Evaluation of Transportation Demand Management Programs at Residential Developments

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Over the last decade, local jurisdictions and transportation agencies have increasingly used transportation demand management (TDM) programs to manage the traffic impacts of new commercial and retail developments. More recently, however, King County and the cities of Kirkland, Redmond, and Seattle, Washington, have introduced TDM programs for residential developments or origin sites. The objectives of the evaluation were (a) to document the implementation of home-end TDM strategies, and (b) to evaluate their effectiveness in mitigating the number of vehicle trips generated by residential development. Because few projects had been built and occupied by the time the evaluation concluded, quantitative evaluation was limited, and the success or failure of residential TDM programs could not be determined. However, it was possible to gain an understanding of the nature and reasons for the implementation problems encountered through qualitative means. These means included interviews with jurisdictional staff, developers, and managers and a focus group among residents. The analysis pointed out problems related to (a) the decision process leading to the imposition of mitigation requirements, (b) the institutional memory of requirements, (c) monitoring, (d) enforcement of compliance, and (e) the adequacy of mitigation measures. Recommendations to mitigate these implementation problems are suggested.

Over the last decade, local jurisdictions and transportation agencies have increasingly used transportation demand management (TDM) strategies as a means of managing the traffic impacts of new commercial and retail developments. TDM programs are developed for a specific development project to mitigate the transportation impacts associated with it by discouraging single-occupant vehicle (SOV) trips and encouraging travel by high-occupancy vehicle (HOV). They serve the site-specific needs of tenants and are designed to reduce SOV trips and parking demand at a development site.

In the past, these efforts to discourage SOV commutes and encourage HOV modes of transportation have almost exclusively been focused on destination sites—office buildings, industrial or office parks, and office or retail developments. Since 1987, however, King County and the cities of Kirkland, Redmond, and Seattle, Washington, have introduced the concept to residential developments, or origin sites, in an attempt to mitigate the transportation impacts of these developments through promotion of HOV use among residents.

Before the onset of this study, no data on residential projects using TDM strategies had been collected, nor had an evaluation been conducted of the TDM programs and the various mitigation measures attempted. An objective assessment of these programs seemed appropriate. Thus, the original objectives of this project were to (a) document the implementation of home-end TDM programs and (b) evaluate their effectiveness in managing the transportation impacts of residential developments on freeways and adjacent arterials. These objectives were meant to identify the effect of home-end TDM programs on HOV use by residents and to identify specific effective actions.

The researchers intended to combine a number of different methodologies, including surveys of project residents, surveys of ridematch and vanpool applicants, interviews with project developers and managers, and comparisons of vehicle counts between TDM program sites and control sites.

However, in the early stages of the project it became clear that the scope envisioned was not appropriate for the available data. Thus, the success or failure of TDM programs on residential developments was not determined. Rather, the scope of the project was extended to gain an understanding of the nature of the problems encountered in implementing these programs and to develop approaches to minimize these problems while gathering as much information relating to the original goals of the study as possible.

PROJECTS IN KING COUNTY, KIRKLAND, REDMOND, AND SEATTLE WITH TRAFFIC MITIGATION REQUIREMENTS

Locations of TDM Projects

The researchers established a list of developments with TDM requirements from files maintained by the Municipality of Metropolitan Seattle (Metro), the region's transit operator. As part of the State Environmental Policy Act (SEPA) process, each jurisdiction informs Metro about major projects with a potentially high impact on transportation. Because, with the exception of the city of Seattle, jurisdictions have generally required developers to negotiate any TDM measures with Metro, its files were relatively comprehensive.

In all, 57 residential projects with TDM requirements were identified and analyzed. Of these, 47 were located in unincorporated King County, 3 in the city of Kirkland, 2 in the city of Redmond, and 5 in the city of Seattle. Thus, almost all projects, and the focus of the study, were in suburban environments. According to the research conducted at the

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outset of this study, none of the other jurisdictions in the region had started to require TDM measures from residential developments. Ten of the projects, all located in unincorporated King County, were single-family lot developments; therefore, a comparative analysis of TDM programs implemented for single-family projects versus multifamily projects could not be carried out because of the small sample size of single-family projects. For 12 projects, the information obtained was too limited or outdated, and the developers or managers for these projects could not be contacted. Nine of these projects were within the jurisdiction of King County, and three within the city of Seattle. Two projects, both in unincorporated King County, had been withdrawn and would not be built, 25 were either still in the approval process, not started, or partially built. Only 18 had been built and occupied by May 1990.

Types of Home-End TDM Requirements

Twelve different measures encouraging mode shift have been imposed on residential developments in the Puget Sound region. They can be grouped into four types, including (a) the provision of physical structures that encourage mode shift, (b) the distribution of transit and rideshare information, (c) the collection of information on commute behavior, and (d) transit subsidies. No more than eight measures were required from any single development. Twenty projects were listed with unspecified TDM program requirements, other than sidewalk improvements (see Table 1).

The provision of physical structures included the requirement of fully connected sets of sidewalks on the project and along adjacent streets in 14 cases (25 percent), bus pads and shelters in 4 cases (7 percent), and secure bicycle storage in 6 cases (11 percent).

The distribution of transit and rideshare information was required for 23 of the projects (41 percent). In 7 cases (13 percent), this included installation of a commuter information center (CIC) on site. Seventeen developers (30 percent) were required to provide a transportation coordinator (TC) on the project. Periodic promotion of transit and ridesharing options was requested in 4 cases (7 percent).

Information on commute behavior, accomplished through surveys of residents, was to be made available on request of the jurisdiction by seven of the projects (13 percent). Five development owners or managers (9 percent) were to submit regular reports to the jurisdiction.

Transit subsidies in the form of a free monthly bus pass to first-time residents were required of 24 developments (43 percent). One project (2 percent) was to provide peak-hour shuttle services to the nearest park-and-ride lot. Originally, two developments, both large multifamily projects, had had this requirement, but it was implemented on only one of them.

KNOWLEDGE OF AND COMPLIANCE WITH TDM REQUIREMENTS

Figure 1 shows a breakdown of projects by knowledge of TDM requirements and compliance.

Knowledge of the Requirements

The developers or managers of 12 of the 45 projects (27 percent) for which contact could be made acknowledged awareness of at least one TDM requirement. Out of 21 projects in which more than one requirement was imposed, developers of 8 projects were aware of the requirements. However, two companies owned six of the projects. In all, only six companies in the area paid serious attention to the requirements. The two companies with more than one project with TDM requirements were among the biggest developers in the region and had a political and economic stake in successful relations with the jurisdiction. They were willing to comply with requirements they considered minor to preclude negative public opinion and higher mitigation costs. All four developers contacted who had both a sidewalk requirement and a generic TDM program requirement knew only about the sidewalk. Three projects reviewed had the single obligation to provide a free bus pass to first-time residents. Managers or developers of these projects were aware of the requirement. It is possible that in some cases developers claimed no knowledge of TDM requirements to cover their unwillingness to comply with them. In cases in which the researchers suspected this, they could not establish whether the requirements were just considered minor and thus ignored until the developer was questioned about their implementation or whether the TDM concept itself was not considered worthwhile. None of the 20 developers of projects with unspecified TDM program requirements was aware of any requirements.

Compliance with the Requirements

While the existence of TDM requirements on projects could be determined with Metro lists, no sources other than the developers themselves were available to establish compliance for all but two of the projects. Thus, compliance had to be determined by interviews with developers.

Of the 12 projects for which developers acknowledged the requirements, only 9 projects (75 percent) had been built and occupied by May 1990. Of these nine, the requirements of eight (89 percent) had been implemented at least in part. As stated earlier, four of them had only a single requirement, three to provide monthly bus passes, one to provide sidewalks. Four other developments, each with a different set of requirements, belonged to the two previously mentioned major development companies. At the time this study was conducted, two of them were just starting to implement the measures because they had been occupied only recently. One developer acknowledged the requirements in an interview and stated that they were minor both in costs and personnel, even though five different measures were required. However, he had not implemented them.

PERCEPTIONS OF DEVELOPERS AND MANAGERS

The information presented discussed in the following paragraphs was gained through informal interviews with devel-

TABLE 1 RESIDENTIAL PROJECTS: TDM MEASURES, KNOWLEDGE OF TDM REQUIREMENTS, AND THEIR IMPLEMENTATION

	Project			Amenities				Transit/Rideshare				Data		Subsidies		Developer		
Name	Units	Type	Built	Wal	Pad	Shel	Bik	Info	CIC	TC	Pro	Sur	Rep	Bus	Shu	Cont	Kno	Impl
The Park at Forbes Crk.	496	mf	X					X	X	X				X	X	X	X	X
Ballinger Commons	485	mf	X				X	X	X	X	X	X	X	X		X	X	X
Redondo Beach Club III	298	mf	X	X				X	X	X	X			X		X		
Riverview Apts	266	mf		X												X		
Emerald Glen II	261	mf			X	X		X		X			X	X		X		
Remington	260	sf	X					X		X		X				X	X	X
Emerald Glen	257	mf	X	X	X	X		X		X				X		X		
Glen Park I	250	mf	X		X			X	X	X	X			X		X	X	
Shadow Brooks	247	sf						X		X		X				X		
Timberline Ridge	242	sf						X						X		X		
Colony at Bear Creek II	238	mf	X				X	X						X		X		
Evergreen Heights	200	mf						X						X		X	X	
Newport Crossing Apts	192	mf		X				X		X	X	X	X	X		X	X	
Kenmore on the Park	180	mf		X												X		
Redondo Reach	167	mf						X		X		X		X		X		
Riverside Apts	150	mf	X											X		X	X	X
Cascade Terrace	144	mf	X											X		X	X	X
Kenmore	140	mf		X												X		
Westview Village	137	mf		X				X		X		X	X	X		X	X	
Silver Shadow Apts	132	mf	X	X		X		X		X				X		X		
White Gate	124	sf		X												X		
Juanita Shores	112	mf					X	X						X		X		
East Empire Gardens	103	mf		X					X									
High Point Park	100	sf					X	X	X	X				X		X		
Salmon Creek Apts	100	mf		X												X		
Westchester Estates	100	sf	X					X		X		X				X		
Terrace View Apts	78	mf					X	X						X		X		
Valley Faire	75	sf		X		X		X		X			X					
Hendrikson Apts.	62	mf							X									
Rainier Meadows Apts	62	mf	X	X												X	X	X
Campus Highlands	53	sf	X					X		X				X		X	X	X
Coal Creek	49	mf					X	X		X				X				
Waterfront Apts	44	mf	X											X		X	X	X
Johnson Court Apts	42	mf						X						X		X		
Queen Anne Apts	17	mf												X				
3515 Wallingfd. Ave N	8	mf												X				

LEGEND

Project: Units = Number of units; **Type** = type of development (sf = single family, mf = multiple family); **Built** = Indicates that project has been built

Amenities: Wal = sidewalk, **Pad** = bus pad, **Shel** = bus shelter, **Bik** = bicycle storage

Transit/Rideshare (Distribution of Information): **Info** = information distribution; **CIC** = commuter information center; **TC** = transportation coordinator; **Pro** = promotion

Data: (Collection of Information on Commuter Behavior) **Sur** = survey residents; **Rep** = report

Subsidies: Bus = bus pass; **Shu** = shuttle

Developer: Cont = Contacted by investigators; **Kno** = developer knows about requirements; **Imp** = developer has implemented requirements

opers and managers of a small number of residential projects. It is qualitative rather than quantitative and cannot be considered representative of all residential projects. It ranges from general data about the projects and their target clientele to more specific information on TDM program requirements.

New multifamily developments in the region for which this information had been gained were geared toward the middle- or upper-middle-class income range. None of the projects contained low-income housing. Background checks on prospective tenants of a sample of these developments, conducted at most new projects, exhibited average incomes between $36,000 and $43,000 per apartment. The turnover rates ranged between 5 and 10 percent per month, or around 75 percent per year, and were considered normal by their management.

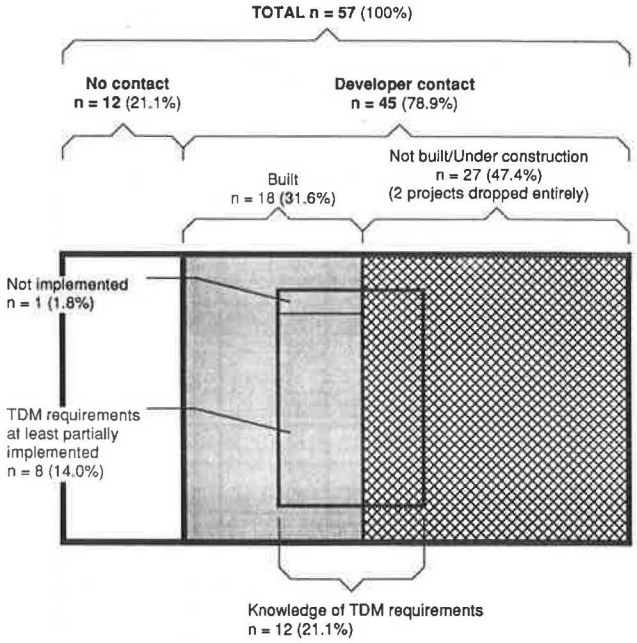

FIGURE 1 Breakdown of projects by knowledge of TDM requirements and compliance.

With the exception of the few projects within the city of Seattle for which the parking ratios were around 1.2 per apartment, the parking ratios on the suburban projects ranged from 1.6 to 2 spaces per apartment.

In general, the representatives of the development community were not interested in the TDM requirements on their projects. They did not consider them important and, for the most part, seemed either to be unaware of them or to be ignoring them. The only exceptions were two of the major companies in the area and developments in the city of Seattle, where all contacted developers complied with their requirements. Transportation issues such as access to transit or proximity of park-and-ride lots were not decision criteria in siting projects. Those developers who were aware of the requirements for their projects tended to be skeptical about the actual success of these programs.

None of the developers considered the requirements to provide information, a commuter information center, a bus pass, or a transportation coordinator a problem. Although no developer had kept track of the actual costs for these requirements, both financial and personnel costs were considered minor or negligible in comparison to the overall costs of the project. This was true both for projects where these TDM measures were implemented, with estimated costs in most cases below $1,000, as well as for projects whose developers were asked to estimate the potential costs of the above requirements for their projects. (A one-zone pass cost $26, and the distribution of information and passes was easily incorporated into the work of the project manager.) The only exception was the shuttle at the Park at Forbes Creek, where the ridership did not justify the expense. The shuttle was operated during peak hours and made two to three runs during each peak time. However, on average only five or six people per day had used it. According to the developer, operating costs were about $3,000 per month, and the resale value of the project would have decreased by $400,000 if this expense had continued.

However, much more concern was expressed about the high costs of physical requirements such as sidewalks and bus pads, which can run up to several tens of thousands of dollars. In one case, the requirement for a sidewalk along the project was at first overlooked by the developer but later enforced by the county. The company refrained from going to court only because of plans for a second project in the neighborhood of the first one. None of the developers who acknowledged the existence of requirements had any problems understanding or implementing them.

With one exception, all representatives of developers who actually contacted Metro to negotiate or implement its requirements were pleased with the support Metro staff had given them. Metro response was considered timely and adequate.

PERCEPTIONS OF RESIDENTS AND TENANTS

Previously unpublished surveys were conducted by Metro of residents of The Park at Forbes Creek and Ballinger Commons, two projects with TDM requirements, a focus group meeting, and comments from managers and developers. The limited number of cases did not warrant distinguishing of projects by external factors such as the level of transit service available or density around the projects.

Interviews with managers of multifamily developments revealed that the interest of residents in transit and carpool and vanpool options was small. If residents asked for transit information at all, which they rarely did, questions about directions and distance to the closest park-and-ride lot prevailed. To the knowledge of the developers and managers, there were no tenants who did not own a car and were thus dependent on transit. As the manager of one of the projects put it: "People who move here expect to use their cars."

The experience with the shuttle service at The Park at Forbes Creek confirmed this attitude. Here, the developer was required to provide free peak-hour shuttle services to the closest park-and-ride lot. Although The Park had close to 500 units and an occupancy rate of 95 percent, only five residents rode the shuttle on a regular basis. The shuttle service was discontinued after 9 months.

According to the manager, only 5 percent of Park residents took advantage of the substitute offer, a free 1-month, two-zone bus pass. For five other projects with a bus pass requirement, a similar response rate was reported. Although no figures on the actual number of requested bus passes could be obtained, the managers of these projects estimated that between 5 and 10 percent of the residents had asked for the passes. In most cases, the tenant was informed about the offer personally or through an information package on moving in. The only exception to this was Remington, a single-family project, at which about 40 percent of the residents had requested a bus pass. In that case, however, the offer was made at the project's well-attended first home owners association meeting, after the transportation management requirements had been introduced. Residents just checked their name on a list. At Ballinger Commons, the one project at which this

information was available, survey results indicated that the bus passes were used an average of 19 times during that month.

One other requirement on large multifamily projects was the provision of a commuter information center (CIC). According to the Ballinger Commons survey, despite the fact that 65 percent of the respondents knew about the existence of the CIC, only 11 percent had ever looked at it (n = 190). At The Park, 55 percent (n = 76) of the respondents had considered it very likely or somewhat likely that they would commute by bus, carpool, or vanpool if a CIC were available. However, The Park had a CIC and the management had gone to great effort to inform residents about the shuttle and other transit and ridesharing options, but only 23 percent of the respondents actually had used one of these modes of transportation. The manager even used the closed-circuit TV system of the project for promotion without, according to him, any success.

Participants of the focus group meeting at the single-family development stated that they would be more likely to take notice of transit or rideshare options if the information were provided in a regular newsletter, e.g., the monthly publication from the home owners association. They suggested the transportation coordinator on the project could be responsible for listing project residents who were interested in carpooling or vanpooling in the newsletter, including information from the ridesharing agency in the area, as well as transit information and updates.

Residents were asked about the likelihood that they would change their mode of transportation if someone at the residence would help them plan their commute. At The Park, where the shuttle service was provided, 38 percent of the respondents answered they were very likely or somewhat likely to change their commute behavior. At Ballinger Commons, 24 percent considered it very or somewhat likely. Interestingly, both projects had a TC requirement, and at both sites a representative of the management served in that position at the time the survey was conducted.

Several projects were required to provide secure bicycle storage facilities. When asked whether they would change their commute if bicycle facilities (bike paths, storage for bikes, and free loaner bikes to ride to a nearby park-and-ride lot) were provided, 38 percent of the respondents at The Park considered it very likely to somewhat likely. At Ballinger Commons, 7 percent considered it very likely or somewhat likely.

For reasons stated earlier, very little can be said about the effectiveness of different TDM measures on residential projects. It seems clear, however, that most residents are not interested in using HOV modes of transportation at projects without low-income housing. It is also not apparent to what extent people's stated willingness to change behavior will match their actual behavior over time. Studies carried out in other parts of the country that suggested that the location, size, and demography of the development can be important factors in the success of TDM programs, as well as land use patterns and zoning policies (*1,2*), were supported by the research for this project. However, further investigation is necessary to gain a clearer understanding of the relationship between those factors and the success of TDM measures and to enable jurisdictions and regions to develop packages of policies complementary to these factors.

IMPLEMENTATION PROBLEMS WITH EXISTING RESIDENTIAL TDM PROGRAMS

Because the original intent of the research could not be carried out because of the small number of developments with TDM programs, the researchers tried to identify reasons for this failure. In the process of research for this project, a number of problem areas were uncovered related to (a) the decision process that leads to TDM program requirements for residential projects, (b) institutional memory about the requirements, (c) monitoring, (d) enforcement, and (e) adequacy of the measures. The following is a description of these problems.

Decision Process Leading to the Imposition of Requirements

All projects listed in this study were assigned requirements under a case-by-case negotiation process as part of the State Environmental Policy Act (SEPA) review. Interviews with staff indicated that as of May 1990 none of the jurisdictions had established administrative guidelines or an ordinance imposing TDM requirements on residential developments, although efforts were under way to establish ordinances in all four jurisdictions. No performance goals had been established by any of the jurisdictions, either for the overall effect of TDM strategies on residential projects or for specific projects or classes of projects. King County, Kirkland, and Redmond usually required the developers of projects to contact Metro to negotiate the set of TDM measures appropriate for that project or to fulfill the requirements. However, procedures varied among jurisdictions.

Kirkland used a rule of thumb to decide on requirements for particular projects and had not established a coherent set of criteria or a consistent process. In Redmond, a project generally had TDM requirements if it contained more than 100 units. If it was close to a bus line, it was required to provide a bus pad and shelter as well as pedestrian access to that shelter. Further requirements were the distribution of information on transit and ridesharing options and a free 1-month bus pass over a varying period of time. However, the process was not well established and staff were not operating on a decisive set of criteria.

In the city of Seattle, residential projects with 20 or more parking spaces had TDM requirements. The Department of Engineering looked at the permit application for each project and could require further information. If deemed necessary, it might ask the Department of Construction and Land Use to request a traffic impact study. After review of all available information, the Department of Engineering would, in close cooperation with Metro, propose requirements such as bus passes or CICs, but the Department of Construction and Land Use was responsible for imposing the requirements. The department was not required to follow the Department of Engineering's suggestions. This process was followed for all types of projects within the jurisdiction of the city of Seattle under SEPA, including nonresidential land uses.

Unincorporated King County had tried to establish a process for assigning requirements to residential developments. In general, when a project was large enough to be required

to conduct a traffic impact study under SEPA, a special review process to include transportation demand management was triggered. The county then tried to ensure that Metro received a copy of the study. In turn, Metro was supposed to put together a set of requirements to recommend to the county. Because of a lack of an established procedure, this process collapsed. From then on, Metro was usually notified as part of the regular SEPA procedure for the project. Metro would work out a set of requirements in negotiation with the developer and send it to King County's Building and Land Development division to be included in further permit review and approval.

These processes allowed for a great amount of flexibility and thus enabled the planning staffs in each jurisdiction to set requirements for a project according to the unique situation of a site. This flexibility can be advantageous when new TDM measures are tested; however, it can also create a set of problems.

During the initial review, insufficiently trained staff may be unable to recognize the significance of a project because of inexperience with TDM programs on that type of project. They may use their discretion and decide that the project does not need mitigation, while it actually has unrecognized or underestimated impacts that justify TDM requirements. Although such requirements can still be imposed at a later stage, that is not likely to happen.

If there is no established process, implementation of TDM program measures is open to irregularities and—unintended—equity problems. As shown in Figure 2, there was no relation between the size of the project and the type or number of requirements imposed on that project, despite the fact that Metro, a single agency, established the requirements for the majority of developments in suburban areas. There were no clear thresholds for any given mitigation measure.

A further problem lay in the need to use SEPA procedures. First of all, only projects considered for SEPA review were considered for TDM requirements. Second, if a project had a large enough impact to justify transportation mitigation measures, they could be implemented in two ways: (a) if the project was considered insignificant under SEPA for all other issues, it had to receive a determination of insignificance that included the mitigation for transportation impacts; or (b) if a project was expected to have a significant impact under SEPA, an Environmental Impact Study would be required and transportation mitigation measures would result from that process. At the time that this paper was written, no process had been established to ensure that mitigation would occur.

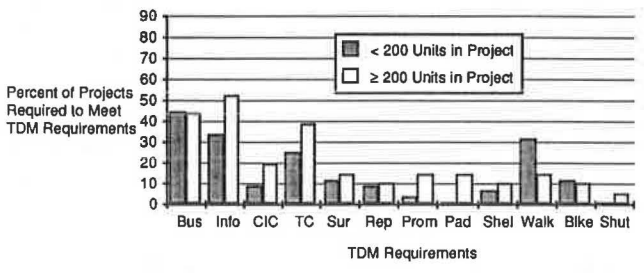

FIGURE 2 Relationship between TDM requirements and percent of projects required to meet those TDM requirements.

An additional problem was posed by the fact that the use of SEPA tended to curtail regional mitigation. Although one project by itself may not have a significant traffic impact, it can create problems if it is combined with other projects nearby. SW Campus Drive in Federal Way is a case in point. Campus Drive was a major development area in which several of the projects analyzed in this paper were located. In at least three cases, TDM measures were required for developments with more than one building phase, but only one of the phases had TDM requirements. One single-family development had five divisions totaling over 300 houses, but only one of its divisions, with about 60 houses, had TDM requirements. On at least one project, of about the same size as its neighbors, no requirements were imposed. SEPA theoretically requires consideration of cumulative impacts, but administratively, it is difficult to impose mitigation measures based on cumulative impacts. This difficulty was apparent in cases in which no procedure had been established, such as in the residential projects analyzed here.

In the Puget Sound region, the decision process using the case-by-case approach has proved to be too flexible. To ensure predictability and continuity, an ordinance must be developed that structures the requirements for residential developments or sets clear performance goals for the TDM program on the residential project. However, the development of an ordinance requires a certain amount of commitment by the jurisdictions to TDM requirements on residential projects. They need to decide what they want to achieve with the policy, relate it to their overall transportation goals, and determine how much staff and money they are willing to commit to the effort.

Institutional Memory of the Requirements

According to officials, none of the jurisdictions that had residential developments with TDM requirements had a compliance tracking system at the time that this paper was written. Thus, information on requirements on developments could and did get lost. Even for the city of Seattle, which had a process to determine the significance of applications, information proved to be incomplete. A representative of the county conceded that under the present system, information on transportation mitigation requirements could get lost when the application went through the subsequent stages. Thus, Metro could have projects on file that were supposed to implement TDM measures, but the county did not have notice of any requirements on the same project.

As described earlier, only a small percentage of the developers contacted claimed awareness of the requirements on their projects. Although some lack of knowledge can be explained by the lack of a jurisdictional tracking system and active enforcement, there were other reasons for this phenomenon. At the developer's office, the person who guided a project through the permit application process was not necessarily the person who would be responsible for it when the time came to implement the requirements. This problem could be true even within the same company. Interviews with developers indicated in at least three cases that the agent responsible for a project changed during the course of this investigation. Even though the first respondent had been aware

of the requirements imposed on the project or was in the process of negotiating them, the next person did not know about them. In another case, the respondent said that he had just taken over the project, had found reference to the mitigation requirements only by chance, and was starting to negotiate them.

Further complicating the transfer of information is the fact that, commonly, development companies hand a project over to a management company once it is occupied. Although the agent in the developer's office may be aware of the requirements, on-site management may not be informed. In at least one case, the researchers observed that information on requirements was lost in the transferral process. One developer mentioned that a 1986 change in tax law complicated the process of information transmission. The law made it more profitable for developers to sell their projects shortly after they were finished and occupied and thus increased the percentage of projects being sold shortly after completion.

Institutional memory is an important factor in ensuring compliance with TDM requirements. The analysis of existing projects and requirements indicated that both the staff at the jurisdictions and the developers, managers, and owners of residential projects often did not know about the requirements of the project (or in the case of the developer or manager, claimed not to know about them).

In order to ensure that the information does not get lost both at the jurisdiction's and the developer's offices, the TDM ordinance should have clearly defined objectives and requirements. It is important to tie the requirements explicitly to the land, independent of ownership or control of the project.

Monitoring Compliance

A monitoring mechanism is needed to ensure compliance with the mitigation measures and to determine whether the developer has made a "good faith" effort to implement the mitigation measures within a reasonable time frame and at an acceptable level of quality. Furthermore, monitoring is particularly important for a new set of rules and requirements (such as transportation mitigation measures for residential developments) to enable the jurisdictions, Metro, and developers to examine the usefulness of the measures or sets of measures and to modify them accordingly.

At the time that this paper was written, monitoring of compliance with mitigation measures in the Puget Sound region was limited. This lack of attention could explain in part why so few developers responded that they knew about the measures. None of the jurisdictions had established a process of monitoring compliance, nor was any of them monitoring projects with TDM requirements on an informal basis. However, there were a few exceptions.

In the case of The Park at Forbes Creek, the developer had completed the negotiation process with Metro and complied with all requirements, including the shuttle, and the project had been monitored by Metro. Without Metro's interest in the shuttle and its ridership problems, and without the developer's desire to make the project work, Metro would not normally have monitored it so closely. According to the developer, one staff member of the city of Kirkland, where the project was located, made "a few informal phone calls." None of the other four projects with requirements belonging to that company had been closely monitored.

Apart from that, monitoring occurred only when mitigation measures required physical structures such as sidewalks or bus pads and shelters, or, as in the city of Seattle, CICs. In one case in the city of Seattle, compliance with a CIC requirement was monitored when the Certificate of Occupancy was issued, but there was no follow up.

None of the jurisdictions in the Puget Sound area effectively monitored the projects, except when physical structures such as sidewalks were required. Thus, neither the effectiveness of the existing mitigation measures nor compliance with the TDM requirements could be established.

Enforcement of Compliance

Enforcement of mitigation measures should not be necessary if the developer makes an earnest effort to comply with them and make them work. However, jurisdictions need to establish a legal basis for enforcement so that violations can be pursued.

Because none of the jurisdictions had effectively monitored compliance with TDM requirements on residential developments or established any performance goals, it is not surprising that none of the jurisdictions in the Puget Sound area had established penalties for noncompliance when this analysis was conducted. Again, the only exceptions seemed physical structures such as sidewalks and the shuttle at The Park at Forbes Creek. The shuttle at The Park was the only requirement for which performance goals had been established on any of the projects.

However, in order to set performance goals for the traffic mitigation measures on a residential development, the jurisdiction must first decide what it wants to achieve with its residential TDM programs; that is, it must establish its role in achieving its overall transportation goals. It then must determine how close to achieving these goals it can come, given its financial, personnel, and political situation, and adjust them accordingly. Only if a realistic and feasible balance between the goals of mitigation measures and the administrative capacity is achieved can transportation mitigation requirements be monitored and enforced effectively and the credibility of the program be ensured.

Adequacy of TDM Requirements

Even if the developer makes a good faith effort to implement the requirements imposed on the project, they will not necessarily result in a significant or recognizable change in commuting habits. The experience with the free shuttle service at The Park at Forbes Creek, where the developer made every effort to make it work, is a case in point. Obviously, it was not the appropriate measure, given the location of The Park and the demographic composition of its residents. Other examples include projects located on Campus Drive South West in Federal Way. Campus Drive South West is a new development area with about 3,000 new apartments and houses. It does not have walking access to a bus line, only driving access to a park-and-ride lot. However, three of the projects with TDM requirements had a bus pass requirement.

Other factors, such as the proximity and convenience of transit service; the destination and length of commute trips; transportation and parking management at the work site; size, design, and lay-out factors at both the residential site and work site; as well as land use and zoning decisions are important determinants that can potentially overwhelm all incentives resulting from the mitigation measures. As authors such as Robert Cervero (*1*) demonstrate, land use and zoning policies are also important factors in a successful TDM program.

RECOMMENDATIONS

This section provides four different approaches to designing TDM ordinances for residential developments that mitigate the implementation problems presented earlier. Both a study on existing TDM ordinances, including requirements from residential developments in other parts of the country (*3*), as well as information from personal communication with staff from these jurisdictions are included here.

The first step for each jurisdiction considering TDM requirements on residential developments should be to decide what it wants to achieve with that policy. The policy must be consistent with the overall transportation goals for the jurisdiction and the region, and the land use and zoning laws. Once the jurisdiction has decided to implement TDM measures on residential developments, it must make the commitment to follow through. In addition, the jurisdiction needs to ensure that the costs of the TDM strategies for the developer are scaled to their potential impact. The local jurisdiction should be able to afford the administrative costs to monitor compliance with requirements and to enforce them. The next step is to balance all of the factors against the political climate in which the jurisdiction operates and to decide on a policy. The research for this report has illustrated the results when jurisdictions have not taken these steps carefully enough.

Four different approaches to a TDM ordinance for residential developments appear possible after consideration of these issues. The first one is to develop an ordinance requiring minimum size thresholds for increasing sets of requirements. The bigger the project is, the larger is the number of requirements and the higher the costs. The developer is not required to meet any performance goals apart from the implementation of the measures themselves. This approach is appropriate for jurisdictions where transportation problems are heavy enough to warrant action, but not heavy enough to demand more stringent requirements. It is also most appropriate for small projects and is used for commercial developments by many jurisdictions in the country. It ensures predictability and continuity and is fairly easy to monitor. Because the requirements are clearly stated for each size of development, the information on them cannot get lost. However, this approach cannot ensure that the requirements are adequate for that particular project, and enforcement may prove difficult in particular if the requirement is not quite appropriate. North Brunswick, New Jersey, applies this approach to residential developments (*3*).

In order to avoid the problem of potential inadequacy of required TDM measures on a residential development, the jurisdiction may, in a second approach, decide to put the choice of the TDM program measures into the hands of the developer. Although a basic set of measures should be carried out for each project, the developer must then choose further measures from a list of additional requirements to tailor the TDM program as closely to the development as possible. This second approach is particularly appropriate for larger developments. The jurisdiction reviews the TDM program, approves it if it is considered appropriate for the project, and issues a transportation special use permit. The permit is tied to the land; therefore, the information on the requirements cannot get lost. It can be revoked if the jurisdiction finds that the development's TDM requirements are not carried out adequately. This mechanism is used in Alexandria, Virginia, for residential projects of 250 or more units (*3*).

In order to ensure compliance under both approaches, the jurisdiction may decide to require the developer, manager, or owner to pay an annual fee for each unit into a fund or performance bond. The developer can then use the fund to comply with the requirements, for example, buy bus passes. Should the jurisdiction determine that compliance is inadequate, it can use the funds to finance TDM programs. If the developer is found to have made a good faith effort, he or she may be allowed to incorporate the remaining funds into the next year's program. The policy may also allow the developers to organize themselves into Transportation Management Associations in coordination with commercial areas in order to pool resources and efforts.

The third approach is a variation to the second approach. Implementation of this approach is dependent on the severity of transportation problems in the area and the political feasibility of even stronger requirements. The jurisdiction sets performance goals and leaves the choice of TDM measures up to the developer.

A fourth approach, even more stringent than the previous ones, is to require the developer to mitigate the projected traffic impact of the development before it has been built by devising and implementing a TDM program on an already existing project. The developer does not receive a building permit before the performance goal for the TDM measures has been reached. This approach requires a high degree of commitment from the jurisdiction and is politically feasible only if the transportation system in the jurisdiction or region cannot be eroded any further. To simplify the monitoring process for the jurisdiction, each TDM program's process has to be reported to the jurisdiction on a regular basis. To ensure the correctness of these reports, a process that requires the developer to pay for an independent audit mechanism in addition to the self-monitoring process is an appropriate solution. This method is successful in Montgomery County, Maryland, despite the fact that it creates equity problems (*4*).

CONCLUSION

The quantitative evaluation of TDM requirements on residential projects in suburban Puget Sound proved difficult, because only a small number of projects had implemented these measures. However, the analysis of available quantitative and qualitative information pointed out implementation problems related to (a) the decision process leading to the

imposition of mitigation requirements, (b) institutional memory of requirements, (c) monitoring, (d) enforcement of compliance, and (e) adequacy of mitigation requirements.

The research presented indicates the dilemma many jurisdictions face. The case-by-case approach to transportation demand management on residential projects used by King County, Kirkland, and Redmond leaves both the staff of the jurisdictions, as well as the developer, with too many uncertainties about their respective responsibilities and creates equity problems. It does not send a strong enough signal of commitment on the part of the jurisdictions and allows developers to ignore or overlook their responsibilities. On the other hand, the evaluation of existing projects with implemented TDM measures has proved the importance of tailoring requirements to that particular development, as well as the area in which it is located.

Transportation demand management at residential projects, like any other policy, needs clearly defined and measurable goals and commitment by the local jurisdiction. It has to be integrated in a wider framework of local and regional transportation planning, balanced with the land use and zoning policies of the jurisdiction and the region, and it has to account for the financial and personnel capacity of the jurisdiction. A stringent and well-considered TDM ordinance for residential developments is worthless if it cannot be monitored and enforced, if it is not linked to land use and zoning policies, or if the political climate does not allow for the level of commitment on the part of the jurisdiction necessary to make the envisioned residential TDM policy feasible. Thus, it is necessary to make a decision between the need for clear thresholds, a well-structured ordinance, and the particular requirements of the project, while keeping the tradeoffs between them in mind. The success of development, imposition, monitoring, and enforcement of TDM measures on residential developments is not only dependent on the quality of the implementation of these strategies but also on other factors such as land use and zoning policies. However, in implementing TDM ordinances for residential projects jurisdictions have a number of options for mitigating the implementation problems.

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