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16. Abstract This study examines telecommuting programs at six agencies and businesses within Texas. The characteristics of the programs are summarized and the experiences with telecommuting are presented. Available reports, interviews with management personnel and telecommuters, and surveys of telecommuters are used to assess the telecommuting programs at the eight case study sites. Additional information is also summarized on other activities at the state and national levels. The study summarizes the sketch planning tools for assessing the potential for telecommuting in major Texas cities and for analyzing the impacts on the transportation system developed in an early phase of the project. Key elements of successful telecommuting programs are identified and policies the state and other groups can use to support telecommuting are outlined. Recommendations for implementing the results of the research are also identified.					
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TELECOMMUTING PROGRAMS IN TEXAS: CASE STUDIES

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IMPLEMENTATION STATEMENT

Addressing concerns related to traffic congestion and air quality is a major focus in many metropolitan areas in Texas and throughout the country. A wide range of travel demand management (TDM) techniques and other strategies are being considered and implemented to help address these issues. Telecommuting is one potential approach to help reduce demand on the transportation system.

This study examines the telecommuting programs at six case study sites in Texas. The characteristics of each program are presented and the experiences to date with telecommuting are summarized. The case studies document the results of interviews with management personnel and telecommuters, surveys of telecommuters, and information from the agencies and businesses. Researchers used the case study results to outline key elements of successful telecommuting programs, to identify policies the state and other groups could use to support telecommuting, and to review the sketch planning tools developed in the first phase of the research study.

The report also presents recommendations for implementing the policies and strategies for encouraging more wide spread use of telecommuting. The study and this report will be of benefit to the Texas Department of Transportation (TxDOT), other state agencies, metropolitan planning organizations, and public and private sector employers interested in maximizing the benefits of telecommuting programs.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration (FHWA) or the Texas Department of Transportation (TxDOT). This report does not constitute a standard, specification, or regulation.

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SUMMARY

INTRODUCTION

Traffic congestion and air quality are significant concerns in most metropolitan areas throughout Texas and the United States. A wide range of travel demand management (TDM) techniques and other strategies are being considered and implemented to help address these issues. Telecommuting represents one potential technique to help reduce demand on the transportation system. Telecommuting includes a variety of non-standard employment arrangements allowing employees to work at home or at other locations. By removing vehicles from the roadway system during peak-periods, telecommuting helps reduce congestion levels, improve air quality, and decrease energy consumption. Telecommuting programs also benefit employers and employees through reducing office space needs, improving productivity, and allowing greater flexibility for individual workers.

This research project was undertaken to enhance the understanding of telecommuting at the state and national levels. The study examines the potential benefits of telecommuting, identifies key elements of successful programs, and outlines policies the state and other groups can use to further encourage telecommuting. The study also presents sketch planning techniques for estimating the potential for telecommuting in major metropolitan areas in the state and the possible impacts of telecommuting on the transportation system.

RESEARCH APPROACH

A state-of-the-art literature review was conducted during the first year of the research study to provide a historical perspective on telecommuting and to examine the current status of programs throughout the country. Documented benefits and issues were examined, along with the impacts of telecommuting on the transportation system, air quality, and energy consumption. Researchers reviewed information from the Employee Trip Reduction (ETR) plans submitted by employers in Houston, surveys of HOV lane users and non-users in Houston and Dallas, and discussion groups in Houston, Dallas, and Austin to further identify the interest of employers and employees in telecommuting. Current methodologies for estimating the potential transportation impacts of telecommuting were reviewed and sketch planning techniques for use in Texas were presented.

Detailed case studies of telecommuting programs at six agencies and businesses in the state were conducted during the second year of the project. The case studies included the City of San Antonio Information Services Department, Mobil Oil Corporation in Dallas, Rice University in

Houston, the State of Texas Comptroller of Public Accounts and the Texas Work Force Commission in Austin, and the Texas Natural Resource Conservation Commission (TNRCC) Region 12 Office in Houston. Each case study included a review of available reports and information, interviews with management personnel and telecommuters, and surveys of telecommuters. Researchers used the case study results and the findings from phase one to refine the sketch planning techniques, to identify key elements of successful programs, to outline policies the state and other groups can use to encourage telecommuting, and to develop potential implementation strategies.

RESEARCH RESULTS

The results of this research study indicate that telecommuting programs are being used successfully by private businesses and public agencies in Texas. A variety of approaches are in use, including full-time and part-time telecommuting and formal and informal programs. Employers and employees are benefiting from telecommuting, and the programs are having positive impacts on the transportation system. The following points summarize the major highlights from the research study.

Texas Case Studies

- The programs at the six case study sites include formal and informal efforts, as well as full-time and part-time telecommuters. Five of the six programs have formal guidelines and require signed agreements between the telecommuters and their supervisors. One program involves full-time telecommuters, while the other five allow telecommuting one or two days a week.
- The formal policies and guidelines in use with five of the programs address the roles and responsibilities of the employer and the telecommuter. Although differences exist, the guidelines share a number of common features. These include establishing telecommuting as a management option, not an employee benefit; recognizing that participation is voluntary; identifying the requirements for employee selection and participation; outlining the home office work environment; establishing the expectations for telecommuters and supervisors; addressing equipment, software, and confidential work material issues; identifying the work hours and communication requirements; establishing that telecommuting is not a substitute for child or dependant care; and discussing termination of telecommuting.

- Many of the guidelines also provide suggestions for both telecommuters and their supervisors on establishing good working habits, getting organized, and developing techniques for regular communication.
- Formal training programs for telecommuters and their supervisors are used at two of the case study sites, but all groups reported either formal advisory committees or informal networks. These groups provide telecommuters and supervisors with the opportunity to interact and to discuss potential problems, needs, and other items.
- Formal agreements are used with five of the six programs examined in this study. The agreements are simple and address the roles and responsibilities of the employer and the telecommuter. The agreements, which are signed by both the telecommuter and the supervisor, govern participation in the program.
- Although a wide range of equipment is used by telecommuters at the six case study sites, the technology sophistication of the different programs varies. In some cases, second telephone lines are put in and links to the main computer systems are provided. In other cases, telecommuters use laptop computers and check in by telephone.
- The sketch planning tool developed as part of the phase one research activities helps identify the potential for telecommuting in major urban areas in Texas. The Standard Industrial Codes (SIC) with the greatest potential for telecommuting include educational services; health services; manufacturing - durable goods; business and repair services; mining; communications and public utilities; public administration; finance, insurance, and real estate; other professional and related services; and wholesale trade.
- Although the case studies document that telecommuting programs are being successfully used in public agencies and businesses in Texas, there appears to be some hesitancy to consider telecommuting on the part of both public and private sector groups. For example, the analysis of the Houston ETR plans conducted in phase one identified a number of employers planning to offer telecommuting programs. When contacted by TTI researchers in the second phase, many of these employers indicated that telecommuting had been dropped from consideration once the ETR program was made voluntary. The most frequently cited reasons for no longer considering telecommuting were management concerns about lack of employee supervision and potential abuse by employees.

Benefits

- The case studies and the literature review identified a number of benefits from telecommuting for employers, employees, the transportation system, the environment, and other groups.
- Supervisors and telecommuters at all of the case study sites indicated that the telecommuting programs were working well and that no significant problems had been encountered. A variety of different methods were reported for ensuring communication between supervisors and telecommuters, and both groups reported some changes in work style to focus more on tangible products and results.
- Employer benefits from telecommuting programs at the six case study sites and at the national level included increases in employee productivity, morale, and commitment; decreases in sick leave; and improvements in retaining valuable employees and attracting new staff members. Some of the national case studies, and one of the Texas programs, also reported cost savings through reduced office and parking space needs.
- Benefits reported by telecommuters included reductions in the stress, time, and costs associated with commuting; increases in productivity, morale, job satisfaction, and responsibility; improvements in balancing job and family responsibilities; and enhancements in dealing with special situations.
- The results from the Telecommuter surveys help document the benefits to the transportation system from the programs at the six case study sites. The 21 individuals surveyed averaged savings of approximately 61 kilometers per one-way trip or 122 kilometers round trip on the days they telecommute. Only two of the survey respondents reported making regular trips on telecommuting days. Both of these individuals made trips to and from day care. These trips were approximately two and five kilometers, compared to their normal commute trip of 52 and 61 kilometers. The corresponding reduction in vehicle kilometers of travel (VKT) results in lower automobile emission levels and enhanced air quality levels. The sketch planning tool developed in phase one can be used to help estimate potential reductions in emissions and energy savings from telecommuting.

Keys to Successful Programs

The interviews with telecommuters and supervisors at the six case study sites and the review of the national experience with telecommuting provide insight into the components of

successful telecommuting programs. The following elements appear to be important in helping to ensure the success of a telecommuting program and in maximizing the potential benefits to all groups.

- **Top Management Involvement.** Support from the top management in a business or agency is critical to the successful development and implementation of a telecommuting program. Managers and supervisors must be willing to provide any necessary financial support, as well as changes in policies and procedures.
- **Telecommuting Policies and Guidelines.** Although not found with all of the case studies, clearly defined program policies and guidelines appear to be an important component of most successful telecommuting programs. These guidelines outline the expectations and responsibilities of both management and telecommuters and establish the parameters for the program. Signed agreements between telecommuters and their supervisors are also a common feature of most programs.
- **Selection of Job Tasks.** Identifying the types of jobs that can be accomplished from home or a remote work site is important. Most program guidelines outline the types of jobs and tasks that will be considered for telecommuting. Characteristics of appropriate jobs for telecommuting include those which do not require extensive interaction with the public or co-workers, data intensive tasks, report writing, and other related activities.
- **Selection of Telecommuters.** Not all employees have the skills and personality to be telecommuters. The guidelines and selection processes used at the Texas case study sites focus on employees who are self-motivated and self-starters, can work independently, have extensive experience, and work well without supervision.
- **Selection of Managers and Supervisors.** The selection of managers and supervisors is also given extensive consideration at the case study sites. Characteristics identified for supervisors of telecommuters include managing by objective, trust in employees, and good communication skills. In addition, many of the supervisors at the case study sites indicated they telecommute on a periodic basis. This allows them to better understand the needs of their telecommuting employees and provides the opportunity to benefit from telecommuting themselves.
- **Establishing Communication Methods.** Both supervisors and telecommuters stressed the importance of establishing regular methods of communication. Techniques reported included calling supervisors at the start of work on telecommuting days, establishing regular times for phone calls, using e-mail and

paggers, establishing regular work hours, and making arrangements in case of an emergency.

- **Equipment and Support.** Ensuring that telecommuters have the equipment necessary to perform their jobs is an important component of successful programs. The exact type of equipment, possible cost sharing arrangements, and the requirements for use varies by program.
- **Ongoing Monitoring.** Most of the Texas case study telecommuting programs reported some type of monitoring program, evaluation effort, or advisory committee. These activities can help address and resolve problems which may arise and can assist in documenting the benefits from telecommuting.

Supporting Policies

The research results also identified a number of policies and activities that can be used to encourage telecommuting. The following policies and activities may be appropriate for state agencies and other groups to consider to promote more widespread use of telecommuting.

- **Federal, State, and Local Legislation and Policies.** Legislative mandates or policies that encourage telecommuting can be enacted at the federal, state, and local levels. For example, the 1990 Clean Air Act Amendments, and the subsequent ETR program in severe and serious air quality non-attainment areas resulted in the consideration of telecommuting in Houston and other areas. In addition, a number of the agency representatives interviewed for the Texas case studies noted that the 1993 state legislative resolution encouraging state agencies to investigate and implement telecommuting programs to reduce the cost of state government helped in the development of their telecommuting programs.
- **Public Information and Promotions.** Agencies at all levels can continue to promote telecommuting through a number of methods. Public information campaigns and targeted marketing efforts can be used to communicate the benefits of telecommuting to all groups. Building on current activities, such as the *Home Office 2000* contests in the Dallas/Fort Worth area, can help maximize resources.
- **Encourage Telecommuting within Public Sector Agencies.** Leading by example, through the implementation of telecommuting programs, represents another approach public agencies may wish to pursue to encourage more widespread use of telecommuting. Establishing telecommuting programs shows

a commitment that may encourage private businesses, as well as other public agencies, to follow.

IMPLEMENTATION STRATEGIES

A number of techniques are appropriate for TxDOT and other groups to consider to help support and promote telecommuting efforts in the state. The following strategies could be used to implement the findings of the research project.

- **Agency Policy and Program.** TxDOT can implement the telecommuting program developed by staff and endorsed by senior management. This approach would allow the Department to lead by example.
- **Videos.** TxDOT, or other groups, could produce a video highlighting the various approaches to telecommuting, the benefits, the keys to successful programs, and the Texas case studies.
- **Workshops or Training Courses.** TxDOT, or other groups, could develop and offer seminars, workshops, and training courses on telecommuting. The various approaches to telecommuting, the development of successful programs, the benefits of telecommuting, and other information could be presented at these sessions.
- **Establish Peer-to-Peer Network.** This strategy would develop a peer-to-peer network to provide opportunities for managers to talk to their counterparts in other agencies or businesses. Such a network could help overcome management fears about losing direct supervision of telecommuters and could provide an ongoing mechanism for communication among management personnel.
- **Educational Outreach Programs.** TxDOT, other state agencies, and local organizations could develop and implement state-wide and regional educational and promotional programs to encourage telecommuting.
- **Technical Assistance.** TxDOT, or other groups, could provide ongoing technical assistance to agencies and businesses establishing telecommuting programs.
- **Use of Advanced Technologies.** Information on telecommuting could be provided on electronic mail, a Home Page on the World Wide Web, and video and teleconferencing.

CHAPTER ONE—INTRODUCTION

Traffic congestion and air quality are significant concerns in most metropolitan areas throughout Texas and the United States. Locations designated by the Environmental Protection Agency (EPA) as air quality non-attainment areas must meet additional requirements to reduce vehicle kilometers of travel and to increase the use of high-occupancy vehicles (HOVs) and alternative commute modes. A wide range of travel demand management (TDM) techniques and other strategies are being considered and implemented to help address these issues.

Telecommuting is one potential technique to help reduce demand on the transportation system. Telecommuting includes a variety of non-standard employment arrangements allowing employees to work at home or at other locations. By removing vehicles from the roadway system during the peak-periods, telecommuting helps reduce congestion levels, improve air quality, and decrease energy consumption. Telecommuting programs may also benefit employers and employees through reducing office space needs, improving productivity, and allowing greater flexibility for individual workers.

Telecommuting is a relatively new approach to work arrangements. The recent increase in telecommuting is largely attributed to rapid advancements in telecommunications and computer technologies. The extent of telecommuting, as well as the potential impact of telecommuting on the transportation system, employers, and employees is not well known. In addition, as a non-traditional work arrangement, a number of concerns are often associated with telecommuting. These include issues related to management, employees, the legal environment, and the transportation system. The successful widespread use of telecommuting will require that these concerns be examined and addressed.

This research study examined the experience with telecommuting programs within Texas and throughout the country. The first phase of the project reviewed national and state telecommuting programs and developed sketch planning tools for estimating the potential for telecommuting in major metropolitan areas in the state and the possible impacts of telecommuting on the transportation system. The second phase of the research study, which is documented in this report, examined telecommuting programs at six case study sites in the state. The case studies included a mix of public agencies and private businesses, as well as a variety of geographical locations within the state. TTI researchers interviewed management personnel and telecommuters at each case study site, surveyed telecommuters, and reviewed available information. The results of phase one and the case studies were used to identify keys to successful telecommuting programs, policies the state and other groups can use to encourage telecommuting, and techniques to implement the research findings.

OBJECTIVES OF RESEARCH STUDY

This research project accomplishes a number of objectives. The study provides a better understanding of the experience with telecommuting at public agencies and private businesses in Texas. The case studies of six telecommuting programs in Texas help to identify the benefits of telecommuting to employers, employees, the public, and the transportation system. Keys to successful programs are identified, along with policies the state and other groups can use to encourage telecommuting. The sketch planning tools developed in phase one for analyzing the potential of telecommuting in Texas cities and for assessing the possible impacts on the transportation system can be used to estimate the general extent and influence of telecommuting in different metropolitan areas in the state.

RESEARCH ACTIVITIES

Researchers conducted a number of activities to accomplish the previous objectives. In phase one, a state-of-the-art literature review provided a historical perspective on telecommuting, as well as the current status of programs throughout the country (1). Documented benefits and issues were examined, along with the impacts of telecommuting on the transportation system, air quality levels, and energy consumption. Information obtained through other research projects provided additional insight into telecommuting in Texas (2, 3, 4). The Employee Trip Reduction (ETR) Plans submitted by employers in Houston, surveys of HOV lane users and non-users in Houston and Dallas, and discussion groups in Houston, Dallas, and Austin all helped to further identify the interest of employers and employees in telecommuting. Current methodologies for estimating the potential transportation impacts of telecommuting were also reviewed and sketch planning techniques for use in Texas were presented.

Detailed case studies of telecommuting programs at six agencies and businesses in the state were conducted in phase two. The case studies included the City of San Antonio Information Services Department, Mobil Oil Corporation in Dallas, Rice University in Houston, the State of Texas Comptroller of Public Accounts and the Texas Work Force Commission in Austin, and the Texas Natural Resource Conservation Commission (TNRCC) Region 12 Office in Houston. The case studies were selected to provide a mix of agencies and businesses, work settings, geographical locations, and telecommuting programs. Each case study included a review of available reports and information, interviews with management personnel and telecommuters, and surveys of telecommuters. The case study results and the findings from phase one were used to refine the sketch planning techniques, to identify key elements of successful programs, to identify policies the state and other groups can use to encourage telecommuting, and to develop potential implementation strategies.

ORGANIZATION OF THIS REPORT

This report is divided into five chapters following the introduction. Chapter Two provides an overview of telecommuting and discusses the various approaches to telecommuting. Chapter Three presents the results of the case studies of telecommuting programs at six agencies and businesses in Texas. The characteristics of each telecommuting program are summarized, along with the experience to date. Information is also provided on other telecommuting activities in the state. The sketch planning tools developed in phase one for estimating the general extent of telecommuting and the influence of telecommuting programs on the transportation system are summarized in Chapter Four. Chapter Five identifies the benefits of telecommuting and the keys to successful programs. It also outlines policies that the state and other groups could use to encourage telecommuting. The report concludes with a set of recommendations on strategies and techniques that can be used to implement the research findings.

CHAPTER TWO—OVERVIEW OF TELECOMMUTING

BACKGROUND

Telecommuting encompasses a wide range of approaches involving non-traditional work arrangements. Rather than moving people to work, telecommuting focuses on moving work to people. Telecommuting is most commonly thought of as employees working full-time or part-time at home. It may also include employees working at a satellite center, conducting sales or services from home or personal vehicles, and working in clients' offices.

Current estimates by the U.S. Department of Transportation and other groups indicate that approximately 30 percent of the American labor force now works at home at least part of the time. While these may not all be telecommuters, some two to seven million workers are estimated to be full-time employees who would otherwise be commuting daily to work (5). Initial telecommuting demonstration projects have been implemented in Hawaii (6), California (7), and the Seattle area (8). Further, private companies and public agencies in different areas have initiated telecommuting programs for various reasons.

The potential for telecommuting has been estimated to reach 15 million workers in the next decade (5). A number of factors will influence the widespread use of telecommuting and the ability to reach this target. These include the nature of businesses, specific work tasks, management structures, employee characteristics, costs, legal issues, traffic congestion levels, air quality concerns, and advances in technologies. This chapter summarizes the various approaches to telecommuting and highlights a few examples of telecommuting programs throughout the country.

APPROACHES TO TELECOMMUTING

Telecommuting involves non-traditional forms of working which eliminates the need for an employee to commute on a daily basis to a central employment location. Telecommuting may involve the use of advanced communications technology, or it may just focus on doing regular work tasks outside the office. Home-based telecommuting is the most familiar form of telecommuting. In this case, a telecommuter is an employee of an organization who completes certain tasks at home and communicates with the organization's main office by telephone, computer modem, or other means. Telecommuting may also involve mobile workers, home-based business owners, and employees working at satellite, local, or neighborhood centers. Examples of the various approaches to telecommuting are summarized below.

- **Telecommuting—Working at Home.** The most common form of telecommuting involves an employee working full-time or part-time at home. Under this approach, an employee may work on a daily basis from home, or may work one or two days a week or month from home. This approach may include the use of advanced technologies—such as equipping a home office with a computer, fax, and modem—or it may simply involve conducting work tasks—such as reading reports or reviewing plan specifications—at home.
- **Telecommuting—Hoteling or Free Addressing.** These are terms used to describe employees who spend most of their time in a client's office. They may have temporary work space, usually in the form of cubicles or offices that are shared with others, at their own office. Accountants or auditors who spend most of their time in a client's office provide an example of this form of telecommuting (9).
- **Telecommuting—Mobile Workers or Virtual Offices.** Sales and marketing staff often use these approaches. Using notebook computers, faxes, modems, and cellular telephones, sales personnel may spend most of their time working from home or their automobile, with only periodic trips to their main office for meetings and other business (10).
- **Telecommuting—Home-Based Businesses.** This approach to telecommuting focuses on self-employed or other home-based businesses. Examples include contractors who spend most of their time on-site, freelance writers, and desktop publishers (11).
- **Telecommuting—Satellite Centers.** Satellite centers are usually defined as branch offices of a company that are located close to an employee's residence. Typically, about 20 to 100 employees from an organization will work out of a single satellite center (7).
- **Telecommuting—Local Centers.** Local centers usually provide office space for employees from multiple organizations. The employees may share space and equipment, and there is generally a site manager in charge of the facility (7).
- **Telecommuting—Neighborhood Centers.** Neighborhood centers are defined as smaller facilities, with usually less than 25 workers from one or several different organizations. Neighborhood centers are often within walking or bicycling distance from workers' homes (7).

The major focus of this research study is on the first group of telecommuters—employees of public agencies or businesses who work at home on a daily or part-time basis. Although the

other techniques are examined, the first approach has the greatest potential for widespread use in Texas. As a result, it formed the major focus for the study.

NATIONAL EXAMPLES OF TELECOMMUTING PROGRAMS

A number of public agencies and private businesses throughout the country have implemented telecommuting programs. Highlights of a few examples of these programs follow.

- **Hawaii Telework Center.** A combination of public and private sector groups sponsor the Hawaii Telework Center Demonstration Project. The project involves employees from the Bank of Hawaii, IBM Corporation, Inter-Island Legal Services, Hawaii Medical Services Association, and Title Guaranty of Hawaii, as well as a number of state employees. The telework facility is located in the suburb of Mililani, Oahu, approximately 32 kilometers from downtown Honolulu. The companies lease office space and provide computer equipment, telecommunication services, and other related equipment. The Hawaii State Legislature provided \$125,000 to help initiate the project. Employees report reductions in trips, travel time, and fuel consumption and an increase in productivity and job satisfaction (12).
- **Harris Bank, Chicago.** The Harris Bank in Chicago has offered telecommuting as one option in the company's Alternative Work Arrangements program. While the formal policy for telecommuting was still under development, some individual managers within the bank started pilot programs within their own departments. Many employees who chose to try telecommuting already owned computers and modems (13).
- **Bell Atlantic.** Bell Atlantic has conducted two pilot tests to help develop its telecommuting policies. Currently, approximately 500 employees telecommute for one to three days per week. Telecommuting employees are expected to purchase their own computers and related equipment, although in some cases surplus office equipment is available for home use. The company has developed a pre-telecommuting workbook to help employees and their managers decide if telecommuting is a workable option for them, as well as a training program for new telecommuters (14).
- **IBM.** IBM Canada's Flexiplace program combines a variety of telecommuting options. Some employees work at home, coming into the office only for staff meetings; others work "on the road" while traveling among customers; still others work for an extended period at a customer's place of business. Besides the increased employee effectiveness afforded by flexible work arrangements, IBM has been able to reduce its real estate costs (15).

CHAPTER THREE—TEXAS CASE STUDIES

The second phase of this research project included detailed case studies of selected telecommuting programs in Texas. Researchers conducted the case studies to provide an in-depth analysis of the approaches utilized with specific programs, and the impacts on telecommuters, management personnel, and the transportation system. The case studies were selected to include a mix of public agencies and private businesses, work settings, geographical locations, and types of programs. The six agencies and businesses examined in the case studies were:

- City of San Antonio — Information Services Department, San Antonio
- Mobil Oil Corporation, Dallas
- Rice University, Houston
- State of Texas — Comptroller of Public Accounts, Austin
- State of Texas — Texas Workforce Commission, Austin
- Texas Natural Resource Conservation Commission (TNRCC) — Region 12 Office, Houston

Researchers used the same general approach with all of the case studies, although some differences occurred due to the availability of personnel at the agencies and businesses. The four major elements of the case studies were a review of the background and nature of the telecommuting program, interviews with management personnel, interviews with telecommuters, and surveys of telecommuters. Appendix A provides a listing of the individuals interviewed at each of the case studies. The four major activities conducted as part of the case studies are described in more detail below.

- **Review of Telecommuting Program.** The first step in each case study was to examine the nature and background of the telecommuting program. Researchers reviewed available information on the objectives, policies, guidelines, and requirements for each program, along with any documentation of the experience to date.
- **Interviews with Management Personnel.** TTI researchers interviewed management personnel at each of the case study sites. A copy of the questions used in the interviews is included in Appendix B. The interviews provided additional information on management changes necessitated by the telecommuting program, the reactions of supervisory personnel, the general impact of the program

on the daily operations of the work unit, and the benefits of the program to the agency or company. Managers were also asked to identify the key elements of successful programs and any recommendations they would make to others considering telecommuting programs.

- **Interviews with Telecommuters.** Researchers also interviewed telecommuters at each of the case study sites. These interviews provided information on the characteristics of telecommuters, their home work environment and work habits, their experience with telecommuting, and the benefits and limitations of the programs. A copy of the questionnaire used in these interviews is provided in Appendix C.
- **Surveys of Telecommuters.** A sample of telecommuters at most of the case study sites completed surveys on their telecommuting and in-office work schedules and travel behavior. The survey, provided in Appendix D, contained additional questions on the general experience with the telecommuting program, as well as the benefits, limitations, and impacts of the program.

The remainder of this chapter summarizes the results of the case studies. The characteristics of each program are described first, followed by the approach and specific requirements for telecommuters and managers. The experience to date with the telecommuting program, including the benefits and limitations identified through the interviews and surveys, is presented next. Additional information on other telecommuting programs and telecommuting activities underway in the state are also highlighted at the end of this chapter.

CITY OF SAN ANTONIO—INFORMATION SERVICES DEPARTMENT, SAN ANTONIO

Program Characteristics

The Information Services Department at the City of San Antonio initiated a six-month pilot telecommuting program in 1992. The pilot program was the result of a yearlong study by City staff assessing the potential for telecommuting and designing a possible program. A Telecommuting Advisory Committee (TAC) was established to oversee the study, develop recommendations to senior management, and monitor and evaluate the pilot program.

In developing their recommendation, the TAC examined literature on telecommuting and reviewed programs in other areas. The Committee developed a *Telecommuting Guide*, which included a set of telecommuting standards, for use with the pilot program (16). Twelve employees were selected by the Committee to participate in the six-month pilot program. The individuals

represented a mix of programmers, project managers, and clerical staff. The participating employees were allowed to telecommute one or two days a week, with management approval.

An evaluation of the pilot program was conducted by the TAC (17). Based on the success of the initial test, the telecommuting program was formalized and expanded to include additional employees. Currently, approximately 50 employees are participating in the program.

The *Telecommuting Guide* developed for the pilot program continues to govern the telecommuting program in the Information Services Department. The following elements are addressed in this document.

- The *Guide* contains the seven policies governing the program. The policies establish telecommuting as a management option, not an employee benefit; recognize participation as voluntary; require a signed agreement for participation; establish that no changes will be made in employee salaries or benefits; indicate that eligible employees must meet job and experience requirements; establish a Telecommuting Advisory Committee; and require telecommuters to participate in any studies, surveys, or evaluations of the program.
- The *Guide* outlines expectations and responsibilities of telecommuters and provides suggestions on organizing and managing work. Telecommuters are required to establish an appropriate and safe work space and guidelines are included for establishing a good work environment. A “do” and “don’t” list is provided on establishing good telecommuting work habits, as is a home office check list.
- The *Guide* also contains suggestions for managers of telecommuters. Recommendations for supervising telecommuters include assigning work that is results oriented, helping employees organize their work, establishing specific deadlines, agreeing on regular communication methods, and coaching staff members on good telecommuting work habits.
- The *Guide* contains a listing of potential benefits of telecommuting for the Department, employees, and the community at large, along with adjustments that may need to be made by the various groups and issues that may arise. Techniques for addressing potential concerns are identified.
- Telecommuters are also provided with the names and telephone numbers of individuals to contact if assistance is needed with computers or other issues.

- The telecommuting standards contain 15 points covering the specific responsibilities of the Department and the employee. The standard, which is signed by both the telecommuter and the supervisor, forms the basis for participation in the program.

Experience with Telecommuting

Researchers used three different information sources to assess the experience with telecommuting at the Information Services Department. First, the evaluation of the six-month pilot program conducted by the Department was reviewed (17). Second, TTI researchers interviewed managers and telecommuters in the Department. Third, seventeen telecommuters completed surveys on their experience with the program and their travel patterns on days they work at home and in the office. The following points highlight the experience with telecommuting at the Information Services Department.

- The telecommuting program has been well received by both supervisors and employees in the Department. No major problems have been experienced and numerous benefits have been documented for the agency, employees, and the environment.
- The productivity of employees and the Department as a whole has improved with the telecommuting program. The Information Services Department supports other city departments. These departments were surveyed before and after the pilot program to measure their satisfaction with the work in the Information Services Department. The other departments noted improvements in responsiveness and faster turnaround time on data processing requests during the telecommuting pilot program. One example of the improved responsiveness was provided during the interviews. The example involved a emergency request from another department for some critical information. The Department employee with responsibilities in this area, who was telecommuting that day, was able to provide the needed information within the hour. Given potential distractions at the office, this response was faster than it probably would have been if the employee was in the office. This experience helped establish the seamless nature of telecommuting for the Department's customers.
- The productivity of telecommuters has been high and no problems have been reported with poor performance. In addition, with the computer links, telecommuters can provide help any time. Telecommuters can respond to emergencies after regular work hours and on weekends, expanding the coverage of the Department and providing standby services over extended hours.

- Telecommuters identified numerous benefits from the program. These included saving money from reduced commuting and parking costs, reduced stress and more time for other activities from not commuting, improved productivity from fewer distractions and interruptions, more time with family and enhanced home life, better balance of work and family responsibilities, and improved morale.
- The evaluation of the pilot program reported an average savings of 37 kilometers per telecommuter per week from not commuting one or two days per week (17). The 17 surveys completed for the case study indicated similar savings. Commute distances on in-office work days ranged from two kilometers to 88 kilometers, with corresponding travel times of five minutes to over an hour. The average commute distance for the 17 survey respondents was 29 kilometers. Fourteen of the respondents regularly drive alone, while two take the bus, and one carpools. Only one participant reported making regular stops to and from work for day care needs, while seven employees noted periodically stopping on the way home for errands and other activities. None of the 17 respondents make regular trips in the morning of the days they telecommute and only two reported periodic trips after work.

MOBIL OIL CORPORATION, DALLAS

Program Characteristics

Telecommuting at Mobil Oil Corporation in Dallas was initiated in 1994, with a 90-day pilot program in the Exploration and Producing Division. The pilot program involved five employees who telecommuted one or two days a week during the three-month test period. The success of this initial effort resulted in company support for telecommuting at the discretion of the individual operating divisions. Rather than a company-wide program, each division is responsible for determining if telecommuting is appropriate and for establishing specific guidelines and procedures.

The guidelines (18) developed during the pilot program continue to be used by the various departments with telecommuting programs. Most departments are organized into work teams, and the decision to allow telecommuting is left to the individual teams. The following items are included in the telecommuting guidelines used in the Exploration and Producing Division.

- Telecommuting is established as a cooperative arrangement among a supervisor, an employee, and the work group. It is not an entitlement and the ability to telecommute is based on the needs of the job, work group, and company, and the employee's ability to meet the eligibility criteria.

- Telecommuting is viewed as a management tool allowing flexibility in work options and is a voluntary agreement between a supervisor and an employee which can be terminated at any time.
- Jobs identified as suitable for telecommuting are characterized by clearly defined tasks and deliverables that can be measured. The guidelines contain a listing of specific work tasks suitable for consideration to provide further guidance to supervisors and employees.
- The telecommuter eligibility criteria focuses on employees who are responsible, self-motivated, results oriented, independent, effective communicators, adaptable, are familiar and comfortable with job tasks and procedures, and are committed to making telecommuting work.
- A checklist is included to help rate employee and work characteristics for individual telecommuting requests. Employee characteristics listed include the ability to work independently, organization and planning skills, self-motivated, self-disciplined, and level of experience. Work characteristics include flexibility in scheduling telecommuting days, in-office reference material easily transported, face-to-face interaction not required, and ability to control and schedule work. A rating of high, medium, or low can be assigned to each of these characteristics to assist a manager in evaluating potential telecommuters.
- Telecommuters must have designated work space at home, and telecommuting is not to be used as a substitute for day care or other dependant care.
- Telecommuters must be accessible during agreed upon work schedules and must take all precautions to secure any proprietary information.
- The telecommuter is responsible for all equipment in the home, including providing a second telephone line if necessary. Mobil makes outdated computer equipment available to employees at no cost, so most telecommuters have computers at home. Mobil also provides appropriate software to link to the local area network (LAN) and an analog telephone line at the employee's on-site computer if needed.

Experience with Telecommuting

Information on the experience with telecommuting at Mobil was obtained from three sources. First, the assessment of the 90-day pilot program conducted by the Exploration and

Producing Division was reviewed (19). Second, an interview was conducted with the Manager of the Oil and Gas Account Group. Finally, two employees in the Oil and Gas Account Group completed surveys on their experience with telecommuting. The following points highlight the experience with telecommuting at Mobil.

- Overall, experience with telecommuting has been very positive. The results from the pilot program and current programs indicate that telecommuting is a feasible and effective work arrangement.
- Telecommuting has been transparent. This means customers, peers, and management perceive no differences in an employee working at home or in the office.
- The pilot program documented increases in productivity related to a number of performance targets. Experience since the initial test has supported the productivity of telecommuters.
- Telecommuters identified a number of benefits with the pilot program and subsequent efforts. These included reduced stress, increased job satisfaction, reduced travel time commuting to work, savings in gasoline and parking costs, enhanced independence and flexibility, and a greater feeling of accomplishment, responsibility, and trust.
- Both management personnel and employees view telecommuting as a positive way of dealing with potential conflicts between work and family responsibilities. Telecommuting helps ease the strain and stress of trying to balance priorities at work and at home.
- The two employees completing surveys identified travel time savings of 40 and 75 minutes on their normal one-way commute trips of 24 and 58 kilometers, respectively, on telecommuting days. No regular trips were reported on telecommuting days.
- Other potential benefits from telecommuting identified by both managers and employees were the enhanced ability to recruit new employees and to retain existing staff, as well as show corporate and individual support for air quality and transportation concerns.
- Keys to successful telecommuting identified by supervisors and employees included planning and flexibility. Telecommuters, supervisors, and the work group should

all have a common understanding of the requirements of the program, the days that individuals will telecommute, and the mechanism for ensuring ongoing communication. Telecommuters need to be well organized to ensure they have the right materials and enough work on telecommute days. Telecommuters also need to be flexible to respond to meetings and other activities that may require them to be in the office on days they are scheduled to work at home.

- Some changes in management style may be necessary to focus more on employee performance and task accomplishment, rather than just attendance.
- Support of the full team is required—the work group, management, and telecommuters—to make telecommuting programs successful.

RICE UNIVERSITY, HOUSTON

Program Characteristics

Interest in telecommuting at Rice University in Houston grew out of the requirements of the Employer Trip Reduction (ETR) Program and the 1990 Clean Air Act Amendments. Telecommuting was being considered in 1994 as one alternative to help the University comply with the ETR requirements to reduce the number of employees driving alone to work and to increase vehicle occupancy levels.

Although a formal program was not established at Rice, a study and a test of the telecommuting concept was initiated in May of 1994. Eleven employees, who were selected based on their interests in telecommuting and their willingness to pay a part of the cost associated with establishing computer connections at home, participated in the pilot telecommuting program. In addition, an effort was made to ensure that all groups at the University—administrators, faculty, and technical support staff—were represented in the pilot program.

During the study, employees were able to telecommute one or two days a week. No formal guidelines were established relating to the home work environment, work hours, or reporting requirements, nor was any formal training provided to either supervisors or telecommuters. Rather, both groups were allowed to work out specific arrangements to meet their needs. In most cases, informal understandings were established between the telecommuters and their supervisors or department. As part of the study, ISDN connections were established between the telecommuter's home and the Rice University computer system. The monthly cost for this connection was shared by the individual and the department. Over a two-year time period, the pilot group increased to some 20 to 30 participants.

In addition to the pilot program, Rice University has also used full-time telecommuting to accommodate employees who have relocated to other metropolitan areas due to family needs. For example, one employee telecommuted from Austin, while another telecommuted from Boston. Both of these instances were viewed as special cases to address specific employee needs, allowing Rice to retain valuable employees who otherwise would have had to leave.

As noted previously, Rice does not currently have a formal telecommuting program. The individuals who participated in the pilot program are still allowed to telecommute on occasion with approval of their supervisor. Further, many use the computer links established during the test to conduct work from home after regular business hours.

Experience with Telecommuting

TTI researchers met with representatives from Rice University to discuss their experience with the telecommuting pilot program. Although no formal evaluation was conducted by Rice on the pilot program, the following comments were provided by telecommuters and supervisors on the experience with the test program at the university.

- Telecommuting was a good experience for the participants. Individuals feel they can work effectively at home, often increasing their productivity. Further, telecommuters like the flexibility offered by the program and support continuing to offer telecommuting as an option to Rice employees.
- Some concerns were voiced by telecommuters about possible loss of professional opportunities due to less time and visibility in the office. The only member of the original study group to discontinue telecommuting did so because they felt isolated from the rest of the work force. To overcome these concerns, several telecommuters developed informal buddy systems with other employees to maintain communication on office activities on telecommuting days.
- Most telecommuters reported establishing regular routines on telecommuting days. Techniques used included maintaining a set work schedule and focusing on specific tasks. Telecommuters noted their work productivity was enhanced by fewer interruptions.
- Participants viewed telecommuting as beneficial to their personal and family life. Positive impacts of telecommuting on home life included making meal preparation easier and dinner more enjoyable, providing more time with children, arranging needed services or home repairs, and scheduling other personal appointments.

- Some problems with computer connections, computer maintenance, and related issues were noted by telecommuters. Since no formal technical assistance program was established at the University, departments and telecommuters had to work these problems out on an individual basis.
- One initial management concern with telecommuting related to employee accountability. Although the lack of interaction between a supervisor and an employee on telecommuting days challenged traditional management approaches, the general feedback from managers was positive toward telecommuting. Increases in productivity were noted, and ways to address the lack of direct interaction were addressed. For example, one supervisor developed criteria to help determine the types of tasks and individuals best suited for telecommuting. The ability of managers and telecommuters to work together to make the program a success was noted as a critical factor.
- The cost of establishing and maintaining the ISDN links between home and the campus was an issue, but not an overriding one. Many telecommuters were willing to share in this cost and no other major expenses were associated with the pilot program.
- The individuals interviewed noted that telecommuting also helped keep good employees who may otherwise have left the University due to family moves.
- The following elements were identified to help ensure the success of a telecommuting program.
 - Supervisors learned that some work tasks are more appropriate for telecommuting and that some employees make better telecommuters than others.
 - Strong support from the top of the agency or business is needed, along with a project champion.
 - Supervisors need to adopt new styles of management and to overcome concerns about not visually observing employees.
 - Telecommuters need to have an organized home work space and should follow a set pattern on telecommuting days.
 - Training for both supervisors and telecommuters is important.
 - Regular communication between supervisors and telecommuters is critical on telecommuting days.
 - Telecommuters should focus on work tasks that are results oriented, not process oriented.

STATE OF TEXAS — COMPTROLLER OF PUBLIC ACCOUNTS, AUSTIN

Program Characteristics

The Comptroller of Public Accounts in Austin initiated a one-year telecommuting pilot program in the summer of 1996. The telecommuting pilot study is one element of the agency's Work ALternative Program (WALT). Other elements of the program include flextime and a 4/40 compressed work week.

The telecommuting pilot program involves 30 employees from 16 of the agency's 34 divisions. Eligibility criteria related to job responsibilities, work tasks, commute distances, and other factors were used to select employees to participate in the test. The agency conducted a two-day training session for telecommuters and their supervisors prior to the start of the pilot program. Evaluations of the test will be conducted after six months and again after one year. The results of these evaluations will be used to determine if telecommuting should be expanded and made a permanent part of the WALT program.

During the pilot program, most selected employees are telecommuting one to three days a week, although two individuals are testing full-time telecommuting. The potential of reducing office space requirements through full-time telecommuting and the use of satellite offices will also be examined during the initial test. The agency developed the following telecommuting guidelines for the pilot program.

- A safe and dedicated work area must be available in the home, and telecommuting is not a substitute for child care or other dependant care. The agency may schedule visits to ensure that the home work space is adequate.
- The agency will pay for the installation of an additional telephone line if one is deemed necessary, but the employee is responsible for the monthly service charge.
- The agency will provide older computers for telecommuters if the employee does not own one. Approximately half of the employees participating in the pilot program reported having their own computers at home.
- The specific work schedule, work arrangements, and communication methods must be agreed upon by the supervisor and the employee. Voice mail and pagers are being used to ensure quick communication when necessary. The need for the type of computer connections is being determined on a case-by-case basis.

- Telecommuting on Monday and Friday is discouraged due to possible negative perceptions from the public, and telecommuters are required to change schedules in case important meetings or other activities require them to be in the office.

Experience with Telecommuting

Interviews were conducted with supervisors and telecommuters at the Comptroller's office. In addition, nine of the 30 employees participating in the pilot program completed surveys. Although the pilot program had only been operating for two months when the interviews were conducted, a number of comments were provided about the early experience with telecommuting. The following points relating to the pilot telecommuting program were provided by the agency staff through the interviews and surveys.

- The experience to date with the telecommuting pilot program has been positive for supervisors and telecommuters. Both groups noted that the program was implemented without any major problems.
- Benefits identified by telecommuters include reduced stress and time commuting, cost savings from reduced driving and parking charges, improved job satisfaction, enhanced productivity, and a better balance between demands at work and at home. Employees noted they are able to concentrate better and have fewer interruptions, allowing them to get more work done.
- Some concern was expressed by telecommuters that they may miss opportunities for advancement or other benefits by being less visible in the office. Others noted missing interactions with co-workers. Making sure that telecommuting days are staggered or are kept to one day a week was suggested as a way of overcoming this concern.
- Some problems were noted with computer connections, but these concerns are being addressed.
- Managers are focusing on evaluating employees by specific performance measures rather than just attendance.
- Support from top management at the agency is needed to help ensure a viable ongoing program.

- Telecommuters reported savings of ten minutes to one hour on one-way commute travel times on the days they did not have to drive to work. The actual one-way commute trip distances ranged from three kilometers to 52 kilometers, with all nine individuals normally driving alone. Only one of the nine telecommuters reported making regular stops on the commute to and from work for day care. All nine did report occasional stops on the trip home for personal business or other activities. The one individual also reported making trips to and from the day care facility on telecommuting days. The one-way distance for this trip was approximately five kilometers, while their normal commute was 37 kilometers. All nine individuals reported some trips after work hours on telecommuting days.

**STATE OF TEXAS—TEXAS WORKFORCE COMMISSION-COMMISSION OF APPEALS
DEPARTMENT, AUSTIN**

Program Characteristics

Telecommuting at the Commission of Appeals Department within the Texas Workforce Commission began on an informal basis in 1991 when a part-time attorney was allowed to work from home in response to family demands. The positive experience with this initial effort led to the development of a formal telecommuting program at the Commission. Currently, 14 attorneys, representing approximately 74 percent of the legal staff, and three stenographers are full-time telecommuters.

A set of formal guidelines, which are outlined in the *Telecommuter's Handbook*, govern the program at the Commission (20). Department staff reviewed the telecommuting policies and procedures of other agencies, including the draft TxDOT program, in developing the Commission's guidelines. The following elements are included in the *Handbook*.

- The telecommuting program is established as a management option, not an employee entitlement. Participation in the program is voluntary and can be terminated without cause. Telecommuters are regular employees, with the same salary, insurance, and benefits as other workers.
- To be eligible for consideration to telecommute an employee must have been with the agency for one year, be self-motivated, and possess a good understanding of their job and the operations of the department.

- The employee must provide a safe and adequate work space at home. Agency personnel may make on-site inspections to ensure that an appropriate work environment is available and that agency equipment is properly maintained.
- Agency or personal equipment may be used at home, but agency equipment and software may not be used for personal purposes and other family members and individuals must not have access to equipment, documents, or information.
- Telecommuters are covered by the Agency Worker's Compensation Insurance, provided the work location and schedule has been approved. Other liability concerns and the responsibilities of the agency and telecommuters are outlined.
- Telecommuting is not viewed as a substitute for child care or dependant care on a regular basis. Primary care may be provided on a temporary basis, however, as long as it does not interfere with work performance.
- Suggestions are provided to telecommuters on planning their work space, organizing their work day, managing their time, and developing good work habits. A supply check list is included to assist telecommuters in organizing their work area. Tips are also outlined on educating family members, friends, and neighbors on the telecommuters work responsibilities.

A formal agreement, which is signed by the supervisor and the telecommuter, governs participation in the program (21). The agreement contains many of the items covered in the guidelines. The following elements are included in the agreement.

- The scope of the agreement establishes the voluntary nature of the telecommuting program, which can be terminated at any time.
- The responsibilities of the telecommuter and the Commission are outlined relating to work schedules, equipment, supplies, use of software, and communications with the office. The Commission reserves the right to make on-site visits to ensure that the home work space is adequate and safe.
- The expectations relating to a telecommuter's work production and work quality are outlined. Telecommuters are required to maintain a tracking log of work assignments and completion dates.
- Telecommuters and supervisors agree to participate in studies, surveys, and other evaluations of the program.

Experience with Telecommuting

The Commission Appeals Department conducted an assessment of the telecommuting program in 1996. The progress report completed on this assessment documents a number of benefits for both the agency and for employees from the telecommuting program (22). Researchers obtained additional information on the experience with the program through interviews with telecommuters and supervisors in the Department. The following points summarize the highlights from the assessment and the interviews.

- The telecommuting program has had a measurable improvement on the productivity and work output of participating employees. Measuring changes in productivity is easier in this case because the attorneys have weekly assignments of cases, hearing tapes, and case quotas. As a result, employee performance—at home or in the office—is easy to monitor. In 1996, the Department set a new record in the timely processing of caseloads.
- The Department was also able to better manage existing office space and realized savings related to office space as a result of the telecommuting program. Between 1991 and 1996, the number of attorneys working for the Department increased from 18 to 20. The office space needs during this same time period were reduced through the telecommuting program. The Department has also been able to realize savings in the costs associated with providing parking spaces, telephones, and other items to telecommuters.
- Benefits of the program identified by telecommuters include greater work productivity, a better balance between work and home demands, reduced stress from daily commuting, and improved job satisfaction. Telecommuters appreciate the program and feel it has enhanced employee morale and loyalty.
- Telecommuters noted that their work productivity has improved through elimination of time spent commuting and parking, fewer interruptions, and flexibility in work schedules. For example, some 60 percent of the Department telecommuters report doing half their work outside the standard 8 a.m. to 5 p.m. workday.
- In one example, a telecommuter was able to continue to work productively for a month from a city 805 kilometers away, while taking care of a sick parent.

- Although telecommuting is not a replacement for child care, the program provides telecommuters with the flexibility to deal with dependant care needs. This feature has been especially well received by staff attorneys with young children. Rather than take sick days, they are able to continue working when a child is ill.
- The Department also perceives that the program provides a unique recruiting tool and helps in retaining good employees.
- Some problems or concerns with telecommuting were identified by telecommuters. These included occasional problems with on-line information access, delays in receiving memos and other information, and reduced contacts with co-workers. All of these concerns are being addressed and none was viewed as major impedance to telecommuting.
- Managers and supervisors did not report any major problems with the program. In response to some initial concerns, adjustments were made in work schedules of telecommuting stenographers who are now required to log on to the computer systems from 8:00 a.m. to 5:00 p.m.
- Key elements to successful programs identified by both supervisors and the telecommuters included establishing clear guidelines and expectations, maintaining regular communication, and ensuring strong support for the program from top management. Telecommuters stressed the need to establish regular work routines, to maintain an organized work area, to limit distractions, and to maintain ongoing communication with supervisors and co-workers. Managers identified regular communication and focusing supervision on measurable work accomplishments as two key elements to a successful program.

**TEXAS NATURAL RESOURCE CONSERVATION COMMISSION—REGION 12
OFFICE, HOUSTON**

Program Characteristics

The Houston or Region 12 Office of the Texas Natural Resource Conservation Commission (TNRCC) has had a formal telecommuting program for two years. The development of the telecommuting program at TNRCC was initiated in response to the requirements of the Employer Trip Reduction (ETR) Program and to the 1993 State House Resolution Number 797, which encouraged state agencies to investigate and implement telecommuting programs to reduce the cost of state government.

An initial pilot telecommuting program was started at the Region 12 office in 1994. Although the ETR requirements have become voluntary since the initiation of the program, the agency has expanded the pilot program and continues to offer telecommuting as an option to qualified employees. Currently, 32 out of the 170 employees in the office participate in the program. The agency developed formal policies and guidelines (23) which govern the telecommuting program. Further, telecommuters and supervisors sign an agreement which establishes the framework and the parameters for the work at home arrangement.

The telecommuting program at the TNRCC Region 12 office was officially established by the Regional Director and formal guidelines are used to manage the program. The guidelines establish the parameters of the program and the responsibilities of the agency, supervisors, and telecommuters in making the program work (23). Major elements of the guidelines and the TNRCC telecommuting program included the following.

- The telecommuting program is voluntary and is not considered an employee right or benefit.
- Training is provided periodically to both supervisors and telecommuters.
- A Telecommuting Program Coordinator position and a Telecommuting Advisory Group was established. The Program Coordinator is responsible for the ongoing development and management of the program. The Advisory Group, which is comprised of telecommuters and supervisors, meets on a regular basis to discuss and resolve issues.
- Guidelines for supervisors of telecommuters include establishing performance measures, agreeing on methods for telephone contacts and communication, providing clear direction to telecommuters, and supporting the overall program.
- Guidelines for selecting telecommuters include having experience with unsupervised work, demonstrating responsibility and self-motivation, having available space at home, and doing work suitable for telecommuting.
- Guidelines defining suitable work include tasks such as data analysis, report writing, telephone-intensive tasks, and computer-related work. Work identified as unsuitable for consideration for telecommuting includes extensive face-to-face contacts, access to information available only in the office, and work tasks requiring special equipment that cannot be provided at home.

- Telecommuters are required to provide a safe and adequate work space in their home. Specific guidelines relating to working and walking surfaces, electrical outlets and equipment, fire prevention and protection, storage, safety, and other elements are presented. A telecommuter is required to complete a self-certification safety checklist, which becomes part of their telecommuting agreement. In addition, TNRCC reserves the right to visit the employee's home to ensure that a safe and adequate work environment exists.
- The guidelines cover personnel policies and procedures relating to the formal agreement, scheduling of telecommuting days and work tasks, the use of TNRCC owned equipment, and other elements.
- The guidelines include a series of helpful hints for telecommuters. Suggestions are provided on getting organized, managing work tasks, educating family and friends, establishing work routines, and examples of good and bad work habits.
- Helpful hints for managers are also outlined in the guidelines. These include managing by objective not by visual observation, establishing agreed upon communication methods and times, clearly communicating expectations to telecommuters and reviewing their work promptly, and coaching telecommuters.
- Telecommuters are allowed to use TNRCC laptop computers and other equipment. TNRCC is responsible for maintaining and servicing this equipment and for providing the needed software. The agency does not pay for specialized equipment needs, nor does it reimburse telecommuters for home utility expenses.
- Supervisors and telecommuters must sign a telecommuting agreement (24) as part of the program. The agreement establishes the parameters and requirements for the telecommuter, the supervisor, and TNRCC. Specific parts of the agreement address the home work area, supplies and equipment, work hours and compensation, safety and liability, employee duties and obligations, and termination of the agreement.
- In addition to the telecommuting agreement, a supervisor is required to complete an employee checkout list prior to an individual starting to telecommute. This checklist helps ensure that a mutually agreed upon work schedule has been established and that communication methods and equipment needs have been addressed.

- Telecommuters are required to maintain a daily activity log on the days that they work at home. This log documents the work activities by hours, the major work tasks accomplished, and the contacts or calls made during the day.

Experience with Telecommuting

TNRCC has not conducted a formal evaluation of the telecommuting program. TTI researchers interviewed one supervisor and two telecommuters at the Region 12 TNRCC office to obtain information on the experience with the program over the past two years. In addition, both telecommuters completed surveys on their commuting behavior and experience with the program. The following points summarize the highlights of the interviews and surveys.

- The program has been received very positively by supervisors and employees. Both groups feel the program is working well and provides numerous benefits to the agency and to employees.
- The telecommuting schedule is worked out between the supervisor and the employee. The most any employee telecommutes is one day a week. Consideration is given to the work schedules of other employees to ensure that there is always adequate coverage in a department or unit. For example, within one work team there is an agreement that there will be no telecommuting on Friday, since some employees have flexible work schedules with Friday off.
- Both the supervisor and the telecommuters noted that establishing regular telephone communication on telecommuting days is important. The Team Leader interviewed requires that telecommuters call her at the beginning of the work day on the days they telecommute. This procedure helps remind her who is telecommuting, establishes the communication link for the day, and helps the telecommuter focus on work.
- Telecommuters noted that it is important to be organized to ensure a productive work day. Suggestions provided to help accomplish this objective included making sure that all of the information needed to complete a task is taken home, organizing your home work space, and focusing on specific work tasks and projects. It was suggested that it is also important to take enough work home. The telecommuters indicated that a common mistake made by many employees when they first started telecommuting was underestimating the amount of work they could complete at home and not taking enough work with them.

- Telecommuters can check out laptops and some have the ability to connect into the office. All telecommuters check their voice mail regularly and call in periodically. Although most telecommuters use laptops or have computers at home, the TNRCC representatives noted that the program is not overly sophisticated.
- Benefits identified by the supervisors for the agency included increased productivity from employees and improved employee morale. For example, the supervisor noted that she has had to adjust her work routine slightly because she receives numerous reports and other paperwork from employees the day after they telecommute.
- Benefits identified by the telecommuters include increased productivity from fewer distractions, greater flexibility in arranging work and family priorities, time savings from not commuting to work, and lower stress levels from not having to drive in rush hour traffic.
- Both telecommuters reported significant savings in vehicle kilometers of travel (VKT) and travel time on the days they telecommute. The survey results indicated that telecommuting saves approximately 60 to 75 minutes and 52 to 61 kilometers for each one-way commute trip made by the telecommuters. Both individuals reported making stops at day care facilities as part of their normal commute trips to and from work and both drive alone. Both also noted that they travel to and from the day care locations on the days they telecommute, but the trip distances reported were only one and five kilometers.
- Suggestions for other agencies and individuals interested in telecommuting included establishing ground rules and realistic expectations for both supervisors and telecommuters, ensuring that telecommuters are self-motivated and have adequate work space at home, and establishing strong ongoing communication between supervisors and telecommuters.
- The Team Leader indicated that she has made small rather than major adjustments in her supervisory and management style. She has not had any problems with the program and telecommutes herself occasionally.
- Telecommuting is viewed as a win/win situation for both the agency and for employees. Employees realize that telecommuting is a benefit and do not abuse the privilege.

OTHER TELECOMMUTING PROGRAMS AND ACTIVITIES

- **City of Richardson.** The Director of Transportation for the city of Richardson has been telecommuting five days a week since March of 1996. The Director is currently the only city employee allowed to telecommute, although expansion of the program is being considered. The city supplied a two-line telephone, fax, and computer for the Director's home, and the city pays the monthly charges for the telephone and fax lines. The city also maintains a small in-office work space for use on days the employee needs to be in the office. To date, the arrangement appears to be working well for both the city and the employee.
- **Compaq Computers, Houston.** Compaq Computer utilizes telecommuting on a national basis, including its Houston office. Sales representatives and other employees work from home on a regular or part-time basis. Telecommuters are linked to the main office by computer modems and may have portable computers, laser printers, cellular telephones, and other items. Company-wide, Compaq has made a significant investment in telecommuting. This investment has resulted in both increased sales and reduced office costs.
- **Deloitte & Touche, Houston.** Deloitte & Touche has a "work at home" program which allows some employees to work a day or two a week from their homes. Participating employees are primarily client service staff rather than administrative personnel. Approximately 100 employees are currently eligible to participate, with some 80 telecommuting during a typical week. Most eligible employees work at home approximately one day a week.
- **Environmental and Conservation Services Department, City of Austin.** The city of Austin has permitted telecommuting on a case-by-case basis, usually for employees with health problems or those on maternity leave. Based on recommendations from the Employee Commute Options (ECO) team, the Environmental and Conservation Services Department is conducting a telecommuting pilot project. Participants in the pilot are allowed to telecommute one or two days a week. The city will use the pilot project results to help formulate a formal telecommuting policy for all divisions.
- **Home Office 2000 Contests.** The North Central Texas Council of Governments (NCTCOG), Dallas Area Rapid Transit (DART), the North Texas Clean Air Coalition, and the Fort Worth Transportation Authority (The T) are conducting a number of activities to promote telecommuting and alternative commute modes during the ozone season. A series of Home Office 2000 contests were held during

the summer of 1996 ozone season. These included the *Wannabe Telecommuter*, the *Messiest Home Office*, and the *Ultimate Home Office*. Prizes and copies of telecommuting guides and reports were awarded to the winning contestants, including the telecommuting brochure prepared by NCTCOG (25).

- **Internal Revenue Service (IRS), Houston.** A pilot telecommuting project at the IRS office in Houston allows some employees to work at home a few days a week. Currently, approximately 25 percent of the office staff, or about 200 workers, are participating in the program. Eligible employees must have at least two years experience, and the current program focuses on revenue agents.
- **Methodist Hospital, Houston.** Approximately 50 employees in the Information Service and Nursing Support and Training Departments at Methodist Hospital currently telecommute. The hospital has a formal telecommuting policy. Among other requirements, the policy states that employees must be reachable by telephone during normal work hours. No formal evaluation of the program has been conducted.
- **National Energy and Water Management Center, Fort Worth.** The National Energy and Water Management Center moved its seven employees into home offices in October 1995. The Center estimates that it will cost approximately \$20,000 to equip the home offices, and another \$5,000 annually to maintain the communications equipment and other items. Even with these costs, the Center estimates a savings of \$30,000 annual rent and maintenance on their current office space.

CHAPTER FOUR—SKETCH PLANNING TOOLS

Sketch planning tools for assessing the potential of telecommuting in Texas cities and for analyzing the possible impacts on the transportation system were developed in the first phase of the research project. The results from the case studies presented in the previous chapter were used to refine these techniques. The sketch planning tools are summarized in this chapter.

ASSESSING THE POTENTIAL FOR TELECOMMUTING IN TEXAS CITIES

Information from other studies (4, 26, 27) examining the extent of telecommuting in specific areas and the results of the case studies was used to develop a sketch planning tool for identifying the general potential for telecommuting in Texas cities. The steps in the development of the sketch planning tool and the use of the technique are described below.

- **Census Data.** Researchers first reviewed the 1990 Census employment data and the number of home-based workers in the major metropolitan areas in Texas. The percent of employees working at home ranged from a low of one percent in Houston to a high of 2.8 percent in Austin. These figures should be used with caution, as they may reflect not only telecommuters but also self-employed individuals and contract workers. Also, some individuals who actually telecommute part-time may not list themselves as working from home.
- **Houston Employer Trip Reduction (ETR) Plans.** The Houston ETR plans include the standard industrial code (SIC) for each employer. The SIC is a general classification system used by the U.S. Census Bureau and other groups to categorize different types of businesses. The percent of companies reporting telecommuting programs, and the percent of workers in those firms, were identified. This information was used to identify the types of public agencies and private businesses within the broad SIC codes that may be realistic candidates for telecommuting. As shown in Table 1, the general SIC codes with the greatest potential for telecommuting include educational services; manufacturing - durable goods; finance, insurance and real estate; business and repair services; mining; communications and other public utilities; public administration; other professional

and related services; and wholesale trade. This information was used to identify the SIC categories that may be more appropriate for telecommuting.

- **Using the Sketch Planning Tool.** Table 2 identifies the number and percent of companies by SIC for Austin, Corpus Christi, Dallas, El Paso, Fort Worth, and San Antonio. This information can be used to provide an indication of the potential for telecommuting within the different sectors of the economy in these areas. For example, both Austin and San Antonio have larger numbers of firms or agencies in the public administration category than the other cities. Similar information can be examined for other urban areas in the state.

Table 1. Percent of Houston Companies with Telecommuting Programs
by Standard Industrial Code*

SIC Name	SIC Number	Percent of Total Companies
Educational Services	8200-8299	26
Manufacturing, Durable Goods	2800-3999	13
Business and Repair Services	7300-7699	10
Mining	1000-1499	10
Communications and Other Public Utilities	4800-4999	8
Public Administration	9000-9899	7
Health Services	8000-8099	7
Other Professional and Related Services	8300-8999	5
Finance, Insurance, and Real Estate	6000-6799	5
Wholesale Trade	5000-5199	5
Manufacturing, Non-Durable Goods	2000-2799	2
Personal Services	7200-7299	2
Entertainment and Recreation Services	7800-7999	2
Transportation	100-999	0
Retail Trade	1500-1799	0
Construction	4000-4799	0
Agriculture, Forestry, Fisheries	5200-5999	0

*Information from 1,200 non-ISD Houston ETR plans. Represents employers with over 100 employees in the Houston area.

ASSESSING THE POTENTIAL IMPACTS ON THE TRANSPORTATION SYSTEM

A number of studies have attempted to quantify the travel, air quality, and energy related impacts of telecommuting (28, 29, 30, 31). These studies have focused on determining the number and length of peak-period trips removed from the roadway system through telecommuting. Estimating the trip reduction potential of telecommuting is not easy, as information is needed on the trip length of telecommuters, the number of days they telecommute, and trips made on telecommuting days. These are key questions, and the answers will determine the impact of telecommuting on the transportation system.

Experience to date indicates that telecommuting does reduce peak-period trips, and that non-work trips do not increase significantly (27, 28, 29, 30). The information from the six Texas case studies supports this experience. The 21 surveys completed by telecommuters indicated an average savings of approximately 61 kilometers per one-way trip, or 122 kilometers round trip, on the days they telecommuted. Only two of the survey respondents reported making regular trips to and from day care on telecommuting days. In both cases, the trip distance to the day care was less than five kilometers.

In developing a sketch planning tool for use in estimating the potential impact of telecommuting on the transportation system, researchers reviewed previous studies and existing sketch planning methods. A 1993 TTI research study (32) examined sketch planning tools for evaluating travel demand management (TDM) and strategies and transportation control measures (TCMs). This project reviewed available techniques and recommended the use of the Systems Application International (SAI) spreadsheet methodology. Rather than developing a new sketch planning tool, this research project utilized the SAI spreadsheet.

A number of variables on trip length, number of participants, and other elements are needed for the SAI spreadsheet. These factors are used to determine changes in vehicle kilometers of travel (VKT) to analyze the impact of different TDM and TCM measures. The impact on emissions is then calculated based on the changes in VKT. In order to determine changes in VKT, the number of telecommuters must be determined, along with their frequency of participation, the average number of commute days, and other trips made on telecommuting days. The national average of 1.75 days per week for telecommuters was used (33) for this analysis. The case study results indicate that this average is appropriate for use in Texas.

The following formula was used to estimate the impacts of telecommuting at various levels of participation. $H(DxFLxTxR) + S(DxFLxTxR) + N(DxFLxTxR)$ where

Description	Default Values		
	(H) Home	(S) Satellite	(N) Non-T/C days
D = Days per year	250	250	250
F = Frequency of participation in percentage of days per day	0.35	0.35	0.65
L = Percentage of participants at the site	0.80	0.20	0.80
T = Trips per day	2.00	1.50	2.00
R = Reduction factor for savings in distance	0.75	0.67	0.10

This equation was then applied using a five percent participation rate. Other rates could be used, but this figure is in line with the case study results and provides a conservative estimate of the potential impact of telecommuting in seven metropolitan areas in Texas that have been examined in previous congestion studies (32). Table 3 provides a summary of the results of this analysis.

Table 3. Estimated Impact of Telecommuting at 5 Percent Participation Rate

Location	Austin	Corpus Christi	Dallas	El Paso	Fort Worth	Houston	San Antonio	Total
Workers	244258	109254	500566	199385	204846	772957	395551	2426817
Avg person per vehicle	1.09	1.11	1.10	1.11	1.11	1.11	1.10	1.10
Percent SOV	74%	76%	72%	74%	77%	72%	73%	74%
Avg trip length	14.0	12.7	16.9	14.8	14.6	16.9	16.6	15.3
Base VKT (millions)	1569.1	625.9	3828.0	1331.3	1356.2	5889.1	2968.1	17567.5
Base SOV work trips (millions)	90	41	181	74	79	277	145	887
Annual VKT saved (millions)	23.3	9.3	57.0	19.8	20.1	87.5	44.1	261.0
SOV Work trips saved (millions)	1.2	0.5	2.4	1.0	1.0	3.62	1.9	11.6

Using the SAI spreadsheet sketch planning tool, a preliminary estimate of the annual emission reductions at a five percent level of telecommuting was made. Table 4 provides this analysis. These estimates are based on the case study results and national trends, and provide a general indication of the potential impact of telecommuting. More detailed information on telecommuting programs in individual urban areas can be substituted in the model to provide a better estimate of the impact of telecommuting in those locations.

Table 4. Estimate of Annual Emission Reductions
from a 5 Percent Level of Telecommuting¹

	Carbon Monoxide			Ozone		
	HC ²	CO ²	Nox ²	HC ²	CO ²	Nox ²
Austin	18	177	11	12	114	10
Corpus Christi	7	71	5	5	45	4
Dallas	43	433	28	30	278	25
El Paso	15	150	10	10	96	9
Fort Worth	15	153	10	10	98	9
Houston	66	666	43	46	427	8
San Antonio	33	335	22	23	215	19
Total	197	1,986	128	136	1,273	114

¹ Using the SAI spreadsheet sketch planning method.

² in metric tons.

CHAPTER FIVE—BENEFITS OF TELECOMMUTING, KEYS TO SUCCESSFUL PROGRAMS, AND SUPPORTING POLICIES

This chapter examines the benefits of telecommuting programs, identifies key elements in the development and implementation of successful programs, and explores policies that the state and other groups can use to support telecommuting. Information obtained through the literature review, the national experience, and the Texas case studies is highlighted.

BENEFITS OF TELECOMMUTING

The literature review and the six Texas case studies identified a number of benefits that may be realized from telecommuting programs. Some of the benefits to employers, employees, and the transportation system are summarized in this section.

- **Employer Benefits.** The most common benefit cited by organizations with telecommuting programs is an increase in the productivity of their telecommuting workers. Faster completion of assignments, fewer sick and absent days, better time management, and increased morale and commitment to the company or agency were all reported. Other benefits realized by some companies include a reduction in office space and its associated costs, enhanced ability to attract and retain quality employees, and improved customer service. Examples of these benefits from national and state case studies include the following.
 - Results from the Texas case studies indicated increased productivity from telecommuters. Supporting evidence for enhanced productivity ranged from documented improvements in the processing of caseloads at the Commission of Appeals Department (22) to reports from supervisors and telecommuters of increased work output.
 - The City of San Antonio Information Services Department reported improved customer satisfaction and more timely response to customer needs from the telecommuting program. Specific examples were provided of telecommuters responding quickly to provide information needed by other departments, which helped to establish telecommuting as a seamless or transparent program.
 - Representatives at all the Texas case study sites indicated that the telecommuting program had helped retain quality employees and had assisted in recruiting new employees. Examples were also provided of using telecommuting to assist and retain valued employees through times of illness or special needs.

- Telecommuting is viewed by many of the case study representatives as another tool to help employees deal with the ongoing conflicts of balancing work and family responsibilities.
- Savings in office space and associated costs were reported at the Commission of Appeals Department, which was able to increase staff but decrease office space as a result of telecommuting (22). At the national level, Pacific Bell reported savings of at least \$50,000 in office space costs through telecommuting (14).
- **Employee Benefits.** Telecommuters at the six case study sites reported numerous benefits from telecommuting. Similar experiences were also noted at the national level. The following benefits were stressed by telecommuters at the six Texas case studies.
 - Telecommuters in the Texas cases studies reported increased productivity from eliminating commuting time, reducing interruptions, and establishing flexible work schedules.
 - Employees indicated lower levels of stress and fatigue from not having to drive and deal with traffic on telecommuting days.
 - Telecommuters reported savings in gasoline and parking costs from not having to drive to and from work every day.
 - Telecommuters noted a better balance of work and home responsibilities. Positive aspects of telecommuting on home life included spending more time with children, making meal preparations easier and dinner more enjoyable, arranging needed services or home repairs easier, and scheduling other personal appointments.
 - Employees viewed the telecommuting programs as providing additional benefits in special situations. Examples provided included caring for sick children or relatives and individual illnesses.
 - Telecommuters reported increased motivation, job satisfaction, and loyalty to their employer, as well as greater feelings of accomplishment, responsibility, and trust.
- **Travel Reduction, Air Quality Enhancement, and Energy Reduction.** Telecommuting programs can also benefit the transportation system by reducing commute trips. These benefits can help companies, agencies, and areas meet air quality legislative requirements and other policy directives. The requirements of the 1990 Clean Air Act Amendments have been a motivating force for telecommuting programs in some areas. Since telecommuting removes work trips from congestion peak-periods, telecommuting programs should have positive impacts on traffic congestion, air quality, and energy consumption. As summarized below, the experience within Texas and at the national level supports these benefits.

- The 21 telecommuters from the Texas case study sites who completed surveys averaged savings of approximately 61 kilometers per one-way trip or 122 kilometers round trip, on the days they telecommuted. Only two of the survey respondents reported making regular trips on telecommuting days. Both of these individuals made trips to and from day care. These trips were less than five kilometers compared to their normal commute trips of 52 and 61 kilometers.
- The State of California Telecommuting Pilot Project, which included 22 state agencies, reported significant savings in VKT. Travel diaries kept by program participants indicated that they made virtually no work-related trips on telecommuting days. The majority of participants also reduced the number of non-work trips on telecommuting days. Overall, on days they worked at home, telecommuters reduced their peak-period trips by an average of 60 percent, their total vehicle kilometers by 80 percent, and their freeway use by 40 percent. The telecommuting program prompted many participants to seek out shopping, recreation, and other non-work destinations that were closer to their homes, both on telecommuting and non-telecommuting days (28).
- Travel diaries completed by telecommuters and other workers provided a model for trip and emissions reductions during the Puget Sound Telecommuting Demonstration Project. On telecommuting days, telecommuting workers averaged 30 percent fewer trips, 63 percent fewer kilometers traveled, and 44 percent fewer cold starts. These factors resulted in a 50 to 60 percent decrease in individual vehicle emissions per telecommuting day (29).
- Telecommuting employees at the state of Hawaii's telework center in Mililani, Oahu, saw a gasoline savings averaging 29 percent, as well as a 7.4 hour reduction in travel time per week (30). An average of 50 vehicle kilometers of travel was saved per employee for each telecommuting occasion in a telecommuting test conducted by the Southern California Association of Governments (SCAG). Most participating employees worked from their homes, with one employee working at a satellite center. The reduced number of work and non-work trips resulted in approximately 60 percent fewer automobile "cold starts" for each telecommuter in the program, along with similar decreases in emissions of organic gases, carbon monoxide, and nitric oxides. Travel energy saved averaged 80 kilowatt-hours (30, 31).
- **Special Situations.** Telecommuting can also help manage response to natural disasters or other emergency situations. The San Francisco earthquake in October 1989 provided an unusual test case for telecommuting programs, as companies in the San Francisco Bay Area searched for ways to continue operating in spite of destroyed roadways that stranded employees at home. Telecommuting programs were also used after the 1993 Los Angeles earthquake to help manage demand on the transportation system (34).

KEYS TO SUCCESSFUL PROGRAMS

The literature review, the interviews with supervisors and telecommuters at the six case study sites, and the information provided from these companies and agencies provide insight into the components of successful programs. The following elements appear to be important in maximizing the potential benefits of telecommuting to all groups.

- **Top Management Support.** Support from top management in a business or agency is critical to the development and implementation of a telecommuting program. Management must be willing to provide any necessary financial support, as well as any changes in policies and procedures for telecommuting. Individuals interviewed at the six Texas case study sites noted that support from management or senior personnel was important to the success of the telecommuting programs.
- **Telecommuting Policies, Guidelines, and Human Resource Support.** Clearly articulating the agency or company policies and guidelines relating to telecommuting is important. These should identify the expectations of both employees and management. The policies should outline the specific requirements for telecommuters, such as a home work area, work hours, communications with the main office, dress, and other items. Most of the Texas case studies utilize some type of guidelines to govern the telecommuting program and require a signed agreement between the telecommuters and their supervisors. Support from the human resource or personnel department is also important to ensure that both supervisors and employees are able to obtain assistance during the implementation of a telecommuting program, as well as on an ongoing basis.
- **Selection of Job Tasks.** The guidelines used at most of the Texas case study sites identified the types of jobs or job tasks appropriate for telecommuting. The following characteristics summarize the main factors used to help identify jobs that may be appropriate candidates for telecommuting.
 - Can work tasks be done at home or at a remote work site?
 - Can work tasks be done without interaction with customers or co-workers?
 - Is the equipment necessary to conduct the work tasks available at home or a remote work site?
 - Can the job objectives be identified and measured?

Certain jobs may be better suited to telecommuting than others. Examples of jobs that are good candidates for telecommuting include research, data analysis, communications, writing, and programming.

- **Selection of Telecommuters.** Once the general jobs and work tasks appropriate for telecommuting have been identified, the next step is to select the employees to participate in the program. Most of the guidelines used with the Texas case studies included criteria for identifying and selecting telecommuters. An employee's work habits should be considered in the selection process. Employees who complete tasks successfully and reliably, enjoy working independently, and like to assume responsibility may be good candidates. The following questions can be used to help identify potential telecommuters.
 - Are you self-motivated and a self-starter?
 - Do you like to work independently?
 - Do you work well without supervision?
 - Do you have a home office or area where you can work at home without interruption?
- **Selection of Managers and Supervisors.** The selection of managers and supervisors of telecommuters must also be done with care to ensure a successful program. Telecommuting may require managers to adopt new or to modify existing management styles and procedures. Employee productivity must be measured by factors other than direct oversight. The lack of interaction with an employee on a daily basis must also be considered. Making sure that both managers and employees are comfortable with the telecommuting arrangement and have established a good working relationship is important. The signed agreements required at most of the case study sites help establish the expectations of both supervisors and telecommuters.
- **Establish Communication Methods.** Both supervisors and telecommuters stressed the importance of establishing regular communication methods. Techniques reported included calling superiors at the start of work on telecommuting days, establishing regular times for phone calls, using e-mail and home pages, and making special arrangements in the case of an emergency.
- **Ongoing Monitoring.** An ongoing monitoring program should be conducted to ensure that a telecommuting program continues to provide the desired benefits for all groups. A monitoring program can help identify problems so that appropriate actions can be taken, and can document the benefits to all groups, which may be important in justifying the program.
- **Equipment and Support.** Ensuring that telecommuters have the necessary equipment to perform their jobs is another important factor with successful programs. Although extensive equipment may not be necessary, the Texas case studies indicate that home computers, links into the office computer, a second telephone line, a fax machine, and a pager are often used by telecommuters. These items may be provided by the employer or the costs may be shared between the employee and the employer. Providing

telecommuters with access to ongoing computer support services and other assistance is also important.

SUPPORTING POLICIES

One objective of this research project was to identify policies that the state and other groups could use to support and promote telecommuting. This section presents potential policies and activities for use by the state, metropolitan planning organizations (MPOs), transit agencies, local governments, private businesses, and other groups to further encourage telecommuting.

- **Federal, State, and Local Legislation and Policy.** Legislative mandates or policies that encourage telecommuting can be enacted at the federal, state, and local levels. The 1990 Clean Air Act Amendments, and the subsequent ETR program in severe and serious air quality non-attainment areas, resulted in the consideration of telecommuting in many areas. For example, many companies and agencies in Houston included telecommuting in their ETR plans as one strategy for meeting the employee trip reduction requirements. When this program became voluntary, many groups decided not to pursue telecommuting efforts. A number of the agency representatives interviewed in the Texas case studies noted that the 1993 legislative resolution encouraging state agencies to investigate and implement telecommuting programs to reduce the cost of state government helped in the development of their telecommuting programs.
- **Public Information and Promotions.** Agencies at all levels can continue to promote telecommuting through a number of methods. Public information campaigns and targeted marketing efforts can be used to communicate the benefits of telecommuting to all groups. The *Home Office 2000* contest in the Dallas/Fort Worth area represents just one example of possible informational and promotional activities. Ensuring that all groups are aware of the benefits of telecommuting and continuing to promote telecommuting programs on an ongoing basis can encourage more widespread use.
- **Provide Incentives for Telecommuting Programs.** Providing financial or other incentives to companies or agencies to implement telecommuting programs represent another potential strategy. Possible incentives could include tax breaks, reductions in parking requirements, zoning bonuses, and other benefits to public and private sector groups.
- **Encourage Telecommuting within Public Sector Agencies.** Leading by example, through the implementation of telecommuting programs, represents another approach public agencies may wish to pursue to encourage more widespread use of telecommuting. Establishing telecommuting programs shows a commitment that may encourage private businesses, as well as other public agencies to follow.

CHAPTER SIX — IMPLEMENTATION STRATEGIES

This report provided an overview of the national experience with telecommuting and a more detailed examination of telecommuting programs at six agencies and businesses in Texas. The characteristics of the program and the experiences with telecommuting were summarized. Sketch planning tools for assessing the potential for telecommuting in major Texas cities and for analyzing the impacts on the transportation system were presented. The benefits of telecommuting, the key elements of successful programs, and the potential policies to promote more extensive telecommuting efforts were discussed.

The results of this study indicate that telecommuting programs offer numerous benefits to employers, employees, the transportation system, and the general public. For these benefits to be fully realized, telecommuting will need to become more widespread. The following techniques represent a few of the approaches TxDOT and other groups may wish to consider implementing to help support and promote telecommuting efforts in the state.

- **Agency Policy and Program.** One way TxDOT can utilize the results of this research project is by implementing a telecommuting program within the department. A telecommuting program has been developed by TxDOT staff (35) and endorsed by senior management, but implementation has been slowed for a number of reasons. Leading by example, through implementation of the telecommuting program, represents one approach TxDOT could take to encourage other groups.
- **Videos.** A video could be produced by TxDOT explaining the various approaches to telecommuting, the keys to successful programs, the benefits of telecommuting, and other information. The video could highlight the case studies summarized in this report, as well as the national experience.
- **Workshops or Training Courses.** A workshop, training course, or seminar could be developed and offered on telecommuting. Such a course could summarize the various approaches, identify techniques to develop a successful telecommuting program, highlight the benefits from telecommuting, and present other information. It might be appropriate to provide a general overview seminar for policy and management level personnel and a more detailed course for the staff members responsible for developing and implementing telecommuting programs. TxDOT, MPOs, and other groups could sponsor developing and conducting these seminars.
- **Establish Peer-to-Peer Network.** It appears that management personnel in many businesses and agencies are still hesitant to pursue telecommuting programs due to fears related to supervising employees at home. Establishing a peer-to-peer network to provide opportunities for managers to talk to their counterparts may alleviate many of these

concerns. TxDOT, MPOs, and other groups could help establish and promote these networks.

- **Educational Outreach Programs.** TxDOT, or other state agencies, could develop and implement a state-wide educational outreach program. Such an effort would be aimed at the employers, employees, and general public. It could be coordinated with local public and private sector groups throughout the state such as the *Home Office 2000* promotion in the Dallas/Fort Worth area.
- **Technical Assistance.** TxDOT, or other groups, could develop a technical assistance program and provide ongoing support to private businesses, public agencies, and groups interested in implementing telecommuting programs. Such a program could be developed and funded at the metropolitan level or at the state level.
- **Use of Advanced Technologies.** Electronic mail, a Home Page on the World Wide Web, and video and telephone conferencing could all be used to provide ongoing assistance, education, and outreach efforts to promote telecommuting. Consideration could be given to coordinating these activities at the state level, through TxDOT, or at the regional level, through MPOs or other groups.

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APPENDIX A – LISTING OF INDIVIDUALS INTERVIEWED

The following individuals were interviewed at the six case study sites.

City of San Antonio — Information Services Department, San Antonio

Nancy Dean, Assistant Information Services Manager

Yolanda Maldonado, Information Specialist

Joyce Maguire, Information Specialist

Rice University, Houston

Hubert Daugherty, Advanced Technology Specialist

Vicki Dean, Director, Systems and Local Area Network Management

Joe Watters, Deputy Director, OWLNET, Systems, and Local Area Network Management

Texas Natural Resource Conservation Commission (TNRCC) — Region 12 Office, Houston

Linda Vassee, Team Leader, Air Section

Sam Akinola, Environmental Quality Specialist

Lann Smith, Environmental Quality Specialist

Mobil Business Resource Corporation, Dallas

Ken Hood, Oil and Gas Accounting Manager

State of Texas — Comptroller of Public Accounts, Austin

Robin Miller, Work Alternatives Coordinator

Xavier Lopez, Manager of Human Resources

Bruce Wright, Senior Writer, Texas Performance Review Division

State of Texas — Texas Workforce Commission, Commission Appeals Department, Austin

Maureen Bucek, Director of Program I

Jacqueline Kaenagy-Valtair, Staff Attorney

Mindy Vescovo, Staff Attorney

APPENDIX B – TELECOMMUTING IN TEXAS - MANAGEMENT INTERVIEWS

The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is conducting a study on telecommuting for the Texas Department of Transportation (TxDOT). The project is examining current telecommuting programs in use by businesses and public agencies in the state. The study is identifying existing and planned telecommuting programs, examining the keys to successful programs, assessing potential impacts on the transportation system, and determining approaches for encouraging more widespread use of telecommuting programs.

To help identify the approaches being used by different companies and agencies, the key elements of successful programs, and the potential impacts, TTI is conducting a series of interviews with managers involved in telecommuting programs. Interviews are also being conducted with telecommuters and travel dairies, which record trips on the days employees work in the office and in the home, are being completed.

1. Please provide a general description of the telecommuting program at your company or agency.
 - formal or informal (copy of policy)
 - nature of program, technology support, and costs
 - length of time
 - eligible employees
2. Were changes in company policies necessary to implement the telecommuting program?
3. Is training provided to managers supervising telecommuters and to telecommuters? If so, please describe the type and nature of training (copies of training).
4. What was your perspective on the telecommuting program before it was implemented? Did you have any specific concerns?
5. What has been your experience with the program?
 - Have you made any changes in your management style?
 - Have you encountered any specific problems and how have these been addressed?
 - Have you noticed any changes in the productivity of telecommuters?
 - Have you noticed any changes in morale or attitudes of telecommuters?
 - What feedback have you had from telecommuters? Other workers?

6. What do you feel are the keys to a successful telecommuting program? What advice would you offer to other managers or companies considering telecommuting?
7. Has your company conducted any formal evaluations of the telecommuting program or any cost saving? Are copies available?
8. Is there any other information or comments you would like to provide about the telecommuting program?

APPENDIX C – TELECOMMUTING IN TEXAS - TELECOMMUTER INTERVIEWS

The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is conducting a study on telecommuting for the Texas Department of Transportation (TxDOT). The project is examining current telecommuting programs in use by businesses and public agencies in the state. The study is identifying existing and planned telecommuting programs, examining the keys to successful programs, assessing potential impacts on the transportation system, and determining approaches for encouraging more widespread use of telecommuting.

To help identify the approaches being used by different companies and agencies, the key elements of successful programs, and the potential impacts, TTI is conducting a series of interviews with telecommuters. Interviews are also being conducted with managers.

1. Please provide a general description of the telecommuting program at your company or agency.
 - formal or informal (copy of policy)
 - nature of program and technology support provided
 - length of time
 - eligible employees
2. Were changes in company policies necessary to implement the telecommuting program?
3. Is training provided to telecommuters and to managers supervising telecommuters? If so, please describe the type and nature of training.
4. Please provide me with some background information on how employees were selected for the telecommuting program.
5. Please describe your normal commute on days you work in the office (miles, travel times, routes to and from work, stops, work start/stop times, lunch).
6. Please describe your normal day when you telecommute.
7. How frequently do you telecommute?
8. What type of equipment do you have in your home for telecommuting? Is this equipment provided by the company or you?
9. What type of work space do you have at home for telecommuting?

10. What type of work do you do on the days you telecommute? How does it differ from the work you do if you are in the office?
11. What did you think the benefits or advantages of telecommuting would be before you started? Have these been realized?
12. Have you noted changes (good or bad) in your:
 - family/personal life
 - work-related stress
 - productivity
 - general morale related to work
 - group/co-worker interaction
13. Have changes occurred in employee supervision, evaluation, or management as part of the telecommuting program?
14. Has your relationship with your supervisor or co-workers changed at all due to telecommuting?
15. Based on your experience, what do you think are the keys to a successful telecommuting program? What advice would you offer other employees, managers, or companies considering telecommuting?

APPENDIX D — TELECOMMUTING IN TEXAS - TELECOMMUTERS TRAVEL SURVEY

The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is conducting a study on telecommuting for the Texas Department of Transportation (TxDOT). The project is examining the extent and impact of telecommuting programs in use by businesses and public agencies in the state. Objectives of the study include identifying existing and planned telecommuting programs, examining the keys to successful programs, assessing potential impacts on the transportation system, and determining approaches for encouraging more widespread use of telecommuting.

As a telecommuter with the City of San Antonio Information Services Department, your help is needed to assist in identifying potential transportation impacts and benefits of the Department's program. Please take a few minutes to complete the attached survey, which includes questions related to your travel and work patterns on days you work in the office and on days you telecommute. Please return your survey to Nancy Dean, Assistant Information Services Manager.

If you have any questions concerning this survey or the study, please feel free to contact Katie Turnbull or Kevin Hall at (409) 845-1535. Your help with this study is greatly appreciated!

Name _____

Home Zip Code _____

Work Zip Code _____

Commute Trip on Days you Work in the Office

1. How many miles is it from your home to your place of work? _____Miles
2. How long does this trip usually take during the morning rush hour? _____Minutes
3. What time do you normally start and end work? _____
4. What is your normal mode of travel to and from work?
____Drive Alone _____Carpool _____Bus _____Other_____
5. How many days a week do you normally make this trip? _____Days
6. Do you ever use other modes of travel? _____No _____Yes
 - If yes, please indicate other modes you sometimes use.
____Drive Alone _____Carpool _____Bus _____Other_____

7. Do you normally make any stops on the way to work? No Yes

- If yes, please check all the activities that apply:

Daycare/school Eat Shopping
 Pick up/drop off relative or carpooler Other _____

8. Do you normally make any stops on the way home from work? No Yes

- If yes, please check all the activities that apply:

Daycare/school Eat Shopping
 Pick up/drop off relative or carpooler Other _____

9. Do you normally leave your office building at lunch? No Yes

- If yes, please check all of the activities that apply:

Eat Shopping Errands Other _____

- What mode of travel do you usually use for these activities?

Walk Bus Drive Alone Carpool
 Other _____

- If you leave the office for lunch, how far away from the office do you usually go?

Miles

Days You Telecommute

10. How many days a week do you normally telecommute? _____

11. How long have you been participating in the telecommuting program? _____

12. What time do you normally start and end work on the days you telecommute?

13. Do you normally make any trips before you start work on the days you telecommute?

No Yes

- If yes, please check all the activities that apply:

Daycare/school Shopping Eat Other _____

- What mode of travel do you usually use for these activities?

Walk Drive Alone Carpool Other _____

- How far away from home is this trip? _____ Miles

14. Do you normally leave your home for lunch on the days you telecommute?
 No Yes
- If yes, please check all the activities that apply:
 Eat Shopping Errands Other _____
 - What mode of travel do you usually use when you leave your home during lunch?
 Walk Drive Alone Carpool Other _____
 - If you leave your home for lunch, how far away from home do you usually go?
 Miles

15. Do you normally make any trips after work on days you telecommute?
 No Yes
- If yes, please check all the activities that apply:
 Daycare/school Shopping Eat Other _____
 - What mode of travel do you usually use for these activities?
 Walk Drive Alone Carpool Other _____
 - How far away from home is this trip? _____ Miles

18. Please provide any comments on your general experience with telecommuting.
 Major benefits to you: _____

 Major benefits to Department: _____

 Any issues or problems encountered: _____

 Any other comments: _____

19. What is your:
 Age: _____
 Sex: M F
 Years of Work Experience: _____
 Job Title: _____

Thank you for your help!