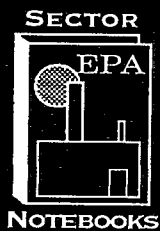
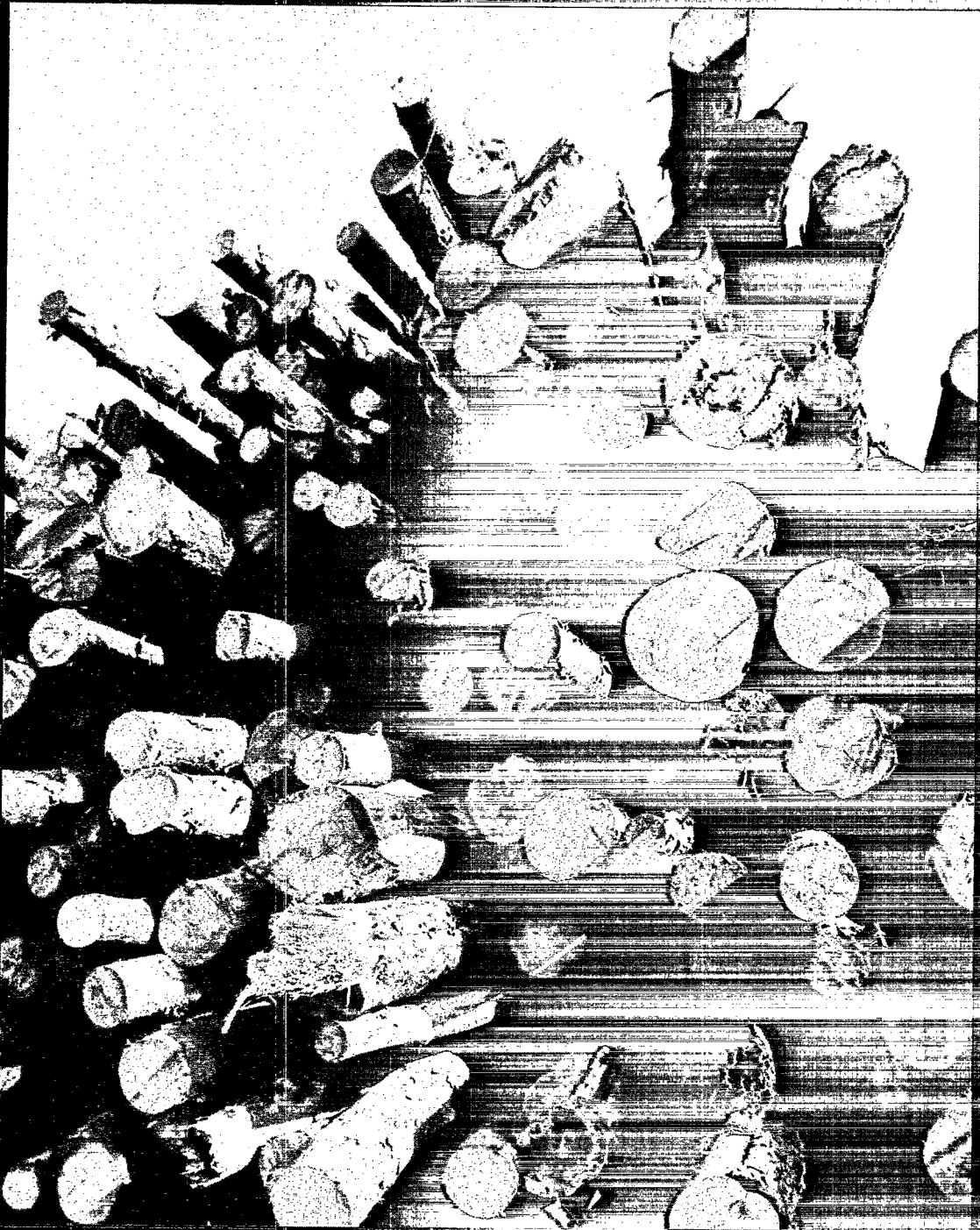




Profile Of The Lumber And Wood Products Industry





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

THE ADMINISTRATOR

Message from the Administrator

Over the past 25 years, our nation has made tremendous progress in protecting public health and our environment while promoting economic prosperity. Businesses as large as iron and steel plants and businesses as small as the dry cleaner on the corner have worked with EPA to find ways to operate cleaner, cheaper, and smarter. As a result, we no longer have rivers catching on fire. Our skies are clearer. American environmental technology and expertise are in demand throughout the world.

The Clinton Administration recognizes that to continue this progress, we must move beyond the pollutant-by-pollutant approaches of the past to comprehensive, facility-wide approaches for the future. Industry by industry and community by community, we must build a new generation of environmental protection.

Within the past two years, the Environmental Protection Agency undertook its Sector Notebook Project to compile, for a number of key industries, information about environmental problems and solutions, case studies and tips about complying with regulations. We called on industry leaders, state regulators, and EPA staff with many years of experience in these industries and with their unique environmental issues. Together with notebooks for 17 other industries, the notebook you hold in your hand is the result.

These notebooks will help business managers to better understand their regulatory requirements, learn more about how others in their industry have undertaken regulatory compliance and the innovative methods some have found to prevent pollution in the first instance. These notebooks will give useful information to state regulatory agencies moving toward industry-based programs. Across EPA we will use this manual to better integrate our programs and improve our compliance assistance efforts.

I encourage you to use this notebook to evaluate and improve the way that together we achieve our important environmental protection goals. I am confident that these notebooks will help us to move forward in ensuring that -- in industry after industry, community after community -- environmental protection and economic prosperity go hand in hand.


Carol M. Browner

EPA/310-R-95-006

**EPA Office of Compliance Sector Notebook Project
Profile of the Lumber and Wood Products Industry**

September 1995

Office of Compliance
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
401 M St., SW (MC 2221-A)
Washington, DC 20460

For sale by the U.S. Government Printing Office
Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328
ISBN 0-16-048273-9

This report is one in a series of volumes published by the U.S. Environmental Protection Agency (EPA) to provide information of general interest regarding environmental issues associated with specific industrial sectors. The documents were developed under contract by Abt Associates (Cambridge, MA), and Booz-Allen & Hamilton, Inc. (McLean, VA). This publication may be **purchased** from the Superintendent of Documents, U.S. Government Printing Office. A listing of available Sector Notebooks and document numbers is included at the end of this document.

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Complimentary volumes are available to certain groups or subscribers, such as public and academic libraries, Federal, State, local, and foreign governments, and the media. For further information, and for answers to questions pertaining to these documents, please refer to the contact names and numbers provided within this volume.

Electronic versions of all Sector Notebooks are available on the EPA Enviro\$en\$e Bulletin Board and via Internet on the Enviro\$en\$e World Wide Web. Downloading procedures are described in Appendix A of this document.

Cover photograph by Steve Delaney, U.S. EPA.

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EPA/310-R-95-003.	Wood Furniture and Fixtures Industry	Bob Marshall	564-7021
EPA/310-R-95-004.	Inorganic Chemical Industry	Walter DeRieux	564-7067
EPA/310-R-95-005.	Iron and Steel Industry	Maria Malave	564-7027
EPA/310-R-95-006.	Lumber and Wood Products Industry	Seth Heminway	564-7017
EPA/310-R-95-007.	Fabricated Metal Products Industry	Scott Throwe	564-7013
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EPA/310-R-95-013.	Petroleum Refining Industry	Tom Ripp	564-7003
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EPA/310-R-95-015.	Pulp and Paper Industry	Maria Eisemann	564-7016
EPA/310-R-95-016.	Rubber and Plastic Industry	Maria Malave	564-7027
EPA/310-R-95-017.	Stone, Clay, Glass, and Concrete Industry	Scott Throwe	564-7013
EPA/310-R-95-018.	Transportation Equipment Cleaning Ind.	Virginia Lathrop	564-7057
EPA/310-R-97-001.	*Air Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-002.	Ground Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-003.	*Water Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-004.	Metal Casting Industry	Jane Engert	564-5021
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EPA/310-B-96-003.	Federal Facilities	Jim Edwards	564-2461

*Currently in DRAFT anticipated publication in September 1997

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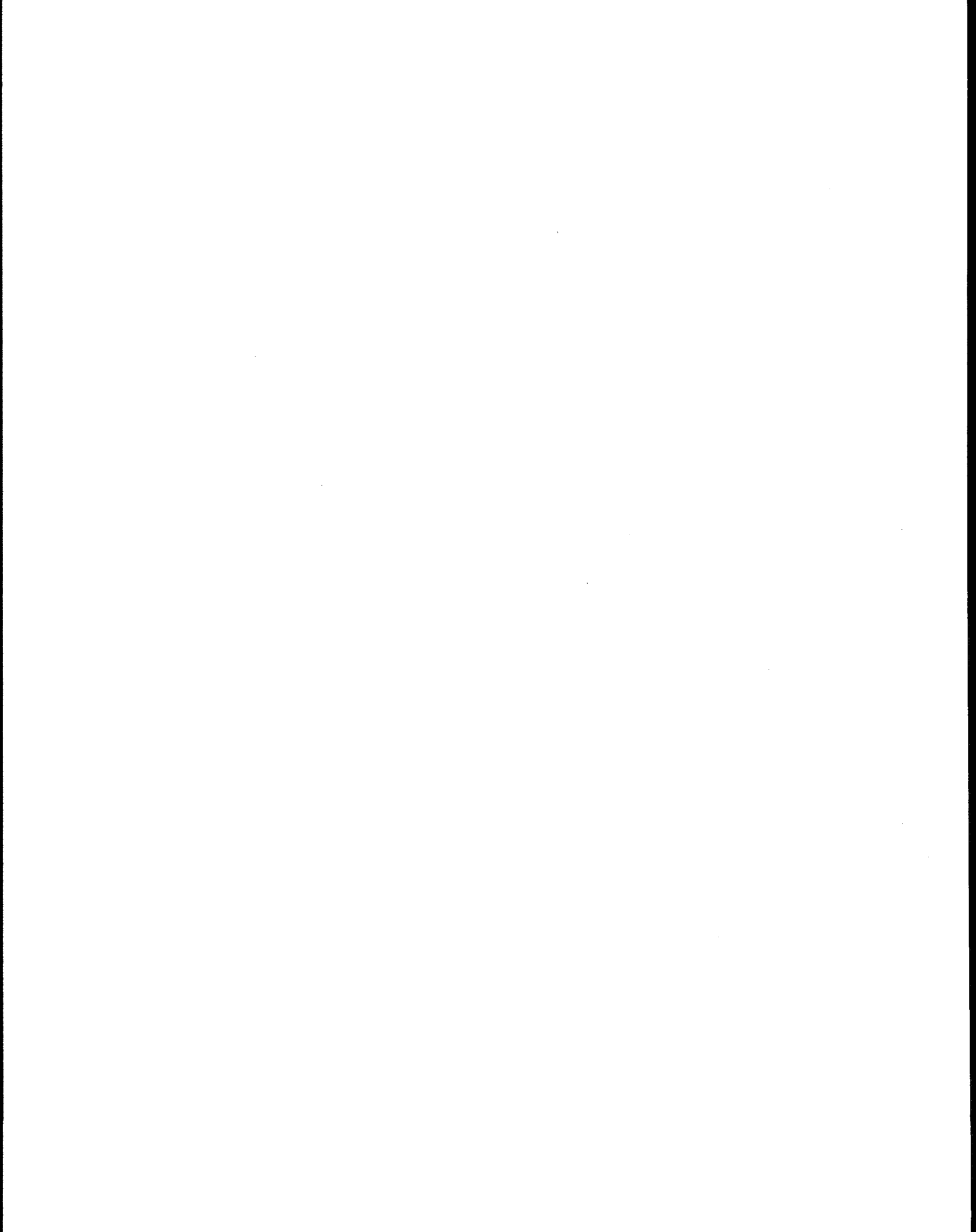
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LUMBER AND WOOD PRODUCTS
(SIC 24)
LIST OF ACRONYMS

ACZA -	Ammoniacal Copper Zinc Arsenate
AFS -	AIRS Facility Subsystem (CAA database)
AIRS -	Aerometric Information Retrieval System (CAA database)
BIFs -	Boilers and Industrial Furnaces (RCRA)
CAA -	Clean Air Act
CAAA -	Clean Air Act Amendments of 1990
CCA -	Chromated Copper Arsenate
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS -	CERCLA Information System
CFCs -	Chlorofluorocarbons
CO -	Carbon Monoxide
CWA -	Clean Water Act
D&B -	Dun and Bradstreet Marketing Index
EPA -	United States Environmental Protection Agency
FIFRA -	Federal Insecticide, Fungicide, and Rodenticide Act
FINDS -	Facility Indexing System
HAPs -	Hazardous Air Pollutants (CAA)
HB -	Hardboard
IDEA -	Integrated Data for Enforcement Analysis (Enforcement Database)
LDR -	Land Disposal Restrictions (RCRA)
LVL -	Laminated Veneer Lumber
MACT -	Maximum Achievable Control Technology (CAA)
MDI -	Methylenediphenyl Diisocyanate
MDF -	Medium density Fiberboard
NAAQS -	National Ambient Air Quality Standards (CAA)
NaOH -	Sodium Hydroxide
NCDB -	National Compliance Database (for TSCA, FIFRA, EPCRA)
NCP -	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP -	National Emission Standards for Hazardous Air Pollutants
NSPS -	New Source Performance Standards (CAA)
NO _x -	Nitrous Oxides
NPDES -	National Pollution Discharge Elimination System (CWA)
OAR -	Office of Air and Radiation
OPA -	Oil Pollution Act
OECA -	Office of Enforcement and Compliance Assurance
OPPTS -	Office of Prevention, Pesticides, and Toxic Substances
OSB -	Oriented Strand Board
OSW -	Office of Solid Waste
OSWER -	Office of Solid Waste and Emergency Response
OW -	Office of Water
P2 -	Pollution Prevention

LUMBER AND WOOD PRODUCTS
(SIC 24)
LIST OF ACRONYMS (CONT'D)

PB -	Particleboard
PCP -	Pentachlorophenol
PCS -	Permit Compliance System (CWA Database)
PF -	Phenol-Formaldehyde
PM -	Particulate Matter
RCRA -	Resource Conservation and Recovery Act
RCRIS -	RCRA Information System
SDWA -	Safe Drinking Water Act
SO _x -	Sulfur Oxides
TGNMO	Total Gaseous Nonmethane Organics
TRI -	Toxic Release Inventory
TRIS -	Toxic Chemical Release Inventory System
TSCA -	Toxic Substances Control Act
UF -	Urea-Formaldehyde
UIC -	Underground Injection Control (SDWA)
UST -	Underground Storage Tanks (RCRA)
VOCs -	Volatile Organic Compounds



LUMBER AND WOOD PRODUCTS (SIC 24)

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Environmental policies based upon comprehensive analysis of air, water, and land pollution are an inevitable and logical supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, enforcement and compliance assurance, education/outreach, research, and regulatory development issues. The central concepts driving the new policy direction are that pollutant releases to each environmental medium (air, water, and land) affect each other, and that environmental strategies must actively identify and address these inter-relationships by designing policies for the "whole" facility. One way to achieve a whole facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial "sector-based" approach within the EPA Office of Compliance led to the creation of this document.

The Sector Notebook Project was initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for eighteen specific industrial sectors. As other EPA offices, States, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded. The ability to design comprehensive, common sense environmental protection measures for specific industries is dependent on knowledge of several inter-related topics. For the purposes of this project, the key elements chosen for inclusion are: general industry information (economic and geographic); a description of industrial processes; pollution outputs; pollution prevention opportunities; Federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community, and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a

manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue, and references where more in-depth information is available. Text within each profile was researched from a variety of sources, and was usually condensed from more detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that can be further explored based upon the citations and references listed at the end of this profile. As a check on the information included, each notebook went through an external review process. The Office of Compliance appreciates the efforts of all those that participated in this process and enabled us to develop more complete, accurate, and up-to-date summaries. Many of those who reviewed this notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this notebook.

I.B. Additional Information

Providing Comments

OECA's Office of Compliance plans to periodically review and update the notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing notebook, or if you would like to provide additional information, please send a hard copy and computer disk to the EPA Office of Compliance, Sector Notebook Project, 401 M St., SW (2223-A), Washington, DC 20460. Comments can also be uploaded to the Enviro\$en\$e Bulletin Board or the Enviro\$en\$e World Wide Web for general access to all users of the system. Follow instructions in Appendix A for accessing these data systems. Once you have logged in, procedures for uploading text are available from the on-line Enviro\$en\$e Help System.

Adapting Notebooks to Particular Needs

The scope of the existing notebooks reflect an approximation of the relative national occurrence of facility types that occur within each sector. In many instances, industries within specific geographic regions or States may have unique characteristics that are not fully captured in these profiles. For this reason, the Office of Compliance encourages State and local environmental agencies and other groups to supplement or re-package the information included in this notebook to include more specific industrial and regulatory information that may be available. Additionally, interested States may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section

with State and local requirements. Compliance or technical assistance providers may also want to develop the "Pollution Prevention" section in more detail. Please contact the appropriate specialist listed on the opening page of this notebook if your office is interested in assisting us in the further development of the information or policies addressed within this volume.

If you are interested in assisting in the development of new notebooks for sectors not covered in the original eighteen, please contact the Office of Compliance at 202-564-2395.

II. INTRODUCTION TO THE LUMBER AND WOOD PRODUCTS INDUSTRY

II.A. Introduction, Background, and Scope of the Notebook

This section provides background information on the size, geographic distribution, employment, production, sales, and economic condition of the lumber and wood products industry. The type of facilities described within the document are also described in terms of their Standard Industrial Classification (SIC) codes. Additionally, this section contains a list of the largest companies in terms of sales.

The lumber and wood products industry includes establishments engaged in cutting timber and pulpwood; sawmills, lath mills, shingle mills, cooperage stock mills (wooden casks or tubs), planing mills, plywood mills; and establishments engaged in manufacturing finished articles made entirely or mainly of wood or related materials such as reconstituted wood panel products manufacturers. The categorization corresponds to the Standard Industrial Classification (SIC) code 24 established by Department of Commerce's Bureau of the Census to track the flow of goods and services within the economy. It should be noted that silviculture (development and care of forests) and the preparation of forested areas for logging is covered by SIC 08 (forestry) and is not addressed in this industry profile.

In this profile, the industry's processes are divided into four general groups: logging timber; producing lumber; panel products and wood preserving. The Bureau of the Census estimates that in 1992, employment in these principal categories totaled approximately 306,700 (See Exhibit 1 for facility employment size distribution). This does not include the additional employment generated by the wood container, structure wood member, wood kitchen cabinet, and wood building/mobile home sectors. Shipments increased less than one percent in 1993, to an estimated \$78.1 billion. Sawmills and planing mills (SIC 242) accounted for \$24.8 billion (31 percent) of industry shipments in 1993. Logging (SIC 241) added an additional \$15.6 billion (17.8 percent).

The Department of Commerce provides the following three-digit breakout for lumber and wood products industries in SIC 24:

- SIC 241 - Logging
- SIC 242 - Sawmills and Planing Mills
- SIC 243 - Millwork, Veneer, Plywood, and Structural Wood Members
- SIC 244 - Wood Containers
- SIC 245 - Wood Buildings and Mobile Homes

SIC 249 - Miscellaneous Wood Products.

The main end use market for the industry's products is the new construction and remodeling sectors.

This profile covers logging, sawn lumber production, panel products including veneer and plywood manufacture and reconstituted wood panel manufacture (which includes particleboard (PB), hardboard (HB), medium density fiberboard (MDF), and oriented strand board(OSB)), engineered lumber, and wood preserving. Each of these are discussed in greater detail later in the profile. This profile does not address production processes, pollution outputs, or regulatory information for the following three-digit industries contained in SIC 24: Wood Containers (SIC 244), Wood Buildings and Mobile Homes (SIC 245), and some areas of Miscellaneous Wood Products (SIC 249).

II.B. Characterization of the Lumber and Wood Products Industry

The discussion of the characterization of the lumber and wood products industry is divided into the following topics: industry size and geographic distribution; identification of the largest U.S. facilities in the industry by capacity; and industry economic trends.

II.B.1. Industry Size and Distribution

Variation in facility counts occur across data sources due to many factors, including reporting and definition differences. This document does not attempt to reconcile these differences, but rather reports the data as they are maintained by each source.

Geographic Distribution

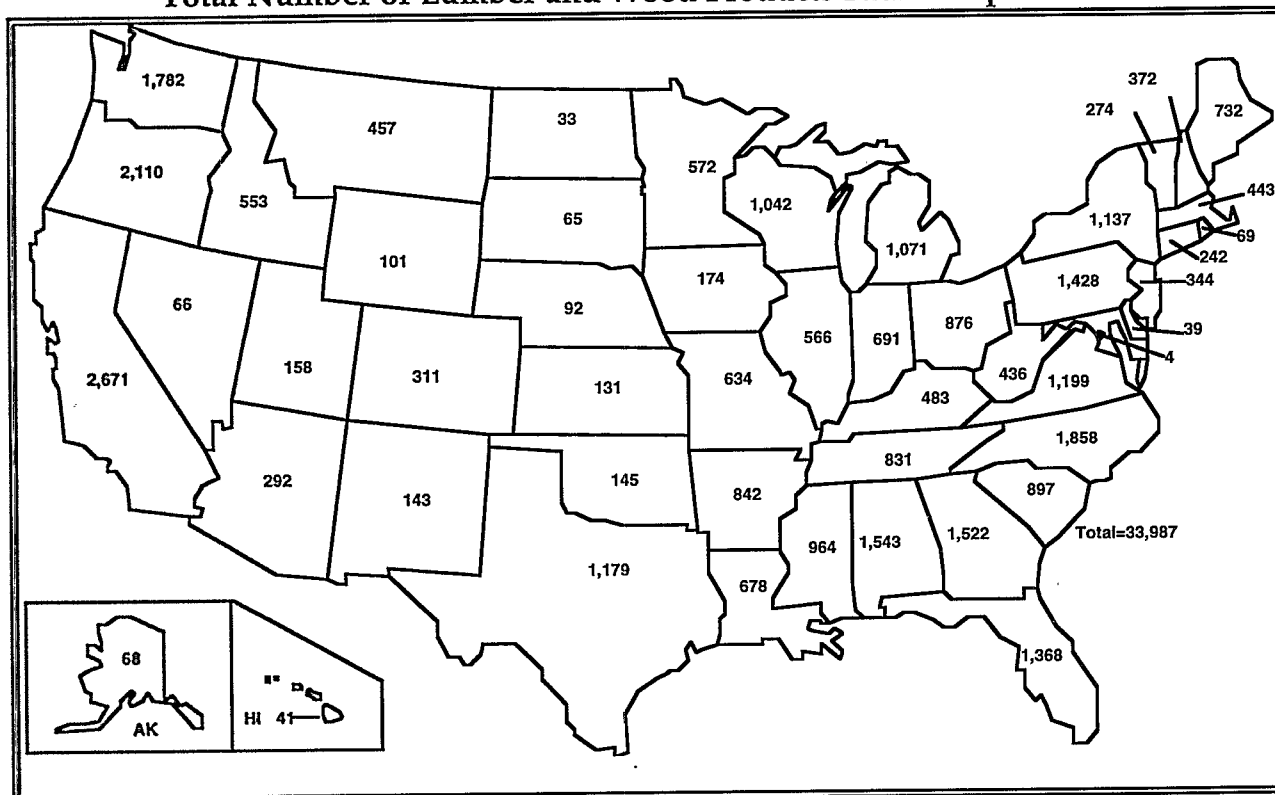
Most of the wood products industry is concentrated in the Pacific Northwest and the Southeast. However, concentrations are also found across the Midwest, the Northeast, and in Appalachia (See Exhibits 2 and 3). Approximately 1/3 of the U.S. is forested. Of this forested area, two-thirds (480 million acres) contain at least 20 cubic feet of commercially usable wood per year per acre, the threshold for determining whether timberland could be commercially productive. The area east of the Mississippi still contains a significant amount of forested acreage; 155 million acres are in the Northern States and 195 million acres are in the South. About 130 million acres of forested land is in Western States. Exhibit 4 illustrates the largest lumber and wood products facilities in the U.S. by capacity.

Exhibit 1
Industry Facility Size Distribution - 1992

Type of Facility	Facilities with 1 to 19 employees	Facilities with 20 to 99 employees	Facilities with 100 or more employees	Total
SIC 2411 - Logging	12,283	691	36	13,010
SIC 2421 - Lumber	4,400	1,283	321	6,004
SICs 2435 & 2436 - Hardwood, Softwood Plywood, Veneer	147	208	164	519
SIC 2491 - Wood Preserving	307	168	11	486
SIC 2493 - Reconstituted Wood Products	108	80	100	288

Source: Based on 1992 Bureau of the Census Data.

Exhibit 2
Geographic Distribution of Industry
Total Number of Lumber and Wood Products Facilities per State*



Source: Based on 1987 Bureau of the Census Data. 1992 Bureau of the Census Data on State breakdown was not available at the time of publication.

*Note: Exhibit represents all industries within SIC 24.

Exhibit 3
Geographic Distribution of Industry
Breakdown of Lumber and Wood Facilities by State

Type of Facility	Number of Facilities Per State
Logging	AL-957, AK-37, AR-403, CA-525, FL-346, GA-796, ID-321, KY-95, LA-413, ME-439, MI-341, MN-176, MS-531, MT-312, NH-130, NH-130, NY-209, NC-677, OH-128, OR-1,293, PA-257, SC-559, TN-128, TX-297, VA-444, WA-597, WV-185, WI-384
Sawmills and Planing Mills	AL-212, AZ-17, AR-218, CA-278, CO-48, CT-34, FL-94, GA-216, ID-100, IL-75, IN-155, KY-185, LA-104, ME-141, MD-58, MA-89, MI-219, MN-96, MS-213, MO-237, MT-68, NH-83, NM-27, NY-231, NC-554, OH-172, OK-50, OR-309, PA-448, SC-126, SD-17, TN-345, TX-116, UT-26, VT-78, VA-370, WA-381, WV-188, WI-206, WY-28
Millwood, Plywood and Structural Members	AL-158, AZ-146, AR-85, CA-1,145, CO-140, CT-122, FL-661, GA-260, ID-66, IL-224, IN-213, IA-54, KS-70, KY-78, LA-77, ME-31, MD-86, MA-172, MI-192, MN-165, MS-73, MO-144, MT-30, NE-47, NV-42, NH-47, NJ-165, NM-62, NY-378, NC-294, OH-225, OK-49, OR-298, PA-315, RI-28, SC-105, SD-21, TN-153, TX-412, UT-82, VT-30, VA-185, WA-273, WV-26, WI-206
Wood Containers	AL-56, AR-39, CA-204, FL-37, GA-69, IL-13, IN-103, KY-71, MI-144, MN-36, MS-39, MO-85, NJ-46, NY-82, NC-80, OH-172, OR-26, PA-155, SC-38, TN-87, TX-85, VA-54, WA-30, WI-83
Wood Buildings and Mobile Homes	AL-46, AZ-20, CA-87, CO-11, DE-2, FL-68, GA-53, ID-13, IL-25, IN-55, KS-12, ME-12, MD-13, MA-18, MI-34, MN-20, MS-12, MO-21, NE-7, NH-20, NY-27, NC-51, OH-36, OR-23, PA-72, TN-32, TX-74, VA-31, WA-18, WI-34
Miscellaneous Wood Products	AL-113, AR-84, CA-432, FL-161, GA-128, ID-43, IL-147, IN-96, IA-27, KY-46, LA-58, ME-91, MD-36, MA-93, MI-141, MN-79, MS-96, MO-102, NH-72, NJ-71, NM-16, NY-210, NC-202, OH-143, OK-26, OR-159, PA-181, SC-68, TN-88, TX-195, VT-115, WA-123, WV-36, WI-119

*Source: Based on 1987 Bureau of the Census Data.**

**1992 Bureau of Census Data on State breakdown was not available at the time of publication.*

Exhibit 4
Largest U.S. Lumber and Wood Products Facilities by Capacity (1993)

Lumber Production	
1.	Weyerhaeuser Co.
2.	Georgia-Pacific Corp.
3.	Louisiana-Pacific Corp.
4.	Sierra Pacific Industries
5.	International Paper Co.
6.	Boise Cascade Corp.
7.	Pope & Talbot Inc.
8.	MacMillan Bloedel Ltd.
9.	WTD Industries Inc.
10.	Simpson Timber Co.

Softwood Veneer	
1.	Scotch Plywood Co. of Alabama
2.	Stone Forest Industries Inc.
3.	Freres Lumber Co. Inc.
4.	Sun Studs Inc.
5.	Plum Creek Manufacturing, L.P.
6.	Hunt Plywood Co. Inc.
7.	Omak Wood Products, Inc.
8.	Roseburg Forest Products
9.	Green Veneer Inc.
10.	WTD Industries Inc.

Softwood Plywood	
1.	Georgia-Pacific Corp.
2.	Willamette Industries Inc.
3.	Boise Cascade Corp.
4.	Louisiana-Pacific Corp.
5.	Roseburg Forest Products Co.
6.	Weyerhaeuser Co.
7.	Champion International
8.	International Paper Co.
9.	Stimson Lumber Co.
10.	Stone Forest Industries Inc.

OSB/Waferboard	
1.	Louisiana-Pacific Corp.
2.	Potlatch Corp.
3.	Georgia-Pacific Corp.
4.	Weyerhaeuser Co.
5.	J.M. Huber Corp.
6.	Norbord Industries
7.	Roy O. Martin Lumber Co. Inc.
8.	International Paper Co.
9.	Langdale Forest Products Co.

Particleboard	
1.	Georgia-Pacific Corp.
2.	Willamette Industries Inc.
3.	Weyerhaeuser Co.
4.	Louisiana-Pacific Corp.
5.	Temple-Inland Forest Products Corp.
6.	Roseburg Forest Products Co.
7.	Masonite Corp.
8.	Allegheny Particleboard Corp.
9.	Boise Cascade Corp.
10.	Timber Products Co.

Medium-density Fiberboard	
1.	Willamette Industries Inc.
2.	Louisiana-Pacific Corp.
3.	Medite Corp.
4.	Masonite Corp.
5.	Plum Creek Manufacturing, L.P.
6.	Georgia-Pacific Corp.
7.	Sierra-Pine, Ltd.
8.	Weyerhaeuser Co.
9.	Norbord Industries
10.	Bassett Industries

Source: American Forest & Paper Association, *Wood Technology's 1994-95 North American Factbook*.

Exhibit 4 (cont'd)
Largest U.S. Lumber and Wood Products Facilities by Capacity (1993)

Hardboard	
1.	Georgia-Pacific Corp.
2.	Masonite Corp.
3.	Weyerhaeuser Co.
4.	Wood Fiber Industries Inc.
5.	Louisiana-Pacific Corp.
6.	Stimson Lumber Co.
7.	Evanite Fiber Corp.
8.	Dee Forest Products Inc.

Laminated Veneer Lumber, I-joists	
1.	Louisiana-Pacific Corp.
2.	Willamette Industries Inc.
3.	Georgia-Pacific Corp.
4.	Tecton Laminates
5.	South Coast Lumber Co.

Parallel, Laminated Strand Lumber	
1.	Trus Joist MacMillian

Glulam Beams	
1.	Willamette Industries Inc.
2.	Anthony Forest Products Co.

Panelboard	
1.	Georgia-Pacific Corp.

Composite Panels	
1.	Oregon Strand Board Co.

Source: American Forest & Paper Association, Wood Technology's 1994-95 North American Factbook.

II.B.2. Economic Trends

The lumber and wood products industry is heavily dependent upon the health of the U.S. residential construction and household furniture industries. Lumber and wood product shipments increased less than one percent in 1993 and this low level of growth is expected to continue in 1994. Domestic wood products shipments over the next five years are expected to remain constant.

Since the mid-1980's, timber harvests from publicly-owned lands have declined by more than 50 percent. The decline is due to new land management policies by the Federal government that have reduced the amount of land available for harvesting.

According to the Hardwood Plywood and Veneer Association, there has been a substantial decline in the use of hardwood plywood prefinished wall paneling due to shifts in consumer preference, a decline in promotion and advertising by major manufacturers, changes in the cost of plywood paneling related to gypsum wallboard, and the

public's concern about real or perceived formaldehyde releases from wall paneling. With respect to reconstituted wood panel products shipments of PB, OSB, and MDF are all increasing rapidly. U.S. shipments of MDF were at record levels in 1993.

The engineered lumber sector of the industry (reconstituted wood substitutes for sawn lumber), is currently seeing a rapid rise in production. The production of glulam beams and laminated veneer lumber (LVL), two types of engineered lumber, is increasing rapidly and this increased growth is expected to continue. By 2003, the North American output of LVL is expected to reach 98 million ft³ (the American Plywood Association's production estimate for LVL in 1995 is 33 million ft³).

III. INDUSTRIAL PROCESS DESCRIPTION

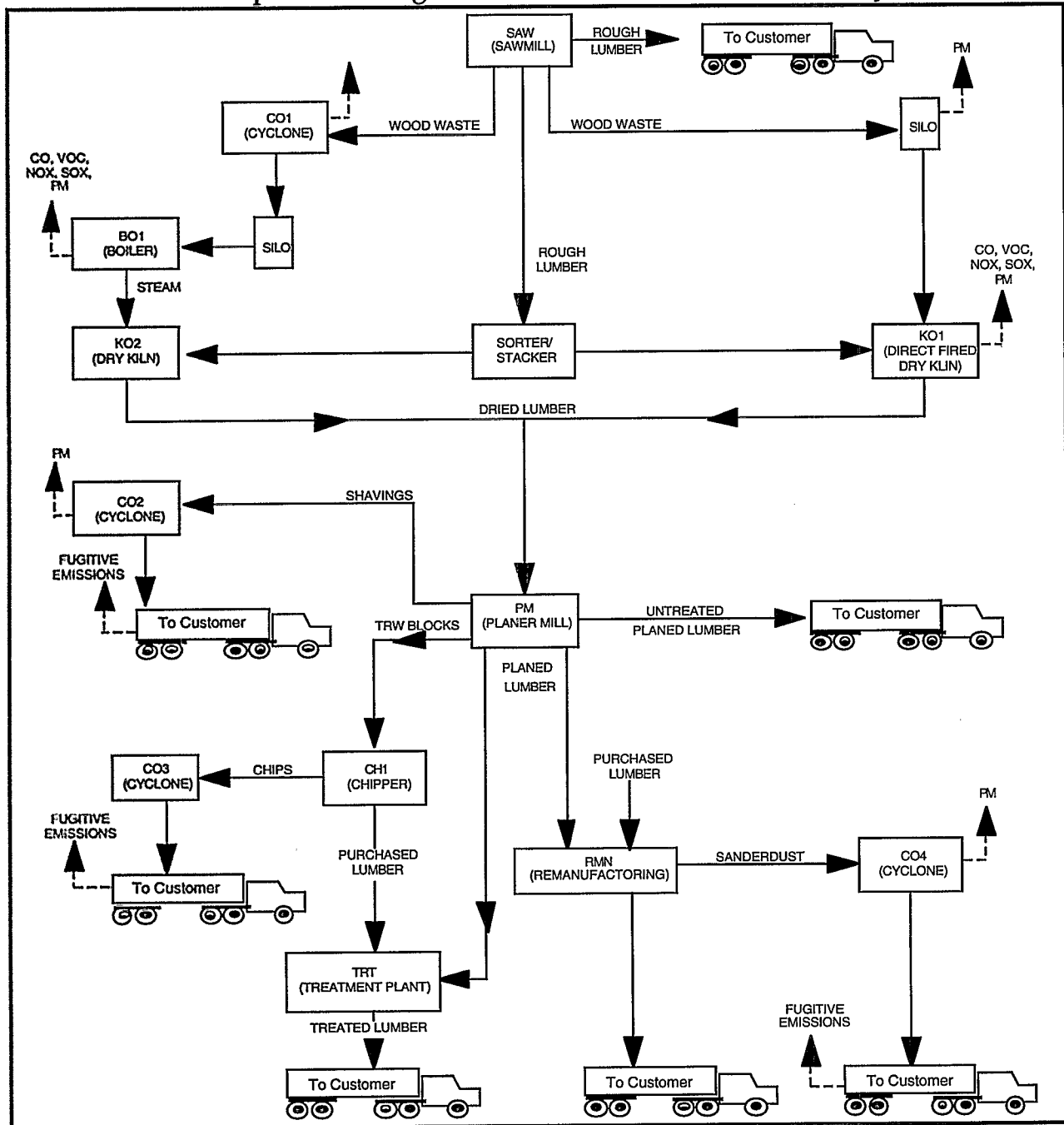
This section describes the major industrial processes within the lumber and wood products industry, including the materials and equipment used, and the processes employed. The section is designed for those interested in gaining a general understanding of the industry, and for those interested in the inter-relationship between the industrial process and the topics described in subsequent sections of this profile -- pollutant outputs, pollution prevention opportunities, and Federal regulations. This section does not attempt to replicate published engineering information that is available for this industry. Refer to Section IX for a list of reference documents that are available.

This section specifically contains a description of commonly used production processes, associated raw materials, the by-products produced or released, and the materials either recycled or transferred off-site. This discussion, coupled with schematic drawings of the identified processes, provide a concise description of where wastes may be produced in the process. This section also describes the potential fate (air, water, land) of these waste products.

III.A. Industrial Processes in the Lumber and Wood Industry

This section describes the major processes used by the lumber and wood products industry. It is divided into the following sections: logging, sawn lumber, paneling (including veneer and plywood and reconstituted wood panel products), engineered lumber, and wood preserving. Information for these descriptions was obtained from a variety of sources including *Characterization of Manufacturing Processes, Emissions, and Pollution Prevention Options for the Composite Wood Industry* (Martin and Northeim, 1995), *Forest Products and Wood Science* (Haygreen and Bowyer, 1989), and *Guide to Pollution Prevention: Wood Preserving Industry* (U.S. EPA, 1993).

Exhibit 5
Example Flow Diagram For a Lumber Production Facility



Source: Southern Lumber Manufacturing Association, 1995.

Logging

Timber harvesting may be accomplished by either manual or mechanical means. However, the traditional methods of hand sawing or ax use are almost never used. Chain saws powered by gasoline engines or large felling machines are currently used to cut down

standing trees. The felling machines use hydraulically-activated shears that cut the tree at its base and transport it to a collection point. The logs are transported by motorized cable or by tractor to larger collection areas for transportation (usually by motor trucks or water) to the sawmill.

Sawn Lumber

Sawn lumber is softwood or hardwood trimmed at a sawmill and destined for a future use such as construction, industrial, or furniture products. Most of the commercially important softwood species such as Southern Yellow Pine, Western Pines, Western Hemlock, Spruce, and Douglas Fir grow in the South or West. Softwood boards are used primarily for framing light construction such as homes, schools, churches, and farm buildings. Hardwood species such as Maple and Oak, are grown and processed mainly in the Eastern portion of the U.S. and are used for flooring, furniture, and crating.

Exhibit 5 illustrates the lumber production process. Logs are delivered to sawmills from the forest and stored in ponds or on land. Most wood is stored on land. Logs are sometimes stored at intermediate points between the forest and the sawmill. If stored on land, the logs are usually sprayed with water to keep them moist and prevent cracking. The raw logs are debarked and then cut into cants (partially cut lumber), which are trimmed into raw lumber. As the logs are debarked, bark is used as hog fuel for boilers or sold as mulch. Shavings, sawdust, and chips can also be used at paper mills and reconstituted wood panel manufacturing plants.

The cants are cut to specific lengths or finished further depending on the final destination of the lumber product. Most lumber is dried to a specific moisture content (conditioned) through air or kiln drying. Air drying, which entails stickering (spacing) and stacking the cut lumber in open storage areas, usually requires several months to a few years. Kiln drying is more time efficient because it uses controlled air flow within a vented closed chamber to quickly dry the lumber to a specified moisture content. Whether lumber is air- or kiln-dried depends upon variables such as the moisture content of the species and the humidity of the region.

Sawmills frequently perform surface protection operations to protect lumber against sapstaining that may occur during temporary storage. Sapstains do not attack the structural components of the wood but do affect the surface, coloring it with dark blue or black stains. This discoloration is often objectionable to the buyer and may decrease the value of the wood and its acceptance of finishes.

Surface protection is typically conducted at mills that process hardwoods; however, softwoods cut for export may also be surface protected. Plants typically treat their lumber with surface protectants only during humid months, depending on the region of the country in which they operate. Wood that is kiln-dried is not normally surface-protected. All green wood to be exported is protected. The most popular surface protectant currently used by approximately 85% of all major U.S. mills who treat lumber is a solution composed of 3-iodo-z-propynyl butyl carbamate (IPBC), didecyl dimethyl ammonium chloride (DDAC), and inert ingredients. The solution is diluted with water to a ratio of 35-1 for spray box application and 100-1 for dip tank applications.

Three major processes are used by sawmills to apply surface protectant to wood: the dip process, the spray process, and the green chain process. Typically the sawmill will use only one process to surface protect; however, some plants use a combination of processes to protect lumber at different locations throughout a mill. Dipping is a batch process; green chain and spray operations are continuous processes. The process used influences the amount of control a plant has over the waste it generates during the surface protection process.

Dip operations offer the best opportunity to control drippage since an owner or operator has the ability to keep the wood over the tank until it stops dripping. Dipping operations can lead to uncontrolled drippage when mills do not allow the treated loads to stop dripping before the next load is dipped. Lumber is dipped in horizontal bundles, and as a result, liquid is often trapped between pieces of wood. When forklifts remove the lumber, large quantities of protectant can drip from the wood onto the ground if the lumber is tipped.

Unlike dipping, the spray operation is a continuous process. Individual pieces of lumber are fed end-to-end by chain, roller, or conveyor belt through a spray box. The spray box is often equipped with flexible brushes or curtains at both ends to isolate the formulation spray and minimize drippage. A drip pan is usually incorporated into the design of the spray box allowing formulation to return to the work tank.

Green-chain systems represent another type of continuous operation. The green-chain is so-named because chains drag fresh cut (or "green") lumber through a tank of protectant formulation and back out again for sorting and grading. A dip vat containing anti-stain formulation is typically located at the head of the green chain and the wood falls into this vat from the cutting operations. Some systems utilize wheels or

rollers just above the formulation surface to force the wood pieces into the solution. As the wood is drawn from the vat and along the green chain, excess formulation is released from the wood onto the return drip pan. Green-chain operations are typically the least controllable with respect to drippage.

Panel Products

This section describes two classes of panel products: (1) hardwood veneer, softwood veneer, and plywood; and (2) reconstituted wood products.

Hardwood Veneer and Softwood Veneer and Plywood

Veneer is a thin sheet of wood peeled or sliced from blocks of lumber called flitches or logs. Veneer is glued together to form plywood. Hardwood found in the Western and Southern U.S. is generally used to manufacture hardwood plywood. Softwood logs from the Northwest and Eastern U.S. are used to make softwood plywood. Softwood plywood is primarily used for construction. Softwood veneer and plywood is typically used for structural and industrial applications and represents over 90 percent, by volume, of U.S. production. Hardwood veneer and plywood is used typically for decorative applications and for making interior paneling, components for furniture and cabinets, and specialty products. There are several other important differences between softwood plywood and hardwood plywood: softwood plywood is generally made with relatively thick faces (1/10" and thicker) and with exterior or intermediate glue (for protected construction and industrial uses where moderate delays in providing protection might be expected or conditions of high humidity and water leakage may exist). Hardwood plywood is made with face veneers generally 1/32" and thinner. Because of its nature and the use of decorative thin face veneers, the glues used for hardwood plywood tend to be colorless or light in color so as not to discolor the surfaces if the adhesive bleeds into and through the thin faces. While most hardwood plywood is all veneer, some is made with particleboard and medium density fiberboard core.

The general processes for making softwood and hardwood plywood are the same: log debarking, log steaming and or soaking, veneer cutting, veneer drying, veneer preparation, glue application, pressing, panel trimming, and panel sanding. These basic processes are illustrated in Exhibit 7. Nevertheless, there are differences in details in these softwood and hardwood plywood processes. Because of its greater volume, this section primarily describes softwood veneer and plywood manufacturing. However, it is noted where details of the

manufacturing process are substantially different for hardwood plywood.

Most softwood plywood plants also produce veneer. Most hardwood plywood plants purchase components for making plywood from outside sources. Logs received at the plant are debarked and cut into lengths appropriate for the plant's processing equipment. Almost all hardwood and many softwood blocks are heated prior to cutting or peeling the veneer to soften the wood. The cut logs are heated by steaming, soaking in hot water, spraying with hot water, or combinations of these methods. The heating time required depends on the diameter of the log, specific gravity, moisture content, and the temperature needed to properly peel that particular species of wood.

The major methods for producing veneer are slicing and peeling. The majority of veneer is produced by peeling (rotary cutting) on a veneer lathe into sheets of uniform thickness. Slicing is used to produce hardwood decorative veneers from a flitch generally in thicknesses of 1/24" and thinner, and is seldom used with softwood. In either case, the wood is forced under a pressure bar that slightly compresses the wood as it hits the cutting edge of a knife. On a rotary lathe, the block, or log section, continuously rotates against the knife and the pressure bar and peels a sheet of veneer from the heated block.

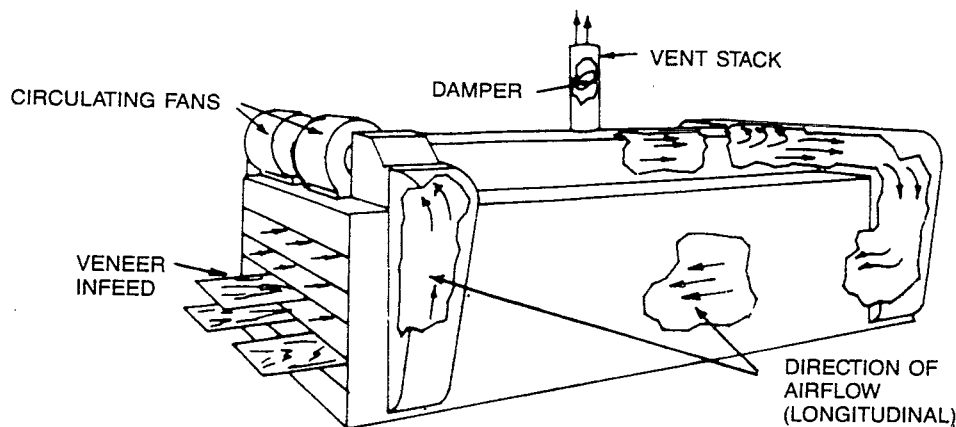
The veneer is peeled at a rate of 300 to 800 lineal feet/min. A series of 120-foot long trays is used in many softwood plywood plants to gently handle these long sheets of wood as they are peeled from the chuck. In softwood mills and some hardwood mills, high-speed clippers automatically chop the veneer ribbons to usable widths at speeds of 1500 lineal feet/min. In hardwood mills, clipping may be done manually to obtain the maximum amount of clear material from the flitch.

After the veneer is peeled and clipped, it must be dried. Two types of dryers are used in softwood veneer mills: roller resistant dryers, heated by forced air; and platen dryers, heated by steam. In older roller dryers, also still widely used for hardwood veneer, air is circulated through a zone parallel to the veneer (see Exhibit 6). Most plants built in recent years use jet dryers (also called impingement dryers) that direct a current of air, at a velocity of 2,000 to 4,000 feet/min., through small tubes on the surface of the veneer.

Veneer dryers may be heated indirectly with steam, generated by a separate boiler, which is circulated through internal coils in contact with dryer air. Dryers may also be heated directly by the combustion gases of a gas- or wood-fired burner. The gas-fired burner is located

inside the dryer, whereas combustion gases from a wood-fired burner are mixed with recirculating dryer air in a blend box outside the dryer and then transported into the dryer. Veneer dryers tend to release organic aerosols, gaseous organic compounds, and small amounts of wood fiber into the atmosphere.

Exhibit 6
Veneer Dryer (Longitudinal)



Source: *Basic Plywood Processing*.

From the dryer, the sheets of veneer travel to a glue application station. Narrow pieces of hardwood veneers are often joined with an adhesive and/or string to maximize recovery. In the gluing process, also known as layup, adhesive is applied to the individual sheets of veneer which are later assembled into plywood. Various adhesive application systems are used including hard rolls, sponge rolls, curtain coaters, sprayers, and foam extruders. The most common application for softwood plywood is an air or airless spray system, which generally uses a fixed-head applicator capable of a 10-foot wide spray at a nozzle pressure of 300 pounds per square inch (psi). Roller applications are most common in the manufacture of hardwood plywood.

With spray systems, control of glue spreads is achieved by adjusting the veneer conveyor speed, or by changing the size of the spray nozzle orifice. Wastes generated in the layup process include adhesive waste (typically overspray), and off-spec plywood.

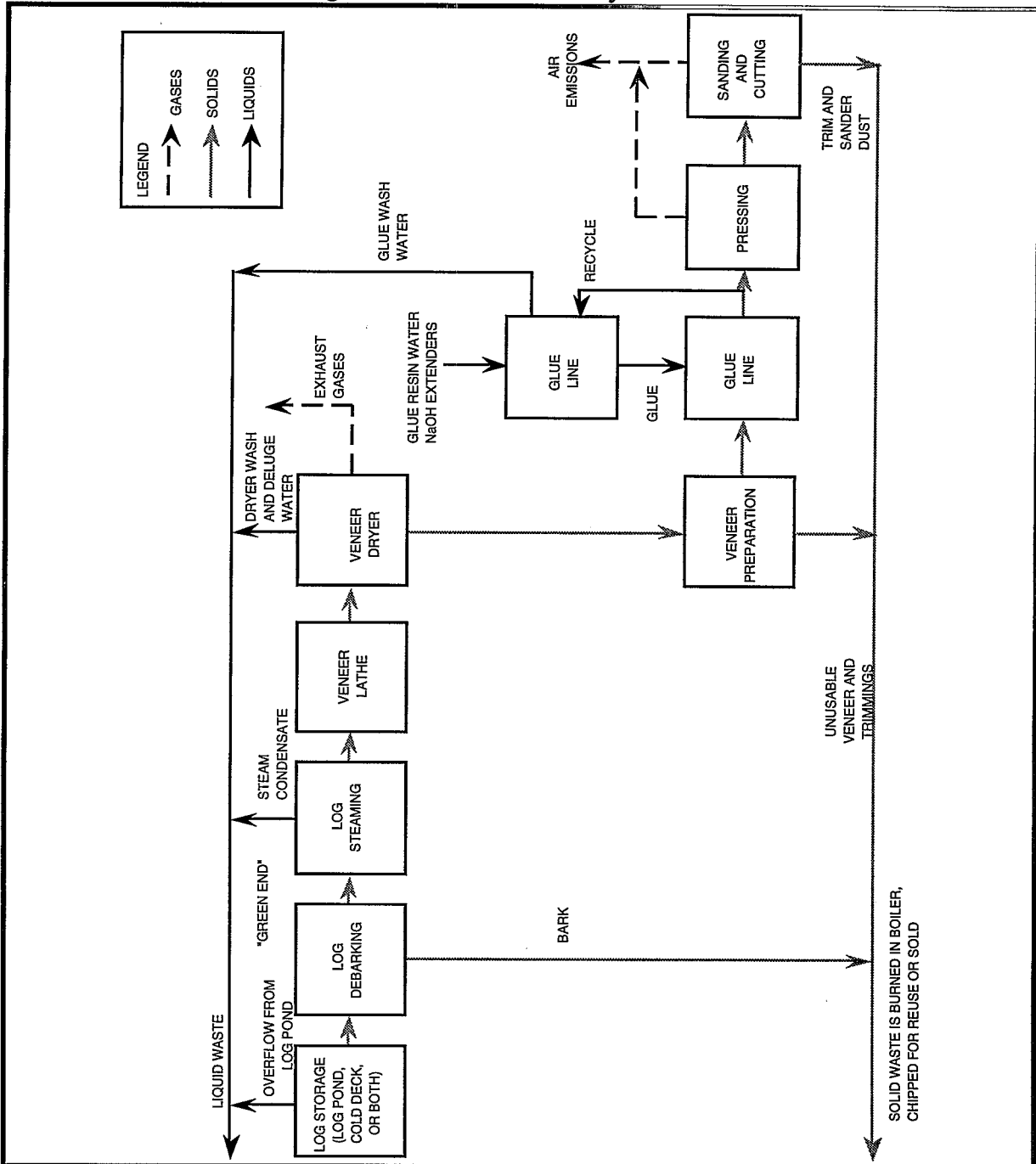
The phenol-formaldehyde (PF) typical in softwood plywood manufacturing and urea-formaldehyde (UF) adhesions typically used in hardwood plywood are made from resins synthesized in regional plants and shipped to individual plywood mills. At the mills, the resins are combined with extenders, fillers, catalysts, and caustic to make a glue mixture. The addition of these ingredients modifies the viscosity of the adhesive and allows it to be compatible with the glue application method (curtain, roll, spray, foam); allows for better adhesive distribution; increases the cure rate; and lowers cost.

Following the application of glue, the panels must be pressed. The purpose of the press is to bring the veneers into close contact so that the glue layer is very thin. At this point, resin is heated to the temperature required for the glue to bond. Most plywood plants prepress the panels in a cold press at lower pressure prior to final pressing in the hot press. This allows the wet adhesive to "tack" the veneers together, permits easier loading of the hot-press, and prevents shifting of the veneers during loading. Pressing is usually performed in multiopening presses, which can produce 20 to 40 4x8-foot panels in each two to seven minute pressing cycle.

One of the goals of the pressing process is to use enough pressure to bring the veneer surfaces together without overcompressing the wood. Less pressure is required if the lathe has cut smooth veneer of a uniform thickness.

After pressing, stationary circular saws trim up to one inch from each side of the pressed plywood to produce square-edged sheets. Approximately 20 percent of annual softwood plywood production is then sanded. Over 90 percent of the hardwood plywood production is sanded. As sheets move through enclosed automatic sanders, pneumatic collectors above and below the plywood continuously remove the sanderdust. Sawdust in trimming operations is also removed by pneumatic collectors. The plywood trim and sawdust are burned as fuel or sold to reconstituted panel plants. Exhibit 7 illustrates the veneer and plywood manufacturing process.

Exhibit 7
Flow Diagram of Veneer and Plywood Production



Source: *Estimating Chemical Releases from Presswood and Laminated Wood Products Manufacturing*, U.S. EPA, Office of Pesticides and Toxic Substances, March 1988.

Note: Many veneer and plywood plants are dry.

Reconstituted Wood Products

Reconstituted wood products, such as particleboard (PB), medium density fiberboard (MDF), hardboard (HB), and oriented strand board (OSB), is composed of furnish, or raw wood, that is combined with resins and other additives and formed into a mat, which is then pressed into a board. The manufacturing processes of these boards differ, as do the raw materials used. For example, the furnish (raw materials) used for particleboard consists of finely ground wood particles of various sizes, while OSB is manufactured using specially-prepared strands of wood. In general, the manufacturing processes involve wood size reduction followed by drying (except for wet process boards), adhesive application, pressing at elevated temperatures. Because these products are based on use of all parts of the sawn log, very little solid waste is generated. Instead, air emissions from dryers and presses tend to be the principal environmental concern stemming from the production of these products. Exhibit 8 compares the process flows for some reconstituted wood product manufacturing processes.

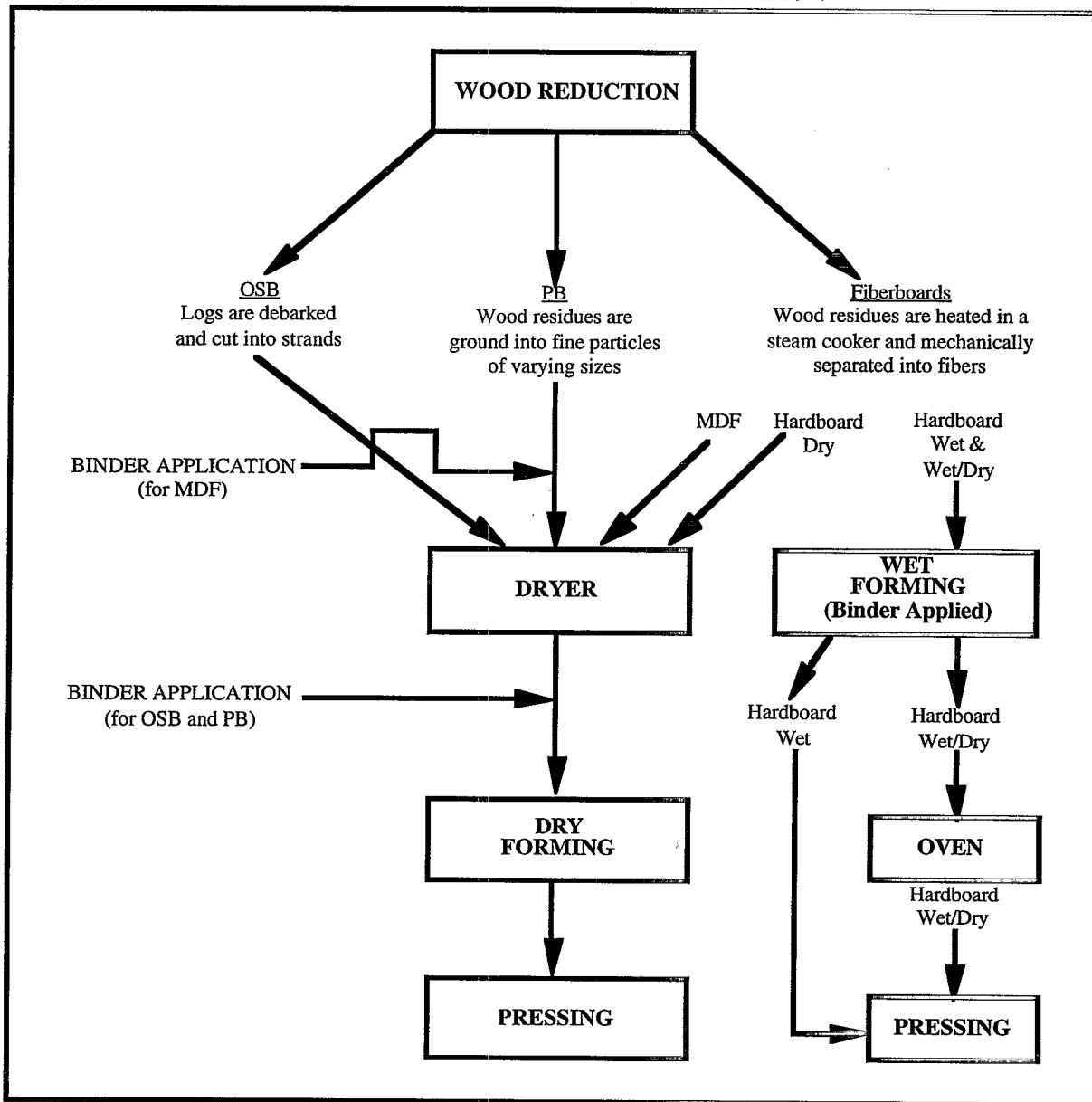
Particleboard (PB)

Particleboard is a panel product made from wood particles of various sizes that are bonded together with a synthetic resin such as urea-formaldehyde (UF). The raw materials, or "furnish," that are used to manufacture PB can be either green or dry wood residues. Green residues include planer shavings from green lumber, and green sawdust. Dry process residues include shavings from planing kiln-dried lumber, sawdust, sanderdust and plywood trim. The wood residues are ground into particles of varying sizes using flakers, mechanical refiners, and hammermills. The material may be screened prior to refining.

The furnish is dried to a low moisture content (two to six percent) to allow for moisture that will be gained by the adding of resins and other additives during "blending." Furnishes are generally no warmer than 100°F when blended to avoid precuring and the drying out of the resin.

Most dryers currently in operation in PB and other reconstituted wood panel manufacturing plants use large volumes of air to convey material of varied size through one or more passes within the dryer. Rotating drum dryers requiring one to three passes of the furnish are most common. The use of triple-pass dryers predominates in the United States (see Exhibit 9). Dryer temperatures may be as high as 1100 - 1200°F with a wet furnish. However, dry planer shavings require that dryer temperatures be no higher than 500°F because the ignition point

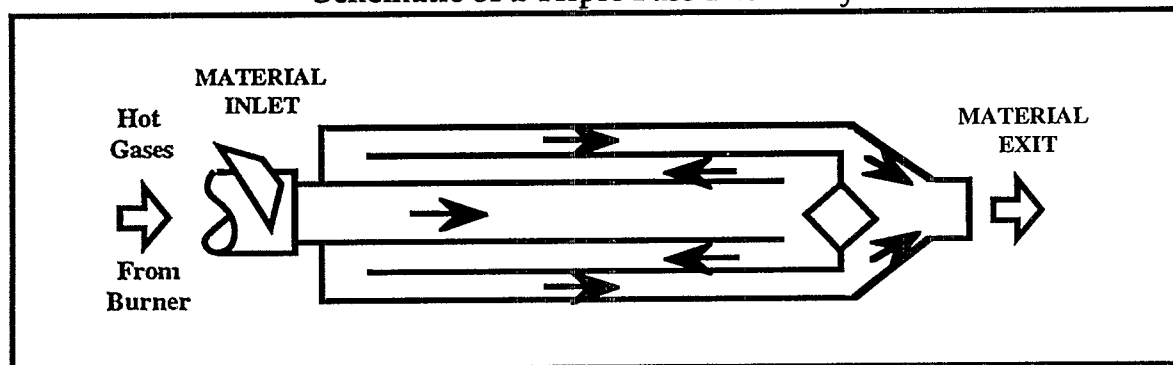
**Exhibit 8
Reconstituted Wood Panel Process Flow**



Source: *Characterization of Manufacturing Processes, Emissions, and Pollution Prevention - Options for the Composite Wood Industry*; Martin and Northeim, Research Triangle Institute Center for Environmental Analysis, 1995.

of dry wood is 446°F. Dry material is the predominant furnish in particleboard. Many dryers are directly heated by dry fuel suspension burners. Others are heated by burning oil or natural gas.

Exhibit 9
Schematic of a Triple Pass Drum Dryer



Source: Characterization of Manufacturing Processes, Emissions, and Pollution Prevention - Options for the Composite Wood Industry; Martin and Northeim, Research Triangle Institute Center for Environmental Analysis, 1995.

Direct-fired rotary drum dryers release emissions such as wood dust, combustion products, fly ash, and organic compounds evaporated from the extractable portion of the wood. Steam-heated and natural gas-filled dryers will have no fly ash.

Air classifiers, which separate particles by surface area and weight, may be used alone or in conjunction with screening equipment. Air classifiers perform best if the feed is limited to particles with uniform widths and lengths. The classifier can then efficiently separate particles of different thicknesses due to the weight difference among particles of approximately equal surface area. Undesired material is usually used as fuel for the dryer burner. The screened particles are stored in dry bins until they are conveyed to the blender. Air classifiers have limited use in the industry. Screening systems are typically used to separate fine from coarse material.

The furnish is then blended with a synthetic adhesives, wax, and other additives distributed via spray nozzles, simple tubes, or atomizers. Resin may be added as received (usually an aqueous solution); mixed with water, wax emulsion, catalyst, or other additives. Waxes are added to impart water repellency and dimensional stability to the boards upon wetting.

Particles for PB are mixed with the additive in short retention time blenders in through which the furnish passes in seconds. The blenders consist of a small horizontal drum with high-speed, high shear impellers and glue injection tubes. As the furnish enters the drum,

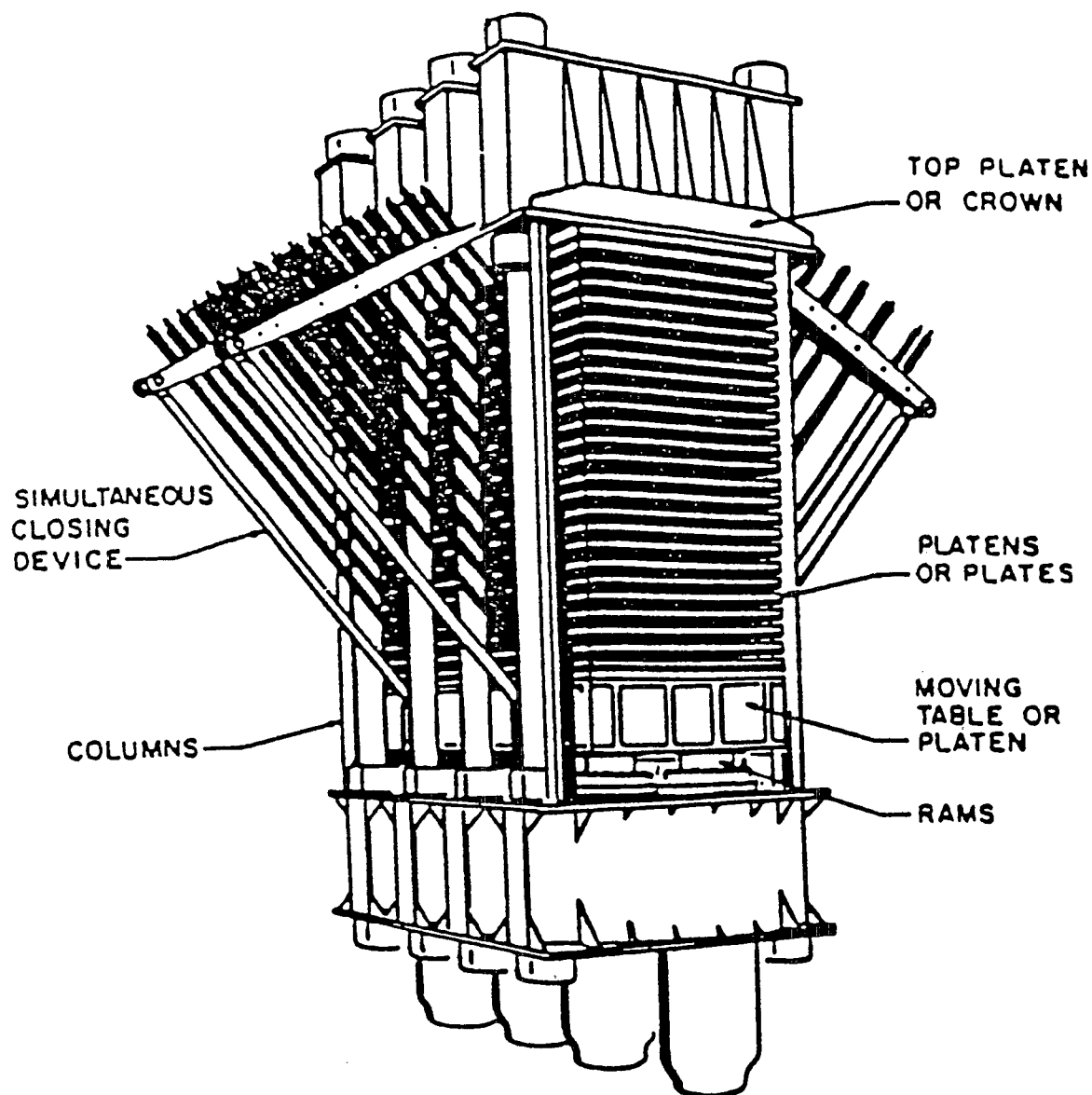
resin is injected, and the impellers hurl the furnish at high speeds to mix it with the resin.

The furnish and resin mixture is then formed into mats using a dry process. This procedure uses air or a mechanical system to distribute the furnish onto a moving caul (tray), belt, or screen. Particleboard mats are often formed of layers of different sized particles, with the larger particles in the core, and the finer particles on the outside of the board.

The mats are hot pressed to increase their density and to cure the resin. Most plants use multiopening platen presses, which typically have 14 to 18 openings (see Exhibit 10). The last ten years has seen the introduction of the continuous press. Though more popular in Europe, the continuous press is currently being used in two PB plants in the United States. Steam generated by a boiler that burns plant residuals runs through a platen passageway to provide the heat in most hot presses. Hot oil and hot water can also be used to heat the platens.

Primary finishing steps for all reconstituted wood panels include cooling or hot stacking, grading, trimming/cutting, and sanding. Cooling is important for UF-resin-cured boards since the resin degrades at high temperatures after curing. Boards bonded using PF resins may be hot-stacked to provide additional curing time. Secondary finishing steps include filling, painting, laminating, and edge finishing. The vast majority of reconstituted panel manufacturers do not apply secondary finishes to their panels; panels are finished primarily by end-users such as cabinet and furniture manufacturers. Panels are also finished by laminators who then sell the finished panels to furniture and cabinet manufacturers.

Exhibit 10
Schematic of a Multi-Opening Board Press



Source: *Characterization of Manufacturing Processes, Emissions, and Pollution Prevention - Options for the Composite Wood Industry*; Martin and Norheim, Research Triangle Institute Center for Environmental Analysis, 1995.

Medium Density Fiberboard (MDF)

The uses for this type of composite wood product are similar to those of PB. The furnish used to manufacture MDF consists of the same type of green or dry wood residues used to manufacture PB and hardboard. Fibers and fiber bundles are generated by first steam-heating the wood, then passing it through a refiner. During this step the wood changes both chemically and physically; becoming less susceptible to the influences of moisture and less brittle as the lignin in the wood softens. This semi-plastic wood is then "rubbed" apart into fibers and fiber bundles in a refiner instead of being mechanically "broken" apart as in the PB manufacturing process.

The furnish is dried to a very low moisture content to allow for moisture to be gained by the addition of resins and other additives. Most MDF furnish is dried in tube dryers.

The blending process for MDF differs from that of PB in that it typically occurs before drying. After refining, the fibers are discharged through a valve known as the blowvalve into the blowline, a larger continuous chamber where the UF resins are mixed with the wood fiber. In the blowline, the fibers are sprayed with a resin which is injected from a line located either immediately after the blowvalve or anywhere along the blowline. Material is dried to an acceptable moisture content in a flash tube dryer at low temperatures after the blowline. If the blending is done mechanically, as in PB, it is done after the flash tube dryer.

MDF is formed using a dry process which uses air to distribute the furnish in a random orientation onto a moving caul (tray), belt, or screen. The mats are then pressed using a multi-opening platen press or a continuous press is currently used in three MDF plants in the United States. The boards are then cooled and finished like other reconstituted wood panels.

Hardboard

Hardboard is a higher-density version of MDF. It is typically used for siding, furniture drawer bottoms, dust stops, sliding doors, and cabinet doors and tops. There are three types of hardboard: wet, wet/dry, and dry process hardboard, each classified by their manufacturing processes. The furnish used to manufacture hardboard consists of the same green or dry process wood residues used to manufacture PB and MDF. The cooked semi-plastic furnish is "rubbed" apart into fiber bundles as in the MDF process. The fibers are all the same size, therefore, they need no screening.

In the manufacture of wet, and wet/dry process hardboard, the furnish is not dried because the forming process uses water. Wet and wet/dry process hardboard mats are formed using a wet process in which fibers are mixed with water and Phenol Formaldehyde adhesive and then metered onto a wire screen. Water is drained away with the aid of suction applied to the underside of the wire. The fiber mat, along with the supporting wire, is moved to a prepress where excess water is squeezed out. Wet/dry process hardboard is dried in an oven before being hot pressed.

In the manufacture of dry process hardboard, the furnish is dried using dryers typical of the reconstituted wood panel industry. As with MDF, the hardboard fibers are discharged through a blowvalve into a blowline after refining. Dry process hardboard mats are formed using a process similar to that of MDF and PB in which air is used to distribute the furnish in a random orientation onto a moving caul (tray), belt, or screen. All reconstituted wood panels are hot pressed to increase their density and to cure the resin.

Oriented Strandboard

The furnish used to manufacture OSB is specially flaked from roundwood. Logs entering OSB plants may be either tree length or cut to 100 inch lengths by a slasher saw. The logs are then debarked and sent to a strander which slices them into strands approximately 0.028 inch thick. The strands are then conveyed to a storage bin to await processing through the dryers. (Note: Some older mills cut the logs into 33 inch blocks before sending them to the strander.)

The strands are dried to a low moisture content to allow for moisture gained by adding resins and other additives. The strands are then blended with additives in long retention time blenders in which the furnish passes through in several minutes. The blenders are very large rotating drums (several feet in diameter and many feet in length) that are tilted on their axes. As the strands are fed into the drums, they are sprayed with either PF or MDI (Methylenediphenyl diisocyanate) resin and either liquid or emulsified paraffin wax. The tumbling action of the strands through the drums allows the strands to mix thoroughly with the resin and wax.

OSB is formed by a dry process, which uses air to distribute the furnish. OSB is produced by deliberate mechanical lining-up of the strands. In the mechanical orientation processes, mats are produced by dropping long slender flakes between parallel plates or disks onto a moving caul (tray), belt, or screen. The boards are then hot pressed and finished.

strand lumber, made from long strands of veneer, is extruded with PF resin into various cross sections and widths. Parallel laminated veneer, or laminated veneer lumber (LVL), is constructed of veneers that are bonded together with phenol-formaldehyde (PF) adhesive resin to form a laminate. The veneers are layered with the wood grain along the long axis of the beam. Laminated veneer lumber is manufactured to typical lumber sizes (2 x 4, 2 x 6, etc.). The length of the beams that can be manufactured is varied using end joints or finger joints. Another application of LVL is in the construction of wood "I" joists (a small beam that resembles the letter "I"). LVL is used to construct the top and bottom (flanges) of the joist and OSB or plywood is used to construct the center (web).

Glulam beams are also emerging as a substitute for lumber. Glulam is short for glued-laminated structural timber – large beams fabricated by bonding layers of specially-selected lumber with Resorcinol or Resorcinol/PF adhesives and timber. End and edge jointing permit production of longer and wider structural wood members than are available naturally. Glulam timbers are used with structural wood panels for many types of heavy timber construction.

Most of the engineered lumber products are used as substitutes for structural softwood lumber of large sizes and in applications where uniform strength is essential. I-beams, however, are finding wide application, with extensive use as floor joists and beams for various structures. There are several advantages of composite lumber when compared with sawn softwood lumber. First, these products allow production of large sizes of lumber from small, low-grade logs. Normally, relatively large and high-grade sawlogs are needed for production of lumber of this size. Second, composite lumber compares advantageously to solid sawn lumber in terms of both uniformity of quality and straightness. While the quality of lumber is determined to a great extent by the raw material, the quality of the reconstituted product is dependent upon the manufacturing process. It is likely, however, that use of composite lumber will increase in the future.

Wood Preserving

Wood is treated with preservatives to protect it from mechanical, physical, and chemical influences. Preserved wood is used primarily in the construction, railroad, and utilities industries to prevent rotting when wood is exposed to damp soil, standing water, or rain, and as protection against termites and marine borers. The most common preservatives include water-borne inorganics like chromated copper arsenate (CCA) and ammoniacal copper zinc arsenate (ACZA), and oil-borne organics like pentachlorophenol (PCP) and creosote. Generally,

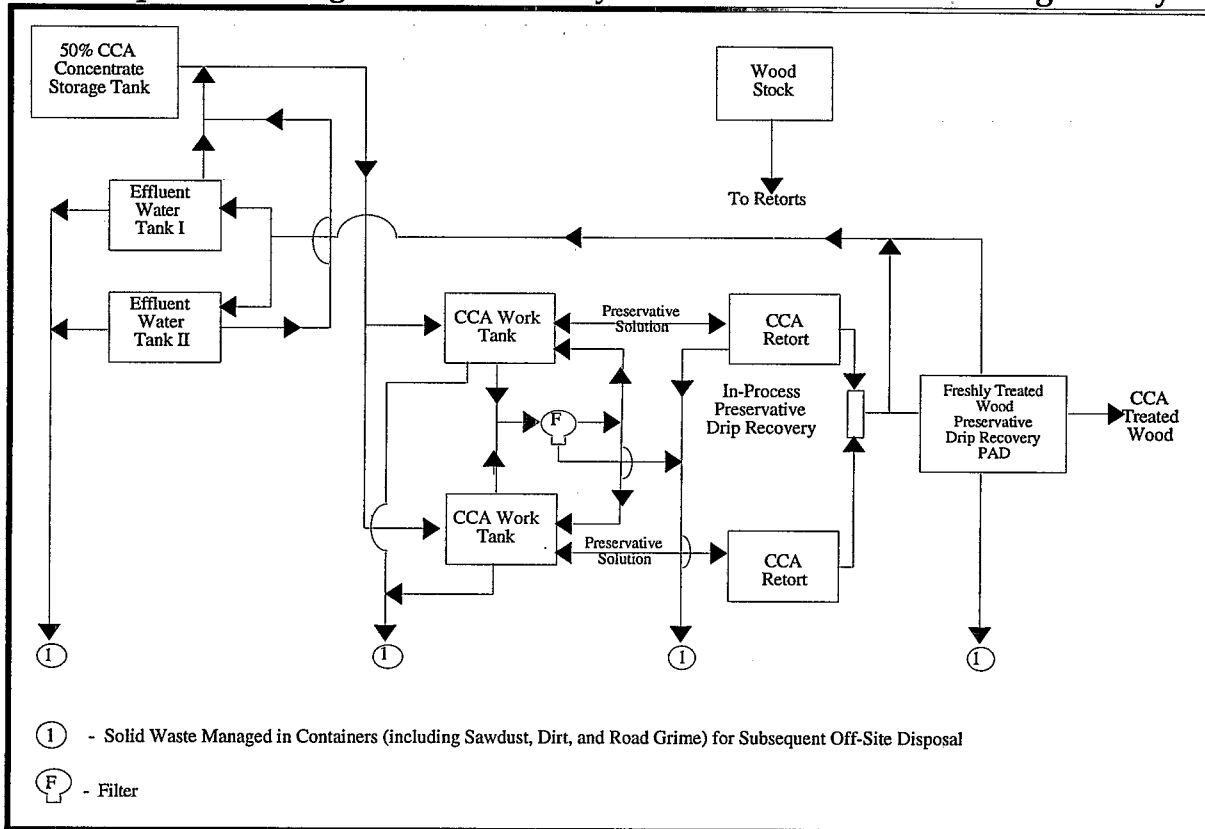
protection against termites and marine borers. The most common preservatives include water-borne inorganics like chromated copper arsenate (CCA) and ammoniacal copper zinc arsenate (ACZA), and oil-borne organics like pentachlorophenol (PCP) and creosote. Generally, water-borne inorganic solutions constitute approximately 78 percent of all preservatives used, while oil-borne creosote and PCP comprise 15 percent and 6 percent, respectively.

Creosote, PCP, and inorganic wood preservatives are all applied using similar processes. More than 90 percent of the wood preservation in the U.S. is performed using pressure treatment processes. Exhibit 10 illustrates a two-cylinder pressure treatment process for CCA. A limited quantity of wood is preserved using non-pressure treatment processes in which the preservative is allowed to diffuse into the wood. This process is used with some oil-borne preservatives, but not with waterborne inorganics.

The penetration required to adequately preserve wood can be achieved only if the wood has been conditioned properly; that is, if the moisture content of the freshly-cut wood is reduced to a point where the preservative can penetrate and be retained by the wood. Wood is usually conditioned in the open air or conditioned in the cylinder (retort) in which the pressure treatment is performed. The sawn lumber is sometimes incised to increase preservative penetration. Open air drying is typically used to prepare large stock for treatment with oil-borne preservatives. Other methods for conditioning wood prior to treatment with oil-borne preservatives include steaming, heating, and vapor drying. Kiln drying is used primarily for water-borne treatment. Conditioning is a major source of wastewater in the wood preserving industry.

After the moisture content of the wood has been reduced, the wood is preserved using either non-pressure or pressure methods. Non-pressure processes include brushing, spraying, dipping, soaking, and thermal processes. These processes involve the repeated use of preservative in a treatment tank with fresh preservative solution added to replace consumptive loss. The continual reuse of preservative leads to the accumulation of wood chips, sand, stones, and other debris contaminated with various hazardous constituents in the bottom of the treating tanks. This contaminated debris is a major source of process waste for non-pressure processes.

Exhibit 11
Example Flow Diagram For a Two-Cylinder CCA Pressure-Treating Facility



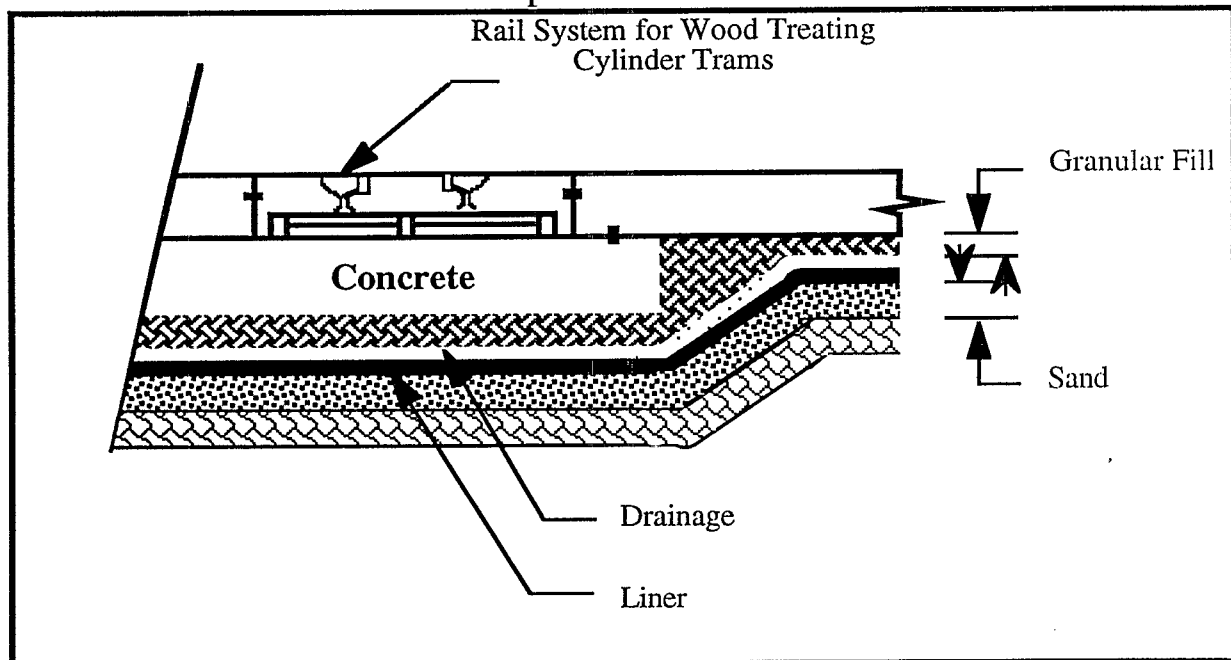
Source: *Title III, Section 313 Release Reporting Guidance; Office of Pesticides and Toxic Substances; March 1983.*

There are two basic types of pressure treatment processes, distinguished by the sequence in which vacuum and pressure are applied. These are "empty-cell" and "full-cell" or "modified full cell" processes. The terms "empty" and "full" are measures of the level of preservative retained by the wood cells.

"Empty-cell" processes obtain relatively deep penetration with limited absorption of preservative. In the Reuping empty-cell process, air pressure is applied to the wood as preservative is pumped into the treating cylinder. Once the desired level of retention has been achieved, the unused preservative is drained off and the excess preservative is vacuum pumped away from the wood. The process is the same in the Lowry empty-cell process, except no initial pressure is applied. In both processes, air compressed in the wood drives out part of the preservative absorbed during the pressure period when pressure is released.

The second method, known as the "full-cell" (Bethel) process, results in higher retention of preservative but limited penetration compared to the empty-cell process. The full-cell or modified full cell procedures are used with both oil- and water-borne preservatives. A vacuum is created in the treating cylinder and preservative is pumped in without breaking the vacuum. Once full, hydrostatic or pneumatic pressure is applied until the wood will retain no more preservative. A final vacuum may then be applied to remove excess preservative, which is returned to the work tank for reuse. The treated wood is removed from the cylinder and placed on a drip pad where it remains until dripping has ceased (see Exhibit 12). Preservative solution, washdown water, and rainwater are collected on the drip pad and maintained in the process. At waterborne plants, these materials are transferred to a dilution water tank where they are blended with additional concentrate to make fresh treating solution. At oil-borne plants, these materials are processed to recover preservative and usable process water. Excess waste water is treated either on-site in a wastewater treatment unit or off-site at a publicly owned treatment works.

Exhibit 12
Drip Pad with Liner



Source: U.S. EPA.

III.B. Raw Material Inputs and Pollution Outputs

Exhibit 13 provides an overview of the material inputs and pollution outputs for different processes in the lumber and wood products industry.

Logging

With the exception of concerns for species and ecosystem preservation, harvesting practices have minimal environmental impacts. Harvesting practices often cause discharges of materials into surrounding waters, threatening water quality standards. The Federal Water Protection Control Act regulates these discharges. In addition, road construction for access to timber areas is of concern, due to impacts on surrounding ecosystems.

Exhibit 13
Process Materials Inputs and Pollution Outputs

Process	Material Input	Air Emissions	Process Waste	Other Waste
Logging	Trees, diesel, gasoline	PM-10, VOCs, CO, NO _x	Not applicable	Waste wood particles
Sawing	Wood logs, diesel, gasoline	PM-10, VOCs, CO, NO _x	Not applicable	Waste wood particles
Surface Protection	Wood, 3-Iodo-2-Propynyl Butyl Carbamate (IPBC), Didecyl Dimethyl Ammonium Chloride (DDAC)	IPBC, DDAC, ethyl alcohol, petroleum naphtha	Dripped formulation mixed with rainwater and facility washdown water	Sawdust, wood chips, sand, dirt, stones, tar, emulsified or polymerized oils
Plywood and Veneer	Veneer, phenol-formaldehyde resins, urea-formaldehyde resins, melamine-formaldehyde resins, sodium hydroxide, ammonium sulfate, acids, ammonia	PM-10, VOCs, CO, CO ₂ , NO _x , formaldehyde, phenol, wood dust, condensable hydrocarbons, terpenes, methanol, acetic acid, ethanol, furfural	Not applicable	Waste wood particles, adhesive residues
Reconstituted Wood Products	Wood particles, strands, fiber, same resins as plywood and veneer, methylenediphenyl diisocyanate resins	PM-10, VOCs, CO, CO ₂ , NO _x , formaldehyde, phenol, wood dust, condensable hydrocarbons, terpenes, methanol, acetic acid, ethanol, furfural	Not applicable	Waste wood particles, adhesive residues
Wood Preserving	Wood, pentachlorophenol, creosote, borates, ammonium compounds, inorganic formulations of chromium, copper, and arsenic, carrier oils	Pentachlorophenol, polycyclic organics, creosote, ammonia, boiler emissions, air-borne arsenics, VOCs	Dripped formulation mixed with rainwater and facility washdown water, kiln condensate, contact cooling water	Bottom sediment sludges, process residuals

Sawn Lumber

Most of the residual wood from sawn lumber production is reused as mulch, pulp, and furnish for some types of reconstituted wood panels; some is burned to produce steam or electricity. Studies cited by the Western Wood Products Association indicate that approximately 70 percent of a sawn log is utilized for lumber and other parts are used for co-products. Some of the small residuals are gathered with pneumatic

systems for combination with larger amounts destined for use in other products. While there is virtually no waste from the manufacturing process because all parts of the log are used for one product or another, wood residuals are high in organic matter and can threaten aquifers if improperly handled.

A major emission of concern from wood boilers is particulate matter (PM), although other pollutants, particularly CO and organic compounds, may be emitted in significant quantities under poor operating conditions. Boilers that burn wood waste produce: fly ash, carbon monoxide, and volatile organic compounds (VOCs). New boilers must meet new source performance standards (NSPS) for air pollutants. In addition, mills are potential sources of toxic manganese air emissions.

Two types of primary waste streams are typically generated during the surface protection phase of sawn lumber production operations: process residuals and drippage. Secondary waste streams include spent formulations and wastewaters.

Typical process residuals from surface protection are tank sludges that accumulate in the dip tank and/or mix tank as a result of continuous reuse of the protectant. Some plants use spray systems that generate a sludge when recovered formulation is filtered. Periodically, the accumulated sludge must be removed, and is typically placed on sawdust or wood chip piles on-site. The ultimate destination of the sludge is dependent upon the management of the sawdust piles. Plants have reported burning sawdust on-site or shipping it off-site for use as boiler feed for energy recovery. Depending upon the particle size, some wood chips may be shipped to a pulp or paper mill.

Some plants generate little or no tank sludge as a result of certain process variations. Dip tank operations sometimes utilize an internal circulation system to enhance mixing and promote penetration into the packed bundles. The agitation does not allow any particulates to settle, and when the bundles are removed, some of the suspended solids are also removed. Green-chain operations sometimes use a system of rollers that are partially submerged into the dip tank. These rollers force the pieces of lumber under the surface of the formulation to ensure thorough coverage of the exposed surfaces. Forcing the lumber deeper into the tank physically drags the lumber through any sludge that has settled in the tank and this sludge leaves the tank with the treated lumber.

Another wastestream results from the excess formulation drippage from freshly surface protected lumber. In the absence of a drip pad,

excess drippage can fall on the ground when the wood is transported from the dip tank or green chain to stacking and packaging areas. Spray operations tend to result in less excess formulation on the wood than either the dipping or green-chain operations. Some plants utilize simple recovery systems to minimize the loss of formulation. For example, pack dip operations hold the wood over the dip tank at an angle to collect excess formulation prior to transfer to storage. Green chain and spray operations may utilize a collection pan under the conveyor to collect formulation as the freshly treated lumber runs along the green chain.

Panel Products

In mills where chips or other furnish is generated on-site, operations such as debarking, sanding, chipping, grinding, and fiber separation generate PM emissions in the form of sawdust and wood particulate matter. The following discussion of pollution outputs from panel production is not divided along product lines. Instead, due to similarities in manufacturing process, this section describes pollution outputs during the drying and pressing stages, where most emissions occur.

Dryers

Organic aerosols and gaseous organic compounds, along with a small amount of wood fiber are found in the emissions from veneer impingement dryers. A mixture of organic compounds is driven from the green wood veneer as its water content is converted to steam in the drying process. Aerosols begin to form as the gaseous emissions are cooled below 302°F. These aerosols form visible emissions called blue haze.

Emissions from the rotating drum wood chip dryers used in reconstituted wood panel plants are composed of wood dust, condensable hydrocarbons, fly ash, organic compounds evaporated from the extractable portion of the wood, and may include products of combustion such as CO, CO₂, and NO_x if direct-fired units are used. The organic portion of industry emissions includes terpenes, resin and fatty acids, and combustion and pyrolysis products such as methanol, acetic acid, ethanol, formaldehyde, and furfural. The condensable hydrocarbons and a portion of the VOCs leave the dryer stack as vapor but condense at normal atmospheric temperatures to form liquid particles that create the blue haze. Both the VOCs and the liquid organic mist are combustion products and compounds evaporated from the wood. Quantities emitted are dependent on wood species, dryer temperature, and fuel used.

One significant cause of blue haze is overloading a dryer by attempting to remove too much moisture within a given time. Overloading results in the introduction of green material to a high-temperature flame or gas stream causing a thermal shock that results in a rapid and excessive volatilizing of hydrocarbons that condense upon release to ambient air, causing the characteristic blue haze.

Another factor affecting the composition of the effluent from rotary drum dryers is inlet dryer temperatures. A study conducted in 1986 by The National Council of the Paper Industry for Air and Stream Improvement (NCASI) with data from five different mills using rotary drum dryers concluded that at inlet gas temperatures greater than 600°F, the emission rate of the total condensable portion of total gaseous nonmethane organics (TGNMO) increased as a function of temperature. The report concluded that the concentration of formaldehyde in the dryer exhaust was also directly related to dryer inlet temperature.

The type of wood species ^{being dried} ~~burned~~ also affects the composition of the effluent from rotary drum dryers. A second NCASI study concluded that high TGNMO emission rates from the dryers occurred when the wood species processed had high turpentine contents, such as Southern Pine. In a separate study on formaldehyde emissions, NCASI showed that dryers processing hardwood or a mixture of hardwood and softwood species had a moderate to dramatic increase in formaldehyde emissions at dryer inlet gas temperatures greater than 800°F, but dryers processing only softwood species had only a slight increase in formaldehyde emissions with increasing temperatures.

Presses

Emissions from board presses are dependent upon the type of resin used to bind the wood furnish together. Emissions from hot presses consist primarily of condensable organics. When the press opens, vapors that may include resin ingredients such as formaldehyde, phenol, MDI, and other organic compounds are released to the atmosphere through vents in the roof above the press. Formaldehyde emitted through press vents during pressing and board cooling operations is dependent upon the amount of excess formaldehyde in the resin as well as press temperature and cycle time.

Mole ratios are used to measure the number of moles of one compound to another in an adhesive. For example, the F:U (formaldehyde to urea) mole ratio measures the number of moles of formaldehyde to the number of moles of urea in the principal adhesive

used for PB and MDF. The nature of the product and the process dictates the mole ratio of resin used. The ratio directly impacts the ultimate strength the resin will produce in the board, i.e., certain products require higher mole ratio resins to attain an adequate level of bond strength. The higher the mole ratio, the higher the board emissions of formaldehyde. Thus lowering the F:U mole ratio is one way of lowering press and board emissions of formaldehyde. However, mole ratio is only one of several variables that can effect formaldehyde emissions. Other variables include application rates, process rates, and the nature of the specific resin formations.

Higher press temperatures generally result in higher formaldehyde emissions. In an NCASI study, emissions of formaldehyde and phenol from PF resins (used mainly for OSB) and structural plywood were not found to be related to any operating procedures, but were affected by different resin compositions. The types of resins used can effect the amount of emissions. There was little information on emissions from the curing of MDI resins (used for OSB along with PF resins).

Wood Preserving

The chemicals used in the wood preserving process and the drip pads used to collect preservative drippage after treatment of wood have been the subject of considerable regulatory action. EPA has issued final regulations regarding wood preserving wastewater, process residuals, preservative drippage, and spent preservatives from wood preserving processes at facilities that use chlorophenolic formulations, creosote formulations, and inorganic preservatives containing arsenic or chromium.

There are six EPA-classified hazardous wastes from wood preserving operations. These are: U051, discarded unused creosote, F027, discarded unused pentachlorophenol-formulation; K001, bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote or PCP; F032, wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations; F034, wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations; and F035, wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium.

Drips and spills during the oilborne preservative process may occur during chemical delivery, chemical storage and mixing, freshly-treated wood storage on bare ground (if RCRA guidelines are not followed), and dry-treated wood storage on ground. Aerosols and vapors may be released to ambient air during chemical storage and mixing, solution storage, and during pressure treatment (once the cylinder is opened). Sludges result if filters are used prior to solution reuse from wastewater treatment, and from the collection sumps at the facility.

During the inorganic treatment process, additional vapors such as arsenic, may be released to ambient air during the pressure treating process, such as from the process tank or work vent during the initial vacuum stage, the flooding via vacuum, pressure relief and blow back, and the final vacuum. Aerosols and vapor may also be released from the cylinder door area during pressure treating and door opening.

Wood preserving facilities generate wastewater during the conditioning of the wood prior to its treatment and as a result of the condensation removed from the treatment cylinder. Rainwater, spills collected from the area around the treatment cylinder, and drip pad wash down water also contribute to wastewater volume. Typical air emissions sources are volatilization of organic chemicals during wastewater evaporation, vapors released from the treating cylinder during unloading and charging operations, and emissions from the vacuum vent during the treating cycle.

After both pressure and non-pressure treatment, some unabsorbed preservative formulation adheres to the treated wood surface. Eventually, this liquid drips from the wood or is washed off by precipitation. If the wood has been pressure treated, excess preservative will also exude slowly from the wood as it gradually returns to atmospheric pressure. This is known as "kickback." Current regulations specify that all wood must be drip-free prior to transfer from a drip pad to a storage yard. Also, storage-yard drippage resulting from "kickback" must be cleaned up within 72 hours of the occurrence. Preservative formulation may continue to exude from pressure and non-pressure treated wood for long periods, even after the wood is shipped off-site and installed for its intended end use. (See Exhibit 11 for schematic of wood preserving process and waste generation)

III.C. Management of Chemicals in Wastestream

The Pollution Prevention Act of 1990 (EPA) requires facilities to report information about the management of TRI chemicals in waste and efforts made to eliminate or reduce those quantities. These data have been collected annually in Section 8 of the TRI reporting Form R, beginning with the 1991 reporting year. The data summarized below cover the years 1992-1995 and is meant to provide a basic understanding of the quantities of waste handled by the industry, the methods typically used to manage this waste, and recent trends in these methods. TRI waste management data can be used to assess trends in source reduction within individual industries and facilities, and for specific TRI chemicals. This information could then be used as a tool in identifying opportunities for pollution prevention and compliance assistance activities.

While the quantities reported for 1992 and 1993 are estimates of quantities already managed, the quantities reported for 1994 and 1995 are projections only. The EPA requires these projections to encourage facilities to consider future waste generation and source reduction of those quantities as well as movement up the waste management hierarchy. Future-year estimates are not commitments that facilities reporting under TRI are required to meet.

Exhibit 14 shows that the lumber and wood products industry managed about 69 million pounds of production-related waste (total quantity of TRI chemicals in the waste from routine production operations) in 1993 (column B). Column C reveals that of this production-related waste, 17 percent was either transferred off-site or released to the environment. Column C is calculated by dividing the total TRI transfers and releases by the total quantity of production-related waste. In other words, about 84 percent of the industry's TRI wastes were managed on-site through recycling, energy recovery, or treatment as shown in columns D, E and F, respectively. The majority of waste that is released or transferred off-site can be divided into portions that are recycled off-site, recovered for energy off-site, or treated off-site as shown in columns G, H, and I, respectively. The remaining portion of the production-related wastes (13.2 percent), shown in column J, is either released to the environment through direct discharges to air, land, water, and underground injection, or it is disposed off-site.

From the yearly data presented below it is apparent that the portion of TRI wastes reported as recycled on-site has increased and the portions treated or managed through energy recovery on-site have decreased between 1992 and 1995 (projected).

Exhibit 14
Source Reduction and Recycling Activity for SIC 24

A	B	C	D	E	F	G	H	I	J
Year	Production Related Waste Volume (10 ⁶ lbs.)*	% Reported as Released and Transferred	On-Site			Off-Site			Remaining Releases and Disposal
			% Recycled	% Energy Recovery	% Treated	% Recycled	% Energy Recovery	% Treated	
1992	33	45%	55.17%	0.10%	11.02%	0.06%	1.84%	2.12%	29.69%
1993	69	17%	78.30%	0.05%	5.90%	0.07%	1.36%	1.09%	13.23%
1994	66	—	79.59%	0.07%	5.32%	0.08%	0.86%	0.59%	13.50%
1995	63	—	79.15%	0.03%	5.63%	0.09%	0.74%	0.62%	13.72%

IV. CHEMICAL RELEASE AND TRANSFER PROFILE

This section is designed to provide background information on the pollutant releases that are reported by this industry. The best source of comparative pollutant release information is the Toxic Release Inventory System (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act, TRI includes self-reported facility release and transfer data for over 600 toxic chemicals. Facilities within SIC Codes 20-39 (manufacturing industries) that have more than 10 employees, and that are above weight-based reporting thresholds are required to report TRI on-site releases and off-site transfers. The information presented within the sector notebooks is derived from the most recently available (1993) TRI reporting year (which then included 316 chemicals), and focuses primarily on the on-site releases reported by each sector. Because TRI requires consistent reporting regardless of sector, it is an excellent tool for drawing comparisons across industries.

Although this sector notebook does not present historical information regarding TRI chemical releases over time, please note that in general, toxic chemical releases have been declining. In fact, according to the 1993 Toxic Release Inventory Data Book, reported releases dropped by 42.7% between 1988 and 1993. Although on-site releases have decreased, the total amount of reported toxic waste has not declined because the amount of toxic chemicals transferred off-site has increased. Transfers have increased from 3.7 billion pounds in 1991 to 4.7 billion pounds in 1993. Better management practices have led to increases in off-site transfers of toxic chemicals for recycling. More detailed information can be obtained from EPA's annual Toxics Release Inventory Public Data Release book (which is available through the EPCRA Hotline at 1-800-535-0202), or directly from the Toxic Release Inventory System database (for user support call 202-260-1531).

Wherever possible, the sector notebooks present TRI data as the primary indicator of chemical release within each industrial category. TRI data provide the type, amount, and media receptor of each chemical released or transferred. When other sources of pollutant release data have been obtained, these data have been included to augment the TRI information.

TRI Data Limitations

The reader should keep in mind the following limitations regarding TRI data. Within some sectors, the majority of facilities are not subject to TRI reporting because they are not considered manufacturing industries, or because they are below TRI reporting thresholds.

Examples are the mining, dry cleaning, printing, and transportation equipment cleaning sectors. For these sectors, release information from other sources has been included.

The reader should also be aware that TRI "pounds released" data presented within the notebooks is not equivalent to a "risk" ranking for each industry. Weighting each pound of release equally does not factor in the relative toxicity of each chemical that is released. The Agency is in the process of developing an approach to assign toxicological weightings to each chemical released so that one can differentiate between pollutants with significant differences in toxicity. As a preliminary indicator of the environmental impact of the industry's most commonly released chemicals, the notebook briefly summarizes the toxicological properties of the top five chemicals (by weight) reported by each industry.

Definitions Associated With Section IV Data Tables

General Definitions

SIC Code -- the Standard Industrial Classification (SIC) is a statistical classification standard used for all establishment-based Federal economic statistics. The SIC codes facilitate comparisons between facility and industry data.

TRI Facilities -- are manufacturing facilities that have 10 or more full-time employees and are above established chemical throughput thresholds. Manufacturing facilities are defined as facilities in Standard Industrial Classification primary codes 20-39. Facilities must submit estimates for all chemicals that are on the EPA's defined list and are above throughput thresholds.

Data Table Column Heading Definitions

The following definitions are based upon standard definitions developed by EPA's Toxic Release Inventory Program. The categories below represent the possible pollutant destinations that can be reported.

RELEASES -- are an on-site discharge of a toxic chemical to the environment. This includes emissions to the air, discharges to bodies of water, releases at the facility to land, as well as contained disposal into underground injection wells.

Releases to Air (Point and Fugitive Air Emissions) -- Include all air emissions from industry activity. Point emissions occur through

confined air streams as found in stacks, ducts, or pipes. Fugitive emissions include losses from equipment leaks, or evaporative losses from impoundments, spills, or leaks.

Releases to Water (Surface Water Discharges) - encompass any releases going directly to streams, rivers, lakes, oceans, or other bodies of water. Any estimates for stormwater runoff and non-point losses must also be included.

Releases to Land -- includes disposal of waste to on-site landfills, waste that is land treated or incorporated into soil, surface impoundments, spills, leaks, or waste piles. These activities must occur within the facility's boundaries for inclusion in this category.

Underground Injection -- is a contained release of a fluid into a subsurface well for the purpose of waste disposal.

TRANSFERS -- is a transfer of toxic chemicals in wastes to a facility that is geographically or physically separate from the facility reporting under TRI. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers for disposal, these quantities do not necessarily represent entry of the chemical into the environment.

Transfers to POTWs -- are wastewaters transferred through pipes or sewers to a publicly owned treatments works (POTW). Treatment and chemical removal depend on the chemical's nature and treatment methods used. Chemicals not treated or destroyed by the POTW are generally released to surface waters or landfilled within the sludge.

Transfers to Recycling -- are sent off-site for the purposes of regenerating or recovering still valuable materials. Once these chemicals have been recycled, they may be returned to the originating facility or sold commercially.

Transfers to Energy Recovery -- are wastes combusted off-site in industrial furnaces for energy recovery. Treatment of a chemical by incineration is not considered to be energy recovery.

Transfers to Treatment -- are wastes moved off-site for either neutralization, incineration, biological destruction, or physical separation. In some cases, the chemicals are not destroyed but prepared for further waste management.

Transfers to Disposal -- are wastes taken to another facility for disposal generally as a release to land or as an injection underground.

IV.A. EPA Toxic Release Inventory for the Lumber and Wood Products Industry

TRI Release amounts listed below are not associated with non-compliance with environmental laws. These facilities appear based on self-reported data submitted to the Toxic Release Inventory program.

The TRI database contains a detailed compilation of self-reported, facility-specific chemical releases. The top reporting facilities for this sector are listed below. Facilities that have reported only the SIC codes covered under this notebook appear in Exhibit 15. Exhibit 16 contains additional facilities that have reported the SIC code covered within this report, and one or more SIC codes that are not within the scope of this notebook. Therefore, Exhibit 16 includes facilities that conduct multiple operations — some that are under the scope of this notebook, and some that are not. Operations in Exhibit 16 include: 2621 - paper mills, 2611 - pulp mills, 2631 - paper mills, and 2812 - industrial inorganic chemicals. Currently, the facility-level data do not allow pollutant releases to be broken apart by industrial process.

Exhibits 17-19 illustrate the TRI releases and transfers for the lumber and wood products industry (SIC 24). For the industry as a whole, VOCs (such as formaldehyde, xylene, toluene, and methanol) comprise the largest number of TRI releases. A large amount of VOC releases, both fugitive and point source emissions, result in part from the extensive use of glues and resins in this industry. VOCs are primarily released during the drying and pressing phases of most wood panel product manufacturing processes. VOC emissions are also associated with solvents used to coat cabinets, decorative panels, and toys.

Exhibit 15
Top 10 TRI Releasing Lumber and Wood Product Facilities (SIC 24 only)

Rank	Total TRI Releases in Pounds	Facility Name	City	State
1	638,622	Merillat Ind. Inc.	Mount Jackson	VA
2	386,994	Component Concepts Inc.	Thomasville	NC
3	383,100	Child Craft Inc. Co. Inc.	Salem	IN
4	341,200	Afco Ind. Inc.	Holland	MI
5	261,000	Decolam Inc.	Orangeburg	SC
6	241,010	Abt Co. Inc.	Roaring River	NC
7	234,697	Weyerhaeuser Particleboard Mill	Adel	GA
8	199,000	J. H. Baxter & Co.	Weed	CA
9	197,800	Georgia-Pacific Corp. Monticello Panelboard	Monticello	GA
10	179,000	Northwood Panelboard Co.	Solway	MN

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 16
Top 10 TRI Releasing Lumber and Wood Product Facilities

SIC Codes	Total TRI Releases in Pounds	Facility Name	City	State
2621, 2611, 2812, 2421	1,273,125	Weyerhaeuser Co.	Longview	WA
2621, 2421, 2436	1,187,356	MacMillian Bloedel Inc.	Pine Hill	AL
2611, 2621, 2631, 2421	1,059,615	Potlatch Corp. Pulp & Paperboard Group	Lewiston	ID
2631, 2436, 2499	768,369	Weyerhaeuser Co. Containerboard Packaging Div.	Springfield	OR
2426	638,622	Merillat Ind. Inc.	Mount Jackson	VA
2493	386,994	Component Concepts Inc.	Thomasville	NC
2435	383,100	Child Craft Inc. Co. Inc.	Salem	IN
2493	341,200	AFCO Ind. Inc.	Holland	NH
2439	261,000	Decolam, Inc.	Orangeburg	SC
2493	241,010	Abt Co. Inc.	Roaring River	NC

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Note: Being included on these lists does not mean that the release is associated with non-compliance with environmental laws.

Exhibit 17
TRI Reporting Lumber and Wood Product Facilities (SIC 24) by State

State	Number of Facilities	State	Number of Facilities
AL	43	ND	1
AR	18	NH	1
AZ	2	NJ	4
CA	19	NM	1
CO	3	NV	1
CT	1	NY	6
FL	19	OH	8
GA	35	OK	3
HI	4	OR	24
ID	3	PA	19
IL	9	PR	3
IN	11	RI	1
KY	8	SC	20
LA	17	SD	2
MA	3	TN	12
MD	6	TX	27
ME	4	UT	1
MI	13	VA	24
MN	12	VT	1
MO	6	WA	10
MS	28	WI	18
MT	2	WV	5
NC	31	WY	2

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 18
Releases for Lumber and Wood Products (SIC 24) in TRI, by Number of Facilities
(Releases reported in pounds/year)

Chemical Name	#/Facilities Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Under-ground Injection	Land Disposal	Total Releases	Average Releases per Facility
Arsenic Compounds	225	392	387	1661	0	5	2445	11
Chromium Compounds	223	397	392	2043	0	0	2832	13
Copper Compounds	222	397	397	2098	0	5	2897	13
Formaldehyde	69	318332	1832467	3500	0	1333	2155632	31241
Creosote	68	377646	641954	8016	0	943	1028559	15126
Arsenic	66	270	260	1451	0	5	1986	30
Copper	65	265	260	1192	0	250	1967	30
Chromium	63	255	245	1779	0	0	2279	36
Pentachlorophenol	36	5605	4206	2531	0	255	12597	350
Sulfuric Acid	25	10	48151	10	0	0	48171	1927
Ammonia	24	361205	264070	78011	0	7460	710746	29614
Methylenebis (Phenylisocyanate)	24	658	9857	0	0	0	10515	438
Phenol	18	20855	210255	2850	0	5	233965	12998
Methanol	14	130145	554849	0	0	8	685002	48929
Toluene	14	215435	715331	0	0	0	930766	66483
Xylene (Mixed Isomers)	12	52437	1005851	0	0	0	1058288	88191
Acetone	10	205915	180720	0	0	0	386635	38664
Methyl Ethyl Ketone	9	8469	481703	0	0	0	490172	54464
Phosphoric Acid	9	0	20	0	0	0	20	2
Hydrochloric Acid	8	0	0	0	0	0	0	0
Methyl Isobutyl Ketone	8	70864	121782	0	0	0	192646	24081
Zinc Compounds	5	0	0	255	0	5	260	52
Ammonium Sulfate (Solution)	4	0	0	5	0	0	5	1
Glycol Ethers	4	34600	65400	0	0	0	100000	25000
N-Butyl Alcohol	4	3199	89582	0	0	0	92781	23195
Naphthalene	4	10529	4852	0	0	1	15382	3846
Anthracene	3	2000	0	0	0	1	2001	667
Dibenzofuran	3	850	0	0	0	1	851	284
Ethylbenzene	2	1300	64644	0	0	0	65944	32972
Ethylene Glycol	2	1000	52900	0	0	0	53900	26950
Nitric Acid	2	0	1173	0	0	0	1173	587
Quinoline	2	272	0	0	0	1	273	137
Ammonium Nitrate (Solution)	1	0	0	0	0	0	0	0
Antimony Compounds	1	0	0	0	0	0	0	0
Butyl Benzyl Phthalate	1	5	5	0	0	0	10	10
Chlorine	1	5	0	10	0	0	15	15
Di(2-Ethylhexyl) Phthalate	1	0	0	0	0	0	0	0
Dibutyl Phthalate	1	0	0	0	0	0	0	0
Dichloromethane	1	37000	0	0	0	0	37000	37000
Methyl Methacrylate	1	250	0	0	0	0	250	250
Styrene	1	0	0	0	0	0	0	0
Tetrachloroethylene	1	2	0	0	0	0	2	2
Toluene-2,4-Diisocyanate	1	68	36529	0	0	0	36597	36597
Zinc (Fume Or Dust)	1	5	5	5	0	0	15	15
Totals	491	1,860,637	6,388,247	105,417	0	10,278	8,364,579	17,036

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 19
Transfers for Lumber and Wood Product (SIC 24) in TRI, by Number of Facilities
(Transfers reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	POTW Discharges	Disposal	Recycling	Treatment	Energy Recovery	Total Transfers	Average Transfers per Facility
Arsenic Compounds	225	0	90677		11192		101869	453
Chromium Compounds	223	0	82702		9494		92446	415
Copper Compounds	222	0	77164		9123		86287	389
Formaldehyde	69	120	1304		750	195	2369	34
Creosote	68	11502	1296906	18667	446558	636818	2410451	35448
Arsenic	66	16	81038		11910		92964	1409
Copper	65	35	54935		8090		63060	970
Chromium	63	7	99933		16200		116390	1847
Pentachlorophenol	36	1125	34860	1010	68963	40981	146939	4082
Sulfuric Acid	25	0					0	0
Ammonia	24	72250	1775				74025	3084
Methylenebis (Phenylisocyanate)	24	600	511		1300		2411	100
Phenol	18	750	15	500	1100		2365	131
Methanol	14	598	2550	4700		5800	13648	975
Toluene	14	0	4300	4800	17700	43400	70200	5014
Xylene (Mixed Isomers)	12	5		16333	1750	78619	96707	8059
Acetone	10	0				9242	9242	924
Methyl Ethyl Ketone	9	0	1700	1800		25990	29490	3277
Phosphoric Acid	9	250					250	28
Hydrochloric Acid	8	0					0	0
Methyl Isobutyl Ketone	8	0				109577	109577	13697
Zinc Compounds	5	0	1505		250		1755	351
Ammonium Sulfate (Solution)	4	0					0	0
Glycol Ethers	4	3060				4500	7560	1890
N-Butyl Alcohol	4	0		750	250	9447	10447	2612
Naphthalene	4	0			751		751	188
Anthracene	3	0			255		255	85
Dibenzofuran	3	0			751		751	250
Ethylbenzene	2	0		1737		3420	5157	2579
Ethylene Glycol	2	0					0	0
Nitric Acid	2	0					0	0
Quinoline	2	0			251		251	126
Ammonium Nitrate (Solution)	1	0					0	0
Antimony Compounds	1	0					0	0
Butyl Benzyl Phthalate	1	0					0	0
Chlorine	1	0					0	0
Di(2-Ethylhexyl) Phthalate	1	0					0	0
Dibutyl Phthalate	1	0					0	0
Dichloromethane	1	0				750	750	750
Methyl Methacrylate	1	300					300	300
Styrene	1	0			250		250	250
Tetrachloroethylene	1	0					0	0
Toluene-2,4-Diisocyanate	1	0					0	0
Zinc (Fume Or Dust)	1	5	5				10	10
Totals	491	90,623	1,831,880	50,297	606,888	968,739	3,548,927	7,228

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

IV.B. Summary of Selected Chemicals Released

The following is a synopsis of current scientific toxicity and fate information for the top chemicals (by weight) that facilities within this sector self-reported as released to the environment based upon 1993 TRI data. Because this section is based upon self-reported release data, it does not attempt to provide information on management practices employed by the sector to reduce the release of these chemicals. Information regarding pollutant release reductions over time may be available from EPA's TRI and 33/50 programs, or directly from the industrial trade associations that are listed in Section IX of this document. Since these descriptions are cursory, please consult the sources referenced below for a more detailed description of both the chemicals described in this section, and the chemicals that appear on the full list of TRI chemicals appearing in Section IV.A.

The brief descriptions provided below were taken from the *1993 Toxics Release Inventory Public Data Release* (EPA, 1994), the Hazardous Substances Data Bank (HSDB), and the Integrated Risk Information System (IRIS), both accessed via TOXNET¹. The information contained below is based upon exposure assumptions that have been conducted using standard scientific procedures. The effects listed below must be taken in context of these exposure assumptions that are more fully explained within the full chemical profiles in HSDB.

¹ TOXNET is a computer system run by the National Library of Medicine that includes a number of toxicological databases managed by EPA, National Cancer Institute, and the National Institute for Occupational Safety and Health. For more information on TOXNET, contact the TOXNET help line at 1-800-231-3766. Databases included in TOXNET are: CCRIS (Chemical Carcinogenesis Research Information System), DART (Developmental and Reproductive Toxicity Database), DBIR (Directory of Biotechnology Information Resources), EMICBACK (Environmental Mutagen Information Center Backfile), GENE-TOX (Genetic Toxicology), HSDB (Hazardous Substances Data Bank), IRIS (Integrated Risk Information System), RTECS (Registry of Toxic Effects of Chemical Substances), and TRI (Toxic Chemical Release Inventory). HSDB contains chemical-specific information on manufacturing and use, chemical and physical properties, safety and handling, toxicity and biomedical effects, pharmacology, environmental fate and exposure potential, exposure standards and regulations, monitoring and analysis methods, and additional references.

The top TRI releases for the lumber and wood products industry (SIC 24) as whole include:

Acetone
Ammonia
Creosote
Formaldehyde
Methanol
Methyl ethyl ketone
Methyl isobutyl ketone
Phenol
Toluene
Xylenes (mixed isomers).

Acetone

Toxicity. Acetone is irritating to the eyes, nose, and throat. Symptoms of exposure to large quantities of acetone may include headache, unsteadiness, confusion, lassitude, drowsiness, vomiting, and respiratory depression.

Reactions of acetone (see environmental fate) in the lower atmosphere contribute to the formation of ground-level ozone. Ozone (a major component of urban smog) can affect the respiratory system, especially in sensitive individuals such as asthmatics or allergy sufferers.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. If released into water, acetone will be degraded by microorganisms or will evaporate into the atmosphere. Degradation by microorganisms will be the primary removal mechanism.

Acetone is highly volatile, and once it reaches the troposphere (lower atmosphere), it will react with other gases, contributing to the formation of ground-level ozone and other air pollutants. EPA is reevaluating acetone's reactivity in the lower atmosphere to determine whether this contribution is significant.

Physical Properties. Acetone is a volatile and flammable organic chemical.

Note: Acetone was removed from the list of TRI chemicals on June 16, 1995 (60 FR 31643) and will not be reported for 1994 or subsequent years.

Ammonia

Toxicity. Anhydrous ammonia is irritating to the skin, eyes, nose, throat, and upper respiratory system.

Ecologically, ammonia is a source of nitrogen (an essential element for aquatic plant growth), and may therefore contribute to eutrophication of standing or slow-moving surface water, particularly in nitrogen-limited waters such as the Chesapeake Bay. In addition, aqueous ammonia is moderately toxic to aquatic organisms.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Ammonia combines with sulfate ions in the atmosphere and is washed out by rainfall, resulting in rapid return of ammonia to the soil and surface waters.

Ammonia is a central compound in the environmental cycling of nitrogen. Ammonia in lakes, rivers, and streams is converted to nitrate.

Physical Properties. Ammonia is a corrosive and severely irritating gas with a pungent odor.

Formaldehyde

Toxicity. Ingestion of formaldehyde leads to damage to the mucous membranes of mouth, throat, and intestinal tract; severe pain, vomiting, and diarrhea result. Inhalation of low concentrations can lead to irritation of the eyes, nose, and respiratory tract. Inhalation of high concentrations of formaldehyde causes severe damage to the respiratory system and to the heart, and may even lead to death. Other symptoms from exposure to formaldehyde include: headache, weakness, rapid heartbeat, symptoms of shock, gastroenteritis, central nervous system depression, vertigo, stupor, reduced body temperature, and coma. Repeated contact with skin promotes allergic reactions, dermatitis, irritation, and hardening. Contact with eyes causes injuries ranging from minor, transient injury to permanent blindness, depending on the concentration of the formaldehyde solution. In addition, menstrual disorders and secondary sterility have been reported in women exposed to formaldehyde.

Carcinogenicity. Formaldehyde is a probable human carcinogen via both inhalation and oral exposure, based on limited evidence in humans and sufficient evidence in animals.

Environmental Fate. Most formaldehyde is released to the environment as a gas, and is rapidly broken down by sunlight and reactions with atmospheric ions. Its initial oxidation product, formic acid, is a component of acid rain. The rest of the atmospheric formaldehyde is removed via dry deposition, rain or dissolution into surface waters. Biodegradation of formaldehyde in water takes place in a few days. Volatilization of formaldehyde dissolved in water is low. Bioaccumulation of formaldehyde does not occur.

When released onto the soil, aqueous solutions containing formaldehyde will leach through the soil. While formaldehyde is biodegradable under both aerobic and anaerobic conditions, its fate in soil and groundwater is unknown.

Although formaldehyde is found in remote areas, it is probably not transported there, but rather is likely a result of the local generation of formaldehyde from longer-lived precursors which have been transported there.

Methanol

Toxicity. Methanol is readily absorbed from the gastrointestinal tract and the respiratory tract, and is toxic to humans in moderate to high doses. In the body, methanol is converted into formaldehyde and formic acid. Methanol is excreted as formic acid. Observed toxic effects at high dose levels generally include central nervous system damage and blindness. Long-term exposure to high levels of methanol via inhalation cause liver and blood damage in animals.

Ecologically, methanol is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to exceed 1 mg methanol per liter water. Methanol is not likely to persist in water or to bioaccumulate in aquatic organisms.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Liquid methanol is likely to evaporate when left exposed. Methanol reacts in air to produce formaldehyde which contributes to the formation of air pollutants. In the atmosphere it can react with other atmospheric chemicals or be washed out by rain.

Methanol is readily degraded by microorganisms in soils and surface waters.

Physical Properties. Methanol is highly flammable.

Methyl Ethyl Ketone

Toxicity. Breathing moderate amounts of methyl ethyl ketone (MEK) for short periods of time can cause adverse effects on the nervous system ranging from headaches, dizziness, nausea, and numbness in the fingers and toes to unconsciousness. Its vapors are irritating to the skin, eyes, nose, and throat and can damage the eyes. Repeated exposure to moderate to high amounts may cause liver and kidney effects.

Carcinogenicity. No agreement exists over the carcinogenicity of MEK. One source believes MEK is a possible carcinogen in humans based on limited animal evidence. Other sources believe that there is insufficient evidence to make any statements about possible carcinogenicity.

Environmental Fate. Most of the MEK released to the environment will end up in the atmosphere. MEK can contribute to the formation of air pollutants in the lower atmosphere. It can be degraded by microorganisms living in water and soil.

Physical Properties. Methyl ethyl ketone is a flammable liquid.

Toluene

Toxicity. Inhalation or ingestion of toluene can cause headaches, confusion, weakness, and memory loss. Toluene may also affect the way the kidneys and liver function.

Reactions of toluene (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Some studies have shown that unborn animals were harmed when high levels of toluene were inhaled by their mothers, although the same effects were not seen when the mothers were fed large quantities of toluene. Note that these results may reflect similar difficulties in humans.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. The majority of releases of toluene to land and water will evaporate. Toluene may also be degraded by microorganisms. Once volatilized, toluene in the lower atmosphere will react with other atmospheric components contributing to the formation of ground-level ozone and other air pollutants.

Physical Properties. Toluene is a volatile organic chemical.

Xylene (Mixed Isomers)

Toxicity. Xylenes are rapidly absorbed into the body after inhalation, ingestion, or skin contact. Short-term exposure of humans to high levels of xylenes can cause irritation of the skin, eyes, nose, and throat, difficulty in breathing, impaired lung function, impaired memory, and possible changes in the liver and kidneys. Both short- and long-term exposure to high concentrations can cause effects such as headaches, dizziness, confusion, and lack of muscle coordination. Reactions of xylenes (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. The majority of releases to land and water will quickly evaporate, although some degradation by microorganisms will occur.

Xylenes are moderately mobile in soils and may leach into groundwater, where they may persist for several years.

Xylenes are volatile organic chemicals. As such, xylenes in the lower atmosphere will react with other atmospheric components, contributing to the formation of ground-level ozone and other air pollutants.

IV.C. Other Data Sources

The Aerometric Information Retrieval System (AIRS) contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry. With the exception of volatile organic compounds (VOCs), there is little overlap with the TRI chemicals reported above. Exhibit 20 summarizes annual releases of carbon monoxide (CO), nitrogen dioxide (NO₂), particulate matter of 10 microns or less (PM₁₀), total particulates (PT), sulfur dioxide (SO₂), and volatile organic compounds (VOCs).

Exhibit 20
Pollutant Releases (Short Tons/Years)

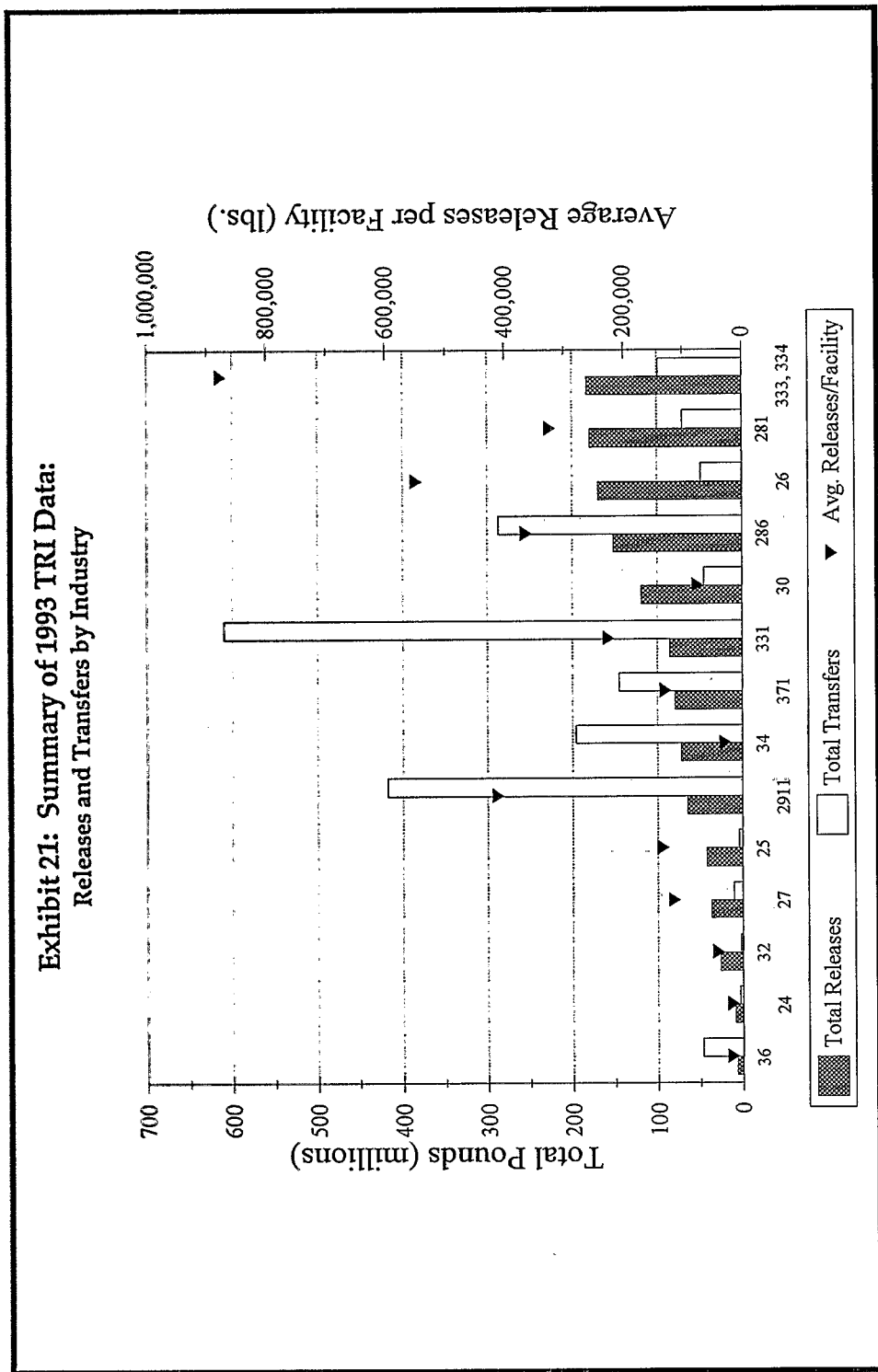
Industry	CO	NO ₂	PM ₁₀	PT	SO ₂	VOC
U.S. Total	97,208,000	23,402,000	45,489,000	7,836,000	21,888,000	23,312,000
Metal Mining	5,391	28,583	39,359	140,052	84,222	1,283
Nonmetal Mining	4,525	28,804	59,305	167,948	24,129	1,736
Lumber and Wood Products	123,756	42,658	14,135	63,761	9,149	41,423
Wood Furniture and Fixtures	2,069	2,981	2,165	3,178	1,606	59,426
Pulp and Paper	624,291	394,448	35,579	113,571	341,002	96,875
Printing	8,463	4,915	399	1,031	1,728	101,537
Inorganic Chemicals	166,147	108,575	4,107	39,082	182,189	52,091
Organic Chemicals	146,947	236,826	26,493	44,860	132,459	201,888
Petroleum Refining	419,311	380,641	18,787	36,877	648,153	309,058
Rubber and Misc. Plastic Products	2,090	11,914	2,407	5,355	29,364	140,741
Stone, Clay, Glass, and Concrete	58,043	338,482	74,623	171,853	339,216	30,262
Iron and Steel	1,518,642	138,985	42,368	83,017	238,268	82,292
Nonferrous Metals	448,758	55,658	20,074	22,490	373,007	27,375
Fabricated Metals	3,851	16,424	1,185	3,136	4,019	102,186
Electronics	367	1,129	207	293	453	4,854
Motor Vehicles, Bodies, Parts, and Accessories	35,303	23,725	2,406	12,853	25,462	101,275
Dry Cleaning	101	179	3	28	152	7,310

Source U.S. EPA Office of Air and Radiation, AIRS Database, May 1995.

IV.D. Comparison of Toxic Release Inventory Between Selected Industries

The following information is presented as a comparison of pollutant release and transfer data across industrial categories. It is provided to give a general sense as to the relative scale of releases and transfers within each sector profiled under this project. Please note that the following table does not contain releases and transfers for industrial categories that are not included in this project, and thus cannot be used to draw conclusions regarding the total release and transfer amounts that are reported to TRI. Similar information is available within the annual TRI Public Data Release book.

Exhibit 21 is a graphical representation of a summary of the 1993 TRI data for the Lumber and Wood Products Industry and the other sectors profiled in separate notebooks. The bar graph presents the total TRI releases and total transfers on the left axis and the triangle points show the average releases per facility on the right axis. Industry sectors are presented in the order of increasing total TRI releases. The graph is based on the data shown in Exhibit 22 and is meant to facilitate comparisons between the relative amounts of releases, transfers, and releases per facility both within and between these sectors. The reader should note, however, that differences in the proportion of facilities captured by TRI exist between industry sectors. This can be a factor of poor SIC matching and relative differences in the number of facilities reporting to TRI from the various sectors. In the case of Lumber and Wood Products Industry, the 1993 TRI data presented here covers 491 facilities. These facilities listed SIC 24 Lumber and Wood Products as a primary SIC code.



SIC Range	Industry Sector	SIC Range	Industry Sector	SIC Range	Industry Sector
36	Electronic Equipment and Components	2911	Petroleum Refining	286	Organic Chemical Mfg.
24	Lumber and Wood Products	34	Fabricated Metals	26	Pulp and Paper
32	Stone, Clay, and Concrete	371	Motor Vehicles, Bodies, Parts, and Accessories	281	Inorganic Chemical Mfg.
27	Printing	331	Iron and Steel	333, 334	Nonferrous Metals
25	Wood Furniture and Fixtures	30	Rubber and Misc. Plastics		

Exhibit 22
Toxic Release Inventory Data for Selected Industries

Industry Sector	SIC Range	# TRI Facilities	Releases		Transfers		Total Releases + Transfers (10 ⁶ pounds)	Average Releases per Facility (pounds)	Average Transfers per Facility (pounds)	Average Release+Transfers per Facility (pounds)
			Total Releases (10 ⁶ pounds)	Average Releases per Facility (pounds)	1993 Total (10 ⁶ pounds)	Average Transfers per Facility (pounds)				
Stone, Clay, and Concrete	32	634	26.6	41,895	2.2	3,500	28.2	46,000		
Lumber and Wood Products	24	491	8.4	17,036	3.5	7,228	11.9	24,000		
Furniture and Fixtures	25	313	42.2	134,883	4.2	13,455	46.4	148,000		
Printing	2711-2789	318	36.5	115,000	10.2	732,000	46.7	147,000		
Electronic Equipment	36	406	6.7	16,520	47.1	115,917	53.7	133,000		
Rubber and Misc. Plastics	30	1,579	118.4	74,986	45.0	28,537	163.4	104,000		
Motor Vehicle, Bodies, Parts and Accessories	371	609	79.3	130,158	145.5	238,938	224.8	369,000		
Pulp and paper	2611-2631	309	169.7	549,000	48.4	157,080	218.1	706,000		
Inorganic Chem. Mfg.	2812-2819	555	179.6	324,000	70.0	126,000	249.7	450,000		
Petroleum Refining	2911	156	64.3	412,000	417.5	2,676,000	481.9	3,088,000		
Fabricated Metals	34	2,363	72.0	30,476	195.7	82,802	267.7	123,000		
Iron and Steel	3312-3313 3321-3325	381	85.8	225,000	609.5	1,600,000	695.3	1,825,000		
Nonferrous Metals	333, 334	208	182.5	877,269	98.2	472,335	280.7	1,349,000		
Organic Chemical Mfg.	2861-2869	417	151.6	364,000	286.7	688,000	438.4	1,052,000		
Metal Mining	10								Industry sector not subject to TRI reporting	
Nonmetal Mining	14								Industry sector not subject to TRI reporting	
Dry Cleaning	7215, 7216, 7218								Industry sector not subject to TRI reporting	

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

V. POLLUTION PREVENTION OPPORTUNITIES

The best way to reduce pollution is to prevent it in the first place. Some companies have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and employing substitution of toxic chemicals. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

In order to encourage these approaches, this section provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the lumber and wood products industry. While the list is not exhaustive, it does provide core information that can be used as the starting point for facilities interested in beginning their own pollution prevention projects. When possible, this section provides information from real activities that can, or are being implemented by this sector -- including a discussion of associated costs, time frames, and expected rates of return. This section provides summary information from activities that may be, or are being implemented by this sector. When possible, information is provided that gives the context in which the techniques can be effectively used. Please note that the activities described in this section do not necessarily apply to all facilities that fall within this sector. Facility-specific conditions must be carefully considered when pollution prevention options are evaluated, and the full impacts of the change must examine how each option affects, air, land, and water pollutant releases.

Surface Protection

Several alternative manufacturing methods are part of the industry's pollution prevention efforts. One common alternative is to replace chemical treatment with another type of treatment to achieve surface protection. For example, the need for surface treatment would be decreased if efforts were made to dry the wood to reduce water content (high water content leads to sapstain). Due to economies of scale, this option may not be economically viable for a smaller mill.

Another pollution prevention option is the use of high velocity spray systems that generate fewer process residuals and less drippage. However, a small production volume may not favor this option since spray systems require a larger flow of wood through the systems to be economically or technically feasible.

Other pollution prevention strategies relating to surface protection include: 1) local and general ventilation within the cutting process area to reduce dust which would accumulate on wood; 2) blowing wood with air to further reduce sawdust on wood prior to surface protection; and 3) the use of drainage collection devices on roof tops to keep rainwater away from process wastes. For wastes that cannot be reduced at the source, generators may consider used surface protectant recycling as the next best option.

Panel Products

Air emissions from panel manufacturing are significantly greater than releases to water or land. The following information on pollution prevention options for the wood panel products industry (including veneer/plywood and reconstituted wood products) is from Martin and Northeim's summary.

Alternative Fiber Sources

One pollution prevention opportunity for the reconstituted wood panel industry is to search for alternative sources of wood fiber. This can be done in two ways: utilizing recycled wood waste and using existing agricultural fibers.

Increasing prices for raw wood furnish have led some firms to develop programs to recycle wood waste into chips for PB production. These firms collect construction site debris, discarded household items, crates, and used pallets for eventual use as PB furnish. Beyond finding sources, an ideal fiber recycling program includes extensive training and research on what materials are suitable, careful quality control of the recycled materials, and cleaning materials to remove foreign matter. There are many hurdles to properly cleaning the material because it is difficult to process different kinds of material and maintain a quality product.

A second alternative source for fiber is agricultural fiber, which can come from two sources: agricultural crops grown expressly for fiber (e.g., kenaf and bagasse) and residues of crops grown for other purposes (e.g., corn stalks/cobs and cotton stalks). Currently, two plants are being built in the U.S. that will use agricultural fiber to manufacture composite panels. In terms of potential availability, the amount of residual fiber generated by U.S. agriculture far exceeds present and future fiber requirements for composite panel manufacture. The feasibility of such a substitution, however, depends on many factors such as product quality, cost, and current uses of agriculture residues.

Alternative Adhesives

Other pollution prevention options in the panel products industry involve adhesive substitution. This involves replacing existing adhesives with less toxic formulations. There are a number of innovative adhesive options currently available for use in the panel products industry.

MDI Substitution

Based on price alone, there seems to be little incentive for manufacturers to switch from PF or UF to MDI adhesives. However, since the early 80's, one third of the OSB industry has switched from PF to MDI adhesives. According to their manufacturers, there are several environmental advantages to using these adhesives. Because MDI adhesives are capable of bonding wood flakes with a higher moisture content, less dryer energy is required to dry flakes suitable for MDI bonding. Other advantages to using MDI adhesives are lower press temperatures and shorter press cycles, both of which may lead to reduced press emissions. However, there are other concerns with respect to the use of MDI adhesives. Some companies are opposed to MDI substitution for reasons such as worker toxics exposure, potential acute impacts of possible spills, and inconsistency with toxic use reduction objectives. Manufacturers of MDI state that safe exposure levels are obtainable through good engineering controls which include making sure that blenders are well sealed, and that the blending and forming areas are well ventilated.

High Moisture Adhesives

Switching to an adhesive that is capable of bonding a high moisture furnish eliminates the need to dry wood to a low moisture content. Dryer energy and temperature can be reduced because less water must be removed from the wood. Press temperature can also be lowered since heat transfer is more efficient in high moisture furnish, reducing VOC emissions.

The gluing of high moisture content wood has become an established practice in plywood manufacture. Many OSB plants are switching to high moisture bonding adhesives with the primary goals of reducing dryer emissions and possibly reducing wood drying costs. Efforts have been made to improve phenolic resin technology to allow better bonding in the presence of water. The primary incentive for bonding high moisture veneer is a reduction in adhesive consumption. In the Southern plywood industry; where dryout is a problem, a dramatic

reduction in adhesive use has been achieved by gluing high moisture veneer.

Naturally-derived Adhesives

Spurred by rapid price increases of petroleum-derived chemicals in adhesives such as PF and UF, chemical material suppliers, forest products companies, and wood adhesive/binder suppliers are expending research and development funds to search for renewable raw material sources. Substitutes could replace entirely, or at least partially, petroleum-derived chemicals now used in the manufacture of wood adhesives. Naturally-derived adhesives are included in this profile as a pollution prevention opportunity because of the potential to use renewable resources, which in many cases are by-products of other processes.

Furfuryl Alcohol Resins

Resins manufactured from furfuryl alcohol are being evaluated as an alternative low-VOC binder to substitute for PF resins. Unlike PF resins, furfuryl alcohol resins are stored stable at ambient temperatures, without refrigeration. As delivered, furfuryl alcohol resin contains very low amounts of volatile components. Upon curing, it reduces 80 to 90 percent of total VOC emissions, and reduces Hazardous Air Pollutants (HAPs) by the same amount. The furfuryl alcohol system offers the same relative speed of cure as the PF resin systems.

Furfuryl alcohol resin is currently in the experimental stage of development. The industry has shown little interest in the resin because of its high cost; which is twice that of a PF resin. However, cost analyses performed for the insulation industry show that using the resin to meet future HAP standards is cheaper than purchasing and operating control devices such as scrubbers. The same is likely true for the wood products industry.

Lignin Adhesives

Lignin is an aromatic polymer that makes up one of the three major components of wood (cellulose and hemicellulose are the others). The abundance of lignin as a waste product in pulp mills has made it a desirable raw material alternative to nonrenewable petroleum-derived chemicals in the production of wood adhesives.

Until recently, no more than 20 to 30 percent of lignin could be substituted into PF resins because cure times increased as the amount of lignin increased. Another drawback is that lignin adhesives have

low cross-linking and strength. However, a new approach has recently been developed that can substitute large amounts of kraft lignin for PF adhesives while actually increasing cure speed and board strength.

Currently, Westvaco is the only company in the U.S. that operates a commercial lignin extraction facility. The capital cost of a new commercial lignin extraction facility compared to the capital cost of a new phenol plant is estimated to be almost equal per pound of product produced. However, because the selling price of lignin is only \$0.32-0.34, compared to the selling price of phenol which is \$.45/solid pound and rising, there is more of an economic incentive to build a new phenol plant than a lignin extraction facility.

Polyvinyl acetate (PVA)

There have been some mill trials and some small quantities of hardwood plywood made with cross-linked polyvinyl acetate (PVA) adhesives. Blends of PVA and UF are also sometimes used in the manufacture of hardwood plywood. Cross-linked PVAs are light in color, are compatible with the hardwood plywood manufacturing process, and don't require additional equipment. Concerns have been expressed about the potential of airborne release of vinyl monomers. PVA adhesives are considerably higher in cost than UF adhesives.

Alternative Manufacturing Processes

Veneer and Plywood Adhesive Reduction

In the softwood plywood industry, a common waste generated by the typical spray-line layup system is over-spray. A more efficient way of applying adhesive to veneer is by foam extrusion, a process in which foamed adhesive is forced under pressure to the extrusion head. This process better concentrates the glue stream onto the veneer, resulting in less wasted adhesive and less chance of adhesive dryout before pressing. In terms of economics, the combination of less waste and lower spread rates when using foam extruders can add up to savings in the 20 to 31 percent range, depending on the type of equipment used.

Another pollution prevention option in the softwood plywood industry is the variable application rate strategy (VARs). The amount of adhesive required to bond veneer varies with moisture content. For example, high moisture veneer requires less glue than low moisture veneer because there is less migration of water from the glue into the veneer. Although the moisture content of veneer varies at a typical plywood mill, glue is applied at a constant rate to prevent dryout of low moisture veneer. A 1992 study by Faust and Borders outlined in Forest

Products Journal, investigated the use of the glue application rate with respect to improved bond quality and reduced resin consumption. The variable application rate strategy (VARS) they developed adjusted the glue spread rate for each individual plywood panel according to its moisture content. Process-sensing and control technology has been developed for the practical application of VARS. Sensor technology is currently available for on-line adjustment and measurement of veneer moisture content and temperature. In addition to compensating for problem bonding conditions that occur unexpectedly during production, the greatest benefit of VARS from a pollution prevention standpoint is a reduction in adhesive consumption and, consequently a reduction in plant emissions.

Alternative Dryers

There are other process modifications that may be implemented to reduce emissions while drying green furnish for reconstituted wood panel manufacture. Researchers are currently investigating the use of alternative drying methods for raw wood furnish.

Rotary drum dryers are used in the OSB industry. These are typically characterized by high-temperature drying air, aggressive handling of strands, and short product-retention times. The adverse affects of these characteristics include VOC emissions and strand degradation. Research has shown that low-temperature drying reduces VOC emissions. However, this requires that the furnish be retained in the dryer for a longer period of time which is difficult to achieve in a rotary dryer. It has been found that conveyor belt dryers generate less VOC emissions than rotary dryers. Temperatures of less than 400°F and very low volumes of exhaust gases are possible with conveyor dryers, resulting in low emission levels of VOC, while virtually eliminating strand damage within the dryer. Conveyor dryers can also be used to dry PB furnish.

The three pass high velocity (3PHV) rotary drum dryer is a major breakthrough in rotary drum drying technology that has the potential to reduce VOC emissions significantly (see Exhibit 9). The 3PHV is a rotating cylindrical drum consisting of three, concentric, interlocking cylinders. Hot gases enter the outermost cylinder with the wood chips and progress through the intermediate and then the inner drum shells in a serpentine flow path. This flow path direction is the opposite of that in the conventional three-pass dryer. This reverse air flow may reduce VOC emissions.

In the first pass, the 3PHV dryer allows smaller, dried particles to pass through the slower moving mass of larger, wetter particles in an area

bounded by the outer and intermediate drum cylinders. This area is much larger than the area of the inner drum of conventional triple pass dryers. As the larger particles are dried, they will "catch up" with the smaller faster moving particles in an area bounded by the intermediate (second pass) drum cylinder. Here, airflow velocities become high enough to convey the entire mass of particles out of the drying portion of the drum and into the inner (third pass) drum cylinder where they will be conveyed out of the dryer. This action prevents the product from reaching temperatures in excess of the wet bulb temperature, thus reducing carbon monoxide and hydrocarbon emissions associated with pyrolysis and combustion of the wood chips.

Wood Preserving

Water-borne preservatives produce less waste than oil-borne preservatives because process wastewater is reused rather than discharged. In addition, well designed treatment plants, good treatment practices, effective housekeeping, and employee training also help reduce waste at the source.

Well designed treatment plants may have enclosed treatment buildings, covered drip pads with liners, automatic lumber handling systems, centralized tank farms with spill containment, and air ventilation systems. The RCRA standards in 40 CFR 264 and 265 require that drip pads must contain drippage, be free of cracks and gaps, and be cleaned and inspected. Plants can also be designed to minimize mist or droplet emissions from cylinders and work tanks through the use of air exchange systems and cylinder and tank venting.

Treatment practices are also important for preventing pollution. Ensuring that wood stock is clean prior to treatment will prevent dirt, sawdust, and other debris from accumulating in the treatment system. To prevent debris buildup, wood can be covered during shipment and/or power-washed when necessary before it enters the treatment plant. Strip pumps may be installed to continuously return residual chemical solutions to the work tank, resulting in less dripping when the cylinder doors are opened. If treating cylinders are tilted slightly away from the drip pad, there is also less spillage when opening the cylinder doors.

Housekeeping is an integral part of waste minimization efforts. All tanks, mixing systems, treating cylinders, drip pads, and spill containments should be inspected regularly for leaks. Drip pads and collection areas should be kept clean. Storage yards should be inspected daily, and any drippage detected should be cleaned up within 24 hours.

Several other preservatives have been proposed as alternatives to traditional preservatives. For example, wood can be treated with borates using both pressure and non-pressure processes. However, because they are highly susceptible to leaching, borates cannot be used to preserve wood that will be in contact with the ground or exposed to the weather (e.g., decking).

Ammoniacal copper/quarternary ammonium (ACQ) is another proposed alternative. Initial above-ground field test data show that ACQ is effective for softwood and hardwood protection. Other alternative preservatives may include copper-8-quinolinolate (Cu₈), copper naphthanate, zinc naphthanate, quarternary NH₄ compounds (QAC), and zinc sulfate.

Treatment processes may vary in their ability to minimize waste. For example, the empty-cell process uses less carrier oil than the full-cell process for oil-borne preservatives. The modified full-cell treatment reduces the uptake of treating solution and minimizes the amount of dripping for water-borne preservatives.

Pollution Prevention Case Studies

Reconstituted Wood Products

By late 1995, CanFibre hopes to start up its first plant to produce MDF using 100 percent post-consumer waste and PF adhesives. The plant (the first of its kind in North America) will be located near Toronto, Ontario. Approximately 1.2 million ft³ per year of structural MDF will be produced from recycled urban waste such as waste wood, cardboard, drink containers, newspaper, etc. The plant will have two significant cost advantages over conventional MDF plants: (1) the costs of post-consumer waste is currently negative, and (2) savings in freight costs due to the plant's location near an urban site (most existing MDF plants are remotely located and the cost of hauling wood waste back to these mills is high). The net mill cost for the process used by the firm's Toronto plant is estimated to be \$183/million square feet (MSF) versus \$228/MSF for a conventional plant. The company plans to build a total of nine plants in North America: six in the U.S. and three in Canada. All plants will use 100 percent post-consumer waste and PF adhesives.

Wood Preserving

Perry Builders, Inc. employs 20 people at its Henderson pressure wood preserving manufacturing facility. Perry Builders recognizes that each wood treater has an important responsibility in properly handling and

disposing of the wastes it produces and is committed to meeting this challenge. Perry uses a water-borne chemical preservative; chromated copper arsenate, to treat lumber, plywood, timbers, and other wood products for decks, fences, and other outdoor uses. Hazardous waste results from contact of sawdust, wood chips, and dirt with the preservative. It has successfully minimized its hazardous waste generation by 80 percent in two years with the implementation of a low-cost waste minimization program. In 1987, Perry Builders generated 15 drums of hazardous waste with a disposal cost of \$2,380. By 1989 Perry Builders reduced its disposal cost to \$310 by generating only two drums.

This reduction was achieved by changing both equipment and processes to achieve a fully integrated closed system in which the application, receipt, transfer, and storage of the preservation takes place in a contained area.

The goal is to apply the preservative to the wood while minimizing the loss of the preservative as a waste. By holding the lumber in the treatment chamber longer to allow drippage, and by using a vacuum pump to further dry the lumber, the treatment solution remains in the chamber and does not come into contact with scrap material and dirt. As an incentive to employees to assure adequate drying time, management instituted pay based on hourly wages rather than an amount of lumber treated. A roof over the area housing the treated lumber prevents runoff during rainfall.

Perry Builders estimates that the cost of the vacuum pump, the roof, and the increased drying time will be recovered in five years through reduced disposal costs. There is also another economic benefit—since the drier lumber weighs less, more footage of lumber can be shipped on each truck, thereby reducing freight costs.

VI. SUMMARY OF FEDERAL STATUTES AND REGULATIONS

This section discusses the Federal statutes and regulations that may apply to this sector. The purpose of this section is to highlight, and briefly describe the applicable Federal requirements, and to provide citations for more detailed information. The three following sections are included.

- Section IV.A contains a general overview of major statutes
- Section IV.B contains a list of regulations specific to this industry
- Section IV.C contains a list of pending and proposed regulations

The descriptions within Section IV are intended solely for general information. Depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. For further information, readers should consult the Code of Federal Regulations and other state or local regulatory agencies. EPA Hotline contacts are also provided for each major statute.

VI.A. General Description of Major Statutes

Resource Conservation And Recovery Act

The Resource Conservation And Recovery Act (RCRA) of 1976 which amended the Solid Waste Disposal Act, addresses solid (Subtitle D) and hazardous (Subtitle C) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs).

Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal. RCRA hazardous wastes include the specific materials listed in the regulations (commercial chemical products, designated with the code "P" or "U"; hazardous wastes from specific industries/sources, designated with the code "K"; or hazardous wastes from non-specific sources, designated with the code "F") or materials which exhibit a hazardous waste characteristic (ignitability, corrosivity, reactivity, or toxicity and designated with the code "D").

Regulated entities that generate hazardous waste are subject to waste accumulation, manifesting, and recordkeeping standards. Facilities that treat, store, or dispose of hazardous waste must obtain a permit, either from EPA or from a State agency which EPA has authorized to implement the permitting program. Subtitle C permits contain general facility standards such as contingency plans, emergency procedures, recordkeeping and reporting requirements, financial assurance mechanisms, and unit-specific standards. RCRA also contains provisions (40 CFR Part 264 Subpart S and §264.10) for conducting corrective actions which govern the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA-regulated facilities.

Although RCRA is a Federal statute, many States implement the RCRA program. Currently, EPA has delegated its authority to implement various provisions of RCRA to 46 of the 50 States.

Most RCRA requirements are not industry specific but apply to any company that transports, treats, stores, or disposes of hazardous waste. Here are some important RCRA regulatory requirements:

- **Identification of Solid and Hazardous Wastes** (40 CFR Part 261) lays out the procedure every generator should follow to determine whether the material created is considered a hazardous waste, solid waste, or is exempted from regulation.
- **Standards for Generators of Hazardous Waste** (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an ID number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit.
- **Land Disposal Restrictions (LDRs)** are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs (40 CFR 268), materials must meet land disposal restriction (LDR) treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Wastes subject to the LDRs include solvents, electroplating wastes, heavy metals, and acids. Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

- **Used Oil Management Standards** (40 CFR Part 279) impose management requirements affecting the storage, transportation, burning, processing, and re-refining of the used oil. For parties that merely generate used oil, regulations establish storage standards. For a party considered a used oil marketer (one who generates and sells off-specification used oil directly to a used oil burner), additional tracking and paperwork requirements must be satisfied.
- **Tanks and Containers** used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations (40 CFR Part 264-265, Subpart CC) require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and to inspect and monitor regulated units. These regulations apply to all facilities who store such waste, including generators operating under the 90-day accumulation rule.
- **Underground Storage Tanks** (USTs) containing petroleum and hazardous substance are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also establishes increasingly stringent standards, including upgrade requirements for existing tanks, that must be met by 1998.
- **Boilers and Industrial Furnaces** (BIFs) that use or burn fuel containing hazardous waste must comply with strict design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and restrict the type of waste that may be burned.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, responds to questions and distributes guidance regarding all RCRA regulations. The RCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Comprehensive Environmental Response, Compensation, And Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a 1980 law commonly known as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. CERCLA also enables EPA to force parties responsible for environmental contamination to clean it up or to reimburse the Superfund for response costs incurred by EPA. The Superfund

Amendments and Reauthorization Act (SARA) of 1986 revised various sections of CERCLA, extended the taxing authority for the Superfund, and created a free-standing law, SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

The CERCLA hazardous substance release reporting regulations (40 CFR Part 302) direct the person in charge of a facility to report to the National Response Center (NRC) any environmental release of a hazardous substance which exceeds a reportable quantity. Reportable quantities are defined and listed in 40 CFR § 302.4. A release report may trigger a response by EPA, or by one or more Federal or State emergency response authorities.

EPA implements hazardous substance responses according to procedures outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The NCP includes provisions for permanent cleanups, known as remedial actions, and other cleanups referred to as "removals." EPA generally takes remedial actions only at sites on the National Priorities List (NPL), which currently includes approximately 1300 sites. Both EPA and states can act at other sites; however, EPA provides responsible parties the opportunity to conduct removal and remedial actions and encourages community involvement throughout the Superfund response process.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, answers questions and references guidance pertaining to the Superfund program. The CERCLA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Emergency Planning And Community Right-To-Know Act

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA, also known as SARA Title III), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by State and local governments. EPCRA required the establishment of State emergency response commissions (SERCs), responsible for coordinating certain emergency response activities and for appointing local emergency planning committees (LEPCs).

EPCRA and the EPCRA regulations (40 CFR Parts 350-372) establish four types of reporting obligations for facilities which store or manage specified chemicals:

- **EPCRA §302** requires facilities to notify the SERC and LEPC of the presence of any "extremely hazardous substance" (the list of such substances is in 40 CFR Part 355, Appendices A and B) if it has such substance in excess of the substance's threshold planning quantity, and directs the facility to appoint an emergency response coordinator.
- **EPCRA §304** requires the facility to notify the SERC and the LEPC in the event of a release exceeding the reportable quantity of a CERCLA hazardous substance or an EPCRA extremely hazardous substance.
- **EPCRA §§311 and 312** require a facility at which a hazardous chemical, as defined by the Occupational Safety and Health Act, is present in an amount exceeding a specified threshold to submit to the SERC, LEPC, and local fire department material safety data sheets (MSDSs) or lists of MSDSs and hazardous chemical inventory forms (also known as Tier I and II forms). This information helps the local government respond in the event of a spill or release of the chemical.
- **EPCRA §313** requires manufacturing facilities included in SIC codes 20 through 39, which have ten or more employees, and which manufacture, process, or use specified chemicals in amounts greater than threshold quantities, to submit an annual toxic chemical release report. This report, commonly known as the Form R, covers releases and transfers of toxic chemicals to various facilities and environmental media, and allows EPA to compile the national Toxic Release Inventory (TRI) database.

All information submitted pursuant to EPCRA regulations is publicly accessible, unless protected by a trade secret claim.

EPA's EPCRA Hotline, at (800) 535-0202, answers questions and distributes guidance regarding the emergency planning and community right-to-know regulations. The EPCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH; and "non-

conventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and indirect discharges. The **National Pollutant Discharge Elimination System (NPDES)** program (CWA §402) controls direct discharges into navigable waters. Direct discharges or "point source" discharges are from sources such as pipes and sewers. NPDES permits, issued by either EPA or an authorized State (EPA has presently authorized forty States to administer the NPDES program), contain industry-specific, technology-based and/or water quality-based limits, and establish pollutant monitoring and reporting requirements. A facility that intends to discharge into the nation's waters must obtain a permit prior to initiating its discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which a facility may make a discharge.

A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards, that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technological standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from State to State, and site to site, depending on the use classification of the receiving body of water. Most States follow EPA guidelines which propose aquatic life and human health criteria for many of the 126 priority pollutants.

Storm Water Discharges

In 1987 the CWA was amended to require EPA to establish a program to address **storm water discharges**. In response, EPA promulgated the NPDES storm water permit application regulations. Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant (40 CFR 122.26(b)(14)). These regulations require that facilities with the following storm water discharges apply for a NPDES permit: (1) a discharge associated with industrial activity; (2) a discharge from a large or medium municipal storm sewer system; or (3) a discharge which EPA or the State determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.

The term "storm water discharge associated with industrial activity" means a storm water discharge from one of 11 categories of industrial

activity defined at 40 CFR 122.26. Six of the categories are defined by SIC codes while the other five are identified through narrative descriptions of the regulated industrial activity. If the primary SIC code of the facility is one of those identified in the regulations, the facility is subject to the storm water permit application requirements. If any activity at a facility is covered by one of the five narrative categories, storm water discharges from those areas where the activities occur are subject to storm water discharge permit application requirements.

Those facilities/activities that are subject to storm water discharge permit application requirements are identified below. To determine whether a particular facility falls within one of these categories, the regulation should be consulted.

Category i: Facilities subject to storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards.

Category ii: Facilities classified as SIC 24-lumber and wood products (except wood kitchen cabinets); SIC 26-paper and allied products (except paperboard containers and products); SIC 28-chemicals and allied products (except drugs and paints); SIC 29-petroleum refining; and SIC 311-leather tanning and finishing.

Category iii: Facilities classified as SIC 10-metal mining; SIC 12-coal mining; SIC 13-oil and gas extraction; and SIC 14-nonmetallic mineral mining.

Category iv: Hazardous waste treatment, storage, or disposal facilities.

Category v: Landfills, land application sites, and open dumps that receive or have received industrial wastes.

Category vi: Facilities classified as SIC 5015-used motor vehicle parts; and SIC 5093-automotive scrap and waste material recycling facilities.

Category vii: Steam electric power generating facilities.

Category viii: Facilities classified as SIC 40-railroad transportation; SIC 41-local passenger transportation; SIC 42-trucking and warehousing (except public warehousing and storage); SIC 43-U.S. Postal Service; SIC 44-water transportation; SIC 45-transportation by air; and SIC 5171-petroleum bulk storage stations and terminals.

Category ix: Sewage treatment works.

Category x: Construction activities except operations that result in the disturbance of less than five acres of total land area.

Category xi: Facilities classified as SIC 20-food and kindred products; SIC 21-tobacco products; SIC 22-textile mill products; SIC 23-apparel related products; SIC 2434-wood kitchen cabinets manufacturing; SIC 25-furniture and fixtures; SIC 265-paperboard containers and boxes; SIC 267-converted paper and paperboard products; SIC 27-printing, publishing, and allied industries; SIC 283-drugs; SIC 285-paints, varnishes, lacquer, enamels, and allied products; SIC 30-rubber and plastics; SIC 31-leather and leather products (except leather and tanning and finishing); SIC 323-glass products; SIC 34-fabricated metal products (except fabricated structural metal); SIC 35-industrial and commercial machinery and computer equipment; SIC 36-electronic and other electrical equipment and components; SIC 37-transportation equipment (except ship and boat building and repairing); SIC 38-measuring, analyzing, and controlling instruments; SIC 39-miscellaneous manufacturing industries; and SIC 4221-4225-public warehousing and storage.

Pretreatment Program

Another type of discharge that is regulated by the CWA is one that goes to a publicly-owned treatment works (POTWs). The national **pretreatment program** (CWA §307(b)) controls the indirect discharge of pollutants to POTWs by "industrial users." Facilities regulated under §307(b) must meet certain pretreatment standards. The goal of the pretreatment program is to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants. Discharges to a POTW are regulated primarily by the POTW itself, rather than the State or EPA.

EPA has developed technology-based standards for industrial users of POTWs. Different standards apply to existing and new sources within each category. "Categorical" pretreatment standards applicable to an industry on a nationwide basis are developed by EPA. In addition, another kind of pretreatment standard, "local limits," are developed by the POTW in order to assist the POTW in achieving the effluent limitations in its NPDES permit.

Regardless of whether a State is authorized to implement either the NPDES or the pretreatment program, if it develops its own program, it may enforce requirements more stringent than Federal standards.

EPA's Office of Water, at (202) 260-5700, will direct callers with questions about the CWA to the appropriate EPA office. EPA also maintains a bibliographic database of Office of Water publications which can be accessed through the Ground Water and Drinking Water resource center, at (202) 260-7786.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint Federal-State system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized States enforce the primary drinking water standards, which are, contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are non-enforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set as close to MCLGs as possible, considering cost and feasibility of attainment.

The SDWA **Underground Injection Control (UIC)** program (40 CFR Parts 144-148) is a permit program which protects underground sources of drinking water by regulating five classes of injection wells. UIC permits include design, operating, inspection, and monitoring requirements. Wells used to inject hazardous wastes must also comply with RCRA corrective action standards in order to be granted a RCRA permit, and must meet applicable RCRA land disposal restrictions standards. The UIC permit program is primarily State-enforced, since EPA has authorized all but a few States to administer the program.

The SDWA also provides for a Federally-implemented Sole Source Aquifer program, which prohibits Federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a State-implemented Wellhead Protection program, designed to protect drinking water wells and drinking water recharge areas.

EPA's Safe Drinking Water Hotline, at (800) 426-4791, answers questions and distributes guidance pertaining to SDWA standards. The

Hotline operates from 9:00 a.m. through 5:30 p.m., EST, excluding Federal holidays.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks which may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk.

TSCA standards may apply at any point during a chemical's life cycle. Under TSCA §5, EPA has established an inventory of chemical substances. If a chemical is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemical's effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

Under TSCA §6, EPA can ban the manufacture or distribution in commerce, limit the use, require labeling, or place other restrictions on chemicals that pose unreasonable risks. Among the chemicals EPA regulates under §6 authority are asbestos, chlorofluorocarbons (CFCs), and polychlorinated biphenyls (PCBs).

EPA's TSCA Assistance Information Service, at (202) 554-1404, answers questions and distributes guidance pertaining to Toxic Substances Control Act standards. The Service operates from 8:30 a.m. through 4:30 p.m., EST, excluding Federal holidays.

Clean Air Act

The Clean Air Act (CAA) and its amendments, including the Clean Air Act Amendments (CAAA) of 1990, are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA and the States to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAAA, many facilities will be required to obtain permits for the first time. State and local governments oversee,

manage, and enforce many of the requirements of the CAAA. CAA regulations appear at 40 CFR Parts 50-99.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Geographic areas that meet NAAQSs for a given pollutant are classified as attainment areas; those that do not meet NAAQSs are classified as non-attainment areas. Under §110 of the CAA, each State must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet Federal air quality standards.

Title I also authorizes EPA to establish New Source Performance Standards (NSPSs), which are nationally uniform emission standards for new stationary sources falling within particular industrial categories. NSPSs are based on the pollution control technology available to that category of industrial source but allow the affected industries the flexibility to devise a cost-effective means of reducing emissions.

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Title III of the CAAA further directed EPA to develop a list of sources that emit any of 189 HAPs, and to develop regulations for these categories of sources. To date EPA has listed 174 categories and developed a schedule for the establishment of emission standards. The emission standards will be developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors.

Title II of the CAA pertains to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms EPA uses to regulate mobile air emission sources.

Title IV establishes a sulfur dioxide emissions program designed to reduce the formation of acid rain. Reduction of sulfur dioxide releases will be obtained by granting to certain sources limited emissions allowances, which, beginning in 1995, will be set below previous levels of sulfur dioxide releases.

Title V of the CAAA of 1990 created a permit program for all "major sources" (and certain other sources) regulated under the CAA. One purpose of the operating permit is to include in a single document all air emissions requirements that apply to a given facility. States are developing the permit programs in accordance with guidance and regulations from EPA. Once a State program is approved by EPA, permits will be issued and monitored by that State.

Title VI is intended to protect stratospheric ozone by phasing out the manufacture of ozone-depleting chemicals and restrict their use and distribution. Production of Class I substances, including 15 kinds of chlorofluorocarbons (CFCs), will be phased out entirely by the year 2000, while certain hydrochlorofluorocarbons (HCFCs) will be phased out by 2030.

EPA's Control Technology Center, at (919) 541-0800, provides general assistance and information on CAA standards. The Stratospheric Ozone Information Hotline, at (800) 296-1996, provides general information about regulations promulgated under Title VI of the CAA, and EPA's EPCRA Hotline, at (800) 535-0202, answers questions about accidental release prevention under CAA §112(r). In addition, the Technology Transfer Network Bulletin Board System (modem access (919) 541-5742)) includes recent CAA rules, EPA guidance documents, and updates of EPA activities.

VI.B. Industry Specific Requirements

Clean Air Act (CAA)

Under the Clean Air Act, PM₁₀, (particulate matter with an aerodynamic diameter of 10 microns or less) and volatile organic compounds (VOCs) are regulated to ensure attainment with the National Ambient Air Quality Standards for PM₁₀ and ground level ozone (VOCs contribute to the formation of ground level ozone). Wood products have the potential to emit PM₁₀ and VOCs in significant quantities.

As required by §110 of the CAA, State Implementation Plans (SIPs) must be developed to identify sources of air pollution and determine what reductions are required to meet Federal standards. An important compliance component of these SIPs are generic opacity limits, which dictate that no stack shall have emissions above a certain percent opacity. Within the wood products industry, these regulations apply to hog fuel boilers and veneer dryers. The standard limit for emissions of all kinds is 20 percent opacity, meaning that only 80 percent of light is

able to pass through the plume. However, some States provide exceptions to the opacity limits for certain industries or manufacturing processes depending on the state's SIP.

Also written into each SIP are provisions that require all new stationary sources constructed in a National Ambient Air Quality Standards (NAAQ) attainment area and that have the potential to emit above a specified tonnage per year to install best available control technology (BACT). In addition, these facilities need to obtain a Prevention of Significant Deterioration (PSD) permit (40 CFR 52.21).

Standards of Performance for Fossil Fuel Fired Steam Generating Units (40 CFR 60.40, subpart D), apply to any fossil fuel-fired and wood residue fired steam generating unit that commences construction modification or reconstruction after August 17, 1971, and that has a heat input capacity derived from fossil fuels of greater than 73 megawatts (250 mm BTU/hr). Unlike subparts Db and Dc, descriptions of which follow, the contribution of heat from wood fuels is not considered in determining the heat input capacity since it is not a fossil fuel. The regulation addresses emission standards, compliance and performance test methods, monitoring requirements (including continuous opacity monitoring systems), and reporting requirements for particulate matter, nitrogen oxides, and sulfur dioxide.

Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (40 CFR 60.40b, subpart Db), apply to any steam generating unit that commences construction, modification, or reconstruction after June 19, 1984 and that has a heat input (heat derived from combustion of fuel only, not exhaust gases, etc.) capacity of at least 29 MW. This includes steam generating units that use wood as a source of fuel. The regulation addresses emission standards, compliance and performance test methods, monitoring requirements, and reporting requirements for particulate matter, nitrogen oxides, and sulfur dioxide. Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (40 CFR 60.40c, Subpart Dc), apply to any small steam generating unit (2.9 MW to 29 MW) that commences construction, modification, or reconstruction, after June 9, 1989. The regulation addresses requirements for particulate matter and sulfur dioxide emissions.

In addition to applying to steam generating units in general (including wood-fueled plants), the subparts make several specific references to wood-fueled plants. With regard to small units, the regulation provides:

- A formula for allowable sulfur dioxide emissions (based on the amount of fuel used) that excludes wood from the calculation of fuel used
- Particulate matter standards for facilities that combust wood
- Opacity standards for facilities that combust wood
- Nitrogen oxide standards for facilities that combust combinations of wood and other fuels
- Compliance procedures for facilities that combust combinations of wood and other fuels.

Clean Water Act (CWA)

Facilities in the lumber and wood products industry that discharge treated wastewaters from point sources to surface waters of the U.S. must obtain a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit program is authorized by Section 402 of the CWA and is implemented through 40 CFR Parts 122 through 124. Other parts of the CFR affecting the NPDES program include Part 125 (technology-based standards), Part 129 (toxic pollutant standards), and Part 130 (water quality-based standards). Discharges to publicly-owned treatment works (POTWs) are subject to the pretreatment standards in 40 CFR Part 403.

Technology-based permit limits are derived from effluent limitation guidelines and standards (ELG); 40 CFR Part 429 for this industry. These limitations incorporate both technology-based and water quality-based limits, depending on which is more protective. Effluent guidelines subdivide the industry based on the following production operations:

- Veneer
- Plywood
- Dry process hardboard
- Wet process hardboard
- Wood preserving—water-borne or nonpressure
- Wood preserving—steam
- Wood preserving—Boulton.

The guidelines set limitations for the pollutants of concern (i.e., BOD₅, TSS, pH, COD, phenols, and oil and grease for those facilities in the wood preserving subcategory).

Resource Conservation and Recovery Act (RCRA)

Wood Preserving Final Rule

EPA amended regulations under RCRA (57 Federal Register 61502, December 30, 1992) by listing as hazardous three categories of wastes generated by wood preserving operations that use chlorophenolic, creosote, and/or inorganic (arsenical and chromium) preservatives.

The listed wastes include wastewaters, process residuals, preservative drippage, and spent preservatives from wood preserving processes at facilities that use or have previously used chlorophenolic formulations, facilities that use creosote formulations, and facilities that use inorganic preservatives containing arsenic or chromium.

Specifically, the following RCRA-regulated hazardous wastes are related to wood preserving operations:

- K001 (bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote or PCP),
- F032 (wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations),
- F034 (wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations), and
- F035 (wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium).

The rule includes permitting and interim status standards for the drip pads used to assist in the collection of treated wood drippage. These standards include requirements for drip pad design, operation, inspection, and closure.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), of 1947 (7 U.S.C. 136) requires registration of pesticides to protect consumers from mislabeled, defective, and ineffective pesticides and to identify products that might be harmful to public health or the environment even when used properly. FIFRA has been amended several times: in 1972, 1975, 1978, 1980, 1988, and 1991. The primary purpose of the 1972 amendments was to ensure that pesticide use would be subject to a thorough review of environmental and human health hazards. The 1988 amendments established schedules and duties for re-registration of pesticides.

Under FIFRA, a registered pesticide must be used in a manner consistent with its label. A registered pesticide may be used in a manner inconsistent with its label in the following situations, unless specifically prohibited by the label:

- Applying a pesticide at a dosage, concentration, or frequency less than that specified on the label
- Applying a pesticide against a pest not specified on the label if the application is to a crop, animal, or site that is specified on the label
- Employing a method of application not specifically prohibited by the label
- Mixing a pesticide with a fertilizer
- Applying a pesticide in conformance with an experimental use permit, or a specific exemption of a Federal or State agency
- Applying a pesticide in a manner that the Administrator determines is consistent with the purposes of FIFRA.

Use of a registered pesticide in a manner inconsistent with its label is unlawful in all other situations.

In addition, the Administrator has the authority to classify pesticides as being for general use or for restricted use only. Pesticides classified as for restricted use only include creosote, pentachlorophenol, and inorganic salts such as chromated copper arsenate, all of which are used in wood-preserving solutions. Such pesticides must be applied only by a certified applicator or under the direct supervision of a certified applicator (section 136j(a)(1)(F)). Standards for certification are established by the Federal government or by State governments with Federal approval.

In a notice published in the Federal Register on January 10, 1986 (Vol. 51, No. 7, January 10, 1986, p. 1334-1348), the EPA established several conditions for registering creosote, pentachlorophenol, and inorganic arsenicals for use in wood preserving, to ensure that such use would not endanger human health standards. EPA and the wood preserving industry agreed that the industry would establish a voluntary Consumer Awareness Program to educate consumers in the proper use of and precautionary practices regarding wood treated with creosote, pentachlorophenol, and inorganic arsenicals, to ensure that such uses would not endanger health standards. Through the program, information about treated wood is disseminated in an information sheet provided to end-users at the time of sale or delivery. An earlier Federal Register notice of July 13, 1984 established terms of registration under which the wood preserving industry agreed to establish air monitoring systems at facilities using formulations containing arsenic.

VI.C. Pending and Proposed Regulatory Requirements

RCRA

As part of EPA's groundwater protection strategy, RCRA prohibits the land disposal of most hazardous wastes until they meet a waste specific treatment standard. While most hazardous wastes have already been assigned treatment standards, EPA must still promulgate two additional rule makings to address newly listed wastes and to make changes to the land disposal restrictions (LDR) program.

When finalized, the Phase III LDR rulemaking will establish treatment standards for some newly listed wastes and will mandate RCRA equivalent treatment be performed upon certain characteristically hazardous wastes that are injected into UIC wells under the Safe Drinking Water Act (SDWA) or managed in Subtitle D surface impoundments prior to discharge pursuant to the Clean Water Act (CWA). By consent decree, EPA must promulgate the final rule for Phase III by January 1996.

Phase IV will similarly restrict other newly listed or identified wastes from land disposal and create influent treatment standards to mitigate the impact of sludges, leaks, and air emissions from surface impoundments that manage decharacterized wastes. Of particular significance to wood preserving industries, Phase IV will restrict the land disposal of F032, F034, and F035. Once the prohibitions for these wastes become effective, they will need to meet numeric treatment levels for specific hazardous constituents commonly found in F032, F034, and F035. Phase IV will also restrict the land disposal of the previously exempt Bevill wastes and adjust the treatment standards applicable to wastes that exhibit the toxicity characteristic for a metal

constituent. Subject to the same consent decree, Phase IV has been assigned a final judicial deadline of June 1996.

Clean Air Act

Many of the chemicals used for wood preserving are listed as hazardous air pollutants (HAPs) in Section 112 of the Clean Air Act Amendments of 1990. Treatment processes have been identified as potentially significant sources of these HAPs and, as such, are source categories for which national emission standards may be necessary.

Three emissions standards based on "maximum achievable control technology" (MACT) will be developed for products covered by SIC 24: a wood treatment MACT standard is due by November 15, 1997; a plywood/PB manufacturing MACT standard is due by November 15, 2000; and a flat wood paneling (surface coating) MACT standard is due by November 15, 2000. The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors.

VII. COMPLIANCE AND ENFORCEMENT HISTORY

Background

To date, EPA has focused much of its attention on measuring compliance with specific environmental statutes. This approach allows the Agency to track compliance with the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and other environmental statutes. Within the last several years, the Agency has begun to supplement single-media compliance indicators with facility-specific, multimedia indicators of compliance. In doing so, EPA is in a better position to track compliance with all statutes at the facility level, and within specific industrial sectors.

A major step in building the capacity to compile multimedia data for industrial sectors was the creation of EPA's Integrated Data for Enforcement Analysis (IDEA) system. IDEA has the capacity to "read into" the Agency's single-media databases, extract compliance records, and match the records to individual facilities. The IDEA system can match Air, Water, Waste, Toxics/Pesticides/EPCRA, TRI, and Enforcement Docket records for a given facility, and generate a list of historical permit, inspection, and enforcement activity. IDEA also has the capability to analyze data by geographic area and corporate holder. As the capacity to generate multimedia compliance data improves, EPA will make available more in-depth compliance and enforcement information. Additionally, sector-specific measures of success for compliance assistance efforts are under development.

Compliance and Enforcement Profile Description

Using inspection, violation, and enforcement data from the IDEA system, this section provides information regarding the historical compliance and enforcement activity of this sector. In order to mirror the facility universe reported in the Toxic Chemical Profile, the data reported within this section consists of records only from the TRI reporting universe. With this decision, the selection criteria are consistent across sectors with certain exceptions. For the sectors that do not normally report to the TRI program, data have been provided from EPA's Facility Indexing System (FINDS) which tracks facilities in all media databases. Please note, in this section, EPA does not attempt to define the actual number of facilities that fall within each sector. Instead, the section portrays the records of a subset of facilities within the sector that are well defined within EPA databases.

As a check on the relative size of the full sector universe, most notebooks contain an estimated number of facilities within the sector according to the Bureau of Census (See Section II). With sectors dominated by small businesses, such as metal finishers and printers, the reporting universe within the EPA databases may be small in comparison to Census data. However, the group selected for inclusion in this data analysis section should be consistent with this sector's general make-up.

Following this introduction is a list defining each data column presented within this section. These values represent a retrospective summary of inspections and enforcement actions, and solely reflect EPA, State, and local compliance assurance activities that have been entered into EPA databases. To identify any changes in trends, the EPA ran two data queries, one for the past five calendar years (August 10, 1990 to August 9, 1995) and the other for the most recent twelve-month period (August 10, 1994 to August 9, 1995). The five-year analysis gives an average level of activity for that period for comparison to the more recent activity.

Because most inspections focus on single-media requirements, the data queries presented in this section are taken from single media databases. These databases do not provide data on whether inspections are State/local or EPA-led. However, the table breaking down the universe of violations does give the reader a crude measurement of the EPA's and States' efforts within each media program. The presented data illustrate the variations across regions for certain sectors.² This variation may be attributable to State/local data entry variations, specific geographic concentrations, proximity to population centers, sensitive ecosystems, highly toxic chemicals used in production, or historical noncompliance. Hence, the exhibited data do not rank regional performance or necessarily reflect which regions may have the most compliance problems.

Compliance and Enforcement Data Definitions

General Definitions

Facility Indexing System (FINDS) -- this system assigns a common facility number to EPA single-media permit records. The FINDS

² EPA Regions include the following States: I (CT, MA, ME, RI, NH, VT); II (NJ, NY, PR, VI); III (DC, DE, MD, PA, VA, WV); IV (AL, FL, GA, KY, MS, NC, SC, TN); V (IL, IN, MI, MN, OH, WI); VI (AR, LA, NM, OK, TX); VII (IA, KS, MO, NE); VIII (CO, MT, ND, SD, UT, WY); IX (AZ, CA, HI, NV, Pacific Trust Territories); X (AK, ID, OR, WA).

identification number allows EPA to compile and review all permit, compliance, enforcement, and pollutant release data for any given regulated facility.

Integrated Data for Enforcement Analysis (IDEA) -- is a data integration system that can retrieve information from the major EPA program office databases. IDEA uses the FINDS identification number to "glue together" separate data records from EPA's databases. This is done to create a "master list" of data records for any given facility. Some of the data systems accessible through IDEA are: AIRS (Air Facility Indexing and Retrieval System, Office of Air and Radiation), PCS (Permit Compliance System, Office of Water), RCRIS (Resource Conservation and Recovery Information System, Office of Solid Waste), NCDB (National Compliance Data Base, Office of Prevention, Pesticides, and Toxic Substances), CERCLIS (Comprehensive Environmental and Liability Information System, Superfund), and TRIS (Toxic Release Inventory System). IDEA also contains information from outside sources such as Dun and Bradstreet and the Occupational Safety and Health Administration (OSHA). Most data queries displayed in notebook Sections IV and VII were conducted using IDEA.

Data Table Column Heading Definitions

Facilities in Search -- are based on the universe of TRI reporters within the listed SIC code range. For industries not covered under TRI reporting requirements, the notebook uses the FINDS universe for executing data queries. The SIC code range selected for each search is defined by each notebook's selected SIC code coverage described in Section II.

Facilities Inspected --- indicates the level of EPA and State agency facility inspections for the facilities in this data search. These values show what percentage of the facility universe is inspected in a 12 or 60 month period. This column does not count non-inspectional compliance activities such as the review of facility-reported discharge reports.

Number of Inspections -- measures the total number of inspections conducted in this sector. An inspection event is counted each time it is entered into a single media database.

Average Time Between Inspections -- provides an average length of time, expressed in months, that a compliance inspection occurs at a facility within the defined universe.

Facilities with One or More Enforcement Actions -- expresses the number of facilities that were party to at least one enforcement action within the defined time period. This category is broken down further into Federal and State actions. Data are obtained for administrative, civil/judicial, and criminal enforcement actions. Administrative actions include Notices of Violation (NOVs). A facility with multiple enforcement actions is only counted once in this column (facility with 3 enforcement actions counts as 1). All percentages that appear are referenced to the number of facilities inspected.

Total Enforcement Actions -- describes the total number of enforcement actions identified for an industrial sector across all environmental statutes. A facility with multiple enforcement actions is counted multiple times (a facility with 3 enforcement actions counts as 3).

State Lead Actions -- shows what percentage of the total enforcement actions are taken by State and local environmental agencies. Varying levels of use by States of EPA data systems may limit the volume of actions accorded State enforcement activity. Some States extensively report enforcement activities into EPA data systems, while other States may use their own data systems.

Federal Lead Actions -- shows what percentage of the total enforcement actions are taken by the U.S. EPA. This value includes referrals from State agencies. Many of these actions result from coordinated or joint State/Federal efforts.

Enforcement to Inspection Rate -- expresses how often enforcement actions result from inspections. This value is a ratio of enforcement actions to inspections, and is presented for comparative purposes only. This measure is a rough indicator of the relationship between inspections and enforcement. This measure simply indicates historically how many enforcement actions can be attributed to inspection activity. Related inspections and enforcement actions under the Clean Water Act (PCS), the Clean Air Act (AFS) and the Resource Conservation and Recovery Act (RCRA) are included in this ratio. Inspections and actions from the TSCA/FIFRA/EPCRA database are not factored into this ratio because most of the actions taken under these programs are not the result of facility inspections. This ratio does not account for enforcement actions arising from non-inspection compliance monitoring activities (e.g., self-reported water discharges) that can result in enforcement action within the CAA, CWA and RCRA.

Facilities with One or More Violations Identified -- indicates the number and percentage of inspected facilities having a violation identified in one of the following data categories: In Violation or Significant Violation Status (CAA); Reportable Noncompliance, Current Year Noncompliance, Significant Noncompliance (CWA); Noncompliance and Significant Noncompliance (FIFRA, TSCA, and EPCRA); Unresolved Violation and Unresolved High Priority Violation (RCRA). The values presented for this column reflect the extent of noncompliance within the measured time frame, but do not distinguish between the severity of the noncompliance. Percentages within this column can exceed 100 percent because facilities can be in violation status without being inspected. Violation status may be a precursor to an enforcement action, but does not necessarily indicate that an enforcement action will occur.

Media Breakdown of Enforcement Actions and Inspections -- four columns identify the proportion of total inspections and enforcement actions within EPA Air, Water, Waste, and TSCA/FIFRA/EPCRA databases. Each column is a percentage of either the "Total Inspections," or the "Total Actions" column.

VII.A. Lumber and Wood Products Industry Compliance History

Exhibit 23 provides a Regional breakdown of the five-year enforcement and compliance activities for the lumber and wood products industry. Region IV conducted almost 50 percent of the inspections of lumber and wood product manufacturing facilities performed in the U.S. This large percentage is due to the concentration of lumber and wood product manufacturers in the Southeastern U.S. The exhibit also indicates that 100 percent of the enforcement actions in Regions II and VII were lead by the State while 100 percent of the enforcement actions in Region VIII were lead by EPA.

Exhibit 23
Five Year Enforcement and Compliance Summary for the Lumber and Wood Industry

A	B	C	D	E	F	G	H	I	J
Lumber and Wood SIC 24	Facilities in Search	Facilities Inspected	Number of Inspections	Average Number of Months Between Inspections	Facilities w/one or more Enforcement Actions	Total Enforcement Actions	State Lead Actions	Federal Lead Actions	Enforcement to Inspection Rate
Region I	11	9	29	24	4	3	0%	100%	0.10
Region II	13	11	49	17	1	6	100%	0%	0.12
Region II	60	40	276	14	11	25	88%	12%	0.09
Region IV	189	123	1,072	11	40	105	88%	12%	0.10
Region V	74	44	203	23	14	29	59%	41%	0.14
Region VI	67	39	239	18	23	59	80%	20%	0.25
Region VII	5	4	31	10	2	2	100%	0%	0.06
Region VIII	12	6	32	24	2	—	0%	0%	0
Region IX	26	20	126	13	9	19	58%	42%	0.15
Region X	37	27	120	19	7	10	60%	40%	0.08
Total/Average	494	323	2,177	14	113	258	79%	21%	0.12

VII.B. Comparison of Enforcement Activity Between Selected Industries

Exhibits 24-27 contain summaries of the one and five year enforcement and compliance activities for the lumber and wood products industry, as well as for other selected industries. As indicated in Exhibits 24 and 25, the lumber and wood products industry has an average enforcement to inspection rate compared to other industries. Exhibits 26 and 27 provide a breakdown of inspection and enforcement activities by statute. Of all inspections of lumber and wood products industry facilities, approximately 59 percent were performed under the Resource Conservation and Recovery Act, while approximately 31 percent were conducted under the Clean Air Act. The large percentages of RCRA and CAA inspections for this industry are due in part to facility construction requirements for wood preserving facilities under RCRA, and emissions standards under CAA.

Exhibit 24
Five Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E	F	G	H	I	J
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Average Number of Months Between Inspections	Facilities w/One or More Enforcement Actions	Total Enforcement Actions	State Lead Actions	Federal Lead Actions	Enforcement to Inspection Rate
Metal Mining	873	339	1,519	34	67	155	47%	53%	0.10
Non-metallic Mineral Mining	1,143	631	3,422	20	84	192	76%	24%	0.06
Lumber and Wood	464	301	1,891	15	78	232	79%	21%	0.12
Furniture	293	213	1,534	11	34	91	91%	9%	0.06
Rubber and Plastic	1,665	739	3,386	30	146	391	78%	22%	0.12
Stone, Clay, and Glass	468	268	2,475	11	73	301	70%	30%	0.12
Nonferrous Metals	844	474	3,097	16	145	470	76%	24%	0.15
Fabricated Metal	2,346	1,340	5,509	26	280	840	80%	20%	0.15
Electronics	405	222	777	31	68	212	79%	21%	0.27
Automobiles	598	390	2,216	16	81	240	80%	20%	0.11
Pulp and Paper	306	265	3,766	5	115	502	78%	22%	0.13
Printing	4,106	1,035	4,723	52	176	514	85%	15%	0.11
Inorganic Chemicals	548	298	3,034	11	99	402	76%	24%	0.13
Organic Chemicals	412	316	3,864	6	152	726	66%	34%	0.19
Petroleum Refining	156	145	3,257	3	110	797	66%	34%	0.25
Iron and Steel	374	275	3,555	6	115	499	72%	28%	0.14
Dry Cleaning	933	245	633	88	29	103	99%	1%	0.16

Exhibit 25
One Year Enforcement and Compliance Summary for Selected Industries

A Industry Sector	B Facilities in Search	C Facilities Inspected	D Number of Inspections	E Facilities w/One or More Violations		F Facilities w/One or More Enforcement Actions		G Total Enforcement Actions	H Enforcement to Inspection Rate
				Number	Percent*	Number	Percent*		
Metal Mining	873	114	194	82	72%	16	14%	24	0.13
Non-metallic Mineral Mining	1,143	253	425	75	30%	28	11%	54	0.13
Lumber and Wood	464	142	268	109	77%	18	13%	42	0.15
Furniture	293	160	113	66	41%	3	2%	5	0.04
Rubber and Plastic	1,665	271	435	289	107%	19	7%	59	0.14
Stone, Clay, and Glass	468	146	330	116	79%	20	14%	66	0.20
Nonferrous Metals	844	202	402	282	140%	22	11%	72	0.18
Fabricated Metal	2,346	477	746	525	110%	46	10%	114	0.15
Electronics/Computers	405	60	87	80	133%	8	13%	21	0.24
Motor Vehicle Assembly	598	169	284	162	96%	14	8%	28	0.10
Pulp and Paper	306	189	576	162	86%	28	15%	88	0.15
Printing	4,106	397	676	251	63%	25	6%	72	0.11
Inorganic Chemicals	548	158	427	167	106%	19	12%	49	0.12
Organic Chemicals	412	195	545	197	101%	39	20%	118	0.22
Petroleum Refining	156	109	437	109	100%	39	36%	114	0.26
Iron and Steel	374	167	488	165	99%	20	12%	46	0.09
Dry Cleaning	933	80	111	21	26%	5	6%	11	0.10

*Percentages in Columns E and F are based on the number of facilities inspected (Column C). Percentages can exceed 100% because violations and actions can occur without a facility inspection.

Exhibit 26
Five Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Number of Facilities Inspected	Total Inspections	Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/EPCRA/Other*	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	339	1,519	155	35%	17%	57%	60%	6%	14%	1%	9%
Non-metallic Mineral Mining	631	3,422	192	65%	46%	31%	24%	3%	27%	<1%	4%
Lumber and Wood	301	1,891	232	31%	21%	8%	7%	59%	67%	2%	5%
Furniture	213	1,534	91	52%	27%	1%	1%	45%	64%	1%	8%
Rubber and Plastic	739	3,386	391	39%	15%	13%	7%	44%	68%	3%	10%
Stone, Clay and Glass	268	2,475	301	45%	39%	15%	5%	39%	51%	2%	5%
Nonferrous Metals	474	3,097	470	36%	22%	22%	13%	38%	54%	4%	10%
Fabricated Metal	1,340	5,509	840	25%	11%	15%	6%	56%	76%	4%	7%
Electronics	222	777	212	16%	2%	14%	3%	66%	90%	3%	5%
Automobiles	390	2,216	240	35%	15%	9%	4%	54%	75%	2%	6%
Pulp and Paper	265	3,766	502	51%	48%	38%	30%	9%	18%	2%	3%
Printing	1,035	4,723	514	49%	31%	6%	3%	43%	62%	2%	4%
Inorganic Chemicals	302	3,034	402	29%	26%	29%	17%	39%	53%	3%	4%
Organic Chemicals	316	3,864	726	33%	30%	16%	21%	46%	44%	5%	5%
Petroleum Refining	145	3,237	797	44%	32%	19%	12%	35%	52%	2%	5%
Iron and Steel	275	3,555	499	32%	20%	30%	18%	37%	58%	2%	5%
Dry Cleaning	245	633	103	15%	1%	3%	4%	83%	93%	<1%	1%

* Actions taken to enforce the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances and Chemical Act, and the Emergency Planning and Community Right-to-Know Act as well as other Federal environmental laws.

Exhibit 27
One Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Number of Facilities Inspected	Total Inspections	Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/EPCRA/Other*	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	114	194	24	47%	42%	43%	34%	10%	6%	<1%	19%
Non-metallic Mineral Mining	253	425	54	69%	58%	26%	16%	5%	16%	<1%	11%
Lumber and Wood	142	268	42	29%	20%	8%	13%	63%	61%	<1%	6%
Furniture	113	160	5	58%	67%	1%	10%	41%	10%	<1%	13%
Rubber and Plastic	271	435	59	39%	14%	14%	4%	46%	71%	1%	11%
Stone, Clay, and Glass	146	330	66	45%	52%	18%	8%	38%	37%	<1%	3%
Nonferrous Metals	202	402	72	33%	24%	21%	3%	44%	69%	1%	4%
Fabricated Metal	477	746	114	25%	14%	14%	8%	61%	77%	<1%	2%
Electronics	60	87	21	17%	2%	14%	7%	69%	87%	<1%	4%
Automobiles	169	284	28	34%	16%	10%	9%	56%	69%	1%	6%
Pulp and Paper	189	576	88	56%	69%	35%	21%	10%	7%	<1%	3%
Printing	397	676	72	50%	27%	5%	3%	44%	66%	<1%	4%
Inorganic Chemicals	158	427	49	26%	38%	29%	21%	45%	36%	<1%	6%
Organic Chemicals	195	545	118	36%	34%	13%	16%	50%	49%	1%	1%
Petroleum Refining	109	439	114	50%	31%	19%	16%	30%	47%	1%	6%
Iron and Steel	167	488	46	29%	18%	35%	26%	36%	50%	<1%	6%
Dry Cleaning	80	111	11	21%	4%	1%	22%	78%	67%	<1%	7%

* Actions taken to enforce the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances and Chemical Act, and the Emergency Planning and Community Right-to-Know Act as well as other Federal environmental laws.

VII.C. Review of Major Legal Actions

VII.C.1. Review of Major Cases

This section provides summary information about major cases that have affected this sector. As indicated in EPA's *Enforcement Accomplishments Report, FY 1991, FY 1992, FY 1993* publications, nine significant enforcement cases were resolved between 1991 and 1993 for the lumber and wood products industry. CAA violations comprised four of these cases, the most of any statute. The remaining cases were distributed fairly evenly, with CERCLA cited twice, RCRA cited twice, and FIFRA cited once.

Three of the CAA violations involved excessive hog fuel (waste wood) boiler emissions. Each of these settlements include Supplemental Environmental Projects (SEPs), such as the installation of boiler precipitators, and penalties were usually under \$100,000. A notable exception, however, is *U.S. v. Louisiana-Pacific Corporation and Kirby Forest Industries* (1993). The case involved numerous violations of State Implementation Plans, Prevention of Significant Deterioration requirements, New Source Review requirements, and State permit requirements at its Louisiana-Pacific facilities. The penalty assessed in this case represents the largest CAA civil penalty ever collected by EPA, and the second largest penalty recovered under any environmental statute. Under the terms of a consent decree, Louisiana-Pacific was required to pay \$11.1 million in civil penalties and was required to install state-of-the-art pollution control equipment valued at \$70 million.

The remaining enforcement actions (under CERCLA, RCRA, and FIFRA) involved sites with contamination caused by wood treatment processes. Penalties assessed against responsible parties at these sites ranged from \$68,000 to \$350,000. In addition, a CERCLA settlement at the Koppers NPL site required Beazer East, Inc. to perform design, construction, operation, and maintenance of an operable unit valued at approximately \$77 million.

VII.C.2. Supplemental Environmental Projects (SEPs)

Supplementary Environmental Projects (SEPs) are compliance agreements that reduce a facility's stipulated penalty in return for an environmental project that exceeds the value of the reduction. Often, these projects fund pollution prevention activities that can significantly reduce the future pollutant loadings of a facility.

In December, 1993, the Regions were asked by EPA's Office of Enforcement to provide information on the number and type of SEPs entered into by the Regions. Exhibit 28 contains a representative sample of the Regional responses addressing the lumber and wood products industry. The information contained in the chart is not comprehensive and provides only a sample of the types of SEPs developed for the lumber and wood products industry.

Exhibit 28
Supplemental Environmental Projects
Lumber/Wood (SIC 24)

Case Name	EPA Region	Statute/ Type of Action	Type of SEP	Estimated Cost to Company	Expected Environmental Benefits	Final Assessed Penalty	Final Penalty After Mitigation
Louisiana-Pacific Corporation Moyie Springs, ID	10	CAA-SIP	Pollution Reduction	\$ 102,950	Installation of electrified filter bed to reduce particulate emissions.	\$ 67,972	\$ 33,986
Merritt Brothers Lumber Company Priest River, ID	10	CAA-SIP	Pollution Reduction	\$ 213,881	Installation of electrostatic precipitator to reduce particulate emissions.	\$ 20,208	\$ 10,104
Rosboro Lumber Company Springfield, OR	10	TSCA	Pollution Reduction	\$ 37,230	Early disposal of PCB and PCB- contaminated electrical equipment.	\$ 37,230	\$ 18,615
JD Lumber, Inc. Priest River, ID	10	CAA-SIP	Pollution Prevention	\$ 58,000	Purchase and installation of "hog" machine to reduce particulate emissions.	\$ 17,500	\$ 8,750
Riley Creek Lumber Company Laclede, ID	10	CAA-SIP	Pollution Reduction	\$ 254,000	Purchase and installation of electrostatic precipitator to reduce particulate emissions.	\$ 20,000	\$ 10,000
Georgia Pacific Zachary, LA	6	CERCLA	Equipment Donation	\$ 6,000	Donate emergency and/or computer equipment to the Local Emergency Planning Committee (LEPC) to respond to and/or plan for chemical emergencies. Participate in LEPC activities.	\$ 25,000	\$ 5,000

VIII. COMPLIANCE ACTIVITIES AND INITIATIVES

This section highlights the activities undertaken by this industry sector and public agencies to voluntarily improve the sector's environmental performance. These activities include those independently initiated by industrial trade associations. In this section, the notebook also contains a listing and description of national and regional trade associations.

VIII.A. Sector-Related Environmental Programs and Initiatives

EPA Region X conducted the "Idaho Rule Effectiveness Study" from March 1991 through October 1992 in the Idaho Panhandle. The study focused on sources of PM and was designed to evaluate the effectiveness of Idaho rules regulating particulate emissions: the sources selected for the study, which included many wood products facilities, were located in or near suspected PM10 non-attainment areas. Inspections evaluated the compliance status of 26 sources with respect to Idaho rules concerning emissions limitations, visible emissions limitations for wigwam burners, permits to construct, operating permits, and particulate standards for combustion sources.

EPA's impression following completion of the study was that existing controls were not adequate to comply with applicable regulations. A majority of sources used multiclones as their primary control device. Equipment was not routinely maintained; sources did not appear to have a routine operation and maintenance program (O&M); and many mill managers had little knowledge of the air quality regulations that applied to their facility.

A second conclusion reached by EPA was that environmental responsibilities were secondary to those related to the operation of the mill. Even at the largest facilities, the manager of the mill was also responsible for environmental compliance and reported to a production-oriented management structure.

The study resulted in the following actions and lessons learned:

- Five facilities installed air pollution control equipment that will permanently reduce PM10 emissions by 415 tons/year. These installations were in response to enforcement actions issued by the Region during the study. Two additional facilities eliminated wood waste incineration entirely, reducing PM10 emissions by over 250 tons/year;

- General industry awareness of environmental regulations has been improved substantially as a result of the initiated inspections, subsequent enforcement actions, and meetings with EPA;
- It is important for a regulatory agency to conduct unannounced inspections;
- After meeting with EPA, an industry group sponsored an opacity certification school in October 1991 which was attended by numerous industry representatives. Additional certifications have been held each April and October since then;
- The problem of wood waste disposal is not only an air quality problem. Resolution of the enforcement cases developed in this study showed that recognition should be given to multimedia environmental impacts;
- Most of the sources will need to obtain operating permits.

VIII.B. EPA Voluntary Programs

33/50 Program

The "33/50 Program" is EPA's voluntary program to reduce toxic chemical releases and transfers of 17 chemicals from manufacturing facilities. Participating companies pledge to reduce their toxic chemical releases and transfers by 33 percent as of 1992 and by 50 percent as of 1995 from the 1988 baseline year. Certificates of Appreciation have been given to participants who met their 1992 goals. The list of chemicals includes 17 high-use chemicals reported in the Toxics Release Inventory.

Twenty-four companies and 43 facilities listed under SIC 24 (lumber and wood products) are currently participating in the 33/50 program. They account for approximately nine percent of the 491 companies under SIC 24. This is lower than the average for all industries of 14 percent participation. (Contact: Mike Burns 202-260-6394 or the 33/50 Program 202-260-6907)

Exhibit 29 lists those companies participating in the 33/50 program that reported under SIC code 24 to TRI. Many of the participating companies listed multiple SIC codes (in no particular order), and are therefore likely to conduct operations in addition to Lumber and Wood Products manufacturing. The table shows the number of facilities within each company that are participating in the 33/50 program; each company's total 1993 releases and transfers of 33/50 chemicals; and the percent reduction in these chemicals since 1988.

Exhibit 29
Lumber and Wood Facilities Participating in the 33/50 Program

Parent Facility Name	Parent City	ST	SIC Codes	# of Participating Facilities	1993 Releases and Transfers (lbs.)	% Reduction 1988 to 1993
Blue Circle America Inc	Marietta	GA	2491	1	250	*
C. M. Tucker Lumber Corp.	Pageland	SC	2491	2	1,000	*
Elco Forest Products Inc	Opelousas	LA	2491	1	0	75
Flagship Trading Corp	Cleveland	OH	2491	1	250	***
Georgia-Pacific Corporation	Atlanta	GA	2493	3	2,722,182	50
Hagerwood Inc	Grand Rapids	MI	2491	2	1,000	*
Honolulu Wood Treating Co.	Ewa Beach	HI	2491	1	256	50
Hutchens Industries Inc	Springfield	MO	3799, 3325, 2421	1	298,000	68
International Paper Company	Purchase	NY	2435	5	2,784,831	50
Julian Lumber Co Inc	Antlers	OK	2491	1	250	50
Louisiana-Pacific Corporation	Portland	OR	2421, 2435	5	294,823	50
Mascotech	Taylor	MI	2426	1	3,163,830	35
Potlatch Corporation	San Francisco	CA	2431, 2426	2	276,643	60
Premark International Inc	Deerfield	IL	2436	3	140,313	***
R L C Industries Co	Dillard	OR	2435, 2436	1	129,083	48
States Industries Inc	Eugene	OR	2435	1	16,272	50
Tarkett North Amercn Holdings	Parsippany	NJ	2426	1	30,190	35
Taylor-Ramsey Corporation	Madison Heights	VA	2491	1	255	***
Thrift Brothers Lumber Co Inc	Westminster	SC	2491	1	510	*
Tri-State Pole & Piling Inc	Lucedale	MS	2491	1	71,255	*
Union Camp Corporation	Wayne	NJ	2611, 2621,2631	1	835,696	50
Weyerhaeuser Company	Tacoma	WA	2491	5	1,006,356	*
Willamette Industries Inc	Portland	OR	2493	1	677,090	34
Wood Preservers Inc	Warsaw	VA	2491	1	31	50

* = not quantifiable against 1988 data.
 ** = use reduction goal only.
 *** = no numerical goal.

Environmental Leadership Program

The Environmental Leadership Program (ELP) is a national initiative piloted by EPA and State agencies in which facilities have volunteered to demonstrate innovative approaches to environmental management and compliance. EPA has selected 12 pilot projects at industrial facilities and Federal installations which will demonstrate the principles of the ELP program. These principles include: environmental management systems, multimedia compliance assurance, third-party verification of compliance, public measures of accountability, community involvement, and mentoring programs. In return for participating, pilot participants receive public recognition and are given a period of time to correct any violations discovered during these experimental projects. (Contact: Tai-ming Chang, ELP Director, 202-564-5081 or Robert Fentress, 202-564-7023)

Project XL

Project XL was initiated in March 1995 as a part of President Clinton's *Reinventing Environmental Regulation* initiative. The projects seek to achieve cost effective environmental benefits by allowing participants to replace or modify existing regulatory requirements on the condition that they produce greater environmental benefits. EPA and program participants will negotiate and sign a Final Project Agreement, detailing specific objectives that the regulated entity shall satisfy. In exchange, EPA will allow the participant a certain degree of regulatory flexibility and may seek changes in underlying regulations or statutes. Participants are encouraged to seek stakeholder support from local governments, businesses, and environmental groups. EPA hopes to implement fifty pilot projects in four categories including facilities, sectors, communities, and government agencies regulated by EPA. Applications will be accepted on a rolling basis and projects will move to implementation within six months of their selection. For additional information regarding XL Projects, including application procedures and criteria, see the May 23, 1995 Federal Register Notice, or contact Jon Kessler at EPA's Office of Policy Analysis (202) 260-4034.

Green Lights Program

EPA's Green Lights program was initiated in 1991 and has the goal of preventing pollution by encouraging U.S. institutions to use energy-efficient lighting technologies. The program has over 1,500 participants which include major corporations; small and medium sized businesses; Federal, State and local governments; non-profit groups; schools; universities; and health care facilities. Each participant is

required to survey their facilities and upgrade lighting wherever it is profitable. EPA provides technical assistance to the participants through a decision support software package, workshops and manuals, and a financing registry. EPA's Office of Air and Radiation is responsible for operating the Green Lights Program. (Contact: Susan Bullard at 202-233-9065 or the Green Light/Energy Star Hotline at 202-775-6650)

WasteWi\$e Program

The WasteWi\$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste minimization, recycling collection, and the manufacturing and purchase of recycled products. As of 1994, the program had about 300 companies as members, including a number of major corporations. Members agree to identify and implement actions to reduce their solid wastes and must provide EPA with their waste reduction goals along with yearly progress reports. EPA in turn provides technical assistance to member companies and allows the use of the WasteWi\$e logo for promotional purposes. (Contact: Lynda Wynn, 202-260-0700 or the WasteWi\$e Hotline at 1-800-372-9473)

Climate Wise Recognition Program

The Climate Change Action Plan was initiated in response to the U.S. commitment to reduce greenhouse gas emissions in accordance with the Climate Change Convention of the 1990 Earth Summit. As part of the Climate Change Action Plan, the Climate Wise Recognition Program is a partnership initiative run jointly by EPA and the Department of Energy. The program is designed to reduce greenhouse gas emissions by encouraging reductions across all sectors of the economy, encouraging participation in the full range of Climate Change Action Plan initiatives, and fostering innovation. Participants in the program are required to identify and commit to actions that reduce greenhouse gas emissions. The program, in turn, gives organizations early recognition for their reduction commitments; provides technical assistance through consulting services, workshops, and guides; and provides access to the program's centralized information system. At EPA, the program is operated by the Air and Energy Policy Division within the Office of Policy Planning and Evaluation. (Contact: Pamela Herman, 202-260-4407)

NICE³

The U.S. Department of Energy and EPA's Office of Pollution Prevention are jointly administering a grant program called The National Industrial Competitiveness through Energy, Environment, and Economics (NICE³). By providing grants of up to 50 percent of the total project cost, the program encourages industry to reduce industrial waste at its source and become more energy-efficient and cost-competitive through waste minimization efforts. Grants are used by industry to design, test, demonstrate, and assess the feasibility of new processes and/or equipment with the potential to reduce pollution and increase energy efficiency. The program is open to all industries; however, priority is given to proposals from participants in the pulp and paper, chemicals, primary metals, and petroleum and coal products sectors. (Contact: DOE's Golden Field Office, 303-275-4729)

VIII.C. Trade Association/Industry Sponsored Activity

VIII.C.1. Environmental Programs

A consortium of Universities, DOE National Laboratories, Forest Service Researchers, and Industrial partners have submitted a coordinated package of proposals for funding under EPA's "Environmental Technology Initiative" (ETI) program aimed at reducing pollution in wood products production. A total of five proposals were submitted, including: "Diffusion of Pollution Prevention Technology for the Lumber and Wood Products Industry," "Process Control Technology to Mitigate VOC Air Emissions in the Production of Oriented Strand Board," "Improved Wood Adhesives for Reduction of Pollutants for the Wood Panel Manufacturing Industry," "Identification and Quantification of Volatile Organic Compounds Emitted from Lumber Dry Kilns," and "Development of Coupled Biological/Chemical Systems to Reduce VOCs in Lumber and Composite Board Facilities." These projects are currently underway at the Forest Products Laboratory in Madison, Wisconsin.

To explore questions related to potential technologies which might be applicable for control of wood panel plant VOC emissions, the American Forest & Paper Association (AF&PA) Solid Wood Committee and NCASI hosted a workshop in October 1993. It was attended by approximately 100 individuals from industry, State regulatory agencies, EPA, and EPA consultants. At the workshop, the following five control technologies were discussed: ultraviolet oxidation, chemical scrubbing with brominated compounds, furnish dryer exhaust gas recirculation to a wood-fired fuel cell for oxidation of

organic compounds, biofiltration, and regenerative thermal oxidation. Topics discussed included: current status of development, performance, problems encountered, potential limitations, energy requirements, and estimated costs. In addition, an EPA representative updated the workshop attendees on the Agency's current efforts to develop a common definition of VOCs and to adopt a standard VOC test method for emissions from solid wood manufacturing plants.

According to the American Forest and Paper Association, wood recycling is on the rise. An estimated 400,000 tons of wood waste were recovered in 1990. This waste included barrels, boxes, brush, Christmas trees, construction and demolition waste, crates, pallets, posts, poles, prunings, railroad ties, sawdust, slab wood, and yard trimmings. The management of wood residue as a component of construction and demolition waste and from urban tree removals is becoming a larger issue as landfill tipping fees rise. Wood residue management is also an increasingly important issue for wood products producers, retailers, and the general public. As virgin wood fiber prices rise, incentives and cost-avoidance pressures are motivating wood users and producers to find ways to fully and most profitably utilize this resource.

The American Forest and Paper Association's American Wood Council is producing a Wood Recycling Reference Handbook to encourage and facilitate wood recycling in the United States. The book will list by state and county where wood residue can be bought for reuse and recycling. The first edition is due out in October, 1995.

VIII.C.2. Summary of Trade Associations

There are numerous trade and professional organizations affiliated with the forest products industry. The largest organization is the American Forest and Paper Association. The smaller associations generally focus on specific types of timber (i.e., hardwoods, pine), or specific types of product (i.e., plywood, particleboard). In addition, there are a number of trade organizations which focus their efforts on specific regions of the country.

General

American Forest and Paper Association 1111 19th Street, NW, Suite 800 Washington, DC 20036 Phone: (202) 463-2700 Fax: (202) 463-2785	Members: 425 Contact: Josephine Cooper
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The American Forest and Paper Association (AF&PA) is the national trade association of the forest, pulp, paper, paperboard, and wood products industry. AF&PA represents approximately 500 member companies and related trade associations (whose memberships are in the thousands) which grow, harvest, and process wood and wood fiber; manufacture pulp, paper and paperboard products from both virgin and recovered fiber; and produce solid wood products.

National Council of the Paper Industry for Air and Stream Improvement 260 Madison Avenue New York, NY 10016 Phone: (212) 532-9000 Fax: (212) 779-2849	Members: 100 Staff: 90 Budget: \$10,000,000 Contact: Dr. Ronald Yeske, President
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Founded in 1943, the National Council of the Paper Industry for Air and Stream Improvement (NCASI) presently conducts research on environmental problems related to industrial forestry and the manufacture of pulp, paper, and wood products. NCASI produces technical documents on environmental issues facing the pulp and paper industry and conducts industry conferences. Publications include: a biweekly bulletin on general issues and a variety of technical bulletins (40/year). NCASI also holds an annual March convention in New York City.

Hardwood

Hardwood Manufacturers Association 400 Penn Center Blvd. Pittsburgh, PA 15235 Phone: (412) 346-2222 Fax: (412) 346-2233	Members: 145 Staff: 5 Contact: Susan Regan
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Manufacturers of hardwood lumber and hardwood products. Conducts promotion programs; compiles statistics.

National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184-0518 Phone: (901) 377-1818 Fax: (901) 382-6419	Members: 1300 Staff: 40 Contact: Ernest J. Stebbins
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United States and Canadian hardwood lumber and veneer manufacturers, distributors, and consumers. Inspects, measures, and certifies hardwood lumber. Maintains inspection training school and conducts short courses at members' lumber yards; conducts management and marketing seminars for the hardwood industry. The organization publishes the National Hardwood Lumber Association-Annual Report and the National Hardwood News, an annual newsletter.

Plywood

Hardwood Plywood & Veneer Association 1825 Michael Faraday Dr. PO Box 2789 Reston, VA 22090 Phone: (703) 435-2537	Members: 150 Staff: 12 Budget: \$1,000,000 Contact: E.T. Altman
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Manufactures and prefinishers of hardwood plywood; manufacturers of veneer; suppliers of glue, machinery, and other products related to the industry. Conducts laboratory testing of plywood, adhesives, finishes, flamespread, formaldehyde emissions, structural, and smoke density. The association provides public relations, advertising, marketing, and technical services to members. It represents the industry in legislative matters and keep members informed on tariff and trade actions. Publications include the annual *Hardwood Plywood and Veneer News* and *The Executive Brief*.

American Plywood Association PO Box 11700 Tacoma, WA 98411 Phone: (206) 565-6600 Fax: (206) 565-7265	Members: 136 Staff: 180 Budget: \$14,000,000 Contact: Gene Zellner
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Manufacturers of plywood, oriented strand board and composites. Conducts trade promotion through advertising, publicity, merchandising, and field promotion. The Association provides quality oversight and conducts research to improve products, applications, and manufacturing techniques. Publications include the *Management Report*, and periodic *Plywood Statistics*.

Hardboard

American Hardboard Association 1210 W. Northwest Highway Palatine, IL 60067 Phone: (708) 934-8800 Fax: (708) 934-8803	Members: 4 Staff: Budget: Contact: C. Curtis Peterson
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Manufacturers representing major U.S. producers of hardboard.

Particleboard

National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879 Phone: (301) 670-0604 Fax: (301) 840-1252	Members: 19 Staff: 10 Budget: Contact: Richard Margosian
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Mat-formed wood particleboard and medium-density fiberboard manufacturers interested in establishing industry product standards with the American National Standards Institute and quality standards for performance. Sponsors educational programs and publishes promotional and technical bulletins on topics including laminating and veneering.

Wood Preserving

American Wood-Preservers' Association P.O. Box 286 Woodstock, MD 21163-0286 Phone: (410) 465-3169 Fax: (410) 465-3195	Members: 2000 Staff: Budget: Contact: John F. Hall
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The association includes processors and users of chemically treated wood and is affiliated with the American Wood Preservers Institute. Publications include the annual *AWPA Book of Standards*, which is a technical handbook covering preservatives and treatments.

American Wood Preservers Institute 1945 Old Gallows Road, Ste. 150 Vienna, VA 22182-3931 Phone: (703) 893-4005 Fax: (703) 893-8492	Members: 150 Staff: 8 Budget: \$1,100,000 Contact: Gene Bartlow
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The American Wood Preservers Institute is the national trade association representing the wood preserving industry. Its members include manufacturers of treated wood products, manufacturers and distributors of wood preservatives, and providers of allied services. AWPI provides technical forums for the industry, publishes a bi-monthly newsletter, and produces annual Industry Statistical Reports.

Regional

Northeastern Lumber Manufacturers Association 272 Tuttle Rd., Box 87A Cumberland Center, ME 04021 Phone: (207) 829-6901 Fax: (207) 829-4293	Members: 200 Staff: 7 Budget: Contact: Stephen Clark
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Northeastern Lumber Manufacturers is an association of hardwood and softwood lumber and timber products manufacturers in New England. The group promotes the interests of the Northeastern lumber manufacturing industry and presents the views of the industry to other organizations, the government, and the public. Publications include the monthly *Northeastern Lumber Manufacturers Association*.

Southeastern Lumber Manufacturers Association PO Box 1788 Forest Park, GA 30051 Phone: (404) 361-1445 Fax: (404) 361-5963	Members: 390 Staff: 10 Budget: \$2,000,000 Contact: Ed C. Cone, Jr.
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Represents Southeastern hardwood and softwood lumber manufacturers and coordinates efforts of membership to alleviate local, regional, and national problems that affect the regional lumber industry. Publishes a quarterly newsletter, *Silva Magazine*, and *Management Update*. SLMA also conducts technical workshops.

Southern Forest Products Association PO Box 52468 New Orleans, LA 70152 Phone: (504) 443-4464 Fax: (504) 443-6612	Members: 220 Staff: 31 Budget: \$2,856,000 Contact: Karl Lindberg
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The Southern Forest Products Association (SFPA) represents Southern pine lumber manufacturers and conducts market development and product promotional programs and government support activities. SFPA publishes a weekly newsletter covering a variety of industry activities.

Western Wood Preservers Institute 601 Main Street, Suite 405 Vancouver, WA 98660 Phone: (360) 693-9958 Fax: (360) 693-9958	Members: 50 Staff: 3 Budget: Contact: Dennis Hayward
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WWPI represents the treated wood industry in Western North America. WWPI provides educational information to assist consumers in the selection and proper, safe, and environmentally appropriate use of treated wood products.

Western Wood Products Association Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122 Phone: (503) 224-3930 Fax: (503) 224-3934	Members: 250 Staff: 63 Budget: Contact: Robert Hunt
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WWPA is a rules-writing agency (for lumber grades), approved under the American Lumber Standard Committee under the jurisdiction of the Department of Commerce. The Association also provides economic and statistical information on the Western lumber industry, conducts research in wood technology, engineering and performance; provides technical and educational services both domestically and internationally; and published technical and consumer information for Western Lumber end-use.

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* Many of the contacts listed above have provided valuable background information and comments during the development of this document. EPA appreciates this support and acknowledges that the individuals listed do not necessarily endorse all statements made within this notebook.

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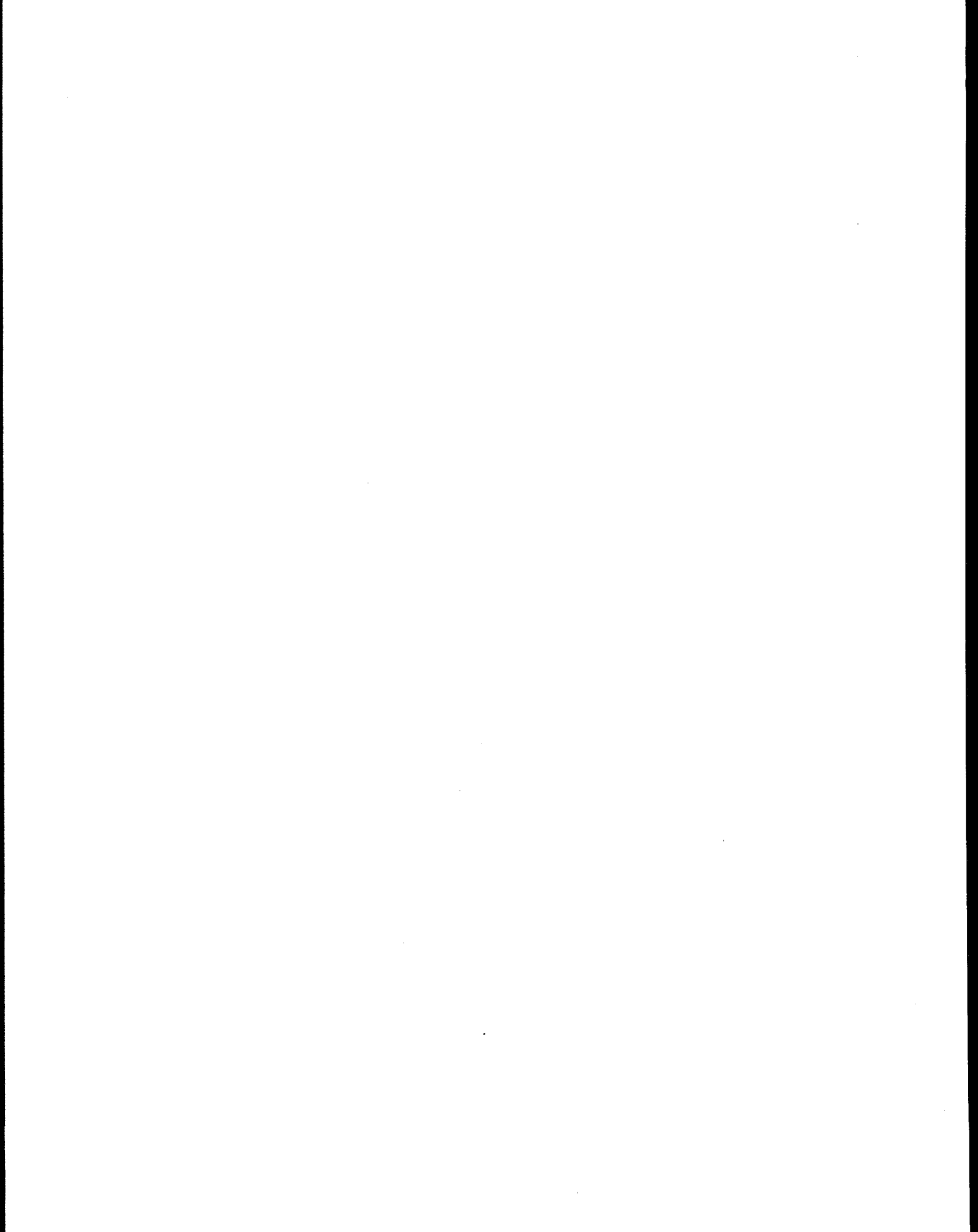
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