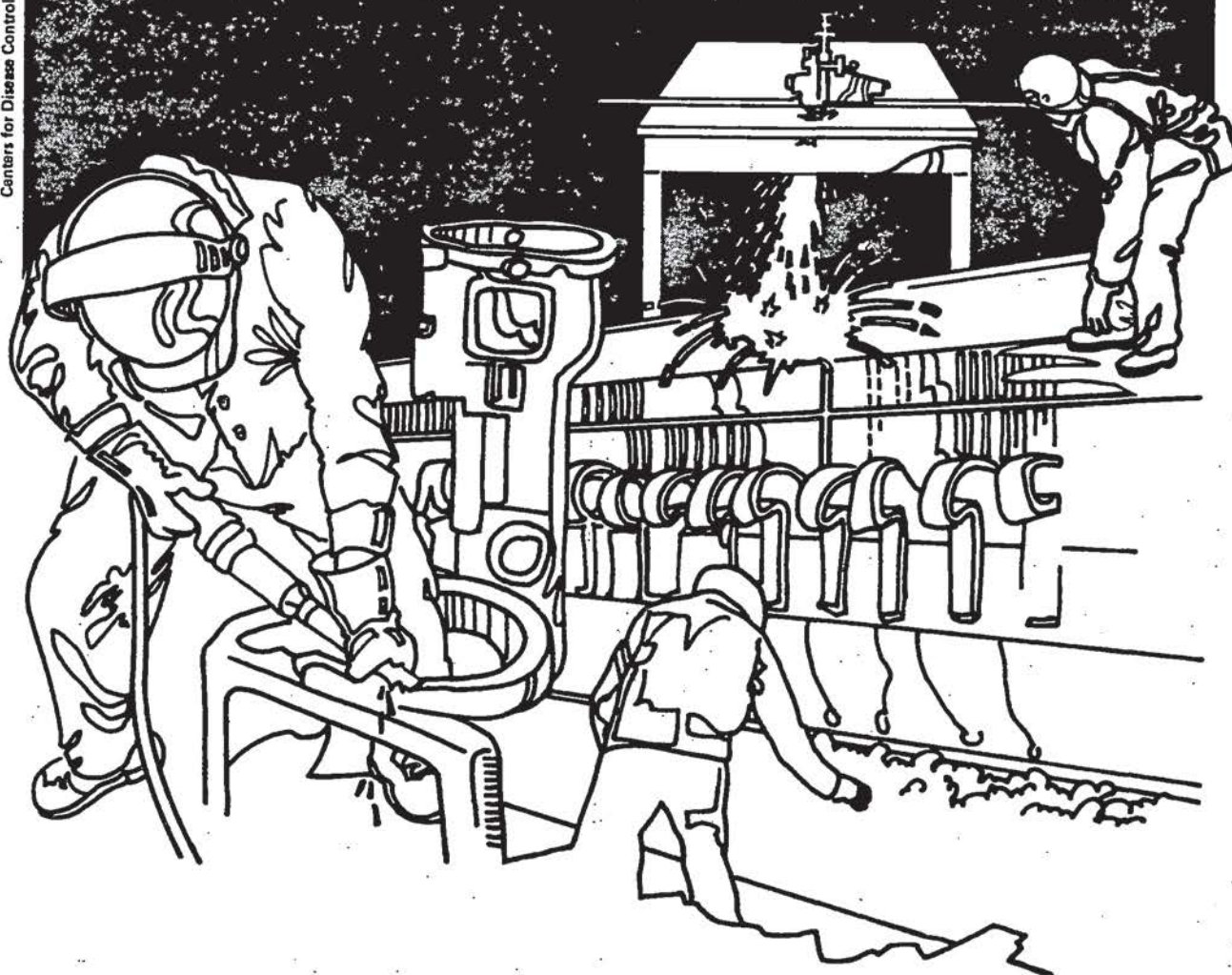


NIOSH



Health Hazard Evaluation Report

HETA 84-013-1504
SEA-LAND SERVICE, INC.
SEATTLE, WASHINGTON

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HHE 84-013-1504
SEPTEMBER 1984
SEA-LAND SERVICE, INC.
SEATTLE, WASHINGTON

NIOSH Investigators:
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I. SUMMARY

In October 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate symptoms of irritation, headaches, and sleepiness in the clerical, maintenance, and managerial staff at Sea-Land Service, Inc., Seattle, Washington. These symptoms were believed to be related to nearby road construction activities involving contaminated soil.

On October 20, 1983, NIOSH investigators conducted an initial survey. A medical survey was conducted on December 12 and 13, during which interviews were conducted with the affected employees. On February 24, 1984, the environmental specialist from the Port of Seattle was interviewed and copies of their sampling data obtained. A subsequent visit was made on June 5, 1984.

Soil samples taken by the Port of Seattle at Terminal 5 near Sea-Land Service contained arsenic (to 55 ppm), cadmium (to 17 ppm), chrome (to 68 ppm), copper (to 890 ppm), cyanide (to 6600 ppm), lead (to 2200 ppm), nickel (to 63 ppm), and zinc (to 6600 ppm). They also contained creosote and a number of polynuclear aromatic hydrocarbons (anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, phenanthrene, pyrene, etc). Total hydrocarbons were up to 6.0 ppm in drilled holes in the soil. Background levels above the surface ranged from 0.2 to 0.9 ppm.

The employees reporting symptoms worked in an office area or in the maintenance facility. Numerous complaints were received in 1981 and 1982. In 1983 the majority of complaints (47 of 53) occurred on 3 days: May 5, June 23 and September 30. The main symptoms included headaches, skin rash, eye and throat irritation, nausea, and dizziness. In June 1983, the Harborview Occupational Medical Clinic examined 22 workers who had been exposed to the dirt in the construction area. In addition, 22 Sea-Land workers, who were near the construction area, were examined. This clinic could not conclusively associate the symptoms of the Sea-Land employees with exposure to the nearby construction work. Interviews conducted by NIOSH personnel in December 1983 supported this conclusion.

On the basis of our investigation and the investigation conducted by the Harborview Occupational Health Center, we determined that a health hazard did not exist at Sea-Land Service, Inc., from exposure to excavated dirt. Concern over the composition of the dirt and the lack of information available to Sea-Land and their employees probably contributed significantly to the reported episodes.

KEYWORDS: SIC 4463 (Marine Cargo Handling) air pollution, indoor air pollution, soil contamination.

II. INTRODUCTION

In October 1983, NIOSH received a request for a health hazard evaluation at Sea-Land Service, Inc., Seattle, Washington. The request was submitted by the management of Sea-Land and asked NIOSH to evaluate employee complaints of irritation, headaches, and sleepiness in the clerical and managerial areas of the plant. NIOSH made an initial site visit to the plant on October 20, 1983. This was followed by a NIOSH medical visit on December 12 and 13, 1983 and a subsequent visit on June 5, 1984.

III. BACKGROUND

Sea-Land Service, Inc., is a large container shipping operation with multiple locations throughout the world. A large facility is located at Terminal 5 at the Port of Seattle. At this location, semi-trailer sized cargo containers are loaded on or unloaded off ships that arrive from and depart to Alaska and the Orient. The containers arrive and depart the facility by truck. Some containers are packed and unpacked at the facility. There are several different areas in this facility including a marine yard, a maintenance garage, a large warehouse connected to the Alaska terminal office area (T1), and a warehouse and office area for the Far East Shipments (T2) (see Figure 1).

Terminal 5 is located at the mouth of the Duwamish River at Elliot Bay on Puget Sound. This area was originally part of the tide flats. Over a period of years, land fill was brought in. In addition, a number of firms have occupied portions of this area and deposited some of their waste material. Some of the current and former industries in the area include a creosote wood treatment facility, a steel mill, a secondary lead smelter, ship building and others.

In the spring of 1983, the Port of Seattle began construction of a new road along the southern and western sides of the Sea-Land facility. During construction a large amount of structurally unsuitable dirt was removed from the area, part of which was stockpiled at a location at the southern end of the Sea-Land facility. In May 1983 it was learned that this soil was contaminated with toxic chemicals. During the late spring and summer of 1983 employees from the Sea-Land garage facility and Sea-Land office area began to complain of symptoms which they attributed to exposure to this dirt. The symptoms experienced by the maintenance garage personnel were principally headache and skin rash. The bulk of the complaints were received on May 5. In the office area most of the complaints were either headache, fatigue, or eye irritation. Numerous complaints were filed in late June followed by a second group on September 30, 1983.

In addition to Sea-Land personnel, a number of construction workers, Port of Seattle workers, and residents were potentially exposed to the dirt either at the excavation site or elsewhere where the dirt was dumped. Representatives from each of these groups were evaluated by the Harborview Medical Center Occupational Medicine Clinic at the request of the Port of Seattle. The interviews and examinations took place during June, and a report was issued on August 12, 1983. There were three major conclusions of the evaluation.

1. Symptoms reported were consistent with an irritating toxic exposure, particularly among those most heavily exposed.
2. The results indicated that the irritating chemicals caused short term irritation but was unlikely to cause chronic problems unless the exposure was repeated over a long period of time. Of the chemicals found during analysis of the soil, cresol appeared to be the most likely to have caused the observed symptoms.
3. The excavated materials, as they were stored at the time of the report, did not pose an imminent health hazard to those working or living near them.

IV. EVALUATION DESIGN AND METHODS

A. Environmental

Environmental air samples were not collected by NIOSH during this investigation since 1) the Port of Seattle had ceased all work on the road project adjacent to Terminal 5 and a large portion of the exposed dirt was covered with plastic; 2) the adverse health effects were episodic and during the investigation there were no employee complaints of health effects; 3) prior to the investigation, Sea-Land found deficiencies in the office ventilation system which they corrected; and 4) prior to the NIOSH investigation the Port of Seattle collected a series of soil samples along the roadbed in the construction area. Results of these sample analysis were obtained from the Port of Seattle and reviewed by NIOSH investigators.

B. Medical

During the initial site visit the NIOSH medical officer interviewed the plant health and safety officer, the requestor, and the union steward for the office area. A list of recently-filed compensation claims and a tabulation of complaints compiled by the plant health and safety officer were reviewed. In addition, he made arrangements to obtain employee rosters for the office areas and maintenance garage. Finally, the report issued by the Harborview Occupational Medicine Clinic was reviewed.

During the follow-up medical visit, the Medical Officer interviewed five people from the office area selected from the complaint list; eight people from the maintenance garage area selected from the complaint list; and three individuals from the yard area identified by the plant health and safety officer. The purpose of these interviews was to determine if significant symptoms or disease existed that would necessitate a more extensive medical survey. No questionnaire was used.

Finally, on February 24, 1984, the NIOSH medical officer interviewed an environmentalist with the Port of Seattle concerning the most recent findings about the chemical composition of contaminants in the dirt excavated from the Terminal 5 site adjacent to the Sea-Land facility.

V. EVALUATION INFORMATION

Building-related illness episodes have been reported more frequently in recent years as buildings have been made more air-tight in order to conserve energy and to reduce air conditioning expenses. Modern high-rise office buildings are constructed primarily of steel, glass, and concrete, with large windows that cannot be opened, making the building totally dependent on mechanical systems for air conditioning. Contaminants may be present in make-up air or may be introduced from indoor activities, furnishings, building materials, surface coatings, and air handling systems and treatment components. Symptoms often reported are eye, nose, and throat irritation, headache, fatigue, and sinus congestion. Occasionally, upper respiratory irritation and skin rashes are reported. In some cases, the cause of the symptoms has been ascribed to an airborne contaminant, such as formaldehyde, tobacco smoke, or insulation particles, but most commonly a single cause cannot be pinpointed.

Imbalance or malfunction of the air conditioning system is commonly identified, and in the absence of other theories of causation, illnesses are usually attributed to inadequate ventilation, heating/cooling, or humidification.

VI. RESULTS AND DISCUSSION

A. Environmental

Soil samples, collected by the Port of Seattle along the new access road in July 1983, contained arsenic (to 55 ppm), cadmium (to 17 ppm), chrome (to 68 ppm), copper (to 890 ppm), cyanide (to 6600 ppm), lead (to 2200 ppm), nickel (to 63 ppm), and zinc (to 6600 ppm). They also contained creosote and a number of polynuclear aromatic hydrocarbons (anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, phenanthrene, pyrene, etc). Total hydrocarbon vapors were measured above the ground for the background levels and in holes drilled 2 to 3 feet in the ground.

The surface background levels ranged from 0.2 to 0.9 ppm total hydrocarbons. These are normal background levels for this type of location. As there is little vegetation in the terminal area, most of the hydrocarbons would be from gasoline vapors from cars and trucks and from incomplete combustion products. A portion could also arise from other nearby industries and from volatile material emanating from the soil such as methane or other chemicals as a result of soil pollution.

Nine of the 28 holes had total hydrocarbon concentrations in the holes that were higher than their corresponding background levels above ground. Six of these were barely above background levels and the other three were 0.8 - 6.0 ppm higher than corresponding background levels.

The ventilation system in the T1 office area was installed in a piece-meal fashion and its maintenance had been relatively poor in the past. This may have contributed to some of the complaints. Prior to this request, Sea-Land management made an investigation of the heating, ventilation and air conditioning system. Several deficiencies, such as closed intake air louvers and poor air distribution, were found and corrected. The system was examined and the changes reviewed.

Several years ago a few employees were experiencing skin rashes from handling carbonless paper. The use of carbonless paper has since decreased. No new material or materials commonly associated with indoor air pollution problems were observed.

On June 5, 1984, during a follow-up visit, the wind was out of the north and a strong odor of creosote from the nearby wood treatment facility was evident at the Sea-Land buildings. The predominant wind is from the south so this odor is not a regular occurrence. This creosote odor is unpleasant and may produce a headache in some individuals if the odor persists for a work shift.

B. Medical

Review of the list of complaints compiled by the health and safety officer at Sea-Land showed that numerous complaints of skin rash, eye irritation, and headache had occurred during 1981 and 1982. On May 5, 1983, twenty individuals from the garage and maintenance areas of Sea-Land reported symptoms. Of these individuals, twelve reported headache alone, one skin rash alone, four headache and skin rash, one headache and sneezing, one a "weird" feeling upon awakening, and one headache, sore throat, and sinus congestion. On June 6, 1983, one individual from the maintenance garage area reported a headache. On June 20, one individual reported headache and one

reported headache and nausea. On June 23, nine individuals from the Far East Terminal (T2) office area reported symptoms. Most were either headaches or eye irritation. During June 27-29, four individuals from the maintenance garage reported symptoms, mainly headache and throat irritation. On July 6, one individual reported a skin rash and on September 30, eighteen individuals from the Alaska terminal office area (T1) reported symptoms. Of these eighteen, three reported headache, two reported nausea, three reported headache and nausea, and the remainder reported a combination of headache, nausea, dizziness, running nose, and/or exhaustion (see Figure 2).

Five office workers from T1 who had reported symptoms on September 30, were interviewed in December during the medical follow-up visit. One reported headaches not specifically associated with her current work area; one reported occasional headaches and nausea with no specific pattern except that they were worse during clear weather. This person also felt that the ventilation was unsatisfactory in her work area. One reported an increased frequency of headaches since the dirt "scare." This person also complained of temperature control and ventilation problems in her work area; one person reported headaches and nausea during the summer but not at the time of the interview. This person also complained of poor air circulation and temperature control in the work area. Three of the five had the impression that their symptoms increased during clear weather and that rain cleared the air, causing a reduction in symptoms.

The medical officer interviewed three people from the loading dock area. Two of these individuals complained of cuts that had not healed over the last year or two. Examination of both of these individuals revealed healing wounds on the hands and forearms. The third individual was asymptomatic. All three expressed concern about the dirt and the potential for exposure to toxic chemicals from it.

Finally, nine of the individuals from the maintenance garage who reported complaints during either May or June 1983 were interviewed. One individual had stress headaches occasionally associated with work. One individual reported that he had a rash on his leg during early summer and that he had a prior history of skin rashes on his hand for the last two years. He had frequent work exposure to solvents, oils, and spray paints. One other individual also reported a rash on his arms which started in July and cleared in October. He felt that it might be a heat rash and was unable to relate it with any exposure at work or change in work practices. None of the other six individuals from the garage and maintenance area reported any symptoms that related to work.

On June 5, 1984, the management reported that they had not received any employee complaints for several months.

Review of the evaluation done by the Harborview Occupational Medicine Clinic showed that none of the Sea-Land employees examined were in the category labelled "high exposure to dirt." Those individuals seen who had symptoms which were highly work related and who were either very highly or highly exposed to the "dirty" dirt were construction personnel working directly in the excavation area for the Valley Cement Company.

VII. DISCUSSION AND CONCLUSIONS

Based on the results of the environmental and medical evaluation conducted at Sea-Land during 1983 and 1984, NIOSH investigators determined that no health hazard to Sea-Land employees from exposure to excavation dirt existed. However, concern over the dirt and the lack of information available to Sea-Land employees concerning the composition of the dirt and its potential for being a health hazard probably contributed significantly to the reports of symptoms received by the health and safety officer at Sea-Land. Some efforts were made by Sea-Land and the Port of Seattle to provide information about the dirt; however, these efforts appear to have been insufficient given the level of anxiety which this potential exposure provoked.

Exposures to solvents and oils in the Sea-Land maintenance garage occur on a daily basis depending on job type. These exposures may have contributed to the skin rashes reported by the two individuals there. Improvements in work practices and substitution of less toxic solvents might help to prevent reoccurrence of this problem.

The cause of symptoms reported by the office personnel at Sea-Land is not clear. The ventilation system in the T1 office area was installed in a piece meal fashion, and its maintenance has been relatively poor in the past. This may have contributed to some of the complaints. However, no new materials or materials commonly associated with indoor air pollution problems were observed during the NIOSH Hazard Evaluation. In addition, smoking appears not to have been a major factor as symptoms occurred even in the nonsmoking areas. Although poor temperature control in work areas was reported by two office workers, temperature monitoring done by Sea-Land personnel and reviewed by NIOSH suggests that temperature has been, in fact, quite stable.

Finally, location of the Far East Terminal adjacent to wood treatment plant which uses creosote and tars may have been a factor in complaints there. During clear weather, the wind may have been from a more northerly direction and carried odors from the wood treatment plant to the Far East Terminal.

VIII. RECOMMENDATIONS

1. Maintain the heating-ventilation-air conditioning system in top condition by making inspections and measurements on a scheduled basis.
2. Maintain a log of all employee health complaints and note the environmental conditions (wind direction, etc.) at the time and activity on the road construction.

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Sea-Land Services, Inc., Seattle, Washington.
2. Washington State Department of Labor and Industries, Olympia, Washington.
3. U. S. Department of Labor, Occupational Safety and Health Agency (OSHA), Region X, Seattle, Washington.

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

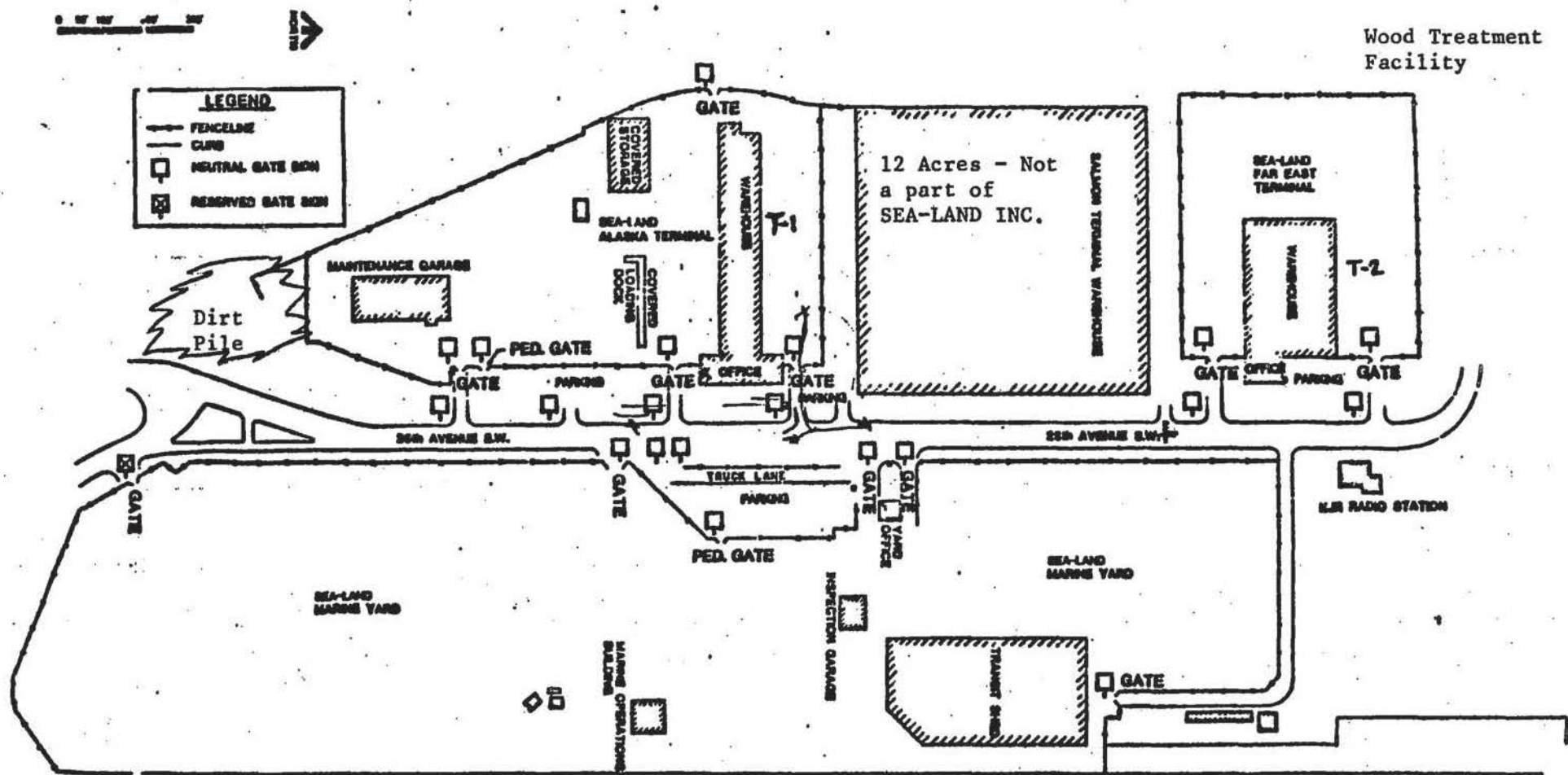


Figure 2. Reports of Symptoms, Sea-Land, Seattle, Washington, May 1 - October 30, 1983

