Market Opportunities for Additional Tonnage of Scrap Paper from Commercial Sources in the Metro Region

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by

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The author wishes to express his thanks for the cooperation of the many haulers, processors and mill personnel who responded to our interviews. There is no better source of timely information and useful facts than those with direct, personal experience in the field, and the report has benefited from their contributions.

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I. Executive Summary

A. Background and Principal Objectives

Metro is considering mandating the source separation of scrap paper from commercial sources as one of several possible ways to increase the region's overall level of solid waste recovery, if increased outreach and education do not help the region reach its 62% goal. Metro estimates that an additional 80,000 tpy of scrap paper can be recovered from commercial sources, consisting of the following grades of paper:

Grade	Tons
Old Corrugated Containers (OCC)	19,000
Old Newspaper (ONP)	20,000
High Grades	10,000
Mixed	31,000

These estimates of additional tonnage were derived from a solid waste composition study conducted by the Oregon Department of Environmental Quality (DEQ) in 2000. In aggregate the study showed that an additional 121,000 tpy of recyclable paper are potentially available from commercial sources.

Since the estimated tonnage of additional recovered material represents about a 20% increase above the 405,000 tpy of scrap paper presently being recovered from residential and commercial sources, Metro is justifiably concerned about finding market opportunities for this additional material. More specifically, Metro can be fairly confident of finding markets for additional OCC, ONP and High Grades, but Mixed waste paper could be a problem. Also, Metro is concerned about:

a) the effect that additional tonnage of all the studied grades may have on the overall supply/demand balance in the Pacific Northwest and the associated impact on scrap paper prices, and
b) the possibility that some of the OCC recovered from new commercial sources may have more than the "typical" old boxboard (OBB) content and what impact that may have on the salability and price of the additional recovered OCC.

B. Scope and Approach

In addition to the principal objectives listed above, Metro also requested that Andover International include consideration of the following issues:

- Supply/demand for OCC, ONP (Nos. 7&8), Printing & Writing (P&W) paper and Mixed waste paper (MWP) in the Metro area, Pacific Northwest and West Coast.
- Impact of Pacific Northwest energy and wood chip costs on the demand for recovered fiber.
- Current and projected ability of domestic and overseas mills that purchase scrap paper from the Metro area to substitute:
  a) recovered fiber for wood pulp
  b) lower quality scrap paper grades (e.g., Mixed for OCC) than those currently being used.
- Possible domestic mill and/or machine closures in the Pacific Northwest that would reduce scrap paper demand from the Metro area.

Based on the findings of the individual tasks required to reach the study objectives, Metro requested that we discuss and recommend:

- Advisability and conditions of a disposal ban and/or mandatory recycling for specific commercial-sector paper/board grades (OCC, ONP, MWP, OBB and Printing and Writing Papers (P&W)).
- The merits and challenges of a ban/mandate for multi-family dwellings, smaller commercial establishments and larger commercial generators such as office buildings, manufacturers and malls.
- Strategies for optimizing quality, quantity and demand for study-focus fiber grades, based on the work in this study and in a study Metro provided regarding the results and effective measures taken in other communities that ban disposal or mandate recovery of these materials.

To achieve the study objectives, Andover International compiled and analyzed published and unpublished information and conducted 15 telephone interviews with regulated haulers, independent recycling collectors and processors in the Metro area and with mill personnel and exporters in the Pacific Northwest. In addition, we updated earlier Andover International proprietary reports regarding scrap paper supply in selected states and metropolitan areas. We also reviewed several reports that Metro provided.

The current and future U.S. supply/demand for scrap paper was also included in the work program, in response to Metro's request for a discussion of factors influencing price trends for the studied grades. Since scrap paper is a world-traded commodity, it was necessary that we conduct an overall U.S. supply/demand (including exports) analysis. As requested, supply/demand conditions (and associated price trends) were projected to 2006.

C. Principal Findings and Conclusions

1. **Demand for OCC, ONP and High Grades.** Because of favorable freight cost to mills in the Pacific Northwest (PNW), any additional tonnage of OCC, ONP and High Grade scrap paper from the Portland metropolitan area will be welcomed and even preferred by these mills. Several respondents to our survey also stated that the quality of material collected in the Metro region is superior to other sources that have lower environmental awareness. Paper grades recovered in the Metro region currently supply less than 11% of PNW domestic demand and 13% of total PNW requirements (including export); projected additional recovery would increase Metro's share of domestic and export supply by only a couple of percentage points (see Table I-1 in the last section of this Executive Summary). PNW domestic demand for these grades is likely to hold steady over the next few years, and export demand is expected to increase.

2. **Demand for Mixed.** "Mixed" scrap paper is composed of a broad combination of bleached and unbleached paper, paperboard, and coated and uncoated wood-free and wood-containing grades. Mixed Paper often remains after positively sorted OCC, ONP and High Grades are removed from commingled materials. Finding markets for the additional 31,000 tons of Mixed will be a challenge. However, since most of this material will come from office buildings, a substantial portion could be upgraded to high-value grades such as Soft Mixed and Hard Mixed, which enjoy plentiful demand in the Pacific Northwest. Soft Mixed includes groundwoods (newspaper, telephone directories) and direct mail; it can be used in newsprint manufacture. Hard Mixed, recovered as comparatively high-quality grades such as Office Paper 1 & 2 (OP-1 and OP-2), has no groundwood or "browns or greys", e.g., OCC or OBB, and can be used in the manufacture of tissue and P&W paper. The residual Low Quality Mixed (LQM), which has high proportions of OBB, probably has to be exported, because existing supplies far exceed the limited use of this material by mills in the Pacific Northwest (and the entire West Coast). This grade is used in other parts of the U.S. and other

regions of the world to make corrugating medium, roofing paper and gypsum linerboard. Fortunately, West Coast export demand for Mixed (i.e., for both the broad category of Mixed and LQM) is projected to increase sharply in the immediate future, due to construction of new mills in Asia that make these products. Pacific Northwest manufacturers of corrugating medium choose not to use Mixed. Exporting, of course, adds cost for processors who ship this low-value grade, but the potential for extracting Hard and Soft Mixed will reduce the amount that needs to be exported.

3. **Processors**. Local scrap paper processors want more scrap paper, and they are confident that they can produce quality products from the additional recovered material. Most of these processors have underutilized capacity, and they say they would look forward to running an additional shift or extending working hours to better spread their fixed costs. Processors do express some concern about how generators prepare their recyclables and how collectors handle/accept the material.

4. **Mills**. Several mill personnel indicated concern that mandating recovery may reduce the quality of their scrap paper feedstock. More specifically, linerboard/corrugating medium producers do not want any more recycled boxboard (OBB), because they believe that more than the current amount found in OCC (about 5%) would adversely affect paper machine performance and product quality. Accordingly, greater amounts of OBB in OCC will be resisted. It may be possible, however, to blend some additional OBB into current and new OCC recovery while staying within mill specifications.

5. **Price**. Scrap paper prices are dictated by global market conditions, although regional mill shutdowns can have an affect on supplier shipping costs and commodity prices. U.S. scrap paper supply/demand conditions (including export sales) indicate that prices will remain essentially the same through 2006. Historical short-term price variations will continue, but there are no foreseeable fundamental changes in either supply or demand conditions that would cause a significant price shift for any of the major scrap paper grades (OCC, ONP, Mixed and High Grades). Domestic U.S. demand is projected to increase only modestly at best by 2006. Exports will increase significantly, particularly to Asia. Compared to the Pacific Northwest's total requirements for OCC, ONP and High Grades, the additional amounts Metro estimates will be recovered --19,000, 20,000 and 10,000 tpy, respectively -- are minimal and would not have any negative impact on their prices. Similarly, after Soft and Hard Mixed are extracted from Mixed Office Paper (MOP), the residual

supply of LQM would be too small to have any impact on its price. (See brief supply/demand and price discussion and Figures I-1 and I-2 at the end of this Executive Summary.)

6. **Energy cost impacts**. Energy costs have the greatest impact on "mechanical" grades of paper, such as newsprint, directory, coated/uncoated groundwood P&W paper and so-called groundwood specialties. The manufacture of mechanical pulp from wood chips (excluding the papermaking) requires five times as many kWh/ton as making deinked pulp. In the recent past, temporary increases in the cost of electric power seemed to increase demand for deink grades of newsprint; however, even paper mills that use recycled scrap also use wood chips. Higher electric power costs would be unlikely to prompt the construction of new or expanded deinking facilities for newsprint or other groundwood paper manufacture. Rather, because of stagnant and even declining U.S. newsprint consumption and the large number of old, comparatively small machines in the Pacific Northwest, company officials are unlikely to make major capital investments to prolong the life of inefficient machines or mills. Rather, they are more likely to idle them in order to run their more efficient mills in other parts of the country at full capacity. Energy costs are not likely to spike again in the near future, but even if they do, more efficient mills would continue to operate in the Pacific Northwest, and the demand for scrap paper from the Metro area would not be affected, because of the favorable freight cost to supply those mills.

7. **Wood chip availability.** There does not appear to be a pending wood chip shortage that would have a "demand pull" on scrap paper prices in the Pacific Northwest. The federal government recently increased the "allowable cut" of timber on federal lands in the region; some trees planted on private land 70 years ago have reached maturity and are ready for harvest; and several paper companies are ready to harvest short-rotation hybrid aspen grown for pulpwood purposes. In the unlikely event of a sharp increase in wood chip prices, some older, marginally profitable mills might be closed down. As with energy prices, however, high-priced chips would not reduce scrap paper demand from the Metro area, because of its favorable freight costs.

D. Recommended Strategies

1. Recommendations for Office Buildings

Opportunity. Based on previous work by Andover International, we estimate that paper and paperboard constitute at least 85% by weight of the total solid waste from a typical office building. Therefore, if the office building has no existing recycling program, about 85% of the waste is potentially recyclable paper. Most of the recyclable paper will be P&W paper; the balance will be a combination of corrugated containers, folding boxboard, newspapers and some wrapping paper. Andover International has found that, even if there is an existing "selective" office paper collection program aimed at recovering primarily uncoated wood-free P&W paper (such as computer and copy paper but excluding magazines, catalogs, and other "glossy" paper), the maximum recovery is about 12% of the recyclable P&W paper. To obtain a significant increase in the recovery of recyclable paper, it is necessary and possible to tap into a major portion of the current solid waste stream from offices.

Collection. We recommend that a limited source-segregation system be set up within the offices so that

1) the current in-office waste collection system is converted into a recycled paper collection system, and
2) the regulated hauler or independent recycling collector collect the resulting recyclable material in the bulk container formerly used for waste.

The only addition to the present in-office disposal and collection of solid waste would be to set up waste collection containers on each floor or in each office for non-recyclable office refuse, such as food packaging, plastic articles, and putrescibles. The existing wastebasket collection system would, in effect, become a recycle collection system, and the paper would not have to be picked up daily. Since the non-paper trash will be a small fraction of the total solid discharge, the incremental in-office cost will be minimal. The reduced quantity of trash would be collected by regulated haulers less frequently and/or in a smaller container, for a service fee lower than current service if an independent recycling collector picks up the scrap paper, and for roughly the same cost if the regulated hauler takes both garbage and recycling.

Under the Metro area's present collection system, *independent recycling collectors*, such as Weyerhaeuser and Smurfit, seldom accept broad mixes of scrap paper from small office buildings,

which do not produce sufficient quantities to make collection economically attractive. Independent recycling collectors prefer to recover a minimum of 1,000 lb/mo per generator to offset their cost of collection. If collection of recyclables involves a cost in excess of revenues, Oregon law requires that it be done by *regulated haulers*. Oregon law also requires that regulated haulers charge the same amount for the same volume of discards, whether those discards are set out as garbage alone or as garbage-plus-recycling. Thus, collecting 4 cy of garbage should theoretically be billed the same as 2 cy of garbage and 2 cy of recyclables; but in fact, franchised service fees and competitive haulers both tend to charge more per cubic yard for the smaller containers, to cover proportionally higher fixed costs vs. revenues. The customers often choose to avoid these additional recycling container charges, and the haulers themselves are not always aggressive in promoting recycling service where the economics are unfavorable.

The recommended change in the office collection system would increase the tonnage of recyclables, making recovery from smaller office buildings more economically attractive for both types of collectors. It is uncertain whether independent recycling collectors will choose to work with commingled paper from smaller customers. Regulated haulers are required to do so if customers request the service; it remains to be seen whether service fee adjustments and outreach/education alone can motivate such voluntary requests.

Metro's recently announced outreach program (May 2003) to recover more mixed office paper (MOP) includes many elements of our "comprehensive" system of collection, in which practically all paper and paperboard products are acceptable in the recovery container, except for a few office discards. It is essential that haulers be involved in the recovery effort if the program is to succeed. The system should be as uniform as possible throughout the region to facilitate collection and processing. Further, the educational/awareness program should be a continuous effort, since most individuals resume old practices if not reminded that they must be changed.

Processing MOP. The P&W paper recovered from MOP in this manner has the potential to be segregated into a Hard Mixed (combination of OP-1 and OP-2), Soft Mixed (OP-3) and LQM. OP-1 and OP-2 are basically wood-free grades used for P&W paper and comparatively high-quality tissue manufacture. Since OP-3 contains a substantial amount of mechanical fiber (i.e., ONP), it would not be acceptable for making tissue or P&W paper, where a wood-free grade is required; however, this OP-3

could be used in newsprint manufacture if the amount of "stickies" (primarily from envelopes) is limited. The residual material, consisting of packaging paper/board, would be LQM, suitable for recycled board manufacture, most likely overseas. The recovered corrugated containers would be sold as OCC.

Processors do bear an additional cost to segregate MOP into the higher value-added grades such as OP-1, OP-2, and OP-3, but processors can control the economics of this effort by balancing the market value of these grades and the lower price they pay for MOP. Several processors in the Metro region say they welcome the prospect of additional tonnage and state that they already handle mixed loads adequately for end-market purposes. In addition, several technologies can reduce these processing costs. MSS/Weyerhaeuser claims its new technology, now being used in a Denver sorting facility, can extract a larger portion of these high grades economically. Van Dyk Baler Corp. offers a Bollegraff Paper Spike to remove small pieces of OCC and OBB from commingled loads.

2. Recommendations for Commercial (Non-Office) Sources of OCC and P&W Paper

Commercial non-office sources include, for example, package stores, drug stores, and general retail establishments in strip malls or small retail districts; they also can include manufacturers, fabricators, warehouses and mechanical service businesses. Virtually all supermarkets and large malls already have recycling programs, particularly for OCC. The bulk of the paper that potentially can be collected from the smaller commercial sources is OCC, although all these generators produce modest quantities of P&W papers as well. For businesses such as package stores, OCC can be the major portion of the solid discharge. In other types of stores, such as small drug stores and small food and merchandise markets, the volume of potentially recyclable OCC may not be great enough to warrant a recovery effort by independent recycling collectors, who seek at least two tons per month as a minimum profitable volume. Franchised regulated haulers, however, are required to provide recycling collection upon request, and they have the opportunity to redeem their costs through service fee adjustments and/or through higher per-cubic-yard charges for smaller containers. Some haulers in Portland's competitive commercial system may lose customers to companies that choose to outbid them on the price of new services—particularly if source separation is mandated for entire classes of paper and/or customer.

One approach used to reach some of the smaller generators is the "cage" container. A number of regulated haulers and independent recycling collectors provide 5-6 cubic yard wire cages and/or

dumpsters that hold 400-500 lbs. These containers are picked up by a front-loading truck. Larger containers also can be used where the same collector serves multiple, nearby businesses. This relatively costly collection system is more attractive economically if the container is full when picked up, if the regulated service fee covers the cost. Wide swings in scrap paper prices and the cost of setting up collection programs pose obstacles to increased efforts by independent collectors. Smaller customers of regulated haulers tend to resist accepting the pass-on costs of new programs.

Our interviews found that programs to recover OCC from small generators are well known and established in the Metro region. The principal obstacle limiting their greater use is the highly variable price for OCC. One independent recycling collector indicated a willingness to collect from small generators if a "floor price" were established to cover his cost of collection and baling. One regulated hauler said that generator education and cooperation are the key needs.

Many non-office businesses also generate modest quantities of P&W paper, such as invoices, manifests, promotional letters, direct mail and so forth. If small quantities of P&W paper mixed with OCC creates economic problems for collectors or processors, Metro and the local jurisdictions may want to consider encouraging smaller customers to take the P&W paper to drop-off facilities or home for residential collection. Most processors, however, have the ability and willingness to separate P&W paper from OCC.

Our recommendation to Metro is that it initiate an outreach program to small generators (and haulers) similar to what has been done recently to increase recovery from office buildings.

3. Recommendations for Multi-Family Dwellings (ONP)

The paper components of the material disposed from multi-family dwellings are similar to those from other residences, primarily ONP and OMG. Other recoverable grades are direct mail and paperboard packaging material, but in considerably lesser amounts than ONP and OMG. Metro estimates that 80% of the multi-family dwellings in the region have recycling collection, but few programs go beyond OCC and ONP. Because of the great demand by paper mills in the Pacific Northwest for ONP, OMG and direct mail, independent collectors have devised methods of collecting these grades from multi-family sources when and where it is economically attractive. Up-scale and larger multi-family sites in particular have comparatively high per capita consumption of ONP and OMG/catalogs. Multi-family

dwellings where the per capita consumption is lower do not provide the "critical mass" to warrant recovery for independent collectors, but regulated haulers cover a large portion of these sites, either for a competitive advantage (in Portland) or as a franchise requirement. Mandates or bans would create economic dislocations for regulated haulers, as well as new administrative problems for jurisdictions.

Techniques to recover ONP and other recyclables from multi-family dwellings are well known; the obstacle is the necessity either for a "floor price" from mills to cover the costs of collection and processing, or for a service fee adjustment by franchising jurisdictions. The City of Portland has provided numerous collection “kiosks” to multi-family sites, which helps reduce part of the collection costs. Other challenges include tenant turnover rates and limited awareness of program standards, which result in more contamination and lower participation.

Applying bans or mandates to multi-family generators may pose more quality problems than with other customers, as has been found in a recent Metro survey of cities that have such regulations. Even so, processors and mills in those locations all were able to handle and use the collected material. As with offices and non-office businesses, Metro should initiate an ongoing outreach and education campaign to housing managers, haulers and residents, whether or not the region imposes mandates or bans.

E. Analyses of Supply/Demand and Price Trend Data

Table I-1, below, documents the Metro region’s share of Pacific Northwest scrap paper demand. The bottom two rows of the table show that Metro recovery provides less than 11% of total mill requirements for scrap paper, and that the projected additional material would increase this share to less than 13% of PNW demand. For Low Quality Mixed (LQM), however, Table I-1 shows that Metro’s current recovery meets 46.1% of PNW domestic demand, and projected recovery would supply 70.3% of PNW domestic demand. Given that the Metro region accounts for about one-fifth of PNW recovery, these percentages illustrate the challenge of selling additional tons of Mixed scrap paper to domestic markets. As stated previously, however, export demand will be sufficient to take up the increase in Mixed scrap paper, and domestic mills can be expected to prefer and continue buying all other existing and new quantities of scrap paper collected in the Metro region. Newsprint manufacturers now buy most scrap paper high-graded from Mixed, and they likely will keep on doing so.

Table I-1

Metro's Recent and Future Market Share of Pacific Northwest Scrap Paper Demand

(000 tons)

	OCC	ONP	MIXED*	HIGH GRADE	TOTAL
DEMAND					
Oregon	**1,129**	**446**	**99**	**186**	**1,860**
Domestic	1,106	422	53	146	**1,727**
Export	23	24	46	40	**133**
Washington	**930**	**526**	**399**	**85**	**1,940**
Domestic	797	453	75	30	**1,355**
Exports	133	73	324	55	**585**
Total PNW	**2,059**	**972**	**498**	**271**	**3,800**
Domestic	1,903	875	128	176	**3,082**
Exports	156	97	370	95	**718**
RECOVERY PNW	**824**	**379**	**312**	**120**	**1,635**
Oregon	333	203	81	62	**679**
Washington	491	176	231	58	**956**
RECOVERY PNW (% Regional Requirement)	40%	39%	59%	44%	**43%**
CURRENT RECOVERY Metro	176	122	59	48	**405**
PROJECTED RECOVERY Metro	195	142	90	58	**485**
Current % PNW Demand	8.5%	12.6%	11.2%	17.7%	**10.6%**
Projected % PNW Demand	9.5%	14.6%	17.0%	21.4%	**12.7%**
Current % Domestic PNW Demand	9.2%	13.9%	46.1%	27.3%	**13.0%**
Projected % PNW Domestic Demand	10.2%	16.2%	70.3%	33.0%	**15.6%**

***** Refers to LQM

Sources: AF&PA for demand; DEQ 2001 data for Metro recovery; adjustments to AF&PA reported data for Oregon made by Andover International

Table I-2 summarizes the recent and future scrap paper supply and demand in the PNW and indicates that the recovery rate is projected to increase from 48.4% to 52.7%. The projected recovery assumes the continuation of the recent recovery rate (48.4%) plus an additional 80,000 tpy each from Portland Metro area and and Seattle, Washington, given that both are contemplating mandating recovery.

Figure I-1, which summarizes the recent and projected U.S. demand for scrap paper, shows an increase from about 45.4 million tons in 2001 to 51.0 million tons in 2006, or about 12% over the five-year period. By comparison, between 1993 and 1998, U.S. demand (including exports) increased from 35.4 million tons to 45.1 million tons, an increase of about 30%.

Note that most of the increased demand is for the export market; domestic demand is projected to increase modestly. Further, the demand growth for Mixed is greater than any other of the major grades. As stated, much of the increased export demand will be to Asian markets.

Figure I-2 tracks the U.S. price history of OCC, No.7/8 ONP and Low Quality Mixed. Except for a spike in 1995, prices remained essentially unchanged. The historical prices are reported in current dollars; if adjusted to constant dollars, the figure would show a price decline. Also, the reported prices are average annual; the month-to-month variation over any year can exceed 200%.

Because historical prices remained essentially unchanged during a period in which recovery increased by about 30%, we do not believe that a 12% increase in demand to 2006 will prompt major price increases.

Table I-2

Recent and Future Scrap Paper Supply/Demand in the PNW

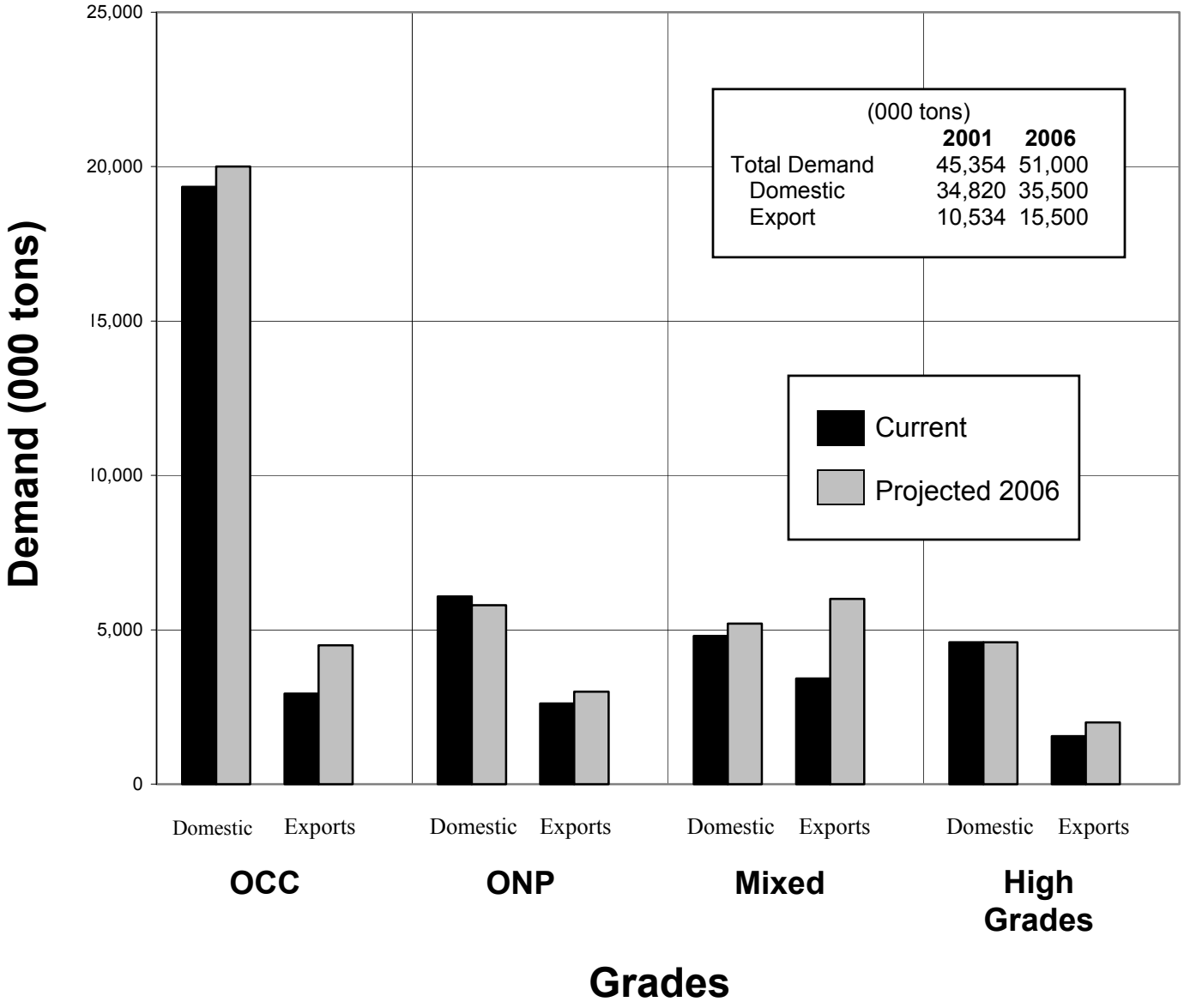
Basis: 000 tons

	Recent (2001)	Future (2006)	Increase
Supply	3,380	3,674	294
Demand	3,800	3,932	132
Domestic	3,082	3,082	0
Export	718	850	132
Recovery	1,635	1,937	302
Recovery Rate (%)	48.4%	52.7%	4.3%

Source: Recent recovery estimates provided by Oregon and Washington State officials; others are Andover estimates

Figure I-1

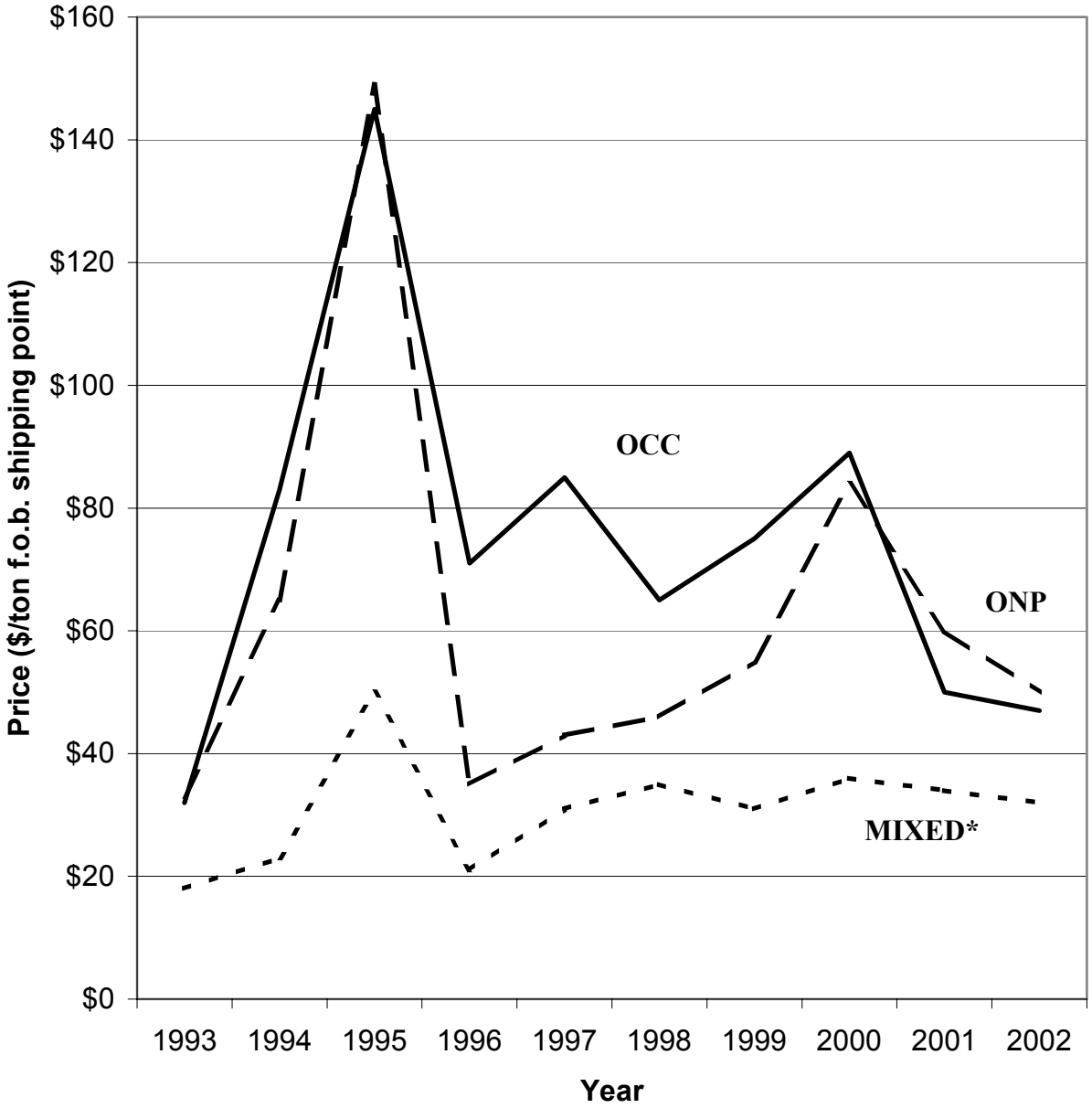
Current and Future Demand for Scrap Paper in the United States



Source: Current - AF&PA; Future - Andover International

Figure I-2

Historical U.S. Prices of Selected Scrap Paper Grades



*MIXED refers to LQM.

II. Introduction

A. Background and Principal Objectives

In order to meet its solid waste reduction target, Metro is planning to increase the recovery of scrap paper within the Portland metropolitan area. Metro is a regional government serving three counties and 24 cities in the Portland, Oregon region. The Metro area has a population of about 1.4 million, of which about 40% live in the city of Portland. Portland also has about 53% of all the businesses in the metropolitan area. It is also the only city in the area that does not franchise its commercial solid waste haulers and the only one that presently mandates recovery from commercial sources. Because of Portland's predominant role in population and businesses, its current and future recovery efforts have a significant influence on scrap paper recovery over the entire metropolitan area.

Current recovery rates for OCC and ONP in the Metro area are among the highest in the United States. However, Metro believes that additional recovery is possible from commercial sources, such as multi-family dwellings, small- and medium-sized retail/manufacturing facilities and office buildings. Some recovery is presently being obtained from these sources, but Metro believes that more is attainable -- about 121,000 tons more, according to a solid waste composition study that the Oregon Department of Environmental Quality (DEQ) performed in 2000 (**Table II-1**).

Metro is considering several methods to increase recovery from commercial sources, including extensive outreach and education, mandating source separation and/or banning disposal of scrap paper grades. Metro has two principal concerns about additional recovery it projects:

a) Finding market opportunities for an estimated 80,000 tons of additional scrap paper, which is about 20% more than the 405,000 tons presently being recovered, and
b) The effect of mandating recovery on the quality of the recovered material and, hence, the price and salability of the recovered grades such as OCC, ONP and High Grades.

Perhaps most importantly, Metro is concerned about finding end-use markets for the additional 31,000 tons of Mixed waste paper it anticipates recovering from commercial sources.

Metro is well aware that there is only a limited demand for Mixed by paper mills located in the Pacific Northwest; hence, it wishes to evaluate prospects for substituting this grade for others, such as OCC, in containerboard manufacture and/or export markets.

Metro has retained Andover International Associates to examine the potential markets for the additional recovered material and to help it develop strategies for exploiting these markets.

Table II-1

Metro Regional Waste Composition, 2000

	Scrap Paper Composition	
Material	**(Tons)**	**(% of Total Paper)**
Cardboard/Brown Bags	37,876	21.0%
Newspapers	19,524	10.8%
Magazines	10,061	5.6%
High Grade Paper	15,561	8.6%
Subtotal	**83,022**	**46.0%**
Mixed Paper		
Low-grade paper	17,404	
Low-grade packaging	15,917	
Bleached poly coats	3,712	
Hard cover books	1,084	
Subtotal	**38,117**	**21.1%**
Total Recoverable Paper	**121,139**	**67.1%**
Non-Recyclable Fiber	27,996	
Non-recyclable paper	15,012	
Non-recyclable packaging	16,218	
Subtotal	**59,226**	**32.8%**
Total Recoverable & Non-Recoverable Paper	**180,365**	**100.0%**

Source: DEQ Waste Composition Study, 2000

B. Scope and Approach

To achieve the study objectives Andover International:

- Reviewed and analyzed published information,
- Updated proprietary Andover International information regarding the supply of scrap paper in states and metropolitan areas,
- Interviewed haulers and processors of scrap paper in the Portland metropolitan area, and

- Interviewed personnel of mills located in the Pacific Northwest that use scrap paper part as part of their furnish to make all major paper/board products (e.g., newsprint, linerboard, corrugated medium and tissue).

We also reviewed reports previously sponsored by Metro, including:

- Commingled Commercial Recyclables Processing Study (October 2002), and
- Impact of Mandatory Recycling, Ordinances and Disposal Bans on Commercial Fiber Recycling (April 2003).

As specified in the Request for Proposals, our report forecasts supply/demand to 2006.

C. Definitions, Terms and Abbreviations

There are over 50 individual paper stock grades (PSG) included in the five major categories (OCC, ONP, Mixed, Pulp Substitutes and High Grade Deinking) commonly used in reporting scrap paper supply/demand data. Paper mills purchase scrap paper on the quality specifications of the individual PSG and not on the basis of the five major reporting categories. Accordingly, identifying market opportunities for the additional tonnage that Metro plans to recover requires an understanding of the PSG included in the major categories.

Unfortunately, grade definitions vary among different reporting sources; an understanding of the inclusions/exclusions in each grade is essential to avoid erroneous conclusions regarding potential market opportunities. For example, if the AF&PA data on the consumption of Mixed paper were taken at face value, the conclusion would be that the Metro region would have no problem selling to Pacific Northwest paper mills an additional 31,000 tons of Mixed. Only after understanding the individual grades included in AF&PA's definition of Mixed does one realize that the Mixed must be segregated into discrete grades (e.g., Soft Mixed, Magazines, Telephone Directories, etc.) to assess market opportunities in the Pacific Northwest.

Metro's (Oregon DEQ's) definition of scrap paper grades differs somewhat from AF&PA's. The reader may wish to skip the following discussion of the distinctions between scrap paper classifications by different authorities, but it is important to understand that Andover International had to convert the

AF&PA demand and supply data into terms that reflect accurately how Metro reports and analyzes available supply and recovery of scrap paper grades, and how Pacific Northwest end markets buy those materials.

The Institute of Scrap Recycling Industries (ISRI) provides quality specifications for 50 individual and 33 specialty grades of scrap paper. The AF&PA aggregates these individual grades into five major categories: Corrugated (OCC), Newspapers (ONP), Mixed Papers (Mixed), Pulp Substitutes (P/S), and High Grade Deinking (uncoated, bleached, wood-free printing and writing papers). **Table II-2** correlates the ISRI and AF&PA grade classifications for scrap paper.

Metro, like most other reporting organizations, generally combines P/S and High Grade Deinking into a single category, i.e., High Grades. AF&PA and Metro assign some individual grades to different categories; for example, Metro and other reporting organizations in the Pacific Northwest consider their recovery of magazines (OMG) and Old Telephone Directories (OTD) to be part of their ONP recovery, because that is what ONP mills in the region accept, while AF&PA reports these materials as Mixed. Accordingly, the definitions used by AF&PA and Metro are described separately.

AF&PA Category/Grade Definition

The following definitions are those published by AF&PA in its 43rd Annual Capacity Survey, 2001-2002.

Corrugated (OCC). Old containers both corrugated and solid fiber, including plant cuttings (ISRI grades 11-13).

Newspapers (ONP). Old newspapers, special news (including deink quality), over-issue news, white blank news, groundwood and flyleaf shavings, coated groundwood sections (ISRI grades 6-9, 22, 24-27, and 44).

Mixed Paper (Mixed). Mixed papers, super mixed papers, office papers (if not requiring deinking or of suitable quality to be used as a pulp substitute), telephone directories, magazines, catalogs, recycled boxboard cuttings, tissue paper converting scrap if predominantly composed of recycled fiber, mill wrappers, specialty grades and all other grades not elsewhere specified (ISRI grades 1-5, 10, 23, 19S-21S, and 33S).

Pulp Substitutes (P/S) Brown. Includes used kraft bags, mixed kraft cuttings, new colored kraft, grocery bag scrap, kraft multi-wall bag scrap, carrier stock, and new brown kraft envelope cuttings (ISRI grades 15-21).
Pulp Substitutes (P/S) Bleached. Includes bleached sulfite and sulfate cuttings, including tissue paper converting scrap if predominantly composed of bleached chemical pulp fiber, and coated book stock of suitable quality to be used as a pulp substitute (ISRI grades 28-31, 36, 47-48, 50).
High Grade Deinking. Includes bleached chemical grade office papers, computer printouts, and various grades of bleached converting scrap to be deinked (ISRI 33, 35, 37-39, 40-43, 45-46, 49,51).

Table II-2 correlates the AF&PA definitions with those of ISRI. Note that AF&PA's definition of ONP contains a number of ISRI grades derived from P&W paper. Furthermore, in reporting their use of scrap paper to AF&PA, some mills include old magazines and catalogs under the ONP category, while others categorize them as Mixed.

Table II-2

Correlation Between AF&PA Grade Definitions and ISRI Grade Specifications

AF&PA Categories	ISRI, Paper Stock Grade (PSG)			
	PSG (No.)	Grade	Prohibited Material (%)	Total Out-throws (%)
OCC	11	Corr. Containers	1	5
	12	Dbl. Sorted Corr.	1/2 - 1	2
	13	New Dbl. Lined Kraft Clippings	None	2
ONP	6	News	1	5
	7	News, Deink Quality	None	1/4
	8	Special News	None	1/4
	9	Over-Issue News	None	None
	22	Mixed Grdwd Shavings	None	2
	24	Wht News Blanks	None	1
	25	Grdwd Computer Printout	None	2
	26	Publication Blanks	None	1
	27	Flyleaf Shavings	None	1
	44	Coated Grdwd Sections	None	2
Mixed	1	Soft Mixed White	2	10
	2	Mixed Paper	1/2	3
	4	Boxboard Cuttings	1/2	2
	5	Mill Wrap	1/2	3
	10	Magazine	1	3
	23	Telephone Directories	None	1/4
	19S	Colored/Wet Strength Scrap	Not Reported	Not Reported
	21S	New Computer Printout (CPO)	Not Reported	Not Reported
	33S	Unprinted TMP	Not Reported	Not Reported
High Grade Deinking	33	New Colored Envel. Cuttings	None	2
	35	Semi-Bleached Cuttings	None	2
	37	Sorted Office Paper (SOP)	2	5
	38	Sorted Colored Ledger	1/2	2
	39	Manifold Colored Ledger	1/2	2
	40	Sorted White Ledger (SWL)	1/2	2
	43	Coated Book Stock	None	2
	45	Printed Bl. Bd. Cuttings	1/2	2
	46	Misprinted Bl. Bd.	1	2
	49	#2 Printed Bl. Cup Stock	None	1
	51	Printed Bl. Plate Stock	None	1
Pulp Substitutes (P/S)				
Brown	15	Used Brown Kraft	None	1
	16	Mixed Kraft Cuttings	None	1
	17	Carrier Stock	None	1
	18	New Colored Kraft	None	1
	19	Grocery Bag Scrap	None	1
	20	Kraft ML Bag Scrap	None	1

Pulp Substitutes (P/S)	21	New Brown Kraft Envel. Cuttings	None	1
Bleached	28	Coated White Shavings	None	1
	29	Grade Not Currently In Use	--	--
	30	Hard White Shavings	None	1/2
	31	Hard White Envel. Cuttings	None	1
	36	Manila Tab Stock	None	1
	47	Unprinted Bl. Board	None	1
	48	Bl. Cup Stock	None	1/2
	50	Unprinted Bl. Plate Stock	None	1/2

*Includes Prohibited Materials

Source: AF&PA and ISRI Scrap Specification, Circular 2002

AF&PA never intended that there would be a direct correlation between the original paper/board products and its six scrap paper categories. Hence, its grade-by-grade estimates of recovery and corresponding calculated recovery rates have limited value in estimating residual supply potentially available for recovery.

Table II-2 also identifies the amount of Prohibited Materials and Outthrows specified in the ISRI grade definitions. Prohibited Materials are defined as: "any material that may be damaging to equipment and/or, which by their presence in a package of paper stock, in excess of the amount allowed, will make the packaging unusable as the grade specified." ISRI's definition of "Outthrows" states: "all papers that are so manufactured or treated or are in such form as to be unsuitable for consumption as the grade specified."

While grade/quality characteristics are published by ISRI, each mill typically publishes its own "spec" sheet because, depending on a mill's equipment and specific product requirements, there are frequently departures from the published quality specifications. In addition, as can be noted by the amount of Prohibited Materials and Out-Throws, the actual weight of the scrap paper reported is overstated by the presence of these two materials.

2. Metro Grade Definitions

The following grade definitions are those used in the DEQ Waste Composition Study referenced earlier (Table II-1), which describes the composition of the remaining scrap paper potentially available for recovery in the Metro region.

PAPER (waste composition classifications from the Oregon DEQ)

Paper Packaging (1-5)

1. Corrugated cardboard and kraft paper (OCC) - Kraft linerboard and containerboard cartons and shipping boxes with corrugated paper medium (unwaxed). This category also includes kraft (brown) paper bags. Excludes waxed and plastic coated cardboard, solid boxboard, multi-walled bags that are not pure unbleached kraft.
2. Low-grade packaging paper. Other low-grade recyclable papers used in packaging, includes chipboard and other solid boxboard (not poly-coated), bags (without poly liners and not pure unbleached kraft), clothing forms, egg cartons (molded pulp), boxes with small plastic windows.
3. Bleached boxboard. Milk, juice cartons & white freezer/refrigerator boxes. Poly-coated bleached paperboard used for milk, ice cream, juice (including aseptic packaging), frozen TV dinners, and many other frozen food boxes. Boxes are printed or unprinted white fiber, but currently have limited markets due to polyethylene coating. Does not include uncoated paperboard (either bleached or unbleached), as uncoated boxboard is included in "low-grade packaging paper" above. Does not include cups or non-food poly-coated packages.
4. Non-recyclable packaging paper. Paper for which no significant recycling opportunities currently exist in Oregon, including waxed cardboard, poly-lined chipboard, foil-lined papers, Christmas wrapping paper, and paper cups, plates, and other paper containers used for takeout food.
5. Mixed paper/other materials. Includes juice cans, oil cans, paper with thick foil laminates or large thick plastic windows.

Other Paper (6-11) (includes printing, writing, and other non-packaging paper)

6. Newspaper (ONP) - Printed groundwood newsprint (minimally bleached fiber); referred to as #1 news. This category also includes glossy paper typically used in newspaper insert advertisements, if believed to be distributed with newspapers.
7. Magazines, including similar glossy publications such as some catalogs, but excluding newspaper glossy inserts.
8. High Grade office/printing/writing paper (uncoated high grades) - Printing, writing and computer papers, including mainly thermo-chemical pulps. Both virgin pulp substitutes and high grade deink fibers are included. This category is composed of high grade paper, which includes white ledger, colored ledger, computer printouts, computer tab cards, bond, copy machine, and carbonless paper. Excludes glossy coated paper such as magazines and pure groundwood publications such as catalogs, and glue-bound publications.
9. Hard-covered books. Books with hard covers.
10. Other low grade recyclable printing paper. Phone books, junk mail (including stray sheets of ledger grade paper commonly included in junk mail), used envelopes, other material with sticky labels, construction paper, blueprint and thermal copy & fax paper, bright-dyed paper (fiesta or neon colors), paperback books, uncoated (non-glossy) groundwood catalogs (glue bindings), glossy coated paper.
11. Other non-recyclable paper. Printing or other non-packaging paper not included above that is not easily recyclable in the United States. Includes paper towels and tissue, carbon paper, photographs, and paper normally soiled through use (paper plates and cups for home use).

Table II-3 indicates the historical recovery of scrap paper in the Metro region. Note that in 2001, the Oregon Department of Environmental Quality (DEQ), which compiles these data, began to include OMG and OTD as part of the ONP recovery. As will be discussed more fully in other chapters of this report, by including these other grades, the reported Metro recovery of ONP is significantly higher than that corresponding to the AF&PA definition. Conversely, the AF&PA reported recovery of Mixed is overstated by the amount of OMG and OTD (and possibly other grades) that DEQ includes in its definition of ONP. In addition, collectors and processors in the Metro region mix quantities of direct mail and office papers with ONP, which local newsprint mills purchase. Insight gained by comparing the grade definitions used by Oregon DEQ and AF&PA, enabled Andover International to adjust the reported AF&PA data to the grade classification used by mills in the PNW.

Table II-3

Metro Region Recovery of Paper, 1992-2001

Material Type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
PAPER (tons)										
Newspaper	73,974	72,886	83,420	96,651	85,635	103,456	98,849	125,985	118,747	121,826
Magazines	8,096	10,318	7,587	7,359	10,921	13,404	20,170	7,883	3,873	0
Phone books (1)	0	0	1,522	2,097	2,602	2,045	1,784	2,289	2,328	0
Mixed waste paper	16,748	22,668	28,208	52,352	35,963	51,784	59,356	55,428	71,853	59,295
Cardboard/kraft paper	111,306	123,212	139,450	171,603	168,657	177,205	179,220	167,908	170,508	175,506
High-grade paper	42,614	28,485	18,847	25,878	33,359	33,073	51,132	43,082	41,101	47,975
Fiber-based fuel	0	0	0	3,302	9,235	2,681	0	0	0	0
Total Paper	**252,739**	**257,568**	**279,033**	**359,243**	**346,372**	**383,646**	**410,512**	**402,574**	**408,409**	**404,603**
Total all Materials	**514,747**	**575,819**	**635,869**	**735,231**	**752,470**	**835,593**	**912,018**	**932,889**	**970,850**	**1,106,645**

(1) Phone books included in mixed waste paper in 1992 and 1993.

Source: Oregon Department of Environmental Quality, December, 2002

1. Terms and Abbreviations

The following terms and abbreviations are used in this report.

Related to Scrap Paper Grades

OCC - Old Corrugated Containers

DLKC - Double Lined Kraft Chippings

ONP - Old Newsprint (includes inserts & flyers made from P&W paper)

Mixed - Mixed waste paper (includes P&W paper, ONP, OCC and other packaging paper). The broad category used by AF&PA which includes OMG, OTD, Soft Mixed, etc.

P/S - Pulp Substitutes (includes those grades which do not require deinking)

High Grade Deinking - Primarily deinked P&W paper

High Grades - In this report, High Grades include P/S and High Grade Deinking

OMG - Old magazines and catalogs

MOP - Mixed office paper (collected grade, not yet sorted; predominantly P&W paper, but could include OBB, OCC, ONP)

LWC - Lightweight coated

OBB - Old boxboard (carrierboard, chipboard, e.g., shoe boxes, beer cartons)

LQM - Low quality mixed that includes paper & board typically used for recycled boxboard manufacture, but also for corrugating medium, roofing paper and gypsum linerboard.

OTD - Old telephone directories

OP - Office paper (sorted grades)

- **OP-1 and OP-2 -** Wood Free
- **OP-3 -** Contains some groundwood paper products

Related to Paper Products

Wood-Free - Coated and/or uncoated P&W paper that contains less than 2% groundwood

Groundwood Paper - Coated and/or uncoated P&W paper that may contain 100% mechanical fiber (e.g., newsprint) or a combination of mechanical and chemical fiber (telephone directories, "super calendered" paper used to make inserts and flyers, "light-weight coated" (LWC) paper, etc.).

Tissue Paper - Includes all grades of tissue: toilet, napkins, facial tissue, packaging tissue and toweling. The quality specifications of the finished products vary widely; thus, the quality requirements of the fiber furnish - whether from wood pulp or scrap paper - also vary widely.

P&W Paper - Printing & Writing paper (includes Wood-free and Groundwood papers)

Boxboard – Includes all types of folding boxboard — SBS (solid bleached sulfate), recycled (made from 100% recycled fiber) and coated and uncoated SUS board (solid unbleached sulfate).
Containerboard - Includes liner and corrugating medium. Quality specifications for liner and medium vary widely, affecting the selection of fiber furnish (wood pulp and/or recovered fiber).
Newsprint - Includes "standard news" and "special news"; the latter has a lower basis weight and/or degree of brightness. The fiber furnish requirements -- i.e., the ratio of mechanical/chemical fiber, degree of brightness and the acceptable level of foreign matter -- vary widely.

Related to Deinking Systems

Flotation System - Practically always combined with a washing system. Must have a minimum of about 15% clay for efficient operation. The clay is typically obtained by introducing clay-coated paper products such as OMG in combination with ONP for newsprint manufacture. A combination of coated wood-free P&W paper and clay-coated bleached kraft board is generally used for P&W paper and tissue manufacture.
Mills typically increase the amount of OMG in newsprint manufacture substantially when more chemical fiber is desired, as in the manufacture of lightweight newsprint. All mills in the Pacific Northwest that make newsprint from recovered fiber, in whole or in part, use the flotation deinking system.
Washing System - As the name implies, this system uses only washing to remove ink. The inclusion of coated paper is prohibited.

Related to Production Rates

tpd - tons per day
tpm - tons per month
tpy - tons per year
Annual Production - Calculated on the basis of 330 days of the reported 24-hour daily production, i.e., about 90% machine capacity utilization for the commodity grades such as liner, medium and newsprint.

Related to Organizations

AF&PA - American Forest & Paper Association
ISRI - Institute of Scrap Recycling Industries
PSI - Paper Stock Institute, a National Chapter of ISRI

III. Supply/Demand Analyses: U.S. and West Coast

A. Scope and Approach

This chapter addresses the current and future supply/demand and recovery of scrap paper in the United States and the West Coast. Since scrap paper is a world-traded commodity, this overall assessment of supply/demand is essential to address Metro's request for price trends and factors regarding the principal grades of scrap paper and to evaluate the prospect of exporting select grades.

The current and future total U.S. consumption of the original paper/board products -- i.e., the potential supply of scrap paper -- are AF&PA estimates. As AF&PA does not publish paper consumption by state, Andover International estimated the individual state and regional scrap paper supply on the basis of its proprietary database. This database includes key indices of paper/board consumption, such as family income, manufacturing activity and number of office workers. Note that our "adjusted" consumption of containerboard is significantly higher than that reported by AF&PA; the additional 3.5 million tons includes our estimate of the net imports versus exports of corrugated shipping containers. With regard to the supply of newsprint and P&W paper, we subtracted from P&W paper and added to newsprint the amount of P&W paper used to make inserts & flyers, which are practically always considered as ONP.

Current state and regional demand information for domestic mills and export sales was also obtained from published AF&PA reports. Andover International combined the AF&PA reported data for P/S and High Grade Deinking into a single category (High Grade) because Oregon and Washington state officials report recovery of the two in this way.

As with paper/board supply, AF&PA does not publish *future* domestic and export scrap paper demand by individual state or geographic area, but only for the total United States. State and regional demand are Andover International's estimates based on:

- our analysis of the products and characteristics of the mills in the studied region,
- information obtained during our interviews for this study, and
- AF&PA's total estimated U.S. domestic and export demand.

In this chapter, we use Andover International's estimates of future domestic and export demand in Oregon, Washington and the West Coast. The AF&PA demand projections for the United States are included in Chapter IV with an explanation of why we believe the AF&PA projections are too high. Naturally, high demand estimates would affect future price trends.

Recovery rates for individual scrap paper grades are typically imprecise, because all of the mills and reporting organizations do not use the same grade definitions. Accordingly, while we calculate and report recovery rates for the individual scrap paper grades for the Pacific Northwest and total U.S., we recognize that derived estimates serve as a guide but are not precise. Recovery rates for the total region and total U.S are more reliable. We are unable to report recovery rates for the entire West Coast, since California does not report scrap paper recovery.

B. Consumption of Paper/Board and Supply of Scrap Paper

The theoretical total U.S. supply of scrap paper -- i.e., the U.S. consumption of paper/board -- is projected to increase from 97.9 million tons in 2001 to about 108.9 million tons by 2006 (AF&PA estimates). To the total reported U.S. supply potentially available for recovery, we have added 3.5 million tons as the net import of corrugated containers versus their export as packaging materials. No adjustment was made to future net imports versus exports, since international trade flows of merchandise are affected by numerous unquantifiable and unpredictable variables. In addition, the net import/export supply of corrugated containers is sufficiently small (about 3.4% of the total) that any variation is within the margin of error in AF&PA's total 2006 paper/board supply projection.

Table III-1 summarizes current and future U.S. and regional paper/board consumption, which is the basis for estimating the corresponding scrap paper supply potentially available for recovery.

Table III-1

Recent and Projected Consumption
of Paper/Board and Supply of Scrap Paper in the U.S., West Coast and Pacific Northwest

		Studied Grades (000 tons)					
2001 Data	**Population (millions)**	**Total Supply**	**Corrugated Containers**	**Newsprint**	**P&W Paper**	**Total Studied Grades**	**Other Paper Products/ Scrap Paper Grades**
U.S. Reported	285.0	97,911	30,156	11,530	30,654	72,340	25,571
U.S. Adjusted	**--**	**101,411**	**33,656**	**13,375**	**28,809**	**77,840**	**25,571**
Oregon	3.4	1,241	428	160	346	934	307
Washington	5.9	2,139	737	277	596	1,610	529
Total PNW	**9.3**	**3,380**	**1,165**	**437**	**942**	**2,544**	**836**
California	33.8	12,306	4,238	1,588	4,125	9,951	2,354
Total W. Coast	**43.1**	**15,686**	**5,403**	**2,025**	**5,067**	**12,495**	**3,190**
2006 Projected							
U.S. Reported	--	108,900	33,800	12,000	35,900	81,700	27,200
U.S. Adjusted	**--**	**112,400**	**37,300**	**13,900**	**34,000**	**85,200**	**27,200**
Oregon	--	1,349	448	166	408	1,022	327
Washington	--	2,325	771	289	703	1,763	562
Total PNW	**--**	**3,674**	**1,219**	**455**	**1,111**	**2,785**	**889**
California	--	13,376	4,433	1,650	4,868	10,951	2,425
Total W. Coast	**--**	**17,050**	**5,652**	**2,105**	**5,979**	**13,736**	**3,314**

Source: Current and future 'reported' total U.S.,AF&PA; U.S. adjusted and state/regional current and future estimates, Andover International

The U.S. supply of scrap paper is expected to grow only modestly (about 1.5% per year) over the studied period because of recent moderating demand growth for practically all paper/board products. Note that U.S. demand growth for the individual grades varies widely, ranging from a modest increase in corrugated containerboard consumption of about 12% (from about 30.2 million tons in 2001 to about 33.8 million tons in 2006) to an increase in P&W paper consumption of about 17% (from 30.7 million tons to about 35.9 million tons).

As discussed, AF&PA does not allocate paper/board consumption by state; these estimates are derived from our proprietary database. Note that we focused on only three major paper/board products -- corrugated containers, newsprint and P&W paper; the others are aggregated in the category of "Other Paper Products". The rationale for this approach is to focus on the principal sources of supply and to correlate the supply with the corresponding scrap paper grades. These three paper/board products

represent 75% of the total paper supply and an even higher percentage of the potentially recoverable paper, since only pre-consumer sources of supply would apply to recovery of other paper products such as tissue and construction paper/board. Further, many post-consumer paper/board packaging products would not be recoverable, because they are poly-coated, foil laminated and/or contaminated with food waste.

Based on our analysis of paper/board demand growth by individual state and area, we project that the supply (consumption) of scrap paper in the Pacific Northwest will increase from about 3.4 million tons in 2001 to about 3.7 million tons by 2006. More specifically, the supply in Oregon is projected to increase by about 108,000 tons, i.e., from 1.24 million tons to 1.35 million tons over the studied period. AF&PA's grade-by-grade projections indicate that much of the increase will be for P&W paper.

Figures III-1 and III-2 summarize respectively the consumption growth for paper/board products in the U.S. and in the Pacific Northwest.

C. Demand Analysis

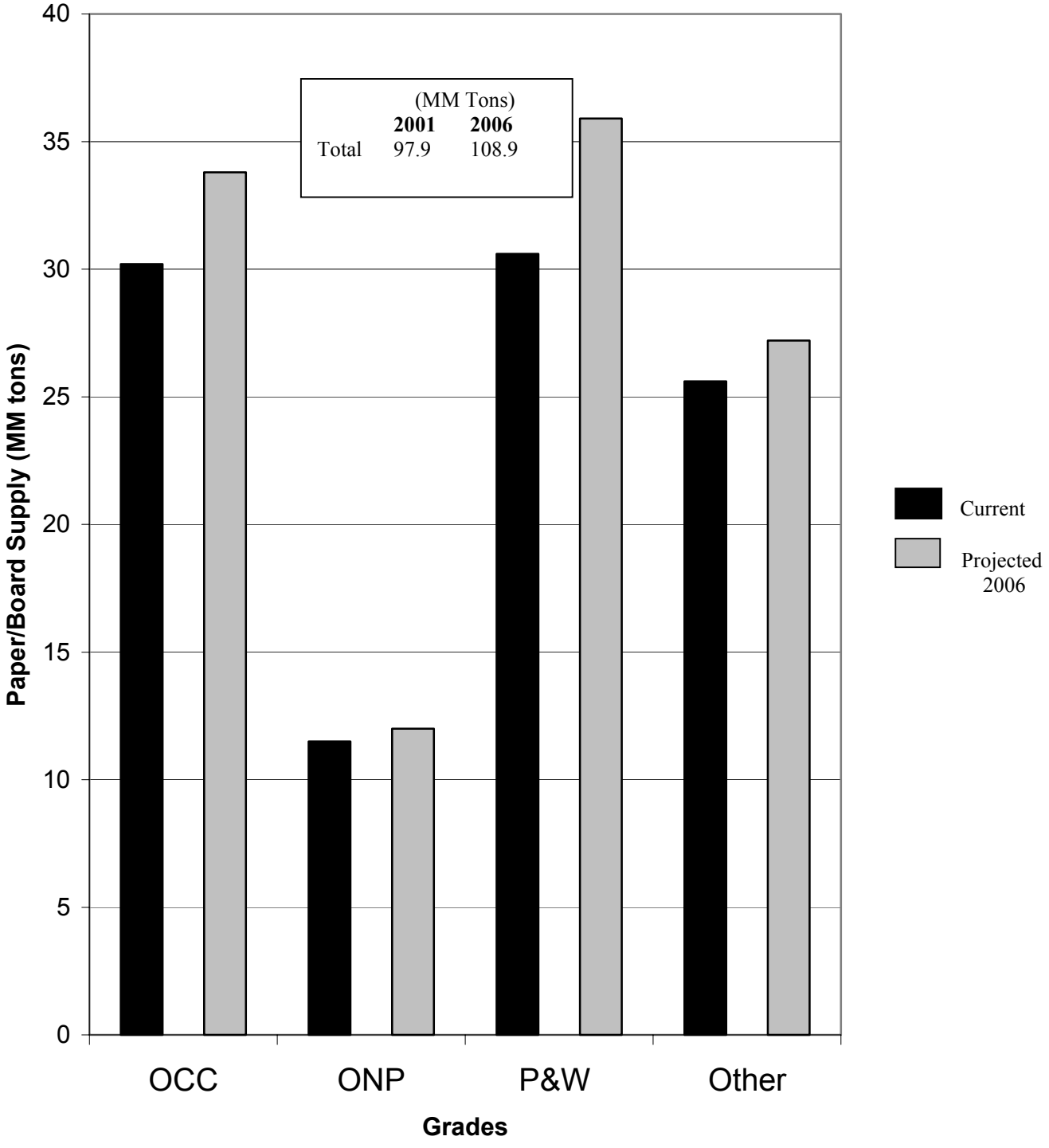
Recent Demand

Table III-2 summarizes the total U.S. and West Coast demand for scrap paper as reported by AF&PA. Not shown here, but well known to those that follow the paper industry, is that U.S. domestic demand for scrap paper declined from about 38.7 million tons in 1999 to about 34.8 million tons in 2001; only increased exports (Figure III-3) have helped maintain overall U.S. total recovery at about 45 million tons. Figure III-3 also indicates that much of the historical (and projected increase in) exports are from the West Coast, which go principally to the Far East.

Table III-2 also shows that the predominant grades used domestically in the Pacific Northwest are OCC and ONP; the demand for Mixed and High Grades is nominal. As mentioned previously, the demand for Mixed as reported here by AF&PA is overstated and that for ONP is understated, because AF&PA reports the recovery of OMG and some direct mail as Mixed, whereas state officials in Oregon and Washington report those grades as part of the ONP recovered. The amount of High Grades is also understated because some of the sorted office paper (OP-1, OP-2 and OP-3) is reported as Mixed.

Figure III-1

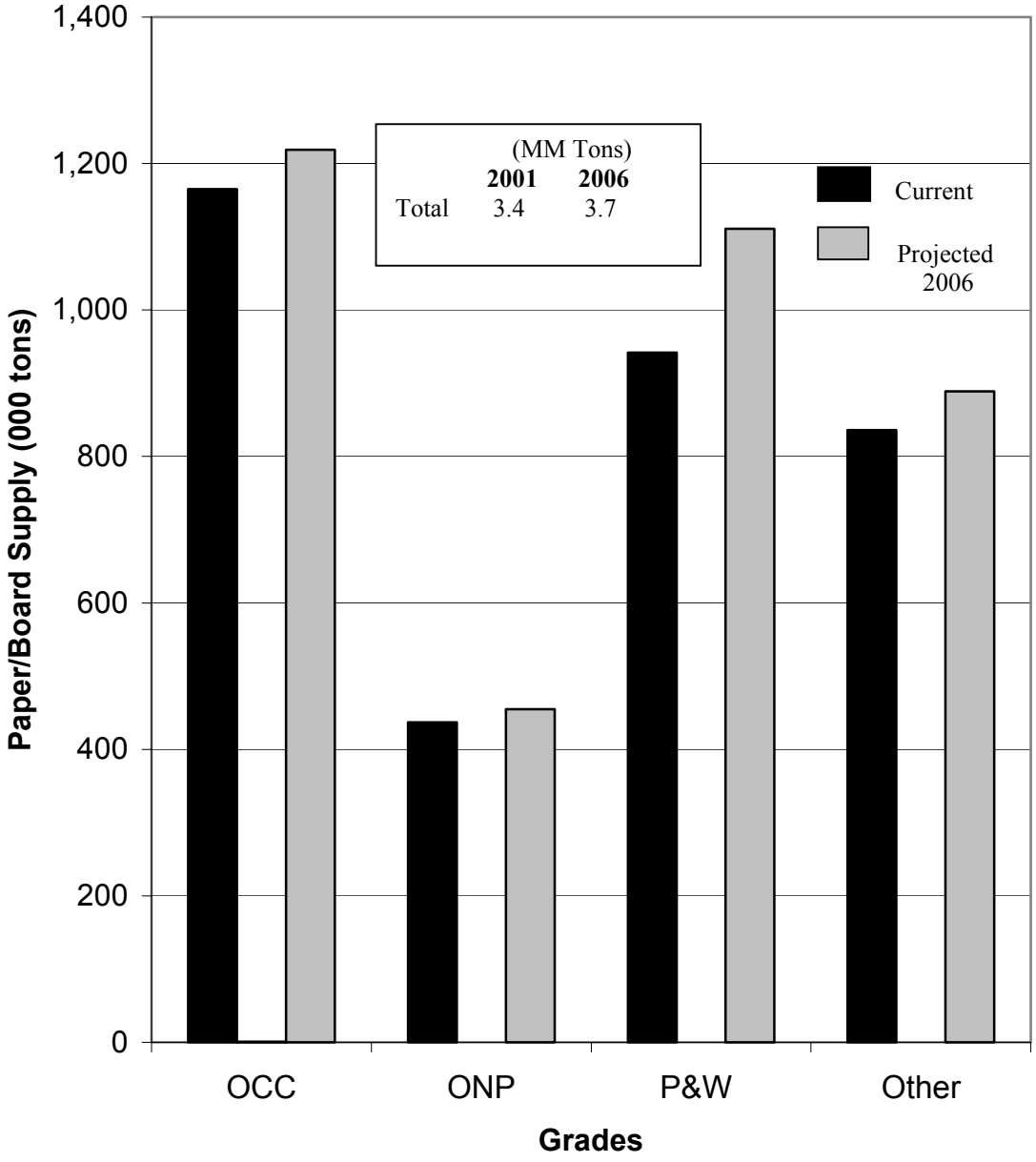
Recent and Future Scrap Paper Supply in the U.S.



Source: AF&PA

Figure III-2

Current and Future Scrap Paper Supply in the Pacific Northwest



Source: Andover International estimates

Table III-2

U.S. and West Coast Demand for Scrap Paper, 2001

	Demand (000 tons)				
	OCC	**ONP**	**Mixed**	**High Grade**	**Total**
United States	**22,282**	**8,692**	**8,227**	**6,153**	**45,353**
Domestic	19,348	6,077	4,800	4,595	34,820
Export	2,934	2,614	3,427	1,558	10,533
Oregon	**1,129**	**342**	**334**	**55**	**1,860**
Domestic	1,106	318	288	15	1,727
Export	23	24	46	40	133
Washington	**930**	**526**	**399**	**85**	**1.940**
Domestic	797	453	75	30	1,355
Export	133	73	324	55	585
Total PNW	**2,059**	**868**	**733**	**140**	**3,800**
Domestic	1,903	771	363	45	3,082
Export	156	97	370	95	718
California	**2,524**	**1,188**	**1,742**	**569**	**6,023**
Domestic	1,611	420	165	161	2,357
Export	913	768	1,577	408	3,666
Total West Coast	**4,583**	**2,056**	**2,475**	**709**	**9,823**
Domestic	*3,514	1,191	**528	206	5,439
Export	1,069	865	1,947	503	4,384

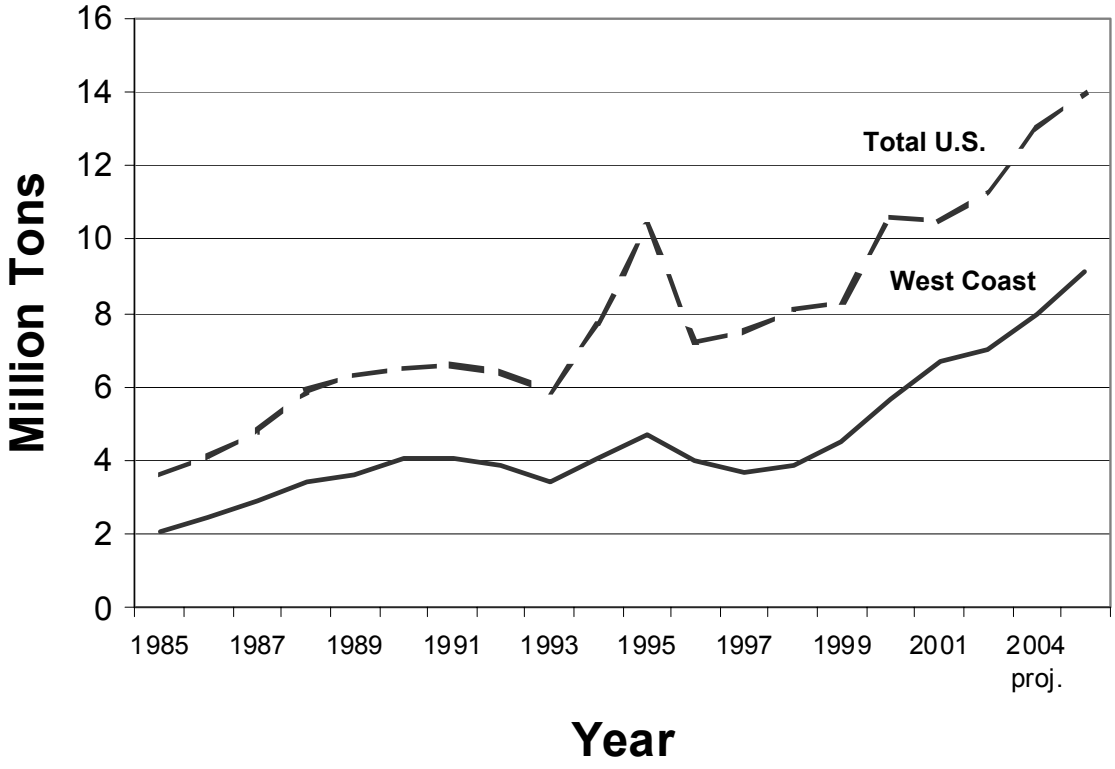
*Includes about 450,000 tpy of OCC for the recycled containerboard mill in Antioch that has since been idled.

**Includes about 50,000 tpy of Mixed as well as an additional 50,000 tpy of ONP and OCC for the recycled board mill in Stockton that has since been idled.

Source: AF&PA

Figure III-3

Historical and Projected U.S. Exports of Scrap Paper



Source: AF&PA data. Historical - AF&PA; Projected - Andover International

The demand data in Table III-2 reveal key characteristics of the paper/board industry in the studied areas. A comparatively large domestic amount of OCC and ONP is used in the Pacific Northwest and California, primarily for the manufacture of linerboard and newsprint. Domestic mill demand for High Grades and Mixed are low in the West (compared to overall U.S. and export demand and to other grades), because the West produces only a nominal amount of recycled boxboard (which uses Mixed) and has limited capacity to make P&W papers and tissue (which use High Grades).

As detailed in Appendix A, few West Coast mills are making recycled boxboard; hence, there is only a nominal domestic demand for LQM. The largest single mill making recycled boxboard on the West Coast (the Newark Sierra paperboard mill in Stockton, California) has been idled since the publication of these data, thereby decreasing the demand for LQM in the studied area even further. The shrinking demand for LQM obviously has a major impact on Metro's ability to market this grade to domestic mills on the West Coast.

The domestic demand for High Grades is also limited. Those mills that make P&W paper containing recycled fiber are purchasing deinked market pulp mainly from other regions of the country. None of the mills making P&W paper on the West Coast have on-site deinking facilities; although, Georgia Pacific's mill in Halsey, Oregon, produces some deink pulp for its Camas, Washington mill.

Another unique feature of the West Coast demand is its disproportionately high percentage of Mixed for export sale: about 57% of the total U.S. exports of Mixed originate from the West Coast, primarily California. **Table III-3** lists exports from individual ports of debarkation.

Table III-3

Scrap Paper Exports: Total U.S. and West Coast, 2001

	Exports (000 Tons)				
	OCC	**ONP**	**MIXED**	**HIGH GRADES***	**TOTAL****
Oregon					
Portland	38	48	50	40	176
Washington					
Seattle	158	84	324	64	630
Total PNW	**196**	**132**	**374**	**104**	**806**
California					
Los Angeles	701	488	1,116	233	2,538
San Diego	--	--	--	66	66
San Francisco	212	280	461	110	1,063
Total CA	**913**	**768**	**1,577**	**409**	**3,667**
Total West Coast	**1,109**	**900**	**1,951**	**513**	**4,473**
Total U.S.	**2,934**	**2,615**	**3,427**	**1,558**	**10,534**
West Coast % of U.S. Exports	**37.8%**	**34.4%**	**56.9%**	**32.9%**	**42.5%**

* Includes Pulp Substitutes

Sources: AF&PA, Annual Statistical Summary Recovered Paper Utilization

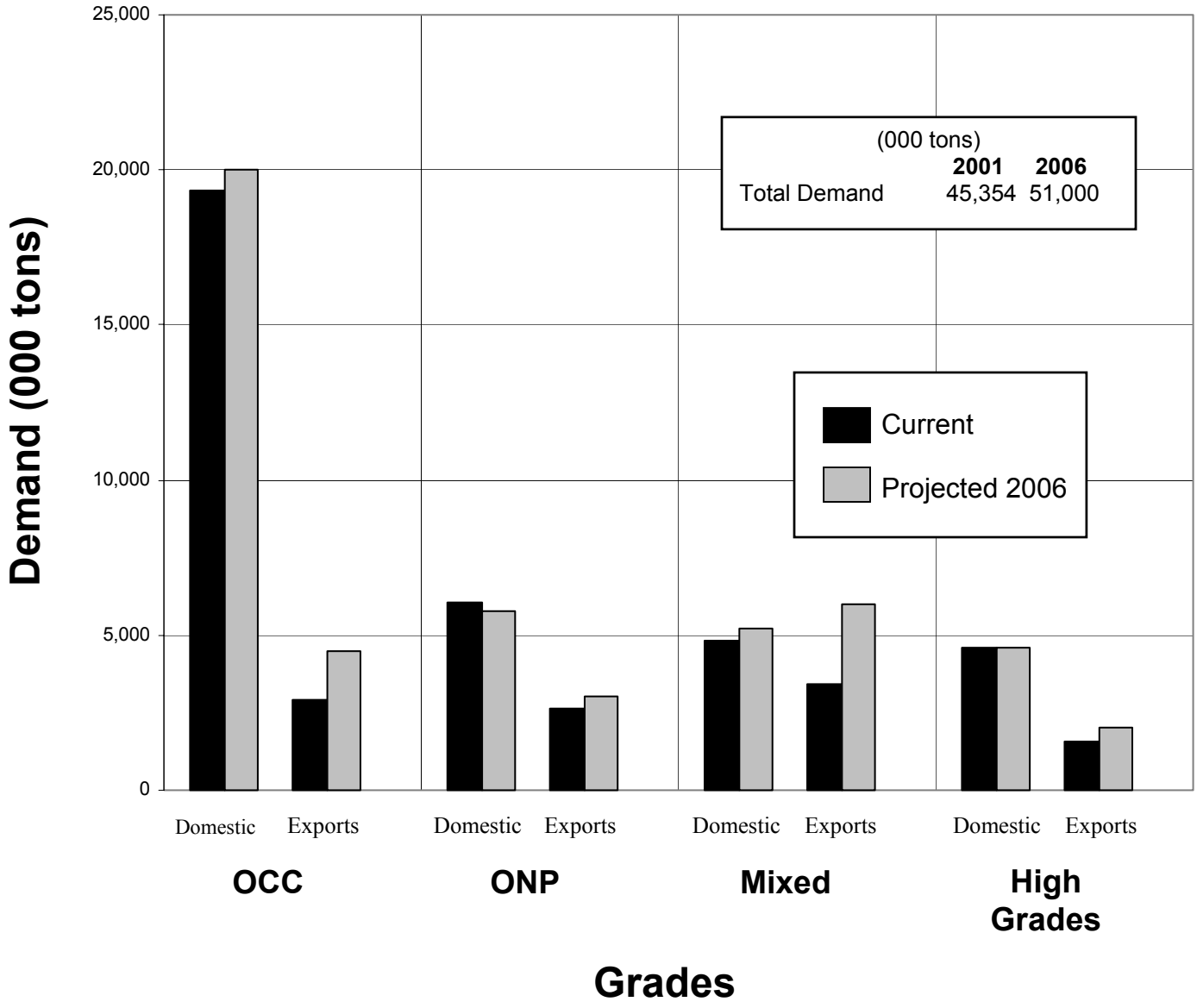
*** There are slight discrepancies between the export data listed in Table III-2 and Table III-3 because the data come from two different AF&PA publications. These discrepancies do not alter the overall implication of the findings, namely, that the West Coast is: (a) a major exporter of all grades, and (b) the region from which much of the Mixed exported from the U.S. is shipped. In all future analyses, we used the AF&PA data as reported in Table III-20.*

Future Demand

Figure III-4 summarizes and compares the current and future U.S. demand for scrap paper. Andover estimates that total demand will increase from about 45.35 million tons in 2001 to 51.0 million. By comparison, AF&PA projects total demand will reach 55.15 million tons in 2006(**Table III-4**).

Figure III-4

Current and Future Demand for Scrap Paper in the United States



Source: Andover International estimates.

Andover lowered domestic demand because the AF&PA estimate assumes that all recycling facilities will operate at full capacity; they seldom do. The export demand was also lowered because:

a) All the new recycling capacity will not be in addition to existing capacity; some smaller/older facilities in the importing countries will be idled, thus reducing their associated scrap paper demand, and
b) Not all the new capacity announced for start-up by 2006 will be built. Experience has demonstrated that not all announcements of new facilities slated for start-up fully five years in the future will actually be built.

The implications of Andover's lower U.S. demand are significant when assessing future scrap paper prices. The lower demand implies no fundamental change in supply/demand conditions; hence a continuation of historical prices. By comparison, the higher AF&PA demand estimate implies a fundamental shift in supply/demand conditions with a departure from historical prices.

Table III-4

Comparison: AF&PA vs. Andover International Estimates of Future U.S. Scrap Paper Demand, 2006

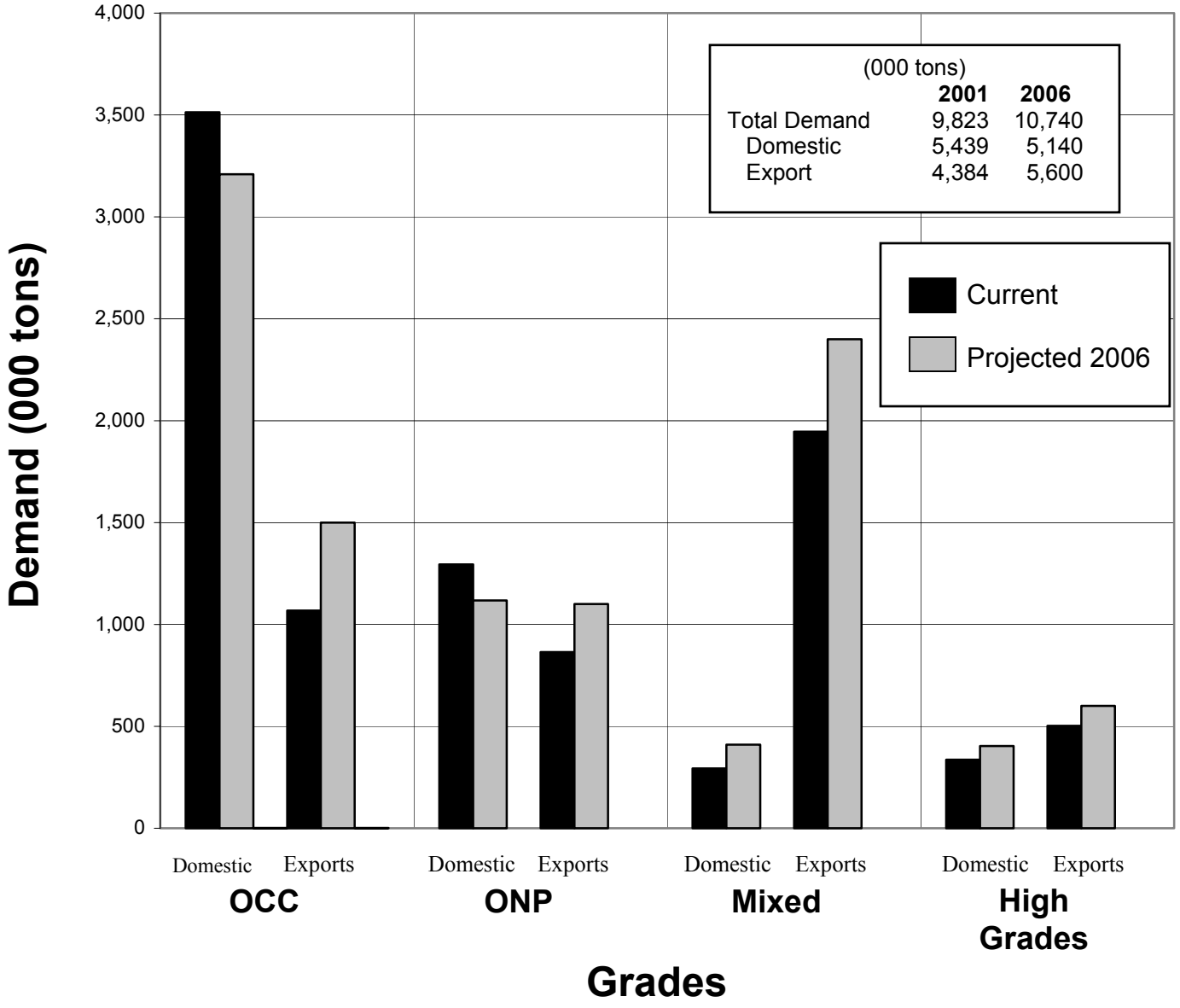
	Demand (Million Tons)	
	AF&PA	Andover
Domestic	37.70	35.50
Export	17.45	15.50
Total	55.15	51.00

* Article by Remy Esquenet of AF&PA, which appeared in Resource Recycling, January 2003

Figure III-5 summarizes current and future scrap paper demand on the West Coast and indicates (a) a significant decline in domestic demand, and (b) a significant increase in export demand**.** Most if not all of the likely reduction in future demand has already occurred with the closures of the recycled linerboard/corrugating mill in Antioch, California and the recycled boxboard and gypsum linerboard mill in Stockton, California. There may be some additional closures that further reduce demand for the major scrap paper grades, so we may safely conclude that there is hardly any likelihood that domestic demand will increase significantly over the studied period. One or two older, inefficient machines/mills may be idled and replaced with larger, more efficient machines, but the overall net increase will be a small percentage of current total West Coast domestic requirements. More importantly, *any future mill closures will not have a negative impact on Metro's sales opportunities because of the region's favorable freight cost for supplying mills in the Pacific Northwest.*

Figure III-5

Current and Future Demand for Scrap Paper on the West Coast



Source: Current - AF&PA; Future - Andover International.

Figure III-6 summarizes current and future scrap paper demand in the Pacific Northwest and indicates that, while there will be no increases in domestic demand, exports are projected to increase significantly. The conclusion regarding future domestic demand is based on information obtained in our interviews as well as our independent assessment of how much new or expanded papermaking capacity the industry is likely to add in the Pacific Northwest.

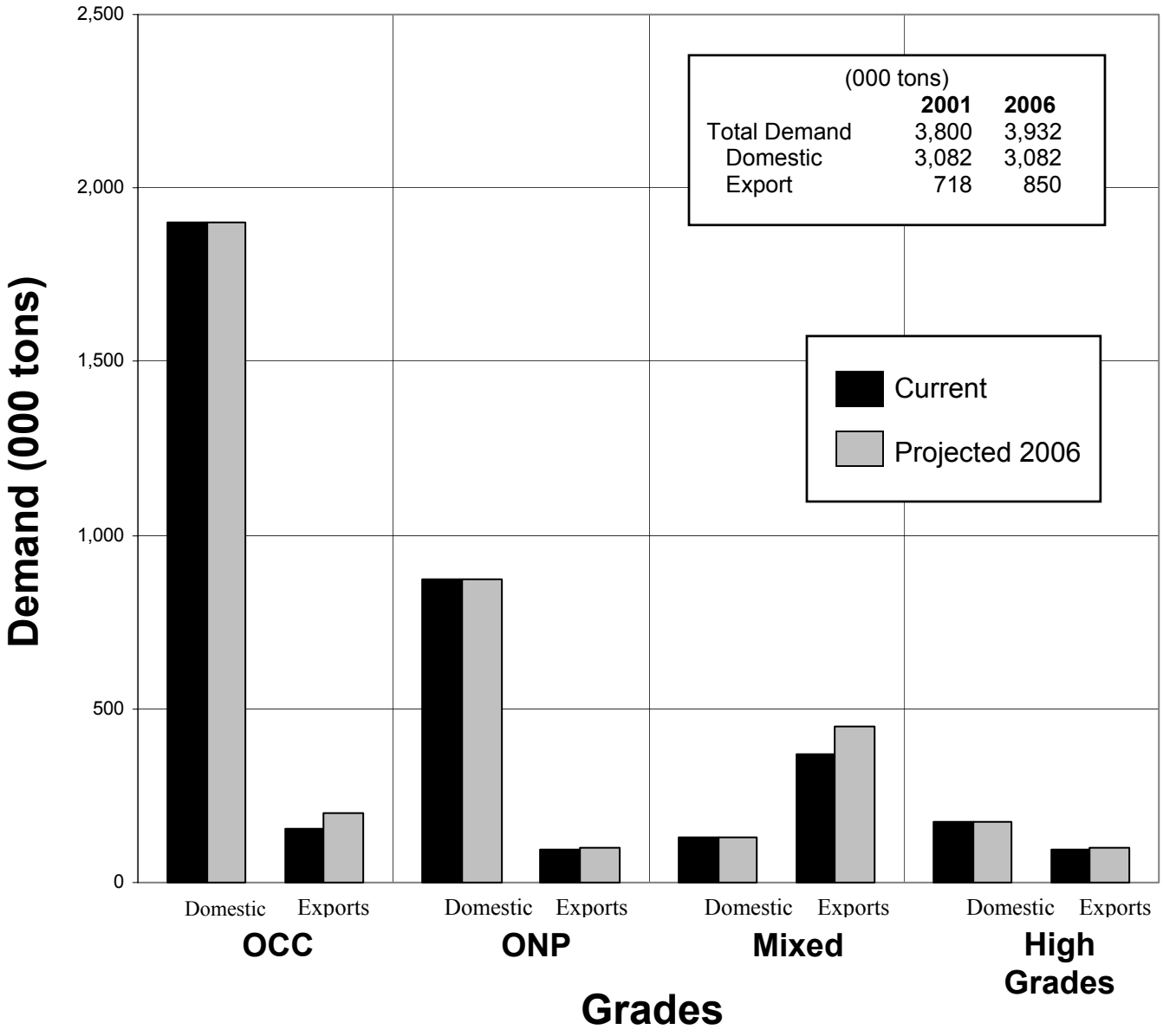
Our examination of mill characteristics indicates that the region has a disproportionately large share of mills with comparatively old, inefficient machines making commodity products such as linerboard and newsprint. Market demand growth for these products in the U.S. has moderated significantly, and no company in the studied region is considering building new capacity for their production. Also, the West Coast, and the Pacific Northwest in particular, has been a significant exporter of these paper/board products to Asian countries. In the past few years, significant new papermaking production capacity has been built in Asia, and more is currently under construction or in the planning phase. As Asian countries become more self-sufficient in their supply of paper and paperboard, exports from the West Coast will decline, prompting the closure of inefficient paper machines and mills.

The combination of moderating domestic demand and declining export sales of both linerboard and newsprint leads us to believe that there will be no significant increase in production of these grades (and their associated demand for scrap paper) in the Pacific Northwest during the studied period. In one or two isolated instances an existing old machine may be replaced with a new larger one with higher scrap paper requirements; however, we believe that this is highly improbable and therefore have not included any additional domestic scrap paper demand in our projections.

Regarding our projection of increased exports, recall that the U.S. consumption of paper and paperboard is projected by AF&PA to grow from 97.9 million tons in 2001 to 108.9 million tons by 2006. Further, Andover International's apportionment of the increase for the Pacific Northwest was from 3.38 million tons to about 3.64 million tons over the same time period. The PNW supply increase of 260,000 tons (3.64 million tons minus 3.38 million tons) provides ample opportunity to increase exports without diverting part of the paper/board needed by mills in the studied area. With only 50% recovery rates for the new supply, scrap paper recovery would increase by 130,000 tons—enough to meet the 132,000 ton projected increase in export demand. With Seattle and the Metro area both considering disposal bans and other initiatives, the PNW could generate even higher rates of recovery.

Figure III-6

Current and Future Demand for Scrap Paper in the Pacific Northwest



Source: Current - AF&PA; Future - Andover International

As indicated, there are ample domestic market opportunities for OCC, ONP and High Grades that may be recovered in the PNW. However, finding domestic market opportunities for additional tonnage of LQM will be a greater challenge if mill personnel persist in their refusal to use it as a partial replacement for OCC in corrugating medium manufacture. Obviously, there is the prospect of exporting more than the estimated amount, but the probability of that occurring is uncertain.

IV. Metro Region's Role as a Supplier of Scrap Paper

A. Scope and Approach

The purpose of this chapter is to assess the Metro region's role as a scrap paper supplier to mills in the Pacific Northwest and for export sales. As specified by Metro, we have focused on possible market opportunities for an additional 80,000 tons that it anticipates obtaining by outreach/education or, if necessary, by mandating recovery or banning disposal of scrap paper from commercial sources. The grades and additional tonnage Metro expects would be recovered include:

Grade	Tons
OCC	19,000
ONP	20,000
High Grades	10,000
Mixed	31,000

In assessing potential market opportunities for the additional tonnage, Metro requested that Andover International determine the following:

(a) whether there is likely to be a deterioration in scrap paper quality as a result of mandating recovery;
(b) what impact, if any, the additional tonnage of recovered material may have on future scrap paper prices; and
(c) what impact possible price changes in energy and wood chips may have on the demand for scrap paper in the studied region.

Andover International is fairly confident that there will not be any major problem selling any additional tonnage of OCC, ONP and High Grades to mills located in the Pacific Northwest; therefore, our principal focus is on investigating market opportunities (for domestic use and export sale) of the additional 31,000 tons of Mixed.

To achieve the objectives directly related to the Metro area, we:

- Reviewed and analyzed reports and other information provided by Metro.
- Compiled and analyzed information related to the characteristics of the mills in the Pacific Northwest.
- Interviewed key personnel that Metro identified as associated with the collecting, processing and purchasing of scrap paper.
- Interviewed other personnel who had a broad understanding of the current and future status of the paper industry and in particular that portion of the industry located in the Pacific Northwest.

Using the information derived from these analyses and interviews, we estimated future demand and made recommendations to help Metro achieve its goal.

B. Background and Bases of Analysis

The region served by Metro includes three counties and 24 cities. In aggregate, the population is about 1.4 million, of which about 40% live in Portland. Portland is also the home of about 53% of all business establishments in the metropolitan area.

All jurisdictions within the Metro region franchise or contract with haulers to collect both garbage and recyclables from residential and commercial sources—except for the City of Portland, which regulates but does not franchise or set service fees for commercial solid waste and recycling collection. All jurisdictions, including Portland, require regulated haulers to provide recycling services to both residential and commercial customers. All collection systems keep glass separated from paper. Most recycling systems commingle different grades of scrap paper to some extent, although large quantities of OCC and High Grades are collected in relatively pure concentrations from commercial generators throughout the region, especially by independent recycling collectors (who do not collect garbage and do not charge for recycling collection).

Another unique characteristic of the Metro area is the excess capacity of its processing facilities for separating commingled recyclables into saleable recovered products, such as aluminum/tin cans, plastics and all the major grades (and sub-grades) of scrap paper (OCC, ONP, High Grades and Mixed). A separate study sponsored by Metro and interviews we conducted indicate that many of these facilities

are operating at about 50% of capacity. Several respondents to our interviews want to operate a second shift if more material were available. Some of the processing facilities are owned and operated by paper companies, e.g., Smurfit, SP Newsprint and Weyerhaeuser; the others are, for the most part, integrated or closely allied with haulers and/or paper companies. Virtually all processors pay unaffiliated haulers and small independent recycling collectors to deliver their recyclables to the sorting facilities.

The mill ownership of some processing facilities implies that their principal focus will be to produce quality material for the parent company mills; the production of other grades would be a secondary consideration. Oregon law, however, forbids the disposal of collected recyclables, and Metro is engaged with processors in a voluntary program of monitoring quality and loss rates for recyclables.

In 2000, the Oregon DEQ sponsored a major study to assess the composition of the solid waste going to landfill. The results of this study, plus an independent analysis Andover International performed regarding supply/recovery of scrap paper, indicate that Metro's level of recovery is much higher than the national average of slightly less than 50%.

As shown previously (Table II-3) about 405,000 tons of scrap paper were recovered from the Metro area in 2001. Based on our estimate of total paper/board consumption in the Metro area, the current recovery corresponds to about a 65% fiber recovery rate. The Metro region's consumption of paper/board is significantly higher than its proportional population share of the total U.S. market would suggest; this statement is based on our assessment of the area's unique economic and demographic characteristics, which we used to apportion the total national consumption to individual states and metropolitan areas.

In this chapter, the nine individual paper stock grades included in AF&PA's reported data of Mixed are separated into two categories:

A. those grades such as: OMG, OTD, Soft Mixed and Hard Mixed, and
B. the remaining grades such as: Boxboard cuttings, Mill Wrap, Colored/Wet Strength Scrap, etc. (ref. Table II-2).

Grades included in Category A are suitable in newsprint and tissue manufacture; thus not classified as Mixed in this chapter. Grades included in Category B and referred to hence as Low Quality Mixed (LQM) are suitable primarily for recycled boxboard and gypsum linerboard manufacture.

The purpose of this re-definition is to better assess actual use of scrap paper by mills in the PNW and to assist in identifying potential market opportunities for the additional 31,000 tons of Mixed that Metro anticipates recovering from commercial sources.

C. Metro Current Share of PNW Scrap Paper Market

Table IV-1 shows the adjustments made to the AF&PA reported data as a result of separating the individual grades into the two aforementioned categories. More specifically, after examining the scrap paper requirements of the newsprint mills and the tissue mill in Oregon, AF&PA's reported 288,000 ton of Mixed was reduced to 53,000 tons of LQM. The rationale for this adjustment is that the reported 318,000 tons of ONP for newsprint mills was insufficient to meet their production requirements. Similarly, the reported 15,000 tons of High Grades was insufficient to meet the Georgia-Pacific Halsey's tissue mill feedstock requirements. The overall result of these adjustments is to point out the limited domestic requirement for LQM; thus, the need to upgrade some of the additional 31,000 tons of "Mixed" if it is to be sold to domestic markets. The alternative is to reduce the amount of "Mixed" by sorting it to make some Soft and Hard Mixed and to export the total 31,000 tons. Andover International estimates an uppermost potential of cutting the 31,000 additional tons of Mixed in half by sorting out Soft and Hard Mixed. This leaves, optimistically, about 15,000 tons of LQM to be marketed. It should be possible to blend about 500 tpy of the new LQM in with new Metro-area supplies of OCC, so long as the percentages meet mill specifications. PNW mills express unwillingness to take any more LQM than they currently receive. These mills say they can tolerate a 5% level of LQM in their OCC.

Table IV-1

Comparison: Reported vs. Adjusted PNW Scrap Paper Demand, 2001

	OCC		ONP		"MIXED"*		HIGH GRADE		TOTAL	
	Reported	Adjusted	Reported	Adjusted	Reported	Adjusted*	Reported	Adjusted	Reported	Adjusted
DEMAND (000 tons)										
Oregon	**1,129**	**1,129**	**342**	**446**	**334**	**99**	**55**	**186**	**1,860**	**1,860**
Domestic	1,106	1,106	318	422	288	53	15	146	**1,727**	**1,726**
Export	23	23	24	24	46	46	40	40	**133**	**133**
Washington (000 tons)	**930**	**930**	**526**	**526**	**399**	**399**	**85**	**85**	**1,940**	**1,940**
Domestic	797	797	453	453	75	75	30	30	**1,355**	**1,355**
Exports	133	133	73	73	324	324	55	55	**585**	**585**
Total PNW (000 tons)	**2,059**	**2,059**	**868**	**972**	**733**	**498**	**140**	**271**	**3,800**	**3,800**
Domestic	1,903	1,903	771	875	363	128	45	176	**3,082**	**3,082**
Exports	156	156	97	97	370	370	95	95	**718**	**718**
RECOVERY PNW (000 tons)	**824**	**824**	**379**	**379**	**312**	**312**	**120**	**120**	**1,635**	**1,635**
Oregon	333	333	203	203	81	81	62	62	**679**	**679**
Washington	491	491	176	176	231	231	58	58	**956**	**956**
RECOVERY PNW										
(%PNW Demand)	40%	40%	44%	39%	43%	59%	86%	44%	**43%**	**43%**
CURRENT RECOVERY Metro (000 tons)	176	176	122	122	59	59	48	48	**405**	**405**
Current % Total PNW Demand	8.5%	8.5%	14.1%	12.6%	8.0%	11.8%	34.3%	17.7%	**10.7%**	**10.7%**
Current % Domestic PNW Demand	9.2%	9.2%	15.8%	13.9%	16.3%	46.1%	106.7%	27.3%	**13.1%**	**13.1%**

Sources: AF&PA for demand; State officials for recovery. Adjustments to AF&PA reported data for Oregon made by Andover International.

* Refers to LQM

D. Principal Findings of Interview Program

Information gathered in an interview program was a key factor used in assessing Metro's potential ability to market the additional 80,000 tons of scrap paper. Accordingly, we have summarized this information before presenting our estimates of future sales opportunities.

Metro provided names and contact information for processors and mill personnel knowledgeable about the industry in the studied area. We contacted several individuals in each category. Since quality requirements for scrap paper used by newsprint, linerboard/medium and tissue mills are very dissimilar, our program included interviews with personnel of mills that make these products. We ceased the interview program when we began to receive similar responses from each new contact.

1. Processors

Practically all processor respondents indicated no concern about possible scrap paper quality deterioration if recovery from commercial sources is mandated. They reported that a significant amount of scrap paper from commercial sources is already being recovered, and they expect no quality problems associated with collecting and processing more. When queried about the prospect of having excessive amounts of OBB in their recovery of OCC, most responded that they have the equipment to effect the separation and produce the quality desired by the mills. One respondent said that OBB would be included with Low Quality Mixed and most likely exported: "There is a ready market for that stuff." Another expressed concern about food and-oil-contaminated OCC, but others pointed out that No. 11 OCC has an allowance of 5% for out-throws and prohibited materials. No. 12 OCC, Double Sorted Corrugated, has a much tighter allowance (2%) but commands a higher price that covers the cost of better sorting. Also, there is a limited market for No. 12 in the Pacific Northwest..

The principal material that would be recovered from multi-family dwellings is ONP. Processors expressed some concern about excessive amounts of OBB in the recyclables if a ban were imposed on this source of supply. One respondent indicated that ONP is presently being recovered separately from other recyclables in upscale dwellings by independent recycling collectors; hence, the percentage of OBB in the residual scrap paper is higher than normal. However, its separation was not perceived to be an insurmountable problem.

Respondents expect no quality problems associated with mandatory recovery from office buildings. All recognize that most of the recyclables collected from office buildings will be P&W paper, much of which can be upgraded to higher value-added grades such as OP-1, OP-2 and OP-3. There is a ready domestic and export market for these grades.

The opinions expressed by processors in the Metro area reinforce the findings of a recent related Metro study of communities that mandate recovery or ban disposal of scrap paper (*Impact of Mandatory Recycling Ordinances and Disposal Bans on Commercial Fiber Recycling*, by Moore & Associates), which found minimal if any quality deterioration of the recovered paper stock grades. Practically all respondents to our interviews maintained that the problem will be in collecting (getting businesses to source separate and pay costs of pickup for) the additional tonnage. Processors have sufficient existing capacity to accommodate all the projected additional 80,000 tons of recovered paper and support Metro's efforts to collect more.

All respondents were well aware of the freight cost advantages that Metro has in delivering scrap paper to mills in the Pacific Northwest. They are confident that every additional ton of OCC, ONP and High Grades recovered can be sold to mills in the Pacific Northwest. They are also aware that there is only a very limited domestic market for Low Quality Mixed paper. Any additional tonnage of Mixed must either be upgraded to the quality material required by domestic mills or exported. Exports of Low Quality Mixed are presently being shipped (by rail) to Mexico or overseas to Asian countries. Several processors who also "broker" tonnage mentioned that because of the limited number of containerized ships coming into Portland, they often are required to incur the additional freight cost (about $17/ton) to transport the material from Portland to Tacoma. This additional cost creates the desire for a minimum price which most believe is needed to handle Low-Quality Mixed; according to several respondents, this “floor price is about $70/ton.” In spite of the wide swings in the price of Low Quality Mixed, most respondents believed that rising export demand for this grade will provide the requisite floor price on a more consistent basis.

Reservations were raised about mandating recovery; several respondents pointed out that the major problem appears to be enforcing existing ordinances that require source separation, rather than creating new ones. Also, practically all respondents indicated that the major new supply of scrap paper would come from office buildings, particularly in downtown Portland.

2. Collectors

All respondents, both regulated haulers and independent recycling collectors, said that the residual sources of OCC are the small generators; the problem lies in collecting it economically. Because of its bulk, according to one processor who also collects, "You typically 'cubic-out' a truck long before you weight it out." This problem would not occur when collecting commingled scrap paper in a packer truck, which is more likely to be done by a regulated hauler.

Practically all respondents pointed out that most small generators have limited space to accumulate large quantities of material; hence, frequent pickups are necessary. Some regulated haulers and independent recycling collectors have solved the storage problem by providing wire cages that hold 5-6 cubic yards, equivalent to 400-500 pounds. The cages are picked up by a front-loading truck. However, in the opinion of one processor who also collects, "These guys can't even cover their out-of-pocket cost at $50/ton delivered to a packing plant. With prices fluctuating from $55/ton to $110/ton in less than six weeks, I am reluctant to start a program to collect OCC from small generators." He went on to say that he, and most likely others, would make a greater effort to recover OCC from small generators if they could be assured a price that would cover their total costs of collection and processing. Several regulated haulers, however, said that economics do not matter as much as generator cooperation and strong, ongoing outreach/education campaigns in attaining new recovery of scrap paper. Again, these responses echo Metro's survey of other communities.

One regulated hauler suggested that Portland institute a franchise collection system so that competition is on the basis of service, not necessarily the lowest price.

ONP and OMG are the principal scrap paper grades recovered from multi-family dwellings. Recovery of these grades from upscale dwellings is well established. Metro reports that roughly 80% of all multi-family sites in the region have recycling service, but the number of materials collected is limited at many sites. Numerous multi-family dwellings do not have sufficient storage space to accommodate steel dumpsters to accept all their recyclables. One respondent suggested establishing an ordinance requiring all new multi-family construction to have sufficient storage space (and access to it) to accommodate the larger/more economical recyclable containers. Another suggestion pertaining to curb-side pickup from residential sources but also applicable to commercial sources was the need to *standardize the collection system* throughout the metropolitan area.

All respondents indicated that office buildings offer the major residual source of scrap paper throughout the metropolitan area. Collection from the city of Portland presents the greatest challenge but, because of numerous office buildings, also the greatest opportunity. Several respondents noted that, because Portland has many large office buildings with many tenants, initiating and maintaining an effective recovery system is more difficult than in the other counties, which tend to have smaller office buildings with a single tenant and owner. Separate but related work that we have performed validates this observation. All other jurisdictions in the Metro area have franchises, however, which increases the opportunities for common-area containers and depots.

The lack of storage space to accommodate separate containers for recyclables and trash was another factor mentioned as inhibiting the recovery from office buildings. As with OCC, about 1,000 pounds/pickup was frequently mentioned as the minimum required to make separate collection of trash and recyclables economically practicable. Not all regulated/franchised haulers took this view, since they have opportunities to seek service fee adjustments outside the competitive sphere.

More than one respondent suggested that the problem with collecting more recyclables from office buildings resides as much with the hauler/collector as it does with the tenants: "It's an economic problem which requires the cooperation of both parties to resolve." Higher per-cubic-yard service fees for smaller containers can obstruct customer willingness to accept additional recycling containers.

One regulated hauler said he opposed any mandate/ban ordinance that cannot be enforced. He asked who would assure compliance and who would be penalized for non-compliance—the generator or the hauler.

3. Domestic Mill Personnel

All mill respondents welcomed the prospect of additional scrap paper supply from the Portland metropolitan area, although some expressed doubt about achieving the desired goal. Several respondents, echoing one of the processors we interviewed, questioned the effectiveness of mandating recovery and what impact that policy/regulation might have on scrap paper quality. All the reservations about quality centered on OCC; we repeatedly heard concerns about "Having too much OBB in our OCC." The reservations were about machine "runnability" and product quality. More specifically,

several stated that excessive groundwood in recycled boxboard would slow their machines: "We don't want any more than presently specified." Another mentioned that the groundwood in recycled boxboard is more hygroscopic than chemical fiber; hence, it reduces compression strength, particularly in a humid atmosphere, and is therefore entirely unacceptable. None expressed any willingness to use Low Quality Mixed as a partial substitute in corrugating medium manufacture, even though all knew that several U.S. mills are doing so.

No reservations were raised by newsprint mill personnel regarding quality problems introduced by mandating recovery, "Just as long as we get the same quality that we are presently receiving."

The cleaning/deinking systems of newsprint mills in the Pacific Northwest vary widely, as do the quality specifications for their product(s). Hence, one quality specification is not acceptable to all mills. Processors are well aware of the differences in quality required but, as mentioned previously, they believe they can meet the requisite standards.

None of the respondents said that their mill is likely to increase recycling capacity during the studied time period (through 2006). Most expressed concern about the future of the papermaking industry in the area, because growing papermaking capacity in Asia is likely to reduce exports of newsprint and linerboard from the Pacific Northwest. Also, most were aware of the moderating U.S. demand growth rates for paper/board and the declining U.S. level of production. Accordingly, while there does not appear to be any rise in scrap paper demand to support additional production, all respondents welcomed any additional supply from the Portland metro area because of the lower freight costs. They stressed, however, that they are unwilling to accept any deterioration in scrap paper quality. Their opinion seemed to be: "Export what we can't use here -- AF&PA tells us that export demand is going to increase significantly in the future."

E. Future Demand

Based on information obtained in our interviews and analyses of characteristics of mills in the Pacific Northwest, we conclude that there will be no increase in the domestic demand for scrap paper in the area through 2006; more likely, there will be a decrease. Nevertheless, Metro will have no difficulty finding domestic markets for any additional tonnage of OCC, ONP and High Grades, because mills in

the Pacific Northwest prefer to obtain their supply from the Portland area, which has a lower freight cost than more distant sources.

Finding domestic markets for the additional 31,000 tons of Mixed collected from office buildings will be more difficult. However, we believe that a substantial amount of the recovered Mixed Office Paper (MOP) can be upgraded to Hard Mixed (i.e., OP-1 and OP-2) and Soft Mixed (OP-3). There are sufficient domestic markets to accommodate any additional supply of these grades; the remaining paper, Low Quality Mixed, can be exported. We concur with AF&PA's forecast that export demand for this grade to Asian markets will increase substantially in the next four years, and the West Coast is a logical source of the additional requirement.

Some higher-value grades are presently being recovered from MOP; the challenge is to recover more. To achieve that goal requires the cooperative effort of the generators, haulers/collectors and processors. We recommend that the generators facilitate the potential upgrading process by setting up a limited source-segregation system within the offices. In this system the current in-office waste collection system is converted into a recycled paper collection system, and the hauler collects the material in the larger container as recyclable paper, rather than as waste.

The only changes in the present in-office disposal and collection of solid waste would be to set up small collection containers on each floor or in each office for non-paper office refuse, such as food packaging, plastic articles and putrescibles. The existing waste baskets and waste basket collection system would, in effect, be recycle collection systems, and the waste container picked up by the hauler would be the recycle container. The only additional operations in-office would be to collect the trash and move it to the loading area. Since the non-paper trash will be a small fraction of the total solid discharge, the incremental in-office cost will be minimal.

Because of the existing relatively poor quality of Mixed feedstock and the high cost of sorting it, facilities in the Metro area presently extract only a limited amount of OP-1, OP-2 and OP-3. Related work that we have performed supports the recommendation that instituting a limited source-segregation system in the office improves the quality of the feedstock to processing facilities and, hence, the economics of recovery.

Several processors in the Metro region say they welcome the prospect of additional tonnage and state that they already handle mixed loads adequately for end-market purposes. In additional, several technologies can reduce these processing costs. One equipment supplier, MSS/Weyerhaeuser, claims that new technology is available to extract economically a larger portion of these grades. This new technology is being used in a Denver sorting facility. A letter describing its benefits is contained in Appendix E. Van Dyk Baler Corporation offers a Bollegraff Paper Spike to remove small pieces of OCC and OBB from commingled loads.

Not all the scrap paper from commercial/office buildings will be recovered as High Grades; there still will be a substantial portion of LQM**.** Reducing the amount of Mixed (i.e., the broad category of Mixed from which Soft and Hard Mixed can be extracted) requires adaptation of the recommended collection system and, possibly, the introduction of new processing technology to make recovery of the High Grades cost effective. To implement the recommended collection system, which we view as the first essential step in recovering more High Grades, we suggest that Metro undertake a widespread education/awareness program to convince office building managers and company CEOs of the advantages of the new collection program and its importance in meeting the area's solid waste reduction target. To the extent possible, given the many separate haulers/collectors and jurisdictions, the collection system should be uniform throughout the area, to facilitate collection and processing. The education/awareness program should be a continuous effort, since most individuals fall back into old practices if not reminded of the necessity for change.

Table IV-2 summarizes the current and future domestic and export demand for scrap paper in the Pacific Northwest and Metro's role in serving that market**.** Note that this table shows Andover International's adjusted estimates for ONP, High Grades and Mixed. Note that we have assumed that about 50% of the additional 31,000 tons of Mixed, recovered primarily from office buildings, can be upgraded to Soft and Hard Mixed, and we have allocated the tonnage of these grades to ONP and High Grades, respectively. The residual additional tonnage (15,000 tons) is assumed to be Low Quality Mixed that will be exported. There is also the prospect that about 500 tons of the new LQM might be blended with projected new supplies of OCC without violating current mill standards. Obviously other assumptions can be made regarding how much of the MOP can be up-graded; the key finding is that the additional tonnage will not significantly affect the Metro region's market share of the Pacific

Northwest's requirements. Accordingly, we conclude that the additional tonnage would have no adverse impact on the region's ability to sell its additional scrap paper or on scrap paper prices.

Table IV-2

Metro's Current and Future Role in Supplying Scrap Paper to Pacific Northwest Markets

	OCC		ONP		LQ MIXED*		HIGH GRADES		TOTAL	
	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future
DEMAND (000 tons)	2,059	2,103	972	975	498	578	271	276	**3,800**	**3,932**
Domestic	1,903	1,903	875	875	128	128	176	176	**3,082**	**3,082**
Export	156	200	97	100	370	450	95	100	**718**	**850**
RECOVERY From Metro (000 tons)	176	195	122	150	59	74	48	66	**405**	**485**
% PNW Requirement	8.5%	9.3%	12.6%	15.4%	11.8%	12.8%	17.7%	23.9%	**10.7%**	**12.3%**

*Low Quality Mixed

Source: Andover International estimates.

F. Impact of Energy and Wood Chip Prices on Pacific Northwest Demand for Scrap Paper

The costs of energy and wood chips affect paper/board products in different ways; hence, each will be discussed separately.

1. Energy

In the recent past, perceptions of electric power shortages have triggered dramatic energy cost increases. This temporary phenomenon is not likely to happen again over the studied period. Accordingly, in assessing the possible impact of energy costs on the demand for recovered fiber, we have assumed more modest price increases prompted by higher "pass-through" costs for fossil fuel.

Energy costs have their greatest impact on the "mechanical" grades of paper, such as newsprint, directory, coated/uncoated groundwood P&W paper and so-called groundwood specialties. Depending on the grade, the manufacture of mechanical pulp from wood chips (excluding the papermaking)

requires 2,400 - 3,000 kWh/ton; thus, even a modest power cost increase would result in a substantial increase in the cost of production. By comparison, the manufacture of deinked pulp for newsprint manufacture requires only 500 - 600 kWh/ton. The facile but erroneous conclusion drawn from this comparison would be that higher electric power costs would prompt the construction of new, or the expansion of existing, deinking facilities for newsprint and other groundwood paper manufacture. However, because of stagnant and even declining U.S. newsprint consumption and the unusual number of old, comparatively small machines in the Pacific Northwest, company officials are unlikely to make major capital investments to prolong the life of inefficient machines and mills. Rather, they are more likely to idle these inefficient facilities and run their more efficient mills in other part of the country at full capacity.

Thus, contrary to intuitive thinking, high energy costs will reduce scrap paper demand in the Pacific Northwest because of mill closures. The reduction will be modest, because the larger more efficient mills will continue to operate. Furthermore, Metro's favorable freight cost when supplying mills in the Pacific Northwest will help to maintain the demand for scrap paper from the Metro area.

2. Wood Chips

The supply and associated cost of wood chips in the studied area has varied widely in the past decade. The sharp decline in "allowable cut" from federal lands caused by environmental factors (the spotted owls) forced the closure of many sawmills, reducing the chip supply. The chips used for paper/board manufacture are, of course, a byproduct of the lumber industry; hence, sawmill closures translate to fewer wood chips for paper/board manufacture.

The current administration in Washington has restored much of the allowable cut reductions that were made by the previous administration. Larger timber harvests from federal lands will increase the chip supply. In addition, many of the seedlings planted on private land 70-80 years ago have reached sawlog size and are ready for harvesting. A third source of wood chips is from "hybrid aspen," a genetically altered species that reaches "pulpwood size" in 8-10 years. While the papermaking fiber from this species does not replace the need for that of the conifers (Douglas fir and others), it is suitable, in limited quantity, for tissue and P&W paper manufacture.

The overall result of the increased wood fiber supply will be to discourage any "demand pull" price increase for scrap paper. Furthermore, if a significant wood chip price increase were to occur, paper mill officials would most likely close old machines rather than make major capital investments to expand existing recycling capacity or build new facilities. Thus, similar to high-cost energy, high-cost wood chips would result in a reduction, rather than an increase, in scrap paper demand in the Pacific Northwest.

V. Factors Affecting Future Scrap Paper Prices

A. Scope and Approach

The principal purpose of this chapter is to identify and discuss key factors influencing future scrap paper prices to 2006. While price forecasts would be outside the scope of this study, we have included historical prices that Metro has provided for selected grades. These prices provide a convenient starting point for discussing which factors exert the most influence on future price trends. Scrap paper is a world-traded commodity; hence, prices in the Pacific Northwest are influenced by overall U.S. and global supply/demand conditions (including exports).

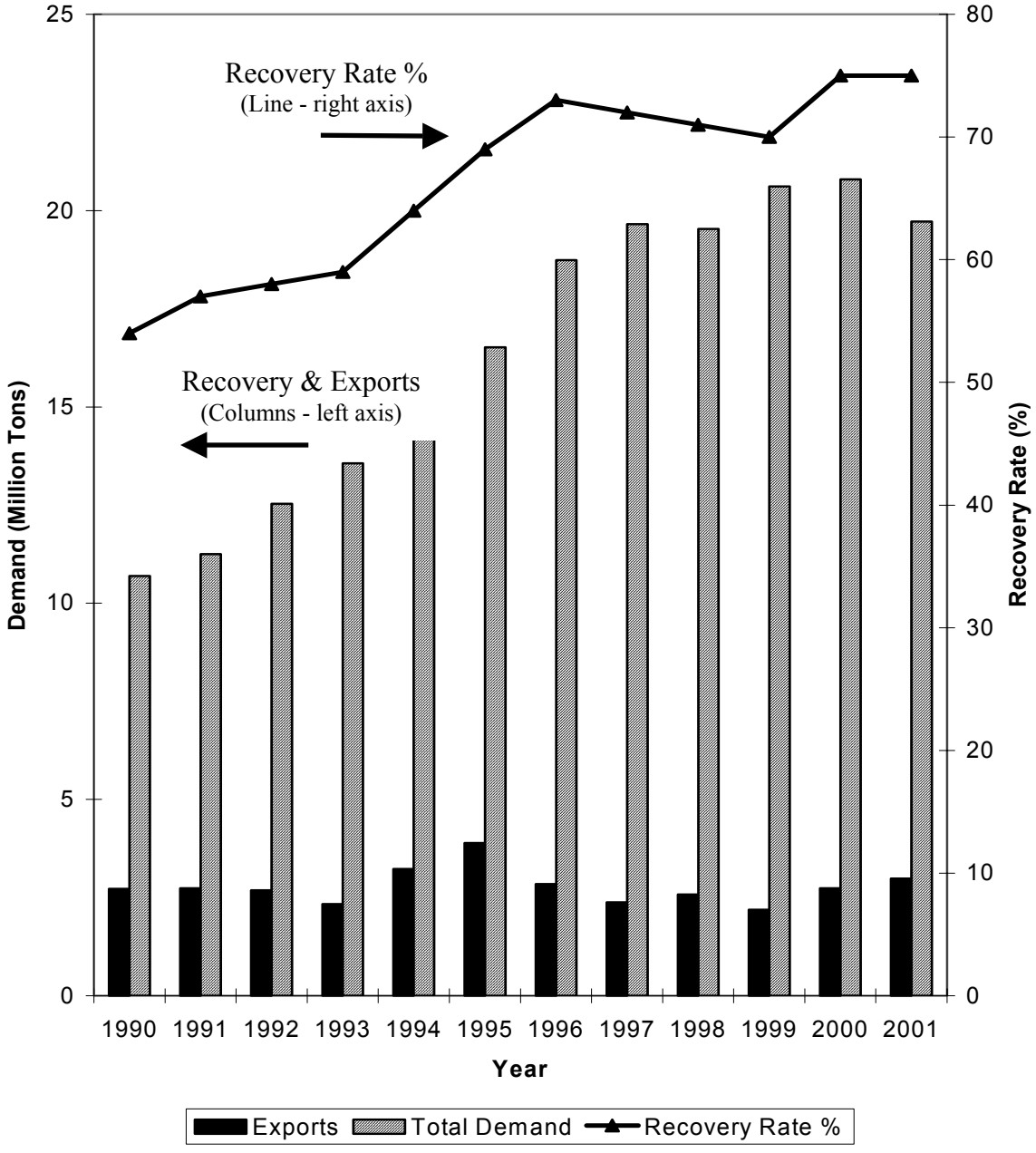
B. OCC Analysis

Figure V-1 tracks the historical U.S. demand (including exports) for OCC and indicates that recovery has increased from about 13.4 million tons in 1990 (including exports) to about 22.6 million tons by 2001, while the recovery rate increased from 54% to 74% over the studied time period. These are historical AF&PA data; accordingly, we have not included our estimates of the additional tons of imported corrugated packaging containers.

Figure V-2 plots historical OCC prices (f.o.b. shipping point) against recovery rates and indicates no correlation between the two. Experience has demonstrated that sudden changes in either the supply or the demand, not recovery rates, cause the peaks and valleys in the prices of all grades of scrap paper. Other factors mistakenly proposed as key indicators of future prices include tipping fees and mill operating rate. Comprehensive analyses we have made comparing regional tipping fee with the price of OCC (and other grades) indicates no correlation whatsoever. For example, the Los Angeles market area frequently exhibits the highest U.S. prices but has one of the lowest tipping fees in the country. Similarly, we have compared industry operating rates for linerboard and medium manufacture with OCC prices and found no correlation.

Figure V-1

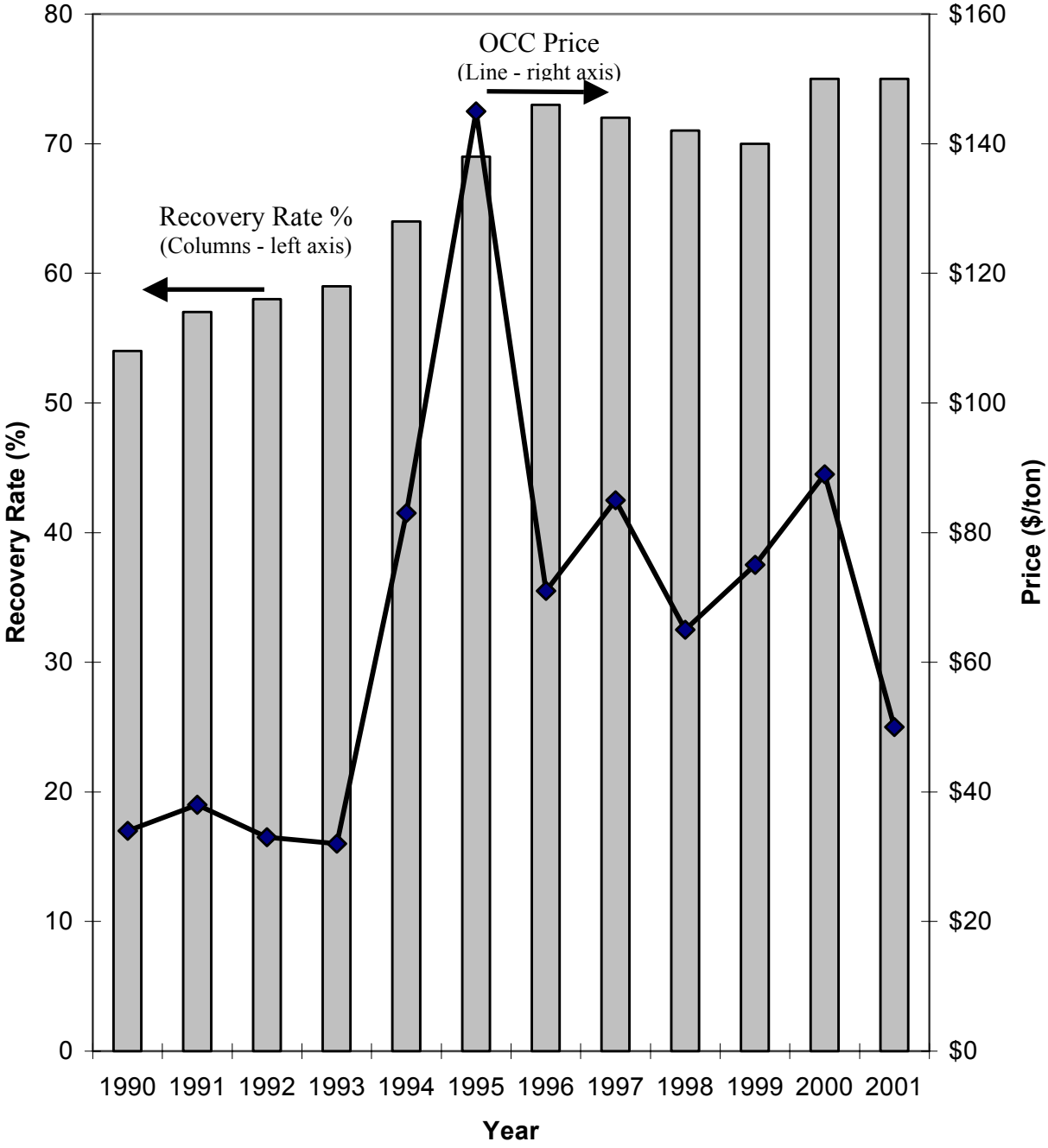
Historical U.S. Demand and Recovery Rates for OCC



Source: AF&PA

Figure V-2

Historical U.S. Recovery Rates and Prices for OCC



Source: Recovery rates reported by AF&PA; national average OCC prices (baled, f.o.b. shipping point) provided by Metro

As indicated, we believe that the key determinant of future prices will be sharp increases in the supply or demand for OCC. To our knowledge, no sharp increase or decrease in the consumption of corrugated containers (i.e., the supply of OCC) is expected in the U.S. over the next 3-4 years; hence, the long-term supply appears fairly stable. Of course, short-term supply/demand spikes can occur because of unforeseeable events such as dock strikes, shortage of containers and interference with collection by bad weather. Figure V-3 illustrates the magnitude of the price swings caused by short-term interruption of either supply or demand.

Such short-term interruptions have occurred on the West Coast in the past few months, causing OCC prices to fluctuate from $55/ton in December 2002 to about $105/ton in March 2003. Prices have declined more recently to about $70/ton. Short-term fluctuations will continue in the future, but we do not believe a new long-term "floor price" will be created because of the expected increase in export demand. We doubt that this increase will exceed our estimate of 74% attainable rate of recovery of the supply (including imported corrugated containers**);** hence, prices are likely to continue their recent short-term fluctuations.

C. ONP Analysis

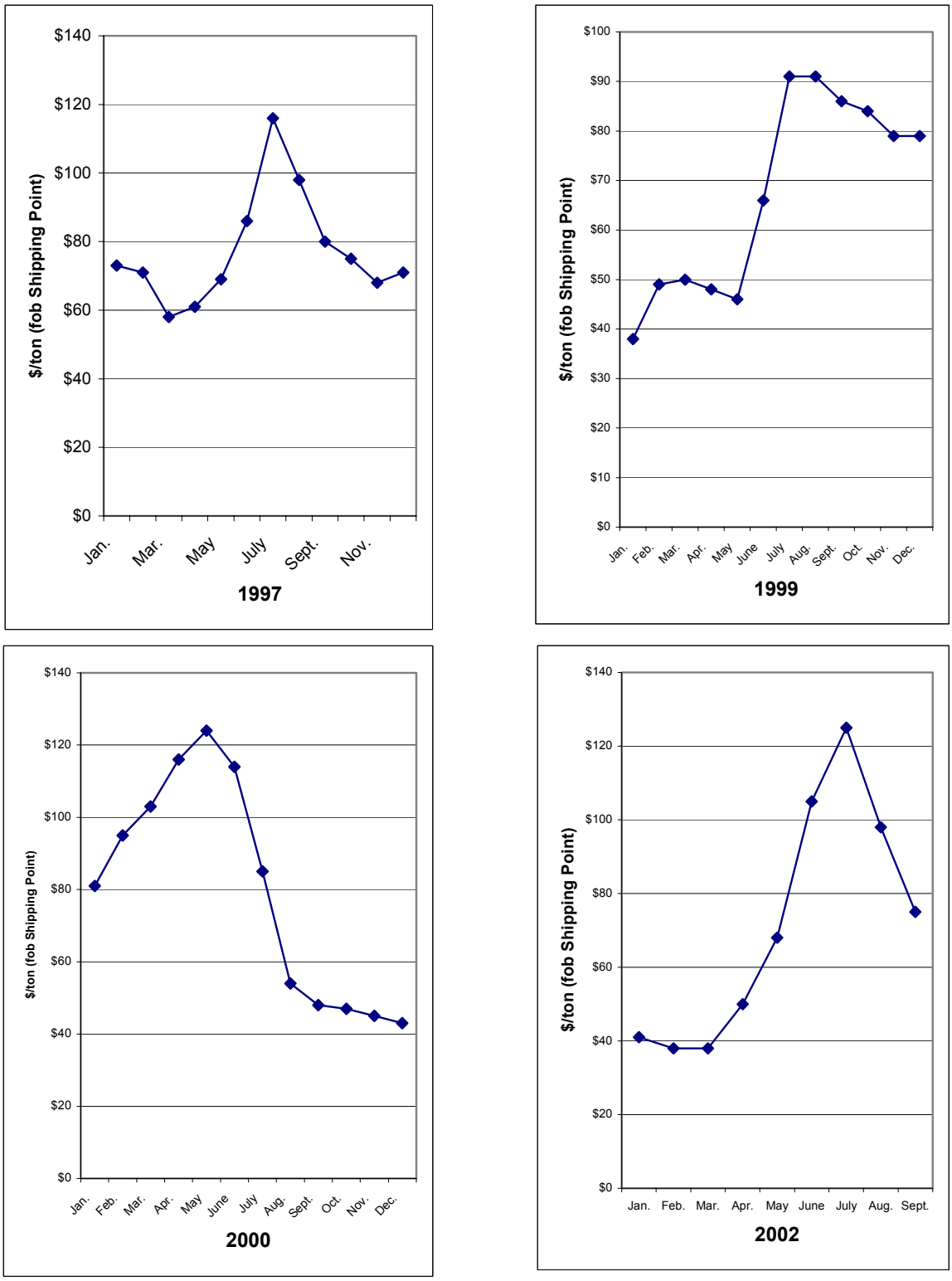
Figure V-4 compares the historical prices for ONP No.7/8 in the U.S. and Pacific Northwest. These data were provided by Metro from a study done locally, and using the assumption that the prices pertain to an ONP grade containing about 7% OMG and direct mail. The price of a "true" No.8 ONP is generally $5-7/ton higher than No.7 ONP because of its more stringent quality requirements.

[FRED: THE PRICE GRAPHS IN THIS FIGURE ARE NOT LABELED.]

Figure V-3

OCC Price Variations

Basis: National average prices, f.o.b. shipping point

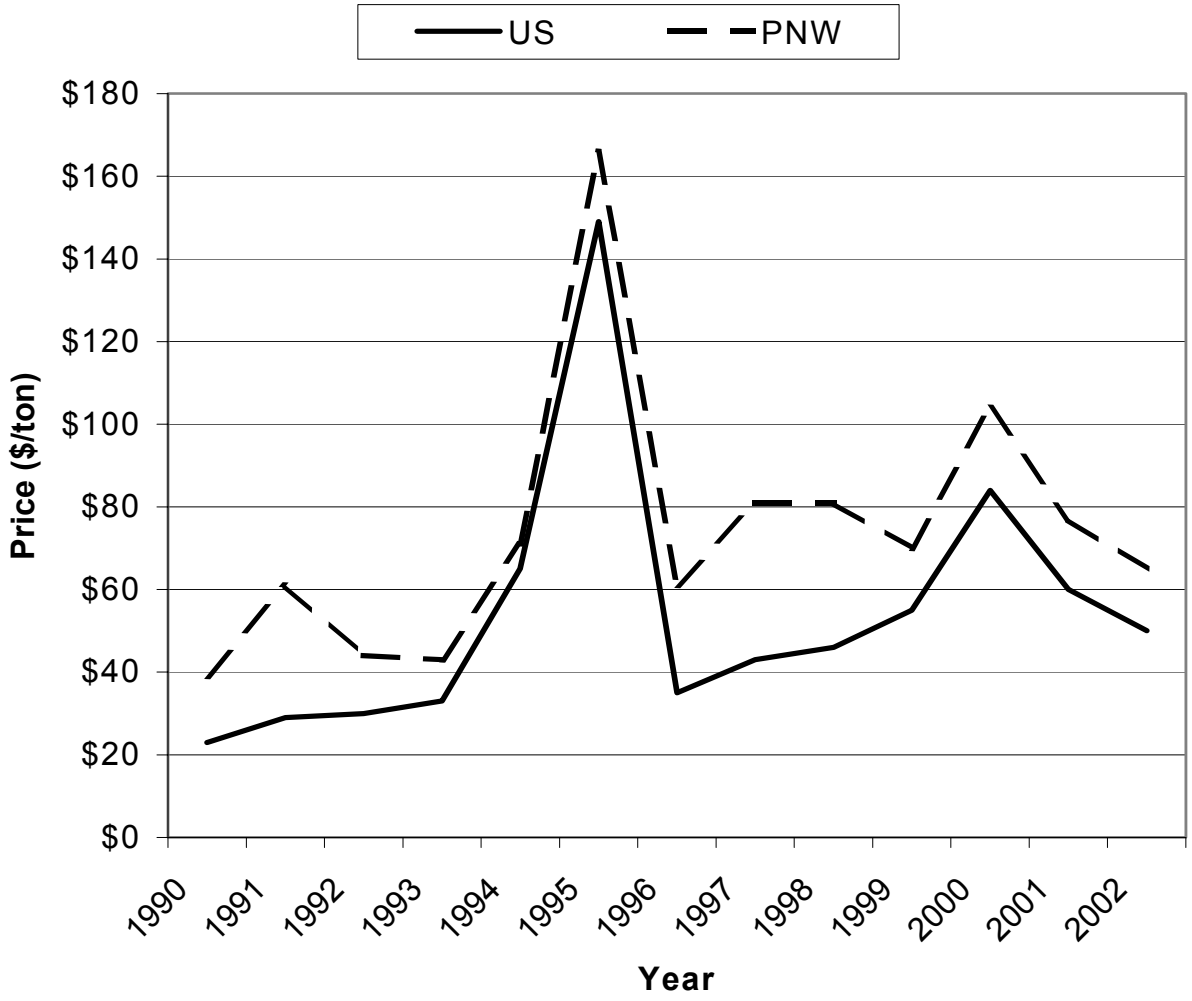


Source: Pulp & Paper Week.

Figure V-4

Historical No.7/8 Old Newspaper Prices

Basis: Price $/short ton f.o.b. shipping point



Basis: Annual average of reported price range

Sources: City of Portland Data, Pulp & Paper Week

The price comparison indicates that Pacific Northwest prices are generally $10-$15/ton higher than average U.S. prices. The reported price differential may be the result of comparing domestic versus export prices. For example, the current (May 2003) domestic price for No.7 ONP is $85-90/ton while that for export (delivered to pier) is $115/ton. Similarly, the current domestic price for OCC is $65-$70/ton while the export rate is $85/ton. Although the historical data provided by Metro lack specificity, they illustrate the average year-to-year changes in price. However, as with OCC, month-to-month variations are greater. For example, domestic prices for No.7 ONP in the Pacific Northwest in March 2003 were $110-115/ton while in May 2003 they dropped to $90-95/ton (f.o.b. shipping point).

The key question concerning future ONP prices is the validity of AF&PA's forecast that demand (domestic and export) will exceed the economic level of recovery. AF&PA believes that when demand exceeds their estimated economic level of recovery (72%), grade substitution must occur**.** If that were to happen, ONP prices would naturally increase substantially. Contrary to the AF&PA's published forecast, however, we doubt that ONP demand will exceed the economical level of recovery by 2006. As discussed previously, AF&PA based its forecast of domestic demand on the assumption that scrap paper "consumption is at capacity level of production." A review of the historical data indicates that this conclusion substantially overstates domestic demand; mills seldom operate at full capacity. Second, although AF&PA now includes newspaper inserts and flyers made from P&W paper as part of its potential ONP supply, it fails to take into consideration that estimates of ONP use reported by some domestic mills include substantial amounts of OMG and direct mail. Also, No.6 ONP (frequently referred to as "board grade news") contains OMG, OCC, OBB, direct mail and other non-newsprint grades. Finally, we question whether AF&PA's ONP export demand data take into consideration the increased recovery of ONP in countries that install new machines to make newsprint.

Based on our analysis of historical data and more recent information, we believe that ONP prices will continue to fluctuate in their historical range ($70-120/ton) rather than spike to about $200/ton as occurred in 1995.

D. Mixed Analysis

AF&PA does not publish data on the demand for LQM. Accordingly, the historical data presented here is for the broad category of Mixed, which includes OMG, OTD, Soft Mixed, etc. The key factor

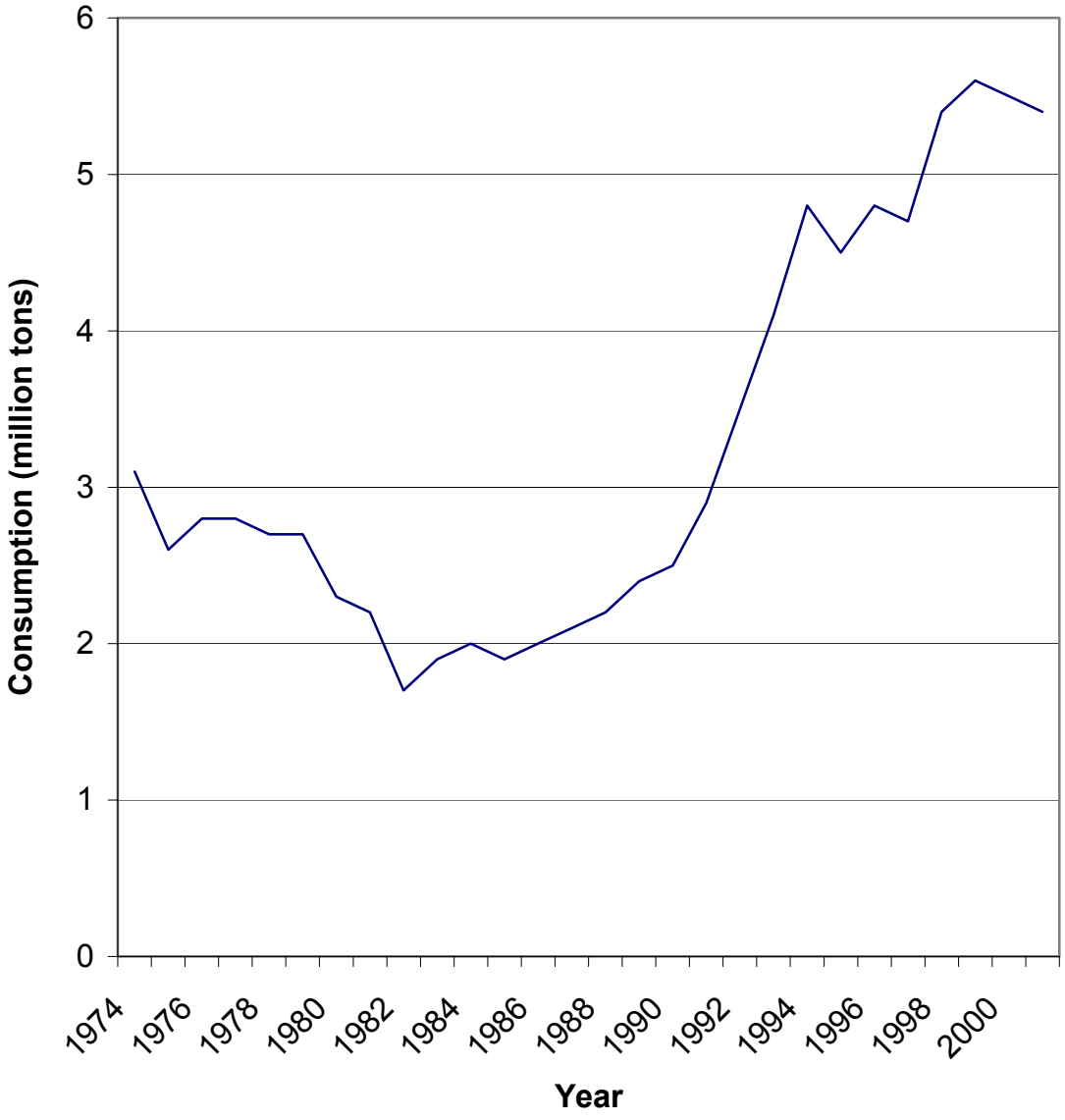
influencing the future price of Mixed is its future demand. **Figure V-5** tracks the U.S. domestic demand for Mixed and indicates that the demand has increased from about 3.1 million tons in 1974 to 5.4 million tons in 2001. Recognize that the composition of Mixed as reported by AF&PA has changed significantly over that period; hence, historical price series can be misleading. As discussed previously, the category of Mixed includes nine different paper stock grades: OMG, OTD, Soft Mixed White, Mixed Paper, Boxboard Cuttings, etc. (ref. Table II-2). In the past (circa 1970-1985), most of the Mixed was low-quality material used in recycled board and gypsum linerboard manufacture. As the production of recycled board declined over this period, demand for Mixed also declined. Consumption by domestic mills began to increase in the mid-eighties as deinking facilities began using OMG, OTD, and direct mail in their feedstock. Some mills reported those grades under the broad category of Mixed as defined by AF&PA. Other mills reported the use of these grades as ONP. Thus, the historical data provides a guide but not detailed information regarding the composition and amount of the individual paper stock grades included in the broad categories of ONP and Mixed.

Lacking precise information on the domestic demand for LQM, we have relied on our knowledge of the industry to discuss growth trends for this sub-category of Mixed. Recall that we previously subdivided Mixed into three groups -- Soft Mixed (used in newsprint and groundwood paper manufacture), Hard Mixed (used in tissue and P&W paper manufacture) and LQM, used primarily in recycled board and gypsum linerboard manufacture. Some LQM is also used as a partial substitute for OCC in corrugating medium manufacture, but the amount used is nominal because not all U.S. mills are equipped to handle this grade.

We believe that the domestic demand for LQM will remain flat through the studied period. However, the use pattern is likely to change. More specifically, in the past three years several recycled board mills have been idled and are not likely to reopen, thereby decreasing demand in this end-use. On the other hand, we expect more LQM to be used in the future as a partial substitute for OCC in corrugating medium manufacture; progress will be slow but is inevitable because it is economically beneficial. New technology and industry practices that initially increase the profits of a select few are eventually adopted by others so that they will not be at an economic disadvantage.

Figure V-5

U.S. Recovered Mixed-Grade Paper Consumption



Source: AF&PA.

While we believe that domestic demand for LQM will remain essentially flat, growing export demand will be the key influence on future prices. . Based on a robust export demand for LQM, we believe that future export prices will be in the more recent range of $65-90/ton delivered to portside. Such prices would generally exceed the $70 "floor price" cost that some Metro area processors identify as break-even for preparing and delivering the LQM for export.

E. High Grades Analysis

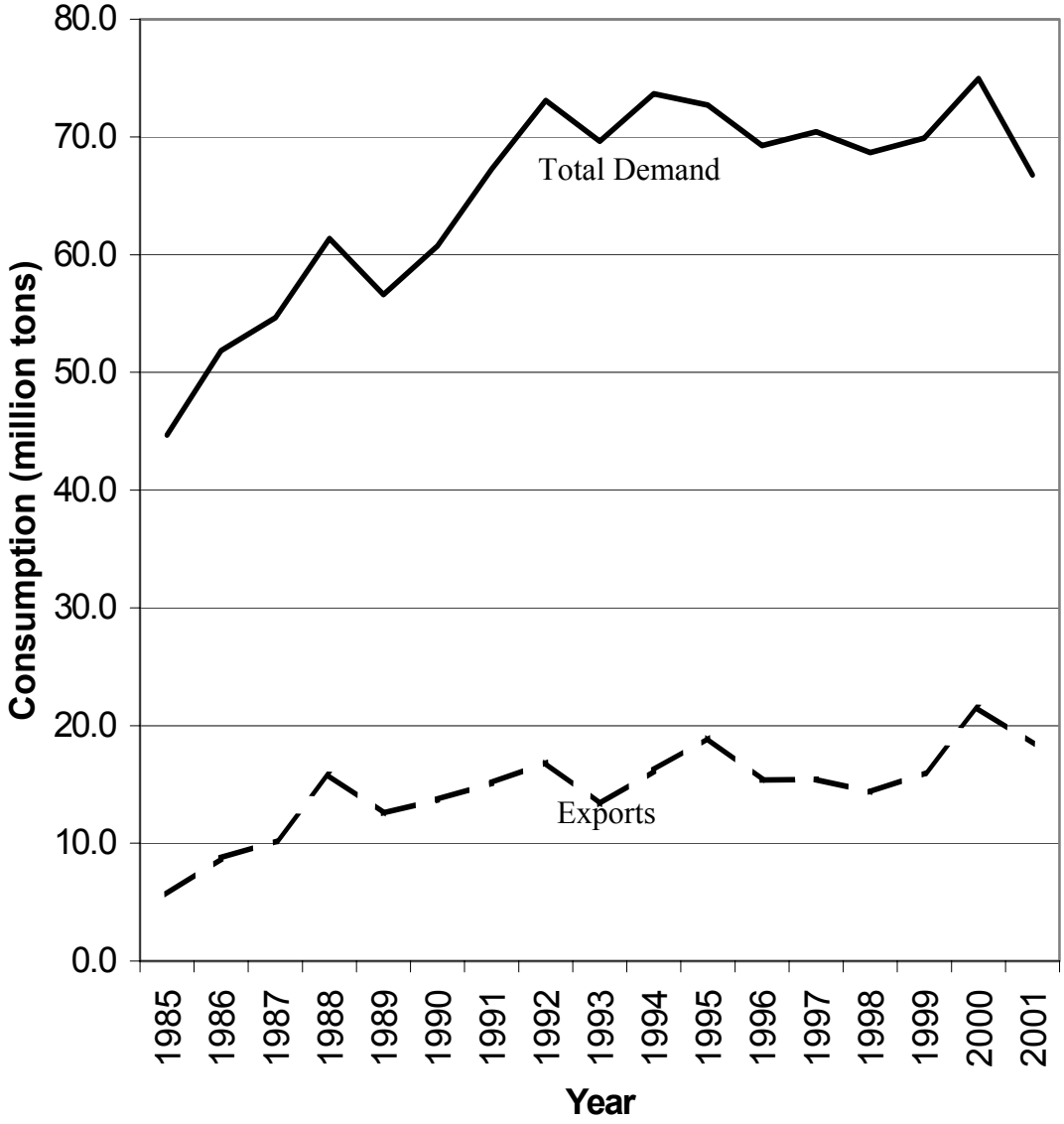
The future price of bleached hardwood kraft pulp is the key factor that will influence the price of High Grade scrap paper. Social pressures to include recycled fiber in P&W paper have decreased demand in this end-use, but its demand is expected to continue to grow modestly in tissue manufacture. Export demand is also projected to increase moderately.

Figure V-6 tracks the historical demand for of High Grades and indicates modest growth in the past few years. Note that High Grades include Pulp Substitutes (P/S) and High Grade Deinking, in keeping with the terminology used by state officials in the Pacific Northwest.

Because of the moderate demand growth for High Grades and the abundant current and future supply of bleached hardwood kraft pulp with its comparatively low future price, we believe that prices for High Grades will remain within their present range (about $95-135/ton for Office Paper and about $180-240/ton for Sorted White Ledger). The price range cited includes those for domestic and export sale.

Figure V-6

U.S. Recovered High Grades* Paper Consumption



*Includes P/S and High Grade Deinking

Source: AF&PA.

Appendices

APPENDIX A

Capacity for Recycled-Content Product and Recycled Pulp Production in the Pacific Northwest

Basis: Daily Capacity (tpd)

Company/Location	Finished Product	Recycled Pulp Production	Grades Used
Oregon			
Newsprint/Groundwood Specialties			
Blue Heron, Oregon City	650	375	ONP, OMG, Special News, and Special Deinking Quality ONP
SP Newsprint, Newberg	1,100	600	ONP, Special News, Special News Deinking Quality
Total	**1,750**	**975**	
Tissue			
Georgia-Pacific, Halsey	260	300	High grades
Linerboard/Corrugating Medium (including White Top Liner)			
Georgia-Pacific, Toledo	2,275	850	OCC
Weyerhaeuser, Springfield	1,430	500*	OCC, DLKC, Dbl. Sorted White Ledger & BL Kraft Cuttings
Weyerhaeuser, Albany	1,550	1,000	OCC, DLKC
Weyerhaeuser, North Bend	650	700	OCC
Total	**5,905**	**3,050 100**	**OCC and related P/S (No Deinking)**
Washington			
Newsprint/Groundwood Specialties			
Daishowa, Port Angeles	450	190	ONP & OTD
Inland Empire, Spokane	450	150	ONP, OMG, OTD and Coated Grwd Sections
North Pacific, Longview	2,000	450	ONP, OMG and Coated Grwd Sections
Ponderay, Usk	720	120	ONP & OMG
Total	**3,620**	**910**	
Linerboard/Corrugating Medium (including White Top Liner)			
Longview Fiber, Longview	3,800	1,400	OCC, DLKC, Kraft Bag Cuttings & Multi-Wall Trimmings
Port Townsend, Port Townsend	575	50*	OCC & DLKC, Kraft Bag Cuttings & Multi-Wall Trimmings
Simpson, Tacoma	1,320	400*	OCC, DLKC, Kraft Bag Cuttings &* Multi-Wall Trimmings
Total	**5,695**	**1,850**	
P&W Paper and Tissue			
Georgia-Pacific, Camas	1,490	100	P/S
Recycled Boxboard (inluding Tube Stock			
Smurfit, Tacoma	120	150	LQM, Boxboard Cuttings, OCC & DLKC
Sonoco, Sumner	115	150	LQM, Boxboard Cuttings, OCC & Over Issued News
Total	**235**	**300**	

***Not reported; estimated.

Source: Lockwood Directory, 2003 Edition.

APPENDIX B

Advanced Sorting Technologies, LLC

April 30, 2003

Fred Iannazzi
Andover International Associates
25 Cherry Street
Danvers, MA 01923

Dear Mr. Iannazzi:

As you requested, I have summarized the key economic advantages of the MSS PaperSort™ system. As described more fully in the material sent to you, the system can be used to sort recyclables recovered from either residential or commercial sources. Since you expressed a specific interest in its application to handle mixed office waste (MOW), I have focused on its application in that area.

Throughput
Compared to manual sort of MOW, our automated paper sorting equipment can produce high quality recovered paper grades (sorted white, colored ledger and OP-1, 2 & 3) at about three times the production rate of the more traditional manual sort system i.e., up to 6 tph. Our system can accommodate feedstock with a contamination level of 30% while producing the above listed grades.

Reliability
A chief concern among paper makers is variability in their feedstock. The PaperSort™ assures reliable quality since the sorting, does not rely on human judgement that frequently varies as the work-day progresses.

Quality
The economic benefit of up-grading MOW rather than selling it as Mixed, depends on the percentage of the higher grades recovered. The PaperSort™ increases both the reliability and the quantity of high quality materials.

Flexibility
The high speed PaperSort™ system can be utilized for many different sorting tasks and does not have to be re-trained. Once it is set-up, changing the sort is a matter of seconds.

There are three commercial installations currently in operation: Baltimore, MD, Denver, CO, and Gothenburg, Sweden. The two in the United States are primarily focused on processing MOW into high grades. While these facilities were built specifically to accommodate our PaperSort™ system, the equipment also could be added to an existing sorting equipment and achieve the aforementioned benefits.

Experience has demonstrated that while the PaperSort™ equipment accommodates undifferentiated office solid waste, the economics of the operation are greatly enhanced by making an initial sort at the point of discard to remove trash and "brown" paper.

I would be pleased to set-up an appointment to have you and any of your associates visit either one of our two U.S. plants. Also, we would be prepared to share with you, preliminary estimates of investment and operating costs for our PaperSort™ equipment.

Please contact me if you have any further questions about our system. Also, I would welcome the opportunity to visit with your client in Portland, Oregon (at no cost to him) to discuss the economic benefit of the PaperSort™ system.

Sincerely,

Felix Hottenstein
Sales Director - AST, LLC

APPENDIX C

List of Survey Respondents

Recycling Collectors/Processors

Steve Jenkins
Environmental Fibers International
4325 N. Commerce
Portland, OR 97217

Jeff Murray
Far West Fibers
644 SE Alexander Street
Hillsboro, OR 97123

Andy Kahut
K.B. Recycling
P.O. Box 550
Canby, OR 97013

John Lucini
SP Recycling Corp
15350 SW Sequoia Pkwy Suite 150
Portland, OR 97224

Brad Lewis
Weyerhaeuser Paper Company
5505 SW Western Avenue
Beaverton, OR 97005

John Matthews
Garten Foundation

Regulated Haulers

Dean Kampfer
Waste Management of Oregon

Eric Merrill
Arrow Waste Connection

Mill Personnel

Ryan Wurglas
OPE (the Portland Metro Division of Arrow)

Wayne Evans
Georgia-Pacific
Halsey, OR 97348

Bob Kovich
Georgia-Pacific

Les Joel
Blue Heron Paper Co.
Oregon City, OR 97045

Pete Grogan
Weyerhaeuser Co.
Tacoma, WA 98477

A senior executive of a large company who wishes to remain anonymous.

Others

Felix Hoftenstein
Advanced Sorting Technologies, LLC