

EFFECTS OF THE UNAVAILABILITY OF BUILDING PERMIT INFORMATION
ON THE BUREAU OF THE CENSUS' DEMOGRAPHIC SURVEYS

Florence H. Abramson, Stephen Heacock,
and Donna Kostanich
U.S. Bureau of the Census

INTRODUCTION

The demographic surveys conducted by the Bureau of the Census use one of the following frames or pair of frames in each area to represent those housing units (HU's) built before the 1980 Census and those housing units built after the 1980 Census: address frame containing addresses in the 1980 Census (produces address segments) supplemented by a frame of new construction residential building permits to represent post-Census housing units (produces permit segments), an area frame to represent all housing units (produces nonpermit area segments), or an area frame (with a yearbuilt screening procedure to exclude post-Census housing units) to represent HU's in the 1980 Census (produces permit area segments) supplemented by a permit new construction frame.

The permit new construction frame includes each permit office within a sample PSU area. Each month, each permit office provides the Census Bureau with a report identifying the number of housing units for which permits were issued during the calendar month. A permit office measure of size is calculated by dividing the number of housing units authorized by four and rounding to the nearest integer. On a monthly basis, the measures of size are cumulated across all permit offices and permit months within PSU. As the first stage of the permit sample selection, permit offices that will yield sample addresses are identified by applying sampling intervals. For these permit offices, the addresses of all permits issued during the month are listed at the permit office. Sample addresses are selected from permit address listings and sent out for interview as permit segments for a scheduled interview period. The Bureau of the Census has found this methodology more efficient than simply representing new construction from area segments and we would encourage other survey organizations to consider similar methods.

Between the time the permits are issued and the permit addresses are listed, the permit information may become unavailable for use by the Census Bureau (i.e., the permits may be lost or destroyed or they may be filed in such a way that for a specific permit month they cannot be readily identified). The unavailability of building permit information can cause problems in the operational redesign of the demographic surveys in three ways. (For a general overview of the entire research program for the 1980 redesign, refer to [1]). The first aspect discussed is the effects of permit unavailability on the initial redesign sample selection. Another concern is with permit data that becomes unavailable for the monthly update sampling which continues until the next redesign. Finally, permit unavailability can affect the sample selection for future surveys that may be established later in the decade.

In addition to a discussion of the effects of

the unavailability of building permit information on the redesign of the demographic surveys, alternative ways of dealing with the problems and some recommendations for use in redesigning the surveys are presented.

INITIAL REDESIGN SAMPLING

After each decennial census, the Bureau of the Census redesigns the sampling frames for the recurring demographic surveys. The implementation of this redesigned sample currently takes place several years after the census. In order to insure that all newly constructed housing units that became ready for occupancy after the census (i.e., after April 1, 1980) have a chance of selection, the decennial census universe must be supplemented with a new construction universe dating back to sometime prior to April 1, 1980. (Because the new construction universe consists of building permits issued for residential housing units and the time span between the date the permit is issued and the date the unit is ready for occupancy can be up to a year or more, the new construction universe must account for permits issued prior to April 1, 1980, for units that were not ready for occupancy until after April 1, 1980. Refer to [2] for additional information regarding permit lag.)

Currently, the new construction sampling for the redesign surveys is scheduled to begin during the third quarter of 1982. If we assume that the new construction sampling time frame will date back to sometime in 1979, then the initial redesign new construction universe will consist of building permits issued over a span of 3 to 4 years. As previously mentioned, during this span of time the building permits may become unavailable for use by the Census Bureau. If steps are not taken to modify the new construction sampling procedures in areas where the permit information may be unavailable, the population living in newly constructed housing units in those areas will have no chance of selection in the recurring demographic surveys.

Several solutions are being considered for modifying the new construction sampling procedures: 1) continuing the procedure used in the 1970 design of double weighting an alternate permit segment to account for the lack of data for a sample segment, 2) ratio adjusting the weights for all remaining permit segments in the same PSU and/or survey month to compensate for the missing data, 3) designating the land area covered by "problem" permit offices (i.e., permit offices for which the building permit data needed to implement the 1980 redesign will not be available) to be included in the nonpermit area frame, and 4) preidentifying "problem" permit offices from which data can be collected while it is still available.

After the 1970 redesign, no attempt was made to preidentify "problem" permit offices. Whenever there was a hit in a particular permit office and permit month for which building permit

data were not available, a "similar" sample permit segment was selected to be double weighted (i.e., to represent twice as many housing units). The basic problem associated with this procedure concerns how well the alternate permit segment represents the unknown units. Even though the number of housing units are statistically represented in the sample, the characteristics (person or housing unit) are not obtained. The criteria used to select the "similar" sample permit segment do not insure that the units in both segments have the same characteristics. Since the characteristics of the unknown units may or may not be like the double weighted units, this method can result in a loss of actual data. This method of double weighting an alternate permit segment can also affect the variance of the estimates. Ratio adjusting the weights for all remaining permit segments in the same PSU and/or survey month has advantages over the selection of one segment to be double weighted. However, if the monthly sample size per PSU for the particular survey is small to begin with, the problems associated with ratio adjusting the weights are nearly the same as for double weighting.

If the land area covered by a problem permit office will be included in the area frame (permit area) in the 1980 design, then all that is required is to convert it from a permit area frame to a nonpermit area frame. However, since this information is not yet known, we cannot assume coverage under the area frame. If we assume the land area will be covered by the address frame, then we must assume that a sufficient list of pre-Census addresses exists. In this case, conversion from an address frame to an area frame would involve costly and unnecessary listing of addresses in the sample area. In addition, if the number of housing units for which permits are issued is large (i.e., large amount of new construction), then the variances for the sample area segments would be adversely affected.

Each of the above solutions involves making adjustments because of the unavailability of data. A preferred solution is to collect the permit information while it is still available and thereby avoid the necessity for adjusting the existing data.

The questions to be addressed, then, are how to identify the problem permit offices, how to collect the permit data while it is still available, and how to handle problem offices that either were not preidentified or that issued so few permits that early collection of data is not cost efficient.

There are two studies involved in the identification of "problem" permit offices. The Computer Use Study was conducted in October 1979 in 814 permit offices [3]. The Computer Use Study questionnaire was designed to obtain information on permit availability and extent of computerization in the permit office. The 814 offices comprise the sample offices in the Survey of Construction (SOC) conducted by the Bureau of the Census. They include most of the active offices (issue permits for large numbers of housing units) that are visited on a monthly basis.

The second study, the Permit Availability Study, is currently being conducted in 299 non-SOC offices (i.e., permit offices not included

in the Survey of Construction). The purpose of this study is to identify problem non-SOC offices, that is, non-SOC permit offices that are not expected to have the permit data for all required months at the time the 1980 redesign sampling is implemented.

The questionnaire for the Permit Availability Study is equivalent to the permit availability portion of the Computer Use Study questionnaire. The information obtained from the two studies should, therefore, be comparable. The results of these studies are to be used to determine the permit offices in which monthly listing of permit data should begin prior to the 1980 redesign sampling.

In addition, some problem offices have already been identified as a result of sampling permit data for surveys under the 1970 design. These problem permit offices will be treated together with the ones identified from the Computer Use and Permit Availability Studies.

In the Computer Use Study, an office was considered a problem office if it met both criteria 1) and 3) or if it met both criteria 2) and 3).

1) Permits and/or summary files are maintained in a manner which makes it almost impossible to identify the permit date of issue

2) Permits and/or summary files are retained for less than 3 years

3) Obtaining building permit information via computerized input from the permit office is not feasible.

Of the 814 SOC offices, 101 met the definition of a problem office.

The 299 offices in the Permit Availability Study are a subset of the 1,884 non-SOC offices for which there were no prior data on permit availability. The offices included in the study were limited to offices that: 1) are in areas that are expected to be in self-representing (SR) PSU's in the redesigned current survey sample design, and 2) issue a sufficient number of building permits for construction of new residential housing units such that the estimated number of missed sample units for the period 1979 -1982 would exceed some specified number of units.

In order to estimate the areas that will be in self-representing (SR) PSU's, the current PSU definitions were used along with assumptions based on SMSA status and population size.

Calculations were made to estimate the number of missed sample units for each of the 1,884 permit offices. The number of housing units for which permits were issued in the years 1978 and 1979 were added and then multiplied by a factor of two (to represent the number of housing units for which permits would be issued in the 4-year period 1979-1982). A sampling interval adjusted to account for all the national current surveys and the AHS-SMSA sample was applied to the number of units obtained for each permit office. The method for computing the sampling intervals was based on the following:

1. For each of the current recurring surveys, assumptions were made about the required sampling interval and the number of samples which would be needed for the decade following redesign.

2. In order to obtain the combined sampling interval (SI_c) that would be needed to satisfy each survey's required SI, a general formula was used, such that SI_c equals the inverse of the sum

of the number of samples needed for each survey (N_i) divided by the required sampling interval for each survey (SI_i).

An arbitrary cutoff of 100 missed sample units was used to determine the 299 offices that were included in the study. (Lower cutoffs were used in 15 SMSA's to accommodate the requirements of the AHS-SMSA sample.) The main purpose of this cutoff was to limit the number of permit offices in the study and should not be interpreted as indicating that fewer than 100 missed sample units would pose no problems for the redesigned sample. Depending on the results obtained from the Permit Availability Study, additional permit offices (i.e., ones falling below the 100 missed sample units cutoff) may be included in a later study.

The procedure for estimating the number of missed sample units for the period 1979-1982 was also applied to the 101 SOC offices identified as problems by the Computer Use Study and to 129 offices that were identified as problems prior to the Redesign research. Out of these 230 known problem offices, there were 63 that fell above the cutoff of 100 missed sample units. These were listed by increasing number of missed sample units. The exact nature of the problem for each office was determined by examining the original Computer Use Study documents and then entered next to the permit office name. Forty-six offices were eliminated because they should not present problems for redesign (e.g., in 1982, permits are expected to be available at least since 1979) or because they are included in the offices that are already being listed on a monthly basis. Listing costs were estimated for the remaining 17 offices depending on the type of problem. For example, for an office that refiles or destroys permits at the end of each month, the monthly listing cost was estimated based on the travel cost and the expected time needed for listing one month's permits. The monthly cost was then multiplied by the number of months for which listings will be needed prior to the implementation of the redesign sampling. For an office that refiles or destroys permits after one or two years, a similar procedure was used for estimating costs, with the following modifications: 1) instead of calculating monthly travel costs, it was assumed that several months' permit data would be listed during the same office visit and 2) the total number of months was estimated based on the earliest month for which permits were expected to still be available.

Listing on a regular basis (even though the permit data may not be needed for the current design) began in mid-1981 in each of the 17 problem offices already identified. Regular listing will begin in the remaining problem offices as soon as feasible after they are identified.

If a large number of permit offices are identified as problems by the Permit Availability Study, the number of offices listed each month may have to be reduced in order to reduce the overall expense of the listing operation. The decision has been made to begin listing only in the most active problem permit offices (i.e., the offices with the highest estimated number of missed sample units). A second cut-off was used to distinguish between "high activity" problem

offices and "low activity" problem offices. High activity was defined as any office from which 200 or more sample units would be missed during the 4-year period 1979-1982. Conversely, low activity was defined as any office from which less than 200 sample units would be missed during the 4-year period 1979-1982. (Lower cutoffs were again used in some SMSA's to accommodate the requirements of the AHS-SMSA sample.) The number of additional problem offices will not be known until results from the Permit Availability Study are compiled. At that time a decision will be made as to whether all problem offices should be listed or only the high activity problem offices.

After the 1980 redesign sampling is implemented, hits in low activity problem permit offices and in permit offices not preidentified as problems can be treated in one of three ways: 1) another sample permit segment can be selected to be double weighted (1970 redesign solution), 2) the weights for all permit segments in the same PSU and/or survey month can be ratio adjusted to compensate for the missing data, or 3) places covered by the low activity problem permit offices that are in the permit area frame can be converted to the nonpermit area frame.

One of the significant factors in making the distinction between problem and nonproblem offices and between high activity and low activity offices is the criteria that were used. If the criteria were different, the offices identified as problem permit offices might vary somewhat. Even after the high activity problem permit offices are identified and the listing procedures established, the cost of the listing operation is a determining factor in deciding the number of offices to list and the frequency of the listings. It should also be noted that since a final recommendation has not yet been made, the method for handling permit availability problems in the initial redesign sampling is still subject to change.

CONTINUING MONTHLY UPDATE SAMPLING

For the continuing monthly update sampling, the permit address listing is completed approximately two months after the end of the permit month. With this short time lag, there are very few problems associated with permits becoming unavailable. Currently, if permit information is not available during the permit address listing, the data for other addresses in the sample PSU are double weighted. This occurs in approximately 1/2 of 1 percent of all permit segments or 1/14 of 1 percent of segments of all types. This section describes several procedures that have been considered for dealing with these problems. If the permit office authorizes a "large" number of units and the permit information is not ever expected to be available at the time of future permit address listings (generally due to permits being filed by address), listings of all permit addresses are obtained immediately at the end of each month before they are filed by address. Ten permit offices are currently handled in this manner.

If no current survey address segments were selected in a permit issuing jurisdiction where permit information is not available, the permit frame could be dropped and a nonpermit area frame reverted to. However, a housing unit could have been in sample from the permit frame and

after the conversion to the nonpermit area frame, the unit would have two chances of selection but would not be weighted accordingly. If address segments were selected in the jurisdiction, it is not feasible to convert to the nonpermit area frame.

NOTE: This alternative was used early in the decade following the 1970 redesign before many of the permit addresses were ever in sample. It could be a useful tool if used in this manner following the 1980 redesign.

If a Standard Permit Universe (SPU) were chosen as the permit sampling system, permit address listing would be completed immediately at the close of the permit month for all permit offices in the SPU. (Refer to the discussion of the Standard Permit Universe in the next section on alternative ways of handling permit new construction sampling for future surveys.) This would virtually eliminate the problem of permit information not being available as it relates to the continuing monthly update sampling. However, as shown below, the SPU is not even remotely a cost effective system for selecting permit addresses for sample.

Computerized access to permit information was considered as a possible means of obtaining permit addresses from the permit offices. In the Computer Use Study, permit offices were asked the extent to which their building permit filing systems were computerized. The questionnaire results showed that only a small percentage of the permit offices were computerized or were planning to computerize in the near future. At best, this alternative could only marginally reduce any permit availability problems.

Since none of the alternative methods appear practical at this time (with the exception of conversion to nonpermit areas early in the decade following redesign), and since the problem is infrequent, the present method of double weighting alternate addresses will probably continue to be used unless further redesign work produces a more feasible method.

NEW SURVEYS

For the 1970 design, reserve measures (ultimate sampling units, USU's) for 16 general purpose samples (GPS) were selected for each CPS hit. As new surveys were introduced during the decade the GPS were used. These samples were insufficient for new surveys that were not national designs and for surveys with sample sizes very much larger than CPS. When new surveys do not use the GPS, the following problems are encountered.

1. The new survey must either be unduplicated with all previous surveys or all surveys must accept a degree of overlapping samples (i.e., the same housing unit assigned for sample for more than one survey).

2. If the sample for the new survey is selected late in the decade, the time lag between permit month and permit address listing month can be longer than for initial redesign sampling. The amount of permit information that is not available is usually a function of this time lag. If an excessive amount of permit information is not available in a PSU (i.e., excessive in relation to the total sample size) the permit frame is discarded and the nonpermit area frame is reverted to for that PSU. This can result in some units

designated for the original surveys through the address or permit frames and for the new survey through the area frame. Unduplication across surveys and sample frames becomes unfeasible. Due to respondent burden, administrative problems, and higher costs, these situations should be avoided where possible.

To address these problems, two major systems for implementation in the initial 1980 redesign sampling were investigated: the current permit system with more GPS and the Standard Permit Universe (SPU) System. In the SPU, a two-stage sample selection of PSU's and then permit offices would identify a fixed set of permit offices for which the permit addresses would be listed on a regular basis. Sample addresses would be selected from the permit address listings. The SPU would serve as the permit frame for all of the current and future surveys regardless of the PSU design [4]. Within these basic systems, several alternatives were considered:

1. To list all permits issued by all permit offices in all months on either a monthly or a quarterly basis (SPU - Alternative 1).

2. To list only those permit months containing sample units--only sample permits for Survey of Construction (SOC) permit offices--as is done currently (SPU - Alternative 2 and Current System -Alternative 2).

NOTE: For SOC permit offices, sample permits are selected from listings by permit month identifying permit number and number of units; addresses are then obtained for sample permits only.

3. To list all permits in all months for all "problem" permit offices (on either a monthly or a quarterly basis) and list only those permit months containing sample units--only sample permits for SOC permit offices--in the remaining permit offices (SPU - Alternative 3 and Current Systems - Alternative 3).

Appendix A contains a list of all assumptions made prior to estimating the workloads and field listing costs that were used to compare these systems. Appendix B provides a detailed description of the calculations for estimating the workloads and field listing costs. Appendix C is a table of the monthly address listing costs for each of the alternatives described above. Together, these appendices incorporate the information used in making the following comparisons.

The following factors were considered in comparing the current system using general purpose samples and the Standard Permit Universe System. Factors 1 and 2 are minor considerations and factors 3 and 4 are major considerations.

1. Permit Office Rapport--By visiting a smaller number of offices more frequently, permit address listers may be able to develop better rapport with the permit officials; that is, permit information may be kept in a manner more suitable to our needs. This has proved helpful in some SOC offices and would be an advantage for any SPU alternative.

2. Permit Office Status Changes--Any system would have to be modified to represent permit office status changes (for example, changes in land area covered by the permit office). Procedures for resolving permit office status changes in the present system are not precise and result in undercoverage or double coverage

for a very small number of offices. In any SPU system, the changes should be less frequent and easier to resolve.

3. SPU Limiting Factor--The number of permit offices in the SPU would be selected such that for at least one permit office, all measures would be assigned to sample. Thus, if more samples, over and above the GPS, are subsequently needed, some permit offices would not be able to provide them. If another permit office was selected to replace this office, we would not have the previous permits for this office on file. In other words, when we select an SPU, we are limiting the number of reserves that can be identified within the system; it cannot be expanded without gathering permit data for at least a few offices not currently in the SPU--exactly what the SPU is supposed to eliminate. Any design which has a prior stage of selection of permit offices has this disadvantage.

4. Field Listing Costs--As shown in Appendix C, the monthly listing costs for 24 GPS per CPS hit for SPU-Alternative 1 (\$113,400) and the Current System-Alternative 3 (\$71,000) are much larger than for the remaining alternatives. The costs can be cut considerably by listing permit addresses quarterly but not enough to be cost competitive. The cost for the Current System-Alternative 2 for the same number of GPS, 24, is \$10,200 monthly and for 48, 72, and 96 GPS, the monthly costs are \$12,200, \$14,200, and \$16,300, respectively. The monthly cost for SPU-Alternative 3 is \$23,600.

If the number of GPS initially identified for the SPU-Alternative 3 is insufficient, then additional costs (over and above the \$23,600 per month already spent) would have to be borne to collect additional permit information from non-problem offices, to select additional offices, and to collect permit information for these additional offices. If the reserves initially identified were sufficient, then all those permit addresses listed in problem offices not initially assigned to sample or to reserves would never be needed.

From a design standpoint, it appears that all alternatives are about equivalent; thus, cost and ease of operation are the overriding factors in making a choice. The SPU-Alternative 1 and the Current System-Alternative 3 have enormous costs relative to the other alternatives without showing a dramatic advantage in operational aspects. The SPU-Alternative 3 costs more than either Alternative 2 systems. Additionally, identification of the problem offices and their changes over time could be awkward, thus, only partially compensating for the permit availability problems. Due to the SPU limiting factor, the safer choice would be to retain the Current System-Alternative 2 rather than the SPU-Alternative 2. The Current System-Alternative 2 will be retained with a "sufficiently large" number, currently undetermined, of GPS reserve measures.

CONCLUSION

The problems associated with permit unavailability can impact on the representation of the population in the demographic sample surveys conducted by the Bureau of the Census. Much redesign research is being carried out to insure that preventive and corrective measures are

taken so that the survey data collected during the decade accurately represent the intended population--both in numbers and characteristics.

Studies designed to assess the extent of permit availability problems have been conducted. The results of these studies are still being compiled and analyzed. Work needs to progress quickly if the permit new construction data collection in "problem" office jurisdictions is to begin prior to the initial redesign sampling (scheduled for late 1982).

Although there has been no redesign work to date on the problem of permits becoming unavailable at some time during the decade, one or more of the solutions intended for the initial redesign sampling may be applicable.

The Standard Permit Universe System was rejected, primarily because of cost considerations. The current permit system will be retained with a sufficiently large number of GPS selected to accommodate future surveys that may be introduced later in the decade. Research is continuing on the question of specifying a "sufficient" number of reserve measures.

Until the redesigned sample PSU designs for the recurring demographic surveys are specified and implemented, the exact permit availability problems will not be known. The value of the research described in this paper is, therefore, dependent upon the accuracy of the assumptions that have been made.

BIBLIOGRAPHY

- [1] Kniceley, R. Maurice, Jr., and Leonard R. Baer. "General Overview of Research in Redesign of the Census Bureau's Demographic Surveys". Paper for presentation at the Joint Statistical Association Meeting, Survey Research Methods Section, Detroit, MI, August 1981.
- [2] Statt, Ronald, E. Ann Vacca, Charles Wolters, and Rosa Hernandez. "Problems Associated with Using Building Permits as a Frame of Post-Census Construction: Permit Lag and ED Identification". Paper for presentation at the Joint Statistical Association Meeting, Survey Research Methods Section, Detroit, MI, August 1981.
- [3] U.S. Department of Commerce, Bureau of the Census, "Redesign Operations Results: Recommendation of the Study of Permit Availability from the Computer Use Questionnaire". Memorandum from L. Baer to C. Jones, February 27, 1981.
- [4] _____ . "Redesign Operations Results: Recommendation Regarding the Standard Permit Universe". Memorandum from L. Baer to C. Jones, March 2, 1981.

APPENDIX A

ASSUMPTIONS

1. There will be 850 Survey of Construction (SOC) permit offices with 15 measures (4 units per measure) per office and 35 measures per sample office. There will be 6,150 non-SOC permit offices in the current design system with an average of 1.7 measures per office and 8 measures per sample office.

2. The Current Population Survey (CPS) sample size will be 86,000 units/month or 2,236,000 units for 26 samples. Approximately 3,000,000 units will be assigned to sample for the other demographic surveys. The United States housing

stock is presently 86,000,000 units; 79 percent (67,940,000 units) will be in CPS PSU's.

3. There will be 26 CPS measures with 1/4 of the GPS/CPS hit at each initial hit, 1/4 of the GPS at each midpoint (the measure midway between two initial hits), and 17 measures for all other surveys and 1/4 of the GPS at each of two ranges of consecutive measures with no overlap with each other or with the CPS or GPS measures. The average CPS PSU sampling interval (SI) would be the ratio of the total units in CPS PSUs and the monthly sample size, or 790.

4. The field permit address listing costs are: (a) \$103 for each complete listing for each SOC office (\$82 average/month for quarterly listing); due to the large number of permits to be listed, the listing must be completed in a separate visit from the SOC visit; (b) \$14 for each partial listing for each sampled SOC office completed in the same visit as the SOC visit; and (c) \$47 for each non-SOC office (\$26 average/month for quarterly listing).

5. The estimated number of SPU permit offices for 24 GPS would be 1,400 and for 48 GPS would be 1,600. Permit offices authorizing less than 50 units per year would comprise a separate permit frame sampled annually in much the same manner as the current design is sampled monthly.

APPENDIX B

A. Estimated Number of PAL Assignments for Both Systems of Alternative 2

The number of hits per month in SOC offices is 16.2 calculated from the ratio of all measures in SOC offices and the CPS SI. The number of SOC offices per CPS hit requiring listing can be calculated from $\sum w_i n_i p_i$ where w_i is the number of initial hits (I), midpoints (M), or other survey hits (O), n_i is the number of offices required per I, M, or O, p_i is the probability of requiring n_i offices: for the larger n_i , p_i is the ratio of the number of measures to select less one and the number of measures per sample office; for the smaller n_i , p_i is one less p_i for the larger n_i , and i is the I, M, or O.

The number of hits per month in non-SOC offices is 13.3. The number of non-SOC offices per CPS hit requiring listing can be calculated from $\sum w_i n_i p_i$. The total number of PAL assignments for 24, 48, 72, and 96 GPS appear in Appendix C.

B. Estimated Number of PAL Assignments for Both Systems of Alternative 3

Based on permit availability studies, 12 percent of the SOC permit offices and 18 percent of the non-SOC permit offices are "problem" offices. A list of problem permit offices could be compiled based on data from a permit availability questionnaire sent to all permit offices in current survey PSU's. Periodically, this list could be updated and additional offices could be added to the problem list and, henceforth, permit information gathered monthly. Permit information for these additional offices before they were designated problems would probably be irretriev-

able. Thus, this system only partially eliminates the problem of permit information not being available. We do not know the magnitude of the problem that would remain.

The estimated PAL workload is: $.12(850) + .18(P0_1) + (1 - .12)P0_2 + (1 - .18)P0_3$, where .12 is the percentage of SOC offices that are problem offices, 850 is the number of SOC offices in the universe, .18 is the percentage of non-SOC offices that are problem offices, $P0_1$ is the number of non-SOC offices in the universe (6150 for Current System - Alternative 3 and 550 for SPU - Alternative 3 for 24 GPS), $P0_2$ is the number of SOC offices in sample per month (102 for 24 GPS), and $P0_3$ is the number of non-SOC offices in sample per month (186 for 24 GPS). The total PAL estimates appear in Appendix C.

C. Field Listing Costs

The total listing costs per month, c , can be calculated using the formulas below. For SPU-Alternative 1, $c = 850c_0 + P0_1c_1$, where c_0 is the cost of listing an entire SOC office; \$103 and \$82 for monthly and quarterly listing, respectively, and c_1 is the cost of listing a non-SOC office; \$47 and \$26 for monthly and quarterly listing, respectively. For Current System-Alternative 2 and SPU-Alternative 2, $c = P0_2c_2 + P0_3c_3$, where c_2 is the cost of listing the sample permits for a SOC office; \$14 for monthly listing, and c_3 = the cost of listing a non-SOC office is \$47. For Current System-Alternative 3 and SPU-Alternative 3, $c = .12(850)c_0 + .18(P0_1)c_1 + (1-.12)(P0_2)c_2 + (1-.18)(P0_3)c_3$. Appendix C lists the expected monthly Field listing cost for each system.

APPENDIX C

MONTHLY ADDRESS LISTING COSTS FOR ALTERNATIVE DESIGNS

	Number of GPS per CPS Hit	PAL Assignments per Month	Listing Completed Monthly (M) or Quarterly (Q)	Average Total Address Listing Cost Per Month
SPU-Alternative 1	24	1400	M	\$113,400
	48	1600	Q	84,000
Current System-Alternative 2 and SPU-Alternative 2	24	288	M	10,200
	48	339	M	12,200
	72	390	M	14,200
	96	441	M	16,300
Current System-Alternative 3	24	1452	M	71,000
			Q	45,600
SPU-Alternative 3	24	444	M	23,600
			Q	19,400