



engine that is at ambient temperature produces significantly more pollutants than an engine that is running at its nominal operating temperature. The cold start period, although somewhat dependent on the ambient temperature, is from 10 to 15 minutes under typical operating conditions. The SCAQMD rules concentrate on cold starts, generally ignoring the hot running phase. If a car has been idle for more than 8 hours, its next start is assumed to be a cold start.

The current version of Regulation XV, in order to make the necessary calculations fairly simple, gives full credit, for a trip not taken, to carpool and vanpool riders. However, the formula for satellite telecommuters is more complicated. Full credit is given only for telecommuters who reduce their one-way commute by at least 20 miles.²¹ Half credit is given to telecommuters who reduce their commute by at least 50%, even if the one-way commute distance saving is less than 20 miles.

Paradoxically, our analysis of the travel patterns of City employees indicates that 52% of those who participate in car- or van-pools drive their cars to the pickup point. The average trip time for that drive is 9.5 minutes. Thus, at least half of the car- and vanpool activities involve as many cold starts as if the participants were driving their cars all the way to work. Home-based telecommuting, according to our data, completely eliminates the cold starts associated with commuting. Satellite office telecommuting, if the commute distance is longer than a few blocks, probably does not reduce cold starts. Yet satellite office telecommuting, as well as car- and vanpooling, can materially reduce the total vehicle miles traveled (which is not counted under Regulation XV). Hence, there is considerable strain between Regulation XV and the realities of automobile-induced air pollution. That is, the rule is biased in favor of rideshare participants and against satellite office telecommuters.

Our air pollution calculations are based on the hot running rate of pollution production for cars, in accordance with the *Mobile 4* specification from the Environmental Protection Agency. Therefore, because they miss the cold start period, they understate the impact of telecommuting. We calculated the air pollution that would have been produced by each telecommuter's car, had they not been telecommuting. The results are as follows, in terms of the

²¹Our analysis of a set of 580 potential telecommuters, together with a set of 36 possible regional satellite office locations, indicates that 91% of the telecommuters would save less than the required 20 miles one-way by commuting to the center closest to their home. However, the remaining 9% produce more than half of the overall VMT savings.



annual level of pollutants *not* produced by the average City telecommuter:

- Carbon Monoxide: 275.6 pounds
- Nitrogen Oxides: 16.9 pounds
- Unburned Complex Hydrocarbons: 51.5 pounds
- Particulates: 1.2 pounds

Technology Requirements

One of the common misconceptions about telecommuting is that it requires intensive computer use; that it is not possible to telecommute unless access to a computer is available. While this can be true for computer programmers and some other professionals, it is not necessarily so for many other people. The dilemma for computer professionals is illustrated by the composition of the non-telecommuter group of our sample; a large fraction of this group consists of individuals who either lack access to the mainframe or who otherwise need computers but do not have their own personal computers at home.

Part of our inquiry deals with the extent to which various forms of technology are useful to City employees. There are two aspects to this inquiry. First, what are the minimum technology requirements for **any** form of telecommuting? Second, what is the effect of availability of a particular form of technology on *increasing the amount of telecommuting*?

We include in our list of “technologies” face-to-face meetings and other traditional forms of communication, since the effectiveness of telecommuting depends on the ability of some of the more electronic technologies to substitute for those traditional ones. Of the more “high-tech” technologies (computers, teleconferencing systems, etc.) 94.3% of the telecommuters and 93.7% of the non-telecommuters said these technologies greatly helped their work. We conclude that computers and sophisticated telecommunications are important to at least nine of every ten (up from four of every five at the mid-term evaluation) City information workers.



Personal Ownership

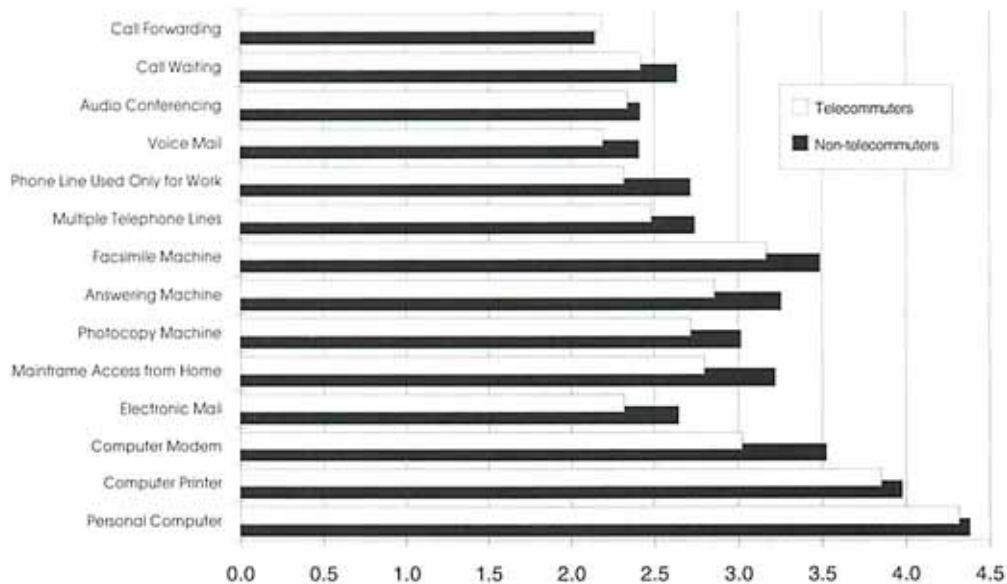
A test of what technology products are personally important is that of personal ownership. Although this

Table 7: Technology Owned at Home by the Participants

Type of Technology	Telecommuters	Non-telecommuters
Personal Computer	73.7	58.2
Computer Printer	67.3	46.8
Computer Modem	39.7	19.0
Electronic Mail	10.3	6.3
Mainframe Access from Home	12.8	7.6
Photocopy Machine	9.0	7.6
Answering Machine	89.1	73.4
Facsimile Machine	18.6	12.7
Multiple Telephone Lines	30.1	19.0
Phone Line Used Only for Work	9.0	8.9
Voice Mail	3.2	1.3
Audio Conferencing	7.1	1.3
Call Waiting	42.9	25.3
Call Forwarding	14.7	7.6

obviously has some cost considerations, Table 7 gives the breakdown of personal ownership of technology among the two groups. Over the period of active telecommuting, a significant difference has developed in technology ownership in the two groups, particularly in the ownership of personal computers and related equipment. It is interesting to contrast computer ownership by the participants of the survey, a 67.7% overall average, with the 46.2% personal computer ownership claimed by the

Figure 4: Relative Power in Making Work Easier





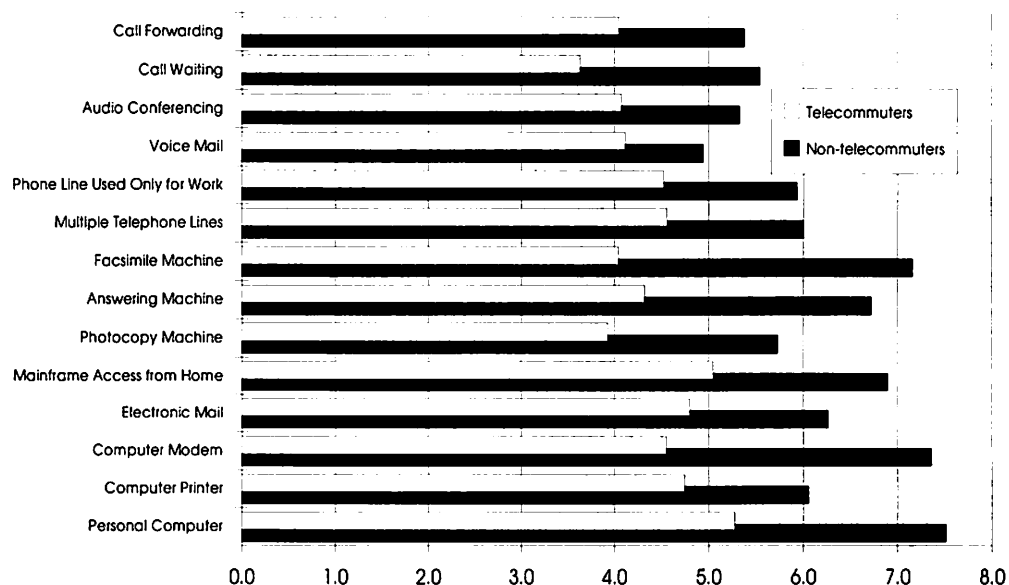
applicants to the project.

*Table 8: Average Answers to:
How Much Easier Does This Technology Make Your Work?
(from 1 = No Effect to 5 = Very Great Effect)*

Type of Technology	Telecommuters	Non-telecommuters
Personal Computer	4.3	4.4
Computer Printer	3.9	4.0
Computer Modem	3.0	3.5
Electronic Mail	2.3	2.6
Mainframe Access from Home	2.8	3.2
Photocopy Machine	2.7	3.0
Answering Machine	2.9	3.3
Facsimile Machine	3.2	3.5
Multiple Telephone Lines	2.5	2.7
Phone Line Used <i>Only</i> for Work	2.3	2.7
Voice Mail	2.2	2.4
Audio Conferencing	2.3	2.4
Call Waiting	2.4	2.6
Call Forwarding	2.2	2.1

One possible explanation for this disparity in computer ownership between telecommuters and members of the control group is that many of the telecommuters may have been on the verge of buying personal computers and their acceptance into the project triggered the purchase. Another possibility is that the internal departmental selection decisions were biased against prospective participants who did not own computers. As to the disparity in computer ownership between original applicants to the project and the members of the control group, it is possible that, since the project began, another 10% of City employees have purchased their own personal computers.

Figure 5: Power to increase Telecommuting (average days per month)





We also asked the participants how much *easier* various technologies made their work. Table 8 shows the results to date. It is clear that personal computers (with printers) and answering machines are key technologies for both groups. Interestingly, the non-telecommuters seem to prize technology slightly more than do the telecommuters. Figure 4 shows the same relationships in graphical form.

In addition to the questions on the general power of each of these technologies, we asked the participants to estimate what effect the availability of the technologies might have on their ability to telecommute. Figure 5 shows those estimates, given as the average additional telecommuting days per months made possible by the technology. Note that, for both of these questions, the non-telecommuters gave higher average estimates than did the telecommuters. This is particularly striking for the estimates of the ability of the technologies to increase the amount of telecommuting. Apparently, the telecommuters have a less optimistic (although still very positive) view of the ability of technology to increase the amount of telecommuting they do. In both cases, if all the estimates were added together they would total more days per month than are available.²² Therefore, the estimates must be taken with a grain or two of salt. In either case, the highest ranked technologies are personal computers, their peripherals, and multiple telecommunications lines.

²²More than double the available days for the telecommuters, triple that available days for the non-telecommuters.



Table 9: Perceived Availability of Various Technologies

Technology	Percent Availability	
	Telecommuters	Non-Telecommuters
Full-Motion Teleconferencing	2.7	0.0
Slow-Scan Teleconferencing	2.7	1.3
Computer Conferencing	9.5	18.2
Voice Mail	11.4	7.8
Cellular Phone	17.6	11.7
Outside Database Searching	22.6	13.2
Electronic Paging	25.9	14.3
Electronic Mail	26.2	32.5
Call Forwarding	31.8	36.8
Phone Conferencing	55.6	63.9
Express Mail	63.5	61.8
Database Development	64.4	66.7
Computer Graphics	65.8	65.8
Spreadsheet Analysis	66.4	72.4
Text Processing	67.3	62.3
Facsimile	73.6	77.9
Internal Mail	73.8	77.9
Specialized Computer Programs	78.1	74.0
Answering Machines	79.9	61.0
Regular Mail	85.1	81.8
Personal Computing	86.3	85.5
Meetings	96.1	87.0
Face-to-Face Conversation	96.8	94.8
Telephone	100.0	100.0



Use At Work

We also tested the relative importance to the participants' work of a broad array of technologies. We included traditional "technologies" such as mail, meetings and face-to-face conversation, as well as a variety of electronic and computer technologies. Since many fairly exotic technologies are included in our survey, the first task is to see how available the technologies are to the City employees participating in the project. Table 9 shows the results, listed in decreasing order of perceived availability. Note that these results depict the employees' *perceptions* about whether the technology is available to them at the workplace. Their perceptions may differ from reality to some extent. In general, there is little difference between the telecommuters and non-telecommuters. Apparently, a few employees believe that neither face-to-face conversation nor meetings are available to them!

Table 10: Overall Importance or Leverage of Technologies to the Respondents

Technology	Telecommuters	Non-Telecommuters
Full-Motion Teleconferencing	4.75	0.00
Slow-Scan Teleconferencing	2.50	3.00
Computer Conferencing	3.50	2.00
Voice Mail	7.00	9.83
Cellular Phone	6.96	10.25
Outside Database Searching	4.34	4.90
Electronic Paging	9.29	9.00
Electronic Mail	8.05	9.18
Call Forwarding	3.57	3.75
Phone Conferencing	3.58	2.78
Express Mail	2.64	2.58
Database Development	6.19	4.98
Computer Graphics	4.45	4.39
Spreadsheet Analysis	5.56	5.48
Text Processing	11.60	13.09
Facsimile	8.25	8.38
Internal Mail	11.78	12.58
Specialized Computer Programs	11.07	11.65
Answering Machines	9.66	11.35
Regular Mail	7.78	8.56
Personal Computing	14.52	13.84
Meetings	8.47	8.73
Face-to-Face Conversation	12.81	13.55
Telephone	16.71	17.47

We also asked the participants how often they used a particular technology and how important the technology was to performing their work. From these answers we derived a composite factor, we call *leverage*, that is a linear product of the other factors. Leverage values can range from 0 (meaning that the technology is either of no use or is not used) to 20 (meaning that the technology is used at least daily and is of immense importance to one's work).



The leverage is computed only for those respondents who have the technology available to them. Therefore a technology that is not widely available can still appear as having high leverage if those few people who use it feel that it is important. Table 10 shows the rankings.

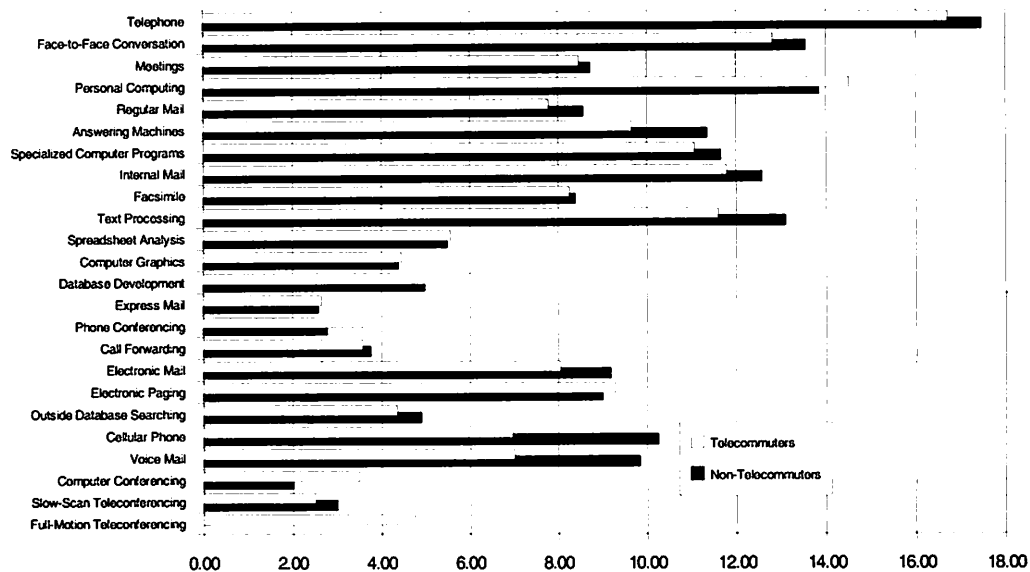
Although there are differences between the telecommuters and the members of the control group, none of the differences now appears to be statistically significant.²³

It is noteworthy that personal computing ranks a close second in importance to the telephone for both groups, with text processing and internal mail alternating for fourth and fifth place. Although face-to-face conversation comes in third in both groups, it (and the telephone!) may be less important to the telecommuters than to the non-telecommuters. Figure 6 shows these results in graphical form. This leads us to conclude that personal computers, although not necessary for every job, have grown in importance for most City employees, whether or not they are telecommuters. Note that meetings occupy ninth place in importance for the telecommuters and twelfth place for the non-telecommuters.

²³The idea of statistically significant differences between groups reflects two factors: size of each group and the differences in their means and variances. Two small groups, with a difference in means comparable to, or larger than, that of a pair of larger groups, may not show that difference as being statistically significant because the expected variance of a smaller group is higher. There were statistically significant differences between the two groups in the baseline and mid-term surveys.



Figure 6: Relative Leverages of Various Technologies



Voice mail, although not perceived as available to many participants, ranks higher than some of the computer capabilities in its leverage. On the other hand, some of the often touted “musts” for widespread telecommuting, such as computer, video and telephone conferencing, score near the bottom of the leverage scale. Full motion video conferencing is the most important of the three for those telecommuters who are aware of it or who have used it. However, most City employees are unfamiliar with either of these teleconferencing technologies.

One interesting relationship that shows up in the non-telecommuter group is the growing importance of electronic mail (computer-based messaging) to telecommuters. In our baseline survey, the non-telecommuters felt that electronic mail was significantly more important, by almost a factor of five, than did the telecommuters. By the mid-term survey, the ratio of perceived importance had diminished to 1.5. It slipped to 1.1 by the final survey. The difference between the two groups was statistically significant at the 0.0002 level²⁴ for the baseline survey, but was significant only at the 0.0994 and 0.6117 levels in the mid-term and final surveys, respectively. In our opinion this, reflects considerable convergence in attitude of the two groups as they increased in size and diversity, and in knowledge and

²⁴That is, the probability is 0.0002 that the difference between the two groups is meaningless. To put it another way: the odds are 4999 to 1 against the difference being meaningless. By the mid-term survey, the odds against the difference being meaningless were reduced to 9 to 1. By the final survey, the odds had fallen to 0.6 to 1.



experience of electronic mail. We repeat our baseline forecast that electronic mail grows to be of comparable importance to the telecommuters as, and if, they gain experience with it.

Personal Investments

Ninety-six (62%) of the 156 telecommuters who responded to the final survey had made some sort of investment in work-related hardware and/or software during the past year. Of these investors, the average spent \$2200 in computer hardware, of which \$1800 was specifically for telecommuting. Software purchases accounted for \$552, on average, of which \$338 was telecommuting-specific. Maintenance costs accounted for \$161 and \$76, respectively; furniture costs averaged \$385 and \$253; and office machines took \$775 and \$353, respectively. Extra telephone services averaged \$118, of which \$88 was telecommuting-specific for 27 of the telecommuters. Total investments ranged from \$5 to almost \$15,000, with an average of just over \$1400. Telecommuting-specific investments ranged from \$10 to almost \$8500, with an average of \$668.



Part 2: Potential Impacts

Impacts Explored

The fundamental goal of the project was to demonstrate a method for reducing traffic congestion and improving air quality. That goal has been met. The next question is: what could be the long term impacts of telecommuting?

We have examined these issues at both the local —City of Los Angeles government — and regional levels. The examination included economic and energy issues as well as the air quality and traffic impacts. As part of the area-wide investigation we have developed a set of forecasts of the range of impacts likely to be produced by the expansion of telecommuting in the Los Angeles Consolidated Metropolitan Statistical Area (CMSA) comprising Los Angeles, Orange, Riverside, San Bernardino and Ventura counties.

City Employees Impact Assumptions

The group of City employees most likely to be directly affected by telecommuting comprises the 15,934 we have identified as prospective telecommuters. Telecommuting will indirectly affect all 45,000+ City employees. One key question is: although we have identified almost 16,000 City jobs that are likely to be telecommutable, how many will really work out to be so in practice?

To help assess that issue, we repeatedly asked the participants in the project — both telecommuters and telemanagers — to estimate how many of their co-workers could reasonably be expected to telecommute under the technology and work rule conditions of the project (that is, largely home-based telecommuting with do-it-yourself computer support). The requests were made both informally, during the focus group sessions, and formally, during the final questionnaire round.



The informal responses by the supervisors, in a group setting, tended to run around 50%. These estimates were strengthened by the formal questionnaires, in which the average response was also 50%, with the upper quartile starting at 75%. The telecommuters informal and formal responses also tended to match, although the telecommuters' estimates were higher: about 60% as the average reply, but with 42% of the telecommuters saying (in the final questionnaire) that almost all of their colleagues could telecommute at least two days per month.

In the following set of estimates we are assuming that *all* of the identified job classifications are telecommutable, either from home or from a satellite telework center. These estimates are based on the nature of the work required for each particular classification.

However, even if the job allows it, individual characteristics and desires may preclude telecommuting for some people. Therefore, we also assumed that there will be individual differences in telecommuting rates — including some individuals who will not telecommute at all. The latter group may be as high as 50% for some job types. The telecommuting rates used for the estimates are thus composite rates, based on the combined assumptions that some people will not telecommute at all; others will only telecommute from satellite centers; still others will only telecommute from home; some will do both.

The only way to estimate the City (or the regional) impacts more accurately is to continue evaluation of the experiences of an expanding number and types of telecommuters. Meanwhile, most of the estimates below for City employees are made for the assumption that most telecommuting will be from home or will be to telework centers that are close enough to home so that the telecommuters will not drive their cars to the centers. This situation may take several years to develop. Hence the estimates should be considered as goals to be reached by the year 2000, rather than immediate objectives.

The following scenarios for the impact of telecommuting on the Los Angeles CMSA are all based on a common set of assumptions about the basic population of the area and size of the work force. Table 11 shows the basic set.

These figures are derived from census data, our own surveys²⁵ and analyses of the composition of the work force.

²⁵Surveys of State of California and City of Los Angeles information employees.

Regional Impact Assumptions



All of this is incorporated in a mathematical model that was originally developed by JALA in the late 1970's and has been refined several times since. The model includes more than 25 independent variables, describing the many factors associated with the changes in acceptance of telecommuting.

Each of these factors can change in value from year to year. For example, the fraction of the total work force that

Table 11: Los Angeles CMSA Impact Assumptions

Total population:	15,187,000
Population annual growth rate	2.346%
Total area work force:	6,828,000
Total information workers:	3,988,000
Commuters	6,691,000
Commuters using private vehicles (including car/van pools):	90.4%
Commuters using mass transit:	8.6%
Average information worker daily commute (round-trip miles):	39

comprises information workers slowly increases over the 1992 to 2030 period. So, too, do the commuter modal selections; distribution of passengers between single occupant cars and higher occupancy vehicles; energy efficiencies of the vehicles; and the various factors in telecommuting (distribution between full-time home-based to full-time telework center-based; average hours per week telecommuting; full-commute and telework center commute distances).

Both of the scenarios include several independent trend estimates. For example, automobile fuel efficiency is assumed to increase at a rate comparable to EPA total fleet standards. The number of telecommuting hours per week increases with time. The average distance to telework centers decreases as the assumed number of center increases. Nevertheless, as population grows, so does traffic congestion (and commute times) together with average commute distance.

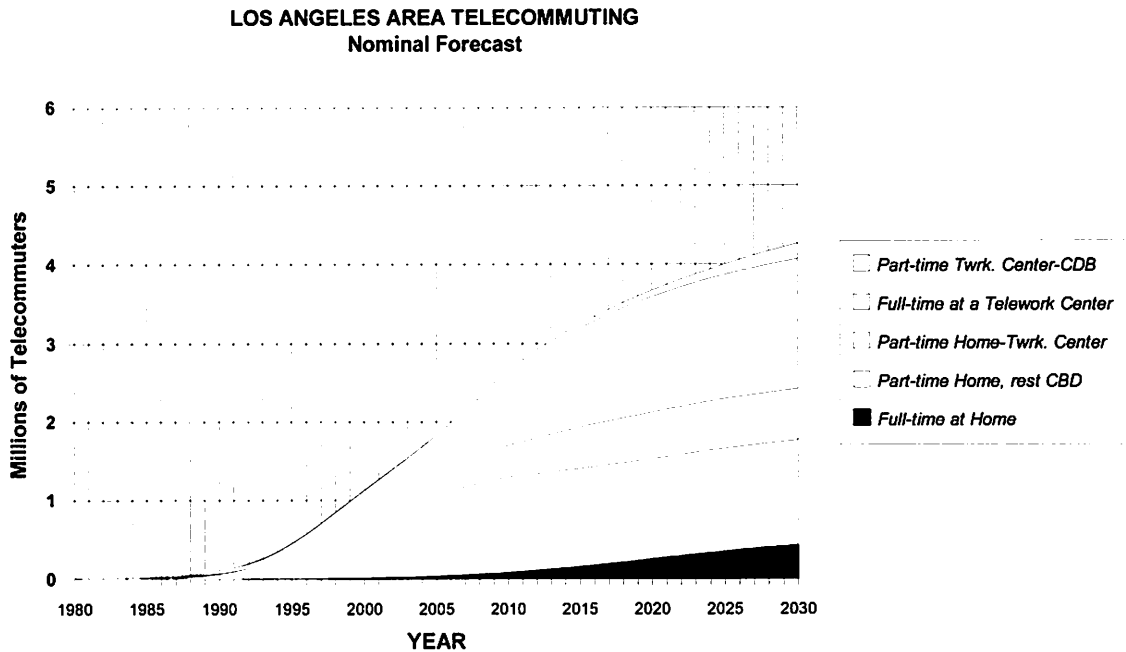
Baseline Scenario

Figure 7 shows the distribution in the five major variants of telecommuting for the nominal model.

This scenario estimates that the five-county area has 194,000 telecommuters of all sorts by the end of 1992. Most of these (144,000) work part time at home, typically less than 1.25 days per week. The rest either work full-time at home (about 5,000) or at a regional center of some sort. When one considers that the governments of the City and County of Los Angeles jointly have more than 2,000 known telecommuters, and that the area total includes university professors, writers, etc., this seems to be a reasonable figure.



Figure 7: Nominal Telecommuting Forecast.



One of the problems with estimating the real extent of an innovation at an early stage is that of counting what is a sparse population component; 1.3% of the population in this case. As the number of telecommuters grows, and particularly as the number of formal telecommuting programs increases among area employers, it will be easier to get more exact numbers of the actual growth.

High Growth Scenario

The high growth scenario assumes that the “normal” rate of growth of telecommuting is boosted by a combination of regulatory and competitive pressures, improvements in

Table 12: Growth Limits by Form of Telecommuting

Type of Telecommuting	Maximum % of Infoworkers
Full-time home	8
Part-time home/CBD	20
Part-time home/LC	10
Part-time LC/CBD	17
Full-time local center	25

technology and consequent attitude changes on the part of potential adopters. Figure 8 shows the results of that analysis.

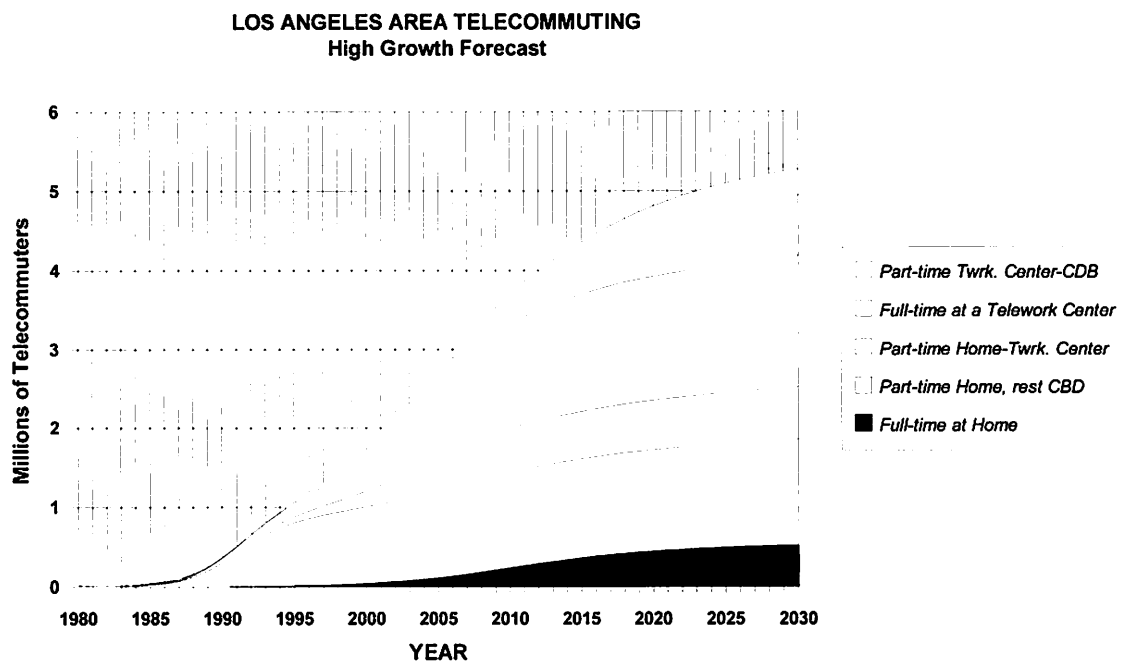
As a check to the validity of the scenario, the 1992 State of the Commute report from CTS reports that 9.1% of its survey respondents claimed that they worked at home an average of four days per month. This amounts to 619,000 home-based telecommuters in the region. The High Growth



Scenario of Figure 8 gives a value of 663,000 telecommuters of all types for 1992, comparable to the CTS estimate. If the CTS survey is correct, the region is at present near the high growth scenario.

Both scenarios have the same assumptions as to the ultimate limits of telecommuting. That is, both assume that telecommuting will peak at 80% of the information workforce, sometime in the mid-21st century. The scenarios also include the same assumptions about the distribution of modes of telecommuting. Table 12 shows the assumptions. The term *CBD* in the table refers to Central Business

Figure 8: High Growth Scenario



District. In this context it simply means the “traditional” office center where the telecommuter would be working otherwise. Similarly, *LC* refers to any one of the forms of regional telework center mentioned earlier. Both scenarios also assume a decreasing distance to the local center over the years, as the number of centers increases.

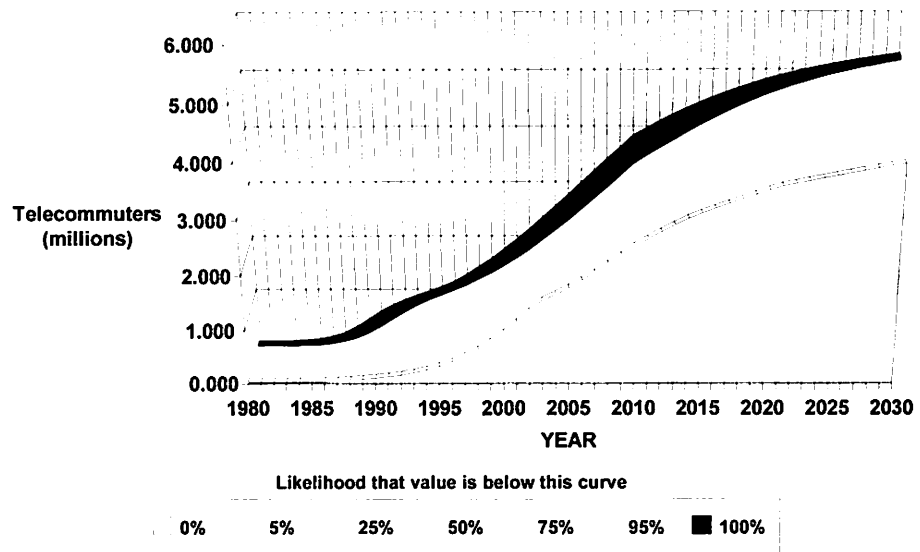
The Scenario Spectrum

These nominal and high growth scenarios generally cover the upper and lower limits of telecommuting in the region, as estimated by our demographic and economic analyses. Neither of these scenarios will actually unfold exactly as shown here. Reality is always different from long term forecasts.



To get an idea of the range of possibilities we performed what is known as a Monte Carlo analysis of the scenarios. For this process, we estimated the likelihood of the various rates of growth of each of the five types of telecommuting, providing a probability distribution function for each. We then ran 1000 scenarios, each time with a different combination of growth rate assumptions, as governed by the probability distributions.

Figure 9: Likelihood Distribution of Telecommuting Scenarios



The results of that analysis are shown in Figure 9. The graph shows the range in expected value of the total number of telecommuters for each of the years from 1980 to 2030. The lowest (0%) curve represents the minimum number of area telecommuters that we expect to see, while the top (100%) curve represents the maximum number we expect to see. The intermediate curves represent the probabilities that reality will be at or below that curve. The CTS survey value of 619,000 telecommuters for 1992 is at about the 85% likelihood point of the analysis. This, too, supports the conclusion that we are presently nearest to the high growth scenario.

Traffic Congestion and Air Quality

City Employees

The City of Los Angeles has 49 sites that are subject to the requirements of Regulation XV. By far the most populous of these are in the Civic Center. Therefore our analysis has been made under the simplifying assumption that all of the

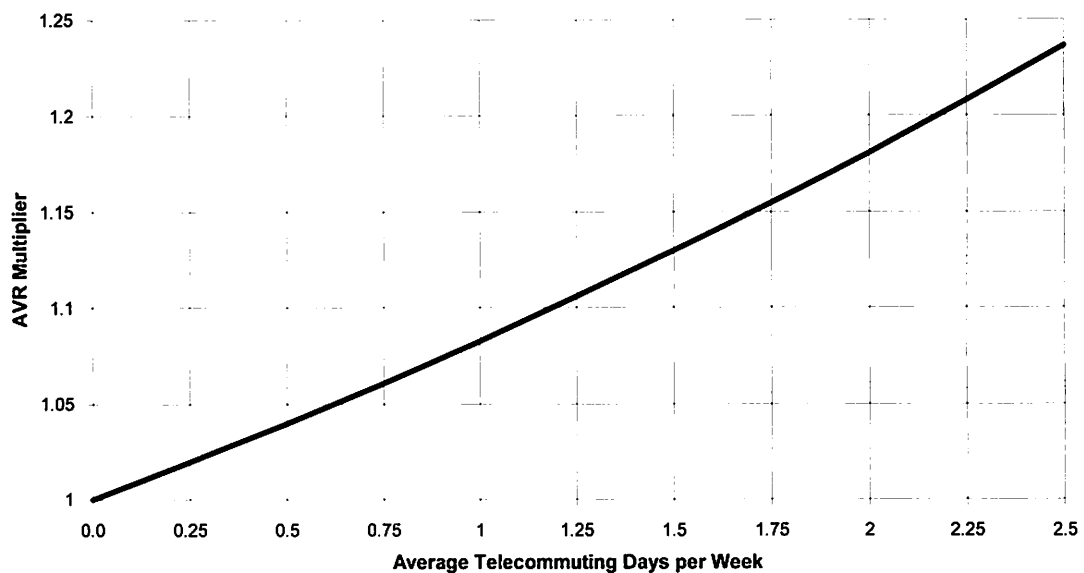


City's employees work in the Civic Center. Distances of a few blocks between sites have no appreciable effect on the results. The department-level computer model, developed as part of this project task, can be used to get more accurate estimates.

For purposes of the analysis, we assumed that City employee still have the ridesharing behavior evidenced by a survey completed by the City Administrative Office in 1991. In that survey, 29% of City employees were on compressed work schedules. Our analysis assumes that the 29% figure continues to hold and that the distribution of types of compressed schedules matches that of the final evaluation survey of the Telecommuting Project; that is, 91% using 9-80 and 7% using the 4-10 schedule.

If the City continues its pattern of ridesharing and compressed schedules, then what is the impact of telecommuting? The City has 49 facilities that are subject to the rules of Regulation XV. These are scattered throughout the City, but the primary concentrations of City employees are in or near the Los Angeles or the Van Nuys Civic Centers. The target Average Vehicle Ridership (AVR) rates for City facilities are either 1.5 or 1.75, with the 1.75s primarily in the Los Angeles Civic Center region.

Figure 10: Telecommuting AVR Multiplier Factor for the City



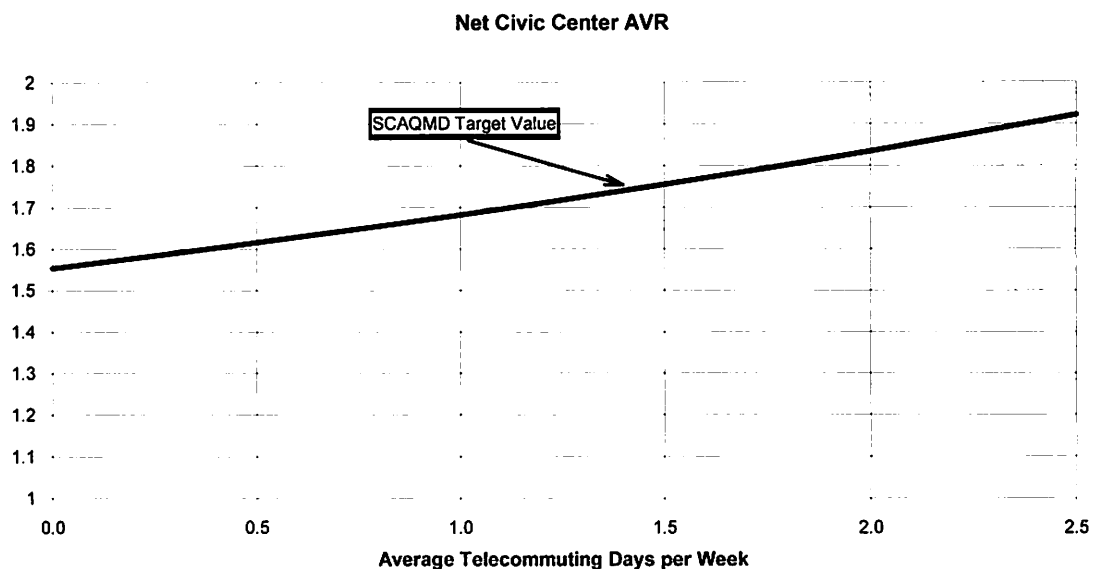
Our analysis indicates the impact of telecommuting on AVR by means of an AVR multiplication factor that is a function of the average level of telecommuting among its 15,934 potential telecommuters. If none of these employees telecommute, the multiplication factor is 1.0; that is, no effect (since $1.0 \times \text{the current AVR} = \text{the current AVR}$). If all of them were to telecommute 5 days per week — an



extremely unlikely situation, then the multiplication factor would increase by more than 60%. Figure 10 shows the relationship, with average telecommuting days per week ranging from 0 to 2.5.

Since the Civic Center area provides the most stringent case of the AVR target we can ask what amount of telecommuting would be required to increase the AVR from its 1992 level of 1.554 to the target level of 1.75. Figure 11 shows the relationships of Figure 10 applied to the current Civic Center AVR. As can be seen from the Figure, the AVR target would be met, without any other AVR-related changes, if the average level of telecommuting were increased to about 1.4 days per week. This is quite an attainable figure. Our analysis of City employee jobs gives an estimated average of 1.46 telecommuting days per week.

Figure 11: Telecommuting impacts on the Civic Center AVR

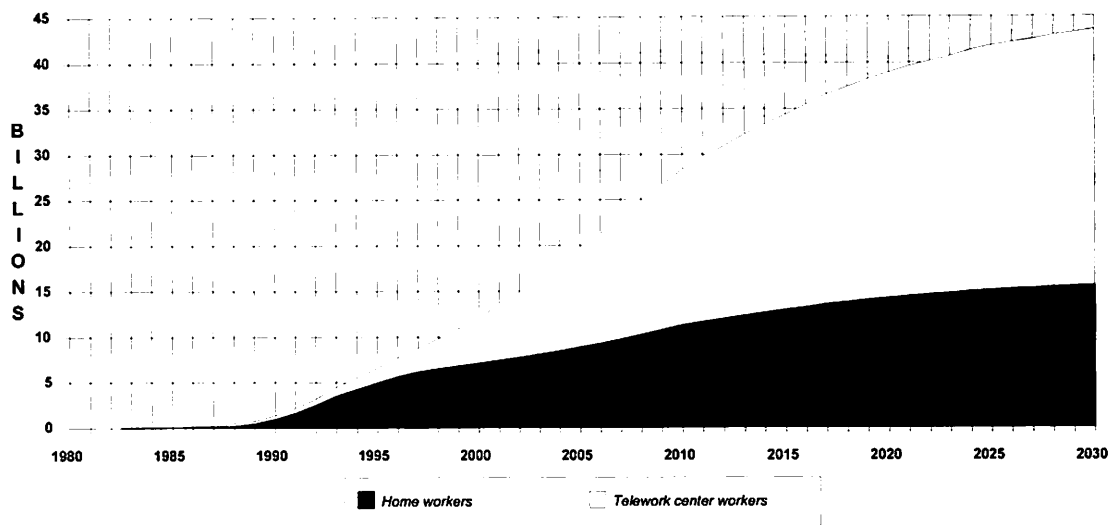


Note that, in this general model, we have assumed that the distribution of job types and commuting behaviors is the same at all City facilities. Of course, this is not the case; each facility has its own particular mix of jobs and commuting behaviors. The relationships of Figure 10 are to be used for estimation purposes only. For example, the achieved AVR at the Van Nuys Civic Center in 1992 was 1.107. Its AVR target is 1.5. The ratio of 1.5 to 1.107 is 1.355. From Figure 10 we see that a multiplication factor of 1.355 is off the scale. Actually, it would require an average of about 3.3 days per week telecommuting to meet the goal if no other changes occurred — and if the population distribution at the Van Nuys Civic Center matched that of City employees in general. This is more than double the requirement at the Los Angeles Civic Center and more



than double our, admittedly conservative, estimate of what can be expected from City employees in the next three or four years. If the model is applicable, it is clear that telecommuting alone cannot solve all the air quality improvement requirements; some combination of telecommuting, additional ridesharing and compressed work weeks seems to be required.

Figure 12: Annual Mileage Reductions from Telecommuting: High Growth Scenario



In any case, if the City were to have its 15,934 telecommuters working from home an average of 1.4 days per week, then the annual pollution reduction would be on the order of:

- 6,150,000 pounds of carbon monoxide;
- 380,000 pounds of nitrogen oxides;
- 1,150,000 pounds of unburned hydrocarbons; and
- 26,000 pounds of particulates.

Area-Wide

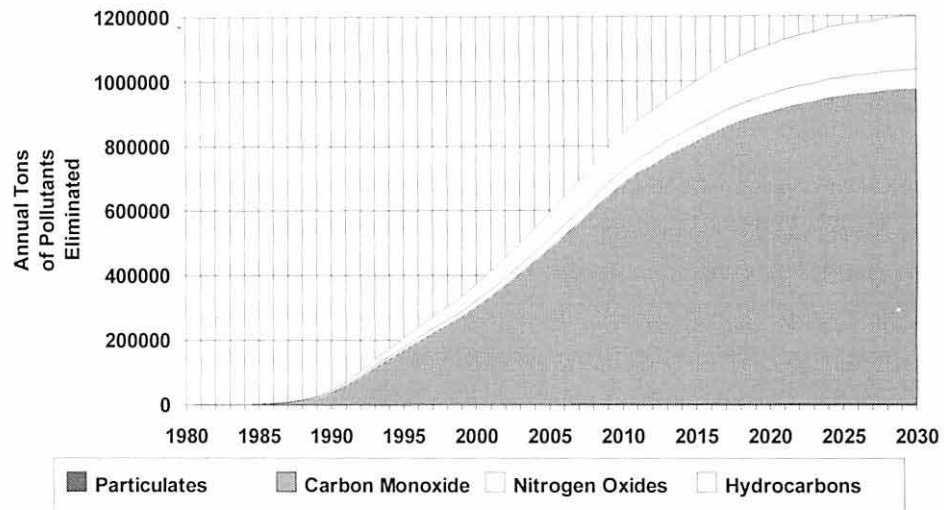
Figure 12 shows the annual levels of reduced car mileage for the Los Angeles CMSA under the high growth scenario.

Since at least half of this mileage reduction involves automobile cold starts — the most polluting phase of car use — telecommuting promises to be a significant reducer of air pollution in coming years. Figure 13 shows the results for the high growth scenario. Since the pollution reduction data were calculated using a constant ratio of pollutants per vehicle-mile, the results are somewhat understated for the 1990s and, perhaps, overstated for the years past 2000. The early understatement is because the data used were for highway travel in the mid-1980s and did not include an increase in pollution for the startup and idling periods. An overstatement could result from a steady improvement, over the mid-1980s levels, in the quantity of pollutants emitted by cars.



For comparison, air pollution data from the South Coast Air Quality Management District show the annual pollution contribution from cars in 1991 to be 1,580,000 tons of carbon monoxide; 221,000 tons of hydrocarbons; 243,000 tons of nitrogen oxides; and 20,000 tons of particulates. If the high growth telecommuting scenario continues, we could expect a reduction by the year 2000 of 19%; 23%; 8%; and 4%, respectively, from present levels.

Figure 13: Air Pollution Reductions from Telecommuting: High Growth Scenario



Clearly, these air pollution reduction values provide a persuasive argument for further development of telecommuting. In addition to the air pollution factors, there are the energy conservation consequences of telecommuting. Our forecast model calculates the net effect of telecommuting on energy conservation. The net effect is derived from the reduction in automobile fuel use by telecommuters, combined with the possibly increased use of computers and the clearly increased use of telecommunications.

Economic Competitiveness

The key effects of pollution reduction, although the primary incentive for the City of Los Angeles Telecommuting Project, may be eclipsed by the economic impacts of telecommuting. The telecommuter effectiveness increase values we have obtained from the project can be considered typical of those in large organizations. In fact, we have tried to be conservative in every case. Therefore, these results may be generalized to the region as a whole without fear of overestimation, in our opinion.



City Employees

Employee Effectiveness Changes

We estimated the likely change in work effectiveness that telecommuting would produce for each of the City telecommuting-appropriate job classifications.²⁶ As in the case of the estimates for the *amount* of telecommuting for a particular classification, the *effectiveness change* estimates are made on a combination of experience gained in the City of Los Angeles Telecommuting Project and from similar projects elsewhere.

The changes are expressed both as an average expected effectiveness improvement and as a total dollar impact for each evaluated classification, using 1992 salaries as the basis. The overall average estimated effectiveness change is 10.7%. **If all of these telecommuters were to perform exactly according to the estimates, the net result would be an annual effectiveness impact of \$75,794,175** (constant 1992 dollars) or more than \$93 million by 1998, assuming average salary escalation of 4.3%.

Whether, and in what form, these impacts would be realized is beyond the scope of this project since it involves a number of key management issues. Foremost among them is the ability of an organizational unit to assimilate the improvements. That is, does an individual's effectiveness increase translate directly into a comparable increase in the effectiveness of the organization in which the individual works — is the effectiveness change used properly? If so, there are two classical first-order options for the organization:

1. Increase the level of services provided by the unit without increasing the number of personnel in the unit. A variant of this is the diversion of expansion funding to technology improvements (such as computers, networks, telecommunications and/or peripheral equipment) rather than to salaries for more employees.
2. Decrease the number of personnel in the unit without changing the level of services. The current euphemism for this is downsizing.

Each of these options must be examined very carefully as part of the management response to the impacts of telecommuting. However, for many of the units we observed during the project, the most logical option is the first; at least some of these units are currently severely

²⁶For details, see the *Department Impact Modeling Report*.



overloaded and telecommuting is allowing them to function at the desired level with their existing staffing.

However the effectiveness impacts are applied, the economic arguments for telecommuting seem quite powerful.

Net City Economic Benefits

Employee effectiveness increases are not the only impacts of telecommuting. There are additional savings in office and parking space, reduced turnover rates and decreased use of sick leave. We have evaluated these total impacts in a series of three alternative scenarios:

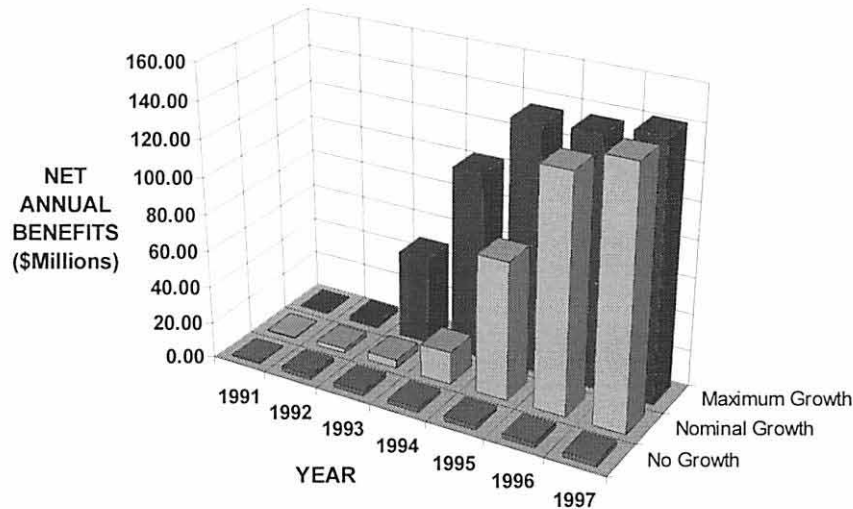
- In the first scenario, the use of telecommuting by the City remains at its current level.
- The second scenario shows a steady growth, beginning in 1993, to the maximum expected number of 15,934 City telecommuters.
- The third scenario shows a more rapid growth rate to the maximum.

The analysis includes estimates of the costs of training and technology improvements required to produce the growth. The net benefits to the City are shown in Figure 14.

Area-Wide

The City of Los Angeles Telecommuting Project and all other well-conceived and organized telecommuting activities show a consistent common economic result: the effectiveness of telecommuters is higher than that of non-telecommuters. Our measures indicate an improvement on the order of 9.3% for the entire group of prospective City telecommuters. Our experience with other organizations in California, both public and private, lead us to expect some

Figure 14: Net Telecommuting Benefits to the City

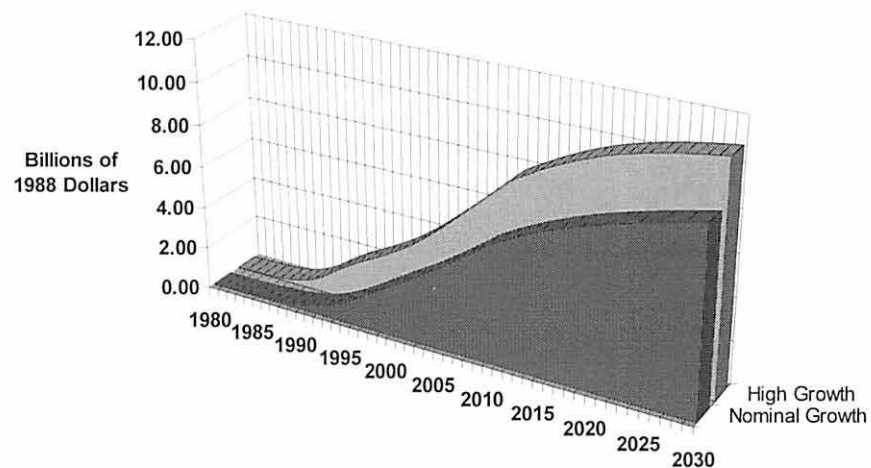




organizations' averages to be as much as double the City of Los Angeles values. Nevertheless, if we take the conservative approach and use the City's effectiveness changes as typical of the region, then the direct effect of telecommuting in the area could be as shown in Figure 15.

The direct economic impact of the effectiveness changes in the year 2000 ranges from at least 2.3 billion to as much as 3.5 billion dollars annually, depending on the scenario the future most resembles. These figures are in constant, 1988 dollars and are based on the area's 1988 per capita salary income. Since information workers — or at least those who are likely to be telecommuters — are more likely to have higher than average salaries, the information in Figure 15 are likely to be doubly understated.

Figure 15: Area-Wide Effectiveness Change Impact of Telecommuting



In addition to the direct effect of telecommuting, the indirect impacts must also be considered. At the microeconomics level, if organizational effectiveness improves, so does the organization's profitability. The organization is better able to compete, both by reducing the costs of its existing goods and/or services and by offering new goods and/or services. Both of these goals are achieved by reducing the person-hours required to produce a unit of output (in these cases, units of information). If the organization is in an expanding market, the newly released person-hours can be used to increase or improve product.

At the macroeconomics level, widespread improvements in competitiveness of individual organizations act to increase economic growth in the region in general. Thus, the overall impact is likely to be some multiple of the direct impacts



shown in the figure. We estimate that the actual impacts could be as high as five times the values shown in Figure 15. That is, in the year 2000, telecommuting could be associated with a 10 billion dollar improvement in the region's economy, compared to what it might be with no telecommuting.

Finally, it is important to consider another, potentially major, "side effect" of telecommuting: its ability to bring work to workers who cannot easily go to a traditional workplace. The 1992 riots demonstrated the consequences of a long standing economic dysfunction in Los Angeles: no jobs for a large component of the population. Among the plethora of rationalizations about the fundamental causes of the riots there is one constant: many people feel that they are trapped in a dead end existence. They feel that they have no access to, or hope of, means to improve their condition. Frustration, rage and eventual destruction are the natural consequences of that situation. What to do?

Telecommuting provides one approach to resolution of that problem. First, work can be sent to any residents who are mobility handicapped, either because of physical impairments or the lack of adequate transportation. Second, work can be combined with training (or vice versa), so that worker skills, from basic reading ability to more complex information skills, can be upgraded while the trainees are working. The information tools to accomplish this are here today and are growing in capability daily.

One strategy to develop this capability is through the development of neighborhood business centers that combine "regular" small business operations with telework/training centers.²⁷ This would promote a system of positive cash flow into the community from the inception of the center(s). Variants of this model have shown themselves to be successful both elsewhere in California and in Europe. As a first step, the Los Angeles County Transportation Commission has plans to initiate one or more centers in South Central Los Angeles in conjunction with its Blue Line stations. Each center would be linked to others via the fiber optics transmission system that is a part of the light rail network.

It is difficult to put a figure on the value of such centers. One success criterion would be that they are at least self supporting and turn out employees who are qualified to work in skilled jobs. If that is the case, then there is a clear economic benefit. If the local economy improves as a direct

²⁷The author, in concert with CHARO, attempted to initiate such a center in East Los Angeles in the mid-1980s, but an impasse with a large corporation, regarding facilities sharing, stifled the project.



result of such activities, then the overall benefit can be substantial.

Over 800,000 Americans information workers are disabled every year. Although we were not able to get exact figures, presumably about 42,000 of those newly disabled information workers live in the five counties area. Some fraction of those workers are perfectly able to do useful work, provided the work can come to them at least some of the time. Each worker who returns to the work force instead of receiving benefit income makes a double contribution to the economy. If telecommuting could produce a 10% reduction in the number of newly disabled individuals who were otherwise able to work, then the additional annual impact could be on the order of 200 million dollars.

Energy Use

Like the traffic, pollution and economic impact aspects, the experience of the City's Telecommuting Project in energy conservation can be generalized to both the rest of the City employees and to the region as a whole.

City Employees

Our forecast of the overall energy conservation impacts is based on an analysis of the commuting patterns of all City employees. This estimate is derived from data supplied from the Department of Transportation as a result of their 1990 survey of City employees. Although commute distances were not included in the survey, we were able to estimate them for about 18,000 of the 30,500 employees in the survey²⁸ on the basis of the ZIP codes for each employee's home and office. The average estimated one-way commute distance for these employees was 19.8 miles, slightly less than that of the telecommuters in the project.

We also assumed that future telecommuters would have the same pattern of compressed schedules as were revealed in a survey conducted by the City Administrative Office in 1991. This produces an average effective work week of 4.84 days. The telecommuting rate was assumed to be an average of 1.4 days per week; sufficient to meet the Civic Center AVR requirements.

The calculations produced an average annual energy saving of 4198 kilowatt-hours per telecommuter, for a total annual saving, assuming all 15,934 telecommuters are active, of 59.9 million kilowatt-hours, about 1,600,000 gallons of gasoline.

Area-Wide

Our forecast model calculates the net effect of telecommuting on energy conservation. The net effect is derived from the reduction in automobile fuel use by

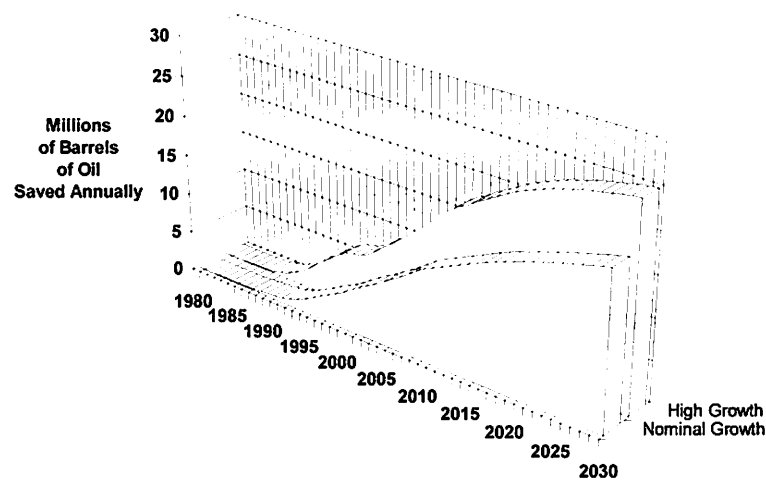
²⁸The remaining employee entries in the database either had missing or faulty entries for one or more of the ZIP codes.



telecommuters, partially offset by the possibly increased use of computers and the clearly increased use of telecommunications.

Two factors are not included in the model. First, notwithstanding the contrary experience of the City project, we expect that telecommuters will tend to use slightly more home heating and cooling energy while they are

Figure 16: Estimated Area-Wide Energy Conservation Impacts of Telecommuting.



telecommuting. At present, there are no data to show an offset of this energy use by a comparable reduction in the heating and cooling of the “downtown” offices of the telecommuters — largely because there are not yet enough telecommuters for the effects to be noticeable. The model assume a wash between these two energy uses in the long run.

Second, the model does not include our finding that about 20% of telecommuter households have a reduction in car use over and above the telecommuting-specific reduction.²⁹ Given these caveats, we feel that the projections shown in Figure 16 provide a conservative estimate of telecommuting’s energy impacts.

One of the perceptions about most large cities is that their citizens suffer/enjoy a large degree of isolation. This is particularly true of so-called bedroom communities, where a large fraction of the resident population travels to somewhere else for nine or more hours every weekday. By

²⁹See our report: *Telecommuting Travel Impact Analysis: Los Angeles Telecommuting Pilot Project* for details.

Neighborhoods and Regional Structure



some quirk of Murphy's Law it often appears that people who live on the west side of Los Angeles (or insert the name of any other city in the region) drive to work on the east side . . . and vice versa and so on.

One of the aspects of moving the work to the workers instead of moving the workers to work is that the workers are not doing the locale swap as often; they are spending more time in the areas in which they reside. Our research and that of others indicates that telecommuters, when they do travel to other than their principal offices, are more likely to make trips to nearby locations than are non-telecommuters. That is, the telecommuters are becoming more locally or community oriented. This can have a number of interesting impacts. We have only preliminary data on these effects, since they are somewhat dependent on the number of telecommuters and many of the effects can take several years to develop.

First, if more people are around the neighborhood on ordinary week days, what is the effect on the crime rate? One possibility is that programs such as Neighborhood Watch may be more successful; there are more neighbors to watch. If telecommuters, who are more likely than average to use electronic mail, start to set up neighborhood electronic alert networks, Neighborhood Watch takes on a new dimension. Yet, if telecommuters are busy concentrating on their work all the time, the effect may be negligible. Our experience is that telecommuters become more neighborhood aware even if they do not become more active in neighborhood activities.

Second, if telecommuters spend more time in the local area, they are more likely to do business with local businesses — at the expense of the businesses near their downtown offices. However, they are less likely to go out to lunch, so the lunch time restaurant business may show little change locally and a decrease at the downtown location. On the other hand, they may be more likely to go to a local restaurant for dinner — with the family.

The net result of this may be that neighborhoods with moderate to large numbers of telecommuters will become more cohesive: neighborhoods after the small, cohesive community style. This cohesion could further increase community emphasis on and participation in education and other activities usually identified with such well-functioning communities.

At the same time, the telecommuters are likely to maintain contacts with co-workers and friends who may be scattered all over the region, or all over the world, for that matter. Thus, they will have the advantages of essentially global job and interest/avocation diversity, while maintaining roots in a local community. While it is difficult to see clear



indications of this at this time, there are clues to the trends. The clues are appearing in such statistics as the growing difficulties employers are having in getting their employees to move to other locales³⁰, and the growing popularity of such computer-based information services as Prodigy™ and CompuServe™.

The desired effect of telecommuting is to help redress the jobs-housing imbalance. That is, to allow existing businesses and employees to be located where they are now without incurring the travel that currently occurs. There is a potential undesirable side effect of telecommuting: the telecommunications equivalent of the “freeway effect.” That is, the mere existence of the ability to move to almost anywhere, while still being able to hold a properly paying job, may cause people to flock to new areas with lower housing costs — urban sprawl. To quote from an earlier publication:³¹

The process as new highways are completed, for example, runs roughly as follows in regions of economic attractiveness:

1. The improved transportation infrastructure is a major inducement for businesses and households to move to areas that are both served by the infrastructure and have lower land prices. The goal in individual household move decisions is to achieve an attractive, affordable, generally low population density residence location.
2. The expanded movement to the newly developing area acts to increase land prices and congestion, increasing population density (and decreasing step 1 attractiveness) as population growth continues in the area.
3. The increasing congestion and improving tax base spur demand for further expansion of the transportation infrastructure either by increasing capacity, often at the expense of removal of local residences, or by extending the infrastructure to more rural areas, or both. Go to step 1.

Continuing repetition of this cycle ultimately results in the wide scale suburbanization of the area and elimination of formerly rural areas. Often these areas were originally forested, agricultural or wildlife habitat land. Los Angeles is often cited as the archetypal example of this process.

³⁰As reported in such publications as *Business Week* and *The Wall Street Journal*. The employees do not want to break up their children’s school work and friendships or, in the millions of multiple earner families, jeopardize their spouse’s jobs.

³¹Jack M. Nilles. Telecommuting and urban sprawl: mitigator or inciter? *Transportation* 18: 411-432, 1991



In the telecommuting case, the existence of a telecommunications infrastructure, which could be wireless, could result in the demand for an expanded transportation infrastructure and increasing conversion of rural land to housing and its related physical infrastructure. We have seen no evidence of this, but the possibilities must be considered in any comprehensive regional plan.



Part 3: Recommendations

Immediate Action

The author makes the following recommendations to the City for addressing the issues raised in this report.

The first three recommendations apply for all circumstances.

- **Increase the level of awareness of upper departmental management** concerning the impacts of telecommuting. This can begin with distribution of report summaries and/or high level briefings to all department General Managers. This was our recommendation after both rounds of focus group meetings and it continues to be because it is so critical to the success of telecommuting.
- **Maintain at least the current level of telecommuting and, at a minimum, begin expanding telecommuting** in those departments that already have active telecommuters.
- **Develop uniform telecommuting guidelines.** The project began with the development of a tentative set of guidelines that were provided to all departments as part of the training program. While they proved to be quite serviceable during the project, the guidelines often were interpreted differently by different departments. A revised set of guidelines would address the issues raised during the project. Appendix 1 provides a suggested set of rules.

Internal Implementation Priorities

Management

The subsequent recommendations are made under the assumption that telecommuting will continue in the departments currently participating in the project.

- **Integrate Transportation Demand Management Strategies.** Telecommuting has proven itself to be an



effective rideshare strategy. Promotion and expansion of telecommuting should be a formal part of an integrated strategy for managing the use of transportation by City employees.

- **Create Specific Incentives and Disincentives.** Although the project has been successful, it is abundantly clear that there is still significant resistance to telecommuting — not to mention downright hostility — on the part of many City managers. In addition to the expanded awareness program listed earlier, a system of incentives (recognition, factors in promotion/salary decisions, etc.) and disincentives (such as minimum telecommuting quotas) should be devised to overcome that resistance.
- **Expand Telecommuting.** The results of the project clearly indicate that the use of telecommuting should be expanded. Our analysis suggests that at least 15,934 City employees — one-third of the City's permanent staff — could successfully telecommute.
- **Increase and Expand Training.** It is also clear that training in the management methods of successful telecommuting is important to telecommuting's success. Both initial, pre-telecommuting training and follow-up reinforcement are called for. All of the City's telecommuters and telemanagers should receive training. Further, the training should include:
 - 1) managers who are not currently (but may become) direct supervisors of telecommuters; and
 - 2) colleagues of telecommuters.
- **Develop TeleService Program.** The City has already developed regional City Halls in Van Nuys and West Los Angeles. Telecommuting could be used to further distribute City services all over the City. This may be of particular importance in areas affected by the recent riots. Mini- or micro-City Halls could be developed, staffed by telecommuters living locally, to provide most City services to local residents.

Technology

- **Form a City-wide action committee, possibly as a subcommittee of the Telecommuting Task Force,** to define and resolve the issues of technology performance and reliability standards; technology needs and applicability for various types of telecommuting work; and ownership and financing possibilities.
- **Improve Access to Information Technology.** There is no question that access to personal computers is a major factor in improving effectiveness of City information workers, whether or not they are telecommuters. A number of telecommuting-trained



City employees were prevented from participating in the project because they didn't have personal computers at home or were unable to get access to the City's mainframe computer. Our focus group sessions and personal interviews indicated many cases where City employees have invested their own funds in computer equipment that is superior in performance to that in their principal office. It appears that the City is incurring major opportunity costs because of the freeze on computer equipment. It is extremely important that this issue be resolved soon.

- **Resolve the uncertainties about mainframe access** for those prospective, trained telecommuters who have not yet begun to telecommute³². This was our recommendation after each round of focus group meetings and continues to be because it still an outstanding issue.
- **Develop a uniform, City-wide policy**, possibly in conjunction with vendors, on duplication of applications software used by telecommuters at home.
- Although voice mail is now available (500 "mailboxes"), most telecommuters are not aware of it. **Broaden the awareness of, and access to, voice mail**, particularly for telecommuters.
- **Increase audio/telephone (and, where appropriate, video) teleconferencing capabilities and awareness** in each department as a means of increasing "attendance" at meetings without increasing travel for meetings.

Provide Area-wide Leadership.

There are many ways in which the City can show leadership in Southern California. The following are examples.

- **Publicize the results of the City of Los Angeles Telecommuting Project** to other cities and to area businesses.
- **Revise zoning ordinances** to encourage telecommuting (while discouraging potential urban sprawl made possible by telecommuting).
- **Cooperate with other Cities and public agencies to share facilities** for telecommuters so that public sector employees all over the region can begin telecommuting from offices near their homes.

³²Only about half of the individuals trained by JALA were allowed to telecommute.



Part 4: A Brief Action Plan

Telecommuting Implementation Group

The planning phase and the first stages of implementation of the Telecommuting Pilot Project were initiated by the Telecommuting Task Force (TTF). The TTF comprised senior managers from several City departments. The purpose of the TTF was to provide general policy guidance to the project, but it was not closely linked to the details of the implementation. Nor was the TTF an advocate of telecommuting, other than to support its testing. It was deliberately neutral.

Assuming our recommendation for expansion of telecommuting is adopted, we further recommend that the first step in the expansion process is the appointment by the Mayor of a proactive Telecommuting Implementation Group (TIG) whose primary task is to ***motivate and coordinate*** the expansion process. This is a quite different mission from that of the TTF. The State of California formed a Telecommuting Advisory Group with a mission similar to that suggested here. The effectiveness of that group is demonstrated by the fact that the Governor decreed that telecommuting is a key work option for State employees and that the number of State telecommuters has more than quintupled since the Pilot Project was completed in mid-1990.

Members of the TIG should be senior managers from every department of the City that has, or is likely to have, active telecommuters. The TIG should also include representatives from all of the affected unions. The Chairperson of the group should be someone who is directly concerned, because of the nature of his/her job, with traffic reduction or with productivity improvement. We suggest



that the City Rideshare Program Administrator accept this responsibility.

The first task of the TIG is to develop a basic telecommuting policy, giving minimum standards and implementation guidelines for the entire City. The duty of each member of the TIG, beyond contributing to the overall standards and guidelines, is to coordinate any expansion of those for her/his own department. The policy should include personnel selection and training criteria and methods; satellite office requirements and implementation procedures; work rules; technology needs; and evaluation requirements and procedures, as a minimum.

Because motivation of managers is fundamental to the success of telecommuting, it is vital that the members of the TIG be movers and shakers, rather than passive coordinators. Their fundamental role, once standards and guidelines are developed, may be to change attitudes within their own departments, where existing attitudes are impeding acceptance of telecommuting. This requires that they be selected on the basis of their leadership and influence with their colleagues.

Further, it is important that the members of the TIG have a minimum tenure of two to three years and that they are suitably rewarded or recognized for their efforts. That is, they should not view their responsibilities to the TIG as just another unwelcome burden.

Telecommuting Expansion Project

In a sense, the Telecommuting Expansion Project is a larger scale version of the Pilot Project. The process is quite similar. First, the Mayor and Council should address the issues of the necessary infrastructure: telecommunications and computers. As we have found from the Pilot Project, a fairly substantial amount of telecommuting can occur with little or modest impact on the budget. However, a fairly small increase in availability of personal computer hardware and software; and an expansion in mainframe access can have substantial additional effects. These issues should be clearly identified, if not resolved, before the next step.

Second, a new series of briefings and/or informal meetings with department General Managers and senior managers should be made, either as a group or on an individual basis. Those briefings should focus on the key policy issues and, where there are Pilot Project data, on the specific experiences in their own departments. No department should be left out of this process. Each General Manager should be asked to develop a telecommuting implementation plan and schedule. The plan should include technology needs.



Third, a series of briefings to mid-level managers and supervisors should be held, on a department by department basis. The purpose of the briefings is to acquaint them with the results of the Telecommuting Pilot Project. Wherever possible, telecommuters and telemanagers from their own departments should attend the briefings and voice their own views on the benefits and risks of telecommuting. The desired outcome of these briefings is that the managers will develop implementation plans for their own groups.

During the first stages of the implementation, some managers — and some departments may continue to reject telecommuting as an option for them. Our strategy has always been, and continues to be, to insist that participation be voluntary at all levels of management. However, in the case of departments that have refused telecommuting and have not achieved the necessary AVR levels by other means, the General Manager should be required to show clearly how the department can achieve its AVR goals without using telecommuting.

Fourth, all potential telecommuters should be given briefings on telecommuting, including clear descriptions of the work options and responsibilities of telecommuters, and should be given an opportunity to volunteer to become telecommuters.

Fifth, it is our opinion that the volunteers and their supervisors should go through some formal selection process that serves as a means for identifying possible problems with telecommuting. If nothing else, the process tends to focus attention on a key ingredient of telecommuting: trust and quality communication between supervisor and employee. During the Telecommuting Pilot Project a set of formal background questionnaires³³ was used for this purpose.

Sixth, the selected telecommuters and telemanagers should be given formal training in telecommuting management techniques. Ideally, the extent of training required by members of a particular work group depends on the level of independence already achieved within the group. In some cases, very little additional training is required. In other cases, several hours of training may be in order. Our experience during the pilot project was that two hours of training for the telecommuters and two hours for the telemanagers was the minimum acceptable for most of the

³³The questionnaires were administered to both the prospective telecommuters and their supervisors. This background evaluation was limited to the Pilot Project but will be available to the City for further implementation at a nominal cost per telecommuter.



TeleService Pilot Project

groups. Some groups needed more detailed training, as we determined from subsequent focus group sessions.

Steps three through six need not be completed for all of the telecommuters at once. A better strategy for large departments may be to implement telecommuting on a division by division basis, or even in smaller increments, as dictated by operational considerations. The overall schedule may be dictated by the requirements of the SCAQMD.

Although the focus of this project was on reducing the level of commuting by City employees, another major opportunity was suggested repeatedly during the course of the project: Why not use telecommuting as a means of more effective local delivery of City services?

The rationale is as follows. The City has an extensive array of service-providing facilities distributed throughout its area. But many of these are single function facilities, such as fire and police stations, parks buildings, and the like. Although there are multi-function facilities in locations other than downtown Los Angeles, such as the Van Nuys, West Los Angeles and San Pedro City Halls, they are few and far between. Further, there are no such facilities to serve areas of particularly high need, such as South-central or East Los Angeles.

Because not all services are available throughout the City, citizens of Los Angeles spend significant amounts of time and effort traveling from their homes and businesses to City facilities in order to receive any one of the variety of services provided by the City. Often, they are required to visit several different locations before receiving all of the services they need. Presumably, some citizens give up the search in frustration before getting the services. There are no quantitative data available as to the magnitude, extent and success of this taxpayer travel activity.

Given the severe constraints on the City's budget, it is not likely that a series of conventional local City Halls will be built any time soon. However, it seems entirely feasible to do "reverse telecommuting:" to use existing City facilities that are turned into multi-purpose operations for disseminating a variety of information and completing routine City-citizen transactions. Applicants would be able to go to a local City facility and be in contact with the required experts regardless of the actual location of the experts.

This need not result in major inroads on facilities that are already overcrowded. For example, a variant of the information kiosks that are being tested by the State of California might provide significant increases in localization of services. Increased telecommuting by the



usual occupants of existing facilities might free up enough space so that the conversion of some of it to multiple uses would be essentially invisible.

The technology required to accomplish this is already in existence. No new inventions are required. Two key questions are: what level (read cost) of technology is required to deliver what services?; and how important are the benefits derived from the localized delivery? As an example, the Department of Telecommunications is investigating the requirements for a broad-band network interconnecting City facilities. The existence of such a network would be a major asset for implementing a broad TeleService program.

As is the case with telecommuting, the benefits derived from a TeleService program may significantly exceed operating costs. However, until a more thorough analysis is made of the opportunities, issues, potential benefits and costs, it is not possible to gauge the total impact. Therefore, we propose that a pilot TeleService project be planned and developed to explore the opportunity.

Interagency Facilities Sharing Project

Sponsored by the Institute for Local Self Government,³⁴ a project is currently under way to develop and demonstrate office space sharing arrangements among local governments. The central concept of the project is that local governments can develop satellite office telecommuting arrangements without necessarily leasing new office space elsewhere. A City of Los Angeles employee living in, say, Rialto could telecommute part time from the Rialto Civic Center rather than commuting to downtown Los Angeles — and vice versa.

The primary barrier to demonstration of satellite center telecommuting during the City project was the rule that the City would lease facilities only for a minimum duration of several years. While this is a quite reasonable approach for negotiating the most favorable leasing terms, it was not possible to lease space for only a few months (the duration of the project) in areas close to City employee residences.

Early in the project we identified more than seven areas where satellite offices could effectively serve City employees. None of them included an existing City facility. Most were outside the City limits. Only near the end of the data-taking stage of the project were we able to reach an agreement with the Ontario Telebusiness Work Center to house one telecommuter outside the City limits.

³⁴The ILSG is a non-profit, non-partisan research and education organization affiliated with the League of California Cities. Its mission is to promote and strengthen local self government.



To test the impact of a network of available telework centers, we used our computer program for evaluating the AVR impacts of various travel demand management strategies. Our analysis of the residence and work locations of a sample of 580 prospective City telecommuters indicates that only 4 now work at the City (or other public agency) facility nearest their homes. The other 576 would save more vehicle miles by either telecommuting at home or from a different facility than their principal office. For the whole group of 580 employees, including some current home-based telecommuters and some rideshare members, the annual additional vehicle miles saved by telecommuting from a satellite office one day per week would be 900,000 miles (17,600 trips).

Participation in the ILSG project or a similar arrangement could materially expand the City's telecommuting without increasing expenditures for office space.



Appendix 1: Telecommuting Guidelines

The Issues

The general issues of telecommuting are common to most organizations: who controls whom/what; who is liable for what; who pays for what; and who, if anyone, is at a disadvantage as a result of telecommuting? The dominant fear expressed by managers during the preliminary phases of the project was that telecommuting would be forced upon them upon conclusion of the project and that they would have no control over who telecommutes or over how often and under what circumstances telecommuting would occur. An opposite management view was also heard, although it didn't surface until later in the project: "this is just a fad and will go away — we don't have to pay attention to it."

The views expressed by various employee representation groups, both within the City and elsewhere around the world, tend toward: "This is a new way for management to exploit the employees." Here too, another voice is heard: "How can we make it a mandatory option for all employees?"

During the development of the project plan and periodically throughout the project, the usual liability questions arose, typified by: "Who's liable if a telecommuter breaks her leg at home while ostensibly working at two in the morning?" And: "What happens if the equipment used by the telecommuter breaks?" Data security issues also arose frequently, particularly with respect to the possibilities for unauthorized access to the City's mainframe computers.

Finally, the telecommuters' main concerns were the (in their view) possibly frivolous attempts by "management" to



arbitrarily limit — or force — their telecommuting. This apprehension was supported by the failure of several departments to allow many of their trained telecommuters to telecommute, and by others to put strict limits on telecommuting days or schedules. We uncovered no occasions, once the active phase of the project began, where telecommuters felt they were forced to telecommute against their wishes.

Approaches

All of these issues arise from a fundamental adversary attitude, possibly supported by past experience, on the part of all of these groups of people. Lurking in this background is the leaden rule: *Do unto others as you think they will do unto you — only do it to them first.*

The dilemma arises from the fact that successful telecommuting requires an attitude of trust and cooperation among the participants. The question is, can a set of rules be developed that acts to encourage growth of the necessary trust, while avoiding the trap of relying on blind faith?

We should emphasize that these concerns were by no means universal. There was abundant evidence during the project that many telecommuters and their supervisors had well developed and proven feelings of mutual trust. Nevertheless, in those cases where such trust is nonexistent or uneasy, it is important to establish some fundamental rules that will act to help improve the situation.

Consequently, the following recommendations are designed to stipulate the roles and responsibilities of telecommuters and telemanagers in such a way as to promote increasing feelings of trust without being unduly restrictive upon the prerogatives of either telemanagers or telecommuters.

A Core Set of Work Rules

The following rules are proposed as a general guide for City Departments in establishing clear relationships between telecommuters and Department management. Some of these rules should be inviolate, while others may be subject to negotiation. Consequently, we have separated them into two groups.

Absolute Rules

- ◆ **Telecommuting is a management option, not an employee entitlement.** Successful telecommuting requires that both the nature of the work to be performed and the working relationships between the telecommuter, the telecommuter's colleagues and her/his supervisor be consistent with the principles of location independence for the period of telecommuting.



- ◆ **Telecommuting must always be voluntary** for both telecommuter and his/her supervisor(s). Either the telecommuter or his/her supervisor may elect to discontinue the telecommuting if: a) the telecommuter is not comfortable with telecommuting; or b) the telecommuter is not performing to mutually pre-agreed upon work standards. Any discontinuation of telecommuting must occur upon adequate prior notice.
- ◆ **Telecommuters and their direct supervisors must be given training** in the management aspects of telecommuting prior to beginning telecommuting if they do not already operate in a location independent mode.
- ◆ **Performance evaluation of telecommuters should be based on prior mutual agreement**, between the telecommuter and his/her direct supervisor, as to specific work goals, objectives and schedules. Although specific objectives and schedules may be based upon estimated times to complete tasks, performance evaluation should not be based on time-to-complete.
- ◆ **Telecommuters are regular employees**, not subcontractors.
- ◆ **There is no distinction in rates of pay and benefits** between telecommuters and non-telecommuters.
- ◆ **Telecommuters should be given the same opportunities as non-telecommuters for promotion and career development**, including access to additional training.
- ◆ **Telecommuters should have regular opportunities to meet** their telecommuting and non-telecommuting colleagues in their organizations in order to minimize any feelings of isolation or exclusion.
- ◆ **Telecommuters should have access** to electronic mail, voice mail and/or whatever other means are normally used in an organization for keeping them linked with their colleagues.
- ◆ **Telecommuters and telemanagers should establish a regular schedule** or other method for maintaining suitable levels of communication with each other.
- ◆ **There should be no arbitrary limitation on telecommuting schedules and frequencies.** The specific schedule and frequency of telecommuting for



an individual telecommuter should be dictated solely by the needs of the work unit and the availability of sufficient quantities of “telecommutable” work, not by any unfounded expressions of distrust of the telecommuter such as prohibiting telecommuting days adjacent to “off” days.

- ◆ **Telecommuters should have the same rights and access to representation as their colleagues.**

Negotiable Rules

- ◆ **Telecommuters should not be required to perform in excess of their in-office levels as a condition of beginning/continuing telecommuting.** An alternative, less protective version: **Telecommuters should not be required to perform in excess of their in-office levels as a condition of beginning/continuing telecommuting to the extent that they feel stressed from the extra load.** Telecommuters naturally tend to perform more effectively and feel less stress during their telecommuting days but the fundamental success criterion for the project was to reduce automobile use while maintaining normal levels of performance.
- ◆ **All operating costs of telecommuting**, such as business related telephone charges, office supplies and special software or necessary software upgrades, shall be paid for directly or reimbursed to the telecommuter by the City.
- ◆ **All necessary equipment and equipment maintenance costs should be covered by the City** in all cases where the telecommuter needs the equipment for telecommuting but does not own, is not able to, or desires not to use her/his own equipment. Several prospective telecommuters were eliminated from participation in the project because they did not have suitable computer equipment at home. Our surveys indicate that the benefits from performance increases to be expected from telecommuters far outweigh the costs of additional computer equipment.
- ◆ **Telecommuters may use their personal computer equipment and/or software for telecommuting**, provided that it is compatible with City computers. Many of the City’s telecommuters have personal computer installations that are superior to that available in their principal offices. However, in these case the employee, not the City, should be responsible for the maintenance of the



equipment and/or software. The employee should also be responsible for insuring that any of her/his software used for City related work is virus-free and compatible with City software.

- ◆ **The City retains the right to, and telecommuters have the right to insist upon, inspection** of home offices and computer equipment/software for safety, adequacy and security.
- ◆ **The schedule worked by a telecommuter need not be that same as that of the principal office,** provided that the schedule is given prior approval by the telecommuter's supervisor. For example, given prior approval, the telecommuter may begin and finish work earlier (or later, or some combination other) than the normal office schedule.
- ◆ **Telecommuters must be reasonably accessible, via telecommunications, to the principal office during normal work hours,** or during some portion of normal hours, given prior approval by the telecommuter's supervisor. In the latter case, the hours of accessibility and work need not be entirely identical. "Reasonably accessible" means that the telecommuter should respond to a call from the office within some time limit mutually agreed upon by the telecommuter and his/her supervisor

Most of these rules were covered in the manuals issued to the telecommuters and telemanagers as part of the training process. They have been amended and augmented as a result of the experience gained during the project.

Legal Approaches

As with the general management and labor relations issues addressed above, the legal aspects of telecommuting are not materially different from those of the traditional workplace. These issues focus primarily on responsibility and liability. The following proposed rules³⁵ address those issues.

- **A telecommuter is covered by Workers Compensation Insurance regardless of the location of her/his workplace and work hours,** provided that the work location and schedule was given prior approval by the telecommuter's supervisor.
- **Accidents at a telecommuter's home to persons who are not employees of the City of Los Angeles**

³⁵Note that JALA International, Inc. is not a law firm. The recommendations given here deal with the substance of the issues and may or may not be in appropriate legal format.



Angeles or, if they are employees, are not engaged in City work activities, **are the responsibility of the telecommuter.**

- **Telecommuters are responsible for protecting City information in their possession, or accessible through the use of equipment in their possession,** regardless of their work location. Any sensitive information in a telecommuter's possession must be given at least the same or equivalent physical protection as would be used or available in the telecommuter's principal office.
- **Telecommuters are not to use City provided equipment or software to perform work for any other employer.**
- **Telecommuting shall not be required as a condition of employment.**
- **The City is not responsible for that portion of home utilities costs or space rental that is attributable to a telecommuter's telecommuting activities.** During the training sessions we stressed that it was extremely unlikely that City employees could deduct the costs of home offices in their federal income tax forms unless telecommuting was required as a condition of employment. A recent Supreme Court decision has strengthened that rule. There are current moves in Congress to change the tax laws so that telecommuters can receive some tax benefits. However, unless and until that occurs, home telecommuters can not deduct those expenses.



Appendix 2: Evaluation Methodology

Two types of evaluation, summative and normative, were used to assess the efficacy of telecommuting. The summative (or ‘what has been happening?’) evaluation was made via a series of questionnaires administered to the telecommuters, and, in some cases, their families; their supervisors; and members of the control group. A cost-benefit model was derived from the summative evaluation data and from other departmental statistics. The normative evaluation (or ‘where should we be going?’) evaluation was achieved via individual interviews and a series of focus group meetings.

The control group was composed of City employees who otherwise would have been qualified to be telecommuters but who elected not to telecommute during the course of the project. That is, the control group members were selected to be as similar to the telecommuters as possible, given the variety of personalities and job types in the project.

Summative Evaluations

The summative evaluations comprised two different types of evaluation: overall impact assessments, including a cost-benefit model; and a travel demand analysis. The impact assessments were made via three series of detailed questionnaires³⁶ that covered general demography; the adequacy of the City’s information infrastructure; personnel roles and information activities; technology use;

³⁶These questionnaires have been used by JALA in a variety of telecommuting projects, in both the public and private sectors, since the mid-1980s.



commuting patterns; telecommuting details; implementation issues; and overall performance impacts. These lengthy questionnaires, often requiring two hours to complete, were administered to the telecommuters and control group members at the beginning, mid-point and conclusion of the data-taking phase of the project. Supervisors of telecommuters and control group members were also given short evaluation questionnaires, focusing on performance issues. These were administered at the same times as the telecommuter/control questionnaires.

Although the general evaluation questionnaires provided overall information on the trip reduction impacts of telecommuting, it was important to get some information on a persistent question about telecommuting impacts: does telecommuting simply act to move the distribution of trips around, with no overall effect on travel? That is, while telecommuters may not use their cars on telecommuting days, they may use them more than usual on non-telecommuting days, including weekends. Therefore, the telecommuters and members of the control group — as well as their driving age family members — were asked to complete logs for each trip made, for whatever purpose, over a period of one week in March, 1992.

The data derived from all of these formal questionnaire series were used to complete a cost-benefit model that quantifies the known dollar impacts of telecommuting and provides a means of forecasting future impacts under various telecommuting scenarios. A related model was developed that provides a comparative analysis of telecommuting with other means of trip reduction, such as carpools and vanpools.

***Productivity vs.
Effectiveness
Measurement Issues***

One of the key economic impact statements about telecommuting is its effect on productivity. There are some very important distinctions to be considered here since major economic commitments may be made on the basis of productivity estimates. The following describes my considerations in developing the various evaluation questionnaires.

Strength of Inference

The results of the surveys, occurring as they did in the real world instead of a laboratory, are complicated by the time-varying composition of the group of telecommuters. Transfers, departures, switches to and from telecommuter/control status (some individuals did this more than once) all tend to obfuscate the results. Consequently, where important factors in the evaluation are discussed, we have included confidence estimates of the reliability of the conclusions. These are generally in the form of an estimate of Type I error: the likelihood that two sample populations (such as telecommuters and controls) are really identical even though the statistic says they



aren't. This is expressed in the form of a probability, p , that the two populations are the same. The lower this probability is, the more likely it is that the populations are indeed different. Ordinarily we don't state that two groups are different in the characteristic in question unless the p -value is 0.1 or less, preferably less than 0.05. That is, the odds are 9 to 1 or 19 to 1 or more $[(1-p)/p]$, respectively against the two groups being the same.

Productivity

Productivity is a loaded term. In particular, manufacturing productivity is usually taken as the model. One has mental images of whiz-bangs being turned out like clockwork. Productivity in this situation is measured as the ratio of the price received for the whiz-bangs produced, divided by the cost of production. When one turns to information work the first problem is: what's the product? In the case of clerk typists the identifiable product may be typo-free letters and memos going into the mail. In the case of a detective or a policy analyst, as examples of the types of telecommuters in the project, the measure of productivity is significantly less well defined. In any case, productivity is a measure of doing things right.

Effectiveness

Effectiveness is the term we prefer to use. Our approach is that productivity is the wrong term to use in any case. This is specifically because of the tendency to count things (letters, typed, decisions made, briefs or specifications written, etc.) as the means of measure. This distracts one from the real purpose of information work: to generate or convey information and to affect decisions. This is a broader concept and, unfortunately, one that is even harder to measure. But the breadth is, we feel, in the right direction. Effectiveness is a measure of doing the right things - and doing them right. As such, it includes productivity as a component, but someone who is very efficient/productive at doing the wrong things is decidedly not effective.

Measuring changes rather than absolutes

It is not possible to measure absolute levels of information work effectiveness, if for no other reason than that there is no consensus on what it is. However, most individual information workers, and their supervisors, have a feel for what has changed over some relatively short period, such as a few months to a year or two.³⁷ In this way we do not

³⁷Even periods of one or two years' duration can be difficult to measure since one's memory of what one did as long as a few days ago can often be faulty.



have to be concerned with what the elements are of the effectiveness evaluation; we do not sink into the pit of endless qualifications of measures for each type of job. We simply ask what has changed, and proportionately how much, in whatever terms the subject is used to thinking of his/her own (or his/her own subordinate's) effectiveness.

Intergroup comparisons

In addition to focusing on changes rather than absolutes, we compare estimates of effectiveness. We compare the self estimates of the telecommuters with the self-estimates of the members of the control group. We compare both of these with the estimates made by the telecommuters'/controls' supervisors of their effectiveness changes. We compare the final self-estimates with the pre-telecommuting self-estimates.

Related measures

Finally, we also examine what has stayed the same. What hasn't changed? The work environment, the roles played by the individuals in their work, the work activities in which they engage, the technological tools they use, the factors that make up effectiveness measures are all part of our evaluation questionnaires. That is, we try to detect any changes in the work environment that might explain changes otherwise attributable to telecommuting. If these work-environmental factors are unchanged and/or common to both the telecommuter and control groups then any effectiveness differences between the groups are more likely to be attributable to telecommuting. Note that there were no significant differences detected in these factors in the pre-telecommuting, the first annual and the final evaluations. In the interests of reducing the length of the questionnaires (and reducing the strain on the respondents), the information infrastructure and work roles questions were dropped from the first annual questionnaire.

Normative Evaluations

Although the summative evaluation techniques provide quantitative snapshots of the impacts of telecommuting, it is also important to be able to improve the process in mid-course. To that end, two series of focus group sessions were held, at about the one-third and two-thirds points in the project. These were augmented by informal meetings and telephone conversations with telecommuters throughout the project, often in response to queries about procedural issues.

The focus group meetings were relatively informal but were structured to elicit comments and suggestions about problems with technology, operating procedures, working



relationships, personal and family impacts of telecommuting. The meetings also served as a means of reinforcing some of the management approaches covered in the initial training sessions. During the first series of meetings the telecommuters and their supervisors met separately, in case there was any reticence about discussing management problems with supervisors (or telecommuters) in attendance. In the second series of meetings, the telecommuters and supervisors met together. There was no substantive difference in the outcomes between the two sets.



Appendix 3: Quotes from Supervisors

The following is a set of comments from the supervisors who completed evaluation forms in the final round of surveys. *[Italicized comments in brackets, for the following items, are those of the author.]*

Good News

- Even with an increased caseload, and the increased complexity of cases, [the telecommuter] has maintained his level of effectiveness. I believe this has been possible because of the quality time telecommuting affords him.
- Telecommuting has allowed [the telecommuter] to keep pace with an increased workload, more complex cases, and specific projects.
- We accomplished things with telecommuting that we haven't been able to do for four or five years. Telecommuting gave us the time [and the freedom from interruptions] that let these tasks be finished with outstanding results.
- This employee has a significant impairment (physical) to her performance. The telecommute day has helped compensate so that she is more productive, even though her overall performance is below her prior capability. (She has a degenerative disease that is also impairing her mental processing.) Telecommuting is a job saver for her and us.



- I'm very supportive of telecommuting. Originally my support was theoretical. Today it is based upon actual practice. The "quiet" or undisturbed time available to telecommuters allows for very productive work on certain tasks/assignments.
- Our work is difficult to quantify in terms of how long a particular part of it should take, and as everyone is at a different task at different times, it just is not clear if someone is getting more, less or no change in the work done. The only thing I can tell is that telecommuters are happy about telecommuting.
- Telecommuting has helped [the telecommuter] as well as other employees I am familiar with in increasing productivity in that they can work on a project with no distractions such as phone calls and people dropping by to talk.
- Telecommuting has forced [the telecommuter] to be a more organized worker. He has had to plan his work here and at home. He stated that the flexibility in work environment and work schedule has helped relieve the boredom that comes with doing repetitive tasks.
- This individual has been on medical leave of absence. We attempted to use telecommuting to alleviate the degree of worksite pressures. While she telecommuted, her production record improved.
- We are suffering a 50% staffing shortage at this time and are convinced that telecommuting has helped us to maintain an acceptable level of case processing.
- I think the telecommuting program should be continued since the productivity, volume of work, increased for the engineers I supervised.
- Due to required meetings, field work, employee unable to complete telecommute goal of once every two weeks. Excellent use of time the few times she did telecommute. Employee is very productive at the office and in the field and at home telecommuting.
- For certain tasks/functions/projects and employees telecommuting is, in my opinion, vastly more effective than traditional methods. I would like to see it gain acceptance.
- I am also convinced that **many** employees under my supervision could be more productive if they



“telecommuted” (and did not have to contend with phone and other interruptions).

- Telecommuting works very well with this motivated employee. When large complex projects need to be completed in a short period of time, she works from home without interruption. She makes optimum use of the phone for communication and for providing and receiving information. She uses her own computer equipment.
- [The telecommuter] lives near [a City facility]; on several occasions, he was able to do field work “next door” without having to travel downtown and back. For him, [the facility] became a ready-made “satellite center.”
- Employee lives 29 miles from work. Effective use of employee's time. Special responsibilities of the job lends itself to telecommuting.
- There is no doubt in my mind that all of our professional and most of our clerical staff could significantly benefit by telecommuting once or twice per pay period. Too many distractions in the office (much public comment telephone work).
- [The telecommuter's] job performance is higher than the average engineer and that continued with telecommuting. He has outstanding PC skills which makes his telecommuting more effective and he has flexible approach to when telecommuting is done. He is well organized and plans ahead which also adds to his being very effective in a telecommuting program.
- I have found that telecommuting works well when an employee is assigned a project that requires extensive reading and analysis.
- [The telecommuter] initially focused on reports and manuals. Later she had access to a main frame connection and devoted time to testing and trouble shooting new information systems. I had to limit the main frame access when I was pressured to keep the phone bill under \$70.00 per month. For an effective program, the Dept. needs to solve the Telecommunications Cost Problem by placing low cost or toll free nodes near the telecommuting employees.
- There has been a slight increase in my workload duties that [the telecommuter] would have

Mixed News



handled had he been present, but at the same time this was offset by the greater productivity.

- I believe that telecommuting is a very good program. But the effectiveness of the program is very much dependant upon “the employee” who participated in the program. Most of the participants are performing well but some would be kind of abusing the system (program). *[Hence, the need for pre-telecommuting screening.]*
- The work was tailored to be effectively done at home. Because main frame accessibility was not available to [the telecommuter] , her work focused on reports, manuals and studies. She was able to accomplish almost two days work in one telecommuting day at home. This was a Win-Win for the Dept.
- Employee lives one mile from work. More effective on job site as position already requires off site field work. *[This and the following quote are from the same supervisor.]*
- Employee lives two miles from work. Responsibilities of position more effectively carried out at work site since job has extensive field work outside of the office. *[Meeting requirements, in a period of great transition, made more telecommuting difficult for these two. Teleconferencing systems might have lessened the problem.]*
- The city has chosen to operate its pilot program on the basis of telecommuters taking one day off per week. I'd like to see a more irregular schedule. *[Note: See the comment on the next quote.]*
- We have removed all our telecommuters from weekly, fixed telecommuting days and have made the option available to any staff member, on a periodic basis, provided that there is justification. We found the practice of having fixed telecommuting days to be negative in that staff began to assume the day as an employment right rather than a privilege. *[Note: Considerable time was spent during the training sessions and in subsequent focus group sessions about the relative advantages and disadvantages of fixed/variable telecommuting schedules, stressing the likely need for flexibility. One can lead a horse to water . . .]*

Not So Good News



Bad News

- Due to personal problems and work related changes in duties and assignments the telecommuting option did not work out for [the telecommuter]. We both continue to be positive in attitude towards it and if situations change would re-implement. *[Satellite office telecommuting might work out better for this telecommuter.]*
- On the plus side [the telecommuter] is very productive on his TC day. On the down side [the telecommuter's] work (we feel) must be reviewed. *[Note: A major part of the training deals with the work definition and review process. It is interesting to note that the requirement to review output apparently is considered by this supervisor to be a novelty, not applicable to in-office workers.]*
- Due to the assignments and upgrading of our work environment [the telecommuter] has not telecommuted in the past several months. There has been a significant decrease in productivity on two of her existing assignments. **Also, because our [senior] manager is unwilling to commit his team to the program, it is no longer one of his top priorities to promote this program. He finds it easier not to support even if the participants are already enrolled in the program. [Emphasis added.]**
- [The telecommuter] elected to stop telecommuting because of too many interruptions at home. *[Note: We find this happens with less than 5% of home-based telecommuters.]*
- This program required more structure, training and monitoring to be effective. Passing out this questionnaire 5 mos. after we terminated the pilot project is ludicrous. *[Comment by a supervisor who was trained but neither supervised a telecommuter nor attended subsequent focus group sessions. Only two of the active departments, accounting for 9 telecommuters, formally terminated their telecommuting as of July 1992.]*

Item 3.
2009 Status of Telework in the Federal Government,
Report to Congress, United States Office of Personnel
Management, August 2009

**STATUS OF TELEWORK
IN THE
FEDERAL GOVERNMENT**

REPORT TO THE CONGRESS



**UNITED STATES OFFICE OF PERSONNEL MANAGEMENT
AUGUST 2009**

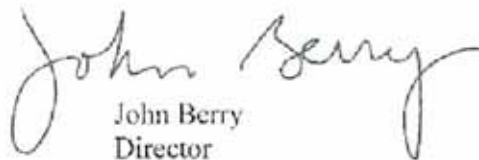
Message from the Director

I am pleased to present the results of the Office of Personnel Management's (OPM) annual Call for Telework Data for calendar year 2008. The report provides an update of telework activity data submitted annually by Executive Departments and agencies. Results provide a longitudinal perspective through a comparison of current and prior year results for all agencies as well as highlights of recent trends within agencies.

Telework clearly has important implications for individuals and even entire communities. Programs have been shown to help individual employees successfully balance the responsibilities of work and family, increase the safety of neighborhoods, and reduce pollution. The potential benefits of a teleworking workforce are now more important than ever: with the cost of gas again on the rise it has become a critical tool in the struggle to balance stretched family budgets; with the threats of new strains of influenza, it provides an effective resource in the face of possible pandemic; as our Nation searches for ways to conserve energy, telework provides a valuable asset toward establishing green workplaces.

The report indicates a steady albeit very slow progress in telework. In a recent Memorandum for Heads of Executive Departments and Agencies, I committed OPM to moving the Federal Telework Program forward through a series of important initiatives. The first of these have been met with the establishment of an expert Advisory Group that draws upon the knowledge of several leaders of high performing telework programs. The results of this group's efforts will be used to help Federal agencies develop strong consistent telework policies and, ultimately, effective telework programs.

We have significant work ahead to develop a strong telework culture. I look forward to our continued collaboration with agencies on this important issue as we move telework forward in the Federal Government.



John Berry
Director

U.S. Office of Personnel Management Telework Call for Data 2009: Results

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Executive Summary

In February 2009, seventy-eight Executive Branch agencies submitted data on their telework programs to the Office of Personnel Management. These data represent telework participation and related activities between January 1 and December 31, 2008.

Agencies have been submitting these reports to OPM since 2001, tracking the progress of telework implementation as the agencies have created and refined their programs and policies. Trends have remained relatively stable over time, with incremental increases and occasional decreases showing overall slow but steady growth.

For 2008, agencies reported that:

- 102,900 employees were teleworking
- 64% of these employees were teleworking relatively frequently (either 1-2 days a week, or 3 or more days per week)
- Almost half of the agencies had not fully integrated telework into their Continuity of Operations (COOP) planning
- Office coverage and management resistance were considered the largest barriers to implementation

Data are reported for each of the agencies, and the large Cabinet-level agencies also report data at the sub-agency level. A closer look at the agency and sub-agency data allows us to break down the overall numbers to identify organizations that have experienced relatively large increases or decreases, either in actual participation or possibly in their capabilities to effectively track participation.

OPM continues to use these results and other information to support agency staff with their telework programs by convening regular meetings of telework coordinators, meeting one-on-one to provide consultation and support, maintaining the comprehensive www.telework.gov website, and connecting agency staff so they can learn from each other's challenges and successes.

The Big Picture: Telework in 2008

- 78 agencies reported a total of 102,900 out of 1,962,975 employees teleworking
 - 5.24% of the total population reported as teleworkers
 - 8.67% of the eligible population reported as teleworkers
- 48 agencies (61%) reported an increase in their overall telework numbers
- 78% of agencies provide formal notice of eligibility to their employees
- 35% track the number of telework requests that are denied; 33 cases were due to performance or conduct issues, 160 were due to type of work
- 38% track the number of agreements that are terminated; 108 of these terminations were based on the employee's decision, 31 were based on the supervisor's decision due to a performance/conduct issue, and 78 were based on a supervisor's decision due to a change in work assignments
- 23% of agencies use electronic tracking to count teleworkers, 83% use telework agreements, 53% use time and attendance (NOTE: agencies may select more than one category due to difference in tracking mechanisms at the sub-agency level, so the total exceeds 100%)
- 44 agencies have fully integrated telework into COOP (56.41%)
- 27 agencies reported cost savings/benefits as a result of telework; of these, the greatest benefit was to morale (24 agencies), then productivity/performance and transportation (22 each), then human capital (21) (note: agencies could select all that apply).
- In terms of major barriers to telework, office coverage was highest (48 agencies), followed by management resistance (38), organizational culture (36), and IT security and IT funding (both at 25) (note: agencies could select all that apply).
- To overcome these barriers, 42 agencies are offering training for managers, 35 are offering training for employees, 29 have increased marketing, and 21 have established or increased budget for IT expenditures (note: agencies could select all that apply).

Comparisons to 2007

- Overall number of teleworkers increased from 94,643 in 2007 to 102,900 in 2008 (8,257 more teleworkers, an increase of 8.72%)

- Number of eligible employees decreased from 1,242,104 to 1,187,244
- Percent of eligibles teleworking increased from 7.62% to 8.67%
- Percent of total employees teleworking increased from 5.12% to 5.24%
- Frequency of telework rose:
 - Number of employees teleworking 3 or more days/week increased, from 12,286 to 13,365
 - Number of employees teleworking 1-2 days/week increased, from 45,231 to 52,339
 - Number of employees teleworking at least once a month stayed basically the same (37,196 in 2008, 37,126 in 2007)

Specific Agency Information

- The Central Intelligence Agency, Office of Science and Technology Policy (Executive Office of the President), Peace Corps, and United States Holocaust Museum did not report
- Some agencies with substantial increases in total number of teleworkers:
 - Department of Health and Human Services (11,272 to 12,785)
 - Department of Interior (6,624 to 10,759)
 - Department of Transportation (4,511 to 6,705)
 - Department of Veterans Affairs (1,788 to 4,161)
 - General Services Administration (1,727 to 4,754)
 - National Labor Relations Board (224 to 368)
 - Nuclear Regulatory Commission (268 to 442)
 - Patent and Trademark Office (3,612 to 4,395)
- Some agencies with substantial decreases in total number of teleworkers:
 - Department of Commerce (3,966 to 2,979)
 - Department of Defense (17,921 to 16,871)
 - Department of Justice (2,848 to 1,753)
 - Department of State (2,447 to 1,004)
 - Department of Treasury (6,861 to 5,444)
 - Social Security Administration (4,011 to 3,440)
 - U.S. International Trade Commission (149 to 64)
- Some sub-agencies with substantial increases in total number of teleworkers:
 - Department of Commerce, Bureau of the Census (12 to 276)
 - Department of Health and Human Services, Centers for Medicare and Medicaid Services (1,524 to 2,742)
 - Department of Interior, U.S. Geological Survey (4,750 to 8,857)
 - Department of Transportation, Federal Highway Administration (773 to 1,869)

- Some sub-agencies with substantial decreases in total number of teleworkers:
 - Department of Agriculture, Food Safety and Inspection Service (891 to 364)
 - Department of Commerce, National Oceanic and Atmospheric Administration (2,816 to 1,473)
 - Department of Education, Office for Civil Rights (128 to 4)
 - Department of Health and Human Services, Food and Drug Administration (3,813 to 2,670)
 - Department of Justice, Executive Office for US Attorneys (1,362 to 35)
 - Department of Treasury, Office of Comptroller of the Currency (1,660 to 270)

Table 1: Overview of Agency Telework Participation

	2008	2007		2008	2007		2008	2007		2008	2007
Agency Name	# of Workers	# of Workers		# of Eligible Employees	# of Eligible Employees		% Eligible Working	% Eligible Working		Total Population	Total Population
Agency for International Development	258	226		1,470	1,265		17.55	17.87		1,692	1,513
Board of Governors of the Federal Reserve System	271	194		1,730	1,600		15.66	12.13		2,000	1,900
Central Intelligence Agency	N/R	24		N/R	Not Available		N/R	0.00		N/R	Not Available
Chemical Safety and Hazard Investigation Board	32	10		35	35		91.43	28.57		37	36
Committee for Purchase from People Who Are Blind or Severely Disabled	13	10		29	26		44.83	38.46		29	29
Commodity Futures Trading Commission	5	9		487	443		1.03	2.03		499	455
Consumer Product Safety Commission	203	184		364	317		55.77	58.04		428	387
Corporation for National and Community Service	138	110		537	573		25.70	19.20		552	586
Court Services and Offender Supervision Agency	331	279		723	827		45.78	33.74		1,122	1,165
Defense Nuclear Facilities Safety Board	4	1		2	1		200.00	100		99	87
Department of Agriculture	5,599	5,779		87,432	75,596		6.40	7.64		103,745	100,685
Department of Commerce	2,979	3,966		35,130	26,187		8.48	15.14		35,130	27,568

* Population numbers are submitted by the agencies in the Call for Telework Data

	2008	2007		2008	2007		2008	2007		2008	2007
Agency Name	# of Tworkers	# of Tworkers		# of Eligible Employees	# of Eligible Employees		% Eligible Working	% Eligible Working		Total Population	Total Population
Department of Defense	16,871	17,921		564,562	557,141		2.99	3.22		740,687	673,319
Department of Education	399	589		3,825	3,896		10.43	15.12		3,922	3,902
Department of Energy	758	579		13,231	12,356		5.73	4.69		14,226	13,824
Department of Health and Human Services	12,785	11,272		59,158	64,114		21.61	17.58		65,436	73,998
Department of Homeland Security	1,380	1,310		54,875	28,865		2.51	4.54		177,961	159,319
Department of Housing and Urban Development	1,928	2,089		8,100	8,818		23.80	23.69		8,701	9,334
Department of Interior	10,759	6,624		45,319	45,620		23.74	14.52		64,078	71,657
Department of Justice	1,753	2,848		37,023	46,428		4.73	6.13		108,232	105,896
Department of Labor	1,570	1,419		15,136	15,269		10.37	9.29		15,345	15,432
Department of State	1,004	2,447		14,207	12,438		7.07	19.67		14,221	12,438
Department of Transportation	6,705	4,511		22,528	20,229		29.76	22.30		54,727	53,336
Department of Treasury	5,444	6,861		96,652	95,960		5.63	7.15		97,837	97,252
Department of Veterans Affairs	4,161	1,788		20,455	118,811		20.34	1.50		285,568	258,777
Environmental Protection Agency	5,249	4,669		16,337	15,942		32.13	29.29		16,659	16,320
Equal Employment Opportunity Commission	721	702		1,837	1,848		39.25	37.99		2,202	2,200
Office of Science and Technology Policy (Executive Office of the President)	N/R	18		N/R	59		N/R	30.51		N/R	59
Export-Import Bank of the United States	30	27		290	257		10.34	10.51		365	359
Farm Credit Administration	68	97		264	252		25.76	38.49		264	252

	2008	2007		2008	2007		2008	2007		2008	2007
Agency Name	# of Workers	# of Workers		# of Eligible Employees	# of Eligible Employees		% Eligible Working	% Eligible Working		Total Population	Total Population
Farm Credit System Insurance Corporation	2	0		7	6		28.57	0.00		10	9
Federal Communications Commission	595	396		1,856	1,782		32.06	22.22		1,856	1,783
Federal Deposit Insurance Corporation	1,422	1,644		5,194	4,533		27.38	36.27		5,194	4,533
Federal Election Commission	60	32		363	350		16.53	9.14		363	350
Federal Energy Regulatory Commission	340	208		1,417	1,255		23.99	16.57		1,427	1,275
Federal Housing Finance Board	12	25		139	136		8.63	18.38		139	136
Federal Labor Relations Authority	11	N/R		117	N/R		9.40	N/R		117	N/R
Federal Maritime Commission	2	6		115	120		1.74	5.00		115	120
Federal Mediation and Conciliation Service	15	7		231	238		6.49	2.94		248	255
Federal Trade Commission	32	14		1,118	1,106		2.86	1.27		1,123	1,108
General Services Administration	4,754	1,727		10,374	10,355		45.83	16.68		12,090	12,071
Institute of Museum and Library Services	2	3		70	0		2.86	0.00		70	68
Inter-American Foundation	23	25		47	47		48.94	53.19		47	47
International Boundary and Water Commission	0	0		264	225		0.00	0.00		264	250
International Broadcasting Bureau	194	150		1,043	1,774		18.60	8.46		1,743	1,774

	2008	2007		2008	2007		2008	2007		2008	2007
Agency Name	# of Workers	# of Workers		# of Eligible Employees	# of Eligible Employees		% Eligible Working	% Eligible Working		Total Population	Total Population
Japan-U.S. Friendship Commission	6	3		3	4		200.00	75.00		4	4
Marine Mammal Commission	2	2		12	11		16.67	18.18		12	11
Merit Systems Protection Board	71	61		218	226		32.57	26.99		218	226
National Aeronautics and Space Administration	826	825		18,224	18,017		4.53	4.58		18,393	18,329
National Archives and Records Administration	205	128		2,780	1,086		7.37	11.79		3,254	2,976
National Capital Planning Commission	6	4		38	38		15.79	10.53		42	42
National Council on Disability	5	5		5	8		100.00	62.50		10	11
National Credit Union Administration	42	38		433	428		9.70	8.88		942	947
National Endowment for the Arts	61	63		168	162		36.31	38.89		168	162
National Endowment for the Humanities	40	34		160	168		25.00	20.24		160	168
National Labor Relations Board	368	224		1,640	1,703		22.44	13.15		1,640	1,703
National Mediation Board	18	17		49	49		36.73	34.69		49	49
National Science Foundation	589	663		1,438	1,396		40.96	47.49		1,448	1,406
National Transportation Safety Board	141	101		398	398		35.43	25.38		400	398
Nuclear Regulatory Commission	442	268		3,594	3,149		12.30	8.51		3,946	3,569
Nuclear Waste Technical Review Board	9	10		11	13		81.82	76.92		11	13

	2008	2007		2008	2007		2008	2007		2008	2007
Agency Name	# of Workers	# of Workers		# of Eligible Employees	# of Eligible Employees		% Eligible Working	% Eligible Working		Total Population	Total Population
Occupational Safety and Health Review Commission	5	6		55	62		9.09	9.68		55	62
Office of Federal Housing Enterprise Oversight	17	35		246	245		6.91	14.29		247	247
Office of Government Ethics	17	17		22	36		77.27	47.22		75	78
Office of National Drug Control Policy	1	1		108	107		0.93	0.93		108	107
Office of Personnel Management	807	774		2,357	3,256		34.24	23.77		4,818	4,855
Office of Special Counsel	32	30		102	100		31.37	30.00		108	106
Overseas Private Investment Corporation	105	104		200	175		52.50	59.43		200	196
Patent and Trademark Office	4,395	3,612		5,314	4,540		82.70	79.56		9,642	9,010
Peace Corps	N/R	74		N/R	644		N/R	11.49		N/R	869
Pension Benefit Guaranty Corporation	133	514		892	888		14.91	57.88		892	888
Railroad Retirement Board	117	130		351	505		33.33	25.74		962	996
Securities and Exchange Commission	1,596	1,509		3,671	3,518		43.48	42.89		3,671	3,518
Selective Service System	41	39		120	127		34.17	30.71		120	127
Small Business Administration	343	334		2,491	5,571		13.77	6.00		2,491	5,571
Smithsonian Institute	37	34		3,000	2,993		1.23	1.14		4,000	3,993
Social Security Administration	3,440	4,011		14,557	14,884		23.63	26.95		63,823	61,965
Trade and Development Agency	2	1		45	38		4.44	2.63		46	40

	2008	2007		2008	2007		2008	2007		2008	2007
Agency Name	# of Workers	# of Workers		# of Eligible Employees	# of Eligible Employees		% Eligible Working	% Eligible Working		Total Population	Total Population
U.S. Access Board	28	20		27	26		103.70	76.92		28	28
U.S. Commission on Civil Rights	7	3		43	45		16.28	6.67		43	45
U.S. International Trade Commission	64	149		379	391		16.89	38.11		379	391
United States Holocaust Memorial Museum	N/R	N/R		N/R	N/R		N/R	N/R		N/R	N/R
TOTAL	102,900	94,643		1,187,244	1,242,104		8.67%	7.62%		1,962,975	1,848,970

Table 2: Telework Frequency

Telework frequency categories shown below are mutually exclusive.

Agency Name	2008 3 days /week	2007 3 days /week	2008 1-2 days /week	2007 1-2 days /week	2008 ≥ 1/month	2007 ≥ 1/month
Agency for International Development	0	0	94	93	164	133
Board of Governors of the Federal Reserve System	43	33	29	60	199	101
Central Intelligence Agency	N/R	8	N/R	8	N/R	8
Chemical Safety and Hazard Investigation Board	0	0	12	0	20	10
Committee for Purchase from the Blind and Severely Disabled	0	0	11	7	1	3
Commodity Futures Trading Commission	5	9	0	0	0	0
Consumer Product Safety Commission	129	97	70	87	4	0
Corporation for National and Community Service	5	3	51	39	82	68
Court Services and Offender Supervision Agency	23	23	257	210	51	46
Defense Nuclear Facilities Safety Board	2	0	2	1	0	0
Department of Agriculture	529	395	2,143	2,163	2,927	3,221
Department of Commerce	90	50	1,566	2,163	1,323	1,753
Department of Defense	2,018	2,071	7,845	7,687	7,008	8,163
Department of Education	48	90	319	267	32	232
Department of Energy	43	25	352	256	363	298
Department of Health and Human Services	585	701	7,409	6,412	4,791	4,159
Department of Homeland Security	252	443	613	445	515	422

Agency Name	2008 3 days /week	2007 3 days /week	2008 1-2 days /week	2007 1-2 days /week	2008 ≥ 1/month	2007 ≥ 1/month
Department of Housing and Urban Development	225	368	1,559	1,360	144	361
Department of Interior	1,688	1,168	5,388	3,294	3,683	2,162
Department of Justice	495	492	789	1,492	469	864
Department of Labor	152	117	534	416	884	886
Department of State	44	0	432	762	528	1,685
Department of Transportation	892	562	1,913	1,749	3,900	2,200
Department of Treasury	1,439	1,665	2,453	2,443	1,552	2,753
Department of Veterans Affairs	1,355	824	1,321	463	1,485	501
Environmental Protection Agency	16	60	3,209	2,721	2,024	1,888
Equal Employment Opportunity Commission	70	20	449	530	202	152
Office of Science and Technology Policy (Executive Office of the President)	N/R	0	N/R	0	N/R	18
Export-Import Bank	1	0	4	2	25	25
Farm Credit Administration	9	8	39	33	20	56
Farm Credit System Insurance Corporation	1	0	0	0	1	0
Federal Communications Commission	18	11	577	385	0	0
Federal Deposit Insurance Corporation	68	99	319	410	1,035	1,135
Federal Election Commission	0	0	33	20	27	12
Federal Energy Regulatory Commission	0	0	238	178	102	30
Federal Housing Finance Board	4	25	7	0	1	0
Federal Labor Relations Authority	1	Not reported	7	Not reported	3	Not reported
Federal Maritime Commission	0	0	0	1	2	5
Federal Mediation and Conciliation Service	10	2	5	5	0	0

Agency Name	2008 3 days /week	2007 3 days /week	2008 1-2 days /week	2007 1-2 days /week	2008 ≥ 1/month	2007 ≥ 1/month
Federal Trade Commission	4	6	28	8	0	0
General Services Administration	244	255	4124	889	386	583
Institute of Museum and Library Services	0	1	0	1	2	1
Inter-American Foundation		0		0		25
International Boundary and Water Commission	0	0	0	0	0	0
International Broadcasting Bureau	0	75	174	75	20	0
Japan US Friendship Commission	3	0	3	3	0	0
Marine Mammal Commission	0	0	1	1	1	1
Merit Systems Protection Board	17	9	45	52	9	0
National Aeronautics and Space Administration	130	121	283	402	413	302
National Archives and Records Administration	8	2	159	102	38	24
National Capital Planning Commission	0	0	4	2	2	2
National Council on Disability	0	0	0	0	5	5
National Credit Union Administration	20	20	21	17	1	1
National Endowment for the Arts	0	0	11	7	50	56
National Endowment for the Humanities	1	1	27	20	12	13
National Labor Relations Board	39	31	142	77	187	116
National Mediation Board	0	0	18	17	0	0
National Science Foundation	7	13	182	220	400	430
National Transportation Safety Board	63	36	72	64	6	1
Nuclear Regulatory Commission	42	26	385	234	15	8

Agency Name	2008 3 days /week	2007 3 days /week	2008 1-2 days /week	2007 1-2 days /week	2008 ≥ 1/month	2007 ≥ 1/month
Nuclear Waste Technical Review Board	0	0	6	9	3	1
Occupational Safety and Health Review Commission	0	0	0	4	5	2
Office of Federal Housing Enterprise Oversight	0	0	6	3	11	32
Office of Government Ethics	1	15	15	1	1	1
Office of National Drug Control Policy	1	1	0	0	0	0
Office of Personnel Management	177	328	439	239	191	207
Office of Special Counsel	3	10	29	20	0	0
Overseas Private Investment Corporation	0	0	29	39	76	65
Patent and Trademark Office	1,944	1,395	2,451	2,194	0	23
Peace Corps	N/R	0	N/R	9	N/R	65
Pension Benefit Guaranty Corporation	4	257	71	257	58	0
Railroad Retirement Board	0	0	106	111	11	19
Securities and Exchange Commission	105	14	470	523	1,021	972
Selective Service System	0	1	39	37	2	1
Small Business Administration	28	50	36	97	279	187
Smithsonian Institute	9	0	10	34	18	0
Social Security Administration	250	243	2,865	3,228	325	540
Trade and Development Agency	0	0	1	1	1	0
U.S. Access Board	1	1	25	15	2	4
United States Commission on Civil Rights	0	0	0	0	7	3
United States Holocaust Memorial Museum	N/R	Not reported	N/R	Not reported	N/R	Not reported
United States International Trade Commission	3	6	13	57	48	86
TOTAL	13,365	12,286	52,339	45,231	37,196	37,126

Table 4: Integration of Telework into COOP Plans

Agency Name	Yes 2008	Yes 2007	Under Consideration 2008	Under Consideration 2007	No 2008	No 2007
Agency for International Development	X	X				
Board of Governors of the Federal Reserve System			X	X		
Central Intelligence Agency	NR	X				
Chemical Safety and Hazard Investigation Board	X	X				
Committee for Purchase from the Blind and Severely Disabled	X	X				
Commodity Futures Trading Commission	X	X				
Consumer Product Safety Commission			X	X		
Corporation for National Service			X	X		
Court Services and Offender Supervision Agency			X	X		
Defense Nuclear Facilities Safety Board	X	X				
Department of Agriculture	X			X		
Department of Commerce	X	X				
Department of Defense			X	X		
Department of Education			X	X		
Department of Energy	X	X				
Department of Health and Human Services	X	X				
Department of Homeland Security			X	X		
Department of Housing and Urban Development		X	X			
Department of Interior			X	X		
Department of Justice	X	X				
Department of Labor	X	X				
Department of State		X	X			

Agency Name	Yes 2008	Yes 2007	Under Consideration 2008	Under Consideration 2007	No 2008	No 2007
Department of Transportation	X	X				
Department of Treasury	X	X				
Department of Veterans Affairs	X	X				
Environmental Protection Agency	X	X				
Equal Employment Opportunity Commission			X	X		
Office of Science and Technology Policy (Executive Office of the President)	NR	X				
Export-Import Bank	X	X				
Farm Credit Administration	X	X				
Farm Credit System Insurance Corporation	X	X				
Federal Communications Commission			X	X		
Federal Deposit Insurance Corporation	X	X				
Federal Election Commission			X	X		
Federal Energy Regulatory Commission			X	X		
Federal Housing Finance Board	X	X				
Federal Labor Relations Authority		NR	X			
Federal Maritime Commission	X	X				
Federal Mediation and Conciliation Service			X	X		
Federal Trade Commission			X	X		
General Services Administration	X	X				
Institute of Museum and Library Services	X	X				
Inter-American Foundation	X	X				
International Boundary and Water Commission	X			X		

Agency Name	Yes 2008	Yes 2007	Under Consideration 2008	Under Consideration 2007	No 2008	No 2007
International Broadcasting Bureau			X	X		
Japan US Friendship Commission	X	X				
Marine Mammal Commission			X	X		
Merit Systems Protection Board			X	X		
National Aeronautics and Space Administration	X	X				
National Archives and Records Administration				X	X	
National Capital Planning Commission			X	X		
National Council on Disability	X	X				
National Credit Union Administration	X	X				
National Endowment for the Arts	X			X		
National Endowment for the Humanities					X	X
National Labor Relations Board			X	X		
National Mediation Board	X	X				
National Science Foundation	X	X				
National Transportation Safety Board			X	X		
Nuclear Regulatory Commission			X	X		
Nuclear Waste Technical Review Board	X	X				
Occupational Safety and Health Review Commission		X	X			
Office of Federal Housing Enterprise Oversight	X	X				
Office of Government Ethics	X	X				
Office of National Drug Control Policy			X	X		

Agency Name	Yes 2008	Yes 2007	Under Consideration 2008	Under Consideration 2007	No 2008	No 2007
Office of Personnel Management	X	X				
Office of Special Counsel	X	X				
Overseas Private Investment Corporation	X	X				
Patent and Trademark Office	X	X				
Peace Corps	NR	X				
Pension Benefit Guaranty Corporation	X	X				
Railroad Retirement Board			X	X		
Securities and Exchange Commission	X	X				
Selective Service System	X	X				
Small Business Administration			X	X		
Smithsonian Institute			X	X		
Social Security Administration				X	X	
Trade and Development Agency	X	X				
U.S. Access Board		X	X			
United States Commission on Civil Rights	X	X				
United States Holocaust Memorial Museum	NR	NR				
United States International Trade Commission			X	X		

Table 5: Sub-Agency Telework Participation

Agency Name	Sub-Agency Name	Population	3 or more days per week	1-2 days per week	At least 1 day per month	Total Teleworkers 2008	Total Teleworkers 2007
Department of Agriculture	Departmental Administration	421	15	69	17	101	101
	Farm and Foreign Agriculture Services	17,446	87	424	85	596	642
	Food Safety and Inspection Service	9,467	51	145	168	364	891
	Food, Nutrition and Consumer Services	1,308	15	281	0	296	266
	Marketing and Regulatory Programs	9,359	89	358	528	975	918
	Natural Resources and Environment	45,657	42	325	1,521	1,888	1,891
	Office of Budget and Program Analyses	51	0	0	0	0	0
	Office of Chief Economist	53	0	0	0	0	0
	Office of Chief Information Officer/Chief Financial Officer	2,045	41	146	68	255	86
	Office of Communications	82	1	1	0	2	2
	Office of Congressional Relations	14	0	0	0	0	0
	Office of Executive Secretariat	20	0	10	0	10	10
	Office of General Counsel	332	0	0	200	200	200
	Office of Homeland Security	14	0	0	0	0	0
	Office of Inspector General	591	0	0	241	241	241
	Office of the Assistant Secretary for Civil Rights	145	0	0	0	0	0
	Office of the Secretary	88	0	0	0	0	0
	Research, Education and Economics	10,625	0	369	37	406	392
	Rural Development	6,027	188	15	62	265	139
Department of Agriculture Total		103,745	529	2,143	2,927	5,599	5,779
Department of Commerce	Bureau of Economic Analysis	470	1	20	28	49	38

Agency Name	Sub-Agency Name	Population	3 or more days per week	1-2 days per week	At least 1 day per month	Total Teleworkers 2008	Total Teleworkers 2007
	Bureau of Industry and Security	NR	NR	NR	NR	NR	NR
	Bureau of the Census	16,270	0	84	192	276	12
	Economic Development	NR	NR	NR	NR	NR	6
	Economics and Statistics Administration	NR	NR	NR	NR	NR	NR
	International Trade Commission	1,361	21	103	222	346	315
	Minority Business Development Agency	80	4	3	0	7	9
	Nat Oceanic and Atmospheric Administration	12,834	53	617	803	1,473	2,816
	Nat Telecommunications and Info Admin	265	1	35	8	44	35
	National Institute of Standards and Tech	2,888	5	643	0	648	672
	National Technical Information Service	NR	NR	NR	NR	NR	NR
	Office of the Inspector General	114	1	27	15	43	NR
	Office of the Secretary	848	4	34	55	93	63
Department of Commerce Total		35,130	90	1,566	1,323	2,979	3,966
Department of Defense	Department of Air Force	148,865	100	107	110	317	140
	Department of Army	265,030	178	200	94	472	880
	Department of Navy	233,753	349	1,935	1681	3,965	3,915
	Other Department of Defense	93,039	1,391	5,603	5,123	12,117	12,986
Department of Defense Total		740,687	2,018	7,845	7,008	16,871	17,921
Department of Education	Advisory Councils and Committees	5	0	0	0	0	3
	EDET-Office of English Language Acquisition	24	0	5	3	8	8
	FC of the Deputy Secretary of Education	6	0	0	0	0	2
	Federal Student Aid	998	15	53	0	68	62
	IMM Office of Sec of Education	95	0	6	0	6	9

Agency Name	Sub-Agency Name	Population	3 or more days per week	1-2 days per week	At least 1 day per month	Total Teleworkers 2008	Total Teleworkers 2007
	Institute of Education Sciences	162	3	16	1	20	59
	National Assessment Governing Board	6	0	1	0	1	3
	National Institute for Literacy	NR	NR	NR	NR	NR	1
	Office of Elem and Sec Ed	211	0	5	0	5	4
	Office of Legis and Congressional Affairs	12	0	0	0	0	4
	Office of Planning, Eval and Policy Develop	122	0	2	0	2	19
	Office of Spec Ed and Rehab Serv	269	2	95	0	97	112
	Office for Civil Rights	588	0	4	0	4	128
	Office of Communications and Outreach	96	0	0	0	0	10
	Office of Innovation and Improvement	86	3	9	4	16	13
	Office of Inspector General	274	4	25	0	29	68
	Office of Management	198	5	35	6	46	5
	Office of Postsecondary Education	214	6	12	0	18	23
	Office of Safe and Drug-Free Schools	44	3	9	2	14	9
	Office of the Chief Financial Officer	177	1	9	2	12	8
	Office of the Chief Information Officer	142	0	3	0	3	2
	Office of the General Counsel	103	2	22	7	31	25
	Office of the Under Secretary	3	0	0	0	0	0
	Office of Vocational and Adult Education	87	4	8	7	19	12
Department of Education Total		3922	48	319	32	399	589
Department of Health and Human Services	Administration for Children and Families	1,257	19	249	71	339	348
	Administration on Aging	106	0	13	2	15	14

Agency Name	Sub-Agency Name	Population	3 or more days per week	1-2 days per week	At least 1 day per month	Total Teleworkers 2008	Total Teleworkers 2007
	Agency for Healthcare Research and Quality	294	0	110	42	152	124
	Agency for Toxic Substances and Disease Reg	NR	NR	NR	NR	0	NR
	Centers for Disease Control and Prevention	9,532	146	1,556	20	1,722	1,037
	Centers for Medicare and Medicaid Services	4,387	59	606	2,077	2,742	1,524
	Food and Drug Administration	9,082	110	1,960	600	2,670	3,813
	Health Resources and Services Admin	1,461	6	275	10	291	256
	Indian Health Service	14,498	40	24	9	73	29
	National Institutes of Health	16,967	145	1,639	1,525	3,309	3,174
	Office of Secretary Health and Human Services	7,332	59	932	335	1,326	953
	Program Support Center	NR	NR	NR	NR	NR	NR
	Substance Abuse and Mental Health Services Admin	520	1	45	100	146	NR
Department of Health and Human Services Total		65,436	585	7,409	4,791	12,785	11,272
Department of Homeland Security	Federal Emergency Management Agency	15,897	23	134	48	205	81
	Federal Law Enforcement Training Center	1,120	1	1	0	2	0
	HQ Components	2,952	1	17	32	50	11
	Office of the Inspector General	564	0	17	52	69	111
	Transportation Security Administration	60,340	29	53	39	121	64
	US Citizenship and Immigration Services	9,575	178	108	62	348	482
	US Coast Guard	7,823	10	219	282	511	454
	US Customs and Border Protection	54,280	10	61	0	71	30