



City of Houston

Annise D. Parker
City Controller



Data Recovery Analysis

September 2004

Report No. 04-27



OFFICE OF THE CITY CONTROLLER
CITY OF HOUSTON
TEXAS

ANNISE D. PARKER

October 5, 2004

The Honorable Bill White, Mayor
City of Houston, Texas

SUBJECT: City of Houston – Data Recovery Analysis
(Report No. 04-27)

Dear Mayor White:

In accordance with the City's contract with Jefferson Wells International (JWI), JWI has completed an analysis of the process for the City of Houston's restoring of historical financial data that was inadvertently deleted from the storage archives and the reconciliation of the restored data to the record of source. The auditors conducted interviews with various Information Technology Department (Department) personnel and performed a risk analysis of the defined data restoration process.

The report, attached for your review, noted several observations regarding the risks involved with the City's data restoration process. JWI provided several recommendations for improvements in controls, the data management process, and the data retention policy. Draft copies of the matters contained in the report were provided to Department officials. The views of the responsible Department officials as to actions being taken are appended to the report as Exhibit II.

We appreciate the cooperation extended to the JWI auditors by Department personnel during the course of the engagement.

Respectfully submitted,

Annise D. Parker
City Controller

xc: City Council Members
Anthony Hall, Chief Administrative Officer
Michael Moore, Chief of Staff, Mayor's Office
Richard Lewis, Director, CIO, Information Technology Department
Judy Gray Johnson, Director, Finance and Administration Department



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September 23, 2004

Ms. Annise D. Parker
City Controller
City of Houston
901 Bagby, 8th Floor
Houston. TX 77002

Dear Controller Parker:

We have completed the analysis of the process for the City of Houston's (the City's) restoring of historical financial data that was inadvertently deleted from the storage archives and the reconciliation of the restored data to the record of source, as outlined in our engagement letter dated February 13, 2004, under Contract No. 51783. This report documents our final report and completes the services agreed to be provided by Jefferson Wells International (Jefferson Wells) as described in the engagement letter.

Our observations and recommendations noted during the performance of the procedures are presented in this report. Our procedures, which accomplished the project objectives, were performed through the June 29, 2004 and have not been updated since that date. Our observations included in this report are the only matters that came to our attention, based on the procedures performed.

Jefferson Wells is pleased to have assisted the Office of the City Controller and the Information Technology Department, and we appreciate the cooperation received during this engagement from the City Controller's Office and the Information Technology Department.

This report is intended solely for the information and use of the City, the City Controller's Office, and the Information Technology Department and is not intended to be used for any other purpose.

A handwritten signature in cursive script that reads 'Lisa D. Anderson'.

Lisa D. Anderson
Jefferson Wells International

Background

The objectives of this engagement were to perform an analysis of the process for restoring data that was inadvertently deleted from the storage archives and to reconcile the restored data to the record of source. Based on information provided by the City, the following is a list of the financial datasets that were inadvertently deleted:

1. The Closed General Ledgers
 - The whole fiscal years of 1990, 1991 and 1992
 - Period 4 through 14 for the year 1997
 - Periods 1 through 6 and Period 14 for the year 1998

2. The Closed Budget Ledgers:
 - The whole fiscal years of 1990, 1991, 1992, 1996, 1997, 1998, 2000, and 2001

3. The Closed Memo Ledgers:
 - The whole fiscal years of 1990 through 2001
 - Periods 1 through 13 for the year 2002
 - Periods 1 through 5 for the year 2003

4. The Closed Year-To-Date General Ledgers (YTD):
 - The whole fiscal years of 1990 through 1998
 - Periods 1 through 7, 11, 12, and 14 for the year 1999
 - Periods 1 through 13 for the year 2000
 - Periods 1 through 12 for the year 2001

5. The Closed Year-To-Date Budget Ledgers (YTDB):
 - The whole fiscal years of 1990 through 2001
 - Periods 1 through 12 for the year 2002
 - Periods 1 through 5 for the year 2003

6. The Closed Year-To-Date Memo Ledgers (YTDC):
 - The whole fiscal years of 1990 through 2001
 - Periods 1 through 12 for the year 2002
 - Periods 1 through 5 for the year 2003

Process Risk Assessment

The approach to the Data Restoration Risk Assessment consisted of the following:

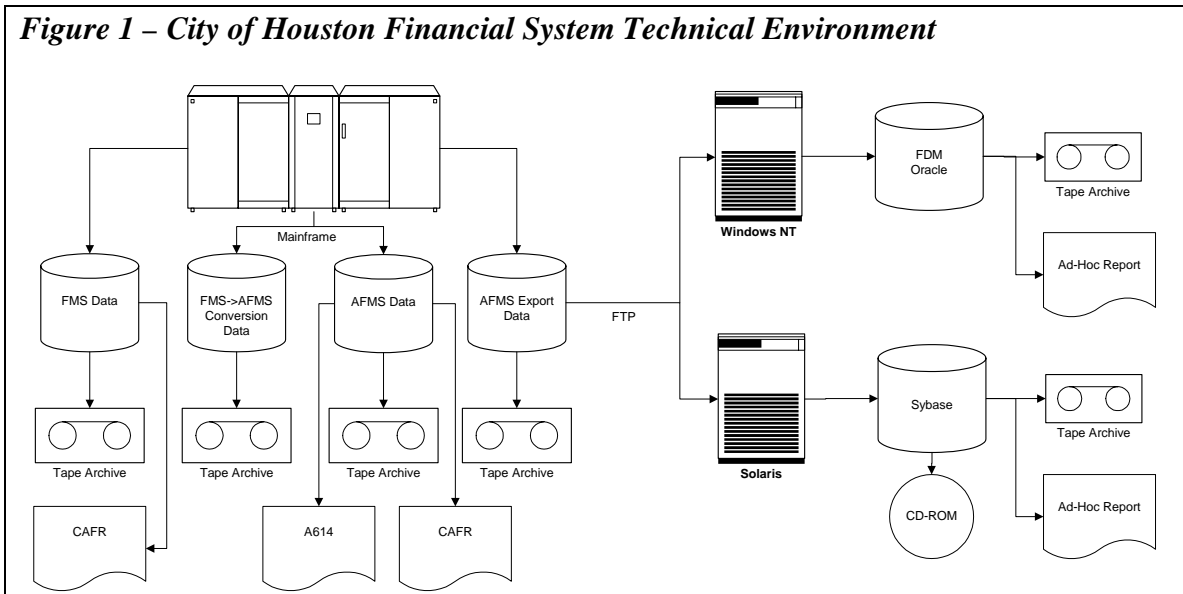
Ø Jefferson Wells conducted interviews with the following Information Technology Department personnel:

Matt Hyde	Assistant Director, Applications/Administration
Jim Hunt	Applications Support
Bob Forsythe	Infrastructure/Data Center/Operations Support
Farshid Amini	Applications/Microtechnology
Denise Johnson	Applications/Core Business Systems/Finance
Christine Pham	Applications/Core Business Systems/Finance
Lou Smith	Infrastructure/Data Center/Technical Support
Glen Pitts	Applications Department Systems
Lee Milne	Applications/Database Design/Administration

Ø Jefferson Wells reviewed and analyzed hardware and software utilized in the extraction, transformation and loading of data to/from Advantage Financial Management System (AFMS) and to/from the Financial Data Mart (FDM).

Ø Jefferson Wells performed a risk analysis of the defined data restoration process.

In order to reconstruct the records that were deleted, multiple systems and technologies had to be accessed. Please refer to Figure 1 for a representation of the systems involved.



š For all fiscal years except 1995* the missing data was restored from the FDM database to AFMS.

š For fiscal year 1995* the missing data was restored from the Sybase database to AFMS.

* 1995 was not part of the originally identified deleted data.

Based on the above, Jefferson Wells made the following observations regarding the risks involved with the City's data restoration process:

š Although data could be restored, there was no electronic system of record available that could be used to verify that the recovered data was correct. Subsequently, archived A614 reports were obtained that allowed a comparison audit to be performed.

š Not all data of interest could be recovered from the consolidated sources of information.

š While the City restored data and validated it at a summary level, requests for detailed transaction history data may yield incorrect results on that level.

Data Management Assessment

The approach to the review of the City's Data Retention Policy, Process, and Controls consisted of the following steps:

Ø Compared the City's data retention policy to applicable State of Texas guidelines.

š The State of Texas:

- Local Schedule GR (3rd edition) "Retention Schedule for Records Common to All Governments," effective November 1, 1995, to determine compliance with state guidelines.

š City of Houston IT documentation:

- "DASD Management Standards"
- "Tape Management Standards"
- "Records Control Schedule...Approved SLR 520 Substitute."

City of Houston IT Policy vs. State Guidelines			
Dataset	Local Schedule GR	Approved SLR 520 Substitute	City DASD Standards
Closed Budget Ledger	5 years	5 years - (GR1025-30c)	8/400 Policy
Closed General Ledger	5 years	5 years - (GR1025-30b)	8/400 Policy
Closed Memo Ledger	5 years	5 years - (GR1025-30d)	8/400 Policy
Closed YTD Budget Ledger	5 years	5 years - (GR1025-30c)	8/400 Policy
Closed YTD General Ledger	5 years	5 years - (GR1025-30a1)	8/400 Policy
Closed YTD Memo Ledger	5 years	5 years - (GR1025-30d)	8/400 Policy

The 8/400 policy is a two-step policy in that 1) unless the dataset is specifically identified as not being eligible for archival, any non-temporary dataset residing on a production volume will be archived to tape if not accessed within 8 days and 2) any production dataset residing on tape will be deleted if not accessed within 400 days.

- Ø Review data management process and associated controls to identify potential business risks.

The current electronic data retention approach is primarily focused on managing Direct Access Storage Device (DASD) utilization and does not effectively address managing or safeguarding the data itself. By utilizing the current processes in place for minimizing DASD and tape consumption, a significant risk exists that key data may be permanently lost if it is not accessed within 400 days or in the event of a disaster. In addition, by relying on only one tape containing key data, a significant risk exists that data will be lost if a tape becomes unreadable or physically damaged. Magnetic tapes are susceptible to errors by nature.

- Ø Provide recommendations for improvements in controls, data management process, and data retention policy.

Jefferson Wells recommends that the City consider the following:

- š Develop a data management process that is owned by City operations and facilitated by IT. The data management process needs to identify data ownership, data classification (e.g., production, development or test), data security requirements, data backup requirements, and data retention requirements. In addition, a communications plan and process should be developed and executed prior to deleting any operational data.
- š Permanently suspend the 8/400 Policy.
- š Create a formalized electronic data backup and retention policy that is in compliance with State guidelines. This should include formalized policies, procedures, and the employee or position responsible for compliance.

- š Create a formalized backup and retention policy that utilizes common tape rotation models such as “Grandfather-Father-Son” or “Tower of Hanoi.” This policy should apply to DASD, AFMS, the Financial Data Mart, and any other critical systems.
- š Store “Monthly” tapes at an offsite storage location for a period meeting or exceeding regulatory requirements or operational requirements, whichever is greater.
- š Utilize “media sets” to segregate data based on regulatory retention requirements.
- š Review and update all data management standards on an annual basis.
- š Conduct a follow-up control review once these policies and procedures are in place.

Reconciliation Summary

The following procedures were performed to complete the City’s data reconciliation steps:

- š The City of Houston Information Technology (IT) Department restored available data from the Financial Data Mart to AFMS, noting 1995 data was not available.
- š A City of Houston contractor restored 1995 data from the Sybase system that was then converted and restored to AFMS.
- š The IT Department generated an A614 report for each period restored to the AFMS. The A614 reports serve as each period’s general ledger.
- š The Controller’s Office routinely created archived backups of A614 reports and provided these to Jefferson Wells on either CD or microfiche. These reports were stored as a database (.dbf) in a summary trial balance format without underlying transaction detail.
- š Jefferson Wells obtained access to the AFMS system via a Rumba terminal in the IT Department. Each A614 recreated from restored data was viewed onscreen and the grand total of debits and credits for each period was compared to the archived backups of A614 reports discussed above.
- š We informed the City of the following two differences as follows:
 - A difference of \$377.86 for Period 7 of 1990.
 - A difference of \$10.82 for Period 4 of 1997.

See **Exhibit** for a detail summary of the reconciling items.

City of Houston
Data Recovery Verification - Reconciliation Phase
Closed General Ledger

Exhibit

Year	Period	Total Debits per		Total Credits per		Source of City - Supplied Report for Reconciliation Purposes (A614)	Total Debits per Controller - Supplied Controller - Supplied A614	Total Credits per Controller - Supplied Controller - Supplied A614	Agree (Y/N)	Difference in Debits	Difference in Credits	Difference
		AFMS restored A614	AFMS restored A614	AFMS restored A614	AFMS restored A614							
1990	1	20,905,346,323.09	20,905,346,323.09	Microfiche	20,905,346,323.09	20,905,346,323.09	Y	-	-	-		
1990	2	3,212,059,133.31	3,212,059,133.31	Microfiche	3,212,059,133.31	3,212,059,133.31	Y	-	-	-		
1990	3	3,693,453,073.38	3,693,453,073.38	Microfiche	3,693,453,073.38	3,693,453,073.38	Y	-	-	-		
1990	4	7,002,061,795.50	7,002,061,795.50	Microfiche	7,002,061,795.50	7,002,061,795.50	Y	-	-	-		
1990	5	6,616,668,429.03	6,616,668,429.03	Microfiche	6,616,668,429.03	6,616,668,429.03	Y	-	-	-		
1990	6	5,737,241,976.17	5,737,241,976.17	Microfiche	5,737,241,976.17	5,737,241,976.17	Y	-	-	-		
1990	7	6,957,501,546.00	6,957,501,546.00	Microfiche	6,957,501,546.00	6,957,501,546.00	Y	-	-	-		
1990	8	6,948,596,375.33	6,948,596,375.33	Microfiche	6,948,596,375.33	6,948,596,375.33	Y	-	-	-		
1990	9	3,560,785,524.07	3,560,785,524.07	Microfiche	3,560,785,524.07	3,560,785,524.07	Y	-	-	-		
1990	10	3,037,700,230.32	3,037,700,230.32	Microfiche	3,037,700,230.32	3,037,700,230.32	Y	-	-	-		
1990	11	4,596,717,235.31	4,596,717,235.31	Microfiche	4,596,717,235.31	4,596,717,235.31	Y	-	-	-		
1990	12	5,753,806,356.27	5,753,806,356.27	Microfiche	5,753,806,356.27	5,753,806,356.27	Y	-	-	-		
1990	13	519,000,775.22	519,000,775.22	Microfiche	519,000,775.22	519,000,775.22	Y	-	-	-		
1990	14	3,485,597,855.01	3,485,597,855.01	Microfiche	3,485,597,855.01	3,485,597,855.01	Y	-	-	-		
1991	1	4,214,304,913.89	4,214,304,913.89	Microfiche	4,214,304,913.89	4,214,304,913.89	Y	-	-	-		
1991	2	3,587,901,919.12	3,587,901,919.12	Microfiche	3,587,901,919.12	3,587,901,919.12	Y	-	-	-		
1991	3	3,056,714,747.67	3,056,714,747.67	Microfiche	3,056,714,747.67	3,056,714,747.67	Y	-	-	-		
1991	4	5,097,845,123.58	5,097,845,123.58	Microfiche	5,097,845,123.58	5,097,845,123.58	Y	-	-	-		
1991	5	5,516,526,212.55	5,516,526,212.55	Microfiche	5,516,526,212.55	5,516,526,212.55	Y	-	-	-		
1991	6	4,035,445,202.27	4,035,445,202.27	Microfiche	4,035,445,202.27	4,035,445,202.27	Y	-	-	-		
1991	7	4,208,511,646.82	4,208,511,646.82	Microfiche	4,208,511,646.82	4,208,511,646.82	Y	-	-	-		
1991	8	6,178,353,613.94	6,178,353,613.94	Microfiche	6,178,353,613.94	6,178,353,613.94	Y	-	-	-		
1991	9	4,144,510,035.10	4,144,510,035.10	Microfiche	4,144,510,035.10	4,144,510,035.10	Y	-	-	-		
1991	10	3,480,865,816.27	3,480,865,816.27	Microfiche	3,480,865,816.27	3,480,865,816.27	Y	-	-	-		
1991	11	3,271,419,252.84	3,271,419,252.84	Microfiche	3,271,419,252.84	3,271,419,252.84	Y	-	-	-		
1991	12	5,190,065,629.30	5,190,065,629.30	Microfiche	5,190,065,629.30	5,190,065,629.30	Y	-	-	-		
1991	13	1,017,373,052.72	1,017,373,052.72	Microfiche	1,017,373,052.72	1,017,373,052.72	Y	-	-	-		
1991	14	4,804,181,404.36	4,804,181,404.36	Microfiche	4,804,181,404.36	4,804,181,404.36	Y	-	-	-		
1992	1	3,723,339,286.32	3,723,339,286.32	Microfiche	3,723,339,286.32	3,723,339,286.32	Y	-	-	-		
1992	2	3,263,357,895.84	3,263,357,895.84	Microfiche	3,263,357,895.84	3,263,357,895.84	Y	-	-	-		
1992	3	3,706,484,445.04	3,706,484,445.04	Microfiche	3,706,484,445.04	3,706,484,445.04	Y	-	-	-		
1992	4	3,915,235,686.02	3,915,235,686.02	Microfiche	3,915,235,686.02	3,915,235,686.02	Y	-	-	-		
1992	5	4,333,754,643.93	4,333,754,643.93	Microfiche	4,333,754,643.93	4,333,754,643.93	Y	-	-	-		
1992	6	5,414,022,777.91	5,414,022,777.91	Microfiche	5,414,022,777.91	5,414,022,777.91	Y	-	-	-		
1992	7	4,041,031,075.95	4,041,031,075.95	Microfiche	4,041,031,075.95	4,041,031,075.95	Y	-	-	-		
1992	8	5,237,216,546.36	5,237,216,546.36	Microfiche	5,237,216,546.36	5,237,216,546.36	Y	-	-	-		
1992	9	4,759,864,853.10	4,759,864,853.10	Microfiche	4,759,864,853.10	4,759,864,853.10	Y	-	-	-		
1992	10	3,098,505,006.75	3,098,505,006.75	Microfiche	3,098,505,006.75	3,098,505,006.75	Y	-	-	-		
1992	11	4,419,651,861.07	4,419,651,861.07	Microfiche	4,419,651,861.07	4,419,651,861.07	Y	-	-	-		
1992	12	5,249,704,164.43	5,249,704,164.43	Microfiche	5,249,704,164.43	5,249,704,164.43	Y	-	-	-		
1992	13	238,618,951.91	238,618,951.91	Microfiche	238,618,951.91	238,618,951.91	Y	-	-	-		
1992	14	3,523,556,957.69	3,523,556,957.69	Microfiche	3,523,556,957.69	3,523,556,957.69	Y	-	-	-		

City of Houston
Data Recovery Verification - Reconciliation Phase
Closed General Ledger

Year	Period	Total Debits per		Total Credits per		Source of City - Supplied Report for Reconciliation Purposes (A614)	Total Debits per Controller - Supplied A614	Total Credits per Controller - Supplied A614	Agree (Y/N)	Difference in Debits	Difference in Credits	Difference
		AFMS restored A614	AFMS restored A614	AFMS restored A614	AFMS restored A614							
1995	1	8,824,684,345.61	8,824,684,345.61	CD	8,824,684,345.61	8,824,684,345.61	Y	-	-	-		
1995	2	5,567,615,433.24	5,567,615,433.24	CD	5,567,615,433.24	5,567,615,433.24	Y	-	-	-		
1995	3	4,246,569,232.62	4,246,569,232.62	CD	4,246,569,232.62	4,246,569,232.62	Y	-	-	-		
1995	4	4,374,237,316.25	4,374,237,316.25	CD	4,374,237,316.25	4,374,237,316.25	Y	-	-	-		
1995	5	4,201,030,834.76	4,201,030,834.76	Microfiche	4,201,030,834.76	4,201,030,834.76	Y	-	-	-		
1995	6	5,791,541,447.46	5,791,541,447.46	Microfiche	5,791,541,447.46	5,791,541,447.46	Y	-	-	-		
1995	7	4,271,418,525.81	4,271,418,525.81	Microfiche	4,271,418,525.81	4,271,418,525.81	Y	-	-	-		
1995	8	9,986,054,034.95	9,986,054,034.95	Microfiche	9,986,054,034.95	9,986,054,034.95	Y	-	-	-		
1995	9	7,284,672,497.62	7,284,672,497.62	Microfiche	7,284,672,497.62	7,284,672,497.62	Y	-	-	-		
1995	10	3,560,388,376.97	3,560,388,376.97	Microfiche	3,560,388,376.97	3,560,388,376.97	Y	-	-	-		
1995	11	5,460,545,942.06	5,460,545,942.06	Microfiche	5,460,545,942.06	5,460,545,942.06	Y	-	-	-		
1995	12	5,306,467,026.88	5,306,467,026.88	Microfiche	5,306,467,026.88	5,306,467,026.88	Y	-	-	-		
1995	13	436,417,999.29	436,417,999.29	CD	436,417,999.29	436,417,999.29	Y	-	-	-		
1995	14	17,550,056,391.95	17,550,056,391.95	CD	17,550,056,391.95	17,550,056,391.95	Y	-	-	-		
1997	4	4,220,350,162.73	4,220,350,162.73	CD	4,220,350,162.73	4,220,350,168.14	N	5.41	(5.41)	10.82		
1997	5	5,259,856,538.22	5,259,856,538.22	CD	5,259,856,538.22	5,259,856,538.22	Y	-	-	-		
1997	6	5,929,018,868.19	5,929,018,868.19	CD	5,929,018,868.19	5,929,018,868.19	Y	-	-	-		
1997	7	8,411,524,779.57	8,411,524,779.57	CD	8,411,524,779.57	8,411,524,779.57	Y	-	-	-		
1997	8	9,587,623,397.28	9,587,623,397.28	CD	9,587,623,397.28	9,587,623,397.28	Y	-	-	-		
1997	9	5,632,155,195.16	5,632,155,195.16	CD	5,632,155,195.16	5,632,155,195.16	Y	-	-	-		
1997	10	6,707,286,638.18	6,707,286,638.18	CD	6,707,286,638.18	6,707,286,638.18	Y	-	-	-		
1997	11	8,219,458,147.26	8,219,458,147.26	CD	8,219,458,147.26	8,219,458,147.26	Y	-	-	-		
1997	12	6,640,925,834.17	6,640,925,834.17	CD	6,640,925,834.17	6,640,925,834.17	Y	-	-	-		
1997	13	336,459,909.48	336,459,909.48	CD	336,459,909.48	336,459,909.48	Y	-	-	-		
1997	14	6,624,646,947.74	6,624,646,947.74	CD	6,624,646,947.74	6,624,646,947.74	Y	-	-	-		
1998	1	8,188,728,921.24	8,188,728,921.24	CD	8,188,728,921.24	8,188,728,921.24	Y	-	-	-		
1998	2	7,404,892,591.72	7,404,892,591.72	CD	7,404,892,591.72	7,404,892,591.72	Y	-	-	-		
1998	3	5,287,424,460.63	5,287,424,460.63	CD	5,287,424,460.63	5,287,424,460.63	Y	-	-	-		
1998	4	7,667,916,292.44	7,667,916,292.44	CD	7,667,916,292.44	7,667,916,292.44	Y	-	-	-		
1998	5	7,466,757,231.39	7,466,757,231.39	CD	7,466,757,231.39	7,466,757,231.39	Y	-	-	-		
1998	6	7,456,043,205.93	7,456,043,205.93	CD	7,456,043,205.93	7,456,043,205.93	Y	-	-	-		
1998	14	9,706,618,625.85	9,706,618,625.85	CD	9,706,618,625.85	9,706,618,625.85	Y	-	-	-		

* Used City supplied A613 instead of A614 as last pages of A614 were not included on the microfiche

EXHIBIT II



CITY OF HOUSTON
Information Technology
Department

Bill White

Mayor

Richard F. Lewis
Chief Information Officer

611 Walker, Suite 848
Houston, Texas 77002

T. 832-393-0065; F. 832-393-0075
richard.lewis@cityofhouston.net

September 16, 2004

Annise D. Parker, City Controller
City of Houston
City Hall – 8th Floor
901 Bagby Street
Houston, Texas 77002

Dear Ms. Parker:

The City of Houston, Information Technology Department has initiated new retention procedures in response to your Process Risk Assessment. These procedures will ensure that historical financial data will not be at risk of being inadvertently deleted.

The City will keep our production open and closed financial ledgers on DASD indefinitely. This will satisfy the Controller's office requirement of permanent storage.

This policy will apply to all systems except the six categories from the financial system. These categories include the General Ledger, Budget Ledger, Memo Ledger, YTD General Ledger, YTD Budget Ledger, and YTD Memo Ledger. A new procedure will be put into place to verify that these ledgers retain their permanent storage status. Once a month the applications group will run an IEBGENR utility to access the files and verify their presence.

The 8/400 policies will be permanently removed from our Policies and Procedures Manual. The 8/800-day rule will be used in its place. The 8/800-day policy will work like the 8/400 in that 1) unless the dataset is specifically identified as not being eligible for archival, any non-temporary dataset residing on a production volume will be archived to tape if not accessed within eight days, and 2) any production dataset residing on tape will be deleted if not accessed within 800 days.

With the conclusion of the audit, a new procedure will be implemented to back up production ledgers to DVD for each fiscal year. The current fourteen years of data will be copied to DVD. Annually, a new DVD will be created that will hold the fourteen periods of closed ledgers for the six categories previously mentioned. All DVDs will be stored in three locations. One copy of the DVD will be stored in-house, a second copy will be made for the offsite storage at 4200 Leeland, and a third copy will be made for the Controller's office.

Regards,

A handwritten signature in blue ink that reads "Richard Lewis".

Richard Lewis
CIO
Information Technology Department

RL/sa

cc: Matt Hyde, Assistant Director, Information Technology Department
Bob Forsythe, IS Administrator, Information Technology Department

Council Members: Toni Lawrence Carol Mims Galloway Mark Goldberg Ada Edwards Addie Wiseman M.J. Khan Pam Holm Adrian Garcia Carol Alvarado
Mark Ellis Gordon Quan Shelley Sekula-Gibbs, M.D. Ronald C. Green Michael Berry Controller: Annise D. Parker

**Views of Responsible
Officials**