THE IMPACT OF TECHNOLOGY UPON THE PROCESSING AND INTEGRATION OF CALIFORNIA TRAFFIC COLLISION RECORDS BY THE YEAR 2001

AN INDEPENDENT STUDY PROJECT BY

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COMMISSION ON PEACE OFFICER STANDARDS AND TRAINING

SACRAMENTO, CALIFORNIA

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This Command College Independent Study Project is a FUTURES study of a particular emerging issue in law enforcement. Its purpose is NOT to predict the future, but rather to project a number of possible scenarios for strategic planning consideration.

Defining the future differs from analyzing the past because the future has not yet happened. In this project, useful alternatives have been formulated systematically so that the planner can respond to a range of possible future environments.

Managing the future means influencing the future--creating it, constraining it, adapting to it. A futures study points the way.

The views and conclusions expressed in this Command College project are those of the author and are not necessarily those of the Commission on Peace Officer Standards and Training (POST).

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Executive Summary

PART ONE: A FUTURES STUDY

California is a unique state. Because of its size, diversity, location, and complexity, it is almost a nation unto itself. The state has well over 30 million persons who reside in 58 counties and over 420 incorporated cities. These individuals represent a wide range of backgrounds, education, employment, and economic status. Often it is said that California sets trends for change in the nation.

Although Californians are very diverse, most of them share in one common denominator. They are at one time or another in a moving vehicle somewhere on a street or highway. This movement of vehicles and people has created a significant public safety challenge. In 1990 Californians were involved in 4,660 fatal accidents and 236,540 injury accidents. This resulted in 5,173 persons killed and 365,758 persons injured, and billions of dollars lost in economic resources. Clearly then, the issue of traffic safety is of paramount importance to both the private and public sector. The foundation of a traffic safety program is an effective statewide traffic records system. This system must contain local and statewide data, but in a manner and form interchangeable and compatible with the state system as well

as other users.

What will the impact of technology be upon the processing and integration of traffic collision records by the year 2001? Using the Nominal Group Technique (NGT) five trends were identified and forecasted: highway level of service, the availability of technology for traffic systems, traffic system funding, level of accident reporting, and local control of traffic accident data. High probability events forecasted were the requirement to report all traffic accidents, a budget cut for the existing statewide traffic records system, state property tax initiative (Prop 13) overturned; and a point of origin data entry system is developed for law enforcement that would automate the input of traffic accident data. A survey of statewide police agencies indicates that most accidents are being reported to the state traffic records. However, there are many local automated systems in use that duplicate the state system.

Policies. After reviewing the survey data and the information from the cross-impact analysis, policies were developed in regards to the issue. They are: technology should be applied to the processing and integration of statewide traffic collision records; specifically, it should be applied to the data entry process to reduce the need for hand entry of traffic collision data. The California Highway Patrol (CHP) should be the lead agency in this regard. A statewide task force should be created to explore and to provide guidance for the implementation of such technology.

Part Two: Strategic Management Plan

The current statewide system was assessed as was the organization that manages the system, the CHP. The technology in current use is ineffective, and expensive to maintain. The organization has the internal capacity to develop and manage a new technologically based statewide records system. A strategic assumption surfacing technique was used to clarify assumptions about the external forces impacting the issue. A mission statement was developed and a performance standard and criteria were established. The selected strategy is to design and develop a new statewide system that can meet or exceed the performance standard. An implementation plan was developed.

Part Three: Transition Management Plan

The transition management plan consists of commitment planning, management structure, and the definition of responsibilities. A critical-mass analysis identified nine key groups, which were analyzed, and assumptions were made concerning their commitment to the selected strategy of creating a new technologically based statewide traffic records system. A management structure was developed for the implementation of the new system. Also, implementation responsibilities were assigned.

Conclusions and Recommendations

There is a future need for emerging computer technology to manage effectively a statewide traffic records system that will serve both the state and local governments. This technology will provide state and local law enforcement with separate, interchangeable, stand-alone databases, and an automated point of origin data entry system. This will provide flexibility and reliability, and will create and maintain separate traffic collision data files that are interchangeable and compatible with the state and local systems. Moreover, the data input system will conform to the statewide format for data definition and error control. This will be accomplished on a standard database software system provided by the state for local processing of traffic collision data. The point of origin data entry system will automatically input or collect much of the collision data presently collected manually in the field by investigating officers, for example driver and vehicle registration data.

The California Highway Patrol should undertake the appropriate actions necessary to implement a new technologically based traffic collision records system that integrates both local and statewide traffic collision data, and makes use of an automated point of origin data entry system.

INTRODUCTION

OVERVIEW

California is a unique state. Because of its size, diversity, location, and complexity, it is almost a nation unto itself. The state has well over 30 million persons who reside in 58 counties and over 420 incorporated cities. These individuals represent a wide range of backgrounds, education, employment, and economic status. Often it is said that California sets the trend for change in the nation.[1]

Although the people of California are very diverse, they all share in one common denominator. They are at one time or another in a moving vehicle somewhere on a street or highway. For example, in 1990, there were over 19 million licensed drivers and 22 million registered vehicles in the state.[2] These drivers accumulated over 210 billion motor vehicle miles of travel on the state's 175,000 miles of streets and highways.[3]

This movement of vehicles and people has created a significant public safety challenge. In 1990 Californians were involved in 4,660 fatal accidents and 236,540 injury accidents. This resulted in 5,173 persons killed and 365,758 persons injured, and billions of dollars lost in economic resources.[4] Clearly then, the issue of traffic safety is of paramount importance to both the private and public sector.

The need for effective, timely, and ongoing traffic accident countermeasures is all to clear. The underpinning of these countermeasures is an effective and timely records system. This need was very aptly described in a report to the U.S. Congress in 1966:[5]

> "The most definite, objective, and specialized accident investigation of which we are capable will be useless unless its results can be fed into a record system, correlated with other relevant data, and made to serve some purpose other than mere accumulation.
>
> Uniform complete, and accurate accident reports, stored in one center in every state, subject to rapid retrieval and analysis, and compatible with a national record system at the Federal level, can tell not only how many accidents we have, about what kind of accidents they are, where and when they occur, the physical circumstances and the people, injuries, death and damage involved, what emergency services and enforcement agencies responded and how, and what judicial actions resulted, to mention only the most obvious possibilities.
>
> No other part of the State program is as basic to ultimate success nor as demanding of complete cooperation at every jurisdictional level."

In further recognition of this need, the Federal Highway Safety Act of 1966 specified that each state should establish a centralized system for the collection, processing, and dissemination of traffic accident data. Subsequently in the early 1970's, such a system was established in California.[6] It is known as the Statewide Integrated Traffic Records System (SWITRS). It is administered by the California Highway Patrol (CHP) for the benefit of the users of traffic safety

information.

Computer technology can provide the means by which traffic collision records and data are collected and used efficiently in a statewide system. Presently, however, this is not the case because the current system (SWITRS) does not make effective use of available technology to provide timely, accessible, and cost-effective information or data. The system is labor-intensive, paper-based, and expensive to maintain, particularly in the collection and entry of data.

The output reports of the current system are four to six months old and therefore not timely for most law enforcement needs. The data is incomplete and does not offer a timely reflection of the traffic accident experience in the local jurisdictions. It is not easily accessible in the form or manner needed by local users. The system also duplicates many local efforts in the collection and processing of traffic accident records. The system is not fully interactive with the Department of Motor Vehicles (DMV) driver license files or the Department of Transportation (CalTrans) state highway files. If these systems were directly linked, there would be less need for control and data entry operations. The availability and transfer of data between all three systems would also be enhanced if they were linked together in a common system.

The current statewide traffic records system is threatened by the trend towards the increase of local automated systems. Many of these systems are non-standard and proprietary. The data from these systems may or may not be compatible or interchangeable with a statewide records system. Some of these systems are being underwritten and funded by the California Office of Traffic Safety (OTS).[7] The increased use of local systems will erode the need for a statewide system.

The strengths of the current system include a statutory or legal need, the submission of data, and processing accuracy. There is legal basis for the need and existence of a statewide traffic collision records system. Such law exists in the statutes of the California Vehicle Code. For example: section 2008 VC requires local police agencies to forward accident reports to the CHP.[8] A survey of system users suggests that most police agencies are submitting traffic collision reports to the state system. Once in the system, the data is very accurately processed from input to output. This is evident from observation of the control and verification processes within the system.

When one considers the problems of the current system and the availability of emerging computer technology, the issue arises of how future technology will impact the

processing and integration of statewide traffic collision records by the year 2001: How technology can be used to process and integrate local and statewide records, and how technology can expedite the collection and input of accident data at the point of origin in the field.

This study will present both a strategic and a transition management plan with recommended policies on how to implement this technology throughout the state. The organizational setting for the management of statewide traffic records will be the California Highway Patrol (CHP).

THE STUDY PROCESS

This paper will present a future-oriented study dealing with the future implementation of technology in the management and integration of traffic accident records. Part One of the study will attempt to create a vision of the future in relation to the issue. Part Two will first present a strategic plan based on a normative scenario of the future; then policies necessary for the realization of the strategic plan will be developed and discussed in view of the normative scenario. Part Three will include a transition plan required for implementation of the strategic plan. This will provide guidance for the realization of the desired future state.

PART ONE: FUTURES STUDY

Charting the future is a risky business at best. One can speculate endlessly about the infinite possibilities of the future. If, however, one attempts to chart or plot a course towards some future destination or desirable outcome, then it becomes possible, in part, to create and manage some of the future. To accomplish this one can use various forecasting techniques to provide a range of estimates concerning possible or likely futures. This presupposes, however, that one has some desired future outcome in mind. Otherwise, it really doesn't matter what the outcome will be.

This was demonstrated very well by the Cheshire cat in Lewis Caroll's Alice in Wonderland. Alice asked the cat which road to take; to which the cat replied, "That depends on where you want to go." "I don't know," said Alice. "Then it really doesn't matter which road you take," said the cat.

The road intended for this study will arrive at the answer to the question, how emerging computer technology will impact the processing and integration of traffic accident records by the year 2001? Specifically, how law enforcement will use the emerging computer technology to minimize or eliminate the need for manual collection and key entry of traffic collision data; also, how technology will be used to

integrate together both local and statewide traffic collision data?

FORECASTING METHODOLOGY AND FINDINGS

A description of the research methodology will be followed by a summary of the findings resulting from this research. The results of the Nominal Group Technique (NGT) will be described later.

Research information for this study was collected by: a scanning process known as STEEP, a literature review, interviews and conferences, the use of a survey, and the Nominal Group Technique (NGT).

A scanning process known as STEEP was used to collect data. It is based on the taxonomy of STEEP to catalog pertinent information into the following categories: social, technological, economic, environmental, and political. This process was used over a period of several months.

A literature review was helpful in providing information on the direction and nature of technological advances and improvements. Magazines and periodicals provided the most current and useful information. Personal interviews were a very important and helpful part of the future scanning process. Those interviewed included technical vendors, police personnel, traffic engineers, consultants, data processing

professionals, business leaders, and technological experts at the Stanford Research Institute and NASA Ames Research Center.

Technological conferences and seminars were attended at the Department of Justice (DOJ), Sacramento, the Governmental Technology Conference '91, Sacramento, the Pacific Telephone Communications Technology Demonstration, San Francisco, and the California Peace Officers Association (CPOA) Training Conferences in Newport Beach and Beverly Hills. On-site inspections were conducted at the DOJ, Teale, Department of Motor Vehicles (DMV), and the California Highway Patrol (CHP) Data Centers in Sacramento, California.

A survey instrument (Appendix A) was used to study law enforcement agencies in California that have traffic law enforcement responsibilities. The primary purpose of this survey was to determine if and how the state's law enforcement agencies collected and used traffic collision data, as well as what was the level or threshold of data being collected.

The Nominal Group Technique (NGT) was used to develop and forecast trends and events. This is a structured group forecasting process that facilitates the generation and development of future trends and events. A trend is an objective or subjective observation, over time, of any

social, technological, economic, environmental, or political unit of measurement. An event is a distinct one-time occurrence that affects the issue in question.

RESEARCH FINDINGS

The research methodology produced the following findings that relate to, or impact upon, the issue of technology for traffic collision records.

The population of the state will continue to expand and change in size, in composition, and in the territorial distribution of its demographic and economic base. Although the rate of true expansion is expected to be at a slower rate than now, it still will continue at levels higher than the national average.

The economy of California will continue to grow and expand. This will encourage immigration and increase the demand for vehicle transportation facilities. The state's economy will continue to shift from manufacturing to service and information-based businesses. The state is in an advantageous position to take advantage of the world markets, particularly in the Pacific Rim countries. It is also poised to provide the emerging Eastern European countries with technological, engineering, and service support trade. There will be an increasing concern for the preservation and

protection of the environment. This will result in stricter environmental controls and regulations. The issue of air and water quality will probably be in the forefront of attention. As the volume of toxic and hazardous material being transported on the highways rises, so will public concern and demand for tighter regulation and control of these substances.

The increasing availability of information will change the pattern of public decision making. People will exercise more control and choices in their lives and the use of public money or tax dollars. A much deeper and broader base of political support will be needed for transportation policy making and funding. This will require greater partnership and participation in the decision-making process between the public and private sectors. There is likely to be a shift from local to regional authorities the better to manage and control public policy concerning transportation, health, and environmental issues.

The transportation system will still rely heavily upon the gasoline-powered vehicle. There will be no magic technological solution to traffic congestion in the foreseeable future. In 1990, there were 22 million registered vehicles in the state and 19 million licensed drivers.[2] By 2001 these numbers will grow to an estimated 28 million

vehicles and nearly 25 million drivers.[9] This will result in heavier traffic volumes, greater traffic congestion, and more traffic collisions.

Computer or electronic digital data technology will continue to advance at a rapid rate. Computer processing speeds, data communications, and data storage rates will increase dramatically in relation to decreasing costs. By the year 2000, the number of computer instructions per second is expected to quadruple in contrast to a declining rate of cost.[10] Fiber optics and more efficient data communication networks will transport larger volumes of data between users.[11]

The capacity to store mass data on-line has not kept pace with the advances made in processor speeds and memory capacities. Mass storage technologies employing magnetic, optical, holographic, and other means are being developed. However, during the next decade, the magnetic disk technology will probably be the most cost-effective data storage medium available to state and local government.[12]

Significant improvements and innovations in the availability and use of computer software will occur. Some of these software systems will help generate and create ideas, images, and thoughts. There will be a variety of systems available to assist with problem solving, modeling, and

decision making. Regulation and control systems will abound that will be used to process and handle a multiplicity of tasks and functions now performed manually.[13]

The data entry technology will consist of a key board, a pen-based, or a touch-screen system, or a combination of these systems. The pen-based systems will be supported by character recognition software that will allow the user to hand-print or write data directly into a computer. Touch-screening will allow users to mark, list, and select choices by merely touching the computer CRT screen at the appropriate spot. Voice recognition has been much touted as the ultimate solution to the data entry problem; however, it still has a long way to go before it can be effectively used for the input of complicated information such as accident data.[14]

While some of these data entry systems may find a niche among specialized users, it is most likely that the commonplace computer keyboard will remain the most effective and efficient means for inputing accident data by law enforcement officers.

Additionally, electronic optical-imaging systems will be widely used by the public sector to file and store documents. Optical-imaging technology encodes information from paper by a photo scanning process that converts a document image into an electronic digital data facsimile. Once captured

electronically, a file can be stored on optical disk and retrieved by an unlimited number of users concurrently. For example, it can be accessed on demand electronically via a computer CRT screen or by printing paper copies. Eventually, this process will replace the need to store or file paper documents.[15]

Overall, the orchestration of new and emerging electronic computer and communications technology will globalize and empower people and economies worldwide. Differences in geographical distances, languages, and cultures will be bridged by the electronic transfer of data and information. This technology will provide individuals with fingertip access to the resources of the world. It will empower people individually to learn, expand, and connect with new knowledge, skills, and abilities. It will eliminate the need for present-day hierarchical and authoritative types of organizations and institutions. It will make the complexity of technology transparent to its users.

SURVEY FINDINGS

A survey questionnaire was developed and sent to 421 police agencies in the state that have traffic collision reporting responsibilities. The California Highway Patrol was not included in this survey because its policies were known.

The form was developed and pre-tested on a selected group of users (Appendix A). It was then sent to each agency with a cover letter explaining the purpose of and the need for the data requested. Subsequently, 278 (66%) of the survey forms were returned, and the data was tabulated. A summary of the results is as follows:

1. Seventy-six percent or 199 of the departments responding use traffic collision data to manage a traffic safety program; the remainder do not. Of the 199 that do use the data, only 14% obtain it from the Statewide Traffic Records System (SWITRS).
2. Approximately 54% of the 199 departments obtain their data from both the SWITRS and a local automated system. Approximately 8% of the departments rely on either a local or manual system exclusively. Moreover, 53% of these automated systems were designed for the local department.
3. The collected data is used mostly by non-law enforcement personnel; 86% of the users are traffic engineers, public works employees, civil attorneys, city officials and other similar personnel. Only 14% of the users are law enforcement personnel.
4. Most of the departments (94%) investigate or report fatal, injury, and property damage only (PDO)

accidents. Additionally, 91% of the departments define an injury accident as anything from complaint of pain on up to severe injury.

5. The majority of departments (65%) are interested in becoming involved in a statewide task force to examine the potential for using technology to solve reporting and data processing problems.

OTHER FINDINGS

The Commission on Peace Officer Standards and Training (POST) has developed and is testing a computer database software program. One of the functions of this program is the processing of local traffic collision data. If this program is used, it should provide the local police agencies with the ability to key-enter data from traffic accident reports into their own databases. Later it is hoped that the local data will be transmitted electronically or sent by magnetic tape to the state system in lieu of mailing copies of accident reports to Sacramento. This system relies heavily on a very labor-intensive key data entry process at the local level.

FORECASTING TRENDS AND EVENTS

The Nominal Group Technique (NGT) was used to develop and evaluate trends and events that may impact the issue.

Seven persons were assembled for the NGT process, consisting of a county traffic engineer, three police commanders, a California Highway Patrol (CHP) commander of the statewide traffic records system (SWITRS), an assistant commander of the CHP Planning & Analysis Division, a CHP field commander, and a coordinator of the Traffic Program Management Institute, California State Polytechnic University, Pomona, California.

The NGT group was given a statement of the issue to review. Then a discussion regarding the issue provided background information and clarity. The NGT group worked together to generate, develop, and refine a list of candidate trends and events (Appendix B). Each trend and event was discussed to ensure mutual understanding of the terms and definitions involved.

FORECASTING TRENDS

The NGT group reviewed the list of candidate trends and then ranked them according to their importance to the issue. The five highest ranked trends were then selected for the NGT process. They were:

1. Highway Level of Service. This is the level of service that the state and local highway system is capable of providing to the motoring public. This level of

service is directly proportional to average speed and movement of vehicular traffic. It is indirectly proportional to the density of vehicular traffic on the highway system.

2. Availability of Technology. This trend indicates the availability of computer technology for law enforcement to manage, regulate, and control the movement and density of vehicular traffic. It includes the use of technology for enforcement and records systems.
3. Traffic System Funding. This trend is the amount of funding available for the development, implementation, and maintenance of automated technologically based traffic law enforcement systems.
4. Level of Accident Reporting. This is the level or degree of traffic accident reporting by law enforcement agencies to the state. If the amount of accident data collected by law enforcement agencies increases, this trend will increase. If the amount of data is less, than this trend will decrease.
5. Local Control of Traffic Accident Data. This is the degree of local control exercised over the definition, collection, and maintenance of traffic accident records and data.

Each member of the NGT group evaluated the five trends using a trend evaluation chart. On this chart they individually recorded an estimate for each trend, regarding where they thought the level of the trend was five years ago and where they thought the trend will be ten years from now. They also estimated where they thought each trend level should be ten years from now.

The individual estimates for each of the five trends were collected and tabulated into the highest estimate, the lowest estimate, and a group median estimate (Table 1). A graph was also prepared for each trend (Graphs 1 through 5 of Appendix C).

TABLE 1

TREND EVALUATION FORM

TREND STATEMENT		LEVEL OF THE TREND (Ratio: 1991 = 100) 1986	1991	1996	2001
1. Highway Level of Service	H	90	100	150	500
	M	75	100	105	125
	L	120	100	95	90
	S	75	100	250	300
2. Availability of Technology	H	90	100	300	500
	M	75	100	200	300
	L	80	100	140	200
	S	75	100	200	400
3. Traffic System Funding	H	90	100	200	250
	M	100	100	120	200
	L	100	100	95	75
	S	100	100	150	350
4. Level of Accident Reporting	H	100	100	110	125
	M	110	100	90	75
	L	120	100	85	50
	S	100	100	120	150
5. Local Control of Accident Data	H	90	100	110	200
	M	100	100	105	125
	L	80	100	80	60
	S	100	100	100	100

HIGH, MEDIAN, AND LOW ARE "WILL BE" ESTIMATES

H = HIGHEST ESTIMATE
M = GROUP MEDIAN ESTIMATE (n = 7)
L = LOWEST ESTIMATE
S = SHOULD BE ESTIMATE

FORECASTING EVENTS

The NGT group reviewed the list of candidate events and then ranked them according to their importance to the issue statement. They then selected the five highest ranked events to be used in the NGT process. They were:

1. Report All Traffic Accidents. A statutory requirement is implemented to require that police agencies investigate and report all traffic accident collisions statewide (including all property damage only accidents). This could occur as the result of an increase in demand for more effective regulations of vehicles and drivers, or in response to rising vehicle insurance rates.
2. SWITRS Budget Cuts. The budget for the current statewide traffic records system (SWITRS) is reduced by 75%. This is due to state budgetary constraints that result in a reduction in funding for SWITRS.
3. Prop. 13 Overturned. The U.S. Supreme Court overturns Proposition 13, the 1978 property tax relief initiative. This results in additional tax revenues for local governments.
4. Point of Origin Data Entry (PODES). A statewide system becomes available to law enforcement agencies that will automate the entry process for much of the

traffic law enforcement data generated in the field. Electronically encoded driver license and vehicle registration data will be collected at the point of origin by a field officer. The data will automatically be transferred to the appropriate report format or other law enforcement data files. This system will significantly reduce the manual labor involved in the key entry of needed data.

5. Stop Reporting PDO Accidents. A majority of law enforcement agencies with traffic enforcement responsibilities decide not to report property damage only (PDO) traffic collisions.

Each member of the NGT group evaluated the five events using an evaluation form. On this form, the NGT members individually recorded the following estimates for each of the five events: the year that the probability of the event occurring first exceeds zero, the probability that the event will occur by 1996 and by the year 2001, and the net impact on the issue area and the net impact on law enforcement for each event.

The individual estimates for each of the five events were collected and tabulated into the highest estimate, the lowest estimate, and a group median estimate. These estimates are shown on Table 2 and Graphs 6 through 10 of Appendix C.

TABLE 2

EVENT EVALUATION FORM

		Yr prob.[1] exceeds zero	PROBABILITY By 1996	By 2001	Net Impact on Issue / L.E.[2]	
EVENTS						
1. Rep All Accidents	H	1992	50	50	8	8
	M	1992	40	50	10	-5
	L	1992	5	25	-5	-7
2. SWITRS Budget Cut	H	1991	70	90	-5	-5
	M	1991	60	85	-10	-5
	L	1991	50	75	-5	2
3. Prop.13 Overturned	H	1992	90	95	10	8
	M	1992	50	95	5	10
	L	1992	30	30	5	5
4. P.O. Data Entry	H	1994	90	95	10	10
	M	1994	60	90	10	10
	L	1992	50	50	5	8
5. Stop Rep. PDO	H	1994	90	95	-10	15
	M	1994	10	25	-10	-5
	L	1994	5	15	-5	10

H = Highest Estimate
M = Group Median Estimate (n = 7)
L = Lowest Estimate
1. Year that probability first exceeds zero
2. Net impact on Law Enforcement
   Net impact on scale -10 to 10
   Probability on scale of 0 - 100

CROSS-IMPACT ANALYSIS

Each NGT group member prepared a cross-impact analysis on a form provided. They were to assume that each event will occur and to estimate the impact of this occurrence on the other four events and five selected trends. Each member prepared 45 separate estimates, which were collected and tabulated into 45 median scores for the group. These median estimates were listed on a cross-impact evaluation form and are shown on Table 3.

Using the median estimates prepared by the NGT group, a cross-impact analysis was conducted to determine what, if any, impact a given event might have on the others if it occurred first, and how it might affect the levels of the selected trends. The cross-impact analysis also identified the most important "actor" and the most important "reactor" events.

The events were assumed to occur at the probability level of 30%. This level was arbitrarily chosen to force the occurrence of events for the purpose of analysis and scenario development. It is a compromise between the "unsettled" times at the 60% probability level and the very "turbulent" times at the 20% level. Thus at the 30% level of probability, four of the five events will occur between the years 1991 and 2001. Event 5 Stop Reporting Accidents does not occur.

Event 2 (SWITRS Budget Cut) occurs first, in January 1994. The occurrence of this event will delay the occurrence of Event 1 (Report All Accidents) until June 1995.

Event 3 (Prop. 13 Overturned) will occur in April 1994. It will impact events 1, 4, and 5. It will shorten the time of occurrence for Event 1 (Report All Accidents) and Event 4 (Point of Origin Data Entry). It will lengthen the time of occurrence for Event 5 (Stop Reporting PDO Accidents).

Event 4 (Point of Origin Data Entry) will occur in October of 1994. The impact of this occurrence is to shorten the time of occurrence for Event 1 (Report All Accidents) and to eliminate the probability of occurrence for Event 5 (Stop Reporting PDO Accidents).

Event 1 (Report All Accidents) will occur earlier than forecasted because of the impact of Event 3 (Prop. 13 Overturned).

As a result of the cross-impact analysis, the four events will occur in the following chronological order:

1. January 1994 E2: SWITRS Budget Cut
2. April 1994 E3: Prop. 13 Overturned
3. January 1995 E4: Point of Origin Data Entry
4. March 1996 E1: Report All Traffic Accidents.

Also, the occurrence of these four events will result in positive impact upon four of the selected trends, Trend 1

(Highway Level of Service), Trend 3 (Traffic System Funding), Trend 4 (Level of Accident Reporting), and Trend 5 (Local Control of Accident Data). Trend 3 (Availability of Technology) is not impacted.

Event 3 (Prop. 13 Overturned) is the most potent "actor" event, impacting eight events and trends. Event 5 (Stop Reporting PDO Accidents) was the weakest actor event. All of the trends except Trend 2 (Availability of Technology) reacted to all of the events. Trend 2 did not react to any of the events.

TABLE 3

CROSS - IMPACT EVALUATION

IMPACTING EVENTS AND YEAR

IMPACTED EVENTS AND TRENDS --->

	E1	E2	E3	E4	E5	T1	T2	T3	T4	T5	
IMPACTING EVENTS											Reactors
E1	X	-20	0	90	-100	10	0	25	50	20	7
E2	-20	X	0	0	15	-10	0	-10	-25	80	6
E3	25	-50	X	50	-20	20	0	100	50	50	8
E4	25	-10	0	X	-30	10	0	10	95	50	7
E5	0	25	0	-30	X	-40	0	-50	-50	-50	6
Actors	4	4		3	4	5		5	5	5	

NOTE: Impacting events are those that have a 30% probability of occurring; numerical values of positive or negative impact represent percentages.

<u>Events</u>
E1: Report all accidents;
E2: SWITRS budget cuts;
E3: Prop.13 overturned;
E4: Point of origin data entry;
E5: Stop reporting PDO accidents;

<u>Trends</u>
T1: Highway level of service;
T2: Availability of technology;
T3: Traffic system funding;
T4: Level of accident reporting;
T5: Local control of accident data.

FUTURE SCENARIOS

Three scenarios were developed to present brief sketches of what some alternative futures might hold, using the information developed from the futures scanning research and in particular from the NGT process. The first is an exploratory scenario, describing the future evolution of present forces in motion: it assumes that nothing will change; trends will continue as projected, and new policy actions will not be developed. The second is a normative scenario; it describes the desirable and achievable future. The third is a hypothetical scenario; it assumes the worst-case future.

SCENARIO ONE: EXPLORATORY

On a June day in the year 2001, Captain Smith stopped his car to observe one of his officers in action at the scene of a traffic collision. Two small cars blocked the intersection and traffic was gridlocked for blocks in all directions. The ambulance had barely left before the tow truck started to clear the intersection.

The captain's mobile computer screen flashed with changing information. He glanced at the screen and watched as a grid map of the area appeared and displayed the alternate traffic routes. The automatic traffic management system was

busy programming the electronic control signals in the area to balance and redirect the congested traffic onto alternate routes. The captain watched as the data rolled across the screen. A picture of a female adult appeared accompanied by a listing of identification and history data. A moment later, the picture of a male followed. The captain assumed that these must be the drivers. The officer apparently had just scanned their driver licenses. The captain was pleased. He knew that the officer was just about ready to clear the scene and be available for another call.

The captain started up his car and headed it back to the station. As he drove, he reflected on the many changes that he had seen in the last ten years. The biggest change, he thought, was the increased use of automation to manage and control the city's traffic problems. Several years ago, the city developed an automated traffic accident reporting system that eliminated most of the need for field officers to prepare accident reports manually. The result had been that his officers now spent more time on patrol and less time writing accident reports. Although the system reported less and different data than needed by the state system, it had now become indispensable in dealing with the increasing number of traffic accidents.

Traffic enforcement and regulation had become a prime

directive for his department and others. The driving force behind this change, he thought, was the increased volume of traffic and the resulting increase in traffic collisions and traffic congestion. Also, the state and regional transportation authorities had imposed strict driver safety, anti-congestion, and anti-pollution measures upon his and other cities. This all added up to a heavier demand for local traffic enforcement efforts.

As the captain pulled into the garage at the station, the computer screen again flickered with the report of another traffic collision. It displayed the location and identity of those patrol units available to respond. He marveled at the efficiency of the computer technology at work. Then for a moment, he wondered which came first, the traffic problems or the computer technology? He wasn't sure, but he did know that without the use of their automated traffic accident reporting system, his officers certainly could not do the job they were expected to do.

SCENARIO TWO: NORMATIVE

On a warm summer evening in the year 2001, Officer Ed Rodriguez of the Local City Police Department (LPD), accompanied by a trainee, has just completed the investigation of a traffic collision. They have cleared the

scene and stopped to document the collision. Ed swings open his lap-top computer (LTC). He calls up the accident report template on his LTC and begins his report. Some of the information has automatically been entered into the report: for example, date, beat, and officer ID. The identifying information for each of the drivers, witnesses, and vehicles has been automatically transferred to the appropriate location on the accident report. That information was obtained when Ed was conducting his investigation and interrogations of the involved parties at the accident scene. For example, when Ed had contacted each of the involved parties at the accident scene, he had used the digital reader on his portable mobile communications extender to read the invisible driver license data electronically encoded on the back of each driver's license. Using the same instrument he had also read and captured the registration information from the license plate registration tab on each vehicle involved in the accident. Ed explains that this automation is the work of the PODES (Point of Origin Data Entry System) that was developed in 1995 in response to a state requirement that all traffic accidents be reported. This was to reverse a trend occurring in many cities of not reporting some traffic accidents.

Ed completes the narrative of the report. He calls up

a diagram of the intersection from his diagram file. In this case, however, he decides that he will print out the intersection and then manually draw in the details of the accident later, when he is back in the office. He also proceeds through a check-off menu to enter the appropriate accident codes. This is a simple one-stroke entry operation for each category, such as weather, direction of travel, roadway condition, primary collision factor, and so forth. Finally, Ed hits the "check" key, and the LTC program commences to perform a simple error check for spelling, consistency, and completeness. Ed saves the file, and it is magnetically stored onto a small magnetic disk that is used to store all of his daily shift activity: accidents, arrests, patrol, and payroll timekeeping data.

Upon his return to the office, Ed produces a paper copy of the accident report; he finishes the diagram and attaches the photographs and other evidential documents. Ed turns in his daily activity disk and submits the accident report file for review and approval. As he does so, he explains to his trainee what will happen to the data and record.

First, he says, the paper accident file will be reviewed and approved. It will then be sent to the office optical records unit, where the file will be optically scanned and stored on an optical disk. The original paper will be filed

for a short period of time and then destroyed. Ultimately, the long-term and permanent record will be stored on an optical disk. When paper copies are needed, they can be routinely produced on demand. The files may be also accessed and reviewed at will on one of the computer monitors in the office.

Ed says that the magnetic activity disk will undergo a separate process: an office technician will subsequently transfer the contents of his daily activity disk into a local office computer work station (similar to a personal computer, or PC). There the data will undergo some further editorial checks, and then it will be routed to update the appropriate local data files: for example, traffic collision, arrests, officer activity, and payroll.

Ed says some of the new data will be set aside in a temporary update file. This data is routinely transmitted to the CHP traffic collision records system in Sacramento. This is done weekly when the CHP central site automatically dials up, polls, and collects the data from the LPD temporary state update file.

At the CHP system site, the data will undergo a final set of error control checks before it is used to update the statewide records system. Separate files will be prepared and the data electronically transferred to the Department of

Motor Vehicles and CalTrans. This is done to update the DMV driver license collision file and the CalTrans state highway accident file.

Local traffic collision data output reports are prepared as needed from the LPD database, explains Ed. Since this database is maintained locally and is very timely, city users can have immediate access to the data in storage, and customized paper reports.

The police chief and his staff will routinely use the data files to track accident trends and enforcement efforts. The data will also be used by the traffic engineers, planners, and the traffic commission.

Most often, the city's traffic collision data files are sufficient. Occasionally, however, the state system can be accessed for additional data. For example, statewide or regional data can be obtained from the state system for comparison purposes, or to replace lost or damaged files as was the case when a water main broke and destroyed some of the city data files. "No problem," says Ed; the state system was used to reconstruct and replace the lost files.

Ed asks the trainee if he has any questions. The trainee says no and looks disinterested. Ed thinks to himself that young people today just take the marvels of technology for granted.

SCENARIO THREE: HYPOTHETICAL

By the year 2001, traffic enforcement and regulation had become a prime directive for police agencies with traffic enforcement responsibilities. This was brought about by the occurrence of several events near the end of the twentieth century. First, there was a restructuring of the local tax and revenue system because of a change in the property tax laws. Then there was the saturation of the vehicle highway system, which necessitated the organization of regional governmental authorities. These regional governments then imposed strict traffic planning and control measures upon the cities.

The state had implemented efficient and tough laws regarding the regulation, licensing, and control of drivers and vehicles. It also implemented an automated system to track and control driver license and vehicle registration data. Unfortunately, many local cities could not afford the technology to use this automated system. Additionally, the increase in traffic volume inevitably led to an increase in the number of traffic collisions. And the high cost for traffic control, highway maintenance, public liability, and vehicle ownership created a stronger demand for thorough and timely accident investigation and documentation. These conditions prompted the state to mandate that all traffic

collisions be investigated and reported by the local authorities.

Consequently, this resulted in a very heavy demand upon the police for stronger and more efficient traffic enforcement. However, the state and many local governments were not equipped, trained, funded, or in general prepared to deal with this demand.

The state was still struggling to maintain its aging and inadequate statewide traffic records system. Many cities were still forwarding paper copies of accident reports to the state, most of which were in longhand or hand-printed form. Some of the more advanced cities were submitting to the state magnetic tapes of the collision data. This magnetic data was collected by those cities in much the same way that the state system collected it: by having someone read the officer's report and manually key the data into a computer. This not only duplicated the officer's report writing efforts, in many cases, it also repeated the labor-intensive key entry process at the state level. Finally, many cities had developed automated systems that were proprietary and non-standard. These systems were not able to exchange data with the state or other automated systems.

Because of these factors, the information extracted by the state and reported to local agencies was six to nine

months old. Local agencies were relying upon their own data to conduct traffic accident analysis.

Over time, the state system became less and less complete. This was due to differences in the definition of the data processed and the fact that there was a significant difference in the reporting threshold of accidents between city and state. For example, many cities did not classify a collision as an injury accident unless the injured was removed by ambulance. This was contrasted with the state system, in which an injury was defined as any complaint of pain or worse.

Most of the traffic collision data flowed from the cities to the state, but little data flowed the other way. Thus there was little incentive for the cities to maintain the integrity of the state system, because they had learned to rely on their own data system. (Incidentally, the cities were forced to establish and maintain expensive back-up systems to protect against the loss of their data records.)

The state system became a secondary and a neglected system. It became technologically obsolete, with an increasing reliance on expensive labor-intensive operations. Its existence could not be justified, particularly in light of the critical budgetary restrictions at the state level. Finally the system was abandoned when funding was denied.

Subsequently, the state looked to other, more cost-effective methods for maintaining traffic collision data. By the year 2001, however, they had not settled upon an alternative. In the meantime, the federal, state, and many local governments did not have access to much in the way of accurate and meaningful traffic collision information. Consequently, there was little reliable information upon which to base public policy decisions concerning the safe, lawful, rapid, and efficient movement of traffic. This occurred at a time when our transportation problems were so acute and in need of immediate solutions.

PART TWO: STRATEGIC MANAGEMENT

The purpose of this part of the study is to develop a strategic management process that will include decision-making, planning, and policy considerations. The preceding futures study provided insight into the relationships of sub-issues in understanding the impact of the future upon the central issue. This insight will help to understand the situation and its changing environment. It will help also in developing considerations for the planning and policy-making process, and to select an appropriate policy.

The policy selected must be capable of impacting the issue and addressing the situational environment. It must be strategic and germane to the issue of how technology can be used to process and integrate statewide traffic records by the year 2001.

STRATEGIC PLANNING

The strategic plan will describe alternatives that are directed toward achieving a desirable future. This desirable future is the normative scenario described in the preceding futures study. Then a recommended course of action will be developed to chart the appropriate course into the desired future.

To begin the process of strategic planning, the present external and internal situations of the California highway Patrol (CHP) will be audited to include the opportunities, threats, weaknesses, and strengths underlying the planning process. It will assist in determining whether or not the organization in question, the CHP, is capable of dealing with and adapting to a changing environment. It is designed to aid in finding the best match between the environmental trends and the organization's internal capabilities.

A strategic assumption surfacing technique is also used to help develop and prepare the strategic plan. It contributes to the audit of the situation through an analysis of the significant stakeholders. Specifically, it is the development of three components: the identification of significant stakeholders, the assignment of assumptions that each stakeholder would hold on the main issue, and the preparation of a graph illustrating the degrees of certainty and importance of the previous assumptions. This process emphasizes the reality of the concept that organizations or systems do not operate in a vacuum or closed internal environment; that the policies of the organization or system have both internal and external implications; and that these external implications can and will influence or impact policy choices.

WEAKNESSES, OPPORTUNITIES, THREATS, & STRENGTHS

THE ENVIRONMENT

The organization studied is the California Highway Patrol (CHP). The CHP is a large statewide organization with over 8,500 employees and an annual operating budget of over $560 million. The CHP operates nearly 2,000 enforcement vehicles along with 340 motorcycles. The CHP is responsible for providing patrol and traffic enforcement services for more than 97,000 miles of roadway, including 7,790 miles of freeways and expressways. It services a population base of 30 million, with almost 19 million licensed drivers and 22 million registered vehicles. The operations of the CHP are divided into four budgetary programs. The largest program is traffic management, the objectives of which are to minimize deaths, injuries, and property losses due to traffic accidents, and to provide protection and assistance to the motoring public. The remaining three programs include regulation and inspection, vehicle ownership security, and administration.[16]

The primary mission of the CHP is the management and regulation of traffic to achieve safe, lawful, and efficient use of the highway system. A secondary mission is to support

local law enforcement, to assist in emergencies, and to provide disaster and lifesaving assistance.

The objectives of the CHP are: accident prevention, emergency incident management, to minimize crime, and to assist other public agencies. There exists also the objective of maximizing service to the public in need of aid or information.

OPPORTUNITIES AND THREATS

Several external environment opportunities and threats to the CHP were identified that are likely to affect the issue of technology and traffic accident records. They include:

1. The highway level of service is projected to increase slightly over the next ten years. It could either be an opportunity for or a threat to the CHP. It will be an opportunity if the level of service can keep up with the anticipated growth in the movement and density of traffic. This would continue to fuel the state and local economy, which in turn would benefit governmental agencies such as the CHP. If the level of service does not keep up with this growth, then the public perception of the highway system managers, including the CHP, will diminish. This loss of public

image will threaten the CHP.

2. The availability of Technology is an opportunity for the CHP. It is expected to increase significantly over the next ten years. The availability of technology will allow the CHP to develop and use automated systems the better to achieve its purposes and objectives. This in turn will strengthen and enhance the public image of the CHP.
3. The development and implementation of a point of origin data entry system is an opportunity for the CHP. This event will likely occur in the next five years and it will provide law enforcement the ability to expedite the collection and reporting of traffic accident data. It would also be an opportunity to improve upon the uniformity and standardization of data reported throughout the state. This would benefit the statewide system and the CHP.
4. The availability and use of traffic system funding will be an opportunity for the CHP. Although the competition for public funds is expected to be fierce, funding for automated traffic systems should be available, particularly for systems that will replace existing labor-intensive operations. As a statewide agency, the CHP is in a strong position to use

economies of scale regarding the application of technology to improve services for the motoring public. This trend should be an opportunity for the CHP.

5. The overturning of Proposition 13 (change in property tax laws) will be an opportunity for the CHP. It is likely to occur in the near future and should result in additional revenues for the state and local governments. This in turn should make it easier for local governments to acquire the hardware and software needed to automate the processing and integration of traffic accident records, particularly for point of origin data entry.
6. The level of accident reporting by local law enforcement is a threat to the CHP. It is expected to decline over the next ten years and will undermine and diminish the validity and accuracy of a statewide traffic records data system.
7. The trend towards greater local control of traffic accident data is a threat to the CHP. It is a threat because the definition and threshold of traffic accident data available for the statewide data system may change under the control of the local users. Eventually, the statewide system would contain a

mixture of different and varying types of compatible and incompatible data.

This would diminish the accuracy, credibility, and usefulness of the statewide system.

8. A significant budget cut for the current system (SWITRS) would be a serious threat to the CHP, because it would reduce the ability of the statewide data system to provide accurate and complete traffic accident data. It would encourage local users to develop and maintain their own systems at the detriment of the state system.

INTERNAL CAPABILITY ANALYSIS

The internal capability analysis is an assessment of organizational strengths and weaknesses. It is a systematic audit of the organization's capabilities. An effective strategy takes advantage of the organization's opportunities by employing its strengths, and counters threats by avoiding, correcting, or compensating for weaknesses.

A representative sample of personnel from the CHP were asked to rate the capabilities and adaptability of the organization. This sample included both uniformed and non-uniformed personnel. They rated the organization anonymously and independently of other raters on a form provided. From

these ratings a numerical average rating was obtained for each dimension. These ratings are listed in Appendix D.

The internal capability survey ratings of twenty organizational dimensions suggests the following strengths and weaknesses. The strengths identified are the level of knowledge skills, and abilities; public image and support; political support; accident investigation; concern with mission; and reactive planning. The weaknesses identified are facilities, number of personnel, salary and benefits, proactive planning, opportunities for growth, and use of technology.

The major strength of the CHP lies in the knowledge, skills, abilities of its people; and in the public and political support it receives. The major weakness identified is the lack of effective technology.

The organization's technological capabilities were also examined. Interviews were conducted with key people and users of the organization's technology. Also the technological applications, resources, management, and user information needs were studied. The findings are summarized as follows:

1. Applications (Weakness). The CHP technological applications in place are inflexible and out of date. This includes the present traffic records system (SWITRS), the management information system (MIS), and

other internal applications.

2. Resources (Weakness). A variety of technological hardware and software is in use throughout the organization. The hardware ranges from main frame computers, mini computers, personal computers, work stations, telecommunications, and software programming languages. These resources are old and expensive to maintain.
3. Management of Technology (Strength). Recently, the management of technology has improved significantly with an effort to coordinate better the planning of future technological systems. In the past, however, such planning was not coordinated, resulting in conflicting projects, isolated islands of information, and no clear vision of what was needed. Budgeting for new systems has been hampered by the diversion of resources and funds to maintain the existing systems.
4. User Information Needs (Weakness). The technology in use does not adequately support the critical needs or mission of the organization. The users of the organization's technology are less than satisfied.

STRATEGIC ASSUMPTION SURFACING TECHNIQUE

STAKEHOLDERS

The Strategic Assumption Surfacing Technique was used to identify stakeholders and their assumptions. This helps to identify their positions in relation to the issue of how to use technology to process and integrate statewide traffic records by the year 2001.

A stakeholder is any person, group, or organization either internal or external, that may affect or be affected by the issue in question. Stakeholders may also include unforeseen entities who have the potential for extreme negative impact. The stakeholders are those who may be impacted by what is done, or who may in turn impact the outcome of what is being attempted. The stakeholders identified for the issue under consideration include the following:

1. The California Highway Patrol (CHP) is presently the administrator of the existing state system (SWITRS). It has a vital interest in any proposals to modify the present system. The CHP will support technological enhancements or improvements to the system. It will oppose any proposal to shift the management responsibility to another organization.

2. The Department of Motor Vehicles (DMV) has a vested interest in the current system. DMV relies on the system for traffic collision data to update its driver license files. DMV will be cautious concerning any changes to the present system.
3. The California Department of Transportation (CalTrans) has a vested interest in the current system. CalTrans relies on the system to update its highway files. CalTrans will be cautious concerning any changes to the present system.
4. The Police Departments will support any improvements to the system that provide more timely and more responsive access. They will oppose any proposal that requires additional funding to implement.
5. The California Office of Information Technology (OIT) is a state control agency. As such, it has the authority to approve or block any major technological modifications or changes to existing state systems. OIT will approve of technology if it demonstrates significant cost benefits or the reduction of labor-intensive operations.
6. The California Office of Traffic Safety (OTS) will likely support any technological innovations or improvements that further the cause of traffic

safety. OTS may help to fund development and implementation costs.

7. The California Commission on Peace Officer Standards and Training (POST) will likely support the use of technology to process and integrate traffic accident records. POST may undertake the responsibility for user training of such a system at the local level.
8. The Federal Government would support a more detailed and complete traffic records system. It would also support more effective linkage between the different existing files of SWITRS, DMV, and CalTrans.
9. The Auto Insurance Industry is likely to support a more efficient accident records system, particularly if insurance companies will have timely access to needed traffic accident data or information.
10. The Vendors and Manufacturers of computer and information systems technology will welcome the opportunity to provide and update the state and local governments with high technology data systems and equipment.
11. The Employee Unions or labor bargaining units may oppose the change if it results in a reduction of personnel. These groups may support the use of technology if it results in the acquisition of new

knowledge, skills, and abilities.

12. The California Legislature will likely support the use of high technology in place of costly personnel resources. As a major user of traffic accident information, the legislature needs credible and responsive traffic accident data.
13. The Motoring Public may support the use of technology if it furthers the interest of traffic safety.
14. The Courts may support the use of technology if it helps to reduce their workload.
15. The Law Enforcement Officers who will have to operate the system at the point of origin will support the change if it saves them time and work.
16. The State and Local Traffic Engineers will support the change, because it will provide them will a higher level of access to data needed for highway engineering purposes.
17. Other Stakeholders considered are the highway construction industry, environmentalists, motor vehicle manufacturers, the trucking industry, universities, researchers, and similar groups. None of these groups appears to be in a position to threaten or impact the issue significantly.

STAKEHOLDER ASSUMPTION PLOTTING

The next step of the process is to plot the assumptions graphically so as to illustrate their status and relationship. Chart 1 is such an illustration. On this chart, assumptions are plotted with reference to importance and certainty. Importance means potential impact on the issue by the stakeholder (as perceived by the researcher). Certainty means the degree of confidence that the assumptions are correct. Certainty regarding the assumptions is depicted vertically, with the top end of the scale being most certain and the bottom end of the scale least certain. Absolute certainty, plotted at the top of the scale, indicates 100 percent confidence that the assumption is correct. The vertical center of the plot indicates 50 percent confidence; the bottom indicates zero. The scale for plotting shows relative importance horizontally, with the right end of the scale indicating greater importance.

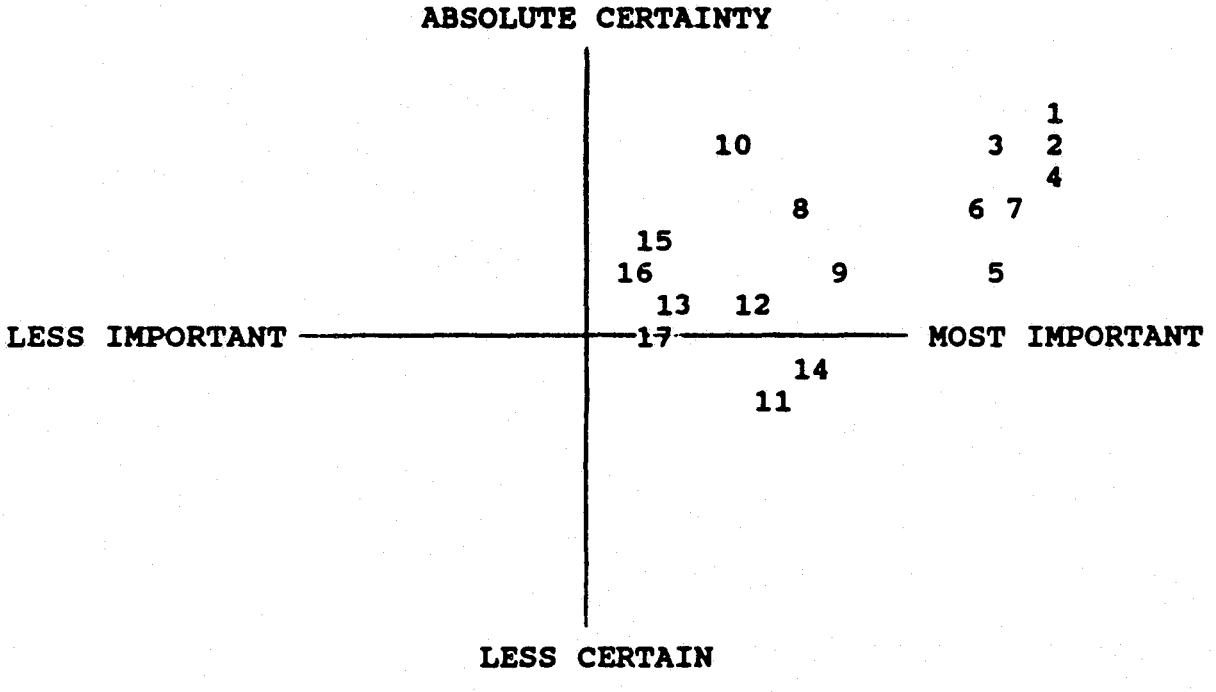
The plot is divided into four quadrants. In the upper right the assumptions are relatively certain and important: the assumptions in this quadrant are critical to the issue. The assumptions regarding the first four stakeholders are in this quadrant. They are rated as the most important and with the strongest certainty. They are the CHP, DMV, CalTrans, and the local police agencies.

Two stakeholders are in the lower right quadrant: the employee unions and the courts. This indicates that the assumptions in regards to these stakeholders are less important and less certain. This quadrant deserves careful attention, because it may identify a stakeholder with the strong potential to impact the issue negatively.

No stakeholders were listed in the lower left quadrant or in the upper left quadrant.

CHART 1

STAKEHOLDER ASSUMPTION PLOT



LEGEND OF STAKEHOLDERS

1. CHP
2. DMV
3. CALTRANS
4. POLICE DEPARTMENTS
5. OIT
6. OTS
7. POST
8. FEDERAL GOVERNMENT
9. AUTO INSURANCE INDUSTRY
10. VENDORS OF TECHNOLOGY
11. EMPLOYEE UNIONS
12. LEGISLATURE
13. MOTORING PUBLIC
14. COURTS
15. LAW ENFORCEMENT OFFICERS
16. TRAFFIC ENGINEERS
17. OTHER GROUPS

MISSION

The primary mission of the California Highway Patrol is the management and regulation of traffic to achieve safe, lawful, and efficient use of the highway system. A secondary mission is to support local law enforcement.

The primary mission of a traffic records system is to support traffic safety effectively: to reduce the incidence of death and injury on the highways, and to reduce the economic loss resulting from the ensuing traffic congestion and traffic accident property damage.

This mission is to be accomplished by the processing and integration of reliable, timely, responsive, accessible, and cost-effective traffic safety information and data. This processing system should couple records maintenance with data analysis. It will allow local, state, and national governmental authorities to direct public resources in a proactive manner towards effective traffic safety policies and programs.

EXECUTION

ALTERNATIVE STRATEGIES

The Modified Policy Delphi was used by in-house CHP staff members to generate and develop alternative strategies. The technique allows each member of the group to generate

alternative strategies to deal with the issue. The group then rated the strategies, based upon the two dimensions of feasibility and desirability (Appendix E). Rating scores were computed, and the two highest rated strategies were discussed then rated again. The following is a summary of the strategies developed by the group.

1. The CHP should initiate appropriate actions either to improve or to enhance the current statewide system.
2. The CHP should replace the current system with a new technologically based statewide system that makes use of point of origin data entry.
3. The CHP should encourage the local police agencies who are users of the system to continue to develop and maintain their own automated traffic records systems. The local agencies would be asked to conform to the reporting standards defined in the CHP Collision Investigation Manual (CIM).
4. The CHP should create a statewide task force of system users to explore and make recommendations concerning the use of technology to process and integrate statewide traffic records.
5. The CHP should recommend that another state agency assume responsibility for the management of the current statewide system.

6. The CHP should contract with a private vendor for the management and maintenance of the statewide system.
7. The CHP should explore the feasibility of using statistical or selected sampling techniques for traffic accident research and analysis purposes. This would reduce the need to collect statewide traffic accident data.

SELECTED STRATEGY

Strategies 1 and 2 above were rated the highest according to feasibility and desirability. After a second rating, Strategy 2 (CHP to replace the existing system with a new system) was identified as the most feasible and desirable of the alternative strategies (Appendix E). Also the group recommended that Strategy 3 (Create a statewide task force) should be used in conjunction with the selected strategy.

PERFORMANCE STANDARD

The group suggested a performance standard or criteria by which to guide the design and development of a new statewide traffic records system. The new system should meet or exceed the following criteria:

1. It must be mission-directed.
2. It must be user-friendly to operate and maintain,

particularly for the field officer.

3. It must be compatible and interchangeable with other state and local databases.
4. It must be based upon technology that is both feasible and available.
5. It must provide timely and responsive information for its users.
6. It must allow its local users easy access to, and easy management of, the data.
7. It must provide credible and unbiased information for its users.
8. It must provide for the easy reconstruction of damaged or lost files.
9. It must have a reasonable expectation of funding approval
10. It must eliminate much if not all dependency upon redundant key data entry operations.
11. It must be cost-effective and make the best of limited and scarce resources.
12. It must allow for future migration to future generations of technology.
13. It should be vendor-independent and provide a modular architecture for future growth and expansion.

IMPLEMENTATION PLAN

The following are specific steps or tasks for the implementation of a technologically based statewide traffic records system. Later in this study (in Part Three Transition Management) specific responsibilities will be assigned to individuals and groups. The steps or tasks are to:

1. Obtain approval for the project from CHP executive management
2. Organize and staff a project team
3. Develop plans, schedules, and assignments
4. Organize a statewide user group or a steering committee, or both
4 Review the existing system
5. Analyze user and system needs
6. Review and refine mission statement and system performance criteria
7. Develop alternative solutions and complete a cost-benefits analysis for each solution
8. Complete a Feasibility Study Report (FSR) in compliance with the State Administrative Manual (SAM), to include a request for proposal (RFP)
9. Obtain legislative and budgetary approvals
10. Develop a detailed design
11. Develop and implement a conversion plan

12. Initiate implementation

13. Conduct system tests

14. Commence production

15. Conduct post evaluations of the ongoing system.

PART THREE: TRANSITION MANAGEMENT PLAN

Transition management is the process of moving an organization from its present state to a desired future state. The elapsed time between the present and future states is called the transition state. This is the time during which change is occurring or taking place. This portion of the study will address the transition management necessary to achieve the desired future state. The present state and the future state will be discussed, and a summary of how a transition process should be developed. The other steps involved will include commitment planning, a management structure, and responsibility charting.

To bridge the gap between the present and the future successfully, a concerted effort must be made to anticipate and deal with the impact of the changes involved. These changes will involve both technological and human dimensions. The technological dimensions will probably complicate the transition on the order of 10 to 20%. The human dimensions, however, will complicate the transition on the order of 80 to 90%. It is the human dimensions that are most critical to the success of the transition. The leadership and staff chosen for the transition team should possess a high level of interpersonal or "people" skills. This is in addition to the

technical skills and knowledge needed.

Once the project team is selected and in place, a plan for design and implementation can be developed. It should provide for heavy involvement and interaction with various user groups, the decision makers, and the funding authorities. There should be clear milestones along the implementation route where approvals and concurrences are obtained in an orderly fashion. This will ensure the creeping and ever-increasing commitment of those persons or agencies involved. Thus at the end of the project the "I didn't know it was going to turn out like this" phenomenon can be avoided.

COMMITMENT PLANNING

The best laid plans will not be achieved unless the people or groups essential to the execution of the plan are committed to its success. The key players must be identified and their level of commitment estimated. The plan should also recommend strategies or actions that will successfully gain the commitment of those players who are essential to the successful implementation of the desired change. That is the purpose of the commitment plan.

CRITICAL MASS ANALYSIS

To implement the proposed change successfully, it is first necessary to identify the critical mass. By definition, the critical mass consists of individuals or groups whose active commitment is necessary to provide the energy for the desired change to occur. In this case, those persons or groups are part of the stakeholders group previously listed. Within this group of stakeholders is a smaller set of players referred to as the critical mass. They are:

1. The California Highway Patrol (CHP)
2. The State Department of Finance, Office of Information Technology (OIT)
3. The local police departments, as represented by the California Police Chiefs Association (CPCA)
4. The Department of Motor Vehicles (DMV)
5. The State Office of Traffic Safety (OTS)
6. The State Department of Transportation (CalTrans)
7. The State Legislature
8. The State Commission on Peace Officer Standards and Training (POST)
9. The Vendors

The California Highway Patrol (CHP) is the present administrator of the current system (SWITRS). The CHP has a vested and primary interest in the direction and outcome of

the system, and is the decision maker and prime mover for any change to the system. It is the most important and central player in this transition equation.

The CHP is a make-it-happen player. However, there may be internal components of the CHP that will attempt to block change. They will attempt to block change because it will bring about a shift in the resources presently assigned to operate and maintain the existing system. The people impacted by this shift will likely resist any efforts to implement the change: for example, the personnel assigned to programming, analysis, data coding, and key entry operations. A transition plan is needed to re-deploy and or re-train these people into new or existing positions.

The State Department of Finance, Office of Information Technology (OIT), has the authority to guide the application of information technology in state government. As such, the OIT is in the position of either blocking or allowing change. The OIT will block change unless it can be demonstrated that the proposed change complies with the policies contained in the State Administrative Manual (SAM) regarding the acquisition and use of information technologies. This will entail the development of a Feasibility Study Report (FSR). This report will have to be prepared and submitted to the OIT. A component of the FSR will be a cost-benefit analysis.

It is anticipated that such an analysis of the proposed change will show that it makes the best use of resources at the least cost. If this is the case, then the OIT should move from a block-change level to a let-it-happen level.

The local police departments are effectively represented by the California Police Chiefs Association (CPCA). The CPCA has expressed a need for change in the current system. Therefore, it is estimated that they are currently at the let-it-happen level. If the CHP were to initiate some action for change that would involve the CPCA, then the police departments and CPCA should move from the let-it-happen to the make-it-happen level. For example, such involvement could be in the form of a statewide task force to explore the use of new technologies to process and integrate statewide traffic records. (The CPCA board of directors passed a resolution recommending that the CHP create such a statewide task force. This was done at their May 1991 meeting.)

The Department of Motor Vehicles (DMV) depends upon the current system for data to update its driver license files: drivers involved, parties at fault, etc. The new change should provide some cost benefits to the DMV. They should be at the let-it-happen level. However, they could quickly move to the block-change level if they thought that the proposed change would compromise the integrity and

accuracy of their data files. To ensure that this doesn't happen, or to get them to move to the help-it-happen level, it is essential that they become an early participant in the developmental and design process. This is particularly true in the design of quality-control systems. It would be wise to involve them in the plan for parallel processing and testing of the new system. This would assure them that the new system is performing as expected before the old system is eliminated.

The Office of Traffic Safety (OTS) is a help-it-happen player. They have an interest in providing grant funds to further the interest of traffic safety. They are vitally interested in the development and implementation of a system that would make the best use of technology to process and integrate statewide traffic accident records. They will likely provide grant monies to fund the design, development, and implementation of the proposed change. They are also in a position to help the local police jurisdictions acquire the necessary hardware and software to collect and process traffic records and data. Early involvement and participation in the transition phase will ensure that the OTS remains a help it happen player.

The Department of Transportation (CalTrans) depends upon the current system for data to update its State Highway

Data File. They may be cautious of the new system's ability to provide accurate and reliable data. Like DMV they could move to block change if they perceive that the change would compromise the accuracy and integrity of their highway data. To ensure that this doesn't happen, it will be necessary to involve them in the design of quality-control systems; and to assure them that old system will remain until the new system has shown that it can perform as expected. If this is done, CalTrans will be a let-it-happen player.

The state legislature is a key player, in that they will be needed to approve the funding necessary to make the transition successful. The legislature is interested in the elimination of inefficient programs and operations. They will support any change that makes better use of technology to reduce costly labor-intensive operations. Proper preparation, involvement, and documentation will be needed. Also, personal contact with key members of the legislature should ensure the support of the legislature as either a let-it-happen or a help-it-happen player.

COMMITMENT ANALYSIS

A commitment analysis was conducted to estimate the current level of commitment of each of the above groups relative to the selected strategies. This commitment analysis

was developed with the assistance of CHP staff in the Information Management Division of CHP Headquarters, Sacramento.

The commitment analysis findings are shown on Chart 2. On this chart, the current level of commitment is indicated by an (x), and the minimum level of commitment that is required for the change to occur is indicated by an (O). An arrow indicates the direction of movement necessary to obtain the required level of commitment. Four levels of commitment are depicted: (1) Block change, (2) Let change happen, (3) Help change happen, and finally (4) Make change happen.

CHART 2

COMMITMENT PLOT

CRITICAL MASS	CHANGE			
	BLOCK	LET HAPPEN	HELP HAPPEN	MAKE HAPPEN
CHP				X ——→O
DOF/OIA	X ——→O			
CPCA		X ——→O		
DMV		X ——→O		
OTS		X ——→O		
CALTRANS		X ——→O		
LEGISLATURE	X ——→O			

X = PRESENT LEVEL
O = DESIRED LEVEL

MANAGEMENT STRUCTURE

The question arises as to what management structure should be used to make the transition trip successfully, the trip through the transition wilderness?

> The most appropriate management system and structure for the ambiguous transition state is the one that creates the least tension with the ongoing system and the most opportunity to facilitate and develop the new system.[17]

The most appropriate structure for the transition of this change should be a matrix type of project management organization that resides within the California Highway Patrol (CHP). The CHP should be the lead player in this transition. The CHP is presently the administrator of the current system, and it is a statewide organization with a broad base or network that touches every police agency involved in traffic safety. The CHP has the resources, knowledge, skills, and abilities to implement a state system: it is recognized for leadership, expertise and experience in traffic safety.

The matrix type of organization would be staffed with both full-time and a part-time staff. The full-time staff would consist of the transition project leader and his or her team. It should have representation from the local police jurisdictions as well as DMV and CalTrans. It should contain an appropriate mix of both technical and user-oriented

persons. A steering committee should be formed, consisting of the CHP, DMV, CalTrans, CPCA, OIT, and OTS. The purpose of this group would be to review and make recommendations concerning the progress, direction, and outcome of the transition.

DEFINITION OF RESPONSIBILITIES

The responsibilities for the accomplishment of the major conversion tasks are assigned to the key players. The level of responsibility assigned is one of the following: responsibility for completion (C), responsibility for support (S), or responsibility to inform (I).

These responsibilities are illustrated on Chart 3. This chart clarifies the actions that are required to implement the desired change. It also reduces confusion and eliminates duplication of effort between the key players.

CHART 3

RESPONSIBILITIES

TASKS	PLAYERS					
	CHP	CPCA	OIT	OTS	DMV	CTRS
1. CHP Approval	C	I	I	I	I	I
2. Organize Team	C	S	I	S	S	S
3. Develop Plans	C	I	I	I	S	S
4. Organize Users	C	S	I	I	S	S
5. Review System	C	I	I	I	I	I
6. Analyze Needs	C	S	I	I	S	S
7. Mission/Criteria	C	S	S	I	S	S
8. Alternative Solutions	C	S	S	S	S	S
9. Feasibility Report	C	S	S	S	S	S
10. Legislative Approval	C	S	S	S	S	S
11. Detail Design	C	S	S	S	S	S
12. Conversion Plan	C	S	S	S	S	S
13. Implemenation	C	S	I	I	S	S
14. System Tests	C	S	I	S	S	S
15. Production	C	S	I	I	S	S
16. Post Evaluation	C	S	S	S	S	S

RESPONSIBILITY LEGEND
C = Completion
S = Support
I = Inform

PLAYERS
CHP = California Highway Patrol
CPCA = California Police Chiefs Association
OIT = Office of Information Technology
OTS = Office of Traffic Safety
DMV = Department of Motor Vehicles
CTRS = Department of Transportation (Caltrans)

CONCLUSIONS AND RECOMMENDATIONS

There is a future need for emerging computer technology to manage effectively a statewide traffic records system, one that will serve both the state and local governments. This need will continue to increase, as evidenced by the future forecasts and findings set forth in this paper. The forecasts are for an increase in the density and volume of traffic upon the highways. This will result in a greater public demand for law enforcement to control and regulate traffic. Therefore, a timely, credible, accessible, and cost-effective traffic records system is needed, a system that can serve its users with integrated traffic collision records.

The present system and its technology, however, are inadequate to meet the needs of the future. The present system is paper-based and relies heavily on labor-intensive operations and on the technology of the past. It is neither timely, nor credible, nor accessible, nor cost-effective for its law enforcement users. It is also incomplete.

Emerging computer technology can best meet this need. This technology is growing at a rapid rate. It will provide new and creative solutions for the collection, processing, storage, communication, analysis, and reporting of traffic accident records. For example, a point of origin data entry

system will automate the entry of driver and vehicle data for the law enforcement officer in the field. This will also eliminate much of the tedious and laborious key data entry process presently being done.

The new computer technology will offer both state and local users more flexibility and reliability. It will allow the creation and maintenance of separate data files that will contain local data, but in a manner and form interchangeable and compatible with the state system as well as other local users. This will provide the users with easy and timely access to their own data and information. For example, users can collect, process, and produce customized output reports on their own small computer work stations (similar to personal computers). They will do this on a standard relational database software system that is supplied by the state and is relatively easy to learn and use for inexperienced computer users. The data input system will conform to the statewide format for data definition, consistency, and error control. The software will also be vendor-independent and usable on a variety of different makes of computer hardware.

The development and implementation of this new technology will require funding. The bulk of this funding should be obtained at the state level. This can be done

through the budgetary process of the California Highway Patrol. In addition, the state Office of Traffic Safety (OTS) should provide federal grant monies for this purpose. The existing system (SWITRS) is costing the state a large amount of money to operate and maintain. The majority of this expense is for the personnel involved in coding and data entry operations. These ongoing personnel costs would more than offset the cost for development and implementation of a new system.

The California Highway Patrol should undertake the appropriate actions necessary to plan, develop, and implement a new, technologically based automated state traffic records system, one that makes use of point of origin data entry and integrates both local and statewide data. This system should be developed with the advice and assistance of a statewide task force of system users.

CPOA LAW ENFORCEMENT TECHNOLOGY COMMITTEE

TRAFFIC DATA QUESTIONNAIRE

APRIL 1991

APPENDIX A

Dept. Name: _____

Dept. Address: _____

Dept. Phone No.: _____

Name of Person Completing Questionnaire: _____

Please indicate your answers to the following questions by placing an "x" on the line corresponding to your answer:

1. Does your Department use Traffic Collision Data to manage a Traffic Safety Program?
   Yes ——— No ——— (Skip to Queston #5)

2. How do you collect the Collision Data?
   - ——— SWTIRS (Statewide Integrated Traffic Record System)
   - ——— Local Automated System
   - ——— Local Manual System
   - ——— Other (Please Explain)

     _____

     _____

3. If you use an automated record or data collection system, is it a locally designed system?
   - ——— Yes
   - ——— No
   - ——— Other
   - ——— N/A (We do not have an automated system)

4. Who are the users of the collected data within your jurisdiction? (Indicate one or more)
   - ——— Law Enforcement Personnel
   - ——— Traffic Engineers
   - ——— Civil Liability Attorneys
   - ——— Public Works Department
   - ——— Other: _____

5. What level of traffic accidents does your department report or investigate?
   - ——— Fatal Only
   - ——— Injury Only
   - ——— Fatal and Injury Only
   - ——— Fatal and Injury and Property Damage
   - ——— Other: _____

Questionnaire Continued On Other Side

6. If applicable, how does your Department define an "*injury*" accident?

- ____ Complaint of Pain
- ____ Visible Injury
- ____ Severe Injury
- ____ Ambulance-Transported Injury
- ____ All of the Above
- ____ Other (Please Explain)

_____

_____

7. What Traffic Collision report forms does your Department currently use?

- ____ CHP 555/555-03/556
- ____ Locally Developed Forms (Please attach copies)
- ____ Both

8. Do you utilize the CHP Collision Investigation Manual (CIM) as a guideline?

- ____ Yes
- ____ No - Do Not Use Any Manual
- ____ No - Use a Locally Developed Manual
- ____ Other:

9. Is your agency interested in becoming involved in a statewide task force to examine the potential for using technology to solve reporting and data processing problems?

____ Yes ____ No

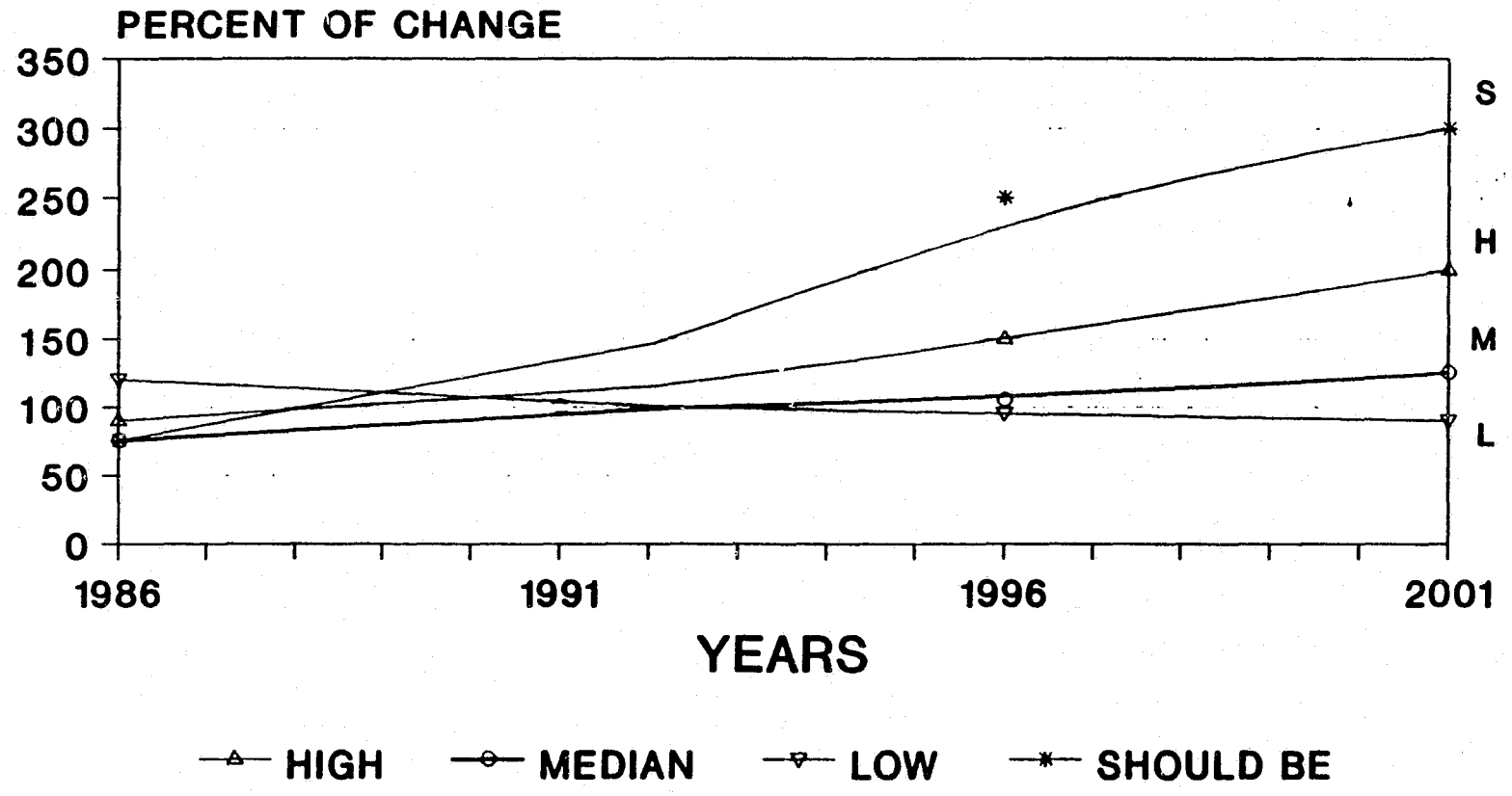
End of Questionnaire

APPENDIX B

CANDIDATE LIST OF TRENDS AND EVENTS

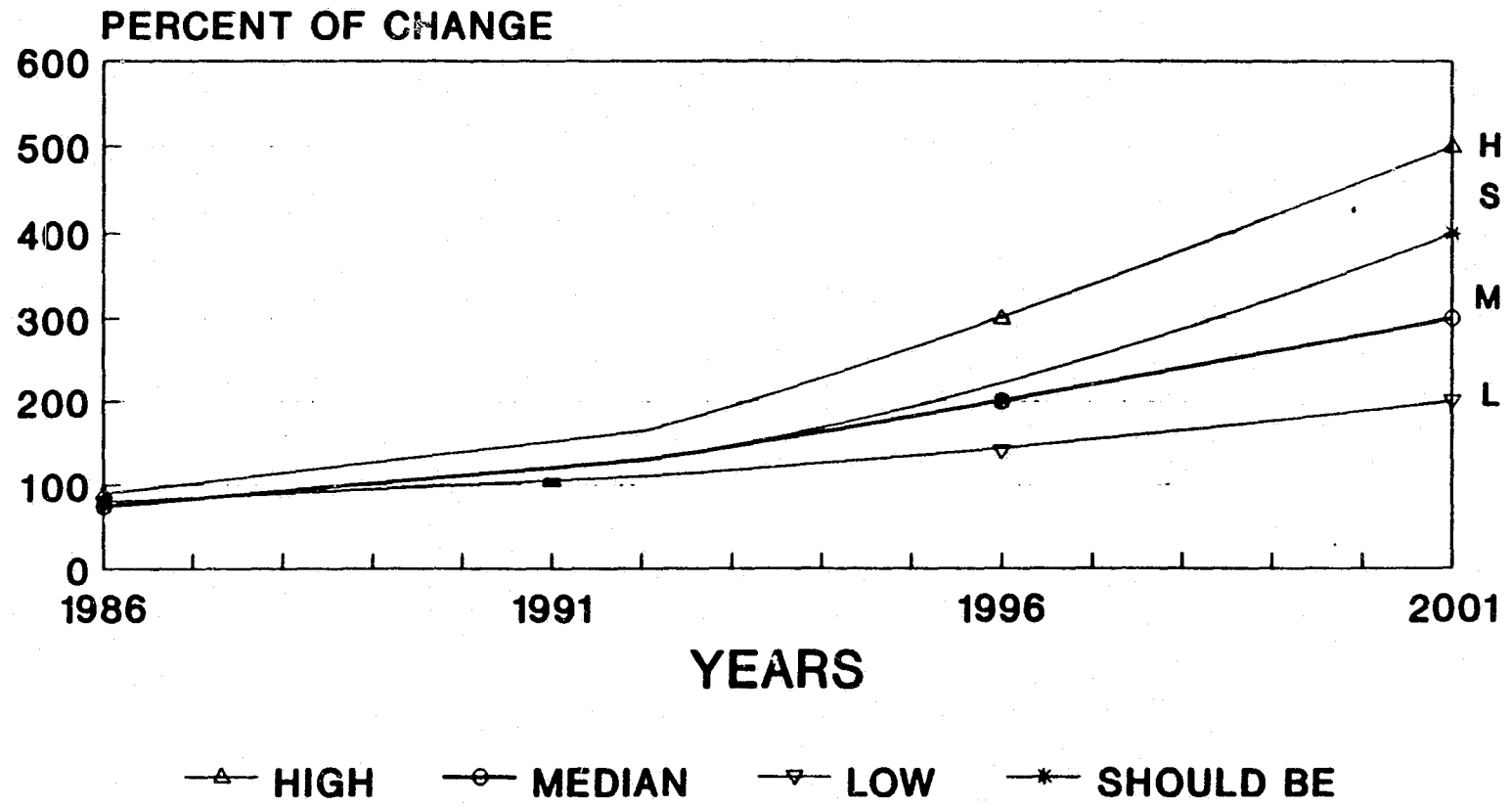
TRENDS	EVENTS
1. Traffic volumes	1. Implementation of anti-Congestion measures
2. Calif. economic growth	2. Report all accidents
3. Advances in technology	3. SWITRS budget cut by 75%
4. Traffic congestion	4. Fuel efficiency/40 mpg
5. Traffic system funding	5. Cost of gasoline at $3/gal
6. California population	6. Prop. 13 overturned
7. Licensed drivers	7. Use of airbags mandated
8. Registered vehicles	8. Stop reporting PDO accid.
9. Vehicle insurance costs	9. Point of origin data entry implemented
10. Vehicle ownership costs	10. Fed. gov. needs more data
11. Local control of data	11. CHP contracts w/cities
12. Use of mass transit	12. Cities access motor vehicle fees account
13. Accident severity	13. Registration fees doubled
14. Demand for traffic enforcement	14. Tough drivers licensing laws implemented
15. Use of automation for traffic systems	15. Regionalization of local government occurs
16. Highway level of service	16. Electronic license plates implemented
17. Use of Toll roads	17. Insurance proof required
18. Vehicle safety improve.	18. CHP staffing reduced 20%
19. Reportable accidents	19. CHP reports all accidents
20. Cost of technology	20. Freeway access controlled

GRAPH 1
T1 HIGHWAY L.O.S.



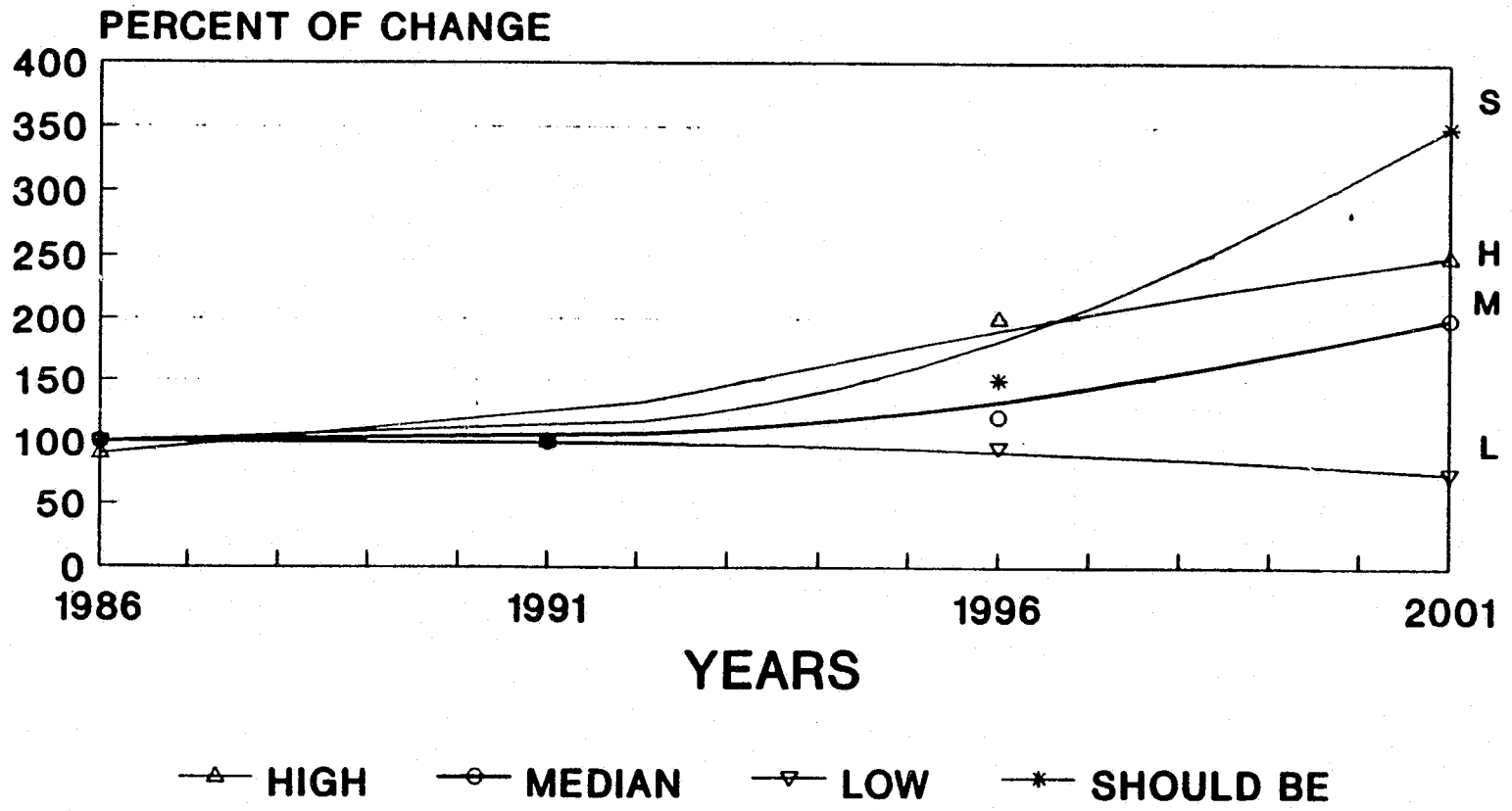
High/median/low are "will be" forecasts.
Highway Level of Service
Base year is 1991 (100%)

GRAPH 2
T2 AVAILABILITY OF TECHNOLOGY



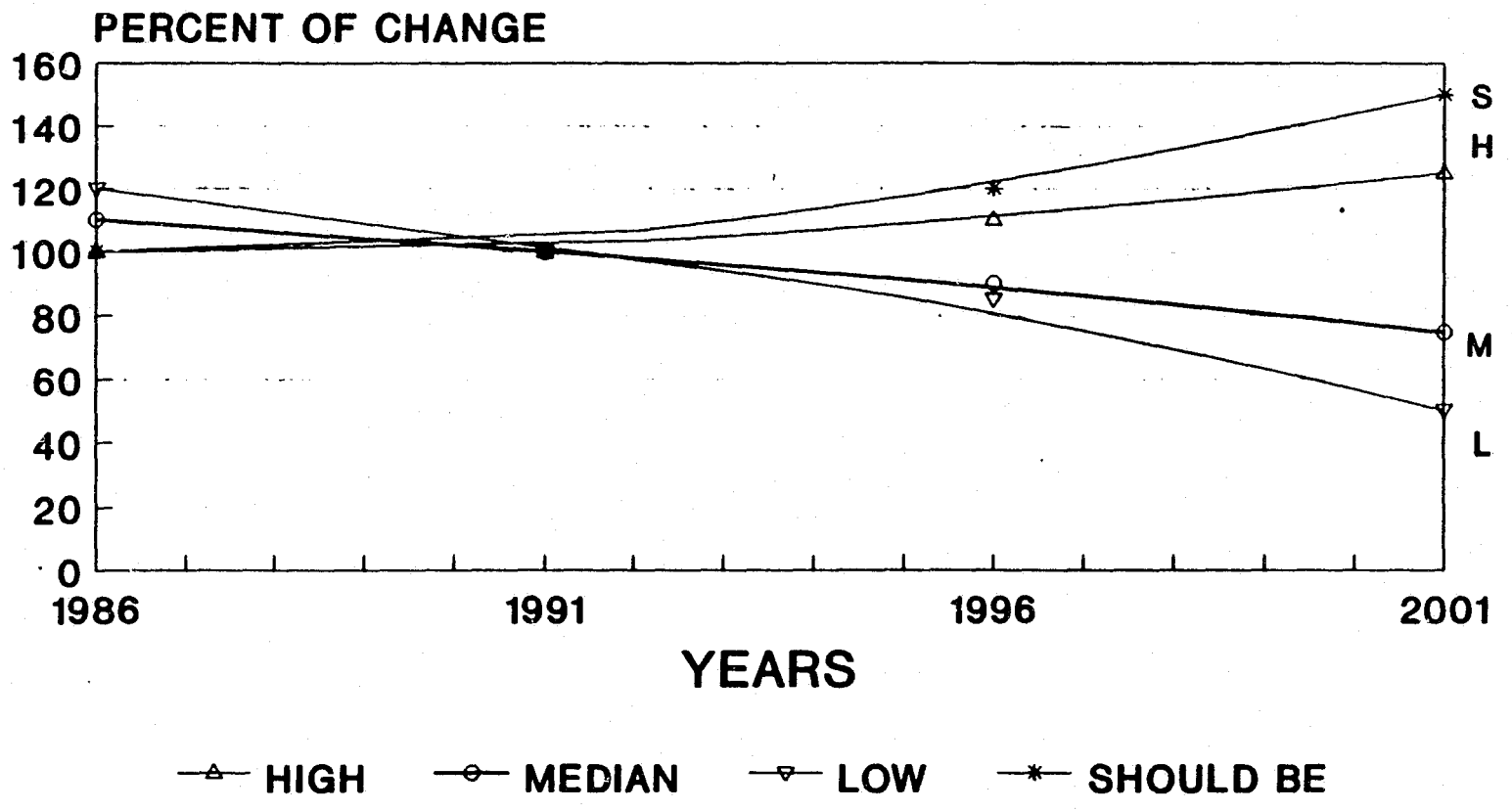
High/median/low are "will be" forecasts.
Technology for Traffic Systems
Base year is 1991 (100%)

GRAPH 3
T3 TRAFFIC SYSTEM FUNDING



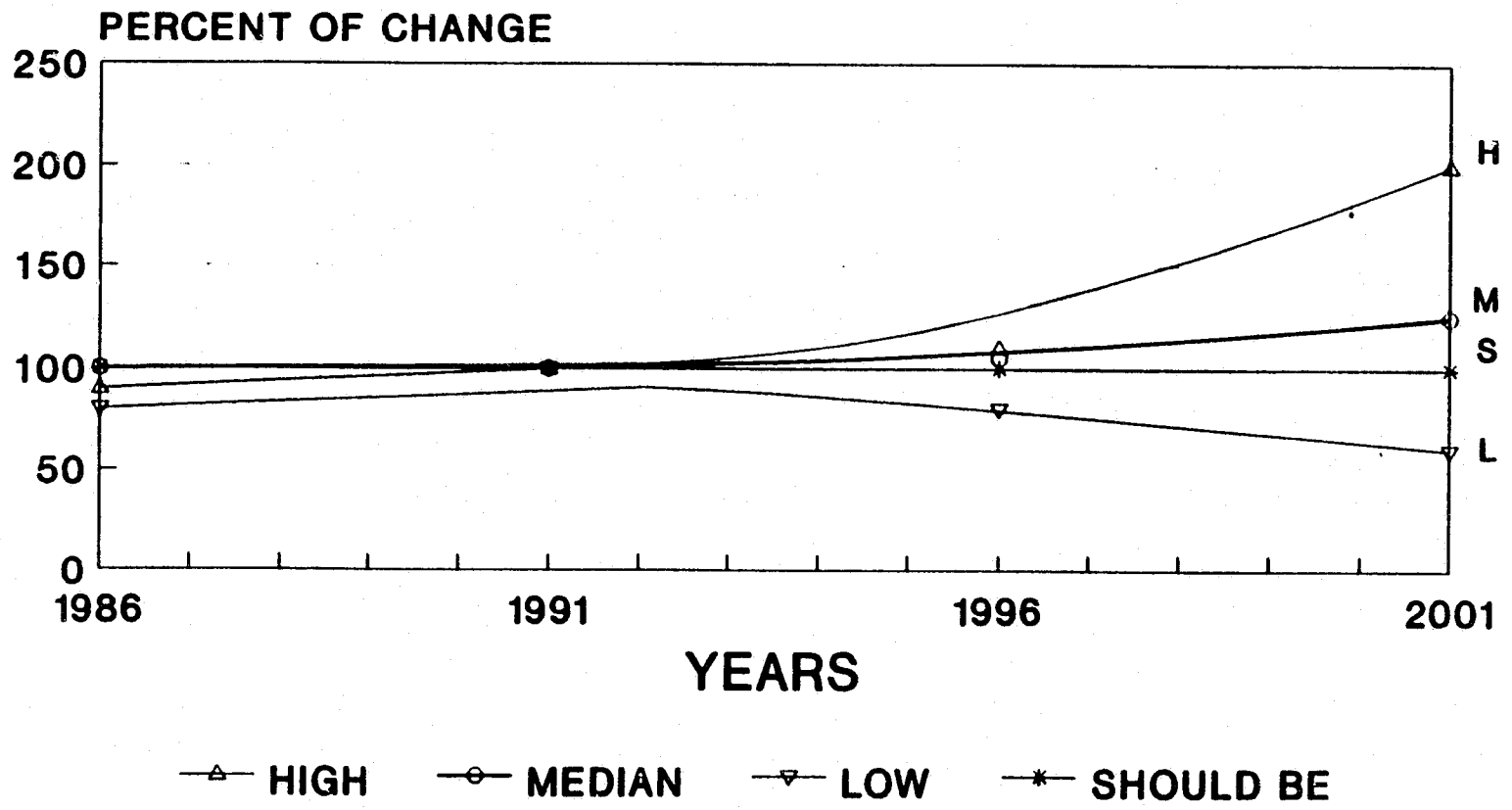
High/median/low are "will be" forecasts.
Funding for Traffic Systems
Base year is 1991 (100%)

GRAPH 4
T4 LEVEL OF ACCIDENT REPORTING



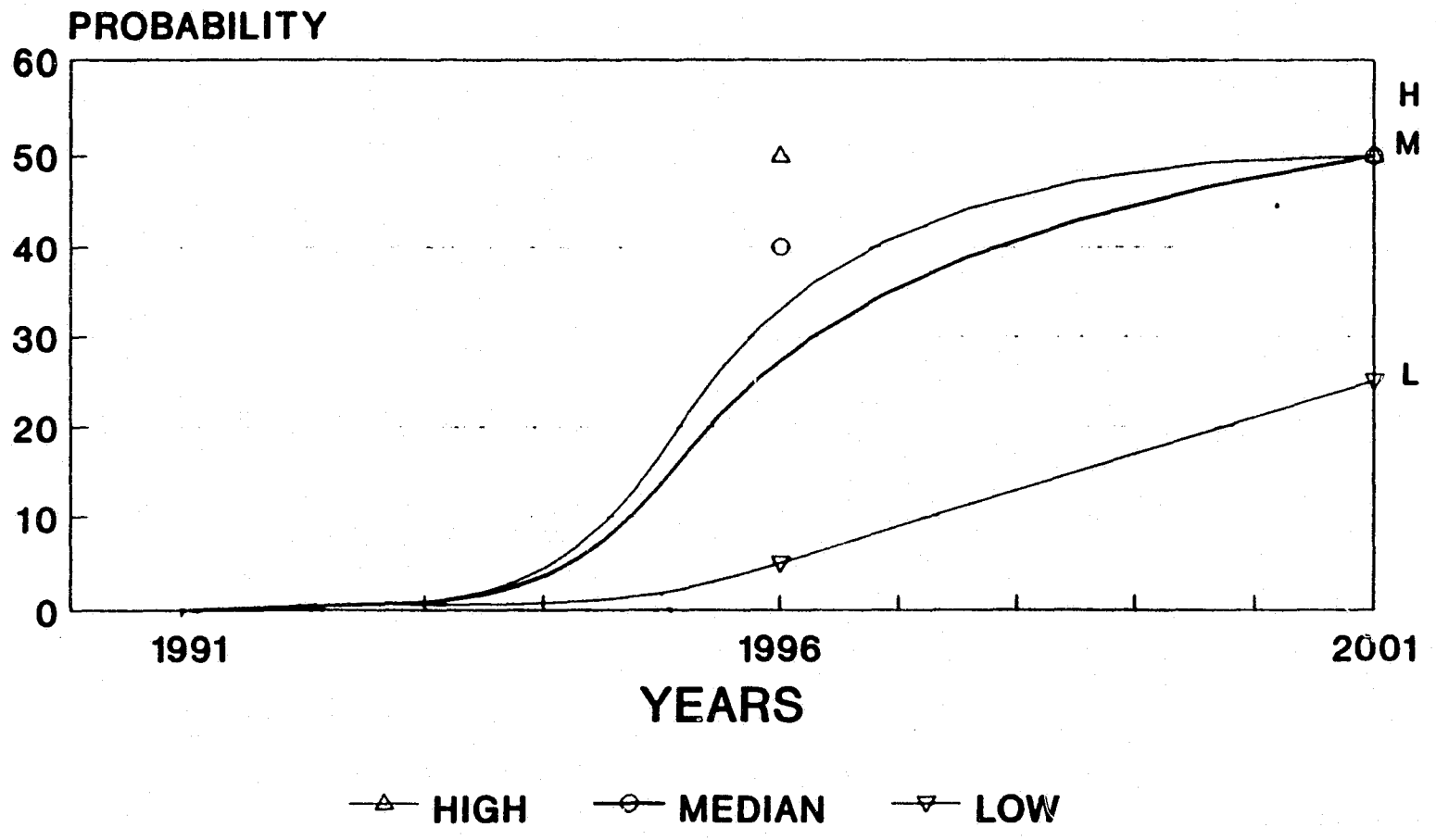
High/median/low are "will be" forecasts.
Level of Accident Reporting to State
Base year is 1991 (100%)

GRAPH 5
T5 LOCAL CONTROL OF DATA



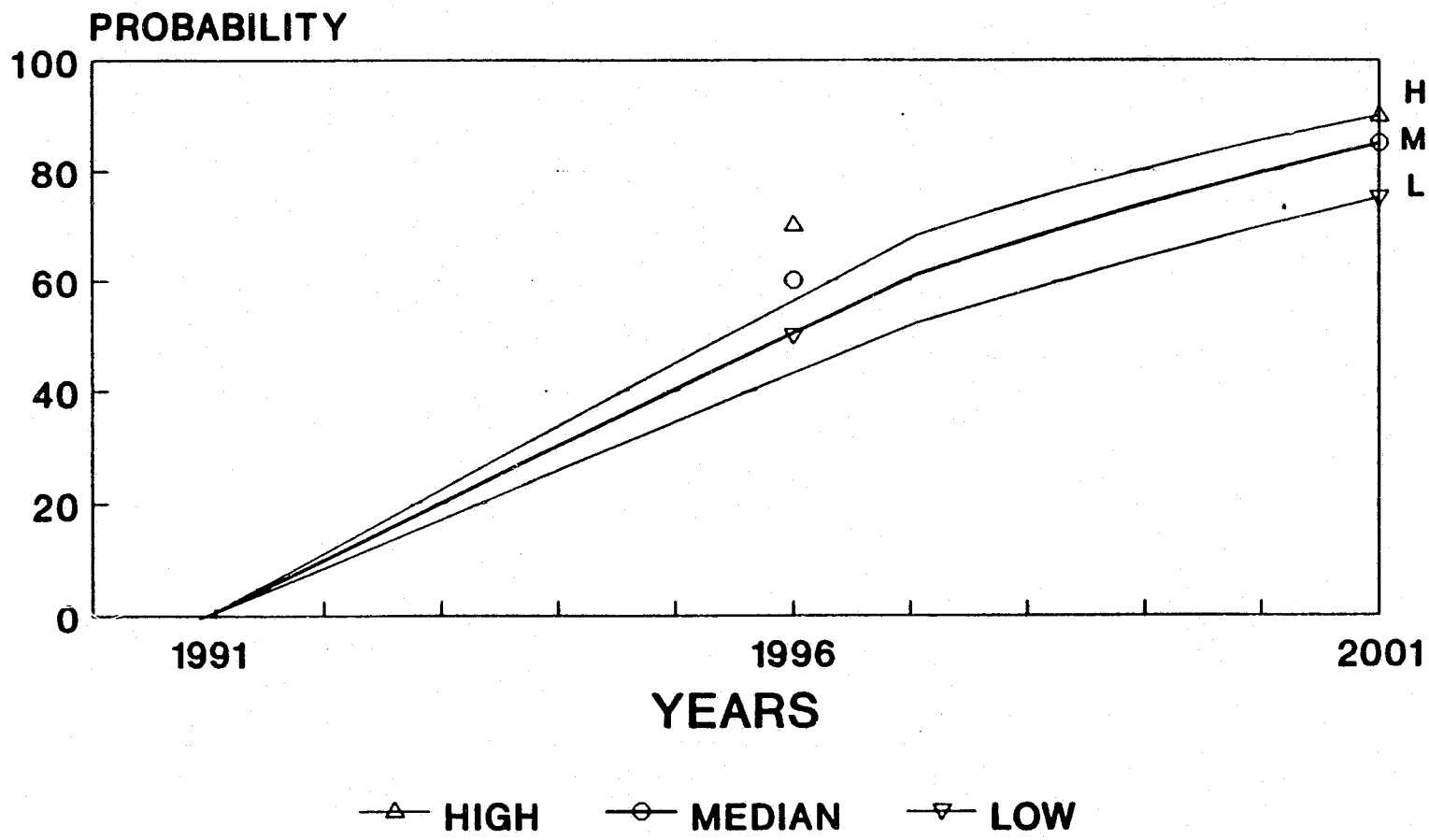
High/median/low are "will be" forecasts.
Local Control of Traffic Accident Data
Base year is 1991 (100%)

GRAPH 6
E1 REPORT ALL ACCIDENTS



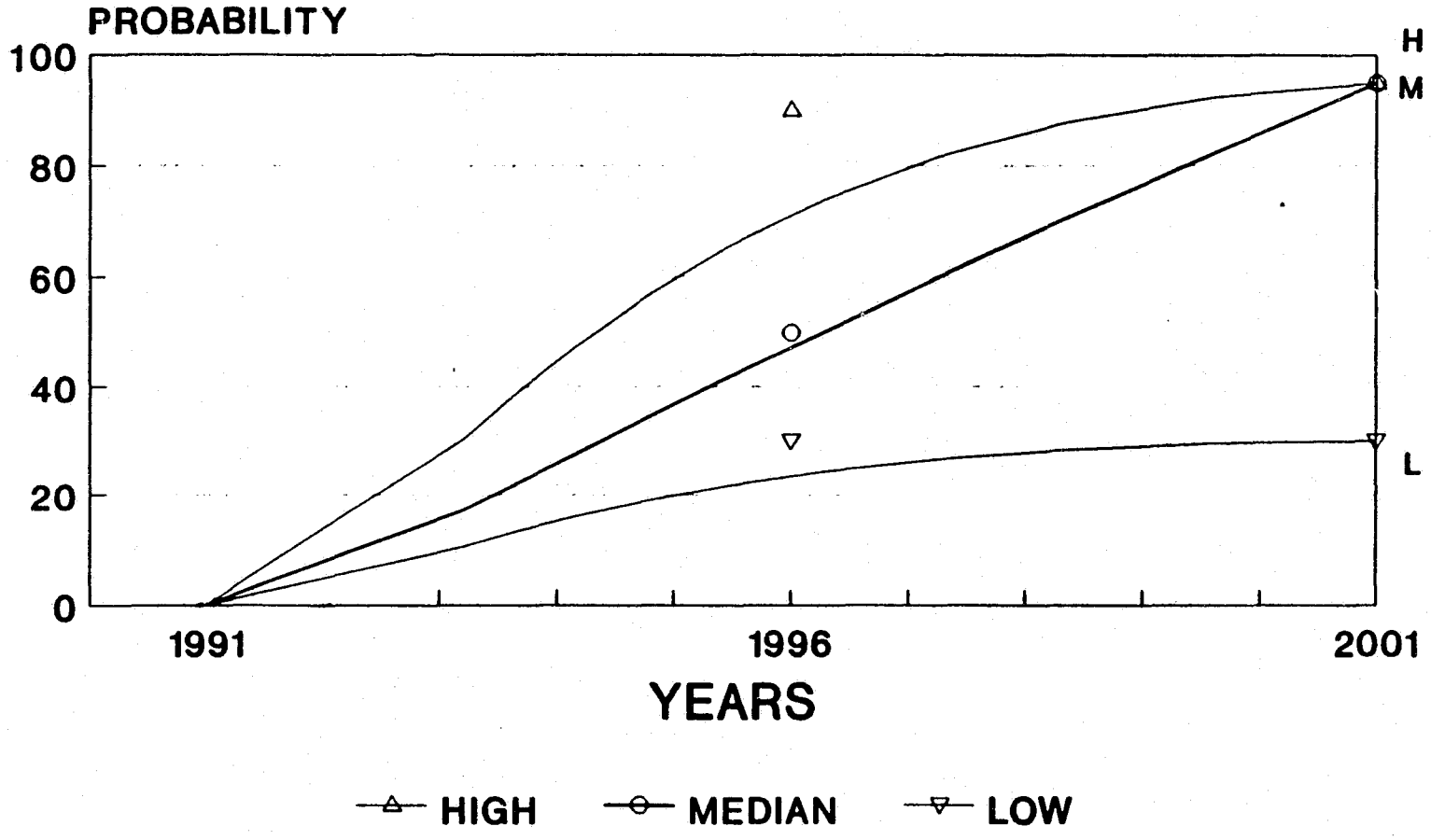
All traffic accidents are reported.

GRAPH 7
E2 SWITRS BUDGET CUT



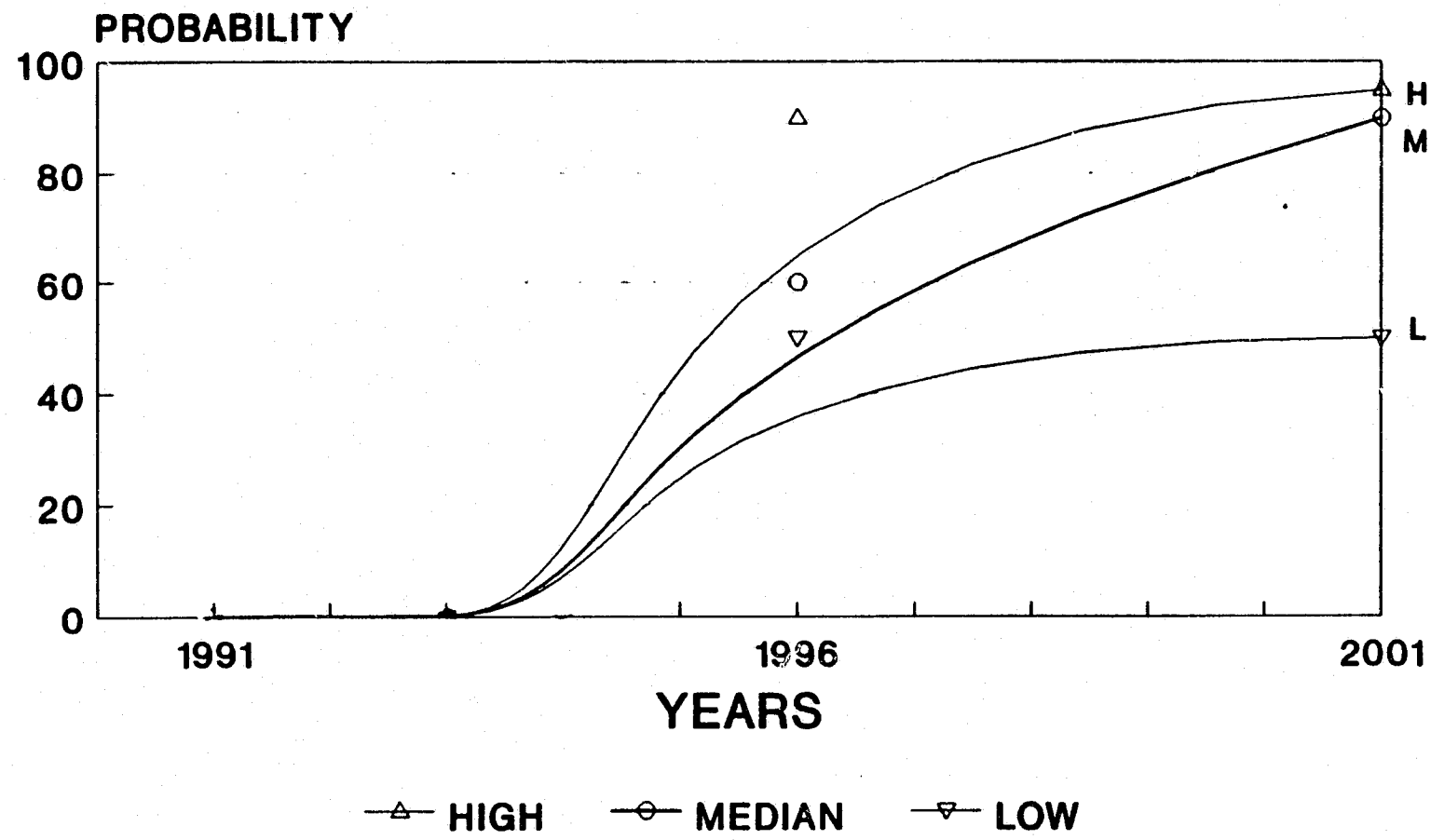
SWITRS budget is cut by 75%

GRAPH 8
E3 PROP.13 OVERTURNED



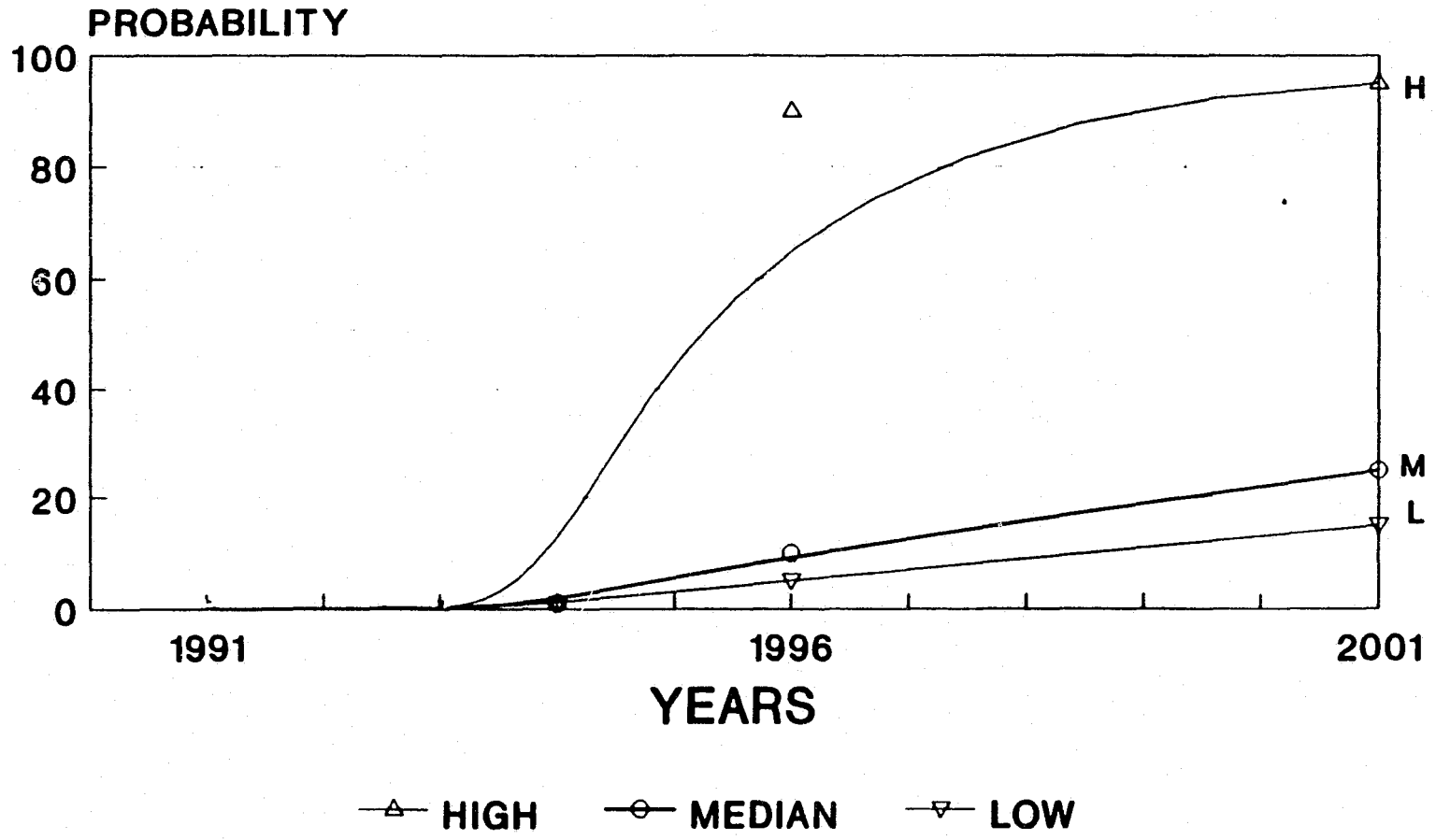
Property tax laws are changed

GRAPH 9
E4 POINT OF ORIGIN DATA ENTRY



Automated data entry system developed

GRAPH 10
E5 STOP REPORTING PDO ACCIDENTS



PDO = property damage only accidents

APPENDIX D

ORGANIZATIONAL INTERNAL CAPABILITY ANALYSIS

Please evaluate and rate each of the following organizational dimensions on a scale of 1 to 5.

1. Unacceptable
2. Improvement Needed
3. Standard
4. Exceeds Standard
5. Outstanding

DIMENSIONS:	Ratings
1. Adequate facilities	2.6
2. Adequate number of personnel	2.9
3. Level of knowledge, skill, & abilities	
a. Management	2.5
b. Supervisors	3.4
c. Officers	4
d. Administrative staff	3
4. Adequate equipment	3
5. Organizational ethics	3
6. Public image and support	4.8
7. Political support	4.6
8. Management philosophy & values	3
9. Level of morale	3
10. Salary & benefits	2.5
11. Use of technology	2
12. Level of training	4
13. Ability to deal with change	2.3
14. Proactive planning	2.2
15. Reactive planning	4.5
16. Response times	2.8
17. Accident investigation	4.3
18. Opportunities for growth	2.2
19. Concern with mission	4.2
20. Concern with image	4.4

APPENDIX E
SELECTION OF ALTERNATIVE STRATEGIES

MODIFIED POLICY DELPHI
RATING SHEET

ALTERNATIVES	RATINGS			
1. Improve and enhance the current system.	DF VD	PF D	PI U	DI ND
2. Replace the current system with a new system.	DF VD	PF D	PI U	DI ND
3. Encourage the development of local systems.	DF VD	PF D	PI U	DI ND
4. Create a task-force to examine use of technology to process and integrate data.	DF VD	PF D	PI U	DI ND
5. Recommend that another state agency manage the system	DF VD	PF D	PI U	DI ND
6. Contract with a private vendor to collect and manage traffic records.	DF VD	PF D	PI U	DI ND
7. Use Statistical techniques in lieu of collecting data	DF VD	PF D	PI U	DI ND

Rate each alternative twice - once for feasibility and once for desirability according to rating legend below.

LEGEND:

FEASIBILITY
- DF = Definitely Feasible
- PF = Possibly Feasible
- PI = Possible Infeasible
- DI = Definitely Infeasible

DESIRABILITY
- VD = Very Desirable
- D = Desirable
- U = Undesirable
- ND = Not desirable

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