION**

1. Your Name \_\_\_\_\_ 2. Department/Organization No: \_\_\_\_\_ / \_\_\_\_\_  
 3. Your job title \_\_\_\_\_ 4. Your home zip code \_\_\_\_\_ 5. Home City \_\_\_\_\_

**TRAVEL INFORMATION**

Before completing the following questions, please read these definitions:

**Carpool:** two (2) to five (5) persons commuting to and from work in a car owned by a driver or passenger.

**Vanpool:** six (6) or more people commuting to and from work in a personal, company or public agency van.

**Transit:** public transportation, including bus or fixed rail services for commuting.

**Buspool:** eight (8) or more people commuting by private or public bus service contracted by commuters or their employer, and with routes and schedules determined by riders.

**Bicycle:** non-motorized bicycle to and from work.

**Telecommute:** work normally done "at the office" which instead is done at home or a remote worksite, thus eliminating or reducing the usual home to work trip.

**Drive alone:** use of a car or motorcycle to and from work without a passenger.

**Walk:** Travel from home to work on foot (walk from a transit stop or a parking lot doesn't count).

6. Count the trip to work as one trip, and count the trip home also as one trip (i.e. two trips per day). How many **total work trips** do you make in a typical work week?

\_\_\_\_\_ Trips per typical work week

7. Based on the above definitions, how do you **usually** get to work? **Check only one:**

- |   |  |
|---|--|
| <input type="checkbox"/> A. Drive alone       | <input type="checkbox"/> G. Transit                                    |
| <input type="checkbox"/> B. Carpool driver    | <input type="checkbox"/> H. Bicycle                                    |
| <input type="checkbox"/> C. Carpool passenger | <input type="checkbox"/> I. Buspool driver                             |
| <input type="checkbox"/> D. Vanpool driver    | <input type="checkbox"/> J. Buspool Passenger                          |
| <input type="checkbox"/> E. Vanpool passenger | <input type="checkbox"/> K. Telecommute (don't usually go to worksite) |
| <input type="checkbox"/> F. Walk              | <input type="checkbox"/> L. Other _____                                |

8. What other modes of travel to work do you **sometimes** use? If you don't use an occasional means of travel, check here and go to question 9:  None. Otherwise, **check only one:**

-- Same options as in question 7 --

- 8A. How many of the weekly trips you reported in question 6 are made by this **occasional means of travel**? If you telecommute, count the number of trips you avoided making:

\_\_\_\_\_ Trips per typical week by occasional mode of travel

9. Usual work schedule: Start time \_\_\_\_\_ End time \_\_\_\_\_

10. Check the days you work in a typical week:  MW  TU  WED  TH  FR  SAT  SUN

11. Does your department allow you to start work anytime within a band of time, for example, 7 to 9 a.m. ("Flextime")? Check one: Yes \_\_\_ No \_\_\_

- 11A. If flextime, how flexible are your start/end times:  <30 Mins.  30-60 Mins.  >60 Mins.

12. How far from work do you live (one way only)? Check one:

- |   |   |
|---|---|
| <input type="checkbox"/> A. 0 - 0.9 miles   | <input type="checkbox"/> E. 10.0 - 14.9 miles |
| <input type="checkbox"/> B. 1.0 - 2.9 miles | <input type="checkbox"/> F. 15.0 - 19.9 miles |
| <input type="checkbox"/> C. 3.0 - 5.0 miles | <input type="checkbox"/> G. 20.0 - 24.9 miles |
| <input type="checkbox"/> D. 5.1 - 9.9 miles | <input type="checkbox"/> H. 25 or more miles  |

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**FIGURE 2 Suggested employee survey sections and questions. (continued on next page)**

should use employer and jurisdiction transportation coordinators from the region who can speak about how to carry out effective employee surveys. TDM consultants with experience in TDM evaluation also could be involved. A workshop might follow the following agenda:

- Review of locality TDM program (TMA and locality staff) (10 min);
- Survey services of TMA (TMA representative and survey contractor) (15 min);
- Pointers on survey procedures (survey contractor, successful employer TDM coordinator) (15 min);
- Case study experience (locality representative) (15 min);
- Questions and answers (all participants) (15 min); and

- Wrap up and materials distribution (jurisdiction staff and TMA) (10 min).

4. Assist employers with the annual report. Employers should complete their own annual TDM reports on forms developed by the jurisdiction staff and should base the report on survey results tabulated by the survey contractor or through in-house survey. The TMA might prepare a mock report to show employers how the report would be developed. The mock report could be done for both a hypothetical large and small employer and contain the following sections:

- Name of company transportation coordinator;
- Main location and subsidiary sites;

13. Where do you normally park if you drive a car or motorcycle to work? Check one:
- |  |   |
|--|---|
| <input type="checkbox"/> A. City owned/leased lot/garage   | <input type="checkbox"/> F. Commercial lot/garage open to all                   |
| <input type="checkbox"/> B. On street at 10 Hr. meter      | <input type="checkbox"/> G. Private restricted facilities (e.g. employees only) |
| <input type="checkbox"/> C. On street at 2 Hr. meter       | <input type="checkbox"/> H. Private driveway                                    |
| <input type="checkbox"/> D. On street - no time limit zone | <input type="checkbox"/> I. Vacant lot, rail right of way, other open land      |
| <input type="checkbox"/> E. On street - time zone/no meter | <input type="checkbox"/> J. Other (explain): _____                              |
14. Do you personally pay for parking? Check one:  Yes  No
- 14A. If you do not pay for parking, why not? Check one:
- A. There is no charge for parking where I park.  
 B. My employer pays for my parking or provides it free.  
 C. Other. Please explain: \_\_\_\_\_
- 14B. If you personally do pay for parking, please indicate how much you pay. Check one:
- |   |   |
|---|---|
| <input type="checkbox"/> A. \$ 1.00 - \$10.00 per month | <input type="checkbox"/> D. \$30.01 - \$40.00 per month |
| <input type="checkbox"/> B. \$10.01 - \$20.00 per month | <input type="checkbox"/> E. \$41.01 - \$50.00 per month |
| <input type="checkbox"/> C. \$21.01 - \$30.00 per month | <input type="checkbox"/> F. Over \$50 per month         |
15. If you drive, which of the following streets, intersections, ramps do you usually use to and from work? Make sure you have designated all the facilities you use to and from work. Check as many as apply: [facilities may vary by location of companies]
- |   |   |
|---|---|
| <input type="checkbox"/> A. Street X          | <input type="checkbox"/> C. Ramp L                    |
| <input type="checkbox"/> B. Street X/street Y | <input type="checkbox"/> D. Highway M/between N and O |

#### COMMUTE PERSPECTIVES

16. If you are interested in receiving information on one or more of the following "modes" to work, please indicate by checking the box. Check as many as apply:
- |                                     |                                      |  |   |
|-------------------------------------|--------------------------------------|--|---|
| <input type="checkbox"/> A. Carpool | <input type="checkbox"/> C. Bus Pool | <input type="checkbox"/> E. Bike             | <input type="checkbox"/> G. Telecommuting |
| <input type="checkbox"/> B. Vanpool | <input type="checkbox"/> D. Transit  | <input type="checkbox"/> F. Moped/Motorcycle | <input type="checkbox"/> H. Other _____   |
17. Flextime often encourages car and vanpooling by making it easier to match pick-up schedules with work hours. Would you be more likely to use carpooling or vanpooling if you worked under flextime? Check one:
- |  |  |
|--|--|
| <input type="checkbox"/> A. Much more likely     | <input type="checkbox"/> D. Already on flextime                |
| <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> E. Does not apply since I telecommute |
| <input type="checkbox"/> C. Not more likely      |  |
18. Would you be more likely to use a bicycle to/from work if there were showers and/or secure parking areas at work? If there already is cycle parking at work, check NA. Check one:
- |  |   |
|--|---|
| <input type="checkbox"/> A. Much more likely     | <input type="checkbox"/> C. Not more likely |
| <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> D. NA              |
19. Would you be more likely to use car or vanpooling if you could get discount taxi service to home, day care or school in emergency situations? If company car/van were available for pooling? If parking stalls close to your work place were reserved for car and vanpoolers? Check one:
- |                  |  |  |   |
|------------------|--|--|---|
| Discount taxi:   | <input type="checkbox"/> A. Much more likely | <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> C. Not more likely |
| Company car/van: | <input type="checkbox"/> A. Much more likely | <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> C. Not more likely |
| Carpool stalls:  | <input type="checkbox"/> A. Much more likely | <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> C. Not more likely |
20. If you could buy transit passes at a 50 percent discount, would you be more likely to use transit? Current fares are \_\_\_\_\_. More likely to use transit if it were more frequent for your trips? Check one:
- |                   |  |  |   |
|-------------------|--|--|---|
| Pass discount:    | <input type="checkbox"/> A. Much more likely | <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> C. Not more likely |
| Frequent transit: | <input type="checkbox"/> A. Much more likely | <input type="checkbox"/> B. Somewhat more likely | <input type="checkbox"/> C. Not more likely |

#### THANK YOU!

Thank you for your time! Please return the survey to \_\_\_\_\_ at \_\_\_\_\_. The deadline for completing the survey is \_\_\_\_\_. Thank you!

FIGURE 2 (continued from previous page)

- Company background (number of employees, job classifications, foreseeable expansions or changes in employee make-up bearing on TDM);
- Description of parking availability and use;
- Description of TDM measures to date and planned for next year;
- Summary of annual program results to date as indicated by survey; and
- Check off list for information on TDM strategies, TMA, survey contractors, other company programs, ordinances, TDM conferences, and literature.

The mock report should pay particular attention to Sections 5 and 6. The report should indicate how certain TDM strat-

egies are best to consider depending on survey results, and how effectiveness is assessed. Figure 4 shows an example of the kind of discussion that might be included in the mock report for these sections.

In addition, the TMA might provide workshops and telephone consultation on completing the annual report.

#### ELEMENT 3: DEVELOPER ROLES

New developments conditioned with TDM requirements ought to include requirements for annual TDM reporting by project tenant and employers, especially during the period before any TDM ordinance or air quality regulations come into effect.

1. Your Name \_\_\_\_\_ 2. Name of employer \_\_\_\_\_

**MANAGEMENT PERSPECTIVES**

3. Are you aware of the [Jurisdiction] Transportation Management Association? \_\_\_\_\_ (if no, skip to Q4)  
If yes, are you a member? \_\_\_\_\_ If yes, please rank the services of the TMA:

A. Information on transportation issues, events, modes of travel:  Good  Fair  Poor  Uncertain

B. Employee transportation survey services [if applicable]:  Good  Fair  Poor  Uncertain

C. Transit pass sales program [if applicable]:  Good  Fair  Poor  Uncertain

4. How many employees in your company now? \_\_\_\_\_ How likely is it your company will be adding employees in the next six months? Check one:

A. Very likely  C. Unlikely  
 B. Somewhat likely  D. Uncertain

About how many employees might be added? \_\_\_\_\_

5. Please indicate whether your company might consider the following alternatives to auto commuting to and from your place of employment. Indicate Yes, Maybe or No in the space provided for each option:

A. Allow the [Name] Transportation Management Association or [Jurisdiction] Ridematch Program to distribute car and vanpooling ("ridesharing") information and applications to your employees, and to help connect employees in your company who are interested in ridesharing.

Yes  Maybe  No

B. Allow the Transportation Management Association or Ridematch to connect your employees interested in ridesharing with interested employees in other [Jurisdiction] companies.

Yes  Maybe  No

C. Allow some of your employees to arrive within a one hour band of time (e.g. 8 to 9 a.m.) and depart 8 hours later ("flextime").

Yes  Maybe  No

D. Periodically, purchase bus passes and sell them to employees at reduced cost.

Yes  Maybe  No

E. Allow compressed work weeks (four days/40 hours) or telecommuting (work from home or satellite office).

Compressed Week:  Yes  Maybe  No Telecommuting:  Yes  Maybe  No

F. Share cost with the Transportation Management Association for the periodic promotion of bicycles, mopeds and motorcycles, perhaps by supporting prize drawings for commuters using these modes.

Yes  Maybe  No

G. Allow carpoolers and vanpoolers to use company cars or vans (when available) for business trips during the day. If there are no company cars, check NA.

Yes  Maybe  No  NA

6. Does your company have a designated Transportation Coordinator?

Yes  No If yes, please list: Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Thank you for your time! Please return the survey to \_\_\_\_\_ at \_\_\_\_\_. The deadline for completing the survey is \_\_\_\_\_. Thank you!

**FIGURE 3 Suggested manager survey questions.**

If and when these policies are in effect, they may supersede project conditions.

The conditions also should specify mitigation fees in support of the TDM monitoring program. Fees should be used to support either the TDM monitoring activities of the jurisdiction staff or the TMA or both. It is important that such fees bear a reasonable relationship to the cost of the TMA and jurisdiction monitoring and evaluation.

Presuming a fee in support of monitoring, a role for the TMA in monitoring and the development of a TDM annual report form, language of the developer agreement might read as follows:

Applicant will submit, for approval of the [proper locality officer] a lease exhibit which requires, as a condition of oc-

cupying the building, cooperation with the [jurisdiction] and [relevant Transportation Management Association] in the monitoring of a Transportation Demand Management program. Lease condition must specify tenants will complete an annual employee transportation survey and report using guidelines provided by the [jurisdiction], and tenants may elect to conduct the survey directly or through contract survey services as may be arranged through the [relevant TMA]. Applicant will pay annual fees in support of the [jurisdiction] and [relevant Transportation Management Association] Transportation Demand Management monitoring program. Annual fees will be established by the [jurisdiction] and based on the annual costs of the respective monitoring programs, but shall be no less than \$xx per employee [fee should be based at a minimum on the unit cost of employee survey and data tabulation for locality, usually \$10 to \$20] based on estimated occupancy for the year.

#### DISCUSSION OF TDM MEASURES TO DATE AND PLANNED

"... the commute distances and home cities of Company X employees strongly favor ridesharing, transit and bicycling. As QUESTION XX shows, almost half the employees say they are traveling 15 or more miles one way to work. Also, as QUESTION X about home City shows, some employees traveling long distances live in the same City. Such commuters are much better candidates for ridesharing than persons making short trips to work. The employee survey also reveals 15 percent travel less than 3 miles to work. At least some of these employees should be candidates for cycling, especially with only one percent now cycling. Consequently, we plan in-house matching services for our long tripper employees, and bike racks and special promotions for our short trippers ..."

"... In another repeat of last year's results, large proportions of employees are not familiar with the service or schedule of transit or the availability of discounted transit passes through the TMA. About 45 percent (40 percent in 19xx) of the employees indicate no awareness of transit service or schedules. Forty six percent (43 percent in 19xx) are not aware the Association offers discounted transit passes. Clearly, there is room for better communication of these options to employees. See QUESTIONS XX and XX...These result suggests potential for better promotion in next year's program. Instead of simply passing out brochures and schedules, we plan a transit day promotion this year. The promotion would ... "

"... As expected, employees did not express great interest in alternatives to driving alone. However, enough employees did express sufficient interest to warrant certain actions on the part of the TDM Coordinator. Table x summarizes the responses to the interest in alternatives to solo driving over the past three years. This year, the relevant question is QUESTION XX. The table summarizes the proportion of respondents expressing medium to high interest in the mode presented. Interest in carpooling leads the pack each year. Vanpooling and flextime were rated next most favored. Interest in Transit was next in interest in only one year, 198x ...Overall, results suggest more potential for ridesharing. We plan preferential parking for poolers in our front lot where parking is preferred and supply is tight. We also plan a flextime demonstration with employees in one department where rideshare interest is highest..."

#### TDM EFFECTIVENESS TO DATE

"... We have compared selected results across 198x, 198x and 198x. We analyzed employee mode choice and interest in alternatives to solo driving in the three years. Table X shows the cities in which employees live for across the three years. The distribution of employees responding by City of residence shows good stability from 198x to 198x. For example, the proportions of employees living in xxxxxxxxxxxx, xxxxxxxx, and xxxxxxxx are fairly consistent across the three years. Thus, we may be fairly confident the comparison of mode shares is not biased by very different trip lengths or commute patterns of employees responding across the three years."

"... Table X shows the mode shares of employees across 198x, 198x and 198x. As the table indicates, there is very little difference in the proportion of solo drivers across the years, or in the proportion of employees cycling, carpooling or taking transit. There is a small decline in solo shares, but the decline may not be significant. However, it is encouraging that the proportion of solo drivers is not increasing as is the case in the overall vehicle occupancy counts conducted by the [agency] across the same years. Overall, we conclude TDM is holding the line on solo driving at our company ..."

**FIGURE 4** Examples of Sections 5 and 6 of the employer annual report.

For large projects, conditions also might specify installation of vehicle counters. Such counters will provide a checkpoint for site-specific TDM monitoring discussed in Section IV. Suggested condition language follows:

The applicant shall install automatic vehicle counters to the specifications of the [jurisdiction] at all driveways entering and exiting the development.

If standard developer agreements for the jurisdiction do not provide for continuity of conditions, then language of the following sort should be added:

The agreement and conditions contained herein shall be a covenant running with the building and occupancy permit for the project binding on applicant, its successors and assigns.

#### ELEMENT 4: TRAFFIC MONITORING OF TDM SITES AND CONTROLS

Jurisdiction staff should carry out a specific traffic monitoring program at selected employment sites with and without TDM programs. The usual traffic monitoring system carried out by jurisdictions on arterials and collectors is useful for tracking general trends, but cannot provide conclusive findings about TDM program effectiveness.

For the most reliable possible findings, vehicles entering and exiting sites with and without TDM programs need to be counted at driveways and compared over time. Only by such a comparative treatment and control methodology can TDM effectiveness be determined separate and distinct from other influences on traffic.

Presuming the objective is to monitor the effect of TDM on vehicle traffic, only vehicles need to be counted. It is not important to know the proportion of cyclists or walkers (whether coming from car drop offs, transit stop, or from a residence) or even vehicle occupancy. Not only is it labor-intensive to monitor pedestrian traffic and vehicle occupancy (especially if transit crosses the cordon), it is not necessary. What is important is the comparative vehicle generation of the TDM and control sites normalized on a per square foot or per employee basis. If TDM is effective over time and increases carpooling, transit use, cycling, and walking, the result will be detected in reduced vehicle generation at the TDM sites compared with the control sites.

Comparing the vehicle trip generations between sites with and without TDM controls for the influences of weather, gasoline prices, overall state of the economy, and other influences acting on both the TDM and non-TDM programs provides direct and independent observation of vehicle and person movement without relying on reports from commuters about travel behavior.

Guidelines for the specific methodology to be used are as follows:

- Counts should take place over at least a 1- to 2-week period during the same time each year. The fall of the year is preferred as the survey season when summer vacations are over and business is conducted as usual. If economy of resources is important, counts could be taken on Tuesday through Thursday, though the entire week is preferred.

- Counts should be over 12 hr (e.g., 7 a.m. to 7 p.m.) or at peak period only, depending on the air quality rule and TDM ordinance in place at the time the monitoring program begins. Air quality regulations usually are directed to trips at all hours; TDM ordinances usually focus on the peak hours. In either case, counters should employ 15-min worksheets.

- Cordons should be set to ensure that only TDM site traffic is counted. If an employer with a TDM program shares a site with other services or users, it may not be possible to set the cordon appropriately. Such sites should be excluded from the sample.

- The number of treatment and control sites should be as large as possible given staff and student resources. A large number of treatment and control sites reduces the probability of unique circumstances influencing the comparative results. For example, if, over the survey period, treatment sites generally are not changing in the make-up of the work force but control sites are, then comparing treatments and controls does not give valid results. The larger the number of treatment and controls, the less is the risk of unique changes at treatment or control sites. Seattle Metro uses 48 combined treatment and control sites in its monitoring program. If the number cannot be this large, treatment and control sites ought to be matched and monitored as much as possible along key variables that may change over time. Key variables include the make-up of the work force, availability of parking, and proximity to transit.

- Vehicle counts should be normalized on the basis of gross floor area and per employee. Employee populations at both treatment and control sites can be expected to grow over the years they are monitored. It is important to control for growth by calculating counts on a per-employee basis. Also important are results on the basis of gross floor area. The latter results will be useful for projecting the traffic impacts of future development proposals and for environmental reviews. To obtain information on gross floor area and employees, the jurisdiction transportation staff must contact building owners and assess total gross floor area and average number of daytime employees that work at the site at the time of the survey. It may be necessary to contact the site employer about the number of employees. It is good procedure in trip generation surveys of work sites to ask cooperation and permission to make driveway counts and offer the owner the results of the survey once completed.

#### **ELEMENT 5: ANNUAL TDM MONITORING REPORT**

The annual TDM monitoring report to jurisdiction decision makers should bring together all the above sources of information into a coherent appraisal of TDM effectiveness. It

should bring together information from several sources and might be organized in four chapters:

- Results of Vehicle Counts At TDM and Control Sites,
- Summary of Employer Surveys and Annual Reports,
- Results of Overall Trends in Traffic and Vehicle Occupancies, and
- Conclusions.

#### **Results of Vehicle Counts At TDM and Control Sites**

The site-specific traffic count program results should be summarized and discussed. Table 1 presents an outline that should be used to summarize and analyze results. The purpose of the table is to indicate peak-period traffic generation rates for the TDM and control sites and whether there is any significant difference between sites for both the current year and the several years over which monitoring takes place. If the TDM program is effective, there should be a statistically significant difference between the two groups of sites, perhaps not in every year but at least in later years as programs mature.

Of course, a narrative should accompany the table to present

- Any problems in data gathering;
- Possible unique changes in either the TDM or control sites (as noted, this will not be a problem as the number of sites increases); and
- Overall conclusions about effectiveness based on the results.

In the case of the mock results in the table, the conclusion would be that there is a significant difference between the exiting p.m. peak traffic between the TDM and control sites, at least in 2 years. There is no difference in the entering p.m. traffic in any years, though this might well be expected because outbound traffic is more likely to be employee generated and affected by TDM programs.

#### **Summary of Employer Surveys and Annual Reports**

This chapter ought to summarize employee surveys as tabulated by individual employers and the TMA. An appendix should contain the summary tabulations by employer. Not all tabulations need to be discussed and summarized. The most important for this chapter are the following key indicators by employer over at least the most recent 3 years:

- Proportion of solo and alternative mode users,
- Average trip length,
- Proportion of peak-period commuters,
- Proportion of employees using critical intersections, and
- Proportional interest in alternatives to solo driving.

The narrative for this section should point to trends in these indicators. For example, in the worst case proportions of solo shares might be climbing across employers, trip lengths increasing, use of critical intersections increasing, and interest in alternatives to solo driving declining. The narrative also



TABLE 1 MOCK TABLE ON TDM AND CONTROL SITE VEHICLE COUNTS

## CURRENT YEAR P.M. PEAK TRIP RATES BY SITES

TDM SITES	VEHICLE TRIPS/1000 GFA*		VEHICLE TRIPS/EMPLOYEE	
	Enter	Exit	Enter	Exit
XYZ Semiconductors	0.55	3.10	0.65	3.66
Blue Sky Freight	1.35	2.70	1.40	3.80
ABC Hospital	2.05	3.39	1.10	4.68
...	....	....	....	....
Means	....	....	....	....
Standard Deviations	....	....	....	....
CONTROL SITES	VEHICLE TRIPS/1000 GFA*		VEHICLE TRIPS/EMPLOYEE	
	Enter	Exit	Enter	Exit
Klean Sand	0.55	3.10	0.65	3.66
Someone Johnson	1.35	2.70	1.40	3.80
West Marine	2.05	3.39	1.10	4.68
...	....	....	....	....
Means	....	....	....	....
Standard Deviations	....	....	....	....

## MEAN P.M. PEAK TRIP RATES BY TDM AND CONTROLS

Year	MEAN TRIPS/1000 GFA*		MEAN TRIPS/EMPLOYEE		DIFFERENCE IN MEANS (+ = Significant)	
	Enter	Exit	Enter	Exit	Enter	Exit
199X	1.25	3.00	1.30	3.15	0.05	0.15
199X	1.70	2.50	1.70	2.75	0.00	0.25+
199X	1.80	3.00	1.90	3.40	0.10	0.40+
....	....	....	....	....	....	....

\* Gross Floor Area

should point to the most and least successful employers and analyze possible reasons for variations in success. Perhaps the most successful employers tend to be the largest companies with better TDM program resources and larger pools of clerical and data processing personnel. A breakdown by employer size would test this hypothesis. Or, success may be related to program duration, with the longest-running programs exhibiting the most success. Again, a breakdown and tabulation by age of program will test this hypothesis. Overall, the purpose of this chapter is to glean as much as possible from the employee survey data about effectiveness trends and probable reasons for success.

This chapter also should highlight employer annual plans. The most important parts of the plans to summarize are the descriptions of annual program results as provided in the plans, as well as descriptions of TDM measures to date and planned. Again, the discussion ought to be more than a mere summary. It should compare and contrast the types of programs that seem to be associated with more and less successful programs. It should point to any common problems pointed to across employers, and the type of information and assistance most often requested.

### Results of Overall Trends in Traffic and Vehicle Occupancies

This chapter would summarize any key data now gathered by traffic engineering staff and reported to the jurisdiction in the form of an annual report perhaps entitled, *Traffic Monitoring*

*Program*. The key data to report are a minimum of the past 3-year trends in

- Peak-period (not just all day, as now reported) traffic volumes on arterials, by jurisdiction subareas.
- Peak-period vehicle occupancy counts on local highways and on arterials used by commuters. Transit vehicle occupancies should not be transit district averages. Surveyors should estimate occupancy at less than 33 percent, from 33 to 66 percent, and over 66 percent, and estimate occupancy on the basis of bus capacity.
- State DOT data on vehicle-miles of travel and vehicle registration presented per unit of population. Many state DOTs collect this information for localities.

The chapter should not just present the data. It should draw specific conclusions about increases or decreases in vehicle occupancies, vehicle registrations, and vehicle-miles of travel per population unit. This information is important to drawing overall conclusions in the last section.

Finally, the results of peak-period traffic volumes on arterials should be categorized and presented in a table comparing volumes for high- and low-growth areas. Growth indicators such as building permits or business licenses should be used to categorize high-, medium- and low-growth areas. This breakdown will indicate to what extent traffic growth is a general phenomenon perhaps related to broad economic and social trends (e.g., changes in vehicle ownership, type of economic activity, and workers per household), or a phenomenon more related to growth and development in specific areas.

**Overall Conclusions About TDM Effectiveness**

The final chapter would draw overall conclusions about TDM effectiveness on the basis of the findings in the previous three sections. The chapter should draw two conclusions:

- Given the results discussed in report Chapters 1-3, is TDM effective or not in reducing solo driving, peak-period travel, vehicle trip generation, and use of critical intersections?

- If TDM is effective, what is the range of effectiveness along the key indicators?

A specific example will help illustrate the types of conclusions possible from findings in the report chapters. Table 2 presents hypothetical results of the chapters and overall conclusions. In the clear cut case, the traffic generation studies at TDM and control sites reveals significant differences in trip generation; employer surveys of employees indicate declines in proportions of solo drivers and use of critical intersections; at the same time overall traffic is up, especially in high-growth areas, and vehicle occupancies are down. The combined evidence strongly supports the conclusion that TDM is effective. Furthermore, levels of effectiveness can be measured in percent declines. In the inconclusive case, results are mixed or not completely reliable. The site-specific traffic studies exhibit no change, though the number of control sites is limited, making reliable comparisons and conclusions more difficult; the employee surveys exhibit modest declines in solo shares, but the proportions of employees using critical intersections remain the same; on the other hand, overall traffic is up in the locality and vehicle occupancies are down.

Overall, the findings suggest that TDM may be modestly effective in reducing solo driving though not use of critical

intersections. It is possible that TDM is reducing not only solo driving (in light of employee survey findings contrasted with locality-wide declines in vehicle occupancies), but is reducing traffic generation at TDM employment sites. However, only by improving the number or type of control sites can this conclusion be made with more confidence.

Clearly, other combinations of findings are possible. Locality traffic and transportation staff must weigh findings carefully and draw conclusions on the basis of the concurrence or disparity of findings and results. In this task, there are no mechanical or set procedures to follow. Good analysis and judgment are required.

The annual report should be submitted to locality decision makers with conclusions about overall program effectiveness and levels of effectiveness. The report should be used to

- Inform the locality decision makers about the effectiveness of TDM, and enable policy decisions about future directions in TDM regulations, TMA roles, monitoring systems, and resources devoted to TDM;

- Inform air quality planners of changes in vehicle-miles of travel attributable to the TDM program to support estimates in emission reductions and conformance to emission reduction goals; and

- Inform the TMA of overall progress in TDM and enable the organization to inform employers about effectiveness, problems, successes, and suggestions for most effective strategies.

**COSTS**

The cost to a city or county of implementing the evaluation system as proposed will vary considerably. Much depends on

TABLE 2 HYPOTHETICAL OVERALL TDM FINDINGS AND CONCLUSIONS

<b>CLEAR CUT CASE</b>			
CHAPTER 1 RESULTS SITE TRAFFIC STUDIES	CHAPTER 2 RESULTS EMPLOYEE SURVEYS	CHAPTER 3 RESULTS LOCALITY-WIDE TRAFFIC	OVERALL CONCLUSIONS
5-10 percent significant difference in last two years	0-10 percent decline in solo shares at larger employers; critical intersection use down	ADT and peak traffic up 3 percent on all arterials, up 6 percent in high growth areas; vehicle occupancies down 2 percent	TDM definitely effective: P.M. traffic: - 10% VMT: - 4% Intersection: - 2%
<b>INCONCLUSIVE CASE</b>			
CHAPTER 1 RESULTS SITE TRAFFIC STUDIES	CHAPTER 2 RESULTS EMPLOYEE SURVEYS	CHAPTER 3 RESULTS LOCALITY-WIDE TRAFFIC	OVERALL CONCLUSIONS
No significant difference in last two years, but control sites limited	0-5 percent decline in solo shares, critical intersection use steady	ADT and peak traffic up 2 percent on all arterials, up 4 percent in high growth areas; vehicle occupancies down 5 percent	TDM possibly effective. Based on solo share declines, best case results are: P.M. traffic: - 3% VMT: - 2% Intersection: 0

local cost of labor, survey and data processing contract services, as well as the complexity of developer requirements, role of the local TMAs, and the number of project and control sites used in the traffic analysis. Additionally, there may be costs to local developers (e.g., embedding traffic counters at sites) and costs to TMAs (e.g., contract costs for survey and data entry).

Some indication of cost is provided by the example of Santa Cruz County in California, which recently adopted the evaluation system. The population of the county is 217,000, about twice the median for counties in the state. Obviously, costs may be somewhat lower in smaller jurisdictions and probably much higher in larger jurisdictions. The county program assumes that local TMAs forming in the county will contract for survey processing services. County costs then include those associated with

- Preparing the employer TSM manual,
- Assisting the TMAs to get started with survey contractors,
- Developing and negotiating conditions and covenants as new developments come on line,
- Carrying out traffic monitoring at TSM and control sites (20 total sites are estimated), and
- Preparing the annual report.

The county already carries out regular traffic counts at many locations and does not need many new hose counters. The county traffic engineer has successfully used student interns

for manual counting and will add several more for this program. Annual county costs are estimated to range from \$40,000 to \$70,000 (excluding \$13,000 in equipment costs), with costs in the initial year probably toward the high side of the range to allow for start-up planning and development.

## CONCLUSION

Local jurisdictions initiating employer-based TDM programs should develop a comprehensive monitoring and evaluation system to track the actions of employers and to assess program results. For best results, the system should incorporate more than the usual annual employee survey. Suggested here is a system of employee and manager surveys, an employer report, roles for the local TMA and developers, and a method for evaluating traffic impacts of demand management. With such a system, local jurisdictions can track not only employer actions and perceptions of results, but jurisdictions also can make their own independent assessments of traffic impacts of demand management. Such assessments are important for continuing, modifying, or curtailing employer-based programs, and developing realistic assessments of whether and how much demand management can lessen traffic and air pollution problems.

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