Hanford and The Tri-Cities Economy: Review and Outlook, March 1989

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March 1989

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HANFORD AND THE TRI-CITIES ECONOMY:
REVIEW AND OUTLOOK, MARCH 1989

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ABSTRACT

The economy of the Tri-Cities, Washington area (primarily, Benton and Franklin Counties) is in transition due to major changes in two Department of Energy programs at Hanford -- the abrupt ending of the Basalt Waste Isolation Project (BWIP) in December 1987 and the placing of the N Reactor in "cold standby" status in February 1988. This report reviews the economic situation in the Tri-Cities during 1988 and presents forecasts for key economic indicators for 1989. This report will be updated about every six months to review the changes in the area economy and forecast the near-term outlook.

PREFACE

The federal government's Hanford Site is the major employer in the Tri-Cities Richland, Kennewick, and Pasco and the area encompassed by Benton and Franklin Counties. It is also, by virtue of its size, considered to be a major employer in the state of Washington. In December, 1987 Congress suddenly halted operations on the Basalt Waste Isolation Project (BWIP) at Hanford. In February 1988, the announcement was received that the N Reactor, a key facility at the Site, was to be placed on "cold standby" status. Recognizing that these events would have significant implications for the Tri-Cities region, the Richland Operations Office of the Department of Energy (DOE-RL) and the Office of Economic Adjustment within the Department of Defense (OEA) initiated a three-year study to monitor, analyze, and forecast socioeconomic change in the Tri-Cities. Updates are planned twice a year on the local socioeconomic situation, including both updated data on economic and social impacts that have occurred and a forecast for the following 12 months.

Because this report is the first of its kind in the local area, the authors have had to anticipate the information needs of the report's readers. We welcome your comments and suggestions concerning report content and format. If you have comments or questions, please write Dr. Michael J. Scott, Pacific Northwest Laboratory K6-57, P.O. Box 999, Richland, Washington 99352 or call (509) 376-2458. We will try to incorporate your ideas in subsequent reports.

EXECUTIVE SUMMARY

The economy of the Tri-Cities and the surrounding area within Benton and Franklin Counties is an economy in transition. During the Federal Fiscal Year (FY) 1988, October 1987 through September 1988, the area received two major economic shocks related to the U.S. Department of Energy (DOE) Hanford Site--the abrupt ending of the Basalt Waste Isolation Project (BWIP) and the placing of the N Reactor in "cold standby" status. These economic shocks have adversely affected the local economy during Calendar Year (CY) 1988, and will continue to have an effect throughout CY 1989 and beyond.

The changed status of N Reactor and its potential effect on the local economy was anticipated and was previously discussed in a Pacific Northwest Laboratory (PNL) report entitled The Economic Effects of Closing Hanford's N Reactor and Nuclear Materials Production Facilities (PNL-6295), published in August 1987. However, it focused on the forecasting of impacts of not restarting the N Reactor, which had been shut down for safety improvements. It did not purport to examine either the loss of the BWIP project or the effects of non-Hanford related changes in the economy of the Tri-Cities region.

CY 1988 proved to be a year of opportunity in the non-Hanford economy. Highlights included new construction projects, an excellent year in agriculture, increases in tourism, increases in the size of the retirement community, and the new location or expansion of several smaller employers in the Tri-Cities. These positive changes in the non-Hanford economy have had the effect of reducing, at least for the current period, the magnitude of economic disruption that otherwise would have been expected to accompany a significant loss of jobs at Hanford.

The question now is whether the relatively moderate impacts observed between the third quarter of 1987 and the fourth quarter of 1988 can be maintained as a result of continued stimulus from the non-Hanford sectors or whether the forces set in motion in early 1988 (including additional job losses at Hanford during 1989) will predominate, leading to more economic adversity in the region. Based on information available in January 1989, we expect the impacts of lower Hanford budgets and employment that began in CY 1988 to continue into CY 1989 and not to be offset to the same degree as in CY 1988. Thus, while the exact timing is uncertain, we expect noticeable job losses to occur in the local service sector beginning about the middle of the CY 1989 and to continue throughout the year.

ES.1 OVERVIEW OF CY 1988

CY 1988 was a year of transition. By the first quarter of the year, the Hanford Site had already begun to feel the employment effects of consolidating the Hanford Site contractors from eight to four. More importantly, significant uncertainties hanging over the Department of Energy's programs at the Hanford Site were resolved. In December 1987, the Congress decided to narrow the focus for the nation's high-level nuclear waste repository site

characterization program to a single site at the Nevada Test Site near Las Vegas, Nevada. This halted the Basalt Waste Isolation Project and the commercial waste isolation mission at Hanford. Associated job losses began to be felt in early CY 1988. In February 1988, citing a surplus of plutonium for defense purposes, the Department of Energy decided to place N Reactor on cold standby status. The economy began in March 1988 to adjust to the related loss of jobs at the N Reactor and in the Nuclear Materials Production mission. Partially offsetting these job losses, remediation of the Hanford Site has received increased attention and support.

The non-Hanford economic base has seen stability or growth in most sectors, offsetting some of the unfavorable economic news from Hanford. Offsetting events included a strong increase in agricultural income, tourism expenditures, and the retired population of the area. Minor increases in employment have occurred in Agriculture and Food Processing (Lamb-Weston headquarters employment and Iowa Beef Packers) and other manufacturing (Advanced Nuclear Fuels, Sandvik Special Metals, and Boise Cascade-Wallula). During the fourth quarter, larger increases occurred in regional retailing with the opening of the expanded Columbia Center and nearby coliseum.

Table ES.1 shows changes in quarterly average seasonally adjusted employment by sector in the Tri-Cities economy between third quarter of CY 1987 and fourth quarter of CY 1988. The first few lines of the table convert the end-of-quarter Hanford employment totals usually reported by DOE into quarterly average seasonally adjusted resident employment figures used in this report. Quarterly average seasonally adjusted figures are used for employment figures throughout this report to smooth out month-to-month fluctuations in employment and present a clearer picture of underlying changes in the local economy. The resident employment concept is used in order to focus on those workers who live in Benton and Franklin Counties. It excludes those workers who work in the two counties but live elsewhere (e.g., Yakima). Individual values in the table are rounded to the nearest 50 workers.

Table ES.1 disaggregates employment and employment changes into their basic and service/secondary sector (non-basic) components. Regional economic growth is dependent on basic sector economic activity. The basic sector is comprised of those industries that sell goods and services outside of the area and bring in money from outside the two counties. Besides Hanford, this includes agriculture, food processing, Washington Public Power Supply System (WPPSS), regional retailing and tourist services, and a few other major employers. The service sector consists of the remaining industries, who serve the local population.

As Table ES.1 indicates, there have been significant employment decreases at Hanford during CY 1988. Some (but not all) of these decreases apparently have been reflected in decreased employment in the service industries in Benton and Franklin Counties. The methodology used in the August 1987 N Reactor Closure Study suggests that, in the long run (approximately 4 years) with no other changes in the non-Hanford basic sector, nearly 2,650 local secondary or service sector jobs could eventually be lost due to the 2,200 resident Hanford jobs lost from the third quarter of CY 1987 to the

TABLE ES.1. Total Resident Employment, Tri-Cities Area, Recent History

Employment Indicator	Quarter Ended					
	Sept. 30, 1987	Dec. 31, 1987	March 31, 1988	June 30, 1988	Sept. 30, 1988	Dec. 31, 1988
Quarterly Average Resident Employment:						
Hanford End-of-Quarter Employment	14,500	14,100	13,500	12,900	12,400	12,200
Hanford Quarterly Average Employment	14,600	14,300	13,900	13,150	12,600	12,250
Less: Not Resident	-1,150	-1,150	-1,100	-1,050	-1,050	-1,000
Hanford Average Quarterly Resident Employment	13,450	13,150	12,800	12,100	11,550	11,250
Non-Hanford Basic Sector	<u>17,950</u>	<u>18,000</u>	<u>18,100</u>	<u>18,100</u>	<u>18,100</u>	<u>18,400</u>
Subtotal	31,400	31,150	30,900	30,200	29,650	29,650
Service Industries (Secondary)	<u>31,800</u>	<u>32,000</u>	<u>31,850</u>	<u>31,200</u>	<u>31,300</u>	<u>31,300</u>
Total Resident Employment	63,200	63,150	62,750	61,400	60,950	60,950
Cumulative Net Change						
Hanford And Procurements	0	-300	-650	-1350	-1900	-2200
Other Basic	0	50	150	150	150	450
Service Sector (Secondary)	0	200	50	-600	-500	-500
Total	0	-50	-450	-1800	-2250	-2250

fourth quarter of CY 1988, a ratio of 1.2 service sector jobs to 1 Hanford job. However, owing to the successful management measures that delayed the Hanford job losses to reduce their adverse economic impact (and reduce the multiplier effect in the short run), the methodology projects that only about 1,000 of the total 2,650 potential job losses should have been expected by the fourth quarter of 1988, with the balance occurring in 1989 and beyond. Fortunately, the positive developments in the rest of the basic sector (including an increase of 450 employees) offset about 450 to 500 of these 1,000 potential lost service sector jobs. Overall, on a quarterly average basis, the employment changes over the period were: Hanford, down 2200 residents (from 13,450 to 11,250); non-Hanford basic, up 450 (from 17,950 to 18,400); service sector, down 500 (from 31,800 to 31,300), for a total net loss of 2,250 jobs. Average employment through the first three quarters was down 2.1% compared with 1987. (In the state as a whole, average resident employment was up by 4.4% through the third quarter.)

The year 1988 also saw other symptoms of a weaker local economy. Personal income in Benton and Franklin Counties (measured in constant 1988 dollars) fell, from \$2.14 billion in CY 1987 to between \$2.10 and \$2.09 billion in CY 1988, a loss of about 2.2%. The earnings component was down 3.7% through the third quarter. (In contrast, the earnings component of State of Washington personal income was up about 1.5% through the third quarter.) The average selling price of a single family home in the Tri-Cities fell by about 2.5% during CY 1988, although the price had stabilized or risen during most of the second half of the year. As a group, local school districts sustained a net enrollment loss by the fall of 1988, a loss that would have been larger but for influx of kindergartners in Kennewick. The local area probably lost population as well due to outmigration.

Movements in local tax bases have been mixed. Based on partial data through the third quarter of CY 1988, all local jurisdictions saw losses in their assessed values compared with a year earlier, while Kennewick's sales and use tax bases grew. Most other jurisdictions' sales and use tax bases appeared to either be down or roughly constant relative to CY 1987.

ES.2 NEXT 12 MONTHS

The experience through the end of December, 1988 indicates that the loss of Hanford resident jobs was not met by the approximately proportional reduction in secondary jobs that would have been expected. The question that must be addressed is whether in the twelve months from January through December 1989 the forces set in motion as a result of the significant number of jobs lost at Hanford in the preceding five quarters will, together with the additional Hanford losses predicted in the forthcoming four quarters, overwhelm the offsetting influence of employment increases elsewhere in the local economy and result in significant net reductions in secondary employment.

Based upon the data gathered as a result of monitoring events during the preceding five quarters and the best estimates of economic activity in the Hanford and non-Hanford basic sectors of the economy, we expect to see continued reaction of the local economy to the reductions in force that have already occurred at Hanford, as well as the effects of some additional 300 to 650 resident Hanford jobs that are expected to be lost through reductions in force and/or early retirements through the fourth quarter of 1989.^(a) (The number of Hanford jobs lost will depend upon Congressional actions that cannot be predicted at this time. Significant additional funding for site restoration is currently pending Congressional action. Approval would favorably influence the current employment forecast.) Offsetting this to some degree will be the impact of the recently arrived headquarters of Lamb-Weston, Inc., Cascade Columbia Foods, and increased regional retailing activity of the Columbia Center and nearby businesses.

Our predictions for CY 1989 assumed the following:

- The farm economy will remain strong but will not grow further.
- Food processing employment will increase by 100 due to the new Cascade Columbia food processing plant starting operation.
- There will be little increase in employment at other major employers (about 50 jobs).

(a) DOE, working on fiscal year basis, and discussing end-of-year magnitudes rather than averages, indicates that the FY 1989 losses will be 500 to 900 jobs. The DOE numbers are equivalent to those used in this forecast. About 200 of the projected DOE losses already occurred between September 30 and December 31, 1988. The remaining differences are due to quarterly averaging and to residency adjustments.

- About 200 of the new jobs associated with the Columbia Center Expansion are assumed to be part of the community's "export" sector; that is, supported by shoppers outside of the Tri-Cities. This number is assumed to grow by about 25% in 1989.
- Total government payments to retirees will increase by about 3.5%, as in recent years.

Table ES.2 summarizes the forecasts of some of the more significant economic indicators for CY 1989. Based upon the assumptions above, total non-basic Hanford employment is projected to increase by about 200 between the fourth quarter of 1988 and the fourth quarter of 1989. The secondary sector, however, continues to experience job losses from the ongoing repercussions of the 1988 Hanford job losses, plus the expected Hanford reductions during 1989. Assuming the smaller number of Hanford reductions (the "high employment" case in Table ES.2), secondary employment is projected to fall

TABLE ES.2. Forecasts of Significant Economic Indicators, Benton and Franklin Counties, October 1988-December 1989

Employment Indicator	Quarter Ended				
	Dec. 31, 1988	March 31, 1989	June 30, 1989	Sept. 30, 1989	Dec. 31, 1989
Quarterly Average Resident Employment					
<u>Low Employment Case</u>					
Hanford (DOE and Contractors)	11,250	11,200	10,600	10,600	10,600
Other Basic Sector	<u>18,400</u>	<u>18,450</u>	<u>18,550</u>	<u>18,600</u>	<u>18,600</u>
Subtotal	29,650	29,650	29,150	29,200	29,200
Service Industries (Secondary)	<u>31,300</u>	<u>31,150</u>	<u>31,000</u>	<u>30,850</u>	<u>30,700</u>
Total Resident Employment	60,950	60,800	60,150	60,050	59,900
Cumulative Net Change	0	-150	-800	-900	-1,050
<u>High Employment Case</u>					
Hanford (DOE and Contractors)	11,250	11,200	10,950	10,950	10,950
Other Basic Sector	<u>18,400</u>	<u>18,450</u>	<u>18,550</u>	<u>18,600</u>	<u>18,600</u>
Subtotal	29,650	29,650	29,500	29,550	29,550
Service Industries (Secondary)	<u>31,300</u>	<u>31,150</u>	<u>31,000</u>	<u>30,950</u>	<u>30,850</u>
Total Resident Employment	60,950	60,800	60,500	60,500	60,400
Cumulative Net Change	0	-150	-450	-450	-550
<u>Calendar Year Data</u>					
	<u>1988</u>	<u>1989</u>			
Personal Income, Benton and Franklin Counties (Annual Rate, Millions of 1988 \$)	\$2,096	\$2,064-\$2,077			
Resident Population, Benton and Franklin Counties (April 1)	139,600	139,000			
Single Family Housing Price	\$58,200	\$57,100-\$57,600			

by 450. Total area employment would fall in this case by 550 (-300 at Hanford, +200 in other basic, -450 secondary). Using the larger estimates of Hanford job losses (the "low employment" case in the table), total Benton and Franklin County employment is projected to fall by 1,050 (-650 Hanford, +200 other basic, -600 secondary).

Personal income in the two-county area is expected to fall by 0.9 to 1.5% after inflation, even though farm income will remain high for a second year in a row and government transfers to a growing retired population will increase by 3 to 4% in 1989. This loss in overall income of the area will be reflected in weakening of retail sales and housing markets. A drop in retail sales and construction would reduce local tax revenues. Based on weaker income and the possibility of higher interest rates in 1989, Table ES.2 shows a decline of about 1 to 2% in average housing prices in the Tri-Cities during 1989. Although undesirable for current owners, lower housing and land costs may help attract additional businesses or retirees to the area.

We do not expect the lower-paying jobs currently being created elsewhere in the basic sector to entirely make up for the Hanford-related losses. Unless there is a further substantial increase in non-Hanford basic sector activity or an upturn in Hanford programs during CY 1989, we expect that the service sector losses will continue into 1990 as the multiplier effects play themselves out.

In summary, even if the expected positive developments outside of Hanford are fully realized, they are unlikely to completely offset the delayed repercussions of the 1988 layoffs and the 1989 job losses at Hanford. The Tri-City labor market, while displaying hopeful signs of long-term rebound as diversification proceeds, can be expected to be weaker a year from now than it is today.

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1.0 INTRODUCTION

This report was prepared at Pacific Northwest Laboratory, Richland, Washington. PNL is operated for the Department of Energy, Richland Operations (DOE-RL) by Battelle Memorial Institute. The report follows up on work done for DOE-RL on economic impacts of changes at Hanford, which was published in August 1987 as The Economic Effects of Closing Hanford's N Reactor and Nuclear Materials Production Facilities (PNL-6295). The study that produced this report was requested and is being funded by DOE-RL and the Office of Economic Adjustment in the U.S. Department of Defense.

1.1 BACKGROUND

The Tri-Cities Socioeconomic Monitoring and Analysis Study is part of a broad strategic planning effort to better understand and quantify the role and importance of the Hanford mission to the State and regional economies. Specifically, this study will track the changes occurring at Hanford and elsewhere within the economy of the Tri-Cities area and document the effects that these changes have on the local and state economies. Using these data, this study will also provide near-real-time forecasts of the effects expected within the next twelve months. These forecasts will be of use to State agencies, affected local jurisdictions, and other organizations in preparing for and managing the anticipated changes in employment, population, economic activity, and public services and revenues.

The Tri-Cities Socioeconomic Monitoring and Analysis Study builds upon the socioeconomic information base that was originally developed in the N Reactor Closure Study and the Basalt Waste Isolation Program (BWIP) socioeconomic studies. The current effort focuses in more detail on the near-term impacts occurring locally as a result of cancellation of BWIP and the declining activity at the N Reactor, as well as other changes occurring in the non-Hanford economy.

Specifically, we will produce a semiannual monitoring and analysis report during the next three Federal fiscal years documenting the actual changes occurring in employment, population, private economic activity, and selected community services.

We will use the actual changes observed in the local area to make up-to-date projections of the impacts expected to occur within the next four calendar quarters. Thus, all interested users of the report will have available to them a consistent set of continually updated data and projections with which to manage the effects of changes in the Tri-Cities economy.

We also plan to provide empirical data on the social impacts experienced, which will allow projections to be made of the retraining and social support needs of impacted workers and their families. State and local educational and social service agencies need this information to anticipate what retraining and services will be required as Hanford layoffs proceed. Currently these agencies lack some of the necessary detailed data with which to

plan. For instance, no one knows how many people who lose their jobs will decide to stay in the area. Gathering this information will benefit community agencies who are currently trying to design mitigation programs.

Such information also serves a future local and perhaps even a national purpose. It provides DOE with a documented example that can be referred to in responding to future community concerns when plants are built, closed, or placed on standby. Therefore, our goal with the current study is to provide as much information as possible concerning changes in the Tri-Cities population as they occur, and to forecast these changes and their impacts as accurately as possible.

1.2 FEDERAL ACTIONS DURING OCTOBER 1987-DECEMBER 1988

In December 1987, Congress decided to halt further studies at the Basalt Waste Isolation Project, a major Hanford activity that employed approximately 1,300 workers at the end of FY 1987 (September 30, 1987). BWIP was rapidly reduced in size. By the end of FY 1988 (September 30, 1988) it employed only about 200 people. Employment at BWIP is expected to fall to about 50 persons by the end of FY 1989 (see Appendix C).

In February, 1988, citing the lack of need for plutonium, the Department of Energy announced that it was placing the N Reactor on cold standby status. Cold standby means that the reactor is ready to start but not expected to operate except in an emergency. Thus, the Hanford Site defense production mission has significantly declined in importance. The work force in the Hanford Nuclear Materials Production mission has declined from 6,400 at the end of FY 1987 to 5,100 at the end of FY 1988 (September 30, 1988), a loss of 1,300. The change in the status of N Reactor is expected to result in the loss of 2,200 to 2,300 cumulative jobs at Hanford by the end of FY 1989 (September 30, 1989) (see Appendix C).

Increases in activity related to defense waste storage began to occur in FY 1988 that will partially mitigate the adverse impact of the two major closures. Hanford environmental remediation programs have begun to accelerate, resulting in an increase in employment in the Hanford Defense Waste Mission from 2,900 at the end of FY 1987 to 3,200 at the end of FY 1988. Further increases are expected, with defense waste jobs climbing to 3,450 to 3,650 at the end of FY 1989 (see Appendix C).

These changes in end-of-quarter job totals at Hanford translate into changes in the quarterly average employment in Benton and Franklin Counties. Quarterly average seasonally-adjusted resident employment is used in this report to analyze local economic change because some of the local industries such as agriculture are characterized by random monthly variation and regular seasonal cycles in employment that do not reflect any underlying economic change and would not be expected to affect service sector economic activity. Resident employment is used to account for the fact that Tri-Cities residents work outside of the Benton and Franklin Counties at businesses such as Boise-Cascade at Wallula (Walla Walla County), but spend their paychecks in the Tri-Cities, affecting the Benton and Franklin Counties' service sector. At

the same time, residents of Yakima County and other counties who work at Hanford are more likely to spend their paychecks where they live and are less likely to affect local Tri-Cities employment.

Table 1.1 gives a chronology of key events at Hanford since September 30, 1987 and shows the corresponding effect on end-of-quarter employment, average employment for the quarter, and average resident employment for the quarter.

TABLE 1.1. Chronology of Key Hanford Events and Corresponding Employment

<u>Date(s)</u>	<u>Event</u>	<u>End-of-Quarter Hanford Employment</u>	<u>Average Hanford Employment During Quarter</u>	<u>Average Hanford Resident Employment During Quarter</u>
September 30, 1987	End of FY 1987	14,500	14,600	13,450
October-December 1987	Announced End of BWIP; Hanford Site Consolidation	14,100	14,300	13,150
January-March 1988	Announcement of Cold Standby for N Reactor; Major BWIP Job Losses	13,500	13,900	12,800
March-June 1988	First Major N Reactor Job Losses; BWIP Job Losses Continue	12,900	13,150	12,100
July-September 1988	Voluntary Early Retirement Incentives; N Reactor Job Losses Continue	12,400	12,600	11,550
October-December 1988	Additional Hanford Job Losses	12,200	12,250	11,250

Sources: Calculated from data supplied by DOE-RL.

1.3 ORGANIZATION OF THE REPORT

The remainder of this report is organized as follows. Section 2.0 describes the Tri-Cities economy and economic and social impacts that have occurred during the period September 1987 through December 1988. Section 3.0 discusses our forecasts for the Tri-Cities over the next year (CY 1989). The report concludes with appendices discussing the methods used in the forecasts, the Hanford Worker Exit Survey being used to gather data on departing Hanford workers, and the latest DOE forecast of Hanford employment.

2.0 THE TRI-CITIES ECONOMY, OCTOBER 1987-DECEMBER 1988

2.1 OVERVIEW

The Tri-Cities economy has now gone through the loss of the nuclear repository mission (Basalt Waste Isolation Project) and the first round of layoffs associated with shutdown of Hanford's N reactor. Approximately 2100 resident and nonresident positions were lost at Hanford between September 30, 1987 and September 30, 1988. About 200 more were lost by December 31, 1988. The cumulative loss in resident Hanford employment from September 30, 1987 through December 31, 1988 has been 2200 jobs. At first glance, the corresponding response of the Tri-Cities economy has been less than expected, with about 500 resident job losses occurring thus far in the service sector through the quarter ending in December 31, 1988. Most of the losses appear to be in businesses directly supporting Hanford (e.g. architectural services, hotel and motel services) or in the public sector (e.g. the school districts and Benton County). Retail trade has shown few job losses and Tri-Cities taxable retail trade volume through September was actually up over the volume of a year ago.

We do not believe that this negates the importance of the Hanford Site job losses. Even with the large number of early retirements represented in the Hanford job losses, the direct loss of a projected \$80-plus million in annual payroll will have an effect, and we expect the effect to become clearer in the next six months. In a very real sense, the economy is waiting for "the other shoe to fall." (Our projections of total Tri-Cities employment for 1989 are discussed in Section 3.0.)

To complicate matters, during the last year the Tri-Cities service economy appears to have undergone a transition from a largely locally-based economy to a more resilient regionally-based one. The evidence for this is not conclusive; yet, we can point out indicators that the change has occurred.

First, there is the expansion of the Columbia Center mall, the nearby location of a Costco store and a sports and special events coliseum, and the current construction of a ShopKo store in the face of lost activity at Hanford. The reasons the investing firms give for this expansion indicate that major regional and national retailers are responding in part to the need for a regional retail center in the mid-Columbia region.

Second, the geographical reach of the local retail sector seems to have increased. For example, Columbia Center mall merchants now indicate that they are drawing more of their customers from the Yakima and Pendleton areas. Perhaps even more important, some believe that they are now capturing a portion (perhaps 10-15%, according to one estimate) of the local retail business that used to go to Seattle, Spokane, Yakima, or Portland. The rise in value of Kennewick's local taxable retail sales in 1988 may support this hypothesis.

If the transition is actually occurring, it is very important. What it portends is that the retail sector itself will begin to act as part of the

economic base and will be less sensitive to major changes at Hanford. The Northwest Regional Autoplex in Pasco also draws a significant proportion (approximately one-fourth) of its \$100 million dollars in annual business from outside the local area, further regionalizing the local retail base. What this means is that a significant fraction of the jobs formerly dependent on Hanford and other basic sector activities for their continued existence are being transformed into basic sector jobs responsible directly for attracting dollars to the region from outside the Benton/Franklin County area.

2.2 HANFORD

Tables 2.1 through 2.3 provide key data on Hanford employment and financial status relevant to a discussion of the recent economic impacts. Data on declines in Hanford employment, payroll, procurement, and taxes for recent years is provided in Table 2.1. Note the distinction between fiscal years (October-September) and calendar years within the table. Table 2.2 shows Hanford end-of-quarter employment at the end of FY 1987 and for each quarter of FY 1988 by mission. It depicts the phasing down of Nuclear Materials Production (N Reactor) and BWIP, together with increased activity in defense

TABLE 2.1. Hanford End-of-Year Employment, Payroll, Procurement, and Calendar Year Taxes, 1986 Through 1988 (dollars in millions)

	<u>September 1986</u>	<u>September 1987</u>	<u>September 1988</u>
Budget (fiscal year)	\$1,010	\$1,053	\$930
Employment (end of fiscal year)	14,500	14,500	12,400
Annual Payroll(a)	\$505	\$505	\$448
Procurements in Washington State	\$151	\$122	\$96
	<u>1986</u>	<u>1987</u>	<u>1988</u>
State Taxes and Fees Paid			
By DOE and Hanford Contractors	\$12.5	\$10.8	\$10.9
By Employees (estimate)	<u>30.0</u>	<u>30.1</u>	<u>27.0</u>
Total	\$42.5	\$40.9	\$37.9
Local Taxes and Fees Paid			
By DOE and Hanford Contractors	\$ 0.9	\$ 0.9	\$ 0.9
By Employees (estimate)	<u>22.1</u>	<u>22.4</u>	<u>20.2</u>
Total	\$23.0	\$23.3	\$21.1

(a) Converted to annual basis, based on fiscal year-end employment and wage level.

Source: Calculated from data supplied by DOE and Hanford contractors.

TABLE 2.2. End-of-Quarter Hanford Employment^(a) by Program and Quarter, Through the End of CY 1988

	<u>Sept. 30, 1987</u>	<u>Dec. 31, 1987</u>	<u>March 31, 1988</u>	<u>June 30, 1988</u>	<u>Sept. 30, 1988</u>	<u>Dec. 31, 1988</u>
Nuclear Materials Production	6,400	6,200	6,100	5,600	5,100	5,000
Defense Waste Management	2,900	3,000	3,100	3,200	3,200	3,200
Basalt Waste Isolation Project	1,300	1,000	400	200	200	100
Nuclear Energy R&D	1,300	1,300	1,300	1,300	1,300	1,300
Other	<u>2,600</u>	<u>2,600</u>	<u>2,600</u>	<u>2,600</u>	<u>2,600</u>	<u>2,600</u>
Total Hanford (resident plus nonresident)	14,500	14,100	13,500	12,900	12,400	12,200

(a) Quarterly average resident employment used for forecasting in Section 3.0 is not available by mission. Source: DOE Richland Operations Office.

waste management. Net losses in jobs totalled 2,200 to the end of CY 1988 year. Quarterly average resident employment, which is used for forecasting in this report, is not available on a mission-by-mission basis.

Table 2.3 provides a preliminary indication of the probable plans of former Westinghouse Hanford Company (Westinghouse Hanford) employees leaving employment at Hanford between May 1988 and early November 1988. The Hanford Worker exit survey was also administered to departing employees of the site contractors other than Westinghouse, but the response rates for the other contractors were either very low (well under 50%) or very uncertain (no information on the total number of persons receiving the questionnaire) or both. The response rate for Westinghouse Hanford was about 84%, so this body of questionnaires was considered to be statistically representative of the underlying population. There also was some ambiguity in the wording of several of the questions that has caused difficulty in both responding to the questionnaire and in interpreting the answers. Table 2.3 interprets the answers of those actually answering the locational questions according to the most likely intentions of the respondents. The results should be considered suggestive rather than definitive; however it does appear from the table that retirees are far more likely to stay in the Tri-Cities than those quitting or being laid off.

While a significant number of employees left the Hanford Site between January 1988 and May 1988, the Hanford Worker exit survey form was not yet in the field. A separate body of information was collected on 836 of these former staff members employed by the Westinghouse Hanford Company at BWIP, most of whom were reductions in force or quits rather than retirees.^(a)

(a) Data were supplied to this study by the Westinghouse Hanford Company Human Resources Department.

TABLE 2.3. Characteristics of Former Hanford Employees Involved in Hanford Employment Reductions at Westinghouse Hanford Company, FY 1988(a)

	<u>Number</u>	<u>Percent of Total</u>
Retired		
Planning to stay in area	81	75.0
Planning to leave area	17	15.7
Plans uncertain	<u>10</u>	<u>9.2</u>
Subtotal	108	100.0
Voluntary Quit		
Planning to stay in area	21	25.0
Planning to leave	53	63.1
Plans uncertain	<u>10</u>	<u>11.9</u>
Subtotal	84	100.0
Reduction of Force		
Planning to stay in area	90	27.4
Planning to leave area	207	63.1
Plans uncertain	<u>31</u>	<u>9.5</u>
Subtotal	328	100.0
Other Reductions (other reason given for leaving, or residential preference left blank)	87	
Total	607	

(a) Estimated from Hanford Worker Exit Survey, Westinghouse Hanford Company. Results May 9, 1988 through November 11, 1988. Plans of retired based on retirement question. Plans of voluntary quits and ROFs based on residential preference.

About 382 or 45.7% were reemployed by other Hanford programs. Of the remainder, 43 or 5.1% were employed elsewhere in the Tri-Cities area, 17 or 2% retired in the Tri-Cities area and 250 or 29.9% left the area. Not enough data were available to determine the location of 17.2% of the total, although some were known to be employed or in school. No information is available to link staff members' stated plans to their subsequent actual decisions regarding whether or not to relocate.

2.3 OTHER BASIC INDUSTRY

As described in PNL's 1987 analysis of potential economic impacts of the closure of the N Reactor, the procedure used to analyze employment changes

distinguishes between a basic sector of the economy and a secondary or service sector. The basic sector includes those businesses that sell goods and services outside Benton or Franklin County. The secondary sector is essentially a support sector; it sells goods and services locally to those involved in the basic sector and to others in the secondary sector. Although Hanford is the largest single component of the basic sector, other basic sector employers together employ about 1.5 times the number of people working at Hanford.

Although no major growth occurred in non-Hanford basic sector employment during FY 1988, which ended September 30, 1988, the fourth quarter of CY 1988 saw the opening of the expanded Columbia Center, the opening of Lamb-Weston's headquarters, and the opening of the coliseum. Construction activity at the coliseum and Columbia Center and increased income from tourism and retirees and higher agricultural product prices helped offset the loss of Hanford jobs. The following paragraphs summarize activity in the non-Hanford basic sector during CY 1988.

Washington Public Power Supply System. One major event during CY 1988 was the closure of the Supply System's Hanford Generating Plant, which depended on steam from the N Reactor. Most of the personnel were reassigned. No significant activity is expected at the partially-completed WNP-1 civilian power reactor during the next year. Supply System employment and payroll in 1988 were slightly less than the year before, with 1,600 workers and approximately \$59 million in payroll.

Agriculture and Agricultural Processing. One of the most significant events in agriculture during 1988 was that Lamb-Weston, Inc. announced that its corporate headquarters were being moved from Portland, Oregon to Kennewick, Washington. The new headquarters has added about 130 direct jobs in the Tri-Cities, about 50 of whom are transferred from Portland.^(a) Seventy-eight are new local hires. Agricultural processing employment in September of 1988 was the same as in September 1987.^(b) Farm income in 1988 will be higher than it has been for the past several years, likely exceeding \$70 million. Prices for three of the main commodities grown in Benton and Franklin counties--wheat, potatoes, and apples--are all up from 20 to 30% relative to 1987. Based upon an estimate of value of production for major crops in the bi-county area, farm income in 1988 may be up from 20 to 25% over 1987.^(c) Ideally, we would like to have a more direct source of farm profitability, but official farm income estimates at the local level are largely constructed from statewide data of doubtful validity for local analysis and are available only after a one- or two-year time lag.

Other Major Employers. The performance of the non-Hanford manufacturing base and other major employers also continues to be strong, with about 3,400 total employment. Together, Advanced Nuclear Fuels, Sandvik Special Metals,

(a) Personal communication with Mr. Dick Williams, Lamb-Weston, Inc., October 25, 1988.

(b) Source: Washington State Department of Employment Security.

(c) See Appendix A, Section A.2.

Boise Cascade's Wallula plant, Iowa Beef Processors (IBP) in Wallula, and regional railroad operations have added approximately 80 workers in the last year.

Regional Retailing. Construction of a 6,000-seat sport and special event coliseum near Columbia Center, the \$15 million addition to the Columbia Center, and the building up of surrounding businesses are all expected to increase the draw of the Tri-Cities as a regional retailing center. According to one source, the new Sears store at Columbia Center employs approximately 175, (75 new) local workers while the new Lamonts employs about 65 new workers.^(a) The Costco and ShopKo discount chains have also moved into the area (the former is already operating while the latter began construction in November 1988). Besides Sears and Lamonts, 34 other new stores will be added to Columbia Center, with a total expected addition to local employment of 297. While some of this activity clearly represents a geographical shift of local activity (Sears, for example, closed its Pasco store), much is expected to be new, basic sector activity.^(b) Another example of regional retailing is the Northwest Regional Autoplex, a Pasco automobile, light truck, and recreational vehicle retailing center. The autoplex consists of four dealerships comprising 13 franchises that advertise jointly throughout Central Washington and Northeast Oregon. The Autoplex dealers estimated sales of about \$100 to \$110 million during 1988, up from about \$93 million in 1987.

Tourism. Data from the Tri-Cities Visitor and Convention Bureau indicates that the pace of tourist traffic to the Tri-Cities has increased during the last two years.^(c) For calendar year 1986, the Visitor and Convention Bureau reports an estimated 402 conventions, tournaments, and tours in the Tri-Cities, involving about 60,100 visitors who spent an estimated \$12.4 million in the local economy. In 1987, this increased to 694 conventions, tournaments, and tours with 56,500 visitors who spent an estimated \$17.8 million. In the first half of 1988, 395 groups came to the Tri-Cities with 39,000 visitors and an estimated \$12.1 million expenditures, which represents another significant increase over the 262 groups, 20,600 visitors, and estimated \$6.3 million in expenditures in the first half of 1987.

Retirement Community. Retirees are also increasing in number. Of the 2,100 jobs lost at Hanford during FY 1988, about one-sixth to one-fifth appear to be retirees. For example, in the group of 607 departing individuals at Westinghouse Hanford Company who filled out the Hanford Worker Exit Survey (about 84% of those leaving), 108 (18%) retired, and of these, 81

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- (a) Tri City Herald, September 23, 1988, p. 1.
 - (b) The DeBartolo Corporation, the mall's developers and owners, forecast that sales at the mall will double with the new addition, from \$100 million per year to \$200 million per year. See "Expansion Keeps Mall Dominant," Tri-City Herald, October 5, 1988.
 - (c) All data reported in this paragraph came from a telephone contact with Mary Lindsay, Tri Cities Visitor and Convention Bureau, October 11, 1988.

(75%) stated that they would probably stay in the area.^(a) Many of the lost job slots in the coming six months will also be retirees. Westinghouse Hanford Company Personnel Department staff estimate that approximately 300 of the 520 individuals who signed up for early retirement under a special incentive program announced in July 1988 are still on staff and are scheduled to leave by the end of March 1989. Each of these voluntary retirees had three years of age and service added to their basis for calculated retirement benefits and were guaranteed a monthly payment of \$250 until eligible to draw Social Security old age benefits. The average cost of the early retirement package was approximately \$1,000 per month per retiree (as opposed to about \$700 per month for the "normal" retiree).^(b) Much of this retirement income can be expected to remain in the area.

A new retirement center with 114 units opened in May 1988 in North Richland, adding significant additional space to a market with three existing centers. Occupancy of the new center is low, but growing steadily. The number of Social Security recipients in Benton and Franklin Counties grew at an average annual rate of 3.5% per year between 1980 and 1987 and numbered about 17,700 in 1987.^(c) This was 27% more than in 1980 and 46% more than in 1975.

2.4 STATE AND LOCAL EMPLOYMENT AND INCOME

Table 2.4 depicts state and county employment and earnings for the last two calendar years and the first nine months of 1988. (Data were not all available for all of the fourth quarter at the time this report was prepared.) The most striking fact that shows up in the table is that the Benton and Franklin County economies appear to have shrunk by about 2.5 to 3.7% during the last year while the state economy has grown by 1.5% (as measured by earnings) or 4.4%, as measured by employment.

Thus, while the shrinkage of the Tri-Cities' economy was not as severe as expected by many analysts, given the number of lost jobs at Hanford, it still stands in marked contrast to the much stronger performance of the state

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- (a) The strictly voluntary Hanford Worker Exit Survey was given to departing Hanford workers during the spring and summer of 1988. Methods for administering the survey and dates during which the survey was used varied by contractor. A total of 774 questionnaires were returned. Only at Westinghouse Hanford Company was there a sufficiently comprehensive and known response rate to make the results representative of the population of departing workers. See Appendix B for further discussion of the Exit Survey and the suggested revisions to it.
 - (b) Personal contacts with Mr. Al Hawkins, Westinghouse Hanford Human Resources Department, Personnel and Reassignment Services and Mr. Gary Clogston, Westinghouse Company Human Resources Department, Compensation and Benefits, October 18, 1988. Cost data from Mr. Glen Belew, Westinghouse Human Resources Department, November 17, 1988.
 - (c) Personal contact with Mr. P. R. Lerner, Social Security Administration, Baltimore, Maryland, October 6, 1988. Data were not available for 1988 when this report was prepared.

TABLE 2.4. State and County Employment and Real Earnings, 1986, 1987 and Average for the First Nine Months of 1988^(a)

	1986	1987	1988	Percent Change 1987-1988
Total, Benton and Franklin Counties				
Average Resident Employment ^(b)	63,000	63,300	61,700	-2.5
Estimated Annual Earnings (\$ Million)	1,401	1,405	1,350	-3.7
State Total				
Average Resident Employment	2,017,600	2,082,800	2,174,900	+4.4
Estimated Annual Earnings (\$ Million)	51,000	52,300	53,100	+1.5

(a) All earnings figures in constant 1988 dollars.

(b) Partial data for 1988 is seasonally adjusted.

Sources: Data from DOE Richland Operations and Hanford Contractors, Washington State Labor Area Summaries (1986, 1987, 1988), Washington Labor Market (1986, 1987, 1988), U.S. Department of Commerce, Bureau of Economic Analysis, and Washington State Department of Revenue (1988), Scott et al. (1987).

as a whole. The other fact that is implicit in the table is that although the Tri-Cities' non-Hanford basic sector grew between 1986 and 1988, it has not made up for the loss in jobs and income at Hanford.

2.4.1 Quarterly Employment by Sector

Table 2.5 summarizes the changes in employment in the Tri-Cities that have occurred since the third quarter of 1987. As mentioned in Section 1, all numbers in the tables represent quarterly average seasonally adjusted figures. The third quarter of 1987 is used as a reference period since it represents the quarter prior to the first round of layoffs at Hanford.

From the bottom the cumulative decline in the published resident employment was 2,250 from the third quarter of 1987 to the fourth quarter of 1988. Hanford employment was down about 2,200 jobs over this time frame.

TABLE 2.5. Total Resident Employment, Tri-Cities Area, Recent History

Employment Indicator	Quarter Ended					
	Sept. 30, 1987	Dec. 31, 1987	March 31, 1988	June 30, 1988	Sept. 30, 1988	Dec. 31, 1988
Quarterly Average Resident Employment						
Hanford End-of-Quarter Employment	14,500	14,100	13,500	12,900	12,400	12,200
Hanford Average Quarterly Resident Employment	13,450	13,150	12,800	12,100	11,550	11,250
Non-Hanford Basic Sector	<u>17,950</u>	<u>18,000</u>	<u>18,100</u>	<u>18,100</u>	<u>18,100</u>	<u>18,400</u>
Subtotal, Resident Basic	31,400	31,150	30,900	30,200	29,650	29,650
Service Industries (Secondary)	<u>31,800</u>	<u>32,000</u>	<u>31,850</u>	<u>31,200</u>	<u>31,300</u>	<u>31,300</u>
Total Resident Employment	63,200	63,150	62,750	61,400	60,950	60,950
Cumulative Net Change						
Hanford And Procurements	0	-300	-650	-1,350	-1,900	-2,200
Other Basic	0	50	150	150	150	450
Service Sector (Secondary)	<u>0</u>	<u>200</u>	<u>50</u>	<u>-600</u>	<u>-500</u>	<u>-500</u>
Total	0	-50	-450	-1,800	-2,250	-2,250

Employment in the non-Hanford basic sector was estimated to have increased by 450 jobs between the third quarter of 1987 and the fourth quarter of 1988. The components of this increase can be roughly estimated and include the increase in local convention business that is estimated to have added about 100 jobs in the basic sector; and addition of about 200 jobs at Columbia Center that are assumed to be supported by sales to nonresidents.

As shown in the table, service sector (secondary) employment takes a sharp plunge in the second quarter of 1988 and basically remains flat for the rest of the year. In the fourth quarter of 1988, secondary employment is about 500 lower than the reference period of the third quarter of 1987. Before too much is made of the quarter-to-quarter movements in secondary employment, some discussion of its estimation may be warranted. Secondary employment is estimated as a residual. That is, total basic employment is subtracted from total employment to yield an estimate of secondary employment. Although this procedure provides the most consistent picture of overall employment changes over long periods of time, it can display some weaknesses in a quarterly framework shown here. Any errors in overall employment or basic sector employment, together with the seasonal adjustment procedures, are reflected in the secondary sector estimates.(a) Thus, our judgment is that the drop in the second quarter is spurious. The decline of 500 by the fourth quarter is roughly consistent with other employment information by industry (See Appendix A, Section A.3).

2.4.2 Analysis of Recent Employment Changes

In light of PNL's N Reactor Closure Study released in the summer of 1987, a question that is being increasingly asked is why hasn't there been more of an impact on the rest of economy from the Hanford cutbacks? Many readers of that study may recall that a major finding of that study was that about 1.2 other jobs would be lost in the Tri-Cities for every job lost at Hanford. From the 2,200 jobs lost at Hanford thus far, one interpretation of the previous study is that we should have seen a decline in service sector employment of 2,650. Instead, the published employment figures indicate that only several hundred jobs have been lost outside of Hanford.

Several issues must be addressed to try to resolve this apparent inconsistency. The first issue relates to the time phasing of the response of jobs in the secondary sector to changes in the basic sector. As is sometimes overlooked in the 1987 study, the full impact of any Hanford cutbacks was expected to take several years or longer to be fully realized. A second issue involves the behavior of segments of the economy outside of Hanford.

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- (a) Unfortunately, local economic statistics cannot directly provide a detailed breakdown of the other basic and secondary sectors. The general approach is to estimate the secondary sector as a residual; that is secondary employment is calculated as total employment less Hanford less other basic employment.

As Table 2.5 shows, the non-Hanford basic sector is estimated to have grown by 450 jobs between the third quarter of 1987 and the fourth quarter of 1988. As intimated in section 2.3, increases in farm income, growth in the general retirement population, and early retirement programs for Hanford workers also all helped to maintain overall spending in the Tri-Cities during 1988.

With these issues in mind, a natural question is how can we explain the events of 1988. By using the time-phased multipliers and estimates of the components of the basic sector, the employment projection model was used to take an historical look at the period from the third quarter of 1987 through the fourth quarter of 1988.

Although this procedure is explained in detail in Appendix A, the major results can be easily summarized. Using time-phased multipliers and the assumption of no change in the remainder of non-Hanford basic sector, one could have expected a reduction of about 1,000 workers in the secondary sector by the end of 1988. Actual job losses were in the neighborhood of 500. Thus, the effects of the non-Hanford basic sector offset about an equal number of jobs or about 500.

2.5 POPULATION AND HOUSING

Most population indicators for the Tri-Cities area show that the resident population declined slightly in 1987 and early 1988, although area population may still be above its 1986 level. There are several such indicators, including the state's annual April 1 estimate of local population, the number of residential telephone customers, observed house and apartment vacancy rates, the school district enrollment, and others. Table 2.6 shows the resident population estimated by the state's Office of Financial Management as of April 1 for the past three years. The table indicates that the immediate Tri-Cities area lost about 425 persons between April 1, 1987 and April 1, 1988, although population in Benton and Franklin counties was constant. The bi-county area grew slightly in population over the two-year period.

Calculations based on more recent telephone customer data in Table 2.7 indicate that the local population downturn that began late in 1987 probably has continued, though not at as fast a pace as employment has declined at Hanford. The table produces a very rough estimate, in part because residential telephone customers do not bear a one-to-one correspondence to the number of households within a service area, and also because the boundaries of telephone service areas do not match the boundaries of their corresponding cities. As long as the losses in telephone customers and population are similarly distributed, however, the telephone customer data should provide a good indication of population outmigration. There has been little measurable effect to date, however, on the school districts or on the retail sector.

Table 2.8 shows that total school district enrollments in the Tri-Cities have generally decreased only slightly between 1987 and 1988. Enrollment is down in Richland, but up in Pasco and Kennewick. Much of the increase, however, can be attributed to the influx of kindergartners into the schools. The cohort of students in grades K-11 during the 1987 school year in the

TABLE 2.6. Benton and Franklin County Resident Population, 1986 Through 1988

Jurisdiction	April 1 Resident Population			Percent Change 1987-1988
	1986	1987	1988	
Richland	30,240	30,280	30,140	-0.5
Kennewick	36,600	37,320	37,180	-0.4
Pasco	<u>18,420</u>	<u>18,520</u>	<u>18,430</u>	<u>-0.5</u>
Subtotal	85,260	86,120	85,750	-0.4
West Richland	3,720	3,700	3,670	-0.8
Benton City	1,820	1,815	1,800	-0.8
Prosser	<u>4,010</u>	<u>4,000</u>	<u>3,990</u>	<u>-0.2</u>
Total, Tri-Cities Area	94,810	95,635	95,210	-0.4
Other-Benton or Franklin Counties	<u>44,490</u>	<u>43,965</u>	<u>44,390</u>	<u>+1.0</u>
Total	139,300	139,600	139,600	0.0

Sources: State of Washington Office of Financial Management.

TABLE 2.7. Population Changes, 1987 to September 1988, Based on Residential Telephone Customers

City	1987 Residential Customers	1987 April 1 Population	Population Per Customer	1987 to September 1988 Change in Customers	Estimated Change in Population
Richland	13,210	30,280	2.2	-326	-746
Kennewick	19,700	37,320	1.89	-128	-241
Pasco	<u>9,610</u>	<u>18,520</u>	<u>1.93</u>	<u>-69</u>	<u>-133</u>
Subtotal	42,520	86,120	--	-523	-1,120
West Richland	1,780	3,700	2.08	-21	-44
Benton City	1,457	1,815	1.25	-14	-18
Local Service Area	45,757	91,635	--	-558	-1,182

Sources: Estimated from data supplied by the Washington State Office of Financial Management, General Telephone and Electric, and Pacific Northwest Bell.

TABLE 2.8. School District Enrollments, 1987 and 1988 School Years

<u>District</u>	<u>September Enrollment</u>		<u>Change</u>
	<u>1987</u>	<u>1988</u>	
Richland			
K	586	526	-60
1-11	5,780	5,669	-111
12	<u>592</u>	<u>525</u>	<u>-67</u>
Total	6,958	6,720	-238
Change, 1987 K-11 to 1988 1-12	6,366	6,194	-172
Kennewick			
K	848	928	+80
1-11	9,169	9,166	-3
12	<u>975</u>	<u>1,011</u>	<u>+36</u>
Total	10,992	11,105	+113
Change, 1987 K-11 to 1988 1-12	10,017	10,177	+160
Pasco			
K	564	547	-17
1-11	5,270	5,315	+45
12	<u>358</u>	<u>362</u>	<u>+4</u>
Total	6,192	6,224	+32
Change, 1987 K-11 to 1988 1-12	5,834	5,677	-157
Kiona-Benton	1,218	1,162	-56
Burbank	<u>791</u>	<u>777</u>	<u>-14</u>
Grand Total	26,151	25,988	-163

Source: Data supplied by individual districts.

three core districts (Richland, Kennewick, and Pasco) declined by 169 students by 1988.^(a) The individual changes were -172 in Richland, +160 in Kennewick, and -157 in Pasco. However, the kindergarten increases in Kennewick and the apparent improved retention of seniors in Kennewick and Pasco (grade 12 population increased) offset this loss to some degree, resulting in a net loss of only 93 students in the three districts. Enrollment fell in Kiona-Benton and Burbank districts, adding to a total net loss in September enrollment of 163.

Figure 2.1 indicates average selling prices for single-family homes recorded by the Multiple Listing Service (MLS) and the Tri-City Board of Realtors have continued to fall during 1988 from their 1981 peak, declining about 2.5% for the year. However, monthly average selling price data from the Board of Realtors prices have been increasing since April 1988. Similarly, indications from a recent report by the local real estate appraisal community, based on comparable arms-length sales of single-family houses, are that prices declined at about 0.5% per month, or 6% per year, through the first half of the year. Thereafter, low inventories of units caused prices to stabilize. A significant number of houses on the market (about one-fourth) are for sale "for debt only," or are being offered by financial

FIGURE 2.1. Index of Selling Price for Single Family Houses in Tri-Cities Real Estate Market, 1977-1988

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- (a) The 1987 K-11 cohort represents those students who would ordinarily be in grades 1-12 in 1988. Net loss in this cohort represents both net outmigration of school-age children and dropouts.

institutions and relocation companies.^(a) These are, in effect, distress offerings and may indicate additional market softness.

Table 2.9 shows that the Tri-Cities housing market may not yet have adjusted to the steady population declines that have occurred in the area since 1981, even though building permits data indicate very small additions to the stock. The last three housing vacancy surveys (April 1983, October 1985, June 1988) show that in the post-WPPSS era, the vacancy rate has persisted at above 8%, and that vacancy rates for single family housing and mobile homes have continued to increase. Multifamily housing units (apartments) vacancy rates may have stabilized, but it is difficult to tell because the last three surveys were all taken at different times of the year.

Table 2.10 shows historical information on population changes, interest rates, sales volume, housing prices, and turnover in Tri-Cities housing stock (number of days on market). In the late 1970s, because mortgage interest rates lagged behind inflation, effective mortgage interest rates were actually negative. This was accompanied by rapid population growth. Under these

TABLE 2.9. Population Change, Building Permits, and Vacancy Rates in Tri-Cities Real Estate Market, 1975-1988

Date of Survey	Percent Population Change	Annual New Building Permits as Percent of Stock	Percent of Units Vacant			
			All Housing	Detached Single Family	Multi-Family	Mobile Homes
May 75	+8.4	na	0.6	0.5	1.6	0.7
May 76	+6.4	na	0.8	0.6	1.8	0.6
Nov 77	+8.0	na	1.7	0.9	4.1	0.9
Dec 78	+8.1	na	1.3	0.9	2.7	0.6
Oct 79	+5.6	na	2.0	1.2	4.4	0.9
Apr 80	+3.9	0.9	2.8	1.2	7.0	1.6
Apr 81	-1.5	1.0	4.3	1.5	11.4	2.1
Apr 82	-2.2	0.6	5.1	2.5	12.1	3.2
Apr 83	-0.5	0.6	8.6	3.6	19.1	8.8
Oct 85	-2.6	0.5	8.2	4.4	17.7	10.4
Jun 88	-0.9	0.2	8.9	5.0	17.7	11.4

Sources: Tri-Cities, Washington Housing Vacancy Survey, June 1988, Federal Home Loan Bank of Seattle, June 1988. Building permits collected from permit-issuing jurisdictions. Estimated stock from Washington State Office of Financial Management.

(a) Classification of Richland and Kennewick houses listed for sale through the Multiple Listing Service as of October 7, 1988 supplied by Henderson, Vining, and Associates, Kennewick, Washington.

TABLE 2.10. Tri-Cities Population Change, Mortgage Interest Rates, Sales Volume and Average Selling Prices of Housing Units in the Tri-Cities Real Estate Market, by Calendar Year, 1978-1988

Date	Percent Population Change (b)	Existing Home Mortgage Interest Rate (c)	Sales Volume, Single-Family Houses (Units Sold During Year) (a)	Average Price Detached Single-Family House (a)			Percent Change, 1988 Dollars	Average Days on Market (a)
				As Reported	1988 Dollars	Percent Change		
1978	+8.0	9.40	2,356	\$51.7	\$93.7	NA	NA	NA
1979	+8.1	10.63	2,130	59.9	97.5	15.9	4.1	NA
1980	+5.6	12.53	1,513	67.3	96.5	12.4	-1.0	NA
1981	+3.9	14.51	1,082	69.7	90.6	3.6	-6.1	129
1982	-1.5	14.78	672	66.0	80.8	-5.3	-10.8	82
1983	-2.2	12.29	1,049	64.9	77.0	-1.7	-4.7	105
1984	-0.5	12.00	1,070	62.7	71.3	-3.4	-7.4	99
1985	-2.2	11.18	985	62.5	68.7	-0.3	-3.7	85
1986	-1.1	9.80	1,266	60.7	65.6	-2.9	-4.7	91
1987	+0.2	8.94	1,168	59.7	62.1	-1.7	-5.1	95
1988	0.0	9.11	1,262	58.2(d)	58.2	-2.5	-6.3	89

(a) Tri-Cities Real Estate Research Report and Tri-City Board of Realtors.

(b) Washington State Office of Financial Management. Change in MSA population from April 1 of year listed from April 1 of the preceding year. Local city population is down slightly since July 1987.

(c) Rates from Survey of Current Business, November 1988, p. 5-6, Business Statistics 1986, p. 65, and Monthly Labor Review, May 1988, p. 95 and December 1987, p. 87.

(d) Includes several repossession sales, which lowered the average selling price during the year. This was a result of a once-only "achievement recognition" program among local realtors.

circumstances, it is not surprising that it was possible for potential buyers to bid up the real price of housing, a situation that existed in the rest of the nation as well as in the Tri-Cities. The peak nominal price was reached in 1981 although the peak real value was reached somewhat earlier. Mortgage interest rates increased significantly in the early 1980s and population growth turned negative in the Tri-Cities in 1981-1982. This had two effects. In the first place, the real price of housing in the Tri-Cities fell sharply. In the second place, the average time required to sell a house probably increased, and sales volume temporarily collapsed. Since their peak about 1983, however, mortgage interest rates have been slowly declining. This has been matched by a slow decrease in the rate at which real (inflation-adjusted) housing prices have fallen in the face of falling local population. Fluctuations in the interest rate appear to be matched by fluctuations in average selling price, time on market, or both. Thus, declining interest rates may have tended to reduce the buyer cost associated with a given-sized mortgage and may have held a floor under local housing market prices. Any substantial future increases in interest rates can be expected to negatively affect price, as will any future population declines.

Building activity in Benton County and the City of Pasco has been highly correlated with the trends in selling prices, units sold, interest rates, and population changes reported in Tables 2.9 and 2.10. Changes in building activity, in fact, appear to have behaved as a "leading indicator," probably reflecting rising inventories and vacancies and anticipating by one or more years the declines in nominal housing prices, as demonstrated in Table 2.11. Thus, during the late 1970s when effective interest rates were at extremely

TABLE 2.11. Tri-Cities New Residential Construction, by Calendar Year, 1978 to 1988

Year	Benton County Building Permits					Pasco Building Permits					Grand Total
	Single Family	Duplex	Multi-Family	Mobile Home	Total	Single Family	Duplex	Multi-Family	Mobile Home	Total	
1978	743	106	--	213	1,062	36	6	56	27	125	1,187
1979	309	102	--	294	705	80	--	448	34	562	1,267
1980	115	14	14	196	339	43	24	46	20	133	472
1981	108	--	--	279	387	38	26	19	28	111	498
1982	61	4	--	183	248	21	6	--	16	43	291
1983	68	--	--	192	260	17	--	--	12	29	289
1984	51	--	--	189	240	5	--	--	9	14	254
1985	39	--	--	175	214	3	--	--	--	3	217
1986	34	--	--	170	204	6	--	--	7	13	217
1987	32	--	--	139	171	4	--	--	6	10	181
1988 ^(a)	16	--	--	77	93	2	--	--	--	2	95

(a) Figures for 1988 reflect activity for January 1988 through August 1988 only.

Sources: Benton County Building Department; Building Inspector's Office, Pasco, Washington.

low or even negative levels, population growth was strong and average prices of single family homes were high and growing in both real and nominal terms, the construction of single family homes began to fall precipitously. For example, in 1979 the number of building permits for single family homes fell sharply (by 390 units) from the previous year's value of 779 even though annual population growth was at its peak value and real prices had not reached their peak value. Whether housing starts serve as an effective leading indicator of positive changes in the housing market of the Tri-Cities area is an open and unanswered question. It is noteworthy that downward trends in building activity for all types of dwellings in the Tri-Cities market have continued through the first 8 months of 1988. Real estate agents and appraisers report very low inventories of houses for sale in the last part of 1988. This may encourage building in 1989.

2.6 TRADE AND UTILITIES

Changes in the economic health and population in the Tri-Cities can also be measured by the level of retail sales and number of utility customers. Both are imperfect indicators. Retail sales data, for example, do not correlate perfectly with local personal income because of changes in the personal savings rate, changes in the amount of out-of-town purchases, and changes in the number and spending habits of out-of-town customers coming to the Tri-Cities.^(a)

Sales tax data also provide an uncertain picture of consumer purchases because many "retail" sales, including several large sales, are sales involving industrial equipment or construction projects. In Richland, for example,

- (a) To the extent that Oregon shoppers make use of their tax cards (which exempt Oregon residents from Washington sales tax), their purchases in the Tri-Cities will not show up in taxable retail sales figures. Sales will less closely correlate with local income.

the largest "retail" sales in 1987 and 1988 have been posted by WPPSS, General Telephone, Advanced Nuclear Fuels, and several construction firms. Moreover, two key components of consumer spending--food and most personal services--are not subject to the retail sales tax. Growth in the export component of retail sales would tend to mask any downturn in local purchasing.

Changes in the number of residential telephones appear to correlate well with estimates of population change in most localities. However, increases in the number of multiple lines to single residences (the so-called "teenager effect") could again mask small changes in population.

Figure 2.2 shows indicators of regional business activity (taxable retail sales) and population (residential telephone customers). Both sources show relatively constant business activity and population over the three years ending in 1987. However, preliminary data through September 1988 indicate that 1988 local population and business activity may be down slightly since 1987.

2.7 TAX BASE OF STATE AND LOCAL GOVERNMENT

While not all local government jurisdictions are equally dependent upon sales and use taxes and property taxes to fund their services and programs, these taxes provide a large portion of the financial base of every local government in Benton and Franklin Counties. In addition, growth or decline

FIGURE 2.2. Indexes of Tri-Cities Area Taxable Retail Sales and Residential Telephone Utility Customers by Calendar Year, 1979-1988

in the tax bases for these taxes provide yet another indicator of the current level of economic activity (sales and use tax base) and an indicator of property values (assessed valuation).

Table 2.12 shows the historical year-to-year changes in the major tax bases of the principal local governments in Benton and Franklin Counties. As can be seen by the table, Kennewick, Richland, and Pasco all experienced increases in their sales and use tax bases since 1981, while their property tax bases declined. Benton County, Benton City, and West Richland have had steep declines in their sales and use tax bases since 1981 and Benton County's assessed value has also declined. While Kennewick suffered from the post-WPPSS decline in business sales and property values, its tax base

TABLE 2.12. Sales, Use, and Property Tax Base by Jurisdiction and Calendar Year, Tri-Cities Area, 1981-1988 (\$ Million)

Jurisdiction	1981	1982	1983	1984	1985	1986	1987	1988 ^(a)
City of Richland								
Sales and Use Base	\$ 189	\$ 201	\$ 213	\$ 192	\$ 212	\$ 212	\$ 224	\$ 214
Assessed Value	1102	1117	1004	933	921	926	915	899
City of Kennewick								
Sales and Use Base	325	339	332	328	330	344	344	380
Assessed Value	982	1034	935	910	862	864	887	877
City of Pasco								
Sales and Use Base	234	253	258	256	240	261	264	270
Assessed Value	451	483	448	455	432	401	393	371
City of West Richland								
Sales and Use Base	6	7	7	6	5	6	5	4
Assessed Value	74	78	95	95	85	84	80	79
City of Benton City								
Sales and Use Base	8	8	9	5	6	6	5	7
Assessed Value	29	29	36	35	32	31	29	22
Benton County								
Sales and Use Base ^(b)	737	550	418	245	242	246	224	230
Assessed Value	3262	3479	3264	3156	3025	3000	2957	2870
Franklin County								
Sales and Use Base ^(c)	72	80	82	93	81	78	76	81
Assessed Value	1161	1235	1171	1176	1154	1118	1100	1083

(a) Base for sales and use tax based on the percentage change in the base from first three quarters of calendar year 1987 to first three quarters of calendar year 1988 for Richland, Pasco, and Kennewick. Other estimates are based on the first half of 1987 and 1988. Estimated assessed values for property tax are as of mid-November, 1988.

(b) Based on sales and use base in the unincorporated area of the county, plus 15% of sales and use base in the cities within the county.

(c) Based on sales and use base outside of Pasco, plus 15% of the sales and use base in Pasco.

Sources: Washington State Department of Revenue and Benton and Franklin County Assessors. Assessed value is the assessed value, net of open space and other exemptions, by the county assessor of all real and personal property within the jurisdiction for the general expense tax levy.

stabilized and even increased in the last three years. This is at least partially due to growth in business volume, and business property value in the immediate vicinity of the Columbia Center,^(a) but may also be partially the result of an aggressive annexation policy that has added population and residential areas formerly located in the unincorporated county. Richland and Pasco both have experienced some turnaround in business volume since 1985, but no increase in assessed property value. Almost all the remaining jurisdictions have shown some losses. Benton County (which depends for almost a third of its use and sales tax revenue on direct Hanford contractor activity) and Benton City, in which a large number of Hanford or WPPSS workers live, have been particularly hard hit.

The estimated 1988 sales and use tax figures presented in the table are not final numbers, since they represent only results through the third quarter of calendar year 1988 for Richland, Pasco, and Kennewick (fourth quarter figures by jurisdiction were not available from the Washington State Department of Revenue). West Richland, Benton City, Benton County, and Franklin County jurisdiction estimates are based on first and second quarter figures, due to unavailability of data. While first and second quarter sales were up in most of the jurisdictions, the figures reveal that sales were down through the third quarter in Richland, while Kennewick and Pasco showed some increases through the third quarter.

The assessed values in the various jurisdictions in 1988 for the 1989 tax year also contain some significant uncertainties. For example, in the absence of any sales data for downtown Pasco property, the Franklin County Assessor's office based their assessed valuation on a downward market adjustment. Some limited sales information has become available since the valuation that suggest the market adjustment was too large and may have to be reversed for the 1990 tax year.

2.8 PUBLIC SERVICE DEMANDS

Public service demands have shown a mixed response to the changes in the local economy. It appears, for example, that local hospital admissions may be down more than would be predicted by the national declining trends in inpatient medical procedures, although it is difficult to attribute the change entirely to Hanford. Applications have increased at the local food banks, although they have not for state unemployment insurance.

Table 2.13 provides information on a number of indicators of social service demand in the Tri-Cities. The number of unemployment insurance

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- (a) For example, Columbia Center's retail sales increased from about \$80 million to \$100 million between 1987 and 1988. The Columbia Center yielded \$840,000 in sales tax revenue and \$65,000 in property tax revenue during 1987. Property taxes are expected to increase by \$44,000 for 1989 with the new \$15 million addition. See "Miracle in the Desert," Tri-City Herald, October 5, 1988, p. B1.

TABLE 2.13. Annual Average Case Loads, Selected Social Service Functions in the Tri-Cities Area, by Calendar Year, 1984-1988

<u>Agency or Program</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
Unemployment Insurance Beneficiaries ^(a)	NA	NA	NA	2,755	2,785
Food Stamp Recipients	2,746	3,088	3,566	3,882	4,238 ^(b)
AFDC-R Caseload	1,428	1,756	3,082	2,239	2,249 ^(b)
AFDC-E Caseload	132	247	350	389	354 ^(b)

(a) Benton and Franklin County data were not available prior to May 1986. All 12 months are included in 1988 figures.

(b) 1988 estimates are based on a comparison of the first 11 months with the first 11 months of 1987.

Sources: Washington State Departments of Employment Security and Social and Health Service.

claimants has not increased appreciably in 1988 on a year-to-year basis, somewhat surprising in view of the number of Hanford job losses. It appears that those who left Hanford either have already left the area to take new jobs (which would be expected, given the high proportions of scientists and engineers thus far), have retired, or have simply not applied. This situation can be expected to change if large numbers of blue-collar Hanford workers and service sector workers begin to lose their jobs. Case loads for AFDC-R (regular program, Aid to Families with Dependent Children) and AFDC-E (AFDC program for families with at least one employable adult) have both remained constant, while food stamp recipients have been up in at least some recent months, possibly reflecting some increased economic distress. State Department of Social and Health Services staff speculate that one reason for the decline in AFDC-R is the Immigration Reform Act (being a welfare recipient is a barrier to qualification).

The Tri-Cities food banks report that the number of people requiring assistance increased from 1986 to 1987, from about 48,600 to nearly 50,000. During 1988 their impression is that, while the number of customers served has not increased significantly, many of the customers require more frequent help. This has been a result of many of these people working on an on-call or part-time basis, making them periodically ineligible for government programs while still in need of assistance.

A brief telephone survey of local social service agencies was conducted by staff of the Governor's Office in October and November, 1988, and yielded the following additional information concerning local social service

demands. (a) Child Protective Services in Pasco noted an increase of complaints and families in conflict figures (2721 for 1988, versus 2001 in 1987), as well as an increase in the severity of cases and a loss of foster homes. Carondelet Psychiatric Care Center, which performs mainly long term mental health care, has seen little change in activity, but Lutheran Social Services, which performs short term crisis intervention, has seen a significant increase. Legal Aid reports increases in requests for help with evictions for nonpayment of rent, bankruptcy, and foreclosure (Legal Aid does not assist with the latter two categories). Tri-Cities Chaplaincy reports that their referral rate is up by 33% due to layoffs. Catholic Family Services has noticed a drop in volunteers, but since they serve mainly lower income groups who are generally not Hanford employees, they have seen little or no change in case load.

The overall picture that emerges is that those services most likely to be impacted by direct job losses at Hanford appear to have been affected, but except for a few cases, the general community has not yet felt the impact. Most of the agencies emphasized that during the late winter months a different picture may begin to emerge as households begin to exhaust their savings and other resources. The N Reactor Closure Study noted, for example, that impacts on AFDC show up 18 months to two years following job losses.

2.9 LOCATION OF SERVICE DEMANDS

Table 2.14 shows that the geographical pattern of job losses for direct Hanford employees was very close to the values predicted for Nuclear Materials Production in the N Reactor Closure Study, despite the fact that many of the actual losses occurred in the BWIP mission. The slightly heavier concentration of the actual values in the Tri-Cities themselves (especially Richland) can be attributed to the fact that many (58%) of the scientists and engineers and senior managers at Hanford live in the core municipalities near Hanford. Nearly 40% of those workers answering the exit survey were in these categories. Scott, et al. noted that scientists and engineers made up over half of the BWIP workforce at the end of FY 1986 (September 1986).

A different body of data on residences of exiting Westinghouse Hanford and Kaiser Engineers Hanford (KEH) workers was compiled from company employment records between January 1 and August 21, 1988 and is shown in Table 2.15. From this larger body of data, a very similar picture emerges. In the raw data, there was a very large component of the workers reported living outside of Benton, Franklin, and Yakima Counties (about 15.5%). Investigation of the method of data compilation showed that many of these workers were reported at a forwarding address rather than their previous local address. When the distribution of existing workers was adjusted to account for this fact, the result is very close to the predicted value, as shown in the last column of Table 2.15.

(a) Data supplied by Mr. Dan Silver, Tri Cities Coordinator, Office of the Governor, November 23, 1988.

TABLE 2.14. Residence of Departing Hanford Workers Compared with Predicted Values, May 9-November 11, 1988

	<u>Predicted Value(a)</u>		<u>Actual Value</u>	
	<u>Number</u>	<u>Percent of Total</u>	<u>Number</u>	<u>Percent of Total</u>
Richland	253	41.6	284	46.8
Kennewick	178	29.4	176	29.0
Pasco	<u>49</u>	<u>8.0</u>	<u>33</u>	<u>5.4</u>
Subtotal	480	79.0	493	81.2
West Richland	30	5.0	31	5.1
Benton City	25	4.2	20	3.3
Prosser	11	1.8	5	0.8
Other-Benton or Franklin Counties	<u>0</u>	<u>0.0</u>	<u>5</u>	<u>0.8</u>
Total, Benton and Franklin Counties	546	90.0	554	91.3
Other Locations and Missing	<u>61</u>	<u>10.0</u>	<u>53</u> ^(b)	<u>8.7</u>
Total	607	100.0	607	100.0

(a) Predicted values based on percentages of direct employees working in nuclear materials production at Hanford in November 1986 as recorded in the N Reactor Closure Study (Scott, et al. 1987). Actual values were those Westinghouse Hanford workers leaving the company between May 9 and November 11, 1988.

(b) A total of 1 missing values was recorded for current residence of the Westinghouse Hanford respondents. Most "other locations" were in the Yakima Valley.

Source: Scott, et al., 1987, Table B.14, and Hanford Worker Exit Survey Results, May 9-November 11, 1988.

TABLE 2.15. Residence of Exiting Hanford Workers Based on Westinghouse Hanford Company and Kaiser Engineers Hanford Company Employment Records, January 1, 1988 to August 21, 1988

	<u>Predicted Value(a)</u>		<u>Adjusted Actual Value(b)</u>	
	<u>Number</u>	<u>Percent of Total</u>	<u>Number</u>	<u>Percent of Total</u>
Richland	676	41.6	710	43.7
Kennewick	478	29.4	496	30.5
Pasco	<u>130</u>	<u>8.0</u>	<u>139</u>	<u>8.6</u>
Subtotal	1,284	79.0	1,345	82.8
West Richland	81	5.0	68	4.2
Benton City	68	4.2	68	4.0
Prosser	28	1.7	27	1.7
Other-Benton or Franklin Counties	<u>0</u>	<u>0.0</u>	<u>8</u>	<u>0.5</u>
Total, Benton and Franklin Counties	1,461	90.0	1,516	93.3
Other Locations and Missing	<u>162</u>	<u>10.0</u>	<u>108</u>	<u>6.7</u>
Total	1,624	100.0	1,624	100.0

- (a) Predicted values based on percentages of direct employees working in nuclear materials production at Hanford in November 1986 as recorded in the N Reactor Closure Study (Scott, et al. 1987), Table B.14. Actual values were those Hanford workers leaving Westinghouse and Kaiser between January 1 and August 21, 1988.
- (b) Adjusted values were obtained by proportionately reallocating 236 workers shown as living outside of Benton, Franklin, and Yakima Counties in the raw values to locations in the three counties.

3.0 CHANGES IN THE NEXT 12 MONTHS

A year after the start of major layoffs at Hanford, the Tri-City economy is showing surprising resilience. The new addition to Columbia Center has recently opened, the Coliseum is completed, and several food processing firms have either moved into the area or have announced plans to do so. For Benton and Franklin County farmers, the agricultural picture is brighter than it has been for the past several years. In spite of these welcome developments, the prospects are for greater reductions in non-Hanford employment over the next year.

3.1 EXPECTED DEVELOPMENTS AT HANFORD DURING 1989

The next twelve months are expected to show some additional net decrease in the level of employment at Hanford. Working on a fiscal year basis, DOE's Richland Operations Office forecasts that between 500 and 900 Hanford job slots will be lost between September 30, 1988 and September 30, 1989 (FY 1989). The exact Hanford budget by program, and the consequent timing and number of job losses is dependent on reallocations of Department of Energy funds for which Congressional approval is required. Consequently, the extent and timing of job losses at Hanford is uncertain at this time (see Table 3.1). Hanford Site payroll can be expected to fall by approximately the same proportion as site jobs; however, the presence of 300 voluntary retirees in this group can be expected to reduce the potential negative effects of the lost positions on the local service sector. Also, many of the job losses are not expected until the end of the second quarter of the fiscal year (March 30, 1989), delaying the potential "ripple effect" on the rest of the community.

TABLE 3.1. Anticipated Changes at the Hanford Reservation, Recent History and Next Twelve Months

Category of Direct Effect	September 30, 1987	September 30, 1988	Projected Values, FY 1989		
			December 31, 1988	March 31, 1989	June-September 1989
Hanford Employment by Mission: ^(a)					
Nuclear Materials Production	6,400	5,100	5,000	4,900	Program Detail
Defense Material and Environmental Restoration	2,900	3,200	3,200	3,300	Not Available
Basalt Waste Isolation Project	1,300	200	100	100	
Nuclear Energy R&D	1,300	1,300	1,300	1,300	
Other	<u>2,600</u>	<u>2,600</u>	<u>2,600</u>	<u>2,600</u>	
Total	14,500	12,400	12,200	12,200	11,500 - 11,900
Average Quarterly Hanford Resident Employment	13,500	11,550	11,250	11,200	10,600 - 10,950

(a) Employment projections relate to the end of the quarter.

Source: Computed from data supplied by DOE Richland Operations Office.

3.2 PROJECTED EMPLOYMENT IN THE TRI-CITIES

This section presents projections of employment and personal income for 1989. As mentioned above, the possibility of additional funding from Congressional actions during FY 1989 creates a degree of uncertainty that necessitates two employment projections. This pair of cases was considered to examine the sensitivity of total area employment to potential changes at Hanford during 1989. (Significant additional funding for site restoration is currently pending Congressional action. Approval would favorably influence the current employment forecast.)

A "high employment" case assumes total FY 1989 job losses at Hanford are about 500. Using quarterly average employment levels, this assumption translates into a drop of about 300 resident workers between the fourth quarter of calendar 1988 and the fourth quarter of calendar 1989 (see Table 3.1). A "low employment" case assumed Hanford job losses over the fiscal year of 900. As in the first case, these losses were translated into quarterly averages for the estimated number of Hanford workers living in Benton or Franklin counties. From the fourth quarter of 1988 to the fourth quarter of 1989, this translation yields a projected decline of about 650 workers. Without any specific information for the final quarter of calendar 1989, it was assumed Hanford employment levels would remain constant.

3.2.1 The Non-Hanford Basic Sector

Only slight growth is expected in the rest of the basic sector during 1989. About 100 jobs are assumed to be added to total food processing industry, brought about by the opening of the Cascade Columbia Foods plant in Kennewick.^(a) Based upon telephone contacts with the other major firms in the Tri-Cities (WPPSS, Boise-Cascade, Sandvik Special Metals, and Advanced Nuclear Fuels), total employment as a group is expected to rise only marginally during 1989, perhaps by 50 jobs.

The expansion of Columbia Center is a bright spot in the Tri-Cities employment picture. After accounting for the jobs lost at the old Sears store in Pasco, approximately 400 new jobs have been created within the new portion of the mall thus far. We have assumed that half of these jobs continue to be supported by the additional business that is attracted from outside the area. For 1989, we have assumed that this figure would increase by about 25%, or about 50 jobs. This judgement was based on additional business that may be attracted by the opening of ShopKo and by scheduled events at the Coliseum.

No other important changes are expected in the rest of the basic sector employment during calendar 1989. There will be some delayed effect of the increase in agricultural income during calendar year 1988. As discussed in Appendix A, the local economy continues to get a modest boost from the growth in government retirement payments.

(a) An underlying assumption regarding food processing is that a normal crop year is experienced in 1989.

3.2.2 Projected Employment by Major Sector

Table 3.2 summarizes the projections for the high employment case through the fourth quarter of CY 1989. Table 3.3 refers to the low employment case and is identical with the exception of the last three quarters. All numbers in the tables represent quarterly average figures; as mentioned in section one, quarterly averages help to smooth out some of the month-to-month fluctuations that show up in the historical monthly data.

The projections are contingent upon the assumptions regarding Hanford and the remainder of the basic sector, as discussed above. The most uncertainty revolves around the projection of employment in the secondary sector--primarily housing construction, trade, finance, services, and government. Based on the examination of historical employment information and state-level economic models, we estimate that in the high employment case that about 450 jobs will be lost in this sector over the coming year. With a greater employment losses at Hanford, that figure might climb to about 600 over the same period (see Table 3.3). Most of these losses are due to the repercussions of the Hanford reductions that have already taken place. Thus, the reductions in secondary employment in 1989 in the two cases are not highly sensitive.

TABLE 3.2. Total Resident Employment, Tri-Cities Area, Recent History and Next Twelve Months, High Employment Case, Seasonally Adjusted

Category of Employment	Employment Forecast Values for Quarter Ending:				
	December 30, 1988	March 31, 1989	June 30, 1989	September 30, 1989	December 30, 1989
Basic Sector:					
DOE and Contractors ^(a)	11,250	11,200	10,950	10,950	10,950
DOE Local Procurement	800	800	800	800	800
WPPSS and contractors	1,600	1,600	1,600	1,600	1,600
Agriculture	5,900	5,900	5,900	5,900	5,900
Food Processing/Agribus.	3,950	3,950	4,000	4,050	4,050
Other Major Employer ^(b)	3,950	3,950	4,000	4,000	4,000
Regional Retail, Tourism	2,200	2,250	2,250	2,250	2,250
Subtotal	29,650	29,650	29,500	29,550	29,550
Service Sector (Secondary)	31,300	31,150	31,000	30,950	30,850
Total Employment ^(c)	60,950	60,800	60,500	60,500	60,400
Cumulative Net Changes					
Hanford and Procurement		-50	-300	-300	-300
Other Basic		50	150	200	200
Secondary		-150	-300	-350	-450
Total		-150	-450	-450	-550

(a) Eight percent of total Hanford employment subtracted as a residence adjustment to account for commuters from Yakima County.

(b) Includes employment at IBP (Iowa Beef) and Boise Cascade at Wallula, both in Walla Walla County.

(c) Includes only employment in Benton and Franklin Counties.

TABLE 3.3. Total Resident Employment, Tri-Cities Area, Recent History and Next Twelve Months, Low Employment Case, Seasonally Adjusted

Category of Employment	Employment Forecast Values for Quarter Ending:				
	December 30, 1988	March 31, 1988	June 30, 1989	September 30, 1989	December 30, 1989
Basic Sector:					
DOE and Contractors ^(a)	11,250	11,200	10,600	10,600	10,600
DOE Local Procurement	800	800	800	800	800
WPPSS and contractors	1,600	1,600	1,600	1,600	1,600
Agriculture	5,900	5,900	5,900	5,900	5,900
Food Processing/Agribus.	3,950	4,000	4,000	4,050	4,050
Other Major Employer ^(b)	3,950	3,950	3,950	4,000	4,000
Regional Retail, Tourism	2,200	2,250	2,250	2,250	2,250
Subtotal	29,650	29,650	29,150	29,200	29,200
Service Sector (Secondary)	31,300	31,150	31,000	30,850	30,700
Total Employment ^(c)	60,950	60,900	60,150	60,050	59,900
Cumulative Net Change					
Hanford and Procurement		-50	-650	-650	-650
Other Basic		50	150	200	200
Secondary		-150	-250	-450	-600
Total		-150	-800	-900	-1050

(a) Eight percent of total Hanford employment subtracted as a residence adjustment to account for commuters from Yakima County.

(b) Includes employment at IBP (Iowa Beef) and Boise Cascade at Wallula, both in Walla Walla County.

(c) Includes only employment in Benton and Franklin Counties.

The projections of total area employment are developed by summing the employment in the basic (both Hanford and non-Hanford) and the secondary sectors. In the high employment case, total area employment falls by about 550 from the fourth quarter of 1988, to a level of 60,400. In the low employment case, total job losses are about double that projection, about 1,050.

The projected losses in either case come about in spite of the Columbia Center gains and an improved farm economy. They result from the fact that, eventually the loss of 2,200 or more jobs at Hanford since September 1987 will directly reduce area incomes by more than \$80 million a year. Unfortunately, the historical record does not give us a very precise picture as how fast these income losses translate into secondary sector job losses.^(a) Nevertheless, some further impacts from the 1988 Hanford cutbacks can be

- (a) For example in the WPPSS downturn, construction employment (WPPSS-related, home building and other) peaked in the middle of 1981 with some 15,000 workers. By December of that year, construction had fallen by 4,000 workers. Employment in wholesale and retail trade, however, continued to rise throughout the last half of 1981 before peaking in December.

expected to show up during 1989. The extent of additional impacts depends upon the severity of the job losses at Hanford in 1989.

3.2.3 Offsetting Factors

What factors would serve to offset these impacts over the next year? Several can be cited. The first involves any major underestimate of changes within the basic sector. As we mentioned above, we have no reliable--and current--information on the farm sector. In 1986 farm proprietors' income in Benton and Franklin counties was nearly \$70 million dollars. After a relatively poor year in 1987, many farm product prices were up in 1988. Farm income is estimated to have approached record levels in 1988. Although there is the possibility that farm income might increase again in 1989, we have assumed in the forecast that farm income will remain at current levels.

The second factor involves the possibility of an increased percentage of purchases that are made locally. The growth of the retail sector around Columbia Center not only attracts more visitors from outside the Tri-Cities but also helps to retain more spending within the community by local residents. This is especially the case as retail competition increases and the variety of goods and services expands. It is difficult to measure the impact that any shift in spending patterns might have. Over the next year, it is unlikely that this effect would do much more than support some of the new jobs just created at the Center. We estimate any effect would result in the increase of fewer than 100 jobs.

In summary, these factors, even if fully realized, are unlikely to completely offset the delayed repercussions of the 1988 layoffs at Hanford. The simple fact is that these job losses have reduced personal income and purchasing power within the Tri-Cities economy that is essential to maintaining stability in local earnings and employment. Unless new basic sector activities are found to replace these losses and/or the leakages of spending goods and services on secondary goods and services to establishments outside the bi-county area are effectively reduced, the overall employment picture will continue to weaken. The Tri-City labor market currently displays hopeful signs of a long-term rebound as economic diversification proceeds. Nevertheless, even if additional Hanford activity during 1989 can offset many of the job losses associated with the N-Reactor (as exemplified in the high employment scenario) the overall employment picture can be expected to be even weaker a year from now than it is today.

3.2.4 Personal Income

The projected declines in total area employment are mirrored in the projections of wage and salary income and total personal income. In 1986, the last year for which official estimates are available, wage and salary income in Benton and Franklin Counties was about \$1.3 billion (about 1.4 billion in 1988 dollars). Total personal income, which in addition to wages and

salaries includes fringe benefits, interest, dividends, proprietors' income, and government transfer payments, was \$1.9 billion (about 2.1 billion in 1988 dollars).

Table 3.4 shows annual estimates and projections of wage and salary income and total personal income over the period 1986 through 1989. The figures are all expressed in terms of constant 1988 dollars to remove the effect of overall price inflation. The historical figure for 1987 can only be considered approximate since we have no direct information for most of the individual components. The personal income projections for 1988 and 1989 are driven by projected changes in wage income, government transfer payments, and farm proprietors' income. Between calendar year 1988 and 1989 wage and salary income in the area is projected to decline between 2.6% (high employment case) and 3.5% (low employment case). The projected reduction in personal income is somewhat less than that (ranging from 0.9 to 1.5%), since several other sources are somewhat independent of the area's wage and salary income. Increases are expected in government and private pension payments. On a calendar year basis, farm income is projected to be higher in 1989 than during 1988 (see Appendix A).

3.3 POPULATION

As it has for most of the 1980s the Tri-City area faces the prospect of continuing declines in total population over the next few years. Outmigration, as a consequence of fewer job opportunities, will likely be greater than the natural increases in the population from demographic factors.

Projecting migration changes is subject to a high degree of uncertainty. In the 1987 N Reactor Closure Study a migration-employment "multiplier" was used to estimate the long-run impact on population from a loss in jobs at Hanford. Specifically, we assumed that about 1.3 people would leave the area for every job lost. This estimate was derived from an analysis of population-employment changes in Benton and Franklin counties from 1981 to 1986 associated with the downturn at WPPSS and from survey information related to the likelihood employees within certain broad occupational categories would migrate.

TABLE 3.4. Wage and Salary Income and Total Personal Income
(millions of 1988 dollars)

<u>Year</u>	<u>Wage and Salary Income</u>	<u>Total Personal Income</u>
1986	\$1,401	\$2,133
1987	1,405	2,143
1988	1,344	2,096
1989	1,309	2,077 High Employment
	1,297	2,064 Low Employment

Several factors complicate the task of making projections of population migration over a short forecast horizon. First, the previous analysis did not focus on the time-phased response of migration to employment. A decision to migrate hinges on various factors, including: 1) job markets in other areas of the country, 2) the local housing market, and 3) expectations of recovery in the local economy. All three would influence how long before a move out of the area would be made after loss of a job. Given these factors, we believe that projections based on the previous experience from WPPSS downturn can be judged only as suggestive.

A second factor concerns the behavior of outmigration in 1986 and 1987, prior to the recent Hanford layoffs. The estimates provided by the Washington State Office of Financial Management indicate that outmigration was still occurring in Benton and Franklin counties in the last few years, in spite of marked improvements in the overall employment picture. Whether this migration is the tail end of a long adjustment process from the WPPSS downturn, a result of other demographic trends affecting other more rural counties within the state, or is simply a result of statistical errors in the estimation procedure, cannot be determined.

Table 3.5 shows the April 1 population estimates for the historical period 1985-1988 and projections for 1989 and 1990, while Table 3.6 shows the distribution of the changes among cities. As explained in Appendix A, estimates of outmigration from the declines in area employment are superimposed on top of three other components: 1) births, 2) deaths, and 3) a constant outmigration reflecting underlying trends. The magnitudes of all of these components are based on 1986-1988 data.

The population projections shown in Table 3.6 apply only to the low employment case. In the high employment case, approximately 200 additional people would be spread across these jurisdictions.

TABLE 3.5. Benton and Franklin County Population, History and Projections (April 1 estimates)

<u>Year</u>	<u>Population</u>
1985	144,000
1986	140,000
1987	139,600
1988	139,600
1989	139,000
1990	138,300 (High employment case)
	138,100 (Low employment case)

TABLE 3.6. Changes in Tri-Cities Area Population: Recent History and Next Two Years, Low Employment Case

City or County	April 1, 1986	April 1, 1987	April 1, 1988	Projected Values	
				April 1, 1989	April 1, 1990
Richland	30,240	30,280	30,140	29,800	29,400
Kennewick	36,600	37,320	37,180	36,950	36,630
West Richland	3,720	3,700	3,670	3,650	3,590
Benton City	1,820	1,815	1,800	1,770	1,730
Prosser	4,010	4,000	3,990	3,980	3,970
Benton County	104,000	104,100	104,100	103,550	102,800
Pasco	18,420	18,520	18,430	18,350	18,220
Franklin County	35,300	35,500	35,500	35,450	35,300

3.4 PROJECTED HOUSING VALUES

The decline in housing values experienced in the Tri-Cities during 1988 is expected to continue at a more modest pace into 1989. Besides the recent modest increases in mortgage interest rates, which will affect the ability of some borrowers to qualify for loans, the prospects in the local economy are for continued decline in jobs and income, especially in the second half of the year, which will put additional downward pressure on prices. Although about 300 of the Hanford jobs scheduled to be "lost" by residents of Benton and Franklin counties during FY 1989 actually will be retirements and therefore will have a lesser effect on the housing market, other Hanford and service sector job slots will be lost and should result in more houses on the market as these people leave. The recent stabilization in prices probably will prevail for the first part of calendar year 1989. However, it is expected that the additional Hanford job losses and ancillary service sector job losses, together with the expected decline in population, will result in a decrease in average housing prices about half as large as 1988's decrease. This decrease should occur toward the latter half of the year. The average price on single family homes will probably decline from a 1988 value of \$58,200 to between \$57,100 and \$57,600.

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APPENDIX A

METHODOLOGY FOR EMPLOYMENT AND POPULATION FORECASTS

APPENDIX A

METHODOLOGY FOR EMPLOYMENT AND POPULATION FORECASTS

This appendix provides a description of how the forecasts of employment, population, and tax revenues were constructed. The forecast methodology in general follows the same approach as PNL's 1987 analysis of economic impacts of a possible N Reactor closure (Scott et al., 1987). The work in this ongoing monitoring effort differs from the earlier study in several ways: 1) the basic economic information is updated from 1986, and 2) more concern is given to short-run timing of impacts.

Section A.1 describes the updates and revisions in the information used to identify the basic and secondary sectors. Section A.2 discusses the approach used to forecast secondary employment. Section A.3 compares predicted employment with actual employment for the four quarters starting with the fourth quarter of 1987. Sections A.4 and A.5 describe how the personal income, and population forecasts were linked to the predicted changes in total employment.

A.1 UPDATED ESTIMATES OF THE BASIC AND SECONDARY SECTORS

In PNL's previous analysis of the N Reactor closure, an attempt was made to provide a detailed breakdown of the Tri-Cities economy into basic and secondary sectors for a recent period. In that study calendar year 1986 was chosen as a reference point. In this first monitoring report, the third quarter of 1987 is chosen as a reference period.

Table A.1 compares the previous estimates of the basic and secondary sectors with revised and updated data for the third quarter of 1987 (1987:3). Major differences are highlighted below.

DOE and Contractors (Hanford). Prior to the recent major layoffs, DOE and contractor employment in the third quarter of 1987 was only slightly higher than the average for 1986. Based upon the personnel location analysis performed in the previous report, 8% of total employment was assumed to live outside the Tri-Cities area (Benton or Franklin Counties). Thus, the 13,200 and 13,450 figures both represent 92% of all workers who work for any one of the DOE prime contractors or in DOE's Richland operations office.

In fiscal year 1986 (October 1985 through September 1986), DOE and its contractors purchased approximately \$50 million of goods and services in the Tri-Cities. The 1987 study estimated that this procurement supported about 800 jobs in Benton and Franklin counties. Given that direct Hanford employment changed little between 1986 and the third quarter of 1987, it is assumed in the present study that the same number of jobs were being supported in the local economy from procurements.

**TABLE A.1. Comparison of Basic and Secondary Employment,
1986 Versus Third Quarter 1987 (1987:3)**

<u>Basic</u>	<u>1986 Employment(a)</u>	<u>1987:3 Employment</u>
DOE and Contractors	13,200	13,450
Local Procurement (direct employment)	800	800
WPPSS and Contractors	1,700	1,650
Agriculture		
Proprietors	2,500	2,300
Employees	3,900	3,600
Agri-Business	1,200	1,200
Food Processing	2,400	2,650(b)
Other Major Employers	1,930	3,850
Tourism	1,900	1,900
Retirees	N/A	N/A
Total Basic	29,530	31,400
Total Secondary	<u>32,570</u>	<u>31,700</u>
Total Resident Employment	62,100	63,100(b)

(a) Source is Table B.6 in (Scott, et al. 1987). Primary sources are given in the 1987 report.

(b) Seasonally adjusted from quarterly averages published by Washington State Employment Security Department.

Washington Public Power Supply System (WPPSS). Employment at the Washington Public Power Supply System dropped only slightly between 1986 and the third quarter of 1987. Part of this decline is from the loss of jobs at the Hanford Generating Plant (HGP); this plant utilized by-product steam from the N Reactor to produce electricity.

Agriculture. In the 1987 report, agricultural employment was estimated in four separate components. Data on farm proprietors and employees were taken from the U.S. Department of Commerce's Regional Economic Information System. The differences in Table A.1 do not reflect a change in employment levels, but are due to revisions in the Commerce estimates. The latest Commerce data are for calendar year 1986. Without having any other source of information, these estimates were assumed to be approximately the same for the third quarter of 1987. In using the annual figure, we implicitly assume

that this is a seasonally adjusted estimate. Actual farm employment in the third quarter was certainly higher than this figure. For agri-business, the third component listed under agriculture, the estimate of 1200 jobs was held at the 1986 value for lack of more recent information. The final component, food processing, shows slightly higher employment in the third quarter of 1987 as compared to all of 1986. The 1987:3 figure is seasonally adjusted; the actual (published) employment was 2900.

Other Major Employers. The scope of other major employers has been expanded to include IBP (Iowa Beef Processors) in Wallula. IBP employs some 1,500 workers, most of whom live in the Tri-Cities. Also added was the estimated employment associated with Battelle's private (non-DOE) contract research (about 400 employees). As in the 1987 study, this category also includes Advanced Nuclear Fuels, Sandvik Special Metals, Boise-Cascade, and the railroads.^(a) The total figure was adjusted downward by 300 to account for workers at IBP and Boise-Cascade who live outside Benton and Franklin Counties. This is an estimate based upon discussions with the personnel offices in these firms.

Tourism. The 1987 N Reactor closure study used an estimate of approximately 1,900 jobs supported by travel and tourism in 1986 in the Tri-Cities. Although convention business has increased since 1986 according to the Tri-City Visitor and Convention Bureau, no attempt was made to estimate how many additional jobs this may have created in 1987. A particular difficulty with this category is that we have no single sector of the economy for which we can track quarter-to-quarter changes in travel-related jobs.^(b)

Retirees. As stated in the 1987 study, approximately 12,000 people over the age of 65 live in Benton or Franklin County. In the methodology of the 1987 study, the transfer income received by these individuals was factored along with basic sector payroll in the determination of a static local multiplier. After adjustment for inflation (by use of the overall Consumer Price Index), government transfer payments increased by nearly 7% between 1984 and 1986, largely due to the growth in the number of beneficiaries. Assuming this rate of growth has remained nearly the same since then, transfer payment income in the third quarter would have been about \$141 million. As will be discussed below, an adjustment to the employment projection procedure was made to account for the Westinghouse early retirement program.

A.2 METHOD USED TO PROJECT SECONDARY SECTOR JOB IMPACTS

This section describes the general method by which secondary job impacts were projected. Five topics are discussed: 1) long-term multipliers,

- (a) The source of the employment data in the present report is from a special aggregation of these firms supplied by Dean Schau of the Washington State Employment Security Department.
- (b) In 1988, however, some additional employment was attributed to the increase in the number of conventions in 1988 over 1987. See Section A.3.

2) time-phasing of multiplier response, 3) computational approach, 4) seasonal adjustment, and 5) income and other adjustments to basic employment changes.

A.2.1 Long-Term Multipliers

As in the 1987 N Reactor Study, the general method of determining job impacts from the loss of jobs in the basic sector is through the use of an employment "multiplier." The multiplier is a ratio, defined generally as:

$$\frac{\text{Change in the Total Number of Jobs}}{\text{Change in Jobs in the Basic Sector}}$$

The focus of much of the 1987 study was to develop estimates of such multipliers, both at the state and local levels. A variety of economic models were used to estimate these multipliers and an effort was made to reconcile the various values generated by the different approaches. Most of the emphasis in the 1987 study was on long-term total employment multipliers, e.g., the ultimate impact on the total number of jobs after all economic interactions have had time to be completed. The information produced by several of the modeling approaches suggested that these interactions may require as long as three to five years to be completed.

Based upon the various model results and subsequent analysis, point estimates of the most probable long-term total local and state multipliers were made. At the state level a value of 2.5 was used and at the local (bi-county) level a value of 2.2 was used. Another way of looking at the local multiplier is that for every resident of Benton or Franklin County who loses his job at Hanford, 1.2 other (secondary) jobs in these two counties will also eventually be lost. Thus, in contrast to a total multiplier which includes the direct job loss, a secondary employment multiplier can be defined as $2.2 - 1.0 = 1.2$.

In the current study, parts of the basic data have been revised and updated, as reflected in Table A.1 discussed above. One of the economic models was rerun to determine the change in the estimated multipliers. The differences were deemed insufficient to warrant any major reassessment of the long-term multipliers.

A.2.2 Time Phasing of Multiplier Response

Unfortunately, the various models used in estimating the long-term multipliers shed little light on how these multipliers would be manifested over time. That is, if the secondary employment multiplier is 1.2 and 1,000 jobs are lost in the basic sector, how fast will the projected 1,200 jobs in the secondary sector be lost?

The available information on the pattern of responses over time of secondary employment to basic employment comes from two sources. The first is the quarterly WASHMOD econometric model of the State of Washington. The

second is regression analysis of historical annual Tri-City employment data. In the short-run forecast methodology, we have put somewhat more emphasis on the latter source.

The regression analysis performed in the 1987 N Reactor study suggested that about half of the secondary job impact would be felt in the first year of any Hanford layoffs. The remainder of the impact was estimated to occur over an extended period, according to a slowly declining geometric sequence. A problem is that inferring the timing on a quarterly basis is blurred by the use of only annual data.^(a) Some experimentation with annual aggregations of quarterly data suggested that on a strict quarterly basis, somewhat more than half of the response would occur in the first four quarters after a drop in basic employment in a particular quarter. For this study, we have assumed that the impacts on secondary employment will extend four years and that about 55% of the response is in the first year.

Even after these assumptions are made, there is considerable uncertainty as to how the responses in the first year are spread out. In the 1987 study, the responses were assumed to be equal across all quarters of the year following the drop in basic employment. In the current analysis, we assume that the responses begin to decline after the first six months or so.^(b) We also assume that the response in the second quarter following any change in basic employment is higher than the first. This assumption stems from the presumption that unemployment insurance and previous savings would help to maintain expenditure levels higher in the first months after a layoff, as compared to subsequent time periods.

The resulting pattern of time-phased secondary employment multipliers is shown in Figure A.1. The first quarter's multiplier is 0.09; the second quarter's multiplier is 0.20, and so on. The cumulative response after any quarter is simply the sum of the previous multipliers. Thus, to use the one-year reference point as described above, the sum of the first four multipliers is 0.65. The total sum of the time-phased multipliers is 1.2, the value corresponding to the long-run secondary employment multiplier.

A.2.3 Computational Approach

To use the time-phased multipliers to estimate the effects of quarter-to-quarter changes in basic sector jobs, the study uses the following procedure. The projection of secondary job changes involves calculating the

-
- (a) The optimal solution to this problem is to reestimate these equations on a quarterly basis. Unfortunately, some of the basic data to estimate Supply System and contractor employment levels by quarter would be very difficult to reconstruct. In addition, some thorny problems with deseasonalizing the data would have to be overcome.
 - (b) This time pattern of behavior is consistent with the results of the state econometric model, WASHMOD.

FIGURE A.1. Time-Phased Employment Multiplier

product of the time-phased multipliers with basic sector employment levels in previous quarters. Formally, secondary employment is calculated by the following expression:

$$S_t = a + \text{Summation } [m_i * B_{t-i}] \quad (1)$$

where $i = 0, 1, 2 \dots 15$

S_t = secondary employment in quarter "t"

a = constant term

m_i = time-phased multiplier for quarter $t - i$

B_{t-i} = basic employment in quarter $t - i$

(e.g., B_t = employment in quarter t ,

B_{t-1} = employment in quarter prior to quarter t , etc.)

To initiate the process, the third quarter of 1987 was chosen as the base period and basic employment estimates for the previous fifteen quarters were constructed. The above equation was then used to generate an estimate of secondary employment in the base period (1987:3). This involves calculating the cross product of the time-phased multipliers with the lagged

values of basic employment. The constant term (a) is then adjusted to make the calculated value equal to the historical value in the third quarter of 1987.

The forecast for the four quarters beginning in the fourth quarter of 1987 is made in the same manner. The equation above utilizes the given (current) quarter's value of basic employment together with the previous fifteen quarters of basic employment. The year starting in 1987:3 provides a foundation upon which to examine the forecasting accuracy of the simple economic base approach. This topic is discussed below.

The forecasts presented in Section 3 of the report start from a base period of the fourth quarter of 1988. The constant term is adjusted again to yield a zero error in that quarter. Thus, the forecast of secondary employment changes is based on both the changes in basic employment that are projected to occur into 1989 and the history of basic employment changes that have occurred since 1985.

A.2.4 Seasonal Adjustment

All quarterly employment figures in the report are shown on a seasonally adjusted basis. Some attention to seasonal adjustment is necessary, primarily due to the large agricultural component in Benton and Franklin Counties. Retail, education, and service sectors also display significant seasonal shifts by quarter.

Seasonal factors for total resident employment were estimated on the basis of quarterly data from 1983 forward. Additive seasonal factors were estimated by use of a difference from moving average technique.^(a) Table A.2 shows total reported employment, seasonal factors, and seasonally adjusted employment for 1987 and 1988.

In constructing the historical series of basic employment that was used in the forecasting equation, employment in food processing was seasonally adjusted in a similar manner. The remaining components of the basic sector were assumed to be already seasonally adjusted. Thus, for example, projected increases in retail employment are assumed to occur on top of any normal seasonal change that could be expected.

(a) Seasonal factors were computed using the SEAS (A) procedure in the TSP Micro-econometric package (from Quantitative Micro Software, Irvine, California). These factors would be similar, but likely not exactly match, those calculated from the more elaborate X-11 procedure used by the Census Bureau. Note that the seasonal factors reflect the difference of each quarter from the annual average. Thus, to obtain, the seasonally adjusted figure, one subtracts the seasonal factor from the published value.

TABLE A.2. Total Employment and Seasonal Factors for Benton and Franklin Counties, 1987-1988 (quarterly averages)

<u>Quarter</u>	<u>Published Employment</u>	<u>Seasonal Factor</u>	<u>Seasonally Adj. Employment</u>
1987:1	59900	-3620	63520
1987:2	68200	4917	63283
1987:3	64100	936	63164
1987:4	60900	-2233	63133
1988:1	59100	-3620	62720
1988:2	66300	4917	61383
1988:3	61900	936	60964
1988:4	58700	-2233	60933

Note: Published employment is the quarterly average of monthly figures estimated by the Washington State Employment Security Department, rounded to the nearest 100 jobs.

The forecast of total employment in Table 3.3 is constructed as a seasonally adjusted estimate. To determine the actual changes in employment from one quarter to the next, the changes in seasonal factors shown in Table A.2 would have to be incorporated.

A.2.5 Income and Other Adjustments

One major difference between the previous study and the current one involves the definition of the basic sector employment. In the 1987 study only changes in the Hanford employment were considered. The focus was on determining the impact of employment changes at Hanford on the local and state economies. The current study includes a forecast of Tri-City employment, which depends upon changes in employment and income in other basic sectors besides Hanford. For example, government transfer payments to retirees constitute an important element of the basic sector, even though no employment is associated with this income. To maintain the multiplier concept of the prior study, the basic sector employment actually used in the forecasting procedure is adjusted to account for this income and other factors. The major adjustments to the basic sector employment are described below.

Accounting for Relative Wage Differences. The employment multipliers developed in the 1987 N Reactor study were designed to apply to changes in Hanford employees only. The present study expands the scope of the earlier work by projecting the response to the entire basic sector, in which changes occur in both Hanford and non-Hanford employment. The key issue is whether the multiplier is the same for a Hanford worker earning \$35,000 per year as compared to a retail store employee who earns half or less of that figure.

Lacking any other information, the assumption for this study is that the multiplier impact for non-Hanford workers is roughly proportional to their average annual (wage) income. In essence, the basic sector employment used in the forecasting equation above is put in terms of "Hanford-equivalent" employees. Average annual wages in 1987 for DOE and contractor employees was about \$35,000. Thus, an employee in a sector in which average wages are about \$17,000 would be measured as one half of a Hanford employee. In other words non-Hanford workers are weighted in proportion to their average earnings as compared to an average Hanford employee.

The earnings weights for the non-Hanford employees are based roughly on the earnings data collected in the 1987 N Reactor report.^(a) In assigning weights to non-Hanford categories of the basic sector, the judgment was that great precision was not called for in light of the degree of uncertainty in the overall procedure. Accordingly, the following weights were assigned to the non-Hanford employment categories:

Procurement-related	0.75
Food processing	0.50
Other major employers	0.75 ^(b)
Tourism/Retail	0.50

Government Transfer Payments. As discussed in the 1987 study, retirees make up a significant portion of the economic base of the community. In 1986, it was estimated that government transfer payments in the form of retirement benefits made up nearly 15% of the total basic sector income. According to information from the Social Security Administration, the number of social security recipients in Benton and Franklin Counties has been growing on average by about 3.5% per year since 1983. Using \$138 million dollars as a measure of government pension benefits in calendar year 1986, the growth in the beneficiary population translates into about a \$1.2 million dollar increase in aggregate income per quarter from this source.

To incorporate the impact from this source, this income has been converted to an "Hanford-equivalent" employment measure by dividing government pension income by \$35,000. Using this approach, the growth in the beneficiary population is equivalent to an increase of about 35 Hanford-related jobs per quarter. One can speculate as to various reasons why the multiplier impacts from these two sources would differ per dollar of income. However, without evidence to the contrary, we assumed that their impacts on secondary employment are roughly the same.

Farm Income. According to Department of Commerce estimates, 1986 farm proprietors' income in Benton and Franklin counties was \$68 million. More

(a) See Table B.6 in (Scott et al., 1987).

(b) Average annual earnings in the 1986 report for this category was estimated to be \$33,700. The weight was assumed to be only 0.75 in this study because of the addition of relatively lower paid workers at IBP.

recent estimates from this source are not expected until 1990.^(a) To extrapolate the 1986 estimate, we developed a rough measure of total farm production value in the two counties for 1986, 1987, and 1988. Based on data from the Washington State Department of Agriculture, values of production were summed for the following crops: 1) wheat, 2) barley, 3) corn, 4) hay, 5) potatoes, 6) asparagus, 7) sweet corn, 8) onions, 9) apples, 10) cherries, 11) concord grapes, and 12) wine grapes.^(b) The five largest crops are estimated to be potatoes, corn, wheat, apples, and grapes.

The value of farm production based upon this data was estimated to have declined about 10% between 1986 and 1987 and to have risen nearly 25% between 1987 and 1988. Less confidence must be attached to the 1988 estimates since we do not have the latest production estimates for all crops nor season average prices. Nevertheless, these estimates are consistent with anecdotal evidence that farm income is up in 1988 relative to the past several years. Prices for wheat, potatoes, and apples are all up substantially from a year ago. An unknown element of error is associated with using value of production as a direct indicator of changes in net farm income.

To incorporate farm income into the forecasting methodology, the annual estimates were interpolated to quarterly values through the end of 1987. The 25% increase from the 1987 to 1988 was phased in through 1988 in the following manner: 1988:2, up 5%; 1988:3, up 15%, and 1988:4, up 25%. Total farm income used in the projection of secondary employment was then:

1988:1	\$59.9 million
1988:2	\$62.9 million
1988:3	\$68.9 million
1988:4	\$74.9 million

Values for 1989 were held at the fourth quarter 1988 levels.

Similar to government pension income, this income was been converted to a "Hanford-equivalent" employment measure by dividing farm proprietors' income by \$35,000. Using this approach, the growth in farm income during 1988 was equivalent to an increase of about 400 Hanford-related jobs. Again, one can speculate as to various reasons why the multiplier impacts from these two sources would differ per dollar of income. However, without evidence to the contrary, we assumed that their impacts on secondary employment are roughly the same.

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- (a) The Department of Commerce estimates of personal income, from which farm proprietors' income is separately estimated, are made every other year on a county basis. The 1986 estimates were released in April 1988.
- (b) Information was taken primarily from Washington Agricultural Statistics, 1985-1986 and 1986-1987 editions. Most price data for 1988 was taken from the October 18 issues of "Washington Agri-Facts," a monthly news release prepared by the Washington Agricultural Statistics Service.

Early Retirement Program. As part of the consolidation of the Hanford contractors and in the face of declining program budgets, the Westinghouse Hanford Company instituted an early retirement program in the summer of 1988. As of the end of fiscal year 1988 (September 30) approximately 200 workers had left jobs at Hanford under this program. About 300 additional workers have also signed up for this program. To take advantage of the provisions of the program, they must resign by March 30, 1989.

Because of the compensation provisions of the early retirement program, and given the fact that most workers taking advantage of this program would likely be in relatively higher pay scales, it has been assumed that the pension incomes of these new retirees would be comparable to the total wage income of an equivalent number of Hanford employees. To incorporate this assumption into the forecasting procedure for secondary employment we have added back into basic sector employment for each quarter from 1987:4 through 1989:1 10% of the change in DOE and contractor employment (i.e., 200 early retirements divided by a total change of 2,000 employees). Beginning the second quarter of 1989, 300 "Hanford equivalent" workers are added to the basic sector, which offsets a large proportion of the projected total reductions in Hanford employment in that quarter.

In essence, over the two-year period starting in the third quarter of 1987, we have assumed that the income losses due to the total DOE and contractor reductions in employment may be offset by about one-sixth due to early retirements. About one-sixth of the payroll losses from the drop of 3,000 or so Hanford workers may be offset by the early initiation of pension benefits to the approximately 500 early retirements. (a)

A.3 ANALYSIS OF RECENT EMPLOYMENT CHANGES

In light of PNL's N Reactor Closure Study released in the summer of 1987, a question that is being increasingly asked is why hasn't there been more of an impact on the rest of economy from the Hanford cutbacks? Many readers of that study may recall that a major finding of that study was that about 1.2 other jobs would be lost in the Tri-Cities for every job lost at Hanford. From the roughly 2,200 bi-county resident jobs lost at Hanford thus far, one interpretation of the previous study is that we should have seen a decline in non-Hanford employment of 2,650. Instead, the published employment figures indicate that only several hundred jobs have been lost outside of Hanford.

A.3.1 Major Issues

Three issues must be addressed to try to resolve this apparent inconsistency. The first issue relates to the time phasing of the response of jobs in the secondary sector to changes in the basic sector. As is sometimes

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- (a) This estimate is also predicated on the assumption that most of these retirees remain in the Tri-Cities. The exit survey described in Section 2 of the report suggests that this is the case.

overlooked in the 1987 study, the full impact of any Hanford cutbacks was expected to take several years or longer to be fully realized. These lags occur because consumers don't immediately reduce expenditures when income declines (or is lost via a layoff) and neither do employers immediately reduce staff when sales decline. Unfortunately the empirical evidence regarding these lags is scanty, and what evidence that does exist may not apply well to the particular situation in the Tri-Cities.

The second issue involves the behavior of segments of the economy outside of Hanford. As Table 2.5 shows, the non-Hanford basic sector is estimated to have grown by 400 jobs over the 1987:Q3-1988:Q4 time frame. To maintain some consistency with the 1987 study, the tables in this report continue to focus on the interrelationship of employment changes in the various segments of the economy. In reality, incomes and spending drive the employment picture in the secondary sector. As intimated in section 2.3, increases in farm income, growth in the general retirement population, and early retirement programs for Hanford workers all helped to maintain overall spending in the Tri-Cities during 1988. (a) None of these sources of income can be directly tied to current employment.

The third issue involves interpretation of the available employment statistics. One aspect of this issue involves employment changes in industries that we normally think of as only secondary. As explained Section 2.4.1, maintaining a distinction between basic and secondary sectors requires us to view changes in employment in any particular industry with caution. Published changes in secondary employment in the retail industry may include offsets to losses of "normal" retail employment by estimated changes in employment involved in regional retailing (i.e. becoming part of the basic sector).

Another aspect of this third issue involves the statistical uncertainty of the primary published data. Nearly all of the employment data used in this report are preliminary in the sense that they are dependent upon a sample of firms in each industry. Revised and final employment figures are based upon tax data supplied by most firms to Olympia, a by-product of the state unemployment insurance program. These revisions to the 1987 data will not be available until early in 1989. Benchmark revisions for the 1988 data will not be available until early in 1990. What relevance does this have to this study? On occasion, the differences in year-over-year changes from the preliminary total employment estimates to the final estimates have been as much as 1%. Applied to the roughly 30,000 workers in the secondary sector, a revision of this magnitude would be approximately 300 workers, a large figure in comparison to the estimated change in Table 2.5. Any deficiencies in the sampling framework are magnified when large numbers of firms are entering or leaving the market, a situation that may characterize the latter part of 1988.

(a) By farm income we mean income to farm owners. The number of farmers shown as part of the basic sector employment cannot serve as a short term indicator of farm income due to variability of farm product prices.

A.3.2 Decomposing Recent Employment Change

With these issues in mind, a natural question is how can we explain the events of 1988. By using the time-phased multipliers and estimates of the components of the basic sector, the employment projection model was used to simulate the period from 1987:Q3 through 1988:Q4.

Two different simulations were performed. In the first, all components of the basic sector were set at their historical values in each quarter. Using the time-phased multipliers as discussed in the section A.2.2, secondary employment was forecast for each quarter from the fourth quarter of 1987 through the fourth quarter of 1988. As described above, there are unfortunately sufficient uncertainties in the exact nature of the multiplier lags and in the estimates of the "actual" sector employment to preclude any type of formal validation of the projection methodology. Accordingly, this initial simulation could be classed as a calibrating simulation. Some minor experimentation of the lag structure was undertaken to yield reasonable similarity to the approach used in PNL's 1987 N Reactor study. The adjustments were well within the confidence intervals suggested by prior statistical analysis. The final set of time-phased multipliers continue to imply that, in the long run, about 1.2 jobs in the secondary sector are lost for each job loss at Hanford.

The second simulation is an impact analysis, similar to that performed in the 1987 N Reactor Closure report. Here only Hanford basic employment was allowed to change; the time phased multipliers were used again to project secondary employment by quarter through 1988.

The results of these simulations are shown in Table A.3. By the third and fourth quarter the predictions of the time-phased multiplier analysis are reasonably close to the secondary employment estimates developed from the published resident employment numbers. By the fourth quarter, the forecasting methodology would have indicated a drop of 573 jobs. Rounded to the nearest 50 as in the main text tables, this translates into a drop of 550 jobs.

Without including the growth in non-basic Hanford sector or applying any of the income adjustments described in the previous section, employment would have fallen by 983 (or, again, a rounded estimate of 1000). Thus, following the rounding procedures used elsewhere in the report, the effect of the offsetting factors is roughly 450 jobs (1000 - 550). Given the overall uncertainties in the underlying information, perhaps a more appropriate estimate would indicate that about half of the potential impact of 1,000 jobs was offset from other factors, i.e. about 500 jobs.

Before much is made of any comparison of predicted versus published as a measure of model performance (i.e. lines one and two of Table A.3), one should also keep in mind the difficulty in accurately measuring total employment in a local area such as the Tri-Cities. A closer look at three months of published total employment figures in the Tri-Cities (Benton and

TABLE A.3. Secondary Employment: Impact Versus Forecast
1987:3 Through 1988:4 (seasonally adjusted)

	<u>1987:3</u>	<u>1987:4</u>	<u>1988:1</u>	<u>1988:2</u>	<u>1988:3</u>	<u>1988:4</u>
Computed from Published Data	31785	31957	31857	31162	31271	31273
Projection Methodology with Offsets	31785	31775	31730	31611	31417	31212
Impact Case--No Offsets	31785	31760	31671	31477	31170	30802

Franklin Counties) leads us to conclude that comparisons of model-predicted employment and actual employment can only be considered suggestive at this point in time.

Table A.4 shows the 1987 and 1988 total employment estimates for the months of July, August, and September. Along with total resident employment the number for total nonagricultural jobs are included.^(a)

Perhaps the most striking aspect of Table A.4 is the magnitude of monthly fluctuations in the year-over-year changes in employment. Part of the explanation lies in differences in food processing employment which

TABLE A.4. Total Resident and Nonagricultural Jobs--Recent Monthly Estimates (published estimates--not seasonally adjusted)

	<u>Total Employment</u>	<u>Total Nonagriculture</u>
July 1987	64,600	55,900
July 1988	63,200	53,500
Change	-1,400	-2,400
August 1987	63,500	55,790
August 1988	60,600	52,840
Change	-2,900	-2,950
September 1987	64,200	56,120
September 1988	61,800	53,880
Change	-2,300	-2,240

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- (a) Total employment pertains to all residents of Benton or Franklin counties who were employed during the month. Total nonagricultural jobs refers the number of jobs in these two counties. Some of these jobs could be filled by residents of other counties.

differ slightly from one year to the next. Another component involves different government programs during the summer months that can distort underlying trends. Finally, as was mentioned above, all of the 1987 and 1988 data are preliminary in the sense that they are dependent on a sample of firms in each sector. (a) Revised and final employment figures are based on tax data supplied by most firms to Olympia, a by-product of the state unemployment insurance program. These revisions for the monthly 1987 data will not be available until early in 1989. Benchmark revisions for the 1988 data will appear a year later than that.

Our basic approach has been to measure secondary employment as a residual. As the discussion above indicates, the potential measurement errors in both total employment and in our own estimates of the basic sector can obscure short-term trends in secondary employment. Another approach, however, is to look closely at the nonagricultural employment data to see if changes in particular sectors correspond to our definition of secondary employment.

Table A.5 provides an approximate decomposition of the nonagricultural employment changes over the fourth quarter of 1987 to the fourth quarter of 1988. The first three columns are taken or calculated from the Employment Security Department estimates. Column four attributes the drop of some 2,100 Hanford workers into three major sectors--Chemicals, Construction, and Business Services. In this context, the total number of Hanford job losses is used, not just losses estimated for area residents. Column five summarizes our judgment concerning other changes in the basic sector. The increase of 30 jobs in primary and fabricated metals is assumed to be in the basic sector.

The increases of 250 jobs in the retail sector and 50 jobs in miscellaneous services is assumed to be associated with the higher volume of convention business reported in 1988 as compared to 1987 and the opening of the Columbia Center expansion. These are the assumptions described in Section 2.4.1.

The last column in Table A.5 shows the remaining change by sector, after the estimates of basic employment have been accounted for. The largest drops occur in business services, other services, and in public education. The net change across all sectors is about 470 workers. This estimate compares favorably with the estimated drop of 500 secondary workers from 1987:Q3 to 1988:Q4 using the residual calculation method and resident employment data as described above. Comparing strictly from 1987:Q4 to 1988:Q4, the resident employment method implies a drop of about 700. Given the quality of the

(a) More variation can be expected in the resident employment figures, since they depend, in part, on a survey of households that is conducted on a statewide basis. According to Dean Schau, the area economist for the Washington State Employment Security Department, this factor may be responsible for the rather low estimate of resident employment change for July.

TABLE A.5. Fourth-Quarter Change in Nonagriculture Employment, Fourth Quarter 1987--Fourth Quarter 1988 (averages of monthly published estimates)

	Published Employment		Change in Employment			
	Fourth Quarter 1987	Fourth Quarter 1988	Total Change	Estimated DOE-Related	Estimated Other Basic	Change in Secondary
Total Manufacturing	11970	10630	-1340	-1420	80	0
Food and Kindred Products	2740	2790	50		50	0
Printing and Publishing	330	320	-10			-10
Chemicals and Allied Prod.	7920	6500	-1420	-1420		0
Primary & Fab. Metal	430	460	30		30	0
Other Manufacturing	550	560	10			10
Total Nonmanufacturing	43760	42960	-800	-660	300	-440
Construction	2340	2250	-90	-100		10
Transport./Pub. Util.	1970	1990	20			20
Nondurable Wholesale	1130	1030	-100			-100
Durable Wholesale/Retail	10480	10680	200		250	-50
Finance, Ins., real estate	1580	1590	10			10
Business/Misc. Services	8450	7820	-630	-560		-70
Other Services	7360	7250	-110		50	-160
Federal Government	1030	1020	-10			-10
State and Local	4680	4710	30			30
Public Education	4740	4620	-120			-120
Total Nonagricultural	55730	53590	-2140	-2080	380	-440

Source: Published employment from Washington State Employment Security Department.

existing information there is no simple way to provide a better reconciliation of the two sources. One should again be remindful that both of these figures are based on the preliminary estimates by the Employment Security Department.

A.4 PERSONAL INCOME

Total personal income in Benton and Franklin counties was nearly \$2 billion dollars in 1986, the latest year for which official government estimates are available. Since all historical data are reported on an annual basis and because these projections are intended to drive annual projections of tax revenues, the personal income projections were done only on an annual basis. Since the last official estimate is 1986, the projection methodology must also be employed to estimate 1987.

Although the Bureau of Economic Analysis in the Department of Commerce distinguishes over 20 components of personal income in the historical estimates, the projection methodology uses only six major categories: 1) wage income, 2) farm proprietors' income, 3) government transfer payments for retirees, 4) dividends interest and rent, 5) unemployment benefits, and

6) all other income. The last category includes such items as fringe benefits, non-farm proprietors' income, and other types of government transfer payments.

The projection procedure is straightforward. An estimate of wage income in the bi-county area is constructed as the sum of payrolls of the total basic sector and the secondary sector. The average annual wage income in the basic sector is about \$35,000 and in the secondary sector is about \$15,000. The projected basic and secondary employment is multiplied by these two wage levels, respectively, and then summed to generate total annual income.

Both farm proprietors' income and government transfer payments are already treated separately as part of overall projection of the basic sector. These components were discussed in the previous section.

The total of dividends, interest, and rent (\$273 million in 1986) is projected by the use of a statistical equation. Historical annual data on dividends, interest, and rent (DIR) was related to two variables: 1) total Benton and Franklin County wage income, and 2) the national total for dividends, interest, and rent. Based on this relationship, a 1% increase in local wage and salary income has been accompanied historically by 0.85% increase in dividends, interest, and rent. A 1% increase in national dividends, interest, and rent has been associated with a 0.26% increase in area income from these same sources. Although this procedure is somewhat crude, lack of data prevents much more sophisticated approaches from being pursued. In any event, this procedure does capture the principal influences: 1) wage income as a proxy for investment by local residents, and 2) national dividends, interest, and rent which reflect general interest rates.

In 1986 the total of the remaining components of personal income was \$183 million. There is no simple method to make credible projections of many of the other components of personal income at a local level. For this study, it was assumed that income from these sources together would move proportionately to total wage income.

The above projection methodology was used to generate an historical estimate of personal income for 1987. For 1988 and 1989 a simpler approach was used that linked directly to the methodology used in predicting the change in secondary employment. In effect, we apply the annual changes in income, 1987/1988 and 1988/1989 that are used in computing "Hanford equivalent" employment described in section A.2.5. Thus, 1988 personal income is equal to the 1987 estimate of personal income plus: 1) the change in total wages and salaries, 2) the change in other labor income (calculated as 9.5% times wages and salaries, 3) the change in government transfer payments, 4) the change due to Hanford workers taking early retirement, and 5) the change in farm income. Table A.6 summarizes these changes for 1988 and 1989.

The positive change in farm income for 1989 is still consistent with our assumption that farm income does not grow beyond the fourth quarter of 1988. Income is calculated to be higher, on average, in the four quarters of 1989 as compared to 1988.

TABLE A.6. Components of Change in Personal Income,
1987-1988 and 1988-1989, Low Employment
Case (millions of \$1988)

<u>Component</u>	<u>1987-1988</u>	<u>1988-1989</u>
Wages and Salaries	-60.9	-46.7
Other Labor Income	-5.8	-4.4
Government Transfer Payments	+5.4	+5.6
Hanford Early Retirement	+4.7	+4.5
<u>Farm Income</u>	<u>+9.6</u>	<u>+9.4</u>
Total	-47.0	-31.6

This procedure implies that we hold dividends, interest, and rent (DIR) and non-farm proprietors' income constant at 1987 levels. These components have likely moved in offsetting directions with DIR increasing and proprietors' income declining. Further work will be required to analyze these components in more detail and to incorporate their impact on total local employment.

A.5 POPULATION CHANGE

In the 1987 N Reactor study, a migration-employment "multiplier" was used to estimate the long-run impact on population (in Benton and Franklin counties) from a loss of jobs at Hanford. This estimate was derived from two independent approaches. The first approach related the estimated migration from 1981 through 1986 to the drop in area employment. The second approach looked at the likelihood employees within certain broad occupational categories would migrate. This approach used data collected as part of the 1980 population census.

Akin to the issue of how fast the secondary sector adjusts to changes in basic employment is how migration responds over time after the loss of jobs within the local economy. Unfortunately, the only source of information on the timing question specific to the Tri-Cities is from the WPPSS experience. As we mentioned in the body of the report, drawing strong quantitative conclusions from this one episode should be avoided. A decision to migrate depends upon various factors, including: 1) job markets in other areas of the country, 2) the prospects for selling a house, and 3) expectations of recovery in the local economy. In several of these respects, the situation in 1988 is markedly different from 1982-1983.

With these caveats in mind, we turn to the historical data to see if they can provide any guidance to the future. Table A.7 shows employment and population in the bi-county area from 1981 through 1988. Compared to the 1987 report, column one in Table A.7 shows the average employment in the first quarter of the year, rather than the annual average. The first quarter is used as it represents a period corresponding more closely in time to the April 1 population estimates that are prepared by the state Office of Financial Management (OFM). The approach is to relate the annual population changes measured for April 1 to the changes in employment over the same time period.

The employment numbers in the table were not seasonally adjusted, and thus the levels are slightly lower than the annual averages.

Total employment as measured in the first quarter peaks in 1981. By the first quarter of 1985, total employment had fallen by over 18,000 jobs. The employment picture began to turn around in 1986. The decline in 1988 represent the first round of Hanford layoffs that started in the fall of 1987.

The OFM population estimates for Benton and Franklin counties are shown in column three. The year 1980 represents a true count of population as part of the last official census. The subsequent estimates are based on a variety of indicators including school enrollment, automobile registrations, and housing vacancy rates. The uncertainty level associated with these estimates is not known.

TABLE A.7. Population and Employment Changes in Benton and Franklin Counties, 1980-1988

Year	Total Employ- ment ^(a)	Change from 1981	Total Popu- lation	Annual Change	Births ^(b)	Deaths	Migration	Cumulative Migration	Cumulative Migration/ Cumulative Employment Change
1980	--	--	144469	--	--	--	--	--	--
1981	75233	--	147200	2731	2983	765	513	0	--
1982	71700	-3533	147900	700	2801	856	-1245	-1245	0.35
1983	61067	-14166	144700	-3200	2986	727	-5459	-6704	0.47
1984	58133	-17100	144000	-700	3243	774	-3169	-9873	0.58
1985	56767	-18466	140900	-3100	2745	807	-5038	-14911	0.81
1986	58667	-16566	139300	-1600	3142	662	-4080	-18991	1.15
1987	59933	-15300	139600	300	2148	1078	-770	-19761	1.29
1988	59100	-16133	139600	0	2499	926	-1573	-21334	1.32

(a) Total employment is measured as the average of first quarter resident employment.

(b) Births and deaths from 1981-1985 are annual averages for these four years.

The change in population shown in column four can be split into three components: births, deaths, and migration. Births and deaths can be fairly precisely measured on a county basis. Migration is then computed as a residual or balancing element. The nature of the overall estimation process implies that small relative errors in the measurement of population can be reflected in large errors in migration.

The annual estimates of migration after the 1981 employment peak are cumulated in column eight. Based on the official estimates, net migration out of the area has continued even after the labor market began to improve in 1986, albeit at lower levels than previously.

The last column in the table shows the cumulative migration since 1981 divided by the change in area total employment over the same period. In the previous report, we chose the 1981-1986 figure to represent the long-run migration-employment multiplier. Based on the different definition of employment in this study (first quarter as compared to annual average), the multiplier over this particular period is slightly lower, 1.15 versus the previous 1.3. As the previous estimate of 1.3 relied on survey evidence as well the time series analysis, there seems no strong reason to change the earlier estimate.

What is clear, however, from the more detailed year-by-year figures shown in the last column of Table A.7 is that migration responds only very gradually to a major drop in employment. In particular, perhaps less than a third of the full response occurs in the first year. This is not surprising due to the impediments to moving out of the area that most people face-- finding a new job, selling a house, waiting until the end of a school year.

What is not so clear from Table A.7 is exactly how to use the results to forecast future migration (and consequently population) changes. The numbers in the last column of the table cannot be used directly if we assume that each "vintage" of layoffs has its own time profile of migration. We are inclined to prefer a model of the distributed lag form used in the estimation of secondary employment above. Thus, the percentage of people migrating in 1983, for example, will be different for these two groups: 1) those losing jobs in 1982, and 2) those losing jobs in 1983. The figure in the last column of the table, 0.47, is an average of these underlying percentages applied to the two separate vintages.

With episodes of rising and falling employment, a standard approach would be to statistically estimate the time-phased multipliers. Lacking this type of data, the approach here is to choose a set of time-phased multipliers, at least for the first several years, that will reasonably explain the pattern of outmigration in the Tri-Cities over 1982 through 1984. On the basis of trial and error data fitting, the following values were chosen for the short-run migration multipliers: 0.35 in the first year, 0.30 in the second year, and 0.25 in the third year. Table A.7 shows actual cumulative migration from 1982 through 1984 as -1245 in 1982, -6704 in 1983, and -9703 in 1984. Using the above multipliers, the corresponding predicted cumulative increases for these years are -1236, -6018, and -11118.

The projections of population for (April) 1989 and 1990 involved several steps. First, we assumed that there has been and will continue to be some level of outmigration unrelated to the employment declines at Hanford. According to the OFM population estimates, some 770 people moved out of the Benton-Franklin county area in 1986 (April 1986 to April 1987), in spite of an increase in overall employment. In 1987, some 1,600 people migrated. Some of the 1987 decline can be associated with the drop of 800 jobs in Tri-Cities between the first quarter of 1987 and the first quarter of 1988. Based upon the analysis of multipliers from the WPPSS downturn, perhaps 20% ($0.35 * 800$) of these jobs might have been related to the decline in employment. This would imply that about 1,200 migrants are not directly related to the employment decline. Taking the average of the approximately 800 migrants (rounded from the 770 shown in Table A.7) in 1986 and approximately 1,200 migrants in 1987, we have assumed that roughly a net 1,000 people per year will leave the Tri-Cities over the next several years, even if the employment picture were to stabilize.

The second step involves using the time-phased multipliers to project migration from (April) 1988 to 1989 and then from 1989 to 1990. Table A.8 illustrates how the year-over-year employment changes were used in this process. The April 1990 population estimate partially depends upon projected employment in the first quarter of 1990. This projection lies outside the scope of the remainder of the report. Employment in this quarter was based on holding basic employment in 1989:4 and 1990:1 at the 1989:3 level and using the forecasting methodology as described above to project secondary employment.

The annual change in bi-county population (shown for the low employment case) is the sum of the change in Table A.8 plus the exogenous migration (1,000 as discussed above), plus births, minus deaths. From Table A.7 births in the 1986 and 1987 averaged a little over 2,300 per year. Deaths in the two counties were about 1,000 per year. Combined with the assumption that 1,000 people will still migrate out of the area even if employment stabilized, we estimate that these factors alone would lead to an increase of about 300 people per year. Added to the employment-related migration in Table A.8 we project a population drop of about 600 between 1988 and 1989 ($-923 + 300$) and a drop of about 900 in the next year ($-1,153 + 300$).

TABLE A.8. Use of Time-Phased Multipliers to Project Migration from Tri-Cities

Change in Employment (low employment case)	-800	-1950	-1050
Outmigration			
4/1/87 - 4/1/88	$0.35 * -800$		= -280
4/1/88 - 4/1/89	$0.30 * -800 + 0.35 * -1950$		= -923
4/1/89 - 4/1/90	$0.25 * -800 + 0.30 * -1950 + 0.35 * -1050$		= -1,153

To compute population changes by jurisdiction, we first allocated primary and secondary employment changes in Benton and Franklin Counties using the residence weights in Table B.14 of Scott et al. (1987). The annual "normal increase" of 300 owing to births, and exogenous outmigrants was allocated based on population lagged one year, with 90% of changes in the unincorporated areas first allocated to Benton County.

APPENDIX B

SURVEY DESIGN

APPENDIX B

SURVEY DESIGN

Much of the data concerning the characteristics of the Hanford workers leaving the site was collected in the Hanford Worker Exit Survey, a brief voluntary questionnaire first administered in May, 1988 by the site contractors as part of the separation process. As part of the scope of the Tri-Cities Socioeconomic Monitoring and Analysis Study, Battelle Pacific Northwest Laboratory social science research staff talked to administrators of the survey and users of the information, examined the questionnaire's design, and redesigned and pretested the new questionnaire, which clears up some ambiguities in the old one.

B.1 REVIEW OF EXIT SURVEY PROCEDURES

The initial discussions with individuals responsible for analyzing and coding the exit survey data suggested some weaknesses in both the survey form and the way it is administered. Figure B.1 shows a facsimile of the original survey form. Several of the survey questions appeared to be confusing the respondents. For example; respondents answering the question on household size (question 12) often included themselves in the total even though they were instructed not to; this results in an inflated number of reported household members. Similar problems existed with several of the other questions. Furthermore, although all of the various Hanford contractors were implementing the survey, they were administering it in different ways. In some cases the respondent was allowed to take the survey home to complete, while in other cases the respondent answered the questionnaire in the personnel office. This variation in how the questionnaire is administered may partially explain the wide variation in response rates reported by the different contractors.

B.2 EXIT SURVEY REDESIGN

In response to these concerns, Battelle staff members contacted each of the persons responsible for administering the survey to discuss how the survey instrument and process could be improved. Based on this feedback, and standard survey design principles, a draft of a new survey instrument was developed. A small scale pre-test to evaluate questionnaire wording and the ease by which the survey could be filled out was conducted using Battelle employees. Currently the redesigned questionnaire has been submitted to DOE for review and to determine if the changes to it will require Office of Management and Budget clearance under Paperwork Reduction Act rules. A facsimile of the redesigned form is shown in Figure B.2.

Once a redesigned survey form is approved, we recommend that a formal pre-test be conducted to evaluate the accuracy and completeness of the

answers we receive. This will entail orientation to the new form of all of the individuals responsible for administering the questionnaire, and instituting standardized survey implementation practices. We are confident that as a result of this survey redesign effort both the quality of data we collect and the survey response rate will improve.

OMB CONTROL NO. 1910-1100

HANFORD WORKER EXIT SURVEY

Local government agencies have asked the Department of Energy to provide socioeconomic data as a result of layoffs at Hanford. This information will be used to assist them in their planning and budgeting activities. Your help is needed in conducting this survey. Your participation is completely voluntary and will be greatly appreciated.

1. Today's date: _____

2. Occupation:

☐ Management	☐ Engineer/Scientist	☐ Technician/Specialist
☐ Clerical	☐ Administrative/Support	☐ Other _____

3. Employer:

☐ Department of Energy	☐ Pacific Northwest Lab.	☐ Boeing Computer Services
☐ Westinghouse Hanford	☐ Kaiser Engineers	☐ Other _____

4. How long have you worked for this employer? _____ (number of years)

(Employment with UNG/RHO/Westinghouse Hanford Co., and JAJ/Kaiser Engineers Hanford should be considered as either Westinghouse or Kaiser service.)

5. Where do you live? _____
City State Zip Code

6. Do you live in the

☐ City limits	☐ County

7. What type of housing do you live in?

☐ An apartment	☐ A mobile home/trailer
☐ A house	☐ Other _____
☐ A duplex	

PLEASE TURN OVER AND COMPLETE THE OTHER SIDE

BD-6000-175 (06/88)

FIGURE B.1. Original Hanford Worker Exit Survey Form

8. Do you own or rent this housing? ☐ Own, how long _____
☐ Rent
9. How many people live in this household (including yourself)? _____ people
10. How many household members attend? Public School Private School
- A preschool? _____
 - Grade school (grades K-6)? _____
 - Middle school (grades 7-8)? _____
 - High school (grades 9-12)? _____
 - College, vo-tech, etc.? _____
11. Which school district do you live in?
☐ Richland, #400	☐ Kiona-Benton, #52	☐ Prosser, #116
☐ Kennewick, #17	☐ Burbank	☐ Other _____
☐ Pasco, #1	☐ Finley, #53	
12. How many people in this household are employed (excluding yourself)? _____
- 12a. How many other household members work at Hanford? _____
13. Why are you leaving?
☐ Take retirement	☐ Reduction in force (including voluntary)
☐ Resignation	☐ Other
14. What is your residential location or preference?
☐ Relocate for a new job	☐ Stay in Tri-Cities, look for a new job
☐ Don't know	
15. If you retire, will you choose to:
☐ Stay in the Tri-Cities	
☐ Relocate to (if known) _____	City State
☐ Don't know	

Please Return To: Hanford Placement
Center
H9-17

BD-6000-175R (06/88)

FIGURE B.1. (contd)

Where do we go from here?

The Impact of Hanford Job Loss on our Communities

Currently many of our community leaders are trying to determine what job losses at Hanford will mean for this area. To assist them in planning for the future, your views are needed. Your participation in this survey is completely voluntary.

Please answer all of the questions. If you want to answer them in more detail than space allows, please write on the last page. Your extra comments will be read and taken into account.

Thanks for your help.

We would like to begin by asking a few questions about your work at Hanford. Please circle the number of your answer.

Q-1 Which of the following categories best describes your current occupation?

- 1 Clerical/Secretarial
- 2 Scientist/Engineer
- 3 Technician
- 4 Manager/Administrator
- 5 Research Assistant
- 6 Other (please specify) _____

Q-2 Which one of the following companies do you currently work for?

- 1 Westinghouse Hanford
- 2 Kaiser Engineers
- 3 Battelle
- 4 U.S. Department of Energy
- 5 Boeing Computer Services
- 6 Hanford Environmental Health Foundation
- 7 Other (please specify) _____

Q-3 How many total years have you worked at the Hanford site?

- 1 Less than two years
- 2 Two to four years
- 3 Five to ten years
- 4 Eleven to twenty years
- 5 More than twenty years

Q-4 Currently people are leaving work at Hanford for many different reasons, which of the following best describes why you are leaving your job?

- 1 I am taking advantage of early retirement incentives
- 2 I am retiring
- 3 I am taking advantage of voluntary reduction in force incentives
- 4 I am losing my job due to an involuntary reduction in force
- 5 Other (please specify) _____

Q-5 As a result of losing their job or resigning some people will move out of the area while others will choose to stay. Which one of the following statements best describes your plans?

- 1 I have no definite plans at this time.
- 2 I am definitely planning to stay in this area.
- 3 I am definitely planning to move out of the area.

When do you plan on moving?

- 1 Within the next month
- 2 Within the next 2-3 months
- 3 Within the next 4-6 months
- 4 Sometime after 6 months
- 5 Don't know

Are you planning to move out of Washington State?

- 1 Yes
- 2 No
- 3 Don't know

Please go on to the next page. ➡

FIGURE B.2. Redesigned Hanford Worker Exit Survey Form

Now we'd like to ask you some questions about where you live and your household size.

Q-6 How many total years have you lived in the local area? By local area we mean within commuting distance to Hartford.

- 1 Less than two years
- 2 Two to four years
- 3 Five to ten years
- 4 Eleven to twenty years
- 5 More than twenty years

Q-7 What is the name of the city or town and county where you currently live? If you don't live within a city or town, then please indicate the town or city near which you reside and depend upon most for goods, services or other needs such as school, church and recreational facilities.

_____ Town or City _____ County

Q-8 Where is your place of residence located in relation to the town or city where you live?

- 1 Within the city limits
- 2 Outside the city limits

Q-9 What type of housing do you currently live in?

- 1 An Apartment
- 2 A House
- 3 A Townhouse
- 4 A Duplex
- 5 A Mobile Home/Trailer
- 6 A Hotel/Motel
- 7 Other (please specify) _____

Q-10 Do you own or rent this housing?

- 1 Own
- 2 Rent

Now many years have you owned this residence?

- 1 Less than two years
- 2 Two to four years
- 3 Five to ten years
- 4 Eleven to twenty years
- 5 More than twenty years

Please go on to the next page.

Q-11 Do you live by yourself?

- 1 Yes (If yes, skip to Q-12.)
- 2 No

For all the people who live with you please provide the following information:

Relationship to you	If you were to move away from this area, would they move with you?		Are they currently employed?		Are they currently employed at Hartford?	
	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No

If there are children living in your household that attend school, please indicate their grade and the name of the school they attend.

Grade	Name of School	Grade	Name of School
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Q-12 To your knowledge has anyone else in your household completed one of these questionnaires?

- 1 Yes
- 2 No

How is this person related to you?

- 1 Spouse
- 2 Parent
- 3 Child
- 4 Brother/Sister
- 5 Friend

Q-13 Finally, could you please indicate today's date: _____ / _____ / _____
Month Day Year

Additional comments:

Thank you for your help!

FIGURE B.2. (contd)

APPENDIX C

DETAILS OF HANFORD EMPLOYMENT FORECAST

APPENDIX C

DETAILS OF HANFORD EMPLOYMENT FORECAST

The economic and social impacts forecasted in this report depend to a large extent on the forecasts that DOE Richland Operations Office is able to make of budgets and required manpower for the Hanford Site. Table C.1 contains the most recent official scenario concerning the future employment by mission at the Hanford Site. In the past, there has been a tendency among offsite analysts to treat these scenarios as "absolute," so several cautionary notes are in order. We note that these are scenarios or forecasts, not assured levels of activity. Budgetary and employment data for FY 1989 are still uncertain, pending future congressional action.

TABLE C.1. Forecast of Hanford Site Employment by Program,
February 1988

	<u>FY 1987</u>	<u>FY 1988</u>	<u>FY 1989</u>
Hanford (DOE and GOCO Contractors)			
Materials Production	6,400	5,100	4,100 to 4,200
Defense Waste and Environmental Restoration	2,900	3,200	3,450 to 3,650
Basalt Waste Isolation Project	1,300	200	50 to 50
Nuclear Energy R&D (FFTF)	1,300	1,300	1,300 to 1,400
Other Programs	<u>2,600</u>	<u>2,600</u>	<u>2,600 to 2,600</u>
Total Hanford Employment (excludes construction)	14,500	12,400	11,500 to 11,900
Annual Change		-2,100	-900 to -500
Cumulative Change		-2,100	-3,000 to -2,600

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The Tri-Cities

ECONOMY

Review and Outlook

March 1989 Summary

Preface

The economies of the Tri-Cities (Richland, Kennewick, and Pasco) and Washington State are being adversely affected by the cutbacks in employment at the federally operated Hanford Site. In an effort to monitor and assess this situation and provide local and state leaders information to plan and respond most effectively, the Department of Energy's Richland Operations Office and the Department of Defense's Office of Economic Adjustment are jointly funding the Pacific Northwest Laboratory to accomplish an economic assessment study. This report reviews recent economic developments in the Tri-Cities and presents a look ahead, through 1989. This information is intended to help readers understand and adjust to changes in the local economy.

Every six months through 1991, we plan to update this report to provide a continuing record of events in the changing Tri-Cities economy. It is our intent that this ongoing monitoring and analysis of the economy will be useful to local citizens, businesses, and others with an interest in the Pacific Northwest and the Tri-Cities.

Summary

Through 1988, Hanford lost 2200 bicounty resident jobs. As noted in the N Reactor Closure Study of 1987, for each Hanford job lost, about 1.2 additional local secondary or service sector jobs are eventually lost over a period of approximately 4 years. In the first year (1988), the negative economic effects expected from the Hanford job losses were moderated by the growth in the non-Hanford basic sector. However, in 1989 we expect the Tri-Cities economy to weaken further. This is primarily due to limited growth foreseen in the non-Hanford basic sector, additional Hanford job losses, and the secondary sector responding to both the job losses that occurred in 1988 and the additional job losses in 1989.

The following tables summarize the results of our monitoring of the Tri-Cities economy in 1988 and our forecast for 1989.

ECONOMIC HIGHLIGHTS 1988

Benton and Franklin Counties

Total Employment Down—2,250 since third quarter 1987

Personal Income Down—2% since 1987

Population Down—600 by April 1, 1989

Housing Prices Down—2.5% since 1987

FORECAST HIGHLIGHTS 1989

Benton and Franklin Counties

Total Employment Down—550 to 1050

Personal Income Down—0.9% to 1.5%

Population Down—700 to 900 by April 1, 1990

Housing Prices Down—1% to 2%

Recent losses at Hanford interrupt a slow recovery of the Tri-Cities economy.

Tri-Cities in the 1980s

In the early 1980s the Tri-Cities was one of the fastest growing metropolitan areas in the United States as the Washington Public Power Supply System was building three nuclear power plants simultaneously on land just north of Richland. This construction boom came to a halt in 1982 as work stopped on two of these reactors.

Overall employment in Benton and Franklin counties peaked in 1981 at about 76,000 jobs. By 1984, total employment had fallen by over 16,000 jobs.

Meanwhile, jobs at Hanford for the Department of Energy and its contractors were growing in number, especially in nuclear materials production (producing plutonium for the Nation's defense). In the next three years (1985 through 1987) the economic climate improved. The number of people working in the Tri-Cities began to increase slowly, so that by 1987 about 4,000 of the lost jobs were recovered. But in 1988 major cutbacks at Hanford once again applied the brakes to local economic growth.

Hanford—The Year in Review

The fall of 1987 through the winter of 1988 was a time of transition for the Tri-Cities—a time of adjusting to new economic realities at the nearby Hanford site.

The latest economic trouble began in December 1987 when the Basalt Waste Isolation Project (BWIP) abruptly ended. That unexpected announcement was followed in February 1988 by the announcement that the N Reactor would be placed in cold standby, due to reduced national defense demand for its main product—plutonium.

Job Losses at Hanford

While the BWIP-related job loss was swift and final, the loss of N Reactor and potential loss of additional nuclear materials production jobs is not over.

Job losses in FY 1988, and additional job losses in FY 1989 and thereafter are expected to have lingering effects as the nuclear materials mission winds down over the coming years.

Benefitting from the 1980s defense buildup, Hanford jobs had been at about 14,500 at the end of Federal fiscal year (FY), September 30, 1987. One year later, September 30, 1988, employment at Hanford was down to 12,400. By the end of calendar year (CY) 1988, total Hanford jobs measured 12,200. Of the total 2,300 drop, 2,200 were residents of Benton and Franklin Counties.

Diversify Hanford, But How?

Meanwhile, the Department of Energy (DOE) and its major Hanford contractors, including Westinghouse Hanford Company (Westinghouse Hanford), which operated both BWIP and N Reactor, Battelle Northwest, which operates the Pacific Northwest Laboratory (PNL), and with the support of Kaiser Engineers Hanford (KEH) and the Hanford Environmental Health Foundation (HEHF), are attempting to diversify Hanford by taking on new research in areas as diverse as space power, environmental research and molecular science.

Westinghouse Hanford, while continuing to manage operations on the Hanford Site, including the Fast Flux Test Facility (an advanced test reactor), defense waste cleanup and storage programs, and the declining production program, is focusing increased attention on isotope production and space power systems.

PNL is pursuing the establishment of an Environmental Center of Excellence and a Molecular Science Research Center, in response to two DOE research

Hanford total bi-county resident job losses through the end of CY 1988 were 2,200.

END-OF-QUARTER HANFORD EMPLOYMENT BY MISSION

- Other Programs
- ▨ Nuclear Energy R&D
- Basalt Waste Isolation
- ▤ Defense Waste Mgmt.
- Nuclear Mat'l's Production

New research areas, operation of the Fast Flux Test Facility and defense waste cleanup are key elements to future Hanford diversification.

interests—environmental research and basic research in materials and energy resources. Both interest areas would significantly diversify the Hanford Site research mission.

One likely element in any Hanford recovery that is expected to combine research, construction, and operations is to clean up existing nuclear wastes created during more than 40 years of defense production. The effort is needed and has broad public support. Proposed Hanford budgets show growth in this area, somewhat offsetting the substantial declines in defense materials production and the elimination of BWIP.

The Tri-Cities Area in 1988

The Tri-Cities felt the impact of Hanford cutbacks on jobs, income, housing, population and school enrollment in 1988. Fortunately, it was not as severe as originally anticipated due to unexpected strength in the non-Hanford economy and a reduced level of Hanford layoffs. How long the good news can offset the bad is highly contingent upon growth in other major sectors outside of Hanford. But it seems likely that the effects of Hanford cutbacks will begin to be more evident in 1989 (see *What's Ahead for Jobs*).

Jobs Through December 1988

After increases in the number of jobs in 1986 and stability in 1987, total jobs in Benton and Franklin Counties declined sharply in 1988 due to the Hanford layoffs. Total resident employment dropped by 2,250 between the third quarter of 1987 and the fourth quarter of 1988, on the basis of seasonally adjusted quarterly average figures.

Use of seasonal adjustment and quarterly averages smoothes out many of the month-to-month variations caused by factors such as weather and the

Christmas retail season, giving a clearer picture of underlying changes in the economy. The chart on the following page focuses on those workers resident in the two counties.

In examining employment changes in Benton and Franklin Counties, the underlying analysis in this report distinguishes between a basic sector of the economy and a secondary or service sector. The basic sector includes those businesses that sell goods and services outside of the bi-county area. Hanford (DOE and its major contractors) is the largest single component of the basic sector. The non-Hanford basic sector includes agriculture and major employers such as the Washington Public Power Supply System, Advanced Nuclear Fuels and Sandvik Special Metals. The secondary sector is essentially a support sector. It sells goods and services locally to those involved in the basic sector and others in the secondary sector. The secondary sector would include most of retail trade, services, construction, local schools, and city and county government workers.

The chart on the following page shows that resident Hanford employment, on a quarterly average basis, dropped by about 2,200 jobs between the third quarter of 1987 and the fourth quarter of 1988 (about 13,450 to 11,250). Non-Hanford resident basic employment increased by about 450 over the same period, while secondary sector resident employment declined by about 500.

The Effects of Non-Hanford Growth in 1988

Economic growth outside of Hanford was strong in 1988. Key factors offsetting the economy-wide impact of Hanford job losses were higher farm prices, expansion of retailing activity in and around Columbia Center, relocation of Lamb-Weston headquarters, a new coliseum, and increases in transfer payments to retirees (reflecting real growth in the region's retiree population).

Strength in the non-Hanford economy mitigated the impacts of Hanford cutbacks during 1988.

Important areas of non-Hanford growth included agriculture, retirees, expanded regional retailing, a new coliseum, and Lamb-Weston headquarters.

It was widely feared that job losses in the secondary sector would be severe during 1988 in the face of the substantial layoffs at Hanford. As noted earlier, the methodology employed in PNL's 1987 study of a possible N Reactor closure suggests that for each Hanford job lost, approximately 1.2 additional local secondary sector jobs are eventually lost over a period of four years. Consequently, with the loss of 2200 Hanford jobs through CY 1988 and with no other changes in the non-Hanford basic sector, nearly 2,650 local secondary or service jobs could eventually be lost. Of the 2,650, about 1,000 jobs were expected to have been lost by the end of 1988.

BENTON AND FRANKLIN COUNTY AVERAGE QUARTERLY EMPLOYMENT BY MAJOR SECTOR (Seasonally Adjusted)

Fortunately, the positive developments in the remainder of the economy offset about 500 of these potential job losses during the year. Continued significant growth in the non-Hanford sector or an upturn in Hanford's programs will be required to offset the lingering effects of the 1988 Hanford losses, as well as to counteract any further reductions at Hanford.

Income Estimates For 1988

Personal income in the Tri-City area (Benton and Franklin Counties) is estimated to have been about \$2.10 billion in 1988, a decline of a little more than 2 percent from 1987 after adjustment for inflation. Personal income is perhaps the best measure of total purchasing power of the area's local population. Personal income includes wages and salaries, farm income, transfer payments such as social security, and dividends and interest income. The drop in personal income in 1988 stemmed primarily from the loss of Hanford payroll, but the impact of Hanford was partially offset by growth in other components.

Total wage and salary income declined from \$1.40 billion in 1987 to around \$1.34 billion in 1988 (again, after adjusting for inflation) which was a 4.3% decline, estimated increases in farm income and government payments to retirees helped to cushion this loss.

Farm income is estimated to be up sharply in 1988 (between \$5 and \$10 million) over the previous year. Prices are higher for wheat, potatoes, and apples, key mid-Columbia commodities.

Transfer payments to retirees in the region increased by about \$5 million over the previous year. The number of retirees continues to increase. In addition, approximately one-sixth of the people who lost jobs at Hanford took advantage of early retirement programs, and over two-thirds of these people intend to stay in the Tri-Cities, according to surveys of exiting Hanford workers. This group helps maintain regional purchasing power.

Declines in wage and salary income were partially offset by increases in farm income and retiree transfer payments.

AVERAGE SELLING PRICE OF SINGLE-FAMILY HOME (\$thousands)

BENTON AND FRANKLIN COUNTY POPULATION (April 1)

Income losses at Hanford totaled about \$50 million during 1988, as compared to 1987. This was partially offset by \$5 to \$10 million in agriculture, and additional spending by retirees and tourists.

Housing

Housing values have been in decline since the Supply System slowdown. In 1988, average single family housing prices were actually lower than in 1979. Prices continued a slow decline during the first half of 1988, although there were signs of stability and increase by year's end.

Population and Schools

Through the first part of 1988, total population in Benton and Franklin Counties was nearly 140,000, essentially unchanged from the previous two years. Population figures are based on annual estimates of population as of April 1. This leveling follows a five-year decline from a peak of nearly 148,000 in 1982. The rapid growth in population in the 1970s had changed to declines after the 1982 Supply System slowdown.

The available data indicate that births in the local area exceeded deaths by approximately 1,500. The State's Office of Financial Management estimates no change in total population between April 1987 and 1988, which suggests probable outmigration. Although some of this outmigration can be attributed to the first round of job losses at Hanford, the remainder likely is due to other factors. State population data were available only through April 1. Based on telephone subscriber data through September, we estimated outmigration of almost 1,200. This loss was most heavily concentrated in Richland. The 1988 outmigration indicates a possible net population loss in the last half of the year. By April 1, 1989 we expect the net loss in population to be about 600.

Consistent with the estimated population drop in Richland, school district enrollment in that city declined by 240 students in the past year. However, Kennewick and Pasco enrollments were up a total of 130 students. The relationship between enrollments and population is still unclear and we are continuing to evaluate it.

The Outlook for 1989

The experience through the third and fourth quarters of calendar year 1988 indicates that Hanford job cut-backs were offset somewhat by a stronger non-Hanford basic sector. However, in 1989 the Hanford impacts are expected to increase in size, while non-Hanford basic sector activity is not expected to be strong enough to offset the impacts. Without additional substantial increases among non-Hanford employers or at Hanford itself, this employment decline will continue into 1990.

Hanford could lose between 300 and 650 jobs in CY1989. While the non-Hanford basic sector will remain stable, the service sector will lose 450 to 600 jobs in CY 1989.

BENTON AND FRANKLIN COUNTY AVERAGE RESIDENT EMPLOYMENT BY QUARTER

Total area employment is projected to fall by 550 to 1050 jobs during CY 1989.

**CHANGE IN BENTON-FRANKLIN COUNTY EMPLOYMENT BY SECTOR
(Fourth Quarter 1988 to Fourth Quarter 1989)**

What's Ahead for Jobs

As the year 1988 illustrates, predicting short term changes in jobs is difficult. To predict changes in 1989 jobs, we assumed the following:

- The removal of fuel from the N Reactor leads to further declines in Hanford jobs. These declines are only partially offset by moderate growth in defense waste and environmental restoration activities. Department of Energy estimates a loss of between 500 and 900 jobs between September 1988 and the end of the federal fiscal year in September 1989. On a quarterly average basis, this translates into a loss of 300 to 650 Hanford job slots for residents of Benton and Franklin counties during calendar year 1989. (Significant additional funding for environmental restoration is currently pending Congressional action. Approval would favorably influence the current employment forecast.)
- The farm economy remains strong but does not grow further.
- Food processing employment increases by 100 as the new Cascade Columbia food processing plant starts operation.
- Little increase at other major employers (approximately 50 jobs).
- About 200 of the 1988 jobs associated with the Columbia Center expansion are assumed to be part of the community's "export" sector, that is supported by shoppers outside the Tri-Cities. This number is assumed to grow about 25% in 1989.
- Total government payments to retirees increase by about 3.5%, as in recent years.

Based upon the assumptions above, total non-Hanford basic employment is projected to increase by about 200 between the fourth quarter of 1988 and the fourth quarter 1989. The secondary sector, however, will continue to experience job losses from the

ongoing repercussions of the 1988 Hanford losses, plus the expected Hanford reductions during 1989. Assuming the lower number of 1989 resident Hanford reductions, secondary employment is expected to fall by 450. Total area employment in this case falls by 550 (-300 at Hanford, +200 in other basic, -450 secondary). Using the higher estimates of Hanford job losses, total Benton Franklin County employment is projected to fall by 1,050 (-650 Hanford, +200 other basic, -600 secondary).

Regional personal income will decline for a second straight year.

Income and Spending Outlook

Based upon the employment projections for 1989, regional personal income is expected to fall by an additional 0.9% to 1.5% in 1989 after inflation.

Farm income is expected to remain high for the second year in a row but not increase sharply as in 1988. A growing retirement population will be primarily responsible for a 3% to 4% increase in government transfer payments in 1989.

A reduction in total personal income should be reflected in retail sales and housing markets. A drop in retail sales and construction activity should result in reduced tax revenues.

Although retail sales and sales tax revenues may decline in proportion to personal income, other factors could upset this relationship. For example, new businesses may be attracted to the Tri-Cities. Additional retail sales to people outside the Tri-Cities may increase the sales-related receipts of state and local governments beyond what locally earned incomes would support. Alternatively, additional layoffs at Hanford may make remaining Hanford workers into more cautious consumers—concerned about their own jobs. They might reduce spending and increase savings.

Housing prices will fall slightly in 1989. Population will likely fall during 1989, but the magnitude of the decline is uncertain.

Housing

Average housing prices, which dropped about 2.5% in 1988 from the previous year, are expected to decline another 1% to 2% in 1989. However, low cost of land and housing, though generally undesirable for existing homeowners, is a positive factor for outside businesses considering new locations. Low housing prices may also attract additional retirees into the area.

Population Outlook

As in the mid-1980s, the Tri-Cities area faces the prospect of renewed declines in total population over the next few years. If fewer job opportunities exist, more workers and their families will end up leaving the area.

We expect that enough people will leave so that population will slightly decline despite more births than deaths.

By April of 1989, we estimate that total bi-county population will have dropped by about 600 from a year earlier. By 1990, there may be an additional decline of between 700 and 900 people, leaving slightly more than 138,000 people in Benton and Franklin counties. Over half of the decline over these two years will occur in Richland.

These projections, however, are more uncertain than employment projections. The 1982 slowdown showed that many families have considerable flexibility in deciding when to permanently leave the area. Lower housing prices and programs to lure retirees into the area may also make the population losses smaller than discussed above.

Conclusion

In summary, while the Tri-Cities did experience significant economic impacts during 1988, the economy did not experience as severe a downturn as had been anticipated. This was due largely to the unexpected strong growth in the non-Hanford basic sector as well as the reduced level of Hanford layoffs. However, for 1989, the non-Hanford basic sector growth is expected to only

partially offset the growing impact of Hanford job losses. The impacts associated with the 1988 Hanford job losses as well as those occurring in 1989 have yet to play themselves out fully in the local economy. We expect employment, population, income and real estate values to be weaker a year from now.

A strong and successful diversified growth in both the non-Hanford and Hanford basic sector will be crucial to mitigating the impacts of the near term Hanford losses. The local area displays the momentum and hopeful signs of a long-term rebound as diversification proceeds. The Tri-Cities will need to sustain that momentum.

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We want this report to be useful as a planning tool, and would appreciate any suggestions for improvement to its content. Please send your comments to: Mr. James Kautzky, Strategic Planning, U.S. Department of Energy, A1-55, Richland Operations Office, Richland, Washington 99352, Telephone (509) 376-2801.

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