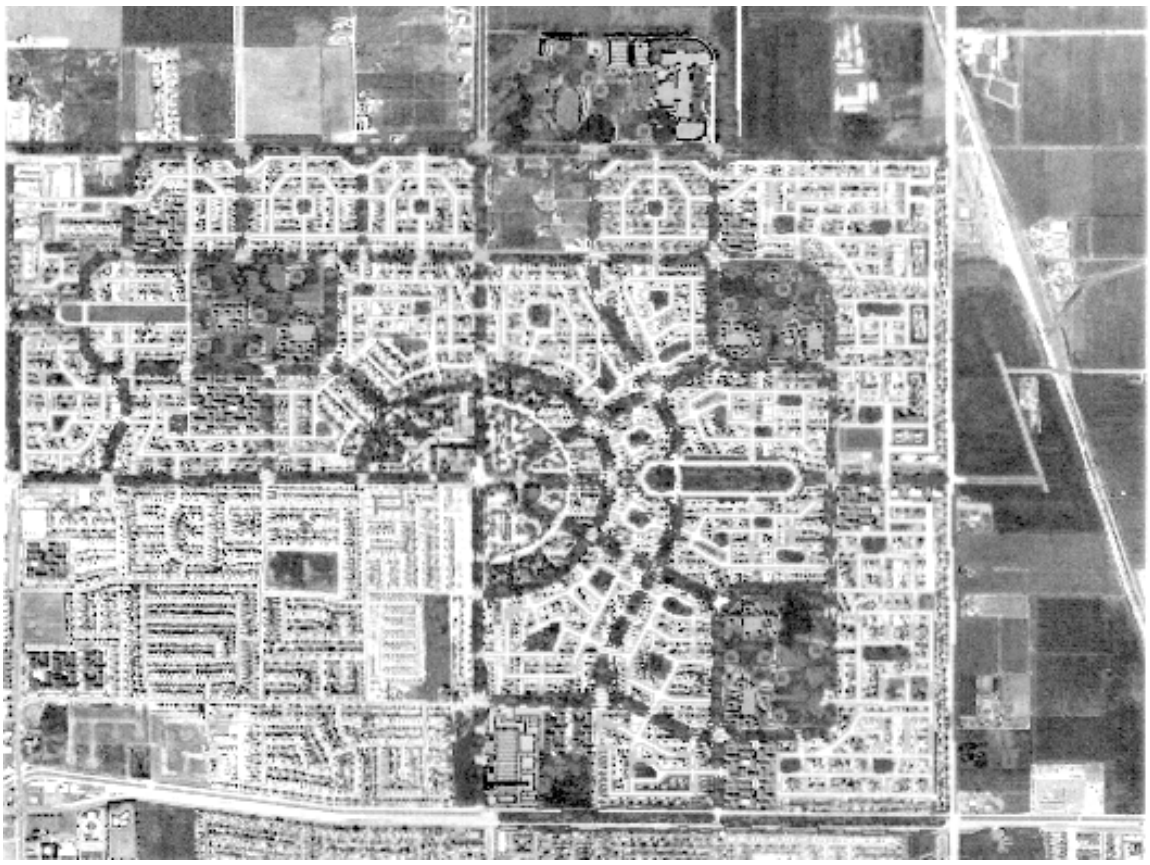

**JALA International, Inc.**

# VILLAGE ONE TELECOMMUNICATIONS FEASIBILITY STUDY

Final Report

October 1994

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# INTRODUCTION AND SUMMARY

## OVERVIEW

The City of Modesto expects to double its population from 175,000 in 1990 to 350,000 by 2010. Modesto's ultimate residential population goal is 500,000.

The northern portion of the San Joaquin Valley including Modesto has increasingly become a source of affordable housing for employees of firms located in the East Bay and even San Francisco. As a result, congestion over the Altamont pass has become severe and air quality in the Valley has significantly declined.

In order for the City of Modesto to realize its planned growth, the negative aspects of this growth, especially traffic congestion and air pollution, will require mitigation. Further, growth will depend on employment opportunities generated by, or associated with, the developments.

As a key element in its growth strategy, the City adopted the "neo-traditional" urban design model (also referred to as pedestrian-oriented development, or POD). Under this policy, all new, large scale development will occur in "urban villages." These villages are characterized by higher densities than traditional single family neighborhoods, with housing clustered around village and neighborhood centers. The development strategy is expected to yield traffic generation factors that are 20% lower than that for a typical suburban development.

In seeking additional methods to mitigate the planned growth, the City has begun to investigate the potential contributions of telecommunications applications, especially the possible role of teleworking and telecommuting[1] for the residents of Village One. Village One has the potential of housing as many as 24,000 residents when build-out is completed.

In addition, the City's economic development consultant, Kreines and Kreines, identified several telecommunications tactics for the City's long run economic strategy. These are described in the report entitled: *Recommended Modesto Economic Development Strategy* (December 1992).

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[1] *Teleworking* is defined as the partial or total substitution of telecommunications (possibly with the aid of computers) for *any* sort of work related travel. *Telecommuting* is that portion of teleworking in which the daily commute to/from work is either reduced or eliminated via telecommunications technology.

As a result of this focus on telecommunications, the City sought and received a grant from the Air Quality Management District to perform a preliminary study of the potential contribution of telecommunications, particularly telecommuting, to Village One, subsequent village developments, and to the City as a whole.

This report, produced by JALA International, is the result of that grant.

## PRINCIPAL RESULTS

This study is based on discussions with City leaders, a set of forecasts of likely future demographic, economic, and technological trends in the region, and analysis of the implications of those forecasts for the design of Village One and public policy in Modesto. Our primary conclusions are as follows:

- There is significant potential that Village One could have as much as 60% of its employed population engaged in information work and using technology that is substantially advanced from that available today.
- A substantial fraction of those workers will be teleworkers by 2020; their employers could be located anywhere on earth.
- There is a potential demand for more than 80,000 square feet of telework space to house those workers in Village One, including space for the local offices of some "virtual" organizations.
- These teleworkers will have significantly reduced travel demand, giving rise to the concept that electric vehicles, rather than automobiles, may have the dominant transportation role in Village One.
- The development scenarios of Village One could—in fact, must—be echoed in Modesto in general, providing a development path for Modesto as one of the early examples of regional tele-mobility.
- This tele-mobility can be used to address a number of issues that concern Modesto in general, including: employment development, education, literacy, revitalization of downtown Modesto, and air quality improvement.
- For these opportunities to be met, Modesto should develop a regional strategy, based on some further analysis, that involves a significant public-private partnership and major use of the potential advantages provided by evolving information technology.
- Marketing these concepts is a crucial component of the strategy.

The following chapters provide the details.

## GOALS

This is project was developed to explore the strategic options for applications of telecommunications technology and services to Village One. Specifically, the project was to:

1. Assess the potential impacts of teleworking and telecommuting on Village One, including trip reduction and air quality improvement potential.
2. Review the technology requirements and costs appropriate for various levels and distributions of teleworking.
3. Estimate the utility of telecommuting and telework as economic development tools for Modesto.
4. Explore the potential market for telework and telecommuting in Village One, including types of jobs and employers constituting the market.
5. Identify the public policy issues and initiatives that might support the use of telework and telecommuting.
6. Provide conceptual designs and functional requirements for teleworking in Village One.
7. Develop a strategy for the use of telecommunications as an economic development tool.

Each of these goals is covered in the following pages, although not necessarily in the order just shown.

## BACKGROUND

Village One is the first of a series of similar development planned for Modesto as it grows toward its goal of 500,000 population. Village One has been planned for the northeast corner of the City. Between 7,000 and 7,800 dwelling units are planned, with a projected total population of 21,000 to 24,000.

The development is planned around a village center and residential districts. The village center will include a variety of residential housing, a village green, library, meeting hall, retail and office space. Parks and schools are at the center of each residential district. A 200 acre industrial park with between 1.4 and 2.3 million square feet of manufacturing-zoned plant will be located on the eastern boundary.

There are three types of traffic issues involved in Village One. The first is the traffic internal to Village One. The second is the number of vehicle trips (VT) generated by Village One. Data on both of these issues are provided by the Environmental Impact Report and are based on standards established in the Institute of Transportation Engineers Trip Generation Manual (fifth edition).

The third traffic issue is the number of vehicle mile traveled (VMT) by the residents of Village One, particularly for the journey to work. There are no data projections available for this aspect of the problem, but assumptions were made based on SCEDCO's Demographic and Economic Profile.

Finally, there is the issue of who the workers are. In this report we have assumed that the future workforce of Village One will be similar in composition to that of the U.S. in general.

## KEY TRENDS AFFECTING VILLAGE ONE

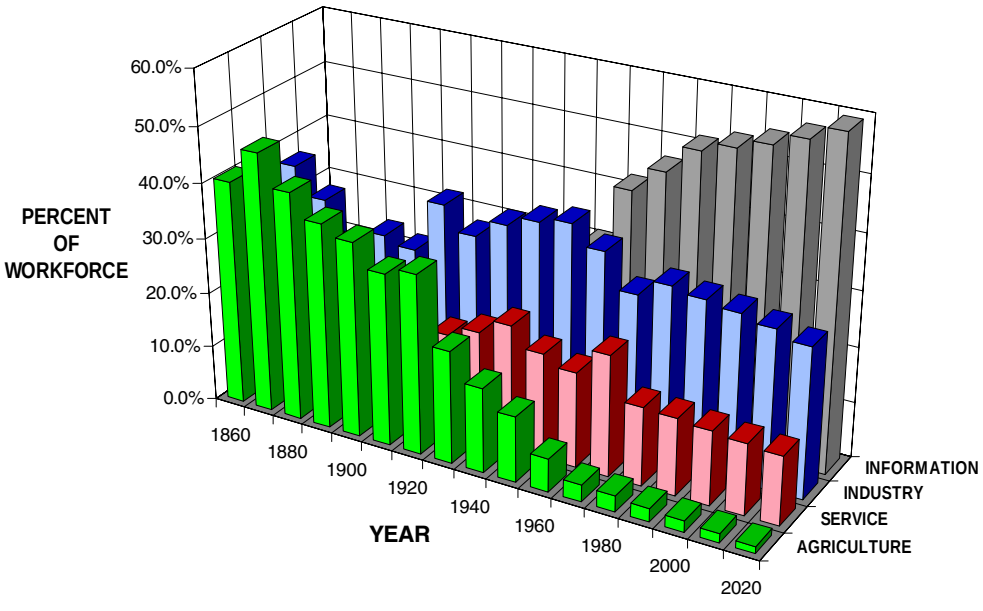
Before addressing the specific objectives of the project, we feel that it is important to place the future of Village One in a more global context. The fundamental message is that the future will be different from the present, in some respects substantially different. The key question for strategic planning is: how will contemporary trends change, and how are they likely to shape the future environment in which Village One will exist? Consequently, how should we plan for a good match between Village One and its future residents?

The following section is a description of some of the trends that will affect Village One. The graphical material was included in the QUEST (QUick Environmental Scanning Technique) exercise that was held in Modesto on April 5, 1994.

### DEMOGRAPHY

A fundamental question is what kinds of people are likely to be residents of Village One? We can not answer that question exactly, but a look at the trends in the U.S. is useful. More particularly, since one of the goals of the project was to concentrate on the economic development aspects of Village One, Figure 1 graphs the expected

**Figure 1:** *Evolution of the U.S. Workforce*




Source: Porat ``The Information Economy'', JALA Forecasts

trends in the composition of the work force. This figure is derived

from U.S. Census data but the data are not reported as shown here. In particular, information work and service are all lumped together in census reports. This is unfortunate, since it masks the importance of information work in the economy.

Information workers are people whose jobs are concerned primarily with the creation, manipulation, transformation, and dissemination of information. Information work became the dominant work form in the U.S. in 1954 and its dominance is increasing, particularly in California. Therefore, Village One is expected to be a community with a substantial number of information workers, possibly a higher proportion than the national averages of the time—at least 60% of the total.

*Table 1:* U.S. versus Modesto Workforce Allocation

| | Workforce in 1990 | | |
|---|---|---|---|
| **Workforce Segment** | **U.S. Percent** | **All-Modesto Percent** | **Modesto Sample Percent** |
| Agriculture | 2 | 2 | 1 |
| Service | 14 | 30 | 23 |
| Industry | 31 | 19 | 21 |
| Information | 53 | 49 | 54 |

This figure can be contrasted to the 1990 breakdown of the Modesto workforce, as shown in Table 1. While the U.S. and Modesto numbers are similar, Taken as a whole, Modesto reverses the roles of industry and service occupations and was slightly below the national average in information workers. However, a sample of the Modesto population near the Village One site shows a slightly higher than average number of information workers.[2]

We conclude that Modesto, at least in the areas near Village One, is following national trends in workforce allocation. Future growth is likely to continue its emphasis on service and information work. At least half the resident workforce in Village One will be information workers.

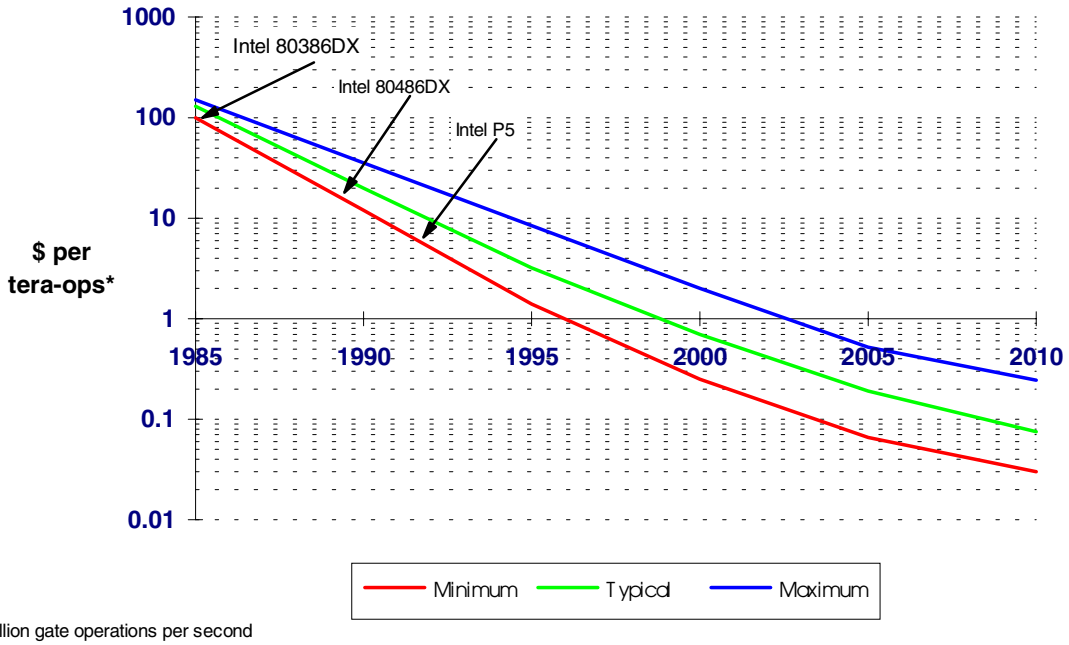
## TECHNOLOGY

A second significant factor in the future of Modesto and Village One is technology, especially information technology. Information technology—telecommunications and computers— has been the

[2]The sample was taken from the census blocks immediately to the south and west of the Village One site.

major force behind the latter phases of the industrial revolution and is certainly a dominant factor in the information age. Figure 2 shows one of the fundamental trends in this technology: the increasing power per dollar of microprocessors—the "brains" in most computers. Although the graph may look complex, its message is simple: *about every seven years the amount of information processing power increases by ten for every dollar spent;* by 2001 the average new personal computer will be ten times as powerful as the one bought today.

**Figure 2:** *Growth in the power of microprocessors*




*Trillion gate operations per second

A similar curve holds true for telecommunications technology. The main technological advances are in fiber optics transmission lines, the computerization of telecommunications, and the development of new forms of telecommunications networks. By the year 2000, most telecommunications technology used in the U.S. will be digital; that is, computer-based. The national attention (some may call it hype) being focused on the development of the National Information Infrastructure is a manifestation of this trend. Whatever the final mix—hundreds of interactive TV channels, global computer networking, distance education, home-based shopping, banking, etc.— telecommunications services of the future will be much more diverse than they are today.

The consequence of these technology trends, combined with the trends in the workforce, point to the increasing use of telecommunicating computers as daily business, educational, and entertainment tools. Therefore, quality digital telecommunications

capability will be considered a "must" in many, if not most, businesses and homes by the end of the next decade.

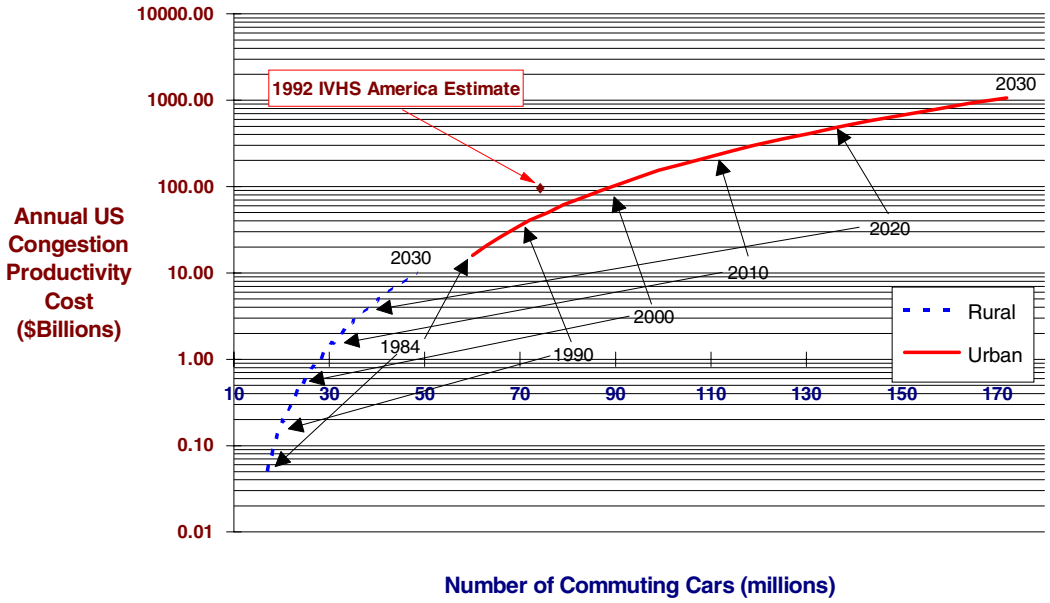
## TRANSPORTATION PATTERNS

Another fundamental factor is California's population growth. While the population has grown, the surface area of California has not (earthquakes notwithstanding). One consequence of this growth has been continuing pressure for new homes. The long term trend in home demand has driven prices up in most urban areas, to the point where many young families can not afford housing close to their work. Even where residences are available because of increasing building densities, the consequence is increased traffic congestion as the greater numbers of workers converge on (or depart from) their workplaces during the daily commutes. At the national level, the picture looks like that shown in Figure 3. The 1995 estimate is approximately $60 billion for the productivity losses resulting from traffic congestion.

Aside from the stress and strain that traffic congestion imposes on commuters, there are serious environmental effects as well. Automobile use—the primary means of commuting—accounts for a major portion of the air pollution produced in urban areas. Major efforts, including the formation of air quality management districts in California, are in place to reduce air pollution from whatever source. There are several options commonly proposed to reduce air pollution from automobiles:

1. reduce the emissions per car via the use of catalytic converters, different fuels, etc.
2. induce commuters to congregate—use mass transit, car- and van-pools
3. reduce the commute distance so that commuters will walk, bike, or otherwise not use motorized transport
4. develop effective, low pollution vehicles

**Figure 3:** *The productivity impacts of traffic congestion*




*Apr-1991 by JALA after Arthur D. Little estimate*

Options 1 and 2 are already fairly well developed and, while useful, can not produce the required magnitude of reduction. Option 4, currently focused on electric vehicles, looks promising for the future, but electric vehicles are currently limited in range and/or speed. Option 3 may sound strange at first—how can one reduce commute distance without changing jobs?—but it is the central theme of this report.

Just for reference, Table 2 shows the commuting patterns for all Modesto and for the segment in Northeast Modesto that was used for our occupation comparison. The average commute time for all Modesto was 22.4 minutes in 1990, while the commute times in the smaller sample area averaged 20.6 minutes, about 8% less. The average commute time in Los Angeles in 1990 was 34 minutes. Four of every five employed Modestans (81%) drove alone to work and 2% worked at home.

All other things being equal, commute *times* are expected to increase over the years as population grows and the number of cars and roads do not. Whether commute *distances* increase depends on the distribution of job locations.

As to work location, in 1990, 82.6% of Modestans (56,311) worked in Stanislaus County. The most popular other counties were: San Joaquin, Alameda, Santa Clara, and Merced, in that order. About 6.5% of Modestans worked in the San Francisco Bay area.

*Table 2:* Commute time distributions (1990 census)

| | All Modesto (number/percent) | NE Modesto Sample (number/percent) |
|---|---|---|
| Less than 5 minutes | 1953/2.9% | 45/2.9% |
| 5 to 9 minutes | 9216/13.8% | 243/15.4% |
| 10 to 14 minutes | 15060/22.6% | 295/18.7% |
| 15 to 19 minutes | 14729/22.1% | 386/24.5% |
| 20 to 24 minutes | 8514/12.8% | 300/19.0% |
| 25 to 29 minutes | 2117/3.2% | 31/2.0% |
| 30 to 34 minutes | 4656/7.0% | 42/2.7% |
| 35 to 39 minutes | 735/1.1% | 8/0.1% |
| 40 to 44 minutes | 961/1.4% | 16/0.1% |
| 45 to 59 minutes | 2428/3.6% | 122/7.7% |
| 60 to 89 minutes | 2475/3.7% | 51/3.2% |
| 90 or more minutes | 3710/5.6% | 36/2.3% |

## TELEWORKING AND TELECOMMUTING

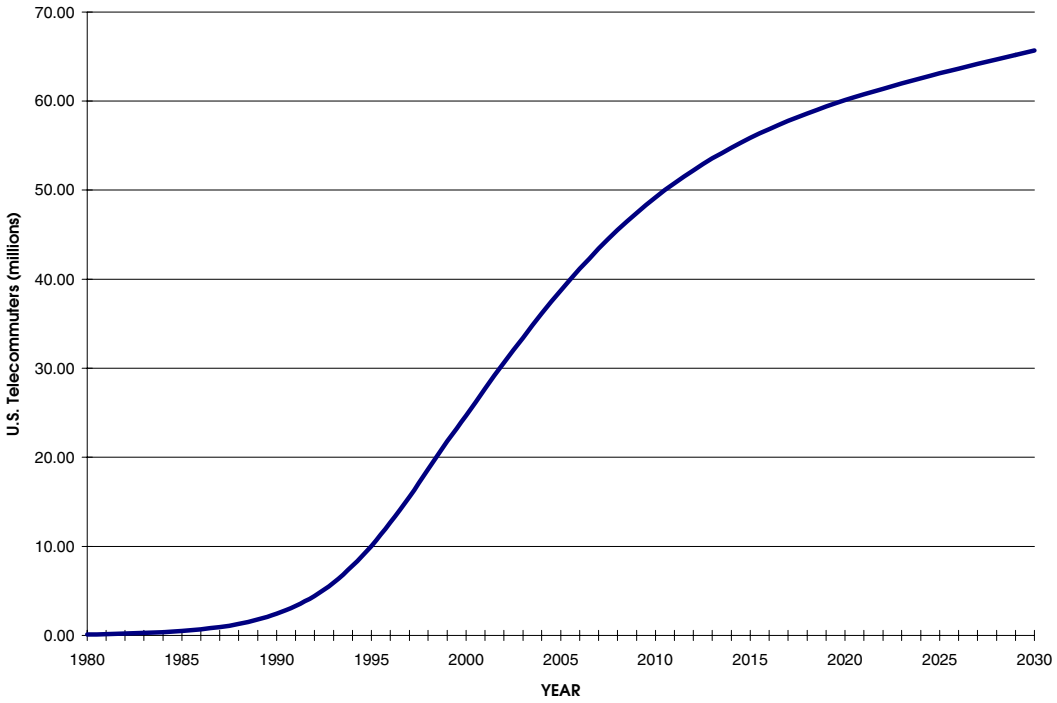
All of these trends influence the acceptance of another concept; one of the hallmarks of the information age:

***In the case of information work, why not move the information instead of the worker?***

As simple as this sounds, it can have profound effects on the activities carried out in or near Village One. *Teleworking* is defined as the substitution of information technology for work related travel. *Telecommuting* is that portion of teleworking that relates to the traditional daily commute to/from work.[3] Because of the technological changes outlined above, a growing proportion of the work performed by information workers involves telecommunications and/or computers. Often, information tasks are *location independent*; that is, they can be performed by an information worker regardless of the worker's location. Essentially all information workers are frequent teleworkers—each time they use a telephone instead of a face-to-face meeting to communicate with someone else.

[3]For more details on teleworking, telecommuting, and their management implications, see *Making Telecommuting Happen*, by Jack M. Nilles. New York: Van Nostrand Reinhold, 1994.

**Figure 4:** *Likely growth of telecommuting in the U.S.*




Hence the question above: much information work is solitary work or can be accomplished using telecommunications, so why do we continue to behave as if we were still in the industrial revolution, going to the information factory every day? A growing number of Americans are finding that they can change their "office" location to home or a place close to home at least some of the time. Figure 4 shows the anticipated growth of telecommuting in the U.S.

This brings us to one of the focal points of this study: What will be the impact of widespread teleworking/telecommuting on Village One? We anticipate that the impacts will result from at least the following considerations:

- Many information workers will want to live in a community that has more of a sense of community than that of the larger cities
- The growing accessibility of telework options will enable many information workers to live and work (at least a substantial fraction of the time) in the same community
- Information worker residential location decisions will be influenced by the extent to which a community offers the infrastructure and services for enhancing information work activities, family life, and personal growth

Therefore, the telecommunications infrastructure and services offered by Modesto and Village One are likely to have a significant impact on its success.

## TELEMOBILITY

The central idea of *telemobility* is that institutions, as well as individuals, can function more effectively in some respects by substituting telecommunications for transportation. A central concept of telemobility is that organizations do not need to be physically centralized (that is, in a central building or campus) in order to be functionally/logically centralized. The mobility is of ideas, images, and data rather than people or paper. At the personal level, it means that individuals can have a wide variety of contacts and working arrangements without necessarily having to travel large distances to experience them. Teleworking and telecommuting are natural components of telemobility, as are teleshopping, distance learning, and telemedicine

Telecommuting is central to the idea of developing telemobility. But telecommuting by itself can be difficult to implement since, in a traditional work environment, it constitutes a change in culture. Telecommuting should be viewed as one element in a larger regional strategy. Telecommuting also requires a regional infrastructure to succeed. In its early development stages this infrastructure includes training and evaluation services, marketing, high profile demonstration projects, resources for home-based teleworkers, low cost, facilities-based options and market-priced facilities-based options.

## SUCCESS CRITERIA

This brings up another central question: What constitutes the success of Village One?

To help answer that question, JALA and the city held an all-day QUEST (QUick Environmental Scanning Technique) exercise on April 5, 1994. The purpose of a QUEST is to develop consensus (or at least a mutual understanding of the issues) among a set of representatives of the key players in an enterprise—in this case, the development of Village One. The 29 attendees represented the City of Modesto, developers, the Modesto City Schools, CSU Stanislaus, Lawrence Livermore Laboratories, SCEDCO, the Chamber of Commerce, employers, and consultants, among others. Here is a summary of the results of the QUEST

### STAKEHOLDERS

Stakeholders are those who have an interest, direct or indirect, in the outcome of the Village One development. The primary stakeholders identified by the group were:

**Land owners**. Both residential owners and the developer community are key stakeholders. Both are concerned with the economics of their investment. In the case of the developers a prime question will be: why develop in Village One instead of some other (presumably less expensive) area? Expected return on investment is a key issue for both groups.

**Business**. A variety of businesses, both within and outside of Village One have stakes in the outcome. Agriculture is affected to the extent that Village One and subsequent Villages take agricultural property.[4] Service providers can look at Village One as an opportunity or a threat, depending on who provides what services. A similar position is held by retailers, both within and outside of Village One. Will Village One provide more customers to malls (or supermarkets, or drugstores, or . . .) or attract them away?

**Employers**. The interests of employers are complex. Village One can produce an attractive tele-workforce for both distant and local employers. Village One can attract employers to the area via satellite telework centers. Teleworking can become global as the technology

[4] Although Village One is situated on land that has low agricultural utility, subsequent Villages may not be. In such cases, there is a tradeoff between residential/business and agricultural use. A decline in agricultural employment may further increase the pressures for conversion of agricultural land to tele- (or other-) business uses.

(and international telecommunications regulations) improve, providing a huge array of potential employers for Village One residents.

**Employees and Families**. Clearly, the residents of Village One have a primary stake in its success. Telecommuting repeatedly has been shown to have a positive impact on both employees and their families—quality of life and community involvement are significantly enhanced.

**Education**. The education community, both "the system" and less institutionalized educators have a stake in the level of expertise and the desires for education of the residents of Village One. This interest includes the opportunities for non-traditional forms of education delivery, such as distance education, school networking, etc., all of which depend on the level of telecommunications technology available in Village One.

**Utilities and Public Agencies**. Village One could include tele-delivery of a variety of public services, from automated utility use monitoring, to building permit applications, to security monitoring, to on-line access to City Council deliberations. Thus, in addition to the fundamental impacts of the existence of Village One on the utilities and government, telecommunications can provide a new set of opportunities for service delivery. One possibility is a self-contained Village One telecommunications network.

**Others**. The list of other stakeholders includes politicians, regulators, public interest groups, information providers, entertainment providers, religious groups, recreation facilities, labor organizations, social groups, and a variety of regional, state, and national decision makers.

## DESIRED SERVICES

The QUEST included a discussion of the kinds of services that would be desired by the residents of Village One. Many services or features were mentioned: a high quality lifestyle, low crime rate, safe bike routes, proximity to shopping and recreation, medical information, child care and community services, but three were chosen as the most important attributes of Village One. The discussion was broken into two segments: services that originated locally, and those that originated elsewhere.

### LOCAL

**Affordability**. A frequent comment made during the QUEST was that Modesto had grown at least partly in response to the unaffordability of housing in the San Francisco Bay area. Homeowners were willing to commute longer distances to work in

order to be able to afford a home in Modesto. The downturn in housing prices in the early 90s is rumored to have stopped, or even reversed the trend. There are two ways to provide affordability:

1. Keep the price of housing low relative to prices in the Bay area, or at least comparable to local alternatives.
2. Provide features that enhance the earning power of the residents (that is, attract residents with higher actual or potential income levels, as might be made possible by teleworking).

**Educational Opportunities**. The QUEST participants felt that a broad range of educational opportunities, both formal and informal, were second only to affordability in importance. Information technology is clearly a major component in future education, but it is not a substitute for competent and dedicated teachers. Nevertheless, a suitable information infrastructure in Village One can augment the existing education establishment and provide a number of expansion and diversification opportunities—leveraging the educational power of local teachers.

**Work Options**. Rounding out the top three was the category of work options. Clearly, the future promises a great number of changes in the nature of work, as well as in the extent and variety of work opportunities.[5] One thing we are sure of, most people entering the workforce today will have several career—and/or job—changes before they retire. All other things being equal, it could be a major challenge to make those moves without changing one's residence location.

### NON-LOCAL

**Metropolitan Access**. One of the rumored activities of Modestans was the weekly migration to the Bay area for weekend amusement. Local availability of, or access to, services found in the metropolitan areas was felt by the QUEST participants to be an important goal. Emphasis was on entertainment and recreation.

**Regional Health care/Shopping**. Next in importance on the list was the availability of health care and shopping services. In both cases, the trend is toward more—and more versatile—electronic delivery of these services, via telemedicine, for health care, and teleshopping, via interactive TV or computer networking.

[5]One of the authors (JMN) is involved in a discussion within the European Union about the coming changes in the nature of work. Called *Rethinking Work*, the project is aimed at exploring local, national, and global changes both in the content and distribution of work, as well as the connections between work and economic development.

**Educational Opportunities**. Education got another set of votes, this time on the possibility that courses from a major university, such as Stanford, might be available on line to Village One residents. As in many other areas, the technological components of the operating costs of such education are diminishing rapidly.

**Government Information, Access, and Services**. Tied for third place with education was the need for access to government at the local, regional, and higher levels. The basic concept was that of a local city/county hall, with "local" meaning at the household or neighborhood level.

## WHO PAYS AND WHO BENEFITS

Cost is a fundamental factor in most of life's decisions, and the purchase of a home is certainly one of the major ones. The cost to buy is weighed against the perceived benefits, many of them intangible. The "bottom line" is, having made the decision, whether the prospective buyer can afford both the down payment and the mortgage(s) on the home, property taxes, maintenance, etc. All of those components are affected by the buyer's position in the job market.

Prior to that point is the decision by the developer to build the house. Major components in the developer's decision to build are the costs of construction—including any costs of "non-standard" features such as special wiring and cabling and extra rooms for office use—and the expected marketability of the finished product. That expectation depends on the developer's idea of who the likely buyers are.

The developer and home buyer are the persons directly involved in paying for the home. There are also a number of parties who may also have to pay, although the "payment" may not be readily apparent. For example, to the extent that the increased number of cars in the area produce air pollution or traffic congestion, the other residents of Village One and the surrounding community pay. If property taxes for the entire city are raised to support some aspect of Village One development,[6] the community pays again, and so on.

Ideally, everyone connected with Village One, however remotely, will benefit from its existence. The developers will benefit by realizing a comfortable profit on their investments and efforts. The homeowners/renters will benefit by having superior living conditions, work and educational opportunities, and retention or appreciation of their economic investment. Modesto will benefit by increasing its economic base and its many other advantages relative to surrounding communities.

[6]Regardless of the mechanism of the development, such as bond issues to support widening peripheral roads, or increasing power plant capacity, for example.

A number of suggestions were made by the QUEST participants concerning ways of achieving the benefits. Here are the top four:

1. Use teleworking to attract information workers and information industries
2. Set up specific telecommuting development, marketing and training programs
3. Arrange a distance learning franchise with Stanford or some other prestigious university
4. Develop specialized agricultural information databases

## THE VILLAGE ONE COMPETITIVE ADVANTAGE

None of the benefits just listed is automatic. In particular, for them to occur, the right decisions have to be made by all parties concerned. One of the factors is that Modesto and Village One do not exist in a vacuum. Other communities in the region can compete for the same opportunities. So the question arises: Why Village One? What can be Village One's competitive advantage?

Some factors discussed during the QUEST were:

- As California's population increases everywhere, commute times will increase in every community that doesn't take advantage of telecommuting
- The costs of living are rising in nearby towns as well as in Modesto; therefore, Village One can incur some level of cost escalation without losing its advantage
- Modesto and Village One can develop product differentiation via telework (such as the four just listed), promoting relocation of business to Modesto (both physically and electronically), a more productive work force, and even specialized new information services to be delivered electronically worldwide.
- Modesto can develop an image of attractiveness at the local, regional, national, and even global scales because of its innovations in community development at a human-, rather than automobile-oriented scale.

Given these general goals and visions of the future, the question is how to get there from here. The following sections explore some strategic alternatives.

# STRATEGIC OPTIONS AND IMPACTS

## SCENARIOS

One way of arriving at strategies for the future is to develop scenarios of possible futures, then examine the steps that have to be taken to realize them. We have done this for Village One at three points: the years 2000, 2005, and 2010. For each of these years we have examined the impacts of the likely levels of teleworking on Village One, with particular attention paid to the environmental impacts.

## ASSUMPTIONS

Behind these scenarios are some fundamental assumptions. They include the following:

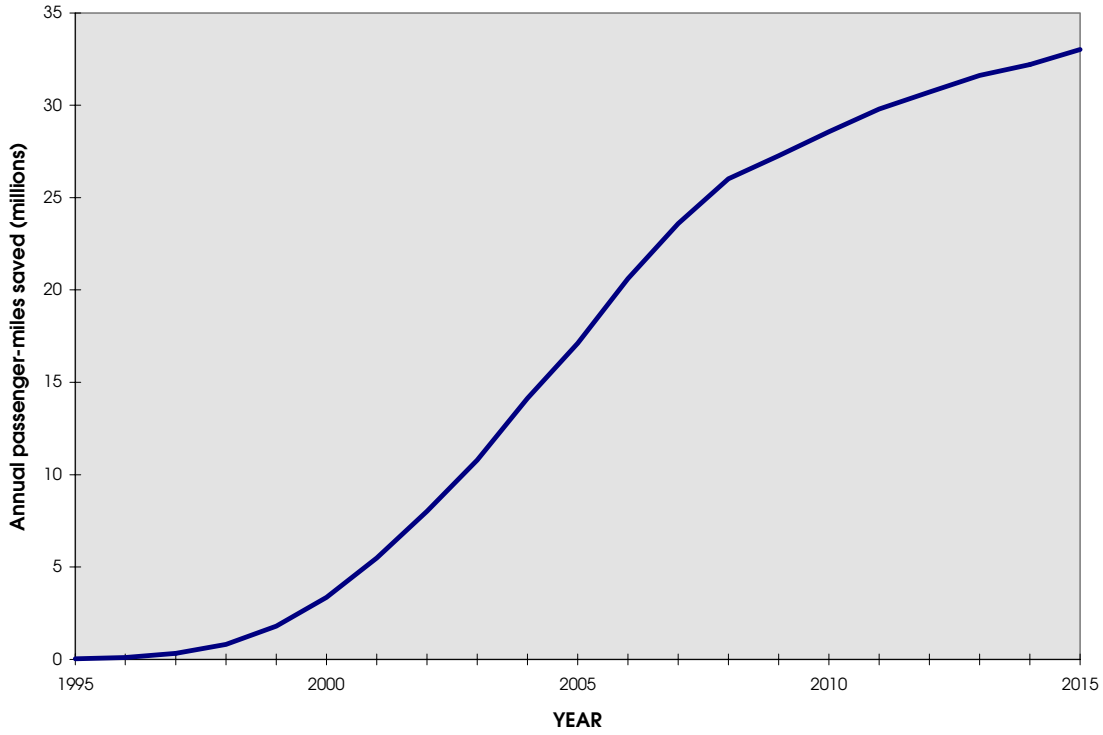
- Growth will be in accordance with the overall plan for Village One, beginning in 1995; build-out size of Village One will be between 7,200 and 8,000 dwelling units.
- The acceptance rate of telework will be the same as that forecast by JALA for California in general.
- Baseline traffic patterns for Village One will be in accordance with the forecast developed earlier by the City of Modesto Transportation Division for the Village One Environmental Impact Report.

These assumptions were used to generate descriptions of Village One for the three scenario years.

## TELEWORK GROWTH

The JALA forecast model for telecommuting growth was developed in the late 1970s and has been refined several times since then. Basically, it describes the likely growth of telecommuting in its several forms: home-based, telework-center-based, and various combinations of these and conventional commuting. The model has a large number of variables that can be "tweaked" in order to assess specific strategy options. However, for the purposes of this preliminary project, only the normal set of parameters was used in the model.

**Figure 5:** *Forecast passenger mile savings from telecommuting in Village One*



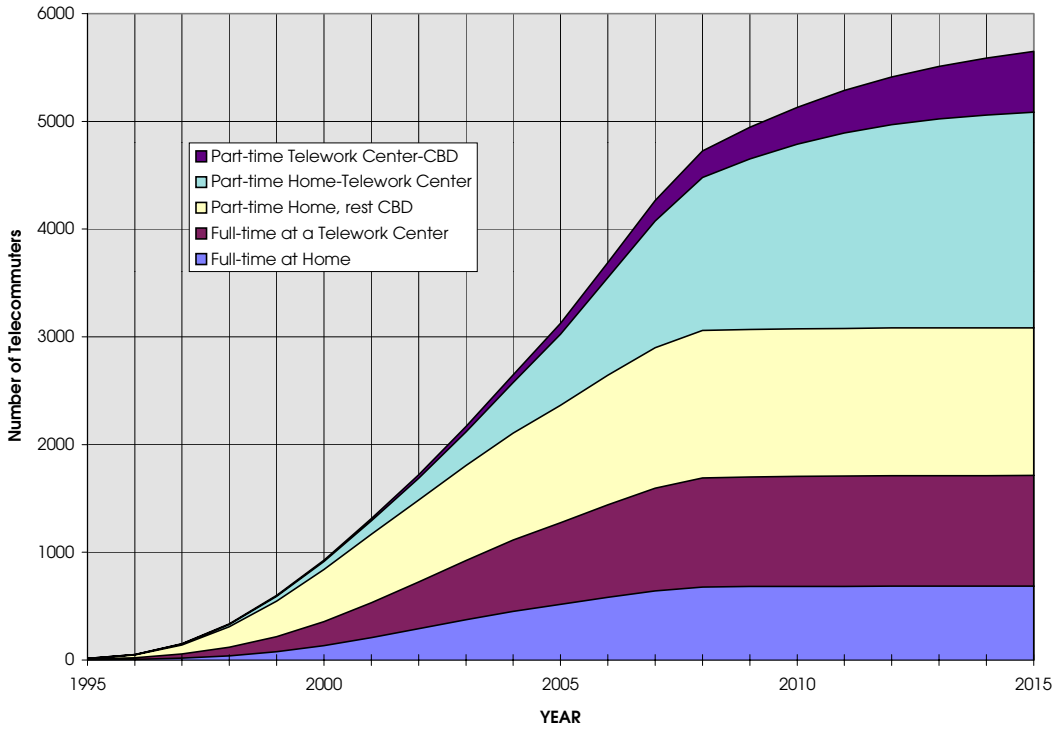

The model provides a number of outputs, one of which is an estimate of the number of passenger-miles saved by telecommuting.[7] The result of the model for our Village One forecast is shown in figure 5. Another graph, Figure 6 shows the different forms of telecommuting forecast by the model. In Figure 6, the term CBD nominally means Central Business District. In this case, however, it is used to refer to any urban or suburban center to which individuals would commute if they were not telecommuting.

Some fraction of the telecommuters will be teleworkers in the broader sense. That is, they will be working for employers in locations to which they will travel only infrequently. However, this model is fairly conservative in that respect, setting the maximum amount of full-time teleworkers at 10% of the information workers.

[7]The model also computes vehicle miles, but it includes assumptions for ride sharing and mass transit use as well, so passenger-mile figures include some of these modal splits as well.

As can be seen from Figure 6, the number of full-time telecommuters in this model stabilizes (that is, reaches its maximum value) at about the time that Village One is fully populated. The number of part-time telework center telecommuters continues to grow, however, until about 2015.

**Figure 6:** *Forecast telecommuters for Village One*




### TRAFFIC FLOW AND ENVIRONMENTAL IMPACTS

The results of the model for telecommuting development are reflected in the Village One trip generation model. Table 3 shows the situation in 2015 under the assumption that no telecommuting would occur. This is the equivalent of the EIR table for full build-out of Village One, with a total of 7600 dwelling units.

The trip generation numbers originally were derived by Modesto personnel from standard tables. The table shows total daily trips (a round trip counts as 2 trips), trips during the evening peak (although the morning peak produces the greatest smog effect), and the distribution of all trip destinations between internal (that is, within Village One) and external.

The telecommuting model acts on this table by altering the number of trips from/to residential areas. The amount of change varies with the type of residence, with single-family residences having the highest

level of telecommuting and senior housing having the lowest. The rationale for this distribution is that single family residences are most likely to have multiple earners per household and senior residences are likely to have few (but some) earners who are potential teleworkers.

*Table 3:* Baseline "No telecommuting" trip scenario

| | | | | P.M. Peak Hour Trips | | | | |
|---|---|---|---|---|---|---|---|---|
| **Use** | **Units** | **Size** | **Daily Trips** | **In** | **Out** | **Total** | **Internal** | **External** |
| RESIDENTIAL | | | | | | | | |
| Single Family | dwelling unit | 5493 | 52458 | 3570 | 1923 | 5493 | 1263 | 4230 |
| Multi-Family | dwelling unit | 1511 | 9776 | 647 | 305 | 952 | 219 | 733 |
| Village Center Residence | dwelling unit | 186 | 1090 | 66 | 31 | 97 | 22 | 75 |
| Senior Housing | dwelling unit | 409 | 1350 | 87 | 77 | 164 | 38 | 126 |
| Residential Subtotals | | 7599 | 64674 | 4370 | 2336 | 6706 | 1542 | 5164 |
| | | | | | | | | |
| COMMERCIAL & OFFICE | | | | | | | | |
| Retail Center | 1000 s.f. | 400 | 21800 | 1020 | 1020 | 2040 | 1224 | 816 |
| Village Center Commercial | 1000 s.f. | 200 | 10900 | 510 | 510 | 1020 | 612 | 408 |
| General Commercial | 1000 s.f. | 25 | 1000 | 63 | 63 | 125 | 75 | 50 |
| Office | 1000 s.f. | 75 | 1500 | 32 | 159 | 191 | 38 | 153 |
| Commercial & Office Subtotals | | 700 | 35200 | 1625 | 1752 | 3376 | 1949 | 1427 |
| | | | | | | | | |
| INDUSTRIAL PARK | 1000 s.f. | 2300 | 12144 | 440 | 1653 | 2093 | 419 | 1674 |
| | | | | | | | | |
| SCHOOLS | | | | | | | | |
| High School | student | 3000 | 4140 | 60 | 90 | 150 | 105 | 45 |
| Middle School | student | 1800 | 2160 | 18 | 36 | 54 | 40 | 14 |
| Elementary School | student | 2400 | 2400 | 24 | 24 | 48 | 34 | 14 |
| School Subtotals | | 7200 | 8700 | 102 | 150 | 252 | 179 | 73 |
| | | | | | | | | |
| **GRAND TOTALS** | | | **120718** | **6537** | **5891** | **12427** | **4089** | **8338** |

The first telecommuting scenario is for the year 2000. It is shown in table 4. The estimated population of Village One for that year is 10,300, with a labor force of slightly less than 5,000, about 3,000 of whom are information workers.

By 2005, Village One has grown to about 80% of its ultimate size, with a total population of 19,000 with about 9,000 in the workforce, and about 5,500 information workers. The trip generation consequences of this are shown in Table 5.

*Table 4:* First telecommuting scenario, the year 2000

| | | | | P.M. Peak Hour Trips | | | | |
|---|---|---|---|---|---|---|---|---|
| **Use** | **Units** | **Size** | **Daily Trips** | **In** | **Out** | **Total** | **Internal** | **External** |
| RESIDENTIAL | | | | | | | | |
| Single Family | dwelling unit | 2357 | 21035 | 1053 | 567 | 1620 | 373 | 1247 |
| Multi-Family | dwelling unit | 648 | 3883 | 172 | 81 | 253 | 58 | 195 |
| Village Center Residence | dwelling unit | 80 | 433 | 16 | 8 | 24 | 6 | 18 |
| Senior Housing | dwelling unit | 176 | 545 | 28 | 24 | 52 | 12 | 40 |
| Residential Subtotals | | 3261 | 25896 | 1269 | 680 | 1949 | 449 | 1500 |
| | | | | | | | | |
| COMMERCIAL & OFFICE | | | | | | | | |
| Retail Center | 1000 s.f. | 172 | 9374 | 439 | 439 | 877 | 526 | 351 |
| Village Center Commercial | 1000 s.f. | 86 | 4687 | 220 | 220 | 439 | 263 | 176 |
| General Commercial | 1000 s.f. | 11 | 440 | 28 | 28 | 55 | 33 | 22 |
| Office | 1000 s.f. | 32 | 640 | 14 | 68 | 82 | 16 | 66 |
| Commercial & Office Subtotals | | 301 | 15141 | 701 | 755 | 1453 | 838 | 615 |
| | | | | | | | | |
| INDUSTRIAL PARK | 1000 s.f. | 987 | 5211 | 189 | 709 | 898 | 180 | 718 |
| | | | | | | | | |
| SCHOOLS | | | | | | | | |
| High School | student | 1288 | 1777 | 26 | 38 | 64 | 45 | 19 |
| Middle School | student | 773 | 928 | 8 | 15 | 23 | 17 | 6 |
| Elementary School | student | 1030 | 1030 | 11 | 11 | 21 | 15 | 6 |
| School Subtotals | | 3091 | 3735 | 45 | 64 | 108 | 77 | 31 |
| | | | | | | | | |
| **GRAND TOTALS** | | | **49983** | **2204** | **2208** | **4408** | **1544** | **2864** |

*Table 5:* Second telecommuting scenario, the year 2005.

| | | | | P.M. Peak Hour Trips | | | | |
|---|---|---|---|---|---|---|---|---|
| **Use** | **Units** | **Size** | **Daily Trips** | **In** | **Out** | **Total** | **Internal** | **External** |
| RESIDENTIAL | | | | | | | | |
| Single Family | dwelling unit | 4349 | 36569 | 1214 | 653 | 1867 | 429 | 1438 |
| Multi-Family | dwelling unit | 1196 | 6692 | 156 | 74 | 230 | 53 | 177 |
| Village Center Residence | dwelling unit | 147 | 743 | 12 | 5 | 17 | 4 | 13 |
| Senior Housing | dwelling unit | 324 | 945 | 36 | 32 | 68 | 16 | 52 |
| Residential Subtotals | | 6016 | 44949 | 1418 | 764 | 2182 | 502 | 1680 |
| | | | | | | | | |
| COMMERCIAL & OFFICE | | | | | | | | |
| Retail Center | 1000 s.f. | 317 | 17277 | 809 | 809 | 1617 | 970 | 647 |
| Village Center Commercial | 1000 s.f. | 201 | 10955 | 513 | 513 | 1025 | 615 | 410 |
| General Commercial | 1000 s.f. | 20 | 800 | 50 | 50 | 100 | 60 | 40 |
| Office | 1000 s.f. | 59 | 1180 | 26 | 125 | 150 | 30 | 120 |
| Commercial & Office Subtotals | | 597 | 30212 | 1398 | 1497 | 2892 | 1675 | 1217 |
| | | | | | | | | |
| INDUSTRIAL PARK | 1000 s.f. | 1821 | 9615 | 348 | 1309 | 1657 | 331 | 1326 |
| | | | | | | | | |
| SCHOOLS | | | | | | | | |
| High School | student | 2375 | 3278 | 48 | 71 | 119 | 83 | 36 |
| Middle School | student | 1425 | 1710 | 14 | 29 | 43 | 32 | 11 |
| Elementary School | student | 1900 | 1900 | 19 | 19 | 38 | 27 | 11 |
| School Subtotals | | 5700 | 6888 | 81 | 119 | 200 | 142 | 58 |
| | | | | | | | | |
| **GRAND TOTALS** | | | **91664** | **3245** | **3689** | **6931** | **2650** | **4281** |

By 2005, according to the forecast, there will be about 3,100 telecommuters, averaging about 10,600 telecommuting days per week. Of that total number of telecommuters, about 760 will be working full time at one or more telework centers in Village One, while another 660 will be working part time at these centers. The

other telecommuters, slightly more than half the total, will be engaged in some form of home-based telecommuting.

Finally, Table 6 shows the situation in the year 2010. Here, Village One is almost completely built (a final size of 7600 dwelling units assumed for this set of scenarios), although telecommuting is still growing among its population.

*Table 6:* Third telecommuting scenario, the year 2010

| | | | | P.M. Peak Hour Trips | | | | |
|---|---|---|---|---|---|---|---|---|
| **Use** | **Units** | **Size** | **Daily Trips** | **In** | **Out** | **Total** | **Internal** | **External** |
| RESIDENTIAL | | | | | | | | |
| Single Family | dwelling unit | 5447 | 43869 | 892 | 480 | 1372 | 316 | 1056 |
| Multi-Family | dwelling unit | 1498 | 7974 | 58 | 27 | 85 | 20 | 65 |
| Village Center Residence | dwelling unit | 184 | 886 | 0 | 0 | 0 | 0 | 0 |
| Senior Housing | dwelling unit | 406 | 1138 | 32 | 29 | 61 | 14 | 47 |
| Residential Subtotals | | 7535 | 53867 | 982 | 536 | 1518 | 350 | 1168 |
| | | | | | | | | |
| COMMERCIAL & OFFICE | | | | | | | | |
| Retail Center | 1000 s.f. | 397 | 21637 | 1013 | 1013 | 2025 | 1215 | 810 |
| Village Center Commercial | 1000 s.f. | 201 | 10955 | 513 | 513 | 1025 | 615 | 410 |
| General Commercial | 1000 s.f. | 25 | 1000 | 63 | 63 | 125 | 75 | 50 |
| Office | 1000 s.f. | 74 | 1480 | 32 | 157 | 189 | 38 | 151 |
| Commercial & Office Subtotals | | 697 | 35072 | 1621 | 1746 | 3364 | 1943 | 1421 |
| | | | | | | | | |
| INDUSTRIAL PARK | 1000 s.f. | 2281 | 12044 | 436 | 1640 | 2076 | 415 | 1661 |
| | | | | | | | | |
| SCHOOLS | | | | | | | | |
| High School | student | 2975 | 4106 | 60 | 89 | 149 | 104 | 45 |
| Middle School | student | 1785 | 2142 | 18 | 36 | 54 | 40 | 14 |
| Elementary School | student | 2380 | 2380 | 24 | 24 | 48 | 34 | 14 |
| School Subtotals | | 7140 | 8628 | 102 | 149 | 251 | 178 | 73 |
| | | | | | | | | |
| **GRAND TOTALS** | | | **109611** | **3141** | **4071** | **7209** | **2886** | **4323** |

The impact of telecommuting, although shown in the tables, is given somewhat more graphically in Figure 7. Although overall trip volume is reduced by less than 10% by 2010, peak hour traffic is reduced by more than 40%.

These results are quite important in that they imply a transportation activity pattern that is quite different from that of most contemporary California communities. Specifically, the twice-daily automobile traffic peaks that are familiar to us all are largely dissipated by 2010 if this model becomes reality. This is because most of the transportation impacts of telecommuting act to reduce peak hour traffic. More general teleworking will also act to reduce mid-day traffic, but those effects are not included in this version of the model.

**Figure 7:** *Impact of telecommuting on reducing daily and peak-hour trips*

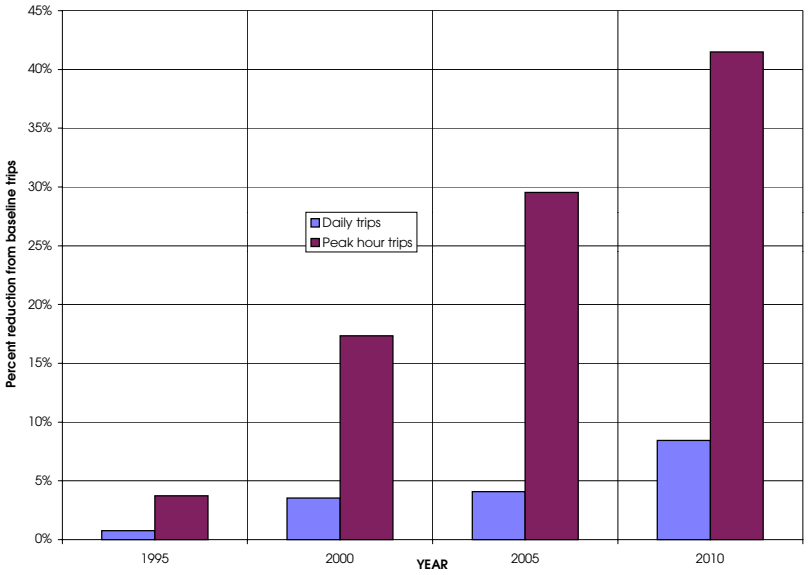
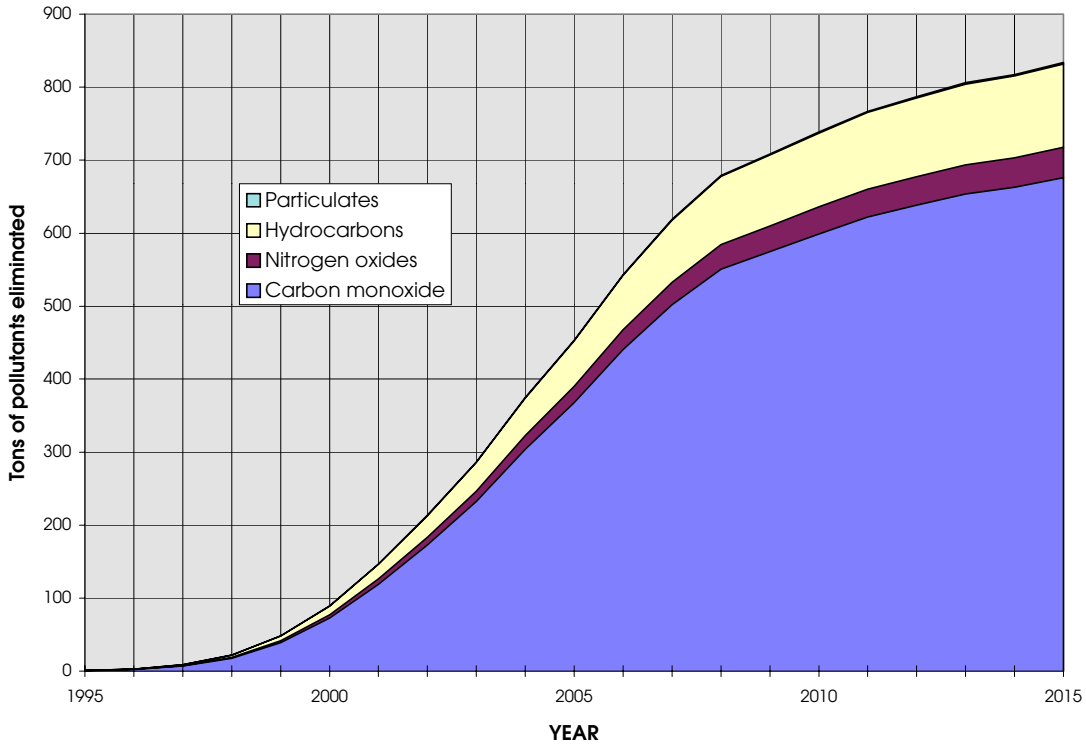



Figure 8 is a representation of the levels of air pollution that are avoided as a result of the telecommuting activities in Village One. The biggest culprit is carbon monoxide, with about 500 tons less production annually by 2007. Particulates provide only a minor

**Figure 8:** *Estimated annual pollution prevention levels from telecommuting*



source of pollution, so they constitute just the thin line at the top of the curves in Figure 8.

These scenarios provide a basis for examining alternatives for developing the future portrayed here. Assuming that these scenarios provide a desirable future, the next question is: How do we get there?

## DESIGN CONSIDERATIONS

### THE CENTRAL PHILOSOPHY

The prime considerations of these scenarios were that the physical structure of Village One would be largely as portrayed in the Village One Specific Plan. That is, the community would follow a "neo-traditional," pedestrian-oriented design. This produces higher densities than those of most communities designed in the 50s and later. This higher density is ideal for a number of features associated with teleworking. For example, some telecommunications infrastructure costs are reduced, simply because fewer miles of cable are required per 1,000 residents. Higher densities promote the use of small neighborhood telework centers, such as the one being tested in Modesto not far from the Village One site. Here, too, the costs of interconnecting telework centers are lower because they can be relatively closer together.

The other focus of the scenarios was that information workers would constitute about three-fifths of the workforce of Village One. Implicit in that assumption was the idea that a community designed specifically for information workers would be more attractive to them and, absent similar designs in nearby communities, would give a competitive advantage to Village One in attracting new residents and retaining existing ones. The further hope is that providing this advantage will not be particularly costly.

The three-fifths composition of the future Village One workforce is probably not a difficult goal to reach, since it merely reflects what has happened in California in general. But information work is changing in its nature, largely because of technological change. A feedback process is in operation here: technological change produces changes in the nature of work; these changes alter the demands for technology; the technology to satisfy those new demands further alters the nature of work; and so on. A number of questions arise.

### SPACE AND TECHNOLOGY

For example:

- What proportion of homes should be designed with space that is easily convertible into office space? How much office space?
- What kinds of technology should be built in?
- What shouldn't be built in—or should be offered as options?
- What kind of intra- and/or extra-Village telecommunications network(s) should there be?
- Should Village One have telework centers?
- If so, how many?
- How big should they be?
- Should they be multi-client, or employer-dedicated centers, or some mix of those?
- What are the cost-risk-benefit tradeoffs in these cases?
- When must these decisions be made?

Because of the high rate of technological change, there is a serious question of timing in the development of the information infrastructure that will support Village One—as well as the rest of Modesto. Most of Village One's information workers will need to use personal computers that are connected to one or more telecommunications networks. As time progresses, they will tend to demand more and more network capacity (both in channel bandwidth and number of channels). Hence, it seems imperative that Village One ultimately have a telecommunications network that is very sophisticated, by today's standards. Yet, today's technology is just beginning to support these ultimate requirements and, since the technology is new, it is relatively expensive. It will be much less expensive in a few years. So, the issue is how to design a telecommunications infrastructure that can easily be retrofitted—or can easily evolve—to meet the requirements of the future without costing too much today.

There is also the question of who (that is, what legal entity) should provide the basic information infrastructure and services. The city itself, Pacific Bell, and cable companies are all candidates to provide some, or even all of the basic infrastructure and many of the information services. Today, there is considerable change in the telecommunications industry, with coalitions of telephone companies and cable companies forming, dissolving and reforming in various combinations. The good news is that this increased competition will probably result in a better infrastructure and services to the consumers. The bad news is that the confusion about who will provide what will persist for the next few years. Planning in such a situation is an exciting business.

Both of these considerations—the rate of technological change and the rate of change of the telecommunications industry—dictate a development approach that leaves a number of options open.

Returning to the space question, the Village One plan was made under the assumption that a substantial portion of its residents would be away at work somewhere during the day time. If many of those workers remain within Village One, as our forecasts indicate, what is the likely impact on shopping, business support industries, school-related foot and vehicle traffic? What are the effects of those changes on such things as air quality, citizen participation in government, community life, property crime? Although we have not investigated these secondary effects in this project, all of them are expected to be positive for Modesto. They should be examined further in order to help refine the planning process.

## DEVELOPMENT STRATEGIES

The preceding forecast-based scenarios quantify the beneficial impacts of teleworking on air quality and congestion in Village One and, by extrapolation, other future villages to be developed in Modesto.

The unanswered question is how to realize these benefits? This section provides possible answers.

### VILLAGE ONE TELEWORK STRATEGY

Strategies directed solely to Village One are relatively narrow in scope, involving the 24,000 or so people who will live in the Village at build-out in the year 2010. In the year 2000 the labor force will be slightly less than 5,000, about 3,000 of whom will be information workers.

By 2005, the labor force will be about 9,000 with 5,500 information workers. At this point, there will be 3,100 telecommuters working in the Village, averaging about 3.4 days per week. The 2005 scenario suggests that about 760 of these will be working full time at a Village telework center with another 660 working part time at a center. The remaining 1,680 will be home-based telecommuters.

The forecasts imply that about 1,100 telework stations will be needed somewhere in the Village. At an average of 80 square feet each, this represents a demand for 88,000 square feet of commercial office space, or more than the total planned for the Village center. Some of this supply could be provided in the adjacent industrial park. Some could be located in community facilities in the neighborhoods.

The recent practice of telecommuting suggests that home-based telecommuters may require some sort of nearby support functions

such as office supplies, photocopy and fax services, clerical support and so forth. Some additional space will also be needed for these services.

The Village One Specific Plan should reflect these space needs, and possibly 1,000 or so of the housing units could be built with a specific home office/"granny flat" option.

With trip volume reduced by 10% and peak hour traffic reduced by more than 40%, the changed demand on the internal circulation system should also be addressed.

The longest distance between a housing unit and one of the elementary schools is approximately 0.5 mile. The longest distance between a housing unit and a middle school is approximately 1.25 miles and to the high school about 1.5 miles. The longest distance to some type of commercial retail facility is about 0.75 mile. The longest distance between a housing unit and the most distant industrial park location is about 3 miles.

Given those intra-Village trip distances, the summer heat, and the winter rain and fog, mode shifts to walking and bicycling by a majority of these teleworkers should probably not be assumed. Therefore, the City's transportation planners might want to evaluate an intensive use of purely local transportation options from short haul buses to electric golf carts (for example, see the ongoing experiment with street-legal golf carts in Palm Desert, California).

The objective of an effective intra-Village transportation system would be to build-on the telework phenomenon (which results in fewer and shorter work trips) in order to eliminate or significantly reduce intra-Village private automobile use by the Village-based teleworkers.

Although it is doubtful that, at the level of Village strategy, the trip reduction impacts of these telework and intra-Village transportation policies can significantly reduce the developer fees for transportation exactions (for street widening and the like), the City's transportation planners should evaluate the impacts. Reducing developer fees would contribute to the likelihood of the Village being built (rather than motivating developers to built in some other community having fewer restrictions).

Beyond these land use and transportation requirements, the final issue is the realization of the information worker mix forecast by the model. We assume that by incorporating these options into the Village One plan, the Village can be marketed as a "telework friendly" development to potential buyers throughout the north San Joaquin Valley housing market. It may be that the information worker forecasts can be exceeded as the result of these relatively minor changes and an aggressive marketing campaign.

In summary, the action steps for a Village Telework Strategy include the following:

1. Re-evaluate the commercial office space planned for the Village in the center and adjacent industrial park, ensuring that 80,000 to 90,000 feet of space are available for telework activities and an additional increment of either office or commercial space for support services. Planners should decide whether demand by this particular activity will justify an expansion of the commercial and office space, especially in light of the reduced transportation impact. Alert developers to the need.
2. Recommend to the builder-developers that the housing mix include up to 1,000 units with a separate space usable for a home office or "granny flat." (Note that other details should be considered by builders; for example, three to four times the standard number of electrical outlets are often required by home-based businesses—this may be coupled with demand for internal conduit for fiber-optic data transmission cable.)
3. Evaluate internal transportation options, from short haul buses to electric golf carts, in order to ensure that 90% of intra-Village trips do not require automobile use. This will guarantee the congestion and air quality benefits of telework in Village One.
4. Future planning efforts should reexamine the transportation infrastructure needs in the impacted intersections around Village One in order to determine whether the Village Telework Strategy can reduce the anticipated development fees for transportation improvements, and make construction of the Village more attractive.
5. Develop an aggressive marketing campaign based on the "telework-friendly" nature of the Village.

This discussion of Village strategies did not include telecommunications because we assume that, for normal telework activities, the Pacific Bell and/or Post-Newsweek cable networks will adequately handle the increased traffic. Even if broadband requirements become standard, Pacific Bell (or some competitive carrier in the marketplace of the future) will be able to service the 3,000 or so affected homes.

The discussion of Village Telework Strategy also did not involve teleconferencing nor the more complex phenomena of teleservices and telecomputing. The reason is that these applications of telecommunications technologies can be developed only as the result of a city-region strategy. For example, the institutional investment necessary to make distance education routinely available to homes in Village One could occur only in the context of a city-wide distance education program.

This larger question of city-region development strategies is discussed next. Since it does involve more than Village One, the strategy make take longer to implement. Consequently, we are looking toward the year 2020 as the milestone for final realization of the strategy, which we will call ***Modesto 2020***.

## TELEWORK STRATEGY FOR MODESTO AND STANISLAUS COUNTY

A succinct expression of the City of Modesto's telework objective is to take advantage of the changes taking place in the telecommunication industry in order to:

- Reduce the levels of traffic congestion and auto generated air pollution
- Improve the local economy
- Improve the quality of life of residents and employees

This objective can only be achieved if the telework strategy is adopted at the scale of the city and county. While considerably more effective, this approach is also much more difficult to accomplish than one based entirely in Village One, although Village One can serve as the focal point of some of the activity.

In general, rapid growth creates problems for a community because the dominant mode of transportation is the single occupant motor vehicle (SOV). The increased use of SOVs has such a deleterious effect that air quality regulators have intervened so as to make growth more difficult. Traffic congestion itself stultifies local economies. Automobile infrastructure is expensive to build and to maintain, inhibiting new development. Smog, congestion and a handicapped economy lower the quality of life.

Telework Strategy should, therefore, facilitate physical and economic growth while reducing the role of the SOV.

The formulation of strategy must address the particular conditions of a specific region. In that regard, the key problems in the Modesto area are well known.

Some of these key problem areas include the following:

### *Labor Skills*

Labor skills are well recognized as the basis for economic development, particularly for communities aspiring to high wage levels. Like other areas in California, Modesto is home to many manual and unskilled laborers who represent traditional employment in industrial and agribusiness processes. As plants become more automated, even entry level positions require knowledge of computers and telecommunications. Improving the skills of the regional labor pool is an essential component of long range economic development.

### *Literacy*

One third to one half of unemployed adults in Modesto require literacy training. In some schools, 80% of the student body does not speak English. The languages groups include Spanish, Cambodian, Lao and Mong. Raising the language capabilities of the un- and under-employed is a prerequisite to improving labor skills.

### *Poverty*

There is currently a 14% unemployment rate in Modesto. In some schools, over 35% of the student body receives support from the Aid to Families with Dependent Children Program. Poverty inhibits learning.

### *Air Quality*

Air pollution has increased to levels of non-attainment with federal standards. As a result, sub-regions in the San Joaquin Valley have been assigned emissions budgets for 1996. New constraints burden physical development.

### *New Construction*

Affordable housing has become a problem in Modesto and the homeless population has grown. Builders are concerned with both the potential costs of development in the "village model" and with a soft market for higher density housing. There is a significant amount of unused commercial space, particularly in the central business district; this is one of the issues in the downtown redevelopment plan.

The City's and the region's responsible organizations are doing their best to address the problems through both normal operations and their own strategic planning efforts. However, the organizations are encountering two fundamental conditions that inhibit progress.

- First, the effort is fragmented over many institutions and this fragmentation is exacerbated by the absence of a unifying strategy.
- Second, there is generally a lack of resources to conduct effective planning and implementation.

A unifying strategy will both help overcome fragmented effort and use scarce resources synergistically.

The following telework strategy can provide that unifying influence, guide the region's organizations toward solutions to identified problems and reduce the impacts of the SOV.

## *Modesto 2020*

An implementable Modesto 2020 Strategic Plan will require more time and resources than what is available in the current contract. The following introduces the concepts around which a telework strategy

would be based. The City-County level strategy requires coordinated action among the following six elements. These actions together address the long run problems identified above.

### *Government Institutions And Private Corporations*

Change is being forced by a new economic climate. As a result, phrases such as reinventing government and re-engineering the corporation have become familiar. Bureaucracies are being downsized and flattened.

The physical decentralization of public and private corporations is seldom discussed, yet that, as much as re-engineering, is the key to improved performance. Each organization must, to the maximum extent possible:

- decentralize its work to where its employees live
- wherever possible, conduct meetings and training sessions—even within the same city and county—electronically rather than in-person
- deliver its services directly to the home or to the neighborhood
- reduce the level of paper-based transactions in order to increase the ease and speed of conducting business

These activities are referred to as telecommuting, teleconferencing, teleservices and telecomputing and together they define a "mobile organization."

City government, County government, the 30 school systems in the County, the Community College District, the myriad of special districts, and the 8 surrounding cities should together adopt the principles of organizational mobility and develop a five year plan for becoming mobile organizations.

The following are examples of organizational mobility:

- the City of Modesto and all other government corporations in the county each allow 30% of their employees to telecommute 1 or 2 days a week
- the City of Modesto and all other government corporations in the county each provide a range of transactions and direct constituent access to records stored on-line through public kiosks and home-based personal computers
- the City of Modesto and all other government corporations make documents such as meeting agendas available through an electronic bulletin board system accessible by government employees and public constituents

- the City of Modesto and all other government corporations in the county routinely use audio teleconferencing for as many meetings as possible and video teleconferencing when appropriate
- all school systems in the County and the community college district ensure inter-enterprise network capabilities so that, for example, student records are quickly and efficiently transferred between institutions
- all school systems in the County and the community college district develop curricula for distance learning in the classroom, neighborhood facility, and home
- all school systems in the County utilize video communications to teach non-English speaking students in their classroom, neighborhood facility or home instead of busing them to a central location to meet with a language acquisition specialist
- the community college district imports distance education from educational institutions throughout the west or even from elsewhere in the world in specialties such as plant biogenetics or other technical areas needed by local industries

As government establishes the benefits of organizational mobility, the private corporations in Modesto and the surrounding county should be encouraged to adopt the same principles in their businesses to the extent possible. Note that there are several current examples of organizations having adopted isolated elements of mobility on an ad hoc basis. These include the County's use of the cable television system to distribute video tapes to county schools and the English as a second language classes provided by Modesto Community College on-site at Tri-Valley Growers.

### *Virtual Villages and the Central Tele-District*

Village One will be developed gradually over the next 20 years. Successful adoption of organizational mobility by the City's leading public and private corporations will begin to support a decentralized urban design, like that being used as the structure of Village One. In order to capture the maximum benefits from organizational mobility, the City should simulate the distance relationships of Village One in selected existing neighborhoods. This constitutes a retrofit of the existing built environment.

The design objective will be to introduce the equivalent of a village center into suburban areas with current population somewhere between 10,000 and 25,000. Existing shopping malls may suit this purpose. In other cases, existing commercial office buildings may be the starting point. The result will be a "virtual village" with a "virtual

village core." The Appendix has more details on the hierarchy of centers.

The redevelopment of the central business district is occurring while the largest employers and service providers are becoming more mobile by adopting systems and procedures for keeping employees and constituents closer to home, and the City is being retrofit into a network of "virtual villages."

This suggests a new role for the central business district. The CBD of Modesto 2020 will be the central meeting place for the city and the county. As work is increasingly performed in or near home, meetings occur electronically and services are delivered in or near home, the central business district will become increasingly important as the place for in-person service consultation and face-to-face contact and conference space. The new City Hall may also reserve part of its space to be a telework center. Other central services include entertainment and retailing (as opposed to home-based or neighborhood-based tele-shopping). The CBD, already the central hub of the public transit system, will expand its center-within-centers role, making the transportation connection to the central tele-hub.

The CBD will also include the highest concentration of telecommunications facilities and telework stations. In this regard, its urban reference will shift from central business district to central tele-district. For example, one possibility is to develop a major cultural center downtown like the ones in Escondido and other California communities. The center would provide the "critical mass" of cultural focus, including TV production and regional distribution. The cultural center could also become a node in a regional, statewide, or national/international network of cultural viewing events.

### *Transportation*

As the public institutions and the private businesses become more mobile themselves, their employees and constituents will take fewer and shorter trips. For the urban area to stay in balance, the transportation systems will also have to adjust.

Public transit systems should be redesigned toward three types of service. The first is service completely local to Village One and the "virtual villages." This service will link homes and businesses within a one-half to one-mile or more radius to a designated "virtual village core."

The second links "virtual village cores" to the central business district. The third, greatly reduced from present levels of service, provides traditional linear service along the major thoroughfares of the city.

Short range private transportation options including electric carts and human-powered vehicles are alternatives to the private motorized automobile.

### *Telecommunications*

A dramatic reduction in SOVs will lead to a dramatic increase in the demand for telecommunications services and bandwidth. Video delivered distance education, for example, will require broadband network services between schools and neighborhood centers and, ultimately, provide access to homes who can afford to subscribe to the service.

Similarly, broadband services (for video and high speed data) will be required between public institutions throughout the county. This suggests that the City will evaluate development of a county-wide inter-governmental network. There are several options for such a network including joint powers authority ownership, or a commercial network on favorable terms from Pacific Bell, Post-Newsweek Cable, or an unforeseen competitive access provider.

The recommendations below include next steps for using the existing cable system.

### *Marketing*

The telework strategy will give Modesto and the surrounding County a competitive advantage over competing locations. Today, the competitive advantage is based on affordable options for land and labor, distribution to markets through the intermodal transportation facility, inexpensive electricity, low crime rate and a small town atmosphere.

Through Modesto 2020, qualities such as a technically skilled labor force, uncongested streets and highways to facilitate the movement of freight, effective and low cost government and educational institutions, clean air and no restrictive air quality regulations, enriched village and neighborhood life, and low cost of living (not requiring one private automobile per driver) will be added to the list.

As opposed to simply attracting teleworkers employed in the East Bay or elsewhere, this strategy will attract employers (as mobile organizations) as well as their employees.

Modesto 2020 is simultaneously an economic strategy and an environmental strategy.

## *Telework Strategy for Village One and Subsequent Villages—Revisited*

The second tier of the strategy—new development in the urban village model—can now be revisited in the context of the Modesto 2020 Strategy.

### *Physical Characteristics*

The telework facilities described in the Village One Strategy will now be expanded to include kiosks and other equipment needed for teleservice delivery. The planned elementary schools, for example, may be redesigned to function as multi-purpose facilities that include public and private telework activities, centers for conducting a range of city, county, and state government transactions, video conferencing facilities, and distance education centers—in addition to serving as elementary schools for the immediate neighborhoods.

### *Transportation*

The internal transportation component will remain unchanged from the Village One Strategy but now the transit connections to the central business district will be strengthened.

### *Telecommunications*

Public broadband services will be required at all schools and other public buildings in the Village. Individual households will subscribe to commercial services based on need and the ability to pay.

### *Marketing*

The adoption of the Modesto 2020 Strategy will increase the likelihood that the planned urban villages will indeed be built. The life style inherent in the villages will become more feasible as a result of organizational mobility, new transportation concepts, and advanced telecommunications. Demand for urban village housing should appear more solid and the cost of building the villages should decline due to a reduction in development fees for transportation infrastructure improvements.

Village One will become one of the more desirable locations in Modesto.

## *Recommendations for Approaching Modesto 2020*

Modesto 2020, as outlined above, requires a complex process of education, planning, urban development and organizational development. The question is, how to begin?

The first priority should be to learn about the costs and benefits of a telework development strategy. This will require at least one or more study sessions with the City council, additional analytical work. For example, one of the steps that should be taken is to develop a more detailed idea of where, and for whom, current Modestans work, with emphasis on the types of individuals/families who are likely to be the residents of Village One (to begin with) and the region. Next, more detailed scenarios can be built from those data and used to explore

alternatives with the City council. The result would be a concrete statement of the Modesto 2020 strategy.

Eventually, a proposal for Modesto 2020 should be circulated to other government organizations in the county to discuss and reach consensus on its adoption.

In the meantime, the Modesto City Council should authorize priority projects and work with the Council of Governments to identify and secure funding for them.

The following are JALA's recommended action steps:

1. Conduct a telecommuting pilot project with the City of Modesto and the County of Stanislaus governments. The pilot should initially be home-based. In a second phase, all 8 local governments in the County should be invited to join and a facilities-based option should be included. The facilities can be acquired at no cost through an agreement between cities to share existing work stations in government buildings. The Southern California Telework Facilities Exchange is a model for this component of the strategy.
2. Modesto Junior College, already a resource to local employers, should be encouraged to offer telecommuting training courses for interested employers throughout the County. This could be broadened to include courses on home-based business development as well.
3. The existing cable television institutional network is an underutilized resource available for use in the Modesto 2020 Strategy. There is currently a 60 mile, 550 MHz cable I-Net that connects all public buildings in Modesto. The City has access to 225 MHz (enough for over 35 video channels) on this network. To date, utilization has been limited to a few applications developed by Stanislaus County including video arraignment, traffic signalization, distribution of educational materials and a GIS (geographic information system) application.

   The City government, school districts and Modesto Community College should be encouraged to immediately develop applications for this network. The Kreines and Kreines Economic Strategy Report suggested that the City evaluate developing its own fiber optic backbone network, but the available cable I-Net should be utilized before an additional investment is considered.

   An example of a school district I-Net application is teaching English as a second language to its substantial non-English speaking student population. Current practice involves busing

children from their home schools to a special language acquisition class where there are often 15 languages and 3 grade levels present in the same room. An I-Net application would allow the language training to occur without the busing and with students assembled in more homogenous grade and language groups.

Another possible application is work groups on curriculum issues, where teachers could participate from their home schools without driving to a central location for the meeting.

Modesto Community College could experiment with using public school buildings and community centers as sites for a distance education program. This experiment should become the basis for testing the feasibility of providing distance education to Village One and the "virtual villages" on a wide scale.

Similarly, the medical applications could be developed and tested over the I-Net in order to evaluate the long run, wide scale feasibility of tele-medicine services at the village scale.

These are all examples of one or more aspects of organizational mobility and would represent incremental progress toward becoming mobile organizations.

4. The City of Modesto should develop a plan for its own adoption of the principles of organizational mobility and then share that plan as a model for use by other organizations. This would become the basis for a telecommunications needs assessment that, in turn, could be used to evaluate the needs for additional network resources (including the possibility of a fiber optic backbone network). SCEDCO may be the appropriate organization to share the plan with the significant private sector employers in the County.
5. The City should immediately develop a County-wide teleconferencing network (audio and computer) in order to improve the efficiency of the public sector by reducing meeting costs and reducing the amount of air pollution caused by for-work travel. This should be a model for similar networks in the private sector. The Southeast Los Angeles County Teleconferencing Network is a model for this project.
6. Designate one to a few "virtual village centers" in traditional neighborhoods in Modesto and begin to offer distance education, telemedicine and government services at these locations. A combination of the public telephone network and the cable I-Net should handle the telecommunications needs of these applications. These centers could also be

placed in public school buildings. Telework support services and eventually telework centers should be developed at the centers.

7. Assess the potential for City and County governments to offer teleservices (information and transactions) through existing kiosk systems such as Info California or LNX (City of Glendale).
8. Work with SCEDCO and other business interests, Modesto Junior College, and the larger school districts to determine the long range labor force skills requirements. Develop a plan to provide the education and training for one specialty on a pilot basis, where the curriculum will be provided electronically by an educational institution outside of the County. This would be an attempt to gain experience importing distance education. This can be expanded to provide university-level distance education via arrangements with Stanford University, the UC system, and their affiliated national distance education networks.
9. Develop a non-profit telecommuting development and marketing organization (similar to tourist bureau) that can develop the following services:
   a) Market the practice of telecommuting to firms located in Sacramento and Bay Area
   b) Compile a skills inventory and on-line system for marketing labor living in the county to employers located in the county
   c) Compile a skills inventory and on-line system for marketing Modesto labor to employers located in the Bay Area.
10. Conduct transportation studies regarding the use of human powered vehicles and golf carts within the villages and virtual villages. If the traffic model shows good results, and the experience in Palm Desert with street-legal golf carts is positive, petition the State for permission to operate golf carts on City streets within Village One or within a virtual village.

## OVERALL MARKETING STRATEGIES: GETTING THERE FROM HERE

The realization of Village One as a prototype for other communities of the future does not end with the construction of the last home or seeing the last business space filled. In fact, even the construction of Village One will depend on how well the image of the potential of the Village is conveyed to developers and potential home buyers. Thus, if Village One and Modesto 2020 are truly to become the models that are outlined here and that we believe they can be, then the Village One story—from conception, to design, to opportunity—must be told. This is the role of marketing. Although the process can

cover the entire Modesto 2020 plan, the following sections concentrate on Village One.

## OBJECTIVES

There are three primary objectives for a Village One marketing program:

- To attract businesses to Modesto from other communities
- To attract residents to Village One, possibly from other areas of Modesto as well as from outside the City
- To keep dollars in Modesto—business, residential, retail, and recreational

## TARGET MARKETS

The Village One project appeals to a broad spectrum of people. So one of the first elements to be considered is that there are multiple markets to which the program can be directed. The Appendix provides a more detailed look at the distribution of market centers and the hierarchy of communications.

- *Residents*—from within Modesto and from other parts of the state. The Village One residential areas will be attractive to those who are seeking a better quality of life.
- *Employees*—the technological elements included in Village One will be attractive to people who are commuting out of Modesto at the present time, as well as to those individuals for whom work location already is flexible.
- *Employers*—many businesses located in higher cost areas of the state are relocating to lower cost regions, including the San Joaquin Valley. Village One may offer employers an opportunity to relocate to Modesto, as well as offer current Modesto businesses the possibility of upgrading their offices/work sites. Corporations that employ high numbers of Modesto residents might also be interested in establishing satellite facilities in the Village One Business Park.
- *Adjacent Communities*—As Modesto grows, communities outside the city limits (Oakdale, Turlock, etc.) will be turning to Modesto for more and more of their services, work sites, and employment.
- *Local Government*—Village One is one of the best examples of a partnership between government agencies and private enterprise. If Village One is to be a model community, ongoing attention to the services available there will be an important part of the sustained marketability of the project.
- *Funding Agencies*—Several of the recommendations made here will require further funding. That, too may take some

marketing effort to assure potential funding sources that Modesto/Village One are high leverage recipients of their support.

- *National Interest*—If Village One succeeds in becoming a prototype for the future, the process of creating Village One and the results achieved will be of interest to businesses on a national, or even international scale.

## SITUATION ANALYSIS

There are a number of marketable elements in the Village One plan. First and foremost, each component is designed to bring people to Modesto or, in the case of the commuting work force, to keep them there.

The residences are not typical in design. They will include amenities which make teleworking possible, from the installation of conduit to the possibility of offering electronic upgrades similar to offerings of carpet upgrades in the average home. They are also higher density than is common in California.

The residents are also not typical. People who choose to live and work in Village One are people to whom quality of life is of primary importance. Our forecasts state that at least 60 percent of them will be information workers.

Village One should hold particular attraction to the Bay Area. Many Bay Area workers live in Modesto and may become teleworkers. Many Bay Area residents who live and work there may consider moving to Modesto and becoming teleworkers. The Bay Area is close enough to Modesto geographically that they share a bond, but it is also far enough from Modesto economically to make areas like Village One especially appealing.

The project is also unique in that the community is participating in its planning, and some ideas which might add to the salability of Village One include the possibility of building schools that are dual use (schools by day, telework centers by night) or including telecenters in high-density dwellings such as apartment or condominium complexes.

There will be a number of organizations interested in implementing marketing programs for Village One, including the Chamber of Commerce and each developer. The recommendations we make, therefore, are designed to give a marketing "umbrella" to the project, under which all other individual marketing projects can be created.

## EDUCATE THE PUBLIC

If electronic communications technology is going to play a large role in Village One and future growth in Modesto, we recommend that

you begin by offering the public seminars which educate them on ways in which technology can transform their lives.[8] Some topics in need of greater public understanding and acceptance are:

- Teleworking/Telecommuting
- Using the technology in your business
- Using the technology in your home

### COORDINATE WITH SCEDCO

The Stanislaus County Economic Development Corporation (SCEDCO) has as its mission the economic development of the region. As such, SCEDCO can be a major resource for augmenting the overall marketing efforts of Village One and Modesto 2020.

We recommend that the City of Modesto and other Village One partners enlist SCEDCO's cooperation in selling Modesto workers to businesses located in the Bay Area and elsewhere. SCEDCO could act as the regional jobs/talent marketing organization.

How might this happen? If Village One is higher-end and offers a lifestyle that well-educated workers might enjoy, you can view the home sales process as one of attracting a workforce. You might hold job fairs throughout the City, inviting information workers to register with a central data base. Posting information about Village One on the Internet might also attract potential residents.

Once the data base has been established, we can create "sales kits" and a video for trade organization representatives to share with employers throughout the state and nation.

With the availability of the electronic superhighway in so much of the Village One design, you would be supporting residents (and those who want to reside in Village One) with a means of obtaining good jobs while keeping their high quality of life.

### DIVERSIFY THE WORKFORCE

Public perception of Modesto—whether accurate or not—is that it is a farm community. What most people don't understand is that farming in California is Big Business. And where an industry like agriculture makes the jump from family farm to high-tech consumer production, you have an opportunity to move to the next step in communications technology.

We recommend also that Modesto identify a niche market in which it can demonstrate preeminence. For example, Modesto could—

[8]The JALA team has put on seminars on telecommuting and subjects related to telecommunications technology throughout California, including a Conference on Telecommuting held in Modesto in November, 1993. We would be happy to plan and implement similar seminars and conferences on topics to be determined.

perhaps through SCEDCO—build a national resource agricultural data/expertise base in one or two subject areas. In the same way Atlanta has become known as the Center for Disease Control and Greenwich has become the Center for Time Control, Modesto could be the Center for Agricultural (Health care, etc.) Information.

### RESIDENTIAL MARKETING

Each developer will have a marketing team assigned to create sales materials for each residential and commercial area within Village One. And each developer will bring to these sales materials the look and feel of what his/her individual corporation wishes to present to the public.

We recommend that the Village One partnership work with us to develop one common marketing piece with multiple applications: it would be distributed through sales offices with individual developer materials to prospective buyers, it would be direct mailed to corporations planning a move to Modesto, or it would be used in promoting Village One to the media.

We also recommend that each developer offer high-tech upgrades, similar to what is currently available for upgrades in flooring or carpet. For example, an option for each home might be a workstation in the den (or the "granny room" noted earlier), complete with a PC, printer, fax/modem, and basic software. For an additional investment, the buyer could offer upgraded hardware, alternative software, or even a second workstation in another room for the growing number of two-earner-teleworking families.

This "value-added" offer will help emphasize the telecommunications elements of Village One, and can be woven through both developer-produced and partnership-produced marketing materials.

### PAID ADVERTISING

Once Village One is under construction and ready for the general public, we recommend paid advertising in regional magazines and billboards, particularly in those areas from which Modesto would like to attract new residents and businesses.

Full-page ads in publications like business journals, regional lifestyle magazines, or statewide professional journals with a theme like "Discover Modesto," with photos of Village One and a call to action (call 1-800-GOOD LIFE[9]) will generate statewide interest in Modesto and Village One. The same theme could easily be carried over into billboards on major commute routes in target areas.

[9]Don't try this at home. We do not know whether this 800 number exists.

## SHARING YOUR SUCCESS

It isn't enough to just be a prototype for the sake of knowing what you did was progressive. The essence of being a "model" from which others can learn is to communicate what it is you have done to others who might seek to emulate your accomplishments.

In short, a well-planned public relations campaign can be a very powerful item in the development tool chest. It is particularly important to identify the unique selling points of the Village One model in Modesto and create ways of sharing the process and results with others. Sharing possibilities include feature stories in lifestyle and business publications already targeted for paid advertising, cable television programs, regional newspapers, and speeches to leaders from the building industry.

## CONCLUSIONS

Village One has the potential to be not only a fine example of a neo-traditional community but, together with the greater Modesto 2020 plan outlined here, the cornerstone of a significant regional development. Many of the key trends are in place and the critical first steps have been taken.

Although many of the trends and impacts discussed in this report will occur without any intervention on the part of the City, they may happen somewhere else first. Modesto has already exerted leadership in its development of the Village One plan, but it has no patent on these ideas; other cities in the central valley could develop similar plans.

Leadership basically means being, or going there first. Therefore, there are some things that Modesto can do to help insure that the momentum of the future is guided by Modesto, not by someone else. Modesto can expand its role as the regional leader without huge expense.

First, some consensus must be reached on the goals of Modesto as an entire community, the options afforded by information technology, the development alternatives available to the community, and the role of Village One and subsequent Villages in them. In order for this to occur, some further background exploration in detail is necessary. This exploration should be done in parallel with the initial development of Village One—it should not be considered an impediment to that development.

Second, serious thought should be given to the development of a City-led marketing campaign for Village One that is consonant with the goals and objectives outlined above. Marketing Village One will not be successful without professional guidance and an adequate budget. Businesses and developers are accustomed to the kind of marketing and advertising campaign we have recommended; city governments typically are not. The City need not assume the entire marketing role or responsibility. Rather, it can serve as the focus for a coordinated and integrated marketing effort.

Third, we recommend that both the growth analysis and options assessment results provided here be revisited and expanded to cover at least Modesto and hopefully the region, as well as performed in greater depth than was possible here.

## APPENDIX: THE HIERARCHY OF CENTERS

The urban studies literature is rich with reference to centers. Central place theory, land rent gradients, lower and higher functions, and service areas are examples of urban phenomena that support the idea of centers.

Indeed, the neo-traditional model of urban design employed in the design for Village One is based on two levels of centers in the urban hierarchy -- the neighborhood and the village center. In this case, each neighborhood center serves from 5,000 to 7,000 people and the village center serves from 20,000 to 25,000 people.

This report includes a recommendation for replicating the village and neighborhood centers of Village One elsewhere in existing developed areas of the city as part of the Modesto 2020 program. In other words, the concept of a hierarchy of centers can be applied to organize the entire city so as to minimize the need for automobile transportation. In order to minimize the time and cost to develop the hierarchy of centers, each would at least initially become a "virtual" center.

This suggests that as few as three virtual village centers near the outer edges of the city—or as many as seven total—could be developed. Fewer village centers would mean that the central business district would serve as the village center for the nearby neighborhoods.

The following provides a brief description of the nature of each center in the three level hierarchy proposed for Modesto. The work at this stage is schematic, with the examples expressed in terms of the telecommunications technologies and services that fit each level of center. Additional study and design will be needed to develop specific details such as the mix of government and commercial services offered at each type of center.

The limitations of the private telecommunications market is an important basis for the following discussion. Specifically, *the hierarchy of centers is based on assumptions that advanced telecommunications networks that include very high bandwidth to the home (via fiber, ISDN, or satellite) and the station equipment to fully utilize such networks (such as multi-media set-top controllers, picture-phones, high speed color laser printers) will at best reach an average penetration rate of between 50% and 70% of all homes and businesses.* Therefore, aside from considerations of the desire for more face-to-face communications, many telecommuters will need access to centers to perform their work.

Furthermore, the centers hierarchy assumes that the major public institutions including city and county government, the school districts, the community college, hospitals and community health

clinics and agencies of the state and federal governments have all become "mobile organizations." This means that each supports a variety of telework, teleservice and teleconference options. In addition, at least some private businesses, notably retailers and realtors, have adopted the network as a place of business (e.g., video catalogs for goods, on-line product information retrieval, and on-line ordering).

The variables in each center include the level of telecommunications service (i.e., the bandwidth available, accessible networks like Pacific Bell, Metropolitan Fiber Systems or a government network), the variety in the capabilities of the station equipment (i.e., laser printers, high definition monitors and screens, Class IV facsimile), and the number of each equipment piece available (e.g., six state-of-the-art work stations at one center vs three previous-generation computers at another center).

### NEIGHBORHOOD CENTERS

Each center will be equipped to support a population of business and residents of approximately 5,000 to 7,500 people.

Hypothetically, each neighborhood center will receive 3 educational data or video channels, 3 government data or video channels and 3 health care educational or video channels. It will also include ten standard capability work stations on a local area network served by two laser printers, a scanner and a fax/data modem server or ISDN lines. The work stations will satisfy the demand for up to 50 telework days per week.

There will also be one ATM[10] for banking and one kiosk each for local and state government information services and transactions.

All facilities will be booked on a first come-first served basis, in the same way that hotel rooms or recreation facilities (such as a golf course) are booked.

Candidates for the physical location of the neighborhood center include an elementary or some other public school, a large grocery store, or a small agglomeration of neighborhood shops including convenience store, drug store, day care center, laundromat, barber shop and so forth.

### VILLAGE CENTERS

Each village center will be equipped to support a population of business and residents of approximately 20,000 to 25,000 people.

[10]Automated Teller Machine, not Asynchronous Transfer Mode.

For the purpose of illustration, each center might receive 12 data or video channels each of education, government, health, business, and public non-profit applications for a total of 60 six megahertz channels. Each will be equipped with the appropriate send and receive equipment (such as codec, video camera, computer, monitor) where half the monitors are over 24 inches and half of them are the latest in high definition resolution. Each will be accessible through a mix ranging from large rooms to individual cubicles in order to accommodate the needs of different sized groups.

There will also be two video teleconference facilities -- one commercially operated and one subsidized for government, non-profit and low income users. There will also be six multi-media consumer stations with high bandwidth network connections used for browsing on-line merchandise catalogs.

Each center will contain 60 work stations, half equipped with state-of-the-art computers and half with previous-generation computers. The work stations will attached to one of two local area networks with one containing more capabilities than the other. For example, the higher level LAN might feature a multi-media jukebox of software, color scanner, color laser printer and a RISC work station equipped with the latest CAD software.

There will also be five ATMs for banking and five kiosks each for local and state government information services and transactions

Candidates for the physical location of the virtual village center in the built city outside of Village One include large shopping malls, long commercial strips, or significant government buildings outside of the existing central business district.

### CENTRAL BUSINESS DISTRICT

The central business district will retain its existing commercial and government functions in addition to those functions of the central tele-district.

As service delivery, work and shopping become more mediated, actual face-to-face meetings and goods inspection (touching rather than viewing) will become more highly valued. These activities will occur in the central district of the city. Retailing will continue to thrive in the central district as it will contain the largest goods inventory in the city.

The central business district will serve the needs of the entire 175,000 population (and the ultimate population of 350,000 to 500,000) not served by the facilities provided at their neighborhood and village centers. *Therefore, this center will include the highest concentration, greatest variety and best capabilities of work stations, teleconference facilities, and network services.*

For example, the central district, rather than the village centers or neighborhood centers, might include the facilities used for those Bay Area telecommuters who require the utmost in technology capability. These individuals will report to downtown work stations one or more days per week rather than traverse the Altamont Pass.

In general, the central district will be heavy in telework opportunities, teleservice opportunities involving external service providers (such as distance education from Stanford), and teleconference opportunities. It will be relatively light in service delivery from local institutions like schools since any travel out of the neighborhoods or villages should simply take the consumer directly to the institution rather than another remote location.