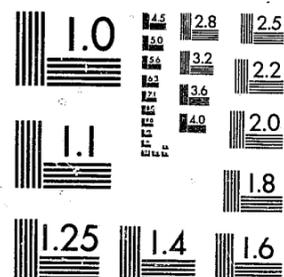


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9 1 1 WITH SELECTIVE ROUTING AND
AUTOMATIC NUMBER IDENTIFICATION IN
ALAMEDA COUNTY - INTERIM REPORT

By: Scott W. Hovey, Jr.
Project Director

Alameda County 911
Trial Project

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PREFACE

This report was started as an interim report on the Alameda County 911 Trial project after two years operating experience with Selective Routing and ANI and four months prior to the implementation of ALI (Automatic Location Identification) - the last advanced 911 feature to be evaluated in the Alameda program. Because of a very recent and very sharp escalation in the phone company's pricing for ALI, its implementation in Alameda County is presently in doubt.

Besides meeting certain LEAA reporting requirements, this report is intended to assist those communities presently considering or planning advanced 911 systems. Appendix II 911 ARG VERIFICATION PROJECT, SUMMARY describes the procedures successfully used by the County to verify the routing geography. Fuller documentation and the programs employed will be included in the final report and are available from the project office in the interim.

Interorganizational difficulties between the Alameda 911 Project and Pacific Telephone have definitely not been ignored nor, hopefully, overstated. They are an essential part of the Alameda County trial and may benefit others considering similar innovative efforts.

It is expected that serious readers will also have available the final report of SRI International's independent assessment of the Alameda 911 system (see reference 1.). In addition to a full description of the equipment configuration and trial setting, that report contains copies of the County's contracts with the telephone company and the other participating jurisdictions.

In addition to all errors, the author emphasizes his personal responsibility for the opinions expressed, points of view stated and conclusions reached.

Scott W. Hovey, Jr.
Project Director

September 17, 1980

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INTRODUCTION

There were and continue to be many difficulties between the Pacific Telephone Company and the 911 Alameda County Trial Project. These difficulties stem from a mix of circumstances unique to the Alameda Trial and should not be encountered with other advanced 911 installations. Their discussion is necessary to demonstrate why the project failed on one of its major goals - the acquisition of accurate cost data for Selective Routing and ANI.

The first section of this report addresses the cost history because the difficulties in that area affected most dealings with PT&T's 911 Coordination Office, the principal management interface with the County's 911 Project Office. Some correspondence has been included in Appendix I only to illustrate this point. It should be emphasized that these problems rarely had any effect on the day-to-day operation of the system. In the eyes of the municipalities, the 911 answering points and the citizens of Alameda County, the 911 system is seen as an enormously successful undertaking.

Subsequent sections of the report have been organized for the benefit of the potential public safety implementer. A special section on Oakland's use of an Automatic Call Distributor has been included because of the interest that has been shown in that arrangement. Aside from that section, no discussion of individual answering points has been made except to illustrate points.

At some point early in the course of the program, PT&T and then AT&T stopped regarding the Alameda system as something on trial, but as the initial installation of a very marketable revenue producer - a service for which Chicago would willingly pay millions extra in order to avoid waiting for, and for which other metropolitan areas were showing a correspondingly high willingness to pay. From that point on economic feasibility of the Alameda Trial was no longer in question. The only questions remaining were those of price versus cost. Quite probably the Alameda Trial would be far more thoroughly and openly documented if it had been an operational failure instead of the success that it is.

COSTING

The costing problems began with an estimate during the preliminary study of slightly under \$1,000,000 to construct a SR/ANI system. It and succeeding estimates during contract negotiations were extremely low because \$400,000 to \$500,000 in local engineering costs had been omitted. Possibly PT&T had elected to swallow all such costs to insure that the greatly delayed program would indeed be undertaken. (After all, even federal funding is limited and the trial might very well prove unsuccessful). Perhaps, as one story has it, the engineering standards department made an honest oversight while one manager was on vacation and his replacement had a heart attack. In any event, the problem was not recognized by the project office until a schedule of estimated billing was received three months after contract signing. In a different form than previous estimates, it apparently contained the missing engineering costs since the estimated payments by the County through implementation added up to \$1,662,000.

PT&T's subsequent explanation* made no reference to any single large error. Instead the earlier schedule was simply dismissed as incorrect and a revised estimate of \$1,231,000 was given. PT&T's letter contained three other elements indicative of the future course of the program:

- a) It emphasized the continuing uncertainty of all estimates;
- b) It tagged the accompanying detail as proprietary information; and
- c) It included a rather petty harassment - a request that proprietary information in the future be examined only at the phone company's San Francisco office.

Though relieved to get the correction, the County asked for the addition to the contract of a maximum cap of the billable implementation costs. This was sought as protection against increases which the federal grant might not be able to cover. PT&T's refusal** to so amend the contract was accompanied by notice of a further reduction in estimated costs.

*See Appendix I, A-1, A-2

**See A-6

One of the outcomes of the recosting was PT&T's decision to pro-rate an estimated \$300,000 in "project coordination" charges among the other anticipated 911 systems in Northern California. Project coordination work was engineering-type work whose performance would so facilitate the implementation of those future systems that its costs should be shared on the basis of phones to be served. Therefore, only 36% would be billed to the Alameda system.

Perhaps because of the proration of coordination charges, the billed implementation costs continued comparatively close to the \$1,231,000. \$1,445,650 has been paid to date.

State Program

A significant factor in the costing problem was the State 911 program. Enacted in 1971 it had been considered a plus in trial site selection. In 1976 the legislation was amended to provide for state payment of 911 telephone costs from a 1/2% statewide tax on intra-state phone bills. This had two effects:

- 1) Metropolitan opponents to the original mandate became supportive, but only on the condition that the state would provide them with the more expensive selective routing variety;
- 2) It became obvious that the 911 surcharge would be able to generate \$15 to \$20 million annually with remarkably little public opposition.

PT&T was asked to provide firm quotes for a dozen selective routing systems well before Alameda's would be in operation. Though needing the quotes in order to file preliminary plans with the State, local agencies showed little concern with the size of them. Detailed breakdowns were uniformly not available but on just a per-capita basis those quotes seemed more than twice as expensive as Alameda's. In addition to differing configurations, direct price comparison was hampered by the unique conditions of the Alameda contract:

- 1) No developmental costs were to be charged Alameda because of the use of federal funds;
- 2) All capital costs were to be billed on an as-incurred basis;
- 3) The only "profit" allowed the phone company was a token \$40,000 "administrative fee" established to recover the costs of capital up to repayment by the County.

Concern about overpricing elsewhere was relayed to the state program manager, although no hard evidence was available. In late 1977 it was discovered that all of PT&T's quotes had been uniformly based on a pending tariff structure and rate elements. A hypothetical pricing of the Alameda system was requested, for informational purposes, on the basis of the rates being used elsewhere. As shown by Figure 1., the annual recurring charge would be \$1,034,000 - nearly three times the prevailing estimate of \$348,000.

The accompanying letter (see A-3) emphasized the uniqueness of Alameda's contractual arrangement and strongly hinted that such a special deal could continue after an E-911 tariff had been filed. With this assurance, the position taken by the 911 Trial Advisory Committee was to let the State worry about the disparity since, as the ultimate bill payer, it would be the State's problem. Aware of the discrepancy, the State 911 office has so far elected to wait for an actual filing of an E-911 tariff and the scrutiny of the California Public Utility Commission.

One reason for constructing the system on a cost-reimbursement basis was to get the costs. Aside from any intended barriers to cost data dissemination, other very real obstacles seem inherent in the way the phone company operates:

- 1) Much of the interchange of orders and bills between Western Electric and a Bell operating company is automated. Conventional lay-intelligible interface documents are not normally available. The Western Electric "Summary of Material" forms for just the answering points was a seven pound stack of parts, numbers, assembly codes, etc.;
- 2) What would be a simple one-person information collection effort in a less structured and specialized organization might involve five people using three different vocabularies;
- 3) The phone company is still a very closed and restrictive organization not used to doing business with "outsiders" except via limited channels - e.g., account executives, clerks who have been especially "cleared" for making customer contact by phone, etc.;
- 4) So much of the telephone company's work is charged under tariff that installers and crafts people are accustomed to providing service expeditiously and without concern for tracking costs. Several "spare" display consoles and circuit boards were installed on a quick and undocumented basis.

ALAMEDA COUNTY

3/77 ESTIMATE

HYPOTHETICAL
REPRICE

<u>SYSTEM COMPONENT</u>	<u>3/77 ESTIMATE</u>			<u>HYPOTHETICAL REPRICE</u>		
	<u>BTC</u>	<u>NRC</u>	<u>AC</u>	<u>BTC</u>	<u>NRC</u>	<u>AC</u>
End Office	\$-	\$ 44,000	\$ 19,000	\$ 77,700	\$ 77,700	\$ 54,612
End Office to ESS Trunks	-	-	23,000	-	-	86,861
ESS Tandem	-	696,000	57,000	450,850	601,090	367,959
ESS to PSAP Trunks	-	-	18,000	-	-	63,206
PSAPs	-	304,000	44,000	168,080	174,295	212,910
Data Management System	-	121,000	187,000	97,600	298,900	248,880
TOTAL	\$-	\$1,165,000	\$348,000	\$794,230	\$1,151,985	\$1,034,428

BTC - Basic Termination Charge

NRC - Nonrecurring Charge

AC - Annual Charge

Figure 1.

Recurring Costs

The estimated recurring costs for the system were \$345,000/year as of December, 1976. Of this amount, \$186,000 was attributed to the Data Management System which would continue to be paid on an actual cost basis. The remainder, \$159,000, was for the switching and station equipment. Since the contract obligated the County to pay a fixed \$240,000 a year (\$20,000/month) for this component, the County asked PT&T for a downward adjustment to \$15,000/mo. PT&T demurred (see A-6) until a more accurate estimate could be made some time closer to the system cut date. In the January '78 comparison with a hypothetical tariff, the Alameda switching costs were still estimated at \$161,000 a year.

PT&T promised a final cost estimation "sometime in April" - a month before the scheduled May 29 cut-over. Because it became evident that the June 6 vote on Proposition 13 had to be taken seriously, the County elected to postpone the system cut until July 9. This would allow an assessment of the proposition's impact, should it pass. It would also provide a longer period for studying the recurring costs.

Predictably, the final cost review was not available in April, nor at any time before the system had been placed in service and had been publicized. On August 4, PT&T presented its final recurring cost estimate of \$748,000/year with the biggest increase being in the switching and station equipment area. PT&T was pleased to point out that the County was protected by the \$20,000 term in the contract from over half of the \$477,200/year in claimed switching costs (see Figure 2.). As this protection would continue for two years, the County and State believed that PT&T would file its E-911 tariff long before the protection expired.

As of this writing, PT&T has not filed an E-911 tariff. In May, 1980 PT&T notified the County of its intent to increase the fixed charge from \$20,000/month to \$38,320/month. The County had disputed PT&T's right to do so (see A-12) and the matter quite probably will be litigated.

Data Management System Costs

Much more satisfactory results have occurred in the Data Management Systems area, where charges are still billed on actual cost basis. This method was chosen, paradoxically, because of PT&T's lesser confidence in its ability to project computer system costs than switching and station equipment costs. A very early estimate (11/75) had been \$12,000/month, plus or minus 25%. By the time of the 8/78 post-cut estimate, PT&T's DMS projection had risen to \$22,500/month. This figure was never approached by actual bills for several reasons.

The estimated IBM 360/165 computer time required for the DMS programs (16,250 CPU seconds/month) was reduced a third almost immediately by scheduling a lengthy file reorganization program for monthly instead of daily operation. Other program tunings produced lesser reductions, and at the end of the trial period only 11,000 CPU seconds were being used each month. Despite a 11.6% growth in the data bases maintained, a second reduction of nearly 4,000 CPU seconds/month was realized in August, 1980 when the DMS programs were shifted to a more cost-effective IBM 3330 processing unit. The monthly computer costs (charged at a disputed 63¢ per CPU/second) have averaged \$5,600/month for the last year and can be expected to drop another \$1,000 in the future.

The other major DMS cost component is PT&T's 911 Operation Unit. The unit was established for the purposes of:

- 1) Resolving errors detected during service order processing;
- 2) Preparing street updates and data base corrections for the computer; and
- 3) Controlling the flow of forms to the County project office necessary for routing assignments (see page 18).

During the DMS design PT&T projected a need for four clerks and a supervisor for the 911 Operations Unit. That many people were needed during a six month file construction period in order to correct the many file conversion rejects. However, the established system is quite adequately manned by two clerks who share a supervisor from another unit.

Even with inflation the DMS clerical costs are approximately half of the post-cut estimate. For the last twelve months cost reimbursement for DMS was \$129,000 - 13% under the initial projection of \$146,000 in November, 1975.

ESTIMATED ANNUAL COSTS/CHARGES FOR
911 SELECTIVE ROUTING WITH A.N.I.

COSTS:		<u>Switching and Station Equipment</u>	<u>Data Management System</u>	<u>Total</u>
1.	Original estimate provided during preliminary study 4/74	-	-	300,000
2.	First revised estimate 11/75	240,000	182,500	422,500
3.	Second revision 12/76	161,000	187,000	348,000
4.	Third revision 3/78	170,000	223,000	393,000
5.	After-Cut Revision 8/78	477,200	271,000	748,200
CHARGES:				
A.	Under Contract (24 mo.) (per After-Cut Revision) 8/78	240,000	271,000	511,000
B.	Under full "hypothetical" tariff as presented in 3/78	785,000	249,000	1,034,500

Figure 2.

SELECTIVE ROUTING

Alameda County was picked as a selective routing trial site partially because it had an extremely bad overlap problem. The extent of the problem could only be estimated on the basis of exchange maps and probable phone distributions until the 911 data base had actually been constructed. The project office was then able to determine that a surprising 86.7% of the main stations would have their 911 calls correctly routed even if handled on a default basis. Nevertheless, the 13.3% whose calls would be misrouted by a comparably configured basic system includes all of Albany, Emeryville, Piedmont and Newark. Figure 3 shows the distribution of phones for each jurisdiction and the "exchange" for which the city would serve as the basic PSAP. The last "Transferred Out" column shows, as a percentage of its own phones, the additional phones that would have to be serviced under such a basic 911 system.

Flexibility

A major advantage of selective routing is the flexibility it provides for inter-governmental planning. Two instances serve to illustrate the point.

- 1) When California voters passed Proposition 13, some jurisdictions initially doubted their ability to fund the additional personnel that would be required by 911. Other cities were eager to move ahead. Although the entire County did eventually cut simultaneously, a partial cut by jurisdiction would have been quite possible.
- 2) After the introduction of 911, the County's Office of Emergency Services began negotiations with the cities of Livermore and Pleasanton regarding a combined centralized dispatching operation. The fiscal climate since Proposition 13 provided the impetus and the homogeneity of the involved communities as a definite plus. Nevertheless, the municipal agencies involved seem more willing to consider such an arrangement with the knowledge that they could easily re-establish their own centers if it did not work out.

DISTRIBUTION OF PHONES

IN CITY	A	B	C	(A+B)	(B+C)	% TRANSFERRED IN OUT	
		IN EXCHANGE				$\frac{A}{A+B}$	$\frac{C}{A+B}$

	A	B	C	(A+B)	(B+C)	$\frac{A}{A+B}$	$\frac{C}{A+B}$
1 ALAMEDA	71	32,076	58	32,147	32,245	.2%	.2%
2 ALBANY	8,124	0	0	8,124	0	100%	0
3 UNIV OF CALIF	555	8,874	55	9,429	8,929	5.9%	.6%
4 BERKELEY	2,708	53,447	21,561	56,155	75,008	4.8%	38.4%
5 EMERYVILLE	5,482	0	0	5,482	0	100%	0
6 OAKLAND	1,884	200,668	23,925	202,552	224,593	.01%	11.8%
7 PIEDMONT	4,603	0	0	4,603	0	100%	0
8 O.E.S. (Uninc.)	13,873	47,295	18,188	61,168	65,483	18.5%	29.7%
9 E.B.R. PARKS	170	0	0	170	0	100%	0
10 SAN LEANDRO	9,785	27,321	598	37,110	27,919	26.4%	1.6%
11 HAYWARD	16,757	32,907	7,872	49,664	40,779	33.7%	15.9%
12 FREMONT	1,145	48,288	13,596	49,443	61,884	2.3%	27.5%
13 NEWARK	10,421	0	0	10,421	0	100%	0
14 UNION CITY	100	12,729	4,661	12,829	17,390	.8%	36.3%
15 LIVERMORE	41	18,655	1,407	18,696	20,062	.02%	7.5%
16 PLEASANTON	162	12,995	662	13,157	13,657	1.3%	5.0%
	75,881	495,225	92,583*	571,136	587,808	13.3%	16.2%

* Includes 16,672 in Contra Costa

Implemental Ease

Despite the long time required by negotiations with the phone company, equipment development, etc., the inter-governmental planning effort was greatly simplified by selective routing. It permitted each PSAP and participating jurisdiction to determine exactly how its calls would be handled. The 911 Participation Agreement entered into with the County formalized those local planning responsibilities:

Local Responsibility

The County will schedule training on and provide training materials for the mechanical use of the advanced 911 features. The 911 Trial Advisory Committee will establish system-wide inter-participant operating procedures as required. However, the planning, organization and operation of Participant's answering points; the establishment of its 911-call-qualifying criteria; the type of response it makes to various 911 requests for assistance; and the adequacy of all training of its personnel shall remain the sole and exclusive responsibility of the Participant.

As might be expected, planning for 911 took local twists in different municipalities. One city elected to buy uniquely customized vehicle decals while another city chose to omit vehicle decals completely. Instead, the latter distributed handbills and telephone stickers to every residence during the first week. The level of preparedness also varied. Some cities had finished training their additional answerers while others were still trying to get them budgeted. Similarly, call answering speed and courtesy levels vary from city to city as they did before 911. But with selective routing it only affects their crime rates, their fire losses and their citizens.

MISROUTINGS

There are two basic categories of system misroutings:

- 1) Routing errors due to equipment or informational system malfunctions; and
- 2) Suboptimal routings resulting from the structural limitations of the underlying telephone network or accepted design limitations of the supporting records systems.

Misroutings due to errors are the first discussed and then the suboptimal routings.

The mishandling and misrouting of emergency calls by "O" operators were a major concern of the Bell system. It is generally accepted that a major motive for establishing 911 was avoidance of those problems and liabilities. To minimize the potential misrouting problems with selective routing, several safeguards were included in the Alameda contract and system design.

Government Responsibility for ARG Accuracy

The contract clearly states that the County would be solely responsible for supplying accurate "definition of the geographic area to be covered by each PSAP . . . in terms of street names and street number ranges" as well as timely updates. The major effort by the project office and the participating agencies to insure an initially accurate ARG (Address Route Grid) file paid off handsomely.* Only five misroutings during the trial period can be attributed to inaccurate County or participant verification. Two of these "errors" were the provision of 911 service to subscribers in neighboring Contra Costa County. They should have received the same misdial recording as before the cut.

Default Routing

Both the Data Management System and the switching system were developed on the principle that calls or potential calls which could not be normally routed would be "default" routed to a manned 911 answering point. The default PSAP would be the most probable answering point based on available information.

* See Appendix II

If a telephone service order for a new phone can not be satisfactorily processed by the Data Management System due to a misspelled street name, for example, the default PSAP to be used temporarily is based on the prefix of the phone number. The portion of the data base with default assignments at any one time approximates .1% (500 to 850 out of 620,000 lines). As previously noted, 87% of these have the correct PSAP as its default. Consequently, the likelihood of a 911 call being incorrectly routed in Alameda County due to a data base error is less than .00014.

Real-time default routings occur at the time of a call when the selective routing switcher does not have (or cannot use) a good ANI due to equipment malfunction. ANI failures with long distance calls are handled by giving the caller dial tone again. With 911 it was decided that default handling of the original call was preferable to a second dial tone which could be misinterpreted. The real-time default PSAP selected by the ESS tandem is based on the particular incoming trunk group.* Real-time default routings occur if:

- 1) A garbled or incomplete ANI is transmitted from the originating end office;
- 2) The 3A processor cannot find a valid routing code in file for the supposedly correct ANI; or
- 3) The 3A is not available to the ESS due to malfunction, maintenance, etc.

In the first case, a pseudo ANI - with a 911 prefix (e.g., 911-0023) is transmitted. The last two digits indicate the originating office. In the latter two cases, the valid but unusable ANI is transmitted in a flashing mode. Both indications serve to alert the answerer to the possibility of the call originating from outside his PSAP's regular jurisdiction. While ANI failure data was not provided by the phone company, the logging teletype at the three answering points indicated errors of less than 1%:

	ANI ERRORS	SAMPLE CALLS	(DAYS)	RATE
Hayward	5	1980	(15)	.25%
Livermore	3	2220	(61)	.14%
O.E.S.	12	1091	(7)	1.10%
As a whole	17	5293		.32 Average

*For 97% of the County's main stations the real-time default PSAP is the same as the background default based on prefix.

Though no indication of a flashing ANI is similarly recorded on the logging teletype, operating personnel believe individual occurrences are about equally frequent.

Nonavailability of the 3A processor generates more noticeable periods when all calls are default routed and all ANI's flashed. There were two such 20 minute periods in 1978 due to memory board failures.

In June of 1979 a very latent software bug in the 3A's audit program began "spot scrambling" routing table entries for particular prefixes and 1000's groups (for example, a hundred errors in the 537-8XXX range). Four times during the summer irregular evidence of the bug's survival (from answering points surprised to receive cross-country calls) required partial reloads of the affected prefixes. When the bug was eventually located in November, a 40-hour reload of the entire data base kept the 3A files unavailable for most of a weekend. Until a corrected version of the program arrived three months later, weekly five minute reinitializations were necessary. There have been no instances of system-wide defaulting in the last six months.

Use of Pre-Completion Orders

A major way that the Alameda Data Management System differs from others is that pre-completion as well as post-completion service orders are processed to determine routing. This was to assure correct routing on even newly installed phones. By acting on the same day that a service order is initially entered into SORD (PT&T's system for on-line service order entry), the ESS could be updated with the correct routing before the phone was even dialed.

A recognized shortcoming with this approach was the high error rate on initial orders. Five to eight percent of service orders require corrective updates before they can be released as completed orders. To avoid duplicating order correcting efforts in the 911 Operations Unit, an error abeyance file was incorporated into the DMS design. It holds errors up to five business days in hopes that a correction will be received from the SORD system. In 70% of the instances that happens, but the remaining 30% constitute a major work load.

Because of the pre-completion approach, PT&T estimates each service order is processed an average of 2.15 times: Upon initial entry to SORD; upon release by SORD as a completed job (and a satisfactorily edited order); and upon any modification in the interim. Furthermore, the abeyance file adds further complexity to the DMS, since it must

guard against processing corrections before errors, cancellations before orders, etc. For these reasons it is estimated that the pre-completion approach accounts for 45% of the computer time used in the Alameda DMS.

It can be argued that the need for 911 and selective routing is greater during the first days of a new telephone installation when a subscriber is in unfamiliar surroundings. It can also be argued that new experiences and surroundings tend to make people more alert, cautious and less likely to need emergency assistance.

Assuming an average residential installation life of three years and one additional week in a default mode, only one more 911 call in 1200 would be incorrectly routed. For these reasons I believe that the Bell decision to use only post-completion orders in their E-911 selective routing was the correct one.

Extensions and PBXs

For a single ANI there can only be one routing and obviously 911 calls from extensions in different locations must be directed to the same PSAP. Less obvious are PBX switchboards where all outbound calls are made over a common group of circuits for economy. Although a unique-appearing ANI may be displayed at the answering position, it does not relate to the originating phone and is unusable for call back purposes. With outward-only circuits or tie-lines, a "not-in-service" recording may be encountered to the surprise of a PSAP answerer attempting to call back.

Four Party and QZ Service

Though 8-party service has been discontinued, 4-party is still provided in the Livermore and Pleasanton exchanges. Earlier expectations that a pseudo-ANI could be used to route all calls on a particular party-line circuit to a particular PSAP (to the Sheriff's, in particular) were not realized. Instead of an ambiguous ANI, calls on 4-party circuits generate no ANI. This absence of ANI is also a characteristic of QZ service, an obsolete method of toll restriction. Both result in real-time default routing.

The only known problem arising from either was when QZ was inadvertently included on the circuits for the City of Livermore's newly purchased PBX. The assistant city manager used 911 to report an in-progress burglary. The call was default-routed to the sheriff rather than the police department located in the same building.

Centrex Service

Unlike Switchboard and multiparty service, Centrex systems do provide a unique ANI for each originating station. The selective routing difficulties with Centrex stem not from the equipment, but rather from the service order structure used by the telephone company.

The telephone number (with the addition of some trailing check digits) provides a very natural and useful account number for the phone company. Not only do subscribers have their "account" number memorized, but in more than 91% of the cases there is only one phone number per account.

To accommodate the chiefly business customers who have more than one telephone number, a single line number is designated as the "pilot-line" number and all other phone numbers on that account are termed non-pilot-lines. Pilot-line numbers are the structural basis for the telephone company's accounting and service order filing systems. The service orders input to the DMS are keyed to the account number (i.e., the pilot-line number) and only secondarily reference the actual non-pilot-line number involved. Most importantly, the service address of the pilot-line number is the only address sufficiently formatted for DMS use (service addresses of non-pilot lines appear in an unformatted and unedited "remarks" typ field for the benefit of installers and directory distributors). Consequently, only the pilot-line address is used by the DMS for determining the routing of any phone numbers on that service account.

For the majority of multi-line subscribers the use of pilot-line addresses presents no problem, since only one address is involved. Much more affected are Centrex customers with hundreds and even thousands of lines serving scores of separate facilities. There are approximately 60,000 Centrex lines in Alameda County belonging to more than 75 customers, including the University of California, several military installations and the County itself. These customers have over 2,000 accounts established for their own cost allocation and charge-back purposes. While each account could have its own address, most normally carried a common headquarters address in the file PT&T used as a source.

Three levels of accommodation could have been made for the Centrex subscribers:

- 1) Each account could have been given an optimal address for routing purposes;
- 2) Each non-pilot line with an address differing from

the pilot could be manually assigned its own address. Since every update would have caused an automatic reversion to the pilot address this was particularly unappealing;

- 3) In a trial spirit, no accomodation could be made until the consequences of that course were known.

With strong urging from PT&T's DMS planners, the project office adopted the third course. The only precut changes were made at the account level and for four of the trial participants: The University of California, which had scores of lines terminating in the city's jurisdiction; the County, which had Centrex in four different exchanges; and the cities of Albany and Piedmont - both of which would have otherwise been unable to demonstrate 911 from city hall phones.

During the first year of the trial, only 4 "misroutings" due to Centrex were reported to the project office. None of these had bad consequences. In one instance, with a savings and loan company, it was discovered that valid pilot addresses could be mechanically maintained for each of its branches. That accomodation was made for public relations purposes. In the second year of the trial, only two reports were received.

There are several reasons why the "Centrex problem" is so small:

- 1) The excellent transfer facilities for getting such calls to the correct agency;
- 2) Centrex users are more aware and less likely to be panicked or directly involved;
- 3) The answering announcement (e.g., "Oakland Emergency") reminds the caller of his situation;
- 4) The 911 answerers are alert to the "Centrex problem" and react quickly.

AUTOMATIC NUMBER IDENTIFICATION

ANI is a technologically flashy 911 feature whose potential value is readily understood by the average citizen. Most people do not realize the "0" operators in urban areas have used similar displays for years, and naturally assume that such a space-age marvel is quite costly. Even most public safety officials mistakenly believe ANI more costly than the less useful capability of holding a circuit open while a trace is made. In fact, the cost of an ANI-forwarding trunk is less than the special trunk assembly needed for called-party-hold, the closest equivalent basic 911 feature.

The most obvious benefits of ANI are the operational benefits from the information provided. During a 28-day study conducted by SRI International, 14 answering points reported using ANI on 2.4% of the 13,139 calls they received. The particular usage recorded was as follows:

For call back purposes:	233 (69%)
To use with a reverse directory to get an address:	85 (26%)
To request a trace from the Telephone Company:	15 (5%)
	333

Call Back

It is not known how much of call back usage was immediate (and therefore comparable to ringback) and how much was from a previously recorded ANI. 37 additional times the answerers referenced the logging teletype, presumably to get an ANI they had neglected to record.

Reverse Directory

All but two PSAPs in Alameda County use the commercially available Haines reverse directory for establishing (or con-

firming) the address from the ANI display. Those not using it are the East Bay Regional Park District, which already has the locations of its 170 phones on file; and the City of Berkeley. A study of the annual directory's accuracy in 1979 showed that the probability of it providing a needed address varied from .62 to .45 depending upon the time of year.* Because of its particularly transient population, the Berkeley Police Department chooses to rely exclusively on information provided by the phone company.

Payphone Listing

Every Alameda PSAP is provided a quarterly reverse listing of the public payphones and published semi-public payphones in its jurisdiction. The need for such a report was identified by the San Leandro PSAP immediately after system cut. The city was plagued with prank 911 calls by children at payphones. PT&T agreed to provide it quarterly for a programming charge of \$1,100 until ALI is available.

The payphone listings (6,000 public and 2,000 semi-public throughout the County) have proven particularly useful to all the PSAPs. Beside deterring street corner prank calls, it has made the agencies more able to respond to street crime victims, strangers, and other payphone users. If PT&T's payphones did not have readily recognizable numbers (XXX-9XXX), the listings would be much less useful.

Trace Requests

The terms "trace" and "trace request" are colloquially used in Alameda County for obtaining address information for a known phone number from the phone company. Since it does not involve the time consuming examination of switching equipment, it is a misnomer.

The very low usage of ANI for traces is generally ascribed to the difficulties and uncertainties encountered with that course. Requests are handled differently depending upon the time of day and day of week:

- 1) During normal weekday business hours, a call to PT&T Security's Listing Room will usually provide an address within 3 to 5 minutes;
- 2) When the phones are switched after 5 p.m. and on Saturdays, the requests are fielded by a records center, which has no records of its own. It must call the appropriate Plant Service Center and request

a check of the line files. Twenty minutes is typical;

- 3) On Sundays, holidays and after 10:30 on any night, the PT&T records center may have to decide if the need justifies the \$125 cost of calling an employee back from home in order to open up the service center. Some two hour traces have occurred under those circumstances.

The project office inquired whether the after hours record center could be given the same microfiche files as security's listing room. It was informed that PT&T had already considered such a suggestion and had adopted a definite policy opposing it. In St. Louis such information is always available from a computerized work station. Presently 25 requests are handled each day - a per call rate ten times greater than Alameda's.

Number Analysis

As previously noted, the tell-tale 9 in a payphone's number is useful in alerting the answerer to that situation. The ANI's prefix is also useful at larger PSAPs, since it permits the answerer to orient himself to the caller's particular exchange. Inconsistent addresses can be challenged in order to catch errors or mischief.

Impact on 911 Usage

Part of the smoothness of the Alameda implementation was due to the initial surge of curiosity traffic being much smaller than other large systems had experienced. Although this was in part a product of a deliberately low key publicity effort, news stories on television, as well as the papers, tended to feature the PSAP's ability to return abandoned calls as much as using 911 only for emergencies.

There is little doubt that the accountability of ANI results in 911 calls being more likely of emergency character. It has become a standard procedure at all (non-ACD) answering points to give 911 priority over any 7-digit number.

Economy

ANI circuits are not only less costly than the called-party-hold variety, but can be used in several ways in which

that old 911 standard can not be:

- 1) They can be concentrated for reduced network costs and smaller station equipment requirements;
- 2) They can be used with automatic call distributors for more optimal center manning; and
- 3) They can be used in conjunction with selective routing.

Though an ANI circuit may be less costly, ANI service may not. At present, ANI without selective routing is only being offered by the Bell companies as a variant of E-911 and at prices (\$40/1000 main station/month plus display equipment costs) that exceed Alameda County's payments during the trial for ANI and selective routing.

Such systems have been implemented in Sedgewick County, Kansas, Baltimore County, Maryland and Jackson, Mississippi. With ANI's many advantages, it seems certain that many other ANI-only systems will be installed regardless of price.

TRANSFER CAPABILITIES

There were two significant design changes in the course of implementing the Alameda 911 system. The lesser, from an operational sense, was the decision to use one ESS and an interfaced 3A processor (a minicomputer) instead of two ESS for the selective routing function.

The original decision to use two ESS machines had been made on the basis of the ESS' poor input-output capabilities. It can only read slow speed paper tape and there wasn't enough time in a day to update an ESS with all of the County's phone changes. The 3A processor not only had good magnetic tape capabilities, its memory was far cheaper than the ESS' twister boards. Although important from an economic and maintenance standpoint, the decision to use a 3A did not greatly impact answering point operations.

The bigger change was the decision in late 1975 to home all answering points on the selective routing ESS(s) and eliminate the dedicated transfer circuits between a police department and its fire department. While this required longer circuits to the secondaries, the simpler ESS-based network transfer offered many advantages. Standardized answering point equipment could be used, since PSAPs would not have to outpulse ANI on a transfer (the ESS would keep it handy as long as the call was alive). Existing and proven Centrex conferencing and transferring features could be utilized. After initializing a transfer in the conference mode, the initiator could drop off when not involved, thus freeing his 911 trunk for another inbound call.

Operationally, transferring is the preferred way of handling a 911 call. It is less time consuming than relaying a message; it eliminates the possible introduction of errors; and it permits the directly involved parties to have a dialogue.

With the switching capabilities of the ESS, any answering point could rapidly transfer to any other answering point homed on it (or, without ANI, to an answering point on the other ESS). If both points were ANI-equipped, the ANI would also be transferred. This greatly reduced the problem of handling default-routed 911 calls. When it was established that a default-routed call actually belonged

911 TRANSFER SPECIFICATIONS

FOR ANSWERING POINT: BERKELEY POLICE (004)

Dial No.	Button	Agency	Phone # *
21	1	BERKELEY P	911T(18)
22	2	ALBANY P	911T(02)
23	3	OAKLAND P	911T(06)
24	4	UNIV. CALIF. P	911T(03)
25	5	CALIF. H. PATROL	658-9111
26	6	BART P	893-8810
27	7	E. B. REG. P	911T(09)
28	8	EMERYVILLE P	911T(05)
29	9	EL CERRITO P	237-2123
30	0	RICHMOND P	237-7000
31	1	F. B. I.	845-7288
32	2	AL. CO. SHERIFF	911T(08)
33	3	U.S. COAST GUARD	556-5500
34	4	BAY BRIDGE TOLL PLAZA	464-1148
35	5	PT&T SP. AGENT	556-2422

- 1961 -

Dial No.	Agency	Phone # *
36	ALTA BATES H	845-7110
37	HERRICK MEM. H	644-6878
38	CHILDRENS H	654-5600
39	AL. CO. H	534-8055
40	PG&E	232-6438
41	CONTRA CO. CO. S.	935-2474
42	SAN FRANCISCO P	553-0123
43		
44		
45		
46		
47		
48		
49		
20		

Prepared by: _____

Figure 4.

Use "911T" for 911 Trunk

to an adjacent PSAP, it could be directed there quite rapidly. Even when the 3A was not available for an entire weekend and all traffic was default routed, no problems were reported.

Each 911 answering point could specify forty destinations it wished accessible by dialing a two-digit code. Six of these destinations would also be available by depressing a single button in the selector console. The 911 trunks to neighboring answering points could be accessed by such transfers and only by such transfers since those trunks were not accessible from stations off the network. Figure 4 shows the assignments chosen by the Berkeley Police Department.

In addition to the two-digit and one-button transfers, an answerer can conference and then transfer a call to any known telephone number in the DDD network. Since all "off-net" transfers would result in billable message units or long distance charges, the project office pessimistically budgeted \$700/month for the first year. After two years of operation the charges have yet to exceed \$125/month.

E-911's "selective transfer" feature was available with use of the ESS but was not required in Alameda County. None of the fire service jurisdictions cross PSAP boundaries. Furthermore, there was concern that not knowing the specific destination of a "FIRE" transfer might be an operational liability. The two buttons on the selector console reserved for selective transfer purposes were innovatively used for other purposes throughout the system.

"Button 7" accesses a cautionary recording intended to facilitate the handling of chronic non-emergency callers. Its message: "911 is an emergency telephone number. Non-emergency use hampers the system and is a state misdemeanor." For many reason, including the slight delay in accessing it, reported use is nil.

Spanish Translation

The Spanish translation capability was added because of a California law that a 911 answering point provide bilingual service if 5% or more have a differing "mother tongue". As shown by Figure 5, five answering points exceeded the 5% threshold. While most had some bilingual employees, none were able to schedule one always present. After considerable investigation, the project office was able to arrange for emergency Spanish translations with Eden Area Information and Referral, Inc. That organization already had a contract with the County for supplying bilingual assistance in the area of

SPANISH "MOTHER TONGUE" DATA for ALAMEDA COUNTY and its CITIES

(All data from U.S. Dept. of Commerce, Bureau of Census' General Social and Economic Characteristics, PC(1)-C6 California, April, 1972.)

City or Area	Total Population	Spanish as a Mother Tongue		Total	% of pop.	Over 5%
		Native	Non-native			
<u>OVER 50,000:</u>						
Alameda	70,952	2,688	502	3,190	4.49 %	
Berkeley	116,691	2,595	1,104	3,699	3.17 %	
Fremont	99,682	5,623	1,076	6,699	6.72 %	x
Hayward	93,093	7,871	1,685	9,556	10.26 %	x
Oakland	361,607	15,028	5,999	21,027	5.81 %	x
San Leandro	68,698	3,758	867	4,625	6.73 %	x
	(810,723)			(48,796)		
<u>OVER 10,000:</u>						
Albany	14,674	-	-	671	4.57 %	
Livermore	37,703	-	-	1,274	3.38 %	
Newark	27,145	-	-	3,183	11.72 %	x
Piedmont	10,917	-	-	125	1.14 %	
Pleasanton	18,328	-	-	712	3.88 %	
Union City	14,797	-	-	4,673	31.58 %	x
	(123,564)			(10,638)		
<u>OTHER CITIES:</u>						
Emeryville	2,683	-	-	est. 121	4.49 %*	
UNINCORPORATED CO.	136,214	-	-	7,367	5.40 %	x
TOTAL COUNTY	1,073,184	-	-	66,922	6.23 %	(X)
<u>OTHER AREAS:</u>						
Castro Valley	1,142/44,812	=	2.55%			
Dublin	463/13,641	=	3.39%			
San Lorenzo	990/24,597	=	4.03%			
<u>OTHER MOTHER TONGUES:</u> English: 72.5%; French: 1.1%; German: 2.7% Other: 17.4%						

* Since no mother tongue data on Emeryville is available, average of Oakland and Berkeley rates has been used.

Information and Referral. As shown by Figure 6, usage has gradually increased to six calls a day, or one for every 11,000 with Spanish mother tongue. High off-hour usage indicates that many answering points use it principally in a backup mode.

Traffic Diversion

While making scheduled engineering changes on the common PSAP equipment, the phone company was able to divert the incoming 911 traffic to the answering points' regular 7-digit emergency trunk group so that no calls would be lost. When all trunks to the University of California's PSAP went out due to a power failure, traffic was diverted to the City of Berkeley within 5 minutes. With the possibility of making such changes on an impromptu basis, the public safety agencies felt no need to arrange for night-switch disaster capability.

Secondary answering points are identical to PSAPs from both an equipment and network standpoint. They are secondary only because they perform no initial answering. This need not be so. A particular phone number or address in Oakland could be arranged to selectively route to the fire department instead of the police department. Though not attempted with the trial, such arrangements might be justified where fire and/or medical hazards enormously exceed the potential need for police assistance. The latter would still be available on a transfer basis.

The ability to route 911 traffic to seven digit trunks during scheduled maintenance obviously demonstrates a capability for selective routing to regular business lines; either in an overflow mode or on a full-period basis.

Excellent public safety communication facilities had already existed in Alameda County. In addition to adequate radio and several interagency hotlines, a County-owned microwave-based telephone network links all police and fire communication centers. Despite these existing facilities for relaying calls, the transfer capabilities are uniformly cited by PSAP personnel as one of the major day-to-day benefits of the system.

DAILY SPANISH TRANSLATION TRAFFIC

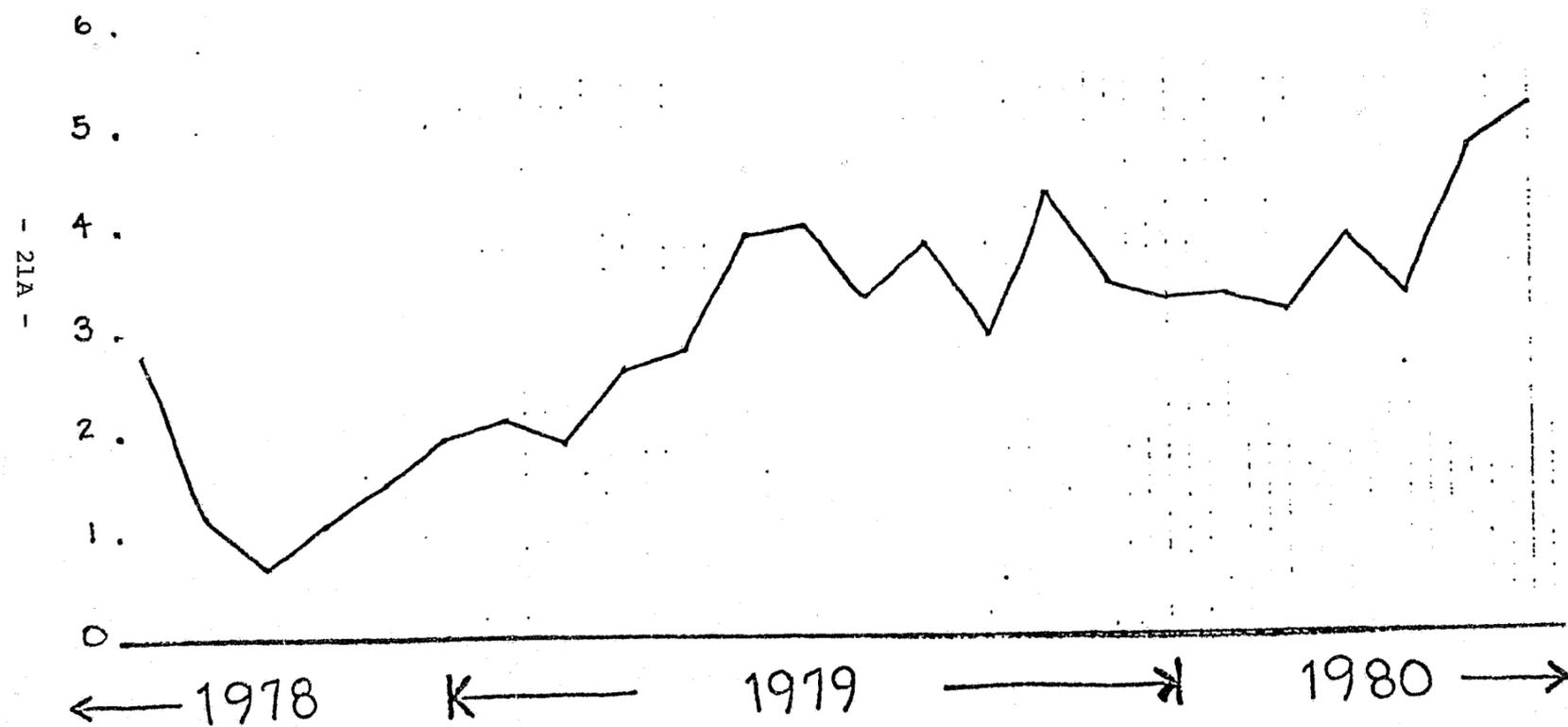


Figure 6.

AUTOMATIC CALL DISTRIBUTOR

The Oakland Police Department was the only agency with an ACD (automatic call distributor), either before or after 911's installation. Its Bell 2B ACD was expanded to two gates for 911: An emergency, or "red" gate for 911 and 7-digit emergency traffic; and a "blue" non-emergency gate for calls to 273-3481, the police department's catch-all number for non-emergency matters. Originally, the call answering positions or turrets were allocated as follows: 5 positions on the red gate; 2 positions on the blue gate' and 5 positions which could select the red or blue gate, depending upon the work load. Subsequently, all positions were made switchable with blue and red lights to show queued calls. Several items were peculiar to the ACD operations and the intermixing of the 911 calls with the existing 7-digit emergency number traffic.

The only indication as to whether a "red" call had been made to 911 or the old 7-digit number (273-3211) was the presence or absence of an ANI display. If an ANI was displayed, the operator would answer "Oakland Emergency", otherwise "Oakland Police". More important that the salutation* was what transfer capabilities could be used. A 911 call for the Highway Patrol or the Oakland Fire Department could be transferred, whereas a 7-digit call would require a relay of the information. Many ACD systems offer "origin announcement" as an option. This gives the answerer a brief recorded announcement regarding the call's origin. A distinctive tone before the 7-digit calls would have been useful.

A second consequence of intermixing 911 and 7-digit on the same gate concerned answering priorities. Although the O.P.D. adopted a policy of giving all emergency calls equal priority, there was really no practical option without a more sophisticated ACD.

A significant flaw with the ACD used at Oakland is loss of ANI upon caller hang-up, rather than operator hang-up. Though contrary to contract specifications, this shortcoming at the Oakland PSAP was not considered bothersome by the operating personnel. They would routinely key the ANI into their computer assisted dispatch terminal at the very beginning of the conversation. If necessary, they could always examine the logging teletype in the next room.

Another 2B limitation is the inability to tabulate very short calls. During the first week of 911 operations, many

*"Oakland Emergency" is now used for both circuits.

very brief and abandoned curiosity calls were made right after TV news stories. These calls were tallied by the logging teletype even if abandoned before ANI transmission was completed. Still, half were missed by the ACD which counts on a sampling basis.

Because Oakland's ACD operators had no 911 circuit buttons, they were unable to place a less urgent 911 call on hold in order to answer another 911 call. Oakland accommodated this by specifying two additional rapid transfer capabilities:

- a) A transfer to the non-emergency 273-3481 (which might have been more appropriately used in the first place);
- b) A transfer to a set of unpublished "holding numbers" which did appear on each answerer's console.

Both transfers free up an incoming 911 trunk. With "a" the caller gets a brand new answerer; with "b" the original answerer may resume the conversation or a second answerer may take the call, aware that the citizen has been put off once.

EQUIPMENT RELIABILITY

Considering the trial nature of the installation, there were remarkably few problems encountered with the station equipment. The only design error requiring repair involved the selector consoles. Due to an undersized capacitor, the ANI displays would generate only partial phone numbers when overheated. Almost immediately after the problem was first encountered at the Oakland PSAP, the standby Bell Labs test center in Holmdel, NJ was able to correctly diagnose the flaw and prescribe a fix. Within the next two days all seventy-five selector consoles in the County were field-corrected.

During the first year of operation the Oakland switching center made tabulations of 911 circuit and equipment malfunctions as reported to the plant service centers. Report tabulations for the period of 11/13/78 through 3/18/79 showed the following:

ESS to PSAP trunk repairs (87 trunks)	6	(87)
PSS Cabinet components replaced	3	(21)
Selector Consoles Replaced	7	(75)
Logging Teleprinter problems	5	(21)
Conventional station equipment repairs	6	(21)
Other and "no trouble found" reports	6	--
	33	

The logging teleprinter problems were a direct result of the project having ordered very inexpensive (\$37.50/month) but light duty R033 Teletypes. Continuously and noisily cycling, the printers were taxed beyond their designed duty cycle. PT&T subsequently equipped each with an idle line motor control with excellent results.

The ESS to PSAP trunk outages were almost always detected as the result of programmed test calls automatically generated over every trunk every day. Malfunction counts on the end office to ESS trunks were not tabulated.

A cabinet component malfunction at the City of Newark produced some unusual consequences. Each one-button-transfer action was interpreted as though the adjacent button had been pushed. Until the offending circuit was replaced two days later, Newark relied upon the two-digit equivalents.

In March of '79, each PSAP control box processor program was upgraded with a maintenance package having several advanced features. One permitted operating personnel to display and adjust the computer's clock so that the logging teletype times would be synchronized with other communication center clocks. More important from a reliability standpoint, another routine would continually perform diagnostic tests. In the event of solid or repeated marginal failures of any component, the program would preserve the results and generate an audible alarm. The responding repairman could then access the trouble data (using an ANI display as a maintenance console) and greatly speed the repair.

Trouble Reporting

For the cut-over, a special phone number to the PT&T Cut-Over Supervisor was distributed to answering point supervisors in case they were experiencing serious problems. Within a week the existing procedure of directing all trouble reports to the regular "611" number was established. An immediate and long-persisting complaint was that the Plant Service Center operators seemed uninformed about the emergency nature of 911 in general and the special answering point equipment in particular. At a Users Task Force meeting, PT&T representatives suggested that a supervisor be routinely asked for when reporting 911 difficulties. Adopted by most answering points, this practice has proven satisfactory.

Phone company responsiveness to trouble reports was complained of on three occasions during the twenty-four month trial period. The PT&T Operational Plans manual pointedly omitted maintenance commitment times with the note that they would be determined at the conclusion of the Alameda Trial. Most Users believe that standards better than those for commercial service could and should be set for the emergency phone system.

SYSTEM USAGE

The preliminary study for Alameda had projected system usage of 2,843 calls per day. This was a conservative rate of 2.6 calls per 1,000 capita (Seattle had suggested 2.5). That estimate was made for a mature system on which the migration to 911 was substantially complete.

For Oakland the migration is still going on as shown by Figure 7. Significant factors affecting the migration picture include the following:

- 1) Aside from the news stories announcing 911 immediately following the July 9 cut, publicity was low key in Oakland. Telephone bill inserts were distributed in late August and 911-EMERGENCY decals did not appear on Oakland Police cars until December;
- 2) Telephone directories with 911 and without the old number were not distributed until June, 1979;
- 3) Calls transferred by the "0" Operator continue to arrive on 7-digit and not 911 trunks.

Based on totals from their logging teletypes, other answering points claimed more rapid migration due to their local publicity programs.

In addition to the logging teletypes, arrangements had been made during implementation for call count data to be collected by PT&T, both at the originating central offices and at the selective routing ESS. There was no apparent difficulty during the first month of operation, although some end offices had been tabulating on an 8a.m. to 8 a.m. basis, rather than at midnight. Other unmanned offices were having to aggregate Saturday and Sunday counts - something which did not bother the project office, since arrangements had been made for hourly totals to be recorded at the ESS. What was overlooked was getting a commitment from PT&T's 911 Coordinator that any of the traffic data being collected for the national trial would be released to the 911 Project Office.

The contract simply stated that the phone company would take monthly measurements to verify the actual grade of

service and provide the County with an "appropriate" report-expedient phrasing which did not concern the County at the time. It acknowledged the phone company's much greater experience in that area, and had been proposed by a respected PT&T engineer.*

Frequent verbal reports were received during the first months of operation. Nevertheless, a request for traffic data resulted in only a statement that the system was operating "well within the contracted levels of service". It and two others during the two-year trial are included in Appendix I.

Figure 8 shows county-wide 911 traffic for portions of eight days. Based on unreleased telephone company data, it indicates a calling rate of 1,758, only 62% of the original projection.

*Mr. Robert Kohn, who had proposed both use of the 3A processor and the ESS switching of transfers between all answering points.

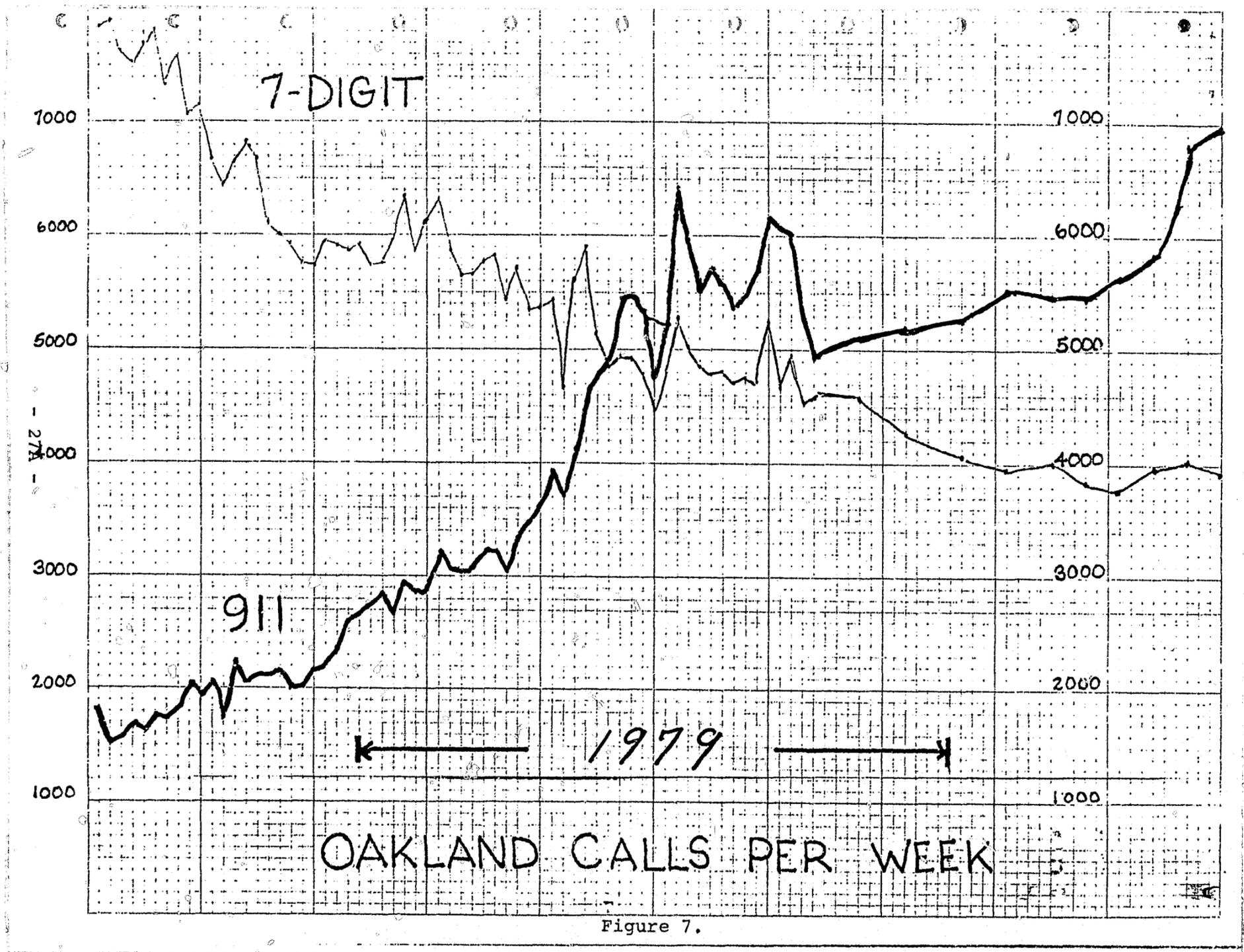


Figure 7.

ALAMEDA COUNTY 911 CALL VOLUMES BY HOUR OF THE DAY

Hour of Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Friday																		98	96	97	80	83	90	101
Saturday (1822)	87	65	73	51	36	30	19	25	32	58	67	89	82	104	68	97	108	115	101	81	103	112	97	122
Sunday (1781)	118	85	100	53	41	38	27	23	24	43	61	53	68	79	86	95	93	93	100	125	74	106	85	111
Monday	36	46	45	17	24				48	58	60	72	71	82	86	109	127	99	86	100	88			
Tuesday									52	49	45	58	74	66	70	88	106	116	113	79	89			
Wednesday									51	45	60	57	79	122	90	98	101	100	95	92	65			
Thursday									66	70	67	68	52	71	77	95	107	123	109	97	92			
Friday									54	53	72	86	104	96	72	110	112	107	130	140	131			
Hourly Average	80.3	72.7	33.7		23	46.7	61.7	75.7	78.4	107.7	103.8	90.3	90.7											
	65.3	40.3	34		24	53.7	69	88.6	98.9	106.4	101.4	100.3	111.3											
Total Hourly Average	1,757.9																							

FOR 125 HOURS DURING 5/30/80 - 6/6/80

Figure 8.

REFERENCES

1. G.E. Barker, T.I. Dayharsh, S.C. Ivy, T.J. Yung, R.E. Bratsberg, An Assessment of the Implementation and Operation of 911 with Selective Routing, Automatic Number Identification, and Automatic Location Identification in Alameda, California; SRI International, Final Report 7543-80-FR-114, under Contract J-LEAA-010-8 (September 1980)
2. Hovey, Scott W. Jr., Study for Alameda County 911; Final Report, Law Enforcement Assistance Administration, Grant No. 73-NI-99-0059G (October 1974)
3. Transcomm, Inc. An Analysis of 911 Emergency Telephone Service and Tariffs; Final Report, U. S. Department of Commerce, Contract No. NT79SAC00038 (February 1980)

APPENDIX I

Selected Correspondence Between the Alameda County 911 Project and PT&T

	<u>From</u>	<u>Date</u>	<u>Subject</u>
A-1	County	11/3/76	\$1,564,000 estimate
A-2	PT&T	12/16/76	Response with \$1,231,000 projection
A-3	County	2/7/77	Non-tracking engineering costs
A-4	PT&T	3/17/77	Rejection of cost limit and \$1,205,000 projection
A-5	County	4/19/77	Request to renegotiate fixed \$20,000/mo.
A-6	PT&T	5/9/77	Response to A-5
A-7	County	12/9/77	Request for hypothetical tariff pricing
A-8	PT&T	1/6/78	Response to A-7
A-9	PT&T	8/4/78	Post-cut cost estimate
A-10	PT&T	12/6/78	Level of service reports (3)
A-11	PT&T	2/12/79	Authorizations to release data to State of California and SRI International (2)
A-12	County	6/2/80	Increase to \$38,320/mo.

November 3, 1976

Mr. James I. Foster
Pacific Telephone & Telegraph Co.
140 New Montgomery Street, Rm. 2405
San Francisco, CA 94621

Dear Mr. Foster:

Several estimates of the cost of the Alameda 911 system have been made. In April of 1974, PT&T quoted a fixed price of \$970,000 to install a Selective Routing/ANI system with a recurring monthly charge of \$22,000. Fixed cost estimates for three other advanced and two basic systems were also provided at that time. In February of 1975, the County suggested increasing the fixed price to \$1,022,343 to reflect a minor circuit addition + a 5% cross-the-board increase for inflation. This figure was the amount in mind when a maximum-cost clause was first considered for our present contract.

In November of 1975, PT&T provided an estimate of \$1,063,000 including the \$40,000 administrative fee with a range of \pm 18% (\$867,900 to \$1,258,100). As indicated on the attached sheet, these costs were broken down by Transmission System (\$904,000) and Data System (\$119,000).

During my October 13 meeting with Bud Walker, I did not specify which of these two estimates I wanted detailed since they varied by less than \$700. I was not interested in the five unpersued configurations priced in 1974 but only the one selected for the contract.

During the contract negotiations in August of '75, PT&T recommended ESS transfer switching because of the greater flexibility and the need to build only one type of station gear for all of the answering points. In the several PT&T briefings to the County on the effect of this change, any increase in cost was dismissed as being negligible. That change and the reclassification of East Bay Regional Parks as a PSAP were the only changes in configuration which occurred before contract signing.

My request for the detail of either the '74 or '75 estimates was based on the assumption that the switching and transmission costs were still reasonably valid since they had been made with a much higher degree of confidence than the data management system. Contrary to your letter, the ESS

A-1

Mr. James I. Foster
November 3, 1976

Page 2

answering system is still identical with respect to the end office modifications, the number of ANI displays, the number of trunks to the ESS'S, etc., that are needed. I had three reasons for wanting the detail on October 13:

- PT&T has proposed a certain level of billing detail, at no additional cost, in lieu of what I requested at our July 29 videoconference. In order to pass upon the acceptability of the proposed level, I need to know what will be the areas of relative financial significance.
- Several alternative answering point configurations are still under consideration, such as a separate CMED, various police and fire dispatching consolidations, and even some joint municipal operations. In order to provide even preliminary cost impacts, I need to know the estimated costs of a PSAP, an answering position, etc.
- Because of the users' apprehension over the adequacy of the trunks, broad estimates of the ESS-to-PSAP trunk costs are necessary for the purpose of evaluating additional trunks versus tightening 911 call criteria.

Since my discussion with Bud, I had an opportunity to total the "Estimated Monthly Charges to Implement 911 in the County of Alameda" report and was shocked to find that the switching and transmission estimates had sky-rocketed from the \$904,000 of November '75 to \$1,564,000.

I now desire the substantiating detail for the switching and transmission portions of both the original '74 (or '75) estimate on which the contract was based and the estimated monthly charges to Alameda County which will have to be paid under the contract.

In particular, I wish to know the cost and any estimating formula used for:

- a. End office modifications (exclusive of the cost contractually to be absorbed by PT&T).
- b. The end office-to-ESS trunks.
- c. ESS modifications.

(A-1)

Mr. James I. Foster
November 3, 1976

Page 3

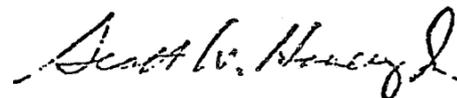
- d. ESS to PSAP trunks.
- e. The common answering point logic devices.
- f. The ANI display and other position related costs.

My previous reasons, though still valid, are obviously secondary to finding out why the switching and transmission cost estimates have gone up 73% in a twelve month period. Such an increase, if accurate, may jeopardize the entire program and certainly will affect the timing and amounts of further federal funding.

I am now requesting this information under the Access to Records paragraph of the contract since it is directly pertinent to the amounts that will be paid under its terms.

In order to get a clearer picture of these estimated costs prior to entering agreements with the participating cities, I would like to have this information by the end of the month.

Sincerely yours,



Scott W. Hovey, Jr.
911 Project Director

SH/tg

Attachment

(A-1)

THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY

140 NEW MONTGOMERY STREET • SAN FRANCISCO, CALIFORNIA 94105
AREA CODE 415 421-9000

December 16, 1976

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 94607

Dear Mr. Hovey:

Your letter of November 3, 1976 asked the critical question of why the increase in the installation charges of the switching and transmission system that was reflected in the billing schedule sent to you in August, 1976. To answer your questions and satisfy ourselves regarding the cost of the Alameda System, we have redone the 1975 cost study. In conjunction with this study, we have also carefully reviewed the billing schedule sent to you.

The results are summarized by the following:

1. The August billing schedule is incorrect. A revised schedule is included as Attachment A.
2. Our current study indicates the estimated charges provided to you in November, 1974 were "in the ball park". Attachment B summarizes the expected charges for the Alameda E911 System.
3. Attachment C indicates the reduction in the monthly recurring cost to operate the switching and transmission system with one ESS and a 3A Processor.
4. The breakdown you requested is used for all charges shown.

As you are well aware, parts of this E911 System are still in the design stage. In this type of situation, many of the costs used are estimates and will continue to be until the equipment is manufactured and installed. Consequently, we cannot guarantee a specific set of charges.

The costing methodology used in both studies was the same except for some labor expense estimates. Attachment D is the current study. The basic difference between 1975 and today is the use of the 3A Processor with one ESS tandem. Attachment E is a copy of the 1975 study.

A-2

The billing schedule sent to you on August 24, 1976 is replaced by the one attached to this letter (Attachment A). The August billing schedule did not include all costs associated with the data management system and included excess costs associated with the switching system. The attached schedule reflects the charges in Attachment B. This is our best estimate (although still an estimate) at this time.

As mentioned, this quote reflects the use of one ESS tandem and a 3A Processor. You indicated a desire to know the impact on the estimated cost resulting from this change. These changes are identified in Attachment C. The use of the 3A Processor will result in an estimated net reduction of \$1,325.00 in the monthly recurring charge for the switching and transmission system.

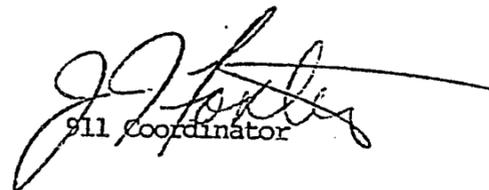
The price to the County for any changes in the system will be determined by a study of the costs of such changes. Utilizing the attached studies to estimate the cost of desired changes in the E911 System could be very misleading.

Attachments D and E are proprietary information of Pacific Telephone and Telegraph Company in the meaning of Paragraph 3 of the Alameda contract. These two studies are being provided to meet your needs relative to funding questions and Monday's meeting. We would appreciate their return as soon as possible.

In the future, when requests are made for material that is of a proprietary nature to Pacific Telephone, I will request that the material be reviewed here at 140 New Montgomery Street, San Francisco. The material and space to review it will be provided for the time required.

The information contained in this letter and the attachments answers the questions in your letter of November 3. If you have any questions prior to Monday's meeting, please give me a call.

Sincerely,


911 Coordinator

Attachments

(A-2)

ESTIMATED COST REDUCTION RESULTING FROM USE OF 3A PROCESSOR

<u>System Component</u>	<u>Annual Cost Changes</u>
End Office	-
End Office to ESS Trunks	- \$700
ESS Tandem	-15,300
ESS to PSAPs Trunks	+100
PSAPs	-
Data Management System	-
Net Change	<u>- \$15,900</u>

(A-2)



ALAMEDA COUNTY 911 TRIAL

100 Webster Street • Suite 104 • Oakland, California 94607 • (415) 874-7431

Scott W. Hovey, Jr. • Project Director

February 7, 1977

Mr. James I. Foster
911 Coordinator
Pacific Telephone Company
140 New Montgomery St., Rm 2405
San Francisco, CA 94621

Dear Mr. Foster:

Last week we received a bill for December charges in the amount of \$12,422.36 - \$11,830.82 for general engineering and \$591.54 for administrative fee. This is completely out of line with the projected schedule of payments you presented on December 15.

Cost Period	12/15 Payment Schedule	Actual (less fee)	Cumulative Sched.-Actual
Thru April '76	\$48,000	\$47,872.80	\$ 127.20
May	4,000	4,269.84	(142.64)
June	5,000	4,608.45	248.91
July	2,000	1,912.04	336.87
August	5,000	5,029.28	307.59
September	3,000	2,966.44	341.15
October	5,000	2,409.75	2,931.40
November	2,000	4,107.55	823.85
December	2,000	11,830.82	\$ (9,006.35)
	<u>\$76,000</u>	<u>\$85,006.97</u>	

The \$85,000 billed for engineering is more than half again as much as the Telco Engineering Costs identified in the "Installed Costs" tabulation in your December 1976 cost study.

You agreed at the December 20 review meeting to provide a revised breakdown of amounts already billed which would identify the County's share (36%) of the 911 project coordination charges. When I repeated the request in mid-January, you said that there might even be a credit coming to the County. Since even the projected billing schedule will require an additional \$91,000 appropriation this fiscal year, it is essential that we realize any credit and get future billing on track as soon as possible.

Yours truly,

Scott W. Hovey
911 Project Director

A-3

THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY

140 NEW MONTGOMERY STREET • SAN FRANCISCO, CALIFORNIA 94105
AREA CODE 415 421-9000

March 17, 1977

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 95607

Dear Mr. Hovey:

Per agreement at the Financial Committee meeting on December 20, 1976, Pacific has reviewed the Alameda cost study and considered the advantages and disadvantages of modifying the contract to reflect actual cost with a maximum limit.

As we anticipated, the PSAP costs decreased with a slight increase in ESS tandem costs. The net change in installation costs is a negative \$114,000. Annual costs increased \$3,000. Attached is a revised "Installed Costs" sheet which can be compared to the one from the 1976 cost study to itemize all changes. Also attached is a revised "Estimated Charges for the Alameda E911 System".

A brief review of the history of negotiating a price for the Alameda E911 System provides a basis for our decision on a maximum price. At one point during contract negotiations, Pacific and Alameda had agreed on firm prices for both installation and annual operations. At the request of LEAA and Alameda, three prices were changed to an actual cost basis, with the annual charges for the switching and transmission system being fixed in the contract, at \$20,000 per month. In November, 1975 Pacific provided its latest estimate of costs with plus and minus ranges. The contract was signed in May, 1976 with the above information having been considered by both parties.

In addition, to insure success of the trial and to assure Alameda that it will benefit monetarily from Pacific's experience gained from the trial, we are prorating only 36 percent of the project coordination charges to Alameda.

We believe the estimated costs reflected in the attachments will be subject to smaller variations than previously. This is due to more accurate costs based upon more complete design information and detailed engineering. The current estimate is well within the range reflected in the November, 1975 quote.

A-4

Based upon these facts, Pacific can find nothing to support offering a maximum price commitment to Alameda. Pacific has already taken extra steps to insure Alameda is charged only for their share of the E911 System. However, if there are strong reasons supporting a maximum price commitment that we have overlooked, please identify them in correspondence and the decision will be reviewed.

We have attached our current schedule of estimated amounts to be billed and their estimated billing dates. Some of the nomenclature has been modified for clarification. We have also combined items III and IV because they are both included in Western Electric's billing to Pacific and hinge upon ship dates. We have also added item XII. It includes a cumulative total to be billed and a cumulative total billed.

If there are questions I can answer, please give me a call.

Sincerely,

J. Foster
911 Coordinator

Attachments

(A-4)

ESTIMATED CHARGES FOR THE ALAMEDA E911 SYSTEM

<u>System Component</u>	<u>Installation Charges</u>	
	<u>1976</u>	<u>1977</u>
End Office	\$ 43,000	\$ 44,000
End Office to ESS Trunks	-	-
ESS Tandem	576,000	696,000
ESS to PSAP Trunks	-	-
PSAPs	542,000	304,000
Data Management System	118,000	121,000
Total	\$1,279,000	\$1,165,000

<u>System Component</u>	<u>Annual Charges</u>	
	<u>1976</u>	<u>1977</u>
End Office	\$ 19,000	\$ 19,000
End Office to ESS Trunks	23,000	23,000
ESS Tandem	53,000	57,000
ESS to PSAP Trunks	18,000	18,000
PSAPs	46,000	44,000
Data Management Systems	186,000	187,000
Total	\$ 345,000	\$ 348,000

3/17/77

(A-4)



ALAMEDA COUNTY 911 TRIAL

100 Webster Street • Suite 104 • Oakland, California 94607 • (415) 874-7431

Scott W. Hovey, Jr. • Project Director

April 19, 1977

Mr. James I. Foster
911 Coordinator
Pacific Telephone Company
140 New Montgomery St, Rm 2405
San Francisco, CA 94621

Dear Mr. Foster:

The County was glad to receive your March 17 estimate for the Alameda 911 system showing an implementation cost (including the \$40,000 administration fee) of \$1,205,000 which is within 13% of the November '75 estimate. The County and the Finance Subcommittee share your hope that the costs will be subject to smaller variations than previously and will forgo pursuit of an overall cap at this time.

Your letter stated that the contract was converted from a fixed price to an actual cost basis at the request of LEAA and the County. This is not correct. Early in the negotiations Art Graham announced that PT&T would not execute a fixed price contract until it had much greater confidence in the Data Management System estimates - something which would require the actual designing of that portion and a delay of many months. It was then mutually agreed to switch to a cost reimbursible basis. Recurring switching costs were kept on a fixed price basis because PT&T expressed much greater confidence in its ability to project them.

In that regard, your attached Estimated Charges For the Alameda E911 System shows \$161,000 in estimated annual charges for the switching subsystem. This is one-third less than the \$20,000 a month in the contract and undoubtedly is a result of the subsequent decision to use the more economical 3A switcher. The reduced recurring costs of the 3A were a principal argument by PT&T for its adoption and a major factor in the County's willingness to use it. We therefore feel it proper to modify the \$20,000 figure at the same time the contract is changed to show the 3A configuration.

We believe that the figure should either be changed to \$15,000 a month or replaced by an actual cost not-to-exceed \$20,000 in any one month. The former would be a simple modification whereas specific language concerning the amount of advance payments, the method for computing adjustments, etc., would have to be developed for the latter.

I would appreciate PT&T's earliest consideration of this matter so that the long-pending contract modification can be concluded and a follow-on LEAA grant request prepared.

Sincerely,

Scott W. Hovey, Jr.
S.W. Hovey, Jr.
911 Project Director

cc: Mr. Zuppan
Mr. Enoch
Mr. Turner

A-5

THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY

140 NEW MONTGOMERY STREET • SAN FRANCISCO, CALIFORNIA 94105
AREA CODE 415 421-9000

May 9, 1977

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 95607

Dear Mr. Hovey:

We have considered your request to reduce the \$20,000 monthly charge as is now stated in the contract.

You suggested in your letter that the modification is proper due to a lower cost figure presented in my March 17 document entitled "Estimated Charges for the Alameda E911 System" and your prior decision to allow the use of the 3A Processor.

While we acknowledge the fact that it was our preference to change the system configuration in favor of the 3A Processor and did indeed anticipate some economies by its adoption, it was not done so solely for the purpose of possible cost reductions.

As you know, one of the most significant benefits of re-configuring the system and adopting the use of the 3A Processor is the resultant benefit of infinitely more flexibility with regard to transferring calls. Additionally, greater flexibility will be realized in the proper routing of Foreign Exchange service calls as well.

A large portion of the reduction in our latest estimate of charges was due to Bell Labs' current estimate of future PSAP terminal costs. We were pleased to see that those estimated charges were greatly reduced. However, we want to emphasize that all stated figures, as well as those for the 3A Processor, are still estimates and as such remain subject to change. Therefore, it is our firm conviction that the monthly dollar amount presently stated in the contract should remain. At some future date (prior to May 31, 1978), we will have cost data that should be more reliable than that which we have today and as such could renegotiate the monthly figure at that time.

A-6

Since the County will not be expected to pay the \$20,000 until after the system has been implemented in May of 1978, we feel that this is the more equitable and fair approach to both parties and should eliminate the possibility of another renegotiation at a later date.

Please be assured that Pacific Telephone will continue, as we have in the past, to give Alameda County every consideration with regard to cost of the trial system, but in order to avoid misunderstandings in the future with regard to revised quotations, we prefer to wait until we have more reliable cost data to support them.

Sincerely,

J. Foster
911 Coordinator

cc: L. Enoch
J. Turner
B. Zuppan

(A-6)



ALAMEDA COUNTY 911 TRIAL

100 Webster Street • Suite 104 • Oakland, California 94607 • (415) 874-7431

Scott W. Hovey, Jr. • Project Director

December 9, 1977

Mr. James I. Foster, 911 Coordinator
Pacific Telephone Company
140 New Montgomery St., Room 2405
San Francisco, CA 94621

Dear Mr. Foster:

This is to confirm the County's request at Monday's 911 Trial Advisory Committee meeting for information on the proposed 911 selective routing tariff and how, if filed, it would affect the PT&T charges for our system. We appreciate your willingness to provide it before January 6.

As you know, our present two year agreement is subject to any applicable tariff that is filed and PT&T plans to file a tariff for Sophisticated 911 before the eighth month of system operation.

It is our understanding that recent quotes for selective routing elsewhere in the State have been based on a tariff structure that has been adopted by the Bell System and with rate element charges that you may seek in the tariff. We realize that any filing is subject to PUC approval and may well result in rates that are lower or higher than you request. Nevertheless we wish to know your present intentions for:

- a. The tariff structure including rate and charge elements.
- b. The proposed charge for those elements (Recurring, Non-recurring, Basic-Termination and duration)
- c. The quantities of each element for the County's system as configured in the modified agreement.
- d. The cost basis of those rates and charges where that basis might be a factor in the PUC permitting a lesser charge for Alameda County.

Frankly, the County is very concerned that the ongoing charges for our system might be substantially more than the \$348,000 you recently reaffirmed as being our non-developmental costs on an annual basis.

Although the State might be expected to pay all of these charges under present law, there are strong feelings in many quarters that the State should mandate 911 in order to avoid the sort of financial disaster recently associated with BART. Because of the County's close involvement with BART and the impossibility of turning 911 off after it is implemented (or published in the phone book), it is essential that we get a better handle on 911's potential cost before turning it on.

Yours truly,
Scott W. Hovey, Jr.
Scott W. Hovey, Jr.

cc. Finance Subcommittee

A-7

THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY

140 NEW MONTGOMERY STREET • SAN FRANCISCO, CALIFORNIA 94105
AREA CODE 415 421-9000

January 6, 1978

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 94607

Dear Mr. Hovey:

This letter responds to the 911 Trial Advisory Committee's request of December 12 and your letter dated December 9.

As requested by the Advisory Committee, Attachment A is a hypothetical repricing of the Alameda E911 System (based upon our modified agreement) using the rates currently used in quotes for all other E911 systems. These are the charges Alameda would be quoted today to install E911, as described in the modified agreement.

Attachment B compares these charges with the March, 1977 cost estimate for Alameda in the same format used in my March 17, 1977 letter (the Installed Costs summary). This makes the comparison easier.

I indicated at the meeting that because of the uniqueness of our billing arrangement with Alameda for the E911 trial, my opinion was that Alameda would not automatically become subject to the tariff rates for E911. However, it must be recognized that the CPUC does have jurisdiction in the matter and could direct a different result. Attachment C explains the reasons why I believe Alameda should not be subject to E911 tariff rates.

You stated in your letter that our agreement is subject to any applicable tariff that is filed. It is our opinion that an E911 tariff will not automatically supersede our contract, at least, until it is terminated or expires (see the exception set forth in Sections 16 and 25 of the contract). Consequently, our E911 tariff filing will not result in an immediate impact on Alameda County's 911 charges.

At the present time the only 911 tariff adopted by AT&T relates to Basic 911. An E911 tariff is currently under development by AT&T.

A-8

Pacific, in conjunction with three other Bell Companies, has developed a set of rate elements for E911. Cost studies were prepared and rates developed which are currently being used to produce quotes for E911 systems in California. We are currently reviewing these rate elements and are going to generate cost studies for these modified elements in the first half of this year. These rate elements and rates will then be developed into a tariff structure.

Attachment B indicates the basic termination charges associated with standard rates. The purpose of a BTC is to recover that portion of capital investment normally recovered in annual charges in the event of service discontinuance prior to the end of the estimated location life. Again, since Alameda is paying its capital "upfront," you would not be subject to a BTC under tariff. If you terminate under the contract, Paragraph 10 is controlling.

In summary, it is our view that standard tariff rates would not apply to the Alameda E911 System as presently contracted for. They would apply to growth equipment and system modifications. At this point in time, it is impossible to identify the dollar change that might occur when, and if, Alameda becomes subject to an E911 tariff. Because of the special circumstances applicable to the Alameda E911 trial, it may be more appropriate that a new contract be negotiated for end offices, ESS tandem, PSAPs and DMS to commence with the expiration of the current contract.

Sincerely,


J. I. Foster
911 Coordinator

Attachments

(A-8)

ALAMEDA COUNTY E911 REPRICE SUMMARY

The following represents hypothetical charges for the Alameda County E911 System as if it were priced like any other system requesting an E911 System Quote. Station Selective Routing, Central Office Transfer, ANI Display, TTY Interface and Forced Disconnect are the E911 features provided.

	<u>Basic Termination Charge (BTC)</u>	<u>Non-Recurring Charge (NRC)</u>	<u>Monthly Recurring Charge (MR)</u>	<u>Annual Recurring Charge (AC)</u>
A. Common County Charges				
1. End Office to Tandem Trunk Groups (33)	\$122,100	\$ 122,100	\$15,230.40	(\$ 182,764.80)
2. Terminating Intertandem Trunk Groups (0)		(None Identified)		
3. E911 Tandem (1)	64,600	214,600	3,400.00	(40,800.00)
4. 3A Processor (1)	302,700	302,700	21,325.00	(255,900.00)
5. Data Management System (DMS)	97,600	298,900	20,740.00	(248,880.00)
6. Data Line from DMS to 3A Processor (1)	-	240	235.25	(2,823.00)
<u>SUBTOTAL</u>	<u>\$587,000</u>	<u>\$ 938,540</u>	<u>\$60,930.65</u>	<u>(\$ 731,167.80)</u>
B. Pacific Answering Locations (23)	\$207,230	\$ 213,445	\$25,271.70	(\$ 303,260.40)
<u>TOTAL (A+B)</u>	<u>\$794,230</u>	<u>\$1,151,985</u>	<u>\$86,202.35</u>	<u>(\$1,034,428.20)</u>

(A-8)

ALAMEDA COUNTY

3/77 ESTIMATE

HYPOTHETICAL REPRICE

<u>SYSTEM COMPONENT</u>	<u>BTC</u>	<u>NRC</u>	<u>AC</u>	<u>BTC</u>	<u>NRC</u>	<u>AC</u>
End Office	\$-	\$ 44,000	\$ 19,000	\$ 77,700	\$ 77,700	\$ 54,6
End Office to ESS Trunks	-	-	23,000	-	-	86,8
ESS Tandem	-	696,000	57,000	450,850	601,090	367,9
ESS to PSAP Trunks	-	-	18,000	-	-	63,2
PSAPs	-	304,000	44,000	168,080	174,295	212,9
Data Management System	-	121,000	187,000	97,600	298,900	248,88
TOTAL	\$-	\$1,165,000	\$348,000	\$794,230	\$1,151,985	\$1,034,42

BTC - Basic Termination Charge

NRC - Nonrecurring Charge

AC - Annual Charge

(A-8)

ATTACHMENT C

The key difference between Alameda E911 charges and quotes for other E911 systems is repayment of capital. Alameda is being billed for all capital, as the system is being installed (the nonrecurring charge). In standard rates, a portion of the Telephone Company's capital is recovered in the nonrecurring charge and the remainder in annual charges and/or a basic termination charge. The costs of recovering capital over time are depreciation, cost of money and income taxes. To the degree capital is recovered "upfront," the capital costs portion of annual charges is reduced. (Annual charges in standard rates also include recurring expenses such as maintenance, administration, property taxes, etc.)

Since we will have recovered all of the capital required to install Alameda within a month or two of the in-service date, we would not propose to charge Alameda that portion of the standard annual charge which would recover capital that Alameda had already paid. This analysis applies to annual charges for end offices, ESS tandem, PSAPs and DMS. It does not apply to facilities between end offices and the tandem and between the tandem and the PSAP, facilities for which Alameda paid no capital.

(A-8)



Pacific Telephone

140 New Montgomery Street
San Francisco, California 94105
Phone (415) 421-9000

August 4, 1978

Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 95607

Dear Mr. Hovey:

The results of our review of Alameda's cost is attached. This is the most detailed analysis to date. However, some of the cost input is still being evaluated to insure accuracy and applicability to Alameda.

Since we have taken so long on this review (for which I apologize), I am forwarding the results and the study itself for your review. I propose that after you review the information, we meet to discuss it and answer your questions. This meeting would include the Product Cost people who put the study together.

The following attachments are included:

1. Attachment A is a summary of results comparing our original 1975 estimate, our 1977 estimate, our February, 1978 estimate, and this estimate.
2. Attachment B explains the basic reasons for the change in cost for each item identified in the summary.
3. Attachment C contains the GE100 work sheets used to work up the costs. The format is different than we have provided in the past, and there are some changes in the costing methodology.

A-9

The changes make it difficult to readily compare the two studies. One objective in meeting with you will be to explain these changes. Also, not all the costs are billable to Alameda County.

Please give me a call and we'll set a date.

Sincerely,

J. A. Foster
J. A. Foster
911 Coordinator

Attachments

(A-9)

	<u>1975</u>	(000) <u>1977</u>	<u>1978*</u>	<u>1978</u>
Switching and Transmission				
End Office		\$ 44.0	\$ 45.0	\$ 93.2
End Office to ESS		-	-	-
ESS Tandem		696.0	659.0	751.8
ESS to PSAP		-	-	-
PSAPs		304.0	308.0	343.0
Subtotal	\$1,039.6	\$1,044.0	\$1,021.0	\$1,188.0
Data Management System	178.5	121.0	126.0	208.9
Total Installation	<u>\$1,218.1</u>	<u>\$1,165.0</u>	<u>\$1,138.0</u>	<u>\$1,396.9</u>

Switching and Transmission				
End Office		\$ 19.0	\$ 21.0	\$ 27.8
End Office to ESS		23.0	23.0	74.6
ESS Tandem		57.0	60.0	238.3
ESS to PSAP		18.0	18.0	54.3
PSAPs		44.0	48.0	82.2
Subtotal	\$ 240.0	\$ 161.0	\$ 170.0	\$ 477.2
Data Management System	182.5	187.0	223.0	271.0
Total Annual Charges	<u>\$ 422.5</u>	<u>\$ 348.0</u>	<u>\$ 393.0</u>	<u>\$ 748.2</u>

*Per letter dated March 6, 1978

(A-9)

ATTACHMENT B

	One Time		Annual	
	1978*	1978	1978*	1978
Switching and Transmission				
End Office	\$ 45.0	\$ 93.2 ①	\$ 21.0	\$ 27.8 ②
End Office to ESS	-	-	23.0	74.6 ③
ESS Tandem	659.0	751.8 ④	60.0	238.3 ⑤
ESS to PSAP	-	-	18.0	54.3 ③
PSAPs	308.0	343.0 ⑥	48.0	82.2 ⑦
Data Management System	126.0	208.0 ⑧	223.0	271.0 ⑨

*Per letter dated March 6, 1978.

Notes:

1. Material cost, W. E. installation and telco engineering increased while telco installation and project coordination decreased.
2. Administration, land, building, power and common increased while maintenance decreased.
3. Changed from estimated actual facility cost to proposed tariff rates.
4. Project coordination decreased while material cost, W. E. installation, telco installation, telco engineering increased.
5. Maintenance, administration, land, building, power and common and speed call lists increased.
6. Telco installation decreased while material cost and telco engineering increased.
7. Maintenance decreased while administration, taxes and land, building, power and common increased.
8. The costing of the DMS has undergone the greatest modification. It would be very difficult to explain here. The cost study sheets (Attachment C) are the best description of the changes.
9. See Note 8.

(A-9)



Pacific Telephone

140 New Montgomery Street
San Francisco, California 94105
Phone (415) 421-9000

December 6, 1978

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 94607

Dear Mr. Hovey:

Per our agreement, Telco has taken monthly measurements on the level of service provided the County on its 911 trunks. To date, the County is well within the parameters agreed upon in the contract, namely a P.001 grade of service to the primary answering points and P.01 to the secondaries.

I have attached copies of weekly status reports relating to the equipment reliability aspects of the trial system. These reports are broken down under four general headings: Trunks, PSAPs, Customer Trouble Reports and Translation Problems.

As you can see, the system is apparently performing very well.

I would be interested in knowing of any similar records the County may be keeping with regard to system reliability. If such reports exist, they would be very helpful to us in determining what, if any, changes or refinements should be made to the system.

Very truly yours,

T. D. Walker

T. D. Walker
Administration Manager -
Public Services

Attachments

cc: J. L. Palmer, W. P. McHale, C. E. Prielipp

A-10



Pacific Telephone

140 New Montgomery Street
San Francisco, California 94105
Phone (415) 421-9000

February 12, 1979

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 94607

Dear Mr. Hovey:

Mr. Foster related to me your concern over PSAPs in the Alameda E911 system reporting busy (or overflow) conditions.

While this is to be expected periodically, it should not be expected on a continuing basis.

The County system, as you know, is engineered to provide a grade of service of at least P.001 to the primary answering points and P.01 to the secondaries. Our records show that we are well within that level of service. However, if you have data indicating otherwise, may I suggest that copies be sent to me in order to determine if a problem really exists.

I am aware of the daily teletypewriter printouts accumulated at each of the PSAPs and suggest that if xerox copies of that activity could be submitted to me, for those days when overflows occur, I could then determine from our own records, on a comparison basis, whether a problem really exists, or if the overflows were caused by a spike in activity of short duration.

Yours very truly,

T. D. Walker
Administration Manager

(A-10)



Pacific Telephone

140 New Montgomery Street
San Francisco, California 94105
Phone (415) 421-9000

Alameda County E-911 - Level of Service Report

May 11, 1979

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster St., Suite 104
Oakland, CA 94607

Dear Mr. Hovey,

Per our agreement, we are continuing to take systematic traffic usage measurements on the county's 911 system.

The grade of service being provided to the primary answering points continues to be well within the levels set in the contract, namely P.001 to the primary answering points and P.01 to the secondaries.

I am well aware of your desire to receive raw data relating to these measurements during each reporting period. However, it is our position that we never provide such data to our customers because it is meaningless without a great deal of training and availability of supplemental data relating to the network as a whole.

As I stated in my letter to you on November 8, 1978, it would be very helpful though if the county would provide us with the average holding time at each of the PSAP's and copies of the call usage data being gathered each month from your logging teletypes.

For your information and review, I have attached copies of the Trouble Status reports from November 13, 1978 to March 18, 1979. These provide added emphasis to the fact that the system is performing well.

T. D. WALKER

TDW:nm

Attachments

cc: R. Patterson (with attachments)

(A-10)



Pacific Telephone

140 New Montgomery Street
San Francisco, California 94105
Phone (415) 421-9000

February 12, 1979

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 94607

Dear Mr. Hovey:

Your request to release confidential billing information to the State of California, Communications Division is herewith granted subject to the following conditions:

1. All information will be presented on the basis it is proprietary information of the Pacific Telephone and Telegraph Company.
2. Only copies of the summary bill may be released (the face bill).
3. The State will agree in writing that they accept the billing on the basis that it is proprietary and shall not be disclosed to others outside of their division.
4. The information is required by the State prior to making payment reimbursements for the Alameda County E911 system.
5. Once the identified needs of the State have been met, the information will be returned to the County.

Sincerely,

J. I. Foster
for J. I. Foster
911 Coordinator

A-11



Pacific Telephone

140 New Montgomery Street
San Francisco, California 94105
Phone (415) 421-9000

July 13, 1979

Mr. Gary Barker
Systems Development Department
SRI International
333 Ravenswood Avenue
Menlo Park, California 94025

Mr. Scott W. Hovey, Jr.
911 Project Director
Alameda County Trial
100 Webster Street, Suite 104
Oakland, California 94607

Gentlemen:

Letters from the Alameda County 911 Project Director and the Law Enforcement Assistance Administration designating authorized representatives under Paragraph 3 of the Alameda 911 Contract have been received (copies attached). Per our agreement, information proprietary to Pacific Telephone, relative to the Alameda 911 System, may be exchanged between SRI International and the Alameda 911 Project Director.

Other than exchange of proprietary information between the parties mentioned, such information shall be held confidential and will not be published or disclosed to other parties without the written consent of a representative of Pacific Telephone.

Sincerely,

J. I. Foster
J. I. Foster
911 Coordinator

Attachments

cc: N. Schroeder, LEAA

(A-11)



ALAMEDA COUNTY 911 TRIAL

100 Webster Street • Suite 104 • Oakland, California 94607 • (415) 874-7431

Scott W. Hovey, Jr. • Project Director

June 2, 1980

Mr. James I. Foster, 911 Coordinator
Pacific Telephone and Telegraph Company
140 New Montgomery St., Rm 2405
San Francisco, CA. 94105

Dear Mr. Foster:

Re.: Disputed Rate Change

Under the provisions of paragraph 24 of our agreement, the County of Alameda hereby disputes PT&T's right to increase the monthly service charge from \$20,000 to \$38,320 solely on the basis of estimated costs contained in your letter of 12/8/78.

The County chose not to formally dispute those estimates when first received one month after going operational for three reasons:

- 1) Though the estimate nearly tripled your \$14,000 quote prior to system cut, the County would be paying only \$20,000 for at least 23 months.
- 2) The claimed increases seemed almost exclusively the result of changes in costing methodology, administrative factors, etc. Although the County considered it very unfair for PT&T to wait three years before changing its costing basis, only the California Public Utilities Commission is in a position to pass on whether the old basis or the new basis is more proper.
- 3) Based on statements from your office and the CPUC staff, the County believed that PT&T would file an advanced 911 tariff sometime in the second quarter of 1979. In which case a resulting CPUC review of advanced 911 costing in general would have been completed long before the expiration of the initial 24 month period and any rate change.

We now formally dispute your right to charge on that basis because of your failure in the elapsed 20 months to: 1) provide any justifying operational cost data; 2) complete the studies in your letter referenced; and most importantly, 3) secure CPUC endorsement of the costing methodologies we have consistently opposed.

This letter constitutes a "Notice of Dispute" as defined in paragraph 24.

Yours truly,

Scott W. Hovey Jr.
Project Director

cc. Donald Manson, LEAA Proj. Monitor
Auditor, County of Alameda
Auditor, Pacific Telephone Co.
Paul E. Popenoe Jr., CPUC Staff

A-12

APPENDIX II

911 ARG VERIFICATION PROJECT

SUMMARY

The following pages are excerpts from the full documentation of the 911 ARG Verification Project. They provide a brief summary of the project; for complete details, see the full documentation.

911 ARG VERIFICATION PROJECT

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911 ARG Verification Project

Introduction

The 911 ARG Verification Project was an effort by the 911 Project Office and Alameda County to verify that PT&T's Address Routing Guide or ARG (a computer file of all streets and associated PSAP's in the Alameda County 911 service area) was in fact an accurate file for 911 routing. The reason that Alameda County, and not PT&T, was to verify the accuracy of the file is as follows:

Prior to the development of 911 service for Alameda County, a 911 Study showed that public opinion was in favor of telephone company control of the 911 computer files: "For reasons of individual privacy, the original plan to accomplish ALI by providing updated telephone directory files to a public safety computer system is much less acceptable to the community than one wherein subscriber information would be kept on a telephone company computer and released only when and while a 911 call is made". (911 Project Study, p. 1).

Therefore, the 911 address files would be phone company files; however, responsibility for the addresses in the files was to remain with the 911 communities. For that reason it was important that there be some way to verify the accuracy of the addresses. This problem formed the basis for the 911 ARG Verification Project.

The telephone company had an existing file, the Master Address Table (MAT), which it would use to create the ARG and furnished a tape of the first extract to the 911 Office. This initial ARG was composed of records of house-#-ranges for streets in Alameda County and some bordering out-of-county streets, sorted by street within postal community. Each record contained a tax code (non-taxing communities all XXX) which was to be translated to a 911 PSAP in the final ARG.

The initial scope of the project was to provide analysis of this first ARG - specifically, to gather statistics on the streets in the file and to determine probable accuracy of PSAP codes which would be assigned to the house ranges. This scope was broadened when it became apparent that not only could statistics be gathered; but also that ARG PSAP's could be machine generated, and ARG pre-conversion corrections coded, accumulated and, in some cases, submitted to PT&T.

911 ARG VERIFICATION PROJECT

Phase 1 - ARG Analysis

September 1976 thru March 1977

Dates

1976	Sept.-Oct.	Background and initial analysis. design Pass #1, Pass #2, Pass #3
	10/01	run Pass #1 (VR conversion)
	10/15	run Pass #2 (Hand Corrections), Pass #3 (VR/ARG compare)
	10/20	design modified Pass #3 (Critical Streets)
	11/08	run MODIFIED Pass #3
1977	1/18	meet with ARG coordinators. discuss results of file comparison; assign reports of missing streets
	3/22	meet with ARG coordinators. assign reports of critical mismatches

Description

This phase began with an analysis of the ARG file to determine a method for checking its accuracy. The best way to do this seemed to be to compare the ARG against another address file with similar boundaries, the assumption being that if two different files of different origin had exactly matching house ranges for a certain streets, the accuracy of those streets could be safely approved.

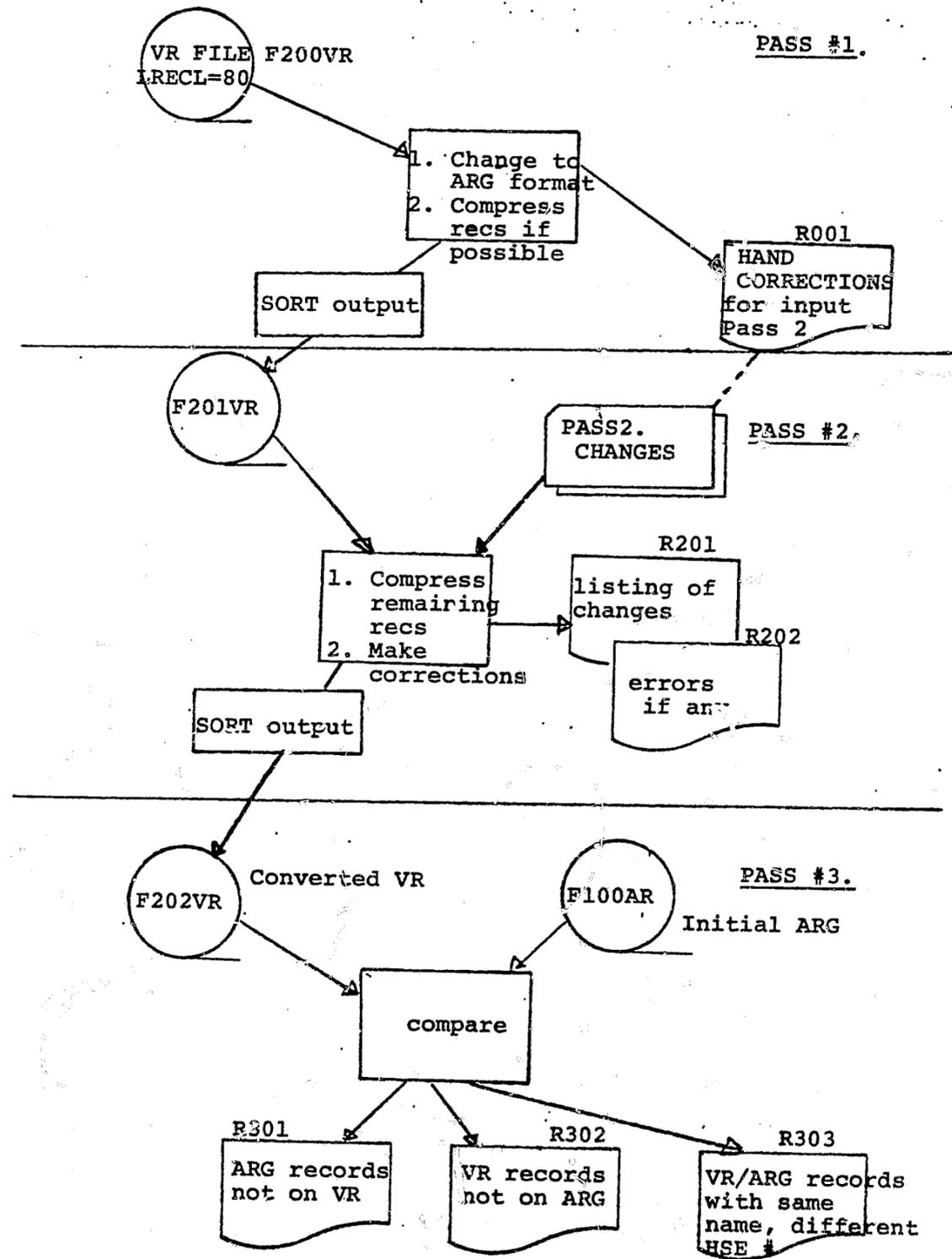
The Alameda County Voter Registration Precinct Guide (VR) was chosen as a comparison file, partly because it contained similar fields and had similar (although not identical) boundaries, and partly because the file accuracy was very good. However, the formats were very different. We decided to convert the VR streets into ARG format - by machine processing as much as possible (Pass #1) and by hand corrections for the balance (Pass #2). The converted VR file would then be compared against the ARG in PASS #3.

Pass #3 was first run on 10/15 and revealed that of approximately 9,500 streets, 1950 did not match. This was quite a large number of mismatches, about 20%, and would have involved the 911 communities in a big effort to investigate and resolve the discrepancies. However, further analysis pointed out the possibility of categorizing the mismatches as "critical" and "noncritical" - the communities could then concentrate on "critical" mismatches and resolve the "noncritical" streets if time allowed. Modifications to Pass #3 were made and the Modified version was run on 11/08. This time the run totals were split into 650 "critical" and 1300 "noncritical" mismatches. This was a very nice reduction and produced the following figures for ARG accuracy:

ARG total streets	=	10,000 (approx.)	100%
streets not on VR (most were valid)	=	700	7%
streets matching	=	7,450	74.5%
noncritical mismatches	=	1,300	13%
critical mismatches	=	650	6.5%

The reports of missing street names (VR missing on ARG, ARG missing on VR) and the reports of critical mismatches were then delivered to the 911 communities' ARG coordinators with instructions for investigating and reporting corrections.

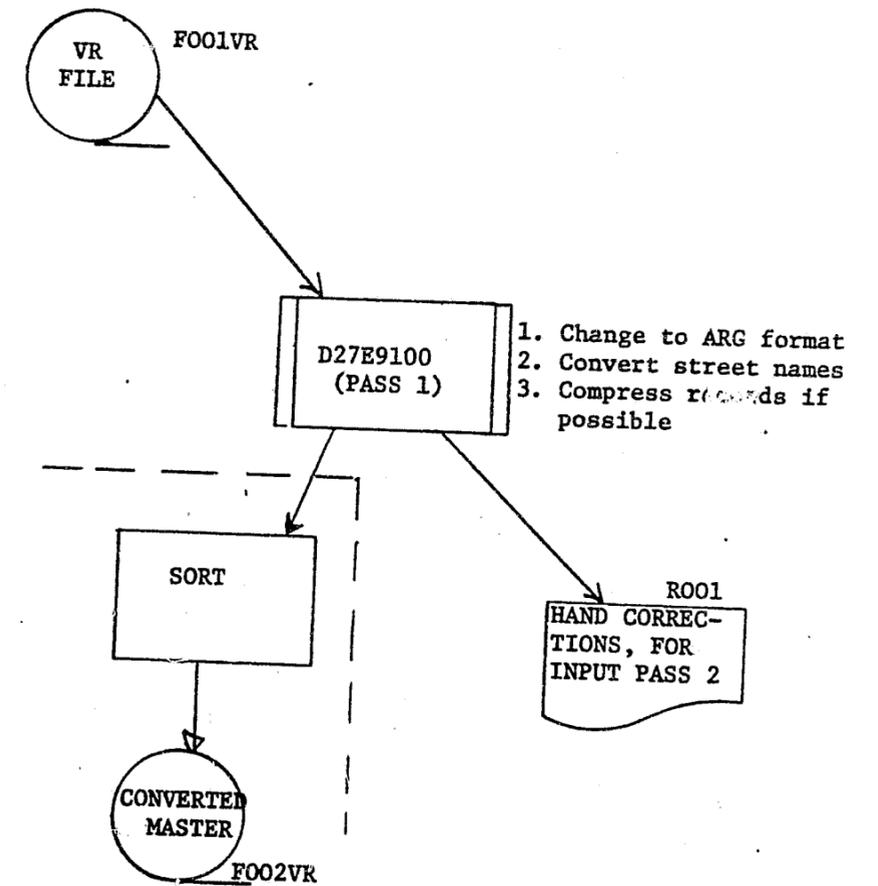
ARG/VR Original System Flow:



Phase 1 - ARG Analysis - con't.

Pass #1 - Voter Registration File Conversion

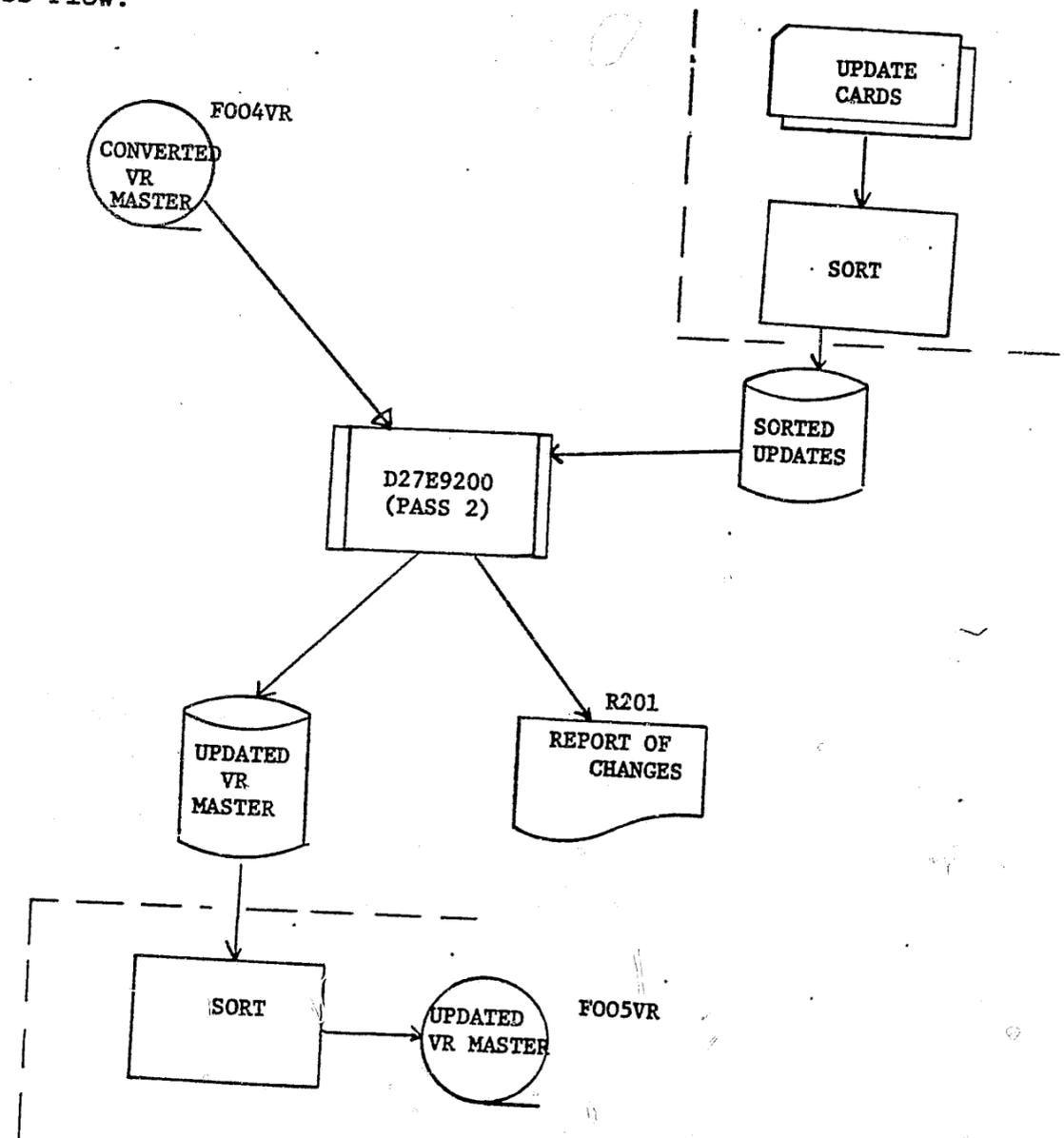
DESIGN. Process Flow: 10/08/76



Phase 1 - ARG Analysis - con't.

Pass #2 - Update Converted VR Master

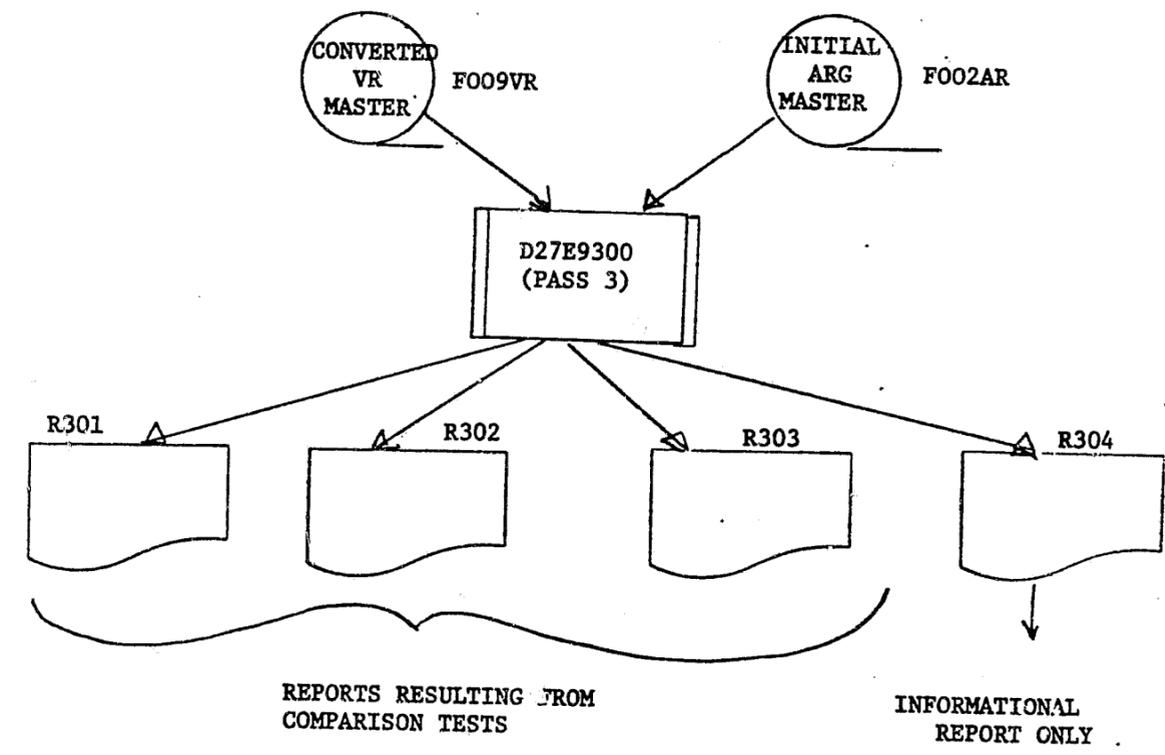
DESIGN. 10/15/76
Process Flow:



Phase 1 - ARG Analysis - con't.

Pass #3 - VR/ARG Comparison

DESIGN. 10/15/76
Process Flow:



- R301 - Streets with Same Name, Nonequal PSAP on HSE # Range.
- R302 - ARG Streets not Found on, VR Master.
- R303 - VR Streets not Found on ARG Master.
- R304 - ARG Streets with 000000-000000 House # Ranges.

PHASE 1: ARG analysis - con't.

Modified Pass #3

After the initial comparison of the ARG and VR files on 10/15, some modifications to Pass #3 were made to prioritize correction of the mismatching streets based on the idea that certain mismatches were not significant for 911 routing.

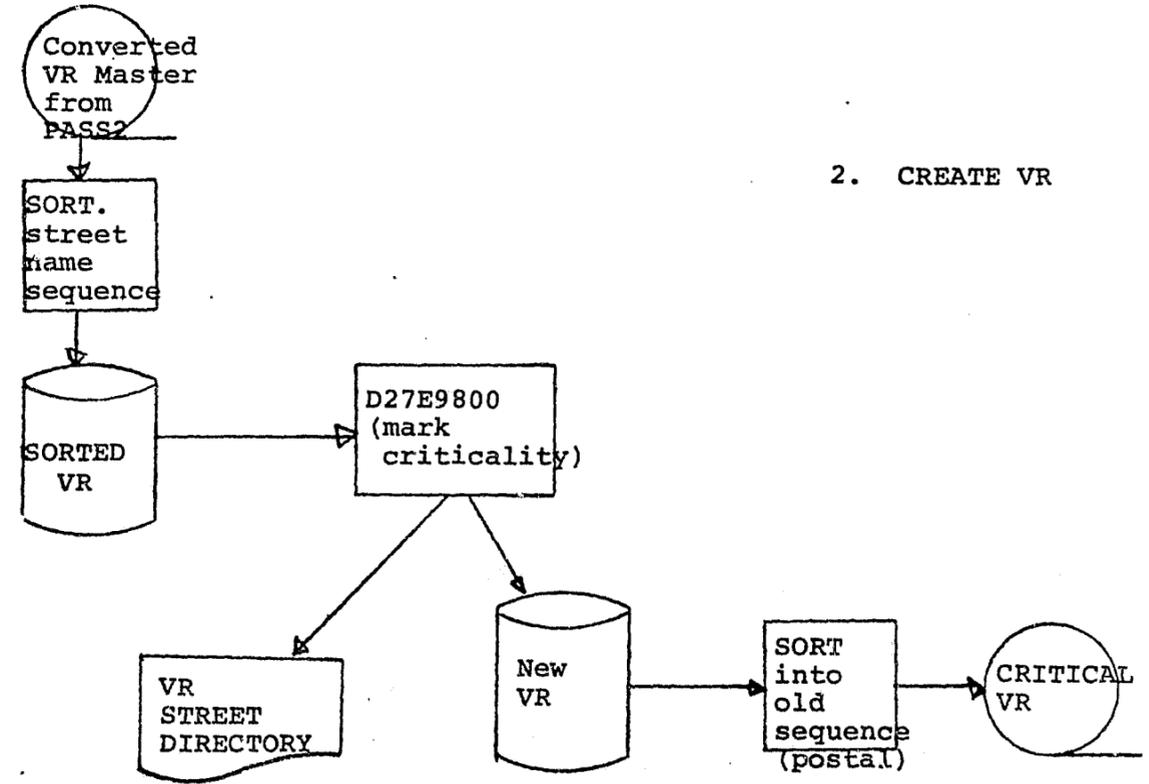
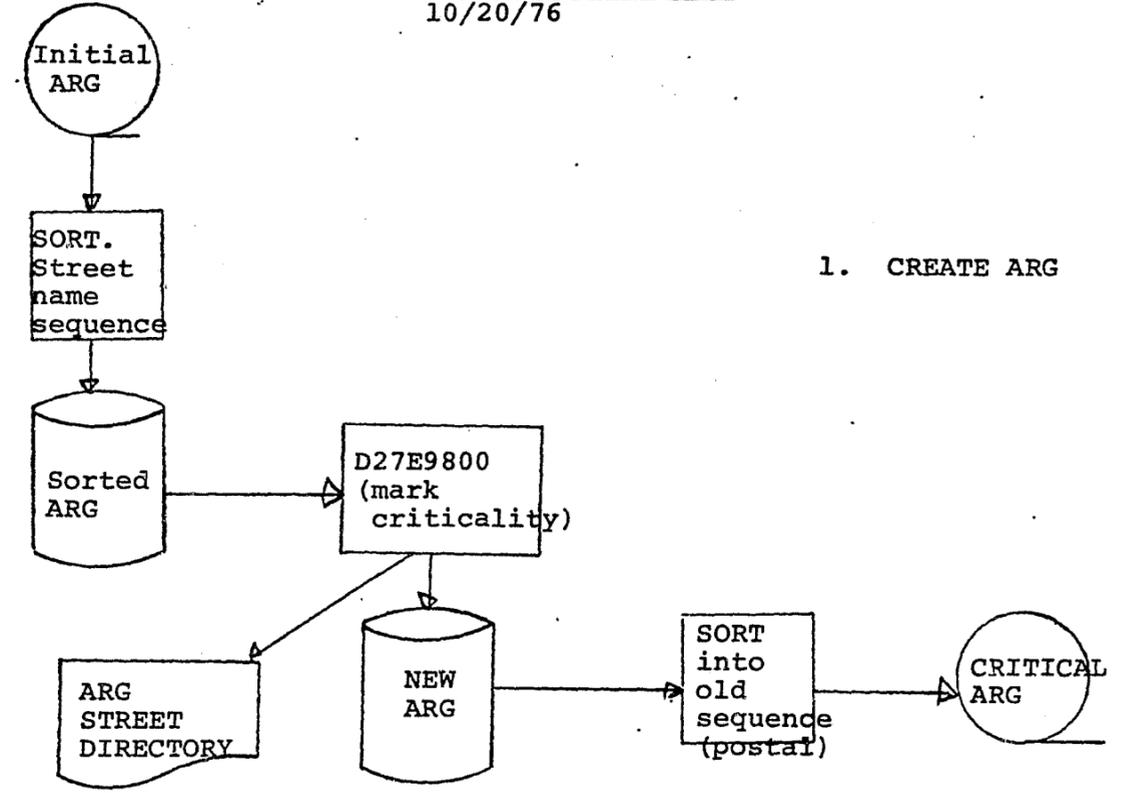
For example, if Street A occurs only in a single community on both ARG and VR files, then all calls for that street will be sent to the proper PSAP even if the two files disagree as to house # ranges. These are low priority "noncritical" mismatches. Higher priority mismatches involve streets which cross between two or more communities and thus have more than 1 PSAP, or streets which have a PSAP different from the PSAP of the postal community (overlapping municipal and postal boundaries.) If the two files disagree on such a street it may be a "critical" disagreement involving a house #, or range of house #'s, which one file contends belongs to 1 PSAP and the other file assigns to a different PSAP and which for 911 purposes could mean a serious problem of mis-routed calls.

In order to isolate this latter sort of "critical" street, a method was devised for preparing the files before comparison (each file was prepared separately):

1. Sort file on street name (as opposed to the normal postal community sequence).
2. Read sorted file and check each street name against a table of contiguous postal communities (i.e., those with touching boundaries).
3. If a street name has records for contiguous postal communities, flag as critical the records which belong to those postal communities (a 2-byte flag in the record).
4. Write out each input record with critical/noncritical marked.
5. Resort the new file back into postal community order. This becomes the input to the Pass 3 compare.

The accuracy of this criticality system was not 100% since, for example, there were cases in which communities A and B both had a same-name street but it was a separate street in each and not the same street crossing from A to B. These streets were unnecessarily flagged as critical; nevertheless, even with shortcomings, the addition of criticality flags was a big help in categorizing address corrections and the method was extended to cover not only any new ARG or VR file but also (in Phase 2) the Model ARG.

ARG/VR Modified System Flow:
10/20/76



3. RUN PASS 3

A.) Report R301 will have more detailed analysis. If ARG & VR streets do not match on PSAP or Hse-#-Range, a comment will be printed beside each street on the report. The comment will be:

*** INTER-COMMUNITY STREET - if either ARG or VR has the street flagged as intercommunity. These nonmatches are highest priority for correction. They will be listed on the ARG and/or VR STREET DIRECTORY.

SINGLE-COMMUNITY STREET - if the nonmatch is somewhat complex but the street exists only in that community. These are 2nd priority for correction.

SINGLE-COMM. ARG WITHIN VR - if the ARG range does not match VR, but the range is smaller than VR. These are lowest priority correction.

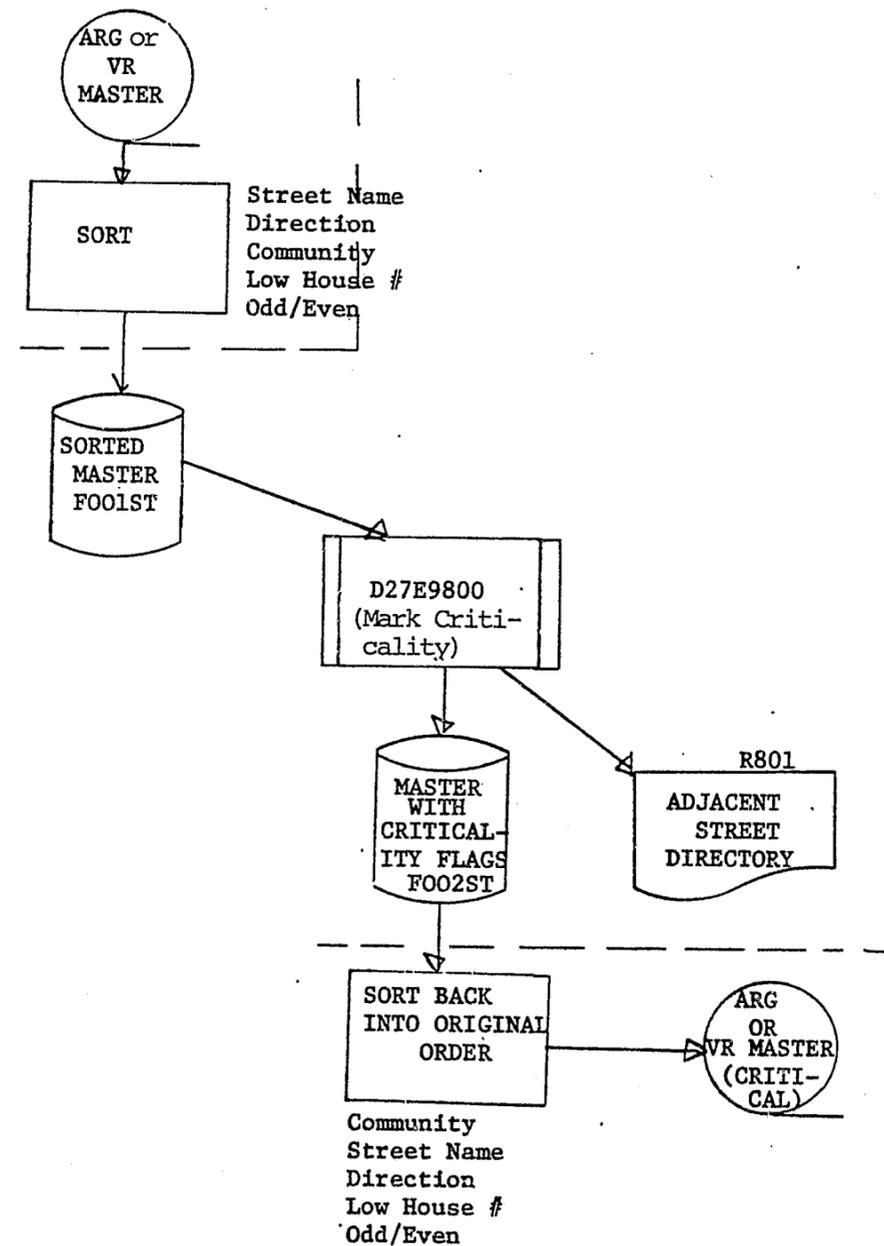
B.) Reports R302, R303 will have an additional comment printed beside the street name if the street has been flagged as inter-community. This comment will be:

*** INTER-COMMUNITY STREET - these streets on both reports are the higher priority for correction. All streets without comment are lower priority.

Phase 1 - ARG Analysis - con't.

Mark Criticality

DESIGN. 10/29/76
Process Flow:



Phase 1 - ARG Analysis - con't.

Computer Runs - Pass #1, Pass #2, Pass #3

The following pages contain results from the Voter Registration File Conversion, the first run of Pass #3, and the run of modified Pass #3. The figures printed are not always the final totals due to corrections and reruns (in particular, the deletion of leading zero records and the changing of low house # 000000 to 000001 (see R304) reduced mismatches considerably from 10/15 to 11/08), but they still give a good picture of the conversion/comparison process.

Sample reports and some JCL listings for the runs are included in Appendix D.

VOTER REGISTRATION FILE COMPARISON - PASS #3
ALL NONMATCHES FROM VR/ARG COMPARISON

10/16/76

	R303 VR STREETS NOT ON ARG	R302 ARG STREETS NOT ON VR	R301 STREETS W/NONMATCH ON PSAP OR HSE #	TOTAL NONMATCH PER COMMUNITY
ALBANY	3	6	22	31
ALAMEDA	28	24	63	115
BERKELEY	37	71	88	196
CASTRO VALLEY	23	32	63	118
DUBLIN	3	39	54	96
EMERYVILLE	2	7	47	56
FREMONT	46	117	248	411
HAYWARD	45	131	262	438
LIVERMORE	23	90	138	251
NEWARK	7	25	86	118
OAKLAND	53	154	413	620
PIEDMONT	3	7	109	119
PLEASANTON	23	64	149	236
SAN LORENZO	1	5	27	33
SAN LEANDRO	14	27	119	160
SUNOL	6	8	15	29
UNION CITY	12	72	90	174
RUN TOTAL	329	879	1993	3201

REPORT #R304 10/15/76
ALL STREETS FROM INITIAL ARG WITH 000000 HOUSE-#-RANGE

	TYPE 1 (LEADING ZERO)	TYPE 2 (BLDGS, ETC.)	TYPE 3 (000000- 999999)	TYPE 4 (000000- XXXXXX)	TOTAL ALL TYPES
ALBANY	3		1		4
ALAMEDA	130	2	10	13	155
BERKELEY	32	52	7	12	103
CASTRO VALLEY	53		12	1	66
DUBLIN	16		41		57
EMERYVILLE	7	2	1		10
FREMONT	81	1	39	4	125
HAYWARD	108	2	63	3	176
LIVERMORE	203	1	34	22	260
NEWARK	101		13	1	115
OAKLAND	171	26	56	52	305
PIEDMONT	48		2	78	128
PLEASANTON	198	5	23	12	238
SAN LORENZO	10		2	1	13
SAN LEANDRO	73		4	8	85
SUNOL	13		6	3	22
UNION CITY	101		18	2	121
RUN TOTAL	1348	91	332	212	1983

MODIFIED PASS #3 (CRITICAL STREETS) 11/08/76

FOR RPT. 301, ONLY CRITICAL MISMATCH COUNTS ARE LISTED SINCE NON-CRITICALS CAN BE POSTPONED. (THE ORIGINAL RPT. 301 MISMATCH COUNTS ARE IN PARENTHESIS).

POSTAL COMMUNITY	VR STREETS NOT ON ARG, R303	ARG STREETS NOT ON VR, R302	STREETS ON BOTH VR AND ARG CRITICAL MISMATCHES, R301	TOTAL NONMATCHES (INCLUDES NON-CRITICAL)
ALBANY	3	6	14 (22)	31
ALAMEDA	26	23	0 (63)	109
BRK	35	70	55 (88)	196
CSTRO	18	22	11 (63)	102
VLY				
DBLN	3	34	3 (54)	93
EMVL	2	7	34 (47)	56
FMT	25	115	19 (248)	407
HAY	11	93	137 (262)	366
LVRMR	9	75	63 (138)	222
NWRK	6	18	13 (86)	112
OAK	32	130	105 (413)	557
PDMT	0	4	29 (109)	56
PLS	13	52	37 (149)	213
SN LRNZ	0	4	8 (27)	31
SN LDRO	6	18	39 (119)	141
SUNL	2	5	6 (15)	23
UC	7	42	22 (90)	151
TOTALS	198	718	595 critical 1352 noncritical	2863

STATISTICS, MARCH 1977

ARG: TOTAL # STREETS (INCLUDING RICH, ETC.) = 10,070
 TOTAL # W/ XXX-PSAP REPLACED = 5,567

VR: TOTAL # STREETS = 9,551
 TOTAL # W/ST. NAME CONVERSION = 2,459
 TOTAL # NEEDING HAND CORRECTION = 280

STREET REFERENCES:

	# OF STREETS - BY NAME (# STREET NAMES IN COUNTY)	# MARKED CRITICAL	# OF THOSE CRITICAL LISTED ON REFERENCE
ARG	9,775	889	373
VR	8,351	919	347

911 ARG Verification Project

Phase 2 - ARG Corrections

March 1977 through September 1977

Dates	1977	Description
January		New ARG tape from PT&T; new VR tape
2/15		create timeschedule for ARG review and correction
3/6		run Pass1, Pass2, Pass3 with new tapes
3/22		meet with ARG coordinators, explain correction procedures
April-		Coordinators submit corrections to 911 Office;
Sept.		911 Office submits same corrections to PT&T, reserves others for post-conversion
7/27		Instructions for MODEL ARG coding given to 911 Office
8/23		Design Model ARG program (D27E9400)
9/25		ARG conversion runs

Description

Phase 2 was the period of the project during which corrections to the initial ARG were made using the PASS 3 reports as guides. Originally the programming portion of the 911 ARG Verification was to have ended here with the streets needing checking having been isolated; however, for two reasons it was decided to extend the programming effort. First, PT&T decided that it would be a savings of time and money to have Alameda County convert the initial ARG to final ARG (that is, assign the PSAP codes) since the converted VR tape could be used as a control file. Second, it seemed advisable to use the computer to keep track of the street corrections as they were defined, both for organizational and printing purposes and in order to check that the desired updates were in fact generated at PT&T.

The first situation, that of ARG conversion, is covered in Phase 3. The second, that is computer capture and storage of corrections, formed the basis for the Model File and history transactions which will be discussed here.

Corrections were of two kinds:

- (1) Those which PT&T would accept as updates to their MAT File (Master Address Table, from which the initial ARG was extracted) and which could be submitted prior to the September conversion. These were mainly streets missing from the ARG, outdated streets still carried in the ARG, and some house-range corrections in taxing communities (since non-taxing communities had all 'XXX' tax codes, house range corrections would not be significant in altering the code).

CONTINUED

1 OF 2

- (2) Those which PT&T would not accept as corrections at the MAT level and which would have to be submitted to PT&T as ARG street ledger updates after the 9/25 conversion and subsequent printing of street ledgers. These were mainly street range updates for streets in non-taxing communities, and non-critical mismatches.

In general, the idea was to allow the 911 communities to complete as much correction work as possible before the ARG conversion, with an ongoing appraisal of the accuracy of the corrections already coded and an accounting of how many streets were not yet resolved. The plan as it evolved was to create a history file on disk of all the changes, both MAT updates and street ledger updates; then, using those history file transactions, a Model ARG could be created by adding, deleting, and changing streets on the converted VR Master. The resultant Model would look exactly as the 911 communities wished the ARG to look. Before ARG conversion, a listing of the history file would show which streets had and had not been resolved, and a Model File/Initial ARG comparison (Pass3) would give a side-by-side printout of the street after and before change so the ARG coordinators could double check their work. After the ARG conversion the same Model File/ARG comparison would pinpoint as mismatches any corrections yet to be made by PT&T.

A turnaround document (Critical Mismatch Report) was developed by the 911 Office and approved by PT&T as suitable for submitting street changes. The procedure was that the ARG coordinators investigated all critical mismatches, completed the Critical Mismatch Report to reflect their findings, and sent the report to the 911 Office. The 911 Office either sent the document to PT&T or stored it for post-conversion (depending on the type of correction); the office also coded a history transaction as per the instructions for Model File/ARG Reports.

Missing streets to be inserted in the ARG and streets to be deleted were handled separately. Instructions for the ARG coordinators regarding these streets, and samples of the 911 Office and PT&T correspondence are included among the following pages.

This whole process continued from April through September and on even to PT&T's December data base conversion and produced these benefits:

1. It was possible to have an organized system for keeping track of changes (the history file).
2. Periodic printouts of the history file showed the changes to date and indicated (by their absence or by a phony house range of 1-2) the streets still in process.
3. The Initial ARG/Model comparison allowed changes to be double checked.
4. After ARG conversion, the Model File became very valuable as a control -- and the point at which a PT&T-furnished ARG and the Model disagreed only on non-critical streets was the point at which the communities could safely approve the ARG.

Phase 2 - ARG Corrections - cont.

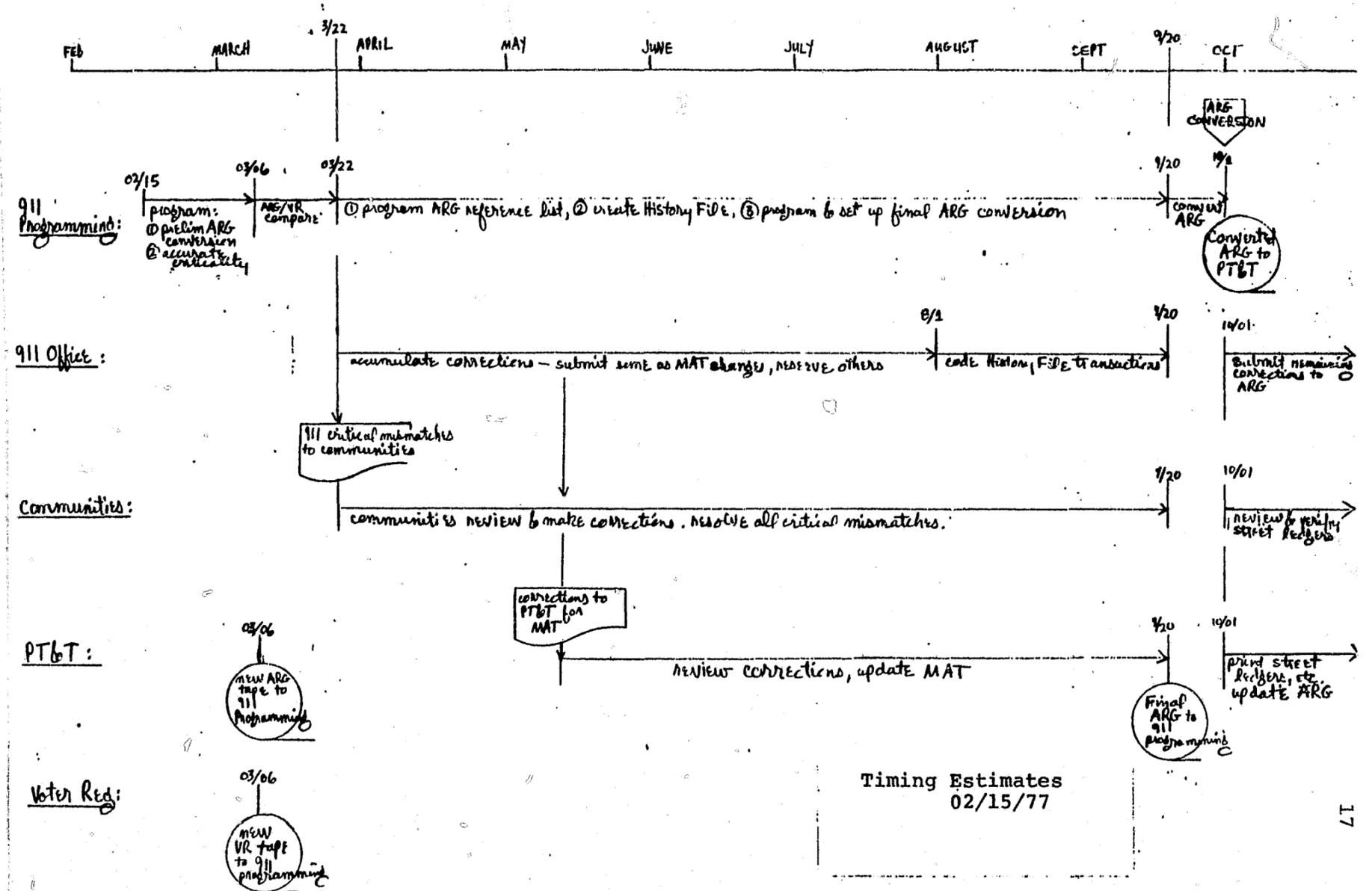
Timing Estimates and System Flow

The following pages contain a linear diagram of timing estimates and task assignment for the Phase 2 ARG corrections. The real beginning date is designated as March 6 when new ARG and VR tapes provided by PT&T and Alameda County were processed and compared; these tapes were used as for definitive Initial ARG and converted VR from that time until 9/20.

There are also three system flowcharts which show the programming for the March 6 VR/ARG compare, the history file creation, and the Final ARG tape conversion (this last is Phase 3).

TIMING ESTIMATES:

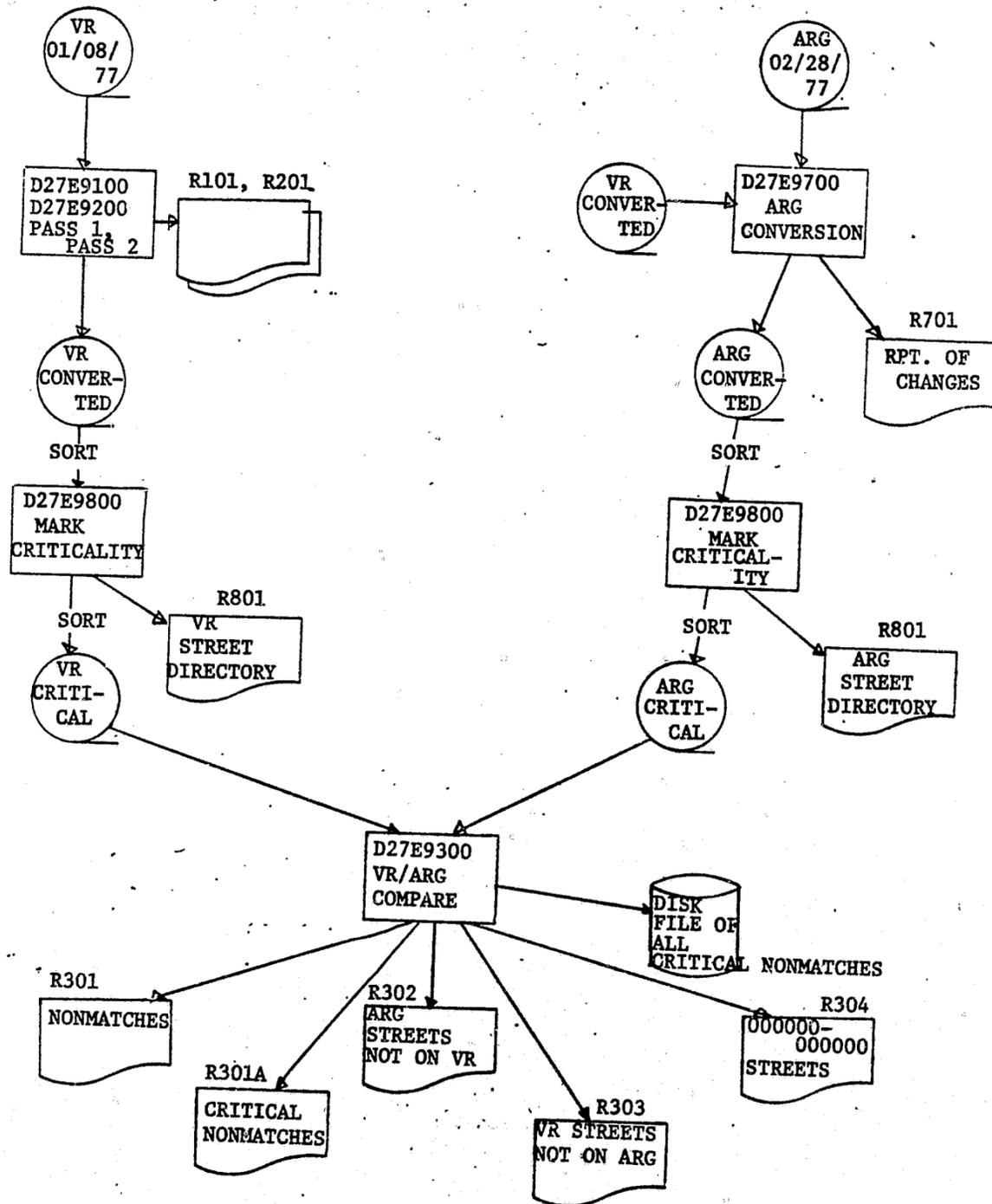
02/15/77



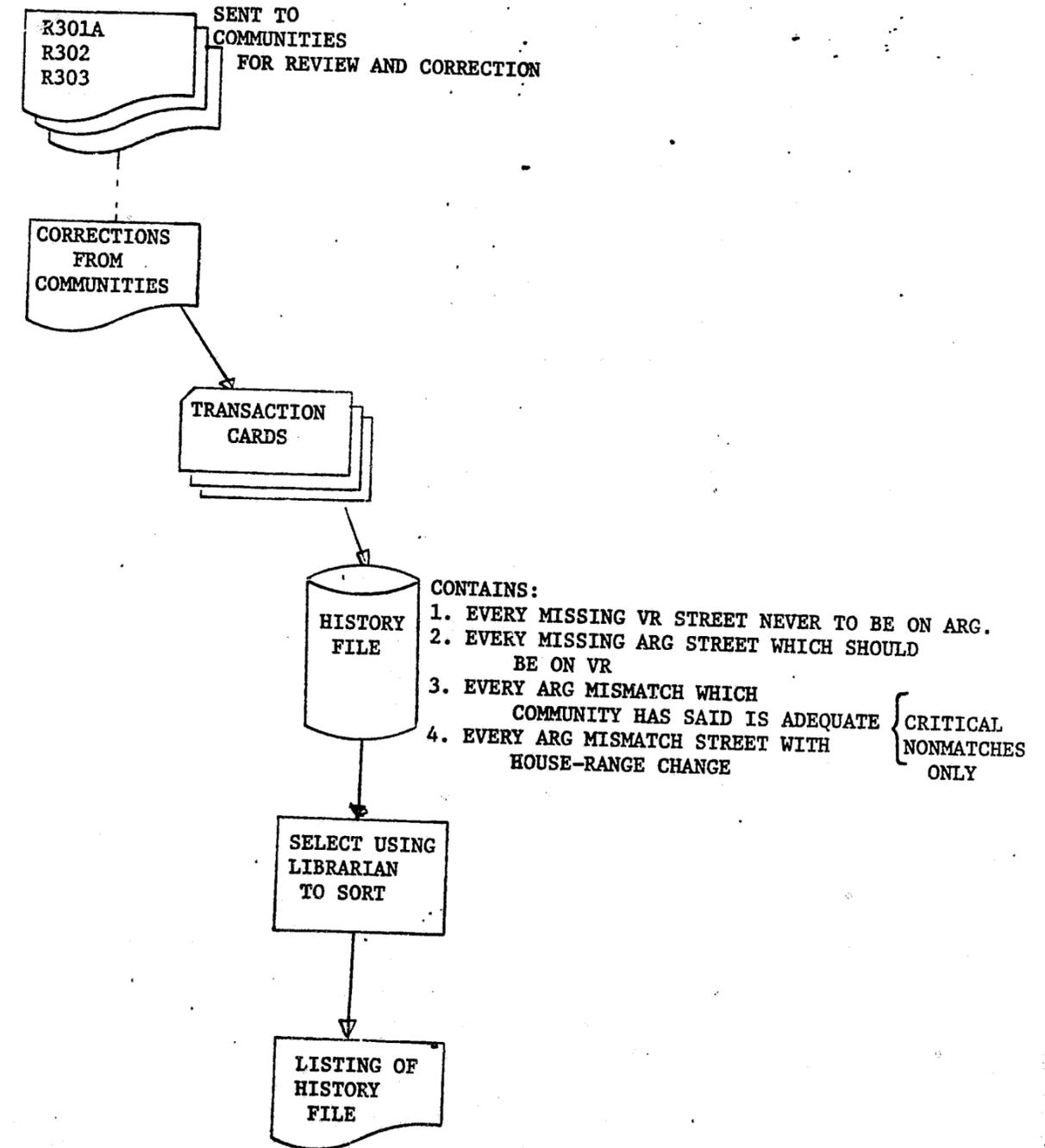
Timing Estimates
02/15/77

02/15/77

March 6 - VR/ARG Compare:

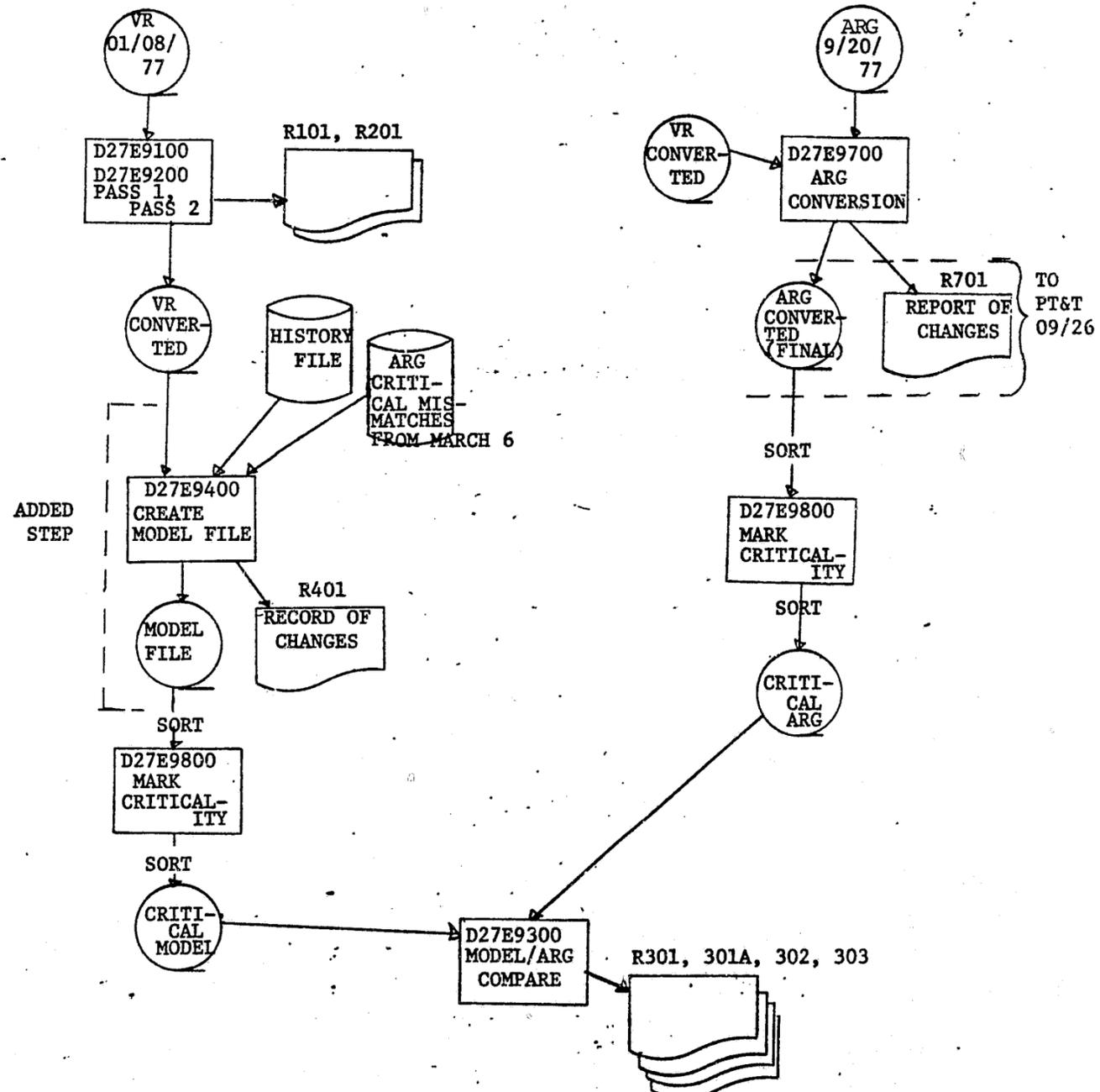


April - September - Create History File:



02/15/77

September 23 - ARG Conversion:



SAME REPORTS AS MARCH 6, BUT ALL CRITICAL NONMATCHES, MISSING STREETS, ETC. WILL VANISH IF THEY HAVE BEEN CONVERTED AS SPECIFIED ON HISTORY FILE. ONLY NEW MISMATCHES OR UNCORRECTED MISMATCHES WILL APPEAR AGAIN.

Phase 2 - ARG Corrections - cont.

Critical Mismatches (Report 301)

Most of the effort in ARG corrections focused on the critical mismatch streets for reasons already discussed in Phase 1. As these corrections progressed it became apparent that one of the most useful tools was the Critical Mismatch Report (Form 305) on the following page. This form was coded one to a street and showed not only the exact disposition for that street to take on the final ARG, but also the initials of the ARG coordinator(s) who had reviewed and approved the street. It was invaluable as a working document for finalizing a street, a transmittal document for sending to PT&T, and a source document for coding the history transactions. Additionally, the bright yellow color made it easy to spot among the maze of reports.

Included after the Critical Mismatch Form are the instructions for it given to the ARG coordinators. The process flow of the corrections has already been described.

COMMUNITY : _____

REPORT NO. _____

STREET : _____

Sheet: _____ OF _____
(If needed)

-Completely outside this PSAP. Send to _____ (PSAP)

-ARG IS adequate for 911.
VR should investigate for possible error: YES: NO:

-ARG IS NOT adequate and must be changed.
VR should investigate for possible error: YES: NO:

(Code entire street exactly as it should be in ARG)

	P S A P	LOW No.	HIGH No.	O/E	Chg'd Entry	For 911 Office Use
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						
j.						
k.						
l.						

see comment sheet

Other PSAP: _____

Reviewed With: _____

Date: _____

Prep'd By: _____

Date: _____

Phase 2: ARG Corrections - con't.

ARG Missing Streets and Extra Streets

As stated earlier, the missing ARG streets and extra ARG streets were handled separately from the mismatching streets. They were largely the result of spelling differences on the two files, which resulted in two streets with different names as far as the Pass 3 comparison could tell; and also the result of many planned, but never constructed, streets still carried on one or the other file.

These streets were reported on R302 (ARG streets not found on VR) and R303 (VR streets not found on ARG) which were given to the ARG coordinators with instructions to mark changes directly on the report pages. The changes were then transcribed to standard form by the 911 Office and sent to PT&T (most of them were MAT changes), which in turn passed the results of its actions back to the 911 Office. This interactive process is shown by:

- (1) the instruction sheet on p. 24.
- (2) some sample R302 and R303 responses on p. 25, 26.
- (3) a chart of the results, p. 27.

1/15/77

PLEASE MAKE NOTATIONS ON THE MISSING STREET REPORTS AS
INDICATED BELOW AND RETURN TO THE 911 PROJECT OFFICE, 100 WEBSTER St.
RM. 104, Oakland, CA 94607.

X = Street name does not (or no longer) exist(s).

- X.1 Its name has changed to _____ which does exist.
- X.2 It has been torn up and replaced by a factory, freeway, park, etc.
- X.3 We have no record of it ever having existed.

Y = Street is planned but not yet constructed.

- Y.1 Construction is soon.
- Y.2 This is a "paper street" whose construction bogged down several years ago.

A = This ARG street exists and

- A.1 Should be considered for addition to the VR file since voters may have addresses on it.
- A.2 Probably should not be added to the VR file.

B = This VR street exists and

- B.1 Should be added to the ARG file since phones will be installed with it as their address.
- B.2 Probably should not be added to the ARG file since phones will not be installed with it as part of their address.

C = See accompanying sheet for explanatory note.

REPORT # R302

VR / ARG COMPARISON
ARG STREET NAMES NOT FOUND ON VR MASTER

10/22/66 PAC

COMMUNITY	PSAP & HSE-#-RANGE (LIST REC ONLY)	DIR STREET-NAME
SUNL	XXX 24- 31 A.1	CARVER LN
SUNL	XXX 2300- 2499 A.1 (TRAIL, NOT DIR)	CLINTON ST
SUNL	XXX 00-999999 A.1	HAPPY VALLEY RD
SUNL	XXX 00-999999 A.2	INTERSTATE ^{HIGHWAY} 680
SUNL	XXX 00-999999 A.1	PAK RIDGE RD (Private St)
SUNL	XXX 5400- 5499 A.1	SHERIDAN
SUNL	XXX 2000- 2999 A.1	SHERIDAN LN (Private St)
SUNL	XXX 01-999999 A.1	WELSH CREEK RD
TOTAL STREETS, SUNL :		08

*** INTER-COMMUNITY STR
*** INTER-COMMUNITY STR

National Criminal Justice Reference Service

ncjrs

While portions of this document are illegible, it was micro-filmed from the best copy available. It is being distributed because of the valuable information it contains.

National Institute of Justice
United States Department of Justice
Washington, D. C. 20531

REPORT # 1203

VR / AFG COMPARISON
 VR STREET NAMES NOT FOUND ON ARG MASTER

11/06776

COMMUNITY	PSAP	HSE-RANGE	(LIST REC ONLY)	DIR	STREET-NAME		
CSTRO VLY	008	1400-1499	B.1		APPLE AV	23, C6	*** INTER-COMMUNITY
CSTRO VLY	008	1400-1499	B.1		ASH ST	26, C5	*** INTER-COMMUNITY
CSTRO VLY	008	22000-22199	B.1		BARNHILL LN	31, C4	
CSTRO VLY	008	00-00	X.1	(PINE RIDGE RD)	B.1 CHABOT VIEW DR	22, B1	NAME CHG. TO PINE RIDGE RD
CSTRO VLY	008	22400-22599	B.1		CHARLENE WY	27, E6	
CSTRO VLY	008	24500-24999			COWING RD (Pvt. St.)	37, A7	*** INTER-COMMUNITY
CSTRO VLY	008	2500-2538	B.1		S CREST AV	25, L	
CSTRO VLY	008	20700-20799	B.2		CROSS RD	28, C5	*** INTER-COMMUNITY
CSTRO VLY	008	1665-1685	(OLD DUBLIN rd)	A.1	DUBLIN	31, C4	
CSTRO VLY	008	21000-23299	B.1		EDEN CANYON RD	72, A2	
CSTRO VLY	008	7000-7899	B.1		HOLLIS CANYON RD (Priv. St.)	1, B2	
CSTRO VLY	008	20100-20899	B.1		MALAGA ST (Priv. St.)	28, C5	(EX-AM)
CSTRO VLY	008	4500-4599	X.3		MILL RD	3	could be Miller Rd (Priv. St.)
CSTRO VLY	008	8700-8799	(OAK TREE LANE)	B.1	OAK TREE LA	18, C4	9-299 private ST
CSTRO VLY	008	1665-1685	B.1		OLD DUBLIN RD	31, C4	
CSTRO VLY	008	6200-6899	B.1		PALO VERDE RD	71, E3	
CSTRO VLY	008	24200-27739	B.1		PALOMARES RD	1, E4	*** INTER-COMMUNITY
CSTRO VLY	008	22100-22399	B.1		PERGOLA DR (Priv. St.)	31, C4	
CSTRO VLY	008	15000-15998	B.1		SKYLINE BL	16, A2	*** INTER-COMMUNITY

TOTAL STREETS, CSTRO VLY : 19 INTER-COMM: 06

RESULTS OF ARG-COORDINATORS WORK ON R302, R303:
(missing ARG, missing VR Streets)

	x.1	x.2	x.3	y.1	y.2	A.1	A.2	A.3	B.1	B.2	C
Albany		3					4		2		
Alameda	1	1	2		8	17	3		14	1	
Berkeley	2	6	9			22	40		25		8
Emeryville			1				7		1		
Fremont	7		21			56		12	19		
Hayward	2	16	15		3	38	34		4		20
Livermore		2	11			26	14		3	1	3
Newark			1		5	14			3		
Oakland			35			78	25		22		
Piedmont									3		1
Pleasanton	17	1	8	1	1	15	6		8	2	5
San Leandro	2	1	1			7	11	2	5		
Union City											
TOTALS	31	30	89	1	17	273	144	14	129	4	67
	No Longer Exists	No Longer Exists	Never Exist- ed	Yes Keep	Keep?	Yes ARG Put on Model	Yes	??	Yes, VR Keep on Model	Vr. Drop From Model	Check Each One

Phase 2 - ARG Corrections - cont.

Model File Creation

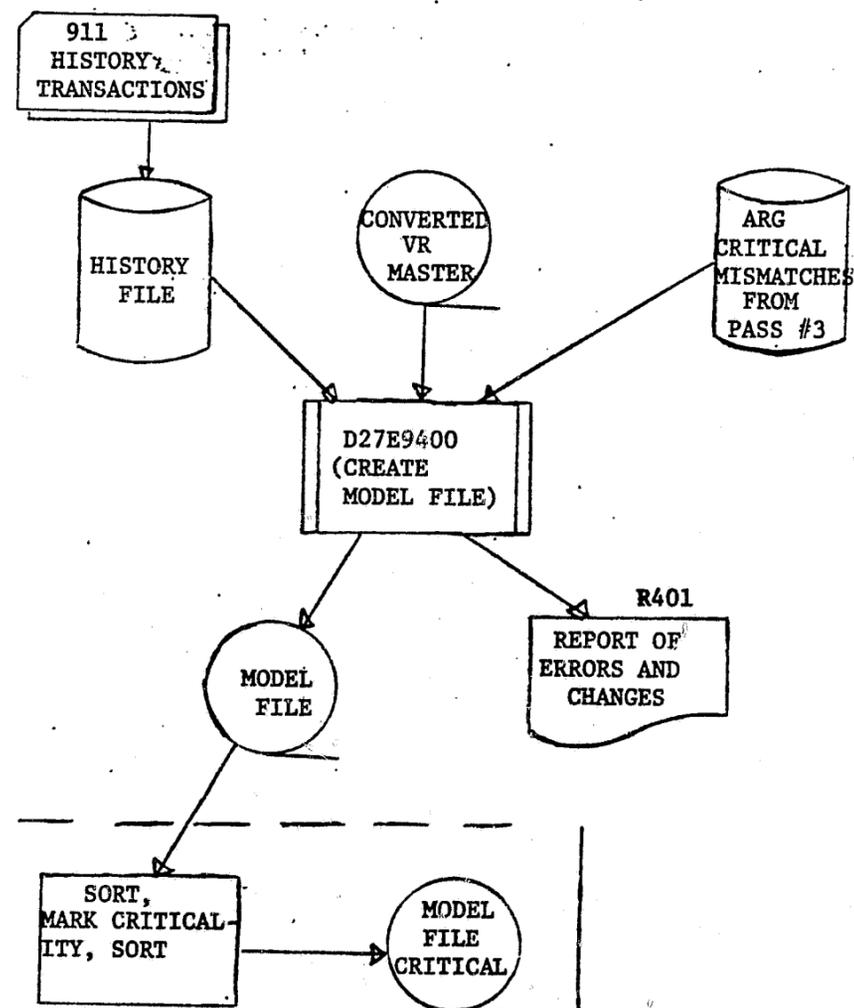
All the corrections from critical mismatches and missing streets were compiled into the 911 History File which, in turn, formed the basis for the ARG Model File. The following pages contain:

- (1) instructions used by the 911 Office to code history transactions prior to the 9/25 ARG conversion. During the time from March 6 to 9/25 the process was to accumulate what the ARG should look like.
- (2) instructions used by the 911 Office after the 9/25 ARG conversion. During the time from 9/25 to 12/1, when the PT&T customer data base was to be converted using the (by then) purified ARG, the process was to resolve all the remaining disagreements of Model to ARG.
- (3) the program design for D27E9400 which created the Model File.

Phase 2 - ARG Corrections - con't.

Create Model File

Process Flow:



Description:

Creation of the Model File will be accomplished by applying changes to the Converted VR Master as per transaction cards contained in the History File. The output from this will be a file which looks exactly as the ARG should look.

By comparing this Model File with any new ARG tape received from PT&T (i.e. Pass #3) it will be possible to see how many streets do not yet conform to the model. At the point that all streets match the Model File, the ARG can be approved by the communities.

Another benefit of this Model File/History File process is that the History File contains the to-date changes as submitted by the ARG coordinators and, by listing out the history transactions, it will be possible to check the progress of the correction effort. Any changes can be altered merely by replacing the transactions in the history file.

History Transactions

- 1.) 80 column layouts: 1 card or several cards for each transaction, depending on transaction.
- 2.) Tran 10 = delete this street from VR file.
Tran 20 = insert this street into file.
Tran 30 = replace this street with the ARG street as it exists on E9300 (a disk file of ARG critical mismatch streets)
Tran 32 = replace this street with the history file cards for the street.
- 3.) See 911 coding instructions for card layouts and detailed description.
- 4.) The history file will be maintained and updated as a Librarian Auxiliary Function and passed to the model file program.
- 5.) Sort sequence for the history transactions will be: Postal Community/Street Name/Tran Code/ low house# odd-even
- 6.) An additional transaction #50 (comment) is provided so the 911 Office can carry comments for streets on the History File. These transactions are ignored by the processing program.

911 ARG Verification Project

Phase 3 - ARG Conversion

September 20 through October 5

Dates

1977 9/20	PT&T sends ARG pre-conversion tape to 911 programming
9/25	ARG conversion runs
9/27	Converted ARG tape back to PT&T
10/1	PT&T's ARG conversion Street Ledgers printed
10/5	Model File/converted ARG compare.
	All Pass #3 mismatch reports to 911 Office.
Oct-Nov	ARG coordinators review street ledgers and mismatches from Model. Street ledger updates submitted to PT&T.

Description

The ARG conversion phase involved running an updated ARG tape provided by PT&T (from MAT as of 9/20) into a program which replaced the 'XXX' and alpha codes (OAK, BRK, etc.), carried as taxing codes, with a true numeric PSAP as specified for 911.

Initially, PT&T did not want any extraneous records dropped during the conversion; however, after the 911 office performed an analysis of 000000-000000 records carried as prefix-records to existing streets and showed that 83% of these 1300+ records were not useful for 911 (see p. 000), it was agreed that these 00-00 records would be stripped.

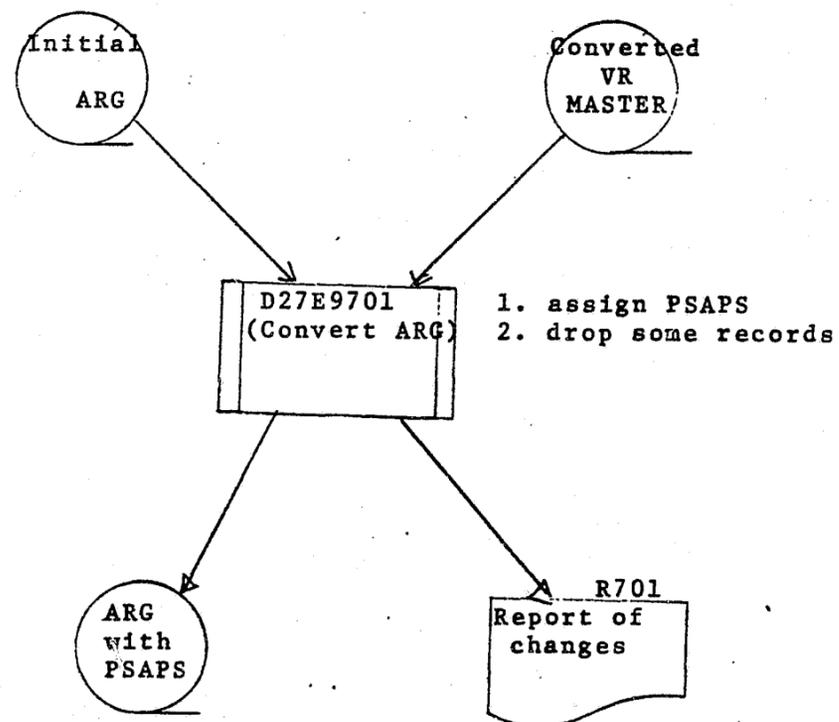
For conversion program processing, an algorithm for PSAP assignment was developed using the city-codes of the VR file as a guide. Rules for this assignment are detailed in the conversion program design which follows.

After the ARG conversion run at Alameda County, the original unconverted PT&T ARG tape, a tape copy of the converted ARG, and a full report of changes were returned to PT&T. They loaded the converted ARG as the starting file of their system, printed ARG street ledgers for each street and sent them to the 911 office for community approval. The 911 office, in turn, submitted the yellow critical mismatch sheets still remaining (appx. 275 critical mismatches in non-taxing communities) to PT&T as ARG street ledger updates.

Between 10/1 when the ARG conversion was complete and 12/1 when PT&T assigned PSAP codes to its customer files using the ARG PSAP codes, it was important that as many remaining updates as possible be made to the ARG. This was a considerable effort on the part of the ARG coordinators, the 911 office, and PT&T, but resulted in a very acceptable ARG by 11/29. On that date a copy of the last pre-database-conversion ARG was sent to 911, and a Pass3 comparison of that ARG and the Model ARG as finalized in Phase 2 showed very satisfactory results for the correction and conversion effort.

Phase 3 - ARG Conversion - cont.ARG Conversion Program

Process Flow:

911 ARG Verification ProjectPhase 4 - ARG Support Programs

Dates

1977 9/25 Print formatted listings of converted ARG
 12/6 Print formatted listings of last ARG prior to PT&T data base conversion and compare Model/ARG.

1978 2/24 Print formatted listings (1st true production ARG) and compare OLD/NEW.
 7/6 Formatted listings of ARG (1st ARG after 911 Startup) and compare OLD/NEW.

Description

The major portion of the ARG Verification project was completed at the end of November 1977 when the ARG was approved by the 911 communities. However, it was felt that a periodic printout of the ARG file would be of value to the 911 office and ARG coordinators since permanent record of additions, deletions, and changes to the ARG were available from PT&T only via street ledgers returned. For that reason, a program to format and print an ARG tape in Postal Community and/or PSAP sequence was written and installed as a permanent job at the Alameda County Data Processing Center. Each time the job is run it gives the 911 Office and ARG coordinators an up-to-date list of the streets and ranges of their responsibility.

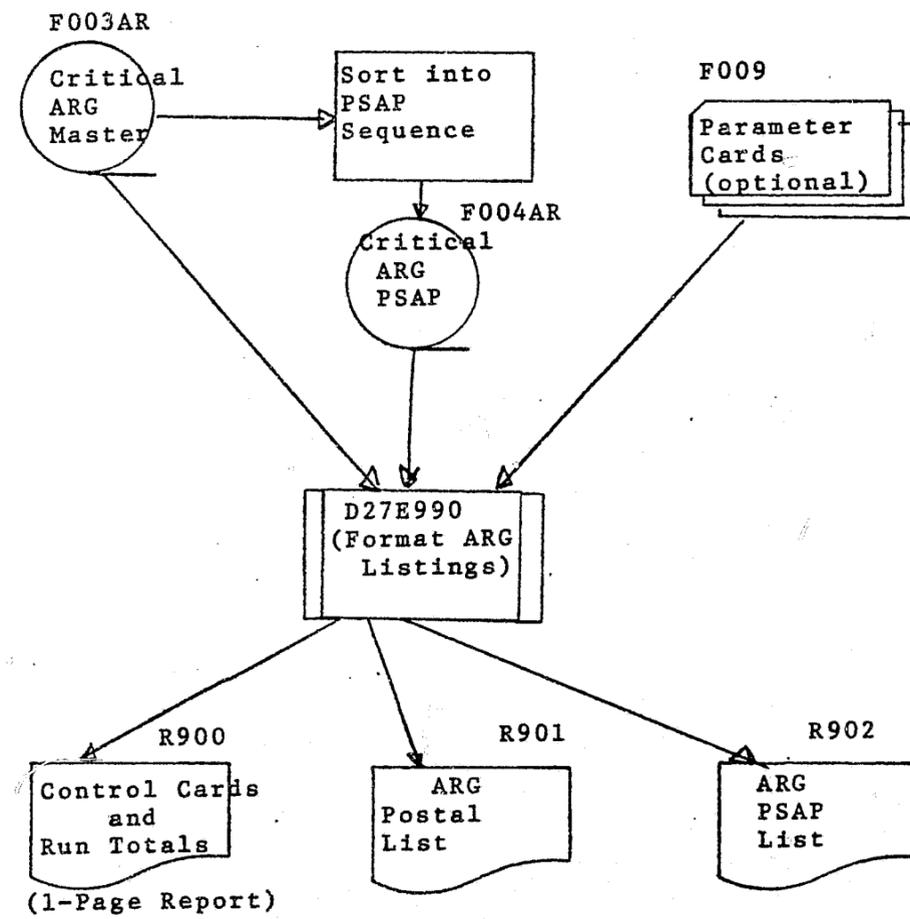
Also, the Pass #3 programs for ARG/VR comparison were modified a bit and installed as a step in the same job to compare the new ARG against the old ARG (i.e. the previous tape). The reports R301, R302, and R303 thus generated present a combined record of all changes to the ARG between the dates of the two tapes. Report R302 contains all streets deleted; Report R303 contains all streets added; and Report R301 contains the old and new image of every street changed.

The job is initiated by the 911 Office, which requests an ARG tape from PT&T (usually 2-3 times a year) and sends the tape to Alameda County DPD. Alameda County DPD processes it and sends the tape and the generated reports and microfiche back to the 911 Office for distribution to the communities.

Phase 4 - ARG Support Programs - cont.

ARG Postal & PSAP List

Process Flow:



APPENDIX III

Study of the Haines Reverse Directory Limitations

HAINES STUDY

The major shortcomings of the commercially available Haines directory are the omission of unlisted subscribers; the omission of an address on many "listed" subscribers; and the infrequency of update.

Unlisted Subscribers

The obtaining of unlisted or non-published numbers is a large and growing problem. In September 1973, 25% of all accounts and 29.2% of residential accounts were unlisted. The percent of unlisted residential subscribers ranged from 17.2% to 38.8% for individual central office areas in Alameda County. By mid-1979 the portion of unlistings had increased to 30.3% of all and 32.0% of residential accounts. Although variance by central office is no longer available, it seems certain that 40 - 45% of residential subscribers in the rapid growth areas of the County are now unlisted. Nevertheless, a county-wide figure of 69.7% will be used for listed phones.

Unlisted Addresses

A relatively recent phenomenon is the omitting of any address from a phone directory listing. A sampling of nearly 2000 entries in the Haines directory had "ADDRESS UNKNOWN" after name and phone number in 9.4% of the cases. This would translate to 6.55% of all subscribers (9.4% of 69.7%) with a strong probability of growing since PT&T has promoted the "delisting" of addresses through bill insertions for unknown reasons.

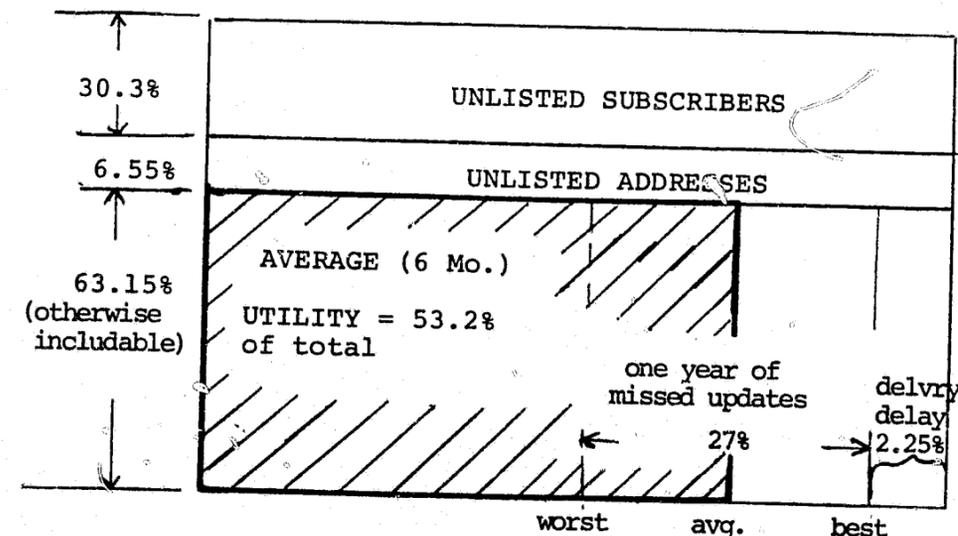
Infrequency of Update

The home office of the Haines Company has estimated that their directories for California are "about half out of date

when we issue a new one" a year later. This estimate must include listings discontinued after publishing. That would not be an ALI problem, since no 911 calls would be generated from those numbers. Contrary to the Haines estimate, a sample examination of 132 entries under the most common prefix for each of the 14 municipal PSAPs showed "new or changed entries since last edition" constituted only 26 to 27%. A similar check by the street portion of the directory (all 13 of the LAUREL and REGENT streets or avenues in the county - 1105 entries) yielded 29.6%. Using 3A update statistics and PT&T-provided distributions of INs versus OUTs and CHANGEs (37%, 34.4% and 28.6% respectively) resulted in an annual rate for new or changed phone service of 27%.

As illustrated below, the combination of unlistings and annual updating significantly limits the Haines value. Assuming a one month initial delivery delay (the books are printed in Ohio) the probability of finding an address for a 911 call would start at .62 and gradually drop to .45 a year later, averaging only slightly better than one chance in two.

PROBABLE UTILITY OF USING HAINES DIRECTORY
IN LOCATING AN ADDRESS FOR A 911 CALL:



END