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*PH Associates, Inc.
1995*

ENVIRONMENTAL ASSESSMENT REPORT

**Zambia Steel and Building Supplies Limited, Timber Storage Facility
Malambo Road
Lusaka, Zambia
Date Assessed : May 15, 1995**

**Prepared for the
ZAMBIA PRIVATISATION AGENCY**

**Prepared by
P H ASSOCIATES, INC.**

August 1, 1995

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1. INTRODUCTION

An environmental assessment was conducted by PH Associates, Inc. of the Zambia Steel and Building Supplies Limited (ZSBS), Timber Storage Facility, Lusaka, Zambia. The purpose of the assessment was to determine whether air, soil, surface water, or groundwater has been potentially affected at the facility site by current or past site activities or processes, and to provide information concerning potential environmental liabilities. This assessment was based on Ministry reviews and interviews, review of applicable environmental regulations, aerial photographs, facility records, interview of site personnel, and an onsite/offsite reconnaissance of the property.

This report has been prepared for the Zambia Privatization Agency (ZPA) pursuant to a contractual agreement between the U S Agency for International Development (USAID) and PH Associates, dated March 16, 1995. The report is based on limited documented information and interviews with available facility personnel, is accurate to the best of PH Associates knowledge and belief, and has been prepared for the exclusive use of ZPA for specific application to the above-referenced facility. No warranty, expressed or implied, is made. In the event of any changes in the nature, design or locations of the facility site or structures, the conclusions and recommendations in this report should not be considered valid unless the changes are reviewed and the conclusions are verified in writing by PH Associates. This report should not be construed to be a legal representation or interpretation of environmental laws, rules, or regulations.

1.1 Background

As part of a preliminary information gathering activity in 1992, the ZPA distributed a questionnaire requesting disclosure of specific company and site information that would be relevant to completing the environmental assessment. The questionnaire for the ZSBS Timber Storage facility in Lusaka was not returned to ZPA.

Additional environmental data was requested by PH Associates in the form of a questionnaire submitted to the facility during June and July 1994. The purpose of the PH Associates questionnaire was to obtain information that was either not available at the time, or to supplement information not fully detailed in the returned ZPA questionnaire. The additional data was obtained by distributing an extensive environmental survey questionnaire to facility management, and requesting their cooperation in completing and returning the survey form. The PH Associates questionnaire was not returned.

The ZSBS Timber Storage facility is located on Malambo Road in the industrial area of Lusaka, Zambia and has been closed since 1991 (Section 7, Figure 1). Little information concerning the facility and past operations was available for review by PH Associates. According to the current ZSBS Management, the personnel of the Timber Storage facility were dismissed in 1991 and were therefore not available for interview.

The facility was previously owned by Timber Merchants Company (TMC) and operated as a sawmill and wood treating facility since the 1950's. Operations under TMC included timber milling, wood treatment, and retail sales of the wood products and hardware goods. In 1975, ZSBS purchased the facility from TMC. ZSBS continued operating the wood treating plant until 1977, when the plant was closed and the facility operated as a retail timber and hardware store.

ZSBS also owns a Door Factory on Kapatu Road and a Head Office and Storage Facility on Buyantanshi Road in Lusaka. These facilities are approximately 400 meters and 2 kilometers west respectively, of the ZSBS Timber Storage facility. The main

manufacturing facility for ZSPS is located on Plot 4645 Chingola Road in Kitwe, Zambia. These facilities are also assessed by PH Associates and addressed in separate reports.

Many other industries are located within a 1 kilometer radius of the ZSBS Timber Storage facility, including Komatsu Limited, a vehicle and heavy equipment repair facility; Match Corporation Limited, Steel Fabrications Limited, National Milling Company, and the United Bus Company depot. The Mulobela and Namununga residential areas are located within a 1 kilometer radius of the ZSBS Timber Storage Facility to the north and south respectively.

2. SCOPE OF WORK

PH Associates performed an environmental assessment to assess and document potential adverse environmental effects on air, soil, surface water, and groundwater that might have resulted from either current or past activities on the site. This assessment was qualitative, based on readily available existing information, interviews and field observations. It did not involve environmental field testing or sampling, laboratory analyses, or an asbestos survey.

In general, PH Associates staff endeavored to:

- Conduct interviews with Ministry personnel and other pertinent organizations to assess the current state of environmental affairs and regulations.
- Review available Ministry reports on past facility inspections and geologic and hydrogeologic data.
- Evaluate existing environmental regulations that are applicable to assessing potentially adverse effects on air, soil, surface water and groundwater.
- Review available facility files to investigate past or current activities on the site with respect to environmental permits and compliance, wastewater, site drainage, and air emissions; and handling, storage, treatment, and disposal or spills of potentially hazardous materials and wastes.
- Review readily available aerial photographs of the site and adjacent properties. In addition, PH Associates reviewed available drawings of the site showing facility layout, underground piping, buried tanks, utilities and site drainage systems.
- With the consent of the site management, perform an onsite field reconnaissance of the facility. During the field reconnaissance, PH Associates looked for evidence of releases of potentially hazardous chemicals, petroleum products, or process wastes to the soil, surface water, and groundwater by spilling, dumping, burning or burial of materials.
- Perform a field reconnaissance of the area, within approximately 1 kilometer radius of the facility, that was feasible within the level of effort identified for this contract. During the field reconnaissance, PH Associates attempted to identify neighboring commercial and industrial sites that may potentially adversely affect the environmental conditions at the facility.
- Interview available staff who were knowledgeable of current and past site activities and processes at the facility and of surrounding properties.
- Document the findings and observations of the visited site with photographs. Copies of these photographs are included in Section 8 of this report.
- Prepare an Environmental Assessment Report presenting the areas of environmental concerns, results of the Ministry records, applicable environmental regulations, aerial photograph reviews, site visits and personnel interviews, and provide conclusions and recommendations for submission to USAID and ZPA.

3. METHODOLOGY

This section presents the methodology used to complete the scope of work for the environmental assessment project. Methods used include a review of the ministry records, environmental regulations, aerial photographs, facility records, ministry and facility personnel interviews, and site visits. Results of the assessment are presented in Section 4.0, and the conclusions and recommendations are presented in Section 5.0.

3.1 Ministry Records Reviews and Interviews

PH Associates interviewed Ministry personnel and other pertinent organizations to discuss the current state of environmental affairs and regulations in Zambia. Ministry records, such as factory inspections, geologic and hydrogeologic reports, were also obtained and reviewed for the sites to be assessed.

The following Ministries personnel and other pertinent organizations were interviewed and the results of these discussions are included in Appendix C.

Environmental Council of Zambia

Mr Julius Kanyembo, Director - April 13, 1995

Mrs Mabwe, Legal Officer - April 24, 1995

Ministry of Energy and Water Development, Water Affairs

Mr Stan Chisala, Senior Engineer - April 18, 1995

Ministry of Labor and Social Security, Chief Inspector of Factories

Mr K Mapani, Chief Inspector of Factories - April 20, 1995

Mr Kakoma Chivundu, Inspector of Factories - April 28, 1995

Mr Lukwesa, Inspector of Factories - April 28, 1995

Ministry of Mines and Minerals Development, Geological Survey Department

Mr O Ng'ambi, Acting Director - April 24, 1995

Mr Clement Namateba, Senior Geologist (PGR) - April 24, 1995

International Bank for Reconstruction and Development (World Bank)

Mr Gedion Nkojo, Resident Representative - April 24, 1995

Mr Julius Chileshe, Natural Resource Economist - April 24, 1995

3.2 Environmental Regulations

Legislative Policies, Acts, and Regulations enacted by Zambia were reviewed for their applicability to completing environmental assessments of the facilities identified by the ZPA. The purpose of the review was to evaluate and summarize those guidelines pertaining to environmental issues which industries in Zambia are required to adhere. A summary of the environmental regulations for Zambia is presented in Appendix D, Table I. Twelve regulations were selected for review based on their potential applicability to the assessed sites. Six of these regulations contained applicable environmental laws addressing air, soil and water pollution and include:

- Water Act of 1949
- Environmental Protection and Pollution Control Act of 1990
- Water Pollution Control Regulations of 1993
- Waste Management Regulations of 1993
- Mining (Dumps) Regulations of 1972
- Mines and Minerals Act of 1976

The applicable regulations or laws used to evaluate environmental compliance of the facilities assessed are summarized in Table 2 of Appendix D. Only recently have regulations addressing the protection of human health and the environment in any detail been enacted. Prior to the passing of the Environmental Protection and Pollution Control Act of 1990 and the establishment of the Environmental Council of Zambia, legislation mostly addressed issues of worker health and safety.

Currently, no guidelines have been implemented by the Environmental Council of Zambia defining specific materials or chemicals as hazardous. Application of the term "hazardous" is generally based on specific characteristics of a substance or constituent such as ignitability, corrosivity, reactivity, and toxicity. Depending on the concentration of the constituent in sludges, soil, surface water, or groundwater, the constituent may or may not be considered hazardous.

Since Zambia has not developed hazardous chemicals guidelines, PH Associates applied fourteen programs adopted by the United States Environmental Protection Agency (EPA) and State Governments that identify substances as either hazardous, extremely hazardous, toxic or carcinogenic. The California EPA May 1992 Chemical Cross-Index reference tabulates all the hazardous chemicals and compounds listed in these programs and was used by PH Associates to assess whether substances found during the assessments were potentially hazardous.

3.3 Aerial Photographs

On April 12, 1995 the Mapping Services Section of the Survey Department was visited by PH Associates to review any available and applicable aerial photographs of the sites to be assessed. The aerial photographs were reviewed to identify possible changes in structures, topography, site activities, processes, and waste disposal practices that could be used as additional information to the current site conditions observed during PH Associates visit.

Review of the aerial photographs from the Survey Department indicated that the photographs and any enlargements are at a scale where ground objects are much too small to provide any useful information or details of the sites. Aerial photographs were available at a scale of 1:30,000 and enlargements at a scale of 1:7,500. Based on PH Associates past experience it was determined that no applicable information would be gained from use of aerial photographs at this scale.

3.4 Facility Site Reviews

Site reviews were conducted by PH Associates and included site visits, analysis of facility records and facility personnel interviews.

3.4.1 Site Visits

PH Associates conducted a field reconnaissance of the site focusing on identifying site activities and practices that have or may have potential environmental effects in the future. An Environmental Assessment Checklist survey form was completed during the field reconnaissance and is attached in Appendix E. The Location Map and Site Plan for the facility are attached in Section 7. Photographs of the field observations taken during the site visit are included in Section 8.

A field reconnaissance of the area within approximately 1 kilometer radius of the facility was also performed to identify neighboring industries that may potentially adversely affect the environmental conditions at the facility. The offsite reconnaissance, that was feasible for the contracted level of effort, involved interviews with facility personnel and a drive-by of the surrounding area. No offsite industries were contacted or visited by PH Associates.

3.4.2 Facility Records

Facility records and aerial photographs applicable to completing the environmental assessment were requested from the facility. Records requested included documents containing information and details on building and structure designs, underground storage tanks, process flow diagrams, process materials and wastes, waste disposal, environmental permits, monitoring programs and controls, and documentation on storage or use of potentially hazardous materials. These records, if made available to PH Associates, are attached in Appendix F.

3.4.3 Interviews

Interviews were conducted with available facility personnel, usually site managers, who could provide information on past or current site activities and processes, potentially hazardous materials use and storage, spills, accidents, utilities, fuel storage areas, maintenance practices, waste disposal, permits, monitoring programs, and laboratory analyses.

4. RESULTS OF ENVIRONMENTAL ASSESSMENT

The results of the environmental assessment are presented below and include the following sections: Facility Ministry Records/Site Aerial Photographs/Facility History and Records/Site Activities and Processes/Environmental Setting/Field Reconnaissance Results and Applicable Environmental Regulations.

4.1 Facility Ministry Records

No environmental data for the ZSBS Timber Storage Facility was available from the Ministries.

4.2 Aerial Photographs

No aerial photographs of the ZSBS Timber Storage Facility were available that would provide PH Associates with information applicable to completing the environmental assessment.

4.3 Facility History and Records

On May 15, 1995, Mr J Holloway of PH Associates interviewed Mr Singh, General Manager of ZSBS Lusaka, Mr Kamuchele, ZSBS Door Factory Manager, and Mr Banda, ZSBS Door Factory Production Manager, to obtain information on ZSBS Timber Storage Facility's history, processes, products, and available facility records, maps, and aerial photographs. Since the facility was closed in 1991 and the Management dismissed, little information concerning the Timber Storage Facility was available.

A Facility Site Plan was drafted by PH Associates during the site visit and is shown in Section 7, Figure 2.

4.4 Site Activities and Processes

The ZSBS Timber Storage facility is currently closed. During operation, facility activities included timber cutting, wood treating, timber and hardware goods storage, and retail sales of timber and hardware goods. Wood was treated at the facility from the 1950's through 1975 under TMC operations and until 1977 by ZSBS. Wood cutting operations at the facility involved cutting timber into various sizes and lengths as requested by the customer. Sawdust from the wood cutting area was collected in a sawdust cyclone.

Wood treatment was performed in the wood treatment plant that generally consisted of two steel storage tanks and a steel pressure vessel (Section 8, Photographs 1 and 2). Products produced in the wood treatment plant included railroad ties and fence posts. No information concerning production rates was available.

The wood treating process began first by loading untreated timber onto a small railway car and placing the loaded railway car into the steel pressure vessel. The vessel was then filled with a mixture of wood treating chemicals and pressurized. According to Mr Kamuchele, either creosote or tanolith was used in the process. Creosote was mixed with a carrier oil such as diesel fuel while tanolith was mixed with water. No information was available on the quantities of creosote or tanolith used at the wood treating plant.

After the wood was treated, the liquid mixture was pumped back into storage tanks for reuse and the wood unloaded. The treated wood was stored in the treated wood storage area. The wood treating mixture was reused several times before a new mixture was needed. The spent mixture was drained from the pressure vessel and discharged into a drain at the bottom of the pressure vessel containment area (Section 8, Photograph 3). Although not confirmed by Mr Kamuchele, PH Associates believe this drain was connected to the stormwater drains at the facility and eventually discharged the process effluent offsite into an unlined stormwater drainage ditch (Section 7, Figure 2).

According to Mr Kamuchele, equipment maintenance for the facility and vehicle fueling was performed at the ZSBS Main Office facility on Buyantanshi Road. No underground fuel storage tanks (USTs) were located on the property.

4.5 Environmental Setting

4.5.1 Topography

The regional topography of Lusaka consists generally of flat-lying, high plateau with more hilly country to the north-northeast. The ZSBS Timber Storage facility is located in northern Lusaka on a flat-lying area at an approximate elevation of 1,220 meters above mean sea level. The site is partially paved with large areas covered with stone and grass.

The Ngwerere and Chunga River and their tributaries are the two main surface water drainage systems for the northern Lusaka area. A tributary of the Chunga River is located approximately 3 kilometers west of the facility and generally flows toward the north, while the Ngwerere River flows towards the northwest and is located 2 kilometers from the facility. Surface water at the ZSBS Timber Storage facility is collected in onsite stormwater collection drains that discharge into an unlined ditch along Malambo Road. The drainage ditch is part of the industrial area stormwater drainage system that eventually conveys surface water runoff in the area to the Lusaka Water and Sewage Company (LWSC) sewage ponds north of the facility. Except during period of heavy precipitation, surface water runoff from the ZSBS Timber Storage facility infiltrates into the subsurface before reaching the LWSC facility (Section 7, Figure 2).

4.5.2 Geology

The geology of the Lusaka area is complex and consists of highly folded bedrock of the Matero Formation and younger Lusaka Formation. The surface bedrock for northern Lusaka is predominantly Matero Formation (mostly schists and slate with some interbedded quartzite) while southern Lusaka consists of Lusaka Formation (mostly limestone). These Middle to Lower Katanga (Precambrian) units were uplifted, faulted, and eroded during several major orogenic (uplift) events, with the latest occurring approximately 460 million years ago (Thieme, 1983). These events have formed the existing high plateau peneplain characteristic of Zambia.

The Matero Formation is more resistant to erosion than the soluble Lusaka Formation, and thus explains the more hilly terrain to the north-northeast. Varying thickness of residual soil (laterites) overly the bedrock. Generally sandy soils tend to develop on the Lusaka Formation while more clayey soil is developed on the Matero Formation. The ZSBS Timber Storage facility is located

on an unknown thickness of soil overlying the Matero Formation near the unconformable contact of the Lusaka Formation.

4.5.3 Hydrogeology

The Lusaka Formation is the most important aquifer in the area due to its high solubility that produces cavities, joints, and fissures in the bedrock, and is generally located in southern Lusaka. Based on 1950-60s borehole data from the Lusaka City Water Supplies wells, the Lusaka Formation Aquifer was located at initial depths of 40 to 75 meters below the ground surface (NRGS, 1963). With the increased development of Lusaka since the 1960s, the initial depth to water in the Lusaka Formation Aquifer has most likely been lowered.

Shallower water is commonly encountered in the Lusaka area between 2 and 11 meters below the ground surface (NRGS, 1963). Vertical migration of surface water is a major contributor to the shallow and deeper groundwater units. There are several reasons for the development of these shallower water units:

- Perched water tables commonly develop on the more clayey laterite soils.
- Former drainage channels that have been subsequently buried by soil deposition act as subsurface drainage ways.
- Due of the large quantity of soluble limestone, extensive subsurface drainage ways have developed within the bedrock cavities and fissures.

Based on the surface water drainage system established in the industrial area and the topography of northern Lusaka area, shallow groundwater likely flows northward towards the tributaries of the Ngwerere and Chunga Rivers. Heavy pumping from high yielding wells in the heavy industrial area may potentially cause localized groundwater movement towards the producing boreholes. According to Mr Kamuchele, one borehole is located on the facility (Section 8, Photograph 4). No borehole information for the ZSBS Timber Storage facility or surrounding industrial area was available for review by PH Associates. However, Mr Kamuchele stated that Match Corporation Limited to the north of the ZSBS Timber Storage facility has a borehole.

4.6 Field Reconnaissance Results

On May 15, 1995, a tour of the ZSBS Timber Storage facility by PH Associates was provided by Mr B Kamuchele, ZSBS Door Factory Manager. During the tour, past operations and products were discussed. Results of the field reconnaissance and interview with the ZSBS Management are presented below.

4.6.1 Utilities

The following is a summary of the utilities that service the ZSBS Timber Storage facility as reported by Mr Kamuchele.

4.6.1.1 Electricity

Zambia Electricity Supplies Corporation Limited (ZESCO) provide electricity to the ZSBS Timber Storage facility. According to Mr Kamuchele, no electrical transformers are located at the facility.

4.6.1.2 Water Supplies

The ZSBS Timber Storage facility water Supplies is obtained, at least partially, from an on-site borehole (Section 8, Photograph 4). Mr Kamuchele did not know the annual water usage, or if the facility also obtains water from the LWSC.

4.6.1.3 Sanitary Sewer

Mr Kamuchele did not know whether the facility was serviced by the LWSC system. No septic tanks were observed during the site visit.

4.6.1.4 Stormwater Control

Surface water runoff from the facility is collected in stormwater collection drains (Section 8, Photographs 5 and 6). The effluent is discharged into an unlined ditch along Malambo Road.

4.6.2 Structures

Structures at ZSBS Timber Storage Facility are made of cement block, bricks, steel, and have concrete floors and asbestos pipe insulation and roofing sheets. These structures and facility areas are shown on the Facility Site Plan (Section 7, Figure 2) and include:

- Timber Warehouse No 1 Area (Section 8, Photograph 7)
- Timber/Hardware Warehouse No 2 Area
- Two office buildings
- Wood Cutting Area under a steel awning with Sawdust Cyclone (Section 8, Photograph 8)
- Wood Treatment Plant (Section 8, Photograph 1)
- Treated Wood Storage Area (Section 8, Photograph 1)
- Sawdust Cyclone
- Canteen (Section 8, Photograph 7)
- Timber Storage Yard (Section 8, Photograph 7)
- One borehole (Section 8, Photograph 4)

4.6.3 Environmental Effects and Observations

Observations made during the field reconnaissance and any potential environmental effects are discussed in the following sections.

4.6.3.1 Chemicals, Petroleum, and Process Materials

Little information concerning chemicals, petroleums, process materials and the average annual quantities used at ZSBS Timber Storage facility was provided by Mr Kamuchele during the site visit. Mr Kamuchele did state that creosote, tanolith, water, and diesel fuel were used onsite in the operation of the wood treatment plant. This plant closed in 1977. No information on the quantity of materials used or disposed of were provided.

Fifteen unmarked, 210 liter drums were observed at the treated wood storage area during the site visit. The contents of the drums was not known (Section 8, Photograph 9).

4.6.3.2 Process Waste Streams

Currently, there are no waste streams produced at the ZSBS Timber Storage facility. During past operations from 1975 to 1991, facility waste streams included effluent from the wood treating plant (1975-1977 only), sanitary wastewater, office trash, scrap timber, and sawdust. The process effluent from the wood treatment plant was believed to have been discharged into the stormwater drainage system that empties offsite into a ditch (Section 8, Photographs 5 and 6). Mr Kamuchele could not provide any additional information concerning waste streams at the facility.

4.6.3.3 Air Emissions

Air emissions from past operations at the ZSBS Timber Storage Facility would have included sawdust from the sawdust cyclone. Currently, there are no air emissions generated at the facility. No boilers were observed at the facility during the site visit.

4.6.3.4 Pesticide/Herbicide Use

Mr Kamuchele had no information concerning pesticide or herbicide use at the facility. Based on the type of past operations at the facility, it was assumed that only minor amounts of pesticides or herbicides, if any, would have been used by the ZSBS Timber Store.

4.6.3.5 Underground/Aboveground Storage Tanks

According to Mr Kamuchele, no USTs were located at the ZSBS Timber Storage Facility. Two aboveground storage tanks (ASTs) were part of the wood treatment plant (Section 8, Photograph 2). These tanks have not been used in the wood treating process since 1977 but prior to that date, it is assumed that the tanks were used to store a combination of creosote, tanolith, diesel fuel, and water.

4.6.3.6 Releases/Spill Controls

No information was available relating to releases or spills at the facility. Although no accidental spills or leaks were observed at the time of the site visit, spills potentially may have occurred at the wood treatment plant during past operation (1950's through 1977).

4.6.3.7 Potentially Hazardous Materials

Currently, no guidelines have been implemented by the Environmental Council of Zambia defining specific materials or chemicals as hazardous. Application of the term "hazardous" is generally based on specific characteristics of a substance or constituent such as ignitability, corrosivity, reactivity, and toxicity. Depending on the concentration of

the constituent in sludges, soil, surface water, or groundwater, the constituent may or may not be considered hazardous.

Materials onsite such as the creosote, tanolith, diesel fuel and the process wastewater containing these materials would have potentially contained specific organic and inorganic constituents at levels that could be identified as hazardous and regulated once guidelines are enacted. Applying regulations adopted by the EPA, these constituents potentially pose a threat to human health and the environment due to ignitability, toxicity, and human carcinogenic risk (Cal EPA, 1992).

Creosote contains constituents such as naphthalene and other organic components that are known human carcinogens. Copper found within tanolith, a copper sulfide based compound, may be present at level to be classified as hazardous to humans based on toxicity. Asbestos found in the sheet roofing and pipe insulation at the facility is also hazardous and known to produce lung cancer in individuals who have had prolonged exposure.

4.6.3.8 Waste Disposal

No information concerning waste disposal procedures or quantities was available from ZSBS. During operation of the wood treating plant, effluent containing a mixture of creosote and diesel fuel, or tanolith and water, is believed to have been discharged to the stormwater drainage system. Drainage from the facility empties into an unlined ditch along Malambo Road. If process wastewater was discharged into the stormwater drainage system, subsurface soil and possibly shallow groundwater quality in the area may have potentially been adversely affected.

No information was available concerning the disposal plan of the fifteen unmarked, 210 liter drums that were observed at the treated wood storage area. The contents of the drums was not known (Section 8, Photograph 9).

4.7 Applicable Environmental Regulations

A summary of the applicable regulations for Zambia is presented in Table 2 of Appendix D. Based on a review of these regulations, the ZSBS Timber Storage Facility may be:

- illegally discharging surface water runoff that may potentially contain residual constituents of creosote, tanolith, and diesel fuel into the open, unlined drainage ditch in front of the facility. This discharge may potentially adversely impact subsurface and groundwater quality in the area.

The Environmental Protection and Pollution Control Act of 1990, states that no person may discharge (directly or indirectly) poisonous, toxic, obnoxious or obstructing matter, or other pollutants into surface or groundwater bodies. The Act also states that it is illegal to dispose of solid wastes anywhere but at a licensed disposal facility.

The Water Pollution Control (Effluent and Wastewater) Regulations of 1993, requires a license to discharge wastewater that may pollute the environment (this includes discharges to the Council sewer). The conditions of the license include discharge record keeping,

weekly sampling and testing of the wastewater, and submission of a bi-annual report to the ECZ. The discharge must meet the standards (limits) for parameters listed in Table 3 of Appendix D.

5. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are presented addressing areas of environmental concerns at the ZSBS Timber Storage facility based on the findings of the environmental assessment.

- Creosote, tanolith, and diesel fuel may have been illegally spilled during operations or leaked from the ASTs at the wood treatment plant. If these spills occurred, soil and groundwater quality in the plant area may potentially have been adversely affected.
- Process wastewater containing creosote, tanolith, and diesel fuel may have been illegally discharged offsite into the stormwater drainage ditch in front of the facility. As a result, soil and groundwater quality may potentially have been adversely affected in the area.
- Asbestos has been used at the facility in pipe insulation and roofing sheets. Asbestos is a known human carcinogenic.
- The contents of fifteen 210 liter drums stored at the treated wood storage area are not known.
- No USIs are used at the ZSBS Timber Storage Facility.
- No transformers are used at the facility.
- Sawdust was the only air emission at the ZSBS Timber Storage facility. No adverse environmental effects can be attributed from air emissions at the facility.
- Based on the field reconnaissance of the area surrounding the facility, there are several neighboring industries (Komatsu Limited - vehicle and heavy equipment repair facility, Match Corporation Limited, Steel Fabrications Limited, National Milling Company, and the United Bus Company of Zambia depot) in the industrial area that may also be expected to have potentially adversely affected the environmental conditions of the surrounding area.

PH Associates recommends that

- ZSBS investigate soil quality at the wood treatment plant and offsite along the drainage ditch in the front of the facility. This investigation should include collecting soil samples to assess the level of possible adverse effects. If constituents of creosote, tanolith, or diesel fuel are found at significant concentrations, then ZSBS should investigate groundwater quality in those areas.
- ZSBS conduct an asbestos survey and implement an asbestos removal plan at the facility.
- ZSBS develop and implement an environmental safety and procedures plan detailing storage, handling, monitoring, cleanup, and disposal procedures for the facility to minimize potential adverse effects to the environment in the future. This plan should address the fifteen drums stored at the treated wood storage area, including determining their contents and appropriate disposal.
- ZSBS maintain inventory and waste disposal records specifically listing the types and quantities of chemicals, fuels, oils, and materials brought onsite and the types and quantities of materials recycled or disposed of and their disposal locations. This "cradle-to-grave" tracking of materials should be incorporated into the environmental safety and procedures program.

6. REFERENCES

BANDA

ZSBS Door Factory, Production Supervisor, Personal Interview, May 15, 1995

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Chemical Cross-Index, May 1992

GOVERNMENT OF ZAMBIA

The Environmental Protection and Pollution Control Act, No 12 of 1990

GOVERNMENT OF ZAMBIA

The Mines and Minerals Act, 1976, Chapter 329 of the Laws of Zambia

GOVERNMENT OF ZAMBIA

The Mining (Dumps) Regulations, 1972, Chapter 329 of the Laws of Zambia, Section 132

GOVERNMENT OF ZAMBIA

The Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 1993 - Statutory Instrument No 71 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA

The Water Pollution Control (Effluent and Wastewater) Regulations, 1993 - Statutory Instrument No 72 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

KAMUCHELE

ZSPS Door Factory, Door Factory Manager, Personal Interview, May 15, 1995

LUSAKA URBAN DISTRICT COUNCIL

City of Lusaka Street Plan, Lusaka, Zambia, (no publication date)

NORTHERN RHODESIA GEOLOGICAL SURVEY (NRGS)

The Geology and Groundwater Resources of the Lusaka Area, Report No 16 of 1963, J G Simpson, A R Drysdall, and H H J Lambert

REPUBLIC OF ZAMBIA

Geologic Map of the Southeast Quadrant, 1981, Scale 1:1,000,000

REPUBLIC OF ZAMBIA

The Water Act, 1949, Chapter 312 of the Laws of Zambia

SINGH

ZSBS Lusaka, General Manager, Personal Interview, May 15, 1995

ZAMBIA GEOLOGIC SURVEY DEPARTMENT

Sheet No SD-35-15, Geologic Map of the Lusaka Area, 1983, Scale 1:250,000, J G Thieme

ZAMBIA GEOLOGIC SURVEY DEPARTMENT

Topographic Sheet 1528 C1, 1993, Scale 1:50,000

7. FIGURES

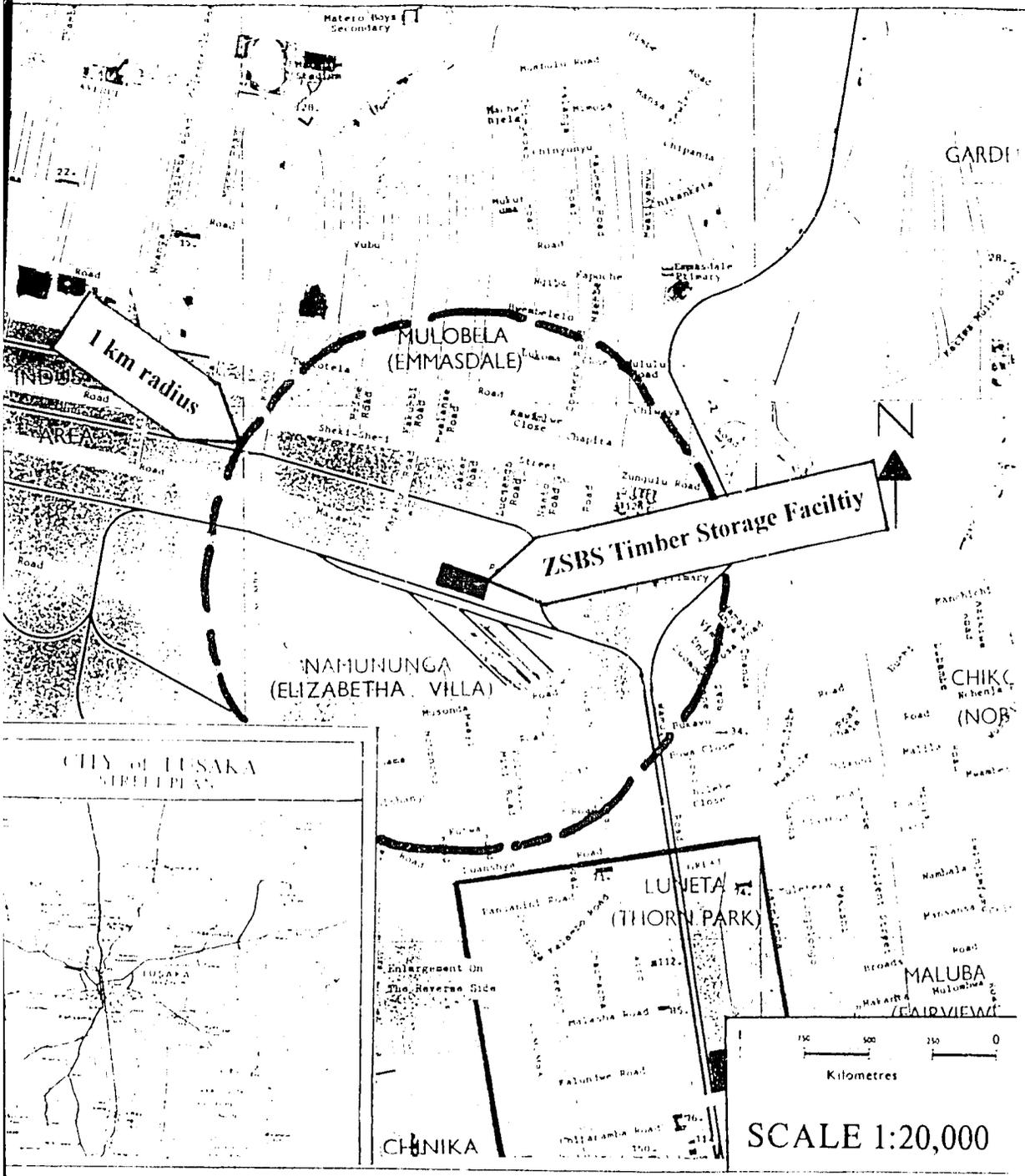
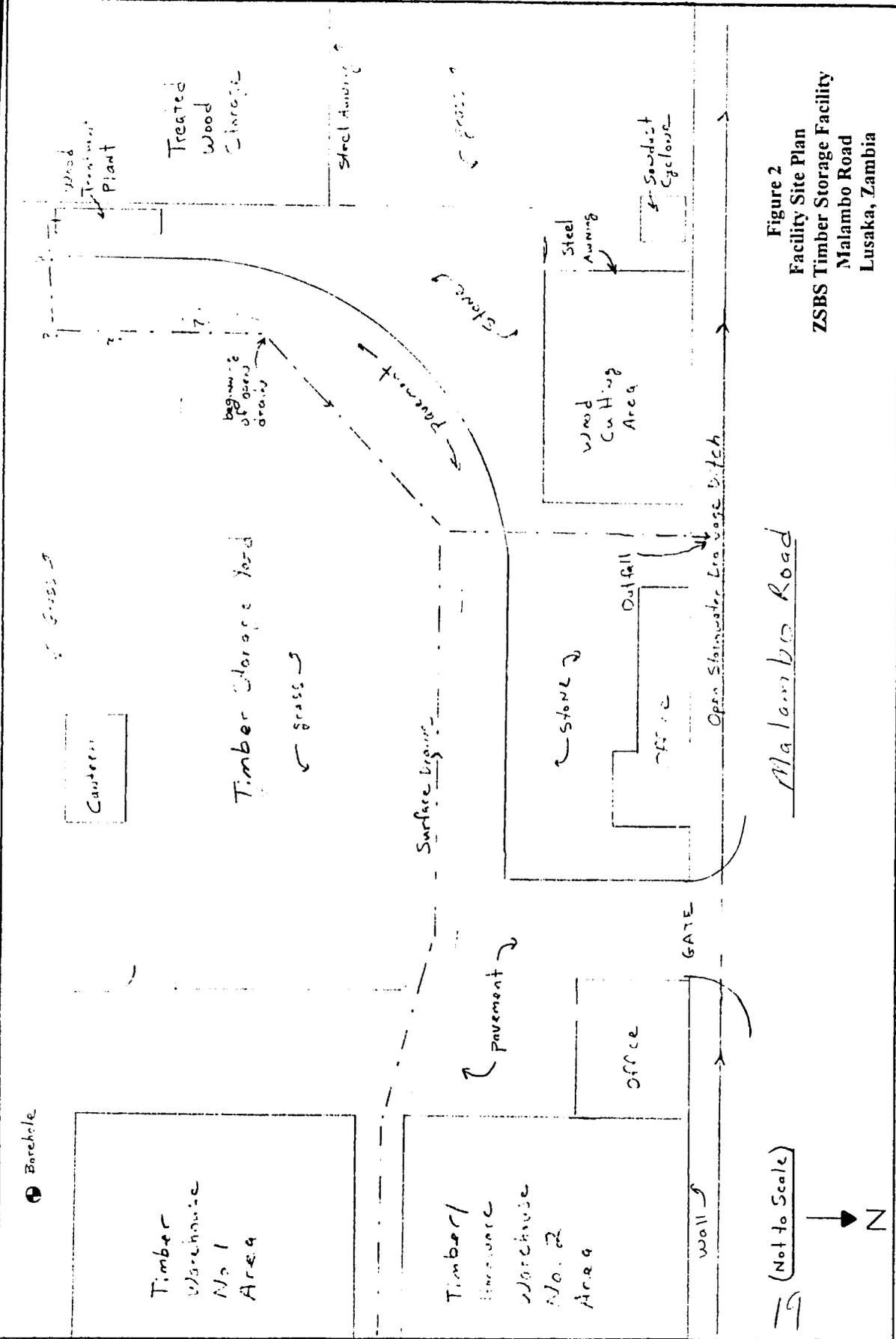


Figure 1
Site Location Map
ZSBS Timber Storage Facility
Malambo Road
Lusaka, Zambia

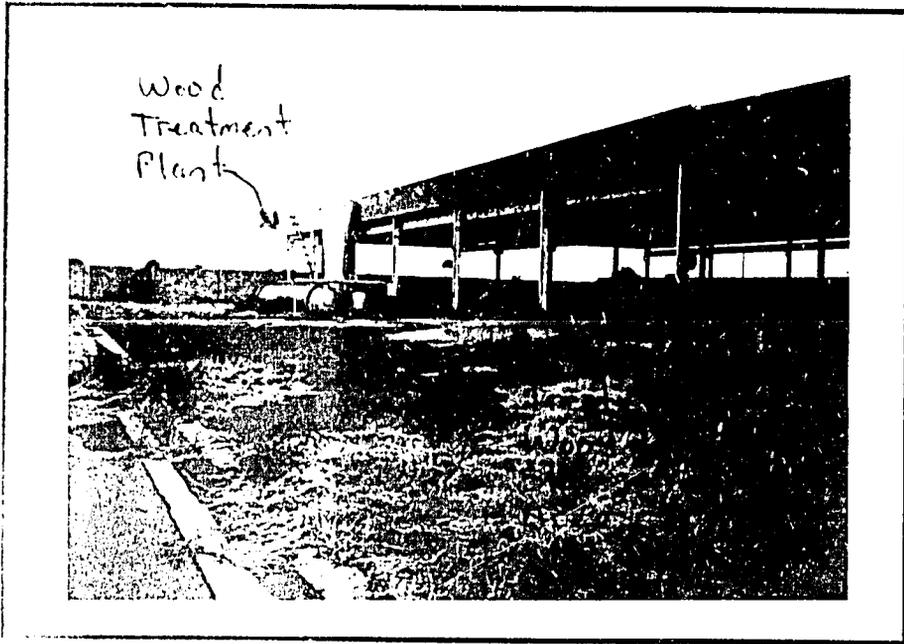


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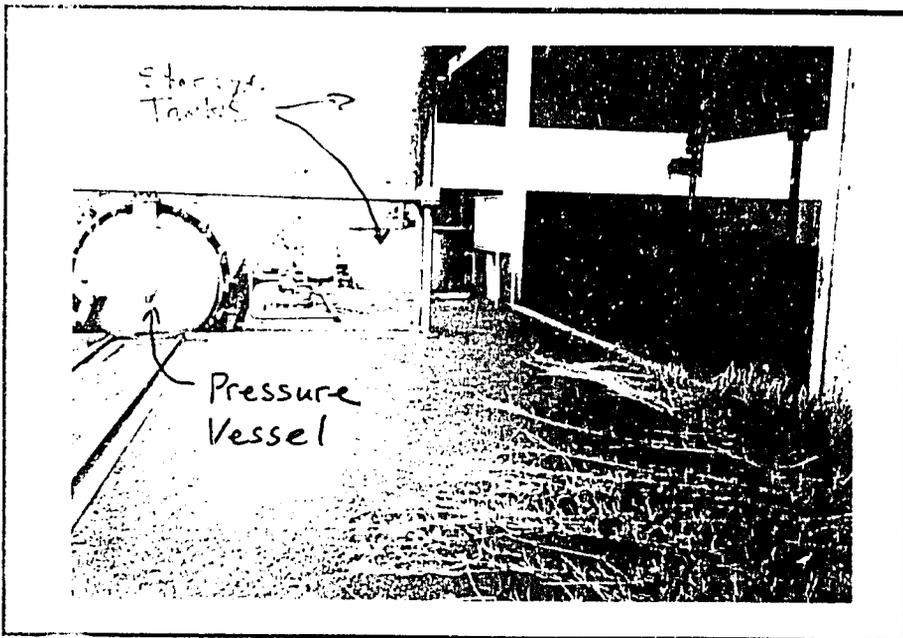
Figure 2
Facility Site Plan
ZSBS Timber Storage Facility
Malambo Road
Lusaka, Zambia

8. PHOTOGRAPHS



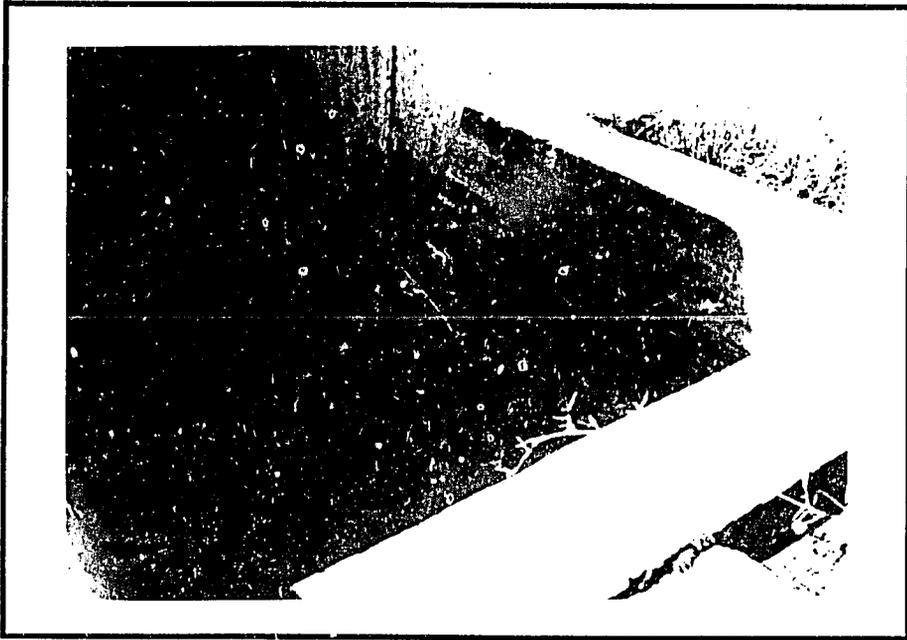
Photograph 1

WOOD TREATMENT PLANT AND TREATED STORAGE AREA



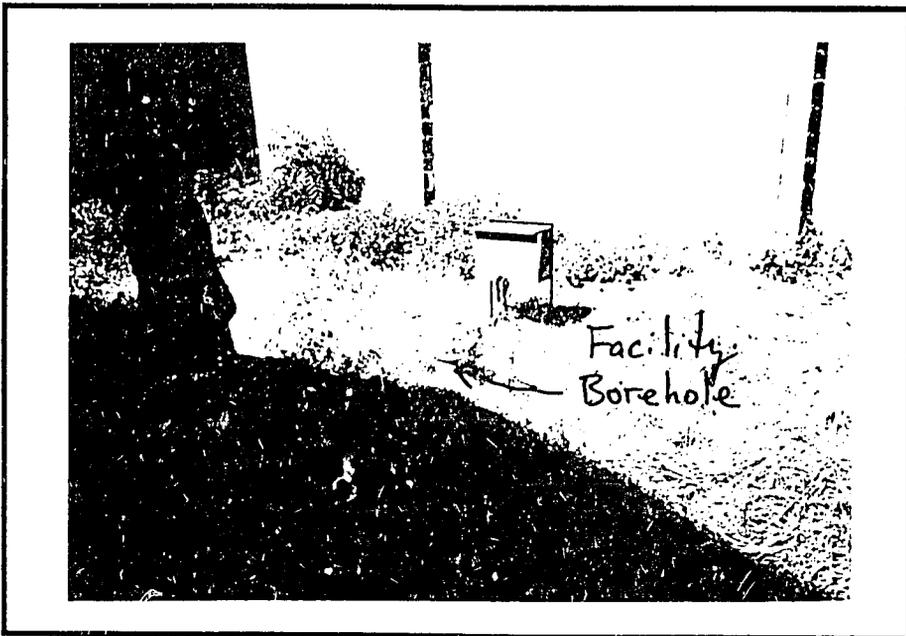
Photograph 2

WOOD TREATMENT PLANT / PRESSURE VESSEL AND TWO STORAGE TANKS



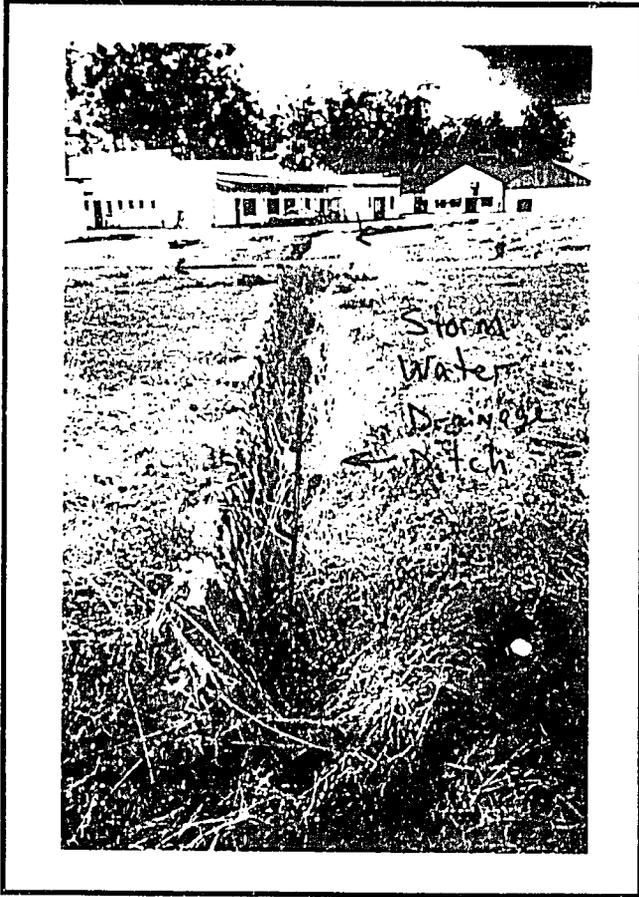
Photograph 3

DRAIN IN PRESSURE VESSEL CONTAINMENT AREA



Photograph 4

FACILITY BOREHOLE



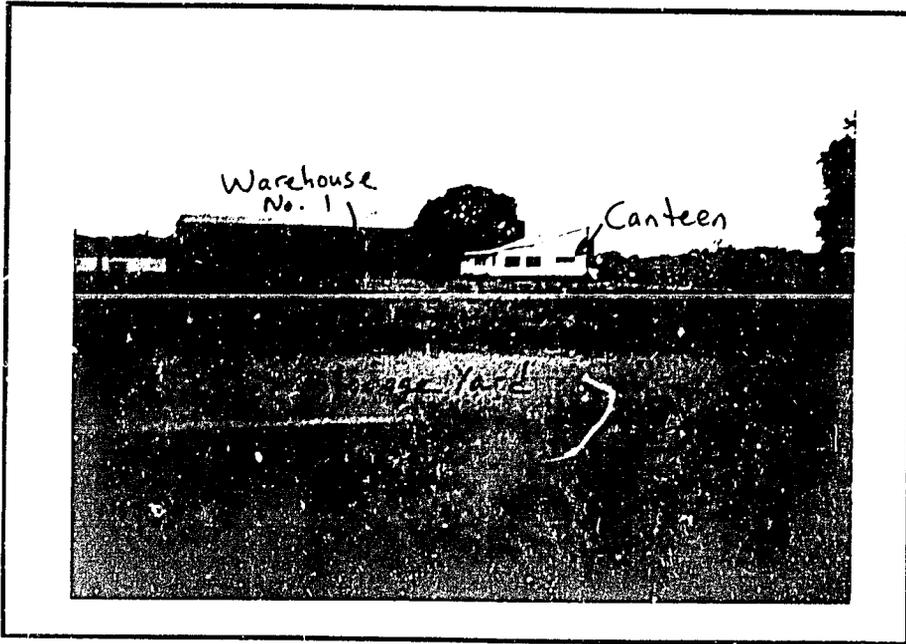
Photograph 5

FACILITY STORMWATER DRAINAGE DITCH



Photograph 6

FACILITY STORMWATER DRAINAGE DITCH DISCHARGING OFFSITE.



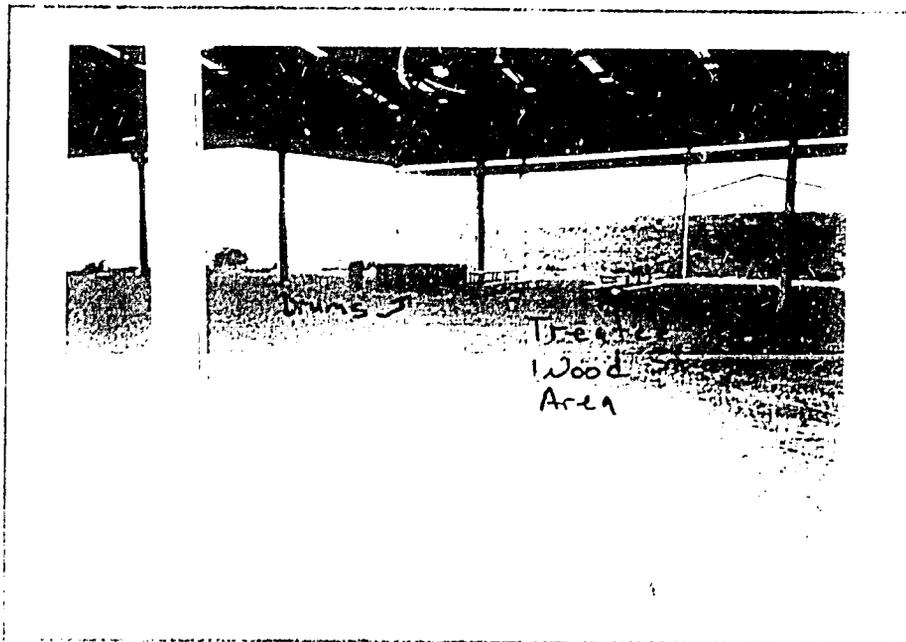
Photograph 7

CANTEEN, WAREHOUSE NO. 1, AND STORAGE YARD



Photograph 8

WOOD CUTTING AREA



Photograph 9

FIFTEEN UNMARKED DRUMS AT TREAT WOOD STORAGE AREA

9. APPENDICES

Appendix A
ZPA QUESTIONNAIRE

**NO ZPA QUESTIONNAIRE
WAS RETURNED FOR THIS FACILITY**

Appendix B
PH ASSOCIATES QUESTIONNAIRE

**NO PH ASSOCIATES QUESTIONNAIRE
WAS RETURNED FOR THIS FACILITY**

Appendix C
MINISTRY REVIEWS AND INTERVIEWS

MINISTRY REVIEWS AND INTERVIEWS

PH Associates interviewed Ministry personnel and other pertinent organizations to discuss the current state of environmental affairs and regulations in Zambia. Ministry records pertaining to assessed sites were requested, however, minimal data was acquired because many of the environmental Ministries are either relatively new and have limited records or there is a lack of funding for the environmental programs and inspections. A more detailed discussion of the environmental regulations for Zambia are presented in Appendix D and a summary of interviews are discussed below.

ENVIRONMENTAL COUNCIL OF ZAMBIA

Mr Julius Kanyembo - Director

Mrs I Mbewe - Legal Officer

On April 13, 1995, Ms Elena Pomar/PH Associates visited Mr Julius Kanyembo, Director of the Environmental Council of Zambia (ECZ). Information on the enforcement of the regulations was obtained on April 24, 1995 from Mrs Mbewe, Legal Officer for the Environmental Council of Zambia. The ECZ was started in 1990 to develop and implement regulations under the Environmental Protection and Pollution Control Act, but it was not functionally operating until June 1992. Legislation and regulations on water pollution control, waste management, environmental impact assessments were recently enacted in 1993 and 1994 and are currently in the process of enforcement. Inspection and site assessments have been conducted in very limited, selected cases. No enforcement activities have been conducted for the Pesticides and Toxic Substances Regulations. Regulatory policy and resolutions are currently being drafted on air pollution and wetlands management. The Environmental Council has set the following regulations in place under the Environmental Protection and Pollution Control Act of 1990:

The Water Pollution Regulations, 1993

These regulations determine the type and amount of effluent that can be discharged from a site and permit requirements.

The Waste Management Regulations, 1993

Requires licensing for transporters of solid and hazardous waste and for operators of waste disposal facilities.

Environmental Impact Assessment Regulations, 1994

These regulations require an environmental evaluation and licensing for new project developments, repairs, and expansion to existing projects.

The Pesticides and Toxic Substances Regulations, 1994

Requires registration with ECZ if manufacturing or importing/exporting a new pesticide or toxic substance.

The ECZ has very limited documentation on contaminated sites or industrial discharges since the Council was only established in 1990.

MINISTRY OF ENERGY AND WATER DEVELOPMENT

Mr Stan Chisala - Senior Engineer Water Affairs

On April 18, 1995, Ms Pomar visited Mr Stan Chisala, Senior Engineer of the Water Affairs Department (WA), in the Ministry of Energy and Water Development. The WA was established by the Water Act of 1949, which provides for the control, ownership, and use of water. Mr Chisala stated that the Ministry does not keep any environmental pollution records for any industry in Zambia.

PH Associates was provided with a copy of the November 1994 National Water Policy issued by the Ministry of Energy and Water Development. This document serves as a guide to conservation management, demand, and supply of water resources in the country. The National Water Policy, however, has no specific policy regarding contamination or water quality control by major industries, including the Council water supply.

The Water Supplies and Water Resources Management Division of WA is expected to have a program in place within a year to monitor the quantity and quality of groundwater boreholes. Enforcement of this program will be made by the Environmental Council of Zambia. Water Affairs also hopes to have the funding to do more adequate monitoring of boreholes for bacteriological analysis in the future. They currently have a chemist to conduct sampling and analysis but these activities have not been performed due to lack of funding.

Mr Chisala discussed some of WA's concerns about industrial and domestic wastewater discharges into some of the major surface water bodies of Zambia. Industries such as textile mills, tanneries, fertilizer producers, breweries and domestic sewage are of great concern in the potential contamination of rivers. Solid waste was also pointed out to be a potential contamination problem in Zambia since most of the municipal councils do not have designated areas for the disposal of these wastes. Wastewater drainage was discussed as being inadequate since the problem of stagnation is present throughout the industrial and urban areas of the country.

MINISTRY OF LABOR AND SOCIAL SECURITY

Mr K Mapani - Chief Inspector of Factories

Mr Kakoma Chivundu - Inspector of Factories

Mr Lukwesa - Inspector of Factories

Mr K Mapani, Chief Inspector of Factories for the Ministry of Labor and Social Security, was interviewed on April 20, 1995, by Ms Pomar to request available information on the sites where environmental assessments are to be conducted by PH Associates. There is approximately 10 years of available data for facility site inspections at the Ministry of Labor and Social Security. Mr Mapani stated that his office is basically concerned with inspections of factory sites where accidents or complaints have been filed.

The Chief Inspector of Factories currently has approximately 364 factory/industrial sites entered into a database, and a series of old reports. A database template was prepared for each site and includes a workplace number, industry classification and various parameters on Worker Health and Safety. The database was found to be poorly maintained and apparently the best information is found in the original site inspection reports. According to Mr Mapani, the department is currently understaffed by about 50%, thus regular visits to all facilities are difficult to perform.

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On April 28, 1995, Ms Pomar met with Mr Kakoma Chivundu and Mr Lukwesa, both Factory Inspectors. PH Associates were provided with site inspection reports for several sites where environmental assessments will be performed. These are summarized in the individual reports, where applicable. Typical problems that are encountered during their site inspections include old and outdated machinery that can cause accidents, lack of maintained fire extinguishers, and noise and air quality problems.

MINISTRY OF MINES AND MINERALS DEVELOPMENT

Mr O Mg'ambi - Acting Director of Geological Survey Department
Mr Clement Namateba - Senior Geologist (PGR), Geological Survey

PH Associates met with Mr O Mg'ambi, Acting Director and Mr Clement Namateba, Senior Geologist of the Geological Survey Department to discuss the regional geologic and hydrogeologic setting of Zambia. A listing of available geologic and hydrogeologic reports and maps were provided by the Department, and those covering the sites to be assessed were purchased.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

Mr Gedion Nkojo - Resident Representative, World Bank
Mr Julius Chileshe - National Resource Economist, World Bank

On April 24, 1995, Ms Pomar met with Mr Gedion Nkojo, Resident Representative and Mr Julius Chileshe, National Resource Economist of the World Bank to request any information regarding historical data for the sites where environmental assessments are to be conducted. Mr Nkojo and Mr Chileshe stated that there was no specific environmental information for the sites.

The importance of having a unified and more focused plan for addressing environmental concerns in the country on behalf of the Government of Zambia (GOZ), NGOs (Non-Government Organizations), International Development Organizations (such as World Bank, UNDP, African Development Bank, etc), and other donor countries, was discussed at great length. The World Bank is presently working on an Environmental Support Program to be included in the National Environmental Action Plan for the Secretariat of the Ministry of Environment and Natural Resources.

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Appendix D
ENVIRONMENTAL REGULATIONS OF ZAMBIA

ENVIRONMENTAL REGULATIONS OF ZAMBIA

As part of the PH Associates scope of work, legislative Policies, Acts, and Regulations enacted by Zambia were reviewed for their applicability to completing environmental assessments of the enterprises identified by the ZPA for privatisation. The purpose of the review was to evaluate and summarize those guidelines pertaining to environmental issues which industries in Zambia are required to adhere. The industries to be assessed include food, agricultural and livestock farmlands, pharmaceutical drug, textile, sawmilling, storage and transportation, construction and engineering, mining and petroleum.

Regulations addressing the protection of human health and the environment have only recently been enacted in any detail. Prior to the passing of the Environmental Protection and Pollution Control Act of 1990 and the establishment of the Environmental Council of Zambia, legislation mostly addressed issues of worker health and safety.

Twelve regulations were selected for review based on their potential applicability to the assessed sites, and are listed in Table 1. Six of these regulations address environmental issues concerning air, soil, and water pollution and include:

- Water Act of 1949
- Environmental Protection and Pollution Control Act of 1990
- Water Pollution Control Regulation of 1993
- Waste Management Regulations of 1993
- Mining (Dumps) Regulations of 1972
- Mines and Minerals Act of 1976

These regulations are summarized in Table 2 and used to evaluate the environmental compliance of the facilities assessed by PH Associates. Of the six regulations listed above, the first four comprise the majority of established environmental legislation and are applicable to most of the assessed industries.

**TABLE I
ENVIRONMENTAL REGULATIONS AND
ENFORCING MINISTRIES OF ZAMBIA**

Policy, Act, or Regulation	Year Adopted	Responsible Ministry
Water Act	1949	Ministry of Energy and Water Development (Water Board)
National Water Policy	1994	Ministry of Energy and Water Development
Environmental Protection and Pollution Control Act	1990	Environmental Council of Zambia
Water Pollution Control (Effluent and Wastewater) Regulations	1993	Environmental Council of Zambia
Waste Management (licensing of Transporters of Wastes and Waste Disposal Sites) Regulations	1993	Environmental Council of Zambia
Pesticides and Toxic Substances Regulations	1994	Environmental Council of Zambia
Environmental Impact Assessment Regulations	1994	Environmental Council of Zambia
Petroleum Act	1930	Ministry of Energy and Water Development (Department of Energy)
Petroleum (Exploration and Production) Act	1985	Ministry of Energy and Water Development (Department of Energy)
Agricultural (Fertilizers and Feed) Act	1990	Ministry of Agriculture
Mining (Dumps) Regulations	1972	Ministry of Mines and Minerals Development
Mines and Minerals Act	1976	Ministry of Mines and Minerals Development

TABLE 2
APPLICABLE ENVIRONMENTAL REGULATIONS
OF ZAMBIA

ACT OR REGULATION	APPLICABLE REGULATIONS
The Water Act 1949	<ul style="list-style-type: none"> • Any person(s) shall have the right to the primary use of public water which is found in its natural channel where access is lawful. • A person(s) must have permission from the Water Board (WB) to impound, store, or divert water from a public stream for primary (drinking), secondary (irrigation), or tertiary (mechanical or industrial) use. • Any land owner must have permission from WB for use of private water supply. • Local authorities must get permission from WB to use public water for primary or tertiary use. • Any person(s) who willfully or through negligence pollutes or fouls any public water so as to render it harmful to man, beast, fish, or vegetation, shall be guilty of an offense.
The Environmental Protection and Pollution Control Act 1990	<p><u>Water Regulations</u></p> <ul style="list-style-type: none"> • No person may discharge (directly or indirectly), poisonous, toxic, obnoxious or obstructing matter, radiation or other pollutants into surface or groundwater bodies. • Industrial/trade owners or operations that discharge effluent from the facility into existing sewage system must obtain written permission from the local authority. • Local authority sewage systems may impose special conditions (ie pretreatment) to facilities that discharge effluent into their system. • Effluent may be mixed for treatment prior to discharge or for conveyance to common point of discharge. • No local authority sewage system or industry/trade shall discharge (directly or indirectly) effluent into surface water or groundwater environment without a license. Any changes to the type, quantity of pollutant, or discharge location must be authorized by the Inspectorate. <p><u>Waste Regulations</u></p> <ul style="list-style-type: none"> • No person(s) shall discharge waste so as to cause pollution in the environment. Based on the interpretation of this regulation by the ECZ, it is illegal to dump or bury waste anywhere but at a licensed disposal facility (no backyard dumping). • No person(s) shall transport waste to any site other than a licensed disposal facility. • Any person(s) intending to operate a waste disposal plant or generate hazardous waste must have a license. • No person(s) shall import any hazardous waste into Zambia. • No hazardous waste shall be exported to any country without a Council (ECZ) permit and consent of receiving country. • No hazardous waste shall be transported within or through Zambia without a Council permit.

ACT OR REGULATION	APPLICABLE REGULATIONS
Water Pollution Control Regulations of 1993	<p><u>License to Discharge Wastewater</u></p> <ul style="list-style-type: none"> • All commercial, municipal, and industrial facilities must possess a license to discharge wastewater that may pollute the environment. • Keep facility records of the licensed activities. • Conduct weekly sampling and testing of discharged wastewater at locations designated by ECZ Inspectorate. • The quality of wastewater discharged must meet the conditions and standards for all parameters contained in Table 3. If any wastewater test results exceed these standards, they must be reported to the Inspectorate within 12 hours. • Monitor the volume of wastewater discharged from the site using a metering device. • Submit bi-annual reports to the ECZ Inspectorate including the mean monthly test analyses results and mean monthly volume of wastewater being discharged. <p><u>License to Withdraw Water</u></p> <ul style="list-style-type: none"> • Facilities must possess a license to withdraw water from a watercourse for the purpose of diluting effluent. • The source of water being withdrawn would not significantly affect the water course. • The license holder must treat effluent so there are no adverse effects to the surface and groundwater environment. • The license holder must keep a record of licensed activities and provide a report to ECZ Inspectorate every six months. • The license holder must conform to all the following wastewater discharge regulations.
Waste Management Regulations 1993	<ul style="list-style-type: none"> • All commercial, municipal, or industrial facilities must possess a license to transport solid wastes offsite. • During loading and transport, wastes cannot be scattered, flowing out, or emitting bad smells. • Vehicles must transport wastes along approved, scheduled routes. • Transporter license may be valid from 6 months to 3 years depending on the transporters compliance with these regulations.
The Mining Regulations 1972	<ul style="list-style-type: none"> • Supervise/inspect site for the prevention of pollution of the surroundings or abatement of any nuisance.
The Mines and Minerals Act 1976	<ul style="list-style-type: none"> • Avoidance of wasteful mining practices or wasteful metallurgic practices. • Any effluent water discharged from any treatment or other process at a mine must comply with the provisions of the Water Act.

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THE WATER ACT

Chapter 312, Adopted 1949, Amendments up to 1970

The Water Act provided the initial guidance for the control, ownership, and use of water in Zambia. This Act established the Water Board (WB) in the Ministry of Energy and Water Development.

The purpose of the Water Board is to supervise all public streams in Zambia, protect the source of water streams, maintain and improve streams, and help prevent unlawful acts (polluting) of streams. The Act does not apply to the Zambezi, Luapula, and part of the Luangwa River.

Applicable Regulations

The Act provides for some basic laws on water rights, some of the regulations that may apply to the assessed sites include:

- Any person(s) shall have the right to the primary use of public water which is found in its natural channel where access is lawful.
- A person(s) must have permission from the WB to impound, store, or divert water from a public stream for primary (drinking), secondary (irrigation), or tertiary (mechanical or industrial) use.
- Any land owner must have permission from WB for use of private water supply.
- Local authorities must get permission from WB to use public water for primary or tertiary use.
- Any person(s) who willfully or through negligence pollutes or fouls any public water so as to render it harmful to man, beast, fish, or vegetation, shall be guilty of an offense.

NATIONAL WATER POLICY OF 1994

This policy discusses planning, implementation strategies, management, and development of water resources for Zambia, and was issued as an internal guidance document under the National Water Policy Development Initiative (Water Development Board) by the Ministry of Energy and Water Development. The Water Development Board proposes and amends existing legislation and enacts new legislation.

Applicable Regulations

None. The policy does not provide any water regulations.

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THE ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL ACT Act No 12, Adopted 1990

This Act provides for the protection of the environment, the control of pollution, and the establishment of the Environmental Council of Zambia (ECZ). The ECZ consists of representatives from 25 different ministries, and formulates policies relating to environmental management of natural resources and the control of industrial and other sources of pollution. The Council reviews environmental government reports, conducts studies and promotes research, educates the public about environmental issues, and conducts other relevant tasks.

The Act includes regulations for water, air, waste, pesticides and toxic substances, noise, ionizing radiation, and natural resource conservation. Many of these regulations are the basis for the updated Water Pollution Control Regulations (1993), Waste Management Regulations (1993), Pesticides and Toxic Substances Regulations (1994), and Environmental Impact Assessment Regulations (1994).

This Act and the ECZ were initiated in 1990, although the Council was not fully operational until June 1992 (Appendix C). Since the ECZ is still a relatively new institution, air, hazardous and toxic waste, and noise standards have not been established.

Applicable Regulations

The Act provides generalized regulations that are applicable to discharge of solid waste and wastewater pollutants into the environment.

Water Regulations

- No person may discharge (directly or indirectly), poisonous, toxic, obnoxious or obstructing matter, radiation or other pollutants into surface or groundwater bodies.
- Industrial/trade owners or operations that discharge effluent from the facility into existing sewage systems must obtain written permission from the local authority.
- Local authority sewage systems may impose special conditions (ie pretreatment) to facilities that discharge effluent into their system.
- Effluent may be mixed for treatment prior to discharge or for conveyance to common point of discharge.
- No local authority sewage system or industry/trade shall discharge (directly or indirectly) effluent into surface water or groundwater environment without a license. Any changes to the type, quantity of pollutant, or discharge location must be authorized by the Inspectorate.

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Air Regulations

Based on discussions with the ECZ (Appendix C), legislation and standards on air pollution are currently being drafted. A review of the air pollution section of this Act shows the following areas will be addressed:

- No person(s) will be allowed to emit any pollutants above emission standards (to be developed).
- Polluting facilities will be required to have licenses, conduct period air sampling and testing, and provide reports to the Inspectorate.

Until these regulations are completed and adopted, there are no applicable air emission requirements for Zambia.

Waste Regulations

Waste handling regulations are found in more detail in the Waste Management Regulations (1993).

- No person(s) shall discharge waste so as to cause pollution in the environment. Based on the interpretation of this regulation by the ECZ, (personal communication with Michael Sankwe/ECZ), it is illegal to dump or bury waste anywhere but at a licensed disposal facility (no backyard dumping).
- No person(s) shall transport waste to any site other than a licensed disposal facility.
- Any person(s) intending to operate a waste disposal plant or generate hazardous waste must have a license.
- No person(s) shall import any hazardous waste into Zambia.
- No hazardous waste shall be exported to any country without a Council (ECZ) permit and consent of receiving country.
- No hazardous waste shall be transported within or through Zambia without a Council permit.

Pesticides and Toxic Substances Regulations

Many of the regulations regarding pesticides and toxic substances relate to the manufacture, import or process of a "new" pesticide or toxic substance. Currently, there are no guidelines or standards defining specific materials or chemicals as toxic or hazardous.

Noise Regulations

No noise regulations are specified in the Act because the ECZ has yet to establish noise emission standards and guidelines.

THE WATER POLLUTION CONTROL (EFFLUENT AND WASTEWATER) REGULATIONS OF 1993

These regulations are part of the Environmental Protection and Pollution Control Act of 1990. The regulations require that any local authority intending to operate a sewage treatment system or owner/operator of any industry that discharges wastewater (directly or indirectly) into any surface water or groundwater environment must apply for a license through the Environmental Council of Zambia (ECZ). Person(s) must also have a license from ECZ to withdraw water from a watercourse for the purpose of diluting effluent.

ECZ has developed standards (limits) for 59 physical, bacteriological, chemical, organic, metal, and radioactive parameters. These parameters and standards are listed in Table 3. Discharged wastewater may NOT exceed these parameter standards.

Applicable Regulations

These wastewater discharge regulations are applicable to many of the sites to be assessed. The following conditions of the licenses are most noteworthy, refer to the original regulation for more specific details.

License to Discharge Wastewater

- All commercial, municipal, and industrial facilities must possess a license to discharge wastewater that may pollute the environment.
- Keep facility records of the licensed activities.
- Conduct weekly sampling and testing of discharged wastewater at locations designated by ECZ Inspectorate.
- The quality of wastewater discharged must meet the conditions and standards for all parameters contained in Table 3. Any wastewater test results which exceed these standards, must be reported to the Inspectorate within 12 hours.
- Monitor the volume of wastewater discharged from the site using a metering device.
- Submit bi-annual reports to the ECZ Inspectorate including the mean monthly test analyses results and mean monthly volume of wastewater being discharged.

License to Withdraw Water

- Facilities must possess a license to withdraw water from a watercourse for the purpose of diluting effluent.
- The source of water being withdrawn would not significantly affect the water course.
- The license holder must treat effluent so there are no adverse effects to the surface and groundwater environment.

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- The license holder must keep a record of licensed activities and provide a report to ECZ Inspectorate every six months.
- The license holder must conform to all the wastewater discharge regulations.

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Parameter	Standards (Unit)
Temperature	40° C
Color	20 (Hazen units)
Odor and Taste	Threshold odor number
Turbidity	15 NTU
Total Suspended Solids	100 mg/L
Settleable Matter	0.5 mg/L
Total Dissolved Solids	3000 mg/L
Conductivity	4300 US/cm
Total Coliform	25000/100 ml
Fecal Coliform	5000/100 ml
Algae	1000 cells/100 ml
pH	6.0 - 9.0
Dissolved Oxygen	5 mg/L
Chemical Oxygen Demand	90 mg (average)
Biochemical Oxygen Demand (BOD)	50 mg/L (Mean Value)
Nitrates	20 mg/L lakes 50 mg/L (watercourse)
Nitrite (NO ₂ as nitrogen)	2.0 mg/L
Organic Nitrogen	5.0 mg/L (Mean)
Total Ammonia and Ammonium (NH ₃)	10 mg/L
Cyanides	0.2 mg/L
Total Phosphorous (PO ₄)	1.0 mg/L
Sulfates	1500 mg/L
Sulfite	1.0 mg/L
Sulfide	0.1 mg/L
Chlorides	8000 mg/L
Active Chloride	0.5 mg/L
Active Bromine (Br ₂)	0.1 mg/L
Fluorides	2.0 mg/L
Aluminium	2.5 mg/L
Antimony	0.5 mg/L
Arsenic	0.05 mg/L
Barium	0.5 mg/L
Beryllium salts	0.5 mg/L
Boron	0.5 mg/L
Cadmium	0.5 mg/L
Total Chromium	0.1 mg/L
Cobalt	1.0 mg/L
Copper	1.5 mg/L
Iron	2.0 mg/L

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Parameter	Standards (Unit)
Lead	0.5 mg/L
Magnesium	500 mg/L
Manganese	1.0 mg/L
Mercury	0.002 mg/L
Molybdenum	5.0 mg/L
Nickel	0.5 mg/L
Selenium	0.02 mg/L
Silver	0.1 mg/L
Thallium	0.5 mg/L
Tin	2.0 mg/L
Vanadium	1.0 mg/L
Zinc	10.0 mg/L
Total hydrocarbons	10.0 mg/L
Oils (Mineral and Crude)	5.0 mg/L
Phenols	0.2 mg/L (steam dist)
	0.05 mg/L (non-steam dist)
Fats and saponifiable oils	20.0 mg/L
Detergents	2.0 mg/L
Total Pesticides and PCB's	0.5 mg/L
Trihaloforms	0.5 mg/L
Radioactive materials	Not permitted
NOTE	
See original Water Pollution Control Regulations and third schedule for standard and test method details.	

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WASTE MANAGEMENT (LICENSING OF TRANSPORTERS OF WASTES AND WASTE DISPOSAL SITES) REGULATIONS OF 1993

These regulations are part of the Environmental Protection and Pollution Control Act of 1990. The regulations only address the handling of "solid waste" generated by commercial, municipal, and industrial sites (personal communication, Michael Sankwe/ECZ). The regulations do not apply to hazardous or toxic substances, generated at commercial, municipal, industrial or household sites. They also do not apply to residential domestic solid wastes of less than 45 kg (99 pounds) per week, or to the transport of inert (construction) debris.

Person(s) who transport solid wastes or own / operate solid waste disposal facility must have a license from the Environmental Council of Zambia (ECZ) and comply with all Waste Management Regulations.

Applicable Regulations

PH Associates will not be assessing any solid waste disposal sites, but will identify each of the assessed facilities method of solid waste disposal. The following regulations are applicable to the transporters of solid waste.

License to Transport Solid Waste

- All commercial, municipal, or industrial facilities must possess a license to transport solid wastes offsite.
- During loading and transport, wastes cannot be scattered, flowing out, or emitting bad smells.
- Vehicles must transport wastes along approved, scheduled routes.
- Transporter license may be valid from 6 months to 3 years depending on the transporters compliance with these regulations.

THE PESTICIDES AND TOXIC SUBSTANCES REGULATIONS OF 1994

This regulation is part of the Environmental Protection and Pollution Control Act of 1990 and applies to person(s) intending to manufacture, import, export, improve, or process a "new" pesticide or toxic substance. The regulation includes specifications on product handling, use, storage, disposal, labeling, packaging, and worker health and safety issues.

Applicable Regulations

None. PH Associates will be assessing a pharmaceutical drug company that does not manufacture, import, export, improve, or process new pesticides or toxic substances.

ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS OF 1994

These regulations are part of the Environmental Protection and Pollution Control Act of 1990. The regulations require that a project brief and environmental impact study be performed for any new project, extension, repair, or maintenance of an existing project. This is to determine whether a project may have adverse or other significant impacts on the environment. Some of the projects that may require an environmental impact study include transportation, dams, mines, forestry, agriculture, industrial facilities such as refineries, tanneries, mineral and lime processing, foundries, breweries, motor assemblers, food processing, electrical substitutions, gas or fuel storage, and solid or hazardous waste disposal site.

Applicable Regulations

None. The environmental impact assessment regulations apply to new projects or existing projects where extension, repair, or maintenance occur. All facilities that PH Associates will assess are existing projects where there are no changes occurring, or operations which are closing down.

THE PETROLEUM ACT
Chapter 424, Adopted 1930, numerous amendments up to 1969

The Act regulates the importation, conveyance, and storage of petroleum and other inflammable oils and liquids. This includes all petroleum, coal, schist, shale or other bituminous by-products. The Act requires licensing to transport or possess dangerous petroleum (gasoline, diesel etc.) and other dangerous petroleum. Dangerous petroleum transported on a public road must be in suitable and secure vessels that are certified and licensed by the Road Traffic Commissioner.

Licenses are required for possession of dangerous petroleum (exceeding 44 gallons) stored in non-inflammable storage sheds. A 55 foot buffer zone should surround the shed, and no storage sheds must be spaced less than 3 feet apart. Petroleum tanks located outside of sheds must be fenced with a 50 foot buffer zone.

Applicable Regulations

None. The Petroleum Act deals mainly with safety requirements and does not address underground storage tank or environmental issues such as storage tank integrity, leaks, or proper abandonment of tanks. Therefore, the Act does not apply to air, soil, or water pollution issues.

**THE PETROLEUM (EXPLORATION AND PRODUCTION) ACT
No 13, Adopted 1985**

This Act regulates petroleum exploration, development, and production in Zambia. It establishes a Petroleum Committee that regulates titles, contracts, and the control of petroleum operations prior to the export or entry into a refinery.

Applicable Regulations

None. The Act does not apply to petroleum depots, refineries, or gas stations, which are the type of sites to be assessed by PH Associates.

THE AGRICULTURAL (FERTILIZERS AND FEED) ACT
Chapter 351, Adopted 1990

This Act regulates and controls the manufacture, processing, importation, and sale of agricultural fertilizers and farm feed. It also provides effectiveness and purity standards for fertilizers and feed.

Applicable Regulations

None. The Act does not address the usage or disposal of fertilizers and feed at agricultural and livestock farms and therefore does not apply to any of the assessed sites.

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THE MINING (DUMPS) REGULATIONS

Chapter 329, Section 132, Adopted 1972

These regulations provide guidelines for the maintenance of mine dumpings (consisting of solid or liquid materials) such as proper water drainage and diversion, and generally keeping the dump site stable. A designated Chief Mining Inspector regulates changes relating to the design and nature of the mine dumpings and requires periodic reporting from the management.

Applicable Regulations

The regulation does not address specific environmental issues on air, soil, and water pollution. There is one very general provision included in the regulation:

- Supervise/inspect site for the prevention of pollution of the surroundings or abatement of any nuisance.

THE MINES AND MINERALS ACT
Chapter 329, No 32 Adopted 1976
Amendments in 1981, 1984, and 1992

The Act determines the policy requirements for exploration, prospecting, and mining licenses and regulates the renewal and termination of mining rights. The amendments mainly deal with increased licensing, permit, and surveying fees. The Act requires proper sanitation and adequate water supply for workers, and many health and safety issues such as exposure and safe handling of inflammable, explosive, and radioactive materials.

Applicable Regulations

Environmental issues relating to air, soil, and water pollution, generated by surface and underground mining operations are generally not addressed by the Act, with the exception of the following:

- Avoidance of wasteful mining practices or wasteful metallurgic practices.
- Any effluent water discharged from any treatment or other process at a mine must comply with the provisions of the Water Act.

Reference can be made to the Water Act for specifics relating to discharged wastewater. The Mines and Minerals Act does have some mine siting criteria and abandonment requirements. However, these requirements do not apply to the existing (active) mine site to be assessed by PH Associates.

REFERENCES

ENVIRONMENTAL COUNCIL OF ZAMBIA

Conditions Governing the License to Discharge Effluent and Wastewater, The Water Pollution Control (Effluent and Wastewater) Regulations, 1993

GOVERNMENT OF ZAMBIA

Agriculture (Fertilizers and Feed) 1990, Chapter 351 of the Laws of Zambia

GOVERNMENT OF ZAMBIA

Environmental Impact Assessment Regulations 1994, Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA

The Environmental Protection and Pollution Control Act, No 12 of 1990

GOVERNMENT OF ZAMBIA

National Water Policy, 1994

GOVERNMENT OF ZAMBIA

The Mines and Minerals Act, 1976, Chapter 329 of the Laws of Zambia

GOVERNMENT OF ZAMBIA

The Mining (Dumps) Regulations, 1972, Chapter 329 of the Laws of Zambia, Section 132

GOVERNMENT OF ZAMBIA

The Pesticides and Toxic Substances Regulations, 1994, Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA

The Petroleum (Exploration and Production) Act, 1985

GOVERNMENT OF ZAMBIA

The Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 1993 - Statutory Instrument No 71 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

GOVERNMENT OF ZAMBIA

The Water Pollution Control (Effluent and Wastewater) Regulations, 1993 - Statutory Instrument No 72 of 1993, The Environmental Protection and Pollution Control Act No 12 of 1990

REPUBLIC OF ZAMBIA

The Petroleum Act, 1930, Chapter 424 of the Laws of Zambia

REPUBLIC OF ZAMBIA

The Water Act, 1949, Chapter 312 of the Laws of Zambia

SANKWE M K

Environmental Council of Zambia, P O Box 35131, Lusaka, Zambia; telephone 224009; Personal Communication, May 19, 1995

Appendix E
ENVIRONMENTAL ASSESSMENT CHECKLIST

CONFIDENTIAL

ENVIRONMENTAL ASSESSMENT CHECKLIST

Facility ESES (Former Wood treating Plant) Lusaka
Location Malambo Rd (Heavy Industry Area)
Date Assessed 5/15/95

Prepared for
Zambia Privatisation Agency

CONFIDENTIALITY STATEMENT

This is an internal document, prepared by PH Associates, Inc., for the use of USAID.

The information contained in this document is confidential and proprietary in nature, and is to be used in conjunction with other facts and data for the sole purpose of providing information concerning potential environmental liabilities.

1.0 GENERAL INFORMATION

- 1.1 Facility Name *Zambia Steel & Bldg. Supplies, Ltd*
(*Timber Storage Facility*)
- 1.2 Locations(s)
Door Factory: Kapulu Rd, Lusaka
Head Office: Buyantonshi Rd, Lusaka
ZSBS, Kitwe: Plot 4645 Chingola Rd, Kitwe
- 1.3 Dates of Assessment(s) *5/15/95*
- 1.4 Assessors *J. P. Holloway*

2.0 FACILITY PROFILE

- 2.1 Address *# Malambo Rd*
- 2.2 Telephone
- 2.3 Telex / TWX / Fax ?
- 2.4 Facility Manager / Assessment Contact
Mr. Singh / GM ZSBS, Lusaka
- 2.5 Individuals consulted as part of this assessment, including their affiliation and titles

NAME (S)	TITLE (S)
<i>Mr. Kamuchele</i>	<i>ZSBS Door Factory, Manager</i>
<i>Mr. Banda</i>	<i>ZSBS " " Production Manager</i>

- 2.6 Number of employees full time *closed*
- Number of employees part time
- 2.7 Operational schedule (number of shifts / hours per day / days per week)
- 2.8 Total site area ?
- 2.9 Total number of buildings *7-10*

2.10 Facility inputs (raw materials, chemicals, fuels, lubricants, pesticides, etc) close

Input	Quantity / Year
Wood (lumber)	?
Hardware goods	?
Tanolith	?
Creosote	?
Diesel fuel	?

2.11 Describe facility production processes of environmental consequence

Wood treatment w/ Tanolith dust (Timber merchants were creating wood treatment till 1975 then 25% used till 1977 since then creosote mixed w/ diesel fuel often used (unknown quantities)

2.12 Facility products close

Product	Quantity / Year
Treated wood	?
Lumber	?
Hardware	?

2.13 What sources of energy are used at the facility? (Electric, oil, coal, wood, charcoal)

Electric to run pumps, & timber cutting machines

3.0 FACILITY HISTORY / LAND USE / PERMITS

3.1 Age of facility and date operations began

1st began in 1950's and Timber Merchants Company sold to ZSBS in 1975

3.2 Land use prior to current enterprise

undeveloped

3.3 Is there a history of potentially hazardous solid waste or waste water?

yes, wood treating chemicals create a Toxicity

3.4 Any accidents or spills that may have resulted in environmental contamination?

None observed but wood treating plant closed since 1977, so spills may have occurred

3.5 Do any environmental permits exist, and if so, is the facility in compliance?

unknown (unlikely)

3.6 Review of the sites within one kilometer radius of the site and document other enterprises that may adversely affect the environment at the site through migration of contaminants or other mechanisms.

Facility Name	Location	Problems identified
Noboru Milling Co	west	?
Kamatsu Limited	"	
Match Corp. Limited	North	
Steel Fabrications Limited	"	↓
United Bus Company	"	

3.7 Describe surrounding land use.
Industrial Area

3.8 Describe all operations and processes that are now closed down.
All operations described are closed

4.0 MANAGEMENT / DOCUMENTATION OF POTENTIALLY HAZARDOUS MATERIALS

4.1 Are any potentially hazardous raw materials or products stored and/or used onsite?

Y N List

Substance	Quantity	Use	Lgth of Storage
<i>cruciate</i>	<i>?</i>	<i>sanitizing</i>	<i>?</i>
<i>Tenolite</i>	<i>?</i>	<i>..</i>	<i>?</i>

4.2 Have there every been any incidents or accidents (spills, fires, injuries, etc) involving any of these materials?

Y N Describe
unknown (possible)

4.3 Are incompatible materials segregated and labelled?

Y N Describe
unknown

4.4 Are pesticides stored or used onsite?

Y N List
unknown

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4.5 Based on management knowledge, are there asbestos containing materials onsite?

Y

N

U

Describe

4.6 Describe, in general, the level of environmental safety measures and practices at the site.

unknown

4.7 Review of records from the facility's Maintenance Department for documentation of releases of potentially hazardous materials.

none

4.8 Review of any additional information and documentation concerning areas of environmental concern.

none

5.0 AIR EMISSIONS

5.1 Total number of plant emission sources (stacks and vents) exhausting to the atmosphere.

sawdust cyclone (closed)

5.2 Type of emission and discharge cycle from each source.

Source	Emission	Cycle (continuous, batch)
Sawdust cyclone	wood dust	closed

5.3 Is there an air emission monitoring program?

Y

N

Describe

65

6.5 Does the facility have a pretreatment plant?

Y (N) Describe type of pretreatment

6.6 Has wastewater ever been discharged to onsite lagoons, leach (soak away) fields, septic systems, spray irrigation, or other system?

Y (N) Describe

6.7 Is the wastewater treated by the City Council and does this facility have limitations on quantity or quality of effluent that it will accept?

Y (N) Describe

yes, sewage is treated by council

6.8 Do any wastewater / effluent permits exist?

Y (N) Describe

6.9 Has the facility ever been inspected by permitting authorities?

Y (N) Describe

6.10 Are there restroom facilities onsite and if so, do they discharge to a septic field or other system. What type of system?

Y (N) Describe

Council

6.11 Have any of these systems ever been cleaned or filled?

Y (N) Describe frequency of clean / fill

~~that~~ *NA*

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7.0 WASTE HANDLING, STORAGE, TRANSPORTATION, AND DISPOSAL

7.1 List the facility solid wastes that are not known to be potentially hazardous (trash, scrap metal, pallets, etc)

Closed

Waste Type	Amount Generated
<i>Sawdust</i>	<i>?</i>
<i>wood scraps</i>	<i>?</i>
<i>off cut wood</i>	<i>?</i>

7.2 Where are the non-hazardous wastes stored and disposed of?

landfill or recycled (ie sawdust)

7.3 Does the facility currently generate, store and / or dispose of potentially hazardous wastes?

Y N

possibly; 15 unlabelled drums at wood treatment plant

7.4 In the past, has the facility ever generated, stored or disposed of any potentially hazardous wastes? (Include onsite lagoons, landfills, incinerators or treatment systems.)

Y N Unknown

possibly creosote or Tarolite containing ~~some~~ process wastewater.

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7.5 With regard to 7.4 above, inventory of facility wastes (now or in the past) that are potentially hazardous. *Close*

Waste Type / Storage	Amount Generated
Lubricants	
Oils (transformer, hydraulic)	
Solvents, degreasers	
Pesticides / Herbicides	
Paints, thinners	
Organic Fertilizers / Feeds	
Process wastes (sludges, plating wastes, still bottoms, etc)	
Other waste storage or disposal	

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8.0 STORAGE TANKS

8.1 Inventory of storage tanks (aboveground and underground)

Tank ID	Tank Size (M3)	Tank Material	Material Stored	Tank Age
1		Steel	Concrete Tankage	? + 30yrs
2			diesel fuel/water	? "
NO underground		Tanks	observed	

8.2 Are leak detection systems or groundwater monitoring systems employed?

Y N Describe
 unknown

8.3 Do the tanks meet any design requirements?

Y N Describe
 NA

8.4 Have any tanks been pulled or abandoned?

Y N Describe
 unknown

9.0 POLYCHLORINATED BIPHENYLS

9.1 Have transformers ever been used onsite?

Y N Describe

9.2 Have hydraulic or heat transfer oils ever been used on site?

Y N Describe
 NA

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9.3 Has any transformer, hydraulic, or heat transfer oil ever leaked or been spilled?

Y N Describe NA

9.4 Has a survey ever been made to determine the presence or absence of PCB or PCB-contaminated oil in any operating or scrap units?

Y N Describe NA

10.0 RADIOACTIVE MATERIALS

10.1 Are any wastes generated onsite which contain radioactive materials?

Y N Describe

10.2 Are radioactive materials disposed of onsite or offsite?

Y N Describe disposal methods, containment etc

11.0 NOISE

closed

11.1 Does the facility generate high levels of noise?

Y N Describe

NA

11.2 Have there been any complaints regarding noise from neighbours?

Y N Describe

NA

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12.0 EMERGENCY PLANS

12.1 Does the facility have an Emergency Plan covering environmental emergencies and involving local authorities?

Y

N

Describe

12.2 Does the facility have an emergency response team?

Y

N

Describe

13.0 ENVIRONMENTAL SETTING

13.1 Describe topography (flat terrain, valley, vegetation).

generally flat w/ slight slope towards north

13.2 Soils / geology

13.2.1 Have soil borings and sampling activities ever been conducted? If yes, how many and describe:

Y

N

Unknown

13.2.2 Is there any observed soil contamination at the site?

Y

N

Unknown

13.3 Groundwater / hydrogeology

13.3.1 Depth to groundwater ?

13.3.2 Is there evidence that groundwater is affected by pollution? ?

13.3.3 Location of all operating and abandoned onsite wells (provide map if possible).

1 operating Borehole (SE corner of facility)

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13.3.4 Well / borehole information (all operating and abandoned wells / boreholes). unknown

Well	Date Installed	Diameter	Depth	Pump rate	Yield per day

13.3.5 Have any groundwater samples ever been taken and analyzed?

Y

N

U

If yes, provide most recent results

13.3.6 Have any groundwater studies been carried out? (ie pumping tests etc)

Y

N

U

Are they available?

13.4 Site drainage and surface water

13.4.1 Are there any surface water bodies known to be contaminated by any source in this area?

Y

N

Describe

13.4.2 How is rain / storm water collected, where does it flow, and is there flooding during the rainy season?

stormwater drains onsite then discharged into unlined, open ditch along front of facility (water)

13.4.3 Any potential for adverse impacts to stormwater runoff due to operations or waste management practices at the facility?

yes soil & groundwater impact (past)

13.4.4 Is there potential for rain to fall directly onto chemicals or other materials that might have an effect on soils or groundwater?

110

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14.0 SUMMARY OF ATTACHMENTS REQUESTED

Check items received

Site maps of the facility identifying buildings, structures, and drainage details for inclusion in our report

Y N

Aerial photographs

Y N

Process flow diagrams for each process at the facility

Y N

Materials/Chemical inventory listing including quantities stored onsite, onsite use, and monthly usage and disposal rate

Y N

Copies of all environmental permits (discharge, etc.)

Y N

Data concerning any releases or spills of materials/chemicals at the facility

Y N

Address and type of industry listing of enterprises neighboring your facilities

Y N

Copy of laboratory analyses of process waste streams (liquid and solid)

Y N

Underground storage tanks; construction details, number, capacities, and use

Y N

Any information about the geologic and groundwater conditions at the facilities (i.e. soil types, depth to groundwater, onsite wells including depth, production, construction details, and groundwater laboratory analyses, etc.)

Y N

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15.0 ADDITIONAL COMMENTS AND SKETCH OF SITE

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Appendix F
FACILITY RECORDS

**NO FACILITY RECORDS WERE
AVAILABLE FOR THIS SITE**