FRASER RIVER ACTION PLAN

Technical Pollution Prevention Guide for Pressure Wood Preservation Facilities in the Lower Fraser Basin

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TECHNICAL POLLUTION PREVENTION GUIDE FOR PRESSURE WOOD PRESERVATION FACILITIES IN THE LOWER FRASER BASIN

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ABSTRACT

The guide gives a brief description of pressure wood preservation facilities and identifies environmental issues unique to this industry. It then provides a study methodology to enable plant operators to carry out a disinterested review of possible sources of pollution within their own facilities. Lastly, the document offers suggestions to the industry for the development of pollution prevention programs.

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RÉSUMÉ

Ce guide fournit une brève description des installations de préservation du bois de compression et passe en revue les problèmes environnementaux particuliers à cette industrie. Il propose également une méthode d'étude aux gestionnaires afin de les aider à mener à bien un examen objectif des sources de pollution potentielles à l'intérieur de leurs installations. Enfin, le document offre à l'industrie une série de suggestions sur la façon d'élaborer un programme de prévention de la pollution.

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1.0 INTRODUCTION

The wood preservation industry in Canada uses a variety of chemicals to impregnate wood to reduce its rate of decay and increase its useful life. As many of the chemicals used are not only toxic to the microorganisms that attack wood, but to a much wider range of life, it is important to control and minimize their release into the environment. The purpose of this document is to provide a technical guide for the development of pollution prevention plans for wood preservation facilities in the Lower Fraser Basin of British Columbia. As a generalization, pollution prevention planning requirements for industrial facilities contain four central themes:

(1) A comprehensive review of all industrial processes that use, generate or release toxic or hazardous materials;

(2) The identification of pollution prevention opportunities in all processes in which toxic or hazardous materials are handled;

(3) A ranking for each of the opportunities and a schedule for their implementation; and,

(4) The implementation of these options, including some measure of their success.

This guide does not attempt to outline a holistic approach to pollution prevention for the entire preservation industry but deals with facility pollution prevention based on the current industry situation, i.e., current raw material usage, types of available preservatives, accepted processes and products, as well as the current state of the art, including Best Management Practices. It does not attempt to address overall industry issues, such as alternative preservatives or substitute materials for treated wood products or disposal aspects.

1.1 Regulatory Initiatives

In June 1995, Ms. Sheila Copps, Federal Minister of the Environment, announced the formal initiation of APollution Prevention - A federal strategy for Action@ (Government of Canada, 1995). The intent, in the words of the Minister, is "to prevent, rather than control pollution"; "to eradicate the causes of pollution instead of just treat its symptoms". The federal government defines pollution prevention as:

"The use of processes, practices, materials, product, or energy that avoid or minimize the creation of pollutants and waste, and reduce overall risk to human health or the environment."

The federal action plan will incorporate many features, such as:

- the use of pollution prevention across all federal government activities;
- incorporation of pollution prevention into federal legislation; and
- fostering a national pollution prevention effort with provincial governments in developing pollution prevention strategies.

As part of the national pollution prevention effort and the Fraser River Ecosystem Initiatives Program, the Fraser Pollution Abatement office has established a goal of reducing pollutants discharged to the Fraser River. One mechanism to achieve the goal is to develop a pollution prevention manual for each 27 identified industries so that voluntary environmental review programs can be conducted with the view of minimizing the creation of pollutants and wastes. The industries include wineries, dry bulk terminals, dairy processing, fruit and vegetable processing, fish processing, automobile recyclers, concrete ready-mixed facilities and wood preservation facilities.

Concurrently, the National Contaminated Sites Remediation Program has indicated a priority element in pollution prevention, in that those in control of activities with the potential to pollute should prepare operational, emergency and contingency plans to prevent or control any conditions that may result in contamination of sites. A pollution prevention manual would include the actions to minimize the potential for site contamination.

Environment Canada contracted Envirochem Special Projects Inc. to prepare a Pollution Prevention Guide for Wood Preservation Plants to support these various national and regional initiatives.

This manual consists of three principal sections:

- a description of wood preservation processes and potential sources of releases and types of releases;
- a listing of Best Management Practices (BMPs) to minimize or eliminate potential releases; and,
- instructions on how to conduct a pollution prevention review with detailed worksheets to aid in the review and to identify priority action items.

The background information should provide the auditors with an understanding of the basic wood preservation operations, equipment and practices that would allow the minimization or elimination of releases. The worksheets will then assist the auditors in determining any shortcomings and in identifying items requiring upgrading.

The ultimate goal is to develop sound and functional pollution prevention programs in preservation facilities.

By definition, pollution prevention is the application of processes, practices, equipment, materials and energy that avoid or minimize the creation of pollution or wastes.

Pollution prevention is an approach for reducing pollution by focusing on minimizing the potential for releases of undesirable substances and waste residuals rather than dealing with them once they are formed.

This guide focusses on the following pollution prevention concepts identified within the federal strategy and by BC Environment (1995):

- avoidance, elimination or substitution of polluting products;
- reduction in the use of polluting products;

- elimination and/or the reduction in the generation of pollution by-products;
- treatment and containment of polluting residual by-products; and,
- remediation of contaminated sites.

This Guide does not address:

- forestry issues;
- off-site manufacture of wood preservative chemicals;
- off-site transport of raw materials, products, residuals and wastes;
- off-site treatment of wastes;
- life cycle management of products;
- energy recovery;
- noise;
- identification and recommendation of alternative wood preservatives; and,
- evaluation and cost-benefits of product substitution (e.g., metals or concrete products).

2.0 INDUSTRY OVERVIEW

Wood preservation is the term given to pressure or thermal impregnation of chemicals into wood to a depth that will provide effective long-term resistance to attack by fungi, insects and marine borers. By extending the service life of available timber, wood preservation reduces the harvest of already stressed forestry resources, reduces operating costs in industries such as utilities and railroads, and ensures safe working conditions where timbers are used as support structures.

2.1 Industry Profile

2.1.1 Canada

In Canada, the predominant wood preservative chemicals or formulations in use are:

- ***CCA (chromated copper arsenate)*** Major CCA-treated products include: fence posts; lumber for patios and landscaping; preserved wood foundations of lumber and plywood; and utility poles.

- ***ACA (ammoniacal copper arsenate)*** Major ACA-treated products include utility poles and marine timbers.

- ***PCP (pentachlorophenol)*** Major PCP-treated products include: utility poles and cross arms.

- ***Creosote*** Major uses include treatment of railway ties and marine pilings.

There are currently 64 wood preservation plants in Canada (Stephens *et al.*, 1996). The estimated wood treatment volume in Canada in 1992 is as shown in Table 2.1.

Table 2.1: Volume of Wood Treated with Preservative in Canada in 1992 - Actual Volumes (ft^3 1,000)

Commodity		Preservative						Total By Product	
		CCA	CCA/ Glycol	PCP/ Oil	Creosote	Creosote/ Oil	ACA		
		Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	Vol.	%
Consumer Lumber		35,800	0	0	0	0	0	**35,800**	51.1
Ind. Const. Lumber & Timber		6,450	0	30	590	70	360	**7,500**	10.7
PWF Lumber		980	0	0	0	0	0	**980**	1.4
PWF Plywood		360	0	0	0	0	0	**360**	0.5
Railway Ties		0	0	730	10	3,940	0	**4,680**	6.7
Poles		4,330	2,090	7,190	1,340	0	0	**14,950**	21.3
Land/ Fresh Water Piling		40	0	0	210	0	0	**250**	0.4
Marine Piling		10	0	0	510	0	30	**550**	0.8
Round Posts		4,680	0	0	10	0	0	**4,690**	6.7
Other		330	0	0	10	0	0	**340**	0.5
Total by Preservative	Vol.	**52,980**	**2,090**	**7,950**	**2,680**	**4,010**	**390**	**70,100**	100
	%	75.6	3.0	11.3	3.8	5.7	0.6	100	

Of this, B.C. treated approximately 18,400,000 ft^3, or 26.2% of the total (Stephens *et al.*, 1994).

2.1.2 Lower Mainland Wood Preservation Industry

There are currently seven wood preservation plants in the Lower Mainland of British Columbia. All seven facilities use CCA, with six of the facilities exclusively using CCA.

There is one facility in the Lower Mainland that uses all four chemicals or formulations described previously. Consequently, in order for this report to cover all the wood preservation facilities and treatment process in use in the lower Fraser River Basin or Lower Mainland, it includes all of the different treatment chemicals. The only process which is not used in the study region is the thermal treatment process which is used at two B.C. operations for pentachlorophenol application to utility poles.

2.1.3 Trends

The growth of the preserved wood products market over the period 1970 to 1990 in constant dollars (to remove the effect of inflation) was about 5% per year. This rate reflected the growth primarily in the consumer lumber market, where CCA is the exclusively used preservative.

The increasing acceptance of consumer wood products (decking, plywood, timbers and preserved wood foundations) is creating larger markets for the waterborne products. This increase more than compensates for the slightly declining market for the oilborne (creosote and PCP) products, which dominate the industrial markets.

3.0 DESCRIPTION OF PROCESSES AND BEST MANAGEMENT PRACTICES

3.1 Waterborne Preservatives

3.1.1 Description of Waterborne Preservatives

CCA accounts for 75% of Canada's, and over 85% of the Lower Mainland's total production of preserved wood. It is used in all seven Lower Mainland wood preservation facilities. Chromated Copper Arsenate (CCA) is supplied to the wood preservers as a "Type C" formulation containing 18.5% copper oxide (CuO), 47.5% chromic acid (CrO_3), and 34% arsenic acid (As_2O_5). The ratio of each primary component Cr:Cu:As, on a weight basis is, therefore, 1.6:1:1.5. The concentrated solution is shipped by bulk truck or rail tanker to the treatment plant and is stored in a concentrate chemical storage area until required. It is then transferred to the chemical mixing area where it is diluted with water to prepare a working solution containing 1.0 to 7.0% active ingredients.

Ammoniacal Copper Arsenate (ACA) accounts for only 0.6% of the wood preservative chemical usage in Canada, and is used in only one of the seven plants in the Lower Mainland. It was introduced into Canada to meet the need for a waterborne preservative with good penetrating characteristics in refractory lumber and the preserved wood foundation market. Because of its ability to treat Douglas fir (as well as other woods), ACA is most prevalent on the West Coast for use in pilings and aquatic applications.

Arsenic acid and copper oxide are purchased from California, while ammonia is purchased from local suppliers. ACA is prepared on-site at wood preservation facilities by mixing and aerating cuprous oxide powder, arsenic acid, aqueous ammonia and water. Initially, an ACA concentrate is prepared which consists of 8 to 12% total oxide (as CuO and As_2O_3). Subsequently, the concentrate is diluted with water, generally to a 2 to 4% total oxide content.

3.1.2 Description of Process

Pressure treatment is used to achieve penetration of chemical agents into the wood and two different processes are used for CCA and ACA application.

The Bethell "full-cell treatment process" consists of the following basic steps:

- placement of wood into a pressure cylinder;
- application of an initial vacuum to remove air from the wood cells;
- flooding with CCA or ACA working solution and pressurization (up to 150 psi) until the target wood preservative retention is achieved;
- draining of the excess CCA or ACA working solution (to the working tank for reuse with subsequent charges); and,
- application of a final vacuum to recover excess working solutions and to reduce carry out with the treated wood.

A "modified full-cell treatment process" may also be used whereby a lesser initial vacuum is applied, and some air remains within the wood cells. The trapped air readily expels excess CCA or ACA during the final vacuum, which results in a "drier" product.

The specific treatment times and pressures are dictated by the species of wood, the type of wood product (e.g., plywood or poles), the moisture content of the wood, and retention and penetration to be achieved. A predetermined range of process parameters is defined by the applicable treatment standards (CSA), and quality control tests are carried out to ensure that a minimum treated product quality is achieved. Once the process is completed the treated wood is withdrawn from the cylinder and stored to allow for fixation of the chemical onto the wood or is subjected to an accelerated fixation process.

Fixation is the term used for the physical and chemical processes, whereby the treatment chemicals bond to the wood and become resistant to leaching. Proper fixation is important for minimizing the potential leaching of preservative chemicals in plant storage yards and installation sites. CCA fixation is a function of time, temperature and humidity, with high temperatures reducing the fixation time required. Consequently, fixation of CCA is often enhanced through the use of accelerated fixation processes carried out in kilns or specially designed chambers or tunnels. Alternatively, steaming, or a hot water bath applied in the treatment vessel may be used to enhance fixation. Generally, accelerated fixation is preferred over fixation under ambient conditions. Enhanced fixation is particularly important when wood is treated during the winter, when ambient temperatures are low. CCA fixation is confirmed by use of a Chromatropic Acid Test, which measures the presence of chromium VI. The absence of chromium VI indicates that all chromium has been reduced to the Cr (III) form, hence >99.5% fixation is assumed (AWPA Standard A3/11, 1993).

The key to the treating process for ACA is the ammonia which facilitates carrying the active ingredient into the cell structure of the wood during the treatment process. When the ammonia is evaporated out of the product, the remaining ingredients become fixed and opportunity for leaching is minimized. The ammonia removal rate is dependent on the product size, temperature, time and air exchange around the product. Inadequate ammonia release from the product allows leaching of the active ingredients. This is particularly undesirable when the treated product is installed in an aquatic environment. Procedures are being used to accelerate the removal of the ammonia and minimize the opportunity for chemical leaching. These include kiln drying and in-retort ammonia removal.

In the Lower Mainland, ambient fixation periods range from a few days during the driest, warmest months to several months during the wettest, coldest months. In British Columbia, covered drip and initial storage pads are commonly used to allow fixation to occur while protected from weather, prior to placing the wood product in the outside storage yard. The use of accelerated fixation processes is being practiced at several Lower Mainland operations and has reduced the required fixation times to several hours.

3.1.3 Potential Chemical Discharges

There is considerable variability in wood preservation plant design and operational practices, and within each plant there are various potential emission sources. The potential sources and types of releases and wastes from CCA- and ACA-treatment plants are illustrated on the generalized process overviews presented in Figures 3.1 and 3.2.

3.1.3.1 Liquid Discharges and Their Sources

The use of waterborne (or water soluble) treatment chemicals enables process reuse of dripped solution, flooring washings or contaminated storm runoff water (within volume limits). Environmental considerations and high cost of wood preservatives have led the wood preservation industry to utilize closed treatment systems which contain, collect and reuse the chemical mixture to the greatest possible extent.

There are numerous potential liquid releases from the waterborne treatment process:

- Drips and spills from delivery, storage and process areas. Poor hose connections, broken lines, tanker leaks and cracked unloading pads are amongst the sources during delivery and unloading.

- Drips and spills from storage and mixing facilities may arise from tank failures (catastrophic releases), tank valve and pipe leaks, tank overflow and leaking pump seals.

- Leaks from cylinder door seals, valves and connections are possible sources from the process equipment. Important sources for drips and spills are inadequate cylinder drainage, door opening and product removal.

Figure 3.1 CCA PRESSURE TREATMENT

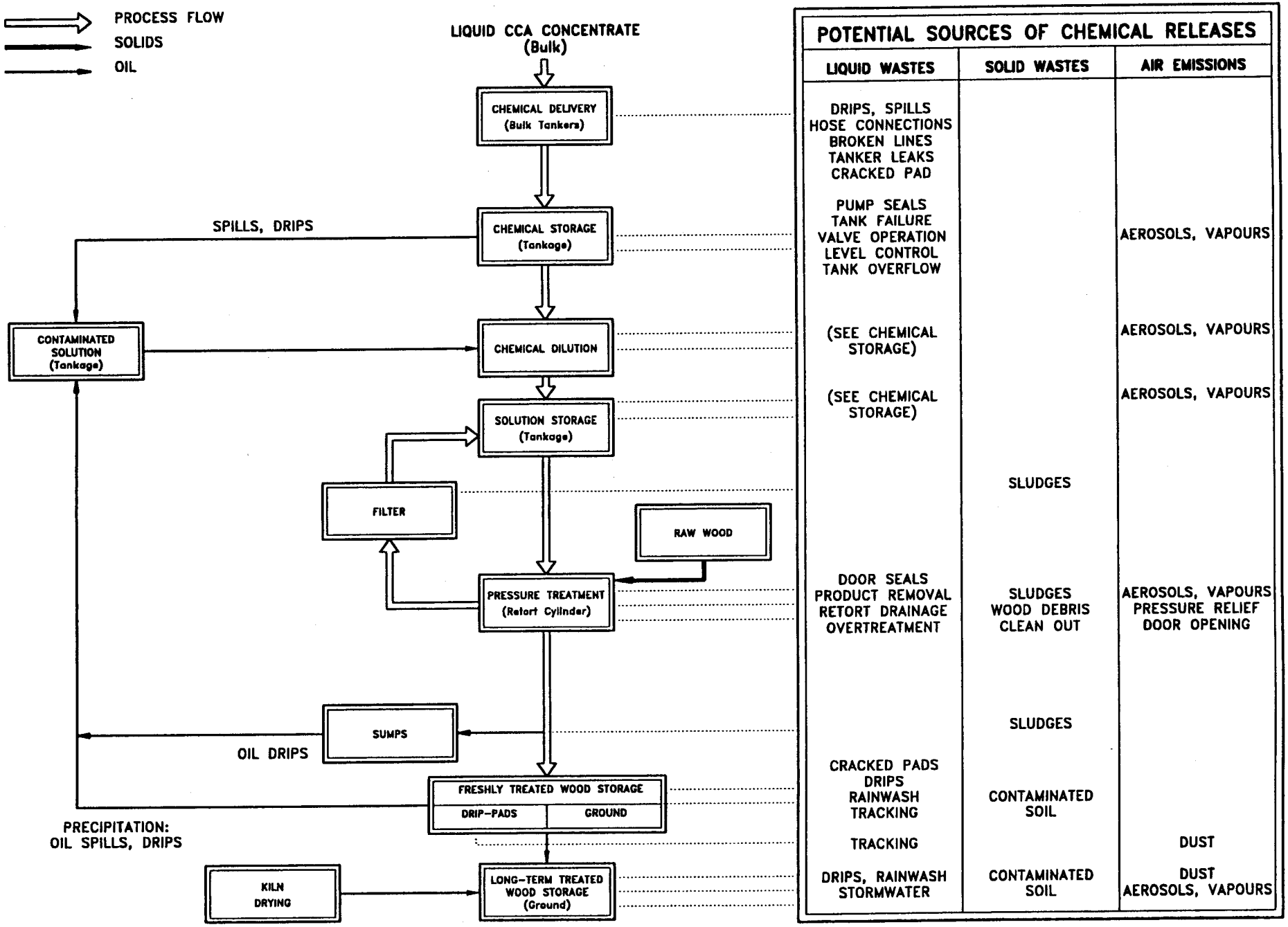
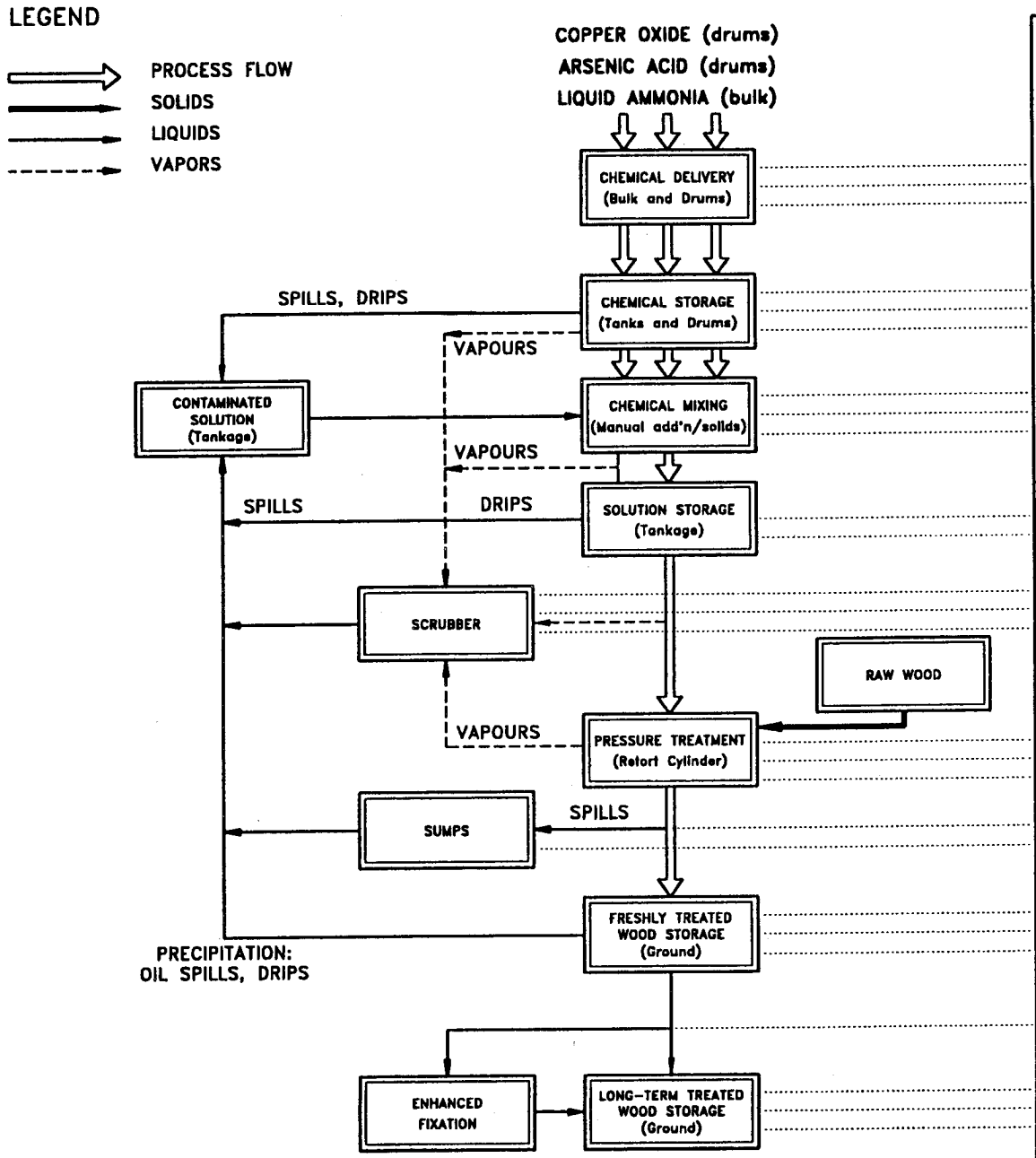


Figure 3.2 ACA PRESSURE TREATMENT



POTENTIAL SOURCES OF CHEMICAL RELEASES

LIQUID WASTES	SOLID WASTES	AIR EMISSIONS
DRIPS, SPILLS HOSE CONNECTIONS BROKEN LINES TANKER LEAKS CRACKED PAD	CONTAINERS CLEANUP BAGS	TANK VENTS SPILL VAPOURS
PUMP SEALS TANK FAILURE VALVE OPERATION LEVEL CONTROL TANK OVERFLOW	TANK BOTTOMS EMPTY CONTAINERS	TANK VENTS
(SEE CHEMICAL STORAGE)	FILTER BAGS	VAPOURS TANK MANAGEMENT
(SEE CHEMICAL STORAGE)		TANK VENTS
	SLUDGES	VAPOURS SCRUBBER FAILURE
DOOR SEALS PRODUCT REMOVAL RETORT DRAINAGE OVERTREATMENT	SLUDGES WOOD DEBRIS CLEAN OUT	AEROSOLS, VAPOURS PRESSURE RELIEF DOOR OPENING
	SLUDGES	VAPOURS
CRACKED PADS DRIPS RAINWASH TRACKING	CONTAMINATED SOIL	VAPOURS
	OFF-SPEC PRODUCT	
DRIPS, RAINWASH STORMWATER	CONTAMINATED SOIL	DUST

1230-01

- The integrity of drip-pads, inadequately sized pads (not allowing sufficient time for product drippage and fixation), premature removal of treated wood to unprotected storage, i.e., prior to having achieved satisfactory fixation, are the major potential sources for releases of preservative chemicals into the environment from ongoing operations.

- Exposure of treated wood to precipitation may result in contaminated stormwaters, particularly if fixation of the chemicals to wood is not satisfactory.

3.1.3.2 Solid Wastes

Solid waste generation at CCA and ACA facilities can vary widely between facilities and is a strong function of waste minimization programs, housekeeping techniques and raw wood cleanliness. During normal operating conditions solid wastes consist of:

- cartridge filters which are used for debris removal from recycled solutions;
- debris and sludges which are periodically removed from the sump, cylinder and tanks; and,
- treated wood waste, such as broken timbers and stickers.

3.1.3.3 Air Emissions

Potential sources of air emissions at CCA and ACA facilities include:

- vapours and mists from vacuum pump exhausts, cylinder door openings and tank vents, as well as from treated wood;
- mists produced by the sprayers of a staining machine;
- emissions from fixation processes and kilns when the treated product is dried following treatment;
- ammonia vapours generated during drying of ACA-treated wood; and,
- wind-blown dust from unpaved storage yards and dust caused by yard traffic as sources of fugitive emissions.

Several monitoring studies in the vicinity of air emission sources at CCA facilities have reported concentrations of copper, chromium and arsenic within existing occupational health limits (Gilbert *et al*, 1983).

The use of aqueous ammonia implies a significant potential for ammonia emissions at ACA facilities if proper controls are not in place. Potential sources of ammonia releases include storage tank vents, ACA mixing tank hatches and vents, vacuum pump exhausts, vapours released when retort cylinder doors are opened and freshly-treated charges. Scrubbers can be used to control ammonia releases from storage and process equipment. Air emissions are generally intermittent and restricted to localized areas. Arsenic and copper concentrations in such localized areas have been reported to be within occupational health limits at ACA facilities; however, ammonia emissions in the vicinity of ACA retort cylinder doors during openings and near freshly-treated wood could exceed existing occupational health limits.

3.1.3.4 Potential Effects

The actual impact of any emission depends on many factors, including the location of the wood preservation facility relative to ground or surface waters, the amount of chemical associated with the releases, the frequency of releases and spill containment and contingency measures in place at the facility.

Available data indicate that improperly designed and/or operated facilities have the potential to contaminate plant soils and groundwaters to levels which would require eventual site cleanups and disallow use of groundwaters for drinking purposes, or to generate contaminated surface runoff waters, which may have potential for effects on aquatic biota.

Uncontained liquid releases other than stormwater are generally confined to yard soils with potential for groundwater contamination. Examples include locations where adequate drip-pads are not used in treated-wood discharging areas or where kiln drainings are uncontained.

The Canadian Council of Ministers of the Environment (CCME) criteria and reported aquatic toxicology information for the components of waterborne preservatives are briefly summarized in Table 3.1 (CCME, 1995).

Table 3.1
Summary of CCME Criteria and Aquatic Toxicity of Waterborne Preservatives

Parameter	CCME Criteria (mg/L)		96-hr LC_{50} (mg/L)
	Drinking Water	Freshwater Aquatic Life	
Ammonia (Total)		2.2, pH 5.6, 10ºC 1.4, pH 8.0, 10ºC	2.4, pH 6.5-7.5
Arsenic	0.05	0.05	10.8
Chromium	0.05	0.02	69
Copper	1.0	0.002-0.004	0.02-0.89

3.1.4 Best Management Practices

Best Management Practices for pollution prevention in CCA- and ACA-treatment plants include proper facility designs, general good operating practice for managing industrial chemicals, and good operating practices specifically related to the preservation process.

3.1.4.1 Facility Designs

An Environment Canada Technical Steering Committee on Wood Preservation developed recommendations for the design and operation of CCA and ACA wood preservation facilities (Konasewich and Henning, 1988a, b).

These documents outline the primary design elements to effect proper pollution prevention:

- containment in process areas, including preservative storage, tank farms and cylinder areas;
- containment in cylinder discharge areas for treated wood;

- collection systems to receive and recycle residual preservative from containment areas, particularly from the cylinder discharge area;
- systems to keep precipitation out of chemical storage, process and treated wood storage;
- systems to facilitate the collection and recycling of all spills and washwaters;
- control of vacuum and kiln exhausts; and,
- emission controls for ammonia vapours.

Furthermore, the documents delineate requirements for tanks, piping, safety, storage of wastes, general spill prevention and process controls.

The U.S. Environmental Protection Agency (1993) adopted many of the technical recommendations contained in the Environment Canada documents, including designs for drip-pads, containment and housekeeping. Some of their additional suggestions were:

- automatic lumber handling systems (in lieu of trams) for cylinder charging and discharging to reduce human and equipment contact with preservative; and,
- use of computer-controlled mixing systems to eliminate worker exposure and ensure solution conformance to standard requirements.

3.1.4.2 General Good Operating Practices for CCA and ACA Preservation Facilities

The basic good operating practices are contained in the Environment Canada "Recommendations for Design and Operation@ of CCA and ACA wood preservation facilities (Konasewich and Henning, 1988a, b).

These documents cover:

- personnel training;
- housekeeping;
- process control and record keeping;
- routine checks of preservative solutions and equipment;
- quality control;

- cleaning and maintenance;
- storage of chemicals, treated product and wastes;
- control of drips and spills; and,
- site monitoring.

Additional aspects of good practice are:

- providing clean operating equipment;
- avoiding the soiling of charging equipment (e.g., trams) and wood to be treated;
- maintaining treatment solutions in proper condition;
- conditioning (drying) wood prior to treatment; and,
- adhering to good process controls in accordance with accepted product standards.

Under normal operating practices, liquid discharges from a CCA- or ACA-treatment facility are confined to liquids that are not contained and reused within the process. For example, stormwater runoff from unpaved and unroofed treated-product storage areas is the most common liquid discharge from many CCA- and ACA-treatment facilities. The quantity of ammonia, copper, chromium or arsenic in such waters depends on many factors that should be considered in a pollution prevention evaluation, such as:

- quantity of treated wood exposed;
- quantity of precipitation;
- fixation time and temperature prior to the precipitation event;
- amount of surface deposits on treated wood;
- wood species and commodity;
- wood condition and treatment process used;
- preservative solution integrity (composition and cleanliness); and,
- topography and soil characteristics of the storage yard.

3.1.4.3 Specific Good Processing Practice

As indicated previously, the greatest potential for preservative releases from routine operation originates from drippage and leaching of preservative from treated wood.

A number of good practices exist for CCA and ACA plants to minimize these releases and thus, reduce the environmental impact from the facilities.

The most important are listed below. These include recommendations made in the draft BMP prepared by Environment Canada and the Canadian Institute of Treated Wood (CITW), which was based on those issued by the CITW and the U.S. Western Wood Preservers' Institute (WWPI) for treated wood in aquatic environments (Brudermann, 1997; WWPI, 1995):

- proper wood preparation: drying, incising, shaping;
- application of preservative solutions in accordance with CAN/CSA-080 (1989);
- good housekeeping to minimize sawdust and other surface residues on wood to be treated;
- treatment parameters in accordance with CAN/CSA-080 (1989);
- avoidance of overtreatment, i.e., a maximum of 1.25 of the standard retention for a product is not to be exceeded;
- application of an effective final vacuum and drip period in the cylinder;
- effective fixation:

CCA:

- accelerated fixation is preferred over fixation under ambient conditions;
- fixation in roofed, paved, curbed areas is preferred, when accomplished under ambient conditions;
- accelerated fixation can be accomplished at elevated temperatures under conditions that do not promote wood drying, i.e., high humidity conditions. Kilns or specially designed fixation chambers that can provide these conditions are suitable;
- steaming in the treatment cylinder or other suitable vessel;
- hot water bath in the treatment cylinder or other suitable vessel; and,
- testing the completion of fixation (AWPA Standard A3/11, 1993).

ACA:

- application of an effective final vacuum after the pressure process, while heating the retort to 80-100ºC (to accelerate ammonia evaporation);

- subsequent storage of the removed wood on a drip-pad until drippage has ceased;
- as an alternative to the final vacuum, ACA-treated wood can be kiln-dried to achieve fixation; and,

- visual inspection to determine whether the treated wood has excessive preservative surface deposits or contaminated residue.

These practices will not only minimize plant yard contamination but also reduce hazards to persons handling the treated material and reduce any depletion of preservative at the installation site during service.

3.1.5 Environmental Status of Lower Mainland Operations

As mentioned in Section 2.1.2, all seven Lower Mainland facilities use the CCA waterborne preservative and one uses ACA. A 1992 assessment of operational practices at six of the facilities (Envirochem, 1992) indicated that relative to dispensed operational requirements outlined in the 1988 wood technical recommendation documents (Konasewich and Henning, 1988a,b), the overall inspection score for the industry was 78 out of 100. The 1992 assessment found the largest number of deficiencies related to:

- contingency planning;
- long-term storage of treated wood and stormwater control;
- environmental monitoring; and,
- tracking of chemicals from the drip-pad area.

Industry performance with respect to aspects such as chemical delivery, chemical storage, retort operation and waste disposal was generally very good with occasional exceptions noted. Many facilities have since undertaken measures to alleviate deficiencies, including wrapping of treated wood and enhanced fixation of treated wood.

In 1995, BC Environment required all Lower Mainland wood preservation facilities, by a pollution prevention order, to undertake actions to decrease the contamination of stormwater

discharges and to maintain the discharges as non-toxic. Issues commonly encountered by Lower Mainland operations include stormwater toxicity and site contamination. Large volume catastrophic and/or accidental discharges of waterborne preservatives have occurred within at least two facilities. Significant losses of fuel due to vandalism is known to have occurred at one site.

3.2 Oilborne Pressure Process

3.2.1 Description of Oilborne Preservatives

There are two oilborne preservatives used in Canada:

- creosote; and,
- pentachlorophenol dissolved in petroleum oil.

One facility in the Lower Mainland uses both preservatives.

Creosote is used either in a mixture of 50:50 creosote/petroleum oil or alone (full strength). Creosote and petroleum oil are delivered to wood preservation facilities by bulk truck or rail tanker, and stored in a bulk storage tank. The American Wood Preservers' Association (AWPA), in their AWPA standard P1/P13 (1993), stipulates the characteristics of coal tar creosote for wood preservation.

In Canada creosote/petroleum oil mixtures are blended by pumping transfers and recirculation between bulk tanks. The benefits of blending creosote with oil are lower cost and improved penetration (lower viscosity) in applications such as railway ties, where conditions of use afford less protection than that usually provided by 100% creosote. The physical properties of wood treated with a mix are quite similar to those of material treated with 100% creosote, i.e., better dimensional stability (compared with untreated or waterborne treated wood), improved mechanical wear, corrosion inhibition, resistance to chemicals and water repellency. Full strength creosote is used where maximum biocidal protection is required, such as for timbers exposed to marine borers.

The second oilborne preservative is pentachlorophenol dissolved in oil. Pentachlorophenol

(PCP) is purchased in granular or flaked form in 23-kg (50-lb.) bags or in solid blocks, usually in 454 and 907 kg (1,000 and 2,000 lb.) weights. Bags of PCP product are now rarely used in British Columbia. Petroleum oils used as carriers for PCP are delivered by bulk truck or rail tanker and stored in tanks.

When PCP blocks are used, dissolution is accomplished by placing the blocks in the treatment cylinder or a mix tank and recirculating oil between the cylinder (or mix tank) and the bulk storage tanks. The concentrate is then diluted to working concentration (5-8% PCP) by recirculation between the mix and bulk storage tanks.

3.2.2 Description of Process

3.2.2.1 Wood Conditioning

In order to enhance penetration of the preservative into the wood, the moisture content of the wood is reduced by air seasoning, kiln drying or a conditioning process. Conditioning may be achieved by processes carried out in the treatment cylinder, i.e., by the application of steam and subsequent vacuum, or boiling under a vacuum in the presence of the treating solution (Boultonizing). Conditioning is a common means of preparing wood for treatment with an oilborne preservative, particularly large-dimension products such as ties, poles and pilings. For given wood products, conditioning procedures are stipulated by the Canadian Standards Association (CAN/CSA 080; 1989).

3.2.2.2 Preservative Application

The wood to be treated is placed on trams which are pushed into a pressure cylinder or retort that may be up to 45 m long and 2 m in diameter. Depending on the species of wood, the wood product and the moisture content of the wood, the operator of the facility determines the required treatment process (full cell or empty cell), and the pressure, temperature and times for various process sequences. Many of the operating parameters, preservative standards and product quality requirements (e.g., penetration and preservation retention) are defined by the Canadian Standards Association (CAN/CSA 080; 1989).

The "full-cell treatment process" is used to apply a maximum amount of oilborne preservative, such as is the case for marine pilings. The process consists of the following steps:

- placement of wood inside pressure cylinders;
- Boultonizing of the wood to remove moisture;
- application of an initial vacuum to remove air from the wood cells;
- flooding with creosote working solution and pressurization (up to 150 psi) until the target creosote retention level is achieved;
- draining of the excess creosote working solution (to the working tank for reuse with subsequent charges); and,
- application of a final vacuum to recover excess surface solutions and reduce carry out with the treated wood.

Long-term "bleeding" of preservative from the treated wood is not desirable and two empty-cell processes are in common use to minimize bleeding on products such as poles. The process sequence is similar to the full-cell process, with the following exceptions:

The Rueping empty-cell process uses an initial pressurization step to compress the air in the interior wood cells after which the cylinder is filled with preservative at constant pressure. The pressure is then increased until the target preservative retention level is reached. Finally, the pressure is relieved as the cylinder is emptied and preservative is expelled from the interior wood cells by the escaping air. Deep penetration is achieved, but the wood cells remain relatively empty.

The Lowry empty-cell process uses no initial pressurization and the treatment vessel is flooded against ambient pressure. Preservative retention for the Lowry process is intermediate between the Rueping empty-cell process and the full-cell process.

Following the drain cycle in both empty-cell processes, a vacuum is applied to encourage removal of excess preservative and removal of pressurized air from the wood cells. This minimizes preservative "bleeding" from the treated product. After the appropriate treatment, the treated wood is withdrawn from the treating cylinder and put on a drip-pad. The time on the drip-pad depends upon the schedule and facility design. For example, at a facility with a double tracking system, the drippage time may be equivalent to the duration of a treatment cycle for

another charge. A facility may also vary its schedule with the quality of material and the treatment level required. After a given time, treated wood is removed from the drip-pad by a fork lift and stored in a designated area until shipment to the customer.

3.2.3 Potential Chemical Releases

Design and operational practices at PCP and creosote wood preservation facilities vary, and each facility has potential sources of emissions that could affect the environment. The potential sources and releases are illustrated in Figure 3.3 and Figure 3.4. Control measures are discussed in the Environment Canada Technical Recommendation Document on design and operation of PCP and creosote wood preservation facilities (Konasewich and Henning, 1988c, 1988d).

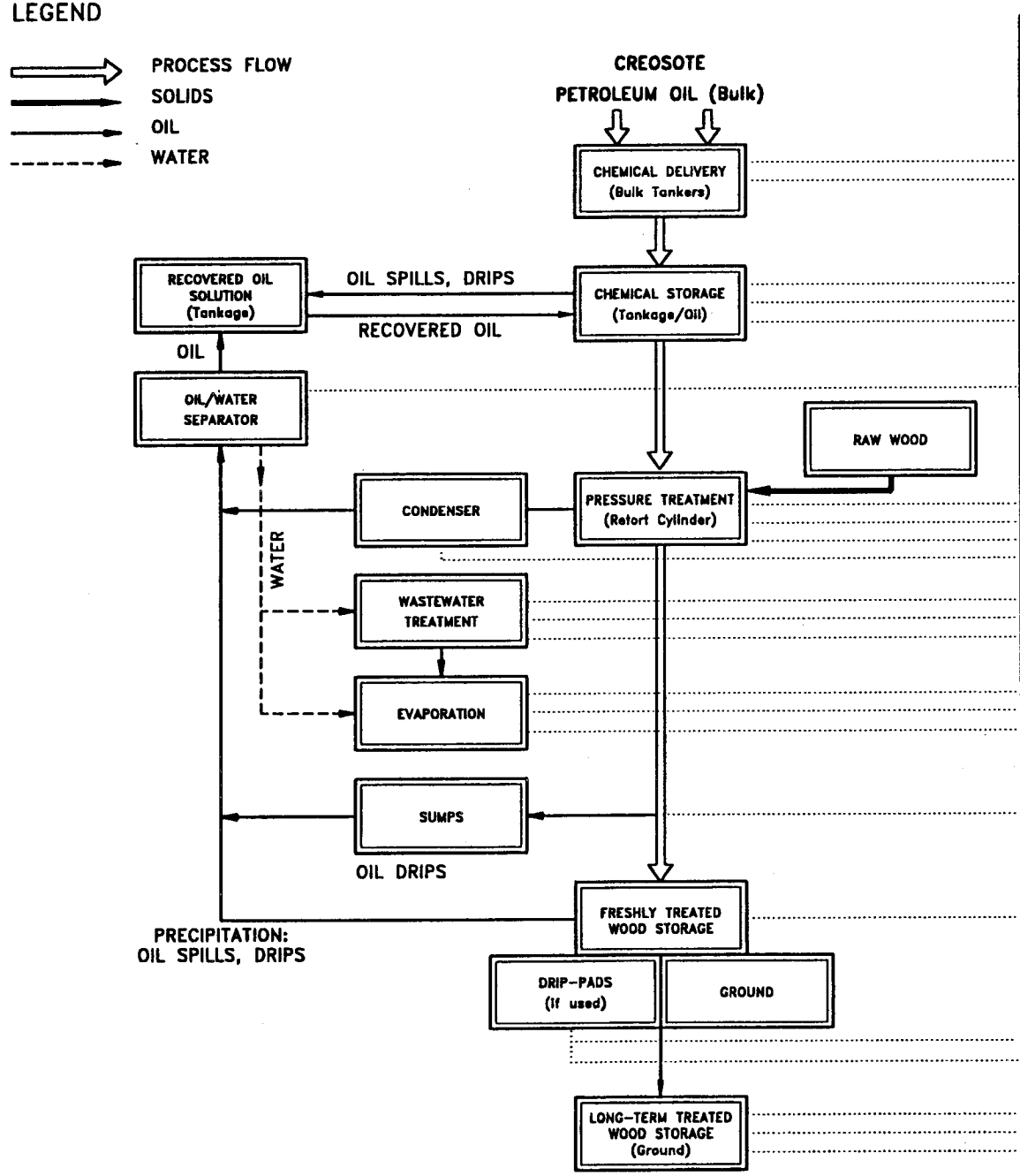
3.2.3.1 Liquid Discharges and Their Sources

Leaks and drips of oil solutions can be contained and reused in the oilborne treatment process. Liquids that are commonly treated before discharge include the following:

- condensates removed from the wood during conditioning and during the initial application of vacuum;
- water released by the wood during the treating cycle and subsequently separated from the unabsorbed treatment oil prior to recycling of the oil; and,
- washwaters.

These liquids likely contain the active ingredients, such as pentachlorophenol or creosote. Technology exists to substantially recover and recycle the active ingredients from the waste stream treatment process prior to discharge of the effluent.

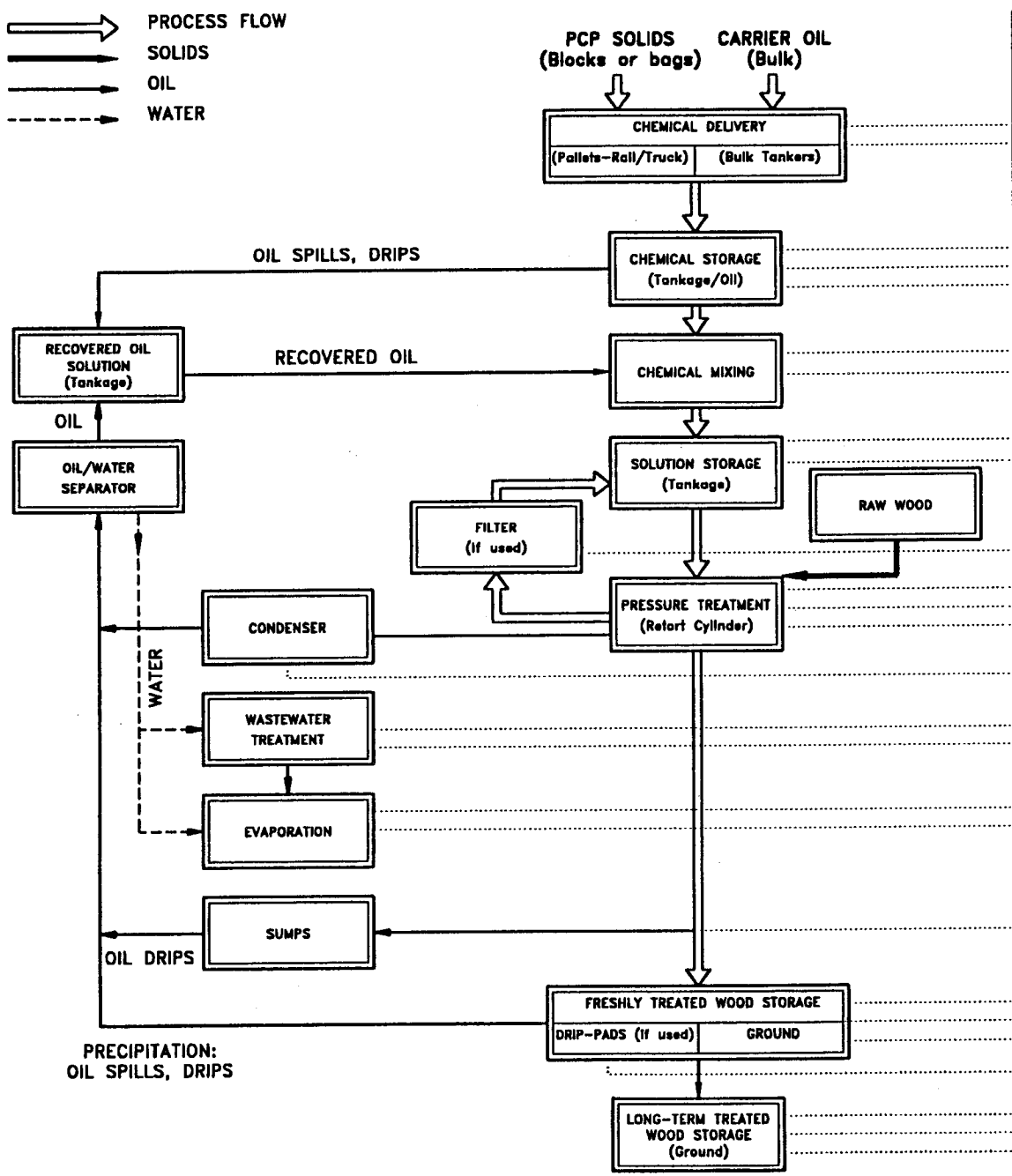
Figure 3.3 CREOSOTE PRESSURE TREATMENT



POTENTIAL SOURCES OF CHEMICAL RELEASES		
LIQUID WASTES	**SOLID WASTES**	**AIR EMISSIONS**
DRIPS, SPILLS HOSE CONNECTIONS BROKEN LINES TANKER LEAKS CRACKED PAD	CONTAINERS CLEANUP BAGS	
PUMP SEALS TANK FAILURE VALVE OPERATION LEVEL CONTROL TANK OVERFLOW	TANK BOTTOMS EMPTY CONTAINERS	AEROSOLS, VAPOURS
	SLUDGES	
DOOR SEALS PRODUCT REMOVAL RETORT DRAINAGE OVERTREATMENT	SLUDGES WOOD DEBRIS CLEAN OUT	AEROSOLS, VAPOURS PRESSURE RELIEF DOOR OPENING
CONDENSER COOLING WATER		
TREATED EFFLUENT	SLUDGES SPENT CARBON	VAPOURS
CONCENTRATED LIQUID	SLUDGES	VAPOURS
	SLUDGES	
CRACKED PADS DRIPS RAINWASH TRACKING		
TRACKING		DUST
DRIPS, RAINWASH STORMWATER	CONTAMINATED SOIL	DUST

1230-02

Figure 3.4 PCP PRESSURE TREATMENT



POTENTIAL SOURCES OF CHEMICAL RELEASES

LIQUID WASTES	SOLID WASTES	AIR EMISSIONS
DRIPS, SPILLS HOSE CONNECTIONS BROKEN LINES TANKER LEAKS CRACKED PAD	CONTAINERS CLEANUP BAGS	
PUMP SEALS TANK FAILURE VALVE OPERATION LEVEL CONTROL TANK OVERFLOW	TANK BOTTOMS EMPTY CONTAINERS	AEROSOLS, VAPOURS
(SEE CHEMICAL STORAGE)		AEROSOLS, VAPOURS
(SEE CHEMICAL STORAGE)		AEROSOLS, VAPOURS
	SLUDGES	
DOOR SEALS PRODUCT REMOVAL RETORT DRAINAGE OVERTREATMENT	SLUDGES WOOD DEBRIS CLEAN OUT	AEROSOLS, VAPOURS PRESSURE RELIEF DOOR OPENING
CONDENSER COOLING WATER		
TREATED EFFLUENT	SLUDGES SPENT CARBON	
CONCENTRATED LIQUID		VAPOURS
	SLUDGES	
CRACKED PADS DRIPS RAINWASH TRACKING	CONTAMINATED SOIL	
TRACKING		DUST
DRIPS, RAINWASH STORMWATER	CONTAMINATED SOIL	DUST

Liquid preservative releases include:

- drips and spills of creosote and oils from delivery, storage and process areas. Poor transfer hose connections, broken lines, tanker leaks and unsealed unloading pads are the major potential sources during delivery and unloading;
- tank failures (catastrophic events), tank valve and pipe leaks, tank overflow and leaking pumps are potential sources for preservative releases from storage and mixing facilities;
- leaking from cylinder doors, valves and connectors are possible sources from the process equipment. Important sources for drips and spills are inadequate cylinder drainage causing preservative solutions to drain externally into the containment or sump areas, door opening and product removal. Cracked containment, sumps and floors would allow releases into subsoil from regular production operations; and,
- the integrity of drip-pads and inadequately sized pads (not allowing sufficient time for product drippage prior to removal to unprotected yard area) are major potential sources for releases of preservative solutions into the environment. In fact, the release of preservative from treated wood on removal from the cylinder and subsequent storage may be considered potentially the most significant from ongoing operations.

Other liquids that are released from oilborne facilities include the following:

- steam condensates from indirect heat transfer in cooling and heating coils, which are generally checked for contamination prior to discharge;
- condenser cooling waters, which are not normally contaminated and are discharged without treatment; and,
- surface runoff from treated wood storage areas, which can contain preservative.

The amount of wood preservative in runoff waters depends on many factors, including:

- quantity of treated wood exposed;
- type of wood (species, commodity, size, moisture content);

- quantity of precipitation and ambient temperature;
- degree of bleeding and amounts of surface deposits;
- preservative cleanliness;
- process type and parameters preventing bleeding; and,
- application of process, e.g., final vacuum, expansion bath, final steaming.

The need for control of runoff waters would depend on analytical and/or bioassay evaluations and regulatory requirements.

3.2.3.2 Solid Wastes

Solid wastes from oilborne pressure treatment facilities include:

- sludges from tanks, sumps and pressure cylinders;
- sludges and spent activated carbon from wastewater treatment processes (e.g., flocculated material);
- bags, containers or wrappings and pallets from bulk pentachlorophenol;
- contaminated soils;
- filter material and sludges;
- cleanup material; and,
- treated wood waste.

3.2.3.3 Air Emissions

Air emissions from oilborne pressure treatment facilities are generally localized, and include:

- emissions during application of vacuum for wood conditioning, for the full-cell process or during the final vacuum steps;
- dust from manual debagging or unwrapping of PCP;
- vapours from tank vents;
- vapours in unventilated storage areas;
- vapours from treating cylinders;
- vapours from opening of cylinder doors;
- vapours from treated charges; and,
- airborne contaminated dust.

3.2.3.4 Potential Effects

The actual impact of any chemical release to the environment depends on many factors, including the location of the wood preservation facility relative to ground or surface waters, the sensitivity of aquatic biota in adjacent surface waters, and the amount of preservative released. Variables that can influence effects on worker health include ambient concentrations, frequency of exposure and protective measures during the time(s) of exposure. Table 3.2 provides a brief overview of the toxicity of oilborne wood preservatives to aquatic biota.

Table 3.2
Summary of CCME Criteria and Aquatic Toxicity of Oilborne Preservatives

Parameter	CCME Criteria (mg/L)		96-hr LC_{50} (mg/L)
	Drinking Water	Freshwater Aquatic Life	
Creosote			0.20-0.56
Pentachlorophenol	0.002*	0.0005	0.032-0.130

* Based on taste.

All oilborne preservative facilities could affect the environment, as could any other chemical manufacturing and chemical user industries if proper control measures are not in place. Documented PCP and creosote releases from wood preservation facilities have been due to either poor design or poor operating practices. The effects of these releases appeared to be either localized within the plant site (i.e., soil and groundwater contamination) or in the environment immediately adjacent to the plant site.

Three major fires at Canadian PCP wood preservation sites have been documented. The incidents of chronic release, accidental spills and fires illustrate the need for proper contingency planning for fire control and for containment of oil solutions and fire runoff waters.

3.2.4 Best Management Practices

Best Management Practices for the prevention of pollution from treatment plants include proper facility designs, general good operating practice for managing industrial chemicals, and good operating practices specifically related to the preservation process.

3.2.4.1 Facility Designs

The Environment Canada technical recommendations documents (Konasewich and Henning, 1988c, 1988d) outline the key design elements for pollution prevention in creosote and PCP preservation facilities:

- containment in process areas, including preservative unloading, storage, tankfarms and cylinder area;
- containment in cylinder discharge areas for treated wood;
- collection systems to receive and recycle residual preservative and spills from containment areas, particularly from the cylinder discharge area;
- systems to keep precipitation out of process and treated-wood storage areas;
- control of vacuum exhausts;
- process controls; and,
- fire controls.

In addition, requirements are stipulated for tanks, piping, safety, storage of wastes and general spill prevention.

3.2.4.2 General Good Operating Practices for Creosote and PCP Preservation Facilities

The Environment Canada technical recommendations documents (Konasewich and Henning, 1988c, 1988d) also contain the basic good operating practices for pollution prevention. These include:

- personnel training;
- housekeeping and equipment maintenance;

- process control and record keeping;
- routine checks of preservative solutions and equipment;
- quality control;
- cleaning and maintenance;
- storage of chemicals, treated product and wastes;
- control of drips and spills; and,
- site monitoring.

Similar to general good practices for CCA and ACA facilities, the following applies to creosote and PCP facilities:

- providing clean operating equipment;
- avoiding the soiling of wood to be treated and charging equipment, such as trams;
- maintaining treatment solutions in proper condition;
- conditioning wood prior to treatment;
- adhering to good process controls in accordance with accepted industry standards; and,
- minimizing the overtreatment of wood.

3.2.4.3 Specific Good Processing Practice

For creosote and PCP operations, a number of good practices exist to minimize the releases of preservatives from routine operations and thereby reduce the environmental impact from these operations. The most important options are listed below. These need to be considered in combination with general good practices as outlined previously. Several of these are contained in the draft document for "Best Management Practices for the Use of Treated Wood in Aquatic Environments" from the Canadian Institute of Treated Wood (1995). Although emphasis in the document is on use of wood in aquatic environments, the practices apply to any wood treatments.

Good practices for creosote and PCP treatments:

- proper wood preparation: drying (or conditioning), incising, shaping;
- application of preservative solutions that meet CAN/CSA 080 (1989) requirements;
- good housekeeping to minimize sawdust and other residues on wood to be treated;
- application of treatment processes and parameters in accordance with CAN/CSA 080 (1989) requirements;
- application of an effective final vacuum and drip period in the cylinder; and,
- visual inspection after treatment to determine whether the treated wood has excessive preservative deposits or bleeds.

Good practices applying to creosote (primarily aimed at rendering treated wood surfaces clean and avoiding excessive bleeding):

- maintenance of a clean preservative solution during use, i.e., purchasing creosotes and maintaining them to limit the xylene insoluble content below 0.5%;
- post-treatment procedures:

  - *First Vacuum:* Following the pressure period and once the creosote has been pumped back to the holding tanks, a vacuum of not less than 22 inches should be applied for at least two hours to recover excess preservatives from the wood. This process will also equilibrate internal wood pressure and cool the wood, which benefits the avoidance of bleeding.

  - *Steaming:* Release vacuum to atmospheric pressure and steam for two hours for lumber and timber, and three hours for pilings. Maximum temperatures are not to exceed 115ºC.

- *Second Vacuum:* A second vacuum is applied for a minimum of two hours at a minimum 22 inches of vacuum.

- *Expansion Bath:* Following the pressure period, the creosote should be heated 5 to 10ºC above press temperatures for a minimum of one hour. Once the creosote has been pumped back to storage, a minimum vacuum of 24 inches should be applied for two hours (as an alternative to steaming/vacuum).

Actual operations have shown that the steaming process results in substantial quantities of oil/water emulsions, which have to be treated prior to discharge.

Good practices applying to PCP (aimed at reducing excessive preservative deposits and bleeding):

- Managing the plant's "in use" PCP solutions by continuous filtration to minimize suspended particulate matter in the working solution. This will reduce the amount of surface deposits and material that may be released from the wood and reduce the propensity for formation of emulsions and sludges.
- Post-treatment steps after the pressure process include effective vacuums, expansion baths in oil, and post steaming to clean the wood surfaces and reduce bleeding.
- As a minimum good practice after drainage of preservative, a final vacuum of at least 22 inches should be applied for two hours.
- Preferably, a vacuum as above is followed by a steam cycle applied for 2-4 hours (depending on standard limitations for species and commodity). This process is completed by a vacuum of at least 22 inches for 2 hours.
- Expansion bath - When final steaming is not utilized, the treater may use an expansion bath. This expansion bath should be in accordance with the CAN/CSA 080 (1989) standard. Note that this process is not desirable when using temperature-sensitive oil solvents.
- The average assayed preservative retention should not exceed 1.25 times the minimum retention specified for the material.

3.2.5 Environmental Status of Lower Mainland Operations

As noted in Section 2.1.2, one facility in the Lower Mainland uses oilborne preservatives. A 1992 assessment of operational practices at this facility (Envirochem, 1992) indicated that relative to design and operational requirements outlined in the 1988 technical recommendations documents (Konasewich and Henning, 1988c, d), the overall inspection score for the industry was 81 out of 100.

Strong points regarding the operation included chemical delivery, retort operation and disposal practices. Improvement was required for long-term wood storage (stormwater control), contingency planning and overflow alarms. Since that time the facility has invested considerable efforts for environmental management.

As in the case of the waterborne operations, the creosote/PCP facility was required in 1995 to comply with a BC Environment pollution prevention order to decrease contamination of stormwater discharges and to maintain discharges as non-toxic. Issues commonly encountered by North American wood preservation facilities include stormwater toxicity, site contamination, waste disposal and wastewater treatment. Although no large volume catastrophic and/or accidental discharges of PCP or creosote are known to have occurred at the Lower Mainland operation, such events have nonetheless been documented in Canada and the U.S. In the past 15 years there have been no fewer than five major fires involving PCP at wood preservation facilities.

3.3 Pollution Prevention and Waste Minimization

3.3.1 General

The potential routine pollutant releases and waste generation from wood preservation facilities have been described in the beginning of this section. Several pollution prevention concepts have been outlined by the federal strategy and by the Canadian Council of Ministers of Environment. Within the terms of reference for this guide, the following concepts are and are not selected for consideration within this pollution prevention plan for the wood preservation industry:

Pollution Prevention Concepts Presently Not Considered Applicable for the Wood Preservation Industry	Pollution Prevention Concepts Selected as Applicable for the Wood Preservation Industry
- replacement of hazardous or toxic materials by less toxic substances;	- reduction of use of not only toxic substances, but also energy, raw materials and non-renewables;
	- reuse of recovered raw materials, products and hazardous substances;
	- elimination or minimization of environmental releases;
	- recycling of recovered substances off-site;
- recovery of energy where by-products cannot be reused, or recycled.	- treatment of non-recoverable waste with a focus on recovery and minimization of residues;
	- elimination of the need for hazardous pollutants, or waste substances, by process modification;
	- safe disposal of residues; and,
	- safe handling of chemicals and products to ascertain that site contamination does not occur.

3.3.2 Potential Pollution Prevention Measures

Based on a review of best management practices in the European, North American and British Columbia wood preservation industry, this section outlines potential measures which can be used to achieve each of the pollution prevention concepts (P2 concepts) selected as "applicable" in Section 3.3.1.

3.3.2.1 P2 Concept: "Reduction of Use of Toxic Substances, Energy, Raw Materials and Non-Renewables"

Within a wood preservation operation, control of raw materials (wood preservation chemicals) can achieve this pollution prevention concept. Control can be achieved by:

- assuring that no "off-spec" batches are produced;
- cleaning of wood and trams prior to treatment to minimize the treating of residues;
- verification that wood is not overtreated (quality control);
- conditioning of the wood prior to treatment;
- containment and reuse of all spilled or dripped wood preservatives; and,
- proper fixation of chemicals in wood.

3.3.2.2 P2 Concept: "Reuse of Recovered Raw Materials, Products and Hazardous Substances"

Practices generally used at wood preservation facilities to achieve this concept include:

- reuse of dripped and spilled wood preservatives;
- recycling of the washwaters from the drip-pads; and,
- recycling of the chemicals from the waste stream treatment (oilborne treatment process)

3.3.2.3 P2 Concept: "Elimination or Minimization of Environmental Releases"

3.3.2.3.1 Solid and Liquid Waste Control

The management practices which may be used to eliminate or minimize environmental releases of wood preservation chemicals include:

- containment of wood preservation chemicals and solutions in the process areas (unloading, storage and application areas);

- appropriate facilities to recycle spills and washwater;
- control of contaminant releases in the stormwater by:
  - ensuring proper fixation of the wood preservation chemicals;
  - wrapping of treated wood;
  - roofing of treated wood; and/or,
  - collection and treatment of drainage waters;
- provision of good housekeeping practices to clean up spills and debris;
- releasing CCA-treated wood from the fixation area only after chemical fixation has been tested and verified;
- ensuring that ACA-treated products are held in storage for a minimum of three weeks under ambient temperatures greater than or equal to 15ºC or they are kiln dried if the temperature falls below 15ºC;
- containment and reuse of contaminated stormwater;
- provision of continuous filtration for `in use' PCP solutions to control suspended particulate matter;
- pavement of treated-wood storage areas to prevent soil contamination; and,
- employee training to assure understanding of control program.

3.3.2.3.2 Air Emission Control

Air emissions are a potential means of pollutant transport from wood preservation facilities. Best management practices to control air emissions include:

- control of vacuum and kiln exhausts;
- ensuring that the emissions from the accelerated fixation facilities are controlled;
- venting the arsenic drums periodically (as directed by the suppliers);
- ensuring that all possible sources of vapours are controlled (i.e., tank vents, cylinder doors, freshly-treated charges and block storage); and,
- maintenance of clean paved yards to minimize fugitive emissions.

3.3.2.4 P2 Concept: "Recycling of Recovered Materials Off-Site"

To meet this pollution prevention objective, the wood preservation facilities would likely:

- reuse the activated carbon filters after off-site regeneration; and,
- return the residues from the cartridge filters to the suppliers for recycling.

3.3.2.5 P2 Concept: "Treatment of Non-Recoverable Waste with a Focus on Recovery and Minimization of Residues"

Treatment of non-recoverable wastes and options for best management practices include:

- debris, contaminated soils and sludges being disposed of by the appropriate facilities;
- controlling the stormwater flowing through the yard to prevent exposure to wood preservatives;
- treatment of the washwaters, condensates and surface runoff waters before discharge as a waste stream; and,
- disposal of the ashes from burnt treated wood by the appropriate facilities.

3.3.2.6 P2 Concept: "Elimination of the Need for Hazardous Pollutants, or Waste Substances, by Process Modification"

To achieve this concept, the facility would generally complete the following:

- ensure proper fixation of waterborne chemicals;
- ensure proper post-treatment steps including vacuums, expansion baths in oil and steaming to clean wood surfaces and prevent bleeding; and,
- using the process of accelerated fixation, through elevated temperatures and high humidity conditions, to ensure a faster fixation of CCA wood preservatives.

3.3.2.7 P2 Concept: "Safe Disposal of Wastes"

Corporate policy should assure that non-recoverable wastes as discussed in Section 3.3.2.5, should be disposed of by approved contractors in approved facilities. The lack of such assurances may result in future financial and legal liabilities to a company.

3.3.2.8 P2 Concept: "Safe Handling of Chemicals and Products to Ascertain that No Site Contamination Nor Sudden Releases Occur"

Site contamination has become a major financial issue to companies. A sudden release of a product into a receiving environment can also result in major regulatory implications. Best management practices to reduce the potential for such liabilities include:

- assurance of proper spill containment volume for bulk liquid storage (e.g., 150% of the largest on-site bulk tank);
- sealed surface floors for bulk storage areas;
- protection of bulk liquid tanks from mechanical impact, vandalism and freezing;
- provision of visible and labelled above-ground piping and valves;
- use of materials and designs as per all applicable codes and manufacturers' recommendations;
- provision of spill response equipment, absorbents and personnel protection equipment;
- provision of worker training with respect to spill response, hazards of wastes, duties and responsibilities;
- provision of containment at fuel and chemical handling areas;
- provision of signage to identify contents of bulk tanks;
- use of lined sludge basins to prevent groundwater contamination; and,
- provision of proper fire precautions and response procedures.

4.0 POLLUTION PREVENTION GUIDE

This section details the components of a pollution prevention program for a typical wood preservation operation. Example worksheets are provided to illustrate the necessary detail required in a pollution prevention review. All references to surnames, tradenames, locations, etc., are intended to be hypothetical. Technical details, including costs and industry status are included for illustration purposes only.

4.1 Pollution Prevention Planning Overview

Pollution prevention is the process of examining a facility (usually industries, offices or institutions) to determine its pollution or residual generation, and then to identify and implement options that will reduce the amount of pollution or residuals. The difference between pollution prevention and the traditional "end-of-the-pipe" (EOP) pollution control approach is that pollution prevention looks at the facility as a whole. This holistic approach of an industry allows the inclusion of many more options than would be considered by an "end-of-the-pipe" approach.

The pollution prevention process is a multi-step process which is described in Table 4.1.

The key elements of this pollution prevention process are summarized on Figure 4.1. It is intended that Sections 2 and 3 will provide adequate background information to assist reviewers in the understanding of the wood preservation process and the potential environmental concerns and pollution prevention options.

This guide is intended for use by the wood preservation industry and regulatory agency representatives, industry suppliers and consultants. It is designed to assist them in reviewing industrial wood preservation operations and in developing and implementing pollution control strategies.

The preparation of this guide considered pollution prevention guides published by PCA

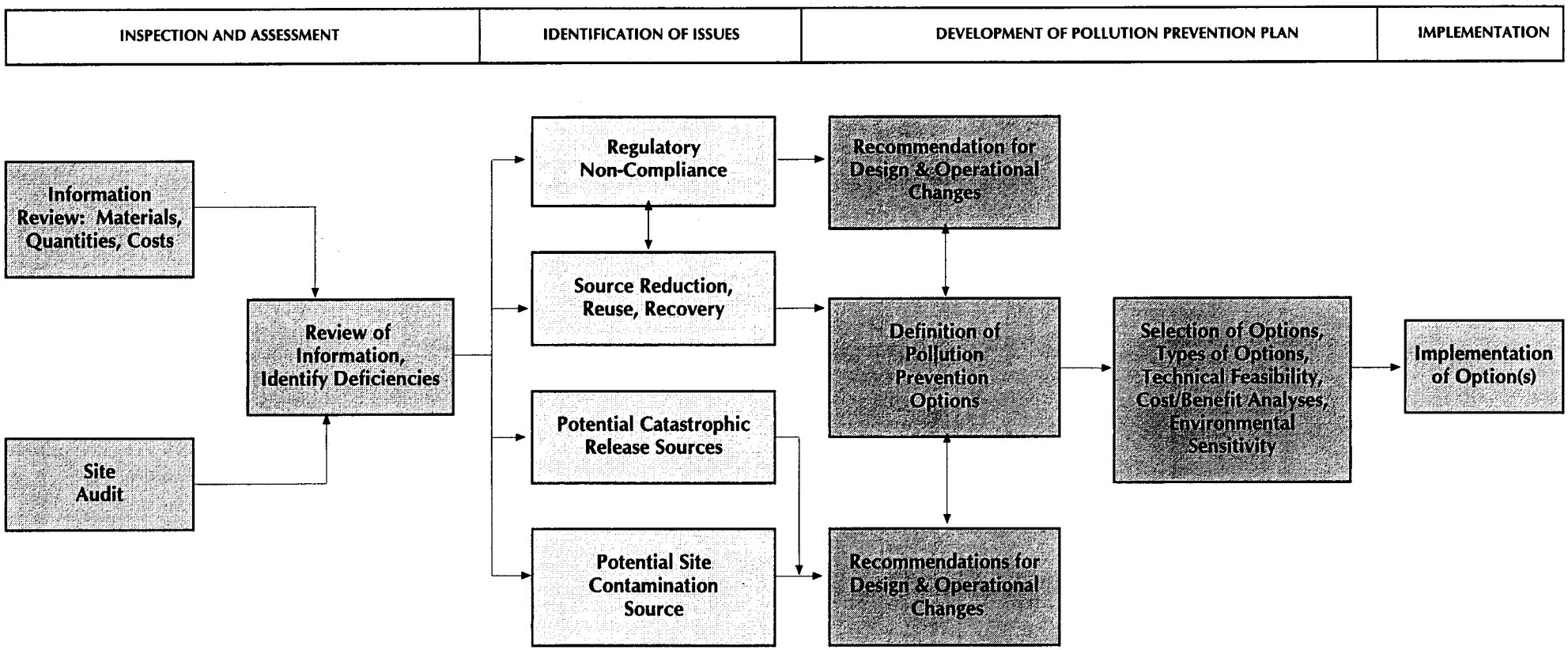
Consultants Ltd. (1994), the U.S. EPA (1992) and the Oregon Department of Environmental Quality (1990), as well as other documents included in the bibliography.

Table 4.1
Pollution Prevention Plan Development Overview

STEP	TASK DESCRIPTION/PURPOSE
1. Initial Planning and Organization	- Obtain management commitment for the program. - Develop pollution prevention goals. - Select team members to develop pollution prevention plans. - Establish timeline for development of pollution prevention plans. - Develop employee awareness of the program and its goals.
2. Team Member Pre-inspection Activities	- Review pollution prevention protocols. - Understand all industrial processes (including pollution control) used at site. - Identify site-specific environmental sensitivity characteristics. - Compile plant data (permits, raw material usage and costs, operating manuals, audits, etc.). - Identify and obtain missing information. - Understand the technical state of the art and best management practices.
3. Conduct Detailed Assessment	- Inspect facility. - Identify sources of existing and potential substance releases. - Compare operations to best management practices. - Determine existing waste generation and water consumption levels. - Identify causes and opportunities for pollution prevention. - Prepare summary of findings. - Revisit operation if necessary to verify any existing or potential concerns.
4. Develop Pollution Prevention Plan	- Rank the significance of the sources or releases. - Identify any non-compliance regulatory issues and report to management immediately. - Identify pollution prevention options. - Conduct financial and cost/benefit prevention options.
5. Write Pollution Prevention Plan	- Report results and obtain corporate commitment. - Determine appropriate schedule for pollution prevention options.
6. Implementation	- Implement pollution prevention options according to plan. - Implement worker training and education.
7. Assess Progress	- Monitor pollution prevention progress. - Provide for continuous improvement in product quality.

Figure 4.1

Implementation Process
Pollution Prevention



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4.2 Step 1: Initial Planning and Organization

4.2.1 Task 1.1: Select Team Members (Worksheet 1)

Purpose:

To select staff with sufficient technical, business and communication skills to develop a facility-specific pollution prevention plan.

Activities:

- Select team members responsible for the development of the pollution prevention plan;
- Appoint a team leader; and,
- Determine responsibilities of team members.

Comments:

In addition to substantial technical, business and communication skills, the team members should have thorough knowledge of the company. The key areas of expertise to consider include:

- process design;
- environment;
- quality control;
- production and maintenance;
- management;
- engineering;
- health and safety; and,
- accounting and purchasing.

The pollution prevention team (P2 Team) leader and members, their areas of expertise and their responsibilities should be indicated in Worksheet No. 1. The first activities to be carried out by the P2 Team should include the development of pollution prevention goals and the establishment of a timeline to carry out all steps necessary to develop a facility-specific pollution prevention plan.

Worksheet 1

The Pollution Prevention Team

Completed By: *J. Brown* Date: *May 20, 1996*

Date: *May 20, 1996*

Company : *Douglas Wood Products Ltd.* Facility Name: *Boyd Road Plant*

Team Leader: *J. Brown* Title: *Plant Superintendent* Phone: *263 - 1456*

Member Names	Responsibilities		Phone
	Corporate	Team	
J.Brown	*Plant Superintendent*	*Leader*	*263 -1456*
S. Wong	*Quality Control*	*Engineering - Process*	*263 -1456*
A. Smith	*Environmental Consultant*	*Environment*	*626 -7329*
J. Doe	*Sales/Accounting*	*Cost - Analyses*	*263 -1456*

Responsibility of Pollution Prevention Team:

1. Inspecting facilities to assess how toxic substances are used and to identify evidence of waste, particularly of hazardous waste.

2. Involving coworkers in identifying problems and suggesting possible solutions.

3. Helping to set and meet our reduction objectives.

4.3 Step 2: Pre-Inspection Activities

Overall Purpose:

Prior to field inspection, data regarding the process and site must be collected in order to plan the field inspection. The data would subsequently be used to perform adequate feasibility and cost assessments of the pollution prevention options identified by the team.

4.3.1 Task 2.1: Identification of Study Area (Worksheet 2)

Purpose:

Corporate information is required for basic documentation to ascertain the exact location of the site and scope of the review.

Activities:

Fill out Worksheet 2.

Comments:

In the case that neighbouring properties are also used for purposes such as: product storage; waste disposal; vehicle maintenance; or others potentially contributing to environmental impacts, these properties should also be included within the assessment process and listed accurately within Worksheet 2.

Worksheet 2

Site

Completed By: *J. Brown* Date: *May 20, 1996*

1. Facility Name: *Boyd Road Plant*

2. Facility / Corporate Owner: *Douglas Wood Products Ltd.*

3. Contact: *J. Brown*

4. SITE ADDRESS:

Street: *2600 Boyd Road*

City: *New Westminster* *Province:* *B.C.* *Postal Code:* *V6G 2C3*

5. LEGAL DESCRIPTION OF SITE LOCATION:

Lot 3, Plan 59346, District Lot 762, Group 2, New Westminster

Group 1 Land District

6 ESTIMATED SITE SIZE: *10 ha*

7. MAILING ADDRESS:

Street: *2600 Boyd Road*

City: *New Westminster* *Province:* *B.C.* *Postal Code:* *V6G 2C3*

8. PHONE and FAX NUMBERS:

Phone: *(604) 263 - 1456* *Fax:* *(604) 263 - 1455*

Other:

4.3.2 Task 2.2: Identification of Environmental Site-Specific Factors (Worksheet 3)

Purpose:

- To identify sensitive environments in the vicinity of the wood preservation operation.
- To provide information to aid in the definition of pollution prevention priorities.

Activities:

- Complete Worksheet 3; and,
- Review files for permit information.

Comments:

Although a pollution prevention program can be conducted within the property boundaries of the facility, the location of the facility will determine the degree of impact of pollution (air, noise, other) or chemical releases. This information may be especially important for non-routine spills or events. To develop the pollution prevention measures, the sensitivity of the environment in and around the facility must be evaluated.

The information provided in Worksheet 3 is brief. In some cases, data may not be directly relevant. For example, groundwater wells may not be present at any wood preservation plants in the Lower Fraser River Basin. However, information on soil composition and groundwater depth may be important, particularly with respect to potential site contamination.

Worksheet 3

Environmental Site-Specific Factors

Completed By: *A.Smith* Date: *May 22, 1996*

1. Distance to nearest fish-bearing wate *Located adjacent to the*

a. Name of waterbody: *Fraser River*

2. Distance to other ecologically sensitive areas:

e.g., Waterfowl Breeding
Source: FREMP Habitat Inventory

Distance	Area Description
2 km	*Estuarine marsh*
3 km	*High production*
	and diversity area

3. Distance to nearest populated area: *2.5 km*

a. Name of Municipality: *New Westminster*

4. Distance to nearest groundwater well: *Not applicable - Municipal Water Supply*

(Source: BC Environment Water Resources Branch)

5. Depth to groundwater at site: *~ 2 m*

6. Composition of site soil: *Sand*

7. Average annual precipitation at site: *700 mm*

(Source: Environment Canada)

8. Is area in a 100-year flood plain? *Yes*

(Source: BC Environment Water Resources Branch)

9. Release point for stormwater discharge: *Fraser River*

4.3.3 Task 2.3: Review of Records and Business Procedures (Worksheet 4)

Purpose:

- To provide background information for the P2 Team.
- To identify ongoing pollution prevention efforts.
- To provide information for the development of the pollution prevention plan.

Activities:

- Review corporate files; and,
- Collect data as outlined in Worksheet 4.

Comments:

A review of records and business procedures provides an initial basis for the pollution prevention review. For the activities of the review team, priority documentation, which should be collected, will include:

- process description;
- site-specific process flow diagrams;
- chemical inventory and related MSDS records; and,
- environmental reviews.

Other data, as shown in Worksheet 4, may be used in the subsequent analyses of pollution prevention options. Additionally, the availability of current documentation, as listed in Worksheet 4, will vary depending upon management practices within that particular facility.

All records, as listed in Worksheet 4, may not be available. Nonetheless, such documentation will simplify and strengthen the pollution prevention program.

Worksheet 4

Completed By: *J. Brown* Date: May 24, 1996

Pre-Survey Information Collection

1. **Facility Name:** *Boyd Road Plant*

2. **Facility Contact for Data:** *J. Brown* **Phone:** *263 - 1456*

3.

Wood Preservatives Used	Number of Cylinders
CCA	*1*
PCP	*1*

4. **Availability of Essential Documentation for Site Inspection:**

DOCUMENT	AVAILABLE Y/N	DATE LATEST VERSION	LOCATION/ COMMENTS
Company Literature (re: Products, Services, etc.)	*Y*	*1996*	*central office*
Process Description	*Y*	*1987*	*central office*
Diagrams, Blueprints, Drawings of Buildings, Process Areas, Storage Areas, etc.	*Y*	*1987*	*central office*
Design Information including Equipment Lists, Equipment Specifications, Process Flow Diagrams	*Y*	*1987*	*J. Brown*
Operating Manuals	*Y*	*1993*	*control room*
Inventory of Chemicals	*Y*	*Current*	*S. Wong*
Product Inventory	*Y*	*Current*	*J. Doe*
Material Safety Data Sheets (MSDS)	*Y*	*Current*	*control room and J. Doe*
Pollution Monitoring Data	*Y*	*Current*	*S. Wong*
Hazardous Waste Manifests	*Y*	*Current*	*S. Wong*
Environmental Audit Reports	*Y*	*1995*	*J. Brown*
Regulatory Permits & Correspondence	*Y*	*1996*	*S. Wong*
Fire Marshall/Fire Inspection Reports	*Y*	*1996*	*S. Wong*
WCB Correspondence/Records	*Y*	*1996*	*J. Brown*
Employee Training Records	*Y*	*1995*	*J. Brown*
Operator Data Logs	*Y*	*Current*	*control room*

5. Availability of Auxiliary Information for Pollution Prevention Program:

DOCUMENT	AVAILABLE Y/N	LAST REVISION	LOCATION/ COMMENTS
Material Balance Analyses			
Input Stream(s)	*Y*	*Current*	*J. Doe*
Product Stream(s)	*Y*	*Current*	*J. Doe*
Waste Stream(s)	*Y*	*Current*	*J. Doe*
Energy Use			
Fuel	*Y*	*Current*	*J. Doe*
Electricity	*Y*	*Current*	*J. Doe (B.C. Hydro Bill)*
Labour Usage/Cost	*Y*	*Current*	*J. Doe*
Operation & Maintenance/Cost	*Y*	*Current*	*J. Doe*
Water Usage/Cost	*Y*	*Current*	*J. Doe*

4.3.4 Task 2.4: Identification of Raw Material and Chemical Usage (Worksheet 5)

Purpose:

- To identify to the pollution prevention team all materials in use at the site.
- To aid in the assessment of cost analyses for the development of pollution prevention plans, e.g., cost savings in recycling and reduction of raw materials.

Activities:

- Review purchasing information; and,
- Complete Worksheets 5(a) and 5(b).

Comments:

All materials should be identified including all wood preservatives used, vehicle fuel, lubricating oil, stain, etc.

The required information for "components or attributes of concern" would pertain to products such as chromate copper arsenate (e.g., 10% arsenic acid).

In the case that other products are used, Worksheet 5 should be modified to include those products.

Worksheet 5(a)
Completed By: *S. Wong & J. Brown* **Date:** *May 27, 1996*

Chemical Use Summary

1. Facility Name: *Boyd Road Plant*

2. Materials Summary

RAW MATERIAL	CCA	ACA	PCP	PCP/ SOLVENT	CREOSOTE	OTHER	STAIN
Trade Name	*CCA type C*		*PCP*	*PCP Solvent*		*Flame Proof*	*water-borne stain*
Chemical Name	*chromated copper arsenate*		*Pentachloro-phenol*	*Naphtha, petroleum*		*NA*	*Vinyl Acrylic*
COMPONENTS/ATTRIBUTES OF CONCERN							
Components and Concentration (Specify Units: %, PPM...)	*10% As_2O_5* *50% CrO_3* *40% CuO*		*86% PCP*	*Petroleum distillate 100%*		*Ammonium phosphate 50%*	*Propylene glycol*
ANNUAL CONSUMPTION RATE							
Overall (Specify Units: Kg, Tonnes, Lb...)	*200 tonnes (oxide)*		*100 tonnes*	*2,000 m^3*		*4 tonnes*	*144 barrels*
SUPPLIERS							
Supplier #1	*Allied Chemicals*		*ABC Chemicals*	*Universal Oil Ltd.*		*ABC Chemicals*	*Acme Inc.*
Supplier #2	*Foster Chemicals*		*Periodic Chemicals*				

RAW MATERIAL	CCA	ACA	PCP	PCP/ SOLVENT	CREOSOTE	OTHER	STAIN
Trade Name	*CCA type C*		*PCP*	*PCP Solvent*		*Flame Proof*	*water-borne stain*
COSTS							
Purchase Price (Cdn. $/_____)	*$4.40/kg oxide*		*$4.00/kg*	*$1,000/$m^3$*		*$4.00/kg*	*$8.95/barrel*
Overall Annual Cost	*$888,000.00*		*$400,000.00*	*$2,000,000.00*		*$16,000.00*	*$1,288.80*
SHIPPING AND STORAGE DETAILS							
Delivery Mode	*truck*		*truck*	*truck*		*truck*	*truck*
Normal Order/Delivery Size	*1 tank*		*10 tonnes*	*80 m^3*		*5 tonnes*	*6 barrels @ 10 US gallons*
No. Shipments/Year	*~ 12/year*		*10 - 12/year*	*~ 25/year*		*1/year*	*~ 24/year*
Shipping Container (Size and Type)	*bulk tank (20 tonnes)*		*0.2 - 1.0 tonne blocks*	*80 m^3*		*bulk tank*	*barrels*
Storage Mode	*storage tank*		*chemical building*	*storage tank*		*bulk*	*barrels and holding basin*
Transfer Mode	*pumped to retort*		*forklift*	*pumped to mixer*		*pumped*	*pumped*
Inventory Size (Max.)	*20 m^3*		*20 tonnes*	*100 m^3*		*4 m^3*	*20 barrels*
EMPTY CONTAINER MANAGEMENT *Stain: recycle for other plant uses ; PCP wrapping - land disposal*							

Worksheet 5(b)
Completed By: *S. Wong & J. Brown* **Date:** *May 26, 1996*

Chemical Use Summary

1. Facility Name: *Boyd Road Plant*

2. Materials Summary

RAW MATERIAL	FUELS		SOLVENTS	OIL/ LUBRICANTS	ANTIFREEZE	OTHER
	VEHICLE	OTHER				
Trade Name	*diesel*		*Solmel*	*Motor oil*	*Prestone*	
Chemical Name	*NA*		*Methylene chloride*	*NA*	*Propylene glycol*	
COMPONENTS/ATTRIBUTES OF CONCERN						
Components	*diesel*		*Methylene chloride*	*NA*	*Propylene glycol*	
Concentration (Specify Units %, PPM...)	*100%*		*100%*	*NA*	*80%*	
ANNUAL CONSUMPTION RATE						
Overall (Specify Units: Kg, Tonnes, Lb...)	*25,000 L*		*200 L*	*2.000 L*	*500 L*	
SUPPLIERS						
Supplier #1	*Universal Oil Ltd.*		*Richmond Chemicals*	*Universal Oil Ltd.*	*Universal Oil Ltd.*	
Supplier #2						

RAW MATERIAL	FUELS		SOLVENTS	OIL/ LUBRICANTS	ANTIFREEZE	OTHER
	VEHICLE	OTHER				
COSTS						
Purchase Price (Cdn. $/_____)	*$0.40/L*		*$5.00L*	*$2.50L*	*$6.00L*	
Overall Annual Cost	*$10,000.00*		*$1,000.00*	*$5,000.00*	*$3,000.00*	
SHIPPING AND STORAGE DETAILS						
Delivery Mode	*bulk*		*truck*	*truck*	*truck*	
Normal Order/ Delivery Size	*5000 L*		*1 drum / 200 L*	*5 drums / 1000 L*	*1 drum / 200 L*	
No. Shipments/Year	*5 - 6*		*1*	*1 - 2*	*2 - 3*	
Shipping Container (Size and Type)	*bulk*		*drums (200 L)*	*drums (200 L)*	*drums (200 L)*	
Storage Mode	*bulk*		*drums*	*drums*	*drums*	
Transfer Mode	*fuel pump*		*hand pump*	*hand pump*	*hand pump*	
Inventory Size (Max.)	*10,000 L*		*1 drum*	*5 drums*	*3 drums*	
EMPTY CONTAINER MANAGEMENT *All drums returned to suppliers*						

4.3.5 Task 2.5: Product Summary Information (Worksheet 6)

Purpose:

- To provide information on production capacity of the facility.

Activities:

- Review production information as per Worksheet 6; and,
- Review corporate policy and efforts with regard to quality control for application of wood preservatives.

Worksheet 6

Completed By: *S. Wong* Date: *May 28, 1996*

Product Summary Information

1. Facility

Name: *Boyd Road Plant*

2. Production Summary:

PRODUCTS	Annual Production (Cubic Metres or Other Unit _____)					
	Water- Borne		Oil-Borne			
	CCA	ACA	PCP	Creosote	Other	TOTAL
Consumer Lumber	*94,400*					
Ind. Construction Lumber & Timbers						
PWF Lumber			*700*			
PWF Plywood						
Railway Ties						
Poles			*16,000*			
Land/Freshwater Pilings						
Marine Pilings						
Round Posts						
Other (1) Timber			*700*			
Other (2)						
Other (3)						
TOTALS						
% of production that conforms to CAN/CSA-80	*100*		*100*			
% of production that conforms to other specifications *						
% of production that conforms to other specifications *						

** Describe Specification or Retention Relative to CSA.*

4.4 Step 3: Conduct On-site Inspection

A detailed facility audit should be conducted which systematically reviews all aspects of the process from the time the process ingredients enter the facility site. The detailed audit forms, which are based on the Environment Canada Technical Recommendation Documents and best management practices, are provided as worksheets in Appendix A. The information is then disseminated to develop a pollution prevention plan. The main advantage of this approach is that it is very structured and minimizes the probability of overlooking any issues of potential or existing concern. The disadvantage is that a high level of technical sophistication is required for this approach, and applying the data for development of a pollution prevention plan may be onerous.

It is proposed that the on-site inspections would focus on three areas in the following priorities:

- ***Compliance with existing regulatory requirements -***
  Compliance indicates the adequacy of existing pollution control efforts. Non-compliance can result in significant legal costs and fines, as well as a poor public image. Liability could be in the order of 100,000s of dollars.

- ***Control of bulk liquids -***
  Release of bulk liquids may result in significant liability to an operation if a release to an adjacent waterbody occurs or if soil and groundwater becomes contaminated. The liability may potentially be in the order of millions of dollars.

- ***Pollution prevention during normal process operations -***
  Objectives for pollution prevention are outlined in Section 3 of this report. In addition to minimizing environmental releases, it is anticipated cost savings for the operation will also result.

4.4.1 Task 3.1 - Priority 1: Assessment of Facility for Regulatory Compliance (Worksheet 7)

Purpose:

- To ascertain that the wood preservation facility is in compliance with existing regulatory requirements.

Activities:

- From the corporate files, obtain all regulatory and monitoring information;
- Inspect existing pollution control equipment to ascertain that it is functioning and maintained; and,
- Complete Worksheet 7.

Actions:

- **Any "no" indication in Worksheet 7 requires immediate corporate actions to address the deficiency (or deficiencies).** The actions may be operational (e.g., attain more monitoring data) or require revision to pollution control equipment if regulatory limits are exceeded.

Worksheet 7
Completed By: *J. Brown* **Date:** *June 2, 1996*

Regulatory Compliance Essential Requirements

1. AIR EMISSIONS AND CONTROLS

a. Sources of controlled emissions *(circle)*

Vacuums and kilns	Tank vents
Freshly-treated charges	Vehicle traffic
Retort cylinder door	Fugitive dust
Bulk transfer system	Bulk fuel handling
Accelerated fixation facilities	Solvent use

b. List permits and/or relevant regulation responsible agency:

GVRD Air Discharge Permit. GVA 9998

No monitoring requirements specified.

c. Is pollution control equipment operational?	No	Yes	(NA)
d. Are monitoring results available?	No	Yes	(NA)
e. Is monitoring frequency and analytical sensitivity in accordance to regulatory requirements?	No	Yes	(NA)
f. Do results indicate compliance with regulatory limits?	No	Yes	(NA)
g. Has the necessary reporting to regulatory agencies occurred?	No	(Yes)	NA

2. LIQUID EFFLUENT RELEASES

a. Sources of effluent releases	TYPES	DISCHARGE LOCATION
	Stormwater runoff	*ditch*
	Treatment System Discharge	*sewer*
	Other:	*septic tank - ground infiltration*

b. List permits and/or relevant regulation responsible agency:
GVRD sewer discharge permit

BC Environment Pollution Control Permit. PE 9678 (septic tank)

Stormwater discharge under BC Environment Pollution Prevention Order - PE 12999.

c. Are monitoring results available?	No	(Yes)	NA
d. Is monitoring frequency and analytical sensitivity in accordance to regulatory requirements?	No	(Yes)	NA
e. Do results indicate compliance with regulatory requirements?	(No)	Yes	NA
f. Has the necessary reporting to regulatory agencies occurred?	No	(Yes)	NA
g. Is pollution control equipment operational?	No	(Yes)	NA

3. SOLID WASTES

a. Sources of regulated solid wastes *(circle)*

(Chemical sludges)	PCB equipment
Settling pond sludges	Soiled wood
Soiled charging equipment	(Contaminated Soil)
(Residues from filters)	Other:

b. List permits and/or relevant regulation responsible agency:

BC Environment Special Waste Permit - PS 4845

c. Have all solid wastes been evaluated to determine if they are Special Wastes?	(No)	Yes	NA
d. If Special Wastes are present, are storage and inspection in compliance with the Special Waste Regulation?	No	(Yes)	NA
e. Are licensed hazardous waste contractors used for disposal?	No	(Yes)	NA
f. Are shipping documents complete and available for review on-site?	No	(Yes)	NA

4.4.2 Task 3.2 - Priority 2: Evaluate Control of Bulk Liquids, Solids and Gases (Worksheet 8)

Purpose:

- To minimize the potential for sudden and accidental releases of bulk liquids.
- To minimize the potential for fires.
- To minimize the potential for site contamination.
- To minimize potential for large-scale financial liability to the company.

Activities:

- Inventory of all bulk liquids and gases in storage;
- Determine containment volumes;
- Assess condition of containment areas, tanks and transfer lines;
- Evaluate fire fighting capabilities; and,
- Complete Worksheet 8.

Actions:

Any "no" response in Worksheet 8 indicates a concern which should be immediately addressed.

Worksheet 8
Completed By: *S. Wong* **Date:** *June 2, 1996*

Control of Bulk Liquid and Gases

1. INVENTORY OF BULK LIQUID AND GASES

PRODUCT	STORAGE TYPE [UST or AST]* and VOLUME [Litres]	IS CONTAINMENT ADEQUATE? [See 2(c) below]
Vehicle fuel *Diesel*	*UST 10,000 L*	*N/A (UST)*
Wood preservatives		
CCA concentrate	*AST 20,000 L*	*Yes*
CCA work solution	*AST 50,000 L*	*Yes*
PCP work solution	*AST 10,000 L*	*Yes*
PCP solvent	*AST 10,000 L*	*Yes*
Flame - proof	*AST 5,000 L*	*Yes*
Solvent	*drum (1): 200 L*	*Yes*
Oil/Lubricants	*drums (5): 1,000 L*	*Yes*
Antifreeze	*drums (2): 400 L*	*Yes*
Other: *Stain*	*drums (5): 40 L*	*No*

**Underground Storage Tank (UST); Aboveground Storage Tank (AST)*

2. ABOVEGROUND TANKS

a. Are all tanks and drums on top of an impermeable floor?	No	(Yes)	NA
b. Is the floor sealed (e.g., absence of cracks)?	(No)	Yes	NA
c. Are all containment volumes in excess of 150% of the largest tank or the volume of the largest tank?	No	(Yes)	NA
d. Are all tanks free of corrosion and physical damage?	No	(Yes)	NA
e. Are all tanks securely mounted and protected from vehicle impact?	No	(Yes)	NA

3. UNDERGROUND STORAGE TANKS

a. Are all the underground tanks less than 10 years old?	(No)	Yes	NA
b. Are the underground tanks and piping leak tested annually and records kept?	(No)	Yes	NA

4. ALL TANKS AND DRUMS

a. Are tanks and drums secured to prevent tampering or accidental impacts?	(No)	Yes	NA
b. Are tanks provided with overfilling protection and/or alarms?	No	(Yes)	NA
c. Are bulk drains (including stormdrains) located away from chemical unloading area and bulk tank storage area?	No	(Yes)	NA
d. Are non-gravity feed systems used for fuel supply/dispensing?	No	(Yes)	NA
e. Are dispensing systems de-energized and locked between use?	(No)	Yes	NA
f. Are dispensing areas provided with drip and spill containment?	No	(Yes)	NA
g. Are spill kits provided at all bulk chemical storage and handling points?	(No)	Yes	NA
h. Has a spill response plan been prepared and is it available?	No	(Yes)	NA
I. Has spill response training occured in the past year?	(No)	Yes	NA

5. FIRE FIGHTING

a. Is fire-fighting equipment readily available?	(No)	Yes	NA
b. Is a fire response and control plan developed?	No	(Yes)	NA

4.4.3 Task 3.8 - Priority 3: Assessment of Current Pollution Prevention Measures for Normal Process Operations (Worksheet 9)

Purpose:

- To assess the entire wood preservation operation in order to identify all areas with a potential for pollution prevention.
- To focus on areas with greatest potential for cost-benefits associated with pollution prevention.

Activities:

- Use Worksheet 9 to identify potential pollution prevention areas relative to objectives stated in Section 3.3.2.

Worksheet 9
Completed By: *J. Brown & S. Wong* **Date:** *June 2, 1996*

Assessment of Current Pollution Prevention Measures

Objective: To evaluate current practices versus pollution prevention concepts.

Concept 1 — Reduction of use of toxic substances, raw materials, and non-renewables.

1.1 Is the wood treated in accordance with the CSA requirements?	No	(Yes)	NA
1.2 Is quality control maintained, i.e., the concentration of the active ingredients in the work solution, and retention levels in the wood?	No	(Yes)	NA
1.3 Is there regular operator training provided?	No	(Yes)	NA
1.4 Are the trams and the wood to be treated cleaned prior to treatment?	(No)	Yes	NA
1.5 Are the spilled or dripped wood preservatives contained and reused?	No	(Yes)	NA
1.6 Are inventories of fluids maintained to identify leakage?	No	(Yes)	NA

Concept 2 — Reuse of recovered raw material, products, and hazardous substances.

2.1 Is the drip-pad preservative reused?	No	(Yes)	N A
2.2 Are the drippage pad washwaters from CCA/ACA facilities recycled?	No	(Yes)	NA
2.3 Are the residues from the CCA filter bags recycled (back to suppliers)?	(No)	Yes	NA
2.4 Are the chemicals from the waste stream treatment recycled?	(No)	Yes	NA
2.5 Are the carbon filters reused after off-site regeneration?	No	(Yes)	NA

Concept 3 — Elimination of environmental releases.

3.1 Solids and liquid waste control

3.1.1 Is the fixation of the CCA preservative (under ambient air temperatures) completed in a roofed area?	(No)	Yes	NA
3.1.2 Is the treated wood released from the fixation area only after CCA fixation has been tested and verified?	(No)	Yes	NA

3.1.3	Are ACA-treated products held in storage for a minimum of three weeks under ambient temperatures greater than or equal to 15°C or kiln dried if the temperature falls below 15°0C?	No	Yes	(NA)
3.1.4	Is the treated-wood storage area free of debris and standing liquids?	No	(Yes)	NA
3.1.5	Are the process areas (chemical unloading, chemical application and all storage areas) contained?	No	(Yes)	NA
3.1.6	Are the chemical storage areas and process areas roofed?	No	(Yes)	NA
3.1.7	Are "in use" PCP solutions continually filtered to control suspended particulate matter?	(No)	Yes	NA
3.1.8	Are the appropriate facilities provided to recycle spills and washwaters?	No	(Yes)	NA
3.1.9	Is the contaminated stormwater from the yard contained and reused?	(No)	Yes	NA
3.1.10	Is the fire-fighting water runoff contained and reused or disposed of appropriately if reuse is not practical?	(No)	Yes	NA
3.1.11	Are the employees trained so as to assure understanding of the control program?	No	(Yes)	NA
3.1.12	Are good housekeeping measures practiced?	No	(Yes)	NA
3.1.13	Is the tracking of chemicals controlled?	No	(Yes)	NA

3.2 Air Emission Control

3.2.1	Are all possible vapours controlled (i.e., tank vents, cylinder doors, freshly-treated charges and block storage)?	(No)	Yes	NA
3.2.2	Are the emissions from the accelerated fixation facilities controlled?	No	Yes	(NA)
3.2.3	Are the arsenic drums vented periodically (as directed by suppliers)?	No	Yes	(NA)
3.2.4	Is the yard free of traffic dust?	No	(Yes)	NA

Concept 4 — Recycling of recovered materials off-site.

4.1 This concept is covered within concept 2.

Concept 5 — Treatment of non-recoverable waste.

5.1	Are the sludges, contaminated soils and debris being disposed of in approved facilities?	No	(Yes)	NA
5.2	Is the stormwater flowing through the yard segregated from the process and treated wood storage areas to minimize the amount of contaminated runoff waters?	No	(Yes)	NA
5.3	Are the washwaters and condensates treated before discharge as a waste stream (oil-borne preservation)?	No	(Yes)	NA
5.4	Are excess stormwaters treated or non-toxic?	(No)	Yes	NA
5.5	Are any ashes from burnt treated wood disposed of by the appropriate facilities?	No	(Yes)	NA

Concept 6 — Elimination of the need for hazardous pollutants or waste substances by process modification.

6.1	Is proper fixation of water-borne chemicals ensured?	No	(Yes)	NA
6.2	Is the process of accelerated fixation, through elevated temperatures and high humidity conditions, being practiced?	(No)	Yes	NA
6.2	Are proper post-treatment steps being implemented including:			
	a. vacuums;	No	(Yes)	NA
	b. expansion baths in oil; and,	No	(Yes)	NA
	c. steaming to clean wood surfaces and prevent bleeding?	No	(Yes)	NA

Concept 7 — Safe disposal of wastes.

7.1 This concept is covered within concept 5.

Concept 8 — Safe handling of chemicals and products to prevent sudden and accidental releases.

8.1	Is the underground storage tank(s) (UST) tested regularly?	(No)	Yes	NA
8.2	Are the storage tanks in a secure area, i.e., located away from high traffic areas and protected from vandalism and freezing?	No	(Yes)	NA
8.3	Is the CCA stored so as to prevent contact with reducing agents (including aluminum, brass and zinc) or with organic combustibles (i.e., gasoline, kerosene, oil)?	No	(Yes)	NA
8.4	Are the proper fire precautions and response procedures implemented?	No	(Yes)	NA
8.5	Is the aboveground piping labelled and visible?	No	(Yes)	NA
8.6	Is the volume of the bulk liquid storage tanks appropriate for proper spill containment, i.e., 150% of the largest on-site bulk tank?	No	(Yes)	NA
8.7	Do the floors for the bulk storage areas have sealed surfaces?	(No)	Yes	NA
8.8	Is adequate training provided with respect to:			
	a. Spill response;	(No)	Yes	NA
	b. Hazards of wastes; and,	No	(Yes)	NA
	c. Duties and responsibilities?	No	(Yes)	NA
8.9	Is spill response equipment, absorbents (where applicable) and personnel protection equipment adequate?	(No)	Yes	NA

4.5 Facility Status and Identification of Priorities for Pollution Prevention (Worksheet 10)

To this point, extensive data has been gathered about the facility. The database includes information on quantities and costs of raw materials used at the facility, environmental sensitivity of the site location, costs of existing waste disposal and treatment, and the results of a thorough review of the operation by an inspection team.

The objective of this section is to provide guidance on setting priorities on selecting processes and waste streams for pollution prevention projects. Priorities for pollution prevention activities at a wood preservation operation will be identified in the following order:

Priority 1: Sources which result in non-compliance with existing regulatory requirements must be addressed immediately. Incidents of non-compliance indicate that current pollution prevention control programs are not satisfactory.

Priority 2: Process designs and operations which may result in significant potential for catastrophic releases and/or for contamination of site soils and groundwater (e.g., improper bulk liquid storage and handling).

Priority 3: Measures which can be taken for improved source reduction, reuse and recovery.

Immediate actions should be taken for regulatory non-compliance and improper bulk liquid storage and handling. As shown in Figure 4.1, there may be overlap among the issues.

The assessments of best management practices for pollution control are summarized in Worksheet 9 with respect to each identified pollution prevention concept. Any "no" indications in Worksheet 9 indicate the candidate processes and waste streams for pollution prevention projects.

Worksheet 10 provides a format for listing and identifying priorities for actions. The Pollution Prevention Team should be in a position to best identify the priorities. Guidance for the priority settling process is provided in Worksheet 10.

Worksheet 10
Completed By: *S. Wong* **Date:** *June 10, 1996*

Facility Status and Identification of Priorities

1. Facility Name: *Boyd Road Plant*

2. Summary of Compliance with Regulatory Requirements (from Worksheet 7):

Regulatory Permit	Permit No.	Compliance Status
Liquid (Effluent Waste Permit)	*BC Environment Permits:* *PE 9678* *PE 12999*	*OK* *OK* *NO*
Air Permit	*GVRD Permits* *GVA 9998*	*OK*
Solid Waste Permit		
Special Waste Permit	*BC Environment Permit:* *PS 4845*	*OK*
Other (please list)		

Listing of "no's" in Worksheet 7
(Any "no" will be a priority item and must be addressed immediately.)

- water treatment plant monitoring frequency and analytical sensitivity isn't in accordance with regulatory requirements.

- stormwater results don't indicate compliance with regulating requirements (PCP > 6 ppb limit; fails 96-h LC_{50} test)

- CCA sludges not evaluated

3. Summary of Potential Concerns–Catastrophic Releases and Site Contamination (from Worksheet 8):

Listing of "no's" in Worksheet 8	Pollution Prevention Team Priority and Basis of Decision*
- CCA containment floor has cracks	*medium priority - cracks minimal in size*
- UST greater than 10 yrs old; not tested	*high priority - liability, site cleanup costs*
- diesel pump not locked	*medium priority - site quite secure*
- spill kits may be inadequate	*high priority - liability, site cleanup*
- fire-fighting equipment at chemical mixing area may be inadequate	*high priority - impact of fire maybe significant*
- spill response training	*high priority - proper response important*
- solvent drum maybe subject to vehicle impact	*high priority - impact probability is high*

* Priorities may be based on aspects such as relative volumes of stored liquids, proximity to waterbodies and storm drains, use of alternative control measures, etc.	
4. Summary of Current Pollution Prevention Concerns (from Worksheet 9):	
Listing of "no's" in Worksheet 9	Pollution Prevention Team Priority and Basis of Decision**
- trams and wood aren't cleaned prior	*medium - residual waste produced*
to treatment.	
- residues from CCA bags aren't recycled	*medium - residues disposed in special waste disposal*
	facility
- chemicals from waste stream treatment plant	*low - separate oils cannot be recycled; disposal at*
aren't recycled	*an approved facility*
- fixation of CCA preservative isn't in a roofed area	*high - CCA losses during precipitation, stormwater*
	contamination
- treated wood released without the testing and	*high - potential site and stormwater contamination;*
verification of CCA fixation	*potential customer problems.*
- Ain use@ PCP solutions aren't continually	*medium - high suspended particle matter; sludge*
filtered.	*generation*
- contaminated stormwater isn't contained and	*high - non compliancy, however 100% reuse is not*
reused	*possible*
- fire-fighting water runoff can't be contained or	*medium - liability concerns*
reused	
- all possible vapours aren't controlled	*medium - no enclosed areas; cylinder door should*
	be controlled
- stormwaters are toxic and not treated	*high - but sources of toxicity not known, technology*
	difficult
- no regular testing of USTs	*high - potential for site contamination*
- spill response equipment and training inadequacy	*high - potential for liability*
** Priorities may be based on aspects such as: potential for high cost/benefits; relative volumes of wastes; local conditions such as proximity to waterbodies; low rainfall conditions, etc.	

4.6 Assessments of Pollution Prevention Status of Facility

At this point, the Pollution Prevention Team should review its findings and assess the degree to which the facility meets all pollution prevention concepts of the Federal Pollution Prevention Strategy, as described in Section 3 of this guide.

If the facility does not meet all concepts, then the process should continue as defined in this document. If the facility does meet all concepts, then:

- the process could stop, and the Pollution Prevention Team should provide a written report to management stating its conclusion that the facility meets the intent of the Federal Pollution Prevention Strategy; or
- the process could continue if the Pollution Prevention Team has reason to believe that some operational and/or design features, although meeting the intent of the Pollution Prevention Strategy, could be improved upon, for reasons such as cost-efficiency, technical reliability, etc.

4.7 Selection of Pollution Prevention Options

4.7.1 Identification of Easily Implemented Pollution Prevention Measures (Worksheet 11)

A review of examples provided in Worksheet 10 would indicate the obvious wide range in technical and cost complexities for the numerous pollution prevention options.

The Pollution Prevention Team may decide that some of the control options, although seemingly trivial (e.g., reduction of speed limits to reduce dust), can be readily implemented at minimal cost and with little need for further assessment. Other measures, such as underground storage tank (UST) testing, are so critical that action should be undertaken without additional deliberations. Such options would be listed in Worksheet 11.

Worksheet 11
Completed By: *J. Brown & S. Wong* **Date:** *June 12, 1996*

Identification of Easily Implemented Pollution Prevention Measures*

1. Facility Name: *Boyd Road Plant*		
2. Recommended measures for immediate implementation:		
Measure	**Priority**	**Type of Pollution Prevention Measure****
- monitor in accordance to regulatory	*high*	*- assign corporate responsibility. Hire sampling*
requirements		*support*
- leak test diesel UST	*high*	*- hire tank testing firm. Decommission*
		immediately if leaks found
- spill kits and training update	*high*	*- assess and train using internal or external*
		resources
- solvent drum protection	*high*	*- move drum to safe, contained area*
- fire-fighting equipment review	*high*	*- assess using external resources*
- verification of CCA fixation	*high*	*- implement sampling and analytical program*
- repair CCA containment floor cracks	*medium*	*- caulk cracks*
- install fuel dispensing locks	*medium*	*- investigste options and install lock*
- clean trams and wood prior to treatment	*medium*	*- air pressure cleaning*
of wood		
- recycle CCA residues - filter bags	*medium*	*- contact suppliers re: recycling*
- filter Ain use@ PCP solutions	*medium*	*- evaluate options - install*
- evaluate CCA sludges with respect to	*medium*	*- analysis of sludges. Hire consultant to*
Special Waste Regulation		*identify any necessary actions.*

* No technical/economic analysis required
** Operating practice, maintenance, minor equipment change, minor process change, etc.

4.7.2 Identification of Pollution Prevention Concerns which Require Detailed Assessment (Worksheets 12 - 15)

The more difficult assessments would likely be associated with the major areas of recycling, reuse and control of solids, and process waters. Control of stormwater runoff is a significant issue in the Lower Mainland. Detailed assessments for pollution control options would likely be required to address such major issues.

The procedure for selection of more complex pollution prevention options will include the following steps:

(1) Define the pollution prevention concerns which require detailed assessment and list possible response options (Worksheet 12).

(2) Evaluate each potential option for technical feasibility (Worksheet 13), including:
- chance of technical success;
- ease of implementation;
- availability of space and utilities;
- impact on production quality and services; and,
- non-disruption of production.

(3) Evaluate each potential option for economic effectiveness (Worksheet 14), including:
- direct and indirect operation costs;
- reduction in raw material costs; and,
- reduction in treatment/disposal costs.

(5) Provide a summary evaluation of each selected option and suggest whether the option should be accepted or rejected (Worksheet 15).

Worksheets 13 and 14 provide an example for only one reduction option. Similar worksheets would have to be completed for each reduction option listed in Worksheet 12.

Worksheet 12
Completed By: *J. Brown & S. Wong* **Date:** *June 12, 1996*

Identification of Pollution Prevention Concerns which Require Detailed Assessment

1. Facility Name: *Boyd Road Plant*

2. Identification of Pollution Prevention Concerns and Possible Response Options.

Pollution Prevention Concern (From Worksheet 10)	Possible Options (From Section 3.2)
1) Stormwaters contain PCP above regulatory	*- reassess treatment procedures (PCP retention,*
limit and are toxic	*vacuum processes, etc.)*
	- permanent roofing of the PCP-treated
	wood storage area
	- treatment of PCP-contaminated stormwaters
	- temporary covers or wrapping wood
2) Poor fixation of CCA preservative and releases	*- reassess existing treatment procedures*
of CCA during precipitation events	*- assess accelerated fixation options*
	- permanent roofing of the treated-wood
	storage area
	- wrap wood (i.e., polyethylene, shrink wrap, or
	semi-permeable paper)
	- temporary cover (i.e., tarpaulins, corrugated
	iron, aluminum, etc.)
3) Controlling the vapour emissions from	*- evaluate emissions; assess risk*
treated wood	*- installation of vents in the chemical application*
	area.
	- do nothing; continue to wear protective apparel

Worksheet 13
Completed By: *S. Wong* **Date:** *June 21, 1996*

Technical Feasibility

Instructions: Copy this form and use one form for each Reduction Option.

Date: *June 21, 1996*

1. **Facility Name:** *Boyd Road Plant*

2. **Pollution Prevention Concern:** *Poor fixation of CCA preservative and releases of CCA during precipitation events.*

3. **Description of option:**

permanent roofing of the treated wood storage area with a pre-engineered steel structure.

4. **Kind of option:**
   - F **Equipment Related**
   - F **Process Related**
   - F **Raw Material Related**
   - F **Personnel Related**

5. **Describe potential personnel requirements (training, safety, etc.):**

minimal - possible inconvenience to daily operations during construction

6. **Are required space and utilities available? Explain:**

Yes. Possible to temporarily move the storage of some wood to allow enough space for construction.

7. **Will production quality or services be affected? Does the system create other environmental or health and safety problems? If yes, explain:**

Yes. Production will decrease for the duration of the construction period.

No environmental or health and safety problems created. Roof supports may affect movement of the treated wood.

8. Technical Feasibility Scale:

Scale for technical feasibility

1) Easily AchievableCRegular Maintenance
2) Minor Equipment Piping Changes
3) Minor Process Change
4) Major Process Change
5) Require Process Development/ New Tech.
6) Currently Unfeasible. Requires Replacement of Process

9. Does the technical feasibility of the option warrant subsequent economic analysis? Explain:

Economic analysis would be beneficial for comparison with other options (i.e., accelerated fixation, wrapping of lumber or a temporary cover).

Worksheet 14

Completed By: *J. Doe* Date: *June 25, 1996*

Wood Preservation

Financial Analyse

1. **Facility Name:** *Boyd Road Plant*

2. **Description of Option (as per Worksheet 13):** *complete wrapping of wood in polyethylene*

3. **CAPITAL COSTS**

Procurement Expenses:	Costs (A*)	Total
a. Recycle Equipment	*NA*	
b. Materials (Piping, Pumps, etc.) *polyethylene*	*$10.00/roll*	*$80,000.00/yr*
c. Installation	*NA*	
d. Engineering	*NA*	
e. Permitting	*NA*	
f. Utility Connection	*NA*	
Total Capital Costs:		*$80,000.00/yr*

4. **ANNUAL COSTS FOR RECYCLE/CONTROL OPTION**

Year		Item	Costs	Total
1	a.	Interest Expense (Capital Cost x Interest)	*NA*	
	b.	Depreciation Expense	*NA*	
	c.	Initial Training	*NA*	
	d.	Operating Expenses (Labour, Utilities, Maintenance)	*$20.00/hr*	*$40,000.00*
	e.	Waste Disposal	*$100.00/month*	*$1,200.00*
Total - Year 1				*$41,200.00*
2	f.	Interest Expense	*NA*	
	g.	Depreciation Expense	*NA*	
	h.	Operating Expenses (Assume 5% per year increase)	*$21.00/hr*	*$42,000.00*
	i.	Waste Disposal (Assume 5% per year increase)	*$105.00/month*	*$1,260.00*
Total - Year 2				*$43,260.00*

Notation:

A* - For example only - Actual costs vary.

5. ASSESSMENT OF APPARENT COST SAVINGS

Wood Preservative	Quantity	Cost	Total	Comments
j. Amount of recovered product	NA			
k. Costs of recovered product	NA			
l. Total value of recovered product	NA			

Water/Solvent Reduction	Quantity	Cost	Total	Comments
m. Amount of recovered water/solvent	NA			
n. Cost per volume	NA			
o. Total value of water	NA			

Labour Reduction	Quantity	Cost	Total	Comments
p. Amount of reduced labour	NA			
q. Cost Labour per Unit	NA			
r. Total Labour Savings	NA			

(Other Costs)	Quantity	Cost	Total	Comments
Waste Disposal Costs:		NA		
Other Costs: *change in monitoring costs*		*$750.00/yr*	*$750.00/yr*	
Change in Utilities Costs:		NA		
Change in Insurance Costs:		NA		
Subtotal - Other				
Total Apparent Cost Savings:			*$750.00*	

6. REAL COST SAVINGS = (Total Annual Costs - Total Apparent Cost)

($41,200.00 + $80,000.00) - $750.00 = $120,450.00 expense

THIS IS AN EXAMPLE ONLY TO SHOW THE METHOD OF CALCULATION. ACTUAL COSTS OF SAVINGS/EXPENSE MAY BE SIGNIFICANTLY DIFFERENT.

Worksheet 15
Completed By: *S. Wong* **Date:** *June 28, 1996*

Summary of Analysis of Pollution Prevention Option

1. Facility Name: *Boyd Road Plant*

2. Option Name: *Permanent roof over the treated wood storage area*

3. Briefly describe the option:
the pre-engineered structure prevents the contact of precipitation with treated lumber

4. Waste Stream(s) affected:
reduction of CCA in the liquid effluent releases

5. Input Material(s) affected:
None

6. Product(s) affected:
will help the fixation of CCA preservative and the quality of the product

7. Indicate Type:

F **Source Reduction**
- F Equipment Related Change
- F Personnel/Procedure Related Change
- F Materials Related Change

F **Recycling/Reuse**
- F On-site
- F Material reused for original propose

- F Off-site
  - F Material used for lower quality purpose
  - F Material sold

8. Financial analysis attached?

Yes (additional financial analysis completed for economic comparison of two options)

9. Originally proposed by:	*S. Wong and A. Smith*	**Date:** *June 21, 1996*
10. Reviewed by:	*J. Doe*	**Date:** *July 19, 1996*
11. Approved by:	*J. Doe*	**Date:** *July 26, 1996*

12. Reason for acceptance/rejection:
Rejection. Annual cost is more than double the annual cost of completely wrapping the treated wood products.

There is also a probability of site decommissioning within the next five years, canceling the long-term gains from

a permanent roof over the storage area.

4.8 Final Report of Pollution Prevention Team

Following completion of the process of identifying priorities and assessment of options, the pollution Prevention Team would provide a summary report for management for recommended actions (Worksheet 16).

A mechanism will be required to ensure that responses to management- approved options occur. The mechanism may include one or both of:

- designation of responsibility for completion of the options to an individual within the company; and/or,
- periodic meetings of the Pollution Prevention Team to monitor progress of actions.

Worksheet 16
Completed By: *S. Wong & J. Brown* **Date:** *July 8, 1996*

Summary of Approved Pollution Prevention Actions

Approved Easily Implemented Pollution Prevention Measures (From Worksheet 11)	Responsibility	Anticipated Completion Date
- hiring of a sampling support team for monitoring in accordance	*J. Brown*	*July 15*
with regulatory requirements.		
- hiring external resources to test the diesel UST	*J. Doe*	*July 22*
- acquisition of updated spill kits and full training sessions by	*J. Brown*	*July 8*
external company.		
- solvent drum moved to a safe, contained area	*S. Wong*	*July 8*
- caulking of CCA containment floor cracks	*S. Wong*	*August 12*
- installation of a high-pressure air hose for cleaning wood and	*J. Brown*	*August 15*
trams prior to treatment of wood		
- installation of fuel dispensing locks	*J. Doe*	*July 28*
- recycling of CCA residues (filter bags)	*S. Wong*	*August 5*
- look at options for an "in use" PCP solution filter	*S. Wong and J. Brown*	*July 30*
- hire consultant firm to evaluate CCA sludges with respect to	*J. Brown*	*July26*
Special Waste Regulation		
- provide test kit or external sampling team for the testing of	*J. Doe*	*July 13*
CCA fixation		
- assessment and updating of fire-fighting equipment by external	*J. Brown*	*July 10*
personnel		

Approved Pollution Prevention Measures Following Detailed Analysis (From Worksheets 12 – 15)	**Responsibility**	**Anticipated Completion Date**
Re: *Poor fixation of CCA preservative and releases of CCA during precipitation events.* Recommendation: *Complete wrapping of CCA-treated wood.*	*J. Brown* *&* *J. Doe*	*August 1996*
Re: *Stormwaters contain PCP above regulatory limit and are toxic.* Recommendation: *Segregation of runoff from storage area. Direction of flows to lagoon. Activated carbon treatment of effluent.*	*A. Smith* *&* *S. Wong*	*August 1997*
Re: *Controlling the vapour emissions from the freshly treated wood.* Recommendation: *Installation of venting system.*	*J. Brown*	*December 1996*
Re: Recommendation:		
Re: Recommendation:		

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APPENDIX A

Detailed Audit Forms

for

On-Site Inspectors

Worksheet A - 1	**Wood Preservation Operational Checklist**
Completed By: S. Wong	Chemical Receiving and Unloading Area
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Ensure absence of potential catastrophic events during delivery of bulk chemicals.***
- ***Ensure contained delivery of bulk chemicals.***
- ***Ensure response capacity to catastrophic events.***
- ***Ensure control over all air, liquid or any solid releases during delivery.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
1.1 ACCESS/SECURITY					
1. Is off-loading area located away from high yard traffic routes?	X				
2. Is vehicle access restricted during delivery?		X		- *Access not completely restricted, but*	
3. Is the delivery pad close to chemical storage?	X			*all operators are involved in delivery*	
4. Are there locking valves on liquid delivery lines?	X				
5. Is plant notified in advance of pending shipment?	X				90/100
1.2 TANKAGE & PROCESS VESSELS					
6. Are bulk liquids transported and delivered by trained personnel?	X				
7. Are semi-bulk containers, drums or bags delivered by trained personnel?		X			50/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
1.3 TRANSFER/PROCESS EQUIPMENT					
8. Is all transfer equipment in a contained area?	X				
9. Are pumps located within a contained area?	X				
10. Are pumps controlled by a local and remote emergency shut-off valve?	X				
11. Are pumps accessible for inspection and maintenance?	X				
12. Are all valves clearly identified with legible product identification tags?	X				
13. Are valves free of apparent leakage?	X				
14. Is transfer piping contained, accessible and visible?	X				
15. Is piping protected from mechanical damage?	X				
16. Are pipe and hoses rated for correct operating temperature and pressure?	X				
17. Are pipes and hoses chemically resistant to delivered products?	X				
18. Are pipes resistant to outside corrosion?	X				
19. Are hose and pipe connections designed to be secure?	X				
20. Are pipes protected from abrasion and movement? (By use of pipe sleeves)	X				
21. Are delivery pipes connected for top delivery to tanks?		X			
22. Are back-flow preventors installed on delivery lines?	X				
23. Are all lines and tanks clearly identified?	X				
24. Is the delivery system totally visible from the point of off-loading to tankage?	X				
25. Are audible alarms installed on tanks, if visibility limited?	X				
26. Are automatic control valves installed to shut off flow when tank is full?	X				95/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

1.4 CONTAINMENT

27.	Is an unloading pad and catchment sump used?	X				
28.	Are impervious construction materials used?	X				
29.	Are liquid-tight joints sealed with chemical-resistant material ?	X				
30.	Are surfaces sealed to enhance ability to keep clean?	X				
31.	Are pads designed to contain a large (tanker) spill?	X				
32.	Are pads or sumps free of settling and cracks?	X				
33.	Is pad located away from direct storm drainage from surrounding areas?	X				
34.	Are pads and sumps lined?	X				100/100

1.5 SAFETY DESIGN (FIRE/ELECTRICAL)

35.	Is static protection for flammable liquids provided at the:					
	a. cargo tank?	X				
	b. receiving tank?	X				
36.	Is all spark-producing equipment located away from flammable vapours?			X		
37.	Are ground-fault interrupters installed in all potential wet areas?	X				
38.	Are valves labelled with red tags for flammable liquids?			X		100/100

1.6 DRIP/DUST CONTROL AND HOUSEKEEPING

39.	Is the loading pad clean?	X				
40.	Are dripless hose connections used?	X				
41.	Are drip-trays used at all hose connections?	X				
42.	Are minor drips to the pad periodically cleaned?	X				
43.	Is washwater recovered for reuse?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
1.7 STANDARD OPERATING PROCEDURES (SOPs)					
44. Are SOPs in place for tanker unloading?	X				
45. Are emergency procedures posted and readily accessible?	X				
46. Is spill and emergency response equipment available?	X				
47. Are employees trained in normal operating procedures?	X				
48. Are employees trained in emergency procedures?	X				
49. Are safety procedures and systems tested annually?	X				
50. Are pipes which are not in use removed or capped?	X				
51. Are tankage capacity, contents and piping checked prior to unloading?	X				
52. Are all Federal Transport of Dangerous Goods Act (TDG) requirements fulfilled?	X				
53. Is an inventory tracking and management program in place?	X				
54. Do purchased chemicals meet all industry standards?	X				100/100
1.8 RESIDUE MANAGEMENT					
55. Are tank vents controlled to prevent releases during unloading?	X				
56. Are residuals of solid products controlled during transfer?	X				100/100

TOTAL SCORE:		735/800
MEAN OF SECTION 1.0 SCORE:		98/100

Worksheet A - 2	**Wood Preservation Operational Checklist**
Completed By: S. Wong	Chemical Storage Area
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Prevent catastrophic events as a result of fires, vandalism, accidents.***
- ***Ensure full containment of all chemicals in bulk storage.***
- ***Ensure ability to inspect and monitor all storage facilities.***
- ***Ensure response capabilities to catastrophic events.***

	Section Description with Suggested Assessment Criteria	***Yes***	***No***	***N/A***	***Comments***	***Score***
2.1	**ACCESS/SECURITY**					
1.	Is there 24-hour security?	X				
2.	Are bulk solid and liquid chemicals in locked areas?	X				
3.	Are tank drain valves locked?	X				100/100
2.2	**TANKAGE AND PROCESS VESSELS**					
4.	Are tanks in sound physical condition, with no visible exterior rust or visible damage?	X				
5.	Are underground tanks leak tested annually?	X				
6.	Are aboveground tanks mounted on containment pad surfaces?		X			
7.	Are tanks mounted in stable positions and anchored securely?	X				
8.	Are tanks located within diked areas?		X			
9.	Are tanks sheltered from weather by a fixed roof?	X				
10.	Are tanks protected from mechanical impact?		X			
11.	Are blocks, bags, or drums of chemical ingredients stored in sheltered areas?	X				
12.	Are tanks protected from freezing (where applicable)?	X				
13.	Are insulated tanks provided with inspection points?	X				
14.	Is the complete tank accessible for detecting leaks?	X				
15.	Are tank vents controlled? (not to workplace)	X				
16.	Are storage areas fire-protected?	X			Subjective Score	85/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

2.3 TRANSFER/PROCESS EQUIPMENT

17.	Is piping rigid and permanent throughout the operation?	X				
18.	Is piping visible and accessible with a simple layout?	X				
19.	Is piping aboveground?	X				
20.	Is containment provided for sub-grade piping?			X		
21.	Are piping and fixtures chemically compatible?	X				
22.	Are valves identified by labelling or colour coding?	X				
23.	Are valves and pipes protected from impact?	X				
24.	Are lines protected from freezing (where applicable)?	X				
25.	Do valves have local drip/spill catch-trays?	X				
26.	Do pumps have local drip/spill catch-trays?	X				
27.	Are back-flow "preventors" on all water supply lines?	X				
28.	Are waterlines connected via top entry to tanks?	X				
29.	Is piping system designed to protect against inadvertent transfers?	X				
30.	Are reliable, accurate level indicators installed?	X				
31.	Is mechanical impact protection functional on sight glasses?			X		
32.	Are shut-off valves functional on all rupturable lines and gauges?	X				
33.	Is overflow piping provided from tanks to containment?	X				
34.	Are independent high-level alarms installed on tanks?		X			
35.	Are high-level alarms interlocked to the automatic shut- off of pumps?		X			
36.	Is there a 24-hour monitoring alarm?		X			
37.	Are there manual alarm buttons at potential major spill points?	X				85/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

2.4 CONTAINMENT

38.	Are containment floors, dikes and joints structurally sound?	X				
39.	Are containment surfaces and joints sealed?	X				
40.	Is a secondary containment barrier built into a tank containment area?	X				
41.	Is subsurface leak detection provided?	X				
42.	Is there a subsurface leak containment and collection system?		X			
43.	Has spill containment volume been calculated and is it available?	X				
44.	Is the spill containment volume in excess of 110% of largest tank volume?	X				
45.	Is tank farm covered to prevent infiltration precipitation?	X				
46.	Does containment have alarms to identify spills?		X		- *pressure cylinder has an alarm for spills*	
47.	Is the containment area visible?	X				80/100

2.5 SAFETY DESIGN (FIRE ELECTRICAL)

48.	Are chemical bulk storage areas located away from combustible sources?	X				
49.	Are drums or bags stored in non-combustible structures?		X			
50.	Are ground-fault interrupters installed in all potential wet areas?	X				
51.	Are valves labelled with red tags for flammable liquids?	X				
52.	Is the fire-fighting equipment readily available?	X				80/100

2.6 DRIP/DUST CONTROL AND HOUSEKEEPING

53.	Is there good housekeeping in storage and containment area?	X				
54.	Are all spills, washes and infiltrating water recycled?	X				
55.	Are all spills, washes and infiltrating water treated before discharge?			X	- *not discharged*	
56.	Is equipment available and capable of transferring and storing spilled chemicals?	X				
57.	Are contaminated surfaces designed to minimize spill pool size?	X				
58.	Are minor spills cleaned?	X				
59.	Is containment designed to minimize tracking of fluids?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
2.7 STANDARD OPERATING PROCEDURES					
60. Are all tanks and storage areas labelled?	X				
61. Is storage area inspected weekly and records kept?		X			
62. Are records kept of annual UST inspections?		X			
63. Are Emergency Response (ER) plans in place for spill and fire?	X				
64. Are short forms of the ER plans posted?	X				
65. Are personnel trained in ER?	X				
66. Is ER equipment available and accessible?	X				
67. Does Emergency Response Equipment (ERE) include appropriate absorbents?	X				
68. Does ERE include personal protection equipment?	X				
69. Do ER measures allow for rapid, effective fire control?	X				
70. Can fire-fighting liquids and residues be contained for treatment?	X				80/100
2.8 RESIDUE MANAGEMENT					
71. Are tank vents controlled?	X				
72. Are releases of solids controlled?	X				100/100

TOTAL SCORE:		710/800
MEAN OF SECTION 2.0 SCORE:		89/100

Worksheet A - 3	**Wood Preservation Operational Checklist**
Completed By: J. Brown	Chemical Mixing
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Ensure full containment of all products during mixing process.***
- ***Ensure adequate response to non-routine events.***
- ***Ensure control of all air, liquid and/or solid releases during mixing.***

	Section Description with Suggested Assessment Criteria	***Yes***	***No***	***N/A***	***Comments***	***Score***
3.1	**ACCESS/SECURITY**					
1.	Is the chemical mixing area limited only to operators?	X				
2.	Is the chemical mixing area locked during plant shut-down?	X				
3.	Are all dispensing systems de-energized and locked between use?	X				100/100
3.2	**TANKAGE AND PROCESS VESSELS**					
4.	Is a permanent, closed mixing system used?		X		- *PCP mix tank not totally enclosed*	
5.	Is equipment provided for safe handling of drums or solids?	X				
6.	Is a high-level alarm installed to prevent mix tank overflow?		X		- *PCP mix tank has no alarm*	33/100
3.3	**TRANSFER/PROCESS EQUIPMENT**					
7.	Are high-level alarms interlocked to tank feed pumps?	X				
8.	Are the mixing facilities visible from the control area?	X		X	- *not applicable to PCP mix area*	
9.	Are controls and transfer equipment isolated from spills to avoid damage?	X				
10.	Are valves and pipes colour coded?	X				
11.	Do valves and pumps have local drip/spill catch-trays?	X				100/100

	Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
3.4	**CONTAINMENT**					
12.	Are all tanks and chemical handling areas fully contained?	X				
13.	Is spill containment volume sufficient?	X				
14.	Are spill containment joints sealed?	X				
15.	Are floors around tanks, dikes and joints structurally sound?	X				
16.	Are tanks protected from freezing?	X				
17.	Are grates or other methods used to minimize tracking of fluids from containment surfaces?		X			
18.	Are surfaces sealed and free of cracks?	X				
19.	Are surfaces sloped for drainage of wetted surfaces?	X				
20.	Is containment protected from the weather?	X				88/100
3.5	**SAFETY DESIGN (FIRE/ELECTRICAL)**					
21.	Does mixing occur in a non-combustible structure?	X				
22.	Are ground-fault interrupters installed in all potential wet areas?	X				
23.	Is fire-fighting equipment readily available?		X		- *equipment deemed insufficient*	66/100
3.6	**DRIP/DUST CONTROL AND HOUSEKEEPING**					
24.	Is the area free of staining, dusts or solid debris?		X		- *PCP dust on floor of mix room*	
25.	Is local containment provided at all potential points?	X				
26.	Is splash protection provided during any open transfers?	X				
27.	Is tracking or cross contamination from the containment areas absent?	X				
28.	Are all spills, washes and contaminated wastewaters reused, collected and/or treated before discharge?	X				
29.	Is a system available to clean up dust and solid debris?		X		- *vacuum system needed for PCP dust*	80/100
3.7	**STANDARD OPERATING PROCEDURES**					
30.	Is an SOP for chemical handling available?	X				
31.	Are all tanks labelled?	X				
32.	Is training provided to chemical mixing personnel?	X				
33.	Is spill response clean-up equipment available?		X		- *PCP clean-up equipment lacking*	
34.	Is personal protection equipment available?	X				
35.	Is a fire response and control plan developed?	X			- *not updated in the past 5 years*	85/100

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
3.8 RESIDUE MANAGEMENT					
36. Are emission controls installed at all transfer points?	X				
37. Are areas free of apparent residual releases?		X		- *PCP residues*	50/100

TOTAL SCORE:		602/800
MEAN OF SECTION 3.0 SCORE:		75/100

Worksheet A - 4	**Wood Preservation Operational Checklist**
Completed By: J. Brown	Chemical Application Area
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Ensure full containment of wood preservatives during application***
- ***Ensure absence of a catastrophic event/spill***
- ***Ensure the appropriate operating procedures are implemented***
- ***Ensure the control of residues***

	Section Description with Suggested Assessment Criteria	***Yes***	***No***	***N/A***	***Comments***	***Score***
4.1	**ACCESS/SECURITY**					
1.	Is the area limited to operators?	X			*- 24-hour watchman and front gates*	
2.	Can the area be locked when not in use?	X			*locked after business hours*	100/100
4.2	**TANKAGE AND PROCESS VESSELS**					
3.	Is the cylinder designed to facilitate drainage of excess preservative?	X				
4.	Is the retort door protected from opening when full?	X				
5.	Are all pressure vessel inspection certificates current?	X				
6.	Are independent interlock alarms installed on the retort doors?		X			75/100
4.3	**TRANSFER/PROCESS EQUIPMENT**					
7.	Is the piping permanent and rigid throughout the plant?	X				
8.	Is the piping visible and accessible with a simple layout?	X				
9.	Are pipes and valves identified by labeling or colour coding?	X				
10.	Is the piping aboveground or in containment?	X				
11.	Are piping and valves chemically compatible?	X				
12.	Are pipes and valves protected from impact?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
4.4 CONTAINMENT					
13. Is containment volume in excess of 150% of largest tank or cylinder?	X				
14. Are sumps and containment constructed with leak-proof joints and impermeable surfaces?	X				
15. Are sumps and containment designed to minimize infiltration of water?	X				
16. Are below-ground sumps, recycle tanks and containers monitored for leakage?	X				
17. Are all sumps protected by independent high-level alarms?		X			
18. Is the immediate drip area impermeable and curbed?	X				
19. Is the immediate drip area large enough to hold all treated wood until dripping is complete?	X				
20. Are drippings collected and reused?	X				88/100
4.5 SAFETY DESIGN					
21. Is the operator control area segregated from the retort and containment area?	X			- *in the same building*	
22. Is the shelter non-combustible?		X			
23. Is the proper fire-extinguishing equipment available?	X				
24. Are ground-fault interupters installed in all potential wet areas?	X				75/100
4.6 DRIP/DUST CONTROL AND HOUSEKEEPING					
25. Is the process area free of noticeable leakage?	X				
26. Are local drip-trays provided under valves, pumps or fittings?	X				
27. Are the pump seals apparently leak-proof?	X				
28. Is the sump area relatively free of liquid?	X				
29. Is pump-seal and cooling water controlled or recycled?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

4.7 STANDARD OPERATING PROCEDURES

30.	Are written operating procedures available?	X				
31.	Is a fire/spill contingency plan in place?	X				
32.	Are spill response materials readily at hand?	X				
33.	Are process controls designed for simple, unambiguous operations?	X				
34.	Does the process control area have a good view of operations?	X				
35.	Is the wood cleaned prior to placement retort?		X		- *depends on condition of wood* → *cleaned*	
36.	Is the treated wood free of apparent bleeding and/or free of solid residues?	X			*if it's been sitting for a while*	
37.	Is the moisture content consistent in all wood about to be treated?		X		- *depends on the time of year*	
38.	Are retorts dedicated to specific preservatives?	X				
39.	Is an inventory control in place? (Chemicals used vs chemicals in treated wood)	X				
40.	Are wastes less than 1 drum/month/retort?	X				80/100

4.8 RESIDUE MANAGEMENT

41.	Are vacuum pump exhausts directed to condenser?	X				
42.	Are tank vents clear?	X				
43.	Are all liquid, vapour, and solid releases obviously in control?	X				100/100

TOTAL SCORE:		718/800
MEAN OF SECTION 4.0 SCORE:		90/100

Worksheet A - 5	**Wood Preservation Operational Checklist**
Completed By: J. Brown	Treated Wood Handling & Storage Area
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Ensure proper containment of the process and storage areas***
- ***Ensure the recycling of washwaters by the appropriate facilities***
- ***Ensure proper operating procedures in the process areas***
- ***Ensure management of the residuals***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
5.1 ACCESS/SECURITY					
1. Is access to storage areas restricted?	X				
2. Is treated-wood storage confined to a specific area?	X				100/100
5.2 TANKAGE AND PROCESS VESSELS	**NOT APPLICABLE**				
5.3 TRANSFER/PROCESS EQUIPMENT	**NOT APPLICABLE**				
5.4 CONTAINMENT					
3. Are all potential drippage areas:					
a. Impermeable?	X				
b. Roofed and curbed/diked to prevent entry of surface runoff and precipitation?	X				
4. Is tracking of liquids from drip areas minimized?	X				
5. If sheltered, is shelter constructed of non-combustible materials?		X			
6. Is treated-wood storage confined to a specific area?	X				
7. If unpaved, is storage area located away from surface waterbodies?			X		
8. If paved, is the storage area curbed?		X			
9. Are surface drainage waters from the treated-wood storage area separated from surface drainage areas of other yard areas?	X				
10. Are surface drainage waters collected at common points?	X				75/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
5.5 SAFETY DESIGN (FIRE/ELECTRICAL)					
11. Are storage areas free of combustible debris and ground vegetation?	X				
12. Are roof and shelter walls (if any) of non-combustible materials?		X			50/100
5.6 DRIP/DUST CONTROL AND HOUSEKEEPING					
13. Are drippage areas free of standing liquids?	X			- *occasional puddle of treatment due to*	
14. Is the area free of debris?	X			*an uneven surface*	
15. Are washwaters recycled?	X				100/100
5.7 STANDARD OPERATING PROCEDURES					
16. Prior to placement of treated wood in storage yard:					
a. Are operational measures taken to enhance fixation of wood-borne preservatives?	X			- *kept on drip-pad for 72 hours*	
b. Are operational measures taken to minimize bleeding of oil-borne preservation?	X				100/100
5.8 RESIDUE MANAGEMENT					
17. Are surface drainage waters monitored?	X				
18. Are chemical releases within permit, regulatory and/or acceptable limits (as per toxicology data)?		X			
19. Are solids (debris) collected and disposed of properly?	X				66/100

TOTAL SCORE:		491/600
MEAN OF SECTION 5.0 SCORE:		82/100

Worksheet A - 6	**Wood Preservation Operational Checklist**
Completed By: S. Wong	Chemical Dispensing - Fuel/Solvent/
Date: *May 25, 1996*	Vehicle Maintenance

General Objectives - Best Management Practices

- ***Prevent catastrophic events such as a result of fires, vandalism or accidents.***
- ***Ensure full control of chemicals during handling.***
- ***Ensure control of all air, liquid and/or solid releases during use.***
- ***Ensure response capability to non-routine events.***

	Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
6.1	**ACCESS/SECURITY**					
1.	Are the dispensing areas limited only to operators?	X				
2.	Are the areas locked during plant shut-down?	X				
3.	Are all dispensing systems de-energized and locked between use?		X			66/100
6.2	**TANKAGE AND PROCESS VESSELS**					
4.	Is a permanent, closed system used?	X				
5.	Is equipment provided for safe handling of drums or solids?	X				100/100
6.3	**TRANSFER/PROCESS EQUIPMENT**					
6.	Are controls and transfer equipment isolated from spills to avoid damage?	X				
7.	Are valves and pipes colour coded?	X				
8.	Do valves and pumps have local drip/spill catch-trays?	X				
9.	Are non-gravity fuel systems used?	X				100/100
6.4	**CONTAINMENT**					
10.	Are all aboveground tanks and chemical-use areas fully contained?		X		- *underground storage tank not contained*	
11.	Is spill containment volume sufficient?	X				
12.	Are spill containment joints sealed?	X				
13.	Are floors around tanks, dikes and joints structurally sound?	X				
14.	Were the underground tanks leak tested?		X		- *not tested since installation 20 years ago*	
15.	Are grates or other methods used to minimize tracking of fluids from containment surfaces?		X			
16.	Are surfaces sealed and free of cracks?		X			
17.	Are surfaces sloped for drainage of wetted surfaces?	X				
18.	Is containment protected from the weather?	X				60/100

	Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
6.5	**SAFETY DESIGN (FIRE/ELECTRICAL)**					
19.	Are fuels and solvents dispensed away from non-combustible structure?	X				
20.	Are ground-fault interrupters installed in all potential wet areas?	X				
21.	Is fire-fighting equipment readily available?	X				100/100
6.6	**DRIP / DUST CONTROL AND HOUSEKEEPING**					
22.	Are areas of use free of staining and dusts?		X		- *area of fuel dispensing shows evidence*	
23.	Is local containment provided at all potential release points?		X		*of releases*	
24.	If any open transfer operations are used, is splash protection provided?		X			
25.	Is tracking or cross contamination from the containment areas absent?	X				
26.	Are all spills, washes and infiltrating water treated before discharge?		X		- *no oil separator*	
27.	Is a procedure available to clean up solid debris?	X				30/100
6.7	**STANDARD OPERATING PROCEDURES**					
28.	Is an SOP for the handling of each product available?	X				
29.	Are all tanks labelled?	X				
30.	Is training provided to personnel?	X				
31.	Is spill response clean-up equipment available?		X		- *equipment seems deficient*	
32.	Is personal protection equipment available?	X				
33.	Is a fire response and control plan developed?	X			- *not reviewed in past 5 years*	
34.	Is the local fire department aware of the plan?	X				
35.	Are laboratory solvents and wastes controlled?	X				88/100
6.8	**RESIDUE MANAGEMENT**					
36.	Are emission controls installed?			X		
37.	Are areas free of apparent residual releases?			X		100/100

TOTAL SCORE:		644/800
MEAN OF SECTION 6.0 SCORE:		81/100

Worksheet A - 7	**Wood Preservation Operational Cecklist**
Completed By: S. Wong	Residual Handling
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Ensure control of all air, liquid and/or solid releases.***
- ***Ensure compliance with all regulatory requirements.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
7.1 ACCESS/SECURITY					
1. Are waste treatment systems accessible only to plant operators?	X				100/100
7.2 PROCESS VESSELS				**NOT APPLICABLE**	
7.3 ITROL EQUIPMENT					
2. Is equipment provided for safe collection and handling of sludges?	X				
3. Is an effluent treatment system used?	X			- *activated carbon system for PCP*	
4. Are air emissions from retorts and condensing systems controlled?	X			*process waters*	
5. Are air emissions from kilns controlled?			X		100/100
7.4 AINMENT					
6. Is the waste treatment area contained?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
7.5 I (FIRE/ELECTRICAL)					
7. Are ground-fault interrupters installed in all potential wet areas?	X				100/100
7.6 OL AND HOUSEKEEPING					
8. Are chemical containers rinsed and disposed? as per suppliers' recommendations?	X			- *PCP wrapping landfilled*	
9. Is dust and debris minimized at the yard area?	X				
10. Are all effluents reused and/or routed through an on-site treatment system?	X				100/100
7.7 ATING PROCEDURES					
11. Is an SOP for residual handling available?	X				
12. Is a record of residual handling maintained?	X				
13. Does regular monitoring of wastewater treatment quality occur?	X				
14. Are monitoring results assessed to evaluate needs for improvement?	X				100/100
7.8 MANAGEMENT					
15. Are all permit requirements fulfilled?	X				
16. Is the facility free of complaints from neighbouring properties?	X				100/100

TOTAL SCORE:	700/700
MEAN OF SECTION 7.0 SCORE:	100/100

Worksheet A - 8	**Wood Preservation Operational Checklist**
Completed By: S. Wong	Waste Storage Area
Date: *May 25, 1996*	

General Objectives - Best Management Practices

- ***Ensure compliance with all regulatory requirements.***
- ***Provide secure containment.***
- ***Provide proper contingency measures.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
8.1 ACCESS/SECURITY					
1. Is access to unauthorized persons prevented by a surveillance system or barrier?	X				
2. Are all valves, pumps. etc., locked?			X		
3. Are signs in place indicating the area is restricted?	X				100/100
8.2 TANKAGE AND PROCESS VESSELS					
4. Are Special Wastes stored so that manual/visual inspection for leaks is enabled?	X				
5. Are containers compatible with Special Wastes?	X				
6. Are containers enclosed?	X				100/100
8.3 ɔCESS EQUIPMENT					
7. Is overflow protection provided for tanks with liquid wastes?			X	*- only sludges stored*	
8. Is a high-level alarm set at 90% of full liquid level of a tank?			X		
9. Is there an automatic feed cutoff system at 95% of full liquid level?			X		NA/100
8.4 CONTAINMENT					
10. Can containment system hold 110% of largest volume of any container?	X				
11. Can containment system hold 25% of the total volume in storage?	X				
12. Is containment of impervious material with liquid-tight joints?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
8.5 SAFETY DESIGN (FIRE/ELECTRICAL)					
13. Is grounding provided where static buildup may occur?	X				
14. Are wastes and ignition sources separated by distance or by 2-hour fire rated barrier?	X				
15. If waste is ignitable, is 24-hour fire alarm system installed?	X				
16. Is a fire suppression system installed?		X			
17. Is facility non-combustible with minimum fire rating of 2 hours?	X				80/100
8.6)L AND HOUSEKEEPING					
18. Are dripless hose connections used for transferring liquid wastes?			X		
19. Is aisle space maintained to enable access to any part of the facility?	X				100/100
8.7 STANDARD OPERATING PROCEDURES					
20. Is a written SOP available?	X				
21. Are inspections regularly conducted?	X				
22. Is training provided with respect to:					
a. Duties and responsibilities?	X				
b. Protective equipment?	X				
c. Fire and explosion response procedures?	X				
d. Spill response?	X				
e. Communications and alarm systems?	X				
f. Use of abatement and clean-up equipment?	X				
g. Shut-down operations?	X				
h. Hazards of wastes?	X				
23. Are records kept of training, duties and responsibilities?	X				100/100

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
8.8 MANAGEMENT					
24. Is air ventilation provided in facility?			X		
25. Are emissions, if any, controlled?	X				100/100

TOTAL SCORE:		680/700
MEAN OF SECTION 8.0 SCORE:		97/100

APPENDIX B

Blank Worksheets
and
Audit Forms

Worksheet 1

The Pollution Prevention Team

Completed By: Date:

Date: _____

Company : _____ Facility Name: _____

Team Leader: _____ Title: _____ Phone: _____

Member Names	Responsibilities		Phone
	Corporate	Team	

Responsibility of Pollution Prevention Team:

1. Inspecting facilities to assess how toxic substances are used and to identify evidence of waste, particularly of hazardous waste.

2. Involving coworkers in identifying problems and suggesting possible solutions.

3. Helping to set and meet our reduction objectives.

Worksheet 2

Site Descr

Completed By: Date:

1. **Facility Name:**

2. **Facility / Corporate Owner:**

3. **Contact:**

4. **SITE ADDRESS:**

Street:

City: *Province:* *Postal Code:*

5. **LEGAL DESCRIPTION OF SITE LOCATION:**

6 **ESTIMATED SITE SIZE:**

7. **MAILING ADDRESS:**

Street:

City: *Province:* *Postal Code:*

8. **PHONE and FAX NUMBERS:**

Phone: *Fax:*

Other:

Worksheet 3 **Environmental**

Completed By: Date: **Site-Specific Factors**

1. **Distance to nearest fish-bearing waterbody:** _____
   a. Name of waterbody: _____

2. **Distance to other ecologically sensitive areas:**
   e.g., Waterfowl Breeding
   Source: FREMP Habitat Inventory

Distance	*Area Description*

3. **Distance to nearest populated area:** _____
   a. Name of Municipality: _____

4. **Distance to nearest groundwater well:** _____
   (Source: BC Environment Water Resources Branch)

5. **Depth to groundwater at site:** _____

6. **Composition of site soil:** _____

7. **Average annual precipitation at site:** _____
   (Source: Environment Canada)

8. **Is area in a 100-year flood plain?** _____
   (Source: BC Environment Water Resources Branch)

9. **Release point for stormwater discharge:** _____

Worksheet 4

Completed By: Date:

Pre-Survey Information Collection

1. **Facility Name:** _____

2. **Facility Contact for Data:** _____ **Phone:** _____

3.

Wood Preservatives Used	Number of Cylinders

4. **Availability of Essential Documentation for Site Inspection:**

DOCUMENT	AVAILABLE Y/N	DATE LATEST VERSION	LOCATION / COMMENTS
Company Literature (re: Products, Services, etc.)			
Process Description			
Diagrams, Blueprints, Drawings of Buildings, Process Areas, Storage Areas, etc.			
Design Information including Equipment Lists, Equipment Specifications, Process Flow Diagrams			
Operating Manuals			
Inventory of Chemicals			
Product Inventory			
Material Safety Data Sheets (MSDS)			
Pollution Monitoring Data			
Hazardous Waste Manifests			
Environmental Audit Reports			
Regulatory Permits & Correspondence			
Fire Marshall/Fire Inspection Reports			
WCB Correspondence/Records			
Employee Training Records			
Operator Data Logs			

5. Availability of Auxiliary Information for Pollution Prevention Program:

DOCUMENT	AVAILABLE Y/N	LAST REVISION	LOCATION / COMMENTS
Material Balance Analyses			
Input Stream(s)			
Product Stream(s)			
Waste Stream(s)			
Energy Use			
Fuel			
Electricity			
Labour Usage/Cost			
Operation & Maintenance/Cost			
Water Usage/Cost			

Worksheet 5(a)
Completed By: Date:

Chemical Use Summary

1. Facility Name: _____

2. Materials Summary

RAW MATERIAL	CCA	ACA	PCP	PCP/ SOLVENT	CREOSOTE	OTHER	STAIN
Trade Name							
Chemical Name							
COMPONENTS/ATTRIBUTES OF CONCERN							
Components and Concentration (Specify Units: %, PPM...)							
ANNUAL CONSUMPTION RATE							
Overall (Specify Units: Kg, Tonnes, Lb...)							
SUPPLIERS							
Supplier #1							
Supplier #2							

RAW MATERIAL	CCA	ACA	PCP	PCP/ SOLVENT	CREOSOTE	OTHER	STAIN
Trade Name							
COSTS							
Purchase Price (Cdn. $/_____)							
Overall Annual Cost							
SHIPPING AND STORAGE DETAILS							
Delivery Mode							
Normal Order/Delivery Size							
No. Shipments/Year							
Shipping Container (Size and Type)							
Storage Mode							
Transfer Mode							
Inventory Size (Max.)							
EMPTY CONTAINER MANAGEMENT							

Worksheet 5(b)
Completed By: **Date:**

Chemical Use Summary

1. Facility Name: _____

2. Materials Summary

RAW MATERIAL	FUELS		SOLVENTS	OIL/ LUBRICANTS	ANTIFREEZE	OTHER
	VEHICLE	OTHER				
Trade Name						
Chemical Name						
COMPONENTS/ATTRIBUTES OF CONCERN						
Components						
Concentration (Specify Units %, PPM...)						
ANNUAL CONSUMPTION RATE						
Overall (Specify Units: Kg, Tonnes, Lb...)						
SUPPLIERS						
Supplier #1						
Supplier #2						

RAW MATERIAL	FUELS		SOLVENTS	OIL/ LUBRICANTS	ANTIFREEZE	OTHER
	VEHICLE	OTHER				
COSTS						
Purchase Price (Cdn. $/_____)	*$0.40/L*		*$5.00L*	*$2.50L*	*$6.00L*	
Overall Annual Cost	*$10,000.00*		*$1,000.00*	*$5,000.00*	*$3,000.00*	
SHIPPING AND STORAGE DETAILS						
Delivery Mode	*bulk*		*truck*	*truck*	*truck*	
Normal Order/ Delivery Size	*5000 L*		*1 drum / 200 L*	*5 drums / 1000 L*	*1 drum / 200 L*	
No. Shipments/Year	*5 - 6*		*1*	*1 - 2*	*2 - 3*	
Shipping Container (Size and Type)	*bulk*		*drums (200 L)*	*drums (200 L)*	*drums (200 L)*	
Storage Mode	*bulk*		*drums*	*drums*	*drums*	
Transfer Mode	*fuel pump*		*hand pump*	*hand pump*	*hand pump*	
Inventory Size (Max.)	*10,000 L*		*1 drum*	*5 drums*	*3 drums*	
EMPTY CONTAINER MANAGEMENT *All drums returned to suppliers*						

Worksheet 6

Completed By: Date:

Product Summary Information

1. Facility

Name: _____

2. Production Summary:

PRODUCTS	Annual Production (Cubic Metres or Other Unit _____)					
	Water- Borne		Oil-Borne			
	CCA	ACA	PCP	Creosote	Other	TOTAL
Consumer Lumber						
Ind. Construction Lumber & Timbers						
PWF Lumber						
PWF Plywood						
Railway Ties						
Poles						
Land/Freshwater Pilings						
Marine Pilings						
Round Posts						
Other (1) Timber						
Other (2)						
Other (3)						
TOTALS						
% of production that conforms to CAN/CSA-80						
% of production that conforms to other specifications *						
% of production that conforms to other specifications *						

** Describe Specification or Retention Relative to CSA.*

Worksheet 7
Completed By: **Date:**

Regulatory Compliance Essential Requirements

1. AIR EMISSIONS AND CONTROLS

a. Sources of controlled emissions *(circle)*

Vacuums and kilns	Tank vents
Freshly-treated charges	Vehicle traffic
Retort cylinder door	Fugitive dust
Bulk transfer system	Bulk fuel handling
Accelerated fixation facilities	Solvent use

b. List permits and/or relevant regulation responsible agency:

_____

_____

_____

c. Is pollution control equipment operational?	No	Yes	NA
d. Are monitoring results available?	No	Yes	NA
e. Is monitoring frequency and analytical sensitivity in accordance to regulatory requirements?	No	Yes	NA
f. Do results indicate compliance with regulatory limits?	No	Yes	NA
g. Has the necessary reporting to regulatory agencies occurred?	No	Yes	NA

2. LIQUID EFFLUENT RELEASES

	TYPES	DISCHARGE LOCATION
a. Sources of effluent releases	Stormwater runoff	_____
	Treatment System Discharge	_____
	Other:	_____

b. List permits and/or relevant regulation responsible agency:

_____

_____

_____

c. Are monitoring results available?	No	Yes	NA
d. Is monitoring frequency and analytical sensitivity in accordance to regulatory requirements?	No	Yes	NA
e. Do results indicate compliance with regulatory requirements?	No	Yes	NA
f. Has the necessary reporting to regulatory agencies occurred?	No	Yes	NA
g. Is pollution control equipment operational?	No	Yes	NA

3. SOLID WASTES

a. Sources of regulated solid wastes *(circle)*

Chemical sludges	PCB equipment
Settling pond sludges	Soiled wood
Soiled charging equipment	Contaminated Soil
Residues from filters	Other:

b. List permits and/or relevant regulation responsible agency:

c. Have all solid wastes been evaluated to determine if they are Special Wastes?	No	Yes	NA
d. If Special Wastes are present, are storage and inspection in compliance with the Special Waste Regulation?	No	Yes	NA
e. Are licensed hazardous waste contractors used for disposal?	No	Yes	NA
f. Are shipping documents complete and available for review on-site?	No	Yes	NA

Worksheet 8
Completed By: **Date:**

Control of Bulk Liquid and Gases

1. INVENTORY OF BULK LIQUID AND GASES

PRODUCT	STORAGE TYPE [UST or AST]* and VOLUME [Litres]	IS CONTAINMENT ADEQUATE? [See 2(c) below]
Vehicle fuel		
Wood preservatives		
Solvent		
Oil/Lubricants		
Antifreeze		
Other:		

**Underground Storage Tank (UST); Aboveground Storage Tank (AST)*

2. ABOVEGROUND TANKS

a. Are all tanks and drums on top of an impermeable floor?	No	Yes	NA
b. Is the floor sealed (e.g., absence of cracks)?	No	Yes	NA
c. Are all containment volumes in excess of 150% of the largest tank or the volume of the largest tank?	No	Yes	NA
d. Are all tanks free of corrosion and physical damage?	No	Yes	NA
e. Are all tanks securely mounted and protected from vehicle impact?	No	Yes	NA

3. UNDERGROUND STORAGE TANKS

a. Are all the underground tanks less than 10 years old?	No	Yes	NA
b. Are the underground tanks and piping leak tested annually and records kept?	No	Yes	NA

4. ALL TANKS AND DRUMS

a. Are tanks and drums secured to prevent tampering or accidental impacts?	No	Yes	NA
b. Are tanks provided with overfilling protection and/or alarms?	No	Yes	NA
c. Are bulk drains (including stormdrains) located away from chemical unloading area and bulk tank storage area?	No	Yes	NA
d. Are non-gravity feed systems used for fuel supply/dispensing?	No	Yes	NA
e. Are dispensing systems de-energized and locked between use?	No	Yes	NA
f. Are dispensing areas provided with drip and spill containment?	No	Yes	NA
g. Are spill kits provided at all bulk chemical storage and handling points?	No	Yes	NA
h. Has a spill response plan been prepared and is it available?	No	Yes	NA
I. Has spill response training occured in the past year?	No	Yes	NA

5. FIRE FIGHTING

a. Is fire-fighting equipment readily available?	No	Yes	NA
b. Is a fire response and control plan developed?	No	Yes	NA

Worksheet 9 Completed By:	Date:

Assessment of Current Pollution Prevention Measures

Objective: To evaluate current practices versus pollution prevention concepts.

Concept 1 — Reduction of use of toxic substances, raw materials, and non-renewables.

1.1 Is the wood treated in accordance with the CSA requirements?	No	Yes	NA
1.2 Is quality control maintained, i.e., the concentration of the active ingredients in the work solution, and retention levels in the wood?	No	Yes	NA
1.3 Is there regular operator training provided?	No	Yes	NA
1.4 Are the trams and the wood to be treated cleaned prior to treatment?	No	Yes	NA
1.5 Are the spilled or dripped wood preservatives contained and reused?	No	Yes	NA
1.6 Are inventories of fluids maintained to identify leakage?	No	Yes	NA

Concept 2 — Reuse of recovered raw material, products, and hazardous substances.

2.1 Is the drip-pad preservative reused?	No	Yes	N A
2.2 Are the drippage pad washwaters from CCA/ACA facilities recycled?	No	Yes	NA
2.3 Are the residues from the CCA filter bags recycled (back to suppliers)?	No	Yes	NA
2.4 Are the chemicals from the waste stream treatment recycled?	No	Yes	NA
2.5 Are the carbon filters reused after off-site regeneration?	No	Yes	NA

Concept 3 — Elimination of environmental releases.

3.1 Solids and liquid waste control

3.1.1 Is the fixation of the CCA preservative (under ambient air temperatures) completed in a roofed area?	No	Yes	NA
3.1.2 Is the treated wood released from the fixation area only after CCA fixation has been tested and verified?	No	Yes	NA

3.1.3	Are ACA-treated products held in storage for a minimum of three weeks under ambient temperatures greater than or equal to 15°C or kiln dried if the temperature falls below 15°0C?	No	Yes	NA
3.1.4	Is the treated-wood storage area free of debris and standing liquids?	No	Yes	NA
3.1.5	Are the process areas (chemical unloading, chemical application and all storage areas) contained?	No	Yes	NA
3.1.6	Are the chemical storage areas and process areas roofed?	No	Yes	NA
3.1.7	Are "in use" PCP solutions continually filtered to control suspended particulate matter?	No	Yes	NA
3.1.8	Are the appropriate facilities provided to recycle spills and washwaters?	No	Yes	NA
3.1.9	Is the contaminated stormwater from the yard contained and reused?	No	Yes	NA
3.1.10	Is the fire-fighting water runoff contained and reused or disposed of appropriately if reuse is not practical?	No	Yes	NA
3.1.11	Are the employees trained so as to assure understanding of the control program?	No	Yes	NA
3.1.12	Are good housekeeping measures practiced?	No	Yes	NA
3.1.13	Is the tracking of chemicals controlled?	No	Yes	NA

3.2 Air Emission Control

3.2.1	Are all possible vapours controlled (i.e., tank vents, cylinder doors, freshly-treated charges and block storage)?	No	Yes	NA
3.2.2	Are the emissions from the accelerated fixation facilities controlled?	No	Yes	NA
3.2.3	Are the arsenic drums vented periodically (as directed by suppliers)?	No	Yes	NA
3.2.4	Is the yard free of traffic dust?	No	Yes	NA

Concept 4 — Recycling of recovered materials off-site.

4.1 This concept is covered within concept 2.

Concept 5 — Treatment of non-recoverable waste.

5.1	Are the sludges, contaminated soils and debris being disposed of in approved facilities?	No	Yes	NA
5.2	Is the stormwater flowing through the yard segregated from the process and treated wood storage areas to minimize the amount of contaminated runoff waters?	No	Yes	NA
5.3	Are the washwaters and condensates treated before discharge as a waste stream (oil-borne preservation)?	No	Yes	NA
5.4	Are excess stormwaters treated or non-toxic?	No	Yes	NA
5.5	Are any ashes from burnt treated wood disposed of by the appropriate facilities?	No	Yes	NA

Concept 6 — Elimination of the need for hazardous pollutants or waste substances by process modification.

6.1	Is proper fixation of water-borne chemicals ensured?	No	Yes	NA
6.2	Is the process of accelerated fixation, through elevated temperatures and high humidity conditions, being practiced?	No	Yes	NA
6.2	Are proper post-treatment steps being implemented including:			
	a. vacuums;	No	Yes	NA
	b. expansion baths in oil; and,	No	Yes	NA
	c. steaming to clean wood surfaces and prevent bleeding?	No	Yes	NA

Concept 7 — Safe disposal of wastes.

7.1 This concept is covered within concept 5.

Concept 8 — Safe handling of chemicals and products to prevent sudden and accidental releases.

8.1	Is the underground storage tank(s) (UST) tested regularly?	No	Yes	NA
8.2	Are the storage tanks in a secure area, i.e., located away from high traffic areas and protected from vandalism and freezing?	No	Yes	NA
8.3	Is the CCA stored so as to prevent contact with reducing agents (including aluminum, brass and zinc) or with organic combustibles (i.e., gasoline, kerosene, oil)?	No	Yes	NA
8.4	Are the proper fire precautions and response procedures implemented?	No	Yes	NA
8.5	Is the aboveground piping labelled and visible?	No	Yes	NA
8.6	Is the volume of the bulk liquid storage tanks appropriate for proper spill containment, i.e., 150% of the largest on-site bulk tank?	No	Yes	NA
8.7	Do the floors for the bulk storage areas have sealed surfaces?	No	Yes	NA
8.8	Is adequate training provided with respect to:			
	a. Spill response;	No	Yes	NA
	b. Hazards of wastes; and,	No	Yes	NA
	c. Duties and responsibilities?	No	Yes	NA
8.9	Is spill response equipment, absorbents (where applicable) and personnel protection equipment adequate?	No	Yes	NA

Worksheet 10
Completed By: **Date:**

Facility Status and Identification of Priorities

1. Facility Name: _____

2. Summary of Compliance with Regulatory Requirements (from Worksheet 7):		
Regulatory Permit	**Permit No.**	**Compliance Status**
Liquid (Effluent Waste Permit)		
Air Permit		
Solid Waste Permit		
Special Waste Permit		
Other (please list)		
Listing of "no's" in Worksheet 7 (Any "no" will be a priority item and must be addressed immediately.)		

3. Summary of Potential Concerns—Catastrophic Releases and Site Contamination (from Worksheet 8):	
Listing of "no's" in Worksheet 8	Pollution Prevention Team Priority and Basis of Decision*

* Priorities may be based on aspects such as relative volumes of stored liquids, proximity to waterbodies and storm drains, use of alternative control measures, etc.

4. Summary of Current Pollution Prevention Concerns (from Worksheet 9):

Listing of "no's" in Worksheet 9	Pollution Prevention Team Priority and Basis of Decision**

** Priorities may be based on aspects such as: potential for high cost/benefits; relative volumes of wastes; local conditions such as proximity to waterbodies; low rainfall conditions, etc.

Worksheet 11
Completed By: **Date:**

Identification of Easily Implemented Pollution Prevention Measures*

1. Facility Name:

2. Recommended measures for immediate implementation:

Measure	Priority	Type of Pollution Prevention Measure**

* No technical/economic analysis required
** Operating practice, maintenance, minor equipment change, minor process change, etc.

Worksheet 12 Completed By:	Date:

Identification of Pollution Prevention Concerns which Require Detailed Assessment

1. **Facility Name:** _____

2. **Identification of Pollution Prevention Concerns and Possible Response Options.**

Pollution Prevention Concern (From Worksheet 10)	Possible Options (From Section 3.2)

Worksheet 13
Completed By: **Date:**

Technical Feasibility

Instructions: Copy this form and use one form for each Reduction Option.

Date: _____

1. **Facility Name:** _____

2. **Pollution Prevention Concern:** _____

_____

3. **Description of option:**

_____

_____

4. **Kind of option:**
   - O Equipment Related
   - O Process Related
   - O Raw Material Related
   - O Personnel Related

5. **Describe potential personnel requirements (training, safety, etc.):**

_____

_____

6. **Are required space and utilities available? Explain:**

_____

_____

7. **Will production quality or services be affected? Does the system create other environmental or health and safety problems? If yes, explain:**

_____

_____

_____

8. Technical Feasibility Scale:

Scale for technical feasibility

1) Easily Achievable—Regular Maintenance
2) Minor Equipment Piping Changes
3) Minor Process Change
4) Major Process Change
5) Require Process Development/ New Tech.
6) Currently Unfeasible. Requires Replacement of Process

9. Does the technical feasibility of the option warrant subsequent economic analysis? Explain:

Worksheet 14

Completed By: Date:

Wood Preservation

Financial Analyses

1. **Facility Name:** *Boyd Road Plant*

2. **Description of Option (as per Worksheet 13):**

3.

CAPITAL COSTS		
Procurement Expenses:	**Costs (A*)**	**Total**
a. Recycle Equipment		
b. Materials (Piping, Pumps, etc.)		
c. Installation		
d. Engineering		
e. Permitting		
f. Utility Connection		
Total Capital Costs:		

4.

ANNUAL COSTS FOR RECYCLE/CONTROL OPTION				
Year		**Item**	**Costs**	**Total**
1	a.	Interest Expense (Capital Cost x Interest)		
	b.	Depreciation Expense		
	c.	Initial Training		
	d.	Operating Expenses (Labour, Utilities, Maintenance)		
	e.	Waste Disposal		
Total - Year 1				
2	f.	Interest Expense		
	g.	Depreciation Expense		
	h.	Operating Expenses (Assume 5% per year increase)		
	i.	Waste Disposal (Assume 5% per year increase)		
Total - Year 2				

Notation:

A* - For example only - Actual costs vary.

5.

ASSESSMENT OF APPARENT COST SAVINGS				Comments
Wood Preservative	**Quantity**	**Cost**	**Total**	
j. Amount of recovered product				
k. Costs of recovered product				
l. Total value of recovered product				
Water/Solvent Reduction	**Quantity**	**Cost**	**Total**	
m. Amount of recovered water/solvent				
n. Cost per volume				
o. Total value of water				
Labour Reduction	**Quantity**	**Cost**	**Total**	
p. Amount of reduced labour				
q. Cost Labour per Unit				
r. Total Labour Savings				
(Other Costs)	**Quantity**	**Cost**	**Total**	
Waste Disposal Costs:				
Other Costs: *change in monitoring costs*				
Change in Utilities Costs:				
Change in Insurance Costs:				
Subtotal - Other				
Total Apparent Cost Savings:				

6. REAL COST SAVINGS = (Total Annual Costs - Total Apparent Cost)

Worksheet 15
Completed By: **Date:**

Summary of Analysis of Pollution Prevention Option

1. **Facility Name:** _____

2. **Option Name:** _____

3. **Briefly describe the option:**

_____

4. **Waste Stream(s) affected:**

_____

5. **Input Material(s) affected:**

_____

6. **Product(s) affected:**

_____

7. **Indicate Type:**

- O **Source Reduction**
  - O Equipment Related Change
  - O Personnel/Procedure Related Change
  - O Materials Related Change
- O **Recycling/Reuse**
  - O On-site
    - O Material reused for original propose
  - O Off-site
    - O Material used for lower quality purpose
    - O Material sold

8. **Financial analysis attached?**

_____

9. **Originally proposed by:** **Date:** _____

10. **Reviewed by:** **Date:** _____

11. **Approved by:** **Date:** _____

12. ***Reason for acceptance/rejection:***

_____

_____

_____

Worksheet 16
Completed By: **Date:**

Summary of Approved Pollution Prevention Actions

Approved Easily Implemented Pollution Prevention Measures (From Worksheet 11)	Responsibility	Anticipated Completion Date

Approved Pollution Prevention Measures Following Detailed Analysis (From Worksheets 12 – 15)	Responsibility	Anticipated Completion Date
Re: Recommendation:		
Re: Recommendation:		
Re: Recommendation:		
Re: Recommendation:		
Re: Recommendation:		

Worksheet A - 1 Completed By: Date:	**Wood Preservation Operational Checklist** Chemical Receiving and Unloading Area

General Objectives - Best Management Practices

* ***Ensure absence of potential catastrophic events during delivery of bulk chemicals.***
* ***Ensure contained delivery of bulk chemicals.***
* ***Ensure response capacity to catastrophic events.***
* ***Ensure control over all air, liquid or any solid releases during delivery.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
1.1 ACCESS/SECURITY					
1. Is off-loading area located away from high yard traffic routes?					
2. Is vehicle access restricted during delivery?					
3. Is the delivery pad close to chemical storage?					
4. Are there locking valves on liquid delivery lines?					
5. Is plant notified in advance of pending shipment?					
1.2 TANKAGE & PROCESS VESSELS					
6. Are bulk liquids transported and delivered by trained personnel?					
7. Are semi-bulk containers, drums or bags delivered by trained personnel?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

1.3 TRANSFER/PROCESS EQUIPMENT

8.	Is all transfer equipment in a contained area?				
9.	Are pumps located within a contained area?				
10.	Are pumps controlled by a local and remote emergency shut-off valve?				
11.	Are pumps accessible for inspection and maintenance?				
12.	Are all valves clearly identified with legible product identification tags?				
13.	Are valves free of apparent leakage?				
14.	Is transfer piping contained, accessible and visible?				
15.	Is piping protected from mechanical damage?				
16.	Are pipe and hoses rated for correct operating temperature and pressure?				
17.	Are pipes and hoses chemically resistant to delivered products?				
18.	Are pipes resistant to outside corrosion?				
19.	Are hose and pipe connections designed to be secure?				
20.	Are pipes protected from abrasion and movement? (By use of pipe sleeves)				
21.	Are delivery pipes connected for top delivery to tanks?				
22.	Are back-flow preventors installed on delivery lines?				
23.	Are all lines and tanks clearly identified?				
24.	Is the delivery system totally visible from the point of off-loading to tankage?				
25.	Are audible alarms installed on tanks, if visibility limited?				
26.	Are automatic control valves installed to shut off flow when tank is full?				

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

1.4 CONTAINMENT

27. Is an unloading pad and catchment sump used?					
28. Are impervious construction materials used?					
29. Are liquid-tight joints sealed with chemical-resistant material ?					
30. Are surfaces sealed to enhance ability to keep clean?					
31. Are pads designed to contain a large (tanker) spill?					
32. Are pads or sumps free of settling and cracks?					
33. Is pad located away from direct storm drainage from surrounding areas?					
34. Are pads and sumps lined?					

1.5 SAFETY DESIGN (FIRE/ELECTRICAL)

35. Is static protection for flammable liquids provided at the:					
a. cargo tank?					
b. receiving tank?					
36. Is all spark-producing equipment located away from flammable vapours?					
37. Are ground-fault interrupters installed in all potential wet areas?					
38. Are valves labelled with red tags for flammable liquids?					

1.6 DRIP/DUST CONTROL AND HOUSEKEEPING

39. Is the loading pad clean?					
40. Are dripless hose connections used?					
41. Are drip-trays used at all hose connections?					
42. Are minor drips to the pad periodically cleaned?					
43. Is washwater recovered for reuse?					

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
1.7 STANDARD OPERATING PROCEDURES (SOPs)					
44. Are SOPs in place for tanker unloading?					
45. Are emergency procedures posted and readily accessible?					
46. Is spill and emergency response equipment available?					
47. Are employees trained in normal operating procedures?					
48. Are employees trained in emergency procedures?					
49. Are safety procedures and systems tested annually?					
50. Are pipes which are not in use removed or capped?					
51. Are tankage capacity, contents and piping checked prior to unloading?					
52. Are all Federal Transport of Dangerous Goods Act (TDG) requirements fulfilled?					
53. Is an inventory tracking and management program in place?					
54. Do purchased chemicals meet all industry standards?					
1.8 RESIDUE MANAGEMENT					
55. Are tank vents controlled to prevent releases during unloading?					
56. Are residuals of solid products controlled during transfer?					
TOTAL SCORE:					
MEAN OF SECTION 1.0 SCORE:					

Worksheet A - 2	**Wood Preservation Operational Checklist**
Completed By:	Chemical Storage Area
Date:	

General Objectives - Best Management Practices

- ***Prevent catastrophic events as a result of fires, vandalism, accidents.***
- ***Ensure full containment of all chemicals in bulk storage.***
- ***Ensure ability to inspect and monitor all storage facilities.***
- ***Ensure response capabilities to catastrophic events.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
2.1 ACCESS/SECURITY					
1. Is there 24-hour security?					
2. Are bulk solid and liquid chemicals in locked areas?					
3. Are tank drain valves locked?					
2.2 TANKAGE AND PROCESS VESSELS					
4. Are tanks in sound physical condition, with no visible exterior rust or visible damage?					
5. Are underground tanks leak tested annually?					
6. Are aboveground tanks mounted on containment pad surfaces?					
7. Are tanks mounted in stable positions and anchored securely?					
8. Are tanks located within diked areas?					
9. Are tanks sheltered from weather by a fixed roof?					
10. Are tanks protected from mechanical impact?					
11. Are blocks, bags, or drums of chemical ingredients stored in sheltered areas?					
12. Are tanks protected from freezing (where applicable)?					
13. Are insulated tanks provided with inspection points?					
14. Is the complete tank accessible for detecting leaks?					
15. Are tank vents controlled? (not to workplace)					
16. Are storage areas fire-protected?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

2.3 TRANSFER/PROCESS EQUIPMENT

17.	Is piping rigid and permanent throughout the operation?				
18.	Is piping visible and accessible with a simple layout?				
19.	Is piping aboveground?				
20.	Is containment provided for sub-grade piping?				
21.	Are piping and fixtures chemically compatible?				
22.	Are valves identified by labelling or colour coding?				
23.	Are valves and pipes protected from impact?				
24.	Are lines protected from freezing (where applicable)?				
25.	Do valves have local drip/spill catch-trays?				
26.	Do pumps have local drip/spill catch-trays?				
27.	Are back-flow "preventors" on all water supply lines?				
28.	Are waterlines connected via top entry to tanks?				
29.	Is piping system designed to protect against inadvertent transfers?				
30.	Are reliable, accurate level indicators installed?				
31.	Is mechanical impact protection functional on sight glasses?				
32.	Are shut-off valves functional on all rupturable lines and gauges?				
33.	Is overflow piping provided from tanks to containment?				
34.	Are independent high-level alarms installed on tanks?				
35.	Are high-level alarms interlocked to the automatic shut- off of pumps?				
36.	Is there a 24-hour monitoring alarm?				
37.	Are there manual alarm buttons at potential major spill points?				

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

2.4 CONTAINMENT

38.	Are containment floors, dikes and joints structurally sound?					
39.	Are containment surfaces and joints sealed?					
40.	Is a secondary containment barrier built into a tank containment area?					
41.	Is subsurface leak detection provided?					
42.	Is there a subsurface leak containment and collection system?					
43.	Has spill containment volume been calculated and is it available?					
44.	Is the spill containment volume in excess of 110% of largest tank volume?					
45.	Is tank farm covered to prevent infiltration precipitation?					
46.	Does containment have alarms to identify spills?					
47.	Is the containment area visible?					

2.5 SAFETY DESIGN (FIRE ELECTRICAL)

48.	Are chemical bulk storage areas located away from combustible sources?					
49.	Are drums or bags stored in non-combustible structures?					
50.	Are ground-fault interrupters installed in all potential wet areas?					
51.	Are valves labelled with red tags for flammable liquids?					
52.	Is the fire-fighting equipment readily available?					

2.6 DRIP/DUST CONTROL AND HOUSEKEEPING

53.	Is there good housekeeping in storage and containment area?					
54.	Are all spills, washes and infiltrating water recycled?					
55.	Are all spills, washes and infiltrating water treated before discharge?					
56.	Is equipment available and capable of transferring and storing spilled chemicals?					
57.	Are contaminated surfaces designed to minimize spill pool size?					
58.	Are minor spills cleaned?					
59.	Is containment designed to minimize tracking of fluids?					

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
2.7 STANDARD OPERATING PROCEDURES					
60. Are all tanks and storage areas labelled?					
61. Is storage area inspected weekly and records kept?					
62. Are records kept of annual UST inspections?					
63. Are Emergency Response (ER) plans in place for spill and fire?					
64. Are short forms of the ER plans posted?					
65. Are personnel trained in ER?					
66. Is ER equipment available and accessible?					
67. Does Emergency Response Equipment (ERE) include appropriate absorbents?					
68. Does ERE include personal protection equipment?					
69. Do ER measures allow for rapid, effective fire control?					
70. Can fire-fighting liquids and residues be contained for treatment?					
2.8 RESIDUE MANAGEMENT					
71. Are tank vents controlled?					
72. Are releases of solids controlled?					

TOTAL SCORE:		
MEAN OF SECTION 2.0 SCORE:		

Worksheet A - 3	**Wood Preservation Operational Checklist**
Completed By:	Chemical Mixing
Date:	

General Objectives - Best Management Practices

- ***Ensure full containment of all products during mixing process.***
- ***Ensure adequate response to non-routine events.***
- ***Ensure control of all air, liquid and/or solid releases during mixing.***

	Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
3.1	**ACCESS/SECURITY**					
1.	Is the chemical mixing area limited only to operators?					
2.	Is the chemical mixing area locked during plant shut-down?					
3.	Are all dispensing systems de-energized and locked between use?					
3.2	**TANKAGE AND PROCESS VESSELS**					
4.	Is a permanent, closed mixing system used?					
5.	Is equipment provided for safe handling of drums or solids?					
6.	Is a high-level alarm installed to prevent mix tank overflow?					
3.3	**TRANSFER/PROCESS EQUIPMENT**					
7.	Are high-level alarms interlocked to tank feed pumps?					
8.	Are the mixing facilities visible from the control area?					
9.	Are controls and transfer equipment isolated from spills to avoid damage?					
10.	Are valves and pipes colour coded?					
11.	Do valves and pumps have local drip/spill catch-trays?					

	Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
3.4	**CONTAINMENT**					
12.	Are all tanks and chemical handling areas fully contained?					
13.	Is spill containment volume sufficient?					
14.	Are spill containment joints sealed?					
15.	Are floors around tanks, dikes and joints structurally sound?					
16.	Are tanks protected from freezing?					
17.	Are grates or other methods used to minimize tracking of fluids from containment surfaces?					
18.	Are surfaces sealed and free of cracks?					
19.	Are surfaces sloped for drainage of wetted surfaces?					
20.	Is containment protected from the weather?					
3.5	**SAFETY DESIGN (FIRE/ELECTRICAL)**					
21.	Does mixing occur in a non-combustible structure?					
22.	Are ground-fault interrupters installed in all potential wet areas?					
23.	Is fire-fighting equipment readily available?					
3.6	**DRIP/DUST CONTROL AND HOUSEKEEPING**					
24.	Is the area free of staining, dusts or solid debris?					
25.	Is local containment provided at all potential points?					
26.	Is splash protection provided during any open transfers?					
27.	Is tracking or cross contamination from the containment areas absent?					
28.	Are all spills, washes and contaminated wastewaters reused, collected and/or treated before discharge?					
29.	Is a system available to clean up dust and solid debris?					
3.7	**STANDARD OPERATING PROCEDURES**					
30.	Is an SOP for chemical handling available?					
31.	Are all tanks labelled?					
32.	Is training provided to chemical mixing personnel?					
33.	Is spill response clean-up equipment available?					
34.	Is personal protection equipment available?					
35.	Is a fire response and control plan developed?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
3.8 RESIDUE MANAGEMENT					
36. Are emission controls installed at all transfer points?					
37. Are areas free of apparent residual releases?					

TOTAL SCORE:		
MEAN OF SECTION 3.0 SCORE:		

Worksheet A - 4	**Wood Preservation Operational Checklist**
Completed By:	Chemical Application Area
Date:	

General Objectives - Best Management Practices

- ***Ensure full containment of wood preservatives during application***
- ***Ensure absence of a catastrophic event/spill***
- ***Ensure the appropriate operating procedures are implemented***
- ***Ensure the control of residues***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
4.1 ACCESS/SECURITY					
1. Is the area limited to operators?					
2. Can the area be locked when not in use?					
4.2 TANKAGE AND PROCESS VESSELS					
3. Is the cylinder designed to facilitate drainage of excess preservative?					
4. Is the retort door protected from opening when full?					
5. Are all pressure vessel inspection certificates current?					
6. Are independent interlock alarms installed on the retort doors?					
4.3 TRANSFER/PROCESS EQUIPMENT					
7. Is the piping permanent and rigid throughout the plant?					
8. Is the piping visible and accessible with a simple layout?					
9. Are pipes and valves identified by labeling or colour coding?					
10. Is the piping aboveground or in containment?					
11. Are piping and valves chemically compatible?					
12. Are pipes and valves protected from impact?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

4.4 CONTAINMENT

13.	Is containment volume in excess of 110% of largest tank or cylinder?					
14.	Are sumps and containment constructed with leak-proof joints and impermeable surfaces?					
15.	Are sumps and containment designed to minimize infiltration of water?					
16.	Are below-ground sumps, recycle tanks and containers monitored for leakage?					
17.	Are all sumps protected by independent high-level alarms?					
18.	Is the immediate drip area impermeable and curbed?					
19.	Is the immediate drip area large enough to hold all treated wood until dripping is complete?					
20.	Are drippings collected and reused?					

4.5 SAFETY DESIGN

21.	Is the operator control area segregated from the retort and containment area?					
22.	Is the shelter non-combustible?					
23.	Is the proper fire-extinguishing equipment available?					
24.	Are ground-fault interupters installed in all potential wet areas?					

4.6 DRIP/DUST CONTROL AND HOUSEKEEPING

25.	Is the process area free of noticeable leakage?					
26.	Are local drip-trays provided under valves, pumps or fittings?					
27.	Are the pump seals apparently leak-proof?					
28.	Is the sump area relatively free of liquid?					
29.	Is pump-seal and cooling water controlled or recycled?					

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*

4.7 STANDARD OPERATING PROCEDURES

30.	Are written operating procedures available?				
31.	Is a fire/spill contingency plan in place?				
32.	Are spill response materials readily at hand?				
33.	Are process controls designed for simple, unambiguous operations?				
34.	Does the process control area have a good view of operations?				
35.	Is the wood cleaned prior to placement retort?				
36.	Is the treated wood free of apparent bleeding and/or free of solid residues?				
37.	Is the moisture content consistent in all wood about to be treated?				
38.	Are retorts dedicated to specific preservatives?				
39.	Is an inventory control in place? (Chemicals used vs chemicals in treated wood)				
40.	Are wastes less than 1 drum/month/retort?				

4.8 RESIDUE MANAGEMENT

41.	Are vacuum pump exhausts directed to condenser?				
42.	Are tank vents clear?				
43.	Are all liquid, vapour, and solid releases obviously in control?				

TOTAL SCORE:		
MEAN OF SECTION 4.0 SCORE:		

Worksheet A - 5	**Wood Preservation Operational Checklist**
Completed By:	Treated Wood Handling & Storage Area
Date:	

General Objectives - Best Management Practices

- ***Ensure proper containment of the process and storage areas***
- ***Ensure the recycling of washwaters by the appropriate facilities***
- ***Ensure proper operating procedures in the process areas***
- ***Ensure management of the residuals***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
5.1 ACCESS/SECURITY					
1. Is access to storage areas restricted?					
2. Is treated-wood storage confined to a specific area?					
5.2 TANKAGE AND PROCESS VESSELS					
5.3 TRANSFER/PROCESS EQUIPMENT					
5.4 CONTAINMENT					
3. Are all potential drippage areas:					
a. Impermeable?					
b. Roofed and curbed/diked to prevent entry of surface runoff and precipitation?					
4. Is tracking of liquids from drip areas minimized?					
5. If sheltered, is shelter constructed of non-combustible materials?					
6. Is treated-wood storage confined to a specific area?					
7. If unpaved, is storage area located away from surface waterbodies?					
8. If paved, is the storage area curbed?					
9. Are surface drainage waters from the treated-wood storage area separated from surface drainage areas of other yard areas?					
10. Are surface drainage waters collected at common points?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
5.5 SAFETY DESIGN (FIRE/ELECTRICAL)					
11. Are storage areas free of combustible debris and ground vegetation?					
12. Are roof and shelter walls (if any) of non-combustible materials?					
5.6 DRIP/DUST CONTROL AND HOUSEKEEPING					
13. Are drippage areas free of standing liquids?					
14. Is the area free of debris?					
15. Are washwaters recycled?					
5.7 STANDARD OPERATING PROCEDURES					
16. Prior to placement of treated wood in storage yard:					
a. Are operational measures taken to enhance fixation of wood-borne preservatives?					
b. Are operational measures taken to minimize bleeding of oil-borne preservation?					
5.8 RESIDUE MANAGEMENT					
17. Are surface drainage waters monitored?					
18. Are chemical releases within permit, regulatory and/or acceptable limits (as per toxicology data)?					
19. Are solids (debris) collected and disposed of properly?					

TOTAL SCORE:		
MEAN OF SECTION 5.0 SCORE:		

Worksheet A - 6	**Wood Preservation Operational Checklist**
Completed By:	Chemical Dispensing - Fuel/Solvent/
Date:	Vehicle Maintenance

General Objectives - Best Management Practices

- ***Prevent catastrophic events such as a result of fires, vandalism or accidents.***
- ***Ensure full control of chemicals during handling.***
- ***Ensure control of all air, liquid and/or solid releases during use.***
- ***Ensure response capability to non-routine events.***

	Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
6.1	**ACCESS/SECURITY**					
1.	Are the dispensing areas limited only to operators?					
2.	Are the areas locked during plant shut-down?					
3.	Are all dispensing systems de-energized and locked between use?					
6.2	**TANKAGE AND PROCESS VESSELS**					
4.	Is a permanent, closed system used?					
5.	Is equipment provided for safe handling of drums or solids?					
6.3	**TRANSFER/PROCESS EQUIPMENT**					
6.	Are controls and transfer equipment isolated from spills to avoid damage?					
7.	Are valves and pipes colour coded?					
8.	Do valves and pumps have local drip/spill catch-trays?					
9.	Are non-gravity fuel systems used?					
6.4	**CONTAINMENT**					
10.	Are all aboveground tanks and chemical-use areas fully contained?					
11.	Is spill containment volume sufficient?					
12.	Are spill containment joints sealed?					
13.	Are floors around tanks, dikes and joints structurally sound?					
14.	Were the underground tanks leak tested?					
15.	Are grates or other methods used to minimize tracking of fluids from containment surfaces?					
16.	Are surfaces sealed and free of cracks?					
17.	Are surfaces sloped for drainage of wetted surfaces?					
18.	Is containment protected from the weather?					

Section Description with Suggested Assessment Criteria		Yes	No	N/A	Comments	Score
6.5	**SAFETY DESIGN (FIRE/ELECTRICAL)**					
19.	Are fuels and solvents dispensed away from non-combustible structure?					
20.	Are ground-fault interrupters installed in all potential wet areas?					
21.	Is fire-fighting equipment readily available?					
6.6	**DRIP / DUST CONTROL AND HOUSEKEEPING**					
22.	Are areas of use free of staining and dusts?					
23.	Is local containment provided at all potential release points?					
24.	If any open transfer operations are used, is splash protection provided?					
25.	Is tracking or cross contamination from the containment areas absent?					
26.	Are all spills, washes and infiltrating water treated before discharge?					
27.	Is a procedure available to clean up solid debris?					
6.7	**STANDARD OPERATING PROCEDURES**					
28.	Is an SOP for the handling of each product available?					
29.	Are all tanks labelled?					
30.	Is training provided to personnel?					
31.	Is spill response clean-up equipment available?					
32.	Is personal protection equipment available?					
33.	Is a fire response and control plan developed?					
34.	Is the local fire department aware of the plan?					
35.	Are laboratory solvents and wastes controlled?					
6.8	**RESIDUE MANAGEMENT**					
36.	Are emission controls installed?					
37.	Are areas free of apparent residual releases?					

TOTAL SCORE:		
MEAN OF SECTION 6.0 SCORE:		

Worksheet A - 7	**Wood Preservation Operational Cecklist**
Completed By:	Residual Handling
Date:	

General Objectives - Best Management Practices

- ***Ensure control of all air, liquid and/or solid releases.***
- ***Ensure compliance with all regulatory requirements.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
7.1 ACCESS/SECURITY					
1. Are waste treatment systems accessible only to plant operators?					
7.2 PROCESS VESSELS					
7.3 NTROL EQUIPMENT					
2. Is equipment provided for safe collection and handling of sludges?					
3. Is an effluent treatment system used?					
4. Are air emissions from retorts and condensing systems controlled?					
5. Are air emissions from kilns controlled?					
7.4 AINMENT					
6. Is the waste treatment area contained?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score

7.5 I (FIRE/ELECTRICAL)

7. Are ground-fault interrupters installed in all potential wet areas?					

7.6)L AND HOUSEKEEPING

8. Are chemical containers rinsed and disposed? as per suppliers' recommendations?					
9. Is dust and debris minimized at the yard area?					
10. Are all effluents reused and/or routed through an on-site treatment system?					

7.7 ATING PROCEDURES

11. Is an SOP for residual handling available?					
12. Is a record of residual handling maintained?					
13. Does regular monitoring of wastewater treatment quality occur?					
14. Are monitoring results assessed to evaluate needs for improvement?					

7.8 MANAGEMENT

15. Are all permit requirements fulfilled?					
16. Is the facility free of complaints from neighbouring properties?					

TOTAL SCORE:	
MEAN OF SECTION 7.0 SCORE:	

Worksheet A - 8	**Wood Preservation Operational Checklist**
Completed By:	Waste Storage Area
Date:	

General Objectives - Best Management Practices

* ***Ensure compliance with all regulatory requirements.***
* ***Provide secure containment.***
* ***Provide proper contingency measures.***

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*
8.1 ACCESS/SECURITY					
1. Is access to unauthorized persons prevented by a surveillance system or barrier?					
2. Are all valves, pumps. etc., locked?					
3. Are signs in place indicating the area is restricted?					
8.2 TANKAGE AND PROCESS VESSELS					
4. Are Special Wastes stored so that manual/visual inspection for leaks is enabled?					
5. Are containers compatible with Special Wastes?					
6. Are containers enclosed?					
8.3 ɔCESS EQUIPMENT					
7. Is overflow protection provided for tanks with liquid wastes?					
8. Is a high-level alarm set at 90% of full liquid level of a tank?					
9. Is there an automatic feed cutoff system at 95% of full liquid level?					
8.4 CONTAINMENT					
10. Can containment system hold 110% of largest volume of any container?					
11. Can containment system hold 25% of the total volume in storage?					
12. Is containment of impervious material with liquid-tight joints?					

Section Description with Suggested Assessment Criteria	Yes	No	N/A	Comments	Score
8.5 SAFETY DESIGN (FIRE/ELECTRICAL)					
13. Is grounding provided where static buildup may occur?					
14. Are wastes and ignition sources separated by distance or by 2-hour fire rated barrier?					
15. If waste is ignitable, is 24-hour fire alarm system installed?					
16. Is a fire suppression system installed?					
17. Is facility non-combustible with minimum fire rating of 2 hours?					
8.6 OL AND HOUSEKEEPING					
18. Are dripless hose connections used for transferring liquid wastes?					
19. Is aisle space maintained to enable access to any part of the facility?					
8.7 STANDARD OPERATING PROCEDURES					
20. Is a written SOP available?					
21. Are inspections regularly conducted?					
22. Is training provided with respect to:					
a. Duties and responsibilities?					
b. Protective equipment?					
c. Fire and explosion response procedures?					
d. Spill response?					
e. Communications and alarm systems?					
f. Use of abatement and clean-up equipment?					
g. Shut-down operations?					
h. Hazards of wastes?					
23. Are records kept of training, duties and responsibilities?					

Section Description with Suggested Assessment Criteria	*Yes*	*No*	*N/A*	*Comments*	*Score*

8.8 MANAGEMENT

24. Is air ventilation provided in facility?					
25. Are emissions, if any, controlled?					

TOTAL SCORE:		
MEAN OF SECTION 8.0 SCORE:		