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Cost Comparison of Selected Alternatives for Preserving Historic Pension Files

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and

National Archives and Records Administration
7th & Pennsylvania Aves., NW
Washington, DC 20408

U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

ABSTRACT

This report describes the results of a cost study of three selected alternatives for preserving the historic pension files. The three alternatives evaluated comprise three levels of technology: Hand retrieval of original paper documents; Hand retrieval of microfiche copies of the original documents; and Automatic retrieval of microfiche copies.

Results indicate that the microcopy alternatives substantially reduce storage space requirements and the labor cost of providing reference service. The automated-retrieval-alternative reduction in reference labor cost is substantial. However, with respect to the historic pension files, the actual savings in reference labor are limited: the daily capacity of the automated system for file retrieval exceeds current annual demand. The extremely high cost of converting the files to microfiche more than cancels out the savings in both space and operating costs, even if the original documents are disgarded after conversion and incur no additional expense.

Improving the storage environment and continuing reference service with the original documents is an attractive alternative. At current usage rates, each file is requested, on the average, every 65 years. At these rates, preservation experts do not expect the documents to deteriorate from reference usage.

DISCLAIMER

Certain trade names and company products are mentioned in the text as examples of a currently available commercial products which could fulfil a need and for which a cost can be obtained from the General Services Administration (GSA) Schedule. In no case does such identification imply recommendation or endorsement by the National Bureau of Standards, nor does it imply that the products are necessarily the best available for the purpose.

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COST COMPARISON OF SELECTED ALTERNATIVES FOR PRESERVING HISTORIC PENSION FILES

CHAPTER I - INTRODUCTION

This report describes the findings of a study performed for the National Archives and Records Administration (NARA was formerly the National Archives and Records Service) by the National Bureau of Standards in accordance with Interagency Agreement letters dated September 7, 1982, and February 28, 1984.

The primary objective of the study is to demonstrate the use of accessible, up-to-date cost data in planning studies and provide an example of the use of cost data in an analytic approach to the selection among options for investment of Federal funds. A secondary objective is to build the foundations of a data system for refining and extending the present cost analysis and for other studies concerning the planning and management of archival material using the NARA pension files as a typical example.

This study describes a systems analysis of costs of three specified alternative means of preserving and servicing Nineteenth Century pension files. Systems analysis of costs was made to identify the least-cost alternative over the designated period of study. These costs include not only the cost of actual document preservation, but also the costs of providing reference service to researchers, as this service cost is affected by the various alternatives. The three alternatives are described as follows:

A. Perform extensive holdings maintenance, and continue to provide reference service with the original records.

B. Convert the original records to microfiche copies using an integral number of microfiches per record; provide reference service through hand-retrieval and furnish researchers with Diazo microfiche copies for their use and retention.

C. Convert the original records to microfiche copies, stacking sequential records continuously on the microfiche, build a machine-readable index to locate specific files among the microfiche, store the microfiches in a commercially-available automatic storage and retrieval system, and furnish researchers with Diazo microfiche copies for their use and retention.

CHAPTER II - METHODOLOGY

This section of the report describes rationale for selection of study focus, procedures, data sources and some of the general assumptions upon which this study was based.

Decision to Study the Pension Files

The pension files were selected for this study of preservation alternatives because, as archived records, they are used relatively frequently (for genealogical studies) and are effectively managed. Archived records seldom are used intensively. Rarely a subset of some records series within the Archives will be heavily used for a short period of time as specific subjects pass through the focus of public interest. One recent example is the subset of files which document Japanese internment procedures during World War II.

The Military Service Branch of the U.S. Archives appears to be especially well managed. This branch has been using microcomputers for several years to store and analyze reference demand data, and a number of demand and cost data elements were readily available. At least two previous studies (1)*,(2), were made using these data and it is believed that most of the data problems had been identified and corrected.

At the time the present study began, the latest cost and usage data available from the Military Service Branch were the last half of calendar year 1983 and the first half of 1984. Some data items were included in the first half of 1984 that were not available earlier. The distribution of these new data items were allocated among the data from the previous six months. It is for this reason that each incremental year in this study is a composite consisting of the last six months of one year and the first six months of the following year.

Selection of Preservation Alternatives

The selection of the preservation alternatives was made by the contract technical monitor. The base case (A.) was selected to be the performance of thorough holdings maintenance on the original documents and the provision of reference service using these documents. A detailed description of holdings maintenance is presented in CHAPTER III, ANALYSIS OF DATA in the Section on base case (A.). Basically, holdings maintenance is systematic maintenance of a series or subseries of records. The purpose of performing holdings maintenance is to assure that documents are properly housed in acceptable containers.

A more theoretically satisfying base case might have been one that continues current operations of reference from the original files. To consider this condition as the base case would presume that a cost could be ascribable to the deterioration of original records stored "as is" over the period of study.

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*Numbers in parenthesis refer to references listed in Appendix A

Unfortunately, the state-of-the-art will not yet support this approach because the cost of wear and deterioration due to poor storage conditions and infrequent reference usage cannot be evaluated. It is believed that the application of holdings maintenance and the controlled environment described in the subsequent sections of this report provide as realistic a base case as can be approached in this study.

The first alternative (B.) for preservation of the pension files considers conversion of the individual pension files into an integral number of microfiches, hand retrieving these fiches for reference and providing researchers with Diazo microfiche copies of the requested file(s) [a file is a collection of documents pertaining to an individual veteran and, on the average, contains 100 sheets of paper. Each file is housed in its own jacket or envelope.] This might be considered a more permanent form of preservation than performing holdings maintenance and providing a controlled environment. However, archival and preservation experts (8) tend to agree that paper records stored under near ideal conditions and subject to relatively light reference usage will last indefinitely. (There are currently about 44,500 requests per year for files, out of approximately 2,921,000 files on hand. This implies that, on the average, each file is used 0.015 times per year.) It is apparent that records are in no danger of deterioration due to usage.

The second alternative (C.) for preservation of the pension files considers conversion of the individual pension files into microfiche copies forming a continuous series of microfiches. By stacking pension records onto fiches and not using an integral number of fiches per file, considerably less fiches are required for record storage. (Approximately 4,100,000 fiches vs 7,200,000 fiches). However, it becomes necessary to prepare a machine-readable index to locate the fiche containing a specific pension file. This alternative provides for automated storage and retrieval using commercially-available equipment which has a high operational capacity and has approximately the same preservation characteristics as the first alternative. (These characteristics for the second alternative are slightly better because there is less handling of fiches by reference technicians.)

Study Procedures

The basic study procedure is to estimate the total cost of operations of the base case and the two preservation alternatives over a 25 year comparison period. The study period was assumed to be 25 years, rather than the life of the alternatives, since little is known of the useful life and the salvage value of the automated storage and retrieval equipment being considered in the second alternative.

Costs of some operations which were common to all three preservation alternatives were not included in the analysis. Such operations were few in number. As an example, cost of responding to mail inquiries for which files do not exist have not been included in this analysis; nor have the costs of the proposed atmospheric filtration system.

Annual total differential costs - capital, operating and maintenance costs- were estimated for the 25 year study period, 1985-86 through 2009-10 inclusive. The sources of data for individual costs are described in Appendix B.

Costs can be classified into two categories: existing costs, and projected costs of selected alternatives. Existing costs of providing service usually could be obtained from National Archives and Records Administration (NARA) for the existing service. Alternative preservation strategies had to be conceived and reviewed for feasibility before estimating the various cost components. For purposes of this analysis, the following general classifications of costs were established:

Reference costs
Costs of retrieving, copying, and refiling requested documents

Equipment Maintenance costs
Cost of contract maintenance of equipment

Costs of Contracted services
Cost of microfilming pension files including film processing-materials and labor.

Transportation costs
Costs of transporting records to remote storage

Storage costs
Annual cost of storage of active reference documents, and annual cost of remote storage for original documents and/or backup microfiche negatives

Rental costs
Costs of government space for conversion to microfiche
Annual cost of space for reference material (government space or equivalent commercial space)

Capital costs
Costs of automated storage and retrieval equipment
Costs of copier equipment
Costs of shelving

Costs of materials
Costs of holdings maintenance materials
Costs of microfiche storage materials
Costs of copier materials

Miscellaneous costs
Costs of preparation of documents for microfilming
Preservation laboratory costs
Periodic microfiche inspection costs

In addition to cost information, data was needed with respect to forecasts of price inflation to bring all cost data to a common base year; optimal combinations of equipment; equipment production rates; demands for reference services; space requirements; reliable operating procedures; discount rates and prescribed methods of evaluating alternative Federal investments; etc.

Data for this study was obtained from both government and private sources. A partial listing is as follows:

U.S.Government

Bob Villanueva, Senior Economist
Council of Economic Advisors
Executive Office of the President
Washington, DC 20500

Officials of the
National Archives and Records Administration
7th and Pennsylvania Ave. NW
Washington, DC 20408

Alan R. Calmes
Geraldine Phillips
David R. Allder
John M. Scroggins
Brenda B. Kepley
Charles Ponders
Joan Smith
Richard Yuso
Nancy Menan
Maida Loescher
John Mendelsohn
Frank Burch
William H. Leary
Norvell Jones
Philip R. Ward
William K. Wilson

The Library of Congress
Washington, DC 20540

Peter Waters

Private Companies

Conservation Resources, International
William K. Hollinger, Jr.
1111 No. Royal St.
Alexandria, Virginia 22314

Julien J. Studley, Inc.
Steven Solomon
1333 New Hampshire Ave.
Washington, DC 20036

The Access Corporation
John K. Rokely
Mary Lee Kolich
700 N. Fairfax St.
Alexandria, VA 22314

MSTC
Whitney S. Minkler
3541 Chain Bridge Road
Suite 9
Fairfax, VA 22030-2793

AmeriCOM
Bruce R. Gray
3700 Mt. Vernon Ave.
Alexandria, VA 22305

National Micrographic Systems, Inc.
926 Philadelphia Ave.
Silver Spring, MD 20910

Security Moving and Storage
Michael Miller
1701 Florida Avenue, NW
Washington, DC 20009

Data Resources (DRI)
Steven Cohen
1750 K St. NW
9th Floor
Washington, DC 20006

BRC Associates, Inc.
B. K. Radhakrishnan
Robert Hughes Watkins
4334 Montgomery Avenue
Bethesda, MD 20814

National Academy of Science
National Research Council
National Materials Advisory Board
Committee on Preservation of Historical Records
2101 Constitution Avenue, NW
Washington, DC 20418

Various members of this committee provided verbal confirmation of a number of elements used in this analysis.

The above mentioned persons, organizations and companies freely and willingly made time available to furnish cost and performance data without which this study could not have been made. The thanks of the author are, therefore, made a part of this final report. The author is, indeed, responsible for any errors of omission.

Description of the Study

The Base Year was selected during the planning of the study as the very earliest possible time that implementation might begin. Since the study specifications were prescribed by the Office of Management and Budget (OMB) Circular A-94, Revised, dated March 27, 1972, costs were not adjusted for inflation. However, since required cost data was available over a range of about three years, it was necessary to apply inflators to adjust available cost data to the 1985-1986 base year. Inflation data was available from forecast tables developed by Data Resources, Inc. (DRI) and furnished by the Council of Economic Advisors. Inflators for government salaries and for consumer prices were also available from DRI and were applied to the respective cost items. Some cost items, such as government building space costs, which were affected by both government salaries and by consumer price items such as fuel, energy and supplies, were adjusted by the simple average of both indices. Since the adjustment period never exceeded three years, the discrepancy introduced here is believed to be minimal.

Also, in accordance with the prescribed methods of OMB Circular A-94, Revised, study period costs were discounted to present value at the rate of 10%. Use of the discounting procedure allows costs (and benefits) accruing in out-years to be compared on a common basis. The discount factors are easily computed using a compound interest table. The present value of an expenditure in, say, five years, is the amount which must be invested in the base year, compounded at 10%, which at the end of five years will yield the expenditure value. Thus, it is apparent that both out-year costs and out-year benefits appear smaller in the comparison than they will be at the time they occur. The purpose of this procedure is twofold: it provides a standard basis of comparison of cost and benefit time-streams when the occurrence of costs and benefits does not take place uniformly; in addition, it weights investment decisions heavily by early-year costs and benefits. The philosophy behind use of the present-value analysis is that there is so much competition for scarce federal-investment dollars, that projects with big, short term returns should get funding priority. The present-value analysis makes these projects stand out among projects offering high early costs and delayed return on investment.

Notwithstanding the purpose of present-value analysis, if a Federal investment is to be made, it must be paid for in current-value dollars, not discounted (present value) dollars. Therefore, for each alternative, this study presents estimates of both discounted and undiscounted costs over the twenty-five year comparison period.

Space rental costs in this type of study are not trivial. The costs of government-owned space were listed as $4.80 per square foot in 1983-1984. Inflated to the base year of 1985-1986, this becomes $5.25. Comparable commercial space in the same section of the city is listed at $20.15 per square foot in 1983-1984, and was inflated to $22.26 for 1985-1986. Where significant amounts of space were used in any alternative, either permanently or temporarily (as for camera space for microfiche conversion), rental costs were included in the analysis.

Although less expensive commercial space is available at other locations in the greater Washington, D.C. area, the cost of comparable commercial space within the Pennsylvania Avenue corridor was used in this study to reflect the true marginal value of space released for other archival purposes, or the cost of acquiring contiguous space in the vicinity of the main Archives Building.

CHAPTER III - ANALYSIS OF DATA

Major Assumptions

In a cost comparison study of this nature, a great many assumptions are inherently a part of the scenarios. Most of these assumptions are related to how the systems, which are being analyzed, perform.

A list of such assumptions follows:

The Base Case (A.) in this study consists of performing holdings maintenance on original documents and using these documents to provide reference service. Holdings maintenance is envisioned to involve replacement of acidic folders and boxes with approved archival materials and relabeling as required. All documents in the pension files have previously been unfolded. The holdings maintenance function will be engineered to use ergonomically designed work stations on wheels, which are wired for plug-in power and have a comfortable seat attached. Maintenance technicians will be trained carefully, and helpers will be assigned to assist with the logistics of pulling boxes for maintenance, restoring boxes to the shelves as maintenance is completed, and bringing in new boxes and folders and removing waste materials.

The NARA is planning to rehabilitate the air filtering, temperature and humidity controls in the main Archives Building as part of a separate project. The improved atmosphere for storage of paper documents is much dependent upon this project, the cost of which is not included in this analysis. It is understood that this improvement will be made and is totally independent of the selected preservation treatment (if any) of the the pension files. After completion, the air filtering, temperature and humidity control system will likely cause rent in the main archives building to increase due to the additional operating costs. This potential increase in rent is not reflected in this analysis.

Reference service to be provided in this base case is similar to the reference service currently available. Up to fourteen copies of individual sheets will be mailed in response to write-in requests; walk-in researchers will be allowed to look at the entire contents of the file.

The First Alternative (B.) system being analyzed in this study for preservation of the pension files consists of converting the files to microfiche using an integral number of fiches for each pension file. Preparation and any special laboratory work required prior to filming will be done by Archives technicians. Camera work, developing, cutting, and quality control will be performed by contract, with all work being done in the Main Archives Building. The basic purpose of this is to maintain control of historic records and to cause as little interruption to reference service as possible. Microfiches are to have eye-readable titles. Silver duplicate negatives are to be made for reference use. Camera original silver negatives will be placed in storage at an off-site location. The original documents are also to be stored off-site after filming and inspection. The reference set of microfiche are to be stored in the Main Archives Building. Each microfiche

would be stored in a polyester sleeve (reference set only) and each set of fiches comprising a pension file are to be stored together within an acid-free, labeled paper envelope. For ease of retrieval and refiling, twenty point dividers are to be placed at approximately every two-hundred fiche. The fiche are to be stored in acid-free boxes on steel shelving. Microfiche readers are to be placed within the storage room for the use of reference technicians. Both walk-in and write-in researchers are to be provided with Diazo copies of the fiches. This would require that both walk-in and write-in researchers have access to a microfiche reader.

The time and cost of retrieval/refiling of microfiche pension files was determined by physical simulation of the process. There is no differential in the simulated time or cost of servicing different types of pension records. If, in fact, there is a differential, as there currently is with the paper records, this could be a potential source of cost estimation variance. It is believed that the variation of reference times and costs currently existing with the original document files is attributable to the locations of various segments of the files within the National Archives Building and the varying logical arrangement of files within these segments. It is proposed that after conversion to hand-retrievable microfiche, all these fiche be stored in one location and in a uniform, logical arrangement.

Transport costs of paper and duplicate negatives to an off-site storage location, periodic inspection, cost of shelving and annual rental costs at the off-site location, postage costs for mailing Diazo copies to write-in researchers have been included. The process of conversion to microfiche would be staged in such a manner as to convert the most frequently-used files first. It was assumed that the existing system would be used entirely the first year, and for the next three years, the microfiche system would be phased in gradually. In the fifth year of the conversion process, it was assumed that the least-used files would be converted and for all practical purposes, reference would be provided from the microfiche files.

The Second Alternative (C.) system being analyzed in this study for preservation of the pension files is quite similar to the first alternative in the conversion of the original paper pension records to microfiche. However, in an effort to reduce the required number of fiche, the pension records are stacked on the microfiche: each pension file does not necessarily comprise an integral number of microfiches. This stacking process requires that a machine-readible index be prepared for the whole set of pension files. This index subsequently must be keyed to the location of the pension records on microfiche in storage. The second alternative system utilizes an automatic electro-mechanical storage and retrieval system.

This system, when coupled with the aforementioned machine-readible index, provides for very rapid retrieval and refile of pension records. Both walk-in and write-in researchers are to be provided with Diazo copies of pension file microfiche which they can retain. As in the case of the first alternative system, researchers would need access to a microfiche reader. The cost of preparing the machine-readible index to the pension files is large. For the purpose of this cost analysis, prices were obtained for key-entry of these

index data in Bombay, India. At least one other government agency has had key-entry of non-sensitive records performed under a similar arrangement. The preparation of duplicate silver negatives, storage of camera original silver negatives, the original paper documents, quality control, periodic inspection, and the mailing of Diazo microfiche copies to write-in researchers would be similar to the first alternative system.

The second alternative system has many interesting properties: it requires little manual interaction with the microfiche; it provides extremely rapid retrieval and refiling capabilities. Unfortunately, the demand does not exist to take advantage of these capabilities. The electro-mechanical storage and retrieval system can service the current total annual demand in little more than one eight hour shift, and optimistic projections of demand do not suggest that this might increase to as much as two eight hour shifts in twenty-five years!

A Fee is charged at this time to write-in researchers to cover the cost of copying and mailing requested pension file information. These fees are paid into the Archives Trust Fund. The fee is periodically reviewed to assure that it covers prescribed costs. For the purpose of this study, this fee was held constant over the twenty-five year period. It is, however, possible that the fee might be adjusted upward or downward to cover the same or different designated costs at any time.

Method of Analysis

The method of analysis utilized a spread-sheet micro-computer program to record data entries, make extensions and provide the summations which comprise the results of this study. Data development which were entered into the spread-sheet are summarized in the Appendix B of this report. The detailed data collection and analysis are massive and are contained in two large loose-leaf notebooks available for review, by special arrangement, at the National Archives, Washington, DC 20408.

The spread-sheet data columns produced for this cost analysis are presented as Table A, in Appendix B. The spread sheet data comprise 130 columns not all of which were used in the analysis. Some columns have entries for the years 1983-1984 and/or 1984-1985 because data was available for these years. These data were adjusted for inflation to approximate the value for the first year of the 25 year study period, 1985-1986. There are twenty-five possible line data entries corresponding to specific years in the study period which includes the year 2009-2010. With the exception of the first column, all columns are labeled sequentially beginning with "B" and continuing through "DZ". Again, with the exception of the first column, which is a sequential numbering of rows, all columns are labeled with generally applicable labels above specific labels. The first columns contain data for the base case; these columns are followed by columns of data for the second preservation alternative (automatic storage and retrieval of microfiche). A large portion of these data for the second alternative are also common to the first preservation alternative. The next set of columns contain data for the first alternative (manual retrieval of microfiche copies). The last set of columns contain summation data on a line-by-line basis. Twenty-five year totals are indicated below the dashed line at the bottom of the page.

CHAPTER IV - RESULTS AND CONCLUSIONS

The purpose of this research is to demonstrate the use of cost analysis in evaluation and selection of preservation alternatives by the National Archives and Records Administration. The methodology is general and is useful in evaluating many types of investment alternatives. This research also demonstrates the usefulness for maintaining a comprehensive cost accounting system within government functions. Where cost data are unknown or unavailable, it is necessary to make estimates by simulation or other techniques.

Results

The results of this study are shown in Table B. The values entered in this table are 25-year estimated total costs for three alternative systems for preserving the historic pension files in the National Archives: Case A, a base case defined as providing service from the original documents and performing holdings maintenance on these documents; Case B, converting the files to "unstacked" microfiche and providing reference service by hand retrieval of microfiche; Case C, converting the files to "stacked" microfiche, building a machine-readable index, and providing automatic retrieval of microfiche. Unstacked microfiche refers to the conversion procedure wherein each new pension file begins with the first page on a new sheet of fiche and continues as necessary to the end of the file which might occur part-way through a sheet of film. Stacked microfiche refers to the conversion procedure wherein a new pension file begins with the first page following the last page of the previous file which might occur anywhere on a microfiche sheet. Stacked microfiche require precise indexing but substantially less fiche because there is no waste space on the contiguous set of fiche.

Each alternative is presented in two cost categories: "Archives space" wherein floor space is priced at the derived government cost for space in the Archives Building; and "Commercial Rent" which is for comparable space within the Pennsylvania Avenue, NW corridor in downtown Washington, DC. For each alternative in Table B, six entries are displayed vertically:

total cost is the estimated 25 year total cost of the alternative (undiscounted).

- o total cost discounted to "present value" at 10%.
- o total estimated trust fund income (it is assumed that demand is stable over the 25 year period and the charges are not changed).
- o total trust fund income discounted to "present value" at 10%.
- o net total cost - total 25 year estimated cost less estimated 25 year income from the trust fund.
- o net "present value" total 25 year cost - total 25 year "present value" cost less total 25 year "present value" of trust fund income. (The discount rate is 10%).

TABLE B
TWENTY-FIVE YEAR ESTIMATED TOTAL COSTS OF THREE ALTERNATIVES FOR PRESERVATION OF HISTORIC PENSION FILES

25 Year Comparison Period Estimate	CASE A Base Case - Use Original Documents		CASE B Hand Retrieval of Microfiche		CASE C Automatic Retrieval of Microfiche	
	Archives Space	Commercial Rent	Archives Space	Commercial Rent	Archives Space	Commercial Rent
Total Cost	$16,552,000	$37,605,000	$45,184,000	$50,097,000	$53,826,000	$59,142,000
Total "Present Value" Cost	6,905,000	14,549,000	32,693,000	36,125,000	37,168,000	40,737,000
Total Trust Fund Income	2,963,000	2,963,000	2,963,000	2,963,000	2,963,000	2,963,000
"Present Value" of Trust Fund Income	1,076,000	1,076,000	1,076,000	1,076,000	1,076,000	1,076,000
Net Total Cost	13,589,000	34,642,000	42,221,000	47,134,000	50,863,000	56,179,000
Net "Present Value" Total Cost	5,830,000	13,474,000	31,618,000	35,049,000	36,092,000	39,661,000

All costs include ongoing and transitional reference costs. Transitional reference costs are the costs of overlapping the existing reference services during the period in which the new reference services are being brought on-line. Some costs which are invariant among alternatives have not been included as an example, the cost of sending a negative reply (one which states that a file does not exist for the pensioner named in the inquiry) to mail inquiries is common to each alternative and is not included.

The derived cost of space per square foot within the Archives Building is very low with respect to comparable commercial space within the Pennsylvania Avenue NW corridor. Each alternative was analyzed using each rental cost separately in order to allow decision-makers at NARA to perceive the differential space requirements of the three alternatives in terms of the marginal cost of additional space required or released for other archival uses.

Costs were developed using 1985-86 as a base year. In accordance with the applicable OMB directive (Circular A-94, Revised, dated March 27, 1972) inflation was not considered within the 25 year study period. This time period was arbitrarily selected to be sufficiently long to reflect the performance differences of the alternative systems without the need for establishing the useful life and salvage value of the various equipment components.

The 10% discount rate is prescribed in the aforementioned OMB circular. The 10% discount is justified in the background information "because outyear benefits are heavily discounted thus emphasizing the selection of capital investments which produce early return-on-investment." By the same token, alternatives wherein large capital investments can be deferred to later years can be made to appear more attractive than alternatives of the same cost which require heavy capital investment in early years of the implementation program.

The present value analysis also has the property of allowing comparison of out-year cost and benefit streams on a common basis. It is clear that a $100,000 benefit next year is far more valuable than a $100,000 benefit occurring 12 years hence. The present value tables are derived for a specified discount rate using a variation of the compound interest formula. As an examaple, the present value of a $100,000 benefit accruing in 12 years at an interest rate of 10% is $100,000 x 0.3186 = $31,860. Or stated another way, $31,860 is the amount which would have to be invested to yield $100,000 in 12 years at a compound interest at 10%.

The present value total costs are useful for making investment decisions and for comparing costs and benefits which accrue in different years. Ultimately the costs of alternatives must be paid in current dollars, not discounted dollars. Therefore, total costs are also shown in terms of 1985-1986 dollars.

Conclusions

The twenty-five year net "present value" costs range from a low of $5,830,000 for the Case A (Base Case) with Archives Building rent to $39,661,000 for a state-of-the-art system providing automatic retrieval of microfiche and rent-

ing commercial space in the Pennsylvania Avenue, NW corridor. This is a high capacity microfiche storage and retrieval system. A system of sufficient capacity to store 2,921,000 files has the capability of retrieving 42,240 files in one eight hour shift. There are currently only 44,500 requests for pension file reference per year. The demand for pension records does not even approach the retrieval capacity of the system; consequently, the benefits of reduced operational costs result in little realizable benefits. The Base Case system is essentially the existing pension file system enhanced with holdings maintenance.

Given current usage of 44,500 reference requests per year and 2,900,000 total files, if every file has an equal likelihood of use, each file would be used every 65 years.

The 2,900,000 historic pension files in the National Archives are all thoroughly indexed. [Only a small fraction of the total holdings in the National Archives are thoroughly indexed.] A theoretical study by Keith R. Eberhardt, Statistical Engineering Division, the National Bureau of Standards, indicates that an indexed series will last nearly twenty times as long as an unindexed series before needing preservation. [See Appendix C]. In view of the substantial difference in cost between the existing system and alternatives based upon microfiche conversion, it might be difficult to justify a preservation alternative other than performing holdings maintenance and providing reference service on the original pension files, notwithstanding the large amount of storage space required. In addition, new reference procedures recently implemented in the Military Service Branch have significantly reduced the costs of providing reference service from the original documents to researchers using the pension files.

On the other hand, the responsible archivist must make the decision as to whether or not making a complete copy of the whole series is worth the high cost of conversion. There are a number of considerations in addition to costs which must be considered in arriving at a final decision. These considerations include a backup for an irreplacible source of genealogical data, and a convenient opportunity to provide complete, compact copies of the series for distribution to other repositories.

APPENDIX A

LIST OF REFERENCES

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APPENDIX B

SPREAD SHEET ANALYSIS

Introduction

Appendix B is presented in two parts: A description of the spread sheet data columns including a brief description of sources and development of these data; a complete listing of the data in Table A.

Description, Sources, and Development of Spread-sheet Data

Column A is not labeled. It is the sequential numbering of rows in Table A.

Column B is the time period for the particular data line. As mentioned earlier, the data year straddles two calendar years.

Columns C trough AF present data on current pension file annual reference demands and unit search times and costs. A positive search means that a requested file exists and can be retrieved. All positive unit search times and costs include the time and cost of refiling. A negative demand means that a search for the requested file was made; however, it was not found to exist in the file set. Annual demand is presented in whole numbers. Search time is presented in hours and costs in dollars. In these calculations made on a minicomputer, the data is printed to four decimal places which is far beyond what the precision of the data justifies. However, this helped to control round-off error and permits anyone to check the results rather exactly using a hand calculator.

The reference service labor times and costs indicated in Columns D, E, G, H, J, K, M, N, P, Q, S, T, V, W, Y, Z, AB, AC, AE, and AF were derived from cost and performance data provided by the Military Service Branch in 1984. A description of the development of these data is presented in the next paragraphs.

Data describing weekly write-in and walk-in pension file research demand by type of pension file was available in Work-performance Statistical Summaries prepared by the Military Service Branch, NARA, for the last two quarters of Fiscal Year FY 1983 and the first two quarters of FY 1984. These data made it possible to separate Pension File and Combined Military Service Record (CMSR) File usage. Data on negative searches as a percentage of total searches was available only for the first two quarters of FY 1984. These percentages were applied to the last two quarters of FY 1983 to produce estimates for a full year.

Units (numbers of files) of work performed per hour by type of pension file were available from the Military Service Branch Performance Statistics. These data were manipulated to yield hours per unit (file) per type of pension file. Positive searches were assessed an additional 1/12th hour for refiling time. Total annual labor costs plus a fringe benefit package cost of 12% were allocated in accordance with the unit times to determine the unit costs of service.

These data are presented in Table A in the following order:

Write-in pre 1861 Revolutionary War Pensions. (Walk-in pre 1861 Revolutionary War Pension Files are available, indexed, on microfilm, self-service in the reference room.)

Walk-in Post 1861 Pensions.

Write-in Post 1861 Pensions.

Walk-in Pre 1861 Non Revolutionary War Pensions.

Write-in Pre 1861 Non Revolutionary War Pensions.

Positive demand and unit search time and cost data are always presented before negative search data.

Column AG presents the total annual FY 1983-84 reference cost for the existing service (Base Case). This value is the summation of the products of the individual demands and the unit costs. Col AG = Col C * Col E + Col F * Col H + Col I * Col K + Col L * Col N + Col O * Col Q + Col R * Col T + Col U * Col W + Col X * Col Z + Col AA * Col AC + Col AE * Col AF.

Column AH lists the estimated space for the base case operation. This includes shelf storage space and stack office space. These data were provided by the Office of the National Archives as an inventory of space in the Main Archives Building by functional use.

Column AI indicates the apparent "rental" cost of space in the Main Archives Building. This cost was determined from information provided by Archives personnel and the net usable space within the Main Archives Building.

Column AJ is the product of Column AH and Column AI and represents the total annual space cost of the base case operation.

Column AK is the estimated unit cost of comparable commercial space in the Pennsylvania Ave. NW Corridor. This data was obtained from a Washington D.C. Metropolitan Area summary published by a commercial leasing organization.

Column AL is the product of Column AH and Column AK and represents the total annual space cost at comparable commercial rates.

Column AM is the total annual number of positive write-in reference requests. Col AM = Col C + Col O + Col AA.

Column AN through Column AQ describe postage costs. Column AN is the unit cost of mailing a transmittal form, 14 sheets of copy and an envelope to respond to a reference request. This is current practice and is typical of the base case.

Column AO is the product of Columns AM and AN and represents the annual cost of postage for the base case.

Column AP is the cost of mailing 100 sheets of copy printed on only one side to a write-in requestor with a transmittal sheet and an envelope. The 100

sheet case is based upon the average size pension file, using fourth class mail and sent to a midcontinent destination represented by the city of Chicago. (This column was not used in the present study because it was deemed to contribute little additional insight in evaluating the selected alternatives.)

Column AQ is the product of Column AM and Col AP. (Column AQ was not used in the present study because it was deemed to contribute little additional insight in evaluating the selected alternatives.)

Columns AR through AT describe price indices. These data were obtained from Steve Cohen of Data Resources Inc. (DRI). Note: These data were applied to base cost data to arrive at a value for Line 1 entries. The price index data, in accordance with the Office of Management and Budget Circular A 95, Revised, was applied only to adjust cost data to the initial study year. No price index was applied after year one of the study.

Column AR is the Consumer Price Index and was used to inflate base data prices of commercial products and services to prices representative of the first year of the study period.

Column AS is the Federal pay index. This index was used to inflate base data Federal payroll costs to prices representative of the first year of the study period.

Column AT is a simple average of the Consumer and the Federal Pay Indices. This composite index was used to inflate base year costs of items which comprise the costs of both Federal salaries and commercial products and services: for example, the cost of space in the Main Archives Building.

Columns AU through BD represent an estimate of the possible growth in reference demand for the pension files. The order of presentation is the same as for Columns C through AF. The growth rate estimates were furnished by the Office of the National Archives. (These data were not used in this study because it was deemed to contribute little additional insight in evaluating the selected alternatives.)

Columns BE through BH present the estimated costs of performing holdings maintenance.

Column BE is a one-time cost and includes the design and procurement of mobile work stations and the preparation and production of a training syllabus.

Column BF is the estimated annual labor cost of performing holdings maintenance and includes training costs during the first year. Assume 1 1/2 minutes per file for performing holdings maintenance with trained teams of technicians since the contents have previously been unfolded. It was estimated that 46 man years (at a work performance rate of 1600 hours per year) would be required to perform holdings maintenance on the pension files.

Column BG is the estimated annual costs of holdings maintenance materials: envelopes, boxes, and labels. Material costs were obtained from Conservation Resources International, Inc.

Column BH is the summation of holdings maintenance costs. Column BH = Col BE + Col BF + Col BG.

Column BI through BN describe the costs of making copies of requested pension files for write-in researchers in the base case. These are per-copy costs and were obtained from cost accounting records of NARA.

Column BI is the estimated labor cost per sheet of copying pension files for write-in researchers.

Column BJ is the estimated machine cost per sheet copied.

Column BK is the estimated materials cost per sheet.

Column BL is the total estimated copying cost per sheet. Col BL = Col I + Col J + Col K.

Column BM is the total number of sheets copied. (The total number of positive write-in requests multiplied by the average of 14 sheets copied for each requestor.)

Column BN is the total annual estimated copying cost and is the product of Columns BL and BM.

Column BO is the annual base case cost of service using the cost of space in the Main Archives Building and is comprised of the sum of Columns AG, AJ, AO, BH and BN.

Column BP is the annual base case cost of service using the cost of equivalent commercial space in the Pennsylvania Ave. N.W. Corridor and is comprised of Columns AG, AL, AO, BH, and BN.

Column BQ is the unit reference charge to each write-in researcher to cover the cost of making copies and postage. This charge is established periodically by the Archives Trust Fund management.

Column BR is an estimate of the total annual write-in fees collected and is the product of Columns AM and BQ.

Column BS is a listing of discount factors (at ten percent) by year (beginning with year one and ending with year twenty-five). This table implicitly assumes end-of-year lump sum costs and returns.

Column BT is an estimate of the maintenance costs for the M5/100 equipment for automatically storing and retrieving pension file microfiche. The unit costs are from the General Services Administration (GSA) Schedule [the prices the U.S. Government pays for many standard items are published in the GSA Schedule] and were furnished by the Access Corporation. The additional costs indicated for years one through six reflect the increased need for equipment as the conversion of the pension files to microfiche approaches completion. The acquisition phasing is described in the paragraph below.

Column BU is the estimated capital costs for the phased acquisition of the M5/100 automatic storage and retrieval equipment. The unit costs are from the

GSA Schedule and were furnished by the Access Corporation. The total costs indicated for each year reflect the increased need for equipment as the conversion of the pension files to microfiche approaches completion. Capital costs of HP-1000 computer and associated software development are included herein. The acquisition plan is as follows: 4 each M-5/100 units the first year (1985-86) and 1 HP-1000 computer. In each of the following four years acquire 4 each additional M5/100 units and, in this fifth year acquire an additional HP-1000 Computer.

Column BV is the estimated annual maintenance costs of the HP-1000 computer equipment required for searching the indices to the microfiche pension files. The unit costs are from the GSA Schedule and were furnished by the Access Corporation. The total costs indicated for each year reflect the increased need for equipment as the conversion of the pension files to microfiche approaches completion. The acquisition phasing is described in the paragraph above.

Column BW is an estimate of the number of Diazo fiche copies which must be made for use by both write-in and walk-in researchers. For stacked fiche, it was assumed that the average file would begin at mid-fiche and require two fiche to copy the whole file since, on the average, each file contains 100 sheets. For unstacked fiche, it was assumed that the eye-readable titling and an average of 100 sheets per file would also require two fiche to copy the typical pension file.

Columns BX through CB address the costs of providing the Diazo microfiche copies needed for researchers which are listed in column BW.

Column BX is the cost of a NB 404 Printer & NB 404 Processor-Desk top rotary printer processor. The price includes 2 cylinders of ammonia and was obtained from the GSA Schedule. Machine replacement is anticipated in year thirteen.

Column BY is an estimate of the annual maintenance of the Diazo printer/processor, parts, and labor.

Column BZ is an estimate of the per/copy cost of ammonia.

Column CA is an estimate of the GSA cost per sheet of Diazo microfiche film.

Column CB is the labor cost of making Diazo microfiche copies. Projecting current practice, the labor is provided at the GS-3, step 5 rate and includes the Archives fringe benefit package of 12%.

Column CC is the estimated total cost of providing Diazo microfiche copies. Note that the values in this column decrease from the initial values in the early years. The reason for this is that the values in this column in the early years contain costs of operating the current paper copy system. These costs taper off as the new system gradually comes into service. During the first year of implementation, all of the copying is assumed to be done with the existing hard copy paper system. In the second year, it is assumed to be 1/3 Diazo microfiche copies and 2/3 paper copies. In the third year of implementation it is assumed to be 2/3 Diazo microfiche copies and 1/3 paper copies. In the fourth year it is assumed to be all Diazo microfiche copies. Except for the transition years, Column CC is the sum of Columns BX + BY + Col

BW * [Col BZ + Col CA + Col CB]. The gradual introduction of the new service has been provided throughout this study in order to maintain uninterrupted access to the files by researchers.

Column CD is an estimate of the "present" or discounted value for each of the twenty-five years in the study period for the base case using space costs for the Main Archives Building. Each line in this Column is the product of corresponding elements of Columns BS and BO.

Column CE is an estimate of the "present" or discounted value for each of the twenty-five years in the study period for the base case using space costs for equivalent commercial space within the Pennsylvania Ave. N. W. Corridor. Each line in the Column is the product of corresponding elements in Columns BP and BS.

Column CF is an estimate of the "present" or discounted value for each of the twenty-five years in the study period of the annual income from the Archives Trust Fund. This fund receives the fees collected for mail order reference service.

Column CG is an estimate of the cost of microfilming preparation labor, supervision and space rental costs in the Main Archives Building. This activity is scheduled to be completed in five years. These costs were obtained by projecting cost data obtained during the microfilming of the Navy Widows files.

Column CH is an estimate of the cost of titling unstacked fiche. This activity is scheduled to be completed in five years. These costs were obtained by projecting cost data obtained during the microfilming of the Navy Widows files.

Column CI is an estimate of the costs of supportive NARA conservation laboratory services. This activity is scheduled to be completed in five years. These costs were obtained by projecting cost data obtained during the microfilming of the Navy Widows files.

Column CJ is an estimate of the cost of key entry of the pension file indices. This process is estimated to be completed within two years. These costs were obtained from the Firm of BRC, Incorporated, Bethesda, MD. BRC has provided this service previously to another government agency.

Column CK is an estimate of the cost of conversion of the historic pension files to microfiche. It includes camera costs, processing, quality assurance, and rent in the Main Archives Building. This process is scheduled to be completed in five years. These cost data were obtained by requesting quotations for conversion from commercial firms providing these services. The lowest of three quotations were used for this study. Prices are comparable to costs provided verbally by the manager of microfilming for the Mormon Church Genealogical Records.

Column CL is the estimated cost of titling stacked microfiche. This column is comparable to Column CH for titling unstacked fiche. Due to efficiencies in multiple titling, it was assumed that titling costs for stacked fiche would be 80% of the cost of titling unstacked fiche.

Column CM is the estimated cost of preparing duplicate silver negatives of the stacked fiche for use in reference service at the National Archives Building. These cost data were obtained by requesting quotations from commercial firms providing these services and selecting the lowest cost. The camera original silver negatives are to be stored off-site.

Column CN and CO are the estimated respective costs of preparing silver positive and visicular positive microfiche copies. These cost data were obtained by requesting quotations from commercial firms providing these services and selecting the lowest cost. Columns CN and CO were not used in this study because it was deemed to contribute little additional insight in evaluating the selected alternatives.

Column CP is an estimate of the labor cost to operate the automatic storage and retrieval system. These costs are based upon a staff of one GS 5/5 systems clerk and three GS 3/5 clerks. The initial costs decline in the early years because, in the beginning, it is necessary to continue operating the existing system to maintain reference service. The existing system is tapered off as more of the proposed system comes on line.

Column CQ is an estimate of the space rental costs in the Main Archives Building for the automatic storage and retrieval system being considered as an alternative. The entry on the first line is the space cost of the existing system. Both systems occupy space in years two through five. At the end of the fifth year, the existing paper files are assumed to be relocated to storage in Boyers, Pennsylvania, and space rental costs in the Main Archives Building are reduced accordingly.

Column CR is comparable to Column CQ, but is based upon commercial rent in the Pennsylvania Ave. N. W. Corridor.

Column CS is an estimate of the annual storage costs of the original pension files at Boyers, Pennsylvania. An estimated 140,000 boxes require approximately 86,650 square feet of shelf space. One square foot of floor space is required for ten square fee t of shelf space.

Column CT is an estimate of the cost of shelving for use at Boyers. A projected requirement of 1238 units @ $255.40 per compartment of ten shelves.

Column CU is vacant and not used in this study.

Column CV is an estimate of the cost of transporting the original pension file documents to the proposed storage location at Boyers, Pennsylvania. The average file is estimated to weigh about ten pounds based upon sample measurements, for a total shipment weight of 140,000 pounds. Costs include required labor surcharges at origin and destination.

Column CW is the estimated cost of positive non-automated (hand) retrieval of unstacked microfiche pension files. Refiling costs are included. Times were determined by physically simulating retrieval and refiling of microfiche.

Column CX is the estimated cost of negative non-automated (hand) searched (but not found) unstacked microfiche pension files. Times were determined by physically simulating search for microfiche.

Column CY is the estimated annual number of positive retrievals for both the stacked and the unstacked microfiche pension files. Note that with the files converted to microfiche, both walk-in and write-in researchers must be furnished Diazo copies of the records.

Column CZ is an estimate of the number of negative retrievals. (A negative retrieval a pension file that is not found either because it does not or did not ever exist, or because it is missing.) This information is used to estimate the cost of operating the hand retrieval system which is not provided with a machine-readable index.

Column DA is an estimate of the Main Archives Building space rental costs for the alternative considering hand-retrieval of unstacked microfiche. Note that these costs are substantially reduced in the sixth year. This is caused by the maintenance of the existing system until the conversion of all the files to microfiche is completed.

Column DB is comparable to column DA but is based upon commercial rental costs in the Pennsylvania Ave. N. W. Corridor.

Column DC is an estimate of the reference costs of hand retrieval of microfiche. The first year is the cost of operating the existing system. It is assumed that in the second year two thirds of the reference service is provided by the existing system (at two thirds of full operating cost) and one third by hand retrieval of microfiche; third year, one third by the existing system and two thirds by hand retrieval of microfiche; and at the end of the fourth year, all reference service is provided by hand retrieval of microfiche. This is assumed because microfiche conversion is to begin on high usage sectors of the pension files and proceed towards segments which receive little or no usage. During the fifth year, microfiche conversion will be completed on the least used segments of the pension files.

Column DD is an estimate of the storage cost of a complete set of silver negative unstacked microfiche at Boyers, Pennsylvania.

Column DE is an estimate of the cost of transporting the boxed set of unstacked microfiche to Boyers, Pennsylvania early in the sixth year of the comparison period.

Column DF is an estimate of the cost of providing shelving for the set of unstacked microfiche at Boyers, Pennsylvania. Space is provided for fiche, paper file envelopes, dividers, and boxes. These camera original silver negative microfiche are not stored in polyester sleeves.

Column DG is an estimate of the cost of boxes, sleeves, dividers and envelopes for the unstacked microfiche which are to be used for reference and for the camera original silver negatives which are to be sent to Boyers, Pennsylvania for backup. (Only the reference set are to be provided with the polyester sleeves.)

Column DH is an estimate of the incremental cost of producing unstacked microfiche. Since preparation and camera work is the same for stacked or unstacked microfiche, this cost reflects the additional expense of the film and the processing of 7,000,000 + microfiche vs. 4,000,000 + microfiche for the stacked alternative.

Column DI is an estimate of the cost of producing duplicate negatives of the unstacked microfiche for reference use in the Main Archives Building. Unit costs were determined by obtaining estimates for specified volumes from commercial firms.

Column DJ is an estimate of the cost of providing additional microfiche reading machines in the reference room and new machines in the stacks for the use of reference technicians who service the unstacked microfiche pension records. Based upon available data, six additional machines will be required to provide for peak period usage in the reading room. Sixteen machines will be required in the stacks. These machines are proposed for incremental purchase as the conversion to microfiche proceeds.

Column DK is an estimate of the annual cost of postage for mailing Diazo microfiche copies of pension files to write-in requestors. The proposed system is assumed to taper into service over the five year period of the conversion to microfiche as described in Column DC above. These costs are the same for stacked or unstacked microfiche.

Column DL is an estimate of the cost of providing additional microfiche reading machines in the reference room for the automatic-storage-and-retrieval of microfiche alternative. Based upon available data, six additional machines will be required to provide for peak period usage in the reading room.

Column DM is an estimate of the cost of providing shelving for the stacked microfiche camera original silver negatives at Boyers, Pennsylvania. It is assumed that the stacked negatives are stored in acid-free boxes with dividers every 200 fiche.

Column DN is an estimate of the cost of boxes and dividers for the stacked microfiche to be stored at Boyers, Pennsylvania.

Column DO is an estimate of transporting the stacked microfiche silver negatives to Boyers, Pennsylvania.

Column DP is an estimate of the annual storage costs for the stacked microfiche camera original silver negatives at Boyers, Pennsylvania.

Column DQ is an estimate of the inspection costs of unstacked microfiche. These costs were provided by Mr. Whitney Minkler of Mirco Systems Technical Corporation, 3541 Chain Bridge Road, Fairfax, VA. 22030. Prices are for a turn-key operation at Boyers, PA., and provide inspection on the 5th, 10th, 15th, 20th, and 25th year. The initial costs in the 5th year are higher than costs in subsequent years because they include set-up of forms.

Column DR is an estimate of the inspection costs of stacked microfiche. These costs were provided by Mr. Whitney Minkler of Mirco Systems Technical Corporation, 3541 Chain Bridge Road, Fairfax, VA. 22030. Prices are for a turn-key operation at Boyers, PA., and provide inspection on the 5th, 10th, 15th, 20th, and 25th year. The initial costs in the 5th year are higher than costs in subsequent years because they include set-up of forms.

Column DS is an estimate of the total yearly cost of procuring, adapting, operating and maintaining the automatic storage and retrieval option for preserving the historic pension files where the space rental costs are for space in the Main Archives Building. Elements in Column DS are the total of corresponding elements in Columns CG, CL, CI, CJ, CK, CM, CP, CQ, CS, CT, CV, DP, DO, DM, DN, DL, DK, DR, BT, BU, BV, and CC.

Column DT is the "present" or discounted value of Column DS where the discount rate is ten percent. Elements in Column DT are the product of corresponding elements in Columns DS and BS.

Column DU is an estimate of the total yearly cost of procuring, adapting, operating and maintaining the automatic storage and retrieval option for preserving the historic pension files where the space rental costs are for commercial space in the Pennsylvania Ave. N. W. Corridor.

Column DV is the "present" or discounted value of Column DU where the discount rate is ten percent. Elements in Column DV are the product of corresponding elements in Columns DU and BS.

Column DW is an estimate of the total yearly cost of procuring, adapting operating and maintaining the Hand-Retrieval-of-Microfiche Option for preserving the historic pension files where the space rental costs are for space in the Main Archives Building. Elements in Column DW are the sum of corresponding elements in Columns CG, CH, CI, CK, DI, DA, CS, CT, CV, DC, DD, DE, DF, DG, DH, DJ, DK, DQ, and CC.

Column DX is the "present" or discounted value of Column DW where the discount rate is ten percent. Elements in Column DX are the product of corresponding elements in Columns DW and BS.

Column DY is an estimate of the total yearly cost of procuring, adapting, operating and maintaining the Hand-Retrieval-of-Microfiche Option for preserving the historic pension files where the space rental costs are for commercial space in the Pennsylvania Ave. N. W. Corridor. Elements in Column DY are the sum of corresponding elements in Columns CG, CH, CI, CK, DI, DB, CS, CT, CV, DC, DD, DE, DF, DG, DH, DJ, DK, DQ, and CC.

Column DZ is the "present" or discounted value of Column DY where the discount rate is ten percent. Elements in Column DZ are the product of corresponding elements in Columns DY and BS.

The spreadsheet data produced in this cost study are presented as Table A in the following pages.

TABLE A (130 Columns)

COST & PERFORMANCE DATA TABULATION

THREE ALTERNATIVES FOR PRESERVATION OF HISTORIC PENSION FILES

	B	C	D	E	F	G
	BASE CASE PENSION FILES, NO INFLATION					
		WRITE-IN PRE 1861 REVOLUTIONARY WAR PENSIONS**********				
	12 month period	annual reference demand	positive unit reference time (hours)	search unit reference costs ($)	annual reference demand	negative unit reference time (hours)
	1983-84	3365	0.3903	3.7571	5983	0.2736
	1984-85	3365	0.3903	3.9074	5983	0.2736
1	1985-86	3365	0.3903	4.0638	5983	0.2736
2	1986-87	3365	0.3903	4.0638	5983	0.2736
3	1987-88	3365	0.3903	4.0638	5983	0.2736
4	1988-89	3365	0.3903	4.0638	5983	0.2736
5	1989-90	3365	0.3903	4.0638	5983	0.2736
6	1990-91	3365	0.3903	4.0638	5983	0.2736
7	1991-92	3365	0.3903	4.0638	5983	0.2736
8	1992-93	3365	0.3903	4.0638	5983	0.2736
9	1993-94	3365	0.3903	4.0638	5983	0.2736
10	1994-95	3365	0.3903	4.0638	5983	0.2736
11	1995-96	3365	0.3903	4.0638	5983	0.2736
12	1996-97	3365	0.3903	4.0638	5983	0.2736
13	1997-98	3365	0.3903	4.0638	5983	0.2736
14	1998-99	3365	0.3903	4.0638	5983	0.2736
15	1999-00	3365	0.3903	4.0638	5983	0.2736
16	2000-01	3365	0.3903	4.0638	5983	0.2736
17	2001-02	3365	0.3903	4.0638	5983	0.2736
18	2002-03	3365	0.3903	4.0638	5983	0.2736
19	2003-04	3365	0.3903	4.0638	5983	0.2736
20	2004-05	3365	0.3903	4.0638	5983	0.2736
21	2005-06	3365	0.3903	4.0638	5983	0.2736
22	2006-07	3365	0.3903	4.0638	5983	0.2736
23	2007-08	3365	0.3903	4.0638	5983	0.2736
24	2008-09	3365	0.3903	4.0638	5983	0.2736
25	2009-10	3365	0.3903	4.0638	5983	0.2736
		84125			149575	

Note: Spread Sheet Program used to develop Table A printed calculations to four decimal places. This does not imply that data is that precise. Table A values were left unchanged to facilitate manual verification only.

	H	I	J	K	L	M
	**********WALK-IN POST 1861 PENSIONS**********					
	search unit reference costs ($)	Annual reference demand	positive unit reference time (hours)	search unit reference cost ($)	Annual reference demand	negative unit reference time (hours)
	2.6308	8230	0.5185	4.9909	729	0.4018
	2.7360	8230	0.5185	5.1905	729	0.4018
1	2.8455	8230	0.5185	5.3982	729	0.4018
2	2.8455	8230	0.5185	5.3982	729	0.4018
3	2.8455	8230	0.5185	5.3982	729	0.4018
4	2.8455	8230	0.5185	5.3982	729	0.4018
5	2.8455	8230	0.5185	5.3982	729	0.4018
6	2.8455	8230	0.5185	5.3982	729	0.4018
7	2.8455	8230	0.5185	5.3982	729	0.4018
8	2.8455	8230	0.5185	5.3982	729	0.4018
9	2.8455	8230	0.5185	5.3982	729	0.4018
10	2.8455	8230	0.5185	5.3982	729	0.4018
11	2.8455	8230	0.5185	5.3982	729	0.4018
12	2.8455	8230	0.5185	5.3982	729	0.4018
13	2.8455	8230	0.5185	5.3982	729	0.4018
14	2.8455	8230	0.5185	5.3982	729	0.4018
15	2.8455	8230	0.5185	5.3982	729	0.4018
16	2.8455	8230	0.5185	5.3982	729	0.4018
17	2.8455	8230	0.5185	5.3982	729	0.4018
18	2.8455	8230	0.5185	5.3982	729	0.4018
19	2.8455	8230	0.5185	5.3982	729	0.4018
20	2.8455	8230	0.5185	5.3982	729	0.4018
21	2.8455	8230	0.5185	5.3982	729	0.4018
22	2.8455	8230	0.5185	5.3982	729	0.4018
23	2.8455	8230	0.5185	5.3982	729	0.4018
24	2.8455	8230	0.5185	5.3982	729	0.4018
25	2.8455	8230	0.5185	5.3982	729	0.4018
		205750			18225	

	N	O	P	Q	R	S
	**********WRITE-IN POST 1861 PENSIONS**********					
	search unit reference cost ($)	annual reference demand	positive unit reference time (hours)	search unit reference cost ($)	annual reference demand	negative unit reference time (hours)
	3.8676	16253	0.6682	6.6245	3329	0.5715
	4.0223	16253	0.6682	6.8895	3329	0.5715
1	4.1832	16253	0.6682	7.1651	3329	0.5715
2	4.1832	16253	0.6682	7.1651	3329	0.5715
3	4.1832	16253	0.6682	7.1651	3329	0.5715
4	4.1832	16253	0.6682	7.1651	3329	0.5715
5	4.1832	16253	0.6682	7.1651	3329	0.5715
6	4.1832	16253	0.6682	7.1651	3329	0.5715
7	4.1832	16253	0.6682	7.1651	3329	0.5715
8	4.1832	16253	0.6682	7.1651	3329	0.5715
9	4.1832	16253	0.6682	7.1651	3329	0.5715
10	4.1832	16253	0.6682	7.1651	3329	0.5715
11	4.1832	16253	0.6682	7.1651	3329	0.5715
12	4.1832	16253	0.6682	7.1651	3329	0.5715
13	4.1832	16253	0.6682	7.1651	3329	0.5715
14	4.1832	16253	0.6682	7.1651	3329	0.5715
15	4.1832	16253	0.6682	7.1651	3329	0.5715
16	4.1832	16253	0.6682	7.1651	3329	0.5715
17	4.1832	16253	0.6682	7.1651	3329	0.5715
18	4.1832	16253	0.6682	7.1651	3329	0.5715
19	4.1832	16253	0.6682	7.1651	3329	0.5715
20	4.1832	16253	0.6682	7.1651	3329	0.5715
21	4.1832	16253	0.6682	7.1651	3329	0.5715
22	4.1832	16253	0.6682	7.1651	3329	0.5715
23	4.1832	16253	0.6682	7.1651	3329	0.5715
24	4.1832	16253	0.6682	7.1651	3329	0.5715
25	4.1832	16253	0.6682	7.1651	3329	0.5715
		406325			83225	

	T	U	V	W	X	Y
	**********WALK-IN PRE 1861 NON REV WAR PENSIONS**********					
	search unit reference cost ($)	annual reference demand	positive unit reference time (hours)	search unit reference cost ($)	annual reference demand	negative unit reference time (hours)
	5.5012	1766	0.7019	6.7565	493	0.5852
	5.7212	1766	0.7019	7.0268	493	0.5852
1	5.9501	1766	0.7019	7.3078	493	0.5852
2	5.9501	1766	0.7019	7.3078	493	0.5852
3	5.9501	1766	0.7019	7.3078	493	0.5852
4	5.9501	1766	0.7019	7.3078	493	0.5852
5	5.9501	1766	0.7019	7.3078	493	0.5852
6	5.9501	1766	0.7019	7.3078	493	0.5852
7	5.9501	1766	0.7019	7.3078	493	0.5852
8	5.9501	1766	0.7019	7.3078	493	0.5852
9	5.9501	1766	0.7019	7.3078	493	0.5852
10	5.9501	1766	0.7019	7.3078	493	0.5852
11	5.9501	1766	0.7019	7.3078	493	0.5852
12	5.9501	1766	0.7019	7.3078	493	0.5852
13	5.9501	1766	0.7019	7.3078	493	0.5852
14	5.9501	1766	0.7019	7.3078	493	0.5852
15	5.9501	1766	0.7019	7.3078	493	0.5852
16	5.9501	1766	0.7019	7.3078	493	0.5852
17	5.9501	1766	0.7019	7.3078	493	0.5852
18	5.9501	1766	0.7019	7.3078	493	0.5852
19	5.9501	1766	0.7019	7.3078	493	0.5852
20	5.9501	1766	0.7019	7.3078	493	0.5852
21	5.9501	1766	0.7019	7.3078	493	0.5852
22	5.9501	1766	0.7019	7.3078	493	0.5852
23	5.9501	1766	0.7019	7.3078	493	0.5852
24	5.9501	1766	0.7019	7.3078	493	0.5852
25	5.9501	1766	0.7019	7.3078	493	0.5852
		44150			12325	

	Z	AA	AB	AC	AD	AE
	********** WRITE-IN PRE 1861 NON REV WAR PENSION**********					
	search unit reference cost ($)	annual reference demand	positive unit reference time (hours)	search unit reference cost ($)	annual reference demand	negative unit reference time (hours)
	5.6331	2066	0.8786	8.4574	2238	0.7619
	5.8584	2066	0.8786	8.7957	2238	0.7619
1	6.0928	2066	0.8786	9.1475	2238	0.7619
2	6.0928	2066	0.8786	9.1475	2238	0.7619
3	6.0928	2066	0.8786	9.1475	2238	0.7619
4	6.0928	2066	0.8786	9.1475	2238	0.7619
5	6.0928	2066	0.8786	9.1475	2238	0.7619
6	6.0928	2066	0.8786	9.1475	2238	0.7619
7	6.0928	2066	0.8786	9.1475	2238	0.7619
8	6.0928	2066	0.8786	9.1475	2238	0.7619
9	6.0928	2066	0.8786	9.1475	2238	0.7619
10	6.0928	2066	0.8786	9.1475	2238	0.7619
11	6.0928	2066	0.8786	9.1475	2238	0.7619
12	6.0928	2066	0.8786	9.1475	2238	0.7619
13	6.0928	2066	0.8786	9.1475	2238	0.7619
14	6.0928	2066	0.8786	9.1475	2238	0.7619
15	6.0928	2066	0.8786	9.1475	2238	0.7619
16	6.0928	2066	0.8786	9.1475	2238	0.7619
17	6.0928	2066	0.8786	9.1475	2238	0.7619
18	6.0928	2066	0.8786	9.1475	2238	0.7619
19	6.0928	2066	0.8786	9.1475	2238	0.7619
20	6.0928	2066	0.8786	9.1475	2238	0.7619
21	6.0928	2066	0.8786	9.1475	2238	0.7619
22	6.0928	2066	0.8786	9.1475	2238	0.7619
23	6.0928	2066	0.8786	9.1475	2238	0.7619
24	6.0928	2066	0.8786	9.1475	2238	0.7619
25	6.0928	2066	0.8786	9.1475	2238	0.7619
		51650			55950	

	AF	AG	AH	AI	AJ	AK
	**********	TOTAL	BASE CASE RENT**********			COMMERCIAL
	search unit reference cost ($)	ANNUAL REFERENCE COST ($)	gross area (sq ft)	Archives space cost/SF ($)	Archives space total cost ($)	space per square foot ($)
	7.3340	246854.38	49505	4.8000	237624.00	20.1500
	7.6274	256728.55	49505	5.0184	248435.89	21.1776
1	7.9325	266999.30	49505	5.2467	259737.88	22.2577
2	7.9325	266999.30	49505	5.2467	259737.88	22.2577
3	7.9325	266999.30	49505	5.2467	259737.88	22.2577
4	7.9325	266999.30	49505	5.2467	259737.88	22.2577
5	7.9325	266999.30	49505	5.2467	259737.88	22.2577
6	7.9325	266999.30	49505	5.2467	259737.88	22.2577
7	7.9325	266999.30	49505	5.2467	259737.88	22.2577
8	7.9325	266999.30	49505	5.2467	259737.88	22.2577
9	7.9325	266999.30	49505	5.2467	259737.88	22.2577
10	7.9325	266999.30	49505	5.2467	259737.88	22.2577
11	7.9325	266999.30	49505	5.2467	259737.88	22.2577
12	7.9325	266999.30	49505	5.2467	259737.88	22.2577
13	7.9325	266999.30	49505	5.2467	259737.88	22.2577
14	7.9325	266999.30	49505	5.2467	259737.88	22.2577
15	7.9325	266999.30	49505	5.2467	259737.88	22.2577
16	7.9325	266999.30	49505	5.2467	259737.88	22.2577
17	7.9325	266999.30	49505	5.2467	259737.88	22.2577
18	7.9325	266999.30	49505	5.2467	259737.88	22.2577
19	7.9325	266999.30	49505	5.2467	259737.88	22.2577
20	7.9325	266999.30	49505	5.2467	259737.88	22.2577
21	7.9325	266999.30	49505	5.2467	259737.88	22.2577
22	7.9325	266999.30	49505	5.2467	259737.88	22.2577
23	7.9325	266999.30	49505	5.2467	259737.88	22.2577
24	7.9325	266999.30	49505	5.2467	259737.88	22.2577
25	7.9325	266999.30	49505	5.2467	259737.88	22.2577
		6674983			6493447.09	

	AL	AM	AN	AO	AP	AQ
	RENT		BASE CASE POSTAGE**********			
	total cost ($)	Annual no. of positive write in's	unit cost ($) (14 sheet) postage	current practice total ($) annual postage	unit cost ($) (100 sheet) postage	100 sheet total ($) annual postage
	997525.75	21684	0.7100	15395.64	2.4200	52475.28
	1048399.56	21684	0.7462	16180.82	2.5434	55151.52
1	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
2	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
3	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
4	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
5	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
6	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
7	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
8	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
9	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
10	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
11	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
12	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
13	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
14	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
15	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
16	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
17	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
18	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
19	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
20	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
21	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
22	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
23	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
24	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
25	1101867.44	21684	0.7843	17006.76	2.6731	57963.50
	27546685.96	542100		425169.03		1449087.51

	AR	AS	AT	AU	AV	AW
			average:	FORCAST ANNUAL REFERENCE DEMAND		
			consumer	Write-in Pre 1861		Walk-in
			price	Rev War Pensions		Pensions
	consumer price index	federal pay index	and fed. pay indexes	4%(not compounded) increase positive	negative	6%(not compounded) increase positive
	1.000	1.00	1.0000	3365	5983	8230
	1.051	1.04	1.0455	3500	6222	8724
1	1.051	1.04	1.0455	3635	6461	9218
2	1.051	1.051	1.0510	3770	6700	9712
3	1.051	1.051	1.0510	3905	6939	10206
4	1.051	1.051	1.0510	4040	7178	10700
5	1.051	1.051	1.0510	4175	7417	11194
6	1.064	1.064	1.0640	4310	7656	11688
7	1.064	1.064	1.0640	4445	7895	12182
8	1.064	1.064	1.0640	4580	8134	12676
9	1.064	1.064	1.0640	4715	8373	13170
10	1.064	1.064	1.0640	4850	8612	13664
11	1.064	1.064	1.0640	4985	8851	14158
12	1.064	1.064	1.0640	5120	9090	14652
13	1.064	1.064	1.0640	5255	9329	15146
14	1.064	1.064	1.0640	5390	9568	15640
15	1.064	1.064	1.0640	5525	9807	16134
16	1.059	1.059	1.0590	5660	10046	16628
17	1.059	1.059	1.0590	5795	10285	17122
18	1.059	1.059	1.0590	5930	10524	17616
19	1.059	1.059	1.0590	6065	10763	18110
20	1.059	1.059	1.0590	6200	11002	18604
21	1.059	1.059	1.0590	6335	11241	19098
22	1.059	1.059	1.0590	6470	11480	19592
23	1.059	1.059	1.0590	6605	11719	20086
24	1.059	1.059	1.0590	6740	11958	20580
25	1.059	1.059	1.0590	6875	12197	21074

	AX	AY	AZ	BA	BB	BC
	Post 1861 Write-in Pensions 6%(not compounded) increase		Post 1861 Walk-in Non Rev 4%(not compounded) increase		Pre 1861 War Pens 4%(not compounded) increase	Write-in Non Rev War Pens
	negative	positive	negative	positive	negative	positive
	729	16253	3329	1766	493	2066
	773	17228	3529	1837	513	2149
1	817	18203	3729	1908	533	2232
2	861	19178	3929	1979	553	2315
3	905	20153	4129	2050	573	2398
4	949	21128	4329	2121	593	2481
5	993	22103	4529	2192	613	2564
6	1037	23078	4729	2263	633	2647
7	1081	24053	4929	2334	653	2730
8	1125	25028	5129	2405	673	2813
9	1169	26003	5329	2476	693	2896
10	1213	26978	5529	2547	713	2979
11	1257	27953	5729	2618	733	3062
12	1301	28928	5929	2689	753	3145
13	1345	29903	6129	2760	773	3228
14	1389	30878	6329	2831	793	3311
15	1433	31853	6529	2902	813	3394
16	1477	32828	6729	2973	833	3477
17	1521	33803	6929	3044	853	3560
18	1565	34778	7129	3115	873	3643
19	1609	35753	7329	3186	893	3726
20	1653	36728	7529	3257	913	3809
21	1697	37703	7729	3328	933	3892
22	1741	38678	7929	3399	953	3975
23	1785	39653	8129	3470	973	4058
24	1829	40628	8329	3541	993	4141
25	1873	41603	8529	3612	1013	4224

	BD	BE	BF	BG	BH	BI
	********* Pre 1861 negative	HOLDINGS MAINTENANCE COSTS one time cost ($)	labor cost ($)	material cost ($)	total cost ($)	COPYING COSTS per sheet labor cost ($)
	2238	0.00	0.00	0.00	0.00	0.0644
	2328	0.00	0.00	0.00	0.00	0.0670
1	2418	14000.00	303131.73	308874.14	626005.87	0.0697
2	2508	0.00	341520.05	308874.14	650394.19	0.0697
3	2598	0.00	341520.05	308874.14	650394.19	0.0697
4	2688	0.00	0.00	0.00	0.00	0.0697
5	2778	0.00	0.00	0.00	0.00	0.0697
6	2868	0.00	0.00	0.00	0.00	0.0697
7	2958	0.00	0.00	0.00	0.00	0.0697
8	3048	0.00	0.00	0.00	0.00	0.0697
9	3138	0.00	0.00	0.00	0.00	0.0697
10	3228	0.00	0.00	0.00	0.00	0.0697
11	3318	0.00	0.00	0.00	0.00	0.0697
12	3408	0.00	0.00	0.00	0.00	0.0697
13	3498	0.00	0.00	0.00	0.00	0.0697
14	3588	0.00	0.00	0.00	0.00	0.0697
15	3678	0.00	0.00	0.00	0.00	0.0697
16	3768	0.00	0.00	0.00	0.00	0.0697
17	3858	0.00	0.00	0.00	0.00	0.0697
18	3948	0.00	0.00	0.00	0.00	0.0697
19	4038	0.00	0.00	0.00	0.00	0.0697
20	4128	0.00	0.00	0.00	0.00	0.0697
21	4218	0.00	0.00	0.00	0.00	0.0697
22	4308	0.00	0.00	0.00	0.00	0.0697
23	4398	0.00	0.00	0.00	0.00	0.0697
24	4488	0.00	0.00	0.00	0.00	0.0697
25	4578	0.00	0.00	0.00	0.00	0.0697
		14000.00	986171.83	926622.42	1926794.25	

	BJ	BK	BL	BM	BN	BO
	COSTS					ANNUAL
	per sheet machine cost ($)	per sheet supply cost ($)	per sheet total cost ($)	total pension sheets copied	total amount copy cost ($)	COST OF SERVICE Archives space Base Case ($)
	0.0500	0.0100	0.1244	303576	37764.85	537638.87
	0.0526	0.0105	0.1300	303576	39475.81	560821.07
1	0.0552	0.0110	0.1359	303576	41255.98	1211005.79
2	0.0552	0.0110	0.1359	303576	41255.98	1235394.11
3	0.0552	0.0110	0.1359	303576	41255.98	1235394.11
4	0.0552	0.0110	0.1359	303576	41255.98	584999.92
5	0.0552	0.0110	0.1359	303576	41255.98	584999.92
6	0.0552	0.0110	0.1359	303576	41255.98	584999.92
7	0.0552	0.0110	0.1359	303576	41255.98	584999.92
8	0.0552	0.0110	0.1359	303576	41255.98	584999.92
9	0.0552	0.0110	0.1359	303576	41255.98	584999.92
10	0.0552	0.0110	0.1359	303576	41255.98	584999.92
11	0.0552	0.0110	0.1359	303576	41255.98	584999.92
12	0.0552	0.0110	0.1359	303576	41255.98	584999.92
13	0.0552	0.0110	0.1359	303576	41255.98	584999.92
14	0.0552	0.0110	0.1359	303576	41255.98	584999.92
15	0.0552	0.0110	0.1359	303576	41255.98	584999.92
16	0.0552	0.0110	0.1359	303576	41255.98	584999.92
17	0.0552	0.0110	0.1359	303576	41255.98	584999.92
18	0.0552	0.0110	0.1359	303576	41255.98	584999.92
19	0.0552	0.0110	0.1359	303576	41255.98	584999.92
20	0.0552	0.0110	0.1359	303576	41255.98	584999.92
21	0.0552	0.0110	0.1359	303576	41255.98	584999.92
22	0.0552	0.0110	0.1359	303576	41255.98	584999.92
23	0.0552	0.0110	0.1359	303576	41255.98	584999.92
24	0.0552	0.0110	0.1359	303576	41255.98	584999.92
25	0.0552	0.0110	0.1359	303576	41255.98	584999.92
					1031399.46	16551792.35

	BP	BQ	BR	BS	BT	BU
	ANNUAL COST OF SERVICE COMM Rent Base Case ($)	Unit write in reference fee ($)	total annual write in reference fees ($)	discount factors	maintenance on system M5/ 100's ($)	M5/100 capital costs ($)
	1297540.62	5.0000	108420.00	0.000000	0.00	0.00
	1360784.74	5.2275	113353.11	0.000000	0.00	0.00
1	2053135.35	5.4654	118511.73	0.909091	27702.00	1420000.00
2	2077523.67	5.4654	118511.73	0.826446	76107.00	960000.00
3	2077523.67	5.4654	118511.73	0.751315	112266.00	960000.00
4	1427129.48	5.4654	118511.73	0.683013	146966.00	960000.00
5	1427129.48	5.4654	118511.73	0.620921	175834.00	1045300.00
6	1427129.48	5.4654	118511.73	0.564474	180792.00	0.00
7	1427129.48	5.4654	118511.73	0.513158	180792.00	0.00
8	1427129.48	5.4654	118511.73	0.466507	180792.00	0.00
9	1427129.48	5.4654	118511.73	0.424098	180792.00	0.00
10	1427129.48	5.4654	118511.73	0.385543	180792.00	0.00
11	1427129.48	5.4654	118511.73	0.350494	180792.00	0.00
12	1427129.48	5.4654	118511.73	0.318631	180792.00	0.00
13	1427129.48	5.4654	118511.73	0.289664	180792.00	0.00
14	1427129.48	5.4654	118511.73	0.263331	180792.00	0.00
15	1427129.48	5.4654	118511.73	0.239392	180792.00	0.00
16	1427129.48	5.4654	118511.73	0.217629	180792.00	0.00
17	1427129.48	5.4654	118511.73	0.197845	180792.00	0.00
18	1427129.48	5.4654	118511.73	0.179859	180792.00	0.00
19	1427129.48	5.4654	118511.73	0.163508	180792.00	0.00
20	1427129.48	5.4654	118511.73	0.148644	180792.00	0.00
21	1427129.48	5.4654	118511.73	0.135131	180792.00	0.00
22	1427129.48	5.4654	118511.73	0.122846	180792.00	0.00
23	1427129.48	5.4654	118511.73	0.111678	180792.00	0.00
24	1427129.48	5.4654	118511.73	0.101526	180792.00	0.00
25	1427129.48	5.4654	118511.73	0.092296	180792.00	0.00
	37605031.22		2962793.34		4154715.00	5345300.00

	BV	BW	BX	BY	BZ	CA
			Cost of (To be furnished to both write-in and walk-i Clients)		diazo	microfiche
	maintenance on system HP-1000 ($)	no of fiche to be copied = 2 X no of positive requests	machine purchase cost ($)	annual maintenance cost ($)	cost of ammonia per fiche ($)	diazo sheet film cost per fiche ($)
	0.00	0	0.00	0.00	0.0055	0.058
	0.00	0	0.00	0.00	0.0055	0.058
1	20400.00	0	0.00	0.00	0.0055	0.058
2	20400.00	21120	6300.00	675.00	0.0055	0.058
3	20400.00	42240	0.00	675.00	0.0055	0.058
4	20400.00	63360	0.00	675.00	0.0055	0.058
5	40800.00	63360	0.00	675.00	0.0055	0.058
6	40800.00	63360	0.00	675.00	0.0055	0.058
7	40800.00	63360	0.00	675.00	0.0055	0.058
8	40800.00	63360	0.00	675.00	0.0055	0.058
9	40800.00	63360	0.00	675.00	0.0055	0.058
10	40800.00	63360	0.00	675.00	0.0055	0.058
11	40800.00	63360	0.00	675.00	0.0055	0.058
12	40800.00	63360	0.00	675.00	0.0055	0.058
13	40800.00	63360	6300.00	675.00	0.0055	0.058
14	40800.00	63360	0.00	675.00	0.0055	0.058
15	40800.00	63360	0.00	675.00	0.0055	0.058
16	40800.00	63360	0.00	675.00	0.0055	0.058
17	40800.00	63360	0.00	675.00	0.0055	0.058
18	40800.00	63360	0.00	675.00	0.0055	0.058
19	40800.00	63360	0.00	675.00	0.0055	0.058
20	40800.00	63360	0.00	675.00	0.0055	0.058
21	40800.00	63360	0.00	675.00	0.0055	0.058
22	40800.00	63360	0.00	675.00	0.0055	0.058
23	40800.00	63360	0.00	675.00	0.0055	0.058
24	40800.00	63360	0.00	675.00	0.0055	0.058
25	40800.00	63360	0.00	675.00	0.0055	0.058
	938400.00	1457280	12600	16200		

	CB copies	CC	CD BASE	CE	CF CASE	CG
	operator cost per copy ($)	total annual copy cost (w/trans.) ($)	present value Archives space ($)	present value commercial rent ($)	present value of trust fund income ($)	MICROFILMING prep labor supervision & rent ($)
	0.000	0.00	0.00	0.00	0.00	0.00
	0.044	0.00	0.00	0.00	0.00	0.00
1	0.046	41255.98	1100914.47	1866486.87	107737.95	3850505.79
2	0.046	36791.63	1020986.52	1716961.13	97943.55	3850505.79
3	0.046	19052.27	928170.13	1560874.70	89039.64	3850505.79
4	0.046	7612.92	399562.55	974747.99	80945.05	3850505.79
5	0.046	7612.92	363238.74	886134.66	73586.42	3850505.79
6	0.046	7612.92	330217.25	805577.49	66896.79	0.00
7	0.046	7612.92	300197.39	732342.91	60815.24	0.00
8	0.046	7612.92	272906.56	665765.89	55286.55	0.00
9	0.046	7612.92	248097.30	605242.76	50260.59	0.00
10	0.046	7612.92	225542.63	550219.78	45691.37	0.00
11	0.046	7612.92	205038.96	500200.32	41537.65	0.00
12	0.046	7612.92	186399.11	454727.69	37761.51	0.00
13	0.046	13912.92	169453.42	413388.03	34328.58	0.00
14	0.046	7612.92	154048.61	375807.43	31207.81	0.00
15	0.046	7612.92	140044.30	341643.38	28370.76	0.00
16	0.046	7612.92	127312.95	310584.76	25791.59	0.00
17	0.046	7612.92	115739.31	282350.43	23446.95	0.00
18	0.046	7612.92	105217.50	256682.08	21315.40	0.00
19	0.046	7612.92	95652.17	233347.09	19377.62	0.00
20	0.046	7612.92	86956.73	212134.23	17616.06	0.00
21	0.046	7612.92	79051.62	192849.43	16014.61	0.00
22	0.046	7612.92	71864.90	175317.15	14558.69	0.00
23	0.046	7612.92	65331.62	159378.97	13235.15	0.00
24	0.046	7612.92	59392.70	144890.75	12032.02	0.00
25	0.046	7612.92	53993.15	131718.34	10938.16	0.00
		270884	6905331	14549374	1075736	19252529

	CH	CI	CJ	CK	CL	CM*
	titling unstacked fiche ($)	conservation lab costs ($)	data entry of microfilm indices ($)	camera supervision processing & rent ($)	titling stacked fiche ($)	prepare silver duplicate negative ($)
	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
1	244811.10	97758.24	333023.87	3008283.96	197920.36	209050.85
2	244811.10	97758.24	333023.87	3008283.96	197920.36	209050.85
3	244811.10	97758.24	0.00	3008283.96	197920.36	209050.85
4	244811.10	97758.24	0.00	3008283.96	197920.36	209050.85
5	244811.10	97758.24	0.00	3008283.96	197920.36	209050.85
6	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00
	1224056	488791	666048	15041420	989602	1045254

* Column CM applies to stacked fiche only

	CN	CO	CP	CQ	CR	CS
	**********					
	(not used in prepare silver positive ($)	tabulations) prepare visicular positive ($)	M system operating labor ($)	M system Archives space cost ($)	M system commercial rent ($)	storage cost of originals at Boyers ($)
	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
1	182940.22	95821.88	266999.30	259737.88	1101867.44	0.00
2	182940.22	95821.88	198730.25	274137.88	1162317.44	0.00
3	182940.22	95821.88	130461.22	274137.88	1162317.44	0.00
4	182940.22	95821.88	62192.17	274137.88	1162317.44	0.00
5	182940.22	95821.88	62192.17	274137.88	1162317.44	0.00
6	0.00	0.00	62192.17	14400.00	60450.00	47543.58
7	0.00	0.00	62192.17	14400.00	60450.00	47543.58
8	0.00	0.00	62192.17	14400.00	60450.00	47543.58
9	0.00	0.00	62192.17	14400.00	60450.00	47543.58
10	0.00	0.00	62192.17	14400.00	60450.00	47543.58
11	0.00	0.00	62192.17	14400.00	60450.00	47543.58
12	0.00	0.00	62192.17	14400.00	60450.00	47543.58
13	0.00	0.00	62192.17	14400.00	60450.00	47543.58
14	0.00	0.00	62192.17	14400.00	60450.00	47543.58
15	0.00	0.00	62192.17	14400.00	60450.00	47543.58
16	0.00	0.00	62192.17	14400.00	60450.00	47543.58
17	0.00	0.00	62192.17	14400.00	60450.00	47543.58
18	0.00	0.00	62192.17	14400.00	60450.00	47543.58
19	0.00	0.00	62192.17	14400.00	60450.00	47543.58
20	0.00	0.00	62192.17	14400.00	60450.00	47543.58
21	0.00	0.00	62192.17	14400.00	60450.00	47543.58
22	0.00	0.00	62192.17	14400.00	60450.00	47543.58
23	0.00	0.00	62192.17	14400.00	60450.00	47543.58
24	0.00	0.00	62192.17	14400.00	60450.00	47543.58
25	0.00	0.00	62192.17	14400.00	60450.00	47543.58
	914701	479109	1964419	1644289	6960137	950872

	CT	CU	CV	CW	CX*	CY
				HAND	RETRIEVAL	
	shelving cost at Boyers ($)		transport originals to Boyers ($)	unit costs of positive retrieval ($)	unit costs of negative retrieval ($)	number of positive retrievals
	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	1.34	1.04	31680.00
2	0.00	0.00	0.00	1.34	1.04	31680.00
3	0.00	0.00	0.00	1.34	1.04	31680.00
4	0.00	0.00	0.00	1.34	1.04	31680.00
5	316192.00	0.00	0.00	1.34	1.04	31680.00
6	0.00	0.00	234500.00	1.34	1.04	31680.00
7	0.00	0.00	0.00	1.34	1.04	31680.00
8	0.00	0.00	0.00	1.34	1.04	31680.00
9	0.00	0.00	0.00	1.34	1.04	31680.00
10	0.00	0.00	0.00	1.34	1.04	31680.00
11	0.00	0.00	0.00	1.34	1.04	31680.00
12	0.00	0.00	0.00	1.34	1.04	31680.00
13	0.00	0.00	0.00	1.34	1.04	31680.00
14	0.00	0.00	0.00	1.34	1.04	31680.00
15	0.00	0.00	0.00	1.34	1.04	31680.00
16	0.00	0.00	0.00	1.34	1.04	31680.00
17	0.00	0.00	0.00	1.34	1.04	31680.00
18	0.00	0.00	0.00	1.34	1.04	31680.00
19	0.00	0.00	0.00	1.34	1.04	31680.00
20	0.00	0.00	0.00	1.34	1.04	31680.00
21	0.00	0.00	0.00	1.34	1.04	31680.00
22	0.00	0.00	0.00	1.34	1.04	31680.00
23	0.00	0.00	0.00	1.34	1.04	31680.00
24	0.00	0.00	0.00	1.34	1.04	31680.00
25	0.00	0.00	0.00	1.34	1.04	31680.00
	316192	0	234500			792000

* Column CX indicates cost of searching for records that are not found

	CZ	DA	DB	DC	DD	DE
	OF	MICROFICHE	**********			
	number of negative retrievals	Archives space cost ($)	commercial rent ($)	reference costs ($)	storage cost unstacked at Boyers ($)	transport cost to Boyers unstacked fiche ($)
	0.00	237624.00	997525.75	0.00	0.00	0.00
	0.00	248435.89	1048399.56	0.00	0.00	0.00
1	12772.00	259737.88	1101867.44	266999.30	0.00	0.00
2	12772.00	268762.20	1140150.68	196577.56	0.00	0.00
3	12772.00	268762.20	1140150.68	126155.82	0.00	0.00
4	12772.00	268762.20	1140150.68	55734.08	0.00	0.00
5	12772.00	268762.20	1140150.68	55734.08	0.00	0.00
6	12772.00	9024.32	38283.24	55734.08	1921.50	6484.93
7	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
8	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
9	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
10	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
11	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
12	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
13	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
14	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
15	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
16	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
17	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
18	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
19	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
20	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
21	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
22	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
23	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
24	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
25	12772.00	9024.32	38283.24	55734.08	1921.50	0.00
	319300	1515273	6428135	1815882	38430	6485

	DF	DG	DH	DI	DJ	DK
	shelving cost at Boyers unstacked fiche ($)	cost of boxes, sleeves,& envelopes unstacked ($)	incremental cost of producing unstacked fiche ($)	cost of duplicate silver neg. unstacked fiche ($)	cost of microfiche readers unstacked ($)	annual postage cost stacked or unstacked ($)
	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	169347.83	118462.50	362260.08	3976.50	17006.76
2	0.00	169347.83	118462.50	362260.08	1192.95	12928.00
3	0.00	169347.83	118462.50	362260.08	1192.95	8849.24
4	0.00	169347.83	118462.50	362260.08	1192.95	4770.48
5	11561.00	169347.83	118462.50	362260.08	1192.95	4770.48
6	0.00	0.00	0.00	0.00	0.00	4770.48
7	0.00	0.00	0.00	0.00	0.00	4770.48
8	0.00	0.00	0.00	0.00	0.00	4770.48
9	0.00	0.00	0.00	0.00	0.00	4770.48
10	0.00	0.00	0.00	0.00	0.00	4770.48
11	0.00	0.00	0.00	0.00	0.00	4770.48
12	0.00	0.00	0.00	0.00	0.00	4770.48
13	0.00	0.00	0.00	0.00	0.00	4770.48
14	0.00	0.00	0.00	0.00	0.00	4770.48
15	0.00	0.00	0.00	0.00	0.00	4770.48
16	0.00	0.00	0.00	0.00	0.00	4770.48
17	0.00	0.00	0.00	0.00	0.00	4770.48
18	0.00	0.00	0.00	0.00	0.00	4770.48
19	0.00	0.00	0.00	0.00	0.00	4770.48
20	0.00	0.00	0.00	0.00	0.00	4770.48
21	0.00	0.00	0.00	0.00	0.00	4770.48
22	0.00	0.00	0.00	0.00	0.00	4770.48
23	0.00	0.00	0.00	0.00	0.00	4770.48
24	0.00	0.00	0.00	0.00	0.00	4770.48
25	0.00	0.00	0.00	0.00	0.00	4770.48
	11561	846739	592313	1811300	8748	143735

	DL	DM	DN	DO	DP
	cost of microfiche readers stacked ($)	shelving cost at Boyers stacked fiche ($)	cost of boxes and dividers for stacked fiche ($)	transport cost to Boyers stacked fiche ($)	storage cost at Boyers stacked fiche ($)
	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00
1	2385.90	0.00	1121.92	0.00	0.00
2	0.00	0.00	1121.92	0.00	0.00
3	0.00	0.00	1121.92	0.00	0.00
4	0.00	0.00	1121.92	0.00	0.00
5	0.00	3005.86	1121.92	0.00	0.00
6	0.00	0.00	0.00	3742.28	499.59
7	0.00	0.00	0.00	0.00	499.59
8	0.00	0.00	0.00	0.00	499.59
9	0.00	0.00	0.00	0.00	499.59
10	0.00	0.00	0.00	0.00	499.59
11	0.00	0.00	0.00	0.00	499.59
12	0.00	0.00	0.00	0.00	499.59
13	0.00	0.00	0.00	0.00	499.59
14	0.00	0.00	0.00	0.00	499.59
15	0.00	0.00	0.00	0.00	499.59
16	0.00	0.00	0.00	0.00	499.59
17	0.00	0.00	0.00	0.00	499.59
18	0.00	0.00	0.00	0.00	499.59
19	0.00	0.00	0.00	0.00	499.59
20	0.00	0.00	0.00	0.00	499.59
21	0.00	0.00	0.00	0.00	499.59
22	0.00	0.00	0.00	0.00	499.59
23	0.00	0.00	0.00	0.00	499.59
24	0.00	0.00	0.00	0.00	499.59
25	0.00	0.00	0.00	0.00	499.59
	2386	3006	5610	3742	9992

	DQ	DR
	5 year microfiche inspection cost unstacked ($)	5 year microfiche inspection cost stacked ($)
	0.00	0.00
	0.00	0.00
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	161595.00	93251.25
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	113116.50	65257.88
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	113116.50	65257.88
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00
19	0.00	0.00
20	113116.50	65257.88
21	0.00	0.00
22	0.00	0.00
23	0.00	0.00
24	0.00	0.00
25	113116.50	65257.88
	614061	354283

	DS	DT	DU	DV
M SYSTEM	**********	**********	**********	**********
	ARCHIVES annual cost ($)	SPACE present value ($)	COMMERCIAL annual cost ($)	RENT present value ($)
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
1	9753152.81	8866503.44	10595282.37	9632075.84
2	9276759.75	7666740.98	10164939.31	8400773.43
3	8889807.73	6679045.90	9777987.29	7346348.52
4	8840720.57	6038327.08	9728900.13	6644965.26
5	9387737.68	5829043.47	10275917.24	6380532.81
6	596853.02	336908.01	642903.02	362902.04
7	358610.74	184023.97	404660.74	207654.90
8	358610.74	167294.42	404660.74	188777.07
9	358610.74	152086.10	404660.74	171615.81
10	423868.62	163419.58	469918.62	181173.83
11	358610.74	125690.91	404660.74	141831.16
12	358610.74	114264.50	404660.74	128937.46
13	364910.74	105701.50	410960.74	119040.53
14	358610.74	94433.32	404660.74	106559.72
15	423868.62	101470.76	469918.62	112494.76
16	358610.74	78044.10	404660.74	88065.91
17	358610.74	70949.34	404660.74	80060.10
18	358610.74	64499.37	404660.74	72781.88
19	358610.74	58635.72	404660.74	66165.27
20	423868.62	63005.53	469918.62	69850.58
21	358610.74	48459.43	404660.74	54682.21
22	358610.74	44053.89	404660.74	49710.95
23	358610.74	40048.93	404660.74	45191.70
24	358610.74	36408.31	404660.74	41083.59
25	423868.62	39121.38	469918.62	43371.61
	53825967	37168180	59141815	40736647

	DW	DX	DY	DZ
	HAND RETRIEVAL**********			
	ARCHIVES annual cost ($)	SPACE present value ($)	COMMERCIAL annual cost ($)	RENT present value ($)
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
1	8440405.92	7673097.06	9282535.48	8438669.46
2	8367681.84	6915437.18	9239070.32	7635592.71
3	8275441.98	6217463.69	9146830.46	6872150.93
4	8189502.13	5593536.42	9060890.61	6188706.08
5	8678850.13	5388880.30	9550238.61	5929943.71
6	367591.81	207496.02	396850.73	224011.92
7	126606.88	64969.33	155865.80	79983.78
8	126606.88	59063.00	155865.80	72712.49
9	126606.88	53693.72	155865.80	66102.37
10	239723.38	92423.67	268982.30	103704.24
11	126606.88	44374.95	155865.80	54630.03
12	126606.88	40340.88	155865.80	49663.68
13	132906.88	38498.34	162165.80	46973.59
14	126606.88	33339.52	155865.80	41044.30
15	239723.38	57387.86	268982.30	64392.21
16	126606.88	27553.33	155865.80	33920.92
17	126606.88	25048.54	155865.80	30837.27
18	126606.88	22771.39	155865.80	28033.87
19	126606.88	20701.24	155865.80	25485.31
20	239723.38	35633.44	268982.30	39982.61
21	126606.88	17108.51	155865.80	21062.30
22	126606.88	15553.15	155865.80	19147.49
23	126606.88	14139.20	155865.80	17406.78
24	126606.88	12853.89	155865.80	15824.43
25	239723.38	22125.51	268982.30	24825.99
	45183771	32693490	50096632	36124808

APPENDIX C

The Effect of Indexing a Series of Archival Records

This exercise examines the savings, in terms of less handling of archival materials by researchers, that accrue when the records are indexed. As a basis for comparison, we consider a series consisting of 1000 cubic feet of records, housed in 3000 standard, one-third cubic foot, archives boxes. In addition, we assume the records are stored in folders within the archives boxes, 12 folders per box, so there are 36000 folders in all. The following discussion compares "Case A," in which the series is assumed to be well-indexed, with the case of an unindexed series, "Case B."

The starting assumption for Case A is that the index for the series in question would identify the archives box, and the exact folder within the box, containing the records needed by any researcher. Thus researchers would only handle the records in the folders containing the specific items of interest.

In Case B we assume that this same series of 36000 folders is virtually unindexed, but that finding aids would allow a researcher to narrow the search to a group of 20 boxes (i.e. 240 folders) in which the records of interest would eventually be found. Assuming that the search within the 20 boxes depends strictly on chance, how many folders would have to be examined? If the needed records are contained in a single folder, then, on the average, the researcher would have to examine 1/2 of the 240 folders, or 120 folders, to find the right one. If 2 folders must be found, then 2/3 of the 240 folders, or 160, would have to be examined on the average. In general, if N particular folders must be found, and the search is modeled as repeated random draws (without replacement) from 240 folders, then a proportion N/(N+1) of the folders will have to be drawn, on the average, to find all N folders of interest.

It is instructive to consider what happens if 1000 researchers per year were to use this series under the assumptions of Case A and Case B. Since the number of folders ultimately needed by each researcher is variable, we assume that the required number of folders varies randomly and with equal probabilities over the range of 1 to 20 folders per researcher. This means that the average number of folders per researcher is 10.5, or 10500 folders per 1000 researchers. In Case A, in which the series is well-indexed, the number of folders handled would be just 10500 per 1000 researchers. However, in Case B, since each researcher searches among the folders in 20 boxes to find the ones needed, the average number of folders handled per 1000 researchers works out to be 1000x240x(average of 1/2, 2/3, 3/4, ..., 20/21) = 208256 folders. This is nearly 20 times as many folders handled compared to Case A.

Assuming the series consists of 3000 boxes (36000 folders), and assuming all folders get equal use, the number of times an average folder is handled per year (i.e., per 1000 researchers) is

Case A 0.29 handlings per folder per year

Case B 5.78 handlings per folder per year

Assuming that a given amount of use (i.e. a given number of handlings by researchers) will cause archival records to need preservation attention, the indexed series (Case A) will last nearly 20 times as long as the unindexed series (Case B) before needing preservation. Put another way, the indexed series can withstand research activity of about 20 times as many users as the unindexed series for the same amount of wear and tear.

The material presented in Appendix C was prepared by Keith R. Eberhardt (Statistical Engineering Division, Center for Applied Mathematics, National Bureau of Standards) for presentation to the Committee on Preservation of Historical Records of the National Research Council, National Academy of Sciences, on September 19, 1985.

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10. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

This report describes the results of a cost study of three selected alternatives for preserving the historic pension files. The three alternatives evaluated comprise three levels of technology: Hand retrieval of original paper documents; Hand retrieval of microfiche copies of the original documents; and Automatic retrieval of microfiche copies.

Results indicate that the microcopy alternatives substantially reduce storage space requirements and the labor cost of providing reference service. The automated-retrieval-alternative reduction in labor cost is very substantial. However, the extremely high cost of converting the files to microfiche more than cancels out the savings in both space and operating costs, except under very high reference usage. (This is true even if the original documents are discarded after conversion and incur no additional expense.)

Improving the storage environment and continuing reference service with the original documents is an attractive alternative. At current usage rates, each file is requested, on the average, every 65 years. At these rates, preservation experts do not expect the documents to deteriorate from reference usage.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

cost analysis, cost modeling, alternative selection life cycle costing, systems analysis, cost study, preservation alternative analysis, alternative analysis

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